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County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

October 11, 2017

Mr. Scott Glenn, Director
Office of Environmental Quality Control
State of Hawai'i, Department of Health
235 South Beretania Street, Room 702
Honolulu, HI 96813

Subject: Draft Environmental Assessment and Anticipated Finding of No Significant Impact for the South Hilo Sanitary Landfill Final Closure, South Hilo, Island of Hawai'i, TMK (3) 2-1-013:152, 156, and 162

Dear Mr. Glenn:

With this letter, the County of Hawai'i Department of Environmental Management (DEM) hereby transmits the draft environmental assessment and anticipated finding of no significant impact (DEA-AFONSI) for the South Hilo Sanitary Landfill (SHSL) Final Closure situated at TMK parcels 2-1-013:152, 156 and 162 on the Island of Hawai'i for publication in the next available edition of The Environmental Notice.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, and Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of action in a text file by electronic mail to your office.

Should you have any questions, please contact Mr. Gregory Goodale, Solid Waste Division Chief at (808) 961-8515 (Gregory.Goodale@hawaiicounty.gov), or Ms. Rebecca Candilasa of Wilson Okamoto at (808) 946-2277.

Sincerely,

William A. Kucharski
Director

cc: Rebecca Candilasa, Wilson Okamoto
Gregory Goodale, Solid Waste Division Chief
Aaron Kreitzer, HDR, Inc.

10-180

AGENCY
PUBLICATION FORM

Project Name:	South Hilo Sanitary Landfill Final Closure
Project Short Name:	SHSL Final Closure
HRS §343-5 Trigger(s):	"Propose the use of state or county lands or the use of state or county funds"
Island(s):	Hawai'i
Judicial District(s):	South Hilo
TMK(s):	2-1-013: 152, 156, and 162
Permit(s)/Approval(s):	FAA Form 7460-1 "Notice of Proposed Construction or Alteration"; Traffic Assessment; Authorization for use of TMK (3) 2-1-013:162; State Department of Health approvals; NPDES Permit for Storm Water Discharges from Construction Activities; Final drainage system design approval; Grading Permit
Proposing/Determining Agency:	County of Hawai'i Department of Environmental Management
Contact Name, Email, Telephone, Address	Gene Quiamas 345 Kekūanāo'a Street, Suite 41 Hilo, Hawai'i 96720 T (808) 961-8270 F (808) 961-8553 Gene.Quiamas@hawaiicounty.gov
Accepting Authority:	(for EIS submittals only)
Contact Name, Email, Telephone, Address	
Consultant:	Wilson Okamoto Corporation
Contact Name, Email, Telephone, Address	Rebecca Candilasa 1907 South Beretania Street, Suite 400 Honolulu, Hawai'i 96826 T (808) 946-2277 F (808) 946-2253 rcandilasa@wilsonokamoto.com

Status (select one)	Submittal Requirements
X DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.

Project Summary

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

The County of Hawai'i Department of Environmental Management Solid Waste Division is planning to permanently close the South Hilo Sanitary Landfill (SHSL) located in East Hawai'i. Based on the available airspace and current daily loads, the SHSL is expected to reach its permitted maximum capacity within the next two years. With limited capacity at the existing landfill, significant constraints to expanding the existing landfill or establishing a new landfill in East Hawai'i, and a steady East Hawai'i waste stream, closure of the SHSL is imminent. Therefore, the proposed action is to close the existing landfill in compliance with State and federal rules and regulations while continuing to meet long-term waste management objectives by implementing waste diversion strategies and hauling residual waste from the East Hawai'i waste stream to the West Hawai'i Sanitary Landfill (WHSL) in Pu'uanahulu.

Proposed improvements associated with final closure of the landfill consist of placing a final cover system on the top and side slopes of the landfill, installing a new passive landfill gass venting system, and constructing a new storm water detention and infiltration basin to accommodate the additional storm water runoff generated by the final cover. Prior to installation of the final cover, the slopes will be slightly regraded to the final design grade and a maintenance access road will be provided along with a perimeter ditch to direct the flow of storm water runoff to the proposed detention basin.

Draft Environmental Assessment

South Hilo Sanitary Landfill Final Closure

Hilo, Hawai‘i Island, Hawai‘i

Prepared For:

Prepared By:

October 2017

DRAFT ENVIRONMENTAL ASSESSMENT

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

District of South Hilo
Island of Hawaiʻi, State of Hawaiʻi
Tax Map Keys: (3) 2-1-013: 152, 156 and 162

Prepared For:

County of Hawaiʻi
Department of Environmental Management
Solid Waste Division
345 Kekūanāoʻa Street, Suite 41
Hilo, Hawaiʻi 96720

HDR, Inc.
1132 Bishop Street, #1200
Honolulu, Hawaiʻi 96813

Prepared By:

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1907 South Beretania Street, Suite 400
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WOC Job No. 10289-01

OCTOBER 2017

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LIST OF ACRONYMS AND ABBREVIATIONS

AFONSI	Anticipated Finding of No Significant Impact
ALISH	Agricultural Lands of Importance to the State of Hawai‘i
BMP	Best Management Practices
CDP	Census Designated Place
CE	Common era
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
cy	Cubic yards
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DBEDT	Department of Business, Economic Development and Tourism
DEM	County of Hawai‘i Department of Environmental Management
DHHL	State of Hawai‘i Department of Hawaiian Homelands
DLNR	State of Hawai‘i Department of Land and Natural Resources
DOH	State of Hawai‘i Department of Health
DOT	State of Hawai‘i Department of Transportation
DWS	County of Hawai‘i Department of Water Supply
EA	Environmental Assessment
E.O.	Executive Order
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FWCA	Fish and Wildlife Coordination Act
GHG	Greenhouse gas
H_2S	Hydrogen sulfide
H_2O	Water
HAR	Hawai‘i Administrative Rules
HDR	HDR Engineering, Inc.
HRS	Hawai‘i Revised Statutes
IPCC	Intergovernmental Panel on Climate Change
IRSWMP	Integrated Resources and Solid Waste Management Plan
KMR	Keaukaha Military Reservation
LSB	Land Study Bureau
LUC	State Land Use Commission
LUPAG	Land Use Pattern Allocation Guide
MGD	Million gallons per day
msl	Mean sea level
MSW	Municipal solid waste

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

MSWLF	Municipal solid waste landfill
NAAQS	National Ambient Air Quality Standards
NHPA	National Historic Preservation Act
NO_2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
O_3	Ozone
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
OP	State of Hawaiʻi Office of Planning
Pb	Lead
PM_X	Particulate matter
RCRA	Resource Conservation and Recovery Act
ROD	Rapid ʻŌhiʻa Death
rPAE	Papai extremely stony muck
SDWA	Safe Drinking Water Act
SHPD	State Historic Preservation Division
SHSL	South Hilo Sanitary Landfill
SMA	Special Management Area
SO_2	Sulfur dioxide
TMK	Tax Map Key
UIC	Underground Injection Control
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UV	Ultraviolet
VOC	Volatile organic compounds
WHSL	West Hawaiʻi Sanitary Landfill

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SUMMARY

Project Name:	South Hilo Sanitary Landfill Final Closure
Location:	South Hilo District, Island of Hawaiʻi, State of Hawaiʻi
Tax Map Keys (TMKs):	(3) 2-1-013: 152, 156, and 162
Proposing Agency:	County of Hawaiʻi Department of Environmental Management Solid Waste Division 345 Kekūanāoʻa Street, Suite 41 Hilo, HI 96720
Recorded Fee Owner:	State of Hawaiʻi
Existing Use:	Landfill
State Land Use Classification:	Urban; Agricultural
County General Plan Designation:	Important Agricultural Lands
County Zoning Designation:	General Industrial (MG-1) and Agricultural (A-20a)
Proposed Action:	The County of Hawaiʻi Department of Environmental Management Solid Waste Division (County) is planning to permanently close the South Hilo Sanitary Landfill (SHSL) in accordance with Resource Conservation and Recovery Act (RCRA) Subtitle D requirements. Based on the available airspace and current daily loads, the SHSL is expected to reach its permitted maximum capacity within the next two years. With limited capacity at the existing landfill, significant constraints to expanding the existing landfill or establishing a new landfill in East Hawaiʻi, and a steady East Hawaiʻi waste stream, the closure of SHSL is imminent. Proposed improvements associated with final closure of the landfill consist of installing a final cover system on the top and side slopes of the landfill, installing a new passive landfill gas venting system, and constructing a new storm water detention and infiltration basin. Prior to installation of the final cover, the slopes will be slightly regraded and a maintenance access road will be provided along with a perimeter ditch to direct the flow of storm water runoff.

Impacts:	The proposed action may result in temporary air quality and soil erosion impacts associated with construction activities. These impacts will be mitigated through implementation of best management practices (BMPs) and adherence to federal, state, and county rules and regulations. With closure of the landfill, a reduction in noise, odors, and fugitive dust will produce positive benefits in the area.
Determination:	Anticipated Finding of No Significant Impact (AFONSI)

1. INTRODUCTION

1.1 Project Scope and Authority

The County of Hawaiʻi Department of Environmental Management, Solid Waste Division (hereafter referred to as the “County”) is planning to permanently close the South Hilo Sanitary Landfill (SHSL) located in the South Hilo District of Hawaiʻi Island. See Figure 1-1. The proposed action (also referred to herein as the “Project”) involves placing a final cover system on the top and side slopes of the landfill, installing a new passive landfill gas venting system, and constructing a new storm water detention and infiltration basin.

The Project requires the use of State lands and is, therefore subject to the State environmental review process. In accordance with Chapter 343, Hawaiʻi Revised Statutes (HRS) and Title 11, Chapter 200, Hawaiʻi Administrative Rules (HAR), this environmental assessment (EA) has been prepared to identify the potential environmental, social, cultural and economic impacts associated with the Project and to evaluate the potential significance of each impact. Pursuant to HRS 343-5(b), the County is the proposing agency and will determine the significance of potential environmental impacts.

The Project will utilize federal funds through the Clean Water State Revolving Fund (CWSRF) program administered by the State of Hawaiʻi. The use of federal funds would constitute a federal action and will require the Project to comply with CWSRF program requirements and cross-cutting federal authorities set forth in the CWSRF regulations at 40 CFR § 35.3145. A discussion on the Project’s compliance with these requirements is provided in Chapter 6 of this document.

1.1.1 State and Federal Regulatory Requirements on Landfill Closures

The federal government regulates solid wastes in the United States under Title 40 of the Code of Federal Regulations Subchapter I (40 CFR Parts 239 to 299). Municipal solid waste (MSW) landfills are subject to the regulations in 40 CFR Parts 257 to 258 (also known as Resource Conservation and Recovery Act (RCRA) Subtitle D). Closure criteria under 40 CFR Part 258, Subpart F states that owners and operators of all MSW landfill units must install a final cover system that is designed to minimize infiltration and erosion and prepare a written closure plan that describes the steps necessary to close all MSW landfill units.

RCRA Subtitle D regulations also require the owner or operator of the landfill to prepare a post-closure plan and perform post-closure monitoring and maintenance on the landfill for 30 years after it closes to ensure the former landfill does not become a risk to public health and safety. Post-closure monitoring and maintenance activities applicable to the SHSL include:

- Maintaining the final landfill cover, and making repairs if necessary, to ensure that the effects of settlement, subsidence, erosion, or other events do not breach the integrity of the cover system;
- Monitoring groundwater for contamination and performing remedial actions if necessary; and
- Maintaining and operating a gas monitoring system.

The State of Hawaiʻi Department of Health (DOH) Environmental Management Division, Solid and Hazardous Waste Branch, Office of Solid Waste Management, is responsible for implementing RCRA and the State's solid waste management rules and regulations, including HAR 11-58.1 which regulates landfills, composting facilities, recycling operations, used oil transporters and salvage yards. Accordingly, DOH will be the agency responsible for approval of the final cover system design, final closure plan and post-closure plan for SHSL.

HDR, Inc. has been contracted by the County to assist in meeting State and federal regulatory requirements on landfill closures.

1.2 Purpose and Need

The SHSL is the only MSW landfill in East Hawaiʻi. Based on available airspace and current daily loads, the County expects the landfill will reach its permitted maximum capacity within the next two years. Although various options to expand the existing landfill or to find an alternative landfill site in East Hawaiʻi have been explored over the years, several significant constraints have thwarted these efforts. Hence, the *Final Report of the Hilo Landfill Feasibility Study* prepared for the County (March, 2012) concluded that "while technically feasible, it is neither practical nor economically sound to proceed with design and permitting a landfill expansion in Hilo. Permitting constraints, land use constraints, and leachate management issues all present significant and, perhaps, insurmountable obstacles. Furthermore, based on our planning level cost estimates, trucking and disposal of waste at the existing West Hawaiʻi Sanitary Landfill provides a potentially feasible and more cost effective disposal alternative."

With expansion of the existing landfill, leachate management in a high rainfall area such as East Hawaiʻi is a major constraint under the permitting requirements of RCRA Subtitle D. Unlike the existing landfill, which is unlined, the expanded portion would now require a liner to capture leachate for treatment prior to disposal. Developing leachate treatment options would be costly, such as with new constructed on site treatment wetlands or a major upgrade to the Hilo Wastewater Treatment Plant to which the collected leachate would need to be transported to by trucks. With opening a new East Hawaiʻi landfill, issues with finding a location such as the cost to relocate existing uses, conflicts with planned uses by current owners/users or environmental justice resolution present major obstacles. While such issues could conceivably be addressed at significant cost and over time, no alternative would be available in time to continue landfill disposal in East Hawaiʻi before the existing landfill reaches capacity. Therefore, the purpose of the proposed action is to close the existing landfill in compliance with State and federal rules and regulations while continuing to meet long-term waste management objectives by implementing waste diversion strategies and hauling residual waste from the East Hawaiʻi waste stream to the WHSL.

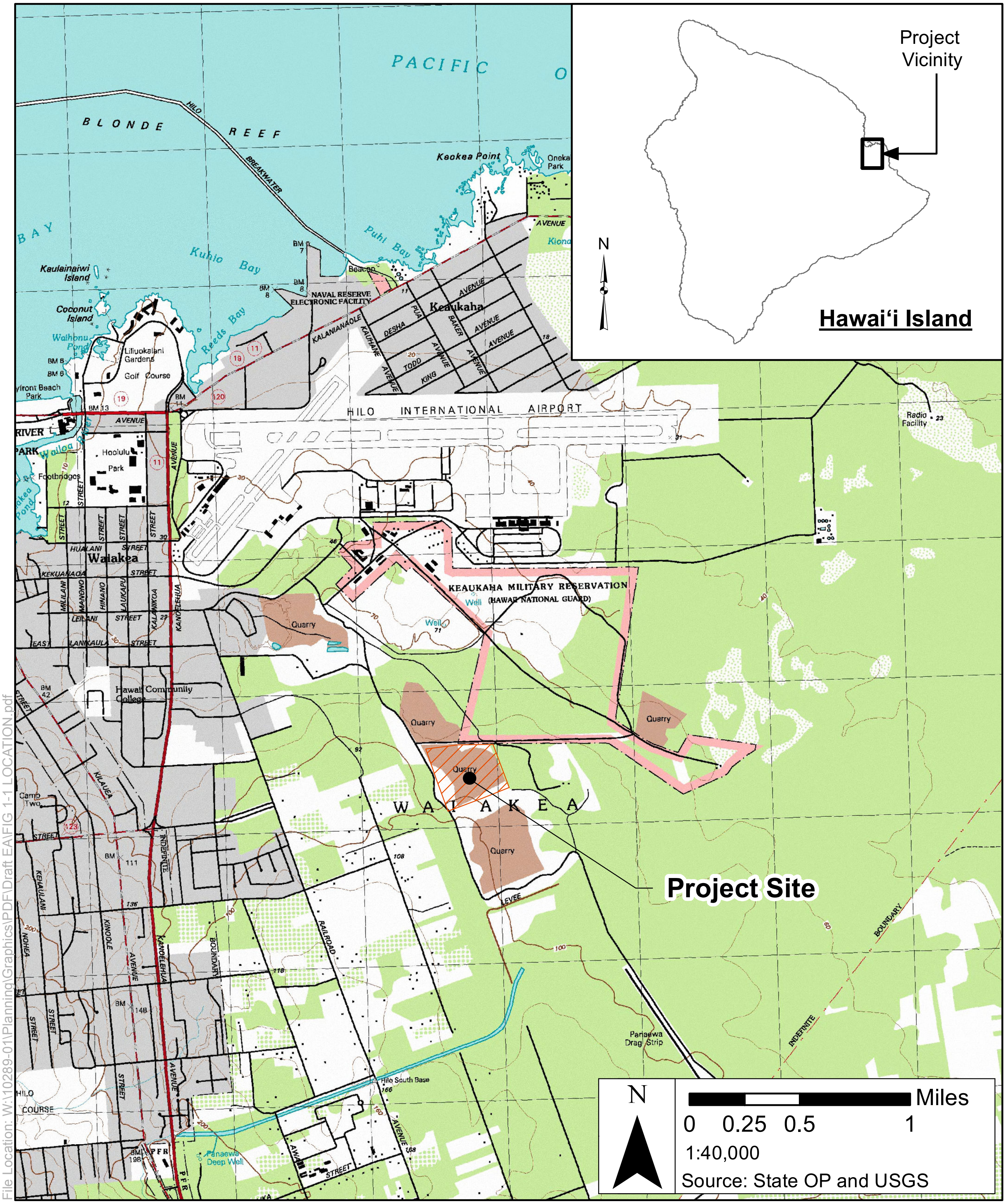

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FIGURE 1-1

LOCATION MAP

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

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2. PROJECT DESCRIPTION

2.1 Project Location

The SHSL is an active 41.3 acre unlined MSW landfill located approximately one mile east of Kanoelehua Avenue (State Route 11) in the South Hilo District of Hawaiʻi Island, Hawaiʻi. The landfill consists of approximately 23.2 acres of exterior side slopes at a ratio of 2:1 (horizontal:vertical), 4.3 acres of drainage terraces and 13.9 acres of top deck with a more gradual slope of approximately 5% (100:5). The landfill sits on land identified as Tax Map Key (TMK) (3) 2-1-013: 152 and 156. A new detention basin is proposed at an adjacent parcel identified as TMK (3) 2-1-013: 162 (See Figure 2-1). All three parcels are owned by the State of Hawaiʻi and are under the control and management of the County of Hawaiʻi for sanitary landfill purposes under Executive Order (E.O.) 2841 for parcel 152; E.O. 3975 for parcel 156; and a pending E.O. for parcel 162. The County is currently working with the State of Hawaiʻi Department of Land and Natural Resources (DLNR) to consolidate and re-subdivide the parcels to conform with their current and proposed use.

2.1.1 Surrounding Uses

Prior to its use as a landfill, the Project area was associated primarily with modern commercial quarrying activities. Today, the SHSL site is immediately bounded on all sides by vacant land which serves as a natural buffer between the landfill and the surrounding area. A sort station, green waste mulching site, HI-5 redemption center, and the Hilo transfer station are in the vicinity northwest of the landfill. Several active quarries are also in the vicinity. Other nearby uses include the Keaukaha Military Reservation (KMR) of the Hawaiʻi Air National Guard and the Hilo International Airport to the north; the Panaʻewa Drag Strip to the south; and the Department of Hawaiian Home Lands Panaʻewa Farmlots and residences to the west and southwest. See Figure 2-2.

2.2 Proposed Action

Final closure of SHSL will involve placing a final cover system on the top and side slopes of the landfill, installing a new passive landfill gas venting system, and constructing a new storm water detention and infiltration basin. Prior to installation of the final cover, the slopes will be slightly regraded to the final design grade and a maintenance access road will be provided along with a perimeter ditch to direct the flow of storm water runoff. The new detention and infiltration basin is proposed at the northwest corner of the landfill to accommodate the additional storm water runoff generated by the final cover.

As organic materials in the landfill decompose, landfill gas—a composition of approximately 50 percent methane (CH_4) and 50 percent carbon dioxide (CO_2) and trace amounts of non-methane organic compounds—is released. A passive landfill gas venting system will be installed within the landfill footprint to allow the passive release of the landfill gas once the landfill is covered. Without the vents, the methane gas could build up reaching potentially explosive levels.

In compliance with HAR §11-58.1, groundwater and landfill gas monitoring will be conducted as part of normal landfill operations even after closure of the landfill during the required 30-year post-closure period. Six (6) existing landfill gas probes sited adjacent to the SHSL footprint will continue to be used to monitor concentrations of methane and other landfill gas on a quarterly basis to ensure levels do not exceed permitted limits. Once the landfill is closed, the existing monitoring probes will remain in place, and the County will continue to maintain them after closure. See Figure 2-3.

During the required 30-year post-closure monitoring and maintenance period, the landfill site cannot be utilized. After the post-closure period, however, potential uses of the site could include, but are not limited to, a photovoltaic farm or passive trails for recreation.

2.3 Project Costs and Schedule

Final closure of the landfill is anticipated to cost approximately $19 million which includes the costs to construct the Project and the costs associated with the ongoing work to prepare the landfill for closure. Once regulatory approvals have been granted, it is estimated that construction will take another 18 months following the issuance of the notice to proceed.

2.4 Operational Plans of the County

The SHSL currently accepts MSW from eight transfer stations throughout East Hawaiʻi: Honomū, Pāpaʻikou, Hilo, Keaʻau, Pāhoa, Kalapana, Glenwood, and Volcano. In addition to MSW from the County transfer stations, the SHSL also accepts MSW from commercial haulers and other government agencies that transport MSW directly to the landfill. Upon final closure of the landfill, the County transfer stations will remain in operation and will continue to accept waste from residential self-haulers. MSW at the landfill itself, however, will no longer be accepted and MSW will need to be diverted to the West Hawaiʻi Sanitary Landfill (WHSL) located in Puʻuanahulu for final disposal.

The County is still in the process of finalizing its post-closure operational plans associated with hauling waste; however, the current plan is to accept MSW at the East Hawaiʻi Regional Sort Station (EHRSS) in Hilo where reusable or recyclable materials will be removed from the waste stream. The residual MSW will then be reloaded into County trailers and hauled to the WHSL. Should the mechanisms and logistics to realize this plan not be in place by the time the SHSL accepts its final load, it is possible that in the interim County trailers from the County transfer stations, commercial haulers, and other government agencies may be required to haul waste directly to the WHSL. The County has started and will continue to coordinate with potentially affected organizations and individuals during the closure process and as the operational plans become finalized.

Over the years, the County has implemented several waste diversion strategies intended to reduce the amount of waste disposed at County landfills. Once the landfill is closed, the County will also continue to implement its current waste diversion program as well as continue to explore other options to effectively divert waste from the island waste stream. By doing so, the County continues to reduce the flow of waste to landfills thereby reducing the impacts and costs associated with trucking waste from East Hawaiʻi to the WHSL.

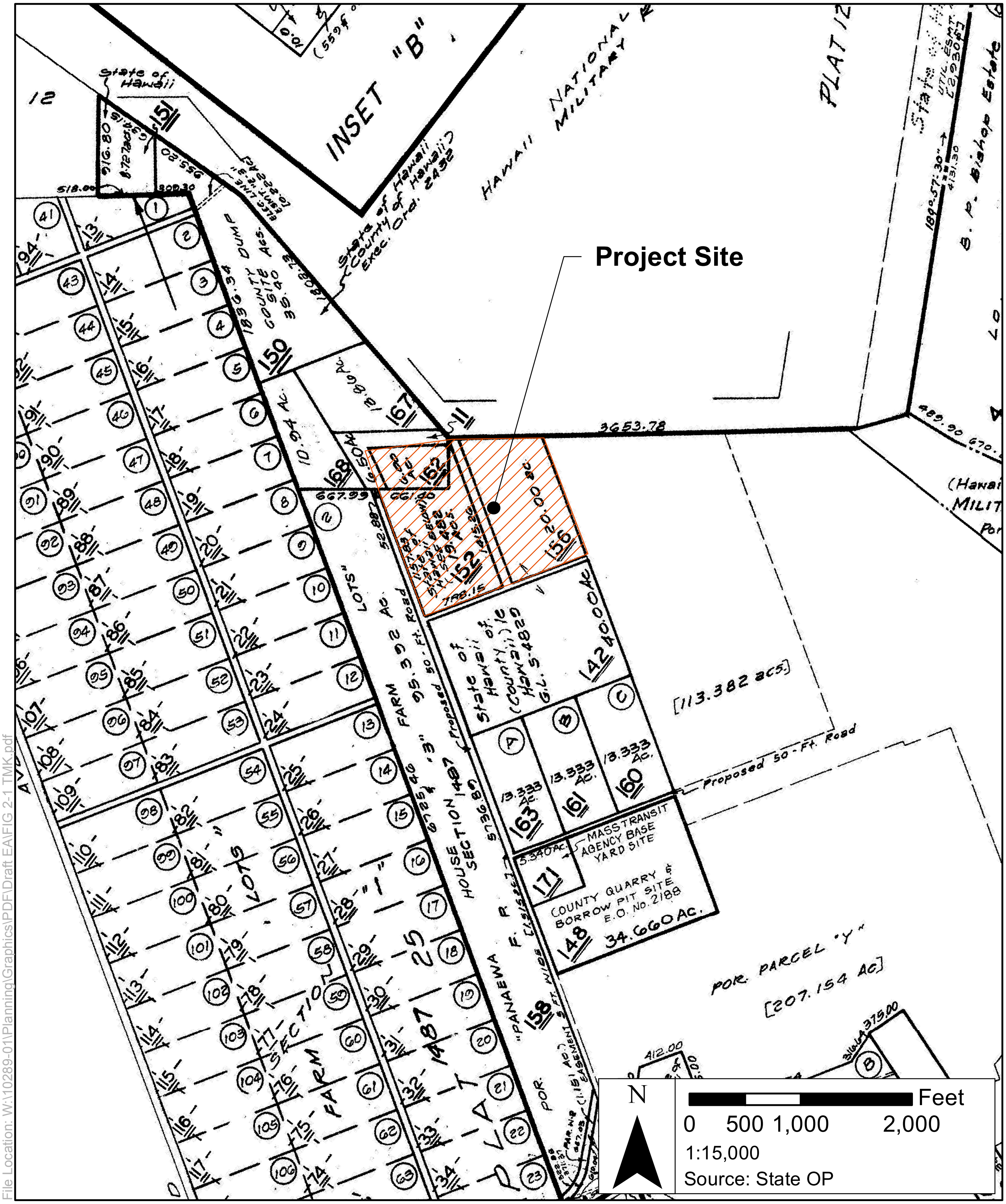

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FIGURE 2-1

TAX MAP KEY (ZONE 2-SECTION 1-PLAT 13)

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

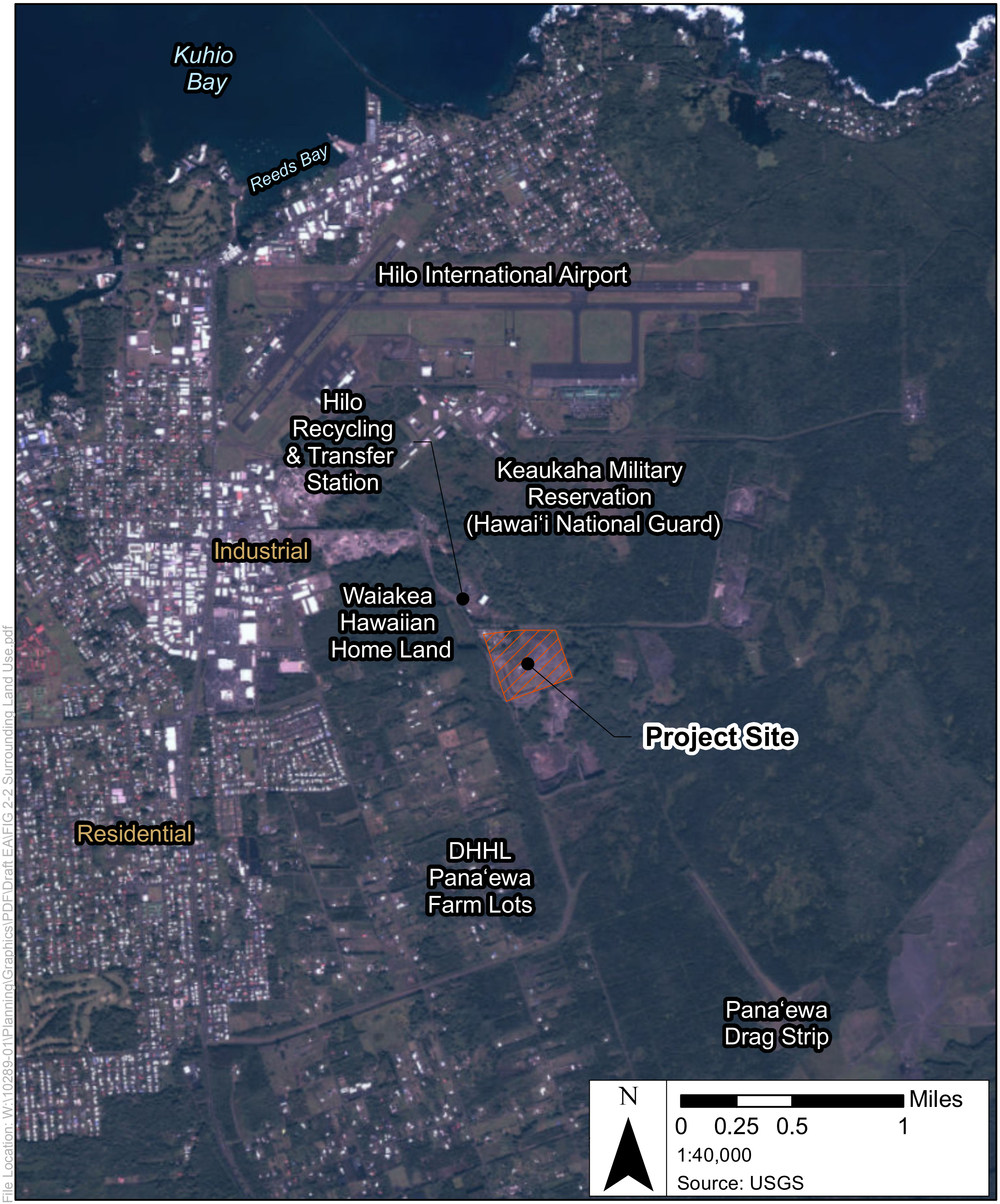

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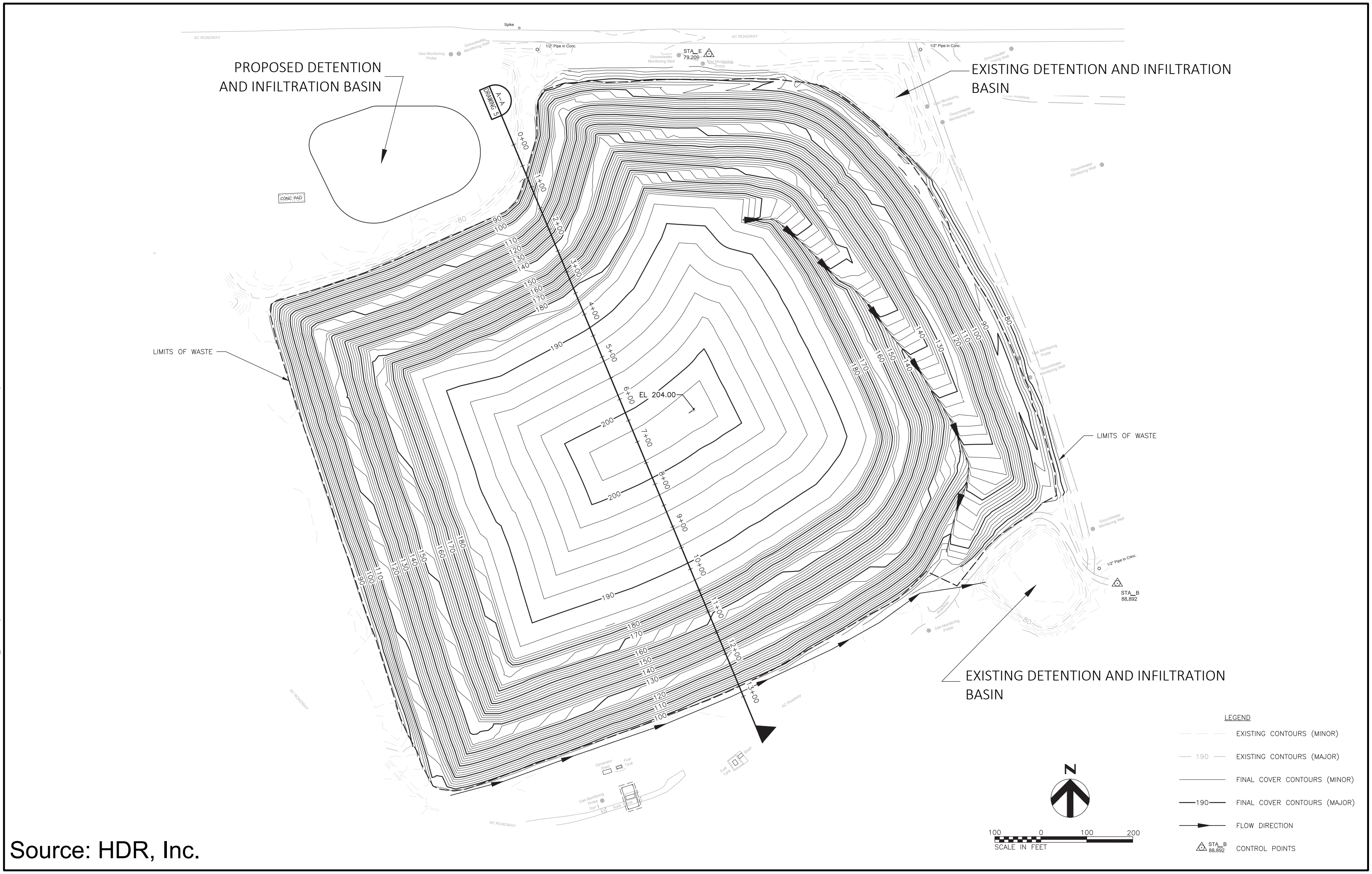
FIGURE 2-2

SURROUNDING LAND USE MAP

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE



Source: HDR, Inc.

FIGURE 2-3

PROPOSED FINAL SITE PLAN

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

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3. DESCRIPTION OF EXISTING ENVIRONMENT, IMPACTS, AND MITIGATION MEASURES

3.1 Climate

The weather and climate of Hawaiʻi Island are significantly influenced by the island's dominant geological features, namely Mauna Loa (13,679 foot summit elevation) and Mauna Kea (13,796 foot summit elevation). The island is home to 4 out of the 5 major climate zones and 8 out of the 13 sub-zones.

Hilo is located within the continuously wet sub-zone of the humid tropical climate zone. Annual rainfall in Hilo averages about 127 inches per year, with the winter months from October to April receiving the majority of the rainfall. Temperatures are relatively uniform throughout the year with averages at the Hilo International Airport ranging from a low of 66 degrees Fahrenheit in the winter months to a high of 82 degrees Fahrenheit in the summer months (DBEDT, 2016). Wind patterns in Hilo are largely a function of the interaction between the northeasterly trade winds and the Mauna Loa volcano. In general, the trades are more persistent in the summer than in the winter and stronger in the afternoon than at night. In the absence of trade winds, winds become light and variable. Diurnal heating and cooling of the island also gives rise to onshore breezes during the day, and offshore breezes during the night.

Globally, slight increases in the average temperature of the Earth's surface have translated to widespread changes in weather patterns. Scientific studies indicate that extreme weather events such as heat waves and large storms are likely to become more frequent or more intense as the Earth's climate changes. Many islands are especially vulnerable to the risks of climate change because of their small size, low elevation, remote geographical location, and concentration of infrastructure along the coastlines (EPA, 2016a).

Greenhouse gases (GHG) from human activities are recognized as one of the drivers of observed climate change (EPA, 2016b). GHGs generally include carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons. MSW landfills are the single largest man-made source of methane gas in the United States. Methane is more effective than carbon dioxide at trapping heat in the atmosphere over a 100-year period (IPCC, 2013).

Act 234, Session Laws of Hawaiʻi 2007, established the state's policy framework and requirements to address Hawaii's GHG emissions. The purpose of the Act is to "reduce, by January 1, 2020 GHG emissions in the State to levels at or below the best estimations and updates of the inventory of greenhouse gas emissions estimates for 1990."

Impacts and Mitigation Measures

No direct or indirect impacts on the climate are anticipated with implementation of the proposed action. The Project is not anticipated to affect temperatures, wind, or rainfall levels in the region. The final cover system will be designed to prevent long-term degradation from UV exposure and erosion from heavy rainfall and wind events.

From a cumulative perspective, GHG emissions from construction and MSW transport activities will have insignificant effects on climate. Due to the temporary nature of construction activities and the relatively small scope of transport activities in the global context, any potential impacts are anticipated to be negligible. In the long-term, the County will explore options to upgrade its transfer trailer fleet and make operational improvements in order to achieve greater efficiency and reduce GHG emissions.

The proposed passive landfill gas venting system will also result in GHG emissions from decomposing materials in the landfill. These emissions, however, would occur without implementation of the proposed action as the landfill is already in place. Therefore, no additional impacts are anticipated with implementation of the proposed action. To date, measurable concentrations of methane have not been identified in gas monitoring probes located around the landfill perimeter. Following closure of SHSL, landfill gas levels will continue to be monitored for exceedance of permitted limits. It is anticipated that landfill gas levels will reduce over time and approach zero. If there is any exceedance of gas levels during the post-closure maintenance period, appropriate mitigation measures will be implemented in compliance with HAR 11-58.1-15(d).

3.2 Physiography

3.2.1 Geology and Topography

Hawaiʻi Island is the youngest and largest island in the Hawaiian chain. The island was formed by the coalescence of five volcanoes—Kohala, Hualālai, Mauna Kea, Mauna Loa, and Kīlauea. Only Mauna Loa and Kīlauea are presently considered active while the other three are considered dormant.

The town of Hilo, created by Mauna Loa lava flows, is characterized by ʻaʻa (clinker) and pāhoehoe (ropy) lava from various eruptions dating back to between 750 to 1,500 years ago (Wolfe and Morris 1996). Flows are typically 5 to 20 feet thick. Due to its relatively young age, the Kau Basalt at the Project site is generally unweathered and has developed only a thin soil layer. These basalt layers are typically highly fractured resulting in high permeability.

The Project site has been previously quarried and is approximately 50 feet deeper than the surrounding areas, located at elevations approximately 100 feet above mean sea level. The top deck of the landfill sits at an elevation of approximately 200 feet above mean sea level. Slopes at the Project site do not exceed 2:1.

Impacts and Mitigation Measures

No direct, indirect or cumulative impacts on geology are anticipated with implementation of the proposed action.

Construction of the Project will require grading of the landfill to its final design grade and excavation for a new storm water detention basin. The proposed land disturbing activities are regarded as the minimum necessary to control landfill drainage, provide access for maintenance activities, and improve slope stability. None of the proposed grading or excavation activities will occur in areas that are previously undisturbed. While the proposed grading and excavation activities may slightly alter the topography at the site, the general topography of the area will remain similar to existing conditions. After construction, the disturbed surfaces of the landfill will be covered and MSW will not be exposed. Over time, some settlement of the landfill from the biodegradation process is expected. The proposed closure plan for the Project will account for this anticipated settlement. No cumulative impacts on topography are anticipated. No mitigation measures are proposed or anticipated to be required.

3.2.2 Soils

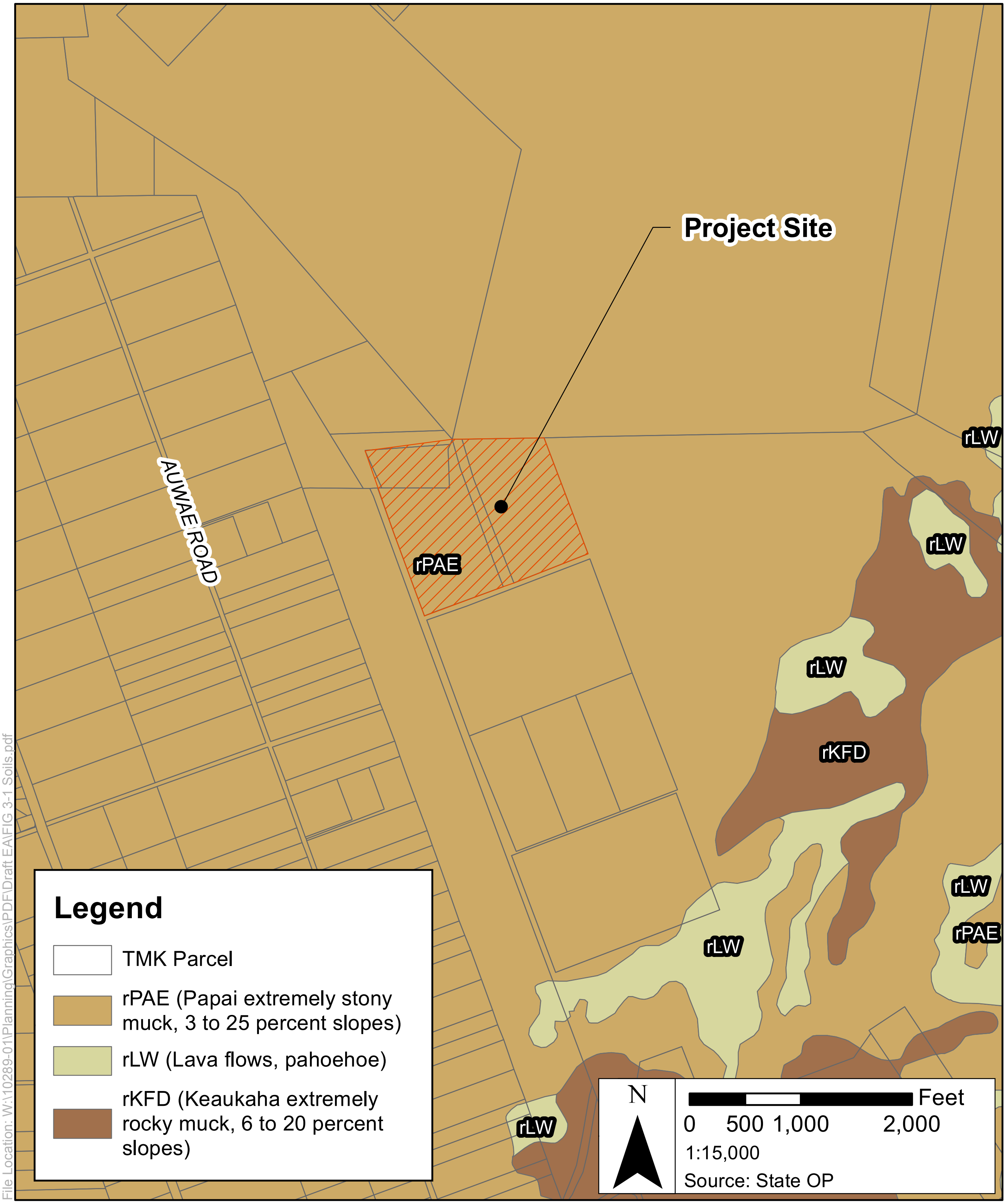
According to the U.S. Department of Agriculture National Resources Conservation Service's (NRCS) *Soil Survey Islands of Kaua'i, O'ahu, Maui, Moloka'i, and Lāna'i, State of Hawai'i*, dated August 1972, soils in the vicinity of the Project site are classified in the Papai series (rPAE). This series is described as extremely stony muck, with three to 25 percent slopes and consists of well-drained, thin, extremely stony organic soils over fragmented 'a'a lava. They are found at elevations ranging from sea level to 1,000 feet and receive between 90 to 150 inches of annual rainfall. Areas with Papai soils are mostly covered in woodland, with some small areas used for pasture, orchards, and truck crops. These soils are slightly acidic and are generally about eight inches deep. Permeability for these soils is rapid, runoff is slow, and the erosion hazard is slight. Papai series soils are given capability subclass VII, meaning they have severe limitations that makes them largely unsuitable for cultivation, limiting their usefulness to pastureland or woodland. Additionally, Papai series soils are of limited use for road fill, as locations for highways, and foundations, due to the fragmental nature of the underlying 'a'a lava. See Figure 3-1.

The State of Hawai'i Department of Agriculture's *Agricultural Lands of Importance to the State of Hawai'i (ALISH)* system of defining agricultural suitability classifies lands into four categories: Prime Lands, Unique Lands, Other Lands and Unclassified. According to ALISH, most of the Project site is classified as Other Lands, which is defined as an area that can be farmed satisfactorily by applying greater inputs of fertilizer, improving drainage, practicing erosion control, and protecting the land from flooding. See Figure 3-2.

The *Detailed Land Classification, Island of Hawai'i*, published by the University of Hawai'i, Land Study Bureau (LSB), evaluates the quality or productive capacity of certain lands on the island using a five-class productivity rating system, with "A" representing the class of the highest productivity and "E" the lowest. Under this system, most of the Project site is rated as "E" land or "not suitable" for agriculture. See Figure 3-2.

<u>Impacts and Mitigation Measures</u>

Construction of the Project will involve land disturbing activities that may result in short-term soil erosion impacts. Such activities include clearing, grubbing, and excavation to construct the proposed detention basin and grading of the landfill. Applicable best management practices and erosion control measures will be incorporated into the Project's construction plans and specifications to minimize soil disturbances and potential short-term erosion impacts during construction. As applicable for each phase, these may include but are not limited to: temporary sediment basins, temporary diversion berms and swales to intercept runoff, silt fences, dust fences, slope protection, stabilized construction vehicle entrance, grate inlet protection, truck wash down areas, and use of compost filter socks. Planting of landscaping also will be done as needed on disturbed areas of the proposed



File Location: W:\10289-01\Planning\Graphics\PDF\Draft EA\FIG 3-1 Soils.pdf

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FIGURE 3-1

SOIL CLASSIFICATION MAP

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

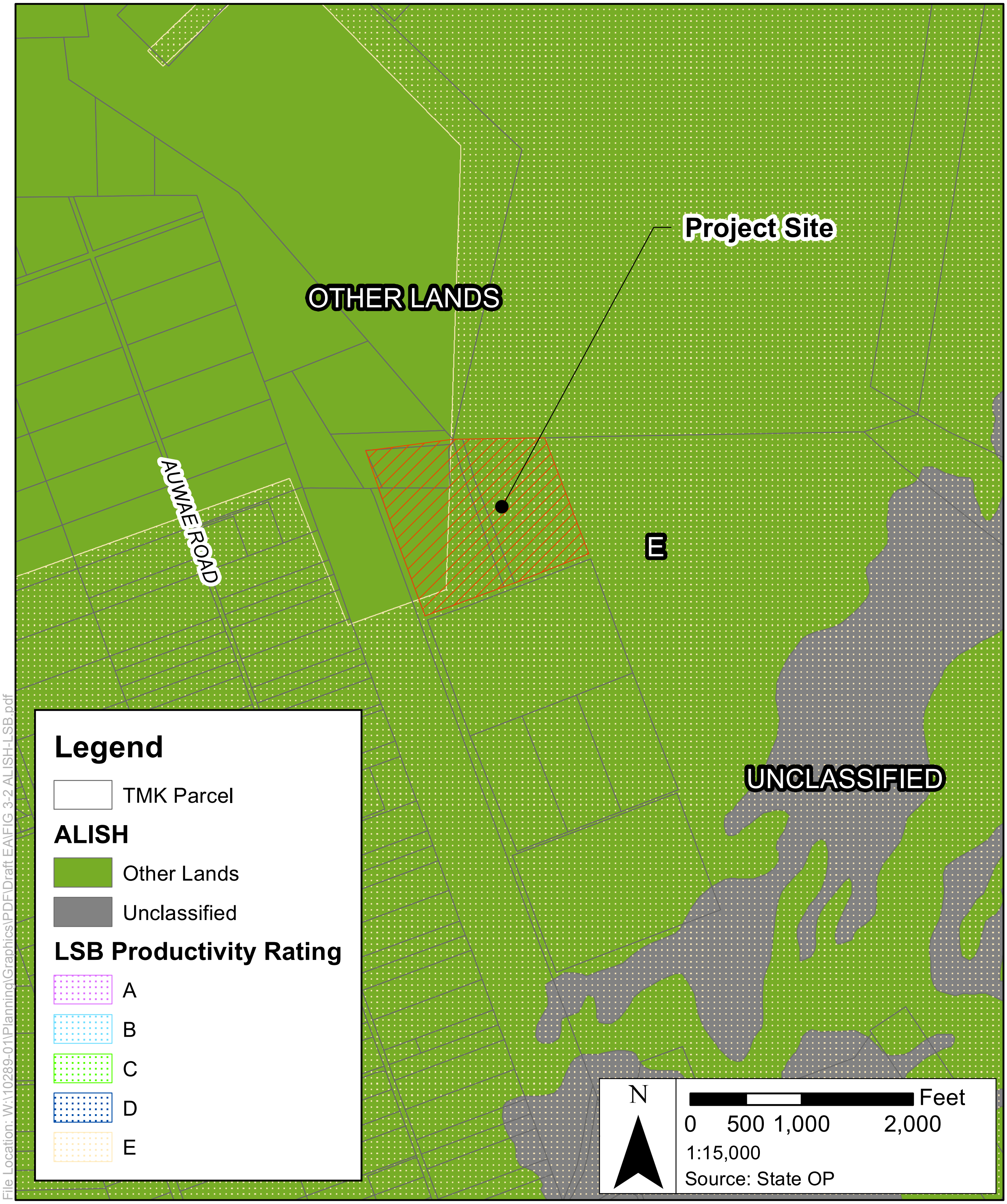

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FIGURE 3-2

AGRICULTURAL LANDS OF IMPORTANCE
TO THE STATE OF HAWAI‘I

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

detention basin to help control erosion. Long-term measures to address soil erosion impacts will be incorporated into the final design.

Coordination will be undertaken with the appropriate agencies during permitting and construction to ensure that the Project will not result in significant impacts with regard to soils and erosion. A National Pollutant Discharge Elimination System (NPDES) permit for storm water runoff from construction activities may be required as individual and/or cumulative soil disturbances on the Project site may exceed one acre of land area. Any discharges related to Project construction or operation activities will comply with applicable State Water Quality Standards as specified in Hawai‘i Administrative Rules, Chapter 11-54 and 11-55 Water Pollution Control, Department of Health. Construction activities will also comply with the requirements of Hawai‘i County Code, Chapter 10, related to Erosion and Sedimentary Control. No indirect or cumulative impacts on soils are anticipated with implementation of the proposed action.

Given the low productivity potential of the soil in the area and need for high inputs, the Project site is not considered suitable for agricultural activity. Therefore, implementation of the Project will not reduce the inventory of productive lands available for agricultural uses.

3.3 Hydrology

3.3.1 Surface Water

Due to the permeability of the ‘a‘a and pāhoehoe lava beneath the soil at the SHSL site, there are no well-defined drainage courses and very little surface water in the area. The nearest surface water bodies include quarry ponds located about a mile northwest of SHSL and a rarely flowing drainage ditch that collects water from streams and ditches in the southeastern part of Hilo and discharges into vacant, low-lying land about a half-mile south of the landfill. Reed’s Bay is the nearest coastline at 1.5 miles away from the landfill. SHSL is nearly one mile west of Wailoa Pond and slightly over two miles southwest of the Wailuku River. There are no delineated or proposed wetlands at the Project site and there are no direct hydrologic connections between the SHSL site and nearby surface waters.

During and immediately after heavy rainstorm events, water currently sheet-flows off certain portions of the landfill face and slopes and/or percolates within the upper layers of the landfill. As the water comes into contact with MSW that has been placed in the landfill, leachate forms which may continue on to infiltrate into the ground. All surface water is captured on-site and concentrated flows are diverted into two (2) existing detention basins where water infiltrates into the ground. There are no surface water bodies that receive surface water runoff from the site.

Normal landfill surface water monitoring activities includes visual inspections of on-site detention basins and drainage ditches to ensure that adequate capacities are maintained to prevent run-on to the waste prism, minimizing storm water ponding within areas accessible to the public, and containing run-off on-site.

Impacts and Mitigation Measures

No direct, indirect or cumulative impacts on surface waters in the Project vicinity are anticipated with implementation of the proposed action as there are no surface water features such as rivers, streams, lakes, ponds, or wetlands on or within proximity of the Project site.

As required by 40 CFR 258.40, the County will install a final cover system with an impermeable geomembrane layer that will prevent storm water intrusion. Storm water runoff will instead be directed towards one of the two existing detention basins and a new proposed detention basin at the northwest corner of the landfill. The County will continue to maintain the SHSL storm water management system to ensure that run-on to the landfill is minimized and that all run-off remains on-site, in conformance with Chapter 27 (“Flood Control”) of the Hawaiʻi County Code, and applicable flood control policies.

Following the closure of SHSL, the County is required to conduct post-closure monitoring and maintenance for 30 years including maintaining the integrity and effectiveness of the final cover, monitoring the ground water, and maintaining and operating the gas monitoring system (40 CFR 258.60).

3.3.2 Groundwater

Due to the relatively young and porous geology of Hawaiʻi Island, most of the rainfall infiltrates to groundwater. The uppermost groundwater aquifer beneath the landfill is typically encountered from six to seven feet above mean sea level (msl), or about 70 to 90 feet below the ground surface at the site. The State of Hawaiʻi has classified groundwater under an aquifer coding system to identify and describe groundwater aquifers. The Project area overlies the North East Mauna Loa Aquifer Sector of the Hilo Aquifer System. Groundwater within this aquifer exists primarily as basal groundwater followed by high level dike and perched water. Cap rock, although thick and extensive, does not play an important role in the coastal regions of the aquifer. The sustainable yield of an aquifer is the amount of groundwater that can be pumped without depleting the source; the Hilo Aquifer System has a sustainable yield of 393 million gallons per day (MGD).

HAR Section 11-23.4 provides criteria for classifying aquifers into those that are designated as underground sources of drinking water and those that are not. The boundary between non-drinking water aquifers and underground sources of drinking water is generally referred to as the underground injection control (UIC) line. The Project site is about a mile below the UIC line, which means that the underlying aquifer is not considered a drinking water source.

Landfills constructed after the adoption of the RCRA Subtitle D regulations (40 CFR Parts 257 and 258) in 1993 have been required to have bottom liners and a leachate collection and management system that prevents moisture derived from waste from impacting groundwater. The SHSL predates RCRA Subtitle D regulations and was built without a bottom liner or leachate collection and management system.

Environmental monitoring of the SHSL is regulated by DOH requirements contained in HAR Section 11-58.1 and by RCRA Subtitle D regulations. These regulations require landfills to have a groundwater monitoring system that includes monitoring wells that extend into the uppermost aquifer beneath the landfill. Wells must be constructed upgradient of the landfill to monitor background water quality, as well as downgradient of the landfill to monitor groundwater that could be affected by a release from the landfill. The regulations require use of a sufficient number of wells to account for naturally-occurring variations in groundwater flow directions and groundwater chemistry.

Groundwater beneath the SHSL is monitored by four monitoring wells, including one upgradient (background) monitoring well, and three downgradient (compliance) wells. Each of these wells provides for adequate sample collection of groundwater from the uppermost aquifer below the SHSL. Historical groundwater elevation measurements indicate that groundwater flow conditions have remained very consistent over time flowing in a northeasterly direction and passing beneath the landfill at a consistent rate over time. Based on the groundwater flow direction and velocity, the monitoring wells are appropriately located and monitored to detect an environmental release from the SHSL.

Groundwater samples are analyzed for general chemistry parameters, heavy metals, and volatile organic compounds (VOCs). The presence of VOCs in groundwater is definitive of contamination by man-made sources. VOCs can enter groundwater from a fuel spill, landfill leachate percolation, or industrial discharge. Groundwater sampling began in 1995 and has been conducted quarterly since that time. To date, no environmental releases in exceedance of State and federal regulations associated with solid waste management have been detected at the SHSL.

Impacts and Mitigation Measures

No significant adverse impacts on groundwater are anticipated with implementation of the proposed action. To date, no adverse impacts to groundwater quality have been detected from the current operation of the landfill, and implementation of the proposed action is not expected to change this. As required by 40 CFR 258.40, the County must install a final cover system designed to minimize infiltration and erosion. The final cover must have a permeability less than or equal to the subsoils present, or have a permeability no greater than 1×10^{-5} cm/sec, whichever is less. The proposed final cover system will utilize a geomembrane layer that is impermeable. As such, storm water is not anticipated to infiltrate into the landfill and leach into the underlying aquifer. Instead, storm water will sheet flow off the landfill and runoff will be captured in on-site detention basins where it will infiltrate into the ground.

Following closure of the SHSL, the County is required to conduct post-closure monitoring and maintenance on the landfill for a minimum of 30 years, including monitoring groundwater (40 CFR 258.60). Monitoring of the four wells will continue on a regular basis and groundwater samples will be collected and analyzed to determine if there are any landfill-related contaminants present. If there is any evidence of groundwater contamination during the post-closure maintenance period, appropriate mitigation measures will be implemented in compliance with HAR 11-58.1-16(d)(3). Additionally, the State of Hawaiʻi Landfill Groundwater Monitoring Guidance Document (Version 1.8) will provide detailed guidance.

3.4 Natural Hazards

3.4.1 Flood and Tsunami Hazard

According to the Flood Insurance Rate Map (FIRM) Panel Number 1551660885C, prepared by the Federal Emergency Management Agency (FEMA), SHSL along with much of the surrounding area is designated as Zone X—an area determined to be outside of the 500-year flood plain.

According to the Tsunami Evacuation Zone maps for Hawai‘i Island, the landfill is located outside of the tsunami evacuation zone.

Impacts and Mitigation Measures

No direct, indirect or cumulative impacts on flood and tsunami hazards are anticipated as the Project is not anticipated to increase flood risks or cause any adverse flood-related impacts at the Project site or lower elevation properties. The proposed final cover system will feature an impermeable geomembrane layer that will contribute additional storm water runoff at the Project site. All newly generated runoff will be retained on-site and directed and conveyed to the two existing detention basins and the new detention basin proposed at the northwest corner of the landfill. A site-specific storm water runoff analysis will be prepared to confirm the sizing of the detention basins to ensure they are adequately sized to accommodate storm water runoff from the design storm event.

3.4.2 Hurricane

The Hawaiian Islands are seasonally affected by Pacific hurricanes from the late summer to early winter months. During hurricanes and storm conditions, high winds cause strong uplift forces on structures, particularly on roofs. Wind-driven materials and debris can attain high velocity and cause devastating property damage and harm to life and limb. It is difficult to predict these natural occurrences, but it is reasonable to assume that future events will occur. While the Island of Hawai‘i has not been in the direct path of a hurricane since recordation began in 1950, the models indicate that the island has a long-term hurricane hazard risk higher than any of the other islands for a direct hit.

Impacts and Mitigation Measures

No direct, indirect, or cumulative impacts on hurricane hazard are anticipated with implementation of the proposed action. The potential for hurricanes, while relatively rare, is present. The application of sand ballast with the preferred final cover system is intended to provide protection of the final cover system from heavy rainfall and wind events. Based on manufacturer-provided wind tunnel testing, the preferred final cover can withstand a 105 mph wind event (HDR, 2017). Irrespective of the mitigation measures taken, the unpredictable and sometimes destructive nature of hurricanes ultimately limits the extent of practical measures that can be taken to avoid hurricane impacts. As such, no additional mitigation measures are proposed or anticipated to be required.

3.4.3 Volcanic Hazard

The island of Hawai‘i is divided into 9 lava flow hazard zones, with lava flows most likely to occur in Zone 1 and least likely in Zone 9. The zones are primarily based on the location of active vents, location and frequency of both historic and prehistoric eruptions, and larger topographic features that will affect the paths of future flows. The hazard boundaries are approximate, and the change in the degree of hazard is generally gradual rather than abrupt.

The SHSL is situated approximately 22 miles from Kīlauea Volcano, the nearest active vent. According to the USGS hazard classification, the entire Project area is contained in lava-flow hazard Zone 3—areas less hazardous than Zone 2 because of greater distance from recently active vents and (or) because of topography. See Figure 3-3. One to five percent of Zone 3 has been covered since 1800 CE, and 15 to 75 percent has been covered in the last 750 years.

<u>Impacts and Mitigation Measures</u>

SHSL is subject to the hazard of lava flows due to the topography of the surrounding area and proximity to an active vent. The Project will not significantly alter the topography or decrease proximity to make the landfill more susceptible to volcanic hazards. Given the destructive nature of lava flows, there are no practical measures to avoid impacts from lava flows. Hawaiian lava flows generally advance slowly and can be easily avoided by people. No mitigation measures are proposed or anticipated to be required.

3.4.4 Seismic Hazard

The entire island of Hawai‘i is rated Zone 4 Seismic Probability Rating (Uniform Building Code, Appendix Chapter 25, Section 2518). Zone 4 areas are at risk from major earthquake damage, especially to structures that are poorly designed or built. None of the several earthquakes of Richter magnitude 6.0 or greater that have occurred on the island since 1950 have caused substantial damage to well-engineered roads, bridges or other roadway structures. This is due in part to the lack of unconsolidated sediments in the local substrate.

The Project site also lies within the occurrence zone of Intensity VIII earthquakes, corresponding to the Mercalli Intensity Scale. Intensity VIII is the third highest on the scale and is characterized by slight damage in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse; great damage in poorly built structures; fall of chimneys, factory stacks, columns, monuments, walls; and heavy furniture can become overturned.

<u>Impacts and Mitigation Measures</u>

No direct, indirect, or cumulative impacts on seismic hazards are anticipated with implementation of the proposed action. Although there have been no slope failures at the current landfill, the long-term stability of the landfill is an important consideration. Unstable slopes can create a safety hazard preventing the SHSL from complying with State and federal regulations. Therefore, a slope stability analysis will be performed as part of the final design and the slopes will be graded to improve slope stability prior to installation of the final cover.

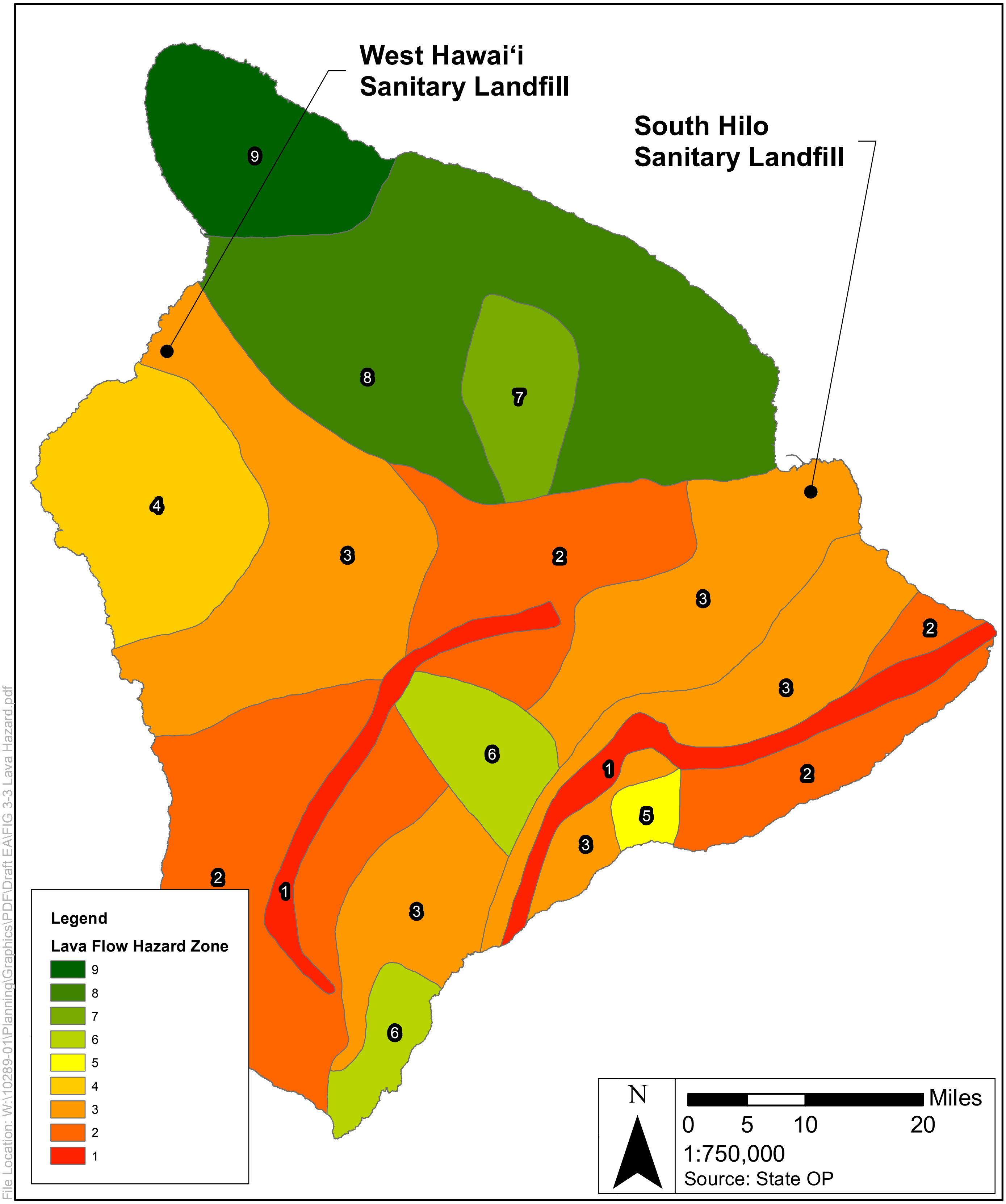

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FIGURE 3-3

LAVA FLOW HAZARD ZONES - HAWAI'I ISLAND

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

3.4.5 Landfill Gas

Landfill gas is a natural byproduct of the decomposition of organic material in anaerobic conditions. Landfill gas contains roughly 50 percent methane and 50 percent carbon dioxide and trace amounts of non-methane organic compounds. When organic waste is first buried, it undergoes an aerobic decomposition stage when little methane is generated. Depending on compaction rates and cover soil properties, anaerobic conditions are generally established within less than a year, and the waste is then decomposed by bacteria generating methane and carbon dioxide. All landfills with a sufficient quantity of organic wastes and moisture will decompose in this manner under anaerobic conditions to form what is known as landfill gas.

Landfill gas can pose a risk to human health and safety when the gas combines with air in certain proportions to become explosive. The landfill gas will pose an explosion hazard only under the following conditions: a landfill must produce gas in which methane levels are between a minimum and maximum limit to form explosive conditions, this gas must achieve conditions for explosions, and this gas must generally collect in a confined space to an explosive concentration.

<u>Impacts and Mitigation Measures</u>

The State of Hawai‘i and U.S. Environmental Protection Agency require landfill owners and operators to monitor their sites for explosive gases and ensure that methane concentrations at the property boundary and in on-site structures do not exceed 25 percent of the lower explosive limit (or 1.25 percent by volume). In accordance with these requirements, the SHSL is equipped with six (6) gas monitoring probes located around the perimeter of the landfill. The probes extend more than 30 feet into the ground and are designed to intercept landfill gas that might migrate into the adjacent soil and rock. Each probe is monitored four times each year to measure methane concentrations, using calibrated field instruments that provide immediate information. To date, measurable concentrations of methane have not been identified in the gas monitoring probes. In addition to monitoring of the perimeter gas probes, structure monitoring is conducted quarterly at each on-site structure, using the same instrument and protocol employed for perimeter gas monitoring. To date, methane has not been detected in any of the on-site structures. An independent assessment of the landfill gas monitoring system found the number, depth, and placement of landfill gas monitoring probes was adequate and appropriate to detect a release from the landfill (GLA, 2004).

The closed SHSL will have a passive landfill gas venting system and landfill gas levels will continue to be monitored for exceedance of permitted limits. It is anticipated that landfill gas levels will reduce over time and approach zero. If there is any exceedance of gas levels during the post-closure maintenance period, appropriate mitigation measures will be implemented in compliance with HAR 11-58.1-15(d).

3.5 Natural Environment

3.5.1 Flora

The original vegetation of the general area likely consisted of pioneer and early successional plant species such as ʻōhiʻa (*Metrosideros polymorpha*), lama (*Diospyros sandwicensis*) and hala (*Pandanus tectorius*), and kupukupu fern (*Nephrolepis exaltata)* (Gagne and Cuddihy 1990). The introduction of exotic and invasive plant and animal species, along with several seeding attempts (using non-native seeds) following a large fire in the Panaʻewa Forest Reserve in 1926 drastically altered this native lowland wet forest into the dense, mostly non-native forest that exists currently.

Vegetation found at the landfill itself consists mainly of scattered weeds. Though this vegetation type is quick to sprout, it is subject to destruction as the face of the landfill is reworked. This community has no conservation value.

Along the outskirts of the landfill and on access roads, vegetation consists of various early successional weed communities. Here alien herbs, vines and grasses dominate. An extremely wide variety of weeds is present in various locations including Napier grass (*Pennisetum purpureum*), *Crotalaria spp.* (rattlepod), *Desmodium spp.* (Spanish clover), sensitive plant (*Mimosa pudica*) and various sedges and grasses. These communities are labeled "early" because they are periodically disturbed through mowing, stockpiling, herbicide spraying, etc. This community has little if any conservation value.

The vegetation surrounding the landfill consists of late successional forest, which is dominated by alien trees, including albizia tree (*Falcataria moluccana*), gunpowder tree (*Trema orientalis*), trumpet tree (*Cecropia obtusifolia*), strawberry guava (*Psidium cattleianum*), *Melastoma candidum*, and bingabing tree (*Macaranga mappa*). Several native trees including hala, ʻōhiʻa, and lama has been previously observed in the area. This forest community has little conservation value for either the plant species it contains or as animal habitat, although Hawaiian hawks may be able to forage there for rats. Also surrounding the landfill are remnants of native ʻōhiʻa-lama-hala forest, heavily invaded by aliens (especially *Melastoma candidum* and strawberry guava). Some relatively intact and higher quality pockets of this forest type are found on the 500 acres of the Hawaiʻi Army National Guard's Keaukaha Military Reserve (KMR), located to the east of the landfill area.

Impacts and Mitigation Measures

No adverse impacts on vegetation resulting from construction of the Project is anticipated as no listed or proposed endangered plant species are known to occur at the Project site. The Project will involve utilizing the area of the existing landfill and a small vegetated area on the parcel adjacent to the landfill footprint. There areas are generally highly disturbed due to the historic use of the area for quarrying and waste disposal activities. Vegetation in these areas have little if any conservation value.

The proposed facilities will be designed and operated or otherwise conditioned or mitigated to meet the requirements of FAA Advisory Circular 150/5200-33B "Hazardous Wildlife Attractants On Or Near Airports". In addition, the proposed final cover will prevent the re-establishment of plant species that may serve as an attractant for birds that could be a potential hazard for avigation interests in the area in compliance with HRS Chapter 262 “Airport Zoning Act”.

Although ‘ōhi‘a are currently not endangered or threatened in Hawai‘i, they are undoubtedly culturally, environmentally, and ecologically significant. Recently, Rapid ‘Ōhi‘a Death (ROD), caused by the fungus *Ceratocystis fimbriata*, has resulted in the death of hundreds of thousands of ‘ōhi‘a and is continuing to drastically alter forest composition across the Island of Hawai‘i (Mortenson et al., 2016). While the proposed action is not anticipated affect ‘ōhi‘a tree clusters, the contractor will be required to adhere to project plans and specifications which will incorporate the following USFWS recommended mitigation measures to avoid spreading Rapid ‘Ōhi‘a Death:

- A survey of the proposed Project site should be conducted within two weeks prior to any tree cutting to determine if there are any infected ‘ōhi‘a trees. If infected ‘ōhi‘a are suspected at the site, the appropriate agencies should be contacted for further guidance.
- Both prior to cutting ‘ōhi‘a and after the Project is complete:
    - Tools used of cutting infected ‘ōhi‘a trees should be cleaned with a 70 percent rubbing alcohol solution. A freshly prepared 10 percent solution of chlorine bleach and water can be used as long as tools are oiled afterwards, as chlorine bleach will corrode metal tools. Chainsaw blades should be brushed clean, sprayed with cleaning solution, and run briefly to lubricate the chain.
    - Vehicles used off-road in infected forest areas should be thoroughly cleaned. The tires and undercarriage of the vehicles should be cleaned with detergent if they have travelled from an area with ROD or travelled off-road. Use a pressure washer with soap to clean all soil off of the tires and vehicle undercarriage.
    - Shoes and clothing used in infected forests should also be cleaned. Shoes should be decontaminated by dipping the soles in 70 percent rubbing alcohol to kill the ROD fungus. Other gear can be sprayed with the same cleaning solutions. Clothing can be washed in hot water and detergent.
    - Wood of affected ‘ōhi‘a trees should not be transported to other areas of Hawai‘i Island or interisland. All cut wood should be left on-site to avoid spreading the disease. The pathogen may remain viable for over a year in dead wood. The Hawai‘i Department of Agriculture has passed a quarantine rule that prohibits interisland movement, except by permit, of all ‘ōhi‘a plant or plant parts.

3.5.2 Fauna

The South Hilo area supports a variety of common alien mammals, birds, reptiles and amphibians. More importantly, several species of native birds forage or fly over the site, including the Hawaiian hawk or ‘io (*Buteo solitaries*), an endangered species. Foraging habitat for Hawaii’s only land mammal, the endangered ‘ope‘ape‘a, or Hawaiian hoary bat (*Lasiurus cinereus semotus*), may also be present in the forested areas surrounding the

SHSL. However, due to noise and disturbance at the Project site along with a lack of tall native trees, it is unlikely that ʻio and ʻopeʻapeʻa nest in the immediate area.

According to the U.S Fish & Wildlife Service (USFWS), other federally listed species that may occur in the Project vicinity include the endangered Hawaiian goose or nēnē (*Branta sandvicensis*) and endangered Hawaiian waterbirds, namely the Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian duck (*Anas wyvilliana*). State and federally listed seabirds may also pass through the Project area. The threatened Newell's shearwater (*Puffinus auricularis newelli*) and a species proposed for listing as endangered, the band-rumped strom-petrel (*Oceanodroma castro*) have previously been noted near the SHSL.

Other mammals previously observed or expected to occur on the property include non-native mongoose (*Herpestes javanicus*), mice (*Mus musculus*), rats (*Rattus spp.*), and feral cats (*Felis catus*). None of these species are federally listed, and all are expected to occur in high abundance near the landfill.

No aquatic habitat is present in or near the Project site.

Impacts and Mitigation Measures

The proposed Project will not have an adverse impact on the endangered species or native fauna observed near the Project area. The listed species of fauna tend not to frequent the SHSL due to historical and existing industrial activities. Furthermore, observations have shown that bird species responsible for aircraft/bird collision are not present in the area, therefore no adverse impact to Hilo International Airport operations are anticipated. The contractor will be responsible for adhering to project plans and specifications which will incorporate the following avoidance and impact minimization measures, as applicable:

- Hawaiian hawk or ʻio: To avoid impacts to Hawaiian hawks, closure activities should avoid brush and tree clearing during their breeding season (March through September). If the Project Site must be cleared during ʻio breeding season, it is recommended that a nest search of the area of the proposed Project site and surrounding area be conducted by a qualified ornithologist immediately prior to the start of closure activities. Pre-disturbance surveys should ensure that closure activity will not occur within 1,600 feet of any Hawaiian hawk nest.

- Hawaiian hoary bat or ʻōpeʻapeʻa: It is recommended that woody plants greater than 15 feet tall should not be removed or trimmed during the Hawaiian hoary bat breeding season (June 1 to September 15). It is further recommended that barbed wire not be used for fencing to protect low-flying, foraging bats.

- Nēnē: In order to avoid impacts to nēnē, it is recommended that a qualified biologist survey the Project area prior to the initiation of any work and conduct nest searches for nēnē if the Project will occur during the breeding season (August to April). If a nest is discovered, work will cease immediately and the

USFWS will be contacted for further guidance. A 100-foot (30m) buffer will be established and maintained around all active nests and broods until the goslings have fledged. No disruptive activities will occur within this buffer. If a nēnē appears during ongoing work, all activity should be temporarily suspended until the animal leaves on its own accord.

- Seabirds: The proposed Project will avoid or minimize use of artificial lighting and avoid night work if possible. If artificial illumination must be used, it will be shielded so the bulb is not visible at or above bulb-height. If night work must be conducted, it will take place outside the sea bird fledging season (September 15 through December 15) and will utilize shielded lighting.

Bird species attracted to the SHSL have the ongoing potential to impact aircraft using Hilo International Airport. The proposed final cover will prevent the re-establishment of plant species that may serve as an attractant for birds and is therefore not anticipated to pose a potential hazard to Hilo International Airport operations. Landfill hazards to airports, including the potential impacts at Hilo International Airport, are addressed as part of the RCRA Subtitle D, Location Restrictions, which states that *"Owners or operators of new MSWLF [municipal solid waste landfill] units, existing MSWLF units, and lateral expansions that are located within 10,000 feet (3,048 meters) of any airport runway end used by turbojet aircraft, or within 5,000 feet (1,524 meters) of any airport runway end used by only piston-type aircraft must demonstrate that the units are designed and operated so that the MSWLF unit does not pose a bird hazard to aircraft."* A 1998 study prepared by A-Mehr titled "*South Hilo Sanitary Landfill Airport Safety Demonstration Report*" concluded that, because of waste management techniques observed being practiced at the SHSL, scavenger birds commonly involved in bird/aircraft collisions were not present at the SHSL, and therefore do not present a significant hazard to the Hilo International Airport operations.

3.6 Archaeological and Historical Resources

The Project area is in the ahupuaʻa of Waiākea, in the moku o loko (district) of Hilo. Waiākea is made up of roughly 95,000 acres. Once considered a region of abundant natural resources and numerous fishponds, Waiākea was also an early important political center (Escott, 2014).

The SHSL is an unlined (pre-RCRA Subtitle D) landfill that has been in operation since at least the 1960's. Prior to its use as a landfill, the Project area was associated primarily with modern commercial quarrying activities. Based on previous studies of the surrounding area, it is unlikely that the parcels are within areas of traditional pre-contact Hawaiian settlement and habitation. An Archaeological Assessment (2016) prepared by Scientific Consultant Services, Inc., notes that early settlements in the Hilo District were located along the coast. Furthermore, the Panaʻewa region where the Project area is located contains marginally thin soils and is not well suited to mechanical agricultural techniques. Due to the extent of ground disturbance in the area, the inland location of the site from historic coastal communities, and the regional soil characteristics, the Project area is unlikely to contain historic properties, archaeological resources, or any resources of a potential traditional cultural nature.

In June of 2003, an *Archaeological and Limited Cultural Impact Assessment for the Proposed Regional Solid Waste Sorting Station* (presently known as the East Hawai‘i Regional Sort Station) was prepared by Rechtman Consulting. The survey area included the parcel adjacent to the landfill where a new detention basin is proposed. No archaeological resources, or any resources of a potential traditional cultural nature (i.e. landform, vegetation, etc.), were observed within the Project area.

Impacts and Mitigation Measures

As no cultural, historic or archaeological sites appear to be present in the Project area, it is anticipated that the proposed action will not adversely affect any historic properties (including traditional cultural properties) at the Project site. Because the study area has been used for quarry and solid waste collection operations since at least the 1960’s, it is also logical to conclude that the proposed construction will not impact any culturally valued resources or cultural practices.

The County and its contractors will be required to comply with all State and county laws and rules regarding the preservation of archaeological and historic sites. The construction documents will include a provision that should historic sites such as walls, platforms, pavements and mounds, or remains such as artifacts, burials, concentrations of shell or charcoal or artifacts be inadvertently encountered during construction activities, work will cease immediately and the State Historic Preservation Division (SHPD) will be contacted, which will assess the significance of the find and recommend appropriate mitigation measures if necessary.

3.7 Air Quality

The present ambient air quality in Hilo is generally good.

Kīlauea Volcano continuously emits volcanic gases which result in emissions of over 1,000 tons of sulfur dioxide per day. This approximate level of output has persisted since 1986, and intermittently since 1983. Hawaii’s strong sunlight and moist air promote oxidation and hydration of sulfur dioxide to a sulfuric acid aerosol which is partially neutralized to ammonium sulfate. The combination of these aerosols, the remaining sulfur dioxide and other volcanic vapors are locally referred to as “vog,” or volcanic fog. The rate of air emissions by Kīlauea may produce vog exposures along the plume trajectory which present chronic or acute public health hazards. Kīlauea’s Pu‘u ‘Ō‘ō vent is located approximately 25 miles southwest of the Airport.

The State of Hawai‘i Department of Health (DOH), Clean Air Branch, monitors the ambient air quality in the State for various gaseous and particulate air pollutants. The EPA has set national ambient air quality standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), ozone (O_3), and particulate matter (PM_{10} and $PM_{2.5}$). Hawai‘i has also established a state ambient air standard for hydrogen sulfide (H_2S) related to volcanic activity on Hawai‘i Island. The primary purpose of the statewide monitoring network is to measure ambient air concentrations of these pollutants and ensure that these air quality standards are met.

Air pollution in Hawai‘i is caused by many different man-made and natural sources. There are industrial sources of pollution, such as power plants and petroleum refineries; mobile sources, such as cars, trucks and buses; agricultural sources, such as previous sugar cane burning and natural sources, such as windblown dust and volcanic activity. The DOH Clean Air Branch is responsible for regulating and monitoring pollution sources to ensure that the levels of criteria pollutants remain well below the State and federal ambient air quality standards.

Air quality on Hawaiʻi Island is affected by emissions from industrial sources, vehicles, and natural sources. The major industrial source for the island is oil-fired power plants, which emit SO_2, nitrogen oxides, and particulate matter. Motor vehicles emit CO, nitrogen oxides and hydrocarbons (an ozone precursor), as well as smaller amounts of other pollutants including particulates. Also emitting SO_2 is the geothermal power plant Puna Geothermal Venture, which supplies about 10-20% of the island's electricity. Volcanic emissions of sulfur dioxide convert into particulate sulfate, which causes a volcanic haze (vog) to blanket the area during occasional episodes of southerly kona winds. Vog concentrations are primarily dependent on the amount of volcanic emissions, the distance from the source vents, and the wind direction and speed on a given day. When trade winds are absent, which occurs most often during the winter months, East Hawaiʻi, the entire island or the entire state can be impacted by vog.

The State maintains six air monitoring stations on the island of Hawaiʻi, one of which is located in Hilo. According to DOH ambient air quality data, the quality of air in the Hilo area is considered to be good. The prevailing northeasterly trade winds tend to disperse pollutants toward the mountains, decreasing the concentration of pollution above Hilo. However, the amount of particulates and other air pollutants can significantly increase during periods when the winds shift to a southwesterly direction. Air flow from this direction carrying vog can lead to an increase in pollution and a decrease in visibility.

Impacts and Mitigation Measures

No significant impacts on air quality are anticipated as a result of the closure of the SHSL. During the construction of the synthetic grass/geomembrane final cover fugitive dust will be controlled, as required, by methods such as dust fences, water spraying and sprinkling of loose or exposed soil or ground surface areas. Respective contractors will be responsible for adhering to air quality standards and minimizing air quality impacts during the various phases of construction.

Exhaust emissions from construction vehicles are anticipated to have negligible impact on air quality in the Project vicinity as the emissions would be relatively small and readily dissipated. Any potential impacts will be mitigated by complying with the State DOH Administrative Rules, Title 11, Chapter 60 "Air Pollution Control". In the long-term, some vehicular emissions related to trucking all municipal solid waste from East Hawaiʻi to the County landfill at Puʻuanahulu in West Hawaiʻi are expected. However, due to the generally prevailing trade winds, the emissions would be relatively insignificant and readily dissipated.

The proposed passive landfill gas venting system will also result in the release of GHGs coming from decomposing materials in the landfill. These emissions, however, would occur without implementation of the proposed action as the landfill is already in place. To date, measurable concentrations of methane have not been identified in gas monitoring probes located around the landfill perimeter. Following closure of

SHSL, landfill gas levels will continue to be monitored for exceedance of permitted limits which is anticipated to reduce over time and approach zero. If there is any exceedance of permitted levels during the post-closure maintenance period, appropriate mitigation measures will be implemented in compliance with HAR 11-58.1-15(d).

3.8 Noise

Ambient noise at SHSL is predominantly attributed to the combined effects of truck traffic servicing the SHSL, aircraft overflights to and from the Hilo International Airport, industrial activities in the surrounding area, and the occasional use of the Pana‘ewa Drag Strip. Residences roughly 1,000 feet or more away near the intersection of ‘Auwae Road and Kahaope‘a Street are the nearest sensitive uses. At this distance, the landfill noise is perceptible but not a nuisance, and is blended in with airport, industrial, agricultural, and naturally occurring sounds. Therefore, existing noise impacts from the SHSL on sensitive receptors are modest.

Impacts and Mitigation Measures

Construction of the Project may result in short-term noise impacts to the surrounding environment. Noise generated by temporary construction activities will be similar in character and intensity to the existing noise conditions and is not anticipated to have an adverse effect on overall noise levels. Following closure of the landfill, noise associated with truck traffic is expected to be reduced to noise from required maintenance activities at the landfill. Noise associated with truck traffic to WHSL is anticipated to increase negligibly. Due to the rural nature of the Project area, the noise-producing nature of surrounding uses, and because no sensitive receptors exist in the immediate vicinity, the Project is not expected to result in significant noise impacts.

3.9 Visual Resources

A viewplane assessment completed as part of the Final EA for the SHSL Phase I Expansion (2006) noted that the SHSL is visible from at least one of the viewplanes mentioned in the *Hawai‘i County General Plan* (Halai Hill), as well as a limited number of other locations in Hilo such as Puainako Street Extension and the UH Research Technology Park. Even from these higher vantages, the bulky base of the SHSL is hidden behind vegetation and occupies only a small segment of the horizon.

From areas surrounding the SHSL, line-of-sight views are generally obstructed because of the relatively flat terrain and the dense, tall forest that acts as a visual barrier. Viewplanes of the SHSL from residences in the agricultural lands in proximity to the SHSL are generally obstructed by tall foliage. Other than the agricultural lots, land uses surrounding the SHSL are generally industrial, including the Hilo International Airport, and are thus less sensitive in terms of visual impacts. Regardless, the views towards the landfill from these areas are also obstructed by trees.

Impacts and Mitigation Measures

No direct, indirect, or cumulative impacts on visual resources are anticipated with implementation of the proposed action. The SHSL is currently only visible from the upland mauka areas in the Hilo suburbs. Viewplanes of the SHSL from the surrounding area is generally obstructed by dense, tall vegetation that provides a visual barrier for the area. Construction of the Project would not significantly alter the existing shape of the landfill and will involve placement of synthetic grass on the surface that will have the appearance of a low, linear vegetated hill that is harmonious with adjacent landscapes. No mitigation measures are proposed or anticipated to be required.

3.10 Traffic

Access to the Project site is off Leilani Street to a 50-ft wide road maintained by the County of Hawaiʻi. In addition to providing access to the landfill, the road is also used to access other properties and facilities including a quarry, borrow pits, sort station, drag strip, and the recently constructed Mass Transit Agency baseyard.

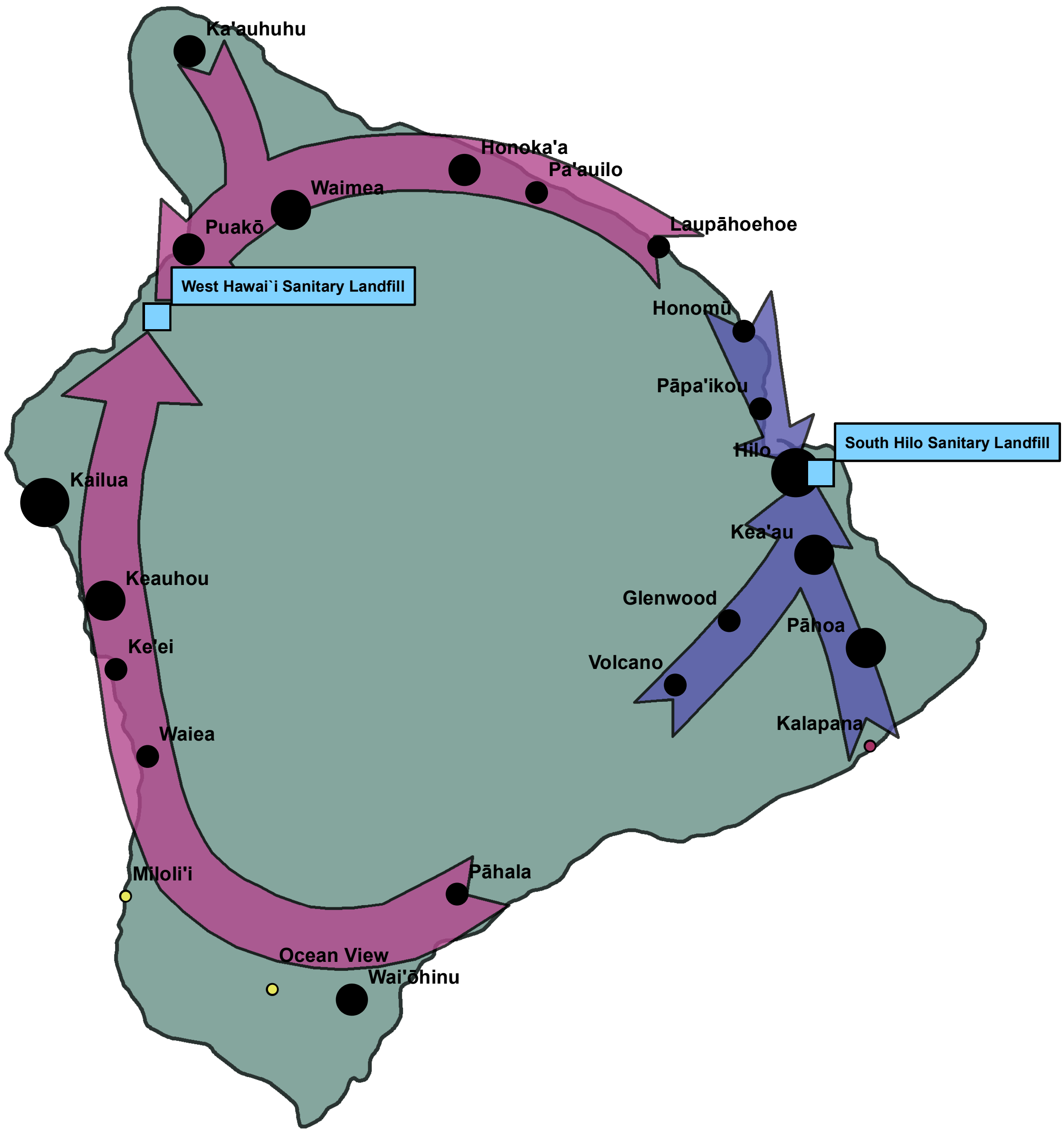
The SHSL currently accepts MSW from eight transfer stations in East Hawaiʻi: Honomū, Pāpaʻikou, Hilo, Keaʻau, Pāhoa, Kalapana, Glenwood, and Volcano. County transfer trailers bring MSW from the East Hawaiʻi transfer stations to the SHSL for final disposal. In addition to the County transfer trailers, MSW is also accepted at the SHSL from commercial haulers and other government agencies. The remaining transfer stations on the island bring MSW directly to the WHSL. See Figure 3-4. Upon closure of the SHSL, all of the island's MSW will be diverted to the WHSL for final disposal.

The option to truck waste to the WHSL was explored as an alternative in the Final EIS for the East Hawaiʻi Regional Sort Station (2004). Various concerns from the community were raised, including the use of West Hawaiʻi as a "dumping ground" for East Hawaiʻi waste, ability of West Hawaiʻi resorts to attract visitors, and reduction in the operational lifetime of the WHSL.

The Final EIS noted that the WHSL has been in service since 1993 and no empirical evidence suggests that it has affected the ambiance of West Hawaiʻi or the ability of West Hawaiʻi to attract visitors. Additionally, the operational lifetime of the WHSL will depend on the island-wide level of participation in waste diversion strategies along with the efforts of the County to promote and enhance waste diversion strategies.

Other concerns related to trucking waste to the WHSL centered on truck traffic and associated fugitive trash, odor and unsightliness. The traffic issue was studied in a traffic impact assessment as part of the 2004 Final EIS which concluded that under the worst case the impact resulting from project related traffic is minimal. The 2004 Final EIS went on to note that careful regulation of the wide variety of carriers would be necessary in order to minimize traffic, odor, and fugitive trash problems. Such regulation would have to include scheduling, secure covers, and other measures.

In 2012, the *Final Report of* the *Hilo Landfill Feasibility Study* recommended the 2004 traffic impact assessment be updated to verify its conclusions regarding the impact of truck traffic associated with trucking MSW to the WHSL. As such, Wilson Okamoto Corporation prepared a Traffic Assessment in October 2017 to assess the traffic impacts associated with closure of the landfill and subsequent diversion of waste to WHSL. The Traffic Assessment is provided in Appendix A and is summarized below.



Source: County of Hawai'i DEM SWD

WILSON OKAMOTO CORPORATION

FIGURE 3-4

FLOW OF MUNICIPAL SOLID WASTE ON HAWAI'I ISLAND

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

The County is still in the process of finalizing its post-closure operational plans associated with hauling waste; however, the current plan is to accept MSW at the EHRSS in Hilo where reusable or recyclable materials will be removed from the waste stream. The residual MSW will then be reloaded into County trailers and hauled to the WHSL. Should the mechanisms and logistics to realize this plan not be in place by the time the SHSL accepts its final load, it is possible that in the interim County trailers from the County transfer stations, commercial haulers, and other government agencies may be required to haul waste directly to the WHSL. In general, all trucks are expected to travel from East Hawaiʻi to the WHSL via Saddle Road/Daniel K. Inouye Highway, which has become a much more viable alternative since previous traffic studies due to recent improvements to the highway. From Saddle Road, all trucks are expected to head north via Mamalahoa Highway, continue west on Waikoloa Road, and travel south to Puʻuanahulu via Queen Kaʻahumanu Highway.

Under the projected 2019 AM and PM peak period operating conditions, Puainako Street is expected to continue operating at LOS "B" during both peak periods while Saddle Road is anticipated to continue operating at LOS "A" during the AM peak period and LOS "B" during the PM peak period. Mamalahoa Highway is anticipated to slightly change from an LOS "B" to an LOS "C" during the AM peak period. However, in general, traffic operations with and without the Project are expected to remain similar and traffic operations along the affected roadways are expected to operate at satisfactory conditions. The projected Year 2019 AM and PM peak period operating conditions are summarized in Table 3-1.

Table 3-1
Existing and Projected Year 2019 LOS Traffic Operating Conditions

Roadway	AM Peak Period			PM Peak Period		
	Existing	Year 2019 Without Project	Year 2019 With Project	Existing	Year 2019 Without Project	Year 2019 With Project
Puainako St	B	B	B	B	B	B
Saddle Rd	A	A	A	B	B	B
Mamalahoa Hwy (SR-190)	B	B	C	C	C	C
Waikoloa Rd	A	A	A	C	C	C
Queen Kaahumanu Hwy	B	B	B	D	D	D

Impacts and Mitigation Measures

Temporary increases in traffic from construction activities are anticipated in the short-term. Due to the temporary nature, these impacts are anticipated to be negligible. Upon final closure of the SHSL, MSW no longer be accepted at the facility and will need to be diverted to the WHSL for final disposal. Direct impacts are anticipated to be a reduction in traffic at the SHSL facility.

Based on the anticipated traffic generated when the landfill is closed along with the existing and projected traffic demands along the foregoing truck routes, traffic operations with and without the Project are expected to remain similar and traffic operations along the affected roadways are expected to operate at satisfactory conditions. Moreover, many of the trips currently generated by the SHSL occur during off-peak periods.

Measures to minimize impacts from trucking residual waste to WHSL may include, but are not limited to, the following:

- All waste being carried by vehicles will be properly contained to prevent waste loss during transportation as required by law.
- Vehicles transporting waste will be advised to route directly to WHSL and avoid any unnecessary stops or detours.
- WHSL should continually monitor for invasive ants using the protocols recommended by the USFWS.
- Driver training.

Long-term impacts will be mitigated by continuing existing waste diversion efforts and exploring new strategies intended to reduce the amount of waste disposed at County landfills. By doing so, the County intends to reduce the flow of waste to landfills thereby reducing the impacts and costs associated with trucking waste from East Hawaiʻi to the WHSL. In addition to the County efforts, waste diversion strategies will also depend on the island-wide level of participation from the public.

3.11 Socioeconomic

The largest towns on the island are Hilo (43,263), Kailua-Kona (pop. 11,975) and Waimea (9,212). Waikoloa has a population of 6,362. The Project site is located within the Hilo Census Designated Place (CDP). Demographic and other information was reviewed from the U.S. Census 2010 for the Hilo CDP and the County of Hawaiʻi and is shown in Table 3-2.

Based upon the data shown on the table, Hilo CDP has a slightly older population than the County of Hawaiʻi. The median age of the population for Hilo CDP was 40.4 versus 40.9 for the County.

By racial mix, the Hilo CDP has a higher percentage of Asians (34.3%) and a slightly higher percentage of individuals with two or more races (32.5%) than the County (22.2% and 29.5%, respectively). These groups (Asians and individuals with two or more races) make up the majority of the population. Native Hawaiian and other Pacific Islanders also comprise a slightly higher proportion than the County as a whole, with 14.2% and 12.1%, respectively. In contrast, Hilo CDP has a population of Whites (17.6%) that is half that of the County (33.7%).

According to the 2010 Census, Hilo CDP has a higher housing occupancy rate, 91.6%, than the County, 81.5%. Housing units in this region are occupied by more owners (62.2%) than renters (37.8%) consistent with County trends (66.0% and 34.0%, respectively).

Table 3-2
Demographic Characteristics

Subject	Hilo CDP		County of Hawaiʻi	
	Number	Percent	Number	Percent
TOTAL POPULATION	43,263	100	185,079	100
AGE				
Under 5 years	2,597	6.0	11,845	6.4
5-19 years	8,169	18.8	35,088	18.9
20-64 years	24,690	57.2	111,312	60.1
65 years and over	7,807	18.0	26,834	14.6
Median age (years)	40.4	---	40.9	---
RACE				
White	7,617	17.6	62,348	33.7
Black or African American	227	0.5	1,020	0.6
American Indian and Alaskan Native	132	0.3	869	0.5
Asian	14,833	34.3	41,050	22.2
Native Hawaiian and other Pacific Islander	6,132	14.2	22,389	12.1
Two or more races	14,064	32.5	54,535	29.5
Other	258	0.6	2,868	1.5
HOUSEHOLD (BY TYPE)				
TOTAL HOUSEHOLDS	15,483	100	67,096	100
Family households (families)	10,287	66.4	44,407	66.2
Married-couple family	7,034	45.4	31,834	47.4
With own children under 18 years	2,307	14.9	11,141	16.6
Female householder, no husband present	2,278	14.7	8,258	12.3
With own children under 18 years	1,027	6.6	4,054	6.0
Nonfamily household	5,196	33.6	22,689	33.8
Average household size	2.69	---	2.70	---
HOUSING OCCUPANCY AND TENURE				
TOTAL HOUSING UNITS	16,905	100	82,324	100
Occupied Units	15,483	91.6	67,096	81.5
By owner	9,623	62.2	44,271	66.0
By renter	5,860	37.8	22,825	34.0
Vacant Units	1,422	8.4	15,228	18.5

The island of Hawai‘i is still a dominantly rural area, with great tracts of open space partly used for farms or ranches. Over most of the island, population is clustered within towns or villages, not widely dispersed, although some areas (particularly Puna) contain large, sprawling “agricultural” subdivisions with low population density. Many businesses and government functions are headquartered in Hilo, including the University of Hawai‘i at Hilo. It is a major commercial center on the island of Hawai‘i and supports several industrial and commercial districts. Hilo International Airport and the deep draft harbor anchor the major shipping center on the island.

The closing of Ka‘u Sugar in 1996 marked the end of the sugar plantation era on the Big Island. Today, County and State government, the University of Hawai‘i at Hilo, several astronomy bases, and diversified agriculture anchor the economy. Ranching continues to be a major industry, with over $20 million in annual sales. East Hawai‘i is noted for its lush tropical agriculture: anthurium, papaya, orchid, foliage, banana, and ginger, among others, as well as a growing potential for wood products.

Over the years, various options to expand the existing landfill or find an alternative landfill site in East Hawai‘i have been explored. There have been several significant constraints have thwarted these efforts. Hence, the *Final Report of the Hilo Landfill Feasibility Study* prepared for the DEM (March, 2012) concluded that “while technically feasible, it is neither practical nor economically sound to proceed with design and permitting a landfill expansion in Hilo. Permitting constraints, land use constraints, and leachate management issues all present significant and, perhaps, insurmountable obstacles. Furthermore, based on our planning level cost estimates, trucking and disposal of waste at the existing West Hawai‘i Sanitary Landfill provides a potentially feasible and more cost effective disposal alternative.”

Impacts and Mitigation Measures

No relocation of residences, businesses, community organizations or farms would occur because of the Project. The Project would only provide a final cover for the landfill that is intended to protect public health, safety, and the environment. Without action, the SHSL would reach the maximum capacity allowed in the County’s current DOH solid waste management permit. As such, the County will need to stop accepting waste at the SHSL. With limited available capacity remaining at the existing landfill, significant constraints to expanding the existing landfill or establishing a new landfill in East Hawai‘i, and a steady East Hawai‘i waste stream, there are no viable options but to truck waste to the WHSL for final disposal.

3.12 Public Services and Facilities

3.12.1 Police, Fire and Medical Services

Police protection in the Project area is provided by the County of Hawai‘i Police Department. The SHSL is part of the South Hilo, Patrol District 1 that covers the area between Halakau in the north, to the mid-point of Kanoelehua Avenue between Hilo and Kea‘au in the south, to Saddle Road in the west. The area is served by the main police station located on Kapi‘olani Street near downtown Hilo, approximately 3 miles from the landfill.

Fire prevention and protection is provided by the Hawai‘i County Fire Department. Fire Department personnel include paramedics who respond to medical as well as fire emergencies. The Hawai‘i County Fire Department Kawailani Fire Station provides fire protection and suppression services in Waiākea. Backup support is provided by the Central Fire Station located 3.5 miles away in Hilo, the Kaumana Fire Station located 4.5 miles away, and the Waiākea Fires Station located 2.5 miles away in Kauakaha. A new fire station, Haihai, is less than three miles from SHSL.

Hilo Medical Center located approximately 5 miles northwest of the Project site on Waiānuenue Avenue is the primary health care facility serving the South Hilo District.

Several medical and healthcare facilities are located along Waiānuenue Avenue in proximity to SHSL including Kaiser Permanente, Saint Francis Dialysis Center, Hale Anuenue Restorative Care Center, Hawai‘i Pacific Oncology Center (owned by Hilo Medical Center), and The Arc of Hilo and Hospice of Hilo.

Impacts and Mitigation Measures

No direct, indirect, or cumulative impacts on police, fire, and medical services are anticipated with implementation of the proposed action. The Project is not anticipated to affect traffic and/or public safety concerns. No mitigation measures are proposed or anticipated to be required.

3.12.2 Educational Facilities

The Project is located in the State Department of Education’s Hilo-Laupahoehoe-Waiākea Complex Area within the Hawai‘i District. The closest State Department of Education (DOE) public schools are: Waiākeawaena Elementary School, Waiākea Elementary School, Waiākea Intermediate School, and Waiākea High School.

Impacts and Mitigation Measures

No direct, indirect, or cumulative impacts on educational facilities are anticipated with implementation of the proposed Project. The Project will not generate new residents or introduce new school-aged children to the area. Therefore, no additional demands will be placed on DOE facilities. While the construction of the proposed Project may generate some noise and fugitive dust, the closest public school, Waiākeawaena Elementary School, is located nearly two miles away. The distance will disperse construction noise. In addition, the Waiākeawaena Elementary School is upwind of the proposed Project site during predominant trade wind conditions, and so even if airborne dust was generated, it would be unlikely to impact children attending classes.

3.12.3 Recreational Facilities

The entire South Hilo District contains 54 parks totaling 590 acres. The nearest recreational facilities to the Project Site are Pana‘ewa Park and Malama Park. Other recreational facilities, parks, and open spaces in the Hilo area include Hilo Municipal Golf Course, Ainaola Park, Ahualani Park, Lokahi Park, Waiākea Uka Park, Kūhiō-Kalaniana‘ole Park, Honoli‘i Beach Park, Lili‘uokalani Gardens, Reeds Bay, Onekahakaha Beach Park, Kealoha Beach Park, Carlsmith Beach Park and Richardson Ocean Park.

<u>Impacts and Mitigation Measures</u>

No direct, indirect, or cumulative impacts on recreational facilities are anticipated with implementation of the proposed action. The Project is not a direct generator of new residents requiring recreational facilities. No mitigation measures are proposed or anticipated to be required.

3.13 Infrastructure and Utilities

3.13.1 Water and Wastewater Systems

Existing water resources for the Hilo area come from ground water (65.5 percent) and surface water (34.5 percent). The water system in the Hilo area is served by one main system, and four smaller systems. The Hilo system consumes a daily average of 5.49 million gallons of water from five surface systems and five deep well sources. The surface sources are the Waiakea-Uka Tunnel, the Olaa Flume Spring, Lyman Spring, Wailuku River-Hookelekele Stream, and Kaohama Stream. Three of the smaller systems use deep well sources, while the one remaining source draws its supply from the surface water. Industrial and Commercial sources draw water from smaller wells.

The County of Hawaiʻi Department of Water Supply (DWS) provides potable water service to the Project area through a 12-inch water main that runs along Leilani Street and extends to the recently constructed Mass Transit Agency baseyard located south of the landfill. The County does not provide sewer service to SHSL.

<u>Impacts and Mitigation Measures</u>

No direct, indirect, or cumulative impacts on water and wastewater systems are anticipated with implementation of the proposed action. The Project does not involve uses that would place additional demand on the existing water and wastewater systems. No mitigation measures are proposed or anticipated to be required.

3.13.2 Drainage System

During and immediately after heavy rainstorm events, water currently sheet-flows off certain portions of the landfill face and slopes and/or percolates within the upper layers of the landfill. Due to the porous nature of the landfill cover materials and the surrounding strata, the concentrated flow of storm water occurs only sporadically. The existing grading plan of the landfill provides for storm water drainage to be directed to two (2) separate existing detention basins where water infiltrates into the ground. One basin is located at the northeast corner of the landfill while the other is located at the southeast corner of the landfill.

<u>Impacts and Mitigation Measures</u>

The Project includes installation of a geomembrane layer that is impermeable and will generate additional storm water runoff that will occur as sheet-flow off the landfill. The additional storm water runoff will be retained on-site and will be accommodated by a new detention and infiltration basin proposed at the northwest corner of the landfill. The new detention basin will be sized using the final surface area that will be contributing storm water runoff from the design storm event. A site-specific storm water runoff analysis to confirm the sizing of the existing and proposed detention basins will be prepared prior to construction of the Project. A final drainage system design that meets the approval of the County of Hawaiʻi Department of Public Works will be constructed. No indirect or cumulative impacts on the drainage system are anticipated with implementation of the proposed action.

3.13.3 Electrical and Communication Systems

There are currently no existing electrical or wired communication systems at the Project site.

Impacts and Mitigation Measures

No mitigation measures are proposed or anticipated to be required.

4. RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

This section discusses the State and County of Hawai‘i land use plans, policies, and controls relating to the proposed project.

4.1 State of Hawai‘i

4.1.1 State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

The State Land Use Law, Chapter 205, HRS, is intended to preserve, protect and encourage the development of lands in the State for uses which are best suited to the public health and welfare of Hawaii's people. All lands in the State are classified into four land use districts by the State Land Use Commission (LUC): Urban, Agricultural, Conservation, and Rural.

The LUC's Land Use District Boundary map for the Island of Hawai‘i depicts Parcels 152 and 162 split between the State Land Use Urban and Agricultural Districts. Parcel 156 is within the State Land Use Agricultural District. See Figure 4-1. The existing and planned use is a permitted use for areas within the State Land Use Urban District. Special Permit No. 574, approved with conditions on January 31, 1985, allowed the extension of the landfill eastward onto 15 acres of Parcel 156. Condition C required the County to submit an application for a State Land Use District boundary amendment from the Agricultural to Urban District for the subject property within five years from the date of approval, which never occurred. The County intends to coordinate with the Planning Department to remedy the lack of compliance with Condition C as it continues to move forward with the Project.

4.1.2 Hawai‘i Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

Hawai‘i's Coastal Zone Management (CZM) Program, established pursuant to Chapter 205A, Hawai‘i Revised Statutes (HRS), as amended, is administered by the State Office of Planning (OP) and provides for the beneficial use, protection and development of the State's coastal zone. The objectives and policies of the Hawai‘i CZM Program encompass broad concerns such as impact on recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. The Hawai‘i CZM area includes all lands within the State and the areas seaward to the extent of the State's management jurisdiction. Hence, the proposed project site is located in the CZM area. A discussion of the project's consistency with the objectives and policies of the CZM program is provided below.

Recreational Resources

Objective: *Provide coastal recreational opportunities accessible to the public.*

Policies:

1) *Improve coordination and funding of coastal recreational planning and management; and*
2) *Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
   a) *Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas.*

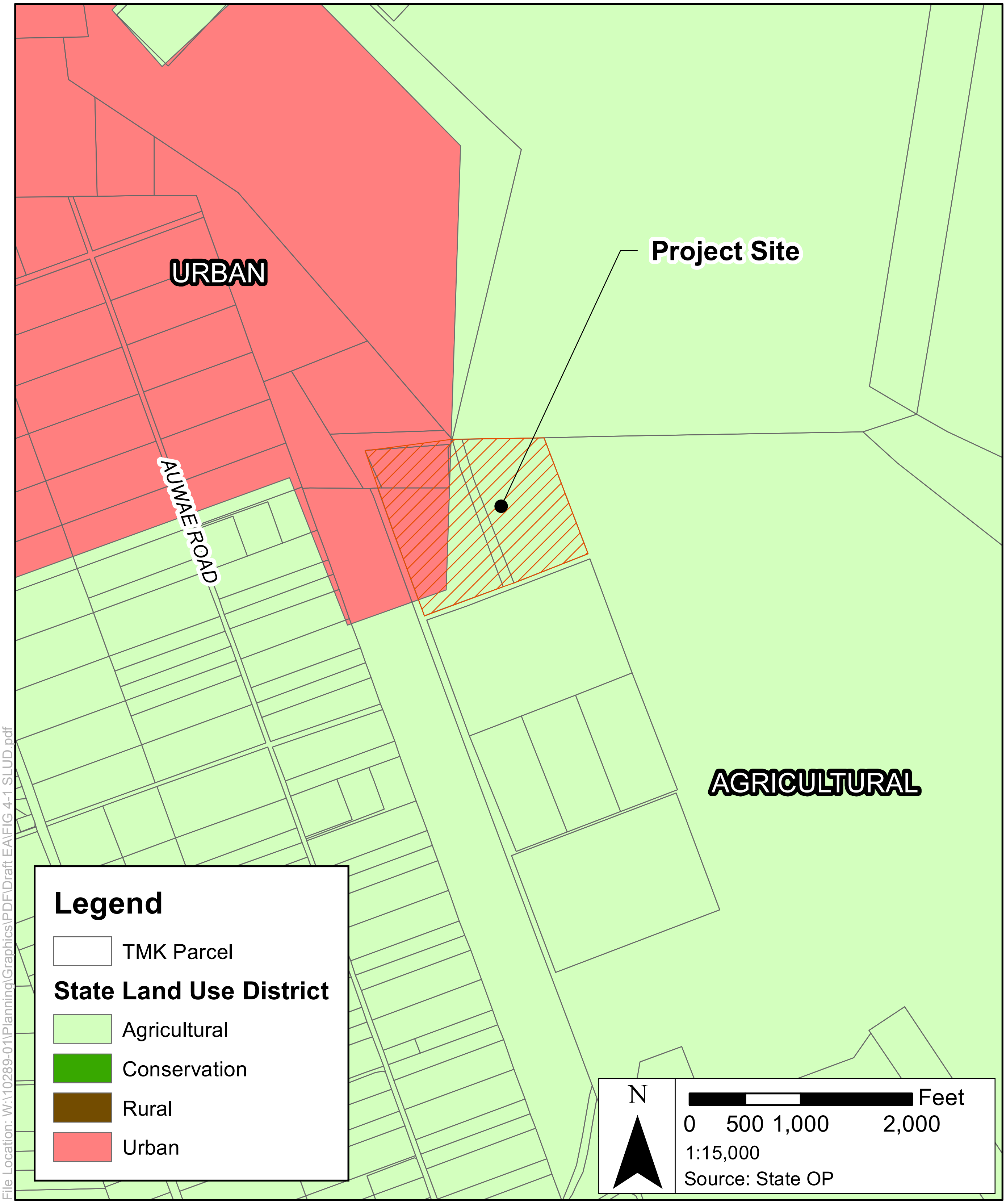


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FIGURE 4-1

STATE LAND USE DISTRICT

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

b) Requiring placement of coastal resources having significant recreational value including, but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when placement is not feasible or desirable.
c) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value.
d) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation.
e) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources.
f) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.
g) Developing new shoreline and recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing.
h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Hawaiʻi Revised Statutes, section 46-6.

Discussion:
The SHSL is not located within proximity to the shoreline or water body such as a stream, river, pond, lake, or ocean. Access to and provision of coastal recreational resources will not be affected by the Project.

Historic Resources

Objective: *Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*

Policies:
1) Identify and analyze significant archaeological resources.
2) Maximize information retention through preservation of remains and artifacts or salvage operations; and
3) Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion:
The site has been used as a landfill for several decades. Prior to its use as a landfill, the Project area was associated primarily with modern commercial quarrying activities. Due to the extent of ground disturbance in the area, the inland location of the site from historic coastal communities, and the regional soil characteristics, the Project area is unlikely to

contain historic properties, archaeological resources, or any resources of a potential traditional cultural nature.

Scenic and Open Space Resources

<u>*Objective:*</u> *Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.*

<u>*Policies:*</u>

1) *Identify valued scenic resources in the coastal zone management area.*
2) *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.*
3) *Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources.*
4) *Encourage those developments that are not coastal dependent to locate in inland areas.*

<u>**Discussion:**</u>

The SHSL is located inland and away from the coast. Thus, the Project would not adversely affect existing public views to and along the shoreline. The SHSL is presently visible only from areas that are a significant distance away on the upper slopes of suburban Hilo. In contrast, light-of-sight views are generally obstructed in the land immediately surrounding the landfill because of the relatively flat terrain and the dense, tall vegetation that acts as a visual barrier. Construction of the Project would not significantly alter the existing shape of the landfill and will involve placement of synthetic grass on the surface that will have the appearance of a low, linear vegetated hill that is consistent with adjacent landscapes.

Coastal Ecosystems

<u>*Objective:*</u> *Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*

<u>*Policies:*</u>

1) *Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources.*
2) *Improve the technical basis for natural resource management.*
3) *Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance.*
4) *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land water uses, recognizing competing water needs.*
5) *Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.*

Discussion:
The SHSL is located approximately 2 miles away from the coast and outside of the Special Management Area (SMA) and Shoreline Setback area. No water bodies such as a stream, river, pond, lake, or ocean occur in the vicinity.

Economic Uses

Objectives: *Provide public or private facilities and improvements important to the State's economy in suitable locations.*

Policies:
1) *Concentrate coastal development in appropriate areas.*
2) *Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.*
3) *Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:*
   a) *Use of presently designated locations is not feasible;*
   b) *Adverse environmental effects are minimized; and*
   c) *The development is important to the State's economy.*

Discussion:
The Project is not coastal dependent and is located approximately 2 miles well away from the coast.

Coastal Hazards

Objective: *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.*

Policies:
1) *Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards.*
2) *Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards.*
3) *Ensure that developments comply with requirements of the Federal Flood Insurance Program.*
4) *Prevent coastal flooding from inland projects.*

Discussion:
The Project will stabilize and close a landfill so as to minimize impacts related to flood, hurricane, and seismic hazards. The SHSL is located in an area outside of the 500-year flood plain. Measures to retain storm water runoff on-site will be taken to mitigate flood impacts on surrounding properties. Such measures include constructing a new detention

and infiltration basin adjacent to the landfill footprint. The final cover system will also be designed in consideration of hurricane force winds and seismic activity.

Managing Development

Objectives: *Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*

Policies:
1) *Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.*
2) *Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements.*
3) *Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

Discussion:
This EA is being prepared pursuant to Chapter 343, HRS, which provides opportunities for agency consultation and coordination as well as for public notification and participation.

Public Participation

Objective: *Stimulate public awareness, education, and participation in coastal management.*

Policies:
1) *Promote public involvement in coastal zone management processes.*
2) *Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities.*
3) *Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

Discussion:
This EA is being prepared and processed pursuant to Chapter 343, HRS, which provides opportunities for agency consultation and coordination as well as for public notification and participation.

Beach Protection

Objective: *Protect beaches for public use and recreation.*

Policies:
1) *Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion.*

2) *Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities.*
3) *Minimize the construction of public erosion-protection structures seaward of the shoreline.*
4) *Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor.*
5) *Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.*

Discussion:
The SHSL is not located within proximity to the shoreline or water body such as a stream, river, pond, lake, or ocean. No structures are proposed and public beaches will not be affected by the Project.

Marine Resources

Objective: *Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*

Policies:
1) *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial.*
2) *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency.*
3) *Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone.*
4) *Promote research, study, and understanding of ocean processes, marine life, and other ocean resources to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources.*
5) *Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

Discussion:
No impacts on marine and coastal resources are anticipated as a result of the Project.
An essentially impermeable cover will be placed on the top and the side slopes of the landfill to prevent leaching into underlying groundwater resources. Perimeter ditches will also be provided to direct storm water flows to detention basins where the storm water runoff will percolate into the ground. No adverse effects on surface water features is anticipated with the Project as the SHSL is not located within proximity to the shoreline or a water body such as a stream, river, pond, lake, or ocean. No structures are proposed and public beaches will not be affected by the Project.
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4.1.3 Hawaiʻi State Plan, Chapter 226, Hawaiʻi Revised Statutes

The Hawaiʻi State Plan, Chapter 226, HRS, identifies the goals, objectives, policies, and priorities that serve to guide for the future long-range development of the State. The Hawaiʻi State Plan also provides a basis for determining priorities, allocating limited resources, and improving coordination of federal, state, and county plans policies, programs, projects, and regulatory activities. The proposed project is consistent with the following applicable objectives and policies:

Section 226-11 Objectives and policies for the physical environment—land-based, shoreline, and marine resources.

(a) *Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:*

(2) *Effective protection of Hawaiʻi's unique and fragile environmental resources.*

(b) *To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:*

(3) *Take into account the physical attributes of areas when planning and designing activities and facilities.*

(4) *Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environment damage.*

(6) *Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaiʻi.*

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

Discussion:
No impacts on marine, coastal or fragile environmental resources are anticipated as a result of the Project. The SHSL is not located within proximity to the shoreline or water body such as a stream, river, pond, lake, or ocean, nor is it located near habitats of any rare or endangered species.

Section 226-12 Objectives and policies for the physical environment—scenic, natural beauty, and historic resources.

(a) *Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaiʻi's scenic assets, natural beauty, and multi-cultural/historical resources.*

(b) *To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:*

(3) *Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.*

Discussion:

The SHSL is located inland and away from the coast. Thus, the Project would not adversely affect existing public views to and along the shoreline. The SHSL is presently visible only from areas that are a significant distance away on the upper slopes of suburban Hilo. At that distance, the synthetic turf landfill cover would appear natural. In contrast, line-of-sight views are generally obstructed in the land immediately surrounding the landfill because of the relatively flat terrain and the dense, tall vegetation that acts as a visual barrier. Construction of the Project would not significantly alter the existing shape of the landfill and will involve placement of synthetic grass on the surface that will have the appearance of a low, linear vegetated hill that is consistent with adjacent landscapes.

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

- *(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:*
  - *(1) Maintenance and pursuit of improved quality in Hawai'i's land, air, and water resources.*
- *(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:*
  - *(2) Promote the proper management of Hawai'i's land and water resources.*
  - *(3) Promote effective measures to achieve desired quality in Hawai'i's surface, ground, and coastal waters.*
  - *(4) Encourage actions to maintain or improve aural and air quality levels to enhance the well-being of Hawai'i's people.*
  - *(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.*

Discussion:

The Project will stabilize and close a landfill so as to minimize impacts related to flood, hurricane, and seismic hazards. The SHSL is located in an area outside of the 500-year flood plain. Measures to retain storm water runoff on-site will be taken to mitigate flood impacts on surrounding properties. Such measures include constructing a new detention and infiltration basin adjacent to the landfill footprint. The final cover system will also be designed in consideration of hurricane force winds and seismic activity.

Section 226-14 Objectives and policies for facility systems—in general.

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

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

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

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

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

<u>Discussion:</u>
The proposed closure of the SHSL will be necessary when its capacity is reached. Given the constraints on expanding the existing landfill or finding another site in East Hawai‘i, as discussed in Section 1.2 Purpose and Need, the most cost-effective alternative is to transport solid wastes to the WHSL for disposal.

Section 226-15 Objectives and policies for facility systems—solid and liquid wastes.

(a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:

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

(b) To achieve solid and liquid waste objectives, it shall be the policy of this State to:

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

<u>Discussion:</u>
The existing waste diversion strategies used to minimize disposal volumes in the SHSL will be continued such that only the residual stream will be transported for disposal at the WHSL. Current waste diversion strategies include recycling, green waste mulching, and recovery of oversized, electronic, and hazardous waste.

Section 226-20 Objectives and policies for socio-cultural advancement—health.

(a) Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:

(1) Fulfillment of basic individual health needs of the general public.

(2) Maintenance of sanitary and environmentally healthful conditions in Hawai‘i's communities.

(b) To achieve the health objectives, it shall be the policy of this State to:

(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.

Discussion:
Closure criteria under 40 CFR Part 258, Subpart F states that owners and operators of all MSW landfill units must install a final cover system that is designed to minimize infiltration and erosion and prepare a written closure plan that describes the steps necessary to close all MSW landfill units.

RCRA Subtitle D regulations also require the owner or operator of the landfill to prepare a post-closure plan and perform post-closure monitoring and maintenance on the landfill for 30 years after it closes to ensure the former landfill does not become a risk to public health and safety. Post-closure monitoring and maintenance activities include:

- Maintaining the final landfill cover, and making repairs if necessary, to ensure that the effects of settlement, subsidence, erosion, or other events do not breach the integrity of the cover system;
- Collecting, treating and properly disposing of landfill leachate;
- Monitoring groundwater for contamination and performing remedial actions if necessary; and
- Maintaining and operating a gas monitoring system.

4.2 County of Hawaiʻi

4.2.1 County of Hawaiʻi General Plan

The County of Hawaiʻi General Plan, adopted by the Hawaiʻi County Council in February 2005 (amended in December 2006), is the overall planning document outlining the long-range comprehensive development of Hawaiʻi Island. It brings into focus the relationship between residents and their pursuits and institutions, offering policy statements that embody the expressed goals for present and future generations.

The Plan contains goals, policies and standards to guide the development of the County in 13 areas: economic, energy, environmental quality, flood control and drainage, historic sites, natural beauty, natural resources and shoreline, housing, public facilities, public utilities, recreation, transportation, and land use. The goals, policies, and standards related to the proposed project are discussed below.

<u>*Environmental Quality Goals*</u>

(a) Define the most desirable use of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.
(b) Maintain and, if feasible, improve the existing environmental quality of the island.
(c) Control pollution.

<u>*Environmental Quality Policies*</u>

(a) Take positive action to further maintain the quality of the environment.

Discussion:
The proposed action serves to maintain environmental quality through the proper closure of an existing landfill in accordance with State and federal regulations. Post-closure monitoring and maintenance on the landfill will be required for a minimum of 30 years after it closes to ensure the former landfill does not become a risk to public health and safety. Post-closure monitoring and maintenance activities include:

- Maintaining the final landfill cover, and making repairs if necessary, to ensure that the effects of settlement, subsidence, erosion, or other events do not breach the integrity of the cover system;
- Monitoring groundwater for contamination and performing remedial actions if necessary; and
- Maintaining and operating a passive gas monitoring system and performing remedial actions if necessary.

Additionally, the County General Plan calls for the following among its Environmental Quality Standards:

(a) Pollution shall be prevented, abated, and controlled at levels that will protect and preserve the public health and well-being, through the enforcement of appropriate federal, state and county standards.
(b) Incorporate environmental quality controls either as standards in appropriate ordinances or as conditions of approval.
(c) Federal and State environmental regulations shall be adhered to.

4.2.2 General Plan Land Use Pattern Allocation Guide and Zoning

The General Plan Land Use Pattern Allocation Guide Map (LUPAG) delineates broad-brush boundaries that are graphic expressions of the General Plan policies, particularly those relating to land uses. The land use pattern in a broad, flexible design intended to guide the direction and quality of future developments in a coordinated and rational manner. These maps delineate a number of land use categories for each area.

The General Plan Land Use Pattern Allocation Guide (LUPAG) designation for the project area is Important Agricultural Land. See Figure 4-2. Important agricultural lands are those with better potential for sustained high agricultural yields because of soil type, climate, topography, or other factors. Parcels 152 and 162 are split-zoned General Industiral (MG-1a) and Agricultural (A-20a). Parcel 156 is zoned A-20a by the County. See Figure 4-3. The existing and planned use is a permitted use for areas within the County zoning Industrial.

4.2.3 County of Hawai‘i Integrated Resources and Solid Waste Management Plan Update

In compliance with Chapter 342G, HRS, counties in Hawai‘i are required to update and revise their solid waste management plans every five years. The last update to the Plan was completed during 2009. The Integrated Resources and Solid Waste Management Plan (IRSWMP) update provides an evaluation of waste management practices in the County, including waste reduction practices and programs, opportunities for implementation of zero

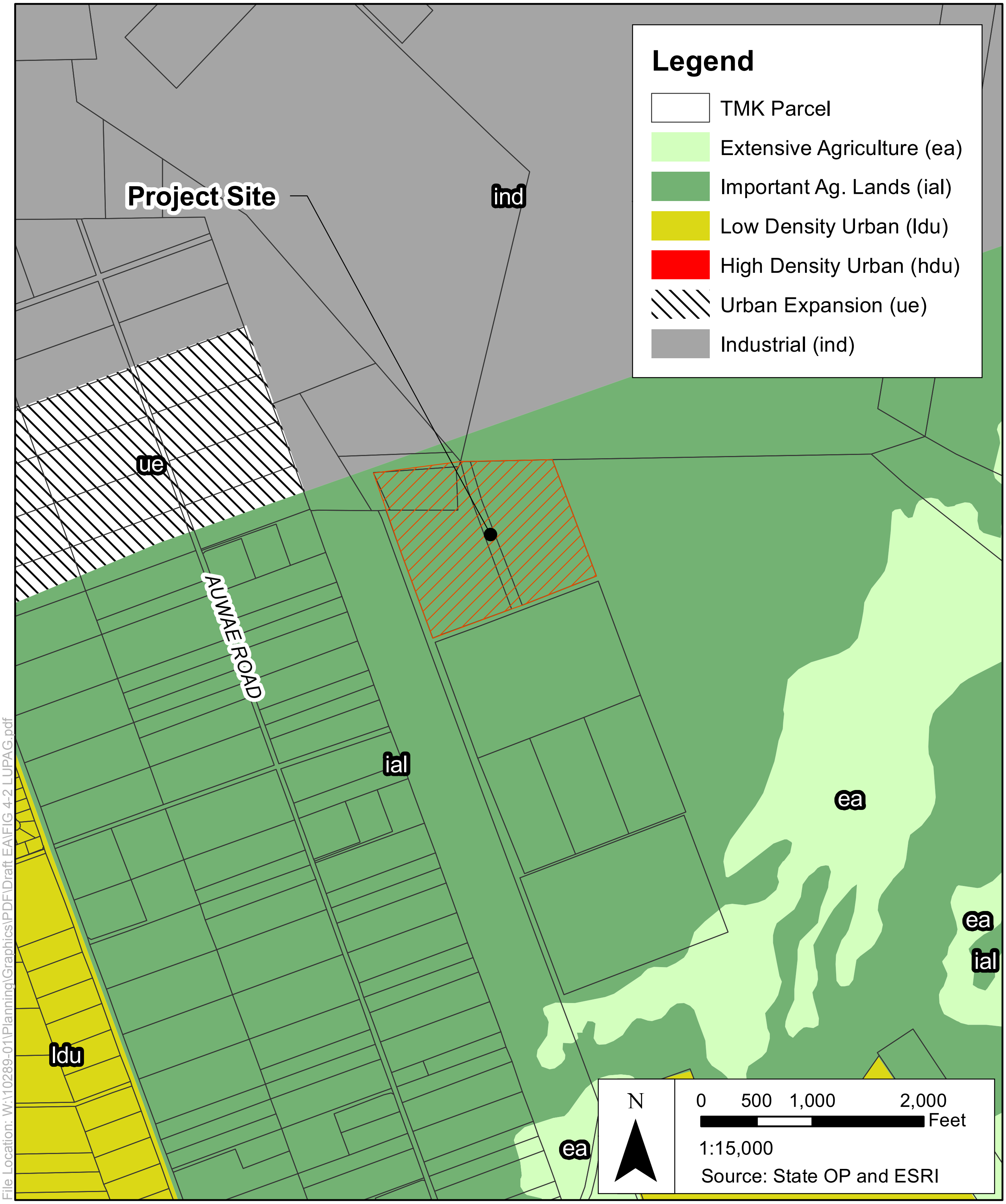

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FIGURE 4-2

LAND USE PATTERN ALLOCATION GUIDE

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

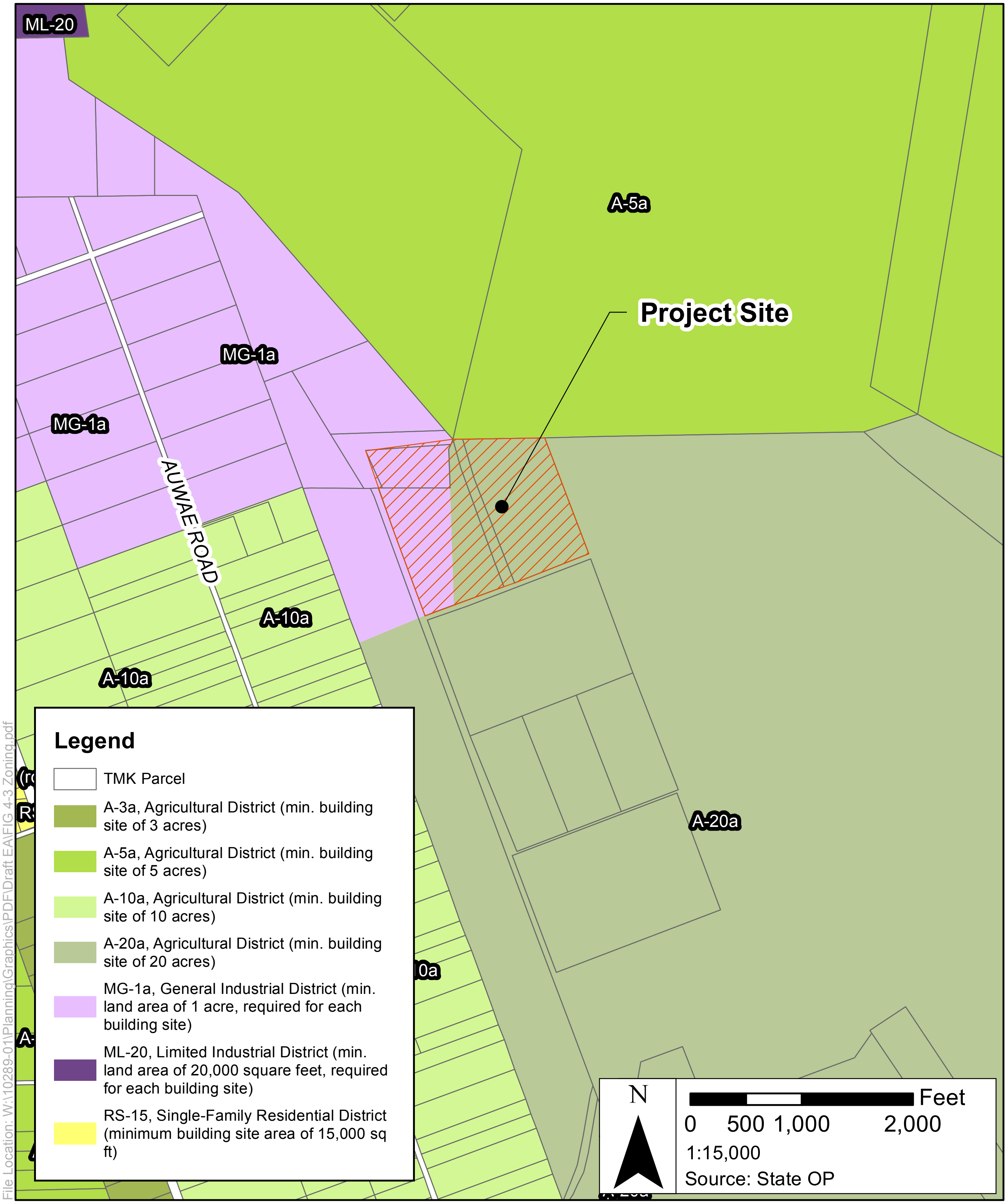

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FIGURE 4-3

COUNTY OF HAWAIʻI ZONING MAP

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

waste policies and practices, the status of both active and closed landfills, and potential options for expanding and extending the capacity of the SHSL.

The IRSWMP update outlines a series of recommendations for action during the County's next 5-year implementation period generally consisting of the following:

- Implementing a series of programs to reduce the volume of waste entering the landfills;

- Making improvements to existing infrastructure to accommodate new waste reduction programs; and

- Conducting more in-depth evaluations of 1) re-configuring the Reload Facility (also known as the East Hawaiʻi Regional Sort Station) at the SHSL and trucking waste to WHSL, or 2) developing a new lined landfill adjacent to the current SHSL, to address the need for long-term capacity for residuals needing disposal.

The County is currently in the early stages of updating the 2009 IRSWMP, expected to be published in the late third quarter of 2019.

4.3 Permits and Approvals

The following is a list of permits, approvals, and reviews that may be required prior to construction and operation of the proposed project.

Federal

Federal Aviation Administration
- FAA Form 7460-1 Notice of Proposed Construction or Alteration

State of Hawaiʻi

Department of Transportation
- Traffic Assessment

Department of Land and Natural Resources Land Division
- Authorization for use of TMK (3) 2-1-013: 162

Department of Health
- Final closure design approval
- Post-closure plan approval
- National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water Discharges from Construction Activities

County of Hawaiʻi

Department of Public Works
- Final drainage system design approval
- Grading Permit

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5. ALTERNATIVES ANALYSIS

5.1 Landfill Expansion or New East Hawaiʻi Landfill

The SHSL is the only MSW landfill in East Hawaiʻi. Based on available airspace and current daily loads, the County expects the landfill will reach its permitted maximum capacity within the next two years. Although various options to expand the existing landfill or to find an alternative landfill site in East Hawaiʻi have been explored over the years, several significant constraints have thwarted these efforts. . Hence, the *Final Report of the Hilo Landfill Feasibility Study* prepared for the DEM (March, 2012) concluded that "while technically feasible, it is neither practical nor economically sound to proceed with design and permitting a landfill expansion in Hilo. Permitting constraints, land use constraints, and leachate management issues all present significant and, perhaps, insurmountable obstacles. Furthermore, based on our planning level cost estimates, trucking and disposal of waste at the existing West Hawaii Sanitary Landfill provides a potentially feasible and more cost effective disposal alternative."

With expansion of the existing landfill, leachate management in a high rainfall area such as East Hawaii is a major constraint under the permitting requirements of RCRA Subtitle D. Unlike the existing landfill that is currently unlined, the expanded portion would now require a liner to capture leachate for treatment prior to disposal. Developing leachate treatment options would be costly, such as with a new constructed sub-surface wetland or a major upgrade to the Hilo Wastewater Treatment Plant to which the collected leachate would need to be transported to by trucks. With opening a new East Hawaii landfill, issues with finding a location such as the cost to relocate existing uses, conflicts with planned uses by current owners/users or environmental justice resolution present major obstacles. While such issues could conceivably be addressed at significant cost and over time, no alternative would be available in time to continue landfill disposal in East Hawaii before the existing landfill reaches capacity. Therefore, the proposed action is to close the existing landfill in compliance with State and federal rules and regulations while continuing to meet long-term waste management objectives by implementing waste diversion strategies and hauling residual waste from the East Hawaii waste stream to the WHSL.

5.2 Alternative Landfill Cover Systems

HDR, Inc. investigated a variety of alternative cover systems based on how they would perform with respect to site specific parameters of the SHSL. The criteria for selecting the final cover alternatives that can potentially be deployed for final closure at the SHSL includes:

1. Does it meet regulatory requirements for infiltration?
2. Does it meet engineering design requirements for constructability, slope stability and long-term performance?
3. Does it meet physical site specific performance parameters for rainfall, wind, and natural exposure?
4. Is it economically feasible?
5. What are post-closure repair and maintenance requirements?

Three final cover systems were identified that can achieve the regulatory requirements set forth by the State of Hawaiʻi (HAR §11-58.1-17(2)). Two of these alternatives were examined as options to the Subtitle D prescribed landfill cover with the intent of avoiding the costly importation of soil materials that would meet the specified soil permeability requirements, and which are not locally available on Hawaiʻi Island for use at SHSL. The third alternative is the Subtitle D prescribed cover system.

The three alternatives were evaluated based on the basis of closure construction cost, overall site work cost, technical feasibility, construction complexity, expert labor, post-closure care, prior Region 9 approval for similar closure systems, and community and State DOT Airports Division acceptance. The findings of the evaluation were used to compare and rank the potential final cover alternatives for closure of the SHSL. See Table 5-1 and 5-2. Alternative 1, a very low permeability geomembrane overlain by synthetic grass was identified as the preferred alternative. In addition to the three alternatives, discussion of a "no action alternative" is also provided below.

Table 5-1 Overall Ranking of Closure Alternatives for Side Slopes

EVALUATION FACTOR	ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3	
	Geomembrane/Turf	**Rank**	**Evapotranspiration (ET)**	**Rank**	**EPA Prescribed System**	**Rank**
Closure Costs ($/acre)	$250,000	1	$300,000	2	$400,000	3
Overall Site Work Cost ($)	$2,300,000	1	$2,500,000	3	$2,500,000	3
Technical Feasibility	Feasible	1	May require further testing	3	Feasible	1
Construction Complexity	Less Challenging	1	Challenging	3	Very Challenging	3
Expert Labor Required	Requires Import	3	Locally Available	1	Locally Available	1
Post Closure Care ($/acre/year)	$2,300	1	$2,400	2	$2,400	2
Prior Region 9 Approval for Similar Closure System	Yes	1	Yes	1	Yes	1
Community & DOT Airports Division Acceptance	Most Favorable	1	Favorable	2	Favorable	2
Overall Evaluation Ranking - Side Slopes Cover Alternatives	1		2		3	

Table 5-2 Overall Ranking of Closure Alternatives for Top Deck

EVALUATION FACTOR	ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3	
	Geomembrane/Turf	**Rank**	**Geosynthetic/Soil Composite**	**Rank**	**EPA Prescribed System**	**Rank**
Closure Costs ($/acre)	$200,000	1	$300,000	2	$400,000	3
Overall Site Work Cost ($)	$2,300,000	1	$2,500,000	3	$2,500,000	3
Technical Feasibility	Feasible	1	Feasible	1	Feasible	1
Construction Complexity	Less Challenging	1	Less Challenging	1	Very Challenging	3
Expert Labor Required	Requires Import	3	Requires Import	2	Locally Available	1
Post Closure Care ($/acre/year)	$1,200	1	$1,600	2	$1,600	2
Prior Region 9 Approval for Similar Closure System	Yes	1	Yes	1	Yes	1
Community & DOT Airports Division Acceptance	Most Favorable	1	Favorable	2	Favorable	2
Ability to Accept a Solar Array in the Future	High	1	Moderate	2	Low	3
Overall Evaluation Ranking - Top Deck Cover Alternatives	1		2		3	

5.2.1 Alternative 1: A Very Low Permeability Geomembrane overlain by Synthetic Grass

The proposed final cover system consists of installing a very low permeability geomembrane layer (synthetic lining) overlain by a synthetic grass layer that is ballasted with 0.5 to 1 inch thick layer of sand. See Figure 5-1. The sand ballast and synthetic grass work to protect the essentially impermeable geomembrane from long-term degradation from ultraviolet (UV) exposure, hail damage, shear stress from light equipment, and wind uplift. This cover system will be deployed on both the SHSL top deck and side slopes. The sand on the side slope areas would also need to be amended with a polymer bonding agent so it adheres to the synthetic grass and will not easily erode from heavy rainfall and wind events. The sand-binder mixture must be reapplied periodically.

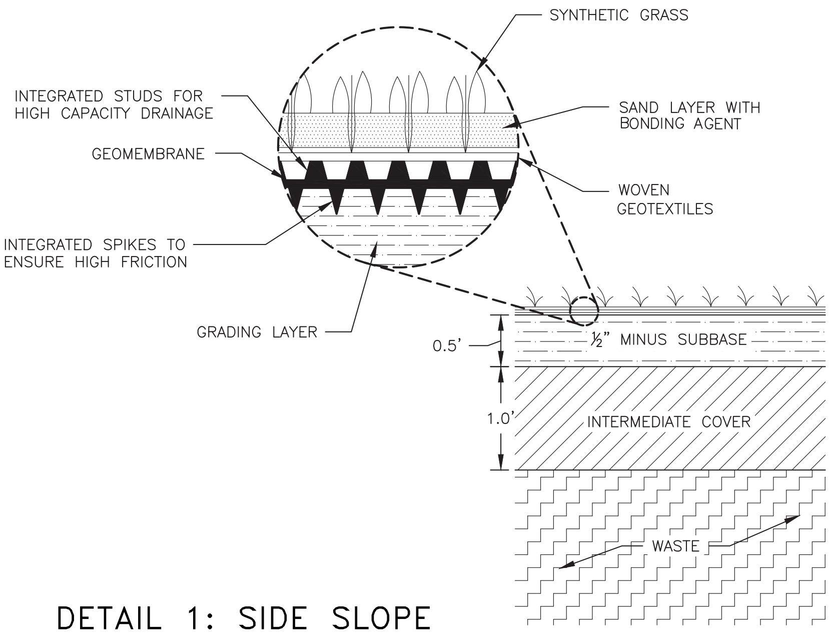
The synthetic grass protection layer replaces the grass and soil of the erosion layer in traditional composite landfill final cover systems for easier surface water management and better erosion control with no significant turbidity. It meets the minimum required factor of safety for stability under static and seismic conditions for Hawai‘i County, can be deployed relatively quickly, and has prior regulatory approval in U.S. Environmental Protection Agency (EPA) Region 9 for final closure at MSW landfills. Synthetic grass also provides a high aesthetic value with the green turf surface and requires less overall maintenance than soil/vegetative covers, which is of particular importance on the 2:1 side slopes. Thirty years or more of service life is anticipated for the exposed turf layer, although some repair and replacement of this layer is eventually required to maintain system design and operation parameters.

In addition to the final cover system, a passive landfill gas venting system will be installed to collect gas produced by the landfill and release it into the atmosphere. Six (6) existing landfill gas probes sited adjacent to the SHSL footprint are used to monitor concentrations of methane and other landfill gases on a quarterly basis which will continue upon final closure of the landfill.

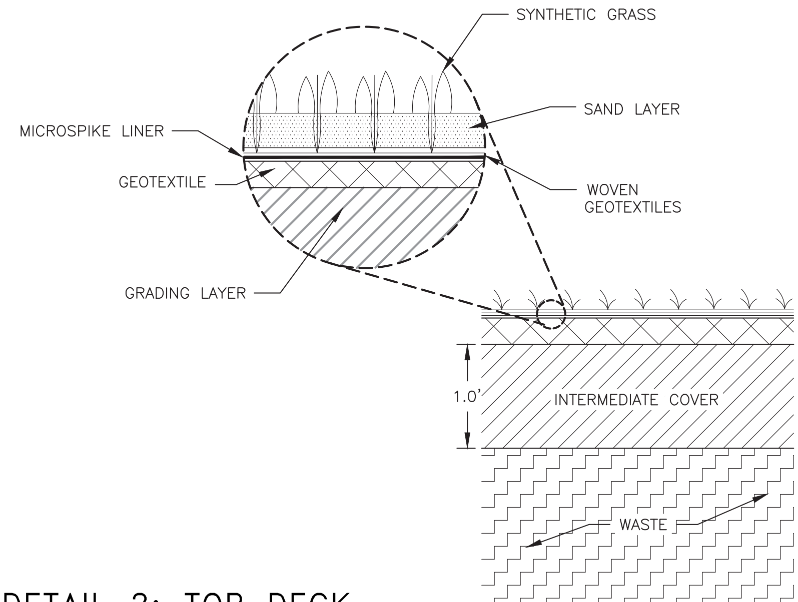
5.2.2 Alternative 2: A Combination Cover System Consisting of an Evapotranspiration Cover System for the Side Slopes and a Geosynthetic/Soil Composite Cover System for the Top Deck

The relative steepness of 2:1 (horizontal:vertical) of the side slopes eliminates the ability to utilize common composite cover systems which combine geosynthetics and soil in these areas. The friction angle between soil and geosynthetics creates a situation where composite cover systems cannot meet the required stability factor of safety under static and seismic conditions. However, a composite geosynthetic/soil cover remains a viable alternative for the top deck due to its relatively flat slopes. Therefore, this alternative consists of a combination cover system that utilizes an evapotranspiration (ET) cover system for the side slope areas and a geosynthetic/soil composite cover system for the top deck, terraces, and maintenance road. See Figure 5-2.

The ET cover system will be designed to minimize infiltration of storm water into the waste by encouraging surface runoff, and relying on soil moisture uptake through evaporation and transpiration from increased soil moisture storage and native plant cover. A landfill gas venting system may not be required for the ET cover system which is comprised from bottom to top of a 12-inch intermediate cover layer and a 36-inch monolithic soil cover that meets minimum requirements for permeability. It should be noted that ET covers are generally suited for arid or semiarid climatic conditions where the ratio of precipitation and potential evapotranspiration is less than 0.75 percent. In other words, performance could potentially be affected as a result of Hilo’s wetter, humid climate. Another disadvantage is that



DETAIL 1: SIDE SLOPE
SYNTHETIC GRASS/GEOMEMBRANE COVER DETAIL
NOT TO SCALE



DETAIL 2: TOP DECK
SYNTHETIC GRASS/GEOMEMBRANE COVER DETAIL
NOT TO SCALE

Source: HDR, Inc.

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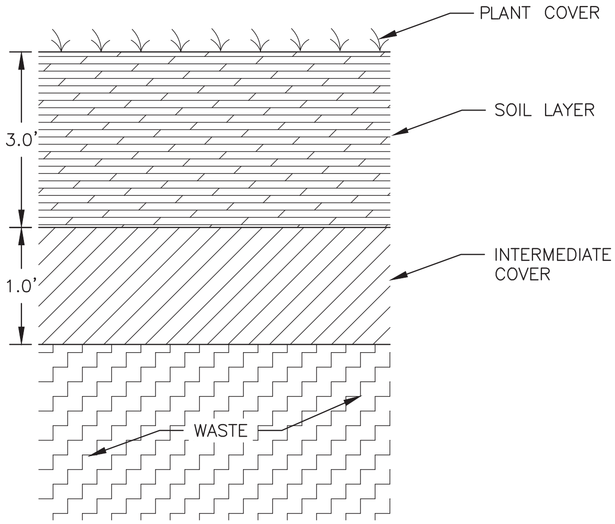
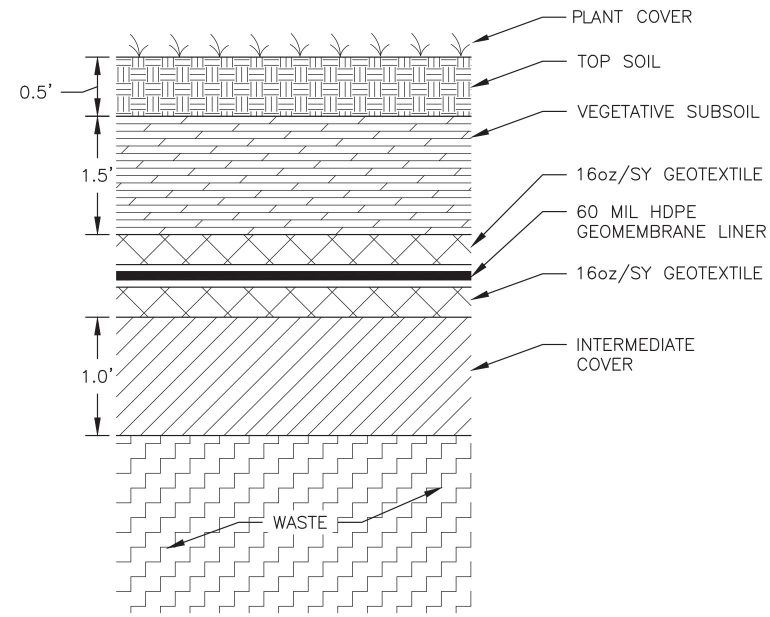
FIGURE 5-1

FINAL COVER DETAILS - ALTERNATIVE 1

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE



DETAIL 1: SIDE SLOPE – EVAPOTRANSPIRATION COVER
NOT TO SCALE



DETAIL 2: TERRACE AND TOP DECK GEOSYNTHETIC/SOIL COMPOSITE COVER
NOT TO SCALE

Source: HDR, Inc.

WILSON OKAMOTO CORPORATION

FIGURE 5-2

FINAL COVER DETAILS - ALTERNATIVE 2

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

vegetation will experience an establishment period in which the cover is vulnerable to significant erosion.

A geosynthetic/soil composite cover would be used on the top deck, terraces and maintenance road. It consists of a geomembrane ballasted and protected by an overlying soil/vegetative layer. One advantage of the impermeable geomembrane cover is that the infiltration rate is lower than a prescribed cover. However, the impermeable cover requires installation of a landfill gas venting system. This cover system is a traditional Subtitle D cover system design and has been the most common type of Subtitle D final cover system on MSW landfills in the US since 1992.

A combination ET cover and geosynthetic/soil composite cover system has the lowest storm water runoff rate than any of the other alternatives. However, it requires more maintenance and replacement of vegetation on the steep side slopes will be necessary. The soil covers are also susceptible to burrowing animals and the vegetated soil covers are a potential habitat for birds near the airport. An increased presence of birds in the vicinity of the airport could create hazards to air navigation.

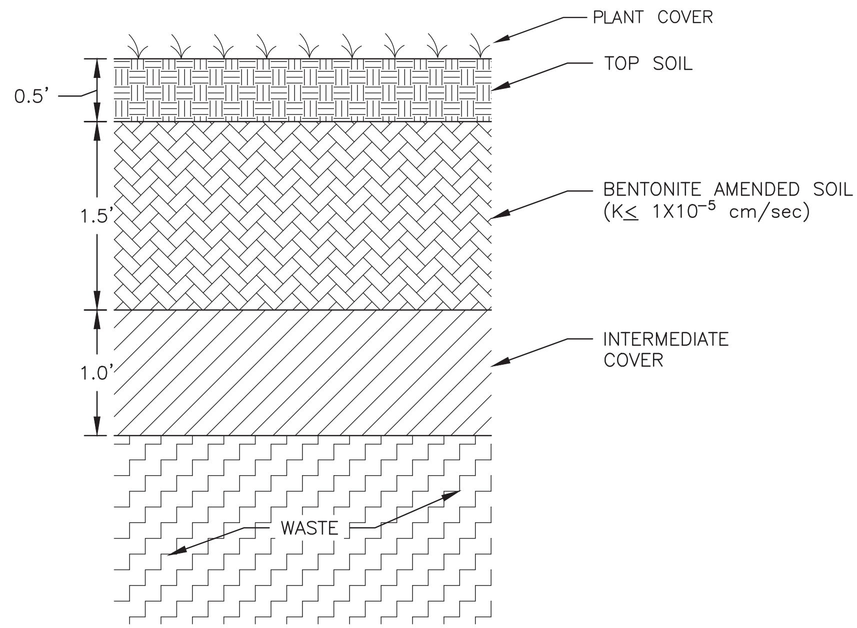
5.2.3 Alternative 3: The U.S. Environmental Protection Agency (EPA) Subtitle D Prescribed Cover System

The prescribed final cover system alternative is a traditional application that consists of an erosion layer underlain by an infiltration layer. See Figure 5-3. This cover system will be designed in accordance with Section 11-58.1-17(1)(A), HAR, or per 40 CFR Section 258.60 and will meet criteria related to permeability and minimization of infiltration and erosion. From the bottom to the top, it will consist of a 12-inch intermediate cover layer, an 18-inch compacted soil layer, and a 6-inch vegetated top soil layer. This prescribed design would be deployed on both the top deck and side slopes of SHSL.

One of the major challenges related to this system is to locate, acquire, haul and compact enough soil materials locally to meet infiltration layer requirements. Soil would likely need to be amended with imported bentonite which is a type of clay to achieve the permeability requirement. In addition, there may be variability of cover soil conditions and achieving soil compaction requirements on the 2:1 side slopes in order to meet permeability requirements would be challenging. In the long-term, maintenance requires reapplication of soil amendment mixture and replacement of vegetation. Another disadvantage is that soil covers are susceptible to burrowing animals and the vegetated soil covers are a potential habitat for birds near the airport. An increased presence of birds in the vicinity of the airport could create hazards to air navigation.

5.2.4 Alternative 4: No Action Alternative

Under the no action alternative, installation of a final cover system will not be pursued and the landfill gas vents and detention basin would not be constructed. Associated environmental impacts would be avoided, construction costs spared, and the need for permits and approvals precluded. The SHSL will remain open until it eventually reaches its maximum permitted capacity. MSW will no longer be accepted at the facility and MSW would need to be hauled to WHSL as it would be the only County landfill on Hawaiʻi Island.



PRESCRIBED COVER DETAIL

NOT TO SCALE

Source: HDR, Inc.

WILSON OKAMOTO CORPORATION

FIGURE 5-3

FINAL COVER DETAILS - ALTERNATIVE 3

SOUTH HILO SANITARY LANDFILL FINAL CLOSURE

Without implementation of the Project, State and federal regulatory requirements would not be met and the SHSL site would remain exposed posing a risk to human health and the surrounding environment. Rainfall would continue to percolate into the unlined landfill producing leachate that would infiltrate the ground below. Large rainfall events could result in significant erosion of the slopes potentially releasing waste and other pollutants into the surrounding environment. Over time the landfill material could become unstable leaving the landfill vulnerable to slope failure, particularly during seismic events.

This alternative was not selected because it does not meet State and federal regulatory requirements, could put public safety at risk, and would result in potentially detrimental effects on human health and degradation of the environment.

6. FEDERAL CROSS-CUTTER AUTHORITIES

The proposed project may utilize Federal funds through the Clean Water State Revolving Fund (CWSRF) program administered by the State of Hawaiʻi, which would constitute a federal action, and will require the project to comply with federal cross cutting authorities and Hawaiʻi CWSRF program requirements.

6.1 Archaeological & Historic Preservation Act, National Historic Preservation Act

The Archaeological & Historic Preservation Act, 16 U.S.C. §469a-1, deals with the threat of loss or destruction of significant data by Federal construction projects; notification requests for preservation of data; and survey of sites, preservation of data and compensation. The National Historic Preservation Act (NHPA) of 1966 requires the consideration of the effect of any project on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. In addition, Section 106 of the NHPA requires consideration of the effects of a project with federal involvement on historic properties. Section 106 is applicable to the project if a federal agency is carrying out the project, approving it, or funding it.

As described in the Archaeological and Historical Resources section, previous studies of the Project area have concluded that it is unlikely the parcels are within areas of traditional pre-contact Hawaiian settlement and habitation. An Archaeological Assessment (2016) prepared by Scientific Consultant Services, Inc. notes that early settlements in the Hilo District were located along the coast. Furthermore, the Panaʻewa region where the Project area is located contains marginally thin soils and is not well suited to modern agricultural techniques. Due to the extent of ground disturbance in the area from quarry and landfill operations, the inland location of the site from historic coastal communities, and the regional soil characteristics, the Project area is unlikely to contain historic properties, archaeological resources, or any resources of a potential traditional cultural nature.

In June of 2003, an *Archaeological and Limited Cultural Impact Assessment for the Proposed Regional Solid Waste Sorting Station* (presently known as the East Hawaiʻi Regional Sort Station) was prepared by Rechtman Consulting. The survey area included the parcel adjacent to the landfill where a new detention basin is proposed. No archaeological resources or any resources of a potential traditional cultural nature (i.e. landform, vegetation, etc.) were observed within the project area.

Should the discovery of potential archaeological or historical resources occur during construction, all work in the area of the find shall stop and SHPD shall be notified. The Historic Preservation Officer will determine what will be necessary for construction to proceed.

6.2 Clean Air Act

Under the Clean Air Act, 42 U.S.C. §7506(c), the U.S. Environmental Protection Agency (EPA) regulates emissions of air pollution from mobile and stationary sources. The EPA has set National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: particulate matter (PM_{10} and $PM_{2.5}$), ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. In addition to these pollutants, Hawaiʻi has also established a state ambient air quality standard for hydrogen sulfide.

Pursuant to the Clean Air Act, states are required to adopt enforceable plans to achieve and maintain air quality that meets established air quality standards. The State of Hawai‘i Department of Health (DOH), Clean Air Branch, administers the state's air quality program and is responsible for regulating and monitoring pollution sources to ensure that the levels of criteria pollutants remain well below the State and Federal ambient air quality standards (HRS, Chapter 342B).

As discussed in the Air Quality section, the quality of air in the general Hilo area is considered "Good." Air quality on Hawai‘i Island is affected by emissions from industrial sources, vehicles, and natural sources. The major industrial source for the island is oil-fired power plants, which emit SO_2, nitrogen oxides, and particulate matter. Motor vehicles emit CO, nitrogen oxides and hydrocarbons (an ozone precursor), as well as smaller amounts of other pollutants including particulates. Also emitting SO_2 is the geothermal power plant Puna Geothermal Venture, which supplies about 10-20% of the island's electricity. Volcanic emissions of sulfur dioxide convert into particulate sulfate, which causes a volcanic haze (vog) to blanket the area during occasional episodes of southerly kona winds.

The proposed passive landfill gas venting system will also result in the irrevocable release of landfill gas coming from decomposing materials in the landfill. These emissions, however, would occur without implementation of the proposed action as the landfill is already in place. no environmental releases in exceedance of State and federal regulations associated with solid waste management have been detected at the SHSL. Following closure of SHSL, landfill gas levels will continue to be monitored for exceedance of permitted limits which is anticipated to reduce over time and approach zero. Appropriate action will be taken, as necessary, in compliance with HAR 11-58.1-15(d) if there is any exceedance of gas levels during the post-closure maintenance period..

6.3 Coastal Barrier Resources Act

The Coastal Barrier Resources Act, 16 U.S.C. §3501, designates coastal barriers along the Atlantic and Gulf coasts and along the shore areas of the Great Lakes for conservation, and is not applicable to the State of Hawai‘i.

6.4 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA), 16 U.S.C. 1456(c)(1), provides for the management of the nation's coastal resources. The goal is to "preserve, protect, develop and where possible, to restore or enhance the resources of the nation's coastal zone." HRS, Chapter 205A sets forth Hawai‘i's CZM Program which is in compliance with the CZMA and approved by Federal and State agencies. The county authorities administer Special Management Area (SMA) permits and shoreline setback provisions as part of the CZM Program. The objectives and policies of the CZM Program are defined in HRS, Chapter 205A-2.

As discussed in the CZM Program section, the proposed project is consistent with CZM objectives and policies. In addition, the SHSL site is located outside of the areas regulated by the SMA permitting and shoreline setback provisions.

6.5 Endangered Species Act, Fish & Wildlife Coordination Act, Essential Fish Habitat

The Endangered Species Act, 16 U.S.C. §1536(a)(2) and (4), is administered by the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's (NOAA), National Marine Fisheries Service (NMFS). The USFWS has primary responsibility for terrestrial and freshwater organisms, while NOAA is mainly responsible for marine wildlife. NOAA-NMFS is also the agency consulted pursuant to the Essential Fish Habitat consultation process of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §1801. The Fish and Wildlife Coordination Act (FWCA), 16 U.S.C. §662(a), provides the basic authority for USFWS involvement in evaluating impacts of proposed water resource development projects on fish and wildlife, and requires Federal agencies to take actions to prevent or mitigate loss or damage to wildlife resources.

According to the U.S Fish & Wildlife Service, federally listed species that may occur in the project vicinity include the endangered Hawaiian hawk, or ʻio (*Buteo solitaries*), Hawaiian hoary bat or ʻopeʻapeʻa (*Lasiurus cinereus semotus*), Hawaiian goose or nēnē (*Branta sandvicensis*) and endangered Hawaiian waterbirds, namely the Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian duck (*Anas wyvilliana*). State and federally listed seabirds may also pass through the Project area. The threatened Newell's shearwater (*Puffinus auricularis newelli*) and a species proposed for listing as endangered, the band-rumped strom-petrel (*Oceanodroma castro*) have previously been noted near the SHSL. Conservation measures will be incorporated into the Project design to avoid or minimize impacts on these listed species.

6.6 Environmental Justice Executive Order

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority and Low Income Populations" signed February 11, 1994 by President William Clinton requires Federal agencies to identify and avoid, minimize, or mitigate "disproportionately high and adverse" effects of Federal projects on the health and environment of minority and low income populations.

Whites make up the minority population in the Hilo Census Designated Place (CDP) at 17.6 percent, which is half that of the County at 33.7 percent and significantly lower than the national total of 72 percent. However, the 2010 median household income of $53,939 was generally higher than the national average of $49,445. No significantly adverse short-term and long-term health impacts are anticipated with implementation of this Project.

6.7 Farmland Protection Policy Act

The Agriculture and Food Act (Public Law 97-98) was passed in 1981 and contained the Farmland Protection Policy Act (FPPA), Subtitle I of Title XV, Section 1539-1549. The purpose of the FPPA is to minimize the effect of Federal programs on the unnecessary and irreversible conversion of prime farmland, unique farmland, and other land of statewide or local importance to nonagricultural uses. It assures that to the extent possible federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. It is administered by the US Department of Agriculture (USDA), National Resources Conservation Service. The three categories of farmland described in FPPA are translated to the Hawaiʻi Department of Agriculture's (DOA), ALISH classifications of "Prime," "Unique," and "Other" agricultural lands.

The SHSL site is entirely within lands considered Other Lands, which is defined as an area that can be farmed satisfactorily by applying greater inputs of fertilizer, improving drainage, practicing erosion control, and protecting the land from flooding. The project will largely involve the existing landfill that is not suitable for agricultural activities. The proposed new detention basin will utilize a small portion of land available for agriculture.

6.8 Floodplain Management Executive Order

Executive Order 11988 is to avoid to the extent possible the adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. To accomplish this objective, “each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities.”

As discussed in the Flood and Tsunami Hazard section, the SHSL site is located in Zone X, an area determined to be outside of the 500-year floodplain. This project will not have an effect on the floodplain.

6.9 Protection of Wetlands Executive Order

The purpose of Executive Order 11990 is to “minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.” Federal agencies, to meet these objectives, in planning their actions are required to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland is unavoidable. The procedures require the determination of whether or not the proposed project will be in or will affect wetlands.

There are no wetlands in the vicinity of the SHSL site. Executive Order 11990 is not applicable to this project.

6.10 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), 42 U.S.C. §300f was established to protect the quality of all waters actually or potentially designed for drinking use from both underground and aboveground sources. The SDWA authorizes EPA to establish minimum standards to protect potable water with which all owners or operators of public water systems must comply; to oversee the agencies that can be approved to implement these rules on EPA’s behalf, such as state governments; and to encourage attainment of secondary standards (nuisance-related). The SDWA also establishes the Sole Source Aquifer Program, under which EPA also may evaluate Federal-funded projects to determine whether they have the potential to contaminate a sole source aquifer.

The SHSL project site is located seaward of the Underground Injection Control (UIC) Line to the west, where the underlying aquifer is not considered a drinking water source. At present, there are two sole source aquifers in the State of Hawaiʻi, the Southern Oʻahu Basal Aquifer on the Island of Oʻahu and the Molokaʻi Aquifer on the island of Molokaʻi. The SHSL project site is located on the island of Hawaiʻi and is not within either aquifer.

6.11 Wild & Scenic Rivers Act

The Wild and Scenic Rivers Act, 16 U.S.C. 1271-1287, declares that certain selected rivers, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in their free-flowing condition for the enjoyment of present and future generations.

The State of Hawaiʻi has approximately 3,905 miles of river, but no designated wild and scenic rivers. The Wild & Scenic Rivers Act is not applicable to this project.

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7. ANTICIPATED DETERMINATION OF FONSI

Based on the significance criteria set forth in Chapter 200, Title 11, State of Hawaiʻi Department of Health Administrative Rules, it is anticipated that the proposed Project will not have a significant effect on the environment, and that a Finding of No Significant Impact (FONSI) will be filed with the State Office of Environmental Quality Control following the public consultation period. The reasons supporting this anticipated determination are described below according to these significance criteria:

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

Development of the Project will require an irrevocable commitment of energy, labor, capital, and materials for construction. However, applying a final cover system is necessary to ensure protection of human health and the environment. The landfill is nearing its maximum permitted capacity and eventually will be unable to accept any more MSW. Leaving the landfill uncovered as in the no action alternative has a greater potential to detrimentally affect the surrounding environment.

The Project will not require any additional use of land except for a small area that will be excavated to construct the proposed detention basin. The basin will collect storm water runoff generated by the final cover preventing potential impacts of flooding and erosion to nearby properties. No significant impacts on flora or fauna species are anticipated due to the construction and operation of the Project.

The site has been used as a landfill for several decades and for commercial quarrying activities prior to that. No effects to any significant historic sites are anticipated as a result of constructing the Project. There is no reported ongoing traditional gathering or hunting practices occurring within the Project area itself. It is anticipated that the proposed Project will have no adverse impact on traditional cultural properties or practices, gathering rights, or access.

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

Considering the Project involves the area already occupied by a permitted landfill, no future beneficial uses of the environment will be affected in by the proposed action. In accordance with RCRA Subtitle D regulations, post-closure care activities consist of monitoring and maintaining the final cover system and monitoring groundwater to ensure that waste is not escaping and polluting the surrounding environment. The required post-closure care period is 30 years from site closure. During this period, land uses at the site must not disturb the integrity or operation of any of the waste containment systems or the monitoring systems.

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

The Project does not conflict with long-term environmental policies or goals and guidelines of the State of Hawaiʻi. Upon closure of the landfill, the County will continue to implement its current waste diversion program as well as explore other waste management strategies to reduce the flow of waste to landfills.

(4) Substantially affects the economic or social welfare of the community or state;

The proposed action simply represents the cessation of a present action and is not anticipated to substantially affect the economic or social welfare of the community or state.

(5) Substantially affects public health;

The proposed action involves placement of a final cover on the top and the side slopes of the landfill which is intended to avoid or minimize threats to public health and safety.

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

The Project is not anticipated to induce growth beyond that which is anticipated for the region. Therefore, secondary impacts associated with population changes or effects on public facilities are not anticipated with implementation of the proposed action.

(7) Involves a substantial degradation of environmental quality;

The proposed action will protect environmental quality by providing a final cover for the landfill that will contain waste and limit the amount of leachate produced. All run-off generated by the final cover will be kept on-site and will be conveyed to detention basins where water will percolate into the ground. Since the final cover will be essentially impermeable, the amount of leachate at the site is anticipated to decrease.

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

The proposed action is the cessation of a present action and is not anticipated to have considerable cumulative effects on the environment. The proposed action also does not involve a commitment for larger actions.

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

No threatened or endangered species of flora or fauna are anticipated to be adversely affected by the Project. The proposed action will primarily affect an area currently utilized as an active sanitary landfill. A small expansion will be required for the closed landfill as a portion of an adjacent parcel is proposed to be disturbed for construction of a detention basin. Nevertheless, the overall effect of the landfill closure will be the cessation of activity related to the operation of the landfill, including associated truck traffic, noise, odors, windblown debris, and leaching of rainfall through the landfill into the ground.

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

Temporary impacts related to vehicle emissions and fugitive dust associated with construction activities is anticipated to minimal and temporary in nature. Landfill gas that is released into the atmosphere from the landfill itself will be monitored for exceedance of permitted levels. To date, measurable concentrations of methane have not been identified in the gas monitoring probes. No water quality impacts are anticipated with implementation of the proposed action as there are no surface waters in the vicinity of the SHSL. Noise generated by temporary construction activities will be similar in character and intensity to existing noise conditions and is not anticipated to have an adverse effect to overall noise levels. After construction is completed, there will be the cessation of activity related to the operation of the landfill, including associated truck traffic, noise, odors, windblown debris, and leaching of rainfall through the landfill into the.

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

The SHSL is located outside of the 500-year flood plain and outside of the tsunami hazard zone. No surface water body, such as rivers, streams, lakes, ponds or wetlands occur in the vicinity. Seismic and lava flow hazards do pose a threat to the site; however, measures will be taken to the extent feasible to protect the landfill from these threats.

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

Scenic vistas and view planes are not anticipated to be substantially affected by the proposed action. The SHSL is presently visible only from areas that are a significant distance away on the upper slopes of suburban Hilo. In contrast, light-of-sight views are generally obstructed in the land immediately surrounding the landfill because of the relatively flat terrain and the dense, tall vegetation that acts as a visual barrier. Construction of the Project would not significantly alter the existing form of the landfill and will involve placement of synthetic grass on the surface that will have the appearance of a low, linear vegetated hill that is consistent with adjacent landscapes.

(13) Requires substantial energy consumption.

The proposed action simply represents the cessation of a present action and is not anticipated to require substantial energy consumption. As a result of the landfill closure, waste will need to be hauled across the island for final disposal requiring the additional consumption of energy. However, the County is committed to exploring new strategies to reduce the flow of waste to landfills and improving efficiency by upgrading its transfer trailer fleet and making operational improvements.

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8. CONSULTATION

8.1 Pre-Assessment Consultation

The following agencies and organizations were consulted during the preparation of the Draft EA. Of the 18 parties that formally replied during the pre-assessment period, some had no comments while others provided substantive comments as indicated by the ✓ and ✓✓, respectively. All written comments are reproduced in Appendix B.

Federal Agencies

✓✓ U.S. Army Corps of Engineers (Corps)
U.S. Department of Agriculture
U.S. Environmental Protection Agency
Federal Aviation Administration
✓✓ U.S. Fish and Wildlife Service
✓✓ U.S. Geological Survey, Hawaiian Volcano Observatory
U.S. Geological Survey, Pacific Islands Water Science Center
National Oceanic and Atmospheric Administration (NOAA),
National Marine Fisheries Service

State Agencies

✓ Department of Accounting & General Services
Department of Agriculture
Department of Business, Economic Development and Tourism (DBEDT)
DBEDT, Land Use Commission
✓✓ DBEDT, Office of Planning
✓ Department of Defense
Department of Education
Hawaiʻi Housing Finance & Development Corporation
Hawaiʻi State Energy Office
Department of Hawaiian Homelands
Department of Hawaiian Homelands – East Hawaiʻi
✓✓ Department of Health (DOH)
DOH, Clean Water Branch
DOH, Environmental Management Division
DOH, Environmental Planning Office
DOH, Environmental Health Services Division
DOH, Hawaiʻi District Health Office
DOH, Office of Environmental Quality Control
Department of Land and Natural Resources (DLNR)
DLNR, State Historic Preservation Division
✓✓ DLNR, Division of Aquatic Resources
✓✓ DLNR, Division of Forestry and Wildlife
✓✓ DLNR, Land Division – Hawaiʻi District
✓✓ DLNR, Engineering Division
✓✓ Department of Transportation (DOT)
DOT, Airports Division Hawaiʻi District
DOT, Highways Division Hawaiʻi District
Hawaiʻi State Legislature, House District 3

Hawai‘I State Legislature, Senate District 1
Office of Hawaiian Affairs
University of Hawai‘i, Water Resources Research Center

County of Hawai‘i

Civil Defense Agency
Department of Parks & Recreation
✓✓ Department of Public Works
✓✓ Department of Research and Development
Department of Water Supply
Fire Department
Office of Housing and Community Development
✓✓ Office of the Mayor
✓ Planning Department
✓ Police Department
Hawai‘i County Council

Other Interested Parties and Individuals

✓✓ Hawai‘i Army National Guard
Hawai‘i Electric Company, Inc.
Hawaiian Telcom
Sandwich Isles Communications, Inc.
Hawai‘i Island Chamber of Commerce
Hawai‘i Leeward Planning Conference
Kanoelehua Industrial Area Association
Keaukaha Community Association
✓✓ Keaukaha-Pana‘ewa Farmers Association
Pana‘ewa Hawaiian Farmers Market
Pana‘ewa Hawaiian Homelands Community Association
Sierra Club of Hawai‘i, Moku Loa Group
Hawai‘i Island Contractors Association

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Appendix A

Traffic Assessment

TRAFFIC ASSESSMENT

FOR

SOUTH HILO SANITARY LANDFILL

Prepared for:

County of Hawai‘i
Department of Environmental Management
Solid Waste Division
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1132 Bishop Street #1200
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Prepared by:

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Honolulu, Hawaii 96826
WOC Ref #10289-01

October 2017

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I. INTRODUCTION

The South Hilo Sanitary Landfill (SHSL) is currently the only landfill in East Hawaii providing collection services for Hilo and seven other solid waste transfer stations. Based on the available airspace and current daily loads, the landfill is anticipated to reach its maximum permitted capacity and plans are currently being developed to permanently close the landfill by the year 2019. As result of the closure, municipal solid waste (MSW) previously disposed at the SHSL is planned to be diverted to the West Hawaii Sanitary Landfill (WHSL) in Puuanahulu, approximately 70 miles west of the existing SHSL. A traffic assessment on diverting waste to the WHSL was previously conducted in 2004 in conjunction with the Final Environmental Impact Statement for the East Hawaii Regional Sort Station, a solid waste processing and recycling facility proposed as an interim solution until a viable alternative is available to serve the East Hawaii waste stream. This assessment is an update to that previous traffic study to determine the traffic impact resulting from the SHSL closure and subsequent diversion of refuse to WHSL.

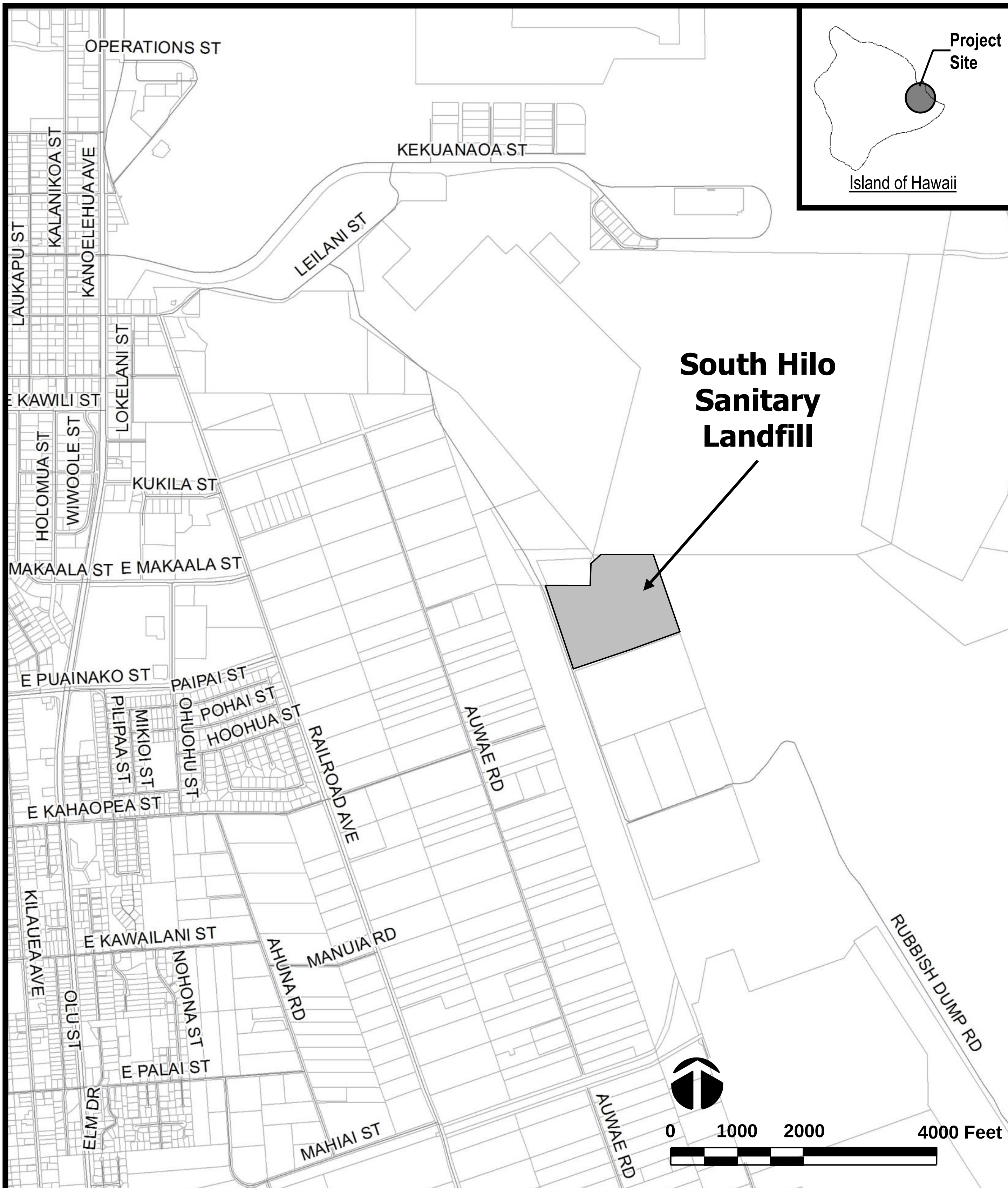
II. PROJECT DESCRIPTION

A. Location

The SHSL is located approximately one mile east of Kanoelehua Avenue (State Route 11) in the South Hilo District of the island of Hawaii with access off Leilani Street. The facility is further identified as Tax Map Keys (TMKs) (3) 2-1-013: 152 and 156. Following the closure of the SHSL, MSW will be diverted to the WHSL in Puuanahulu. This facility is located approximately two and a half miles south of Waikoloa with access off Queen Kaahumanu Highway (State Route 19). See Figures 1 and 2 for the location of both facilities.

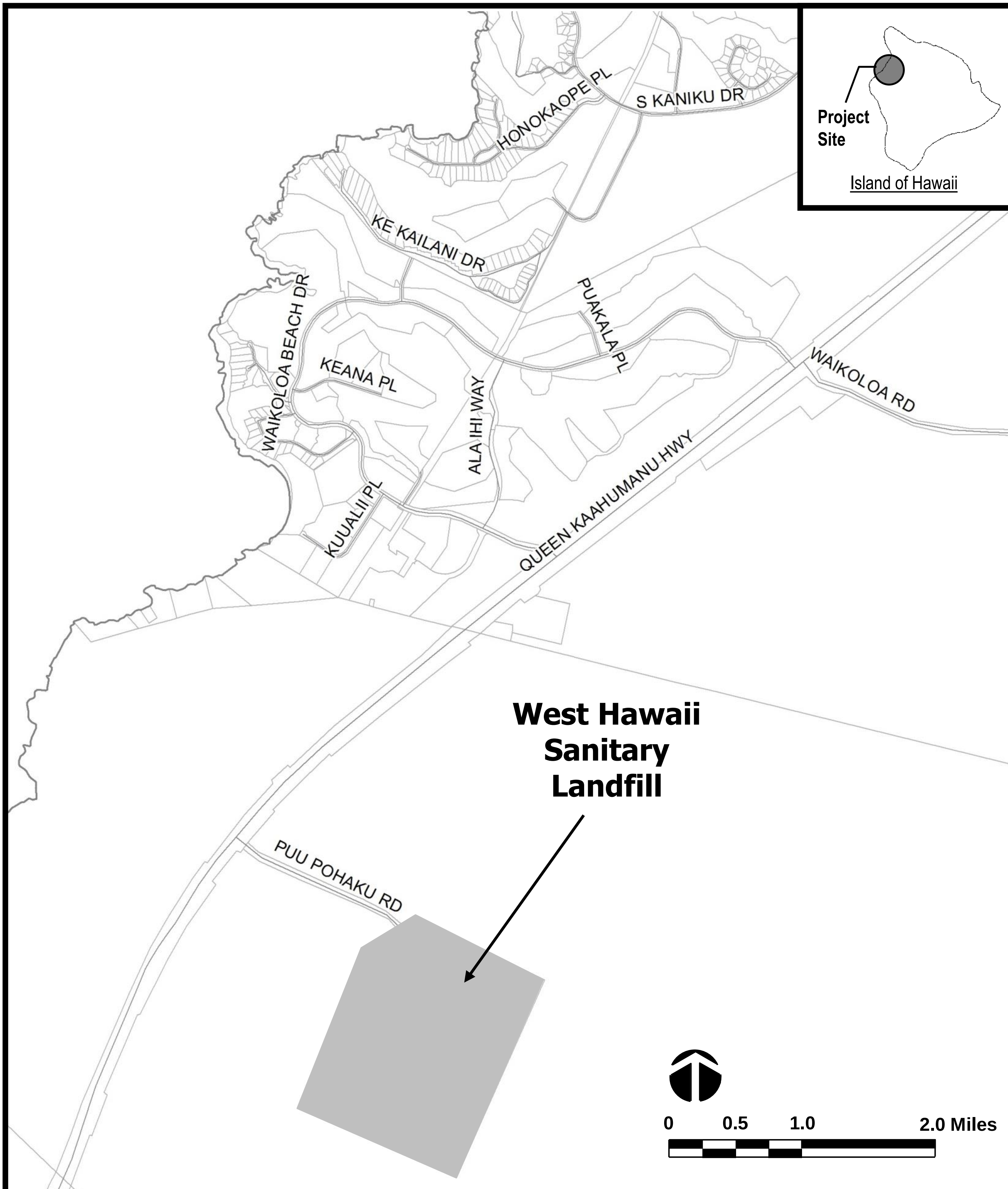
B. Project Characteristics

The SHSL currently accepts MSW from eight Hawaii County transfer stations: Honomu, Papaikou, Hilo, Kalapana, Pahoa, Volcano, Glenwood, and Keaau. County trucks from the respective transfer stations destined to the SHSL traverse the following routes (see Figure 3):



WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

SOUTH HILO SANITARY LANDFILL	FIGURE
LOCATION MAP AND VICINITY MAP SOUTH HILO SANITARY LANDFILL	1

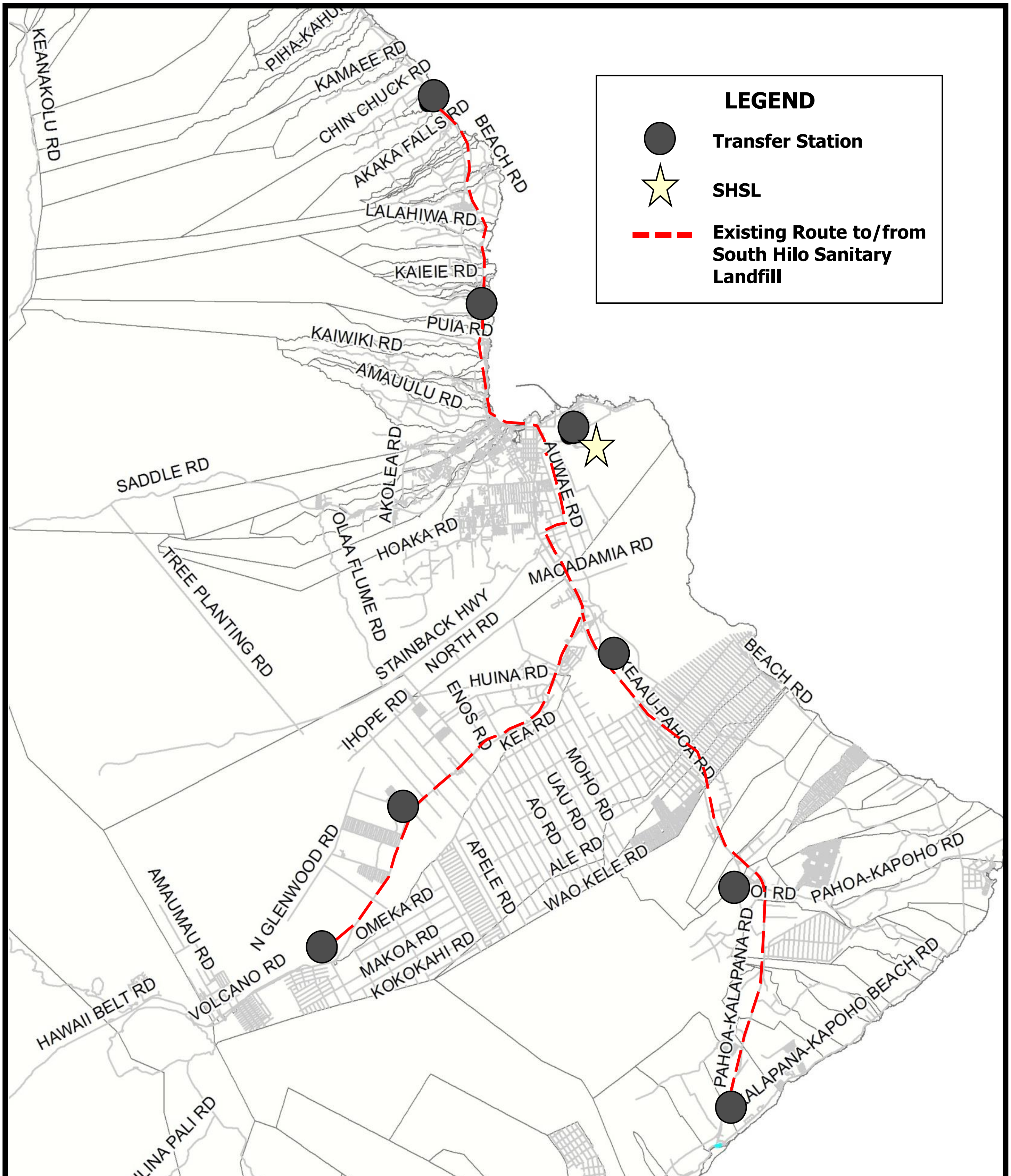


WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

SOUTH HILO SANITARY LANDFILL

LOCATION MAP AND VICINITY MAP
WEST HAWAII SANITARY LANDFILL

FIGURE
2



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SOUTH HILO SANITARY LANDFILL

TRANSFER STATION LOCATIONS AND EXISTING ROUTES

FIGURE 3

- The Honomu and Papaikou transfer stations (located north of the SHSL) travel south along Mamalahoa Highway (State Route 19) to access the landfill via Leilani Street.
- The Kalapana, Pahoa, and Keaau transfer stations (located to the southeast of the SHSL) travel north on State Route 190 (Kapalana-Pahoa Road/Keaau-Pahoa Road) and Mamalahoa Highway (State Route 11) to access Puainako Street and Railroad Avenue to access the landfill via Leilani Street.
- Volcano and Glenwood transfer stations (located to the southwest of the SHSL) travel north along Volcano Road (State Route 11) which transitions to Mamalahoa Highway near State Route 130, then utilize Puainako Street and Railroad Avenue to access the landfill via Leilani Street.

In addition, the facility also accepts MSW from private commercial haulers and other government agencies. These vehicles use a variety of routes through Hilo based on their relative location to the landfill. The proposed project entails the permanent closure of the SHSL as it is soon projected to reach its maximum permitted capacity. As result of the closure, MSW previously disposed at the SHSL is planned to be diverted to the WHSL in Puuanahulu.

III. EXISTING TRAFFIC CONDITIONS

A. Field Investigation and Methodology

The traffic data used in this assessment was obtained from the State Department of Transportation (HDOT), Highways Division survey stations consisting of 24-hour mechanical count surveys collected in 2015 along the anticipated transport routes to the WHSL. Appendix A includes the traffic data.

The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2010, and the Highway Capacity Software (HCS7) developed by McTrans. The analysis is based on the concept of Level of Service (LOS) to identify the traffic impacts associated with traffic demands during the peak periods of traffic.

LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions. "Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity.

B. Existing Roadway Characteristics and Traffic Volumes

1. Puainako Street

Puainako Street is a major collector roadway which predominantly consists of one lane in each direction, except between Railroad Avenue and Mamalahoa Highway (locally known as Kanoelehua Avenue) where the roadway comprises of two lanes in each direction. The roadway segment between Railroad Avenue and Kilauea Avenue serves commercial uses but transitions to residential uses after Kilauea Avenue. Near Pohakulani Street, historical traffic data collected by the HDOT Highways Division in 2015 indicates that the average daily traffic (ADT) along this roadway is approximately 8,457 vehicles per day. The AM peak hour occurs between 8:00 AM and 9:00 AM while the PM peak hour occurs between 3:15 PM and 4:15 PM. The peak hour volume during the AM peak period is approximately 456 vehicles per hour with 553 vehicles per hour during the PM peak period.

2. Saddle Road

Saddle Road (also known as the Daniel K. Inouye Highway) is a rural minor arterial which serves as a connector roadway between Hilo and West Hawaii and provides access to Mauna Loa and the Mauna Kea Observatories. Considerable realignment and reconstruction efforts in recent years have been made to numerous segments of this roadway to upgrade it to current highway standards. Near Ua Nahele Street, historical traffic data collected in 2015 by the HDOT Highways Division indicates that the ADT along this roadway is approximately 4,262 vehicles per day. The AM peak hour occurs between 8:00 AM and 9:00 AM while the PM peak hour occurs between 3:45 PM and

4:45 PM. The peak hour volumes during the AM peak period is 157 vehicles per hour with 401 vehicles per hour during the PM peak period.

3. Mamalahoa Highway (State Route 190)

Mamalahoa Highway (also known as Hawaii Belt Road) is an urban principal arterial that traverses through the entire island of Hawaii consisting of Routes 11, 19, and 190. Route 190 refers to the roadways between Kailua-Kona and Waimea. At the western terminus of Saddle Road, Mamalahoa Highway consists of one lane in each direction. Historical traffic data collected in 2015 by the HDOT Highways Division indicates that the ADT along this roadway is approximately 5,798 vehicles per day. The AM peak hour occurs between 6:45 AM and 7:45 AM while the PM peak hour occurs between 3:45 PM and 4:45 PM. The peak hour volumes are approximately 344 vehicles per hour during the AM peak period and 483 vehicles per hour during the PM peak period.

4. Waikoloa Road

Waikoloa Road is a minor arterial located between Mamalahoa Highway and Queen Kaahumanu Highway. It is predominantly comprised of one lane in each direction and serves as connector roadway for the residential community of Waikoloa Village. Historical traffic data collected in 2015 by HDOT Highways Division indicate that the ADT along this roadway is approximately 8,263 vehicles per day. The AM peak hour occurs between 6:45 AM and 7:45 AM while the PM peak hour occurs between 3:00 PM and 4:00 PM. The peak hour volumes during the AM peak period is approximately 649 vehicles per hour with 706 vehicles per hour during the PM peak period.

5. Queen Kaahumanu Highway

Queen Kaahumanu Highway is an urban principal arterial predominantly comprised of one lane in each direction. Historical traffic data collected in 2015 by HDOT Highways Division indicate that the ADT along this roadway is approximately 14,966. The AM peak hour occurs between 7:00 AM and 8:00 AM while the PM peak hour occurs between 3:30 PM and

4:30 PM. The peak hour volume during the AM peak period is 987 vehicles per hour with 1,150 vehicles per hour during the PM peak period.

IV. PROJECTED TRAFFIC CONDITIONS

A. Site Generated Trips and Distribution

The trips associated with the SHSL closure include the trips associated with the transfer stations and trips associated with the private commercial haulers. Table 1 below summarizes the number of county trucks and commercial vehicles that currently dispose at the SHSL provided by the DEM and collected over the course of a week in July 2017. A more detailed account of these trips is included in Appendix B. Based on data provided, the number of trips originating from each transfer station varies throughout the week; however, to represent a conservative analysis, the maximum number of trips during the respective peak hour of each respective transfer station was used.

Table 1: Site-Generated Trips

Origin	Max Weekday Trips	AM Peak Hour Trips	PM Peak Hour Trips
Honomu	1	0	0
Papaikou	1	0	0
Kalapana	1	0	0
Pahoa	5	1	0
Volcano	3	1	1
Glenwood	4	2	0
Keaau	5	2	1
Hilo	4	3	0
Commercial Haulers	77	20	10
Totals	101	29	12

With the expected closure, the overall volume of MSW needing disposal is expected to remain similar to existing conditions as various County waste diversion strategies intended to reduce waste disposed at the landfills continue to be implemented. As such, similar volumes of MSW previously disposed at the SHSL are expected to be diverted to West Hawaii at the WHSL in Puuanahulu. According to the information provided by the DEM, the County ultimately plans to aggregate solid waste at the County's East Hawaii Regional Sort Station in Hilo before it is diverted to West Hawaii. Additionally, the County plans to purchase larger vehicles to transport the consolidated waste to WHSL. However, should the mechanisms and logistics to realize this plan not be in place by the time the SHSL accepts its final load, it is possible that in the interim, trucks from the transfer stations, commercial haulers, and other government agencies may be required to haul waste directly to WHSL. As such, for a conservative analysis, the traffic assessment was conducted under this interim condition.

In general, all county trucks and commercial haulers are expected to travel from East Hawaii to the WHSL in Puuanahulu via Saddle Road/Daniel K. Inouye Highway. East of Saddle Road, the County trucks and private commercial haulers are assumed to utilize the available routes between their origin and Saddle Road/Daniel K. Inouye Highway based upon the convenience of the available routes and the ability of these routes to accommodate larger vehicles. Their anticipated routes are described as follows:

- County trucks originating from the Hilo Transfer Station are anticipated to use Mamalahoa Highway and Puainako Street to access Saddle Road.
- County trucks from the two transfer stations north of Hilo (Honomu and Papaikou) are anticipated to connect to Saddle Road by traveling south on Mamalahoa Highway (State Route 19) which transitions to State Route 11 at Kanoelehua Avenue then west along Puainako Street.
- All county trucks from the transfer stations located south of Hilo are expected to follow their existing routes up to Mamalahoa Highway (State Route 11) then head west along Puainako Street to access Saddle Road near Ua Nahele Street.
- All private commercial haulers are expected continue utilizing their existing routes to and from Hilo and connecting to Saddle Road via Puainako Street.

From Saddle Road, all county trucks and commercial haulers are expected to head north via Mamalahoa Highway, continue west on Waikoloa Road, and travel south to Puuanahulu via Queen Kaahumanu Highway. Figure 4 shows the anticipated route to WHSL. All site-generated trips occurring during the commuter peak hours as shown in Table 1 were reassigned along the affected roadways based upon their assumed origin and modified routes to the WHSL.

B. Through-Traffic Forecasting Methodology

The travel forecast is based upon historical traffic count data obtained from the HDOT, Highways Division at survey locations along the anticipated transport routes between the respective transfer stations and WHSL. Historical data along Puainako Street, Waikoloa Road, and Queen Kaahumanu Highway indicate relatively stable traffic. As such, an annual growth rate of approximately 0.5% was conservatively assumed along these roadways. Using 2017 as the Base Year, a growth factor of 1.01 was applied to existing traffic demands along these roadways to achieve the projected Year 2019 traffic demands.

Traffic count stations were also located along Saddle Road and Mamalahoa Highway. However, sufficient historical data is unavailable along these roadways and as such, a conservative annual growth rate of approximately 2.0% was assumed along these roadways. Using 2017 as the Base Year, a growth rate factor of 1.04 was applied to the existing traffic demands along these roadways to achieve the projected Year 2019 traffic demands.

C. Total Traffic Volumes Without Project

The projected Year 2019 AM and PM peak period traffic operating conditions without the project scenario are summarized in Table 2. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D. Under Year 2019 without project conditions, traffic operations along the traveled roadways are expected to continue operating at LOS “C” or better during the AM peak period and LOS “D” or better during the PM peak period. Capacity analysis calculations are included in Appendix C and D

Table 2: Existing and Projected Year 2019 (Without Project) LOS Traffic Operating Conditions

Roadway	AM		PM	
	Existing	Year 2019 Without Project	Existing	Year 2019 Without Project
Puainako St	B	B	B	B
Saddle Rd	A	A	B	B
Mamalahoa Hwy (SR-190)	B	B	C	C
Waikoloa Rd	A	A	C	C
Queen Kaahumanu Hwy	B	B	D	D

D. Total Traffic Volumes With Project

The projected Year 2019 AM and PM peak period operating conditions are summarized in Table 3. The existing levels of service are provided for comparison purposes. Puainako Street is expected to continue operating at LOS “B” during both peak periods while Saddle Road is anticipated to continue operating at LOS “A” during the AM peak period and LOS “B” during the PM peak period. Mamalahoa Highway is anticipated to slightly change from an LOS “B” to an LOS “C” during the AM peak period. However; in general, site-generated trips are expected to have minimal impact on the existing roadways with traffic operations expected to remain similar to existing conditions. Capacity analysis calculations are included in Appendix E.

Table 3: Existing and Projected Year 2019 (With Project) LOS Traffic Operating Conditions

Roadway	AM			PM		
	Existing	Year 2019 Without Project	Year 2019 With Project	Existing	Year 2019 Without Project	Year 2019 With Project
Puainako St	B	B	B	B	B	B
Saddle Rd	A	A	A	B	B	B
Mamalahoa Hwy (SR-190)	B	B	C	C	C	C
Waikoloa Rd	A	A	A	C	C	C
Queen Kaahumanu Hwy	B	B	B	D	D	D

V. RECOMMENDATIONS

The following are the recommendations of this study for consideration during the implementation of the project, to the extent feasible:

1. During normal operations, County trucks destined to and from the WHSL should consider using the routes specified in this report to ensure that the impact of the proposed project is limited to only the roadways that have been assessed.
2. The respective State and County transportation agencies should assure that the public roads along the transport routes continue to have sufficient roadway widths, sight distances, and turning radii to accommodate safe vehicle ingress and egress, and avoid or minimize encroachments to oncoming traffic lanes.
3. Continue to provide adequate space within the WHSL for vehicle turn-around and queueing on-site.

VI. CONCLUSION

The County of Hawaii plans to close the South Hilo Sanitary Landfill which receives MSW from eight transfer stations in East Hawaii as well as private commercial haulers since the landfill is anticipated to reach its maximum permitted capacity. As result of the closure, solid waste previously disposed at SHSL is planned to be diverted to the West Hawaii Sanitary Landfill in Puanahulu, with County trucks from the transfer stations and commercial haulers expected to transport MSW directly to the West Hawaii facility. With the anticipated closure of the SHSL, traffic operations along the affected roadways are expected to operate at satisfactory conditions. It should be noted that many of the trips currently generated by the SHSL occur during off-peak periods. However, the County has plans in the future to aggregate all solid waste in East Hawaii before it is diverted to West Hawaii in larger vehicles. As such, in the interim, consideration should be given to the requirements for these future fleet vehicles in the implementation of the proposed project.

APPENDIX A

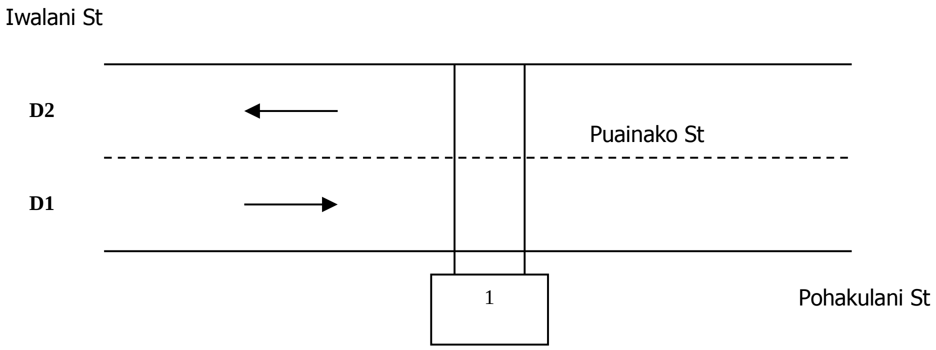
EXISTING TRAFFIC COUNT DATA

Traffic Data Service

Traffic Station Sketch

Section ID/Station #: B71200000158

Island: Hawaii	
Area: WAIAKEA	



Meter #	File Name	GPS
1. bt30	D0813025_B71200000158 D0813026_B71200000158	19.69387, -155.0821

Station Description:
Puainako St: Iwalani St to Pohakulani St

Survey Beginning Date/Time: 8/13/15@ 0000		Survey Ending Date/Time: 8/14/15@ 2400	
Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	1312		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Puainako St		17		2000	

D1= Direction to End — D1: Pohakulani St/Kaumana Dr (Rte 1950)
D2= Direction to Begin — D2: Iwalani St / RAILROAD AVE

Run Date: 2016/05/19

Hawaii Department of Transportation

Highways Division **Highways Planning Survey Section**

2015 Program Count - Summary

Site ID: B71200000158 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 8400

Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 2000

Location: Puainako St btwn Iwalani St _Pohakulani St

DATE : 08/13/2015

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
12:00-12:15	6	8	14	06:00-06:15	59	33	92	12:00-12:15	63	62	125	06:00-06:15	57	66	123
12:15-12:30	4	9	13	06:15-06:30	64	35	99	12:15-12:30	68	60	128	06:15-06:30	62	59	121
12:30-12:45	13	10	23	06:30-06:45	78	47	125	12:30-12:45	75	57	132	06:30-06:45	49	58	107
12:45-01:00	4	6	10	06:45-07:00	67	39	106	12:45-01:00	58	62	120	06:45-07:00	51	56	107
01:00-01:15	5	3	8	07:00-07:15	56	53	109	01:00-01:15	54	69	123	07:00-07:15	50	51	101
01:15-01:30	9	6	15	07:15-07:30	51	50	101	01:15-01:30	70	61	131	07:15-07:30	37	60	97
01:30-01:45	7	4	11	07:30-07:45	76	61	137	01:30-01:45	82	49	131	07:30-07:45	35	37	72
01:45-02:00	11	3	14	07:45-08:00	44	65	109	01:45-02:00	65	70	135	07:45-08:00	40	40	80
02:00-02:15	5	8	13	08:00-08:15	69	67	136	02:00-02:15	69	48	117	08:00-08:15	39	38	77
02:15-02:30	2	8	10	08:15-08:30	72	46	118	02:15-02:30	68	69	137	08:15-08:30	25	42	67
02:30-02:45	6	3	9	08:30-08:45	51	51	102	02:30-02:45	62	54	116	08:30-08:45	33	40	73
02:45-03:00	7	3	10	08:45-09:00	67	44	111	02:45-03:00	57	72	129	08:45-09:00	27	27	54
03:00-03:15	3	1	4	09:00-09:15	68	53	121	03:00-03:15	50	80	130	09:00-09:15	23	41	64
03:15-03:30	5	3	8	09:15-09:30	74	51	125	03:15-03:30	71	74	145	09:15-09:30	25	38	63
03:30-03:45	5	8	13	09:30-09:45	69	71	140	03:30-03:45	38	69	107	09:30-09:45	23	32	55
03:45-04:00	15	6	21	09:45-10:00	75	59	134	03:45-04:00	58	62	120	09:45-10:00	27	27	54
04:00-04:15	7	8	15	10:00-10:15	65	70	135	04:00-04:15	82	67	149	10:00-10:15	17	34	51
04:15-04:30	8	11	19	10:15-10:30	50	51	101	04:15-04:30	64	65	129	10:15-10:30	23	27	50
04:30-04:45	16	18	34	10:30-10:45	59	55	114	04:30-04:45	70	80	150	10:30-10:45	12	31	43
04:45-05:00	19	16	35	10:45-11:00	60	64	124	04:45-05:00	59	65	124	10:45-11:00	11	16	27
05:00-05:15	12	46	58	11:00-11:15	52	60	112	05:00-05:15	62	81	143	11:00-11:15	18	10	28
05:15-05:30	31	30	61	11:15-11:30	72	70	142	05:15-05:30	62	65	127	11:15-11:30	16	13	29
05:30-05:45	36	28	64	11:30-11:45	63	56	119	05:30-05:45	66	82	148	11:30-11:45	17	7	24
05:45-06:00	39	20	59	11:45-12:00	78	61	139	05:45-06:00	59	78	137	11:45-12:00	6	16	22

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:30 AM to 08:30 AM			PM - PEAK HR TIME	05:00 PM to 06:00 PM		
AM - PEAK HR VOLUME	261	239	500	PM - PEAK HR VOLUME	249	306	555
AM - K FACTOR (%)			6.16	PM - K FACTOR (%)			6.84
AM - D (%)	52.20	47.80	100.00	PM - D (%)	44.86	55.14	100.00
DIRECTIONAL PEAK				DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM	07:15 AM to 08:15 AM		PM - PEAK HR TIME	04:00 PM to 05:00 PM	05:00 PM to 06:00 PM	
AM - PEAK HR VOLUME	268	243		PM - PEAK HR VOLUME	275	306	

AM PERIOD (00:00-12:00)				PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	09:15 AM to 10:15 AM			PM - PEAK HR TIME	05:00 PM to 06:00 PM		
AM - PEAK HR VOLUME	283	251	534	PM - PEAK HR VOLUME	249	306	555
AM - K FACTOR (%)			6.58	PM - K FACTOR (%)			6.84
AM - D (%)	53.00	47.00	100.00	PM - D (%)	44.86	55.14	100.00

NON-COMMUTER PERIOD (09:00-15:00)				6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
TWO DIRECTIONAL PEAK				AM 6-HR PERIOD (06:00-12:00)	1,539	1,312	2,851
PEAK HR TIME	09:15 AM to 10:15 AM			AM 12-HR PERIOD (00:00-12:00)	1,814	1,578	3,392
PEAK HR VOLUME	283	251	534	PM 6-HR PERIOD (12:00-18:00)	1,532	1,601	3,133
DIRECTIONAL PEAK				PM 12-HR PERIOD (12:00-24:00)	2,255	2,467	4,722
PEAK HR TIME	09:00 AM to 10:00 AM	09:15 AM to 10:15 AM		24 HOUR PERIOD	4,069	4,045	8,114
PEAK HR VOLUME	286	251		D (%)	50.15	49.85	100.00

Run Date: 2016/05/19

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2015 Program Count - Summary

Site ID: B71200000158 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 8400

Functional Class: URBAN:COLLECTOR **Count Type:** CLASS **Counter Type:** Tube **Route No:** 2000

Location: Puainako St btwn Iwalani St _Pohakulani St

DATE : 08/14/2015

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
12:00-12:15	8	9	17	06:00-06:15	69	31	100	12:00-12:15	57	80	137	06:00-06:15	78	66	144
12:15-12:30	5	4	9	06:15-06:30	69	51	120	12:15-12:30	67	64	131	06:15-06:30	68	68	136
12:30-12:45	6	4	10	06:30-06:45	70	37	107	12:30-12:45	60	64	124	06:30-06:45	64	60	124
12:45-01:00	8	2	10	06:45-07:00	94	34	128	12:45-01:00	59	78	137	06:45-07:00	61	61	122
01:00-01:15	9	1	10	07:00-07:15	55	41	96	01:00-01:15	61	62	123	07:00-07:15	69	58	127
01:15-01:30	3	5	8	07:15-07:30	30	49	79	01:15-01:30	71	68	139	07:15-07:30	54	44	98
01:30-01:45	8	1	9	07:30-07:45	5	39	44	01:30-01:45	82	76	158	07:30-07:45	60	65	125
01:45-02:00	9	2	11	07:45-08:00	1	47	48	01:45-02:00	74	58	132	07:45-08:00	36	61	97
02:00-02:15	1	5	6	08:00-08:15	36	73	109	02:00-02:15	77	38	115	08:00-08:15	45	66	111
02:15-02:30	5	3	8	08:15-08:30	58	54	112	02:15-02:30	80	58	138	08:15-08:30	50	56	106
02:30-02:45	4	5	9	08:30-08:45	78	56	134	02:30-02:45	3	51	54	08:30-08:45	49	50	99
02:45-03:00	6	4	10	08:45-09:00	77	44	121	02:45-03:00	34	64	98	08:45-09:00	47	49	96
03:00-03:15	5	2	7	09:00-09:15	65	50	115	03:00-03:15	70	78	148	09:00-09:15	39	59	98
03:15-03:30	5	6	11	09:15-09:30	72	50	122	03:15-03:30	62	61	123	09:15-09:30	32	58	90
03:30-03:45	10	6	16	09:30-09:45	65	53	118	03:30-03:45	55	92	147	09:30-09:45	29	51	80
03:45-04:00	5	4	9	09:45-10:00	77	64	141	03:45-04:00	58	63	121	09:45-10:00	31	41	72
04:00-04:15	5	10	15	10:00-10:15	81	62	143	04:00-04:15	76	86	162	10:00-10:15	30	34	64
04:15-04:30	13	13	26	10:15-10:30	76	46	122	04:15-04:30	38	77	115	10:15-10:30	21	27	48
04:30-04:45	7	17	24	10:30-10:45	63	59	122	04:30-04:45	65	79	144	10:30-10:45	26	38	64
04:45-05:00	22	24	46	10:45-11:00	82	68	150	04:45-05:00	57	69	126	10:45-11:00	25	30	55
05:00-05:15	15	34	49	11:00-11:15	56	73	129	05:00-05:15	74	68	142	11:00-11:15	18	29	47
05:15-05:30	28	33	61	11:15-11:30	70	67	137	05:15-05:30	38	76	114	11:15-11:30	25	15	40
05:30-05:45	40	22	62	11:30-11:45	53	62	115	05:30-05:45	53	80	133	11:30-11:45	17	13	30
05:45-06:00	44	31	75	11:45-12:00	71	56	127	05:45-06:00	54	79	133	11:45-12:00	18	15	33

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM		
AM - PEAK HR VOLUME	249	227	476
AM - K FACTOR (%)			5.63
AM - D (%)	52.31	47.69	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:00 AM to 07:00 AM	07:45 AM to 08:45 AM	
AM - PEAK HR VOLUME	302	230	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM		
PM - PEAK HR VOLUME	251	302	553
PM - K FACTOR (%)			6.54
PM - D (%)	45.39	54.61	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	06:00 PM to 07:00 PM	03:30 PM to 04:30 PM	
PM - PEAK HR VOLUME	271	318	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	10:30 AM to 11:30 AM		
AM - PEAK HR VOLUME	271	267	538
AM - K FACTOR (%)			6.36
AM - D (%)	50.37	49.63	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	12:45 PM to 01:45 PM		
PM - PEAK HR VOLUME	273	284	557
PM - K FACTOR (%)			6.59
PM - D (%)	49.01	50.99	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	12:45 PM to 01:45 PM		
PEAK HR VOLUME	273	284	557
DIRECTIONAL PEAK			
PEAK HR TIME	01:30 PM to 02:30 PM	12:00 PM to 01:00 PM	
PEAK HR VOLUME	313	286	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	1,473	1,266	2,739
AM 12-HR PERIOD (00:00-12:00)	1,744	1,513	3,257
PM 6-HR PERIOD (12:00-18:00)	1,425	1,669	3,094
PM 12-HR PERIOD (12:00-24:00)	2,417	2,783	5,200
24 HOUR PERIOD	4,161	4,296	8,457
D (%)	49.20	50.80	100.00

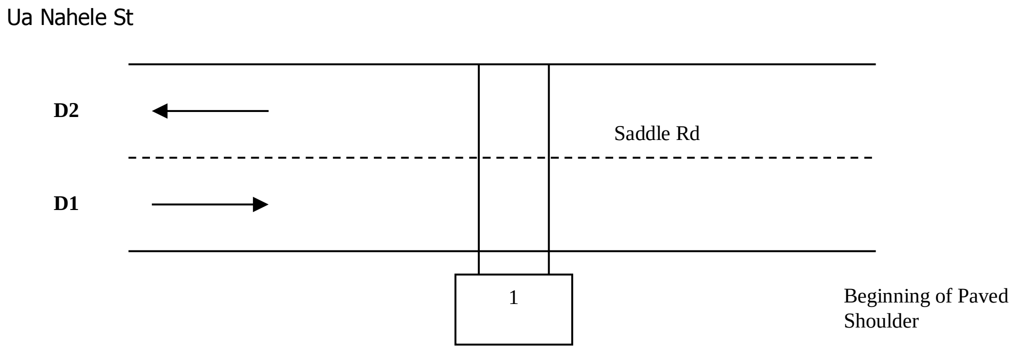
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii
Area: Hilo

Section ID/Station #: B71020000015



Meter #	File Name	GPS
1. BT35	D0416001_B71020000015	19.68157, -155.18519
2.	D0416002_B71020000015	

Station Description: Saddle Rd: Ua Nahele St to Beginning of Paved Shoulder

Survey Beginning Date/Time: 4/16/2015 @ 0000			Survey Ending Date/Time: 4/29/2015 @ 2400	
Survey Method:	Road Tube	Data Type:	Class	
Survey Crew:	LM		C1B	
Sketch Updated:		By:	SR	
Remarks:	1292			

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Saddle Rd		6		0200	

D1= Direction to End — D1: Beginning of Paved Shoulder / Mamalahoa Highway

D2= Direction to Begin — D2: Ua Nahele St / Hilo Urban Boundary

Run Date: 2016/06/27

Hawaii Department of Transportation

Highways Division **Highways Planning Survey Section**

2015 Program Count - Summary

Site ID: B71020000015 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 4200

Functional Class: RURAL:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 200

Location: Saddle Rd - Ua Nahele St to beginning of paved shoulder

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 04/20/2015															
12:00-12:15	1	10	11	06:00-06:15	16	4	20	12:00-12:15	27	51	78	06:00-06:15	25	51	76
12:15-12:30	1	4	5	06:15-06:30	22	6	28	12:15-12:30	29	45	74	06:15-06:30	15	48	63
12:30-12:45	1	2	3	06:30-06:45	17	6	23	12:30-12:45	28	64	92	06:30-06:45	16	32	48
12:45-01:00	2	5	7	06:45-07:00	15	6	21	12:45-01:00	39	46	85	06:45-07:00	15	35	50
01:00-01:15	3	7	10	07:00-07:15	13	11	24	01:00-01:15	30	38	68	07:00-07:15	18	25	43
01:15-01:30	1	1	2	07:15-07:30	22	6	28	01:15-01:30	35	40	75	07:15-07:30	13	41	54
01:30-01:45	3	1	4	07:30-07:45	19	12	31	01:30-01:45	30	59	89	07:30-07:45	15	26	41
01:45-02:00	3	3	6	07:45-08:00	30	8	38	01:45-02:00	31	65	96	07:45-08:00	10	21	31
02:00-02:15	0	2	2	08:00-08:15	16	13	29	02:00-02:15	40	52	92	08:00-08:15	19	19	38
02:15-02:30	3	1	4	08:15-08:30	24	5	29	02:15-02:30	29	66	95	08:15-08:30	14	22	36
02:30-02:45	2	1	3	08:30-08:45	26	23	49	02:30-02:45	26	52	78	08:30-08:45	17	9	26
02:45-03:00	1	3	4	08:45-09:00	32	18	50	02:45-03:00	26	47	73	08:45-09:00	19	16	35
03:00-03:15	3	0	3	09:00-09:15	38	39	77	03:00-03:15	24	61	85	09:00-09:15	9	22	31
03:15-03:30	3	1	4	09:15-09:30	38	18	56	03:15-03:30	22	61	83	09:15-09:30	11	27	38
03:30-03:45	1	1	2	09:30-09:45	40	32	72	03:30-03:45	21	71	92	09:30-09:45	6	22	28
03:45-04:00	2	3	5	09:45-10:00	47	27	74	03:45-04:00	43	59	102	09:45-10:00	6	40	46
04:00-04:15	2	1	3	10:00-10:15	45	33	78	04:00-04:15	43	50	93	10:00-10:15	4	22	26
04:15-04:30	0	0	0	10:15-10:30	22	37	59	04:15-04:30	33	55	88	10:15-10:30	6	16	22
04:30-04:45	6	1	7	10:30-10:45	34	30	64	04:30-04:45	37	81	118	10:30-10:45	2	16	18
04:45-05:00	6	2	8	10:45-11:00	36	41	77	04:45-05:00	30	55	85	10:45-11:00	3	8	11
05:00-05:15	8	2	10	11:00-11:15	37	37	74	05:00-05:15	36	44	80	11:00-11:15	2	7	9
05:15-05:30	14	1	15	11:15-11:30	35	49	84	05:15-05:30	22	57	79	11:15-11:30	0	1	1
05:30-05:45	16	0	16	11:30-11:45	34	61	95	05:30-05:45	27	65	92	11:30-11:45	0	8	8
05:45-06:00	18	2	20	11:45-12:00	36	47	83	05:45-06:00	18	49	67	11:45-12:00	1	6	7

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM		
AM - PEAK HR VOLUME	98	59	157
AM - K FACTOR (%)			3.68
AM - D (%)	62.42	37.58	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	08:00 AM to 09:00 AM	
AM - PEAK HR VOLUME	98	59	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	156	245	401
PM - K FACTOR (%)			9.41
PM - D (%)	38.90	61.10	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	156	252	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	11:00 AM to 12:00 PM		
AM - PEAK HR VOLUME	142	194	336
AM - K FACTOR (%)			7.88
AM - D (%)	42.26	57.74	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:45 PM to 04:45 PM		
PM - PEAK HR VOLUME	156	245	401
PM - K FACTOR (%)			9.41
PM - D (%)	38.90	61.10	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	01:30 PM to 02:30 PM		
PEAK HR VOLUME	130	242	372
DIRECTIONAL PEAK			
PEAK HR TIME	09:15 AM to 10:15 AM	01:30 PM to 02:30 PM	
PEAK HR VOLUME	170	242	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	694	569	1,263
AM 12-HR PERIOD (00:00-12:00)	794	623	1,417
PM 6-HR PERIOD (12:00-18:00)	726	1,333	2,059
PM 12-HR PERIOD (12:00-24:00)	972	1,873	2,845
24 HOUR PERIOD	1,766	2,496	4,262
D (%)	41.44	58.56	100.00

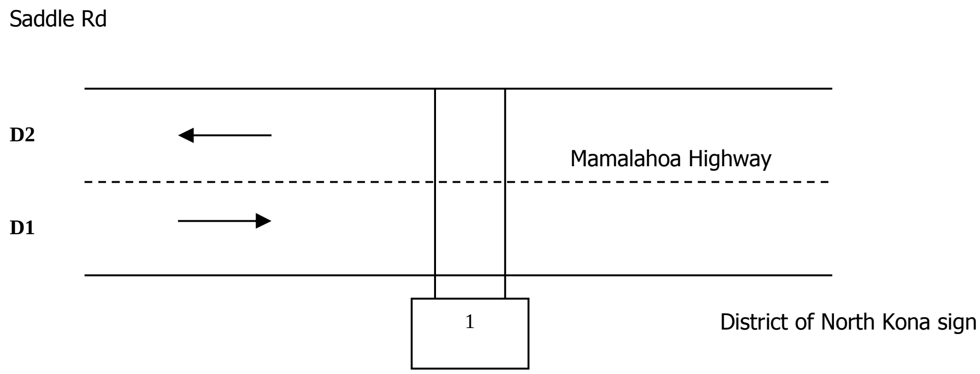
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii	
Area: Holualoa	

Section ID/Station #: B71019001380



Meter #	File Name	GPS
1. bt11	D0416011_B71019001380	19.84386, --155.749886
2.	D0416012_B71019001380	

Station Description:

Mamalahoa Highway: Saddle Rd to District of North Kona sign

Survey Beginning Date/Time: 4/16/2015 @ 0000			Survey Ending Date/Time: 4/29/2015 @ 2400
Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:	973		

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Mamalahoa Highway		16		0180	

D1= Direction to End — D1: District of North Kona sign/ Mamalahoa Hwy (Rte 190)

D2= Direction to Begin — D2: Saddle Rd / Kuakini Hwy

Run Date: 2016/06/27

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2015 Program Count - Summary

Site ID: B71019001380 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 5200

Functional Class: RURAL:MINOR ARTERIAL **Count Type:** CLASS **Counter Type:** Tube **Route No:** 190

Location: Mamalahoa Highway: Saddle Rd to District of North Kona Sign

DATE : 12/10/2015

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
12:00-12:15	2	1	3	06:00-06:15	21	46	67	12:00-12:15	44	42	86	06:00-06:15	38	40	78
12:15-12:30	3	3	6	06:15-06:30	37	68	105	12:15-12:30	29	34	63	06:15-06:30	35	37	72
12:30-12:45	1	3	4	06:30-06:45	20	49	69	12:30-12:45	47	37	84	06:30-06:45	25	29	54
12:45-01:00	1	2	3	06:45-07:00	34	51	85	12:45-01:00	36	33	69	06:45-07:00	22	31	53
01:00-01:15	2	1	3	07:00-07:15	45	36	81	01:00-01:15	56	37	93	07:00-07:15	22	16	38
01:15-01:30	1	0	1	07:15-07:30	47	56	103	01:15-01:30	48	30	78	07:15-07:30	13	13	26
01:30-01:45	0	0	0	07:30-07:45	35	40	75	01:30-01:45	44	35	79	07:30-07:45	19	21	40
01:45-02:00	4	2	6	07:45-08:00	32	39	71	01:45-02:00	56	29	85	07:45-08:00	9	23	32
02:00-02:15	0	1	1	08:00-08:15	31	50	81	02:00-02:15	48	41	89	08:00-08:15	10	25	35
02:15-02:30	0	2	2	08:15-08:30	38	31	69	02:15-02:30	45	41	86	08:15-08:30	17	16	33
02:30-02:45	1	1	2	08:30-08:45	45	39	84	02:30-02:45	63	35	98	08:30-08:45	8	20	28
02:45-03:00	2	1	3	08:45-09:00	38	51	89	02:45-03:00	54	58	112	08:45-09:00	12	18	30
03:00-03:15	1	0	1	09:00-09:15	33	47	80	03:00-03:15	42	40	82	09:00-09:15	7	10	17
03:15-03:30	1	2	3	09:15-09:30	49	63	112	03:15-03:30	63	57	120	09:15-09:30	15	15	30
03:30-03:45	2	3	5	09:30-09:45	46	38	84	03:30-03:45	56	49	105	09:30-09:45	15	13	28
03:45-04:00	4	5	9	09:45-10:00	33	56	89	03:45-04:00	57	61	118	09:45-10:00	17	15	32
04:00-04:15	2	1	3	10:00-10:15	37	36	73	04:00-04:15	68	54	122	10:00-10:15	8	4	12
04:15-04:30	5	4	9	10:15-10:30	26	40	66	04:15-04:30	61	49	110	10:15-10:30	8	7	15
04:30-04:45	4	7	11	10:30-10:45	26	51	77	04:30-04:45	76	57	133	10:30-10:45	11	16	27
04:45-05:00	4	15	19	10:45-11:00	40	24	64	04:45-05:00	39	53	92	10:45-11:00	9	8	17
05:00-05:15	14	12	26	11:00-11:15	39	38	77	05:00-05:15	60	49	109	11:00-11:15	7	5	12
05:15-05:30	9	25	34	11:15-11:30	47	35	82	05:15-05:30	47	57	104	11:15-11:30	4	2	6
05:30-05:45	15	39	54	11:30-11:45	36	30	66	05:30-05:45	57	54	111	11:30-11:45	8	1	9
05:45-06:00	22	36	58	11:45-12:00	42	40	82	05:45-06:00	47	51	98	11:45-12:00	3	2	5

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM			PM - PEAK HR TIME	03:45 PM to 04:45 PM		
AM - PEAK HR VOLUME	161	183	344	PM - PEAK HR VOLUME	262	221	483
AM - K FACTOR (%)			6.55	PM - K FACTOR (%)			9.20
AM - D (%)	46.80	53.20	100.00	PM - D (%)	54.24	45.76	100.00
DIRECTIONAL PEAK				DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM	06:00 AM to 07:00 AM		PM - PEAK HR TIME	03:45 PM to 04:45 PM	03:15 PM to 04:15 PM	
AM - PEAK HR VOLUME	161	214		PM - PEAK HR VOLUME	262	221	

AM PERIOD (00:00-12:00)				PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:30 AM to 09:30 AM			PM - PEAK HR TIME	03:45 PM to 04:45 PM		
AM - PEAK HR VOLUME	165	200	365	PM - PEAK HR VOLUME	262	221	483
AM - K FACTOR (%)			6.95	PM - K FACTOR (%)			9.20
AM - D (%)	45.21	54.79	100.00	PM - D (%)	54.24	45.76	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	210	175	385
DIRECTIONAL PEAK			
PEAK HR TIME	01:45 PM to 02:45 PM	09:00 AM to 10:00 AM	
PEAK HR VOLUME	212	204	

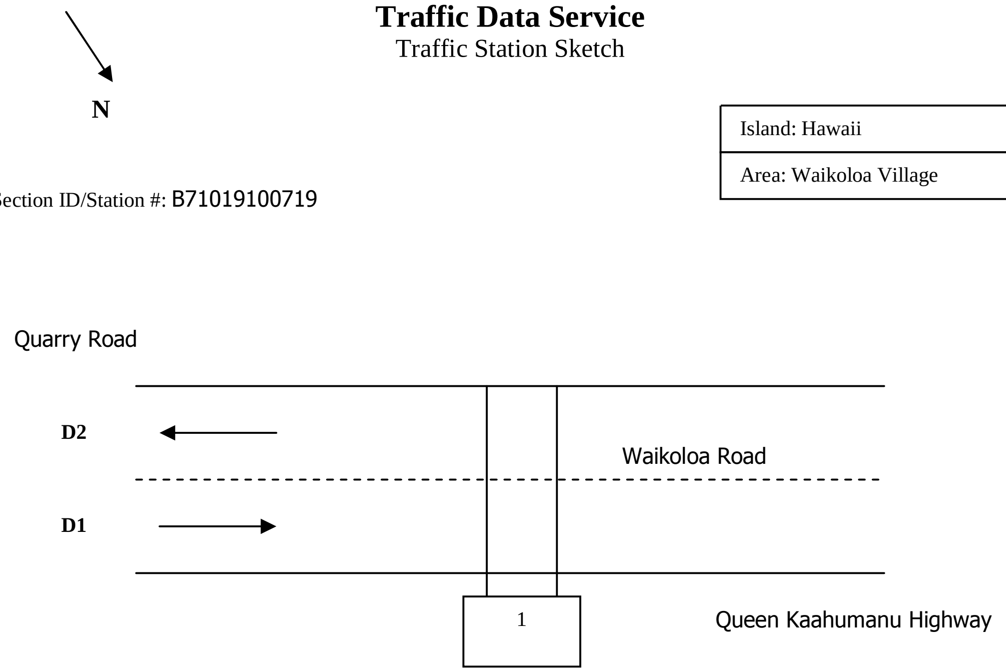
6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	877	1,054	1,931
AM 12-HR PERIOD (00:00-12:00)	977	1,220	2,197
PM 6-HR PERIOD (12:00-18:00)	1,243	1,083	2,326
PM 12-HR PERIOD (12:00-24:00)	1,585	1,470	3,055
24 HOUR PERIOD	2,562	2,690	5,252
D (%)	48.78	51.22	100.00

Traffic Data Service

Traffic Station Sketch

Island: Hawaii
Area: Waikoloa Village

Section ID/Station #: B71019100719



Meter #	File Name	GPS
1. bw59	D0902005_B71019100719	19.91458, -155.8355
2.	D0902006_B71019100719	

Station Description:
Waikoloa Road: Quarry Road to Queen Kaahumanu Highway

Survey Beginning Date/Time: 9/2/15@ 0000			Survey Ending Date/Time: 9/3/15@ 2400		
Survey Method:	Road Tube	Data Type:	Class		
Survey Crew:	LM		C1B		
Sketch Updated:		By:	SR		
Remarks:	1020				
FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Waikoloa Road		16		0191	

D1= Direction to End — D1: Queen Kaahumanu Highway / Queen Kaahumanu Highway (Rte 19)
D2= Direction to Begin — D2: Quarry Road / Mamalahoa Highway (Rte 190)

Run Date: 2016/05/18

Hawaii Department of Transportation

Highways Division **Highways Planning Survey Section**

2015 Program Count - Summary

Site ID: B71019100719
Functional Class: URBAN:MINOR ARTERIAL
Location: Waikoloa Rd - Quarry Rd to Queen Kaahumanu Hwy

Town: Hawaii
Count Type: CLASS

DIR 1: +MP **DIR 2:** -MP
Counter Type: Tube

Final AADT: 8300
Route No: 191

DATE : 09/02/2015

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
12:00-12:15	11	1	12	06:00-06:15	7	74	81	12:00-12:15	49	62	111	06:00-06:15	85	22	107
12:15-12:30	16	1	17	06:15-06:30	24	97	121	12:15-12:30	59	55	114	06:15-06:30	66	26	92
12:30-12:45	7	0	7	06:30-06:45	30	134	164	12:30-12:45	41	57	98	06:30-06:45	56	26	82
12:45-01:00	3	1	4	06:45-07:00	29	149	178	12:45-01:00	58	48	106	06:45-07:00	54	27	81
01:00-01:15	4	0	4	07:00-07:15	30	120	150	01:00-01:15	58	65	123	07:00-07:15	40	16	56
01:15-01:30	5	1	6	07:15-07:30	22	133	155	01:15-01:30	54	46	100	07:15-07:30	42	23	65
01:30-01:45	3	2	5	07:30-07:45	30	149	179	01:30-01:45	58	63	121	07:30-07:45	64	21	85
01:45-02:00	3	2	5	07:45-08:00	29	116	145	01:45-02:00	64	54	118	07:45-08:00	36	23	59
02:00-02:15	2	2	4	08:00-08:15	22	99	121	02:00-02:15	50	48	98	08:00-08:15	39	14	53
02:15-02:30	2	2	4	08:15-08:30	34	72	106	02:15-02:30	89	50	139	08:15-08:30	38	18	56
02:30-02:45	1	1	2	08:30-08:45	43	93	136	02:30-02:45	53	84	137	08:30-08:45	38	14	52
02:45-03:00	0	0	0	08:45-09:00	44	84	128	02:45-03:00	72	75	147	08:45-09:00	31	18	49
03:00-03:15	0	0	0	09:00-09:15	36	79	115	03:00-03:15	94	66	160	09:00-09:15	51	10	61
03:15-03:30	0	0	0	09:15-09:30	36	91	127	03:15-03:30	102	69	171	09:15-09:30	36	17	53
03:30-03:45	1	1	2	09:30-09:45	29	97	126	03:30-03:45	106	65	171	09:30-09:45	51	12	63
03:45-04:00	3	0	3	09:45-10:00	36	79	115	03:45-04:00	133	40	173	09:45-10:00	57	12	69
04:00-04:15	1	6	7	10:00-10:15	35	72	107	04:00-04:15	117	50	167	10:00-10:15	64	12	76
04:15-04:30	2	17	19	10:15-10:30	32	85	117	04:15-04:30	121	36	157	10:15-10:30	48	17	65
04:30-04:45	2	28	30	10:30-10:45	53	49	102	04:30-04:45	122	30	152	10:30-10:45	34	13	47
04:45-05:00	6	25	31	10:45-11:00	39	47	86	04:45-05:00	106	29	135	10:45-11:00	29	13	42
05:00-05:15	8	36	44	11:00-11:15	48	37	85	05:00-05:15	123	39	162	11:00-11:15	31	8	39
05:15-05:30	8	32	40	11:15-11:30	38	25	63	05:15-05:30	106	33	139	11:15-11:30	25	3	28
05:30-05:45	10	46	56	11:30-11:45	43	62	105	05:30-05:45	88	41	129	11:30-11:45	15	2	17
05:45-06:00	8	68	76	11:45-12:00	48	63	111	05:45-06:00	96	37	133	11:45-12:00	8	0	8

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM			PM - PEAK HR TIME	03:15 PM to 04:15 PM		
AM - PEAK HR VOLUME	111	551	662	PM - PEAK HR VOLUME	458	224	682
AM - K FACTOR (%)			8.31	PM - K FACTOR (%)			8.56
AM - D (%)	16.77	83.23	100.00	PM - D (%)	67.16	32.84	100.00
DIRECTIONAL PEAK				DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	06:45 AM to 07:45 AM		PM - PEAK HR TIME	03:45 PM to 04:45 PM	03:00 PM to 04:00 PM	
AM - PEAK HR VOLUME	143	551		PM - PEAK HR VOLUME	493	240	

AM PERIOD (00:00-12:00)				PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM			PM - PEAK HR TIME	03:15 PM to 04:15 PM		
AM - PEAK HR VOLUME	111	551	662	PM - PEAK HR VOLUME	458	224	682
AM - K FACTOR (%)			8.31	PM - K FACTOR (%)			8.56
AM - D (%)	16.77	83.23	100.00	PM - D (%)	67.16	32.84	100.00

NON-COMMUTER PERIOD (09:00-15:00)				6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
TWO DIRECTIONAL PEAK				AM 6-HR PERIOD (06:00-12:00)	817	2,106	2,923
PEAK HR TIME	02:00 PM to 03:00 PM			AM 12-HR PERIOD (00:00-12:00)	923	2,378	3,301
PEAK HR VOLUME	264	257	521	PM 6-HR PERIOD (12:00-18:00)	2,019	1,242	3,261
DIRECTIONAL PEAK				PM 12-HR PERIOD (12:00-24:00)	3,057	1,609	4,666
PEAK HR TIME	02:00 PM to 03:00 PM	09:00 AM to 10:00 AM		24 HOUR PERIOD	3,980	3,987	7,967
PEAK HR VOLUME	264	346		D (%)	49.96	50.04	100.00

Run Date: 2016/05/18

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2015 Program Count - Summary

Site ID: B71019100719
Functional Class: URBAN:MINOR ARTERIAL
Location: Waikoloa Rd - Quarry Rd to Queen Kaahumanu Hwy

Town: Hawaii
Count Type: CLASS

DIR 1: +MP **DIR 2:** -MP
Counter Type: Tube

Final AADT: 8300
Route No: 191

DATE : 09/03/2015

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
12:00-12:15	12	3	15	06:00-06:15	11	71	82	12:00-12:15	47	57	104	06:00-06:15	90	49	139
12:15-12:30	9	0	9	06:15-06:30	26	87	113	12:15-12:30	64	49	113	06:15-06:30	87	22	109
12:30-12:45	8	2	10	06:30-06:45	28	85	113	12:30-12:45	55	55	110	06:30-06:45	67	18	85
12:45-01:00	1	0	1	06:45-07:00	22	152	174	12:45-01:00	49	55	104	06:45-07:00	62	24	86
01:00-01:15	9	1	10	07:00-07:15	24	110	134	01:00-01:15	56	49	105	07:00-07:15	72	23	95
01:15-01:30	5	1	6	07:15-07:30	27	126	153	01:15-01:30	59	71	130	07:15-07:30	67	20	87
01:30-01:45	2	1	3	07:30-07:45	27	161	188	01:30-01:45	72	61	133	07:30-07:45	57	22	79
01:45-02:00	4	1	5	07:45-08:00	32	139	171	01:45-02:00	62	78	140	07:45-08:00	42	17	59
02:00-02:15	2	1	3	08:00-08:15	25	101	126	02:00-02:15	73	51	124	08:00-08:15	53	16	69
02:15-02:30	4	1	5	08:15-08:30	26	99	125	02:15-02:30	78	55	133	08:15-08:30	61	10	71
02:30-02:45	1	0	1	08:30-08:45	33	93	126	02:30-02:45	82	85	167	08:30-08:45	40	13	53
02:45-03:00	2	1	3	08:45-09:00	26	71	97	02:45-03:00	84	60	144	08:45-09:00	39	12	51
03:00-03:15	0	4	4	09:00-09:15	48	84	132	03:00-03:15	112	73	185	09:00-09:15	45	18	63
03:15-03:30	3	2	5	09:15-09:30	38	96	134	03:15-03:30	125	57	182	09:15-09:30	56	24	80
03:30-03:45	2	2	4	09:30-09:45	28	99	127	03:30-03:45	106	56	162	09:30-09:45	50	25	75
03:45-04:00	4	4	8	09:45-10:00	43	56	99	03:45-04:00	134	43	177	09:45-10:00	42	23	65
04:00-04:15	0	10	10	10:00-10:15	35	80	115	04:00-04:15	102	41	143	10:00-10:15	54	9	63
04:15-04:30	3	7	10	10:15-10:30	30	93	123	04:15-04:30	118	47	165	10:15-10:30	50	19	69
04:30-04:45	0	15	15	10:30-10:45	43	58	101	04:30-04:45	102	54	156	10:30-10:45	52	9	61
04:45-05:00	4	20	24	10:45-11:00	54	60	114	04:45-05:00	85	62	147	10:45-11:00	33	16	49
05:00-05:15	5	28	33	11:00-11:15	27	61	88	05:00-05:15	65	52	117	11:00-11:15	23	6	29
05:15-05:30	8	40	48	11:15-11:30	49	67	116	05:15-05:30	114	37	151	11:15-11:30	37	8	45
05:30-05:45	10	43	53	11:30-11:45	47	56	103	05:30-05:45	95	42	137	11:30-11:45	19	3	22
05:45-06:00	8	41	49	11:45-12:00	51	64	115	05:45-06:00	76	32	108	11:45-12:00	17	2	19

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM			PM - PEAK HR TIME	03:00 PM to 04:00 PM		
AM - PEAK HR VOLUME	100	549	649	PM - PEAK HR VOLUME	477	229	706
AM - K FACTOR (%)			7.85	PM - K FACTOR (%)			8.54
AM - D (%)	15.41	84.59	100.00	PM - D (%)	67.56	32.44	100.00
DIRECTIONAL PEAK				DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM	06:45 AM to 07:45 AM		PM - PEAK HR TIME	03:00 PM to 04:00 PM	03:00 PM to 04:00 PM	
AM - PEAK HR VOLUME	116	549		PM - PEAK HR VOLUME	477	229	

AM PERIOD (00:00-12:00)				PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM			PM - PEAK HR TIME	03:00 PM to 04:00 PM		
AM - PEAK HR VOLUME	100	549	649	PM - PEAK HR VOLUME	477	229	706
AM - K FACTOR (%)			7.85	PM - K FACTOR (%)			8.54
AM - D (%)	15.41	84.59	100.00	PM - D (%)	67.56	32.44	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	317	251	568
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	09:00 AM to 10:00 AM	
PEAK HR VOLUME	317	335	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	800	2,169	2,969
AM 12-HR PERIOD (00:00-12:00)	906	2,397	3,303
PM 6-HR PERIOD (12:00-18:00)	2,015	1,322	3,337
PM 12-HR PERIOD (12:00-24:00)	3,230	1,730	4,960
24 HOUR PERIOD	4,136	4,127	8,263
D (%)	50.05	49.95	100.00

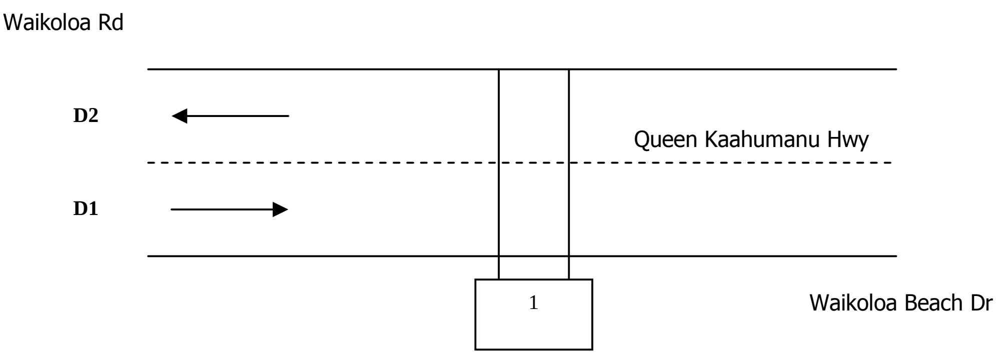
Traffic Data Service

Traffic Station Sketch

N

Island: Hawaii	
Area: Puako	

Section ID/Station #: B71001907467



	Meter #	File Name	GPS
1.	bw69	D0902017_B71001907467 D0902018_B71001907467	19.91402, -155.8712

Station Description:
Queen Kaahumanu Hwy: Waikoloa Rd to Waikoloa Beach Dr

Survey Beginning Date/Time: 9/2/15@ 0000			Survey Ending Date/Time: 9/3/15@ 2400
Survey Method:	Road Tube	Data Type:	Class
Survey Crew:	LM		C1B
Sketch Updated:		By:	SR
Remarks:			

FACILITY NAME	JURI	FUNC CLASS	AREA TYPE	ROUTE NO.	ROUTE MILE
Queen Kaahumanu Hwy		14		19	

D1= Direction to End — D1: Waikoloa Beach Dr / Palani Rd (Rte 190)

D2= Direction to Begin — D2: Waikoloa Rd / entrance to Kuhio Wharf

Run Date: 2016/05/18

Hawaii Department of Transportation

Highways Division — Highways Planning Survey Section

2015 Program Count - Summary

Site ID: B71001907467 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 14900

Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** CLASS **Counter Type:** Tube **Route No:** 19

Location: Queen Kaahumanu Hwy - Waikoloa Rd to Waikoloa Beach Dr

DATE : 09/02/2015

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
12:00-12:15	21	2	23	06:00-06:15	26	142	168	12:00-12:15	94	92	186	06:00-06:15	137	76	213
12:15-12:30	22	3	25	06:15-06:30	39	180	219	12:15-12:30	95	109	204	06:15-06:30	102	45	147
12:30-12:45	15	0	15	06:30-06:45	40	225	265	12:30-12:45	82	112	194	06:30-06:45	78	57	135
12:45-01:00	12	2	14	06:45-07:00	52	229	281	12:45-01:00	118	86	204	06:45-07:00	80	55	135
01:00-01:15	4	1	5	07:00-07:15	70	159	229	01:00-01:15	107	106	213	07:00-07:15	63	65	128
01:15-01:30	7	2	9	07:15-07:30	59	182	241	01:15-01:30	107	103	210	07:15-07:30	61	47	108
01:30-01:45	4	4	8	07:30-07:45	73	205	278	01:30-01:45	108	116	224	07:30-07:45	82	47	129
01:45-02:00	3	4	7	07:45-08:00	89	171	260	01:45-02:00	116	109	225	07:45-08:00	62	43	105
02:00-02:15	2	3	5	08:00-08:15	83	130	213	02:00-02:15	114	97	211	08:00-08:15	77	31	108
02:15-02:30	2	8	10	08:15-08:30	79	106	185	02:15-02:30	139	114	253	08:15-08:30	79	30	109
02:30-02:45	1	3	4	08:30-08:45	87	132	219	02:30-02:45	127	111	238	08:30-08:45	64	24	88
02:45-03:00	0	2	2	08:45-09:00	69	124	193	02:45-03:00	130	126	256	08:45-09:00	76	38	114
03:00-03:15	2	6	8	09:00-09:15	79	110	189	03:00-03:15	175	114	289	09:00-09:15	74	28	102
03:15-03:30	0	5	5	09:15-09:30	86	121	207	03:15-03:30	159	116	275	09:15-09:30	79	30	109
03:30-03:45	2	11	13	09:30-09:45	86	131	217	03:30-03:45	154	144	298	09:30-09:45	85	29	114
03:45-04:00	1	16	17	09:45-10:00	67	107	174	03:45-04:00	164	107	271	09:45-10:00	90	22	112
04:00-04:15	3	4	7	10:00-10:15	89	110	199	04:00-04:15	201	101	302	10:00-10:15	84	26	110
04:15-04:30	7	42	49	10:15-10:30	96	100	196	04:15-04:30	188	71	259	10:15-10:30	80	23	103
04:30-04:45	5	37	42	10:30-10:45	91	102	193	04:30-04:45	204	55	259	10:30-10:45	55	15	70
04:45-05:00	10	47	57	10:45-11:00	88	92	180	04:45-05:00	186	74	260	10:45-11:00	33	8	41
05:00-05:15	8	56	64	11:00-11:15	80	115	195	05:00-05:15	204	72	276	11:00-11:15	41	19	60
05:15-05:30	14	78	92	11:15-11:30	97	98	195	05:15-05:30	164	66	230	11:15-11:30	33	8	41
05:30-05:45	22	84	106	11:30-11:45	83	115	198	05:30-05:45	130	71	201	11:30-11:45	29	7	36
05:45-06:00	17	125	142	11:45-12:00	101	112	213	05:45-06:00	160	66	226	11:45-12:00	9	6	15

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	254	775	1029
AM - K FACTOR (%)			7.33
AM - D (%)	24.68	75.32	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:45 AM to 08:45 AM	06:30 AM to 07:30 AM	
AM - PEAK HR VOLUME	338	795	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM		
PM - PEAK HR VOLUME	678	468	1146
PM - K FACTOR (%)			8.17
PM - D (%)	59.16	40.84	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	04:15 PM to 05:15 PM	03:00 PM to 04:00 PM	
PM - PEAK HR VOLUME	782	481	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	06:45 AM to 07:45 AM		
AM - PEAK HR VOLUME	254	775	1029
AM - K FACTOR (%)			7.33
AM - D (%)	24.68	75.32	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:15 PM to 04:15 PM		
PM - PEAK HR VOLUME	678	468	1146
PM - K FACTOR (%)			8.17
PM - D (%)	59.16	40.84	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	510	448	958
DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM	09:00 AM to 10:00 AM	
PEAK HR VOLUME	510	469	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	1,809	3,298	5,107
AM 12-HR PERIOD (00:00-12:00)	1,993	3,843	5,836
PM 6-HR PERIOD (12:00-18:00)	3,426	2,338	5,764
PM 12-HR PERIOD (12:00-24:00)	5,079	3,117	8,196
24 HOUR PERIOD	7,072	6,960	14,032
D (%)	50.40	49.60	100.00

Run Date: 2016/05/18

Hawaii Department of Transportation

Highways Division **Highways Planning Survey Section**

2015 Program Count - Summary

Site ID: B71001907467 **Town:** Hawaii **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 14900

Functional Class: URBAN:PRINCIPAL ARTERIAL - OTHER **Count Type:** CLASS **Counter Type:** Tube **Route No:** 19

Location: Queen Kaahumanu Hwy - Waikoloa Rd to Waikoloa Beach Dr

DATE : 09/03/2015

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
12:00-12:15	15	6	21	06:00-06:15	34	152	186	12:00-12:15	128	117	245	06:00-06:15	115	76	191
12:15-12:30	16	3	19	06:15-06:30	39	218	257	12:15-12:30	131	122	253	06:15-06:30	122	60	182
12:30-12:45	15	3	18	06:30-06:45	47	194	241	12:30-12:45	131	123	254	06:30-06:45	93	58	151
12:45-01:00	4	0	4	06:45-07:00	50	215	265	12:45-01:00	180	129	309	06:45-07:00	92	66	158
01:00-01:15	14	1	15	07:00-07:15	43	180	223	01:00-01:15	168	126	294	07:00-07:15	95	56	151
01:15-01:30	7	4	11	07:15-07:30	64	184	248	01:15-01:30	161	129	290	07:15-07:30	99	53	152
01:30-01:45	5	3	8	07:30-07:45	63	181	244	01:30-01:45	162	131	293	07:30-07:45	74	55	129
01:45-02:00	6	2	8	07:45-08:00	85	187	272	01:45-02:00	166	102	268	07:45-08:00	96	33	129
02:00-02:15	3	2	5	08:00-08:15	74	111	185	02:00-02:15	152	111	263	08:00-08:15	88	35	123
02:15-02:30	1	6	7	08:15-08:30	67	157	224	02:15-02:30	154	105	259	08:15-08:30	94	43	137
02:30-02:45	2	0	2	08:30-08:45	63	131	194	02:30-02:45	142	142	284	08:30-08:45	68	35	103
02:45-03:00	2	2	4	08:45-09:00	97	116	213	02:45-03:00	132	125	257	08:45-09:00	85	28	113
03:00-03:15	3	5	8	09:00-09:15	89	115	204	03:00-03:15	149	110	259	09:00-09:15	68	28	96
03:15-03:30	4	8	12	09:15-09:30	102	121	223	03:15-03:30	126	126	252	09:15-09:30	95	34	129
03:30-03:45	0	8	8	09:30-09:45	61	140	201	03:30-03:45	151	118	269	09:30-09:45	93	30	123
03:45-04:00	2	6	8	09:45-10:00	80	120	200	03:45-04:00	175	96	271	09:45-10:00	102	28	130
04:00-04:15	1	16	17	10:00-10:15	92	94	186	04:00-04:15	200	95	295	10:00-10:15	86	25	111
04:15-04:30	6	25	31	10:15-10:30	78	123	201	04:15-04:30	225	90	315	10:15-10:30	80	15	95
04:30-04:45	1	50	51	10:30-10:45	90	129	219	04:30-04:45	155	70	225	10:30-10:45	63	25	88
04:45-05:00	10	50	60	10:45-11:00	85	101	186	04:45-05:00	173	112	285	10:45-11:00	46	18	64
05:00-05:15	6	66	72	11:00-11:15	92	108	200	05:00-05:15	140	98	238	11:00-11:15	44	17	61
05:15-05:30	18	68	86	11:15-11:30	98	106	204	05:15-05:30	168	70	238	11:15-11:30	33	11	44
05:30-05:45	15	90	105	11:30-11:45	100	112	212	05:30-05:45	150	58	208	11:30-11:45	31	7	38
05:45-06:00	13	113	126	11:45-12:00	123	117	240	05:45-06:00	107	80	187	11:45-12:00	19	4	23

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM			PM - PEAK HR TIME	03:30 PM to 04:30 PM		
AM - PEAK HR VOLUME	255	732	987	PM - PEAK HR VOLUME	751	399	1150
AM - K FACTOR (%)			6.59	PM - K FACTOR (%)			7.68
AM - D (%)	25.84	74.16	100.00	PM - D (%)	65.30	34.70	100.00
DIRECTIONAL PEAK				DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	06:15 AM to 07:15 AM		PM - PEAK HR TIME	03:45 PM to 04:45 PM	03:00 PM to 04:00 PM	
AM - PEAK HR VOLUME	301	807		PM - PEAK HR VOLUME	755	450	

AM PERIOD (00:00-12:00)				PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK				TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	07:00 AM to 08:00 AM			PM - PEAK HR TIME	12:45 PM to 01:45 PM		
AM - PEAK HR VOLUME	255	732	987	PM - PEAK HR VOLUME	671	515	1186
AM - K FACTOR (%)			6.59	PM - K FACTOR (%)			7.92
AM - D (%)	25.84	74.16	100.00	PM - D (%)	56.58	43.42	100.00

NON-COMMUTER PERIOD (09:00-15:00)				6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
TWO DIRECTIONAL PEAK				AM 6-HR PERIOD (06:00-12:00)	1,816	3,412	5,228
PEAK HR TIME	12:45 PM to 01:45 PM			AM 12-HR PERIOD (00:00-12:00)	1,985	3,949	5,934
PEAK HR VOLUME	671	515	1186	PM 6-HR PERIOD (12:00-18:00)	3,726	2,585	6,311
DIRECTIONAL PEAK				PM 12-HR PERIOD (12:00-24:00)	5,607	3,425	9,032
PEAK HR TIME	12:45 PM to 01:45 PM	12:45 PM to 01:45 PM		24 HOUR PERIOD	7,592	7,374	14,966
PEAK HR VOLUME	671	515		D (%)	50.73	49.27	100.00

APPENDIX B

SUMMARY OF REPORT FROM SOLID WASTE DIVISION

Weekly Total Trips at the South Hilo Sanitary Landfill

Origin	7/10/2017	7/11/2017	7/12/2017	7/13/2017	7/14/2017	7/15/2017	7/16/2017	Weekly Total
Glenwood	4	2	1	-	2	1	5	15
Volcano	2	1	1	3	1	4	2	14
Hilo	3	4	4	4	4	4	6	29
Kalapana	1	-	-	-	1	-	-	2
Keaau	5	4	5	5	4	5	5	33
Pahoa	4	4	2	5	3	4	4	26
Papaikou	-	1	-	-	-	1	-	2
Honomu	-	1	-	-	-	-	1	2
Commercial	71	70	59	71	77	29	18	
TOTAL	**19**	**16**	**13**	**17**	**15**	**19**	**22**	**121**

Source: County of Hawaii, Solid Waste Division

■ (yellow)	Weekday
■ (orange)	Weekend

Number of Trips during Peak Hour

Origin	AM							MAX	PM							MAX
	07-10	07-11	07-12	07-13	07-14	07-15	07-16		07-10	07-11	07-12	07-13	07-14	07-15	07-16	
Honomu	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0
Papaikou	-	-	-	-	-	1	-	0	-	-	-	-	-	-	-	0
Kalapana	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0
Pahoa	1	1	-	1	-	1	1	1	-	-	-	-	-	-	-	0
Volcano	-	1	1	-	-	1	-	1	1	-	-	-	-	-	-	1
Glenwood	2	-	-	-	-	-	2	2		-	-	-	-	-	-	0
Keaau	1	1	1	2	1	1	1	2	1	-	-	1	-	1	1	1
Hilo	3	1	1	2	-	-	2	3		-	-		-	-	2	0
Commercial Haulers	9	9	7	7	11	10	5	11	6	6	4	7	10	2	5	10

Source: County of Hawaii, Solid Waste Division

Weekday

Weekend

APPENDIX C

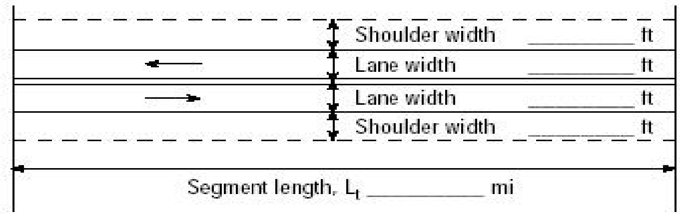
CAPACITY ANALYSIS CALCULATIONS
EXISTING PEAK PERIOD TRAFFIC ANALYSIS

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Puainako St (Route 2000)*
Agency or Company	*Wilson Okamoto*	From/To	*Mamalahoa/Saddle*
Date Performed	*8/31/2017*	Jurisdiction	*County*
Analysis Time Period	*AM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*249*veh/h
Opposing direction vol., V_o	*227*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*2.4*
Peak-hour factor, PHF	*0.89*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*24*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF* f_{g,ATS} * f_{HV,ATS})$	*282*	*257*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*39.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.9 mi/h*
		Percent free flow speed, PFFS	*87.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*280*	*256*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*29.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*38.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*50.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.16*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*279.8*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.92*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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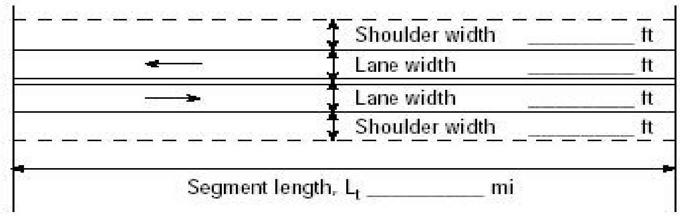
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Puainako (Route 2000)*
Agency or Company	*Wilson Okamoto*	From/To	*Mamalahoa/Ext*
Date Performed	*8/31/2017*	Jurisdiction	*County*
Analysis Time Period	*PM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*251*veh/h
Opposing direction vol., V_o	*302*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*2.4*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.85*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*24*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.992*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*298*	*357*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*6.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.0 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*33.0 mi/h*
		Percent free flow speed, PFFS	*84.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*296*	*356*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*33.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.9*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*49.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.17*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*295.3*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.95*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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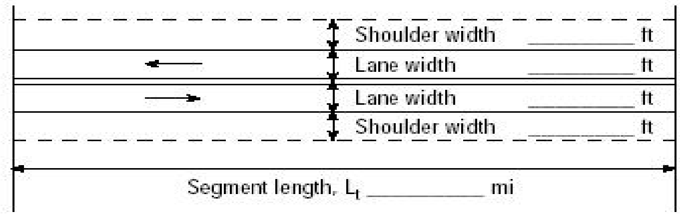
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Saddle Rd*
Agency or Company	*Wilson Okamoto*	From/To	*Ua Nahele St*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Analysis direction vol., V_d	*98*veh/h
Opposing direction vol., V_o	*59*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.92*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.7*	*2.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.967*	*0.967*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.68*	*0.67*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*162*	*99*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.1* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.8* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*42.6* mi/h
		Percent free flow speed, PFFS	*95.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.8*	*1.9*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.984*	*0.982*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.73*	*0.73*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*148*	*89*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*16.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.9*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*35.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.06*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*95.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*106.5*
Effective width, Wv (Eq. 15-29) ft	*33.18*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-0.19*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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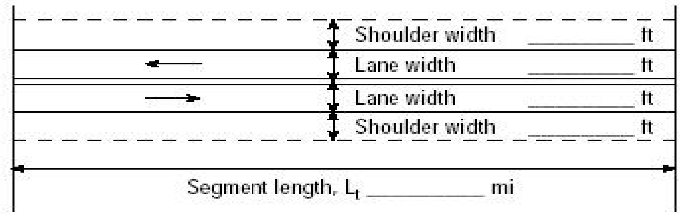
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Saddle Rd*
Agency or Company	*Wilson Okamoto*	From/To	*Ua Nahele St*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*156*veh/h
Opposing direction vol., V_o	*245*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Peak-hour factor, PHF	*0.92*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.4*	*2.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.973*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.73*	*0.80*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*239*	*341*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*39.3 mi/h*
		Percent free flow speed, PFFS	*87.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.8*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.78*	*0.83*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	*221*	*325*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*26.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*41.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.10*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*169.6*
Effective width, Wv (Eq. 15-29) ft	*27.96*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.64*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	

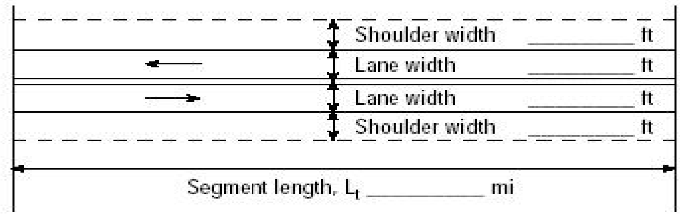
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*JT*	Highway / Direction of Travel	*Mamalahoa Hwy (Rt 190)*
Agency or Company	*Wilson Okamoto*	From/To	*Saddle Rd/Waikoloa*
Date Performed	*9/1/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Analysis direction vol., V_d	*161*veh/h
Opposing direction vol., V_o	*169*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.83*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.3*	*2.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.975*	*0.975*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.75*	*0.75*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*265*	*278*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* *mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8* *mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*53.8* *mi/h*
		Percent free flow speed, PFFS	*90.1* *%*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.8*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.984*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.80*	*0.80*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*246*	*258*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*26.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*39.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*45.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.11*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*90.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*194.0*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.73*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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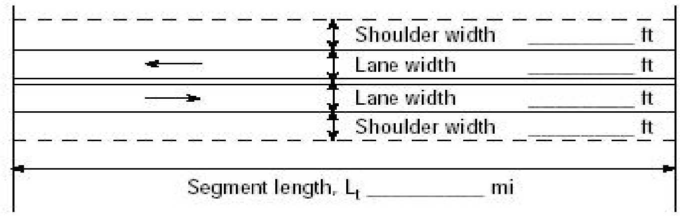
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Mamalahoa Hwy (Rt 190)*
Agency or Company	*Wilson Okamoto*	From/To	*Saddle Rd/Waikoloa*
Date Performed	*9/1/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Sanitary Landfill*

Input Data



Analysis direction vol., V_d	*262*veh/h
Opposing direction vol., V_o	*221*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*

☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain	☐ Level ☑ Rolling
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.91*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.1*	*2.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.978*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.82*	*0.78*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*359*	*319*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.6* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*52.9* mi/h
		Percent free flow speed, PFFS	*88.5* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.7*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.986*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.84*	*0.82*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*348*	*300*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*37.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*56.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.17*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*88.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*287.9*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.93*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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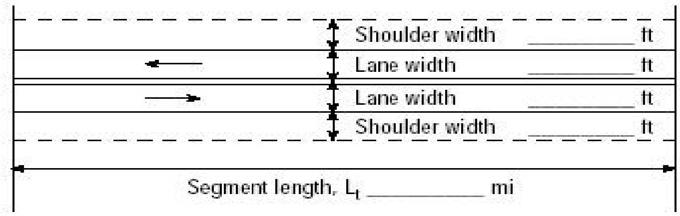
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Waikoloa Rd*
Agency or Company	*Wilson Okamoto*	From/To	*Quarry Road/Queen Kaahumanu*
Date Performed	*9/1/2017*	Jurisdiction	*County*
Analysis Time Period	*AM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*100*veh/h
Opposing direction vol., V_o	*549*veh/h
Shoulder width ft	*12.0*
Lane Width ft	*12.0*
Segment Length mi	*0.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.86*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*2*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.8*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.984*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*118*	*640*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*47.8 mi/h*
		Percent free flow speed, PFFS	*87.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*117*	*638*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*19.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*16.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*21.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.07*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*116.3*
Effective width, Wv (Eq. 15-29) ft	*48.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-6.17*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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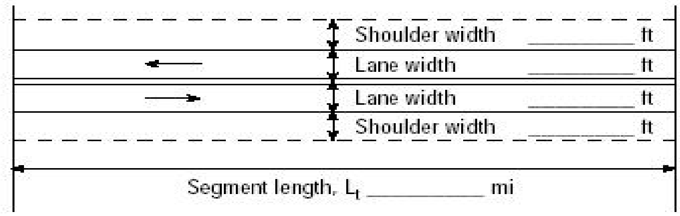
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Waikoloa Rd.*
Agency or Company	*Wilson Okamoto*	From/To	*Quarry Road/Queen Kaahumanu*
Date Performed	*9/1/2017*	Jurisdiction	*County*
Analysis Time Period	*PM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.95*

No-passing zone *20%*

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0%*

Access points *mi* *2*/mi

Analysis direction vol., V_d *477*veh/h

Opposing direction vol., V_o *229*veh/h

Shoulder width ft *12.0*

Lane Width ft *12.0*

Segment Length mi *0.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*504*	*243*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.4 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*47.3 mi/h*
		Percent free flow speed, PFFS	*86.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*502*	*242*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*47.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*26.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*65.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.30*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*502.1*
Effective width, Wv (Eq. 15-29) ft	*36.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-0.39*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

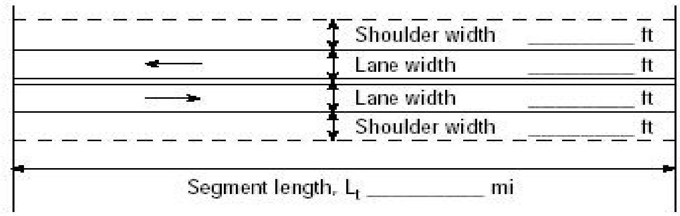
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*JT*	Highway / Direction of Travel	*Queen Kaahumanu Hwy*
Agency or Company	*Wilson Okamoto*	From/To	*Waikoloa Rd/Waikoloa Beach Dr*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1/mi*

Analysis direction vol., V_d	*258*veh/h
Opposing direction vol., V_o	*732*veh/h
Shoulder width ft	*10.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.992*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*289*	*815*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*50.6 mi/h*
		Percent free flow speed, PFFS	*84.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*287*	*813*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*39.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*17.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*44.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.17*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*286.7*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.69*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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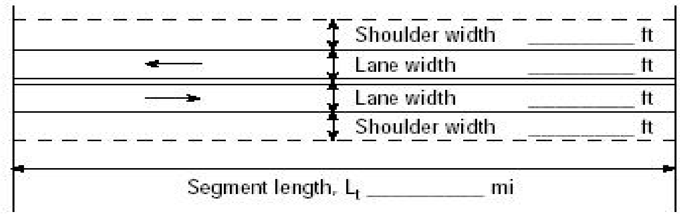
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Queen Kaahumanu Hwy*
Agency or Company	*Wilson Okamoto*	From/To	*Waikoloa Rd/Waikoloa Beach Dr*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*Existing*

Project Description: *South Hilo Sanitary Landfill*

Input Data



Analysis direction vol., V_d	*751*veh/h	☑ Class I highway ☐ Class II highway ☐ Class III highway	
Opposing direction vol., V_o	*399*veh/h	Terrain ☑ Level ☐ Rolling	
Shoulder width ft	*10.0*	Grade Length mi	Up/down
Lane Width ft	*12.0*	Peak-hour factor, PHF	*0.91*
Segment Length mi	*3.0*	No-passing zone	*20%*
		% Trucks and Buses , P_T	*2* %
		% Recreational vehicles, P_R	*0%*
		Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.998*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*827*	*441*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*48.6 mi/h*
		Percent free flow speed, PFFS	*81.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*825*	*438*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*66.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*18.7*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*79.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.49*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*825.3*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.23*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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APPENDIX D

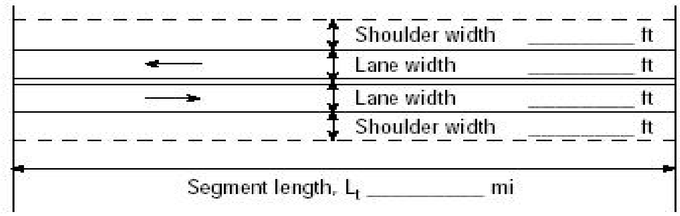
CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2019 PEAK PERIOD TRAFFIC
ANALYSIS WITHOUT PROJECT

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*JT*	Highway / Direction of Travel	*Puainako St (Route 2000)*
Agency or Company	*Wilson Okamoto*	From/To	*Mamalahoa/Saddle*
Date Performed	*8/31/2017*	Jurisdiction	*County*
Analysis Time Period	*AM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.89*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*24*/mi

Analysis direction vol., V_d	*251*veh/h
Opposing direction vol., V_o	*229*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*2.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.992*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*284*	*259*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*6.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.0 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*33.9 mi/h*
		Percent free flow speed, PFFS	*86.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*283*	*258*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*30.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*38.5*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*50.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.17*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*282.0*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.92*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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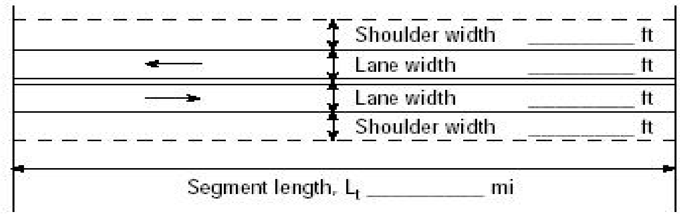
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Puainako (Route 2000)*
Agency or Company	*Wilson Okamoto*	From/To	*Mamalahoa/Ext*
Date Performed	*8/31/2017*	Jurisdiction	*County*
Analysis Time Period	*PM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.85*

No-passing zone *20%*

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *4%*

Access points *mi* *24*/mi

Analysis direction vol., V_d *254*veh/h

Opposing direction vol., V_o *305*veh/h

Shoulder width ft *6.0*

Lane Width ft *12.0*

Segment Length mi *2.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*301*	*361*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*6.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.0 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*33.0 mi/h*
		Percent free flow speed, PFFS	*84.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*299*	*360*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*33.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF} / v_{d,PTSF} + v_{o,PTSF})$	*49.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*298.8*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.95*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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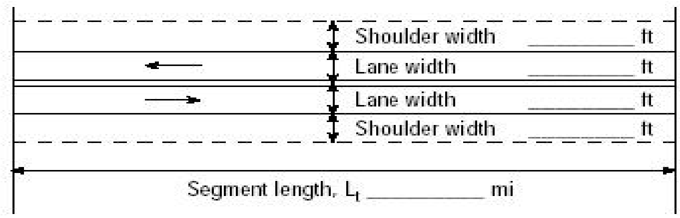
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*JT*	Highway / Direction of Travel	*Saddle Rd*
Agency or Company	*Wilson Okamoto*	From/To	*Ua Nahele St*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Analysis direction vol., V_d	*102*veh/h
Opposing direction vol., V_o	*61*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.92*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2 %*
% Recreational vehicles, P_R	*2%*
Access points *mi*	*1/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.7*	*2.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.965*	*0.965*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.68*	*0.67*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*169*	*103*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*42.5 mi/h*
		Percent free flow speed, PFFS	*95.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.8*	*1.9*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.982*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.74*	*0.73*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}*f_{g,PTSF})$	*152*	*92*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*17.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*36.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.07*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*95.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*110.9*
Effective width, Wv (Eq. 15-29) ft	*32.82*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-0.06*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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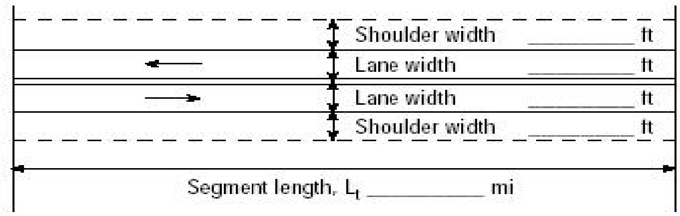
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Saddle Rd*
Agency or Company	*Wilson Okamoto*	From/To	*Ua Nahele St*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



Analysis direction vol., V_d	*162*veh/h	Class I highway ☐ Class II highway ☑ Class III highway ☐	
Opposing direction vol., V_o	*255*veh/h	Terrain	Level ☐ Rolling ☑
Shoulder width ft	*6.0*	Grade Length mi	Up/down
Lane Width ft	*12.0*	Peak-hour factor, PHF	*0.92*
Segment Length mi	*3.0*	No-passing zone	*20%*
		% Trucks and Buses , P_T	*2* %
		% Recreational vehicles, P_R	*0%*
		Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.4*	*2.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/\ (1+P_T(E_T-1)+P_R(E_R-1))$	*0.973*	*0.978*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.73*	*0.81*
Demand flow rate[2], v_i (pc/h) $v_i=V_i\ /\ (PHF^*\ f_{g,ATS}\ ^*\ f_{HV,ATS})$	*248*	*350*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/\ f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*39.2 mi/h*
		Percent free flow speed, PFFS	*87.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.8*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/\ (1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.78*	*0.84*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^*\ f_{g,PTSF})$	*229*	*335*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*26.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}\ /\ v_{d,PTSF}+v_{o,PTSF})$	*41.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.10*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*176.1*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.68*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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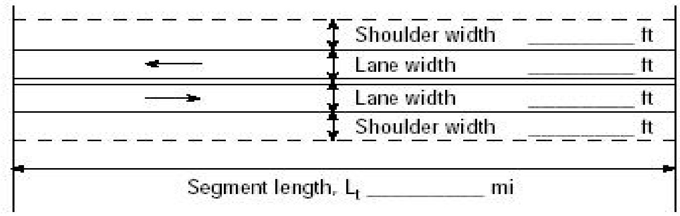
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Mamalahoa Hwy (Rt 190)*
Agency or Company	*Wilson Okamoto*	From/To	*Saddle Rd/Waikoloa*
Date Performed	*9/1/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.83*

No-passing zone *20%*

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0%*

Access points *mi* *1/mi*

Analysis direction vol., V_d *167*veh/h

Opposing direction vol., V_o *176*veh/h

Shoulder width ft *6.0*

Lane Width ft *12.0*

Segment Length mi *3.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.3*	*2.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.975*	*0.975*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.75*	*0.76*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*275*	*286*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*53.7 mi/h*
		Percent free flow speed, PFFS	*89.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.7*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.986*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.80*	*0.81*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*255*	*265*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*28.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*39.0*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*48.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.12*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*89.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*201.2*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.75*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

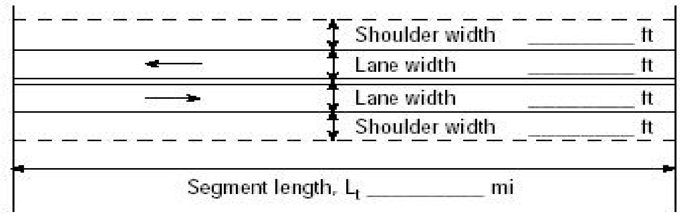
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Mamalahoa Hwy (Rt 190)*
Agency or Company	*Wilson Okamoto*	From/To	*Saddle Rd/Waikoloa*
Date Performed	*9/1/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Analysis direction vol., V_d	*272*veh/h
Opposing direction vol., V_o	*230*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.91*
No-passing zone	*20%*
% Trucks and Buses, P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.1*	*2.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/ (1+ P_T (E_T -1)+P_R (E_R -1))$	*0.978*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.83*	*0.79*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*368*	*327*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*52.8 mi/h*
		Percent free flow speed, PFFS	*88.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.7*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))$	*0.986*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.85*	*0.83*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*357*	*309*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*37.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.6*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*56.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*88.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*298.9*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.95*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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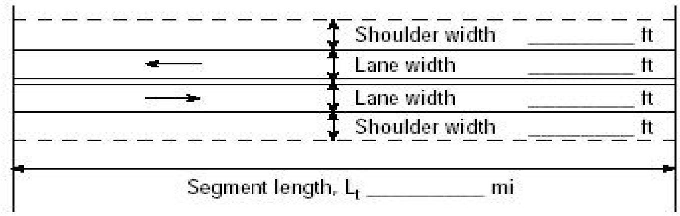
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Waikoloa Rd.*
Agency or Company	*Wilson Okamoto*	From/To	*Quarry Road/Queen Kaahumanu*
Date Performed	*9/1/2017*	Jurisdiction	*County*
Analysis Time Period	*AM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*101*veh/h
Opposing direction vol., V_o	*554*veh/h
Shoulder width ft	*12.0*
Lane Width ft	*12.0*
Segment Length mi	*0.0*
Peak-hour factor, PHF	*0.86*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2 %*
% Recreational vehicles, P_R	*2%*
Access points *mi*	*2/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.8*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*119*	*645*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*47.8 mi/h*
		Percent free flow speed, PFFS	*87.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*118*	*644*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*19.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*16.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*22.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.07*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*117.4*
Effective width, Wv (Eq. 15-29) ft	*47.88*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-6.11*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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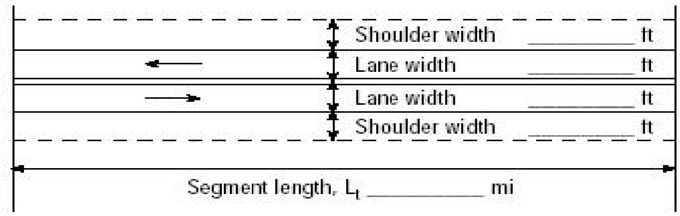
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		**Site Information**	
Analyst	*JT*	Highway / Direction of Travel	*Waikoloa Rd.*
Agency or Company	*Wilson Okamoto*	From/To	*Quarry Road/Queen Kaahumanu*
Date Performed	*9/1/2017*	Jurisdiction	*County*
Analysis Time Period	*PM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF	*0.95*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*2*/mi
Analysis direction vol., V_d	*482*veh/h
Opposing direction vol., V_o	*231*veh/h
Shoulder width ft	*12.0*
Lane Width ft	*12.0*
Segment Length mi	*0.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*509*	*246*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.5* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.4* mi/h	Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*54.5* mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*47.2* mi/h
		Percent free flow speed, PFFS	*86.6* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	*507*	*244*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*47.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*26.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*65.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.30*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*507.4*
Effective width, Wv (Eq. 15-29) ft	*36.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-0.38*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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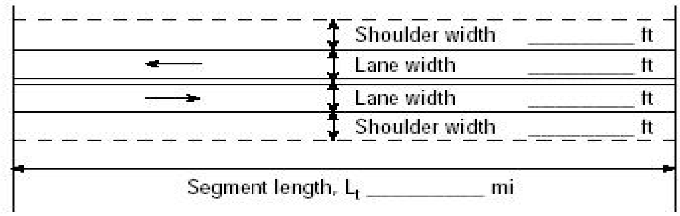
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Queen Kaahumanu Hwy*
Agency or Company	*Wilson Okamoto*	From/To	*Waikoloa Rd/Waikoloa Beach Dr*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi
Analysis direction vol., V_d	*258*veh/h
Opposing direction vol., V_o	*739*veh/h
Shoulder width ft	*10.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.992*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*289*	*823*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*50.5 mi/h*
		Percent free flow speed, PFFS	*84.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*287*	*821*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*39.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*17.0*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*43.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.17*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*286.7*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.69*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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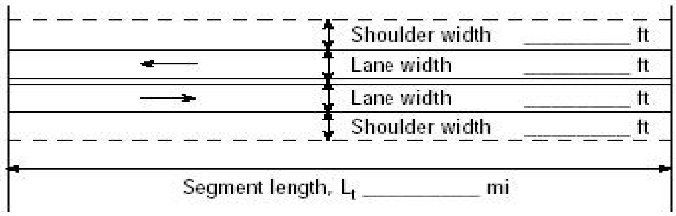
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		**Site Information**	
Analyst	*JT*	Highway / Direction of Travel	*Queen Kaahumanu Hwy*
Agency or Company	*Wilson Okamoto*	From/To	*Waikoloa Rd/Waikoloa Beach Dr*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*Without Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*759*veh/h
Opposing direction vol., V_o	*403*veh/h
Shoulder width ft	*10.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Peak-hour factor, PHF	*0.91*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*836*	*446*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*48.5 mi/h*
		Percent free flow speed, PFFS	*81.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*834*	*443*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*67.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*18.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.49*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*834.1*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.23*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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APPENDIX E

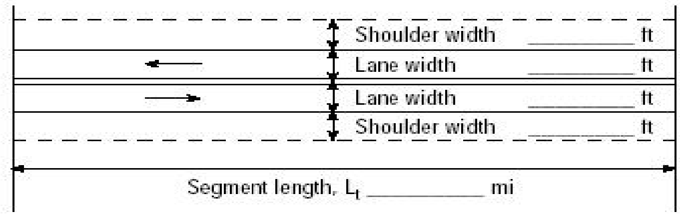
CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2019 PEAK PERIOD TRAFFIC
ANALYSIS WITH PROJECT

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		**Site Information**	
Analyst	*JT*	Highway / Direction of Travel	*Puainako St (Route 2000)*
Agency or Company	*Wilson Okamoto*	From/To	*Mamalahoa/Saddle*
Date Performed	*8/31/2017*	Jurisdiction	*County*
Analysis Time Period	*AM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*271* veh/h
Opposing direction vol., V_o	*229* veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*2.4*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.89*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*24*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.992*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*307*	*259*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*6.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.0 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*33.7 mi/h*
		Percent free flow speed, PFFS	*86.4 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*305*	*258*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*31.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.9*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*52.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*304.5*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.96*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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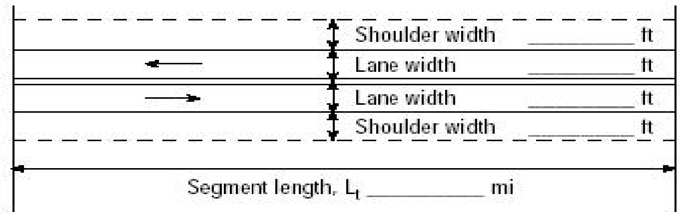
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Puainako (Route 2000)*
Agency or Company	*Wilson Okamoto*	From/To	*Mamalahoa/Ext*
Date Performed	*8/31/2017*	Jurisdiction	*County*
Analysis Time Period	*PM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*266*veh/h
Opposing direction vol., V_o	*305*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*2.4*
Peak-hour factor, PHF	*0.85*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*24*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*315*	*361*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*39.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.9 mi/h*
		Percent free flow speed, PFFS	*84.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*314*	*360*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*34.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*51.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*312.9*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.98*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F. 3. For the analysis direction only and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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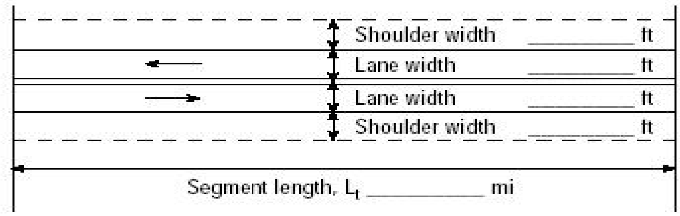
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Saddle Rd*
Agency or Company	*Wilson Okamoto*	From/To	*Ua Nahele St*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



Analysis direction vol., V_d	*122*veh/h
Opposing direction vol., V_o	*61*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*

☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.92*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.6*	*2.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.969*	*0.967*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.70*	*0.67*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*196*	*102*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.1* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.8* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*42.3* mi/h
		Percent free flow speed, PFFS	*94.6* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.8*	*1.9*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.984*	*0.982*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.75*	*0.73*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*180*	*92*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*19.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.1*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*39.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.08*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*94.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*132.6*
Effective width, Wv (Eq. 15-29) ft	*31.02*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.61*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

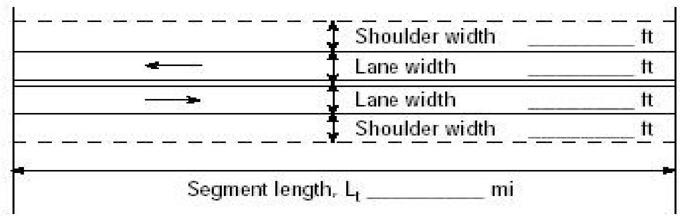
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		**Site Information**	
Analyst	*JT*	Highway / Direction of Travel	*Saddle Rd*
Agency or Company	*Wilson Okamoto*	From/To	*Ua Nahele St*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.92*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Analysis direction vol., V_d	*174*veh/h
Opposing direction vol., V_o	*255*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.3*	*2.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.975*	*0.978*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.74*	*0.81*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*262*	*350*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.8* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*39.1* mi/h
		Percent free flow speed, PFFS	*87.4* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.8*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.984*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.79*	*0.84*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*243*	*335*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*28.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.9*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*43.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.11*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*189.1*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.72*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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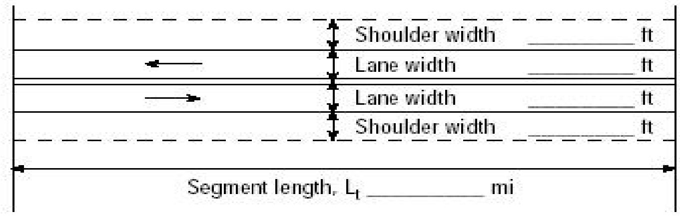
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Mamalahoa Hwy (Rt 190)*
Agency or Company	*Wilson Okamoto*	From/To	*Saddle Rd/Waikoloa*
Date Performed	*9/1/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*187*veh/h
Opposing direction vol., V_o	*176*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Peak-hour factor, PHF	*0.83*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.2*	*2.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.977*	*0.975*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.77*	*0.76*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*299*	*286*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*53.5 mi/h*
		Percent free flow speed, PFFS	*89.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.7*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.986*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.81*	*0.81*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*282*	*265*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*31.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*38.6*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*51.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.13*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*89.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*225.3*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.81*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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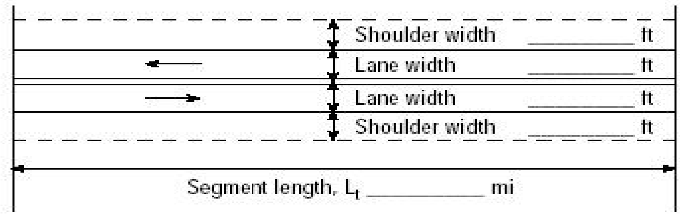
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Mamalahoa Hwy (Rt 190)*
Agency or Company	*Wilson Okamoto*	From/To	*Saddle Rd/Waikoloa*
Date Performed	*9/1/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.91*
No-passing zone	*20%*
% Trucks and Buses, P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi
Analysis direction vol., V_d	*284*veh/h
Opposing direction vol., V_o	*230*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.1*	*2.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.978*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.84*	*0.79*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*380*	*327*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.6 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*59.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*52.7 mi/h*
		Percent free flow speed, PFFS	*88.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.6*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.988*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.86*	*0.83*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*367*	*309*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*38.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*57.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*88.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*312.1*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.97*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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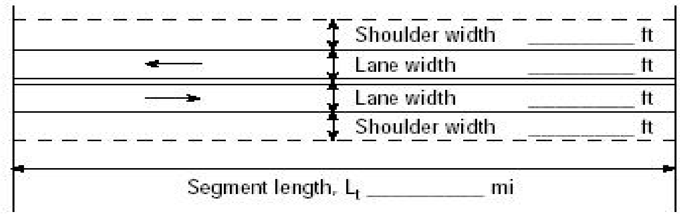
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Waikoloa Rd.*
Agency or Company	*Wilson Okamoto*	From/To	*Quarry Road/Queen Kaahumanu*
Date Performed	*9/1/2017*	Jurisdiction	*County*
Analysis Time Period	*AM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*121*veh/h
Opposing direction vol., V_o	*554*veh/h
Shoulder width ft	*12.0*
Lane Width ft	*12.0*
Segment Length mi	*0.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.86*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*2*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.986*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*143*	*645*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/ f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*0.5* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8* *mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*54.5* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS} + v_{o,ATS}) - f_{np,ATS}$	*47.6* *mi/h*
		Percent free flow speed, PFFS	*87.3* *%*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*141*	*644*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*22.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*17.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF} *(v_{d,PTSF} / v_{d,PTSF} + v_{o,PTSF})$	*25.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.08*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*140.7*
Effective width, Wv (Eq. 15-29) ft	*45.48*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-4.89*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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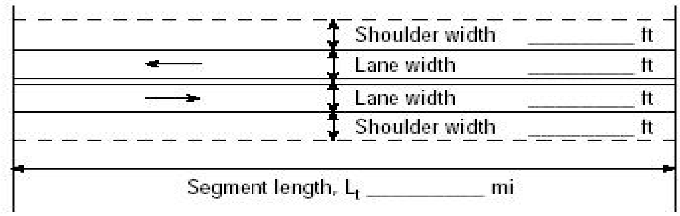
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*JT*	Highway / Direction of Travel	*Waikoloa Rd.*
Agency or Company	*Wilson Okamoto*	From/To	*Quarry Road/Queen Kaahumanu*
Date Performed	*9/1/2017*	Jurisdiction	*County*
Analysis Time Period	*PM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Landfill Facility*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*494*veh/h
Opposing direction vol., V_o	*231*veh/h
Shoulder width ft	*12.0*
Lane Width ft	*12.0*
Segment Length mi	*0.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.95*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*2%*
Access points *mi*	*2*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.996*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*522*	*246*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*0.5* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.4* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.5* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*47.1* mi/h
		Percent free flow speed, PFFS	*86.4* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*520*	*244*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*48.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*25.8*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*65.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.31*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*520.0*
Effective width, Wv (Eq. 15-29) ft	*36.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-0.37*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

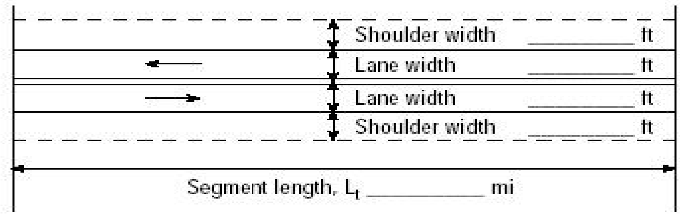
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Queen Kaahumanu Hwy*
Agency or Company	*Wilson Okamoto*	From/To	*Waikoloa Rd/Waikoloa Beach Dr*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*AM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*278*veh/h
Opposing direction vol., V_o	*739*veh/h
Shoulder width ft	*10.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.992*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*311*	*823*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*60.0 mi/h*
		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Total demand flow rate, both directions, *v*		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*59.8 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*50.4 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.6 mi/h*	Percent free flow speed, PFFS	*84.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*310*	*821*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*41.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*17.4*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*46.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*308.9*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.73*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If $v_i(v_d$ or $v_o)$ >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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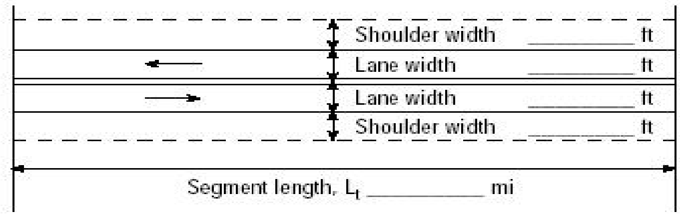
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*JT*	Highway / Direction of Travel	*Queen Kaahumanu Hwy*
Agency or Company	*Wilson Okamoto*	From/To	*Waikoloa Rd/Waikoloa Beach Dr*
Date Performed	*9/5/2017*	Jurisdiction	*State*
Analysis Time Period	*PM Peak*	Analysis Year	*With Project (2019)*

Project Description: *South Hilo Sanitary Landfill*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*771*veh/h
Opposing direction vol., V_o	*403*veh/h
Shoulder width ft	*10.0*
Lane Width ft	*12.0*
Segment Length mi	*3.0*
Peak-hour factor, PHF	*0.91*
No-passing zone	*20%*
% Trucks and Buses, P_T	*2* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*1*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*849*	*446*

Free-Flow Speed from Field Measurement

Mean speed of sample[3], S_{FM}	
Total demand flow rate, both directions, v	
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$	
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3 mi/h*

Estimated Free-Flow Speed

Base free-flow speed[4], BFFS	*60.0 mi/h*
Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Adj. for access points[4], f_A (Exhibit 15-8)	*0.3 mi/h*
Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*59.8 mi/h*
Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*48.4 mi/h*
Percent free flow speed, PFFS	*81.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*847*	*443*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*67.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*18.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.50*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	1700
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	81.0
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	847.3
Effective width, Wv (Eq. 15-29) ft	32.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	1.24
Bicycle level of service (Exhibit 15-4)	A

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Appendix B

Pre-Assessment Consultation Documentation

Harry Kim
Mayor

Wil Okabe
Managing Director

Frank J. De Marco, P.E.
Director

Allan G. Simeon
Deputy Director

County of Hawai'i
DEPARTMENT OF PUBLIC WORKS
Aupuni Center
101 Pauahi Street, Suite 7 · Hilo, Hawai'i 96720-4224
(808) 961-8321 · Fax (808) 961-8630
public_works@hawaiicounty.gov

MA

AUGUST 31, 2017

RECEIVED
SEP 05 2017
WILSON OKAMOTO CORPORATION

ATTN: MILTON ARAKAWA
WILSON OKAMOTO CORPORATION
1907 SOUTH BERETANIA STREET, SUITE 400
HONOLULU, HAWAII 96826

SUBJECT: SOUTH HILO SANITARY LANDFILL FINAL CLOSURE
ENVIRONMENTAL ASSESSMENT PRE-ASSESSMENT CONSULTATION
TMK: 2-1-013:156 and 156 (Proposed Detention Basin at 2-1-013:162)

We received the subject dated August 1, 2017 and have the following comments:

The subject parcel is in an area designated as Zone X on the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA). Zone X is an area determined to be outside the 500-year floodplain.

All development-generated runoff shall be disposed of on site and not directed toward any adjacent properties. A drainage study shall be prepared and the recommended drainage system shall be constructed meeting the approval of the Department of Public Works.

Construction activities shall comply with the requirements of Hawaii County Code, Chapter 10, Erosion and Sedimentary Control.

Should there be any questions concerning this matter, please contact Ms. Robyn Matsumoto in our Engineering Division at (808) 961-8924.

BEN ISHII, Division Chief
Engineering Division

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Ben Ishii
Division Chief
Engineering Division
County of Hawaiʻi
Department of Public Works
101 Pauahi Street, Suite 7
Hilo, Hawaiʻi 96720-4224

Subject: Environmental Assessment Pre-Assessment Consultation for
South Hilo Sanitary Landfill Final Closure
Hilo, Hawaiʻi Island, Hawaiʻi

Dear Mr. Ishii:

Thank you for your letter dated August 31, 2017 regarding the subject pre-assessment consultation. We offer the following in response to your comments:

We acknowledge that the subject parcel is designated as Zone X, an area determined to be outside the 500-year floodplain.

Plans and specifications for the project will require that all development-generated runoff be disposed of on site and not directed toward any adjacent properties. The County of Hawaiʻi Department of Environmental Management Solid Waste Division (County) will prepare a site-specific storm water runoff analysis to confirm the sizing of the existing and proposed detention basins that will manage and infiltrate runoff on site. A final drainage system design that meets the approval of your office will be constructed.

We acknowledge that construction activities will need to comply with the requirements of Hawaiʻi County Code, Chapter 10, Erosion and Sedimentary Control.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

Harry Kim
Mayor

Wil Okabe
Managing Director

Barbara J. Kossow
Deputy Managing Director

MA

County of Hawai'i
Office of the Mayor

25 Aupuni Street, Suite 2603 • Hilo, Hawai'i 96720 • (808) 961-8211 • Fax (808) 961-6553
KONA: 74-5044 Ane Keohokalole Hwy., Bldg. C • Kailua-Kona, Hawai'i 96740
(808) 323-4444 • Fax (808) 323-4440
Email: harry.kim@hawaiicounty.gov

August 28, 2017

Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawai'i 96826

RECEIVED
SEP 01 2017
WILSON OKAMOTO CORPORATION

Attention: Milton Arakawa, AICP

Dear Mr. Arakawa:

I received your letter of August 14, 2017 pertaining to the Environmental Assessment for the South Hilo Sanitary Landfill Closure proposed by the County of Hawai'i Department of Environmental Management. I appreciate the opportunity to provide my comments.

As you may know, this project has a rather long history. There have been a number of previous studies done which concern or relate to the South Hilo Sanitary Landfill. These have included an Environmental Impact Statement for an East Hawai'i Regional Sort Station, Environmental Assessment for the South Hilo Sanitary Landfill Phase I Expansion , Zero Waste Implementation Plan for the County of Hawai'i, Hilo Landfill Feasibility Study, and Pilot Study on Long Hauling to West Hawai'i Sanitary Landfill, to name several studies of note. While concerns and issues raised in these and other studies are being debated and considered, the South Hilo Sanitary Landfill is currently close to reaching its capacity. Therefore, we have no other alternative at the present time but to close the landfill in a timely manner in accordance with applicable Federal and State regulations.

I would like to emphasize that upon closure of the landfill, we plan to continue the County's current diversion program and will continue to explore other options to effectively divert waste from the Big Island waste stream. We also look forward to planning and discussing other project initiatives which can enhance and implement the County of Hawai'i's solid waste management strategies.

At this juncture, there are no other near term options besides closure of the South Hilo Sanitary Landfill. However, we look forward to planning and bringing to fruition other possible solid waste initiatives with the community as well as the expedient implementation of the South Hilo Sanitary Landfill Closure.

Sincerely,

Harry Kim
Mayor

WK:gs

WILSON OKAMOTO CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

The Honorable Harry Kim
Mayor of the County of Hawai'i
Office of the Mayor
25 Aupuni Street, Suite 2603
Hilo, Hawai'i 96720

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure
Hilo, Hawai'i Island, Hawai'i

Dear Mayor Kim:

Thank you for your letter dated August 28, 2017 regarding the subject pre-assessment consultation. We appreciate your comments on the project and understand that there are no other near term options besides closure of the South Hilo Sanitary Landfill. We acknowledge that the County of Hawai'i will continue to plan and bring to fruition other possible solid waste initiatives with the community along with the expedient implementation of the South Hilo Sanitary Landfill Closure.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

1907 S. Beretania Street, Suite 400 • Honolulu, Hawaii • 96826 • (808) 946-2277

Harry Kim
Mayor

Michael Yee
Director

Daryn Arai
Deputy Director

West Hawai'i Office
74-5044 Ane Keohokalole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawaiʻi
PLANNING DEPARTMENT

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

RECEIVED
SEP 05 2017
WILSON OKAMOTO CORPORATION

MA

August 31, 2017

Wilson Okamoto Corporation
Attn: Milton Arakawa, AICP
1907 South Beretania Street, Suite 400
Honolulu, HI 96826

Dear Mr. Arakawa:

SUBJECT: Pre-Assessment Consultation
Project: South Hilo Sanitary Landfill Final Closure Environmental Assessment
TMKs: (3) 2-1-013:152, 156 and 162, South Hilo, Hawaiʻi

Thank you for your letter dated August 1, 2017, requesting comments regarding the pre-assessment consultation on the South Hilo Sanitary Landfill Final Closure Environmental Assessment.

The Planning Department has reviewed the proposed action and proposed alternatives and we have no comment at this time. Please provide us with a copy of the Draft EA for our review.

If you have any questions, or if you need further assistance, please feel free to contact LeAna Gloor of this office at (808) 961-8308.

Sincerely,

for MICHAEL YEE
Planning Director

LBG:ja
P:\\wpwin60\LBG\EA-EIS_REVIEW_COMMENTS\2017-8-31-South-Hilo-Landfill-Final-Closure-EA-PreAssessment-Consultation.doc

WILSON OKAMOTO
CORPORATION
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10289-01
October 23, 2017

Mr. Michael Yee
Planning Director
County of Hawaiʻi
Planning Department
101 Pauahi Street, Suite 3
Hilo, Hawaiʻi 96720

Subject: Environmental Assessment Pre-Assessment Consultation for
South Hilo Sanitary Landfill Final Closure
Hilo, Hawaiʻi Island, Hawaiʻi

Dear Mr. Yee:

Thank you for your letter dated August 31, 2017 regarding the subject pre-assessment consultation. We acknowledge that the Planning Department has no comment at this time.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

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We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawaiʻi, DEM SWD
Aaron Kreitzer, HDR, Inc.

Harry Kim
Mayor

County of Hawai`i

POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawai`i 96720-3998
(808) 935-3311 • Fax (808) 961-8865

Paul K. Ferreira
Police Chief

Kenneth Bugado Jr.
Deputy Police Chief

RECEIVED
AUG 30 2017
WILSON OKAMOTO CORPORATION
MA

August 22, 2017

Mr. Milton Arakawa, AICP
Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, HI 96826

Dear Mr. Arakawa:

SUBJECT: SOUTH HILO SANITARY LANDFILL FINAL CLOSURE
ENVIRONMENTAL ASSESSMENT PRE-ASSEMENT CONSULTATION
HILO, HAWAII ISLAND, HAWAII

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or public safety concerns.

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact Captain Gregory M. Esteban, South Hilo Patrol District Commander, at (808) 961-2214 or via e-mail at gregory.esteban@hawaiicounty.gov.

Sincerely,

HENRY J. TAVARES, JR.
ASSISTANT POLICE CHIEF
AREA I OPERATIONS BUREAU

GE:lli/170734

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Henry J. Tavares, Jr.
Assistant Police Chief
Area I Operations Bureau
County of Hawai'i
Police Department
349 Kapi'olani Street
Hilo, Hawai'i 96720-3998

Subject: Environmental Assessment Pre-Assessment Consultation for
South Hilo Sanitary Landfill Final Closure
Hilo, Hawai'i Island, Hawai'i

Dear Mr. Tavares:

Thank you for your letter dated August 22, 2017 regarding the subject pre-assessment consultation. We appreciate your review of the project and acknowledge that the Police Department does not anticipate any significant impact to traffic and/or public safety.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

Harry Kim
Mayor

Diane L. Ley
Director

Ron Whitmore
Deputy Director

County of Hawai'i

DEPARTMENT OF RESEARCH AND DEVELOPMENT
25 Aupuni Street, Room 1301 • Hilo, Hawai'i 96720-4252
(808) 961-8366 • Fax (808) 935-1205
E-mail: chresdev@hawaiicounty.gov

August 31, 2017

Milton Arakawa, AICP
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, HI 96826

Dear Mr. Arakawa:

We are writing in response to your August 1, 2017 notice of pre-assessment consultation for the South Hilo Sanitary Landfill (SHSL) Final Closure. Thank you for the opportunity to comment.

As you explore alternatives, we encourage you to identify ways to maximize waste diversion that reduces the flow of waste to landfills, thereby reducing the amount of waste that needs to be trucked, as well as the associated impacts and costs.

We also ask that you consider carefully the impacts of the closure of the SHSL on homeowners and businesses that currently utilize the services available at the landfill. Will commercial haulers be required to truck waste to the West Hawaii Sanitary Landfill (WHSL)? Will services like recycling, green waste/compost, and safe disposal of oversized, electronic, and hazardous waste continue to be available?

Please also consider the various impacts of the trucks hauling waste from East Hawaii to the WHSL, including but not limited to traffic congestion, safety, debris, and visitor destinations along the route. Various alternative hauling routes and schedules as well as robust impact mitigation strategies should be considered.

Regarding options for covering the SHSL, please consider whether any preclude future opportunities to harvest valuable resources (e.g., rare metals) and to produce energy from the waste or gas emissions.

When weighing the trade-offs of different cover alternatives, please consider greenhouse gas emissions (GHG) relative to Act 234 of the 2007 State Legislature, which declared a policy to reduce GHG emissions statewide to 1990 levels by 2020.

Again, thank you for the opportunity to comment. Please notify us when the Draft Environmental Assessment is available for review. In the interim, please contact Deputy Director Ron Whitmore if you have any questions.

Sincerely,

Diane L. Ley

Diane L. Ley
Director

RW:nc

WILSON OKAMOTO CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Ms. Diane L. Ley
Director
Department of Research and Development
County of Hawaiʻi
25 Aupuni Street, Room 1301
Hilo, Hawaiʻi 96720-4252

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure Hilo, Hawaiʻi Island, Hawaiʻi

Dear Ms. Ley:

Thank you for your letter dated August 31, 2017 regarding the subject pre-assessment consultation. We offer the following in response to your comments:

Upon final closure of the South Hilo Sanitary Landfill (SHSL), the County of Hawaiʻi Department of Environmental Management Solid Waste Division (County) will continue to implement current waste diversion strategies as well as explore new strategies to reduce the flow of waste to landfills.

We would like to emphasize that the County's eight (8) transfer stations in East Hawaiʻi—Honomū, Pāpaʻikou, Hilo, Keaʻau, Pāhoa, Kalapana, Glenwood, and Volcano—are intended to remain in operation following closure of SHSL. Existing services such as recycling, green waste/compost, and safe disposal of oversized, electronic, and hazardous waste are expected to be unaffected by closure of the landfill, and residents who self-haul waste will be allowed to continue disposing at the existing transfer stations.

The County is still in the process of finalizing its post-closure operational plans; however, the intent is to accept waste at the East Hawaiʻi Regional Sort Station (EHRSS) in Hilo where reusable or recyclable materials will be removed from the waste stream, and the residual waste will be reloaded and hauled to the West Hawaiʻi Sanitary Landfill (WHSL) in Puʻuanahulu for final disposal. Should the mechanisms and logistics to realize this plan not be in place by the time the SHSL accepts its final load, it is possible that, in the interim, the County transfer station trailers, commercial haulers, and other government agencies may be required to haul waste directly to WHSL. In any case, the County will continue to coordinate with potentially affected organizations and individuals during the closure process.

A Traffic Assessment is being prepared to assess the traffic congestion impacts associated with hauling waste from East Hawaiʻi to the WHSL. The findings of the study along with a discussion of other potential secondary impacts resulting from closure will be included in the Draft Environmental Assessment (Draft EA). Additionally, mitigation strategies will be considered and implemented as needed to avoid or minimize any adverse impacts resulting from trucks hauling waste from East Hawaiʻi to the WHSL.

You have noted that various alternative hauling routes and schedules should be considered. We would like to highlight previous studies that have been done which have assessed alternative trucking routes and schedules, including an Environmental Impact Statement for an East Hawaiʻi Regional Sort Station, the Hilo Landfill Feasibility Study, and the Pilot Study on Long Hauling to West Hawaiʻi Sanitary Landfill. These studies, along with the aforementioned Traffic Assessment, will be considered as the County finalizes their post-closure operational plans. With regard to harvesting valuable resources such as rare earth metals, we are unaware of methods to do so economically that would be a consideration in designing the landfill cover. Collecting gas emissions at the closed SHSL for energy production would not be economically feasible due to the relatively small amount that will be produced and the need to refine the gas for use in energy production. A discussion of greenhouse gas emissions (GHG) relative to Act 234 of the 2007 State Legislature will be included in the Draft EA.

Your letter, along with this response, will be included in the Draft EA for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawaiʻi, DEM SWD
Aaron Kreitzer, HDR, Inc.

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

MA

August 22, 2017

SUBJECT: Request for Comments for South Hilo Sanitary Landfill Final Closure, Hilo, Hawaii Island, Hawaii DA File No. POH-2017-00170

Wilson Okamoto Corporation
Attention: Milton Arakawa, AICP
1907 South Beretania, Suite 400
Honolulu, HI 96826

RECEIVED
AUG 25 2017
WILSON OKAMOTO CORPORATION

Dear Mr. Arakawa:

The U.S. Army Corps of Engineers, Honolulu District (Corps), is in receipt of your letter dated August 1, 2017 for the South Hilo Sanitary Landfill Final Closure located in Hilo, Island of Hawaii, Hawaii. Your project has been assigned Department of the Army (DA) file number POH-2017-00170. Please reference this number in all future correspondence.

Please be advised, if the proposed project involves work in waters of the U.S., a DA authorization may be required. Under Section 10 of the Rivers and Harbors Act, structures and/or work in or affecting the course, location, condition, or capacity of navigable waters of the U.S. require DA authorization. Navigable waters of the U.S. are waters subject to the ebb and flow of the tide.

Under Section 404 of the Clean Water Act, DA authorization is required for discharges of dredged or fill material into waters of the U.S., including wetlands. Generally, discharges of fill material include materials that change the bottom elevation of a water of the U.S. and includes rock, sand, soil, debris, overburden, etc. Waters of the U.S. include navigable waters of the U.S. and other waters including wetlands, rivers, streams, lakes, and ponds.

Based on our initial review of the information provided, it appears there may be waters of the U.S. in the project area. A delineation of any potential waters of the U.S. will help us determine permit requirements. Depending on the circumstances of your project, a permit may be required from this office prior to commencing proposed work. Accordingly, we recommend the landowner or the authorized agent continue coordination of the development of this project with our office.

Thank you for your cooperation with the Honolulu District Regulatory Program. Should you have any questions related to this determination, please contact me at 808-835-4056 or via e-mail at brennan.j.dooley@usace.army.mil. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Office by

accessing our web-based customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Sincerely,

DOOLEY.BRENNAN.JOHN.1512992613

Digitally signed by DOOLEY.BRENNAN.JOHN.1512992613
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=DOOLEY.BRENNAN.JOHN.1512992613
Date: 2017.08.22 14:04:45 -10'00'

Brennan Dooley,
Regulatory Specialist, Regulatory Branch

cc:
State of Hawaii DOH-CWB

WILSON OKAMOTO CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Brennan Dooley
Regulatory Specialist
Department of the Army
U.S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawai'i 96858-5440

Subject: Environmental Assessment Pre-Assessment Consultation for
South Hilo Sanitary Landfill Final Closure
Hilo, Hawai'i Island, Hawai'i

Dear Mr. Dooley:

Thank you for your letter dated August 22, 2017 (POH-2017-00170) regarding the subject pre-assessment consultation. We offer the following in response to your comments:

There are no water bodies at the project site that meet the definition of waters of the U.S. under the Clean Water Act (CWA). Nonetheless, we acknowledge that Department of Army (DA) authorization will be required if the project involves work in waters of the U.S., including structures and/or work in or affecting the course, location, condition, or capacity of navigable waters of the U.S. under Section 10 of the Rivers and Harbors Act, and for discharges of dredged or fill material into waters of the U.S. under Section 404 of the CWA. If required, it is understood that the landowner or authorized agent shall continue to coordinate the development of this project with your office.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM Solid Waste Division
Aaron Kreitzer, HDR, Inc.

MA

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
01EPIF00-2017-TA-0385

AUG 22 2017

RECEIVED
AUG 24 2017
WILSON OKAMOTO CORPORATION

Mr. Milton Arakawa, AICP
Wilson Okamoto Corporation
1907 Beretania Street, Suite 400
Honolulu, Hawaii 96826

Subject: Technical Assistance for the Closure of South Hilo Sanitary Landfill, Island and County of Hawaii

Dear Mr. Arakawa:

The U.S. Fish and Wildlife Service (Service) thanks you for your correspondence on August 3, 2017, requesting pre-assessment consultation in preparation for a draft Environmental Assessment (EA) for the closure of the South Hilo Sanitary Landfill located on the Island and County of Hawaii. This response is in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C 1531 *et seq.*).

Project Description

The County of Hawai'i Department of Environmental Management (DEM), Solid Waste Division is proposing to permanently close the 41.3-acre South Hilo Sanitary Landfill (SHSL) located at the eastern edge of Hilo. SHSL is the only municipal solid waste landfill in East Hawaii. Based on the available airspace and current daily loads, DEM expects the landfill will reach its permitted maximum capacity within the next two years.

Final closure involves placement of a final cover system atop the landfill. Prior to installation of the cover, the slopes will be regraded and a maintenance access road will be provided along with a perimeter ditch to direct the flow of stormwater runoff into two or three detention basins. Upon final closure of the landfill, DEM plans to continue its current waste diversion program and proposes to truck residual waste to the West Hawaii Sanitary Landfill (WHSL) in Puuanahulu.

Environmental Effects

Since the landfill is unlined, closure has potential long term pollution consequences. We recommend that each alternative in your EA provide details on how the proposed project will prevent ground water leaching and off site contamination. Please also provide information related to long-term environmental monitoring of the site after it has been closed.

The Service is concerned that the detention basins could attract the following endangered birds which could put them at risk of adverse effects resulting from interaction with contaminants. We recommend you further address these concerns in your EA.

<u>Endangered Nene (Hawaiian goose, *Branta (=Nesochen) sandvicensis*):</u> Nene are found on the islands of Hawaii, Maui, Molokai, and Kauai predominately, with a small population on Oahu. They are observed in a variety of habitats, but prefer open areas, such as pastures, golf courses, wetlands, natural grasslands and shrublands, and lava flows. Threats to the species include introduced mammalian and avian predators, wind facilities, and vehicle strikes.

We recommend you incorporate the following measures into your project description to avoid and minimize impacts to Nene:

- Nene should not be approached, fed, or otherwise disturbed.
- If Nene are observed loafing or foraging within the project area during the Nene breeding season (September through April), a biologist familiar with their nesting behavior should survey for nests in and around the project area prior to the resumption of any work. Surveys should be repeated after any subsequent delay of work of three or more days (during which the birds may attempt to nest).
    - If a nest is discovered within a radius of 150 feet of proposed work, or a previously undiscovered nest is found within said radius after work begins, all work should cease immediately and the Service should be contacted for further guidance.
- In areas where Nene are known to be present, reduced speed limits should be posted and implemented, and project personnel and contractors informed about the presence of endangered species on-site.

<u>Endangered Hawaiian waterbirds (Hawaiian stilt, *Himantopus mexicanus knudseni*; Hawaiian coot, *Fulica alai*; Hawaiian duck, *Anas wyvilliana*):</u> Listed Hawaiian waterbirds are found in fresh and brackish-water marshes and natural or man-made ponds. Hawaiian stilts may also be found wherever ephemeral or persistent standing water may occur. Threats to these species include non-native predators, habitat loss, and habitat degradation. Hawaiian ducks are also subject to threats from hybridization with introduced mallards.

We recommend you incorporate the following measures into your project description to avoid and minimize impacts to listed Hawaiian waterbirds:

- In areas where waterbirds are known to be present, reduced speed limits should be posted and implemented, and project personnel and contractors informed about the presence of endangered species on-site.
- If water resources are located within or adjacent to the project site, water quality best management practices (see attached) regarding sedimentation and erosion in aquatic environments should be incorporated into the project design.
- A biological monitor that is familiar with the species' biology should conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Surveys should be repeated again within three days of project initiation and after any subsequent delay of work of three or more days (during which the birds may attempt to nest). If a nest or active brood is found:
    - Pacific Islands Fish and Wildlife Office should be contacted within 48 hours for further guidance.

- A 100-foot buffer should be established and maintained around all active nests and/or broods until the chicks/ducklings have fledged. No potentially disruptive activities or habitat alteration should occur within this buffer.
- A biological monitor that is familiar with the species' biology should be present on the project site during all construction or earth moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

Invasive Species Prevention

The following biosecurity protocols are for preventing the movement or introduction of harmful invasive pests including coqui frog, little fire ant, noxious weeds, and other high-risk invasive species into project sites. It is the project leader's and contractor's responsibility to ensure compliance with these protocols:

- Vehicles, machinery, and equipment must be thoroughly pressure washed and visibly free of mud, dirt, plant debris, frogs and frog eggs, insects and other debris. A hot water wash is preferred. Areas of particular concern include bumpers, grills, hood compartments, areas under the battery, wheel wells, undercarriage, cabs, and truck beds.
- All work vehicles, machinery, and equipment may be subject to inspection.
- Any vehicles, machinery, and equipment that do not pass inspection will be turned away.
- All work vehicles, machinery, and equipment should be visually inspected for plant debris, insects, soil, frog (coqui) and frog eggs. Particularly vehicles that are transporting residual waste to WHSL.
- Monitoring for invasive ants should be conducted throughout the project duration and continue upon its completion.
  - Invasive ants, such as little fire ant, can be monitored for by placing chopsticks baited with a dab of peanut butter and jelly throughout the site. These baits should be placed every 10-20 feet around the area, in the shade, and must be left out for 1 hour. The immediate surrounding areas should also be searched for ants. If the site area is extremely large, monitoring should occur in areas of higher concern for ant infestations.
  - Any ants found should be collected, bagged and labelled for identification. Infested areas will be sanitized following recommendations by the Hawaii Ant Lab (http://www.littlefireants.com/) or other ant control expert and in accordance with all State and Federal laws. Control records will be required to confirm treatment. Treatment is the responsibility of the site owner.
- Base yards and staging areas inside and outside of the site must be kept free of invasive pests.
- Base yards and staging areas may be inspected for invasive pests at the beginning of the project.
- Pest control records may be requested anytime.
- Project vehicles or equipment stored outside of a base yard or staging area, such as a private residence, should be kept in a pest free area. Such vehicles or equipment may be subject to additional inspection as described in above and will be turned away if infested.

In addition to the previous protocols, the following protocols should also be implemented to the operation of trucking residual waste to the WHSL in Puuanahulu:

- All waste being carried by vehicles should be properly contained to prevent waste loss during transportation.
- Vehicles transporting waste should route directly to WHSL and avoid any unnecessary stops or detours.
- WHSL should continually monitor for invasive ants using the protocols described above.

Minimize Spread of Rapid Ohia Death

Rapid Ohia Death (ROD), a newly identified disease, has killed large numbers of mature ohia trees (*Metrosideros polymorpha*) in forests and residential areas of Hawaii Island. The disease is caused by a vascular wilt fungus (*Ceratocystis fimbriata*). Crowns of an affected tree turn yellowish or brown within days to weeks and dead leaves typically remain on branches for some time. All ages of ohia trees can be affected and can have symptoms of browning of branches or leaves. As of early 2017 the disease has been confirmed in all districts except North and South Kohala. Additional information on ROD can be found at:

http://www2.ctahr.hawaii.edu/forestry/downloads/ROD-trifold-03.2016.pdf and
http://www2.ctahr.hawaii.edu/forestry/disease/ohia_wilt.html.

The following avoidance and minimization measures should be followed for projects working in ohia forests or at sites with ohia trees on Hawaii Island:

1) A survey of the proposed project site should be conducted within two weeks prior to any tree cutting to determine if there are any infected ohia trees. If infected ohia are suspected at the site, the following agencies should be contacted for further guidance.
   a. Service – please contact the name at the bottom of this letter.
   b. Dr. J.B. Friday, University of Hawaii Cooperative Extension Service, 808-969-8254 or jbfriday@hawaii.edu
   c. Dr. Flint Hughes, USDA Forest Service, 808-854-2617, fhughes@fs.fed.us
   d. Dr. Lisa Keith, USDA Agriculture Research Service, 808-959-4357, Lisa.Keith@ars.usda.gov

2) Both prior to cutting ohia and after the project is complete:
   a. Tools used for cutting infected ohia trees should be cleaned with a 70 percent rubbing alcohol solution. A freshly prepared 10 percent solution of chlorine bleach and water can be used as long as tools are oiled afterwards, as chlorine bleach will corrode metal tools. Chainsaw blades should be brushed clean, sprayed with cleaning solution, and run briefly to lubricate the chain.
   b. Vehicles used off-road in infected forest areas should be thoroughly cleaned. The tires and undercarriage of the vehicle should be cleaned with detergent if they have travelled from an area with ROD or travelled off-road. Use a pressure washer with soap to clean all soil off of the tires and vehicle undercarriage.
   c. Shoes and clothing used in infected forests should also be cleaned. Shoes should be decontaminated by dipping the soles in 70 percent rubbing alcohol to kill the ROD fungus. Other gear can be sprayed with the same cleaning solutions. Clothing can be washed in hot water and detergent.
   d. Wood of affected ohia trees should not be transported to other areas of Hawaii Island or interisland. All cut wood should be left on-site to avoid spreading the disease. The pathogen may remain viable for over a year in dead wood. The

Hawaii Department of Agriculture has passed a quarantine rule that prohibits interisland movement, except by permit, of all ohia plant or plant parts.

Thank you for participating with us in the protection of our natural resources. We look forward to reviewing the draft EA. If you have any further questions or concerns regarding this consultation, please contact Eldridge Naboa, Fish and Wildlife Biologist, 808-792-9451, e-mail: Eldridge_Naboa@fws.gov. When referring to this project, please include this reference number: ***01EPIF00-2017-TA-0385***.

Sincerely,

Michelle Bogardus
Island Team Manager
Maui Nui and Hawaii Islands

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

The U.S. Fish and Wildlife Service recommends that the measures below be incorporated into projects to minimize the degradation of water quality and minimize the impacts to fish and wildlife resources.

1. Turbidity and siltation from project-related work shall be minimized and contained within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.

2. Dredging/filling in the marine environment shall be scheduled to avoid coral spawning and recruitment periods and sea turtle nesting and hatching periods.

3. Dredging and filling in the marine/aquatic environment shall be designed to avoid or minimize the loss special aquatic site habitat (beaches, coral reefs, wetlands, etc.) and the function of such habitat shall be replaced.

4. All project-related materials and equipment (dredges, barges, backhoes, etc.) to be placed in the water shall be cleaned of pollutants prior to use.

5. No project-related materials (fill, revetment rock, pipe, etc.) should be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands, etc.) or on beach habitats.

6. All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.

7. No contamination (trash or debris disposal, non-native species introductions, attraction of non-native pests, etc.) of adjacent habitats (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests, etc.) shall result from project-related activities. This shall be accomplished by implementing a litter-control plan and developing a Hazard Analysis and Critical Control Point Plan (HACCP – see http://www.haccp-nrm.org/Wizard/default.asp) to prevent attraction and introduction of non-native species.

8. Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate the clean-up of accidental petroleum releases.

9. Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.

10. Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric etc.) after exposure and stabilized as soon as practicable (with native or non-invasive vegetation matting, hydroseeding, etc.).

WILSON OKAMOTO CORPORATION

INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Ms. Michelle Bogardus
Island Team Manager, Maui Nui and Hawai‘i Islands
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawai‘i 96850

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure Hilo, Hawai‘i Island, Hawai‘i

Dear Ms. Bogardus:

Thank you for your letter dated August 22, 2017 (01EPIF00-2017-TA-0385) regarding the subject pre-assessment consultation. We acknowledge that the response provided is in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). We offer the following in response to your comments:

The Draft EA will provide a discussion on how the project will prevent ground water leaching and off site contamination and plans related to long-term environmental monitoring of the site once it has been closed.

We acknowledge that the Fish and Wildlife Service (Service) is concerned that the detention basins could attract endangered birds such as the Hawaiian goose (*Branta sandvicensis*), Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian duck (*Anas wyvilliana*) which could put them at risk of adverse effects resulting from interaction with contaminants. We would like to emphasize that the preferred project alternative involves installation of an impermeable cover on the top and side slopes of the landfill that will prevent storm water intrusion and significantly minimize, if not eliminate, the amount of leachate infiltrating the ground. The County of Hawai‘i Department of Environmental Management Solid Waste Division (County) will continue to work cooperatively with your office to incorporate appropriate mitigation measures into the project design that will avoid or minimize adverse effects on listed species that may occur in the project area.

The contractor will be responsible for ensuring compliance with the plans and specifications for the project which will include biosecurity protocols for preventing the movement or introduction of harmful invasive pests including coqui frog, little fire ant, noxious weeds, and other high-risk invasive species into project sites and for minimizing the spread of Rapid ‘Ōhi‘a Death (ROD).

In addition, stated protocols related to the operation and trucking of residual waste to the West Hawai‘i Sanitary Landfill (WHSL) in Pu‘uanahulu will be implemented.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai‘i, DEM SWD
Aaron Kreitzer, HDR, Inc.

United States Department of the Interior

USGS
science for a changing world

U.S. GEOLOGICAL SURVEY
Hawaiian Volcano Observatory
Post Office Box 51
Hawaii National Park, Hawai'i 96718-0051

IN REPLY REFER TO:

MA

August 8, 2017

Wilson Okamoto Corporation
1907 South Beretania St. Suite 400
Honolulu, HI 96826
Attn.: Milton Arakawa, AICP

RECEIVED
AUG 10 2017
WILSON OKAMOTO CORPORATION

Dear Mr. Arakawa:

I have received your letter of 1 August referring to the South Hilo Sanitary Landfill Final Closure consultation. Thank you for reaching out to HVO for comment.

The area in question is in lava hazard zone 3 which is defined as follows: "areas less hazardous than zone 2 because of greater distance from recently active vents and/or because of topography. One – five percent of zone 3 has been covered since 1800 CE, 15-75 percent has been covered in the last 750 years."

More information about lava flow hazards may be found here: https://pubs.usgs.gov/mf/1992/2193/

South Hilo is in a severe earthquake hazard zone, so any final design should account for potential shaking hazards as they would impact the stabilized feature.

Earthquake hazards are addressed in these USGS ground motion hazard maps:
https://earthquake.usgs.gov/hazards/hazmaps/hi/1998/maps.php

I refer you as well to the State of Hawai'i building codes for information about seismic design appropriate for Hawai'i.

I also encourage you to reach out to Stephen Anthony, Director of the USGS Water Science Center in Honolulu, to discuss groundwater issues that may be pertinent.

Stephen S. Anthony | Director
U.S. Geological Survey | Pacific Islands Water Science Center
Inouye Regional Center | 1845 Wasp Blvd., Bldg. 176 | Honolulu, HI 96818
O: 808.690.9602 | C: 808-285-6448 | F: 808-690-9599
santhony@usgs.gov | http://hi.water.usgs.gov

Best of luck in your planning and decision process.

Christina Neal
Scientist in Charge
USGS Hawaiian Volcano Observatory
808-967-8853

TAKE PRIDE IN AMERICA

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Ms. Christina Neal
Scientist in Charge
U.S. Geological Survey
Hawaiian Volcano Observatory
P.O. Box 51
Hawai'i National Park, Hawai'i 96718-0051

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure
Hilo, Hawai'i Island, Hawai'i

Dear Ms. Neal:

Thank you for your letter dated August 8, 2017 on the subject pre-assessment consultation. We offer the following response to your comments:

We acknowledge that the project area is in lava hazard zone 3 and is in a severe earthquake hazard zone. The information you provided on lava flow hazards as well as earthquake hazards is appreciated and will be accounted for in the final design and implementation of the project.

We will refer to the State of Hawai'i building codes for information relating to seismic design appropriate for Hawai'i.

We appreciate your recommendation and have sent Stephen Anthony, Director of the USGS Water Science Center in Honolulu a pre-assessment consultation letter to which he may comment on pertinent groundwater issues.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

10289-01
Letter to Ms. Neal
Page 2
October 23, 2017

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

From: Motoyama, Karl K CIV (US)
To: Milton Arakawa
Subject: FW: South Hilo Sanitary landfill Final Closure Environmental Assessment Pre-Assessment Consultation
Date: Wednesday, September 06, 2017 4:51:55 PM

Mr. Arakawa:

Pursuant to our telephone discussion today, please find enclosed below the Hawaii Army National Guard (HIARNG) Environmental Office's questions and comments in response to Wilson Okamoto's pre-assessment consultation notification on the preparation of an environmental assessment (EA) of the County of Hawai'i Department of Environmental Management's proposal to permanently close the South Hilo Sanitary Landfill.

Please don't hesitate to contact me if you have any questions. Thank you.

V/R,

Karl K. Motoyama
Hawaii Army National Guard (HIARNG)
Supervisory Environmental Protection Specialist
91-1211 Enterprise Avenue, Bldg. 1903
Kapolei, Hawaii 96707
Phone: 808-672-1266
Cell: 808-206-2045

HIARNG Environmental Office Questions and Comments:

1) Please explain/describe Alternative 1.

2) Alternative 2:
   a. Since using the ET cover system will facilitate stormwater surface runoff, will the adjacent Hawaii Army National Guard (HIARNG) Keaukaha Military Reservation (KMR) property experience additional/increased stormwater runoff?
   b. With the increased probability of soil erosion, resulting from the additional stormwater runoff generated at the landfill, would the runoff negatively affect, e.g., increased sediment from the runoff, the KMR access road near the landfill?
   c. If utilizing a geosynthetic/soil composite cover that requires landfill gas venting, will air monitoring be conducted to assess local air quality impacts? Who will be responsible for conducting such monitoring? What is the estimated duration of the air qualitymonitoring?
   d. As stated, using a combination of ET cover and geosynthetic/soil composite cover system would reduce stormwater runoff but increases vegetation and, therefore, requires additional maintenance. Will a prescribed maintenance program, which mitigates the potential 1) increase in invasive plant species, 2) presence of burrowing animals, and 3) increased presence of birds (that pose a hazard to aircraft) be implemented? Who will be responsible to conduct the maintenance program and and what will be the planned maintenance schedule?
   e. The potential increase in invasive plant and animal species could possibly impact and incur more costs for the HIARNG to maintain its current invasive species control projects. Further, the potential increase in bird presence could impact training (aviation) missions conducted at KMR.

3) Alternative 3:
   a. Alternative 3 appears to be less conducive for the increase in invasive plants and animals to the area. Alternative 3 also appears to provide reduced potential for increases stormwater runoff and erosion into the adjacent KMR property. Further, this alternative also appears to minimize the impacts of increased bird populations, which could potentially impact the training missions at KMR.

WILSON OKAMOTO
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10289-01
October 23, 2017

Mr. Karl K. Motoyama
Supervisory Environmental Protection Specialist
Hawai‘i Army National Guard (HIARNG)
91-1211 Enterprise Avenue, Building 1903
Kapolei, Hawai‘i 96707

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure
Hilo, Hawai‘i Island, Hawai‘i

Dear Mr. Motoyama:

Thank you for your email dated September 6, 2017 regarding the subject pre-assessment consultation. We offer the following in response to your comments:

Alternative 1 calls for the installation of an impermeable geomembrane layer (synthetic lining) overlain by a synthetic grass layer that is ballasted with 0.5 to 1 inch thick layer of sand. The sand ballast and synthetic grass work to protect the geomembrane from long-term degradation from ultraviolet (UV) exposure, hail damage, shear stress from light equipment, and wind uplift. This cover system will be deployed on both the SHSL top deck and side slopes. The sand on the side slope areas would also need to be amended with a polymer bonding agent so it adheres to the synthetic grass and will not easily erode from heavy rainfall and wind events. The sand-binder mixture must be reapplied periodically.

The synthetic grass protection layer replaces the grass and soil of the erosion layer in traditional composite landfill final cover systems for easier surface water management and better erosion control with no significant turbidity. It meets the minimum required factor of safety for stability under static and seismic conditions for Hawai‘i County, can be deployed relatively quickly, and has prior regulatory approval in U.S. Environmental Protection Agency (EPA) Region 9 for final closure at MSW landfills. Synthetic grass also provides a high aesthetic value with the green turf surface and requires less overall maintenance than soil/vegetative covers, which is of particular importance on the 2:1 side slopes of the landfill. Over time it is expected that some repair and replacement of this layer is eventually required to maintain system design and operation parameters.

In addition to the final cover system, a passive landfill gas venting system will be installed to prevent landfill gas— a natural byproduct of the decomposition of organic material in anaerobic conditions—from building up in the landfill. It is anticipated that landfill gas levels will reduce and approach zero over time.

Monitoring of landfill gas after the landfill closes is required in accordance with Resource Conservation and Recovery Act (RCRA) Subtitle D regulations (40 CFR 258 to 259) for a minimum of 30 years. Presently, there are six (6) gas monitoring probes sited adjacent to the landfill footprint. These gas probes will continue to be maintained and monitored by the County after closure of the landfill for exceedance of permitted levels. To date, no environmental releases in exceedance of State and federal regulations associated with solid waste management have been detected at the SHSL. If there is any exceedance of permitted levels during the post-closure maintenance period, appropriate mitigation measures will be implemented in compliance with HAR 11-58.1-15(d). To date, measurable concentrations of methane have not been identified in the gas monitoring probes and existing landfill gas levels are anticipated to reduce over time.

As required by the County of Hawai‘i Department of Public Works, all additional storm water runoff generated by the final landfill cover system will be contained on site and is not expected to adversely affect the KMR access road near the landfill.

Should Alternative 2 be implemented, it is likely that a maintenance program will be required to mitigate the potential for invasive plant species, burrowing animals, and increased presence of birds to occur. We acknowledge that presence of invasive plants and animal species could possibly impact and incur more costs for HIARNG to maintain its current invasive species control projects and the presence of birds could impact training (aviation) missions conducted at KMR. The County of Hawai‘i Department of Environmental Management Solid Waste Division (County) would be responsible for conducting the post-closure maintenance program which would be required for a minimum of 30 years after closure in compliance with RCRA Subtitle D regulations.

Your letter notes that Alternative 3 would reduce the potential for increases to storm water runoff and erosion to the adjacent KMR property. We would like to clarify that while Alternative 3 would minimize the potential for increases in storm water runoff, it actually has a greater potential than Alternative 1 (the preferred alternative) to attract bird populations that could potentially impact the training missions at KMR.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control’s (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

10289-01
Letter to Mr. Motoyama
Page 3
October 23, 2017

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

MA

DAVID Y. IGE
GOVERNOR

RODERICK K. BECKER
Comptroller

AUDREY HIDANO
Deputy Comptroller

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)1284.7

AUG 14 2017

RECEIVED
AUG 16 2017
WILSON OKAMOTO CORPORATION

Mr. Milton Arakawa, AICP
Wilson Okamoto Corporation
1907 So. Beretania Street, Suite 400
Honolulu, Hawaii 96732

Dear Mr. Arakawa:

Subject: South Hilo Sanitary Landfill Final Closure
Environmental Assessment Pre-Assessment Consultation
Hilo, Hawaii Island, Hawaii
TMK: (3) 2-1-013:152, (3) 2-1-013:156, and (3) 2-1-013:162

Thank you for the opportunity to provide comments for the subject project. This project does not impact any of the Department of Accounting and General Services' projects or existing facilities in this area, and we have no comments to offer at this time.

If you have any questions, your staff may call Mr. Kimo Marion of the Public Works Division at (808) 586-0491.

Sincerely,

RODERICK K. BECKER
Comptroller

c: Mr. Cory Kaizuka, DAGS HDO

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Roderick K. Becker
Comptroller
State of Hawaiʻi
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaiʻi 96810-0119

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure
Hilo, Hawaiʻi Island, Hawaiʻi

Dear Mr. Becker:

Thank you for your letter dated August 14, 2017 regarding the subject pre-assessment consultation. We acknowledge that the project does not impact any of the Department of Accounting and General Services' (DAGS) projects or existing facilities in this area, and that the DAGS has no comments to offer at this time.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawaiʻi, DEM SWD
Aaron Kreitzer, HDR, Inc.

MA

DAVID Y. IGE

SUZANNE D. CASE

ROBERT K. MASUDA

JEFFREY T. PEARSON, P.E.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: 08/28/17
DAR # 5585

RECEIVED
SEP 01 2017
WILSON OKAMOTO CORPORATION

MEMORANDUM

TO: Bruce S. Anderson, PhD
DAR Administrator

FROM: Troy Sakihara , Aquatic Biologist

SUBJECT: South Hilo Sanitary Landfill Closure, Pre-Assessment Consultation

Request Submitted by: Milton Arakawa, Project Manager, Wilson Okamoto Corporation

Location of Project: South Hilo, County of Hawaii

Brief Description of Project:

This is a pre-assessment of the proposed closure of the South Hilo Sanitary Landfill (SHSL). The SHSL is expected to reach maximum capacity within two years. Three alternatives are being considered to cover the SHSL after its closure to control effects from erosion, infiltration and storm water run-off.

Comments:
☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: Date: 8/29/17
Bruce S. Anderson, PhD
DAR Administrator

DAR# 5585

Brief Description of Project

This is a pre-assessment of the proposed closure of the 23.2 acre South Hilo Sanitary Landfill (SHSL), which is the only municipal solid waste landfill in East Hawaii. The SHSL is expected to reach maximum capacity within two years. Three alternatives are being considered to cover the SHSL after its closure to control effects from erosion, infiltration and storm water run-off:

Alternative 1 is to use a very low permeability membrane made of woven geotextile material covered by synthetic grass with sand used as ballast. The sand layer on the slopes will be mixed with a bonding agent to minimize effects from erosion and maximize stability. Alternative 2 is to use a combination of an evapotranspiration cover for the slopes, and a geosynthetic/soil composite cover for the leveled top, although this method is more suitable for arid to semi-arid climatic conditions. Alternative 3 is to use the US Environmental Protection Agency Subtitle D prescribed cover system, which is a traditional application consisting of an erosion layer on top of an infiltration layer.

DAR# 5585

Comments

The DAR recommends that phytoremediation methods are considered to mitigate possible effects of degraded water quality, pollutants, and the harboring of aquatic invasive species in the existing and proposed storm water run-off detention basins. In particular, it is recommended that native aquatic and semi-aquatic plants are used for this purpose and constructed as a bioswale, which would provide natural filtration and remediation of contaminants. This is considered to be an ecologically sound and efficient approach to managing storm water run-off.

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Bruce S. Anderson, Ph.D.
Administrator
Division of Aquatic Resources
State of Hawaiʻi
Department of Land and Natural Resources
1151 Punchbowl Street, Room 330
Honolulu, Hawaiʻi 96813

Subject: Environmental Assessment Pre-Assessment Consultation for
South Hilo Sanitary Landfill Final Closure
Hilo, Hawaiʻi Island, Hawaiʻi

Dear Dr. Anderson:

Thank you for your memorandum dated August 28, 2017 regarding the subject pre-assessment consultation. You have recommended the consideration of phytoremediation methods to mitigate possible effects of degraded water quality, pollutants, and the harboring of aquatic invasive species in the existing and proposed storm water run-off detention basins.

While we acknowledge the advantages of phytoremediation, we must also consider concerns that living green plants may attract birds which may be a concern to nearby aviation interests. Moreover, the potential for roots to penetrate and physically damage the cap is of particular concern in ensuring the integrity of the protective containment system. We would like to emphasize that the preferred cover alternative consists of an impermeable layer that will prevent storm water intrusion and the potential for contaminants to be picked up and carried with storm water runoff at the site. The existing detention basins and the proposed new detention basin will then collect the runoff where it will naturally infiltrate into the ground.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawaiʻi, DEM SWD
Aaron Kreitzer, HDR, Inc.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 7, 2017

Wilson Okamoto Corporation
Attention: Mr. Milton Arakawa, AICP
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

via email: marakawa@wilsonokamoto.com

Dear Mr. Arakawa:

SUBJECT: Pre-Assessment Consultation – South Hilo Sanitary Landfill Final Closure located in Waiakea, Island of Hawaii; TMK: (3) 2-1-013:152 and 156 (landfill) and TMK: (3) 2-1-013:162 (proposed detention basin)

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division and (b) Land Division – Hawaii District on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at (808) 587-0417. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

'17 AUG 10 PM 1:48 ENGINEERING

August 9, 2017

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
Fr: X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__ Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

~~FROM:~~ To: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation – South Hilo Sanitary Landfill Final Closure
LOCATION: Waiakea, Island of Hawaii; TMK: (3) 2-1-013:152 and 156 (landfill) and TMK: (3) 2-1-013:162 (proposed detention basin)
APPLICANT: County of Hawaii, Department of Environmental Management, Solid Waste Division

Transmitted for your review and comment is information on the above-referenced matter. We would appreciate your comments by **August 30, 2017.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Print Name: Carty S. Chang, Chief Engineer
Date: 8-11-17

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Pre-Assessment Consultation – South Hilo Sanitary Landfill Final Closure, Waiakea, Island of Hawaii; TMK: (3) 2-1-013:152 and 156 (landfill) and TMK: (3) 2-1-013:162 (proposed detention basin)

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a designated Flood Hazard.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zone designations can be found using the Flood Insurance Rate Map (FIRM), which can be accessed through the Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may take precedence over the NFIP standards as local designations prove to be more restrictive. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: [signature]
CARTY S. CHANG, CHIEF ENGINEER

Date: 8-11-17

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

2017 AUG 11 A 10:04
RECEIVED
LAND DIVISION
HILO, HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 9, 2017

RECEIVED
LAND DIVISION
2017 AUG 21 AM 10:54
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation – South Hilo Sanitary Landfill Final Closure
LOCATION: Waiakea, Island of Hawaii; TMK: (3) 2-1-013:152 and 156 (landfill) and TMK: (3) 2-1-013:162 (proposed detention basin)
APPLICANT: County of Hawaii, Department of Environmental Management, Solid Waste Division

Transmitted for your review and comment is information on the above-referenced matter. We would appreciate your comments **by August 30, 2017.**

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]

Print Name: GORDON C. HEIT
Date: 8/16/17

cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

75 Aupuni Street, Room 204
Hilo, Hawaii 96720
PHONE: (808) 961-9590
FAX: (808) 961-9599

August 16, 2017

MEMORANDUM

TO: Russell Y. Tsuji, Administrator

FROM: Gordon C. Heit, Hawaii District Land Agent

SUBJECT: Pre-Assessment Consultation – South Hilo Sanitary Landfill Final Closure

LOCATION: Waiakea, South Hilo, Island of Hawaii, TMK: (3) 2-1-013:152, 156 (landfill) & (3) 2-1-013:162 (proposed detention basin)

APPLICANT: County of Hawaii, Department of Environmental Management

Pursuant to your request for comments on the above matter, we offer the following:

The properties identified above are encumbered under the following Executive Orders to the County of Hawaii for sanitary landfill purposes:

- Parcel (3) 2-1-013:152 - EO 2841 signed June 13, 1977
- Parcel (3) 2-1-013:156 – EO 3975 signed March 14, 2003

Parcel (3) 2-1-013:162 is currently unencumbered. Prior authorization will be required before property can be utilized.

The Land Division will provide further comments when the Draft Environmental Assessment is available for review.

Please contact me should you have any questions.

WILSON OKAMOTO CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Russell Y. Tsuji
Land Administrator
Land Division
State of Hawaiʻi
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaiʻi 96809

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure Hilo, Hawaiʻi Island, Hawaiʻi

Dear Mr. Tsuji:

Thank you for your letter dated September 7, 2017 regarding the subject pre-assessment consultation. We offer the following in response to comments from the following Department of Land and Natural Resources (DLNR) Divisions:

Engineering Division
We acknowledge that rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44 CFR), are in effect when the development falls within a designated Flood Hazard Zone. We also acknowledge that local community flood ordinances may take precedence over the NFIP standards as local designations prove to be more restrictive. We would like to note that the project is designated as Zone X, an area determined to be outside the 500-year floodplain.

Land Division – Hawaiʻi District
It is understood that parcels (3) 2-1-013:152 and 156 are encumbered under Executive Orders 2841 and 3975, respectively. It is also understood that parcel (3) 2-1-013:162 is currently unencumbered. The County of Hawaiʻi Department of Environmental Management Solid Waste Division (County) will continue to work cooperatively with DLNR in obtaining authorization prior to utilization of the site and to consolidate and resubdivide the parcels to conform with their current use.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

EM

Milton Arakawa, Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street
Suite 400
Honolulu, HI 96826

RECEIVED
SEP 11 2017
WILSON OKAMOTO CORPORATION

August 31, 2017

Dear Milton Arakawa,

The Division of Forestry and Wildlife has received your inquiry regarding the pre-assessment consultation for a draft Environmental Assessment for the South Hilo Sanitary Landfill facility located one mile east of Kanoelehua Avenue, Hilo, TMKs (3) 2-1-013: 152 and 156. The proposed action would include placement of a final cover system atop the 23.2 acre landfill. Prior to its installation, the slopes would be regraded and a maintenance access road will be provided to direct flow of storm-water runoff, accommodated by two existing detention infiltration basins with a third detention basin proposed.

The State and Federally listed Hawaiian hoary bat or 'Ōpe'ape'a (*Lasiurus cinereus semotus*) has the potential to occur in the vicinity of the proposed project. DOFAW recommends avoiding the use barbed wire, as bat mortalities have been documented as a result of becoming ensnared by barbed wire during flight. Hawaiian hoary bats roost in both exotic and native trees. If any trees are planned for removal during the bat breeding season there is a risk of injury or mortality to juvenile bats. To minimize the potential for impacts to this species, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Site clearing should be timed to avoid disturbance to breeding Hawaiian hoary bats.

The endangered Hawaiian hawk or 'Io (*Buteo solitaries*) may occur in the project vicinity. DOFAW recommends surveying the area to ensure no Hawaiian hawk nests are present if trees are to be cut.

State and Federally listed Hawaiian goose, or Nēnē (*Branta sandvicensis*) may occur in the vicinity of the proposed project site. To minimize the potential for take, surveys for Nēnē by a qualified biologist are recommended before any land clearing or excavation activities occur, and should be repeated if these activities are delayed more than three days. If a nest is discovered at any point, please contact DOFAW staff. If a bird is present during ongoing activities, then all activities within 100 feet (30 m) of the bird should cease, and the bird should also not be approached. Work may continue after the bird leaves the area of its own accord.

Finally, we note that artificial lighting can adversely impact seabirds that may pass through the area at night causing disorientation which could result in collision with manmade artifacts or grounding of birds. If nighttime lighting is required at the facility, DOFAW recommends that any lights used be fully shielded to minimize impacts.

We appreciate your efforts to work with our office for the conservation of native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Katherine Cullison, Conservation Initiatives Coordinator at (808)587-4148 or Katherine.cullison@hawaii.gov.

Sincerely,

James Cogswell
Wildlife Program Manager
Division of Forestry and Wildlife

WILSON OKAMOTO CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. James Cogswell
Wildlife Program Manager
Division of Forestry and Wildlife
State of Hawai'i
Department of Land and Natural Resources
1151 Punchbowl Street, Room 325
Honolulu, Hawai'i 96813

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure Hilo, Hawai'i Island, Hawai'i

Dear Mr. Cogswell:

Thank you for your letter dated August 31, 2017 regarding the subject pre-assessment consultation. We offer the following in response to your comments:

We acknowledge that the State and Federally listed Hawaiian hoary bat, or 'Ōpe'ape'a (*Lasiurus cinereus semotus*), and Hawaiian goose, or Nēnē (*Branta sandvicensis*), along with the endangered Hawaiian hawk, or 'Io (*Buteo solitaries*), has the potential to occur in the vicinity of the proposed project. Recommended avoidance and minimize measures will be incorporated into the project design. It will be the contractor's responsibility to adhere to project plans and specifications which will incorporate measures to avoid or minimize impacts to listed species during construction.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

1907 S. Beretania Street, Suite 400 • Honolulu, Hawaii • 96826 • (808) 946-2277

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

DAVID Y. IGE
GOVERNOR

ARTHUR J. LOGAN
MAJOR GENERAL
ADJUTANT GENERAL

KENNETH S. HARA
BRIGADIER GENERAL
DEPUTY ADJUTANT GENERAL

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

MA

August 29, 2017

Mr. Milton Arakawa, AICP
Wilson Okamoto Corporation
1907 South Berethania Street, Suite 400
Honolulu, Hawai'i 96826

RECEIVED
SEP 05 2017
WILSON OKAMOTO CORPORATION

Dear Mr. Arakawa

Subject: South Hilo Sanitary Landfill Final Closure Environmental Assessment Pre-Assessment Consultation, Hilo, Hawai'i Island, Hawai'i

Thank you for the opportunity to comment on the above project. The State of Hawaii Department of Defense has no comments to offer relative to the proposed project.

Should you have any questions or concerns, please have your staff contact Ms. Shao Yu Lee, our Land Manager on Oahu, at (808) 733-4222.

Sincerely,

NEAL S. MITSUYOSHI, P.E.
Colonel, Hawaii National Guard
Chief Engineering Officer

c: Mr. Karl Motoyama, Hawaii Army National Guard (HIARNG) Environmental
Mr. David Kennard, Hawaii Emergency Management Agency (HI-EMA)
Ms. Havinne Okamura, HI-EMA
Mr. Albert Chong, HI-EMA

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Neal S. Mitsuyoshi, P.E.
Colonel, Hawai'i National Guard
Chief Engineering Officer
State of Hawai'i
Department of Defense
3949 Diamond Head Road
Honolulu, Hawai'i 96816-4495

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure Hilo, Hawai'i Island, Hawai'i

Dear Mr. Mitsuyoshi:

Thank you for your letter dated August 29, 2017 regarding the subject pre-assessment consultation. We acknowledge that the State of Hawai'i Department of Defense has no comments to offer relative to the proposed project.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

EPO 17-187

August 31, 2017

RECEIVED
SEP 07 2017
WILSON OKAMOTO CORPORATION

MA

Mr. Milton Arakawa, AICP
Wilson Okamoto Corporation
1907 S. Beretania Street, Suite 400
Honolulu, Hawaii 96826

Dear Mr. Arakawa:

SUBJECT: Pre-Assessment Consultation (PAC) for Environmental Assessment South Hilo Sanitary Landfill Final Closure, Hilo, Hawaii

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your PAC to our office on August 7, 2017.

We understand from the PAC that "*The County of Hawai'i Department of Environmental Management (DEM), Solid Waste Division is proposing to permanently close the South Hilo Sanitary Landfill (SHSL) located at the eastern edge of Hilo on Hawai'i Island, Hawai'i. SHSL is the only municipal solid waste (MSW) landfill in East Hawai'i. Based on the available airspace and current daily loads, DEM expects the landfill will reach its permitted maximum capacity within the next two years.*"

Hawaii's environmental review laws require Environmental Assessments (EAs) and Environmental Impact Statements (EISs) to consider health in the discussion and the mitigation measures to reduce negative impacts. In its definition of 'impacts,' §11-200-2, Hawaii Administrative Rules (HAR) includes health effects, whether primary (direct), secondary (indirect), or cumulative. Further, §11-200-12(b)(5), HAR, lists public health as one of the criteria for determining whether an action may have a significant impact on the environment.

We advocate that you consider health from a broad perspective; one that accounts for the social, economic, and environmental determinants of health and wellbeing. Community well-being can be impacted by access to physical activity, health care, feelings of social connectedness and safety. Design solutions that take these factors into consideration positively contribute to the social determinants of health in a community, improving the well-being of those who live there by influencing health promoting behaviors. Social determinants contribute to preventable chronic diseases such as asthma, diabetes, obesity, and cardiovascular disease.

In the development and implementation of all projects, EPO strongly recommends regular review of State and Federal environmental health land use guidance. State standard comments to support sustainable healthy design are provided at: http://health.hawaii.gov/epo/landuse. Projects are required to adhere to all applicable standard comments. EPO has an updated environmental Geographic Information System (GIS) website page http://health.hawaii.gov/epo/egis It compiles various maps and viewers from our environmental health programs.

EPO also encourages you to examine and utilize the Hawaii Environmental Health Portal at: https://eha-cloud.doh.hawaii.gov. This site provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings.

Mr. Milton Arakawa, AICP
Page 2
August 31, 2017

Any waste generated by the project (that is not a hazardous waste as defined in state hazardous waste laws and regulations), needs to be disposed of at a solid waste management facility that complies with the applicable provisions (HAR, Chapter 11-58.1 "Solid Waste Management Control"). The open burning of any of these wastes, on or off site, is strictly prohibited. You may wish to review the Minimizing Construction & Demolition Waste Management Guide at: http://health.hawaii.gov/shwb/files/2016/05/constdem16.pdf Additional information is accessible at: http://health.hawaii.gov/shwb. For specific questions call (808) 586-4226.

To better protect public health and the environment, the U.S. Environmental Protection Agency (EPA) has developed a new environmental justice (EJ) mapping and screening tool called EJSCREEN. It is based on nationally consistent data and combines environmental and demographic indicators in maps and reports. EPO encourages you to explore, launch and utilize this powerful tool in planning your project. The EPA EJSCREEN tool is available at: http://www.epa.gov/ejscreen.

We request that you utilize all relevant information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design. Thank you for the opportunity to comment.

Mahalo nui loa,

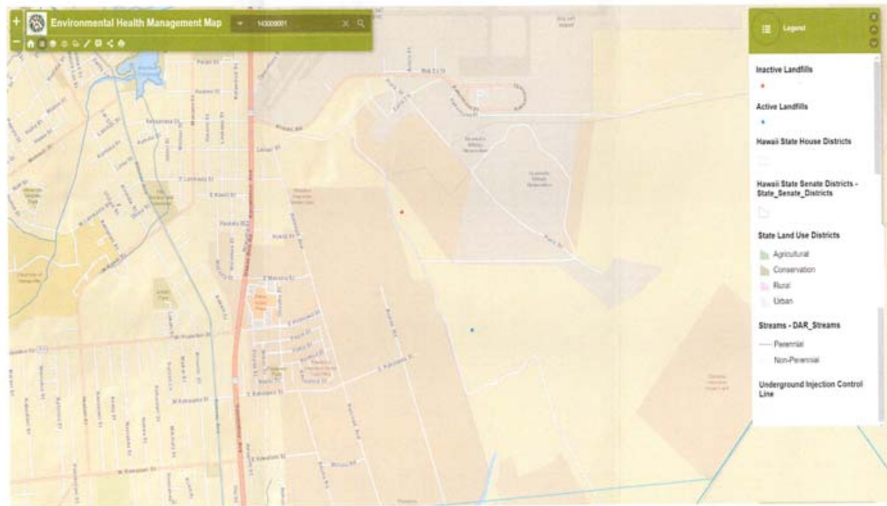
Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

LM:nn

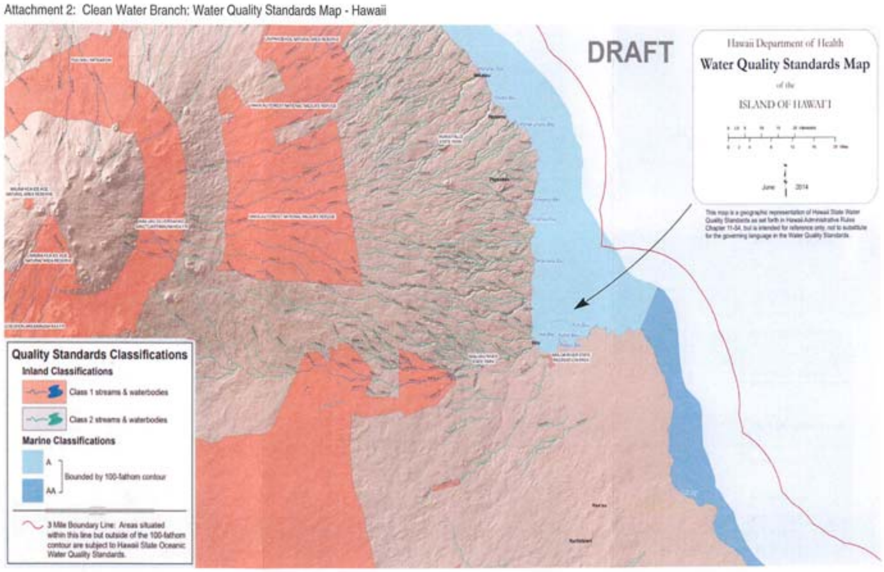
Attachment 1: Environmental Health Management Web App Snipit of Project Area: http://health.hawaii.gov/epo/egis
Attachment 2: Clean Water Branch: Water Quality Standards Map - Hawaii
Attachment 3: U.S. EPA EJSCREEN Report for Project Area

c: DOH: EMD, SHWB, CWB, CAB, DHO HI {via email only}

Attachment 1: Environmental Health Management Web App Snipit of Project Area: http://health.hawaii.gov/epo/egis



Attachment 2: Clean Water Branch: Water Quality Standards Map - Hawaii



Attachment 3: U.S. EPA EJSCREEN Report for Project Area

EPA United States Environmental Protection Agency

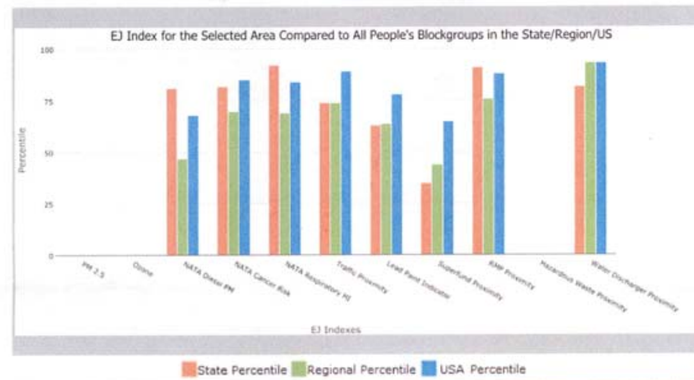
EJSCREEN Report (Version 2016)

1 mile Ring Centered at 19.699829,-155.045195, HAWAII, EPA Region 9

Approximate Population: 522

Input Area (sq. miles): 3.14

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	N/A	N/A	N/A
EJ Index for Ozone	N/A	N/A	N/A
EJ Index for NATA* Diesel PM	81	47	68
EJ Index for NATA* Air Toxics Cancer Risk	82	70	85
EJ Index for NATA* Respiratory Hazard Index	92	69	84
EJ Index for Traffic Proximity and Volume	74	74	89
EJ Index for Lead Paint Indicator	63	64	78
EJ Index for Superfund Proximity	35	44	65
EJ Index for RMP Proximity	91	76	88
EJ Index for Hazardous Waste Proximity*	N/A	N/A	N/A
EJ Index for Water Discharger Proximity	82	93	93



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report (Version 2016)

1 mile Ring Centered at 19.699829,-155.045195, HAWAII, EPA Region 9

Approximate Population: 522

Input Area (sq. miles): 3.14

August 8, 2017

+ Digitized Point

Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0
National Pollutant Discharge Elimination System (NPDES)	0

EJSCREEN Report (Version 2016)

1 mile Ring Centered at 19.699829,-155.045195, HAWAII, EPA Region 9

Approximate Population: 522

Input Area (sq. miles): 3.14

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in $\mu g/m^3$)	N/A	N/A	N/A	9.37	N/A	9.32	N/A
Ozone (ppb)	N/A	N/A	N/A	51	N/A	47.4	N/A
NATA* Diesel PM ($\mu g/m^3$)	0.121	0.149	64	0.978	<50th	0.937	<50th
NATA* Cancer Risk (lifetime risk per million)	31	34	45	43	<50th	40	<50th
NATA* Respiratory Hazard Index	1.3	1	79	2	<50th	1.8	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	360	990	61	1100	54	590	72
Lead Paint Indicator (% Pre-1960 Housing)	0.073	0.16	43	0.24	41	0.3	31
Superfund Proximity (site count/km distance)	0	0.098	29	0.15	13	0.13	16
RMP Proximity (facility count/km distance)	0.32	0.19	87	0.57	61	0.43	68
Hazardous Waste Proximity* (facility count/km distance)	N/A	0.14	N/A	0.14	N/A	0.11	N/A
Water Discharger Proximity (facility count/km distance)	0.34	0.34	67	0.2	86	0.31	77
Demographic Indicators							
Demographic Index	63%	52%	83	47%	73	36%	84
Minority Population	94%	77%	80	58%	87	37%	92
Low Income Population	33%	26%	69	36%	50	35%	52
Linguistically Isolated Population	1%	6%	26	9%	20	5%	47
Population With Less Than High School Education	6%	9%	38	17%	26	14%	29
Population Under 5 years of age	5%	6%	42	7%	39	6%	43
Population over 64 years of age	14%	15%	50	13%	69	14%	61

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

+ The hazardous waste environmental indicator and the corresponding EJ index will appear as N/A if there are no hazardous waste facilities within 50 km of a selected location.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Ms. Laura Leialoha Phillips McIntyre
Program Manager
Environmental Planning Office
State of Hawai'i
Department of Health
P.O. Box 3378
Honolulu, Hawai'i 96801-3378

Subject: Environmental Assessment Pre-Assessment Consultation for
South Hilo Sanitary Landfill Final Closure
Hilo, Hawai'i Island, Hawai'i

Dear Ms. McIntyre:

Thank you for your letter dated August 31, 2017 (EPO 17-187) on the subject pre-assessment consultation. We offer the following in response to your comments:

We acknowledge that Hawaii's environmental review laws require Environmental Assessments (EA) to consider health in the discussion and mitigation measures to reduce negative impacts. We further acknowledge that public health is listed as one of the criteria for determining whether an action may have a significant impact on the environment. A discussion of any potential health impacts will be provided in Draft EA document.

We appreciate your recommendation to review State and Federal environmental health land use guidance in the development and implementation of the project. We intend to adhere to all applicable standard comments. We also appreciate the information provided regarding the environmental GIS website, the Hawai'i Environmental Health Portal, the Minimizing Construction & Demolition Waste Management Guide, and the EPA EJSCREEN tool. These resources will be useful in the review and design of the project.

We acknowledge that any waste generated by the project needs to be disposed of at a solid waste facility that complies with Chapter 11-58.1, HAR, "Solid Waste Management Control."

Your letter, along with this response, will be included in the Draft EA for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

DAVID Y. IGE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

FORD N. FUCHIGAMI
DIRECTOR

Deputy Directors
JADE T. BUTAY
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

IN REPLY REFER TO:
DIR 0995
STP 8.2216

September 12, 2017

EM

Mr. Milton Arakawa, AICP
Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii 96826

RECEIVED
SEP 15 2017
WILSON OKAMOTO CORPORATION

Dear Mr. Arakawa:

Subject: South Hilo Sanitary Landfill Final Closure
Environmental Assessment Pre-Assessment Consultation
Hilo, Hawaii Island, Hawaii
TMK: (3) 2-1-013: 152, 156, 162

Our Department of Transportation's (DOT) comments on the subject project are as follows:

Airports Division (DOT-AIR)

1. The landfill site is located approximately 1.3 miles from the centerline of Runway 3-21 and 1.4 miles from the centerline of Runway 8-26 of the Hilo International Airport (ITO).

2. State Law (Hawaii Revised Statutes, Chapter 262 – Airport Zoning Act) requires that the State and DOT-AIR act to prevent hazards and not allow proposed non-conforming uses that are in conflict with the Federal Aviation Administration (FAA) Hazardous Wildlife Attractants requirements.

3. We recommend that the proposed facilities be designed and operated or otherwise conditioned or mitigated to meet the requirements of FAA Advisory Circular 150/5200-33B *Hazardous Wildlife Attractants On Or Near Airports*.

As noted in the Early Consultation Summary provided for this project, the use of vegetated soil covers are a potential habitat for birds. To avoid this concern, we recommend use of the synthetic turf alternative described in the summary.

The site plan indicates two (2) existing detention and infiltration areas and one (1) proposed detention and infiltration area. These areas must be designed and maintained to avoid attracting wildlife.

4. FAA regulations require the submittal of FAA Form 7460-1, Notice of Proposed Construction or Alteration, in accordance with Code of Federal Regulations, Title 14, Part 77.9. Additionally, because the proposed final elevation is higher than the ITO Horizontal Surface Airspace Height Limit, all operating equipment heights need to be included in the submittal of a FAA Form 7460-1. This form and criteria for submittal can be found at the following website: https://oeaaa.faa.gov/oeaaa/external/portal.jsp

5. All applicants need to be aware of the duties of the state and county agencies to implement the State of Hawai'i Office of Planning Technical Assistance Memo related to this project and all projects within 5 miles of an airport: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf

Highways Division

1. In addressing the effects of the South Hilo Landfill closure, the Draft Environmental Assessment should address the traffic impact of the trucking of waste (due to the subject South Hilo Landfill closure) to the West Hawaii Sanitary Landfill.

2. The traffic assessment should be prepared and submitted for our review and acceptance. Any mitigation measures or improvements shall be provided at no cost to the State.

If there are any questions, please contact Mr. Norren Kato of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Sincerely,

FORD N. FUCHIGAMI
Director of Transportation

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Ford Fuchigami
Director of Transportation
State of Hawai'i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813-5097

Subject: Environmental Assessment Pre-Assessment Consultation for
South Hilo Sanitary Landfill Final Closure
Hilo, Hawai'i Island, Hawai'i

Dear Mr. Fuchigami:

Thank you for your letter dated September 12, 2017 regarding the subject pre-assessment consultation. We offer the following in response to your comments:

Airports Division (DOT-AIR)
We acknowledge the landfill site is approximately 1.3 miles from the centerline of Runway 3-21 and 1.4 miles from the centerline of Runway 8-26 of the Hilo International Airport (ITO).

We acknowledge that State Law requires that the State and DOT-AIR act to prevent hazards and not allow proposed non-conforming uses that are in conflict with the Federal Aviation Administration (FAA) Hazardous Wildlife Attractants requirements.

The proposed facilities will be designed and operated or otherwise conditioned or mitigated to meet the requirements of FAA Advisory Circular 150/5200-33B *Hazardous Wildlife Attractants On Or Near Airports*.

We acknowledge your recommendation to use the synthetic turf alternative described in the early consultation project summary for this project. The proposed detention and infiltration areas will be designed and maintained to avoid attracting wildlife.

The FAA Form 7460-1, Notice of Proposed Construction or Alteration, has been submitted for the project and is currently under review. We are aware of the duties of the state and county agencies to implement the State of Hawai'i Office of Planning Technical Assistance Memo related to this project and all projects within 5 miles of an airport.

Highways Division
A Traffic Assessment that assesses the traffic impact of trucking waste to the West Hawai'i Sanitary Landfill will be prepared and submitted for your review and acceptance. The County of Hawai'i Department of Environmental Management Solid Waste Division will coordinate with your office regarding any mitigation measures or improvements required as a result of this project.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

MA

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-15709

August 24, 2017

RECEIVED
AUG 28 2017
WILSON OKAMOTO CORPORATION

Mr. Milton Arakawa, AICP
Wilson Okamoto Corporation
1907 S. Beretania Street, Suite 400
Honolulu, Hawaii 96826

Dear Mr. Arakawa:

Subject: South Hilo Sanitary Landfill Final Closure
Environmental Assessment Pre-Consultation;
Hilo, Hawaii Island, Hawaii
TMK: (3) 2-1-013: 152 and 156; and (3) 2-1-013: 162

Thank you for the opportunity to provide comments on the pre-consultation request for the preparation of a Draft Environmental Assessment (Draft EA) on the South Hilo Sanitary Landfill final closure. The pre-consultation review material was transmitted to our office via letter dated August 1, 2017.

It is our understanding that the County of Hawaii, Department of Environmental Management, Solid Waste Division, is proposing the permanent closure of the South Hilo Sanitary Landfill. The landfill closure will be conducted in compliance with Federal and State rules and regulations, while meeting the County of Hawaii's long-term waste management objectives. Leachate management, land use, and permitting issues constrain any expansion of the facility. Therefore, the County of Hawaii expects this landfill to reach maximum capacity within two years.

The final closure of the landfill will involve the placement of a cover system atop the landfill. Stormwater detention and infiltration basins will be created to treat stormwater runoff. Three landfill closure alternatives will be evaluated in the Draft EA: low permeable membrane overlain by synthetic grass; a cover consisting of evapotranspiration cover and geosynthetic soil; and a U.S. Environmental Protection Agency prescribed cover system.

The Office of Planning (OP) has reviewed the transmitted material and has the following comments to offer:

1. Pursuant to Hawaii Administrative Rules (HAR) § 11-200-10(4) – general description of the action's technical, economic, social, and environmental characteristics; this project must demonstrate that it is consistent with a number of state environmental, social, economic goals, and policies. Hawaii Revised Statutes (HRS) Chapter 226,

the Hawaii State Planning Act, provides goals, objectives, policies, planning coordination and implementation, and priority guidelines for growth, development, and the allocation of resources throughout the state.

   The Draft EA should include a discussion on the project's ability to meet all parts of the Hawaii State Planning Act. The analysis should examine consistency with these statutes or clarify where it is in conflict with them. If any of these statutes are not applicable to the project, the analysis should affirmatively state such determination, followed by discussion paragraphs.

2. The coastal zone management (CZM) area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (see HRS § 205A-1).

   HRS Chapter 205A-5(b) requires all state and county agencies to enforce the CZM objectives and policies. The Draft EA should include an assessment as to how the proposed action conforms to each of the goals and objectives as listed in HRS § 205A-2. Compliance with HRS § 205A-2 is an important component for satisfying the requirements of HRS Chapter 343.

3. The Draft EA should provide a list of any federal, state, or county permits required for this project. A listing of required permits will allow OP to assess the project's potential impact on plans, policies, and programs that fall under our jurisdiction (e.g., CZM Federal Consistency).

4. It is noted that the proposed facility is within two miles of the state operated Hilo International Airport. The Draft EA will need to summarize any potential impacts to air operations, which includes, but not limited to, construction activity related to the closing of the landfill that may attract bird or wildlife that encroach on aircraft flight paths, Federal Aviation Administration permits (if required), and mitigation strategies if this project interferes with active runway operations. For more information on this, please see the OP Technical Assistance Memorandum on the 2016-1 FAA Order 5190.6B in regards to the use of land adjacent to airport boundaries.

   This memorandum can be viewed or downloaded from the OP website at: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf

5. Pursuant to HAR § 11-200-10(6) – identification and summary of impacts and alternatives considered; in order to ensure that surface water and marine resources in the vicinity of South Hilo remain protected, the negative effects of stormwater inundation and polluted runoff from this project should be evaluated in the Draft EA.

   OP acknowledges that this landfill closure project includes three stormwater detention and filtration basins which will be located within an adjacent parcel near the landfill. The development of these drainage terraces is consistent with low-impact development (LID).

OP also acknowledges that U.S. Environmental Protection Agency Resource Conservation and Recovery Act Laws and State Department of Health regulations, require erosion control measures for the landfill cover. The Draft EA should include an evaluation of the project area's vulnerability to flooding, its proximity to surface water resources, soil absorption characteristics of the area in the vicinity of the landfill, and any impact to surface water resources. These items should be considered when developing mitigation measures for the protection for surface water resources and the coastal ecosystem, pursuant to HAR § 11-200-10(7).

OP has a number of resources available to assist with onsite stormwater management and polluted runoff mitigation that can be considered in addition to the stormwater terraces. OP recommends consulting these guidance documents and stormwater evaluative tools when developing strategies to address polluted runoff. They offer useful techniques to keep land-based pollutants and sediment in place and prevent contaminating nearshore waters, while considering best management practices that take into consideration the types of contaminants needed to be controlled and the physical characteristics of the project area. The evaluative tools that should be used during the design process include:

- <u>Stormwater Impact Assessments</u> can be used to identify and evaluate information on hydrology, stressors, sensitivity of aquatic and riparian resources, and management measures to control runoff, as well as consider secondary and cumulative impacts to the area http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_stormwater_impact_assessments_guidance.pdf

- <u>Low Impact Development (LID), A Practitioners Guide</u> covers a range of structural best management practices for stormwater control management, onsite infiltration techniques, and proven filtration techniques that minimize negative environmental impacts http://files.hawaii.gov/dbedt/op/czm/initiative/lid/lid_guide_2006.pdf

If you have any questions regarding this comment letter, please contact Joshua Hekekia of our office at (808) 587-2845.

Sincerely,

Leo R. Asuncion
Director

WILSON OKAMOTO
CORPORATION
INNOVATORS • PLANNERS • ENGINEERS

10289-01
October 23, 2017

Mr. Leo R. Asuncion
Director
Office of Planning
State of Hawai'i
P.O. Box 2359
Honolulu, Hawai'i 96804

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure
Hilo, Hawai'i Island, Hawai'i

Dear Mr. Asuncion:

Thank you for your letter dated August 31, 2017 (Ref. No. P-15709) on the subject pre-assessment consultation. We offer the following in response to your comments:

Project documents will include a discussion of the project's consistency with various state environmental, social, economic goals and policies for land use as well as with Chapter 226, the Hawai'i State Planning Act.

Project documents will include an assessment as to how the project conforms to the goals and objectives of the Hawai'i CZM program as listed in HRS §205A-2.

The Draft EA will provide a list of any federal, state, or county permits required for this project.

The Draft EA will summarize any potential impacts to air operations, which includes, but not limited to construction activities related to the closing of the landfill that may attract bird or wildlife that encroach on aircraft flight paths, FAA permits (if required), and mitigation strategies if the project interferes with active runway operations. We appreciate the information provided on the TAM.

A summary of the potential impact to nearshore marine resources and actions proposed to ensure the coastal ecosystems are protected and potential hazards mitigated will be included in project documents. We appreciate the information on the OP's <u>Stormwater Impact Assessment</u> and will use this resource to identify mitigation measures and BMPs that can be applied to protect water quality and the marine ecosystem.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

We appreciate your participation in the pre-assessment consultation review process.

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

September 30, 2017

RECEIVED
OCT 02 2017
WILSON OKAMOTO CORPORATION

MA
EM

Milton Arakawa
Wilson Okamoto Corporation
1907 S. Beretania Street, Suite 400
Honolulu, HI 96826

RE: South Hilo Sanitary Landfill Closure
Environmental Assessment Pre-Assessment Consultation

Dear Mr. Arakawa,

I represent the Pana'ewa agricultural community adjacent to the South Hilo Sanitary Landfill. We were excluded from and should have been included in the Environmental Assessment Pre-Assessment Consultation for the closure of the landfill.

The Pana'ewa DHHL agricultural community is comprised of 280+ Native Hawaiian families. Our closest family lives within an approximate 1-mile radius from the landfill. Our sister community, the Pana'ewa DHHL residential community, is also located close to the landfill site.

Our Pana'ewa DHHL communities and our families are directly impacted by the health and safety risks from the landfill closure. Any proposed detention and infiltration area must be located in an area on the landfill site that is as far as possible from our communities.

According to your firm, post-closure monitoring requires maintaining the landfill cover and conducting repairs to ensure settlement, subsidence, erosion and other events do not breach the integrity of the cover system; collecting, treating and properly disposing of the landfill leachate; monitoring groundwater contamination and performing remedial actions if necessary; and maintaining and operating a gas monitoring system.

We have significant concerns regarding the County of Hawai'i's capacity and lack of expertise to perform consistent and competent post-closure monitoring of the landfill for 30 years.

Please include our community in future assessments regarding the landfill closure.

Sincerely,

Maile Lu'uwai
President
Keaukaha Pana'ewa Farmers Association
1518 Auwae Road
Hilo, HI 96720
maile@luuwailaw.com
808.280.0083

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10289-01
October 23, 2017

Ms. Maile Lu'uwai
President
Keaukaha Pana'ewa Farmers Association
1518 Auwae Road
Hilo, Hawai'i 96720

Subject: Environmental Assessment Pre-Assessment Consultation for South Hilo Sanitary Landfill Final Closure Hilo, Hawai'i Island, Hawai'i

Dear Ms. Lu'uwai:

Thank you for your letter dated September 30, 2017 regarding the subject pre-assessment consultation. We regret the apparent misdirection of the environmental assessment pre-assessment consultation request to the Keaukaha Pana'ewa Farmers Association. Based on a mailing list compiled for the project, on August 1, 2017, we sent letters via email requesting comments to Mr. Kihei Ahuna and Mr. Howard Pe'a, who were identified as the president and vice president, respectively, of the Keaukaha Pana'ewa Farmers Association. We requested comments be provided to us by September 1, 2017, and we did not subsequently receive any comments from these individuals. Your contact information as President of the group has been updated on the mailing list for any future correspondence pertaining to this project.

We appreciate the information you have provided on the Pana'ewa agricultural community and the Pana'ewa residential community that neighbor the landfill site. You noted a preference to have any proposed detention and infiltration area be located as far from the communities as possible. To clarify, the proposed action involves installing an impermeable cover on the top and side slopes of the landfill. This will prevent storm water from infiltrating through the closed landfill. Instead, rainfall on the cover will be captured, conveyed, and retained in two existing and proposed drainage basins that will be adequately sized to accommodate the design storm event. The basins must be sited as close to the landfill footprint as possible to minimize the potential for soil erosion and sedimentation occurring in the surrounding areas. As such, the new basin is proposed to be located at the northwest corner of the landfill.

We acknowledge your concerns regarding the County of Hawai'i's capacity and expertise to consistently and competently perform post-closure monitoring of the landfill for 30 years. Nevertheless, post-closure monitoring is not an option but a requirement under State and Federal regulations that enforce compliance by the County.

Your letter, along with this response, will be included in the Draft Environmental Assessment (Draft EA) for the project. The Draft EA has been published and made available for download, review and comment in the October 23, 2017 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please use the following link to view the current issue of the notice:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2017-10-23-TEN.pdf

Sincerely,

Rebecca Candilasa
Planner

cc: Gene Quiamas, County of Hawai'i, DEM SWD
Aaron Kreitzer, HDR, Inc.

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