Dr Anne Thurston, OBE

Anne Thurston worked with governments in lower resource countries for over four decades to share solutions for managing public sector records. Between 1970 and 1980 she lived in Kenya, where she conducted research and worked for the Kenya National Archives. In 1980 she became a Lecturer, later a Reader, in International Records Studies at University College London. She established the International Records Management Trust in 1989 and was its Director for thirty years, until the end of 2019.

Recognising the impact of information technology on the public sector evidence base, she structured the Trust to address the requirements for achieving accountability and transparency in the digital environment. She directed dozens of practical projects across the Caribbean, Africa and Asia; led the development of relevant educational materials that were made available to lower resource countries without charge; and directed a range of research projects. She regularly monitored international good practice for managing digital records, studied the consequences of the failure to manage records as evidence in the public sector, and related these issues to practical challenges for governance.

Dr Thurston was a member of the UK Lord Chancellor's Advisory Council on Public Records from 1994 to 2000. She was awarded an OBE for Services to Public Administration in Africa in 2000; in 2006, she received a lifetime achievement award from the UK Records Management Society, and in 2007, she received the Emmett Leahy Award for Outstanding Contributions to the Information and Records Management Profession globally.

EXHIBIT "I-62"

Witness Statement of Anne Thurston, Ph.D., OBE

February 10, 2021

Q. Please state your name and place of residence.

A. My name is Anne Thurston. I am a resident of Kauaʻi County and live northeast of the Kapaʻa Bypass in Kapaʻa.

Q. Are you concerned with the availability of transportation and wastewater services for the proposed HoKua Place development?

A. Yes, I am very aware of the serious traffic congestion that already plagues Kuhio Highway and the Kapa`a bypass. In my commute to Līhuʻe, I frequently experience noxious sewer odors after leaving the Kapa`a bypass and on my approach to the Wailua River bridge. This also caused me to take a particular interest in provisions for wastewater treatment.

When the County General Plan was being updated to its most recent version, I attended many meetings along with other residents who were concerned about the developments being approved on Kauai without adequate infrastructure, delaying the construction buildout. I have attended several community, Planning Commission, and County Council meetings concerning the proposed HoKua Place development. As I grew concerned about the wastewater that this development would likely create, both during and after its construction, and I decided to study this issue.

As a concerned community member, I very much appreciate the need for homes for the island's residents. At the same time, I feel that it is critical that we must also preserve valuable agricultural land for food sustainability.

Q. Please discuss the scope of your testimony concerning wastewater services for the proposed HoKua Development.

A. The substance of my testimony will be based on the research I have done regarding the Wailua Wastewater Treatment Plant (WWTP) and its capacity limitations. I am concerned that the WWTP will not be able to handle the waste from another large development. In addition to the odor problem, my concern stems from incidents of wastewater spills, a manhole cover that blew open and spewed untreated sewage, and other operational problems as reported by the *Garden Island* and in the inspection reports for the Treatment Plant. *See* Exhibits I-69 through I-98.

EXHIBIT "I-63"[1]

I reviewed thousands of pages of government records obtained from the State Department of Health (DOH), which provided many of the documents via a googledrive link. Below is a summary of some of the documents that indicated permit violations, discharge exceedances, and County remediation efforts for the Wailua WWTP:

1. March 3, 2011: Exceedance of permit limits from February 23, 2011.[1] Exh. I-69.
2. September 13, 2012: One violation of effluent limits.[2] Exh. I-70.
3. November 26, 2012: Two samples in October exceeded the permit limit.[3] Exh. I-71.
4. December 27, 2012: One violation in December.[4] Exh. I-72.
5. December 29, 2012: Exceedances of permit limits on November 12 and 27.[5] Exh. I-73.
6. January 4, 2013: Two violations of effluent limits occurred.[6] Exh. I-74.
7. April 30, 2013: In February 2012, operators attempted to switch Wailua WWTP effluent flow to the ocean and the outfall was unable to handle the flow. The flow was switched back to the golf course.[7] Exh. I-75
8. June 28, 2013: One violation of effluent limits.[8] Exh. I-76.
9. August 8, 2013: County concerns about the draft NPDES permit and accompanying fact sheet due to several key provisions in relation to effluent limits.[9] Exh. I-77.
10. October 1, 2013: DOH Fact Sheet for proposed NPDES Permit for Wailua Wastewater Treatment Plant. Compliance summary in §6.[10] Exh. I-78.
11. October 1, 2013: County comments indicating there is insufficient information provided in the fact sheet to demonstrate that the compliance schedule included in the permit for ammonia nitrogen meets the requirements of 40 CFR §122.47.[11] Exh. I-79.
12. December 27, 2013: Emergency call log entry. Permit document. Spill at the intersection of the turning to Ele'ele and Hanamuall'i Highway: 100 gallons per minute, totalling about 2,000 gallons sill heading towards Hanapepe Valley.[12]

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[1] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20110303.TschuppE.Email.re_WETT%20Result%2002_23_11%20Wailua%20WWTP.pdf
[2] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20120913.DMR-%20Aug.%202012-HI%200020257%20with%20attachments.PDF
[3] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20121126.DMR-Oct.%202012-HI%200020257%20with%20attachments.PDF
[4] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20121227.DMR%20for%20Nov.2012%20with%20attachments-HI0020257.PDF
[5] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/2013A022.pdf
[6] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20130104.DMR-Feb.%202013-HI%200020257%20with%20attachments.PDF
[7] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20130430.Annual%20Report-WWPPP-2013B177.pdf
[8] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20130628.DMR-Wailua%20WWTP-May%202013-HI%200020257.pdf
[9] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20130808.COK%20DPW-Comments%20on%20Public%20Notice%20Permit-0020257.PDF
[10] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20131001.Response%20to%20Comments%20-%2010010PKP.13b.pdf
[11] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20131001.Response%20to%20Comments%20-%2010010PKP.13b.pdf
[12] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20131215.Call%20log-Manhole%20overflow%20spill-Eleele%20Rd.%20and%20Haumualii%20Hwy.-0020275.PDF

13. February 28, 2014: During Jan. there were 2 violations of effluent limits.[13] Exh. I-80.
14. April 25, 2014: Growth of the population and the number of residences and businesses in the Wailua WTP service area has been low. There are specific resorts and residential developments at various stages of development of design and permitting that could become significant sources of wastewater flow the Wailua WWTP, although delayed indefinitely by economic conditions.[14] Exh. I-81.
15. December 24, 2014: One permit violation in November 2014.[15] Exh. I-82.
16. February 27, 2015: Permit document. Two permit violations.[16]
17. May 27, 2015: During the 2015-2016 reporting period two spills occurred within the WWTP facility. The first spill occurred on May 5, 2015, when 10,000 gallons of treated effluent overflowed at the onsite effluent manhole due to blockage of the onshore portion of the outfall line due to tree roots. The second spill of 300 gallons of sludge occurred on January 8, 2016 due to overflow from the sludge drying beds.[17] Exh. I-83.
18. May 29, 2015. Permit document. One permit violation occurred in May: the effluent nitrate plus nitrite nitrogen was in excess of the permit limit. An unusual event occurred: shortly after routing the plant flow to the ocean, due to partial blockage of the effluent line, effluent backed up downstream of the chlorine contact change and spilled to the ground just outside of the effluent filter building.[18] Exh. I-84.
19. August 28, 2015: During July, one permit violation occurred.[19] Exh. I-85.
20. October 30, 2015: Wailua WWTP staff has been operating the facility to comply with the interim effluent ammonia limits, however evaluation of plant performance data indicates that the treatment capacity of the existing liquid processes will not support compliance with the final effluent limits.[20] Exh. I-86.
21. December 28, 2015: One permit violation in November 2015.[21] Exh. I-87.
22. February 26, 2016: An enterococcus monthly geometric mean permit violation.[22] Exh. I-88.
23. May 1, 2017: During the reporting period, spill occurred within the WWTP facility. On November 30, 2016 approximately 300 gallons of sludge overflowed the sludge drying bed

[13] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20140228.DMR-Jan.%202014-0020257.pdf
[14] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20140425.Annual%20Report%20Wastewater%20Pollution%20Prevention%20Program-0020257.PDF
[15] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20141224.DMR%20for%20November%202014-HI0020257.PDF
[16] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20150227.DMR%20for%20January%202015-HI0020257.PDF
[17] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20150527.DMR%20for%20April%202015-HI0020257.PDF
[18] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20150529.Annual%20Report-Wastewater%20Pollution%20Prevention%20Program-HI0020257.PDF
[19] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20150828.DMR%20for%20July%202015-HI0020257.PDF
[20] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20151030.Final%20Report,%20Ammonia%20Nitrogen%20Effluent%20Limits%20Compliance%20Alternatives%20Evaluation%20Study-HI0020257.pdf
[21] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20151228.DMR%20for%20November%202015-HI0020257.PDF
[22] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20160226.DMR%20for%20January%202016-HI0020257.PDF

due to collapse of sand used for containment of the end of the drying bed.[23] Exh. I-89.
24. November 17, 2017: Compliance Inspection Report. The Facility had a number of operational and maintenance issues. Many of the items observed were noted in previous inspection reports and had not been adequately addressed. The Permittee also had several nitrite + nitrate levels that exceeded permit standards for Outfall Serial No. 001 in 2017.[24] Exh. I-90.
25. March 29, 2018: Permit document. Various deficiencies identified.[25] Exh. I-91.
26. April 26, 2018: Corrective Action Plan. Permit document. The O & M Inspection Report gave a rating of unacceptable to the Wailua WWTP for the period February 2017 to January 2018: chlorine monitoring system inoperative; effluent filter inoperative.[26] Exh. I-92.
27. May 31, 2019: Wailua WWTP Annual Report - Wastewater Pollution Prevention Program. During the 2018-2019 reporting period, one spill occurred within the collection system, on November 1, 2018, when a sewer main break created a blockage that led to the spill. Approximately 8,000 gallons of raw wastewater spilled on the highway and entered the Wailua River.[27] Exh. I-94.
28. April 2, 2020, filename "20200402.msg.SpillReport.pdf": An estimated 20,000 gallons of secondary treated wastewater spilled from the WWTP as a result of heavy rains overwhelming the Wailua WWTP on March 28, 2020.
29. May 31, 2020: Annual Report WW Pollution Prevention Program. During the 2019-2020 reporting period, two spills occurred at the Wailua WWTP: March 17, 2020 and March 28, 2020, both resulting from the Wailua WWTP being overwhelmed by inflow/infiltration due to intense storms. The first spill was approximately 40,000 gallons after approximately 16-inches of rainfall occurred in the 24-hour period prior to the spill. The second spill was approximately 20,000 gallons after approximately 6-inches of rainfall occurred in the 8-hour period prior to the spill. Both spill responses consisted of coordinating with Department of Health staff on Kaua'i.[28] Exh. I-95
30. August 25, 2020: WET Test Result Fail. The Facility had a number of operational and maintenance issues. Many of the items observed were noted in previous inspection reports and had not been adequately addressed. Due to the ongoing Covid-19 pandemic and the associated interisland travel restrictions, DOH implemented a modified inspection protocol.[29] Exh. I-96.
31. December 14, 2020: Compliance Evaluation Inspection Response. For the failed August 2020 WET test, the County entered accelerated monitoring per the TRE workplan, consisting of 6 WET tests over the following 12 weeks. None of these tests failed. Stormwater was not reviewed during this inspection, as the Facility is not currently authorized to discharge stormwater. Compliance Evaluation Inspection. In addition to the

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[23] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20170501.2016%20Annual%20Receiving%20Water%20Monitoring%20Programs%20Report%20and%20Zone%20of%20Mixing%20Dilution%20Analysis%20Study-HI0020257.pdf
[24] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20171101.msg-Wailua%20WWTP%20Ammonia%20Nitrogen%20Effluent%20Limits%20Compliance%20-%20NPDES%20Permit%20No.%20HI%200020257.pdf
[25] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20180330.msg-2017%20Annual%20Receiving%20Water%20Monitoring%20Report-HI%200020257.pdf
[26] http://eha-web.doh.hawaii.gov/wpc-viewer-static/permits/HI0020257/20180426.HI0020257.pdf
[27] https://drive.google.com/file/d/1QvrJuP1fUO00D30Ic2-VKvbyGr1Lr5hP/view?usp=sharing
[28] https://drive.google.com/file/d/1x11_sE-yK46esegSbjUvrwKGL66CK9zY/view?usp=sharing
[29] https://drive.google.com/file/d/1xsWJqmX14F_7cAGa952ofHE5WMudHCKP/view?usp=sharing

> DMR exceedances indicated above, the Facility also failed the Whole Effluent Toxicity (WET) test in August 2020. The Facility is currently following its Initial Investigation Toxicity Reduction Evaluation (TRE) workplan to determine the cause of the failed WET test. There are no other treatment facilities currently servicing this area and a cessation of function or operation would cause severe hardship to the residents. Based on effluent data, significant facility enhancements and capital costs would likely be necessary to comply with applicable WQS for which the ZOM was applied. As discussed in Part E.3.c.(2)(a), the operation of the facility has been found to benefit the public.[30] Exh. I-98.

My review included documents from the DOH Wastewater Branch indicating that because individual wastewater systems and an onsite wastewater treatment plant are not proposed for HoKua Place, it would likely be serviced by the County Wailua WWTP. Based on my review of documents and on the written response from the County, it is evident that the Wailua WWTP will not be available to service HoKua Place in the foreseeable future. This is reflected in the 2018 Kauaʻi Kākou General Plan, which shows that East Kauaʻi will have a deficit of wastewater treatment capacity of -3.13 million gallons a day (MGD) and of domestic water capacity of -1.67 MGD. Exh. I-26 at 141 (2018 General Plan, Fig. 3-7).

In my work experience I regularly reviewed government records. I worked with governments in lower resource countries for over four decades to share solutions for managing public sector records so this work is quite familiar to me.[31] In my review of the Wailua WWTP records I learned that the Wailua WWTP capacity is actually 1 MGD. Their records establish that the plant is currently processing 0.6 MGD daily, and, in an email dated January 26, 2021 to myself, the Wastewater Division Chief indicated that the County has extended wastewater allocation to two pending approved developments for another 0.27 MGD, leaving insufficient capacity to service the proposed HoKua Place development, which estimates it will need approximately 0.21 MGD. Exh. I-02 (FEIS Vol. 1A at 96). Wailua WWTP has a design flow of 1.5 MGD but actual capacity is 1.0 MGD. The head works facility does not work properly and needs replacement. The Rapid Bloc Activated Sludge system does not work and needs replacement. A new pump station is needed and the collection system should be extended." Exh. I-26 at 509.

In 2017, the DOH Clean Water Branch conducted a detailed inspection of the Wailua WWTP and examined the reasons for its extensive record of wastewater exceedances. The County

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[30] https://drive.google.com/file/d/1ydxK1fhoyw79A0P1lTX6RjpMMwSCHX-l/view?usp=sharing

[31] Between 1970 and 1980 I lived in Kenya, where I conducted research and worked for the Kenya National Archives. In 1980 I became a Lecturer, later a Reader, in International Records Studies at University College London. I established the International Records Management Trust in 1989 and was its Director for thirty years, working remotely and internationally, until the end of 2019.

has been fined, but it has worked hard to correct the operational deficiencies. In 2018, the estimated cost of the probable construction upgrades needed at the WWP was $17,300,000. An engineering infrastructure report prepared by R. M. Towill confirmed the operational deficiencies and need for upgrades at the Wailua WWTP. Exh. I-65. Kaua'i's four municipal wastewater systems, including the Wailua WWTP, were constructed in the 1970s. Exh. I-26 (2018 General Plan Update at 509). The Wailua WWTP has a design flow of 1.5 MGD "but actual capacity is 1.0 MGD. The head works facility does not work properly and needs replacement. The Rapid Bloc Activated Sludge system does not work and needs replacement. A new pump station is needed and the collection system should be extended." *Id.* at 509. The Wastewater Branch Chief has advised, however, that there is currently no budget for the needed upgrade. The four municipal wastewater systems were all constructed in the 1970s. They consist of gravity flow pipelines, manholes, pump stations, force mains and the treatment plant. *Id.* at 508.

Having lived on Kauai for some time, I am aware that approved ~~of~~ subdivisions can wait many years before construction begins because of the lack of sufficient infrastructure, as for instance has been the case with the Kulana Subdivision, which lies near to the proposed HoKua Place site. It has been over 20 years since the subdivision was approved, and the infrastructure has only this year been approved to permit home construction. I want to compliment the County on its Discharge Monitoring Reports and its accurate record keeping. This documentation supports the Wastewater Chief's concern about the County's inability to service the HoKua Place development.

Q. Does this conclude your testimony?

A. Yes.

FINAL
ENVIRONMENTAL ASSESSMENT

WAILUA FACILITY PLAN

Prepared for:

County of Kauai
Department of Public Works
Division of Wastewater Management

April 2008

Fukunaga & Associates, Inc.
Consulting Engineers
1388 Kapiolani Boulevard, 2nd Floor
Honolulu, Hawaii 96814
(808) 944-1821

EXHIBIT "I-64"

Project Summary

Project:	Wailua Facility Plan
Proposing Agency:	County of Kauai, Department of Public Works Division of Wastewater Management
Contact Person:	Mr. Edward Tschupp, P.E. Division of Wastewater Management Chief
Purpose:	A planning study for the expansion and management of the Wailua wastewater system to the year 2025
Anticipated Determination:	Finding of No Significant Impact (FONSI)
Location:	Wailua, Island of Kauai, State of Hawaii
Wailua WWTP Service Area	
Tax Map Key:	Fourth District, Third Zone, Ninth Section Fourth District, Fourth Zone, First Section Fourth District, Fourth Zone, Third Section Fourth District, Fourth Zone, Fifth Section Fourth District, Fourth Zone, Sixth Section
Property Owner:	Various
State Land Use Classification:	Various
County Zoning Ordinance:	Various
Wailua WWTP	
Tax Map Key:	Fourth District, Third Zone, Ninth Section, Sixth Plat, Nineteen Parcel
Property Owner:	County of Kauai
State Land Use Classification:	Urban
County Zoning Ordinance:	Open
Pre-assessment Consultation:	State Department of Hawaiian Home Lands County of Kauai, Department of Planning County of Kauai, Department of Public Works U.S. Fish and Wildlife Services National Oceanic and Atmospheric Administration (NOAA), The Pacific Islands Regional Office of the National Marine Fisheries Service (NMFS)

I. INTRODUCTION

A. PROJECT SUMMARY

The purpose of this project is to develop a comprehensive wastewater facility plan for the Wailua Wastewater System, County of Kauai, State of Hawaii.

The planning period for this project encompasses the period from the present to the year 2025. This report will be used to help improve water quality, protect public health, and accommodate planned future growth. The plan includes estimates of future wastewater flow based on population growth projection up to the year 2025. The plan also evaluates future wastewater treatment and effluent disposal alternatives and estimates costs and pricing data for the alternatives. These considerations will be used to determine the expansion needs for the Wailua Wastewater Treatment Plant (WWTP) and other construction within the Wailua wastewater system, and determine the timing for when the improvements should be implemented.

For the overall planning period, three planning intervals were selected as follows: near term, middle term, and far term. The near term improvements should be implemented within the next few years (present-2010). The middle term improvements are in the following five years (2010-2015). The far term improvements are in the following 10 years (2015-2025) or beyond after middle term improvements.

The projects described in this plan may be funded by Federal Funds through the State of Hawaii Clean Water State Revolving Fund Program. The projects will be required to meet all National Environmental Policy Act (NEPA) and Hawaii State Revolving Fund Program (HSRFP) requirements.

B. BACKGROUND

The Wailua WWTP was originally constructed in 1964 and receives wastewater from the Kapaa, Papaloa, Waipouli, and Wailua areas. The plant was originally designed to treat an average flow of 0.5 million gallon per day (mgd). The plant has gone through four phases of construction, the most recent in 1992 to expand to the current design average daily flow of 1.5 mgd and a design peak flow capacity of 5.03 mgd. However due to age and a harsh salt air environment, the actual treatment capacity is reduced to 1.0 mgd. Moreover, the treatment capacity of 1.0 mgd is not reliable due to a lack of standby units. Several processes are in poor condition and in need of repair. However, the lack of standby units makes it difficult to remove these units from service for repair and maintenance.

The existing collection system consists of gravity lines, pump stations, and force mains. The collection system is centered in the coastal area along the Kuhio Highway. The project location map is shown on Figure 1.

There are several projects, either public or private, that may affect portions of the Wailua-Kapaa sewage system, including:

- As part of the renovations to the Coco Palms Resort, it may be possible to allocate land to the County for the construction of a new Coco Palms sewer pump station (SPS). The location and size of the parcel will be subject to negotiation.

- The State Department of Transportation (DOT) is planning to widen Kuhio Highway in the vicinity of the Coco Palms SPS. The highway-widening project will encroach on the pump station site. This project is expected to begin construction at the end of 2007.

Careful planning and coordination of construction activities will be necessary.

C. PROJECT TECHNICAL DESCRIPTION

1. Existing Facilities

The Wailua WWTP is located on approximately 2.1 acres of County owned land next to Lydgate Park. The treatment plant is designated as an R-2 facility, which means the plant provides secondary treatment and disinfection. This meets the minimum requirements for wastewater treatment per Hawaii Administrative Rules (HAR) Title 11, Chapter 62. The current plant layout is shown on Figure 2.

In the Wailua-Kapaa area, wastewater treatment is accomplished with Individual Wastewater Systems (IWS), such as cesspools or septic tanks, or at the County owned and operated Wailua WWTP. Figure 3 shows the parcels in the Wailua-Kapaa area that have water and sewer service. IWSs are assumed to be used in the parcels that have water service but no sewer service. Based on that assumption, there are approximately 4,300 residential cesspools in the Wailua-Kapaa area. The discharge of raw waste water directly into the ground is not beneficial to the environment; therefore, Department of Health (DOH) now limits the construction of any new cesspools. Approximately 12% of the cesspools in the Wailua-Kapaa area have reported failures.

The Wailua WWTP currently uses two methods of effluent disposal, which are an ocean outfall and water reuse for irrigation at the adjacent Wailua Golf Course. Treated effluent is conveyed to the golf course by pumping out of the effluent chamber downstream of the chlorine contact basin. Effluent sent to the ocean outfall flows by gravity to the ocean through an overflow pipe. When effluent is sent to the golf course, it is stored in a reservoir located at the golf course and is pumped out as required for irrigation.

TABLE 1
Summary of Recommendations, Wailua Wastewater Facility Plan

PHASE & IMPROVEMENT TYPE	PROJECT NAME	PROJECT JUSTIFICATION	ESTIMATED COST
Near Term (<5 Years)			
Repair/Rehab Collection System	Upgrade or Replace Coco Palms SPS	Site Location Marginal, Capacity Inadequate	$4,240,000
Repair/Rehab WWTP	1. WWTP Process, Electrical & Disinfection Equip. 2.Restore/Upgrade Treatment Process	1. Electrical System Inadequate, Equipment in need of Upgrade/Replace 2. WWTP capacity limited to 1.0 MGD (permitted for 1.5 MGD). Capacity will be inadequate by mid-term	$7,800,000 $8,000,000
Mid Term (5 - 10+Yrs)			
Repair/Rehab Collection System	Replace SPS 3,4 & 5	Age & Condition	$7,000,000
Repair/Rehab WWTP	Replace On-site Pump Station	Age & Condition	$600,000
Far Term (>10+ Yrs)			
Repair/Rehab Collection System	Parallel sewer line on Leho Dr.	Existing sewer inadequate	$637,000
Expand/Upgrade Collection System	1. Expand Sewers to Lower Kapaa [1] 2. Expand sewers to Wailua House Lots[1] 3. Expand Sewers to Wailua Homesteads[1] 4. Expand sewers to upper Kapaa[1]	Sewer areas with chronic cesspool problems Expand collection system Expand collection system Expand collection system	$36,400,000 $40,200,000 $105,000,000 $60,000,000
Expand/Upgrade WWTP	1. Wailua WWTP Expansion to 2.0 MGD 2. Construct new Kapaa WWTP[2]	1. Capacity Projected to be Inadequate 2. WWTP for expanded collection system	$23,000,000 $25,900,000

Notes:

1. Term of sewer collection system is undetermined and is subject to availability of funds.
2. Term of Kapaa WWTP is undetermined and is subject to growth and expansion of the collection system

D. LAND ACQUISITION

The Wailua WWTP will require additional land to expand the treatment plant for the middle term flows. Approximately 1.6 acres of land east of the existing treatment plant are needed for this expansion. The land adjacent to the treatment plant is owned by the County of Kauai and is part of the Wailua River State Park. Transfer of this property to the Department of Public Works (DPW) is necessary.

The County will also need to acquire land to construct a new treatment plant in Kapaa. The County should engage in discussions with landowners of properties that may be suitable for acquisition for a future WWTP site. Early negotiation with landowners will allow the County to reserve the land so that it is available when needed.

The County will also need to acquire new sites to replace the existing old pump stations. The County should continue negotiations with the owners of the Coco Palms Resort to acquire a site for the new Coco Palms SPS. The County should begin negotiations with the landowners of the resorts along Papaloa Road and Aleka Loop to acquire land for new pump station(s) there.

E. DEPARTMENT OF HAWAIIAN HOME LANDS

The DHHL development in Wailua is currently not in the Wailua-Kapaa service area. The development area is designated Agricultural and outside the Urban land use of County & State General Plans. The projected wastewater flow from the DHHL development is approximately 0.35 mgd in the middle term and an additional 0.30 mgd in the far term. Connection to the County system will have a significant impact on plant flow and expansion plans. Connecting to the County collection system could accelerate the need of a new Kapaa WWTP. If DHHL connects to the County collection system during the middle term, incoming wastewater flow will be approximately 1.74 mgd, which exceeds the projected middle term capacity of 1.5 mgd. The following facilities recommended for the far term would have to be moved up to the middle term to accommodate the DHHL flow and increase plant capacity to 2.0 mgd:

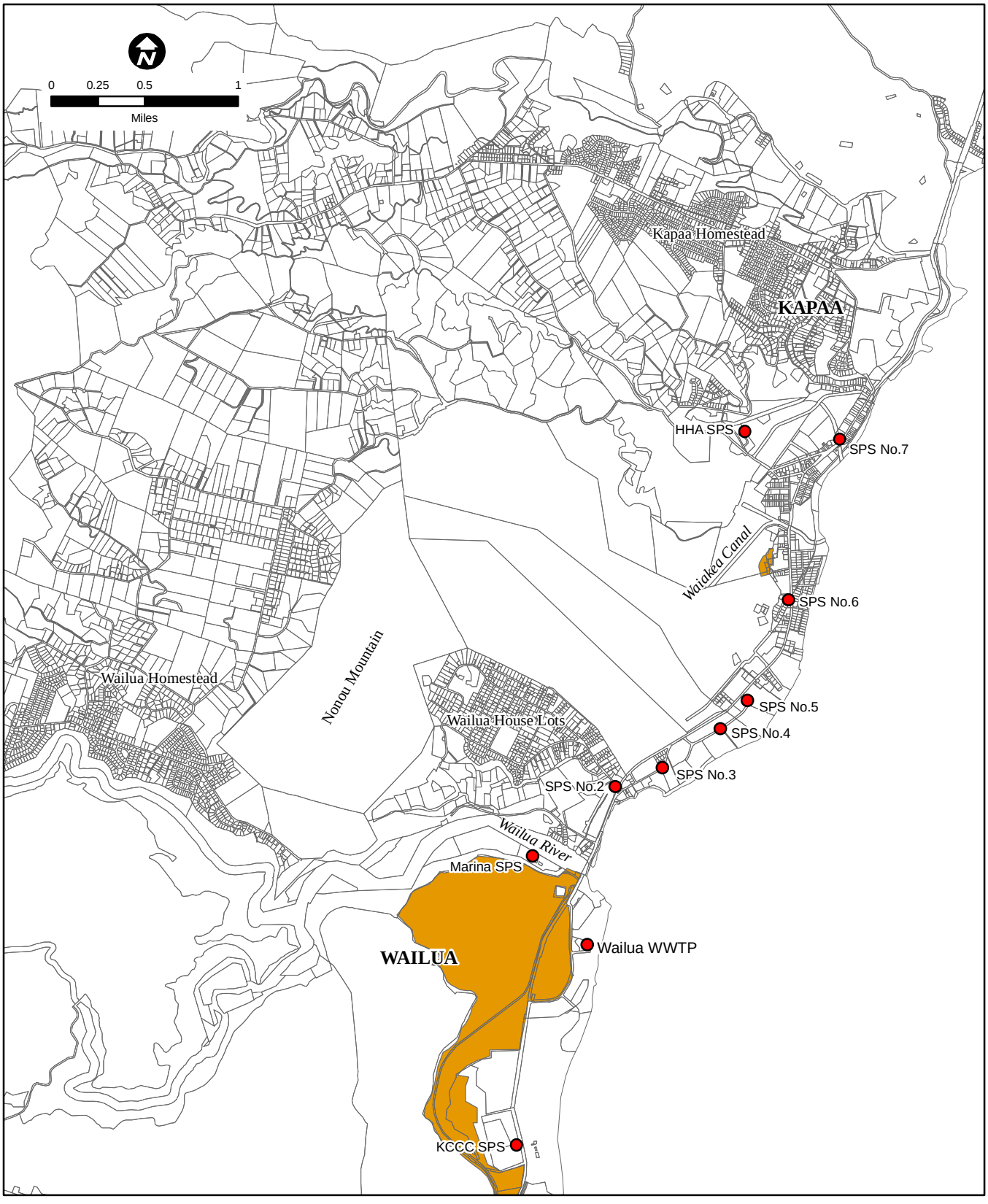
- Construct an influent gravity line parallel to the 24” line recently installed.

The far term expansion to 2.0 mgd will not have sufficient capacity to accommodate the DHHL flow. The estimated flows for far term (1.72 mgd) and an additional flow from DHHL (0.65 mgd) will bring the average daily flow to approximately 2.37 mgd. The following additional facilities will be required for the far term to accommodate the DHHL flow and increase plant capacity to 2.5 mgd:

- Construct additional membrane tanks, including permeate pumps, RAS pumps, and blowers.
- Construct additional surge basins adjacent to the existing basins.
- Construct additional effluent disposal facilities.

Beyond the far term, if all non-agricultural properties in the Wailua and Kapaa area are connected to the County collection system, the service area will be divided between the Wailua WWTP and a new Kapaa WWTP. The total wastewater flow to the Wailua WWTP (including DHHL) will be approximately 2.33 mgd.

Figure 7 shows the proposed DHHL development.



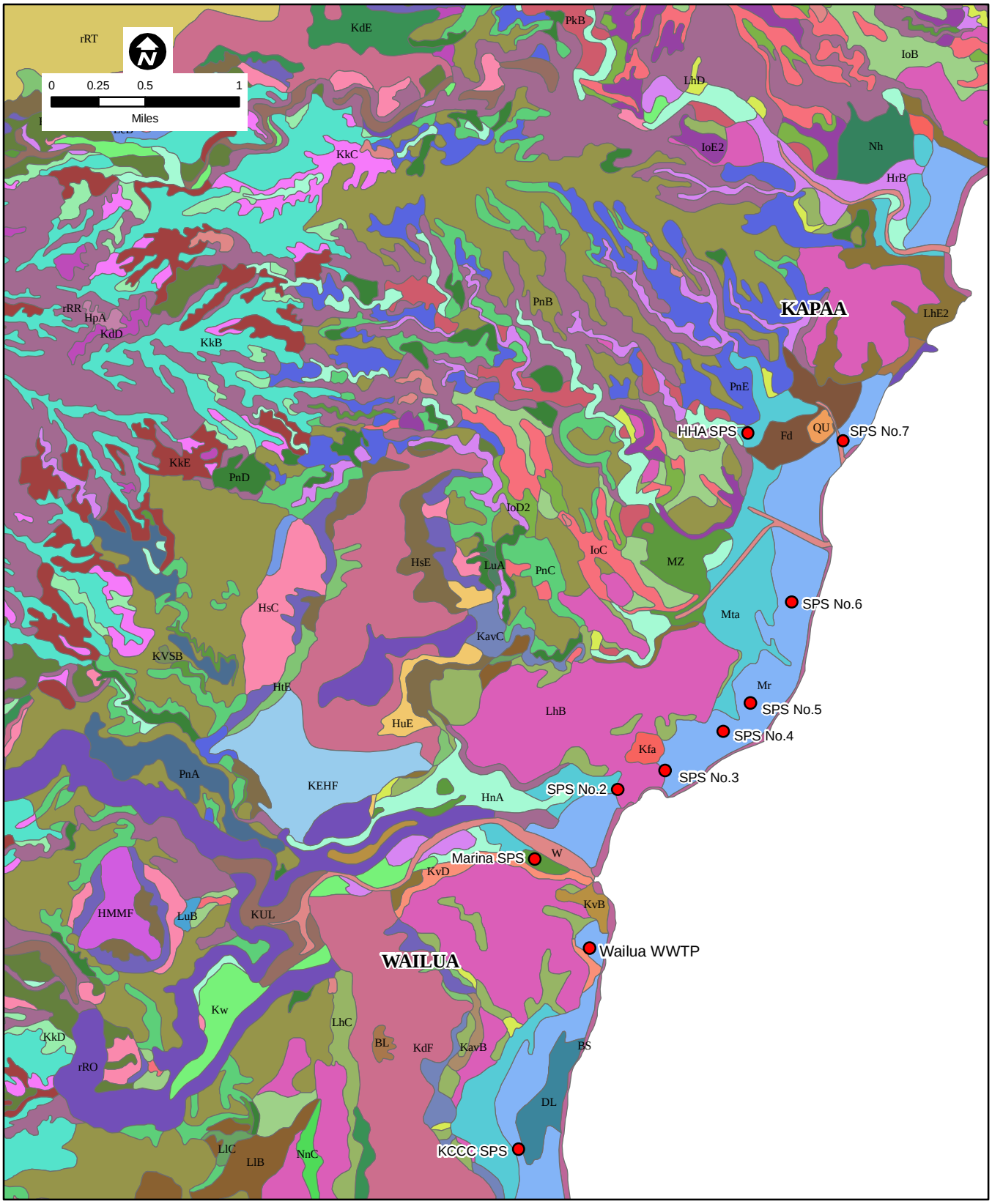
LEGEND:

Proposed DHHL Development

WAILUA FACILITY PLAN **Proposed DHHL Development**

COUNTY OF KAUAI
Department of Public Works
Division of Wastewater Management

FIGURE 7



LEGEND:

LhB Lihue silty clay, 0 to 8 percent slopes (SPS No.2)
Mr Makuleia fine sandy loam (SPS No.3,4,5,6,7, KCCC SPS, Wailua WWTP)
Mta Makuleia clay loam, poorly drained variant (HHA SPS)
MZ Marsh (Marina SPS)

WAILUA FACILITY PLAN **USDA SCS Soils Map**

COUNTY OF KAUAI
Department of Public Works
Division of Wastewater Management

FIGURE 13

8. Climate

   The climate of Wailua is generally warm and subtropical with mild seasonal changes throughout the year. The variations in temperature encountered in the area range between 70.4 and 78.5^{o} F on the average for the coolest and warmest month, respectively.

   The Wailua area is characteristic of the windward coastal region where the prevailing winds, known as the trade winds, are generally from the northeast direction. The average rainfall in Wailua is approximately 49 inches per year per data collected by the National Climatic Data Center between the years 1971 and 2000 (reference 5).

9. Flood and Tsunami

   The Flood Insurance Rate Map (FIRM), issued by the Federal Emergency Management Agency (FEMA), indicates that the Wailua WWTP is located in Zone X. This is an area determined to be outside of the 100 year flood plain. SPS No.3, 4, 5 and HHA SPS are also located within Zone X, while Marina SPS, KCCC SPS, SPS No.2, 6, and 7 are located Zone A, which is the 1% annual chance in 100 year. Figure 15 shows the flood zones for the Wailua area.

   Recent Tsunami Evacuation Maps, as published by the Civil Defense Agency, indicates that the existing Wailua WWTP is not currently in a Tsunami Evacuation Zone. SPS No.3, 4, 5, 7 and the Marina SPS are located in a Tsunami Evacuation Zone, as shown in Figure 16. In the event of a tsunami warning, people in all areas within the Tsunami Evacuation Zone must be evacuated and follow additional instructions issued by the Civil Defense Agency.

   Historical tsunami data indicated a wave height ranged from 12 to 20 feet along the shoreline near the project areas during both the 1946 and 1957 tsunamis.

FINAL REPORTS

GENERAL PLAN UPDATE
KAUA‘I INFRASTRUCTURE ANALYSIS

1. TRANSPORTATION SYSTEM
2. DRAINAGE SYSTEM
3. WATER SYSTEM
4. WASTEWATER SYSTEM
5. SOLID WASTE SYSTEM

May 2015

PREPARED FOR:

County of Kaua‘i

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Solid Waste System

Executive Summary

This study provides an analysis of the various infrastructure systems servicing the residents of the County of Kaua‘i. It describes existing infrastructure, conditions, deficiencies, demand forecast, and recommendations for solutions. This study is intended to be used as a technical analysis during the Kaua‘i General Plan Update process.

The infrastructure analysis was based on consultations with County agencies and a review of existing and ongoing studies. Cost estimates for the needed improvements were obtained from County agencies or existing and ongoing studies where available.

While the original scope of the project did not include a review of private systems, interviews and research of private systems were included to the extent possible in order to provide a more comprehensive view of the island’s infrastructure.

Transportation System

The transportation system components evaluated were roadway, freight, public transit, bikeway, pedestrian, and emergency response systems. Existing infrastructure, travel demand, and level of service are described. The report includes transportation goals and objectives according to (1) Federal-Aid Highways 2035 Transportation Plan (FAHTP) and (2) Kaua’i Multimodal Land Transportation Plan (MLTP). The FAHTP developed a list of recommended long-range potential solutions to address system preservation, safety, capacity, and congestion needs as well as multimodal infrastructure solutions. The list of program solutions is not fiscally constrained, meaning the potential solutions are recommended based on need and the ability to meet Plan goals, and not on fiscal limitations. The FAHTP proposes solutions to address transportation issues and needs from the regional stand point.

A Future scenario analysis was used to guide development of programs for implementation of the MLTP. Using multiple performance indicators, two potential future scenarios were developed. The Baseline Scenario assumes no intervention in travel behavior to alter current trends, which would result in a 19 percent increase in traffic levels island-wide by 2035. In the Preferred Scenario, interventions were identified to maintain traffic levels at 2010 levels through 2035. The interventions include having a much higher percentage of people walk, bike, and use transit, resulting in a lower percentage of driving trips. According to the MLTP, achieving the Preferred Scenario requires a change in some of the drive-alone trips to other modes of transportation such as walking, biking, and transit. The primary objective is to prevent further growth in vehicular traffic despite an anticipated increase in population. The plan describes six programs that the County, the State, and other agencies will need to deploy between now and 2035: including a transit program, a bicycle program, a pedestrian program, a county roads program, an agriculture transportation program, and a land use program.

The key difference between the FAHTP and the MLTP is the creation of the Preferred Scenario in the MLTP where interventions were assumed to be implemented which would result in no increase in traffic levels, thereby reducing the need for the expensive capacity improvement projects identified in the FAHTP.

Drainage System

The existing drainage system and the island's principal flood problems are described, as documented by the Federal Emergency Management Agency (FEMA) in the Flood Insurance Study (FIS) of Kaua‘i County. Three types of flooding are described: stream overflow, tsunamis, and hurricanes.

The streams and rivers are the major drainage systems for Kaua‘i. There is also a system of sugar cane irrigation ditches throughout the island which act as drainage channels. The Kaua‘i County Storm Water Runoff System Manual (Drainage Standards), adopted in July 2001, promote the maintenance of these natural drainageways. In order to reduce flooding due to the limited capacity of these natural drainageways the Department of the Army Corps of Engineers constructed flood protection levees along certain streams on Kaua‘i.

There is no Drainage Master Plan for the island, only for communities and developments. The Department of Public Works intends to focus on specific problem areas and watersheds, with the objective of developing strategic plans that specify preventive as well as remedial actions.

Drainage Master Plans are recommended for flood-prone areas such as Hanalei, Nāwiliwili, Kapa‘a, Wailua, Po‘ipū and Kekaha. The Drainage Master Plans would provide detailed analysis of the flood conditions and assess the feasibility of levees, detention basins, or other flood control alternatives.

The Kaua‘i County Code of 2006 defines the standards and requirements for new development storm drainage infrastructure as follows:

- Protect and preserve existing natural drainage channels;
- Protect the subdivision from flood hazards;
- Provide a system by which water within the subdivision will be removed without causing damage or harm to the natural environment, or to property or persons;
- In order to protect the water courses and shorelines, reduce the amount of pollutants and sediments to no greater than predevelopment levels;
- In order to protect the water courses and shorelines, maintain peak runoff rate and volume similar to predevelopment rates; and

- Protect wetlands and other similar areas that provide water quality benefits. For example, provide for the crossing of water courses by spanning rather than by culverts when possible, so that natural stream beds will not be altered where the alterations will cause undue environmental change.

For new developments, the Kaua‘i Drainage Standards recommend storm runoff detention to maintain storm runoff to pre-development rates.

Water System

Many of the oldest existing water systems were initially constructed by sugar plantations and later expanded and transitioned to the County Department of Water (DOW) for management, control and operation.

There are thirteen (13) existing County systems that serve particular service areas: Waimea-Kekaha, Hanapēpē-‘Ele‘ele, Kalāheo, Lāwai-Ōma‘o, Kōloa-Po‘ipū, Puhi-Līhu‘e-Hanamā‘ulu, Wailua-Kapa‘a, Anahola, Moloa‘a, Kīlauea-Waipake-Kalihiwai, Anini, Hanalei, and Wainiha-Hā‘ena. Existing private systems include the Grove Farm Water Purification Plant, Princeville Utilities, and the Pacific Missile Range Facility (PMRF).

As required by HRS Section 46-143(1)(A), the Needs Assessment Study and Facility Reserve Charge Update has been prepared to identify the existing deficiencies in source and storage systems. The latest version of the Needs Assessment Study was prepared for the DOW in November of 2013, but it is still in draft form and not yet approved by the DOW.

This report includes a brief description of the existing source, storage and transmission deficiencies according to the November 2013 Draft Needs Assessment Study. The existing deficiencies are due to age, deterioration, or inadequate size based on current fire protection standards.

In the Water Plan 2020 report, historical water use data from 1995 to 1998 were used in conjunction with population and land use projections from the 2000 Kaua‘i General Plan to develop future water demands in 2005, 2010 and 2020. In the November 2013 draft of the Needs Assessment Study, the water demand projections for 2030 were calculated by interpolating the population projections in the Water Plan 2020 report for the years 2020 and 2050, and then applying the year 2020 water usage rates.

The Water Plan 2020 report developed capital improvement projects to address the long-term water system needs as part of its Capital Improvements Program (CIP) development. Since the Water Plan 2020 report was approved in 2000, many of the projects have been constructed. The November 2013 draft Needs Assessment report presented an updated summary list of Capital Facilities Projects.

After the current update of the Kaua‘i General Plan, the Department of Water will commence with the new Water Plan 2040 study. The new study will incorporate the population and demographic projections in the SAF prepared for the General Plan update. It is recommended that the new study also include:

- Assessment of the feasibility and desirability of integration of private water systems into the County water system; and
- Assessment of the use of renewable energy at its facilities.

Wastewater System

There are various centralized wastewater systems on the island either privately owned or owned by the County of Kaua‘i. This report summarizes the wastewater master plans completed for the major areas on the island.

The County provides wastewater service to Waimea, Hanapēpē-‘Ele‘ele, Līhu‘e-Hanamā‘ulu, and Wailua-Kapa‘a. There are numerous privately owned wastewater systems on Kaua‘i. In rural areas where wastewater service is not available, many residents and smaller businesses use Individual Wastewater Systems (IWS) and cesspools. The areas that rely on private wastewater treatment plants or IWSs/cesspools include Puhi, Kekaha, Princeville, and Po‘ipū. Other private systems service smaller areas including Nāwiliwili, Kokee, Kalepa Village, Huleia, and Whaler’s Cove.

Wastewater flow rates are typically estimated according to land use and population estimates. Whether the treatment plant is County-owned or privately-owned, the design capacity of the wastewater treatment system must be able to meet the demand. Improvements and expansions may also be necessary to satisfy increasing volumes of wastewater from newly developed regions.

Future demands and recommended improvements are reported for the County’s wastewater system consisting of the Waimea Wastewater Treatment Plant, the ‘Ele‘ele Wastewater Treatment Plant, the Līhu‘e Wastewater Treatment Plant, and the Wailua Wastewater Treatment Plan.

Solid Waste System

The solid waste infrastructure analysis begins with an overview of the existing solid waste management system of waste collection and disposal, as well as existing programs related to reuse, recycling, and recovery.

Solid waste composition and quantities generation are projected over a 15-year planning period from 2020 to 2035. Currently, the County estimates that its diversion rate is approximately 31

percent. The County's Integrated Solid Waste Management Plan (ISWMP) recommends a set of programs, activities, and facilities to be implemented in order to reduce the rate of source generation, and increase the rate of waste diversion, by reuse, recycling, and recovery. The County has identified a Resource Recovery Park (RRP) project as a critical element to achieve its long-term goal to increase its diversion rate to 70 percent by 2023.

The County plans to continue permitting and construction activities for the lateral and vertical expansion of Kekaha Municipal Solid Waste Landfill (MSWLF). A new landfill facility will be required once Kekaha MSWLF reaches capacity.

Alternative disposal technologies are considered including a biorefinery facility, a Landfill Gas to Energy (LGtE) facility, a Waste-to-Energy (WtE) facility, and a Waste-to-Fuel (WtF) facility.

Many businesses in the County are involved in source reduction activities by providing opportunities for residents to reuse items rather than buying new products. These companies include Aloha Shares Network, local pig farms, Habitat for Humanity, thrift stores, the Local Trade radio program on KONG AM 570, foam peanut reuse at the County Recycling Office, and the Kaua‘i Food Bank.

GENERAL PLAN UPDATE

KAUAʻI INFRASTRUCTURE ANALYSIS

TRANSPORTATION SYSTEM

Prepared For

County of Kauaʻi

Prepared By

R.M. Towill Corporation

May 2015

Transportation

The purpose of the transportation infrastructure analysis in relation to the General Plan Update is to present the two primary transportation planning documents for the island of Kaua`i, contrast the assumptions and methodology used for each document, and compare the projections used for each document with updated projections which have been prepared for the General Plan Update. This information can be used by the County to set forth policies to guide future capacity improvements to the County's transportation system.

Section 1. Existing Transportation Planning Documents

This section provides a summary of the two primary transportation planning documents for the island of Kaua`i.

1.1 Federal-Aid Highways 2035 Transportation Plan (FAHTP)

The Federal-Aid Highways 2035 Transportation Plan (FAHTP) for the District of Kaua`i was finalized by the State Department of Transportation in July 2014. The FAHTP is a long-range plan assessing future forecast demand against existing transportation infrastructure to determine needs and deficiencies for the Federal-Aid highway system. Stakeholder groups helped identify regional system needs in alignment with statewide and federal planning factors to develop the final goals and objectives of the Plan:

- Preserve and maintain the existing transportation system
- Maintain and improve safety for all modes
- Provide modal integration and complete streets
- Improve capacity and system efficiency
- Support evacuation and emergency access/egress during incidents
- Promote resiliency and ability to respond to climate change
- Better funding levels

Stakeholder groups also identified needs and deficiencies:

- Address capacity needs and congestion
- Provide emergency access/egress to communities
- Improve safety of non-motorized modes

- Improve transit service
- Maintain clear highway operations during heavy rains

The FAHTP developed a list of recommended long-range potential solutions to address system preservation, safety, capacity, and congestion needs as well as multimodal infrastructure solutions.

1.2 Kaua`i Multimodal Land Transportation Plan (MLTP)

The Kaua`i Multimodal Land Transportation Plan (MLTP) was prepared by Charlier Associates, Inc. for the County of Kaua`i. The MLTP, adopted by the Kaua`i County Council on January 30, 2013, set forth the following goals and objectives:

Goal 1. Kaua‘i County will be served by a balanced, multimodal transportation system that provides choice, flexibility and resiliency in personal access and circulation for all.

Objectives:

a. Increase the range of practical mode choices available for access and circulation

b. Increase transit service levels

c. Reduce single−occupant vehicle mode share

d. Reduce VMT (vehicle miles of travel) per capita

e. Shorten trip lengths (all modes)

f. Improve connectivity between local land uses (all modes)

g. Ensure equitable access and mobility for all ages and income levels

Goal 2. Kaua‘i County will be served by a freight transport system that supports the island’s economic sectors, including food and agriculture, health and wellness, sports and recreation, arts and culture, science and technology, and sustainable technologies and practices.

Objectives:

a. Encourage job growth

b. Support local, sustainable agriculture production, processing or distribution

c. Improve access to community gardens and farmers' markets

d. Advance sustainable technologies and practices in freight transport

e. Protect highway freight transport from the impacts of short term storm and seismic events and long term sea level rise

Goal 3. Kaua'i County will be served by a transportation system that supports economic vitality and provides affordable access to jobs and economic opportunity.

Objectives:

a. Reduce the cost of commuting to work

b. Reduces the % of household expenditures for housing and transportation

c. Create jobs associated with sustainable transportation technologies

d. Protect personal access and mobility from the impacts of short term storm and seismic events and long term sea level rise

Goal 4. The Kaua'i County transportation system will support and enhance public health.

Objectives:

a. Improve the safety of walking in neighborhoods, villages and towns

b. Improve the safety of bicycling in neighborhoods, villages and towns

c. Provide access to local recreational facilities, parks and trails for island residents

d. Provide safe, convenient pedestrian connections between homes and schools

e. Provide safe, convenient bicycle connections between homes and schools

Goal 5. The Kaua'i County transportation system will be planned and designed to protect and enhance the island's natural landscapes and environmental quality.

Objectives:

a. Reduce the physical footprint of roads, streets and drive aisles

b. Reduce the physical footprint of surface parking

c. Reduce per capita air pollutant emissions from motor vehicles

d. Reduce per capita carbon emissions from motor vehicles

Goal 6. Kaua‘i County will be served by a transportation system that makes efficient use of energy and is less dependent on imported petroleum.

Objectives:

a. Reduce per capita consumption of petroleum-based fuels in motor vehicles

b. Reduce per capita consumption of energy for access and circulation

c. Encourage development of alternative energy sources for motor vehicles

d. Reduce the cost of alternative energy sources for motor vehicles

e. Encourage and facilitate non-auto travel choices for visitors and tourists

Goal 7. The Kaua‘i County transportation system will be maintained in a state of good repair.

Objectives:

a. Provide maintenance, repair and recapitalization of transit capital facilities

b. Provide maintenance, repair and recapitalization of roadway facilities

c. Provide maintenance, repair and recapitalization of pedestrian facilities

d. Provide maintenance, repair and recapitalization of bicycle capital facilities

Goal 8. Kaua‘i County will be served by a transportation system that protects and enhances the cultural values of Kaua‘i, the rural character of the island and a high quality of life.

Objectives:

a. Protect cultural resources and sites

b. Reduce the concentration of tourism activity at over-used beaches and other sites

c. Enhance the cultural values and traditions of Kaua‘i

d. Restore historic and prehistoric access routes to appropriate, low impact use

e. Protect and enhances scenic resources

A Future scenario analysis was used to guide development of programs for implementation of the MLTP. Using multiple performance indicators, two potential future scenarios were developed. The Baseline Scenario assumes no intervention in travel behavior to alter current trends, which would result in a 19 percent increase in traffic levels island-wide by 2035. In the Preferred Scenario, interventions were identified to maintain traffic levels at 2010 levels through 2035. The interventions include having a much higher percentage of people walk, bike, and use transit, resulting in a lower percentage of driving trips.

The following performance monitoring indicators were used in the MLTP:

- Annual VMT (Vehicle Miles Traveled)
- Per Capita VMT
- Annual Motor Fuel Consumption
- Per Capita Motor Fuel Consumption
- GHG (Greenhouse Gas) Emissions
- Vehicle Collision Rate
- Mode Share
- Transit Ridership
- Physical Activity Levels
- Annual Household Transportation Costs

The results of the future scenario analysis showed that implementation of the Preferred Scenario would result in outcomes that support man of the goals of the MLTP:

- Reduced energy consumption;
- No increase in traffic levels;
- Reduced household transportation costs;
- Increased levels of physical activity; and
- An increase in the use of the non-driving modes of transportation, including walking, biking and transit.

The MLTP provided six programs to implement an island-wide multimodal transportation network: a transit program, a bicycle program, a pedestrian program, a county roads program, an agriculture transportation program, and a land use program.

1.3 Key Difference

The key difference between the FAHTP and the MLTP is the creation of the Preferred Scenario in the MLTP where interventions were assumed to be implemented which would result in no increase in traffic levels, thereby reducing the need for the expensive capacity improvement projects identified in the FAHTP.

The population projections also differed between the two reports. In the FAHTP the population in Kaua'i was projected to grow by over 30 percent by 2035, whereas in the MLTP the population in Kaua'i was projected to grow by 27 percent by 2035.

Section 2. Overview of Existing Transportation System

2.1 Introduction

This section describes the existing roadway system and the existing and projected travel demand.

2.2 Existing Roadway System

There are a total of 417 miles of public roads on Kaua`i, of which 107 miles are part of the State highway system. Kaumuali`i Highway (State Route 50) and Kūhiō Highway (State Route 56 and State Road 560) serve as the primary roadways around the perimeter of the island. These two highways provide connections to and from other towns and communities, and provide further local access via a network of minor arterials and collector roadways.

Kaumuali`i Highway extends approximately 33 miles to the west of Līhu`e. It is the main highway providing access to the West Side, starting as a principal arterial between Līhu`e and Ōma`o. It is classified as a minor arterial from Ōma`o through Hanapepe and Waimea, ending at Barking Sands to the west. Extending mauka and makai from Kaumuali`i Highway to provide local access are a number of collector roadways such as Waimea Canyon Road, Halewili Road, Maluhia Road, Ōma`o Road, Po`ipū Road, and Ala Kinoiki Road.

Kūhiō Highway is a 38-mile roadway to the north of Līhu`e, and is the sole access between the north shore and Līhu`e. It begins as a principal arterial from Līhu`e to Kapa`a and Wailua, and continues as a minor arterial around the northeast perimeter of the island through Anahola and Princeville. It is classified as a collector roadway from Hanalei to the west end of Hā`ena.

Within Līhu`e, Ahukini Road (State Route 570), Kapule Highway / Rice Street (State Route 51), Nāwiliwili Road (State Route 58) are classified as principal arterial roadways and provide local circulation to businesses, retail, the airport and harbor.

The Federal Aid System examined in the Federal-Aid Highways 2035 Transportation Plan (FAHTP) includes roadways under both State and Kaua`i County jurisdiction classified as collectors and arterials. The island's existing roadway system is shown on Figure 2.2.1, depicting State and County roadways, scenic roadways, and other paved and unpaved roads.

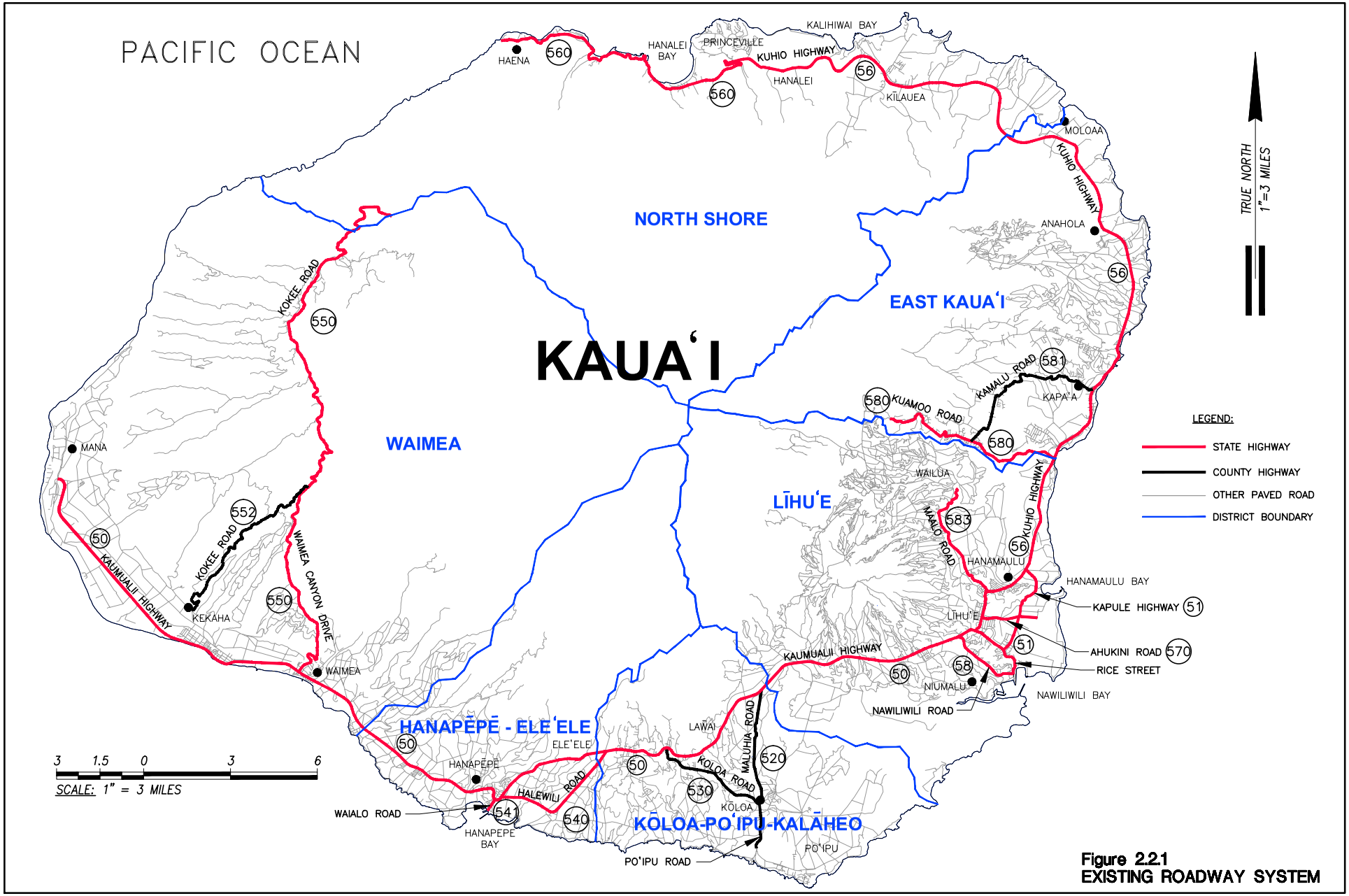

Figure 2.2.1
EXISTING ROADWAY SYSTEM

2.3 Travel Demand

Travel demand includes the following different modes of travel: general vehicles, freight vehicles, transit, bicycles, pedestrians, and emergency response vehicles. The following discussion compares the existing and projected travel demand developed by the Federal-Aid Highway System Transportation Plan 2035 (FAHTP) and the Multimodal Land Transportation Plan (MLTP) and the changing needs for the different travel modes.

2.3.1 Vehicular Volumes

The FAHTP provided a discussion of the existing and projected vehicular volumes in terms of volume to capacity (V/C) ratios and level of service (LOS). The V/C ratio provides a direct comparison of relative vehicular volume to the capacity of a roadway. The LOS describes operating conditions in 6 letter-grade categories. A description of each Level of Service is provided in Table 2.3.1. A V/C ratio of 1.0 indicates the vehicular volume is equal to capacity of the roadway, and is indicative of a LOS F.

Table 2.3.1 Description of Level of Service

Level of Service (LOS)	General Operating Conditions
A	Free flow; vehicular movements are mostly unimpeded with little or no delay
B	Reasonably free flow; vehicular movements are slightly restricted
C	Stable flow; vehicular movements are noticeably restricted
D	Approaching unstable flow; vehicular movements are more limited
E	Unstable flow; vehicular movements are limited by close spacing between vehicles
F	Forced or breakdown flow; vehicular movements are very limited with long wait times or extreme congestion

With Līhu`e being the central hub of the island, the average daily traffic volumes are highest within and around this location. Kaumuali`i Highway carries 36,000 vehicles per day, while

Kūhiō Highway carries over 36,000 vehicles per day (2013 figures). Both of these corridors have a V/C ratio of 1.0 or greater and operate at LOS F. See Figure 2.3.1 for a graphic of the existing operating conditions on the island based on V/C ratio. As shown on Figure 2.3.1, Kaumuali`i Highway is at LOS F from Rice Street to Maluhia Road and also within Kalaheo. Portions of Kaumuali`i Highway are at LOS E near Ōma`o and ‘Ele‘ele. Kūhiō Highway is mostly at LOS F from north of Hanamā`ulu to Kapa`a.

According to the MLTP, the millions of vehicle miles traveled (VMT) increased from 645.4 to 818.3 from 2000 to 2007, but declined to 771.5 in 2010. However, according to the 2013 Hawaii Data Book prepared by the Hawai`i Department of Business, Economic Development and Tourism, the VMT increased to 948.7 in 2013. The amount of driving per person (VMT per capita) followed a similar trend, where the VMT per capita increased from 8,582 to 10,190 from 2000-2006, and then declined to 9,496 in the year 2010, but then increased to 10,605 in 2013. The VMT per capita used the “de facto” population which is the average population present on any given day, which includes visitors and excludes residents temporarily absent.

The FAHTP states that with the projected growth in population and employment, and the anticipated increase in land use and development, traffic volumes are expected to increase by over 30 percent by the year 2035 along Kaumuali`i Highway between Līhu`e and Kalaheo, as well as along Kūhiō Highway between Līhu`e and Kapa`a.

See Figure 2.3.2 for a graphic of the projected operating conditions in the year 2035 on the island based on V/C ratio. As shown on Figure 2.3.2, conditions on Kaumuali`i Highway at Ōma`o worsen to LOS D and LOS F, and to LOS F at ‘Ele’ele. Kapule Highway worsens from LOS D to LOS F. Kūhiō Highway worsens from LOS D to LOS F in Hanamā`ulu. Based on these projected operating conditions, travel times and the potential for delays on these portions of Kaumuali`i Highway and Kapule Highway would increase.

It should be noted that the projected operating conditions presented in the FAHTP are based on different projections and assumptions than the MLTP.

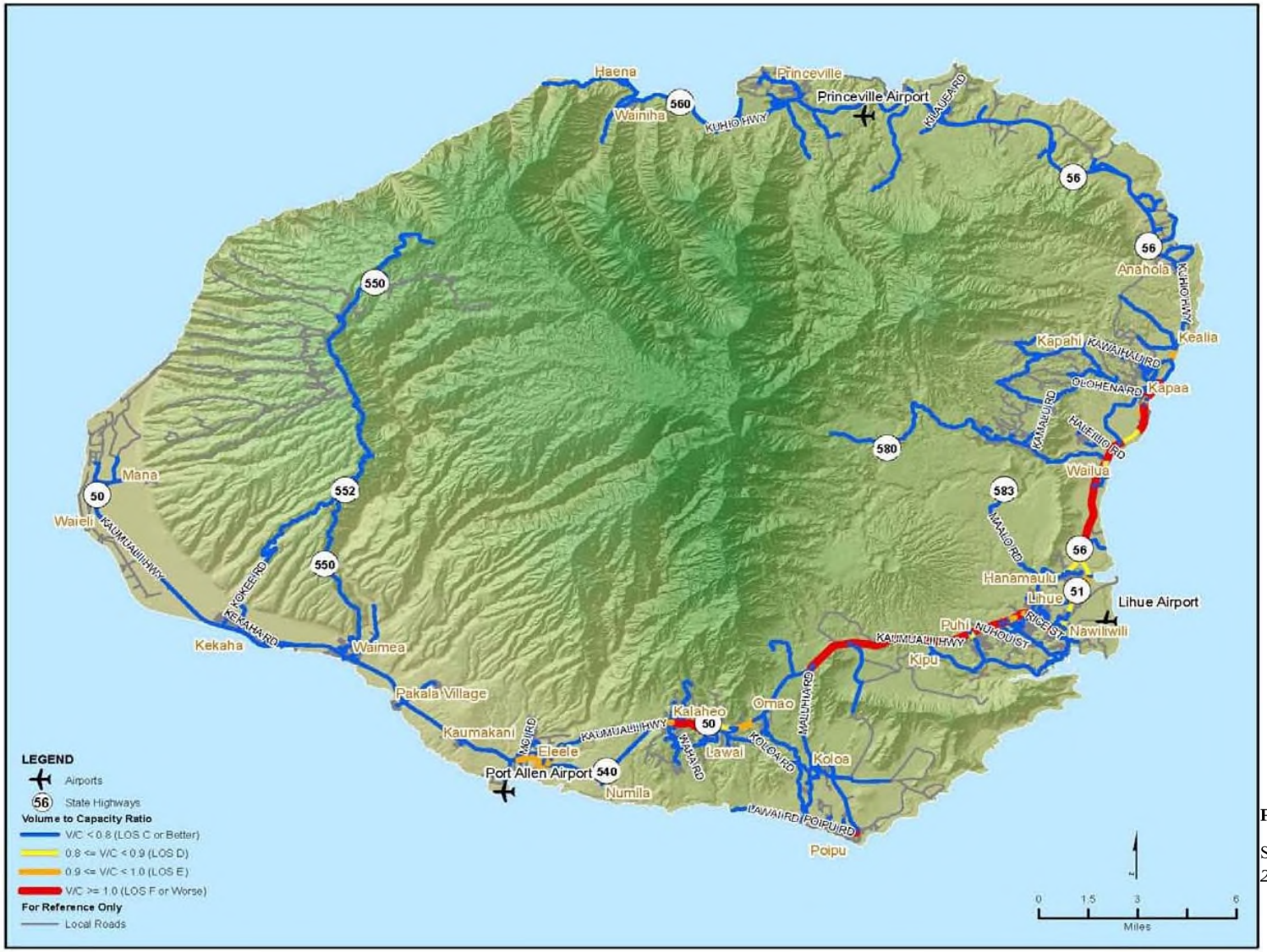

Figure 2.3.1 2007 Volume to Capacity Ratio

Source: *CH2M HILL, Federal-Aid Highways 2035 Transportation Plan, March 2014*

Figure 2.3.2 2035 Volume to Capacity Ratio

Source: *CH2M HILL, Federal-Aid Highways 2035 Transportation Plan, March 2014*

2.3.2 Freight System

Freight activities are concentrated at Līhu`e Airport, Nawiliwili Harbor, and Port Allen Harbor. Nawiliwili Harbor handles approximately 90 percent of all cargo (over 900,000 tons) transported to or leaving from Kaua`i. Freight operations at Port Allen are limited to fuel. Approximately 60,000 freight vehicles annually are necessary to transport the cargo around the island.

According to the FAHTP, with the expected growth of the economy, freight tonnage is expected to increase approximately 20 percent by 2035, resulting in over 1 million tons of cargo handled at Nawiliwili Harbor annually. This translates to about 12,000 additional freight vehicles on Kaua`i's roadway system. As described in Section 2.3.1, traffic volumes on Kaumuali`i Highway, Kūhiō Highway, and Kapule Highway are projected to worsen. Increases in transportation delays will have economic impacts to freight operations if the roadway system is not able to accommodate this increase in demand.

Figures 2.3.3 and 2.3.4 show the existing and projected freight distribution on the island's highways.

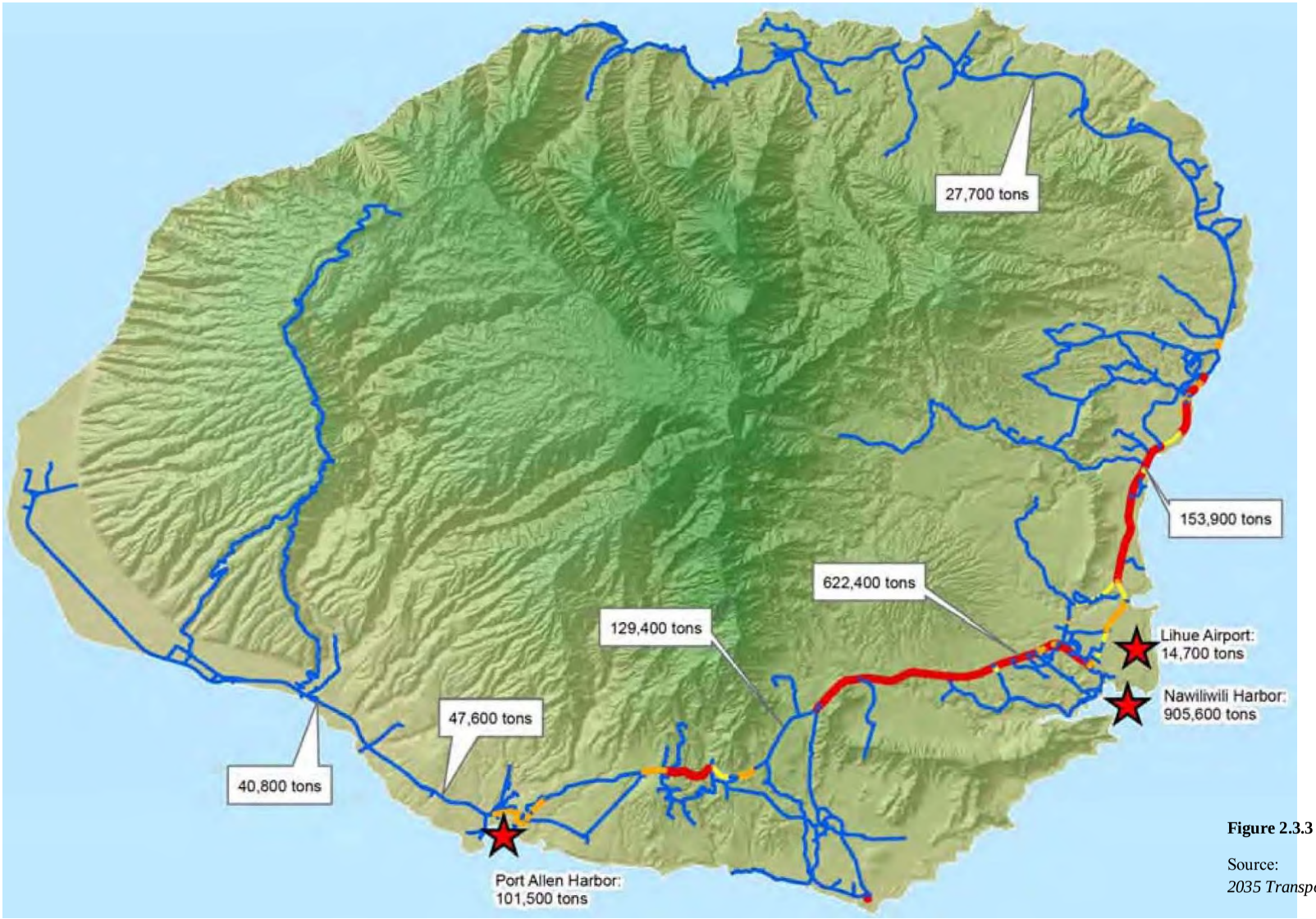

Figure 2.3.3 2007 Freight Distribution

Source: *CH2M HILL, Federal-Aid Highways 2035 Transportation Plan, March 2014*

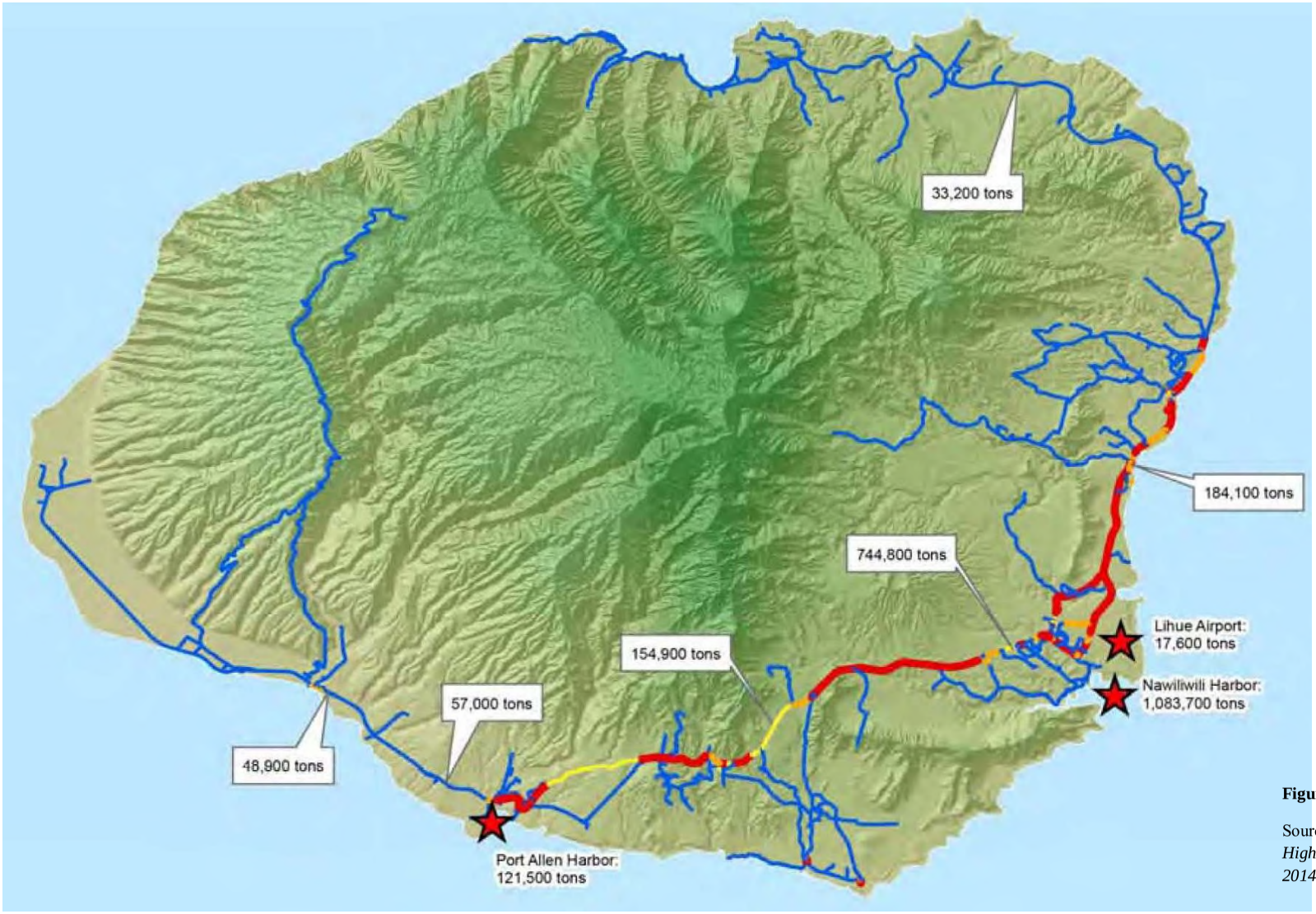

Figure 2.3.4 2035 Freight Distribution

Source: *CH2M HILL, Federal-Aid Highways 2035 Transportation Plan, March 2014*

2.3.3 Public Transit System

The Kaua`i Bus public transit system consists of fixed-route transit service, express service routes, door-to-door para-transit services, and designated park-and-ride lots and transit stops. Mainline fixed-route bus service provides regional service between towns. With Līhu`e being the transit system hub, service extends to Hanalei along Kūhiō Highway, and to Kekaha along Kaumuali`i Highway. The existing transit routes are shown on Figure 2.3.5. Shuttle fixed-route bus service operates within or between adjacent towns. There are currently 55 vehicles in the fleet, operated with County personnel. The vehicles range from 14-passenger vans to buses that range in size from 16 to 33 passengers.

According to the MLTP, the number of weekday riders on the fixed-route bus service has increased significantly from 903 in 2007 to 2,671 in 2012, while ridership on the para-transit service has increased slightly from 172 in 2007 to 193 in 2012.

Transit ridership is expected to increase. To accommodate increased demand, operating efficiency needs to improve, and the number and size of transit vehicles need to increase. Since transit vehicles also share the same roadways as freight and passenger vehicles, traffic operations will need to accommodate the additional demand in order to provide efficient transit service.

2.3.4 Bikeway System

Kaua`i has approximately 23 miles of bicycle facilities of three types: bike paths or shared use paths, bike lanes, and shared roadways.

Future needs have been identified in the State of Hawaii Master Plan: Bike Plan Hawaii for paths and shared facilities on most of the major highways and arterials throughout the island. Shared facilities are intended to accommodate both bicycles and motorized vehicles on the same road. The existing and planned bicycle system is shown on Figure 2.3.6.

2.3.5 Pedestrian System

Pedestrian facilities include sidewalks, crosswalks, and paths. The Statewide Pedestrian Master Plan provides information on existing infrastructure for pedestrians, and identifies areas of concern for the future on the State highway system. Some examples of deficiencies or needs include gaps in sidewalks, narrow shoulders, and lack of crosswalks on roadways meant to be shared with pedestrians. On Figure 2.3.7, the existing State Pedestrian System is shown.

In the MLTP, it was noted that many areas do not have sidewalks. Most County roads outside of town centers do not have sidewalks. Furthermore, many roads lack adequate shoulders for pedestrians due to obstructions or being too narrow. The lack of a safe walking environment results in many residents and visitors choosing to drive instead of to walk, which increases vehicular traffic.

2.3.6 Emergency Response System

Due to the geography and existing roadway configuration on Kaua`i, Kūhiō Highway and Kaumuali`i Highway form a "belt' highway system. Any roadway congestion could delay emergency response time and have adverse impacts to residents and emergency response vehicles trying to reach critical emergency facilities.

Existing roadways and bridges need to be preserved and maintained to remain viable for emergency use. Future traffic congestion needs to be addressed in order to provide efficient emergency response services. A Lihue bypass is being planned, and the existing Wilcox Tunnel (owned by Grove Farm) could be used as a bypass between Lihue and Koloa. A Kapa`a bypass had been considered, but is no longer being pursued.

Section 3. Proposed Solutions

3.1 Introduction

Proposed solutions from the FAHTP and MLTP are presented in the following discussion. The FAHTP discussion focuses on the capacity projects, including a list of the prioritized capacity projects. As described in Section 1, the MLTP solution focuses on a Preferred Scenario where the need for capacity projects is minimized by implementing interventions were identified to maintain traffic levels at 2010 levels through 2035.

3.2 Federal-Aid Highways 2035 Transportation Plan (FAHTP)

The FAHTP project team together with identified stakeholders developed potential solutions to address the transportation issues and needs on Kaua`i from the regional standpoint. After evaluation and prioritization of potential solutions, the types of projects that ranked highly include those that address the region's goals for system preservation, safety, efficiency and capacity improvement. Other types of projects involving multi-modal or complete streets, and improvement of resiliency/security and addressing climate change are integrated as well. The list of potential solutions can be used by decision-makers to allocate future project funding and guide the long-term vision of transportation on the island. Full implementation, notwithstanding fiscal limitations, is estimated to cost $3.2B in current dollars. A breakdown of the cost by type of project is provided in Table 3.2.1. The list of program solutions is not fiscally constrained, meaning the potential solutions are recommended based on need and the ability to meet Plan goals, and not on fiscal limitations. A strategic selection of projects based on funding availability is highly recommended.

Table 3.2.1 FAHTP Long-Range Program Solutions and Cost Estimates

Funding Program	Plan Cost Estimates	Percent
System Preservation	$ 315 M	10 %
Safety	$ 595 M	19 %
Capacity (non-constrained)	$ 2.2 B	70 %
Congestion	$ 57 M	1 %
Other	$ 10 M	< 1 %
TOTAL	$ 3.2 B	100 %

Source: CH2M HILL, Federal-Aid Highways 2035 Transportation Plan, March 2014

3.2.1 Capacity Projects

A "short list" of potential priority long-range capacity solutions is provided in Table 3.2.2. These projects were identified separately due to their relatively large scale and the 17 projects in the list are estimated to cost $1.5B in current dollars. The approximate locations of the projects are shown on Figure 3.2.1 (refer to the letter reference in Table 3.2.2).

Table 3.2.2 Potential Long-Range Capacity Solutions (sorted by State Route number)

Fig. Ref.	Rte. No.	State/ County	Project	Description	Est. Cost FY 2011 ($M)
A	50	State	Kaumuali`i Highway – Anonui Street to Kipu Road (Phase 1B)	Additional 2 travel lanes to allow for safe passage of vehicles	$22.3
B	50	State	Kaumuali`i Highway – Kipu Road to Vicinity of Haiku Airstrip (West of Humane Society, M.P. 3.47, Phase 1C)	Additional 2 travel lanes to allow for safe passage of vehicles	$22.3
C	50	State	Kaumuali`i Highway – Vicinity of Haiku Airstrip (West of Humane Society, M.P. 3.47) to Huleia Bridge (Phase 2)	Highway improvements	$58.5
D	50	State	Kaumuali`i Highway – Huleia Bridge to West of Kahili Mountain Park Road (Approx. 1000 ft, Phase 3)	Highway improvements	$55.8
E	50	State	Kaumuali`i Highway – Kahili Mountain Park Road to Kōloa Rd	Highway improvements	$71.4
F	50	State	Kaumuali`i Highway – Kalaheo Town to Kōloa Road	Additional 2 travel lanes to allow for safe passage of vehicles	$33.5
G	50	State	Kaumuali`i Highway – Hanapepe Road to ‘Ele’ele Road	Additional 2 travel lanes	$12.9
H	51	State	Kapule Highway	Additional 2 travel lanes with bike lanes and sidewalks	$98.1
I	56	State	Kūhiō Highway – Kapule Highway to Mailihuna Road	Additional 2 travel lanes	$128.0
J	520	County	Po`ipū Road – Lāwa’i Road to Ala Kinoiki Road	Improve existing roadway to include bike lanes, sidewalks, and intersection impr.	$6.7
K	570	State	Ahukini Road – Kūhiō Highway to Kapule Highway	Improve airport access including realignment and illumination. Additional 2 travel lanes with sidewalks and bike lanes or a bicycle path	$41.7
L	580	State	Kuamoo Road – Kūhiō Highway to Kamalu Road	Improve existing roadway to include bike lanes and sidewalks	$30.3
M	581	County	Kamalu Road – Kuamoo Road to Olohena Road	Improve existing roadway to include bike lanes and sidewalks	$15.0
N	5860	County	Kawaihau Road – Kūhiō Highway to Mailihuna Road	Improve existing roadway to include bike lanes and sidewalks	$10.1
O	N/A	County	Līhu`e-Hanamā`ulu Bypass Road	Construct a new 2-lane Līhu`e - Hanamā`ulu Bypass Road along existing agriculture road alignment	$115.4
P	N/A	State	Kapa`a Relief Route – Kapule Highway to Kapa`a Stream	Construct the Kapa`a Relief Route between Kapule Highway and Kapa`a Stream	$600.0
Q	N/A	County	Northern Leg of the Western Access Road	Construct a new 2-lane, signed shared roadway from Kōloa Road and the completed section of the Ala Kalanikaumaka intersection to Maluhia Road and Ala Kinoiki intersection	$20.0

Source: CH2M HILL, Federal-Aid Highways 2035 Transportation Plan, March 2014

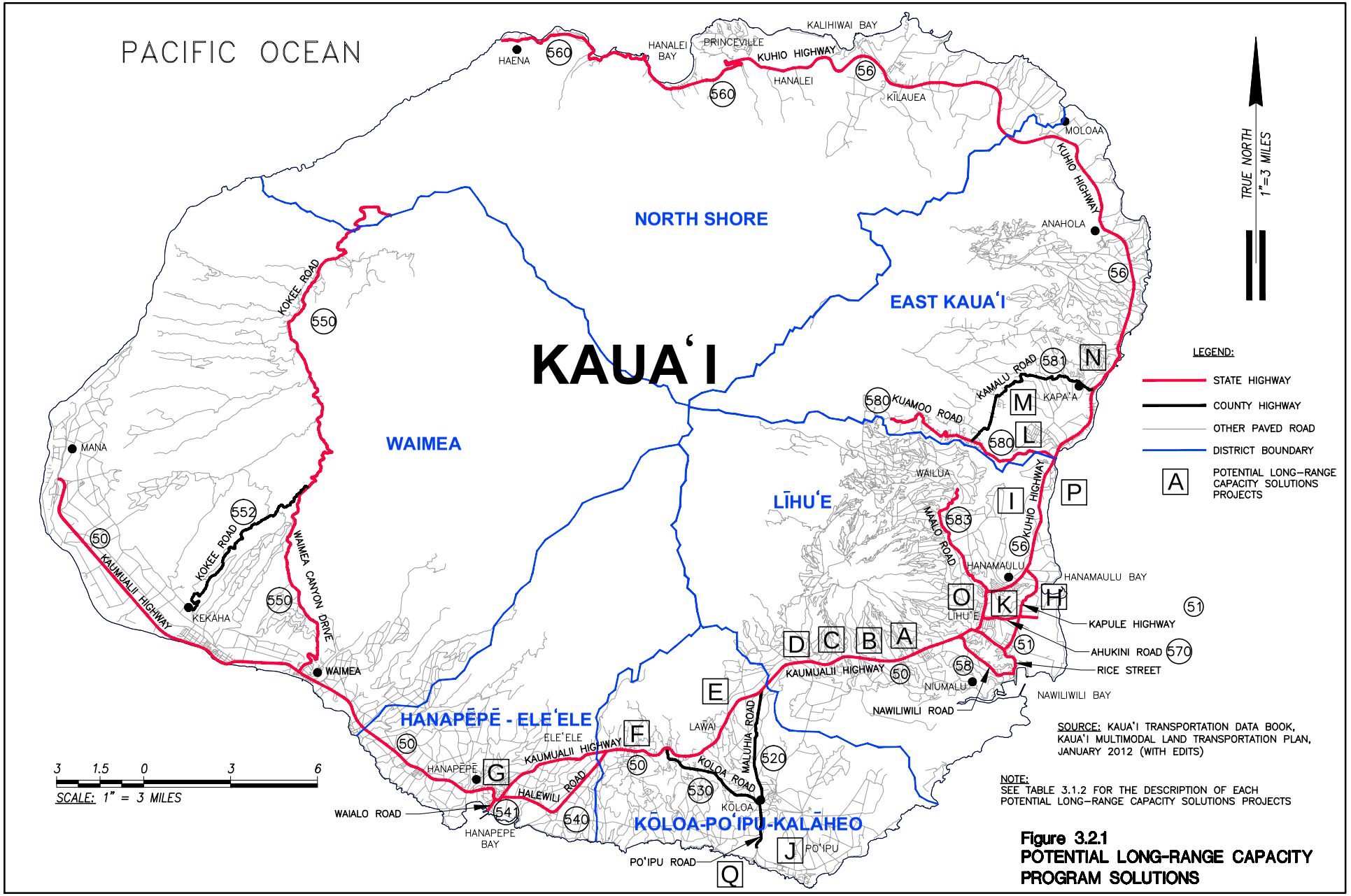

Figure 3.2.1
POTENTIAL LONG-RANGE CAPACITY PROGRAM SOLUTIONS

3.2.2 Implementation of the FAHTP and the State Transportation Improvement Plan (STIP)

The FAHTP represents the State Highway Division's 20+ year long-range goals. The Mid-Range Plan (still to commence) will prioritize solutions to be accomplished over an 8-10 year period with fiscal constraints. This plan can be updated more frequently as economic forecasts change. The State then identifies a program of projects that can be implemented over the next four years with available funds in the Statewide Transportation Improvement Program (STIP). The STIP projects are developed through environmental planning, preliminary engineering, design, then into construction.

Funding for transportation projects comes from the State of Hawaii's Highway Fund, which receives limited federal and state contributions. Federal funding comes from the Highway Trust Fund raised primarily through the federal gas tax. State funding comes from six main sources: fuel taxes, rental/tour vehicle surcharges, weight taxes, vehicle registration fees, miscellaneous fees, and interest from invested highway funds. The Kaua`i District receives approximately 8-10 percent of the State of Hawaii's Highway Fund. Based on historic distributions, Kaua'i District could expect to receive approximately $630 million, adjusted for inflation and in Fiscal Year (FY) 2011 dollars, for transportation projects between FY11-FY35. The shortfall between anticipated funding levels and funding needs causes projects to be deferred. The state may consider alternative revenue sources such as user fees, general excise taxes, and public/private partnerships. The State may also look into reducing future demand on the transportation system through transportation demand management strategies.

If funding is not available for all of the recommended projects, the Preferred Scenario in the MLTP would help to reduce the cost for capacity projects, and allow the available funding to be allocated towards the other funding programs such as system preservation, safety and congestion.

3.3 Kaua`i Multimodal Land Transportation Plan (MLTP)

According to the MLTP, achieving the Preferred Scenario will require a change in some of the drive-alone trips to other modes of transportation such as walking, biking, and transit. The island-wide multimodal transportation plan describes six programs that the County, the State and other agencies will need to deploy between now and 2035. These include a transit program, a bicycle program, a pedestrian program, a county roads program, an agriculture transportation program, and a land use program. The primary objective is to prevent further growth in vehicular traffic despite an anticipated increase in population.

3.3.1 Transit Program

The purpose of this program is to support further substantial increases in ridership, with a goal to quintuple ridership by 2035. This will require a mix of strategies: increasing operating efficiency, increasing operating revenue, increasing external funding, increasing county transit appropriations, and using the savings and increased funding to improve transit service levels. Ways to address operating efficiency include increasing the frequency of service, particularly for higher-demand times and locations, and the County/State constructing well-designed, ADA-accessible bus stops at all rider-generating locations (subdivisions, commercial centers, employment centers, schools, etc).

Currently, the transit system is operated using County employees, but a transition to contract personnel is being considered. As ridership increases, the number of buses will increase, as well as possibly the capacity or size of buses. The County is procuring a few large buses from Oahu to see if this option is compatible for Kaua`i. Satellite baseyards are being planned to accommodate the increase in buses and to increase operating efficiency.

The County is moving towards using compressed natural gas (CNG) to fuel buses, and is considering a fueling station for County vehicles. Other plans include using SmartCards to add convenience for users, transitioning non-ADA-qualified para-transit use to fixed route transit service, and implementing a mandate to build bus shelters at all bus stops by 2020.

3.3.2 Bicycle Program

This program recommends a regular investment in bicycle planning infrastructure improvements for the next 25 years, to provide safer bicycle infrastructure throughout the island.

3.3.3 Pedestrian Program

This program aims to increase the feasibility, comfort, and safety of pedestrian travel for short trips. To encourage more pedestrian trips, this plan includes short and long term pedestrian program components. The program focuses on making improvements to the most crucial pedestrian places on the island, including the town core areas where densities are higher, along corridors connecting schools and parks that are frequently used by children, and on streets that provide access to bus stops. The program components include pedestrian planning, Safe Routes to School (SRTS) program, future town core planning, Līhu`e Town Core Plan implementation, access to transit, social trail/path identification, and pedestrian safety improvements.

3.3.4 County Roads Program

Making necessary improvements to streets to accommodate all modes of travel will be a critical aspect of achieving the goals of this plan, while maintaining the rural character by limiting

highway widening. Other key principles include support for designated scenic road corridors, freight transport, reducing speeding, improving safety, and preventing future traffic growth and additional congestion.

3.3.5 Agriculture Transportation Program

This program focuses on reducing the cost of agriculture transportation, protecting against disruption during emergency events, improving access to agriculture products, and ensuring agriculture workers have affordable and reliable access to their jobs.

3.3.6 Land Use Program

This program identifies specific needs and approaches for integrating the County's transportation program with its growth management systems. It is guided by the principle requirements for sustainable development: compactness, completeness, and connectedness. Some components include improving land use mix, embedding park and schools in neighborhood, building connected networks for travel, circulation and access, and adopting transportation facility design standards.

3.3.7 Implementation of the MLTP

Highest priority is given to maintaining facilities in "state of good repair" and improvements to public transit (The Kaua`i Bus) and pedestrian system facilities. County roadway and bikeway projects to implement the Līhu`e Town Core Plan and community development plans are also given high priority, as well as various planning studies that focus on multimodal approach. County departments and other entities are expected to collaborate within a permanent Transportation Coordinating Committee (TCC) to oversee development and implementation of the MLTP. The TCC will work to implement the County's new 6-year Capital Improvements Program for transportation projects, and will work with the State Department of Transportation (DOT) to coordinate the County's highest priorities with the State's STIP.

A short-term (one to three year) action plan is compiled in the MLTP listing program goals, action items, and responsible parties. The MLTP is designed according to three implementation periods: the short-range period from adoption of the plan through 2015, the mid-range period from 2016-2020, and the long-range period from 2021 to 2035. The plan will be updated in 2021 after monitoring progress during the mid-range period.

3.4 Comparison With 2014 Socio-Economic Analysis and Forecasts

The Kaua`i General Plan Update: Socioeconomic Analysis and Forecasts (SAF) was prepared by SMS for the County of Kaua`i. The SAF, dated February 2014, provides forecasts of population, households, jobs and employment, housing units, visitors, and visitor units for the County of

Kaua`i from 2013 to 2035. In this section, the population projections from the SAF will be compared to the results of the FAHTP and the MLTP to assess their validity and whether adjustment of the results is required.

3.4.1 Population Forecast

The population growth used in the SAF forecasting model was 1.1 percent per year for the County of Kaua`i. The forecasts in the SAF for the County of Kaua`i are roughly linear projections from the last recorded empirical data to a forecast point in 2035. The forecasts are linear trends representing population growth over the forecast period.

The population projections were also broken down according to the six District Planning Areas for the County of Kaua`i, using historical population allocation data. The projected growth for the six districts is not linear.

The historic and projected resident population presented in the SAF is provided in Table 3.4.1.

Table 3.4.1 Resident Population of Kaua`i County Planning Areas, 1990 to 2035

District	Year					
	1990	2000	2010	2020	2030	2035
County of Kaua'i	51,676	58,463	67,091	74,693	83,328	88,013
Līhu'e	11,169	12,507	14,683	18,017	21,595	23,456
Kōloa - Po'ipū - Kalāheo	9,600	10,545	11,696	13,623	15,737	16,855
Hanapēpē - 'Ele'ele	3,873	4,362	6,157	6,463	6,860	7,094
Waimea	4,698	5,660	5,561	5,901	6,323	6,566
Hanalei (North Shore)	5,913	6,605	8,002	8,286	8,686	8,933
Kawaihau - Kapa'a (East Kaua'i)	16,192	18,784	20,992	22,403	24,128	25,110

Source: Kaua`i General Plan Update: Socioeconomic Analysis and Forecasts, February 2014

According to the projections from the SAF shown in Table 3.4.1, the population for the County of Kaua`i is projected to increase by 31 percent. The Līhu'e district had the largest projected increase in population from 2010 to 2035 at 60 percent, while the Hanapēpē - 'Ele'ele district had the smallest projected increase over the same period at 15 percent.

De facto population is the resident and visitor population present on any given day. The historic and projected de facto population presented in the SAF is provided in Table 3.4.2.

Table 3.4.2 De Facto Population of Kaua`i County Planning Areas, 1990 to 2035

District	Year					
	1990	2000	2010	2020	2030	2035
County of Kaua'i	68,558	75,200	82,101	92,485	102,500	107,915
Līhu'e	NA	15,368	17,266	20,582	24,424	26,433
Kōloa - Po'ipū - Kalāheo	NA	16,012	17,248	20,133	22,800	24,213
Hanapēpē - 'Ele'ele	NA	4,362	6,157	6,463	6,860	7,094
Waimea	NA	5,930	5,719	6,144	6,542	6,770
Hanalei (North Shore)	NA	10,232	11,514	12,723	13,357	13,722
Kawaihau - Kapa'a (East Kaua'i)	NA	23,297	24,196	26,439	28,517	29,684

Source: Kaua`i General Plan Update: Socioeconomic Analysis and Forecasts, February 2014

3.4.2 Comparison With FAHTP

In the FAHTP, it was noted that the population in Kaua'i is expected to grow by over 30 percent by 2035, which corresponds with the growth of 31% presented in the SAF. However, the projected 2035 population of 85,200 in the FAHTP is about 2,800 (3.2%) less than the projected 2035 population of 88,013 in the SAF. In the FAHTP, it was also noted that the most significant population growth would be in the Līhu'e and Kōloa - Po'ipū areas, which also corresponds with the data in Table 3.4.1.

If the projections presented in the SAF were used instead of the projections used in the FAHTP, some modifications may be required to the recommendations presented in the FAHTP.

3.4.3 Comparison With MLTP

In the MLTP, the population in Kaua'i was projected to grow by 27% to 85,296, which is less than the projected population growth in the SAF of 31% to 88,013.

In the MLTP, the de facto population was projected to grow by 22% to 98,979, which is considerably less than the projected de facto population growth of 31% to 107,915. The difference is in the projected growth of the visitor population.

Since the MLTP assumes no increase in traffic volumes in the Preferred Scenario, the impact of a potentially higher de facto population does not have an affect on potential capacity projects. Instead, the main affect of the potentially higher de facto population would be on the improvements required for the transit program in order to accommodate higher ridership to accomplish the desired no increase in traffic volume.

GENERAL PLAN UPDATE

KAUA'I INFRASTRUCTURE ANALYSIS

DRAINAGE SYSTEM

Prepared For

County of Kaua'i

Prepared By

R.M. Towill Corporation

May 2015

Drainage

The purpose of the drainage system analysis in relation to the General Plan Update is to present information which can be used by the County to set forth policies to guide future improvements to the County's drainage system infrastructure.

Section 1. Overview of Existing Drainage System

1.1 Introduction

The streams and rivers are the major drainage systems for Kaua'i. There is also a system of sugar cane irrigation ditches throughout the island which act as drainage channels. The Kaua'i County Storm Water Runoff System Manual (Drainage Standards), adopted in July 2001, promote the maintenance of these natural drainageways. In order to reduce flooding due to the limited capacity of these natural drainageways the Department of the Army Corps of Engineers constructed flood protection levees along certain streams on Kaua'i.

1.2 Existing Drainage System

The central and windward areas of the island receive an abundance of rainfall with Mount Waialeale at the center of the island recording an average annual rainfall of 480 inches.

Since the last update of the Kaua'i General Plan in 2000, the Federal Emergency Management Agency has made revisions to the Kaua'i County's Flood Insurance Study (FIS), including updates to base flood elevations, floodway, special flood hazard areas, zone designation, and incorporation of previously issued letters of map revision and storm surge analyses. The County has also updated the tsunami evacuation maps for the island.

The FIS studied all or portions of the following flooding sources by detailed methods: Hanalei Watershed, Kapa'a Watershed, West Kaua'i Watershed, Waimea Watershed, Wailua Watershed, Lihue Watershed, Hanapēpē Watershed, Anahola Watershed, Kōloa Watershed, Wainiha Watershed, and Hanamā`ulu Stream. Tsunami inundation on the entire coastline was restudied by detailed methods, updating the inundation limits along the southwest, south, and eastern coastlines.

The FIS also studied all or portions of the following flooding sources by approximate methods: Wainiha Watershed, Lihue Watershed, Kapa'a Watershed, Hanalei Watershed, Kōloa Watershed, Wailua Watershed, Kalihiwai Watershed, and Waimea Watershed.

The majority of streets in the older developments on Kaua'i have grassed shoulders with roadside swales. Some of these streets have no underground drainage systems. Storm runoff flows along roadside swales to a major street with curbs, gutters and sidewalks and an

underground drainage system or to a location where the street crosses a man made ditch or natural drainageway. Newer subdivisions have a combination of roadside swales and underground drainage systems or curbs, gutters and sidewalks with underground drainage systems.

Section 2. Principal Flood Problems

The island of Kaua'i experiences three types of flooding: stream overflow, tsunamis, and hurricanes. The cause of stream overflow may be attributed to debris-clogged streams, flash flooding, undefined streamflow patterns, isolated depressions in topography, inadequate drainage facilities, and changed drainage conditions because of development. Tsunamis and hurricane-induced storm surge and waves have also caused flood devastation on the island.

Hanalei Watershed: The Hanalei River has overflowed on numerous occasions, inundating portions of Kuhio Highway and adjacent farm land. The Hanalei River flood plain has several existing features that aggravate riverine flooding. With low flows, the river is impeded by a sandbar at the mouth and by overgrowth along the banks. With high discharges, the dune built for new development constricts the flood plain at the mouth. Existing highway bridges and a sandbar restrict flow at Waioli and Waipa Streams. Hanalei is also exposed to flooding caused by tsunami and high waves from large storms, especially its shoreline structures and beachfront development.

Anahola Watershed: The mouth of Anahola Stream is restricted by a natural sandbar, increasing flood stages when discharges are low. Heavy rainfall causes flash flooding, severe erosion, landslides, and property damage.

Kapa'a Watershed: Several tsunamis have had devastating impacts along the Kapa'a-Kealia coastline. Also in past recorded events, riverine flooding at Kapa'a Stream caused damage to cane haul roads, bridges and crops. Since the completion of the Moikeha and Waikaea Canals, there has been no documented significant flood damage. However, overgrowth and siltation at the canals, as well as the buildup of debris at the highway bridges over Kapa'a Stream aggravate flooding in the Kapa'a area.

Wailua Watershed: The channel capacity along the lower 2 mile segment of the Wailua River has been frequently exceeded, nearly inundating the road leading into the Wailua Homestead area in the latest flooding in 1975. Debris accumulation at the highway bridge causes flooding upstream on the Wailua River. The coastal areas of Wailua are also vulnerable to tsunami flooding.

Lihue Watershed: Flooding on Puali and Nāwiliwili Streams inundates the low-lying coastal area, including residential areas, parking lots and roads near Puali Stream. Existing aggravating factors include sand buildup at the mouth of Nāwiliwili Stream, and debris accumulation at bridge openings, especially at Rice Street Bridge. The coastal areas of Nāwiliwili and Niumalu are subject to tsunami flooding as well.

Kōloa Watershed: Frequent flooding in the coastal areas of Kōloa-Po'ipū occurs due to low-lying topography and inadequate drainage facilities. Debris accumulation and overgrowth on

Waikomo Stream also contribute to frequent flooding in Kōloa, especially in the vicinity of Waikomo Stream and Waikomo Road. Omao Stream is prone to overflowing according to local residents. The coastal areas of Waikomo Stream and Po'ipū have a history of extensive damage caused by hurricane storm surges and wave action.

Hanapēpē Watershed: The low-lying areas behind the levees in Hanapēpē experience flooding from Hikiula Gulch flows. Where the levees discontinue between Hanapēpē Road and the mouth of the river, another low-lying area is prone to flooding. A sandbar at the rivermouth contributes to flooding in this area as well. The Hanapēpē Bay area is vulnerable to inundation caused by tsunamis and hurricanes.

West Kaua'i Watershed: Past flooding in the Kekaha area inundated residential areas, roads and sugarcane fields. According to local residents, flooding was aggravated by sand plugs in the drainageways near Kekaha. Being another coastal town, it is subject to flooding from tsunamis, and high waves brought by hurricanes and large storms.

Wainiha Watershed: Flooding from Wainiha River affects low-lying areas in Wainiha Valley, including residential areas, crop lands, and a portion of Kuhio Highway. High surf conditions, and especially tsunamis, cause extensive flood damage into and up Wainiha Valley. Further up the valley, flash flooding causes landslides and road damage as well.

Waimea Watershed: A levee system was constructed and improved to protect the town of Waimea from flooding of Waimea River. However, interior drainage in the low-lying areas of Waimea Valley became more pronounced. Overflow into interior areas can be caused by closure of flood gates during high flows on the river and blockage of drain pipes.

Section 3. Flood Protection Measures

There are very few flood protection structures constructed on Kaua'i due to the county's land management, drainage, watershed, and water quality policies. Instead, the county's flood plain management is guided by flood plain information reports on several flood-prone areas, as provided by State and Federal agencies.

Only the districts of Hanapēpē, Waimea, and Kapa'a utilize flood-control structures. Levees constructed along the banks of Hanapēpē River protect most of Hanapēpē from a 0.2 percent annual chance event discharge of 52,000 cfs.

In Kapa'a, the county built the 4,600-foot-long Moikeha Canal to provide some protection from a 1 percent annual chance flood event. The Waikaea Canal was built with a capacity slightly under a 10-year flood. The Waipouli Canal along Kuhio Highway intercepts excess runoff from Waikaea.

A levee along the west bank of the Waimea River protects Waimea from a 1 percent annual chance flood event. Upstream of the highway, a United States Army Corps of Engineers (USACE) project constructed two drainage outlet structures, pipe culverts, a levee extension, and a floodwall to protect the town from a 1 percent annual chance interior flood with an operating headwater elevation of 5.7 feet.

There are many reservoirs in Kaua'i, used primarily for irrigation purposes. They provide some storage capacity, but are not effective in protecting downstream areas from flooding because they are normally already filled with irrigation water prior to the rainfall. Detention basins can be designed which will reduce peak flows and storm runoff volume. The Kaua'i Drainage Standards provide criteria for detention basin design.

There is no Drainage Master Plan for the island, only for communities and developments. The Department of Public Works intends to focus on specific problem areas and watersheds, with the objective of developing strategic plans that specify preventive as well as remedial actions.

Drainage Master Plans are recommended for flood-prone areas such as Nāwiliwili, Kapa'a, Wailua, Po'ipū and Kekaha. The Drainage Master Plans would provide detailed analysis of the flood conditions and assess the feasibility of levees, detention basins, or other flood control alternatives.

The Kaua'i County Code of 2006 defines the standards and requirements for new development storm drainage infrastructure as follows:

- Protect and preserve existing natural drainage channels
- Protect the subdivision from flood hazards

- Provide a system by which water within the subdivision will be removed without causing damage or harm to the natural environment, or to property or persons.
- In order to protect the water courses and shorelines, reduce the amount of pollutants and sediments to no greater than predevelopment levels
- In order to protect the water courses and shorelines, maintain peak runoff rate and volume similar to predevelopment rates
- Protect wetlands and other similar areas that provide water quality benefits. For example, provide for the crossing of water courses by spanning rather than by culverts when possible, so that natural stream beds will not be altered where the alterations will cause undue environmental change.

For new developments, the Kaua'i Drainage Standards provide recommendations, such as storm runoff detention to maintain storm runoff to pre-development rates, which prevent new developments from worsening existing drainage conditions.

GENERAL PLAN UPDATE

KAUAʻI INFRASTRUCTURE ANALYSIS

WATER SYSTEM

Prepared For

County of Kauaʻi

Prepared By

R.M. Towill Corporation

May 2015

Water

The purpose of the water infrastructure analysis in relation to the General Plan Update is to set forth policies to guide future capacity improvements to the County's water system. The County Department of Water Supply is responsible for developing and operating the water system that includes the source, storage and distribution facilities. The private water systems on the island are also described in this report.

Section 1. Overview of Existing Water Systems

1.1 Introduction

Many of the oldest water systems that exist today were initially constructed by sugar plantations, and later expanded to meet increased demand as the island's population increased. These water systems were later transitioned to the County of Kaua`i Department of Water (DOW) for management, control and operation. The DOW is a semi-autonomous agency which serves approximately 20,500 customers (as of November 2013) and operates on fees charged for water. Descriptions of the DOW water systems are provided in Section 1.2.

There are also nine private water systems on Kaua'i which are regulated by the State Department of Health, Safe Drinking Water Branch. Descriptions of the private water systems are provided in Section 1.3.

1.2 Existing Department of Water (DOW) Water Systems

The existing DOW water systems serve particular geographic areas or groups of customers. For planning purposes, the DOW defines the existing water system as 13 service areas as shown on Figure 1.2.1 and as listed below. The information on the existing DOW water systems is based on discussions with the DOW, the latest DOW water system maps, and the Water Plan 2020, prepared by DOW in March of 2001.

1. Waimea-Kekaha:

   Waimea is the civic center of the West Side and has many community facilities including a high school, hospital, along with restaurants and retail stores. Kekaha has a residential area, agricultural areas, industrial areas and State parks. The Pacific Missile Range Facility is also included in this service area. There are approximately 5,135 people in this service area.

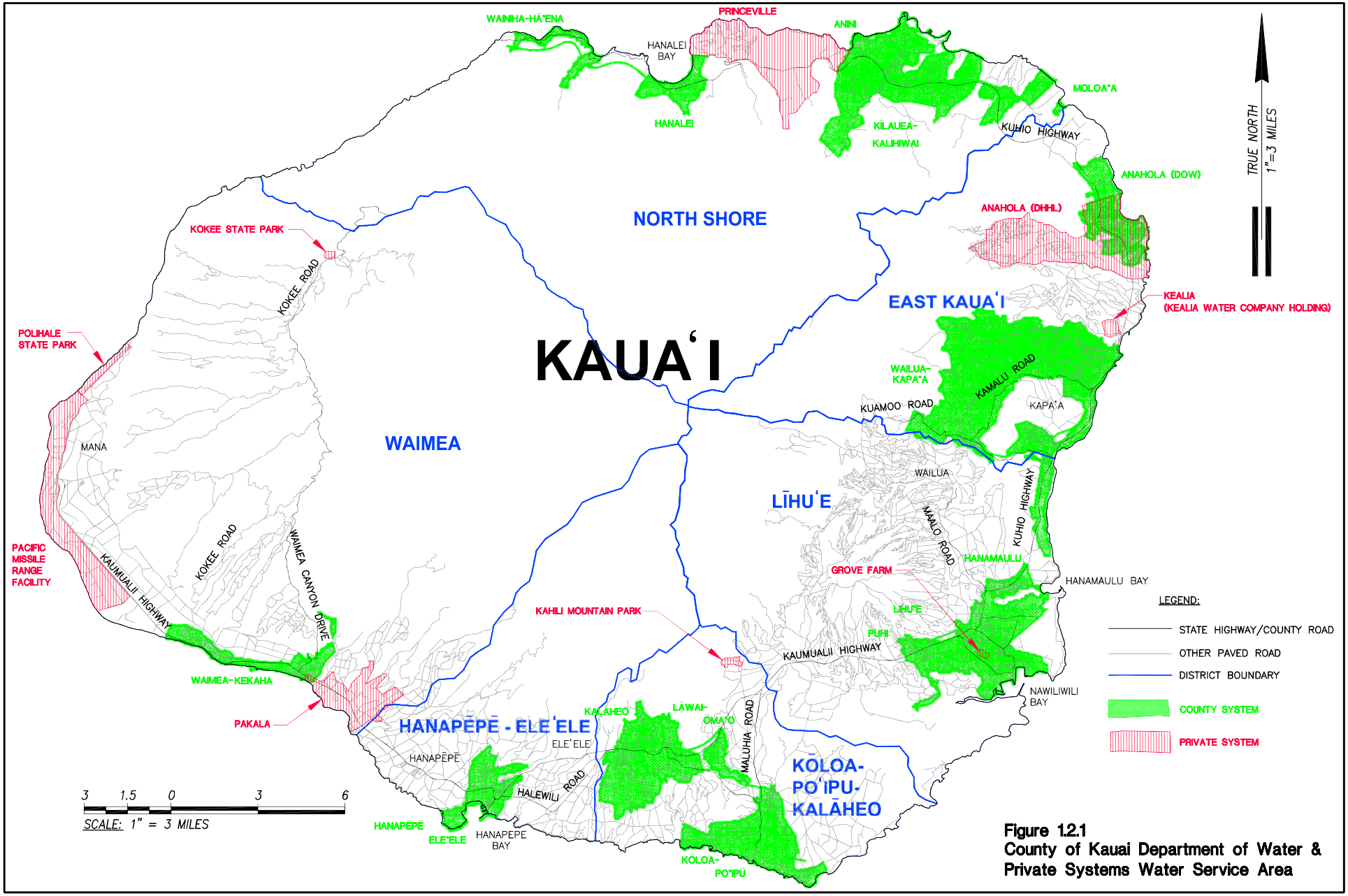

Figure 1.2.1
County of Kauai Department of Water & Private Systems Water Service Area

There are three pressure zones within this service area: the 540 zone, the 196 Waimea Zone, and the 196 Kekaha Zone. The Waimea Heights Booster Station pumps water up to the 540 zone from the Waimea 196 zone. The Waimea Booster Station moves water from the 196 Kekaha Zone to the Waimea 196 Zone due to the distance between the Kekaha and Waimea service areas.

The Waimea-Kekaha service area is supplied by six active sources:

- Kekaha Shaft No. 12
- Paua Valley Well
- Kekaha (Waipao) Well "B"
- Waimea Well "A" (No. 26)
- Waimea Well "2"
- Kapilimao Valley Well

Kekaha Shaft No 12 and Paua Valley Well are within the same site and service the 196 Kekaha zone with two 0.5 million gallon (MG) storage tanks, Paua Valley Tank #1 & #2. Vertical turbine pumps are used to transfer the water into the storage tanks. The Paua Valley Tank #1 is a concrete tank and the Paua Valley Tank #2 is a glass-lined steel tank. There are 10-inch and 12-inch water main on Mana Road to service Kekaha.

Kekaha (Waipao) Well "B" and Waimea Well "A" (No. 26) both service the 196 Waimea zone. There are two concrete storage tanks; the Waimea Tank 1 is 0.25 MG, and the Waimea Tank 2 is 0.50 MG. The two wells use vertical turbine pumps to transfer the water into the storage tanks.

The Waimea Well "2" services the 196 Waimea zone and the 540 zone which is the Waimea Heights area. It also uses a vertical turbine pump to transfer the water into a 0.1 MG concrete storage tank.

The Kapilimao Valley is serviced by the Kapilimao Well and 0.6 MG storage tank.

The distribution system is comprised of many older pipes installed in 1924. Other pipes within the system were installed in the 1950s and later.

2. Hanapēpē-Ele`ele

This area includes Port Allen, the island's major electrical power generating station, and other industrial uses. Hanapēpē town and Hanapēpē Heights, Ele`ele's small business area and residential areas are included in this service area. There are approximately 4,430 people.

There are four pressure zones within the Hanapēpē-Ele`ele water system: the 402 Hanapēpē Zone, the 212 Zone, the 340 zone, and the 402 Ele`ele Zone. Water is delivered to Ele`ele via booster pump stations since all the water sources are located on the Hanapēpē side of the service area.

The Hanapēpē-Ele`ele service area is supplied by four wells: Hanapēpē Well No. 4, Hanapēpē Well No. 25, Hanapēpē Well "A", and Hanapēpē Well "B" per County of Kaua'i Department of Water Area Maps.

The Hanapēpē Well No. 25 services the 212 zone within the Hanapēpē area. It uses a submersible pump to transfer the water to a 0.5 MG storage tank. The Hanapēpē Well "A" services the 402 Hanapēpē Zone (Hanapēpē Heights) and has a vertical turbine pump to move the water to a 0.5 MG storage tank. Hanapēpē Well "B" and Hanapēpē Well No. 4 both service Ele`ele. They both employ vertical turbine pumps to transfer the water into two 0.4 MG storage tanks and are within the 340 Zone. Hanapēpē Well No. 4 also services the 402 Ele`ele Zone with a 0.2 MG storage tank.

The main transmission line is a 12-inch pipe within Kaumualiʻi Highway and another 12-inch line running parallel to Hanapēpē River. Pipes within the distribution system are very old having been installed in the 1920s-1940s.

3. Kalāheo

Kalāheo's commercial areas along the highway and along Papalina Road, as well as various residential areas off of the highway, are included in this service area. There are approximately 6,280 people living in this service area. There are four pressure zones within this service area: the 1290 Zone, the 1222 Zone, the 1112 Zone and the 886 Zone. In addition, the Kalāheo service area is interconnected with the Lāwai service area which has two pressure zones, the 825 Zone and the 677 Zone.

The Kalāheo service area is supplied by two wells: Kalāheo Well 5631-01 (Well A) and Kalāheo Well 5631-02 (Well B) per County of Kaua'i Department of Water Area Maps. The two wells are on the same site and employ vertical turbine pumps to pump water into the 0.1 MG Nursery Tank and the 0.33 MG Kalaheo Treatment Plant, Clear Well storage facilities. The two wells have a combined capacity of 2,000 gpm and service the following pressure zones: 1290 Zone, 1222 Zone, 1112 Zone, and 886 Zone.

There are five booster pumping facilities within this service area: the Nursery Booster Station (BS), Kalāheo, Backwash Tank, Kukuiolono, and New Kalāheo BS. The Kalāheo and Backwash Tank booster stations are for emergency use only.

A 12-inch transmission main runs from the two wells down to Lae Road to supply the Kalāheo service area. Pipes within the distribution system vary in age with the oldest pipes having been installed from 1942-1953.

4. Lāwai-Ōma`o

   The Lāwai-Ōma`o service area consists primarily of agricultural homestead lands which have been subdivided and developed for residential use. There are approximately 3,520 people within this service area. There are two pressure zones within this service area, the 825 Zone and the 677 Zone. In addition, the Lāwai service area is interconnected with the Kalāheo service area which has four pressure zones: the 1290 Zone, the 1222 Zone, the 1112 Zone and the 886 Zone.

   There are four wells supplying this service area: Lāwai Well 22, Lāwai Well No. 2, Piwai Well No. 2, and Piwai Well No. 3 per County of Kaua'i Department of Water Area Maps. Lāwai Well 22 services the Lāwai - Ōma`o area within the 677 Zone. It uses a submersible pump to fill the concrete 0.25 MG Lāwai Tank. The Lāwai Well No. 2 services the Lāwai Valley in the 825 Zone. A submersible pump is also used to fill the 0.03 MG Andrade Tank which is a steel tank with glass lining and ceramic coating storage tank. The Piwai Wells No. 2 and 3 service the Ōma`o area in the 677 Zone.

   The main transmission lines for the two Lāwai wells are 12-inch pipes within Kaumuali‘i Highway. The two Piwa wells also have 12-inch transmission mains which are within Kaumuali‘i Highway and Ōma`o Road. There is an 8-inch main along Kaumuali‘i Highway that interconnects Lāwai-Ōma`o with the Kalaheo system. Pipes within the distribution system vary in age with the oldest pipes being installed in 1953 and the rest after 1960.

5. Kōloa-Po`ipū

   The Kōloa-Po`ipū service area is comprised of resorts and residential areas near or along the coast and around Kōloa town. There are approximately 5,310 people in this service area. There are two pressure zones within the Kōloa-Po`ipū service area, the 366 Zone and the 245 Zone.

   The Po`ipū service area includes several projects to be constructed. There are six water sources supplying this service area per County of Kaua'i Department of Water Area Maps:

   - Kōloa Well E
   - Kōloa Well 16A

- Kōloa Well 16B
- Kōloa Well C
- Kōloa Well D
- Kōloa Well F

Kōloa Well E uses a vertical turbine pump to fill the 1.5 MG Po`ipū Tank #1 and services the Po`ipū area in the 245 Zone. Kōloa Well 16A uses a vertical turbine pump to fill the 0.25 MG Paanau Tank which also services the Po`ipū area in the 245 Zone. Kōloa Well 16B uses a submersible pump to fill the 1.0 MG Kōloa Tank which services the Kōloa area in the 366 Zone. Kōloa Well C uses a vertical turbine pump to fill the Po`ipū Tank #2 Mahaulepu 2 which is a 1.5 MG concrete tank that services the Po`ipū area in the 245 Zone. The Kōloa F Well services the 245 Zone.

The main transmission lines from these well to the distribution system are 8-inch lines running within Wailaau Road. The pipes within the distribution system are galvanized steel and cast iron pipes which were installed between 1924 and 1937.

6. Puhi-Līhu`e-Hanamā`ulu

The Puhi-Līhu`e-Hanamā`ulu service area includes Līhu`e Airport, commercial harbor, industrial areas, Wilcox Hospital, hotels, government and business areas, some residential areas. There are five pressure zones within this service area:

- 510 Zone
- 393 Zone
- 295 Zone
- 173 Zone
- 319 Zone

The service area is supplied by the following 10 active sources per County of Kaua'i Department of Water Area Maps.:

- Puhi Well #2
- Puhi Well #3
- Puhi Well #4
- KCC Puhi Well #1
- Kilohana A
- Kilohana B
- Kilohana C
- Kilohana G

- Kilohana I
- Garlinghouse Tunnel

Other sources available but not in use as of March 2001 are as follows: Kokolau Tunnel, Puhi Well #1, Puhi Well 5a & 5b, and Kolohana F.

The majority of these sources are located in the upper pressure zones and feed the lower zones through pressure reducing valves (PRV). Puhi Well # 2 uses a vertical turbine pump to transfer water into the 1.0 MG KCC "393" Tank which services the Lihue- Hanamā`ulu area in the 393 Zone. Puhi Wells #3 and #4 both use vertical turbine pumps to transfer water into the two 0.1 MG Grove Farm Tanks #1 & #2, which service Nāwiliwili in the 295 Zone. KCC Puhi Well #1 services the 510 zone with the concrete 0.5 MG KCC Tank 1. Kilohana A also services the Puhi area in the 510 zone and uses a vertical turbine pump to fill the 1.0 MG concrete KCC Tank 2. Kilohana B & C services the Lihue- Hanamā`ulu area in the 393 zone. They fill the two Lihue Steel Tanks #1 & #2 which are both steel tanks with a 1.0 MG capacity. Kilohana G uses a vertical turbine pump to fill the 1.0 MG New Nāwiliwili Tank and services the Nāwiliwili-Nuimalu area in the 173 Zone.

The main transmission lines vary in size between 16 inches and 12 inches and are located within Kaumualiʻi Highway. Pipes within the distribution system vary in age with the oldest pipes being installed between 1926 and 1935, and the rest after 1946. These pipes are well past the typical 50 year useful life span of pipes and will need to be replaced.

7. Wailua-Kapa`a

The Wailua-Kapa`a service area includes hotels, businesses, schools, hospitals, and urban residential neighborhoods along the highway and along Kuamoo Road and Kawaihau Road. There are also old agricultural homesteads in the central part of the basin which are being turned to residential use. There are eight (8) pressure zones within the Wailua-Kapa`a service area:

- 605 Zone
- 538 Zone
- 530 Zone
- 428 Zone
- 313 Zone
- 268 Zone
- 233 Zone
- 214 Zone

There are ten sources supplying water to this service area:

- Wailua Homestead Well A & B
- Akulikuli Tunnel
- Makaleha Tunnel
- Kapa`a Homesteads Well 1 & 2
- Moelepe Tunnel
- Nonou 9-1A
- Nonou 9-1B
- Nonou 9-1C

Waiua Homestead Well A and B use submersible pumps to fill the University of Hawaii Tank Site and the Wailua Homesteads Well #3 Site, respectively. The two tanks both have a capacity of 0.25 MG and they service the 605 Zone. Akulikuli Tunnel supplies the 0.5 MG Wailua Homesteads Tank and services the Wailua Homesteads in the 538 Zone. The Makaleha Tunnel supplies the 0.125 MG Puupilo Steel tank which also services the 605 Zone. Kapa`a Homestead Well 1 uses a submersible pump to transfer water into the 1.0 MG Makaleha tank and services the upper Kapa`a Homesteads in the 530 Zone. Nonou 9-1A and Nonou 9-1B both uses vertical turbine pumps to fill the 2.0 MG Nonou Tank and services the coastal areas in the 214 Zone. The Nonou 9-1C source also uses a vertical turbine pump to fill the 0.2 MG Ornellas tank which services the Lower Kapa`a Homestead area in the 313 Zone.

Pipes within the distribution system vary in age with some pipes being installed before 1930 and the rest after 1945.

8. Anahola

The Anahola service area is comprised of residential and agricultural homesteads owned by the Department of Hawaiian Homelands (DHHL). It also includes privately owned residential and agricultural lots in and around Anahola Valley. There are approximately 2,170 people within this service area. DOW is in a partnership with DHHL to operate the water system, portions of which are owned by one entity or the other. There is one pressure zone within this service area, the 288 Zone.

The Anahola service area is supplied by Anahola Well “A” and Anahola Well “B”. The Anahola Well “A” uses a line shaft to fill the 0.15 MG Anahola Tank and the

Anahola Well "B" uses a submersible pump to fill the 0.5 MG Anahola #2 New Tank. Both tanks are concrete tanks servicing the 288 Zone.

The main transmission lines from the two wells are 12-inch lines running in Kalalea Road and Kūhiō Highway. The pipes within the distribution system vary in age with some pipes being installed in 1929 and the rest after 1956.

9. Moloa`a

The Moloa`a service area includes the east side rural communities in Moloa`a and Anahola. This service area is the smallest service area with only two small clusters of residences and is comprised of one pressure zone, the 292 Zone. A private landowner operates a state well from which water is sold to these residences as well as some agricultural activities in the area. Moloa`a Well No. 1 and 2 supply this service area, with a 5,000 gallon steel storage tank per County of Kaua'i Department of Water Area Maps. The distribution system is comprised of PVC pipes that were installed in 1985.

10. Kīlauea-Waipake-Kalihiwai

The Kīlauea-Waipake-Kalihiwai service area is comprised of Kīlauea Town and some agricultural subdivisions that extend towards mauka and makai of the highway. There are approximately 3,760 people serviced in this area and there are three pressure zones: 637 Zone, 466 Zone, and 566 Zone.

Kilauea Well No. 1 & 2 supplies this service area. Kilauea Well #1 uses a vertical turbine pump to fill the two 0.25 MG Kilauea Tanks #1 & #2 which services the Kilauea-Kalihiwai area in the 466 Zone.

The Kalihiwai booster pumping facility fills the Kalihiwai Ridge tank which has a capacity of 0.1 MG. It services the upper Kalihiwai area in the 637 Zone. The Waipake booster pumping facility fills the 0.1 MG Waipake tank and serves the Waipake area in the 566 Zone. The Namahana booster pumping facility fills the 0.1 MG Namahana tank but is not in use.

The main transmission lines are within Kūhiō Highway, Halaulani Road, and Kahiliholo Road and are 8 inches in size. The oldest pipes within the distribution system were installed in 1972.

11. Anini

The Anini service area is comprised of the residences at Princeville. This service area is served by Princeville Utilities, which is a private utility. There are approximately

110 residents living within this service area. The DOW contracts with Princeville Utilities to supply water to the Anini service area. There are no DOW storage facilities in this service area and the distribution network is comprised of PVC pipes. The oldest pipes were installed in 1984.

12. Hanalei

The Hanalei service area consists of residences and small-town business uses. There are approximately 1,020 residents living within this service area. There is one pressure zone, the 225 Zone, within this service area. The Maka Ridge Well 73 supplies this service area and there are two concrete storage tanks, the 0.25 MG Maka Ridge Tank which is a tank and the 0.05 MG Hanalei Tank per County of Kaua'i Department of Water Area Maps. The main transmission line runs within Kūhiō Highway and is an 8-inch pipe. The pipes within the distribution system vary in age with some pipes being installed in 1924 and the rest after 1962.

13. Wainiha-Hā`ena

The Wainiha-Hā`ena service area consists of residences along the coast and in Wainiha Valley. There are approximately 1,120 residents within this service area. It is comprised of two pressure zones, the 224 Zone and the 144 Zone.

The service area is supplied by Hā`ena Well 66, Wainiha Well No. 67 and Wainiha Well No. 2 per County of Kaua'i Department of Water Area Maps. The Hā`ena Well No. 66 uses a vertical turbine pump to fill the Hā`ena Steel Tank which has a 0.1 MG capacity and services the Hā`ena area in the 144 Zone. It also fills a 6,500 gallon steel tank. The Wainiha Well #67 uses a submersible pump to fill the 5,000 gallon Wainiha Redwood Tank which services the Wainiha Valley in the 224 Zone.

The main transmission line runs within Kūhiō Highway and is an 8-inch pipe. The pipes within the distribution system were installed in 1960.

1.3 Existing Private Water Systems

The State Department of Health Safe Drinking Water Branch regulates nine private water systems on Kaua'i, which are shown on Figure 1.2.1 and described below.

1. Grove Farm

   Grove Farm Company is a community and economic development firm based in Līhu`e, which owns approximately 38,000 acres from Hanamā`ulu to Kōloa. Waiahi Water Company is a division of Grove Farm, and partnered with the County DOW to develop Kapaia Reservoir as a water source. In 2005, Waiahi Water Company opened the Grove Farm Water Purification Plant (GFWPP) on Kaua`i.

   The GFWPP, operated by Aqua Engineers, Inc., utilizes raw water pumps to draw water from the Kapaia Reservoir, via the Hanamā`ulu Ditch system, and into the treatment facility which houses four 1.0 million gallons per day (MGD) treatment trains and a 264,000-gallon chlorine contact tank. Treated water is then pumped into DOW's Līhu`e-Hanamā`ulu-Puhi water system by the facility's finished water pumps, and serves nearly 15,000 residents. The existing capacity is estimated to be 3.0 MGD with the assumption of one treatment train out of service. The initial construction cost was borne by Grove Farm, and the facility is currently operated by Grove Farm staff.

   DOW purchases water from the GFWPP for a monthly fee which pays for operation, pay down of project development debt, Grove Farm's initial investment, and profit. As such, the DOW tasked the Needs Assessment Study to include an analysis of a potential upgrade or expansion of this facility. The study, which is still in draft form and not yet approved by the DOW, estimates the cost of $8.13 million to upgrade the existing system to increase capacity by 60 percent, and the cost of $31.725 million to expand the existing system to double the capacity. Neither estimate includes the cost for any land acquisition or additional transmission capacity between GFWPP and DOW water systems. The study further analyzes various cost sharing and buyout opportunities for the DOW.

2. Princeville

   The Princeville water system (Public Water System No. 428) is a community water system owned and operated by Princeville Utilities Co., Inc. It is located on the north side of the island of Kaua`i. The State Department of Health conducted a Sanitary Survey of the Princeville water system and the following information is based on the Sanitary Survey Report dated March 25, 2009. The average daily demand for the Princeville water system is 1.18 MGD and there are 1,029 service connections

serving approximately 1,698 residents in the Princeville, Kalihi Wai, and Anini Vista Communities, including the Princeville Resort and golf clubhouses. The Princeville water system obtains water from three wells: Well No. 1 (State Well No. 2-1126-01), Well No. 2 (State Well No. 2-1126-02), and Well No. 4 (State Well No. 2-1127-02).

The Princeville water system utilizes vertical turbine pumps on Wells No. 1 and 2 and a submersible pump on Well No. 4. The water from each well is disinfected on site with Stenner peristaltic metering pumps to treat the water with sodium hypochlorite. Water from Well No. 1 and 2 are pumped into the 411 Reservoir which is a concrete reinforced tank with a capacity of 1.5 MG. Water from Well No. 4 is pumped into two other reinforced concrete tanks: the 580A and 580B Reservoirs. The 580A Reservoir holds 50,000 gallons and the 580B Reservoir is a 0.5 MG tank. Well No. 1 and 2 can also be pumped into the 580A and 580B Reservoirs by a booster pump station located along Kūhiō Highway. Two 33 gallons per minute (gpm) pumps in the booster pump station were recently replaced with a 400 gpm pump.

The Princeville distribution system is gravity-fed from the three tanks and the system also includes two PRV stations (Fire Station and Kamehameha). The water pressure within the distribution system ranges from 55 pounds per square inch (psi) to 90 psi.

Well No. 5 and new 1.2 MG reservoir are planned to accommodate future increases in demand. The well has been drilled and tested but has not been developed.

3. Pacific Missile Range Facility

The Pacific Missile Range Facility (PMRF) is a United States Department of the Navy military base located on the west side of the island of Kaua`i. The PMRF water system (Public Water System No. 430) is owned and operated by the United States Department of the Navy. The State Department of Health conducted a Sanitary Survey of the PMRF water system and the following information is based on the Sanitary Survey Report dated August 28, 2009. The average daily flow for the PMRF water system is approximately 0.42 MGD and there are 185 service connections within the system. The PMRF water system obtains water from two sources - a well source and a connection to the Kaua'i Department of Water's Kekaha system. The PMRF water system facilities, all located on the PMRF base, include two mechanical control buildings, four storage tanks, and two pneumatic pressure tanks.

The PMRF water system utilizes three submersible pumps to draw water from the Mana Shaft located at the Kamokala Ridge Magazine area. Water is pumped about two miles into the PMRF's treatment facility on base where it is disinfected with chlorine, fluoridated, and then stored in either a 0.42 million gallons (MG) or a 0.10 MG steel tank. The water flows from these tanks into the PMRF distribution system.

About 80% of the PMRF's water needs are supplied by the Mana shaft. The other 20% is supplied by a connection to the County DOW Kekaha system. The water supplied from the DOW, is disinfected and fluoridated and then pumped into two 0.01 MG steel storage tanks.

The PMRF water system serves 1,200 people to provide drinking water and fire protection to the entire PMRF base. Water demand on the PMRF base consists of mechanical, industrial, residential, park facilities, cafeteria, picnic/camp grounds and irrigation. The PMRF water system employs two booster pumps and a 0.01 MG hydro-pneumatic tank to maintain a distribution system pressure of 40-60 psi. Two more booster pumps and another 0.01 MG hydro-pneumatic tank are available to also maintain the distribution system pressure of 40-60 psi. When fire flow is needed for fire protection the PMRF water system has two high capacity pumps that will turn on when the system pressure drops below 20 psi.

No major capital improvements are planned.

4. Pakala
   The Pakala water system, which is owned and operated by the Gay and Robinson Sugar Plantation, is a community water system for Pakala Village serving approximately 1,500 people. The community consists of employee and retiree housing for workers of the sugar plantation and cattle ranch.

5. Kahili Mountain Park
   The Kahili Mountain Park water system, which is owned by the Seventh Day Adventist Church and operated by Aqua Engineers, Inc., serves vacation rentals, the Kahili Adventist School and residential areas owned by the Seventh Day Adventist Church.

6. Kealia
   The Kealia water system, which is owned by Kealia Water Company Holding and operated by Aqua Engineers, Inc., serves approximately 260 people in an unincorporated community off of Kūhiō Highway near the coast.

7. Kokee State Park
   The Kokee State Park water system, which is owned and operated by the State Department of Land and Natural Resources (DLNR) Parks Branch, provides water for the remote beach park's toilets and showers.

8. Polihale State Park
   The Polihale State Park water system, which is owned and operated by the State DLNR Parks Branch, provides water for the remote beach park‘s toilets and showers.

9. Anahola Farm Lots
   According to the Anahola Regional Plan prepared by the Department of Hawaiian Home Lands (DHHL) in June 2010, the DHHL water system in Anahola serves 79 customers in the DHHL farm lots and the Anahola Bay View area. All other residential customers are on the DOW water system. The DHHL system is operated by Aqua Engineers, Inc.

1.4 Water Use and Development Plan

The State Water Code, Chapter 174C, Hawaii Revised Statutes, establishes the Hawaii Water Plan as the guide for implementing comprehensive water resources planning to address the problems of supply and conservation of water. The County Water Use and Development Plans (WUDPs) are one of five components of the Hawaii Water Plan.

The purpose of the County WUDPs is to inventory all projected water demands within each county and ensure that the future water needs of the county are met. The WUDPs should set forth the “allocation of water to land use in that county” and maintain consistency with county zoning and land use policies. The WUDPs serve to inform future land use planning and provide guidance to the Commission for decision-making on water allocations and water reservation requests.

The most recent Kaua’i WUDP was prepared in February 1990. The information in this WUDP is outdated, with water usage and projections made to the year 2010, and the water usage conditions at the time have changed significantly with the closure of the last sugar mill on Kaua’i in 2009.

The Kaua’i WUDP is currently being updated, with its completion scheduled for mid-2016.

Section 2. Improvement Program

2.1 Existing Need

There are many existing facilities that presently need to be replaced or rehabilitated due to their current condition or existing deficiencies. As required by HRS Section 46-143(1)(A), the Needs Assessment Study and Facility Reserve Charge Update has been prepared to identify these existing deficiencies in source and storage systems. The latest version of the Needs Assessment Study was prepared for the DOW in November of 2013, but it is still in draft form and not yet approved by the DOW. The analysis of existing deficiencies in the current draft of the Needs Assessment Study was provided by DOW staff as of 2006. Existing systems that are deficient in source and/or storage would require new facilities to be developed to provide additional source or storage capacity.

The DOW water systems with existing source and storage deficiencies are shown in Table 2.1.1.

Table 2.1.1 Existing Source and Storage Deficiencies (evaluation done in 2006)

Water System	Existing Source Deficiency	Existing Storage Deficiency
Kekaha-Waimea	Yes (143 gpm)	Yes
Hanapēpē-Ele`ele	No	No
Kalāheo	No	Yes
Lāwai-Ōma`o	No	Yes
Kōloa-Po`ipū	No	Yes
Puhi-Līhu`e-Hanamā`ulu	No	No
Wailua-Kapa`a	No	Yes
Anahola	Yes (111 gpm)	No
Moloa`a	N/A (no DOW-owned source)	Yes
Kīlauea-Waipake-Kalihiwai	Yes (93 gpm)	Yes
Anini	N/A (no DOW-owned source)	N/A (no DOW-owned storage)
Hanalei	Yes	Yes
Wainiha-Hā`ena	Yes (67 gpm)	Yes

Source: Needs Assessment Study and Facility Reserve Charge Update, Leidos, November 2013

Per the November 2013 draft of the Needs Assessment Study:

- Approximately 21 percent of the DOW's Capital Improvements Program (CIP) for source projects is required to address existing source deficiencies.
- An estimated 23 percent of the CIP for storage projects is required to address existing storage deficiencies.

- Approximately 237 miles (out of 399 total miles) installed between 1921 and 1980 are expected to be replaced due to age, deterioration, or inadequate size based on current fire protection standards.

- Approximately 20 percent of the Capital Replacement Program (CRPL) and all of the CIP costs are needed to eliminate existing deficiencies in the transmission system.

CRPL projects are replacement projects but are also sized to provide additional capacity, and the capacity increasing portion of these projects is considered to help eliminate transmission system deficiencies.

The Facility Reserve Charge (FRC) includes a credit component for new customers in consideration for the portion they pay to help eliminate existing deficiencies, source and storage repair and replacement, and debt service payments on existing facilities.

2.2 Projected Need

In the Water Plan 2020 report, historical water use data from 1995 to 1998 was used in conjunction with population and land use projections from the 2000 Kaua'i General Plan to develop future water demands in 2005, 2010 and 2020. In the Water Plan 2020 report, it was assumed that the water usage rates would remain the same from 2000 to 2020, and that non-metered water would decrease from 25 percent to 15 percent by 2020.

In the November 2013 draft of the Needs Assessment Study, the water demand projections for 2030 were calculated by interpolating the population projections in the Water Plan 2020 report for the years 2020 and 2050, and then applying the year 2020 water usage rates; the system-wide population and water use projections are summarized in Table 2.2.1.

Table 2.2.1 Population and Water Use Projections

Year	Service Area Population	Projected Water Use (gallons per day)
2000	54,800	
2020	68,880	17,794,000
2030	75,280	19,445,900

Source: Needs Assessment Study and Facility Reserve Charge Update, Leidos, November 2013

The service area population is projected to increase by 9 percent from 2020 to 2030.

The DOW water systems with projected deficiencies in source and storage systems are identified in Table 2.2.2.

Table 2.2.2 Projected Source and Storage Deficiencies

Water System	2030 Source Deficiency Without New Source Capacity	2030 Storage Deficiency Without New Storage Capacity
Kekaha-Waimea	Yes	Yes
Hanapēpē-Ele`ele	No	No
Kalāheo	Yes	Yes
Lāwai-Ōma`o	No	Yes
Kōloa-Po`ipū	Yes	Yes
Puhi-Līhu`e-Hanamā`ulu	Yes	Yes
Wailua-Kapa`a	No	Yes
Anahola	Yes	No
Moloa`a	N/A (no DOW-owned source)	Yes
Kīlauea-Waipake-Kalihiwai	Yes	Yes
Anini	N/A (no DOW-owned source)	N/A (no DOW-owned storage)
Hanalei	No	Yes
Wainiha-Hā`ena	Yes	Yes

Source: Needs Assessment Study and Facility Reserve Charge Update, Leidos, November 2013

The Kaua`i General Plan Update: Socioeconomic Analysis and Forecasts (SAF) was prepared by SMS for the County of Kaua`i. The SAF, dated February 2014, provides forecasts of population, households, jobs and employment, housing units, visitors, and visitor units for the County of Kaua`i from 2013 to 2035. In the SAF, the projected resident population for the County is 74,693 for the year 2020 and 83,828 for the year 2030, which is an increase of 12 percent.

A comparison of the population projections between the 2013 draft of the Needs Assessment and the SAF indicates that the SAF is higher in the population projection for 2020 and 2030, and the SAF also has a higher projected increase in population from 2020 to 2030. This indicates that the projected source and storage deficiencies listed in Table 2.2.2 as currently identified by the Department of Water may understate the extent of the deficiencies.

2.3 Capital Facilities Projects

The Water Plan 2020 report developed capital improvement projects to address the long-term water system needs as part of its Capital Improvements Program (CIP) development. Since the Water Plan 2020 report was approved in 2000, many of the projects have been constructed. The November 2013 draft Needs Assessment report presented an updated summary list of Capital Facilities Projects which is presented in Table 2.3.1.

Table 2.3.1 Water System Summary – Capital Facilities Projects By Type

Costs are in thousands of dollars

Water System	Number of Projects	Source	Storage	Transmission & Distribution	Other	Total
Kekaha-Waimea	24	$ 1,779	$ 9,850	$ 47,097	$ 0	$ 58,726
Hanapēpē-Eleele	13	$ 1,146	$ 2,483	$ 22,953	$ 4,061	$ 30,644
Kalāheo	12	$ 3,939	$ 5,175	$ 33,607	$ 7,714	$ 50,434
Lāwai-Ōma`o	16	$ 4,933	$ 6,532	$ 35,153	$ 0	$ 46,618
Kōloa-Poipu	16	$ 3,448	$ 15,923	$ 28,354	$ 0	$ 47,724
Puhi-Līhu`e-Hanamā`ulu	32	$29,058	$ 23,471	$ 85,888	$12,825	$151,242
Wailua-Kapa`a	40	$15,967	$ 35,856	$ 98,258	$ 164	$150,244
Anahola	8	$ 2,620	$ 2,751	$ 10,859	$ 0	$ 16,230
Moloa`a	4	$ 131	$ 1,526	$ 5,592	$ 0	$ 7,248
Waipake-Kīlauea-Kalihiwai	17	$ 3,284	$ 11,120	$ 40,289	$ 655	$ 55,348
Anini	3	$ 66	$ 0	$ 8,522	$ 0	$ 8,587
Hanalei	10	$ 3,327	$ 1,791	$ 12,201	$ 639	$ 17,959
Hā`ena-Wainiha	13	$ 2,765	$ 5,535	$ 14,144	$ 0	$ 22,444
TOTAL	208	$72,460	$122,013	$442,917	$26,058	$663,449

Source: Needs Assessment Study and Facility Reserve Charge Update, Leidos, November 2013

As noted in Section 2.3, the SAF has higher population projections for 2020 and 2030 than the 2013 draft of the Needs Assessment. This indicates that the capital facilities projects described in Table 2.3.1 as currently identified by the Department of Water may understate the extent of the capital facilities projects required to address projected deficiencies.

2.4 Recommendations

After the current update of the Kaua'i General Plan, the Department of Water will commence with the new Water Plan 2040 study. The new study will incorporate the population and demographic projections in the SAF prepared for the General Plan update. It is recommended that the new study also include:

- Assessment of the feasibility and desirability of integration of private water systems into the County water system; and
- Assessment of the use of renewable energy at its facilities.

GENERAL PLAN UPDATE

KAUA‘I INFRASTRUCTURE ANALYSIS

WASTEWATER SYSTEM

Prepared For

County of Kaua‘i

Prepared By

R.M. Towill Corporation

May 2015

Wastewater

The purpose of the wastewater infrastructure analysis in relation to the General Plan Update is to set forth policies to guide future capacity improvements to the County's wastewater system. The County's wastewater management is responsible for developing and operating the wastewater system that includes the collection, treatment, and disposal facilities.

Section 1. Overview of Existing Wastewater System

This section provides a summary of the existing wastewater infrastructure for Kaua‘i. The centralized wastewater systems on the island are either privately owned or owned by the County of Kaua‘i. Various wastewater master plans for the major areas on the island have been completed. This section will summarize the various wastewater master plans and compile them into one document.

1.1 Introduction

The County of Kaua‘i provides wastewater service to four (4) major communities which include Waimea, Hanapēpe-‘Ele‘ele, Līhu‘e-Hanamā‘ulu, and Wailua-Kapa‘a, as shown in Figure 1-1. Communities outside the County's service area rely on private wastewater treatment plants. In rural areas where wastewater service is not available, many residents and smaller businesses rely on Individual Wastewater Systems (IWS) and cesspools. The areas that rely on private wastewater treatment plants or IWSs/cesspools include Puhi, Kekaha, Princeville, and Po‘ipū.

1.2 County of Kaua‘i Wastewater Infrastructure

The County of Kaua‘i's wastewater infrastructure facilities consists of the Waimea Wastewater Treatment Plant, the ‘Ele‘ele Wastewater Treatment Plant, the Līhu‘e Wastewater Treatment Plant, the Wailua Wastewater Treatment Plant, and various wastewater pump stations. A summary of the County owned wastewater treatment plants and corresponding service areas are presented in Table 1-1. The locations of the wastewater treatment plants are shown in Figure 1-2. A brief description of each of the wastewater systems is presented as follows:

Table 1-1. County of Kaua‘i Wastewater Treatment Plant Summary

Treatment Plant	Service Area	Design Capacity	Effluent Quality
Waimea	Waimea community	0.7 mgd	R-1[1]
‘Ele‘ele	Hanapēpe, ‘Ele‘ele, Port Allen	0.8 mgd	Secondary

Līhu‘e	Properties along Kapule Highway, Kūhiō Highway, Ahukini Road, and Rice Street	2.5 mgd	R-1
Wailua	Kapa‘a, Papaloa, Waipouli, Wailua	1.5 mgd	R-2[2]

1. R-1: Recycled water that has been oxidized, filtered, and disinfected.
2. R-2: Recycled water that has been oxidized and disinfected.

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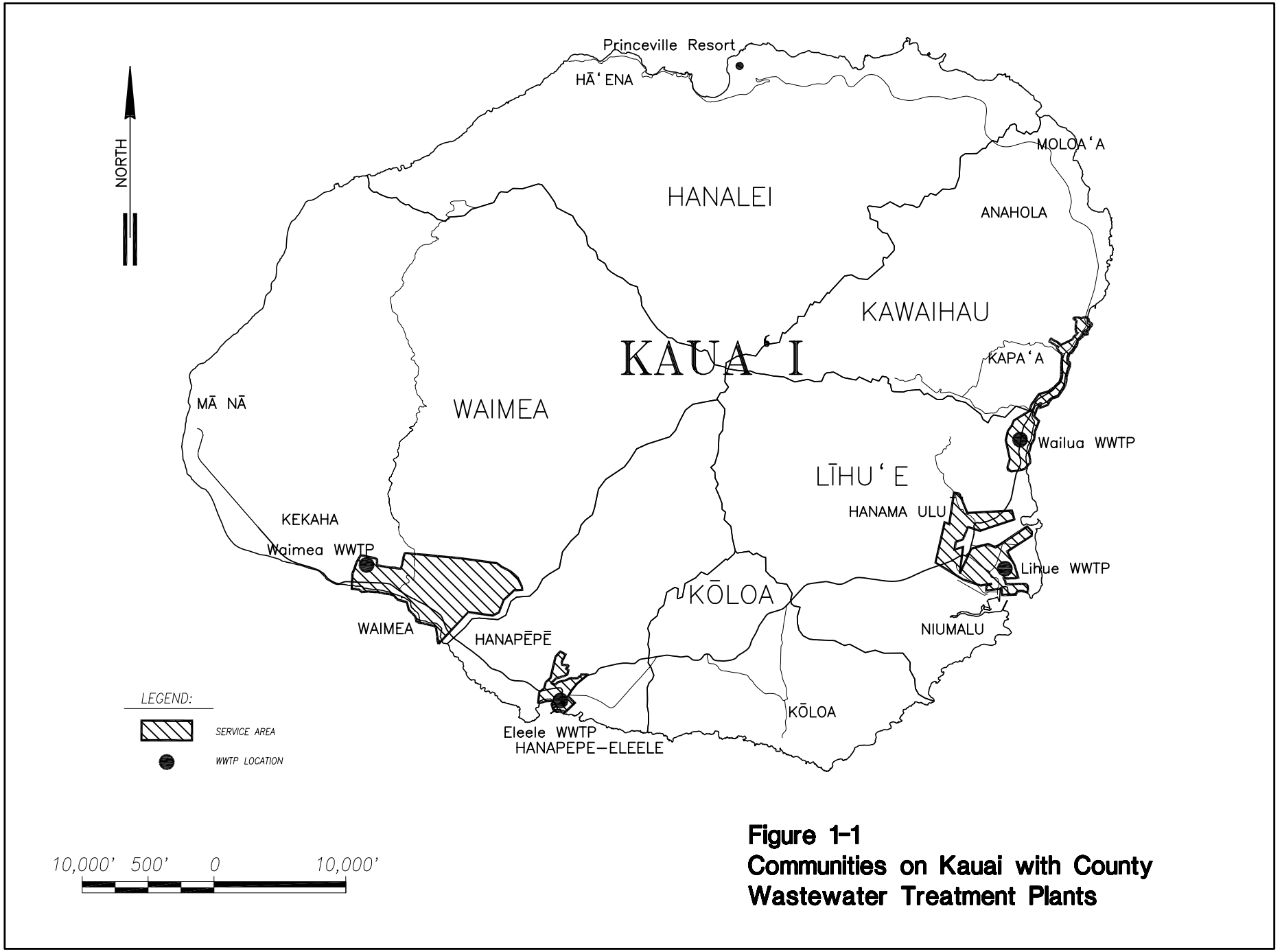

Figure 1-1
Communities on Kauai with County Wastewater Treatment Plants

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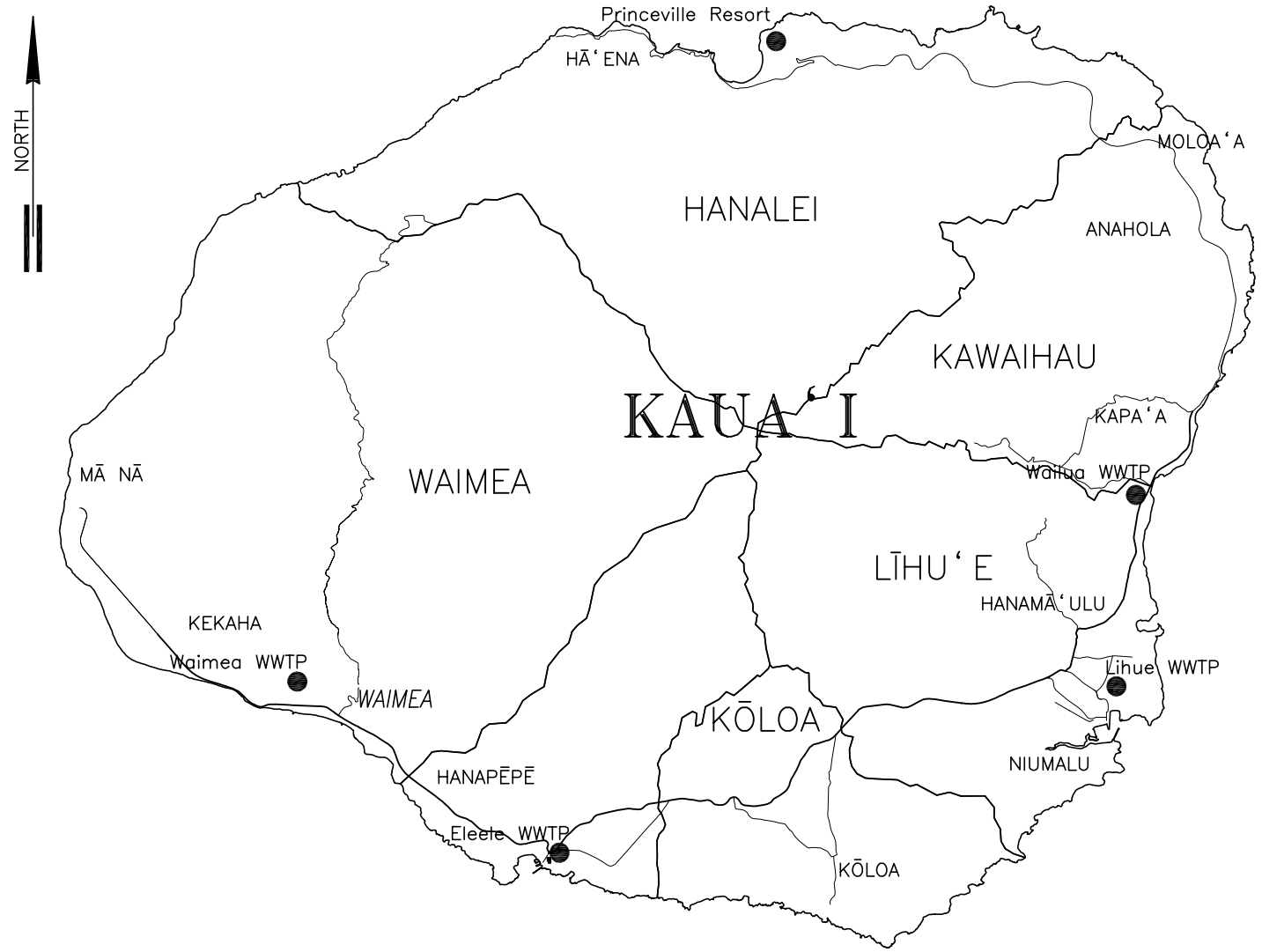

Figure 1-2
County of Kauai Wastewater Treatment Plants

1.2.1 Waimea Wastewater System

The Waimea wastewater system was constructed in the early 1970s in the southwestern area of Kaua‘i and expanded in 2013. The system services the Waimea community and consists of gravity pipelines, manholes, four (4) wastewater pump stations, associated force mains, and the wastewater treatment plant. The locations of the four (4) wastewater pump stations and wastewater treatment plant are shown in Figure 1-3.

1.2.2 ‘Ele‘ele Wastewater System

The ‘Ele‘ele wastewater system was constructed in 1977 and expanded in the 1990s to service the Hanapēpe, ‘Ele‘ele, and Port Allen areas. The system is comprised of gravity pipelines, manholes, three (3) pump stations, corresponding force mains, and the wastewater treatment plant. The locations of the pump stations and wastewater treatment plant are shown in Figure 1-4.

1.2.3 Līhu‘e Wastewater System

The Līhu‘e wastewater system was constructed in the 1970s to service the properties along Kapule Highway, Kūhiō Highway, Ahukini Road, and Rice Street and was expanded in the late 1990s. The system consists of gravity pipelines, manholes, five (5) wastewater pump stations, associated force mains, and the wastewater treatment plant. The locations of the five (5) wastewater pump stations and wastewater treatment plant are shown in Figure 1-5.

1.2.4 Wailua Wastewater System

The Wailua wastewater system was constructed in 1964 to service the Kapa‘a, Papaloa, Waipouli, and Wailua areas and has subsequently been expanded in phases, most recently in 1991. The system is comprised of gravity pipelines, manholes, ten (10) pump stations, the corresponding force mains, and the wastewater treatment plant. The locations of the wastewater pump stations and wastewater treatment plant are shown in Figure 1-6.

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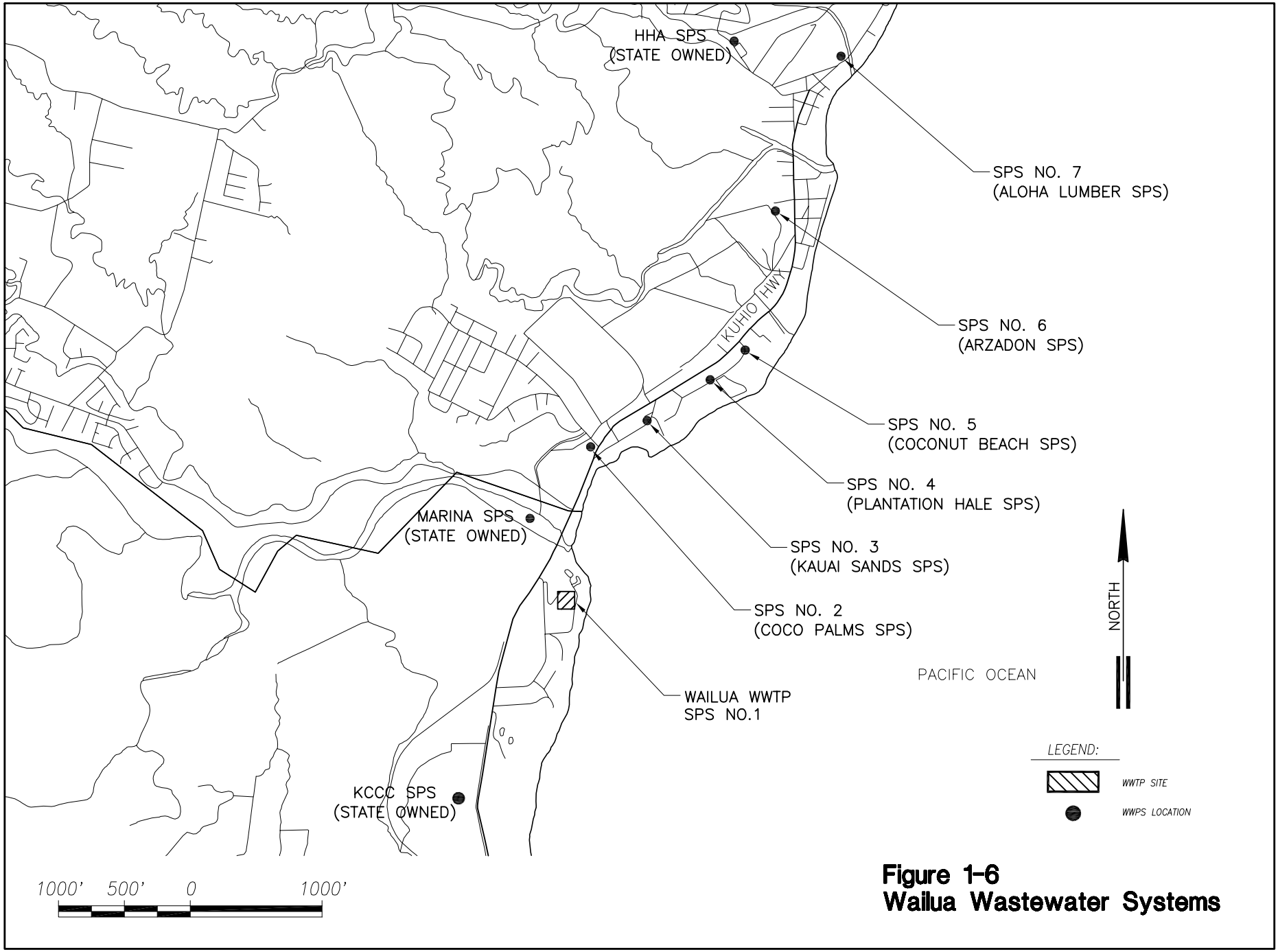

Figure 1-6
Wailua Wastewater Systems

1.3 Private Wastewater Systems

There are numerous privately owned wastewater systems on Kaua‘i. The larger systems are shown here and include wastewater systems that service the Puhi, Pacific Missile Range Facility, Princeville, and Po‘ipū areas. Other smaller wastewater systems on Kaua‘i include Alihi Lani, Nāwiliwili, Kōke‘e, Hale Kahanalu, Kalepa Village, Kūhiō Shores, Lāwa‘i Beach, and Whaler’s Cove. A summary of the large wastewater systems is shown in Table 1-2.

Table 1-2. Privately Owned Wastewater Treatment Plant Summary

Treatment Plant	Ownership	Design Capacity	Effluent Quality
Puhi	Grove Farm	1.0 mgd	R-1
Pacific Missile Range Facility (PMRF)	U.S. Navy	North end: 7,500 gpd South end: 10,000 gpd	Secondary
Kaua‘i Beach Resort Assoc. (KBRA)	KBRA	0.1 mgd	Secondary
Princeville	Princeville	1.5 mgd	R-2
Po‘ipū	HOH Utilities, LLC	0.8 mgd	R-1

1.3.1 Puhi Sewer and Water Company System

The Puhi Sewer & Water Company is owned by the Grove Farm and provides wastewater treatment to developed regions such as the Kukui Grove, Puakea, and Puhi areas. The wastewater system includes gravity sewer lines, two (2) pump stations, associated force mains, and the wastewater treatment plant.

1.3.2 Pacific Missile Range Facility Wastewater Treatment Plant

The Pacific Missile Range Facility (PMRF) is a U.S. Naval facility and the world’s largest instrumented, multi-dimensional testing and training range. The PMRF is located on the western shore of Kaua‘i near Kekaha on approximately 1,800 acres. There are two wastewater treatment plants that service the PMRF area.

1.3.3 Kaua‘i Beach Resort Association Wastewater Treatment Plant

The Kaua‘i Beach Resort Association (KBRA) maintains and operates their private wastewater treatment plant. The KBRA facility is located on the eastern shore of Kaua‘i and north of the Līhu‘e area. The treatment plant was constructed in 1981 and services three sub-associations.

1.3.4 Princeville Wastewater Treatment Plant

The Princeville development is located on the northern shore of Kauaʻi on approximately 2,200 acres. The Princeville wastewater treatment system includes gravity sewer lines, six (6) pump stations, associated force mains, and the treatment plant. The wastewater treatment plant services the Princeville Hotel, commercial shopping areas, single and multi-family units, and the golf course.

1.3.5 Poʻipū Wastewater Treatment Plant

The Poʻipū Wastewater Facility was originally constructed in 1981 and later expanded in 2004 to service the Poʻipū resort area. The effluent from the treatment facility is used for irrigation at the Kiahuna Golf Course and at the Koloa Landing resort. Any remaining effluent from the treatment plant is disposed through injection wells.

1.4 Individual Wastewater Systems (IWS)

Many areas on the island are not connected to a centralized sewer collection system and are assumed to treat the wastewater using IWS. Some of the areas include the Kupolo and Ulu Mahi areas in Līhuʻe, the Hanapēpe Heights area near ʻEleʻele, portions of the Kekaha area in Waimea, and portions of the Kapaʻa area in Wailua. Approximately 85% of over 1000 households in the Kekaha area may still be on cesspools. The agricultural and rural lots in the mauka section of ʻEleʻele are also not connected to the County system however, due to the large lot sizes and spacing, it is not feasible for those to be connected. In the Līhuʻe area between Hanamāʻulu and Nāwiliwili, there are pockets of residential communities that rely on IWS/cesspools. There are over 4000 IWS/cesspools in the Wailua-Kapaʻa area with approximately 12% of the cesspools failing. There are two types of individual wastewater systems:

- Cesspool is a pit in the ground where raw sewage is collected and does not receive treatment. The solids in the wastewater settle to the bottom of the cesspool, while the water sits above and seeps into the surrounding soil walls. In order to prevent overflow of the cesspool, the liquid and sludge generated will need to be occasionally pumped out and properly disposed of at a septage receiving facility. However, the discharge of untreated wastewater into the environment can be detrimental to water quality. The Hawaiʻi State Department of Health (DOH) now prohibits the construction of new cesspools, unless granted by the DOH director.

- DOH Typical IWS: The typical IWS system is a septic tank, which is usually made of concrete or fiberglass and collects raw wastewater. The tank is usually comprised of two chambers. The first chamber is similar to a cesspool by allowing the solids to settle to the

bottom and the scum to float to the top. The first chamber also allows the solids to anaerobically digest and reduce the volume of solids. The liquid can then flow into the second chamber where further settlement takes place. This partially treated wastewater permeates into the soil through a leach field. The sludge and scum that remain in the septic tank will need to be pumped regularly to prevent overflow and failure.

The residential areas that do not have a connection to a sewer collection system are treating their wastewater using individual wastewater systems. Many of the IWSs could eventually be serviced by a nearby wastewater treatment plant. The wastewater treatment plants take into account the increased flow from the IWSs especially when calculating the flows for future development.

Section 2. Capacity Assessment, Deficiencies, & Demands

This section presents wastewater treatment plant capacities, existing deficiencies, and projected wastewater demands for Kaua‘i.

2.1 Overview

Wastewater flow rates are typically estimated according to land use and population estimates. Improvements and expansions may be necessary to satisfy the increasing volume of wastewater from newly developed regions.

2.2 County of Kaua‘i Wastewater

The wastewater treatment plants for the County of Kaua‘i differ in the size of design capacity and the types of processes used to treat the wastewater. The Waimea, ‘Ele‘ele, Līhu‘e, and Wailua wastewater treatment plants are briefly described in the following sub-sections.

2.2.1 Waimea Wastewater Treatment Plant

The Waimea Wastewater Treatment Plant (WWTP) was recently upgraded to an R-1 Moving Bed Biofilm Reactor (MBBR) facility with a design capacity of 0.7 million gallons per day (mgd). The service area for the facility mainly consists of residential lots (approximately 90% of residences), and institutional/commercial sources (business district) in the Waimea community. The unit processes used to treat the wastewater include screening and degritting, Moving Bed Biofilm Reactor (MBBR), dissolved air flotation (DAF), disk filters, ultraviolet disinfection, sludge stabilization, and a centrifuge dewatering unit. The existing treatment plant data is presented in Table 2-1.

Table 2-1. Waimea WWTP Design Criteria

Description	Quantity	Unit
Design Daily Flow	700,000	gpd
Influent Screens		
Number of screens	2	each
Peak Capacity each screen	2.8	mgd
Vortex Grit Tank	1	each
Number of tanks	1	each
Peak Capacity	5.6	mgd
Flow Equalization Tanks		
Number of tanks	2	each
Capacity of tank, each	148,000	gallons
Moving Bed Biofilm Reactor Tanks		
Number of Trains	2	each
Tanks per Train	2	each
Design Average Flow	700,000	gpd
Design Peak Flow	1.8	mgd
Dissolved Air Flotation Tanks		
Number of Tanks	2	each
Maximum Flow per tank	2.0	mgd
Disk Filters		
Number of Filters	2	each
Maximum flow per filter	2.0	mgd
UV Disinfection Unit		
Number of Units	1	each
Maximum flow through unit	1.6	mgd

Due to the recent expansion to an R-1 facility by the County of Kaua‘i, there are no major equipment deficiencies at the Waimea WWTP. Upgrades to the R-1 distribution system and expansion of the Kekaha sewer system would be the next phase of work. The need for modifications/expansion to the R-1 irrigation system will be dependent upon surrounding irrigation demands.

2.2.2 ‘Ele‘ele Wastewater Treatment Plant

The ‘Ele‘ele Wastewater Treatment Plant (WWTP) is located along the southwest coast of Kaua‘i and serves the Port Allen, ‘Ele‘ele, and Hanapēpe business and residential areas. The facility produces secondary quality effluent and discharges the effluent to injection wells. The treatment plant has a design average daily flow capacity of 0.80 million gallons per day (mgd) and currently receives an average daily flow between 0.40 - 0.60 mgd. The ‘Ele‘ele WWTP utilizes an activated sludge process, which includes comminuting, aeration, clarification, effluent chlorination, aerobic digestion, mechanical dewatering, and effluent disposal by injection wells. The existing treatment plant data (not including the near-term modifications) is presented in Table 2-2.

The County anticipates the need to further modify and expand the Eleeele facility by year 2025. Per the Facility Plan (2008), the modifications were divided into three phases: near-term, mid-term, and term improvements. The near-term improvements are currently under construction and include new headworks, new recycle pump, second blower, new emergency generator, and replacing of the dewatering unit. The mid-term expansion includes an increase in treatment capacity to an average daily flow of 1.0 to 1.2 mgd.

Table 2-2. ‘Ele‘ele WWTP Design Criteria

Description	Quantity	Unit
Design Daily Flow	800,000	gpd
Bar Screens		
Number of screens	1	each
Peak Capacity each screen	3.6	mgd
Aerated Grit Chamber	1	each
Screw conveyor	1	each
Motor size	2	hp
Activated Sludge System		
Anoxic zone		
Compartments	4	each
Volume for tanks 1-3	1,500	ft^3, each
Volume for tank 4	4,400	ft^3
Anoxic Mixers		
Quantity	5	each
Capacity, each	2,000	gpm
Aerobic zone		
Trains	3	each
Volume per train	12,900	ft^3
Clarifiers (rectangular)		
Quantity	2	each
Length	72	feet
Width	20	feet
Side wall depth	17.5 max	feet
Chlorine Contact Basin		
Tank volume	2,700	ft^3
Aerobic Digester		
Number of digesters	3	each
Volume, total	41,000	ft^3

Some deficiencies at the ‘Ele‘ele WWTP were identified in the mid and term improvements. These deficiencies include a lack of backup generator power to additional unit processes, a lack of explosion proof conduits for various equipment, an inadequate working space fronting the Hanapēpe SPS No. 2 generator, electrical building, and replacing of main power service. A project to address near-term and mid-term deficiencies is currently under construction.

2.2.3 Līhu‘e Wastewater Treatment Plant

The Līhu‘e Wastewater Treatment Plant (WWTP) is located between the Līhu‘e Airport and the Kaua‘i Lagoons Resort. The service area for the facility mainly consists of residential subdivisions and commercial properties along Kapule Highway, Kūhiō Highway, Ahukini Road, and Rice Street which includes nearby Nāwiliwili and Hanamā‘ulu areas. According to the latest Līhu‘e Wastewater Facility Plan dated 2008, only half of the 2.5 mgd capacity is currently used and projections to year 2025 do not anticipate using the full capacity. The facility produces R-1 quality effluent with a design capacity of 1.5 million gallons per day (mgd) or 2.5 mgd secondary treatment with disposal to injection wells. The unit processes used to treat the wastewater include screening, degritting, aeration, primary clarification, biotower (trickling filter/solids contact process), anaerobic sludge digestion, secondary clarification, tertiary filtration, UV disinfection, and sludge dewatering by centrifuge. For re-use, the County of Kaua’i and Kaua’i Lagoons have a contract under which the golf course shall accept up to 1.5 mgd effluent. Currently, the golf course receives 1.0 to 1.2 mgd. The existing treatment plant data is presented in Table 2-3.

Table 2-3. Līhu‘e WWTP Design Criteria

Description	Quantity	Unit
Design Daily Flow	2,500,000	gpd
Mechanical Bar Screens		
Number of screens	2	each
Peak Capacity each screen	6.25	mgd
Aerated Grit Chamber	1	each
Detention time at 6.25 mgd	2	min
Primary Clarifier		
Number of clarifiers	1	each
Diameter	50	feet
Side water depth	8.5	feet
Biofilter		
Number of biofilters	2	each
Diameter, each	60	feet
Media type	Plastic 60° crossflow	
Design hydraulic loading rate	1.08	gpm/sf
Aerated Solids Contact Tank		
Number of tanks	2	each
Detention time	1.56	hours
Secondary Clarifier		
Number of clarifiers	2	each
Diameter	60	feet
Side water depth	16	feet
Tertiary Filters		
Number of filters	2	each
UV Disinfection (Trojan 3000+)	1	each
Dissolved Air Flotation Thickener		
Number of thickeners	1	each

Diameter	25	feet
Sidewater depth	9.5	feet
Solids capture	91	percent
Anaerobic Digester		
Sludge loading flow	13.89	gpm
Primary digester volume	479,703	gallons
Primary digester hydraulic detention time	23.99	days
Secondary digester volume	373,887	gallons
Secondary digester hydraulic detention time	18.69	days
Centrifuge Skid		
Number of centrifuge skid	1	each
Capacity	100	gpm
Injection Well		
Number of wells	7	each

Some future improvements at the facility include replacing the aeration system (install dissolved oxygen meters) and putting the second train (trickling filter/solids contact) back in service. Deficiencies with the collection system include replacing the Halekō WWPS with a new WWPS (if new development occurs) and installing new sewer lines for Ulu Mahi/Pua Loke, Nāwiliwili/Kupolo, and Kapaia.

2.2.4 Wailua Wastewater Treatment Plant

The Wailua Wastewater Treatment Plant (WWTP) is located on the eastern coast of Kaua‘i along Kūhiō Highway on approximately 2.1 acres of County owned land. The plant receives wastewater from the Kapa‘a, Papaloa, Waipouli, and Wailua areas. Originally, the design of the treatment plant allowed an average flow of 0.5 million gallons per day (mgd) and production of R-2 quality effluent. By 1992, expansion to the facility allowed an increase in average daily flow to 1.5 mgd, but due to a lack of redundancy, age, and condition of some components of the facility, the Facility Plan (2008) recommended the County consider the capacity to be 1.0 mgd. The effluent is pumped to the Wailua Golf Course as R-2 water or disposed via an NPDES permitted ocean outfall. The Wailua WWTP processes used to treat the wastewater include degritting, aeration, final settling, tertiary filtration, aerobic digestion, sludge stabilization, sludge drying beds, and chlorination. The existing treatment plant data is presented in Table 2-4.

Much of the Wailua-Kapa‘a area is assumed to treat their wastewater with Individual Wastewater Systems (IWS) or through private wastewater treatment facilities because the wastewater is not serviced through the County. Approximately 4,300 residential areas are expected to have cesspools, while the remaining areas are serviced at the Wailua WWTP. From the Wailua WWTP, the R-2 effluent is pumped to the Wailua Golf Course irrigation system or it is discharged to the NPDES permitted ocean outfall.

The existing Rapid Bloc basins are not currently in use however, the basins remain. The current design at the facility includes a new generator building, a new electrical building, and new

surge/grit basins. The DAFT unit will also be decommissioned and replaced with a rotary drum thickener.

Future development will address the issue of cesspool failures in the Kapa‘a area. The estimated land use of the development will involve various single family units, multifamily units, hotels, commercial use, industrial use, employment, and schools. With the change in land use, the population in the area will generate more wastewater. The recommendation is to expand the Wailua WWTP to a capacity of 2.0 mgd. A value exceeding the 2.0 mgd will require the need to develop additional effluent disposal capacity or the development of another treatment plant.

Table 2-4. Wailua WWTP Design Criteria

Description	Quantity	Unit
Design Daily Flow	1,000,000	gpd
Influent Mechanical Bar Screens		
Number of screens	1	each
Bar Spacing	1/4	inches
Surge Basin		
Number of Basins	3	each
Treatment Capacity	4.0	mgd
Aeration Basins		
Number of tanks	2	each
Treatment Capacity	1.0	mgd
Secondary Clarifiers		
Number of tanks	2	each
Treatment Capacity	0.7	mgd
Cloth Media Filter		
Number of Filters	1	each
Treatment Capacity	3.0	mgd
Chlorine Contact Tank		
Treatment Capacity	1.05	mgd
Treatment Capacity with 10-inch Reuse Pipeline	3.0	mgd

After completion of the mid-term improvements at the Wailua Wastewater Treatment Plant (WWTP), a new membrane bioreactor system may be considered. The collection system will also require upgrades to accommodate the Wailua areas that are experiencing frequent cesspool failures. Some of these modifications include: a new pump station to replace SPS No.1 and expansion of the collection system to include service to Kapa‘a.

2.3 Private Wastewater System

There are over 35 privately owned wastewater treatment plants that serve various sized developments on Kaua‘i. Quantifying the exact number of facilities is difficult since there are many treatment plants for smaller hotels/condominiums with wastewater flow rates under 10,000 gallons per day. Larger master planned developments have their own wastewater systems which

include Princeville, Puhi, and Po‘ipū. Other private wastewater systems service smaller areas that include Nāwiliwili, Kōke‘e, Kalepa Village, Hulē‘ia, and Whaler’s Cove. The larger privately owned wastewater treatment plants are briefly described in the following sub-sections.

2.3.1 Puhi Sewer and Water Company System

The Puhi Sewer & Water Company WWTP has a design capacity of 1.0 million gallons per day (mgd). The treatment plant currently utilizes approximately half of its design capacity. The system can also be further expanded to accommodate 3.0 mgd if there is an increase wastewater demand. The wastewater is treated using activated sludge, chemical coagulant addition, up-flow sand filtration, and chlorine disinfection.

2.3.2 Pacific Missile Range Facility Wastewater Treatment Plant

The PMRF wastewater treatment plant is privately owned by the U.S. Navy and treats the wastewater generated within the region. The PMRF contains two wastewater treatment facilities. The facility in the south end of the region treats approximately 10,000 gallons per day (gpd). The treatment process consists mainly of a primary settler, an anaerobic treatment lagoon, and a secondary infiltration pond. The north end facility is located near the base’s north entrance and treats approximately 7,500 gpd. The processes used to treat the wastewater include grit screening, an aeration chamber, sludge tanks, primary and secondary clarifier, and chlorine treatment. The effluent generated from the treatment facility is pumped to a leach field.

2.3.3 Kaua‘i Beach Resort Association Wastewater Treatment Plant

The Kaua‘i Beach Resort Association (KBRA) facility, with a wastewater capacity of 140,000 gpd, treats about 90,000 to 100,000 gpd of wastewater and discharges the effluent into injection wells. The Smith & Loveless extended aeration package treatment plant, originally constructed in 1981, services the Kaua‘i Beach Resort and the Kaua‘i Villas. There are a total of three injection wells but only two are in operation. Due to high pressure levels, one injection well was abandoned in 2007.

2.3.4 Princeville Wastewater Treatment Plant

The Princeville WWTP was constructed in 1970 and later expanded in 1987, 1990, and 1994. The facility now occupies approximately three acres of land with an average design capacity of 1.5 mgd. The facility services the Princeville resort community and the Hanalei Bay Resort. The treatment processes include headworks with a mechanical bar screen, an aerated grit chamber, four activated sludge aeration basins, four rectangular final clarifiers, a chlorine contact tank, and an effluent pump station. The

solids treatment processes include three aerobic sludge digestion tanks, five sludge drying beds, and dewatering equipment. Once treated, the R-2 quality effluent is pumped to an offsite reservoir for irrigation at the Princeville Golf Course.

2.3.5 Po‘ipū Wastewater Treatment Plant

The Po‘ipū WWTP originally had a design capacity of 500,000 gpd of wastewater and used a conventional activated sludge process to produce R-2 quality effluent. In 2004, the treatment plant capacity was increased to 1.0 mgd due to the increase in land area development. The treatment plant also replaced the activated sludge process with a Moving Bed Bio-Reactor (MBBR) fixed film process. An integrated fixed film activated sludge process was later installed to increase the efficiency of the MBBR. Coagulation, cloth disk filtration, and ultraviolet disinfection were incorporated into the system to upgrade the effluent to R-1 quality. When the effluent does not meet the R-1 quality standards, the effluent is disposed of through injection wells. Otherwise, the R-1 effluent is used for irrigation at the Kiahuna Golf Course and the Koloa Landing resort.

Section 3. Future Demand

This section will provide an introduction and summarize the future demands for the four (4) major communities on Kaua‘i.

3.1 Introduction

The future demands of the four (4) major communities the County of Kaua‘i, Waimea, Hanapēpe-‘Ele‘ele, Līhu‘e-Hanamā‘ulu, and Wailua-Kapa‘a have been summarized in their respective facility plan reports.

Future demands for the County of Kaua‘i’s wastewater systems consisting of the Waimea Wastewater Treatment Plant, the ‘Ele‘ele Wastewater Treatment Plant, the Līhu‘e Wastewater Treatment Plant, and the Wailua Wastewater Treatment Plant are presented in the following sub-sections.

3.2 Waimea Wastewater System

The facility plan for the Waimea wastewater system serves as a guide for its expansion to the year 2020. The future wastewater flow rates are based on projected increases in housing (250 single family homes), transient/hotel units (300), resort developments, commercial, office and industrial space, and institutional uses. Kīkīaola’s near-term development accounts for the majority of the housing and resort increase while their long-term development includes an area located on Kīkīaola land between Waimea and Kekaha and an 18-hole golf course.

Three alternatives were developed in wastewater treatment. The first alternative is to treat the wastewater flows from the Waimea and Kekaha areas without any additional flows from Kīkīaola’s near-term developments. The second alternative is to treat the wastewater flows from the Waimea and Kekaha areas with the additional flows from Kīkīaola’s near-term developments. The third alternative is to treat the wastewater flows from the Waimea and Kekaha areas with the additional flows from both the Kīkīaola’s near-term and long-term developments.

The projected wastewater flow rates and respective construction costs up to the year 2020 for Waimea is 360,000 gpd ($36.8 million), 510,000 gpd for Kekaha, 300,000 gpd for Kīkīaola’s near-term developments, and 1.0 mgd for Kīkīaola’s near-term and far-term developments.

With the recent upgrades and expansion of the wastewater treatment plant to a current design capacity of 0.7 mgd, the near-term and mid-term improvements (those improvements still relevant) from the facility plan would be accommodated. The future development of Kekaha in around year 2025 would most likely be accommodated however, the facility plan should be

revisited to evaluate whether an expansion to the current Waimea WWTP is necessary or a new Kekaha WWTP would be required.

A separate analysis by SMS Research determined that a projected growth of 18% up to the year 2035, can be expected in the Waimea area. Recent upgrades to the facility and expansion to a design capacity of 0.70 mgd, would allow for this future population growth. With an average daily flow rate of 0.25 mgd (33 percent of design capacity), a new facility plan would be required when the actual wastewater flow rate reaches 75 percent of the design capacity (Hawaii Administrative Rules Title 11 Chapter 62). This facility plan would evaluate upgrades to the conveyance areas (gravity, pump stations) and expansion of the facility based on the anticipated increase in flow rates.

3.3 ‘Ele‘ele Wastewater System

The facility plan for the ‘Ele‘ele wastewater system serves as a guide for its expansion to the year 2025. The three intervals were selected (as previously mentioned) for planning purposes and include near-term, mid-term, and term. The mid-term developments include a residential and commercial subdivision and connection of an existing residential collection system (Hanapēpe Heights subdivision). The anticipated additional wastewater flow rate is estimated at 115,810 gpd. The overall wastewater flow to the facility is increased to 0.87 mgd, which exceeds the overall design capacity. The mid-term expansion of the ‘Ele‘ele WWTP should increase the overall treatment to 1.2 mgd.

The far-term expansion of the ‘Ele‘ele WWTP is estimated up to the year 2025. The proposed developments for the area include residential and commercial facilities, some of which are owned by the Department of Hawaiian Homelands (DHHL). If the DHHL property does not connect to the county wastewater system, a far-term expansion would not be required though replacement of aging equipment would need to be completed. The improvements are estimated to be approximately $15.2 million.

If the DHHL property is connected, then a far-term expansion of the facility would be required to accommodate a flow of 1.39 mgd. With this expansion, other improvements include larger pipes along Kaumuali‘i Highway, a larger influent gravity pipe into the treatment plant, new anoxic aerobic tanks/mixers, a new clarifier, new effluent filter, and new ultraviolet disinfection system. These improvements are estimated to be approximately $26.0 million.

With the recent upgrades and expansion of the wastewater treatment plant to a current design capacity of 0.8 mgd, a portion of the long-term improvements (those improvements still relevant) would be accommodated. It is anticipated that the wastewater treatment plant would begin to reach its capacity during the long-term improvements. Depending on the timing of the developments, the facility plan would need to be revisited.

A separate analysis by SMS Research determined that a projected growth of 15% up to the year 2035, can be expected in the ‘Ele‘ele area. The facility has a design capacity of 0.80 mgd and would be able to accommodate this future population growth. With an average daily flow rate of 0.40 mgd (50 percent of design capacity), a new facility plan would be required when the actual wastewater flow rate reaches 75 percent of the design capacity (Hawaii Administrative Rules Title 11 Chapter 62). This facility plan would evaluate upgrades to the conveyance areas (gravity, pump stations) and expansion of the facility based on the anticipated increase in flow rates.

3.4 Līhu‘e Wastewater System

Future demands on the Līhu‘e wastewater system would require some modifications or possible replacement of the existing collection system/pump stations. The Līhu‘e WWTP however, has adequate treatment capacity to the year 2025 as only half of the current 2.5 mgd capacity is being used. If further expansion of the treatment facility is required, then there is sufficient room on surrounding lands.
The following alternatives were evaluated for the Līhu‘e WWTP in the Līhu‘e Wastewater Facilities Plan:

1. Limited Expansion – Operation, maintenance, and replacement of the current WWTP equipment.
2. Līhu‘e Only – Route all new developments (Hanamā‘ulu Triangle, Kaua‘i Lagoons, Līhu‘e Mill, Molokoa Homes 2, Ahukini Mauka, and Ahukini Makai) in the Līhu‘e area including unsewered properties to Līhu‘e WWTP.
3. Līhu‘e Area and Property North of Ahukini Makai - Route all new developments (Hanamā‘ulu Triangle, Kaua‘i Lagoons, Līhu‘e Mill, Molokoa Homes 2, Ahukini Mauka, and Ahukini Makai) in the Līhu‘e area including unsewered properties and the property north of Ahukini Makai to Līhu‘e WWTP.
4. New Private Ahukini WWTP – Route a portion of the new developments (Hanamā‘ulu Triangle, Kaua‘i Lagoons, Līhu‘e Mill, Molokoa Homes 2) and unsewered areas to Līhu‘e WWTP. A private new Ahukini WWTP would service Ahukini Mauka and Ahukini Makai.

All four alternatives were evaluated and categorized by short-term, mid-term, and long-term developments. For all alternatives, the short-term average daily wastewater flow rate (ADWF) is 1.6 mgd and peak wet weather wastewater flow rate (PWWF) is 5.9 mgd. The mid-term ADWF is 2.0 mgd and PWWF is 7.3 mgd. The long-term ADWF is 2.9 mgd and the PWWF is 10.9 mgd. The four alternatives were evaluated based on various criteria and the recommended alternative is Alternative 2 – Līhu‘e Only flows.

With the recent upgrades and expansion of the wastewater treatment plant to a current design capacity of 2.5 mgd, the short-term and mid-term improvements (those improvements still relevant) from the facility plan would be accommodated. Depending on the area of development, the existing gravity sewer trunk lines and pump stations would most likely require rehabilitation or possible replacement. The long-term projected wastewater flow rate of 2.9 mgd would most likely be accommodated however the County would need to consider revisiting or updating the facility plan.

A separate analysis by SMS Research determined that a projected growth of 60% up to the year 2035, can be expected in the Līhu‘e area. Recent upgrades to the facility and expansion to a design capacity of 2.5 mgd, would allow for a portion of this future population growth. Depending on the phasing of this increase in population, a new facility plan would eventually be required. With an average daily flow rate of 1.10 mgd (44 percent of design capacity), a new facility plan would be required when the actual wastewater flow rate reaches 75 percent of the design capacity (Hawaii Administrative Rules Title 11 Chapter 62). This facility plan would evaluate upgrades to the conveyance areas (gravity, pump stations) and expansion of the facility based on the anticipated increase in flow rates.

3.5 Wailua Wastewater System

The Wailua Facility Plan was completed in 2008 and serves as a guide for expansion to the year 2025. The wastewater needs for the Wailua area will grow as new development will continue to occur. The three intervals were selected (as previously mentioned) for planning purposes and include near-term, mid-term, and far-term improvements. The near-term improvements (currently under construction) will not expand the Wailua WWTP, but will provide operational and maintenance reliability by replacement of aging equipment. The current wastewater flow rate and projected near-term flows of 0.5 mgd is within the 1.0 mgd of the current treatment capacity limit.

The mid-term projections may expand the collection system to include Kapaa Highlands/subdivision, Coconut Beach Resort, Coconut Plantation Village, and various areas in Wailua with failing cesspools. These anticipated flow rates do not include the Department of Hawaiian Homelands development which would significantly impact the mid-term flows. The Hanamā‘ulu Triangle development and Hanamā‘ulu Housing would also impact the flow rates by freeing up capacity at the Wailua WWTP. Expanding the collection system to include upper Kapaa is estimated to be over $60 million.

The far-term projections will require an expansion of the Wailua WWTP to a capacity of 2.0 mgd which would be the maximum flow capacity since the system is limited by the existing outfall. The proposed developments include mainly failed cesspool properties in Kapa‘a. If the

wastewater flow from future developments or existing failing cesspool properties exceeds 2.0 mgd, an additional treatment plant may be required in Kapa‘a. The anticipated wastewater flow rates do not include the proposed DHHL development in Wailua. A proposed Kapa‘a WWTP could start up as a small membrane bioreactor (MBR) facility with a treatment capacity of approximately 0.5 mgd.

With the recent upgrades and expansion of the wastewater treatment plant to a current design capacity of 1.5 mgd, the near-term and mid-term improvements (those improvements still relevant) from the facility plan would be accommodated. Depending on the areas of development (Hanamā‘ulu, DHHL, and Kapa‘a), the existing gravity sewer trunk lines and pump stations would most likely require rehabilitation or possible replacement. The long-term projected wastewater flow rate of 2.0 mgd would require the County to consider revisiting or updating the facility plan.

A separate analysis by SMS Research determined that a projected growth of 20% up to the year 2035, can be expected in the Wailua area. The facility has a design capacity of 1.5 mgd and would be able to accommodate this future population growth. With an average daily flow rate of 0.6 mgd (40 percent of design capacity), a new facility plan would be required when the actual wastewater flow rate reaches 75 percent of the design capacity (Hawaii Administrative Rules Title 11 Chapter 62). This facility plan would evaluate upgrades to the conveyance areas (gravity, pump stations) and expansion of the facility based on the anticipated increase in flow rates.

Section 4. Recommended Improvements

This section will provide an introduction and summarize the recommended improvements for the four (4) major communities on Kaua‘i.

4.1 Introduction

Recommended improvements for the four (4) major communities which include Waimea, Hanapēpe-‘Ele‘ele, Līhu‘e-Hanamā‘ulu, and Wailua-Kapa‘a have been summarized in the respective facility plan reports.

Recommended improvements and associated costs (when available) for the County of Kaua‘i’s wastewater system consisting of the Waimea Wastewater Treatment Plant, the ‘Ele‘ele Wastewater Treatment Plant, the Līhu‘e Wastewater Treatment Plant, and the Wailua Wastewater Treatment Plant are presented in the following sub-sections.

4.2 Waimea Wastewater System

The Waimea WWTP was recently upgraded as part of a Phase I expansion to an R-1 facility with a design capacity of 700,000 gpd. This facility upgrade included a new headworks facility, new Moving Bed Biofilm Reactor (MBBR), dissolved air flotation (DAF) unit, tertiary filtration, an ultraviolet disinfection process, a dewatering facility (centrifuge), and a new photovoltaic system (125 kW). The next phase for the Waimea wastewater system would be for R-1 distribution as well as an expansion on the Kekaha sewer system. An R-1 distribution system for the Waimea area would require a separate Basis of Design and Engineering Design Report to be completed and approved by the Hawaii State Department of Health. The current R-1 effluent is pumped to the Kīkīaola reservoir. Two injection wells currently provide backup for the R-1 effluent.

An analysis of the Kekaha sewer system was completed in 2009 (Waimea WWTP Facility Plan) and it was determined that a wastewater collection/treatment system was not warranted due to the extremely high construction cost. The cost did not include land acquisition which could increase the overall project cost considerably.

4.3 ‘Ele‘ele Wastewater System

The facility plan for the ‘Ele‘ele wastewater system was separated into three planning intervals (as previously mentioned) which include near-term, mid-term, and far-term. The near-term improvements are currently under construction. The mid-term improvements for expansion to 1.2 mgd include the following modifications at the ‘Ele‘ele WWTP:

- Construct a new anoxic tank and two aerobic trains

- Install a third centrifugal blower
- Construct two new circular clarifiers
- Install two cloth disk filters
- Construct a new ultraviolet disinfection system
- Install a new gravity belt thickening system
- Construct a new electrical building
- Acquire additional land for future facilities

The estimated cost for the mid-term expansion to 1.2 mgd is approximately $16.1 million and does not include the land acquisition.

The far-term improvements are dependent upon whether the DHHL subdivision in Hanapēpe connects or does not connect to the County collection system. The far-term improvements for both cases are listed in the table below:

Table 4-1. Far-term Improvements

Far-term Improvements (Does Connect)	Far-term Improvements (Does Not Connect)
Replace the 8” trunk sewer in Kaumuali‘i Highway with a new 15” line	Replace the existing collection system pump stations with new pump stations
Replace the existing 15” and 18” sewer pipes in Kaumuali‘i Highway with new 21” pipes	Construct a new aerobic digester
Construct anoxic and aerobic tanks that mirror the existing tanks	Construct possibly a new reclaimed water pump station for plant effluent reuse
Construct a new circular clarifier	Increase plant staffing
Install a new effluent filter unit	Expand electrical distribution for new facilities
Construct a new ultraviolet disinfection train	

The estimated costs for the above far-term improvements are estimated at $15.2 million which does not include land acquisition.

The estimated costs for the far-term improvements (with DHHL wastewater flows) are estimated at $26.0 million. The expansion needed would be to an average of 1.39 mgd if DHHL does connect with the County wastewater system.

Unlike the Waimea Wastewater Treatment Plant, there are no plans to install a photovoltaic system (“green infrastructure”) to assist with energy savings cost.

4.4 Līhu‘e Wastewater System

The Līhu‘e WWTP has adequate treatment capacity to the year 2025 although some of the equipment are in need of repair/replacement. Various repair/replacement projects at the facility were evaluated and categorized into short-term, mid-term and long-term improvements. A majority of the short term improvements have already been constructed. The wastewater collection system also requires upgrades/modifications.

Various collection system alternatives were evaluated in the Līhu‘e Wastewater Facility Plan and categorized into mid-term and long-term options. The recommendations were then narrowed down into two alternatives with the associated cost estimates:

1. Re-route the Hanamā‘ulu WWPS flows to Līhu‘e WWTP through Kapule Highway
   short-term $4.41M, mid-term $3.77M, and long-term $15.26M

2. Construct a new Ahukini Road relief line
   short-term $5.71M, mid-term $3.77M, and long-term $15.26M

A summary of the major mid-term recommendations for the Līhu‘e wastewater system is as follows:

Proposed studies, repairs/replacements

a. Repair or replace aeration system with more efficient diffusers/blowers

b. Install/replace flow meters and telemetry in all WWPS and at the WWTP

c. Repair or replace septage-receiving station

2. Total mid-term capital costs - $12.0M

A summary of the major long-term recommendations for the Līhu‘e wastewater system is as follows:

1. Collection system
    a. Install sewer lines for Ulu Mahi/Pua Loke
    b. Install sewer lines for Nāwiliwili/Kupolo
    c. Install sewer lines for Kapaia
2. Major WWTP work
    a. Provide new support facilities
    b. Add another primary clarifier
    c. Add another sludge thickener (DAFT) tank
    d. Convert the existing secondary digester to a primary digester
3. Effluent Disposal System
    a. New aboveground cover R-1 storage tank
    b. New R-1 pump station
    c. New R-1 distribution piping
    d. New spray irrigation system for Līhu‘e Airport
4. Total long-term capital costs - $35.6M

Unlike the Waimea Wastewater Treatment Plant, there are no plans to install a photovoltaic system (“green infrastructure”) to assist with energy savings cost.

4.5 Wailua Wastewater System

Improvements to the Wailua wastewater system were evaluated and categorized into short-term, middle-term, and far-term. The short-term improvements as previously discussed are currently under construction. The middle-term improvements currently in design will restore the Wailua WWTP capacity to 1.5 mgd.

The middle-term modifications include the following:

- Construct a new generator and electrical building
- Construct additional surge basins
- Replace the DAF sludge thickener
- Construct a new grit system at the headworks
- Expand the existing collection system to include areas in Kapa‘a with failing cesspools

Modifications for the middle-term improvements at the Wailua WWTP are estimated to cost approximately $7.6 million. If the lower Kapa‘a collection system is added due to the failing cesspools, the construction cost for this increment is estimated to be approximately $36.4 million.

The far-term improvements to increase the Wailua WWTP capacity to 2.0 mgd will require the following work:

- Construct new headworks
- Construct a new locker room/storage building
- Construct a new ultraviolet disinfection system to replace the chlorination system
- Construct an influent gravity line

Modifications for the far-term improvements at the Wailua WWTP are estimated to cost approximately $7.7 million. If a new Kapa‘a WWTP is needed due to the Wailua WWTP exceeding its 2.0 mgd capacity, the construction costs for this additional facility are estimated to be approximately $20.9 million. The proposed Kapa‘a WWTP will be an MBR plant with headworks, surge basins, biological treatment units (aerobic, anoxic, and anaerobic tanks), blower building, membrane tanks, UV disinfection tank, aerobic digester, sludge thickening/dewatering facilities, and effluent disposal facilities.

Unlike the Waimea Wastewater Treatment Plant, there are no plans to install a photovoltaic system (“green infrastructure”) to assist with energy savings cost.

GENERAL PLAN UPDATE

KAUAʻI INFRASTRUCTURE ANALYSIS

SOLID WASTE SYSTEM

Prepared For

County of Kauaʻi

Prepared By

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Solid Waste

The purpose of the solid waste infrastructure analysis in relation to the General Plan Update is to set forth policies to guide future physical development of the County's solid waste system. The County's solid waste management objectives are principally set forth in its Integrated Solid Waste Management Plan, and in other planning documents to design an integrated system to maximize the recovery of solid waste, while minimizing waste that requires landfill disposal. Currently, the County estimates that its diversion rate is approximately 31%. The Zero Waste Resolution (Section 3.1) foresees the County of Kaua‘i reaching a diversion goal of 70% by 2023 through a reduction in the rate of waste generation and an increase in the rate of reuse and recycling.

Section 1. Overview of Existing Solid Waste Management System

This section provides an overview of the County of Kaua‘i's current waste management programs related to waste reuse, recycling, and recovery.

1.1 Introduction

The County government plays the primary role in managing solid waste and is guided by federal and state laws and regulations. The County provides direct service to the public by collecting solid waste, operating facilities and programs for reuse and disposal, and regulating the disposal of solid waste.

Kaua‘i County maintains an island-wide system of solid waste collection and disposal serving its resident and visitor population. The County provides residents with several options for the management of various wastes. Recycling and waste disposal options generally target residents rather than commercial and non-residential waste generators as the County estimates that up to 45% of municipal waste is generated by residential sources. The County manages recycling programs through use of private contractors. Non-residential waste generators also generally use private contractors for their recycling and waste disposal needs.

The County owns the Kaua‘i Resource Center (a waste reduction and recycling center) located in Līhu‘e near the airport and four transfer stations located in Hanalei, Kāpa‘a, Līhu‘e, and Hanapēpē. The Kaua‘i Resource Center and eight recycling drop-bins located throughout the island are operated and maintained by a private contractor. Collectively, the decentralized recycling programs accept various types of materials for recycling including appliances, scrap metal, green waste, motor oil, motor oil filters, tires, propane tanks, and used cooking oil, thereby providing residents with diversion options in lieu of a limited number of private recycling vendors. The County also owns the Kekaha Municipal Solid Waste Landfill (MSWLF), which is operated by Waste Management Inc., under contract to the County (see Figure 1.1.1).

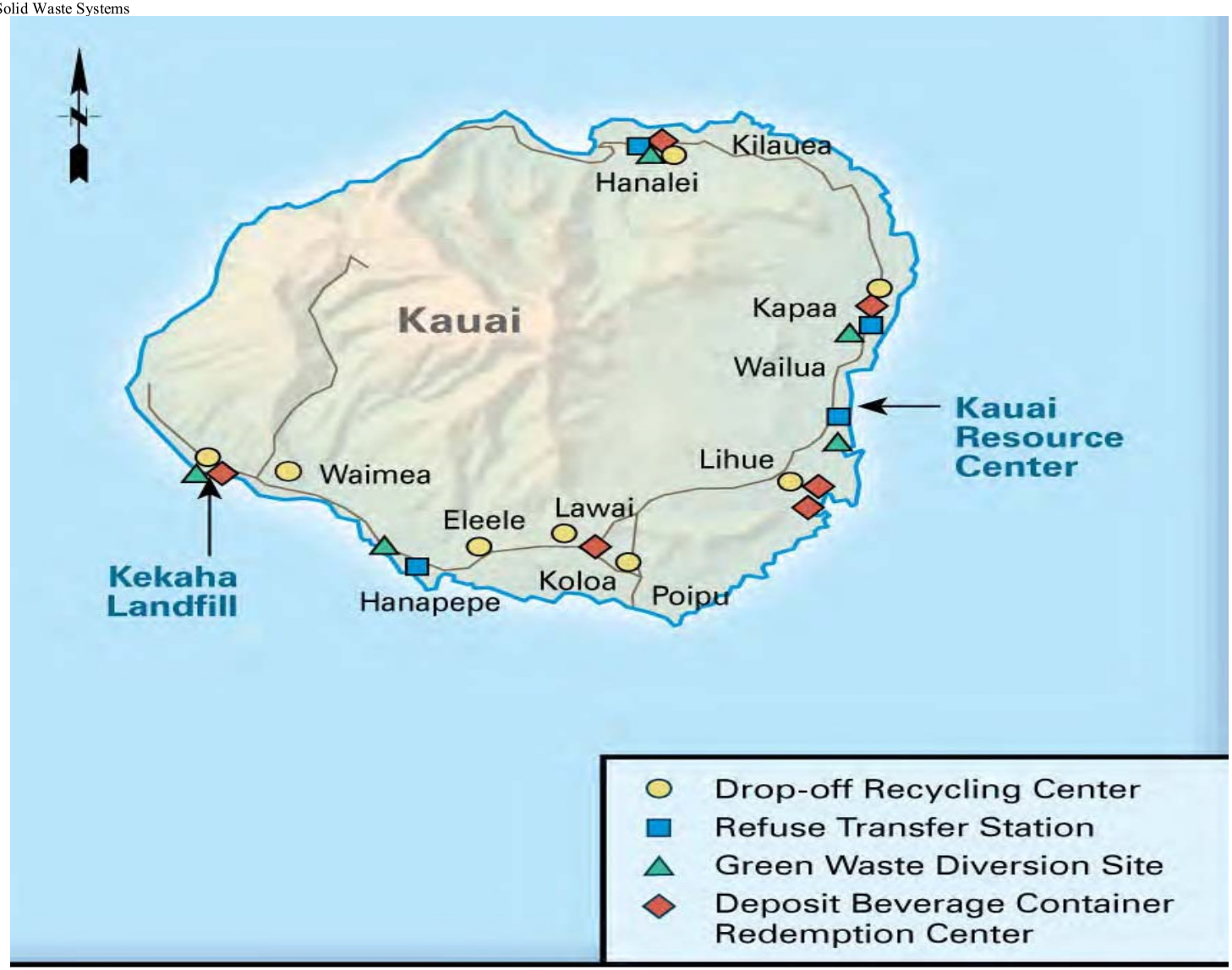

Figure 1.1.1 Solid Waste Management Facilities

Source: *Figure 1-1, Integrated Solid Waste Management Plan*

County solid waste facilities and services are administered by the Department of Public Works, Road Construction and Maintenance Division. The County has one solid waste coordinator and one clerk who are responsible for the overall management of the landfill and administration and budgeting of solid waste programs. The County's solid waste program has its own annual operating cost supported by the Solid Waste Disposal Fund and subsidized by the General Fund. Components of Kaua‘i's solid waste system are described below.

1.2 Solid Waste Collection

1.2.1 Residential Solid Waste Collection

The County provides weekly curbside collection of municipal solid waste (MSW) to nearly 31,297 accounts including all single-family residences in the County. County collection vehicles unload at the County transfer stations where the refuse is compacted into open top transfer trailers and taken to the Kekaha MSWLF, located on the western side of the island.

In July 2010, the County began transitioning to automated MSW collection. Under the automated system, residents are provided 96-gallon carts to place household waste, which the County collects using automated side-loading vehicles. The County operates three automated routes four days per week (12 routes) and four manually collected routes five days per week (20 routes). Manual collection consists of vehicles where a driver and two collectors are required to exit the vehicle and physically lift cans and bags to discard materials into the vehicle. This system requires each collection crew to manually lift eight to 10 tons of material each day. Conversely, automated collection requires one individual to drive the vehicle and uses an automated arm to lift refuse carts and deposit the garbage into the vehicle. The County, like many large municipalities throughout the United States, is transitioning to an automated collection system to reduce costs with associated worker injuries and labor, as well as improve neighborhood aesthetics.

In addition to curbside collection, the Solid Waste Division operates four transfer stations throughout Kaua‘i where residents can deliver MSW and green waste. Residents can also deliver residential MSW directly to the Landfill for disposal.

1.2.2 Commercial Solid Waste Collection

Commercial refuse includes waste generated from hotels and most apartment and condominium complexes. Except for a limited number of businesses served by the Solid Waste Division, private haulers collect commercial refuse or the businesses self-haul their refuse to a transfer station or the Landfill.

1.3 Transfer Stations

The County operates four transfer stations in Hanapēpē, Līhu‘e, Kāpa‘a, and Hanalei that consolidate waste from MSW collection trucks into large transfer trailers for more efficient and economical transport to the Landfill. The four transfer stations accept MSW and green waste from County residents free of charge. The Hanalei, Kāpa‘a, and Hanapēpē stations receive used oil from residents through the Do-it Yourselfer (DIY) program (Section 1.7). The Līhu‘e station receives scrap metal and white goods. Hanalei is the only transfer station with recycling drop-off bins in addition to Kekaha MSWLF.

1.4 Kekaha Landfill

Kekaha MSWLF is County owned and staffed, in part, with County employees. The County contracts Landfill operations and monitoring services to Waste Management, Inc. (WMI). MSW collected by the County from residential and commercial customers is compacted into open-top trailers at one of four County operated transfer stations for transfer to Kekaha MSWLF. The Kekaha MSWLF also accepts solid waste directly from commercial haulers and the public and serves as a recycling drop-off site.

Kekaha MSWLF is comprised of two distinct refuse fill areas identified as Phase I and Phase II and is the primary disposal site for solid waste on Kaua‘i. Phase I began operations in 1953 and continued until operations ceased on October 8, 1993. Phase II began operations on October 9, 1993 and was originally permitted to reach a height of 37 ft above mean sea level (msl), which was anticipated to provide capacity for municipal solid waste (MSW) filling operations through 2003. However, in 1998 Phase II required vertical expansion to 60 ft above msl to accommodate additional MSW resulting from Hurricane Iniki. In 2005, Phase II was approved a second vertical expansion allowing a height of 85 ft above msl, which is the currently permitted maximum height. In 2010, to extend the life of the facility, the KLF lateral expansion (“Cell 1”) was constructed. In the coming year, the County anticipates approval of an additional lateral expansion (“Cell 2”), currently in the permitting process. The currently permitted fill areas (i.e., Phase II, including Cell 1) are expected to reach capacity by late March 2014.

According to data provide by the Solid Waste Division (SWD), the Kekaha MSWLF has received approximately 75,000 tons of solid waste per year in recent years, although peak values in the past have been as high as 95,000 tons per year.

1.5 Source Reduction

Per the Kaua‘i County Code, Chapter 21, Integrated Solid Waste Management,
“Source Reduction means the design, manufacture and use of materials to:

1. Minimize the quantity or toxicity, or both, of the waste produced; and
2. Reduce the creation of waste either by redesigning products or by otherwise changing societal patterns of consumption, use, or waste generation.”

Source reduction activities are often difficult to track because they sometimes go unnoticed. Reducing waste is not as visible an activity compared to recycling. Reusing items is a source reduction activity because it stops waste at the source and delays or avoids that item's entry in the waste collection and disposal system. Efforts are being made in Kaua‘i by various businesses, residents, and the County to reduce waste at the source. County agencies have an increased awareness of waste diversion issues through ongoing participation in the County’s office paper recycling program.

Many businesses in the County are involved in source reduction activities by providing opportunities for residents to reuse items rather than buying new products. These companies include:

- Aloha Shares Network. Maui Recycling Group developed this statewide program. In August 2005, the County received Council approval to accept ownership of the Kaua‘i Aloha Shares Network. The network is an electronic reuse network that exchanges information about reusable materials in an effort to divert them from the landfill. Currently there is very little activity on the network, but the County hopes to solicit more donations in the future.

- Pig Farms. Local pig framers collect food waste from local hotels and restaurants, and the County jail for use as feedstock. In FY 2013, pig farmers recycled an estimated 356 tons of foodwaste into feedstock.

- Habitat for Humanity. This non-profit organization accepts and reuses building supplies for low income housing construction projects. They also operate a thrift store in Hanapēpē to resell building supplies and other household goods.

- Thrift Stores. Thrift stores not only provide an opportunity for residents to donate items such as clothing and household goods, but also provide opportunities for those who need to buy these items at minimal costs. Several thrift stores are located throughout the County, including:

    - Kaua‘i Humane Society Thrift Store in Līhu‘e;

    - Salvation Army Thrift Stores in Līhu‘e and Hanapēpē;

    - Wilcox Hospital Auxiliary in Līhu‘e; and

    - Habitat for Humanity Thrift Store in Hanapēpē.

- Trade Radio. This daily radio show on KONG AM 570 provides a venue where callers can buy, sell, or trade reusable items.

- Foam Peanut Reuse. The County Recycling Office has a drop and swap exchange for foam shipping peanuts and bubble wrap in the lobby of the Kaua‘i Resource Center. This program provides residents and small businesses with a place to drop or pick up shipping materials at no charge. The County does not keep track of users or quantities, but there is an active exchange of material on a daily basis.

- Kaua‘i Food Bank. This local non-profit organization collaborates with many businesses, grocery stores, schools, and farmers to eliminate the waste of edible foods. Each month, the Kaua‘i Food Bank feeds almost 6,000 individuals in need by distributing over 100,000 pounds of food.

1.5.1 Education

The County encourages source reduction and reuse in many ways, including publishing information in the Kaua‘i Recycling Guide, fielding calls to the Recycling Office, having a booth and talking with residents at community events, speaking to school children, and posting information on its website.

The County encourages residents to reduce waste by using canvas bags made from recycled plastic while they shop in lieu of disposable paper or plastic bags. Through the use of reusable bags, the County hopes to decrease the quantity and eventually phase out disposable bags because of the threat plastic bags pose to the environment. The County distributes canvas bags to Kaua‘i residents that sign a pledge to reduce, reuse, and recycle and complete an eco-quiz related to waste diversion. To enhance the program to replace disposable shopping bags with canvas bags over the coming years, the County plans to increase the number of bags distributed and participating retailers by offering incentives and training programs.

In October of 2009, the Kaua‘i County Council adopted a law requiring all retail establishments to provide only recyclable paper bags or reusable bags to their customers. The new law took effect January 11, 2011 and applies to any commercial business facility that sells goods directly to the ultimate consumer, including but not limited to grocery stores, pharmacies, liquor stores, mini marts, and retail stores and vendors selling clothing, food and personal items. Restaurants and takeout food establishments are also subject to the law. By definition, the ordinance states that retail establishments shall not include fundraisers by nonprofits or non-incorporated community booster organizations. The purpose of the legislation is to reduce the significant impacts of plastic checkout bags on the environment, which include litter, an increasing burden on the landfill, and threats to marine life. Business failing to comply with the requirements of the law may be issued a fine.

1.5.2 Home Composting

The County offers free composting bins to residents in an effort to divert compostable food and yard waste from the Landfill. In order to receive a free bin, residents must agree to participate in an annual composting survey, and must view a 20-minute composting training video. In FY

2013, the County estimates that approximately 2,480 tons of food and yard waste were recycled using home composting.

1.5.3 Waste Assessments

The County's Recycling Coordinator assists businesses with recycling, waste reduction, and waste diversion issues and conducts waste assessments upon request. A waste assessment includes a site visit by the County Recycling Coordinator to understand current waste management and recycling practices. The County Recycling Coordinator then makes recommendations to improve recycling and reduce waste generation.

1.6 Recycling and Bioconversion

1.6.1 Recycling

General Household Recyclables

General household recyclable items (e.g. cardboard, newspaper, mixed paper, glass, plastic, aluminum cans, and [recently] steel cans) are accepted for recycling at the Kaua‘i Resource Center and through the Kaua‘i Recycles drop bin program at the eight drop-bin locations (Hanalei, Kāpa‘a, Līhu‘e, Po‘ipū, Lāwa‘i, ‘Ele‘ele, Waimea, and Kekaha) throughout the island. The only plastics accepted are #1 polyethylene terephthalate (PET) and #2 high-density polyethylene (HDPE). Other forms of plastic (i.e. #3-#7) because of their relatively low market value and lack of processing space to store large volumes of materials prior to shipping are not currently accepted. Paper, glass, aluminum containers, and recyclable plastic are processed by a single contractor on Kaua‘i. Garden Isle Disposal (GID), the main private solid-waste hauler on the island and owner of the only recycling processing facility on Kaua‘i, is contracted by the County and private entities to collect and haul residentially and commercially generated paper, glass, aluminum, and plastic materials for recycling. Excluding limited occurrences of commingling and contamination, GID generally receives source-separated recyclables, and therefore does not have or require mechanized sorting equipment.

The volume of materials collected in fiscal year (FY) 2013 through the Kaua‘i Recycles drop-bin program was approximately 1,691 tons. An additional 242 tons (excluding HI-5) of recyclables were collected at the Kaua‘i Resource Center during FY 2013. It is noted the Kaua‘i Resource Center includes a HI-5 redemption center, which increases the volume of materials collected at that site due to financial incentive.

In addition to residential sources of materials, GID also collects recyclable materials from commercial sources. Some United States (U.S.) mainland-based stores, such as Kmart, manage their own recyclables; however, most commercially generated recyclables on Kaua‘i are managed through GID.

Residential Curbside Recyclables Collection Pilot Program

Between September 2011 and August 2011, the County conducted a pilot curbside recycling program in the Līhu‘e-Puhi area. During the pilot program recycling bins were supplied to 1,300 residences (670 in the Puhi area and 630 in central Līhu‘e), and unsorted (“single-stream”) recyclable materials were collected every second week.

A report evaluating the pilot program (SAIC 2011) provided the following select findings and recommendations:

- 28.5 pounds per month of recyclables were collected from each household on average.
- The composition of collected materials was consistent with materials collected by other U.S. curbside single-stream recycling programs reviewed by SAIC.
- State deposit beverage container program (discussed below) materials represented a low percentage of materials collected.
- Paper products composed more than 70 percent of materials collected.
- A fully expanded curbside recycling program would require a materials recovery facility (MRF) that can process single-stream recyclable materials.
- An island-wide curbside recycling program would initially collect a projected 3,100 tons per year (TPY) of materials.

The report estimated that approximately 3,700-4,800 TPY of materials could be collected through a curbside program, compared to the 1,600 TPY currently being collected through recyclables collection at the Kaua‘i resource Center and the drop-bins. During the pilot program, drop-bins at the Kaua‘i Resource Center and the Kaua‘i Recycles drop-off bins experienced 20 percent and 6 percent declines in deliveries, respectively, compared to the previous year. The County intends to implement an island-wide recycling single-stream collection program once a suitable MRF is available. For further information on the County’s implementation plan for island-wide curbside collection of residential recyclable materials, see Section 3.3.1. Recycling.

State Deposit Beverage Container Program

While not a County program, the State’s Deposit Beverage Container program, referred to as “HI-5”, supports recycling and landfill diversion on the island of Kaua‘i. The program, implemented in January 2005, encourages recycling, reduces litter, and promotes diversion of recyclables form the landfill. Under the law (Hawai‘i Administrative Rules [HAR] Title 11, Chapter 282 Deposit Beverage Container Recycling), administered and regulated by the Hawai‘i State Department of Health (DOH) Solid and Hazardous Waste Branch, a $0.05 deposit fee and $0.01 container fee were added to each glass, polyethylene, terephthalate, high-density

polyethylene, and metal beverage container less than or equal to 68 fluid ounces and intended for consumption in Hawai‘i. Commercially operated certified redemption centers (CRCs) redeem containers for $0.05 per container. The State then reimburses the CRCs with the $0.05 redemption fee plus a standard container handling fee. On Kaua‘i, handling fees are $0.03 per container for aluminum, bimetals, and plastic, and $0.04 per container for glass. For containers that must be shipped out-of state, CRCs receive a $0.02-$0.04 handling fee per container from the State for operational and shipping costs. Unredeemed container and deposit fees go toward other costs to support the State-managed Deposit Beverage Container program (DOH 2007).

The Hawai‘i State DOH Solid Waste Branch regulates the private redemption centers and companies that sell HI-5 materials. The County has eight privately operated CRCs:

- Kaua‘i Community Recycling Services operates four facilities in Kekaha, Kilauea, Kapa‘a and Kōloa. The County contracts the Kekaha and Kōloa facilities using funding provided by the State Deposit Beverage Container program. The two sites are open to the public two days per week.

- Reynolds Recycling operates three facilities in Nāwiliwili Harbor, Kaphai, and Lāwa‘i.

- GID operates one facility (Kaua‘i Resource Center) in Līhu‘e.

GID is currently the only company on Kaua‘i with the capability to process, weigh, and ship used beverage containers to market, and therefore all materials ultimately go through GID before being sold in out-of-state markets. Currently, GID accepts aluminum and plastic from the redemption centers for no charge and charges five cents per pound to accept and process glass. The redemption centers keep the container handling fees, while GID keeps all capital generated from the sale of the HI-5 materials. In FY 2013, The HI-5 Redemption Deposit Beverage Container Program (including County contracted) totaled 2,735 tons of recycled materials.

Puhi Metals Recycling Center

The County formerly owned the Puhi Metals Recycling Center (PMRC), the island’s primary metal recycling facility. Grove Farms Inc. and Resource Recovery Solutions LLC now privately own and operate the PMRC. The PMRC accepts recyclable metal goods from both residential and commercial sources.

1.6.2 Bioconversion

Green Waste

The County’s four transfer stations and Kekaha MSWLF accept green waste intended for recycling, including:

- Lawn trimmings;

- Yard waste
- Tree trimmings (stumps, branches, leaves);
- Shrubbery; and
- Christmas trees.

The County contracts three private companies to manage green waste collected by the County:

- Heart and Soul Organics LLC, based in Kilauea
- Kaua‘i Nursery and Landscaping, base in Līhu‘e
- Shredco LLC, with operation at Hanapēpē Transfer Station and Kekaha MSWLF

In FY 2013, the County collected 18,751 tons of green waste.

1.7 Special Waste

Per Chapter 21 of the Kaua‘i County Code, special wastes include tires, asbestos-containing materials, white goods, and dead animals (except those disposed of by the Kaua‘i Humane Society), and any mixed waste containing used tires, asbestos-containing materials, white goods, or dead animals. The County operates programs to manage materials that require unusual handling and/or have disposal restrictions.

Special wastes are those components of the waste stream that require special handling due to their size or physical, chemical or biological composition for proper processing or disposal. Collection of special waste is typically done alone and not with regular MSW. Special wastes, as defined by H.B. 324 include:

- Asbestos;
- Agricultural wastes;
- Infectious medical wastes;
- Abandoned and derelict vehicles;
- Sewage sludge;
- Waste combustion ash;
- White goods;

- Tires;
- Used motor oil; and
- Lead acid batteries.

Also generally regarded as special waste, although not specifically mentioned in H.B. 324, are:

- Household batteries;
- Propane tanks;
- Used cooking oil; and
- Construction and demolition materials.

The County manages special waste as follows:

- **Scrap Tires**. The four transfer stations and Landfill accept residential scrap tires at no charge. The transfer stations and Landfill does not accept tires from commercial users. PS&D Tires accepts commercially generated tires for a fee. In FY 2013, the County collected approximately 125 tons of tires. Approximately 271 tons of commercial tires were collected in FY 2013. HRS 3421-23 requires tire retailers to accept the equivalent amount of used tires at no fee when consumers purchase new tires.

- **White Goods.** The four transfer stations and Kekaha MSWLF accept white goods from residents year round at no charge. Pursuant to HAR Title 11 Chapter58.1, white goods cannot be accepted at any Subtitle D landfills in Hawai‘i. The County contracts Resource Recovery Solutions LLC to collect and process white goods at the PMRC. The PMRC accepts white goods free from residents. Before commercially hauled refrigerators and air conditioning units can be processed it is required that the freon (i.e. chlorofluorocarbons) and halogenated oils be drained and collected. The facility charges $20 per commercial unit.

- **Asbestos-Containing Materials.** The Landfill accepts Category I and Category II nonfriable asbestos-containing waste materials, as defined in 40 CFR, Part 61 of the U.S. Environmental Protection Agency’s (EPA) Code of Federal Regulations.

- **Used Motor Oil Diversion.** The four transfer stations and Landfill accept used motor oil for recycling through the Do-it Yourselfer (DIY) program. To encourage recycling of motor oil, the County offers residents free motor oil drainers. For FY 2013, the County projected a budget of $55,000 for motor oil recycling. The County’s four transfer stations accept used motor oil filters.

- **Used Cooking Oil Diversion.** The County currently offers a used cooking oil recycling program. Residentially generated used cooking oil is accepted at the Līhu‘e and Hanapēpē transfer stations. The cooking oil is then transported by Kaua‘i Grease Trap to Kaua‘i Farm Fuels in Hanapēpē, where it is processed and converted to biodiesel.

- **Propane Tank Recycling.** The County contract Resource Recovery Solutions LLC to collect propane tanks at the PMRC. Propane tanks pose a challenging waste stream for the County to manage. The PMRC accepts propane tanks from residential and commercial haulers free of charge. In FY 2013, the County recycled 5 tons of propane tanks.

- **Battery Recycling.** The County operates a battery recycling program at the Kaua‘i Resource Center. The center accepts alkaline (dry cell), nickel-cadmium (NiCad), and lithium batteries. The program does not accept car and uninterrupted power supply (UPS) batteries; however, retailers collect these types of batteries year-round. State law requires retailers to accept old car batteries when consumers purchase new ones. Napa Auto Parts in Līhu‘e accepts old car and UPS batteries for no charge from residents.

- **Automobiles and Scrap Metal Recycling.** The County contracts Resource Recovery Solution LLC to collect and process scrap metals and vehicles at the PMRC. The PMRC accepts the materials for free from residential and commercial haulers. In FY 2013, the County recycled 2,447 tons of scrap metal.

- **Construction and Demolition Waste.** Kekaha MSWLF accepts construction and demolition (C&D) debris for a tipping fee of $90 per ton for commercial haulers and no fee for residents. The County does not track C&D debris quantities disposed of at Kekaha MSWLF. Pacific Concrete Cutting and Coring, located in Līhu‘e, is the only company on-island that conducts C&D debris recycling.

1.8 Household Hazardous Waste and Electronic Waste

1.8.1 Household Hazardous Waste

Hazardous waste is regulated under the federal Resource Conservation and Recovery Act (RCRA), Subtitle C. Per this federal law, hazardous waste exhibits at least one of four characteristics – ignitability, corrosivity, reactivity, or toxicity.

Hazardous waste is defined in the Hawai‘i Administrative Rules (HAR), Title 11, DOH Chapter 261-3 and in the HRS, Chapter 342J-2 (Hazardous Waste) as “a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may: (1) Cause or significantly contribute to an increase in mortality or an increase in a serious irreversible or incapacitating reversible illness; or (2) Pose a substantial existing or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed”.

The HRS Chapter 342G-1, defines “household hazardous waste” as “those wastes resulting from products purchased by the general public for household use which, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may pose a substantial known or potential hazard to human health or the environment when improperly treated, disposed of, or otherwise managed”.

Household-generated hazardous waste (such as automotive products, cleaners, pesticides, herbicides, paints and solvents), is exempt under both the Resource Conservation and Recovery Act (RCRA) rules of the Code of Federal Regulations (40 CFR Part 261.4) and the HAR, Title 11, DOH, Chapter 2614. HAR 11-261-4(b)(1) states that the following solid wastes are not hazardous wastes and are exempt from regulation: solid wastes derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas). Also exempt under the Federal and State (HAR 11-261-5) rules are conditionally exempt small quantity generators (CESQGs). CESQGs are small businesses that generate 100 kilograms or less (approximately 220 pounds or 25 gallons) of hazardous waste per month.

The County offers an annual Household Hazardous Waste (HHW) collection event for a wide range of non-regulated residentially generated HHW materials, such as oil-based paints and solvents, non-regulated liquid wastes, household batteries, lead-acid batteries, mercury, and fluorescent light bulbs. Commercial and institutional hazardous wastes require management through a private hazardous waste disposal contractor. In 2012, the County contracted Enviroservices & Training Center LLC to conduct HHW collection events at no charge to residents. Enviroservices conducts similar HHW collection events on Hawai‘i island and O‘ahu. Following collection events, batteries are transported to Napa Auto Parts on Kaua‘i for recycling; mercury is removed from lamps for their disposal at Kekaha MSWLF; and mixed waste (e.g. mercury, flammables, and other hazardous liquids) are transported to O‘ahu, bulked, and then shipped to the U.S. mainland for final disposal in a hazardous waste landfill. In FY 2013, the County collected 11 tons of HHW.

1.8.2 Electronic Waste

The Hawai‘i Electronic Waste and Television Recycling and Recovery Law (HAR Title 19, Chapter 339D) requires manufacturers of televisions, computers, printers and monitors to provide recycling programs for the materials they generate. Currently, manufacturers do not provide feasible electronics recycling opportunities on Kaua‘i. The majority of manufacturers offer “mail back” programs, where users must package and ship items for recycling, discouraging residents from using the recycling program. Since the law went into effect the County has had to subsidize the recycling programs to increase electronics recycling. At this time, the County is unable to subsidize the electronic recycling program due to high costs.

The County accepts business and residential electronic waste for free the 2nd Friday/Saturday of each month. In FY 2013, the County collected 55 tons of electronic waste. No businesses accept

electronics for recycling. However, non-profit agencies will accept donated electronics in useable condition for reuse. Certain electronics manufacturers offer recycling options for a fee.

The County sits on the Hawai‘i Electric Device Recycling Task Force and is working to modify the legislation to improve programs on Kaua‘i and mandates manufacturers to provide more convenient electronic recycling events for island residents on a regular basis.

1.9 Public Education and Information Component

Per Chapter 342G-26(g) of the Hawai‘i Revised Statutes, the public education and information component of the Plan shall describe the programs that the County will use, in coordination with the efforts of the DOH, to:

- Provide comprehensive and sustained public notice of the options for alternative source reduction, recycling and bioconversion, and for the proper handling of household hazardous and special wastes; and

- Distribute information and education materials regarding general solid waste issues through the media, schools and community organizations.

- The County employs one Recycling Coordinator to manage the County’s recycling program, including public outreach and education activities.

Section 2. Solid Waste Projections and Composition

This section presents projected waste composition and quantities over a 15-year planning period. For this analysis, the planning period begins in 2020 and extends to 2035.

Population growth rates were developed by SMS Research and Marketing Service, Inc. (SMS 2014) for the County of Kaua‘i specifically for the County’s General Plan Update. The estimated growth rates for the County are 1.09% for residential and 1.02% for visitor populations on an annual basis. These rates are lower than those projected and used in the ISWMP (1.72% per year residential and 1.62% per year visitor). SMS estimated the population projections for future years by multiplying the growth rate by the population from the previous year. The County has combined the residential and visitor populations (i.e. de facto population) to provide a total population that is reflective of both residential and commercial waste generators. This is consistent with the approach taken in the County’s Integrated Solid Waste Management Plan (ISWMP). Table 2-1 shows the de facto population projections for 2010–2035 for the County and each of the six planning districts. Many of the analyses that follow rely directly or indirectly on these projections.

Table 2-1. De Facto Population Levels, 2010 and Projected for 2020-2035

	Year			
	2010	**2020**	**2030**	**2035**
County of Kaua‘i	82,101	92,485	102,500	107,915
Līhu‘e	17,266	20,582	24,424	26,433
Kōloa – Po‘ipū – Kalāheo	17,248	20,133	22,800	24,213
Hanapēpē – ‘Ele‘ele	6,157	6,463	6,860	7,094
Waimea	5,719	6,144	6,542	6,770
Hanalei (North Shore)	11,514	12,723	13,357	13,722
Kawaihau – Kapa‘a (East Kaua‘i)	24,196	26,439	28,517	29,684

2.1 Current Solid Waste Generation Quantities

The first step in developing a long-term solid waste management plan is to quantify and project the amount of waste that will be generated. Waste generation is the sum of waste that is disposed, converted to energy, composted, recycled and reused. The County provided annual waste quantity data for the years 2008–2010. The per capita waste generation rate (lbs/capita/day) was calculated for each year, using the following formula.

$$\text{Generation Rate} = \frac{\text{Quantity of waste (tons/year)}}{\text{Total population}} \times \frac{\text{2,000 (lbs/ton)}}{\text{365 (days/year)}}$$

The ISWMP reported waste generation of 116,389 tons in 2005. County data indicates this increased to approximately 120,000 tons in 2008 and then declined to approximately 105,000 tons in both 2009 and 2010. According to a recent study by the County, the estimated per capita waste generation rate for 2012 and 2013 was 6.7 lbs/capita/day.

2.2 Solid Waste Composition

As part of the 2009 Kaua‘i County ISWMP, the County conducted a waste characterization study to determine the waste composition of the materials disposed. With help from County officials, it was determined that composition of solid waste has stayed relatively the same.

The ISWMP provides a breakdown of the waste composition by material as a percentage of the total waste generated. In the report, similar waste materials were grouped together to form categories. Categories included Recyclables, Organics, Construction & Demolition, Durables, Household Hazardous Waste, Rubber, and Residuals. Table 2-2 shows the expected waste composition during the planning period. This table does not include source-separated C&D or special wastes (sludges, asbestos, etc.).

Importantly, the waste composition analysis conducted in 2005 and presented in the ISWMP is the composition at the landfill site, which is post or downstream of any diversion activities undertaken by the County or private waste companies. Therefore, the quantities of divertible materials reported as being potentially available for diversion are lower than would be reported if determination of the waste composition was undertaken upstream of the landfill, prior to diversion activities. Per the County’s request, this analysis will be the basis for this report.

Table 2-2. Solid Waste Stream Composition

Materials Group	Materials	Percent Residential Waste Stream	Percent of Commercial Waste Stream
Paper	Newsprint	5.9%	5.3%
	Magazines	3.0%	2.8%
	High Grade Office	0.8%	2.3%
	OCC and Kraft Bags	5.0%	11.3%
	Mixed Recyclable Paper	7.9%	5.3%
	Non-Recyclable Paper	3.5%	3.3%
	Compostable Paper	7.8%	8.2%
Total Paper		**33.8%**	**38.5%**
Plastics	#1 PET Beverage Containers	0.6%	0.3%
	#1 PET Beverage Containers (Deposit)	0.4%	0.5%
	#2 HDPE Containers	1.5%	1.3%
	#2 HDPE Containers (Deposit)	0.0%	0.0%
	#6 Polystyrene	1.2%	2.3%
	Other Plastic Containers	0.4%	0.4%
	Other Plastic Products	3.2%	3.9%

	Film/Wrap/Bags	6.0%	6.3%
Total Plastics		**13.4%**	**15.0%**
Metals	Aluminum Non-Deposit Beverage Containers	0.0%	0.0%
	Aluminum Deposit Beverage Containers	0.4%	0.4%
	Ferrous Food and Beverage	1.7%	1.4%
	Other Ferrous Metals	2.0%	1.6%
	Other Non-Ferrous Scrap	1.4%	1.1%
Total Metals		**5.4%**	**4.5%**
Glass	Glass Non-Deposit Containers	2.6%	2.0%
	Glass Deposit Containers	1.5%	1.6%
	Other Mixed Cullet	0.6%	0.3%
Total Glass		**4.7%**	**3.9%**
Yard Waste	Small Yard Waste	8.0%	5.5%
	Large Yard Waste	0.0%	0.0%
Total Yard Waste		**8.0%**	**5.5%**
Food Waste	Food Waste	15.7%	13.5%
Total Food Waste		**15.7%**	**13.5%**
Wood	Non-Treated	0.3%	3.4%
	Treated	1.7%	1.3%
Total Wood		**2.0%**	**4.7%**
Demolition/Renovation/ Construction Debris	C/R/D Debris	1.5%	1.1%
Total Demolition/Renovation/Construction Debris			**1.1%**
Durables	Electrical and Household Appliances	1.8%	0.7%
	Central Processing Units/Peripherals	0.0%	0.1%
	Computer Monitors/TV's	0.0%	0.0%
	Cell Phones and Chargers	0.0%	0.0%
	Other Durables	0.3%	0.4%
Total Durables		**2.0%**	**1.1%**
Textiles and Leathers	Textiles and Leathers	3.2%	4.6%
Total Textiles and Leathers			
Diapers	Diapers	2.9%	1.7%
Total Diapers		**2.9%**	**1.7%**
Rubber	Rubber	0.2%	0.3%
Total Rubber		**0.2%**	**0.3%**
HHW	Automotive Products	0.0%	0.0%
	Paints and Solvents	0.0%	0.0%
	Pesticides, Herbicides, Fungicides	0.0%	0.0%
	Household Cleaners	0.0%	0.0%

	Lead Acid Batteries	0.0%	0.0%
	Other Batteries	0.5%	0.4%
	Other HHW	0.2%	0.0%
	Mercury Containing Products	0.0%	0.0%
Total HHW		**0.7**%	**0.5**%
Sharps	Sharps	0.1%	0.1%
Total Sharps		**0.1**%	**0.1**%
Other Organic	Other Organic	0.8%	0.7%
Total Other Organic		**0.8**%	**0.7**%
Other Inorganic	Other Inorganic	1.8%	1.5%
Total Other Inorganic		**1.8**%	**1.5**%
Fines/Super Mix	Fines/Super Mix	3.6%	2.5%
Total Fines/Super Mix		**3.6**%	**2.5**%
Other		0.3%	0.3%
Total Other		**0.3**%	**0.3**%
GRAND TOTAL		**100.0**%	**100.0**%

2.3 Projection of Solid Waste Generation

In today’s leading economies, the per capita waste generation rates remain relatively constant over time. Changes to product packaging combined with economics and environmental awareness, stewardship, and education can act to offset increases in consumption to stabilize per capita waste generation rates. This analysis assumes that the per capita generation rate will remain constant into future years. By combining the per capita generation rate with the population estimates, total annual waste quantities over the 15-year planning period were projected.

The total annual quantity of waste reported in 2010 represents the de facto population (i.e. residential and commercial) streams. The ISWMP indicated that commercial wastes accounted for 56% and residential wastes accounted for the remaining 44% of the waste generated each year. Assuming that the residential and commercial generation rates remain constant over time, total waste generation rates were projected by summing the escalated residential and commercial quantities throughout the planning period. Table 2-3 shows the projected waste generation by residential and commercial sources for the planning period 2020–2035.

Table 2-3. Summary of County Municipal Waste Quantities Generated, 2010 and Projected for 2020-2035

	Annual Waste Generation (TPY)		
Year	**Residential**	**Commercial**	**Total**
2010	44,171	56,218	100,389
2020	49,758	63,328	113,086
2030	55,146	70,186	125,332
2035	58,059	73,894	131,953

Waste generation rates for the six planning districts were projected by multiplying the forecasted percentages of populations residing in each of the six planning areas by the total projected County municipal waste quantities. Table 2-4 shows projected waste generation quantities for the County broken down by planning district for the 2020–2035 planning period.

Table 2-4. Summary of Estimated County Municipal Waste Quantities by Planning District, 2010 and Projected for 2020-2035

	Annual Waste Generation (TPY)			
	2010	**2020**	**2030**	**2035**
County of Kaua‘i	100,389	113,086	125,332	131,953
Līhu‘e	21,112	25,167	29,864	32,321
Kōloa – Po‘ipū – Kalāheo	21,090	24,618	27,879	29,606
Hanapēpē – ‘Ele‘ele	7,528	7,903	8,388	8,674
Waimea	6,993	7,513	7,999	8,278
Hanalei (North Shore)	14,079	15,557	16,332	16,779
Kawaihau – Kapa’a (East Kaua‘i)	29,586	32,328	34,869	36,296

The amount of solid waste generated by residents and visitors on Kaua‘i is expected to increase by nearly 17 percent from approximately 113,068 tons in FY 2020 to a projected 131,953 tons in FY 2035, and new facilities or improvements to existing facilities will be needed to accommodate this increase. To deal with this increase the County plans to implement waste reduction, reuse, recycling and bioconversion strategies predicted to increase the quantity of waste diverted from disposal. These solid waste infrastructure improvements are presented below in Section 3.

Section 3. Status of Long-Range Plan

3.1 Overview

In 1991, the State of Hawaii set a goal for each county to divert 50 percent of its waste stream from landfill disposal by 2000. In 2005, the County of Kaua‘i reported a diversion rate of 25 percent. In 2009, the County published its *Integrated Solid Waste Management Plan* (ISWMP), which identified and recommended a range of programs, activities, and facilities to be implemented in order to maximize waste diversion. The ISWMP is a fundamental waste policy document for the County, and its recommendations and methodologies are employed herein. The ISWMP projected a diversion rate of 35 percent by 2013, a goal adopted by the County in 2009-2010. Currently, the County estimates that its diversion rate is approximately 31 percent.

In order to maximize its waste diversion rate, the County has adopted zero-waste principles that promote the highest and best use of materials to eliminate waste and pollution by emphasizing a closed-loop system of production and consumption. Zero-waste principles are consistent with the County’s commitment to island-wide sustainability. The principles of a zero-waste policy and the zero-waste diversion goal were formally adopted by the Kaua‘i County Council in October 2011. Pursuant to this policy, the County has committed its legislation, policies, rulemaking, and actions to incorporate zero-waste management principles to the extent possible and feasible, with the specific goal of implementing the County’s ISWMP and achieving the waste diversion goals in a cost effective manner. As part of this process, the County adopted a longer-term waste diversion goal of 70% by 2023.

Per the Hawai‘i Revised Statutes, Chapter 342G, Integrated Solid Waste Management (HRS 342G-2), each county shall consider the following solid waste management practices and processing methods in their order of priority:

1. Source reduction;

2. Recycling and bioconversion, including composting; and

3. Landfilling and incineration.

The County of Kaua‘i has previously undertaken various studies and analyses that were relied upon in this report. The studies most significantly affecting this General Plan Update are:

- Integrated Solid Waste Management Plan, County of Kaua‘i (Beck 2009)

- Centralized Composting Facility Master Plan, County of Kaua‘i (Beck 2008)

- Pilot Curbside Recycling Report, Kaua‘i County (SAIC 2011)

- Kaua‘i Resource Recovery Park Feasibility Study, County of Kaua‘i (AECOM 2013)

The ISWMP provides a recommended action plan for the County to maximize waste diversion by implementing cost-effective integrated solid waste management components. The Pilot Curbside Recycling Report assisted in defining the County's proposed approach to recyclables collection, and in providing an estimate of the anticipated effectiveness of such a program. The Composting Plan outlines a proposed approach for development of a centralized composting facility to serve the County's needs. The Resource Recovery Park (RRP) Feasibility Study provides a recommended action plan for the County that explores various components and technologies available to the County and the potential for co-locating a range of facilities to further maximize waste diversion.

To fulfill the County's long-range planning goals and projected demand forecast through 2037, the County's primary objective is to maximize the recovery of solid waste through reuse, recycling, composting and energy conversion, in order to minimize the amount of waste that requires landfill disposal. To meet these objectives the County will further improve solid waste management programs with island-wide curbside collection of green waste and mixed recyclables and the addition of semi-automated collection to communities now serviced manually; increase efficiency in transfer station and convenience center operations; increase the material recycling rate including construction and operation of a material recovery facility (MRF) and composting facility; and provide an additional landfill for residual items which cannot be recycled to energy or material.

The following narrative summarizes the tasks the County will initiate over the next two decades to achieve the objective of minimizing the need for landfill disposal. Because the County already has a number of effective programs and facilities in place, many of the proposed future tasks entail the continuation and expansion of those existing activities.

3.2 Source Reduction

Waste reduction is difficult to quantify because it avoids creation of waste in the first place. This section of the Plan will identify and evaluate specific measures for achieving source reduction, as outlined in HRS 342G-26, including:

- Increased efficiency in the use of all materials;
- Replacement of disposable materials and products with reusable materials and products; and
- Reduced packaging.

Significantly reducing the amount of waste that is produced requires substantial changes in the amount of packaging that is used in consumer products, as well as the durability of these products, and/or changing consumer habits through education and economic incentives. As the County does not have the ability to dictate the design of consumer products and packaging, the County focused its evaluation on educational and economic options that are available to the County to reduce the amount of waste that Kaua‘i residents and businesses produce.

The County will continue to facilitate or provide source reduction opportunities to the residents and businesses of Kaua‘i. Specific initiatives include in-house implementation of source reduction policies and directives by which the County has the opportunity to set an example for reducing waste at the source. Similar to waste assessments for businesses, the County’s Recycling Coordinator should conduct site visits at all County offices and buildings to not only improve recycling efforts, but also look for opportunities to increase source reduction.

3.2.1 Residential and Commercial Efforts

3.2.1.1 Residential Efforts

Variable Rate Refuse Collection

One potential incentive is variable rate or Pay-As-You-Throw (PAYT) refuse collection. The County will implement a hybrid PAYT system where all residential customers will be assessed a flat fee for residential refuse service, which will allow the set out of one cart of refuse each week and a specified number of tags to place on solid waste that cannot fit into the carts. If residential customers require additional carts or tags, they will be charged an additional amount by the County. The County plans to implement the PAYT system once the island’s curbside collection of refuse has been automated. The County will continue to provide residents with the option of disposing of waste at the transfer stations and Landfill/WTE Facility at no charge to minimize open dumping. To facilitate the success of this program, the County will pass an ordinance requiring solid waste be in a cart or have a tag to be collected, and make open dumping and littering ordinances more stringent.

Canvas Bag Program

The County is actively promoting the use of exchanges, such as the Aloha Shares Network. Currently, this on-line exchange network posts donations from individuals, businesses, organizations and government agencies. Recipients must be non-profit organizations, churches, or schools. Other materials exchange programs match people who are looking for certain reusable items with people who are looking to discard items. These and other on-line programs are successful at diverting material from landfills, by providing a free option to traditional advertising and allowing people to list items for sale or give away.

Household Hazardous Waste

Beyond minimizing the quantity of waste produced, the County Code defines “source reduction” as including minimizing the toxicity of waste produced. Most household hazardous wastes include ingredients that are toxic, corrosive, ignitable or explosive. This definition includes many items stored in a garage, basement, bathroom or kitchen, such as paint thinner or car batteries.

Plastic Bags and Styrofoam Food Packaging

As for Styrofoam and other types of non-recyclable food packaging, the County encourages the use of alternative biodegradable food packaging. These alternatives are available on island. Biodegradable food packaging is considered compostable in many instances because it is manufactured primarily from corn starch. The County has also implemented an island-wide ordinance to replace disposable shopping bags with canvas bags.

Reuse Center

Direct, local reuse of items can be considered the highest-value waste diversion process, as it is the least resource- and energy-intensive option, encourages local direct reuse, and displaces the purchase of new items. A reuse center typically provides an opportunity for the exchange of secondhand or gently used items. These types of facilities are commonly operated by non-profit organizations including Goodwill and Habitat for Humanity. It is estimated that these materials account for less than 1% of the waste stream.

The County plans to provide space at the planned RRP for potential development of a reuse center that can be operated in a manner consistent with existing non-profit facilities within the County. The proposed facility is intended to enhance the opportunity for reuse within the County by supporting activities like the refurbishment of damaged items such as bicycles, furniture, and even electronics. Once implemented, it is proposed that a center for hard-to-recycle materials be located at the reuse center.

3.2.1.2 Commercial Efforts

Technical Assistance and Waste Assessment

The County currently offers technical assistance in the form of waste assessments to businesses. The County promotes this service through public education and advertising and continues to assist commercial entities reduce their waste and seek out options to prevent waste from being created in the first place. Because businesses are usually billed for solid waste collection service based on volume, the desire to reduce the amount of refuse created already exists.

Reusable Packaging Containers

Because of the County’s geography, most retail goods are transported in corrugated cardboard. Reusable packaging containers (including plastic pallets) can help businesses reduce their long-term costs while preventing unnecessary waste by reducing packaging costs, reducing damage to withstand multiple uses, reducing labor costs, and avoiding disposal costs.

The County Recycling Coordinator will provide information on reusable shipping containers and other waste reducing options to businesses through waste assessments and public speaking engagements to the Chamber of Commerce and other business organizations.

Lodging Industry Source Reduction

Because the County is a major tourist destination, hotels, motels, and condominium rentals are a large contributor to the waste stream. There are many things the lodging industry can do to reduce the amount of waste generated at hotels, motels, and condos. The County's Recycling Coordinator assists businesses with recycling, waste reduction, and waste diversion issues and conducts waste assessments upon request. The County will continue to work with the lodging industry to promote source reduction.

3.2.2 Education

The County will consider expanding its current public education efforts regarding source reduction including, but not limited to:

- Create a page on the County's website dedicated to source reduction and reuse ideas. The page could provide tips to residents and businesses on ways to reduce the amount of waste they create.

- Continue to provide free home composting bins to County residents in an effort to promote and increase backyard composting of food and yard waste.

- Consider promoting source reduction through an advertising campaign using billboards, television and/or newspaper advertisements, public service announcements, local television shows such as Russell the Rooster, etc.

3.3 Recycling and Bioconversion

The purpose of this section of the plan is to evaluate the County's current recycling and bioconversion programs and provide alternative strategies for increasing diversion. The goals of the strategies are to:

1. Increase diversion of materials from the Kekaha MSWLF;

2. Minimize costs to the County and customers;

3. Promote sustainability;

4. Facilitate the development of small businesses;

5. Further protect the environmental health of the County; and

6. Increase participation in upstream waste diversion programs.

3.3.1 Recycling

Curbside Collection of Residential Recyclable Materials and Unit-Based Waste Collection

The County initiated a pilot curbside recycling program in September 2011. Under the program, recyclables were collected from 1,300 households, using a single-stream system wherein a household placed all of their recyclable materials in one provided container. The goal of the program was to test the curbside recycling service to determine potential participation rates and other logistics associated with island-wide implementation of a recycling program.

On average, households participating in the pilot placed 342 pounds of recyclables out for collection per year. Multiplying this annual rate by 31,297 households yields an annual estimate of 5,350 TPY, if the pilot project was implemented island-wide. The report on the pilot project's results (SAIC 2011) noted, based on a review of other U.S. recycling programs, that 400 pounds per household per year are typical of recovery rates after one year of operation, and 520 pounds per household per year for a fully mature program. In order to achieve a diversion goal of 70% by 2023, consistent with the County's zero-waste policy, the County believes that greater recovery of household recyclables is necessary. In conjunction with aggressive supporting policies including PAYT, County staff suggest a range of 450–650 lbs/household/year of recyclables captured. The County plans to implement curbside collection of residential recyclable over the next five years and hopes to completely automate the island by 2019. Using the typical and County recovery estimates (SAIC 2011) and number of households projected (SMS 2014) over the planning period, the tonnage of curbside-collected recyclable materials would increase as shown in Table 3-1.

Table 3-1. Projected Increase in Tonnage of Curbside-collected Recyclable Materials, 2020-2035

		Typical Recovery Estimates		County Recovery Estimates	
Year	Projected Number of Households	TPY @ 400 lbs/hh/year	TPY @ 520 lbs/hh/year	TPY @ 450 lbs/hh/year	TPY @ 650 lbs/hh/year
2020	25,902	5,180	6,735	5,828	8,418
2030	28,788	5,758	7,485	6,477	9,356
2035	30,349	6,069	7,891	6,829	9,863

hh household

Based on the foregoing, Table 3-2 summarizes the potential annual quantity of residential recyclables that may be collected and require processing by the end of the 15-year period (i.e. 2035).

Table 3-2. Summary of Potential Residential Recyclables, Tons of Materials, 2035

	Potential Residential Recyclables (TPY by 2035)	
Recyclable Source Material	**Low Estimate**	**High Estimate**
Curbside Recycling Program (County estimates)	6,829	9,863
Current Drop-off Recyclables (which may be captured by curbside in the future)	1,568	2,858
HI-5 Materials [a]	819	1,911
Total Residential Recyclables	9,216	14,632

[a] Assumes 30% of currently collected HI-5 materials may be processed at the MRF, increasing to 70% by end of planning period.

The report on the pilot project's results (SAIC 2011) made the following recommendations:

- Develop a Material Recovery Facility (MRF) or support the development of such a facility in the private sector capable of processing a mixed, single stream of recyclable materials.

- Implement single-stream curbside collection of recyclables island-wide.

- After the island-wide curbside collection program is in place, adjust the Kaua‘i Recycles drop-bin contract accordingly. Reduce frequency of service, collect a mixed stream of recyclables, and reduce the number of drop-bins. Continue to accept all materials collected in the pilot program, and expand the list of materials to include steel cans. Investigate the feasibility of including #3 through #7 plastics.

- Implement "Pay as You Throw" (PAYT) (in which residents are charged for curbside collection of waste based on the amount disposed of, rather than as a fixed fee not tied to disposal quantity) in conjunction with the island-wide curbside collection program to provide an economic incentive for public participation. The PAYT charge would provide incentive for households to maximize the amount of waste diverted from disposal and encourage participation in the curbside recycling program and the County's other recycling and diversion efforts.

Commercial Recycling

In addition to the residential recyclable quantities noted above, the County's proposed MRF (described below) will have the capacity to process commercial recyclables as well. The potential quantity of recyclables from the commercial sector is shown in Table 3-3.

Table 3-3. Commercial Recyclables Composition and Generation by Material Type in County, 2010 and Projected for 2020-2035

	Material Type (TPY)				
Parameter	Total Recyclable Fibers [a]	#1 & #2 Plastics	Total Food & Beverage Ferrous & Non-ferrous Metal Containers	Total Food and Beverage Glass Containers	Commercial Recyclables Available (TPY)
Composition (%)	27.0%	2.1%	1.8%	3.6%	34.5%
2010	15,179	1,181	1,012	2,024	19,395
2020	17,099	1,330	1,140	2,280	21,848
2030	18,950	1,474	1,263	2,527	24,214
2035	19,951	1,552	1,330	2,660	25,493

[a] Sample calculation: 56,218 tons of commercial waste (from Table 2-3) x (27% fibers) = 15,179 TPY of total recyclable fibers from commercial sources

Based on the quantity of commercial waste generated in 2010 (Table 2-3), it is estimated that approximately 9,000 tons of commercial recyclables are currently being diverted. The numbers presented in Table 3-3 present an upper limit on diversion: it will not be possible to divert 100% of the material stream from the landfill. In addition, some of the diverted materials may be managed by the private sector. With the implementation of policies and incentives directed at the commercial waste stream, the County has a goal of achieving a 60% diversion rate. County staff believe the County will manage 40% to 60% of the diverted commercial recyclables by the end of the planning period (Table 3-4).

Table 3-4. Tons of Commercial Recyclables Recoverable by County Over the Planning Period

Year	Commercial Recyclables Available (TPY)	Forecast Diversion %	Estimated Amount Diverted (TPY)	Estimated % Mannaged by County	Estimated Quantity Managed by County (TPY)
2010	19,395 + 9,000	—	9,000	0	0
2020	21,848 + 9,000	30%	9,254	15	1,388
2030	24,214 + 9,000	45%	14,946	40	5,979
2035	25,493 + 9,000	60%	20,696	60	12,417

Note: Commercial Recyclables Available from Table 3-3.

These assumptions regarding capture of recyclables from the commercial sector are aggressive, since the County does not have flow control over the commercial waste stream; therefore, there is no guarantee that the commercial waste haulers will use the County’s MRF. However, given the County’s 70% diversion goal, an aggressive approach is required. Commercial parties may employ other waste management strategies (e.g., they may market high-grade materials and only direct lower-grade materials to the County’s facility). While the County will pursue policies and programs to entice the commercial sector to fully utilize the County’s MRF, the County could needlessly expose itself to financial risk if it over-sized the MRF based on overly optimistic waste stream projections. It is noted that business risks may also exist for the private contractors

and their ability to provide ongoing cost effective diversion services. As a result, the County may need to offer these services in order to achieve their waste diversion goals.

The County will implement a comprehensive business waste reduction/recycling program. Once the business program is fully operational, the County will work with the business community to modify existing ordinances to:

- Require businesses of a certain size or producing a minimum amount of recyclable material to establish recycling programs for glass, cardboard, office paper and green waste;

- Prohibit the disposal of commercially-generated cardboard, green waste, and glass at the transfer stations (with minimum amount in loads defined);

- Define the amount of cardboard in a commercial load that is banned from disposal (i.e., loads containing a minimum of 1 cubic yard loose old corrugated cardboard);
- Modify ordinance penalty fees;

- Restructure commercial tipping fees at the Landfill and transfer stations to encourage recycling; and

- If an affordable recycling processing option is available, all waste haulers will be required to obtain a license from the County with a provision that in order to receive a license, recycling services must be provided to commercial customers.

Proposed Kaua‘i County Business Recycling Ordinance

Limited remaining capacity at the current landfill, coupled with the long and costly process of building future landfill capacity, gives the goal of achieving maximum waste diversion increasing significance. In striving to meet this goal, the County of Kaua‘i Solid Waste Division is proposing legislation to require businesses to have recycling programs in place to capture and divert designated recyclables from disposal.

The County estimates that as much as 55% of Kaua‘i's waste stream generated by businesses. Much of this waste is recyclable, and increasing diversion of material will save valuable landfill space as well as conserve natural resources. This ordinance would reinforce existing restrictions on the disposal of commercially generated cardboard, metal, and green waste. It is anticipated that such an ordinance would divert approximately 8,000 tons of waste from the landfill each year.

The purpose of the Business Recycling Ordinance is to establish and implement a program to facilitate the diversion of waste generated by Commercial Generators (Businesses, Governmental Agencies, Institutions, and Multi-family Residences) from landfill disposal. The ordinance would require businesses to separate and recycle designated recyclables that have local processing capacity and developed markets. Designated recyclables currently include cardboard,

metal, green waste, and mixed paper for all businesses, with the additional requirement for food and beverage establishments to recycle their glass beverage containers and HI5 aluminum and plastic containers.

Visitor Recycling

The County's visitor population is over one million people per year. Thus, the potential impact on the County's recycling program could be significant if there was an increased effort to capture more of the recyclable materials generated by visitors.

The County also has a large number of condominium rentals and home rentals for visitor lodging. Concerted efforts will be made to ensure these dwellings have recycling collection services available or, at a minimum, recycling education and instructions are provided for the guests. In many instances, hotel and/or rental condominium cleaning staff is allowed to take deposit beverage containers that are disposed as refuse in the individual guest rooms and redeem them for the deposit. This certainly contributes to recycling; however, it is not as visible as providing recycling containers in hotel/condominium common areas for guests to use.

The County recognizes the costs that will be associated with instituting a visitor recycling program and that these costs would need to be passed onto guests. Because this would increase the rates at properties with recycling programs, economic incentives or mandates would be necessary to make wide-spread recycling viable at these establishments. To determine what are the most effective and sustainable mechanisms to recycle waste from Kaua‘i visitors, the County will conduct focus groups with the representatives of the hospitality industry and these representatives will assist with the design and implementation of a tourist recycling program.

Recycling at Special Events

Recycling at special events presents a significant challenge in most cases because the events involve hundreds of people, numerous activities, and can be spread over a wide area. In addition, there is limited opportunity for advanced education. In general, special events can be categorized by three primary activities: (1) street or large area activities spread over a large area; (2) contained activities (i.e., located in a specific facility, but which may differ significantly from event to event); and (3) sporting events (usually in a stadium or arena). The County will continue to proactively address special event recycling by providing technical advice and maintaining a log of events throughout the year to assist event coordinators with recycling initiatives.

Materials Recovery Facility (MRF)

A MRF is a processing facility that receives collected recyclable materials, sorts the materials based on type, removes any contaminants, densifies the materials, and then bales them into a form suitable for transport and sale to markets. The County is currently in the process of developing and identifying potential sites for a MRF. Recyclable materials available to the County as feedstock for the MRF are available from both residential and commercial sources.

There is one recyclable materials processor located in the County, which has limited capacity and capability to process co-mingled materials. In addition, once the County implements its planned residential curbside recyclable collection program it is projected that the quantity of materials collected for processing will significantly increase. As a result, there is a need to develop co-mingled recyclable materials processing capacity. As identified in the ISWMP, development of a materials recovery facility (MRF) is one of the key infrastructure components to maximize waste diversion.

Through development and implementation of a MRF, the County anticipates a lower-bound recovery estimate of 7,682 TPY, which amounts to approximately 5% of the County’s overall waste stream, and an upper-bound recovery estimate of 26,683 TPY, which amounts to approximately 17% of the County’s overall waste stream. The County has proposed a layout for the MRF that will enable future upgrades to increase system capacity and/or output cleaner products. Upon finalization and selection of a site for the MRF, a more detailed site-specific design, and associated costs will be developed.

Resource Recovery Park (RRP)

In order to achieve its waste diversion goals, the County has identified a Resource Recovery Park (RRP) as a critical element of the County's solid waste management strategy. A RRP is a ‘one-stop service center’ that is intended to include a comprehensive and integrated set of waste management programs and facilities to support maximization of the diversion of waste from the landfill via reuse, recycling, and recovery. Providing a single centralized location where residential and commercial entities are able to conduct all of their recycling and waste diversion activities can provide a synergistic effect, and help promote reuse, recycling, and reduction of waste disposal, while simultaneously allowing the County to achieve cost savings through shared resources and economies of scale. The sustainability benefits associated with siting a new landfill near the waste generation centroid (area of the island generating highest proportion of waste) may be even more pronounced if the County develops a RRP co-located with the new landfill, near the waste generation centroid. Therefore, the proposed project includes the siting of the RRP co-located or nearby the new MSWLF.

A RRP can include a wide range of components and technologies for diverting those recoverable materials accepted directly from public and private contractors or waste generators. The decision to implement particular components and technologies as part of the RRP is a function of a number of factors, including end use or market availability for the recovered material and cost considerations. The County has also made a commitment as part of its Zero Waste Resolution to divert as much as 70% of the waste materials generated from the municipal landfill. The RRP can be designed to accommodate any or all potential diversion components and technologies, which can be implemented in a staged approach when favorable conditions are met.

The following elements are recommended as feasible for implementation at the RRP, subject to other, non-technical constraints and considerations:

- A centralized drop-off facility that includes drop-off bins for recyclable materials, green waste, scrap metal, C&D waste from residents and small commercial generators, used tires, and residential wastes.

- An onsite processing area for metals including vehicles, white goods, propane tanks and scrap, C&D waste, and used tires.

- A specially designed area for the receipt, bulking, lab packing, and storage of household hazardous waste, used motor oil and filters, used cooking oil, electronic waste, a HI-5 redemption area, a reuse center, and center for hard-to-recycle materials.

- A single-stream MRF, designed to process residential curbside-collected materials, HI-5 materials, and materials that may be attracted from commercial sources, including an educational center.

- A composting facility transitioning to an aerated static pile facility to process curbside collected green waste, bio-solids, and food waste.

- A landfill gas to energy (LFGtE) facility.

Metals Recycling Facility

The County currently contracts metal-recycling operations with the PMRC, which accepts a range of scrap metals for processing, including automobiles, white goods, propane tanks and other metal scrap. The scrap metals are accepted, processed, and prepared for market. The PMRC is operated by a private contractor and is situated on private land under a lease agreement. The County currently accepts white goods at the four transfer stations and at Kekaha MSWLF. A metals recycling facility is recommended as part of the RRP and it is assumed that the services provided as part of the RRP would be under private contract.

Once the RRP is developed, the County plans to provide space for potential development of a metals recycling facility with operations similar to those conducted at the PMRC. The County has available various procurement options for the development and operation of the proposed facility. The capital cost of this facility may or may not be funded by the County.

County data indicates that approximately 4,669 tons of all metal types were processed in FY 2011. The collection and processing of these materials represents approximately 4.4% diversion (conservative estimate). This rate of diversion is expected to remain relatively constant in the future, as this is already a well-established program that would be relocated to the RRP.

3.3.2 Bioconversion

This section of the Plan identifies and evaluates specific measures to increase the amount of green waste that is diverted from landfill disposal. The ISWMP contains the following recommendations related to improved diversion of organic materials:

- Establish an automated weekly, curbside collection system for green waste.
- Provide curbside collection for pre-consumer organics.
- Expand the ban on municipal landfill disposal of non-residential green waste to include residential waste, and expand the ban to include disposal restrictions at the transfer stations.
- Establish a central green waste and organics processing facility to produce mulch or compost.

These measures along with other methods the County is considering to implement to improve green waste diversion are briefly discussed below.

Curbside Green Waste Collection

The County plans to implement weekly residential curbside green waste collection. It is projected that this program would be implemented by approximately 2020. It is essential to continue to divert green waste as it is one of the most cost effective materials to divert since it can be marketed on the island and comprises a substantial portion of the residential waste stream. Because the provision of weekly curbside collection of green waste may significantly decrease the demand for the drop-off sites, the County will aggressively monitor their use.

Collection Program for Pre-Consumer Organics

If a facility to compost organics were available, pre-consumer food waste and non-recyclable paper could potentially be collected at the curbside. Initially the County would limit this service to commercial establishments, but would evaluate expanding to residential customers. If these organics are added to the program, the County would provide wheeled carts to generators in the program. The carts are sturdy and have attached lids, helping to minimize odor and animal/insect problems that could be encountered during storage of materials between collections and when set-out at the curbside for collection. The carts could be used to hold green waste, food waste and non-recyclable paper.

Disposal Ban on Green Waste for Residents and at the Transfer Stations

The County is authorized to establish a ban on the disposal of green wastes to keep these materials out of the Landfill. Landfill disposal bans are typically enforced at the point where the collection vehicle tips its load – at transfer stations and at the Landfill. Disposal bans work best in situations where the need is widely recognized and alternatives to disposal are available.

Currently, the County bans the landfill disposal of loads from businesses, industries, governments, institutions and other non-residential sources that exceed 20 percent green waste. To further divert green waste from disposal, the County will expand the ban to require residents and businesses to limit the drop-off of only incidental amounts of commercial and residential

green waste at the transfer stations and the Landfill. This ban will be enacted after all resident have access to and understand the curbside green waste collection system.

As stated above, a green waste disposal ban, by itself, does not guarantee the successful diversion from disposal of the desired quantities of materials. Thus, before the County institutes the ban, the County will implement concurrent, complementary strategies such as:

- Ensuring the public understands the reasons for/benefits of the ban;
- Enforcement of the ban;
- Building widespread support among key stakeholders for the ban;
- Dissemination of public information on the alternatives to disposal of green waste; and
- Promotion of the beneficial uses and markets for processed green waste.

Composting Facility

To cost-effectively manage the additional green waste produced through the curbside collection program, the County will develop a centralized organics processing facility. As identified in the ISWMP, development of a composting facility is one of the key infrastructure components to maximize waste diversion. Three primary sources of organics will be available for composting: green waste from residential and commercial sectors, biosolids, and food waste. The current and projected quantities of each of these materials that may be available for processing at the proposed facility are summarized below.

Green Waste

Green waste includes lawn and tree trimmings, shrubbery, and Christmas trees. Table 3-5 summarizes the quantities of green waste received at the County’s landfill and transfer stations in recent years.

Table 3-5. County Green Waste Diversion in 2005 and 2007-2010

	Green Waste Received (Tons)		
Year(s)	**County Transfer Stations**	**Kekaha MSWLF**	**Total**
2005	—	—	10,585
July 2007-June 2008	10,814	1,221	12,035
July 2008-June 2009	10,408	1,374	11,782
July 2009-June 2010	17,809	930	18,739

Source: County of Kaua‘i, Hawai‘i
— For 2005, only the total amount was recorded.

For the purposes of this General Plan Update, it is assumed that all of the material currently dropped off at the transfer stations and the landfill site would be available for processing at the centralized composting facility located at the RRP. For planning purposes, the current level of

green waste capture and diversion (i.e., 18,739 TPY) is assumed to remain constant for the planning period.

Based on the waste composition analysis, in addition to the material being diverted via the transfer stations and the landfill, additional organic matter from both the residential and the commercial sectors is not being recovered, and is presumably disposed of at the landfill. The quantities disposed of in 2010 (from Table 2-3) and projections of these quantities throughout the planning period are presented in Table 3-6.

Table 3-6. Quantities of Green Waste Disposed of at the County's Municipal Solid Waste Landfill, 2010, and Projected for 2020-2035

	Green Waste Disposed of at Landfill (TPY)		
Year	**Residential**	**Commercial**	**Total**
2010	3,534	3,092	6,626
2020	3,981	3,483	7,464
2030	4,412	3,860	8,272
2035	4,645	4,064	8,709

*Green waste composition 8% residential, 5.5% commercial

Upon full implementation of a curbside collection program, as proposed in the ISWMP, and further enforcement of bans on the disposal of organics in the landfill from the commercial sector, a portion of the green waste forecast to be disposed of at the landfill can be diverted and processed at the RRP. The capture rate from the residential sector is assumed to increase from 30% to 60% over the planning period. It is also assumed that the current commercial composting operators on the island will continue to provide their service to their commercial clients; therefore, a lower recovery rate from the commercial sector has been assumed. The assumed capture rates from the commercial sector over the planning period are 20%, 30%, and 40% for the years 2020, 2030, and 2035, respectively. Table 3-7 summarizes the projected quantities of green waste.

Table 3-7. Quantities of Green Waste Recoverable from Disposal after Introduction of County Curbside Collection, 2010 and Projected for 2020-2035

	Green Waste Disposed of by Year (TPY)		Assumed Recovery (%)		Green Waste Recoverable (TPY)		
Year	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Projected Total Additional Recovery**
2010	3,534	3,092	—	—	—	—	—
2020	3,981	3,483	30%	20%	1,194	697	1,891
2030	4,412	3,860	60%	30%	2,647	1,158	3,805
2035	4,645	4,064	60%	40%	2,787	1,626	4,413

Note: Green Waste Disposed of by Year from Table 3-6.
— not implemented

Adding the green waste from the transfer stations (18,740 TPY; Table 3-5) to the green waste expected to be diverted from the landfill (Table 3-7) gives the estimated total amount of green waste available for processing at the RRP, as summarized in Table 3-8.

Table 3-8. Projected Quantities of Green Waste Available for Processing

Year	Green Waste Quantity (TPY)
2020	20,630
2030	22,544
2035	23,152

Note: Quantities summed from:
Table 3-5: July 2009-June 2010 Total +
Table 3-7: Projected Total Additional Recovery

Biosolid Quantities

Biosolids include the residual solids and semi-solids separated during the treatment of wastewater at the County wastewater treatment plant. The RRP composting facility can also process the County's biosolids (sewage sludge), which would result in diversion from the landfill and the addition of relatively small amounts of nutrients to the composted product. While no data are available regarding the composition or quality of the biosolids, based on the lack of identified industrial pollution sources served by Kaua‘i's wastewater treatment plants, it is assumed that the biosolids are suitable for the anticipated end-use as compost. Using the population forecast presented in Section 2 while holding the per capita bio-solids generation rate constant at an estimated 32.2 lbs/capita/year, the potential quantity of biosolids that may be available for processing at RRP are estimated in Table 3-9.

Table 3-9. Biosolid Quantities Available for Processing by the County in 2010, and Projected for 2020-2035

Year	County Population	Per Capita Generation Rate (lbs/capita/year)	Total Biosolids (TPY)
2010	82,101	32.2	1,322
2020	92,485	32.2	1,489
2030	102,500	32.2	1,650
2035	107,915	32.2	1,737

Source: *Centralized Composting Facility Master Plan* (Beck 2008); County population data from Table 2-1

Food Waste Quantities

Commercial food waste includes clean, unprepared food material typically generated in the preparation for market or the preparation of meals for consumption and the remaining uneaten food and scraps. Commercial food waste sources include grocery stores, hotels, restaurants and convenience stores. Residential food waste is generated in the preparation of meals plus any food not consumed during meals and discarded. In 2010, approximately 15,200 tons of residential and commercial food waste was disposed of at Kekaha MSWLF, and 670 tons of food waste was reused by pig farmers in the County. Therefore, a total of approximately 15,870 tons of food

waste was generated by residential and commercial sources, i.e., approximately 1.0 lb/capita/day, as calculated below:

$$\frac{15{,}870 \text{ tons} \times 2{,}000 \text{ lbs per ton}}{82{,}101 \text{ total population} \times 365 \text{ days/year}} = 1.0 \text{ lb/capita/day}$$

The 2005 Kaua‘i waste characterization study indicated that approximately 7,257 tons of food waste from residents was disposed of, and that no measurable amount was recycled. This is equivalent to approximately:

$$\frac{7{,}257 \text{ tons} \times 2{,}000 \text{ lbs/ton}}{67{,}217 \text{ residential population} \times 365 \text{ days/year}} = 0.59 \text{ lb/capita/day}$$

Therefore, if the total per capita organics generation rate is 1.0 lb/capita/day and the residential organics generation rate is 0.59 lb/capita/day, then the commercial food waste generation rate is 0.41 lb/capita/day.

As outlined in the ISWMP, the County intends to focus initially on the diversion of commercially generated food waste. Table 3-10 summarizes the forecast food waste quantities from all commercial sources based on the total County population.

Table 3-10. Suitable Commercial Food Waste Available for Processing/Recovery by the County, 2010 and Projected for 2020-2035

Year	Total County Population	Commercial/Capita Organics Generation Rate (lb/capita/day)	Commercial Organics Generated (TPY) [a]	% Assumed Suitable/ Acceptable for Processing (%)	Assumed Capture Rate (%)	Total Commercial Food Waste (TPY) [b]
2010	82,101	0.41	6,143	50%	25%	768
2020	92,485	0.41	6,920	60%	30%	1,246
2030	102,500	0.41	7,670	70%	40%	2,147
2035	107,915	0.41	8,075	75%	50%	3,028

Note: County population data from Table 2-1
Example calculations:
[a] (82,101 capita) × (0.41 lb/capita/day) × (365 days/2,000 lbs/ton) = 6,143 (tons)
[b] (6,143 tons) × 50% × 25% = 768 (tons)

The County has also indicated that in the long term, in order to further maximize waste diversion, they will initiate collection and processing of residential food waste. It is projected that this program would be implemented by approximately 2020 or later. Table 3-11 summarizes the forecast residential food waste quantities.

Table 3-11. Suitable Residential and Visitor Food Waste Quantities Available for Processing/Recovery by the County, 2010 and Projected for 2020-2035

Year	Total County Population	Residential Per-Capita Organics Generation Rate (lb/capita/day)	Residential Organics Generated (TPY) [a]	% Assumed Suitable/ Acceptable for Processing (%)	Assumed Capture Rate (%)	Total Residential Food Waste (TPY) [b]
2010	82,101	0.59	8,840	80%	0%	0
2020	92,485	0.59	9,958	80%	50%	3,983
2030	102,500	0.59	11,036	80%	60%	5,297
2035	107,915	0.59	11,619	80%	70%	6,507

Note: Population data from Table 2-1.
Example calculations:
[a] (82,101capita) × (0.59 lb/capita/day) × (365 days/2,000 lbs/ton) = 8,840 (tons)
[b] (8,840 tons) × 80% × 0% = 0 (tons)

Table 3-12 summarizes the total amount of suitable organic material that may be available for processing at the RRP over the planning period.

Table 3-12. Summary of Organics Available from All County Sources, 2010 and Projected for 2020–2035

Year	Green Waste from Transfer Stations and Landfill [a]	Green Waste Recovered from Curbside Collection [b]	Biosolids [c]	Suitable Commercial Food Waste [d]	Suitable Residential Food Waste [e]	Total Available Organics
2010	18,739	—	1,322	768	—	20,829
2020	18,739	1,891	1,489	1,246	—	23,365
2030	18,739	3,805	1,650	2,147	5,297	31,638
2035	18,739	4,413	1,737	3,028	6,507	34,424

— not implemented
[a] From Table 3-5: July 2009–June 2010 total
[b] From Table 3-7: Projected Total Additional Recovery
[c] From Table 3-9: Total Biosolids
[d] From Table 3-10: Suitable Commercial Food Waste
[e] From Table 3-11: Residential Food Waste Quantities Available for Processing/Recovery by the County

Based on the implementation of these diversion activities that may be available over the planning period, it is estimated that approximately 34,424 TPY of organic material may be captured and diverted by the end of the 15-year planning period (Table 3-12). This represents approximately 21% of the total waste stream.

The centralized composting facility is necessary because the current composting facilities are already exceeding their permitted processing capacity and are not conveniently located to County population centers. In addition, a centralized processing facility could potentially be designed to not only compost organic waste, but also disaster debris material. When identifying a site for a composting facility, a disaster debris staging area will be considered as well since a significant portion of this waste stream could be composted. More detail on disaster debris disposal is provided in Section 3.7.2.3.

Assist Private Facilities with Food Waste Composting

Currently, the island's private composters are not processing food waste. To encourage them to do so, these facilities would be eligible to apply for the County's innovative recycling grants to demonstrate the viability of food waste composting to DOH since their state permits would need to be modified, and help the composters overcome perceived challenges. The County will also help to coordinate "matches" between generators of food and the composters.

"Food Waste to Animal Feed" Infrastructure

The County will further develop the "food waste to animal feed" infrastructure by coordinating and subsidizing a food waste collection program to provide animal feed to local pig and goat farmers.

Specifically, the County will educate and encourage commercial and institutional generators of food waste to participate in a food waste diversion program. This will involve a separate collection of organic materials that are suitable for hog or goat feed, and the establishment of working relationships with the farmers who would receive the materials. The County's innovative recycling grant may be made available to interested parties to initiate a project that would demonstrate the logistical and financial aspects of a food waste to animal feed diversion effort.

Promote Reuse of Pallets

Most pallets generated by businesses are discarded as refuse and sent to the Landfill. Currently there are no pallet companies located in Kaua‘i so there is limited opportunity for recycling or reusing pallets. Some of the larger businesses may be backhauling pallets to the mainland via empty shipping containers.

The County will evaluate the costs and benefits of pallet chipping when the central composting facility becomes operational. Until then, the County will evaluate the feasibility of grinding pallets with the two private firms that currently have contracts with the County to provide grinding services for wood waste.

3.4 Special Waste

Special wastes are those components of the waste stream that require special handling due to their size or physical, chemical or biological composition for proper processing or disposal. Below are the proposed tactics the County is considering for the management of these materials. Also, any key issues associated with the current management of these materials and strategies to address these issues are presented.

Construction and Demolition Material Processing Facility

The County plans to provide space at the proposed RRP for potential development of a C&D processing and recycling facility. C&D material can include a range of materials. The most common and largest quantity of materials includes concrete, brick, block, and asphalt, treated and untreated lumber, plaster board or drywall, cabinets, doors, windows, roofing, and soil.

The available waste composition data suggest that just over 5,000 TPY of C&D material are generated on Kaua‘i; not all of this material would be suitable for recovery at the RRP. Recent observations by County staff suggest that more C&D material than that amount – i.e., approximately 16,000 TPY, or nearly 15% of the annual waste stream – may actually be generated. This amount includes 3,000–4,000 tons of concrete/brick/block and asphalt, which is currently processed (crushed and size classified) by Pacific Cutting & Coring. A further 10,000–12,000 tons of other C&D materials are disposed of at the County’s landfill. The composition of these wastes and quantity estimates were determined based on a visual/qualitative assessment by County staff of C&D materials entering the Kekaha MSWLF between April and July 2011.

The strategy to divert C&D material from disposal consists of a combination of programs/policy instruments, service contracts and infrastructure potentially developed in two phases:

Phase 1 C&D processing facility: A waste ordinance would dictate that C&D waste materials be source-separated at construction/demolition sites as clean loads of mixed rigid and film plastics, clean drywall, mixed scrap metal, uncontaminated wood, pallets, old corrugated cardboard (OCC), and small quantities of concrete brick and block. These clean loads would be delivered to an area on the RRP site with dedicated bunker for each material. Once a sufficient quantity of any one of these material has accumulated to justify shipping, the material would be shipped to market. This is referred to as the Phase 1 C&D processing facility.

Phase 2 C&D sorting facility: In the event that the waste ordinance regarding source separation does not yield the desired result, the County may implement the second phase of this facility, which would consist of a C&D sort line to process mixed C&D materials.

As it relates to the 3,000–4,000 tons of concrete/brick/block and asphalt materials, the County would continue to rely on a private company to process this material. However, it is proposed that an area be reserved at the RRP site for the stockpiling/temporary storage/onsite contracted processing of up to 5,000 tons of this material. A contractor with portable crushing/screening equipment would mobilize to the site at least three times per year to process the materials. This service approach applies to both Phase 1 and 2 C&D processing operations as described above.

C&D material is not currently collected by the County for recycling. Consistent with how other services are provided by the County, it is assumed that a private contractor would provide C&D material recycling service as part of the RRP. Depending on the actual quantity of these waste materials generated within the County, a significant contribution can be made to diversion overall.

Proposed Kaua‘i County Construction and Demolition Diversion Ordinance

In striving to achieve maximum waste diversion, the County of Kaua‘i Solid Waste Division is proposing legislation to require the diversion of C&D debris from landfill disposal.

The County estimates that as much as 15% of Kaua‘i’s waste stream is C&D waste. Much of this waste is recyclable, and increasing diversion will save valuable landfill space as well as conserve natural resources. This ordinance would reinforce existing restrictions on the disposal of commercially generated cardboard, metal, and green waste. It is anticipated that such an ordinance would divert approximately 4,000 tons of waste from the landfill each year.

The proposed C&D ordinance targets construction projects valued at $100,000 or more. Projects that only require a plumbing, electrical, or mechanical permit are exempted, as well as roofing projects that do not include tear off of existing roofing. Projects where there is lack of space or access or lack of recyclable materials are also eligible for exemption with Departmental verification.

The ordinance would require contractors to separate and recycle designated recyclables that have local processing capacity and developed markets. Designated recyclables currently include cardboard, metal, green waste, and concrete and asphalt. Salvage of reusable materials is also encouraged under the ordinance.

The ordinance would require contractors to document the recycling, salvage, and disposal activities that take place during the project, including quantifying all materials generated on the job site and documenting the location where items were recycled or disposed. The County Solid Waste Division will monitor projects and reports for compliance.

Used Tire Processing Facility

The majority of used tires from passenger vehicles on Kaua‘i are typically managed through the commercial service centers where new tires are installed. Industrial tires and tires from non-residential sources are accepted directly by local private businesses. The County currently accepts used tires from residents at all transfer stations and the landfill. The used tires are then managed by a private contractor. The used tires are typically shipped off-island, where they are shredded and burned as a fuel source. For those tires not collected by these methods, they can be collected at the RRP. The County proposes to include a processing area at the RRP for used tires that includes capacity to manage all used tires generated in the County. This is estimated to be approximately 70,000–80,000 tires per year. It is estimated that used tires account for less than 1% of the waste stream directed to disposal, and that effectively 100% of used tires are being captured and diverted by the current recovery system. Tires are banned from landfill disposal in the County.

The County currently accepts tires at all transfer stations and at the Kekaha MSWLF. The collected tires are then processed by a contractor. It is assumed that a private contractor would

provide the same service as part of the RRP. The RRP would have the capacity to manage 70,000–80,000 tires per year.

3.5 Household Hazardous Waste and Electronic Waste

Household Hazardous Waste Depot

The RRP should include the collection of domestically generated hazardous wastes, limited to household quantities, in accordance with the ISWMP. The County may also wish to accept small quantities of hazardous waste from small businesses and farmers, as appropriate. Typical household hazardous wastes collected include aerosols, batteries, oil, paint, cleaning products, pesticides, and propane cylinders. Other future diversion opportunities identified by the County may include a chemical swap program and paint remixing. Many of these materials may have limited recovery potential, but can be harmful to the environment if disposed of without proper management. Furthermore, elimination of these materials from the landfill improves its leachate quality. An estimated 370 TPY of HHW are generated by residents (approximately 0.35% of the total waste stream).

A HHW depot is recommended as part of the overall RRP. The County currently offers an annual HHW event at the four County transfer stations. However, a permanent depot would allow the County to provide an improved and expanded level of service.

Electronic Waste Depot

An electronic waste depot is recommended as part of the overall RRP to receive and process electronic waste. Electronic waste, including computers, monitors, televisions, telephones, and stereo equipment, would be received at the proposed combined HHW and electronic waste depot building. When sufficient quantities of material are collected, the bin, container, or pallet would be transported to a (likely off-island) processor for disassembly (if appropriate), recovery, and safe disposition of hazardous and residual waste materials. The exception to this approach would be for electronic equipment that is still usable and in working order. In such cases, the electrical equipment would be managed through the reuse center at the RRP. Annual collection of electronic waste is already provided by the County through a private contractor. It is assumed that a private contractor would provide the same service as part of the RRP. Some of these materials are also collected from the public through non-governmental organizations.

The County currently collects e-waste during periodic events. In 2011, approximately 100 tons (or less than 0.1% of the total waste stream) of e-waste material was collected through an event, mainly from the commercial sector. By offering a permanent collection service for this type of waste and making the collection more convenient, the amount of diversion achieved is expected to increase. Diverting additional e-waste may also improve the landfill leachate quality and provide for the recovery of valuable metals.

3.6 Educational Center

Education and promotion are key to maximizing the capture and diversion of all recyclable materials. Therefore, an educational center is recommended as a key component of the RRP, as it provides the opportunity to discuss directly with residents, businesses, trade associations, community groups, schools, visitors, legislators, and others the benefits of waste diversion and the programs offered at the RRP. These discussions can then be reinforced by providing guided tours of the RRP and its operations indirectly bolstering the County's diversions efforts. Work stations can also be provided at the educational center to support research that may be ongoing at the RRP related to its various components including composting, energy production, technology evaluation, and monitoring.

3.7 Solid Waste Collection

Many communities are converting to automated systems in an effort to reduce litter, minimize costs, improve efficiency and limit worker injuries. The Plan recommends that the County continue the transition from manual to automated collection as follows:

- The County will continue phasing in automated collection in each of the five collection districts. Converting to an automated collection system will reduce staffing requirements for solid waste collection by one laborer per crew. The County will re-assign that individual to the curbside green waste collection;

- Begin collecting pre-consumer food waste from commercial generators.

- The County will conduct a collection and fleet maintenance efficiency study; and

- The County will contract with a professional firm to manage the implementation of the automated collection program.

3.8 Transfer Stations and Landfills

3.8.1 Existing Facilities

The County operates four transfer stations in Hanapēpē, Līhu‘e, Kāpa‘a, and Hanalei that consolidate waste from MSW collection trucks into large transfer trailers for more efficient and economical transport to Kekaha Landfill. The County has no planned changes or additions to the existing transfer stations.

Kekaha Landfill, the islands only permitted MSWL, has been operated in two phases. Phase I reached capacity years sooner than anticipated due to a sharp increase in solid waste disposal following Hurricane Iniki in 1992. Phase II opened in 1993 and is approaching its design capacity. In 1998, the maximum height of the Phase II landfill was increased to 60 ft above msl. Since that time, the County has implemented an additional vertical expansion to 85 ft above msl and a horizontal expansion (Cell 1). Kekaha Landfill is expected to reach capacity of currently

permitted fill areas (i.e., Phase II, including Cell 1) by late March 2014. The County is currently designing and attempting to permit an additional horizontal expansion (Cell 2) and a vertical expansion of Phase II/Cells 1 and 2.

Provided the County obtains approvals for the two expansions and continues using Kekaha Landfill, the landfill will reach capacity between 2022 and 2024 and a new landfill will need to be constructed. An interim closure project of the Kekaha Landfill will also be required. The closure construction of Kekaha Landfill is expected to take approximately 18 months to complete and will commence once capacity is reached and a new landfill has been constructed. To deal with future projected MSW generation quantities the County has identified several strategies, which are discussed briefly below.

3.8.2 Strategies for Long-Range Plan

3.8.2.1 Kekaha Landfill

Lateral Expansion

In November 2007 the Final Environmental Assessment for Kekaha Landfill Phase II Lateral Expansion was published. The purpose of the proposed action is to laterally expand Phase II and thereby prolong the life of the Kekaha Landfill as it is the only permitted MSW landfill on the Island of Kaua‘i.

The proposed lateral expansions were planned in three areas: Cell 1, Cell 2, and Cell 3. In 2009, Cell 1 of the landfill was constructed expanding the Phase II fill area into the existing leachate lagoon and adjacent acreage. Phase II/Cell 1 is currently permitted to receive MSW up to 85 ft above msl and is currently in use and expected to reach capacity by late March 2014. Phase II/Cell 2 is currently in the planning and permitting stages. The Cell 2 lateral expansion would expand the Phase II fill area into the valley area between the closed Phase I landfill and the existing Phase II landfill. Based on current landfill waste mass density and daily waste disposal rates, the Phase II/Cell 2 lateral expansion is expected to extend the useful life the existing landfill for several additional years. Phase II/Cell 3 lateral expansion would expand the Phase II fill area directly over the closed Phase I landfill. Phase II/Cell 3 lateral expansion is not expected to be implemented, rather the County intends to construct a new Subtitle D landfill prior to Phase II/Cell 2 reaching capacity.

Vertical Expansion

In October 2013 the Final Environmental Assessment and Finding of No Significant Impact for Kekaha Landfill Phase II Vertical Expansion was published. The purpose of the proposed action is to vertically expand the currently permitted Phase II/Cell 1 area and the proposed Cell 2 lateral expansion, thereby prolonging the life of the Kekaha MSWLF. The need arises because the currently-permitted Kekaha MSWLF Phase II is projected to reach capacity in late March 2014, at which time the Island of Kaua‘i would be without a landfill for the safe disposal of MSW.

Interim Landfill Closure Project

Provided the County obtains approvals to continue using Kekaha Landfill beyond 2014, once capacity is reached the County will initiate an interim closure project. Upon closure, the landfill owner and operator will be responsible for capping the landfill and monitoring groundwater, methane gas, and leachate, for a period of not less than 30 years after the landfill has ceased accepting waste. The closure construction of Kekaha Landfill is expected to take approximately 18 months to complete and is estimated to commence sometime between 2022 and 2024.

3.8.2.2 New Subtitle D Landfill

In January 2013, the Final Environmental Assessment/Environmental Impact Statement Preparation Notice for the New Kaua‘i Landfill and Resource Recovery Park was published. A new landfill facility will be required once Kekaha MSWLF reaches capacity to achieve the project objective of providing for the proper disposal of all forms of MSW that cannot practicably be further reused, recycled, or otherwise recovered. The proposed project includes construction and operation of a both new MSWLF and a RRP (Section 3.3.1).

The County’s selection of an appropriate site for a new MSWLF has been an ongoing island-wide issue since 2000, balancing the potential for environmental, technical, economic, and social impacts on the public and surrounding community. Upon finalization and acceptance of the EIS, land rights would have to be acquired and the proposed facilities would have to be designed, permitted, approved, and constructed before the new MSWLF is ready to accept refuse. The entire process is expected to take several years. Completion of the proposed project is time-critical, to ensure proper management of waste on the island given the expected closure of the existing Kekaha MSWLF in the coming years.

The County proposes to develop and operate the new MSWLF on a 270-acre site near Ma‘alo Road in Kaua‘i. Infrastructure at the MSWLF will include access roads, utilities, an office, shop area, stormwater infiltration basin, leachate aeration pond, scale house, drop-off area, and internal roadways. The RRP may be established either on the MSWLF site or on a nearby, approximately 80-acre, privately-owned site, pending the outcome of discussions between the landowners and the County.

The proposed new MSWLF will be designed to accept MSW. Other forms of waste that may be accepted at the facility include recycling residue and unacceptable wastes that are not classified as hazardous waste. Hazardous waste will not be accepted at the landfill. The sources of refuse will come from waste collected by the County, private collection companies, residential and commercial self-haulers, non-hazardous industrial solid waste generators, and possibly treated biosolids from wastewater treatment plants.

By the time it is operational, the new MSWLF will be the only on-island facility that meets the requirements of the Resource Conservation and Recovery Act (RCRA) Subtitle D federal regulations. These regulations provide for the following:

- The construction and operation of the facility in accordance with design and safety standards
- Implementation of a groundwater monitoring and corrective action plan
- Provision for landfill leachate and gas monitoring and collection
- Closure and post-closure care plans
- Financial assurance that the operator of the facility is capable of completing and maintaining closure activities and post-closure monitoring and maintenance requirements

The operating requirements of the landfill will further require the application of daily cover material, controlling disease vector populations (e.g., rats, mice, and flies), monitoring methane gas, restricting public access, controlling litter, controlling storm water run-on and runoff, protecting surface water from pollutants, and maintaining appropriate records. Federal and state design standards will also require the landfill to have a composite liner made of a synthetic flexible membrane over a compacted clay layer. All landfills must have groundwater monitoring wells, and the landfill owner and operator will be responsible for cleaning up any contamination if it does occur. Upon closure, the landfill owner and operator will be held responsible for capping the landfill and monitoring groundwater, methane gas, and leachate, for a period of not less than 30 years after the landfill has ceased accepting waste. Construction of the new Ma‘alo MSWLF site is estimated to start in 2022.

3.8.2.3 Disaster Debris Management Plan

In September 1992 when Hurricane Iniki struck Kaua‘i, more than five times the annual volume of solid waste was generated during a period of less than 24 hours. At the time, Kekaha Landfill Phase I was nearing capacity and the debris management system was not prepared for the sudden increase in waste volume. Recovery took more than two years and the lessons learned point to the necessity for a clear policy and chain of command; the ability to act quickly and correctly in establishing temporary sites, and executing contracts; and providing training and information to debris management personnel so that things do not have to be redone. More specifically:

- There must be a clear chain of command to direct County personnel and equipment;
- Policy and planning documents must be well known to all personnel representing or providing services to the County;
- Temporary sites must be identified and acquired within a few hours of a disaster;
- Contracts for private services must be in-place and ready. These include site management, hauling, and specific material processing. The Mayor only has to give notice to proceed in order to procure those services, and

- Landfill personnel must be ready and able to handle substantial increases in volume on short notice.

The County resources available for disaster debris management consist of the following basic elements:

- Existing landfill capacity
- Planned landfill capacity which may be available in the future
- Transfer stations
- Departmental personnel and supervisors
- Solid waste handling equipment
- Puhi Recycling Center

Kekaha Landfill Phase II, the only permitted MSW landfill on the Island of Kaua‘i, is reaching its maximum capacity. Due to the landfills isolation from the population center by a coastal highway, it is particularly vulnerable to high wind, waves or tsunami. If a new landfill is not constructed, it would be advisable for the County to install a bypass road in the vicinity of Kekaha Town, where the road is very close to the coastline. The bypass road would allow heavy trucks to access the landfill without passing through residential areas of Kekaha and reduce the probability that the road will be washed out during a hurricane or tsunami. In addition, the existing system of transfer stations is currently dependent on line power for operations (except for Lihue transfer station), and would be out of service during a major disruption of power transmission. It is advisable that the County equip transfer stations with backup power generators to allow them to function during a natural (or other) disaster.

The Solid Waste Division has completed a new landfill siting study and has assessed proposals on alternative technologies to reduce the amount of waste disposed at the landfill. A new landfill site is also being developed. Under normal circumstances, a delay of approximately 5 years can be expected between the development of a landfill concept and it actual operation of a solid waste facility. Assuming the current permitted landfill conditions, during the next 4 to 5 years, the County will not have enough disposal capacity to handle a major natural disaster. Until the expansion of Kekaha Landfill is approved or a new landfill or disposal facility is operational, it is essential that this lack of landfill space be mitigated using some or all of the following methods:

- Identify potential temporary debris storage and recovery sites located close to the source of generation.
- Develop effective protocols for diverting high volume components such as green waste, lumber and aggregate.

- Implement contracts for reuse, recycling or reduction of waste volume.

- Equip the transfer stations to operate without line power, and provide tie-downs for county trailers and equipment.

In addition to the current mitigation plan, the County has prepared a Disaster Debris Action Manual (DDAM) to reduce the impact of a natural or man-made disaster by effectively managing debris, and to assist County officials in preparing for, and responding to, natural disasters such as hurricanes, floods, and tsunamis.

Individual tasks that constitute the action plan are summarized below:

- Identification of key County agencies and staff responsibilities for the development and implementation of the DDAM, and designation of a Kaua‘i Debris Management Coordinator (DMC), who is responsible for all debris management activities related to natural disasters.

- Designation of a disaster debris management team responsible for managing debris, accounting, contracting and island-wide response activities during the implementation of the DDAM.

- Definition of debris sheds throughout the County for the purpose of allocating equipment, contractors and Temporary Debris Storage and Reduction sites (TDSR sites).

- Estimation of debris quantity and composition for Kaua‘i “design event” a category 4 hurricane.

- Preparation of debris management protocols and best management practices (BMPs) for managing different types of disaster debris.

- Determination of the protocols for handling non-eligible disaster debris.

- Determination of infrastructure requirements for responding to a natural disaster.

- Definition of action steps to be completed during all disaster phases.

- Identification of candidate sites for temporary debris and storage and recovery sites.

The development of debris management contracts has not been included in the DDAM since there are draft contracts available in the Hawaii State Plan; however, it is advisable that the County generate standing agreements with key labor and equipment suppliers in order to ensure that required services will be available in the event of a disaster. It is also advisable to secure agreements with TDSR site owners prior to a disaster in order to more effectively implement the DDAM following a natural disaster.

3.9 Alternative Disposal Technologies

The County has evaluated a variety of downstream technologies, other than landfilling, to ultimately manage the portion of Kaua‘i’s solid waste stream that is not targeted upstream to be reduced, reused, recycled or composted. The County is currently reviewing different alternatives to landfill disposal, including:

- Biorefinery;
- Landfill Gas to Energy (LGtE);
- Waste-To-Energy (WtE); and
- Waste to Fuel (WtF).

3.9.1 Biorefinery Facility

Hawaii Bioenergy, LLP has initiated a biomass-to-fuel project on Kaua‘i referred to as the Hawaii BioFuel Supply Project. It was initially thought that there may be an opportunity to co-locate this biorefinery at the RRP to achieve savings for the County. In August 2011, the company executed a biofuel supply contract with Hawaiian Electric Company (HECO). The proposed facility must be operational within 60 months following approval of the contract. Within this 60-month timeframe, Hawaii Bioenergy must begin growing appropriate woody biomass crops (i.e., trees), and design, permit, construct, and commission the biorefinery pre-processing facility. As the RRP is not expected to be completed within that timeframe, there is likely not an opportunity to co-locate the facility at the RRP.

Applicability to Kaua‘i Waste Stream

Hawaii Bioenergy intends to grow biomass on Kaua‘i and process the biomass through a technology such as gasification or AD in order to produce a biofuel and/or generate power. The project will proceed on privately owned lands near the proposed new landfill and RRP. Hawaii Bioenergy may have an interest in receiving and processing all paper wastes that may be available from the County, dependent on the quality of the paper, amount and type of contaminants (e.g., staples), moisture content (e.g., food waste, green waste), and the market value of the paper. A homogeneous biomass feedstock is preferred for this process, however, and the quantity of paper received from the County would account for only 5–10% of their planned total throughput.

Waste Diversion Potential

This proposed private facility offers an opportunity for the County to divert approximately 30,000 TPY of waste in the future, or approximately 21% of its waste stream, when considering both residential and commercial sources.

3.9.2 Landfill Gas to Energy Facility

Landfill gas (LFG) is generated by the decomposition of organic material in a municipal solid waste landfill. It is a combustible mixture comprised mainly of methane and carbon dioxide, and is commonly collected and directly combusted to prevent odors, and may optionally be used to generate energy. A LFGtE energy facility can provide the County with a number of benefits. It provides an opportunity to manage landfill gas in a sustainable manner while providing electricity for up to approximately 2,200 homes and revenue potential of up to $6.96 million annually in future years. This facility is recommended for inclusion as part of the RRP.

Capital costs to construct this facility would be approximately $2.32 million for the first phase, increasing to a total of $6.96 million for full capacity build-out. Operations and maintenance (O&M) costs to operate this facility would be approximately $133,000/yr for the initial phase, increasing to $312,000/yr when operating at full capacity.

Applicability to Kaua‘i Waste Stream

While not providing any actual waste diversion, a LFGtE facility does offer a number of substantial benefits. The methane gas generated by the landfilling of waste can be collected and combusted in a manner that enables the production of electricity. Based on the estimated disposal capacity of the new Ma‘alo MSWLF, a LFGtE facility is expected to manage landfill gas in a sustainable manner by collecting and combusting the landfill gas in a controlled manner.

Waste Diversion Potential

If a 3.75-MW (megawatt) LFGtE project was implemented at the proposed Ma‘alo MSWLF, it would provide a reduction in emissions equivalent to approximately 158,000 metric tons of carbon dioxide per year, and would generate enough electric power for about 2,200 “typical” homes. Revenue generation from the sale of electrical energy, at a rate of $0.13/kW-hr (the resale rate quoted in the ISWMP), is estimated to be $1.73 million annually for the initial phase (1.6 MW) and increase to $4.0 million annually when operating at the ultimate capacity (3.75 MW). LFGtE does not assist in achieving any level of waste diversion. In fact, other efforts to divert the organic waste stream from the landfill would decrease the amount of energy produced at the LFGtE facility.

It is essential to understand that, due to the projected site life of the proposed landfill (approximately 264 years), the full 3.75-MW electric-generating capacity would not be available for quite some time. However, one advantage of multiple-engine projects of this type is that generating capacity can be added modularly in 1.3–1.6 MW increments as enough LFG becomes available. A projected 264-year site life means that one of the three planned engine generators could be brought on line in about the 7th year of landfill operation, a second engine generator could be added in about the 18th year of landfill operation, and the third engine generator could be added in about the 97th year of landfill operation. During the landfill post-closure period (after waste has ceased being accepted), the three generators could be similarly phased out, as the landfill gas generation decreases.

3.9.3 Waste to Energy

Waste to Energy (WtE) is a form of energy recovery whereby energy is created in the form of electricity or heat from the direct incineration of waste. Modern incinerators are able to reduce the volume of the waste feedstock by up to 95%, depending on the composition of the waste and the degree of recovery of materials such as metals from the ash for recycling. Various thermal technologies exist that can be used by a WtE facility, including starved air (or multi-stage combustion), mass burn (or single stage combustion), fluidized bed, and rotary kiln. The differences between the technologies are technical in nature relating to items such as process oxygen concentrations and temperatures. Technology selection should be based on the expected waste quantities and composition available.

For a WtE facility accepting approximately 80,000 TPY of waste, the capital costs are estimated to be $120–$125 million, with costs increasing to approximately $150 million for a WtE facility accepting 100,000 TPY of waste. O&M costs would include labor, chemicals, residues handling, maintenance and consumables, and would be approximately $120 per ton, net of energy revenues, not including landfilling of residuals. For comparison, the ISWMP estimated capital costs of $46–$52 million and annual operating costs of $8–$9 million including debt service based on a throughput of 40,500 TPY, or less than half of the residuals available on the island. The ISWMP estimated the cost per ton, net of energy revenue, to be $121–$139 per ton.

In order to invest in a WtE facility, a comprehensive fuel supply (waste composition) study should be undertaken to estimate the quality and volume of waste available as fuel for the WtE facility. The conceptual design would be developed based on the information obtained during the fuel supply study. An economic analysis can then be undertaken, where an in-house financial model is developed for the purpose of computing estimated tariffs, debt capacity, expected profitability, investor return, and other financial parameters, by providing technical and cost assumptions. This information would be used as the basis for deciding if WtE is the most suitable method of managing certain waste streams on the island. Residual waste that is not treated through the WtE facility, as well as the combustion ash, would be deposited into the landfill. Based on O‘ahu’s experience, the DOH may require the County to operate a monofill portion of the landfill to manage the ash separately from the other MSW. A WtE facility is not recommended at this time as part of the overall RRP.

Applicability to Kaua‘i Waste Stream

WtE offers a number of substantial benefits in which residual waste could be used as feedstock to generate potential energy. Of the total waste forecast to be generated for each year, the County estimates that approximately 80,000 TPY (rounded for ease of calculation) of residual waste could be used as feedstock for the WtE plant by 2035. The energy generation potential can be estimated using the following calculations. Using the design value of 80,000 TPY of waste, and assuming that the plant will operate for 7,900 hours per year (hr/yr) (WtE plants typically operate 7,800–8,000 hr/yr), then the throughput of waste is 10.13 tons per hour, or 2.81 kilograms per

second (kg/sec). It is noted that the ISWMP considered a WtE facility of only 40,500 tons to accommodate the residential waste stream.

The efficiency of a WtE plant will depend on the design; however, it can be assumed that the facility will operate with an efficiency of 25% net energy generated and 28% gross energy. For the purpose of providing an approximate energy generation figure, 25% can be used. As such, 26.72 MJ/sec (MW) × 25% = 6.68 MW/second × 7,900 hours per year = 52,780 MW-hours per year (net value) of energy generated.

Waste Diversion Potential

A WtE facility could process up to 80,000 TPY (i.e., 53% of the County's waste stream) by the end of the planning period. Allowing for 25% non-combustible waste, 60,000 tons of waste could be diverted from landfill.

3.9.4 Waste to Fuel Facility

Waste-to-fuel systems involve the processing of MSW to produce a fuel, and subsequent use of that fuel as a substitute for some of the fossil fuels in utility power generation, typically including industrial, commercial, or institutional applications (e.g., power generation or water heating). Two such waste-to-fuel systems include:

- Any one of numerous proprietary processes to produce a refuse-derived fuel (RDF), the final stage of which may include the densification of the RDF into pellets (Section 3.8.4.1).

- Gasification or pyrolysis, which produces a synthetic gas ("syngas") (Section 3.8.4.2).

3.9.4.1 Refuse Derived Fuel Processing

Refuse Derived Fuel (RDF) refers to fuel in any form that is derived from waste. The term RDF is commonly used to refer to solid waste that has been mechanically processed to produce a readily storable and transportable fuel that is homogeneous, and thus optimized for combustion. RDF processing has two basic components: RDF production and RDF incineration. An RDF production facility makes RDF in various forms through materials separation, size reduction, and pelletizing. Although RDF processing has the advantage of removing recyclables and contaminants from the combustion stream, the complexity of this processing has increased the operating and maintenance cost and reduced the reliability of RDF production facilities. On average, capital and operating costs per ton of capacity for incineration units that use RDF are higher than for other incineration options.

The RDF produced is usually in the form of either pellets or baled paper and plastic, which have been marketed for use in electrical generating stations that use fluidized-bed technologies. RDF is typically only produced in situations where markets are remote from the point of generation and the material requires long-distance transport.

3.9.4.2 Gasification/Pyrolysis

Gasification is the general term used to describe the process of partial combustion which produces a combustible synthetic gas (syngas) that can fuel an internal-combustion engine, gas turbine, or boiler, under excess-air conditions. Such systems can be used to convert municipal solid waste into a gaseous fuel.

Pyrolysis is similar to gasification with the exception of the heat source. A pyrolysis system uses an external source of heat to drive the process whereas gasification uses the heat from the waste. Typically gasification is configured to maximize the production of gaseous fuel and pyrolysis is optimized to produce liquid fuel. There is only limited operating experience with pyrolysis technology for mixed solid waste, primarily in Japan.

Applicability to Kaua‘i Waste Stream

Given the lack of markets for a RDF product in Kaua‘i suitable for combusting a waste material, the short distance to potential fuel substitute markets if they exist, the fact that RDF production does not achieve waste diversion unless there is a market for the RDF product, and the incremental cost for waste management, this is not a recommended component of the RRP.

Generally, the information available for existing facilities indicate that there would be significant risk in relying on the gasification/pyrolysis technologies to manage Kaua‘i’s MSW, and we do not currently recommend it as a reliable and effective solution.

Waste Diversion Potential

It is estimated that following diversion of residential and commercial recyclables plus organic wastes and non-curbside collected materials (e.g., HHW, tires, scrap metal, electronics, residential C&D material), approximately 55% of the total waste stream may be available as feedstock for a thermal process. It is typical to assume that approximately 25% of the waste stream by weight is non-combustible and requires further management as a residual (i.e., typically the landfilling of leftover ash, as is done on O‘ahu). Therefore, overall diversion at a waste-to-fuel plant could be approximately 41% of the total waste stream.

3.10 Summary of Long-Range Plan

3.10.1 Source Reduction

- Begin working with other Hawai’i counties to introduce Extended Producer Stewardship legislation in Hawai’i;
- Encourage and expand the canvas bag program to replace disposable shopping bags with canvas bags;

- Encourage residents to purchase products, such as cleaning products, with minimal health or environmental hazards;

- Educate residents on the environmental and economic costs associated with the generating and management of solid waste;

- Work with the schools to incorporate source reduction education into the curriculum.

- Begin developing Unit Based/Pay-As-You-Throw (PAYT) pricing policies and educational materials for program implementation; and

- Institute a hybrid PAYT collection program whereby all residents pay an additional incremental fee if they require more than one cart for weekly refuse collection.

3.10.2 Recycling and Bioconversion

3.10.2.1 Recycling

- Develop a County-owned Materials Recovery Facility (MRF);

- Provide every-other-week curbside collection of residential recyclable materials, with a hybrid PAYT system;

- Enhance commercial recycling through ordinances, technical assistance and services;

- Increase visitor recycling;

- Facilitate recycling at special events;

- Develop a County-owned Resource Recovery Park (RRP); and

- Provide financial support for innovative recycling initiatives.

3.10.2.2 Bioconversion

- Establish a weekly curbside collection system for green waste, with automated refuse collection;

- Expand the ban on the landfill disposal of non-residential green waste in Kaua‘i to include residential waste and expand the ban to include disposal restrictions at the transfer stations;
- Establish a central green waste and organics processing facility to produce mulch and/or compost;

- Provide curbside collection for pre-consumer, commercial food waste;

- Assist private facilities with food waste composting;
- Further develop the “food waste to animal feed,” infrastructure;
- Promote the reuse of pallets; and
- Evaluate expanding automated refuse collection to green waste and recyclables.

3.10.3 Special Waste

- Develop a construction and demolition material processing facility; and
- Develop a used tire processing facility.

3.10.4 Household Hazardous Waste and Electronic Waste

- Develop a household hazardous waste depot; and
- Develop an electronic waste depot.

3.10.5 Public Education and Information Component

- Develop an educational center.

3.10.6 Solid Waste Collection

- Continue phasing in automated collection in each of the five collection districts and re-assign one individual to the curbside green waste collection;
- Begin collecting pre-consumer food waste from commercial generators.
- Conduct a collection and fleet maintenance efficiency study; and
- Contract a professional firm to manage the implementation of the automated collection program.

3.10.7 Transfer Stations and Landfills

3.10.7.1 Kekaha Landfill

- Continue permitting and construction activities to laterally expand Phase II of Kekaha MSWLF;

- Continue permitting and construction activities to vertically expand is planned Phase II/Cell 1 and Cell 2 to 120 ft above msl; and

- Initiate an interim closure project of Kekaha MSWLF once it has reached capacity and a new Subtitle D MSWLF has been constructed.

3.10.7.2 New Subtitle D Landfill

- Acquire land rights and design, permit, approve, and construct the required infrastructure and new Subtitle D MSWLF.

3.10.7.3 Disaster Debris Management Plan

- Identify key County agencies and staff responsible for the development and implementation of the Disaster Debris Action Manual (DDAM), and designate of a Kaua‘i Debris Management Coordinator (DMC), who is responsible for all debris management activities related to natural disasters;

  Designate a disaster debris management team responsible for managing debris, accounting, contracting and island-wide response activities during the implementation of the DDAM;

- Define debris sheds throughout the County for the purpose of allocating equipment, contractors and Temporary Debris Storage and Reduction sites (TDSR sites);

- Estimate debris quantity and composition for Kaua‘i “design event” for a category 4 hurricane;

- Prepare debris management protocols and best management practices (BMPs) for managing different types of disaster debris;

- Determine the protocols for handling non-eligible disaster debris;

- Determine infrastructure requirements for responding to a natural disaster;

- Define action steps to be completed during all disaster phases; and

- Identify candidate sites for temporary debris and storage and recovery sites.

3.10.8 Alternative Disposal Technologies

- Promote the establishment of a biorefinery facility by supporting Hawaii Bioenergy, LLP in growing appropriate woody biomass crops (i.e., trees), and designing, permitting, constructing, and commissioning the biorefinery pre-processing facility;

- Consider developing a Landfill Gas to Energy (LGtE) facility to manage landfill gas in a sustainable manner while providing electricity;

- Consider developing a Waste-To-Energy (WtE) facility to divert waste from landfill disposal while providing electricity; and

- Consider developing a Waste to Fuel (WtF) facility for the processing of MSW to produce a fuel and subsequent use of that fuel as a substitute for some of the fossil fuels in utility power generation. Two such waste-to-fuel systems include: refuse-derived fuel (RDF) and gasification or pyrolysis.

Section 4. Relationship to General Plan

4.1 Overview

As outlined in Section 3, over the next two decades, the County will further improve solid waste management programs with island-wide curbside collection of green waste and mixed recyclables and the addition of semi-automated collection to communities now serviced manually; increase efficiency in transfer station and convenience center operations; increase the material recycling rate including construction and operation of a green waste, food waste, and sewage sludge composting facility; and provide local landfills for the small volume of residual items which cannot be recycled to energy or material thereby further reducing dependency on landfill disposal.

4.2 Policy

The following general policies apply to solid waste management on Kaua‘i. Specific policies to guide solid waste programs should be provided in the long-range ISWMP.

a. Using long-range integrated resource planning, the County shall manage an island wide system of solid waste collection, reuse, recycling and disposal that (1) is environmentally sound and cost-effective; (2) increases diversion of waste from the island’s landfill(s); and (3) provides for the timely and orderly expansion of solid waste facilities.

b. Through a multi-faceted program of education, management measures, and financial incentives, the County shall support and stimulate Kaua‘i businesses and residents to reduce their solid waste generation and increase the reuse and recycling of materials.

c. The County shall incorporate entrepreneurial principles in managing solid waste, involve private businesses, and support market-oriented innovations and initiatives. Among other options, the County shall consider opportunities for utilizing the waste stream for energy generation.

4.3 Implementing Actions

The County government shall:

a. Prepare a long-range Integrated Solid Waste Management Plan, to be adopted by the County Council and updated every five years. The ISWMP shall set policies to guide solid waste programs, facility planning, capital improvements, operations, user fees, and financing.

b. Commit the necessary funding and staff resources to implement the County Integrated Solid Waste Management Plan.

c. Increase the effectiveness of the County’s solid waste system by maximizing the convenience of reuse and recycling centers for users.

d. Establish a sit of measurable goals to evaluate County efforts to divert solid waste from the island’s landfill.

e. Develop a proactive process for siting and designing sanitary landfills and other facilities that incorporate early and detailed consultation and negotiation among the utility, the County government, community stakeholders, and the general public.

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