Lima Ola Workforce Housing Development

Master Plan Update

ʻEleʻele, Kauaʻi, Hawaiʻi

TMK: (4) 2-1-001:054

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Exhibit 13-B

TABLE OF CONTENTS

TITLE PAGE..... Page 1

TABLE OF CONTENTS..... Page 2

LIMA OLA WORFORCE HOUSING DEVELOPMENT MASTER PLAN UPDATE

I. BACKGROUND..... Page 3

II. PURPOSE..... Page 3

III. INTRODUCTION..... Page 4

IV. LIMA OLA WORKFORCE HOUSING DEVELOPMENT

MASTER PLAN UPDATE, APRIL 2017..... Page 5

V. CONCLUSION ..... Page 6

EXHIBITS:

Exhibit 1: Lima Ola Workforce Housing Sustainability Plan

Exhibit 2: Infrastructure Delivery Plan for Lima Ola Workforce Housing

Exhibit 3: Agricultural Impact Assessment

Exhibit 4: Lima Ola Workforce Housing Assessment of Relationship to Land Use Plans, Policies and Controls

Exhibit 5: Preliminary Drainage Analysis for Lima Ola Workforce Housing Development

LIMA OLA WORKFORCE HOUSING DEVLOPMENT
MASTER PLAN UPDATE
APRIL 2017

I. BACKGROUND

In February 2010, the County of Kauaʻi acquired 75 acres in ʻEleʻele on the west side of Kauaʻi for the development of Lima Ola Workforce Housing Development ("Lima Ola") for the sole purpose of developing 100% affordable housing opportunities for Kauaʻi's working people. In 2011, the Kauaʻi County Housing Agency (KCHA) began master planning with the assistance of a Citizen Advisory Committee (CAC) that included seven community members with long-standing ties to and knowledge of ʻEleʻele/Hanapēpē and the larger Westside region. In March 2012, the Lima Ola Workforce Housing Development Master Plan ("Master Plan") was completed and published.

Taking into consideration the demographics of west Kauaʻi, current and future housing needs of the County, Lima Ola's site conditions, and the surrounding neighborhoods, the Master Plan identified the following goals for Lima Ola's development and established a framework to direct long-term development that would span decades:

1. Design and develop a community that provides a range of affordable housing options.
2. Design and develop a community that incorporates smart growth principles.
3. Design and develop a community that fosters social interaction and the spirit of aloha.
4. Design and develop a community that supports healthy living initiatives.
5. Design and develop a community that allows building "green" and is environmentally sustainable.
6. Design and develop a community that serves as a prudent public investment for Kauaʻi.

II. PURPOSE

The Master plan serves as a roadmap for decision making. Those involved with the planning determined that Lima Ola would be a ***"real world example that integrates progressive objectives for residential living, environmental sustainability, and affordability."*** The Master Plan stated, "***It is recognized that no plan can be definitive, especially for long-term development, and a reasonable amount of flexibility must be retained when community build-out will occur over many years."***

The Lima Ola Workforce Housing Development Master Plan Update, April 2017 ("Master Plan Update") provides an update of Lima Ola since the publication of the Master Plan. Recognizing that the development of Lima Ola will span decades, the Master Plan is treated as a living document that will go through several iterations.

III. INTRODUCTION

In 2014, KCHA enlisted the professional services of Community Planning and Engineering, Inc. ("CPE") to perform value engineering on Lima Ola in order to meet cost constraints, to incorporate design alterations to increase environmental efficiency and sustainability, and to perform site design revisions based upon consultation with community and government departments. The following are benefits because of the value engineering done on Lima Ola:

1. The re-engineered site design reduced the average development cost by $71,375 (or 40%) per unit.
2. Improved Lima Ola's connectivity and reduced area of roadway by 43%.
3. Increased developable lands by 10.5 acres resulting in increased density from 400 to 550 units.
4. Reduced infrastructure development costs by nearly $3 million.

Figure 1: Comparison of original Master Plan concept and Revised Master Plan Concept.

The completion of the value engineering process initiated the update to the Master Plan. Despite changes in parcel and building configuration and site layout and density, the newly revised value engineered Lima Ola maintained the goals and framework of the Master Plan. The revised Lima Ola site plan continues to resonate the goals of the Master Plan as follows:

1. Affordable with a range of rental and homeownership opportunities for Kaua'i's 'ohana.
2. Green sustainable features that are environmentally responsible and lowers energy costs.
3. Healthy lifestyles inspired though opens spaces, walking paths, and recreational areas,
4. Close-knit community where gathering places encourage social interaction.

IV. LIMA OLA WORKFORCE HOUSING DEVELOPMENT MASTER PLAN UPDATE, APRIL 2017

In August 2016, Kaua‘i County Council unanimously approved Lima Ola’s 201H Application which granted zoning exemptions and allowed Lima Ola to proceed with land use entitlements with the State Land Use Commission (LUC). Lima Ola, pursuant to Hawai‘i Revised Statutes (HRS), Section 201H-38, will petition the LUC for a district boundary adjustment. To prepare Lima Ola’s petition and meet the requirement of the 201H process, the following additional studies and reports were completed:

1. Lima Ola Workforce Housing Sustainability Plan

The Lima Ola Workforce Housing Sustainability Plan (“Sustainability Plan”) prepared by Environet, Inc., sets the framework for the development and growth of Lima Ola (Exhibit 1). The Sustainability Plan considers established sustainability programs to plan and develop a community that is mutually supportive and balanced among environmental, economic, and social equity concerns for the residents of Lima Ola and the surrounding community and natural environment.

2. Infrastructure Delivery Plan for Lima Ola Workforce Housing

The Infrastructure Delivery Plan for Lima Ola Workforce Housing (IDP) identifies the timing of Lima Ola’s infrastructure needs to support the build-out of 550 new affordable housing units (Exhibit 2). The IDP provides Lima Ola’s infrastructure needs to support the proposed development of 550 units. In addition, the IDP includes a proposed phasing schedule of infrastructure and budgeting and financing information for Lima Ola.

3. Agricultural Impact Assessment

Island Planning prepared an Agricultural Impact Assessment (AIA) that addresses the Lima Ola’s impact on agriculture through the conversion of its 75 acres from agriculture to urban designation (Exhibit 3).

The AIA provides an overview of the agricultural conditions at the project site, the locational advantages and disadvantages for agriculture, the impacts of Lima Ola on coffee farming operations (current use) and future agriculture operations. The AIA also discusses the consistency of Lima Ola with State and County agricultural policies related to agricultural land and conclude that there will be a short-term impact in current agricultural activities within the development area, with no significant long-term disruption. Most importantly, the Agriculture Report confirms that Lima Ola will benefit agricultural businesses in the long-term with the attraction and retention of employees due to the increase of affordable housing options.

4. Lima Ola Workforce Housing Assessment of Relationship to Land Use Plans, Policies & Controls

The Lima Workforce Housing Assessment of Relationship to Land Use Plans, Policies, and Controls ("Land Use Assessment") provides an analysis of Lima Ola's proposed development in relation to public land use policies and controls (Exhibit 4). The Land Use Assessment discusses Lima Ola's development in accordance with State and County public land use policies and controls:

5. Preliminary Drainage Analysis for Lima Ola Workforce Housing Development

The Preliminary Drainage Analysis for Lima Ola Workforce Housing Development ("Drainage Analysis") was prepared by CPE to analyze Lima Ola's development impacts to the existing drainage conditions within the project (Exhibit 5).

The Drainage Analysis identifies a drainage system that will mitigate on-site and off-site drainage for Lima Ola and concludes that the development of Lima Ola will not disturb upstream existing drainage conditions and will have no adverse drainage impacts to areas downstream and/or abutting properties of the project area.

V. CONCLUSION

In KCHA's effort to provide a transparent and inclusive process-for the public we serve, government permitting agencies, and private and public financing partners, this Master Plan Update provides the planning progress of Lima Ola's since the Master Plan's publication. The Master Plan continues to guide Lima Ola's planning and development decisions however, as the County pursues permits and land entitlements with public agencies, updates to the Master Plan are necessitated

Figure 2: Current Aerial View of Lima Ola Workforce Housing Site, April 2017

EXHIBIT 1

Lima Ola Workforce Housing Sustainability Plan

LIMA OLA WORKFORCE HOUSING SUSTAINABILITY PLAN

Prepared For:
Community Planning and Engineering

Prepared By:
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1286 Queen Emma Street
Honolulu, HI 96813

April 2017

LIMA OLA WORKFORCE HOUSING SUSTAINABILITY PLAN

Executive Summary

This Sustainability Plan "Plan" sets out a framework for the development and growth of the Lima Ola Workforce Housing Project. The objectives for the development were selected by addressing how to create a community that provides an adequate quality of life for Kaua'i's residents and a mutually supportive balance among environmental, economic, and social equity concerns for the residents of Lima Ola and the surrounding community and natural environment.

The Lima Ola Sustainability Plan incorporates recommendations and models from sustainability programs and plans. These plans include:

- ***Smart Growth Network***

  In 1996, the U.S. Environmental Protection Agency joined with several non-profits and government organizations to form the Smart Growth Network. Smart growth refers to the management of growth to make it possible "for communities to grow in ways that support economic development and jobs; create strong neighborhoods with a range of housing, commercial and transportation options; and achieve healthy communities that provide families with a clean environment".

- ***OEQC Sustainable Building Design Guidelines***

  The Environmental Council, as part of a "Planner's Checklist" adapted Guidelines for Sustainable Building Design in Hawaii. These guidelines do not constitute law. A resource-efficient building is built to minimize energy use, expense, waste, and impact on the environment. Compared with conventional projects, a resource-efficient building will:

  1. Use less energy for operation and maintenance,
  2. Contain less embodied energy,
  3. Protect the environment by preserving water and other natural resources,
  4. Minimize health risk for those that construct, maintain and occupy the building,
  5. Minimize construction waste,
  6. Recycle and reuse generated construction waste,
  7. Use resource-efficient construction materials, and
  8. Provide the highest quality product practical at competitive first and cycle cost.

➢ *Hawaii BuiltGreen Program*

The Hawaii BuiltGreen Program is a statewide program to incentivize the designing and building of energy and resource efficient homes in Hawaii. The program was originally developed in 2000 by a public/private partnership between the State Department of Business, Development, & Toursim (DBEDT), US Department of Energy and five private partners.

This is a local based initiative based on homegrown knowledge of professionals familiar with the unique conditions of Hawaii. The Hawaii BuiltGreen program focuses on design choices through:

1. Energy Performance and Comfort
2. Health and Indoor Air Quality
3. Durability and Materials Conservation
4. Environmentally-Friendly Home Operations

➢ *ENERGY STAR Program*

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (USDOE).
In 1992, the EPA introduced ENERGY STAR as a voluntary labeling program to identify and promote energy-efficient products to reduce greenhouse gas emissions. Computers and monitors were the first labeled products. In 1996, EPA partnered with the USDOE for particular product categories. The ENERGY STAR label is now on major appliances, office equipment, lighting, home electronics, and more.

➢ *EPA Land Use and Development Practices - Low Impact Development (LID)*

Land use practices can improve air quality, reduce storm water runoff, increase energy efficiency and reduce greenhouse emissions to improve the quality of life for citizens. LID is a land development approach that allows land to be developed in a manner that helps lessen potential environmental impacts. LID employs principals such as minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

➢ Ahupuaa System

The concept of private property was unknown to the ancient Hawaiians, but they did follow a complex system of land division. All land was controlled by the highest chief or king who held it in trust for the whole population. A whole island or mokupuni, was divided into smaller parts, down to the basic unit belonging to a single family.

In the Ahupuaa System the stewardship of the land and its resources were formalized thru the kapu system. The kapu (taboo) – administered and enforced by konohiki or priest – placed restrictions on fishing certain species during specific seasons, on gathering certain plants, and on many aspects of social interaction as well. In this way the community maintained a sustainable lifestyle.

In the Ahupuaa System, sharing resources as well as working within the rhythms of the natural environment, Hawaiians enjoyed an abundance of food and a quality of lifestyle with leisure time for recreation. This lifestyle encouraged a high level of artistic achievement which included expression through song and chant, creating rich traditions that continue today.

LIMA OLA WORKFORCE HOUSING SUSTAINABILITY PLAN

Introduction

In February, 2010 the County of Kauai purchased 75 acres of land located in Eleele, Kauai (Figure 1). The land was acquired for the sole purpose of developing affordable housing for the working people of Kauai.

In recognizing the opportunity that this purchase represented, Kauai Mayor Bernard P. Carvalho Jr. identified Lima Ola to be to be a part of the County of Kauai's Holo Holo 2020 plan. The Holo Holo 2020 plan calls for all organizations businesses, residents, and visitors on Kauai to be part of creating an island that is sustainable, values our native culture, has a thriving and healthy economy, cares for all – keiki to Kapuna, and has a responsible and user-friendly government.

Lima Ola is planned to be a four phased development and may take up to 20 years to complete. The community planned for Lima Ola will provide a real world example that integrates residential living, environmental sustainability, and affordably at a significant scale of development. Thoughtful planning concepts will be utilized to better encourage active and healthy lifestyles, offer viable options to walk or bike, and lower reliance on nonrenewable resources for transportation and home energy. Lima Ola is not a standalone development, but one that will create linkages to the existing surrounding community. The new influx of residents is expected to bring greater economic vitality and civic energy to the area.

Figure 1 Lima Ola, Aerial View

Goals and Objectives

Goals and objectives for Lima Ola were identified early on in the planning process and have provided consistent guidance to all that have worked on the project. Goals generally describe outcomes. Objectives are more concrete actions that contribute to goal achievement.

➢ *Goal: Design and develop a community that provides a range of affordable housing options.*

- ✓ Objective: Provide housing opportunities for households earning from 50% to 140% of Kauai area median household income.
- ✓ Objective: Provide a variety of housing types and occupancy that meet lifestyle needs and preferences.
- ✓ Objective: Design a community were income levels are integrated, not separated.

➢ *Goal: Design and develop a community that fosters social interaction and a spirit of aloha.*

- ✓ Objective: Provide community spaces and amenities where people can get to know, and interact with their neighbors.
- ✓ Objective: Incorporate design elements that create a distinctive sense of place that reflects local heritage.
- ✓ Objective: Relate to the larger context so that the community fits into the regional fabric of the past, today and the future.

➢ *Goal: Design and develop a community that supports healthy living initiatives.*

- ✓ Objective: Provide opportunities for public recreation and leisure where people can easily incorporate physical activity into their daily lives.
- ✓ Objective: Provide safe walking and biking routes to school and local business.
- ✓ Objective: Provide housing and community facilities that enable people to stay in the same neighborhood as they grow older, while remaining active, independent, and socially connected.
- ✓ Objective: Provide areas for community gardens and green space.

➢ *Goal: Design and develop a community that allows building "green" and is environmentally sustainable.*

- ✓ Objective: Design units to take advantage of natural ventilation and cooling, solar water heating and other alternative energy systems, rainwater catchment for irrigation, and the use of recycled or recyclable materials.
- ✓ Objective: Encourage walking and bicycling by providing safe and attractive facilities to reduce the community's carbon footprint.
- ✓ Objective: Engineer the community with minimal land disturbance and proper placement and sizing of storm water runoff facilities.
- ✓ Objective: Utilize Low Impact Design concepts like multifunctional landscaping and grass swales.
- ✓ Objective: Limit solar heat by providing shade trees, landscaping with appropriate native vegetation, and minimal road widths.

Background

In the mid 2000's, during the administration of Mayor Baptiste, the Kauai housing market experienced a boom. There was a surge in private development activity, but little in the way of new housing inventory that was affordable for Kauai residents. The County began looking at ways to bring relief. In 2004 an affordable housing resolution was passed to acquire land for affordable housing. After researching options offered by landowners, Mayor Bryan Baptiste selected the purchase of the 75 acre Eleele site at a cost of 2.5 million after looking at all potential development sites available to the county. Mayor Bernard Carvalho, who succeeded Bryan Baptiste as mayor, was the director of the housing agency at that time.

The 75 acre parcel was purchased from McBryde Sugar Company with the stipulation that the site be used for affordable housing as defined by the County's Housing Policy Ordnance. The County currently has a License Agreement with Kauai Coffee Company. Under this agreement, coffee farming on this site will be phased-out as the development of Lima Ola commences.

The County of Kauai began master planning the Eleele parcel in 2009 with a bond allocation from the general fund. The Kauai County Housing Agency (KCHA) was tasked with the Lead Developer role in moving Lima Ola to execution. A Master Plan for Lima Ola was developed by Kimura International with grant funding from the Center of Disease Control's Communities Putting Prevention to Work (CPPW) program. The master planning team was assisted by a Citizen Advisory Committee (CAC) that included seven community members with long-standing ties and knowledge of Eleele and the larger Westside region. The Lima Ola Master Plan was completed in May of 2012.

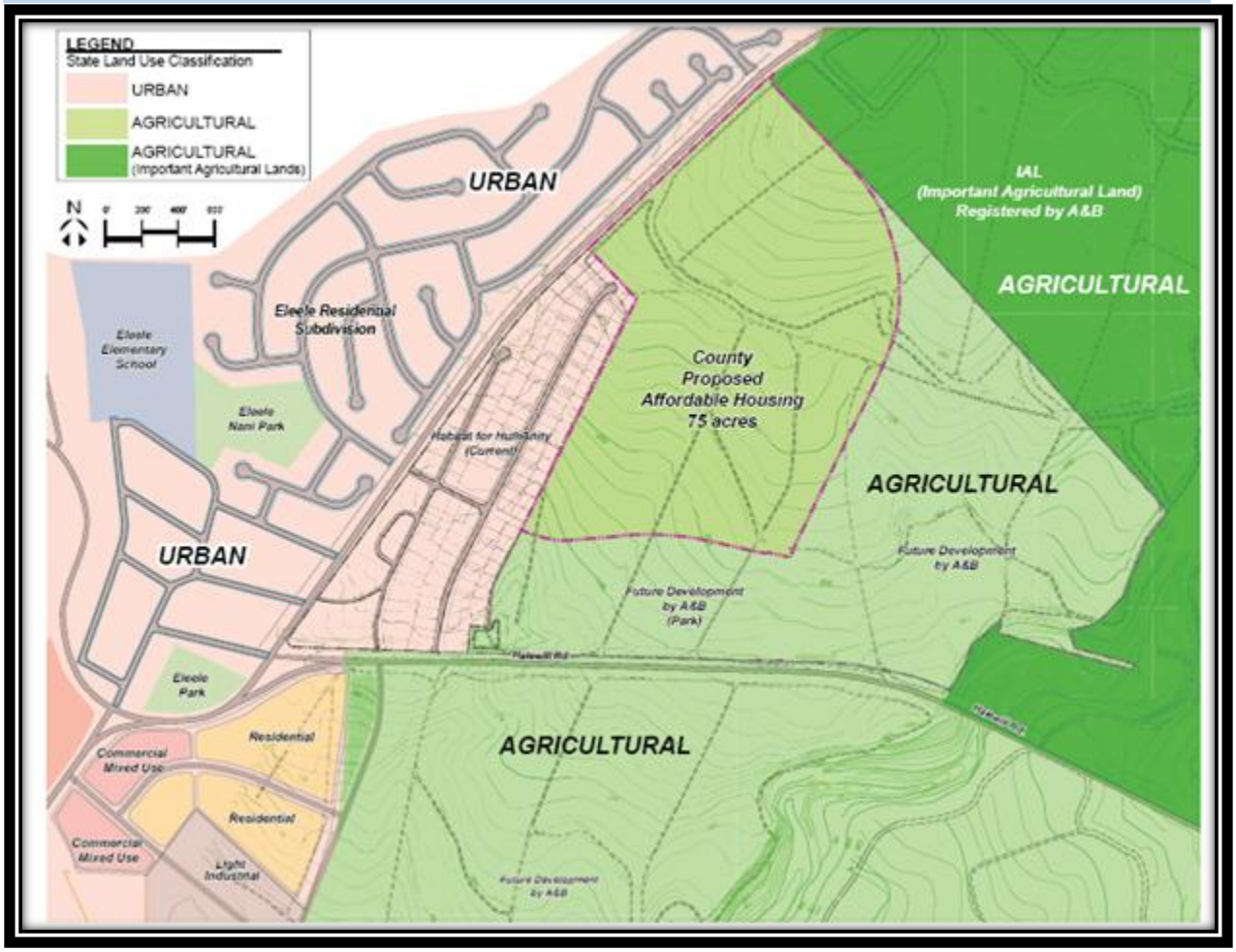
The County of Kauai understood that before development of Lima Ola could proceed, entitlements would need to be obtained. Proper entitlement of the parcel includes a Boundary Amendment from Agriculture to Urban by the Land Use Commission, an amendment to the General Plan changing the parcel designation from Agricultural to Urban, and zoning district change from Agricultural to Residential. In researching the most appropriate course to make the necessary changes, KCHA reached out to other counties in Hawaii developing affordable housing, Hawaii Housing Finance and Development Corporation (HHFDC) as well as the Kauai County Planning Department. It was clear that the most appropriate means of moving forward was to utilize Section 201H-38 of the Hawaii Revised Statutes (HRS).

Section 201H-38, HRS promotes the delivery of affordable housing by allowing the exemption of qualified projects from:

> *…all statutes, ordinance, charter provisions, and rules of any government agency relating to planning, zoning, construction standards for subdivisions, development and the improvement of the land and the construction of units thereon.*

The 201H-38, HRS process would involve the KCHA engaging the public in meetings and gathering input from residents of the Eleele/Hanapepe area (23 public meetings held), completing an Environmental Assessment and a 201H Application. The 201H Application would then be taken to the Kauai County Council (KCC). KCC would have 45 days to either approve the application, approve with modifications, or deny. The final step in 201H process involves a boundary amendment by the Land Use Commission. LUC would also have 45 days to either approve the boundary amendment or deny the amendment.

Figure 2 **Current Zoning**



In August of 2013 Community Planning and Engineering, Inc. was contracted by the County of Kauai to complete an Environmental Assessment for Lima Ola. This contract included completion of a Water Master Plan, Topographical Survey, Electrical Preliminary Report, Telecommunications Preliminary Report and Value Engineering. The EA was completed and a Finding of No Significant Impact (FONSI) was issued in July of 2016.

At request in August 2016 Council Member Joanne Yukimura introduced Resolution 2016-53, approving the 201H Application for Lima Ola Workforce Housing to the Kauai County Council. On August 17, 2016, KCC approved Resolution 2016-53 by a vote of 7-0.

Site Conditions

Lima Ola will be an extension of urban development to the west. A new residential subdivision being developed by Habitat for Humanity lies immediately southwest of the proposed Lima Ola community site. Further, the established residential community of Eleele Nani and Eleele Elementary school are located directly west / southwest of the proposed Lima Ola development, across Kaumualii Highway.

Figure 3 **Relationship to Surrounding Community**

Proximity to Existing Services, Schools, Shopping and Recreation

Center/Service	Identify	Distance (in miles):
Eleele Shopping Center	Ace Hardware, Big Save, Eleele Laundromat, First Hawaiian Bank, Ichiban Sushi and Bar, Kauai Community Federal Credit Union, Kings Chapel, KoolKutz, Longs Drugs, McBryde Federal Credit Union, McDonald's, Subway, NF Kawamura Store, NO.1 Chinese BBQ, Toi's Thai Kitchen, Twin Design Shop, State of Hawaii-Department of Human Services West IM Unit.	0.8
Port Allen Marina Center	Captain Andy's, Holo Holo Charters, Blue Dolphin Charters, Kauai Chocolate Company, Happy Honu Gifts, A&B Properties, Kauai Sea Tours, McBryde	0.9

		Resources Inc., Tropics Day Spa, Port Allen Bar and Grill, West Side Medical Clinic, Bubbles Below, Inc.,	
Port Allen Industrial Center		Red Dirt Factory Outlet, Kauai Island Brewery, Kalei Steel Works, Eleele Gym, Rainbow Paint and Fishing Supply, Martin Steel, Kauai Automated Fuels, KIUC Port Allen Power Plant,	0.9
Hanapepe		Hanapepe Fire Station, No Ka Oi Plants, Kauai Custom Marine, Hanapepe Armory, Port Allen Airport, Salt Pond Transfer Station, Salt Pond General Store, ReStore Kauai, Restaurants (+12), King's Chapel, Hanapepe Hawaiian Congressional, Hanapepe United Church, Hanapepe Church of the Nazareth, Kauai Soto Zen Temple, Hanapepe Hongwanji	<3
Waimea		Ishihara Market, Big Save, Restaurants (+10), Gas Station, Waimea Library, Waimea Sports Field, Lucy Wright Park, Banks (3), West Side Technology Center, Waimea Fire Station, Waimea Plantation Cottages	<7
Kekaha and West		Pacific Missile Range Facility Makaha Ridge Tracking and Radar Station Kokee Lodge, Museum and Restaurant Kekaha Landfill, Kikaola Boat Harbor	<17
Kalaheo and Lawai		Kalaheo Fire Station, Kalaheo Neighborhood Center, Kalaheo Clinic, Kalaheo Dental Group, Service Stations (2), Restaurants (+10), Lawai Self Storage, Lawai General Store, Aqua Engineers, post offices (2)	<6
Koloa and Poipu		Hotels/Resorts (+25), restaurants (+50), grocery/general Stores (4), hardware store, clinics (+3), pharmacy, various hospitality related businesses and services	<12
Schools:	**Elementary**	Eleele Elementary Kamehameha School Kaumakani	0.5 3.2
	Middle	Waimea Canyon Middle School	7
	High	Waimea High School	6.6
	College	Kauai Community College	12.9
Child care: **(family projects)**		Family Child Care Homes (Ages NB – 5) Haloalaunula Early Learning Center	0.3 0.6
Public Library & Post Office:		Hanapepe Public Library Eleele Post Office	1.2 1.0

Healthcare/Pharmacy	Kauai Medical Clinic CVS Eleele West Side Pharmacy Kauai Veterans Memorial Hospital	0.8 0.8 1.3 7.1
Community Center/ Activities:	Hanapepe Neighborhood Center, Hanapepe Stadium Hanapepe Bay Salt Pond Beach Park	1.4 1 1.5
Parks/Playgrounds:	Eleele Nani Eleele Park Salt Pond Park	< 0.2 2.5
Banks/Financial Services:	First Hawaiian Bank (Hanapepe-Eleele) Bank of Hawaii-Hanapepe Branch American Savings Bank-Hanapepe Branch Kauai Community Federal Credit Union	0.6 1.2 1.2 0.8
Public Transportation:	County of Kauai Bus Service: East bound services (Kaumualii Hwy) West bound services (Port Allen) West bound services (Kaumualii Hwy) to be added	 <1 0.8 <1
Agribusiness:	Kauai Coffee Factory and Visitor Center Dow AgroScience BASF Plant Science Syngenta No Ka Oi Plants	1.3 6.2 8.2 9 2.0

Current Use

Under a License Agreement with the County, the project site is being leased to Kauai Coffee Company (tenant) for coffee farming. The 75 acres of Lima Ola represent less than three percent of the total acreage currently utilized for coffee farming by Kauai Coffee. At the tenant's option, coffee trees currently on site can be removed and relocated to nearby coffee fields that lay fallow.

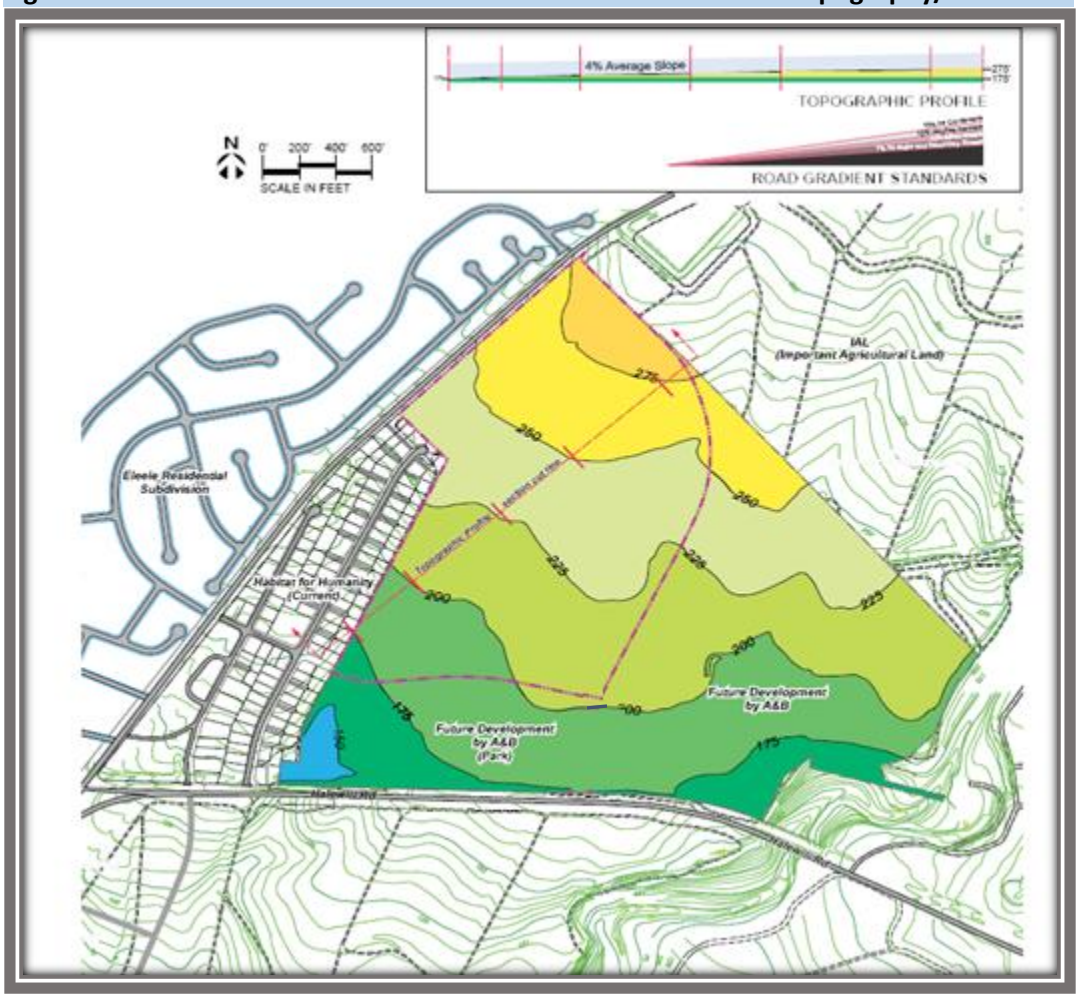
Farming operations, sugar and coffee, and the Eleele community to the east of Kaumualii Highway have worked together since the 1960's. Lima Ola will continue the tradition of a mutually beneficial coexistence between workforce housing and agriculture.

Topography and Soils

Lima Ola is located on a site that has an approximate 4% slope in the makai direction **(Figure 4).** The highest elevation is at 275 feet mean sea level (msl) is located north, while the lowest elevation of 175 msl is located south near the future park development by Alexander and Baldwin and Halewili Road. The predominate soil type found on site is known as Makaweli silt clay loam. This soil type has

moderate permeability, slow runoff potential, and a low erosion hazard. Due to the characteristics of this site anticipated earth moving operations of cut and fill will be minimal.

Figure 4 **Topography/Site Grade**



Utilities

There are no utilities currently on-site. Mainline connection points for water, sewer and telecommunications are within close proximity to project and have the capacity for service to Lima Ola.

Biological Impacts

A terrestrial flora and fauna survey was conducted by SWCA Environmental Consultants (SWCA) in September 2013 to document the existing biological resources that may be impacted by the development of Lima Ola.

Flora - No state for federal listed threatened, endangered, or candidate plant species, or rare native plants were observed in the survey area.

Fauna – Thirteen bird species that are typically found in agricultural areas were observed and included the Pacific golden plover, a migrant shorebird species. The Hawaiian hoary bat is also present within the vicinity of the proposed project site.

The following control measures were suggested by the U.S. Fish and Wildlife Service (USFWS) and will be implemented at the project site to minimize or avoid possible impacts to biological resources:

To prevent direct impacts to the Hawaiian hoary bat:

- ✓ No trees taller than 15 within the project site will be trimmed or removed between June 1 and September 15 when non-volant juvenile bats may be roosting in trees.
- ✓ Any fences that are erected will have barbless top-strand wire to prevent the establishment of the Hawaiian hoary bat on barbed wire.

To prevent the impacts on Hawaiian petrel and Newell's shearwater:

- ✓ Construction activity will be restricted to daylight hours as much as practicable during the breading season (April thru November) to avoid the use of nighttime lighting that could be an attraction to the seabirds.
- ✓ All outdoor lighting will be shielded to prevent upward radiation at the housing development.
- ✓ Outdoor lights that are not needed for security or safety will be turned off from dusk thru dawn during fledgling fallout period of September 15 thru December 15.

KCHA will coordinate construction activities with USFWS during construction should any other species be found accessing the project site before or during development.

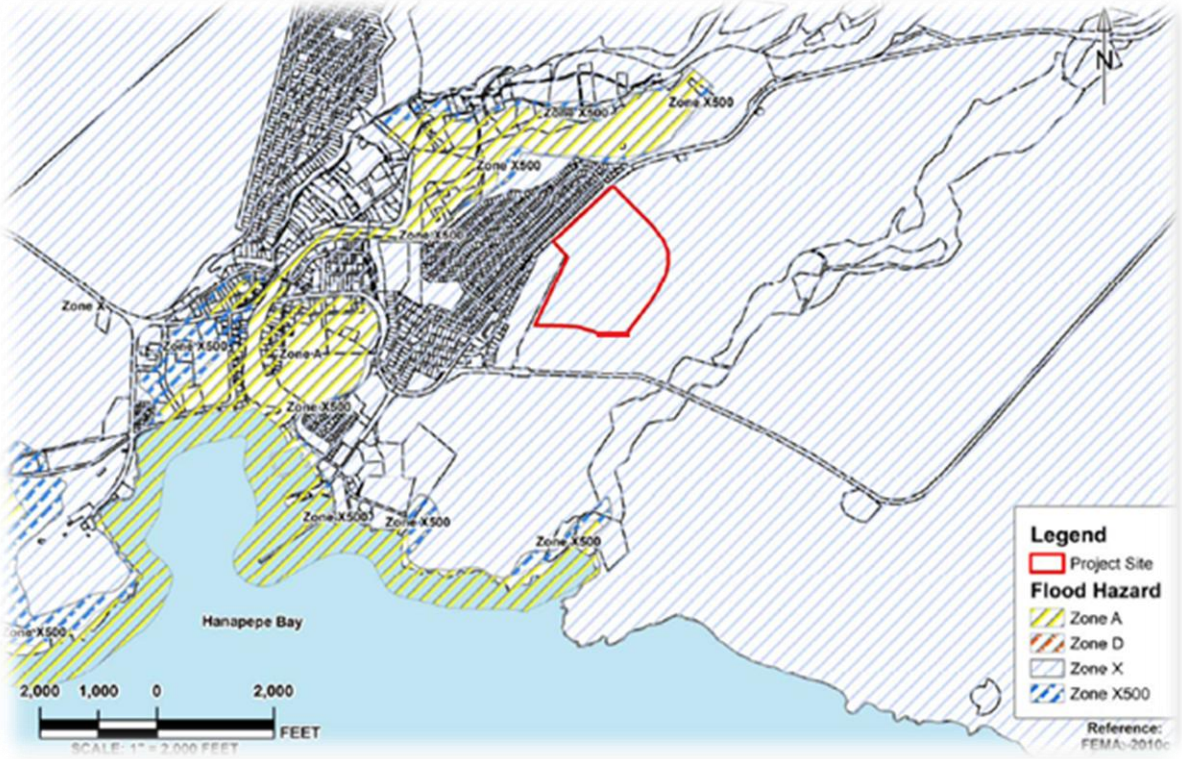
Water Resources

The development of Lima Ola would not significantly impact water resources.

- ✓ **Groundwater** - due to the estimated depth of ground water at more than 100 feet below the ground surface, there would be no impact from construction activities such as grading and trenching.
- ✓ **Surface Water** – No permanent surface water bodies are present at the project site. Project development will require design and construction of surface water drainage system. LID designs will be incorporated into the design to incorporate vegetated drainage swales and a detention basin which will allow for natural bio-filtration of stormwater and groundwater recharge.
- ✓ **Floodplains** – According to the Federal Emergency Management Agency (FEMA) records, the project site is located in Flood Zone X, designated as "areas outside of the 0.2% annual chance floodplain (Figure 5).

- ✓ **Wetlands** – There are no listed natural wetlands or wetland habitat s with the project site. Soils present in the project site are not listed on the Natural Resource Conservation Service List of Hydric Soils. A manmade irrigation ditch (Pump No.1 Ditch) locate at the project is occasionally flooded.

Figure 5 **FEMA Flood Zone Map**



Prior to construction of Lima Ola a Stormwater Prevention Plan (SWPP) would be developed in order to: identify sources of stormwater pollution, describe the practices used to prevent stormwater pollution, and identify Best Management Practices (BMPs) and procedures the contractor would implement to comply with a National Pollution Discharge Elimination System permit (NPDES). BMPs employed during construction would minimize/eliminate impacts from stormwater generated at the site.

Solid Waste and Hazardous Materials

Kimura International performed a Phase I Environmental Site Assessment on the project site in December 2009. No documented evidence of any recognized environmental conditions were discovered that would impact the site. However historical agricultural use of the site resulted in a Phase II Environmental Site Assessment being performed that included a soil investigation. No target chemicals were detected at levels above the State of Hawaii Department of Health Tier 1 Environmental Action Levels.

During construction the contractor will establish a Spill Prevention Plan to minimize/eliminate the potential of spills hazards of petroleum associated with construction equipment.

Residential solid waste service for Lima Ola would be provided by the County of Kauai Public Works Solid Waste Division in accordance with the collection policies. In addition a recyclables collection station will be stationed within the community.

Traffic and Transportation

The western boarder of Lima Ola is partially situated adjacent to Kaumualii Highway (State highway) and at Lima Ola's furthest extent to the east still remains within a quarter of mile of the Kaumualii Highway. Halewili Road (State) does not border the project site, however it situated within a quarter mile of Lima Ola's southern border.

A Traffic Impact Analysis Report (TIAR) was conducted by Hatch Mott MacDonald in 2014. Results of the report showed that even without the development of Lima Ola traffic in the vicinity would be adversely impacted by long term growth and anticipated vehicular traffic.

A key component to the TIAR are the recommendations for highway improvements that would be associated with the development of Lima Ola. The roadway improvements recommended in the report would improve the traffic conditions even with the development of Lima Ola (Figure 6). Recommended improvements have been captured in the project budget. Improvements will be scheduled as recommended in TIAR and will run concurrently with the appropriate phase of site development.

Figure 6 **Area Intersection Traffic Ratings**

Intersection	Intersection Control	Existing Conditions (Year 2014)		No Action (Year 2040)		Proposed Action (Year 2040)	
		LOS		LOS		LOS	
		am	pm	am	pm	am	pm
Waialo Road - 'Ele'ele Road / Kaumuali'i Highway	Signal (existing)	C	E	D	F	D	F
	With Proposed Improvement	N/A	N/A	N/A	N/A	D	E
Kaumuali'i Highway / Halewili Road	One-Way Stop (existing)	overall (A); side-street (C)	overall (A); side-street (E)	overall (A); side-street (E)	overall (A); side-street (F)	overall (A); side-street (E)	overall (A); side-street (F)
	With Proposed Improvement	N/A	N/A	N/A	N/A	overall (A); side-street (C)	overall (A); side-street (E)
Kaumuali'i Highway / Laulea Street - Mahea Road	Two-Way Stop (existing)	overall (A); side-street (C)	overall (A); side-street (E)	overall (A); side-street (D)	overall (A); side-street (F)	overall (E); side-street (F)	overall (E); side-street (F)
	With Proposed Improvement	N/A	N/A	N/A	N/A	B	B
Kaumuali'i Highway / Laulea Street	One-Way Stop (existing)	overall (A); side-street (C)	overall (A); side-street (C)	overall (A); side-street (D)	overall (A); side-street (C)	overall (E); side-street (F)	overall (B); side-street (F)
	With Proposed Improvement	N/A	N/A	N/A	N/A	B	A

Source: Hatch Mott MacDonald, 2014

Pedestrian Circulation

Currently discontinuous sidewalks between Eleele Nani subdivision, Ele Ele Elementary School and the remainder of Eleele town impede impact pedestrian circulation flow in the area. The TIAR also notes that there is a need for traffic calming devices along Kaumualii Highway.

The development of Lima Ola will improve pedestrian circulation for the existing community by completing sidewalks along Mahea Road, from Lima Ola to Kaumualii Highway. The addition of traffic calming devices as recommended in the TIAR will encourage walking and biking by creating a safer experience for pedestrians.

Along with the recommendations found in the TIAR, Kauai County Housing Agency has been in communications with the County of Kauai Transportation Agency (CKTA) on improvements in the area that would reduce vehicle demand and promote multimodal transportation. As part of those conversations the following improvements will incorporated with the phase 1 development of Lima Ola:

- ✓ New Bus stop, with bus pull-off, passenger shelter, and fully ADA accessible will be constructed on Kaumualii Highway.
- ✓ ADA-accessible path providing user-friendly access to the bus stop from Lima Ola.
- ✓ Safety measures on Kaumualii Highway to address the increase in pedestrian traffic generated by the bus stop.

KCHA will continue to work with CKTA on advancements that can be made to the on and off-site transportation system of Lima Ola.

Fire Hazards

Currently there is a moderate to high risk for fire at the project site due to the amount of foliage at the site.

During construction foliage would be cleared which would reduce the risk of fire. The proposed development will be designed in accordance with county and national fire safety guidelines. Input from Kauai County Fire Department (KCFD) has gone into the preliminary design of Lima Ola. KCHA will continue to coordinate with KCFD to implement fire mitigation measures throughout the development.

Climate and Air Quality

Currently there are air quality impacts from fugitive dust as a result of agricultural operations. The amount of dust is dependent on rainfall in the area.

The highest potential for impacts to the air quality is during the earth moving phase of development with the generation of fugitive dust. Contractors working on site will need to adequately address fugitive dust in the BMP Plan. As a result, applicable BMPs would be implemented during construction activities in order to control fugitive dust emissions. These BMPs will include watering active work areas, use of wind/dust screens, establishing a tire washing program, establishing landscaping early, scheduling clear and grubbing operations as close to work times possible and limiting clear grub area to a maximum of 10 acres.

Socioeconomics and Environmental Justice

Lima Ola will be located in Census Tract 407, County of Kauai. Census Tract 407 (CT 407) includes the Eleele, Kalaheo, and a portion of Lawai.

According to the 2010 Census, CT407 had a population of 8,403 residents, roughly 12 percent of the island's population. The 65 over population consisted of 15% of the 8,403 residents. CT407 racial distribution found that 25 percent of the population consisted of two or more races; 26 percent was either full or part Native Hawaiian and Other Pacific Islander; 51 percent was either full or part Asian; and 51 percent was either full or part white. The median household income for CT407 was $64,050 in 2010, less than the median household income average of $67,492 for the State of Hawaii (U.S. Census Bureau, 2016).

The County of Kauai has the largest aging population in the state. Housing units needed to serve elderly households account for 11 percent of the total needed units in all Hawaii counties. The County of Kauai well exceeded the state average at a need of 19 percent. The number of housing units needed to accommodate low and moderate income elderly households in the County of Kauai (under 80% of area median income accounts for 82 percent of the total elderly units needed. In other counties, elderly housing need for the same income range is 60-69% (County of Kauai Housing Agency 2011).

In addition to the growing need for the aging population, there is an urgent need for housing in general for the west side of Kauai. The development and expansion of housing in West Kauai has been slower than other parts of the island, and there is a disproportionate amount of new housing units in comparison the number of new residents. From 2000-2010, there was a 23% share of population growth to West Kauai, while the share of housing unit growth for the same time period was only 15% (County of Kauai Housing Agency 2012).

Lima Ola will have a positive impact on Environmental Justice, as its primary goal is to "design and develop a community that provides a range of affordable housing options" (Couty of Kauai Housing Agency). Housing opportunities would be designated to fulfill the preferences of people at all different stages of the life.

There will also be a positive impact to children with creation of an on-site community park. Eleele Elementary school is located within walking distance of Lima Ola. The project is designed with establishing walking and bicycling the neighborhood as a safe and appropriate means of travel.

Cultural and Archeological

The project site is located in the Hanapepe ahupuaa. It is not specifically mentioned in texts documenting pre-Contact period. In post-Contact times the area was acquired by The McBryde Sugar Co. and used for the farming of sugar cane. 1996 the Koloa Mill was shut down and sugar production of the area ceased.

An Archeological Inventory Survey (AIS) was conducted on the site in September 2013 and April 2014 in order to identify and document historical properties, to assess their historical significance for eligibility on the Hawaii NRHP, and to make project effect recommendations. A single historic property was identified during the AIS and designated as State Site 50-30-09-2219, which is known as "Pump Ditch No. 1". The feature has been properly documented according to state regulations, and there are other examples of similar features in the area. Therefore, the development of Lima Ola would not represent a significant impact. No pre-Contact properties were found on site and due to extensive landscape modifications over the past 100+ years, it is unlikely that other historic resources exist within the site

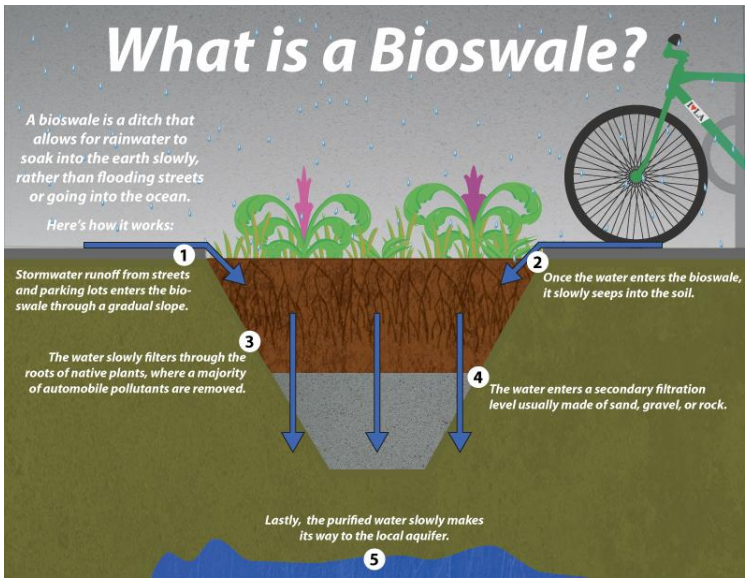
Site Plan and Design Elements

Healthy living depends, in part, on a built environment that is in harmony with nature. Taking a responsible development approach that minimizes the cumulative environmental impacts will create a more durable and comfortable community that is sustainable from one generation to the next.

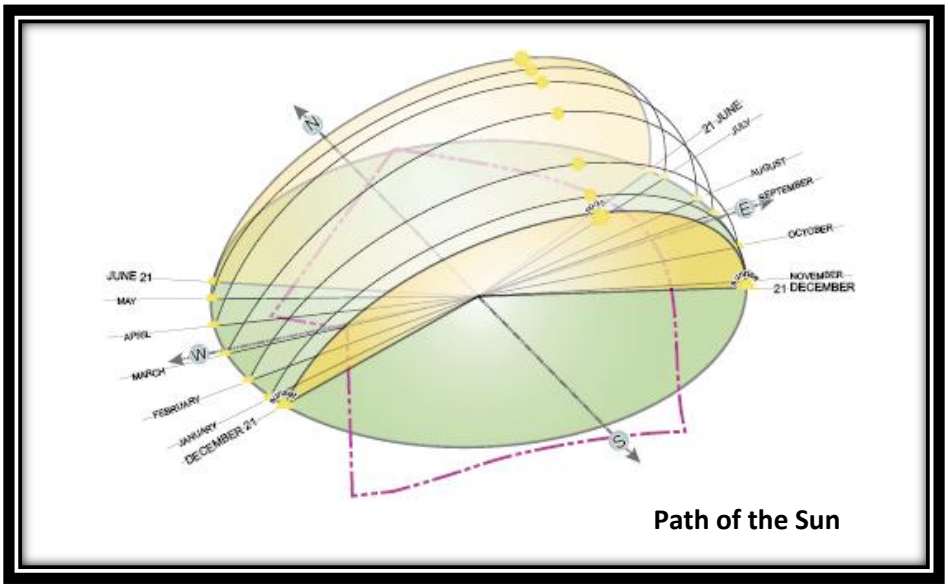
Sustainability planning for Lima Ola involves a multi-faceted effort that will need to be examined and refined as the community evolves and technology develops.

Permeable Surfaces and Drainage

- ✓ Design narrower streets that require less asphalt
- ✓ Encourage the use of recycled asphalt (RAP)
- ✓ Promote a distribution system of managing stromwater, including landscaped swales, bio-retention, rain gardens, and other LID collection mechanisms
- ✓ Provide a stormwater system that controls erosion and reduces natural and urban pollutants at their source

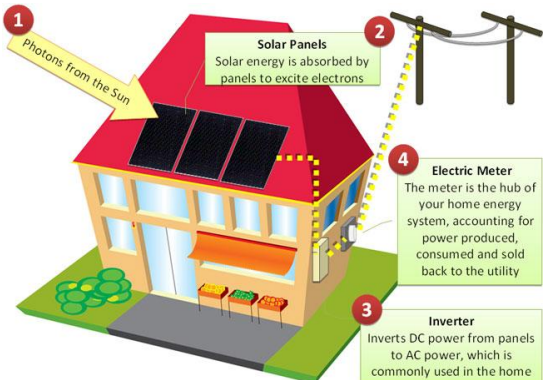


Solar Orientation and Energy



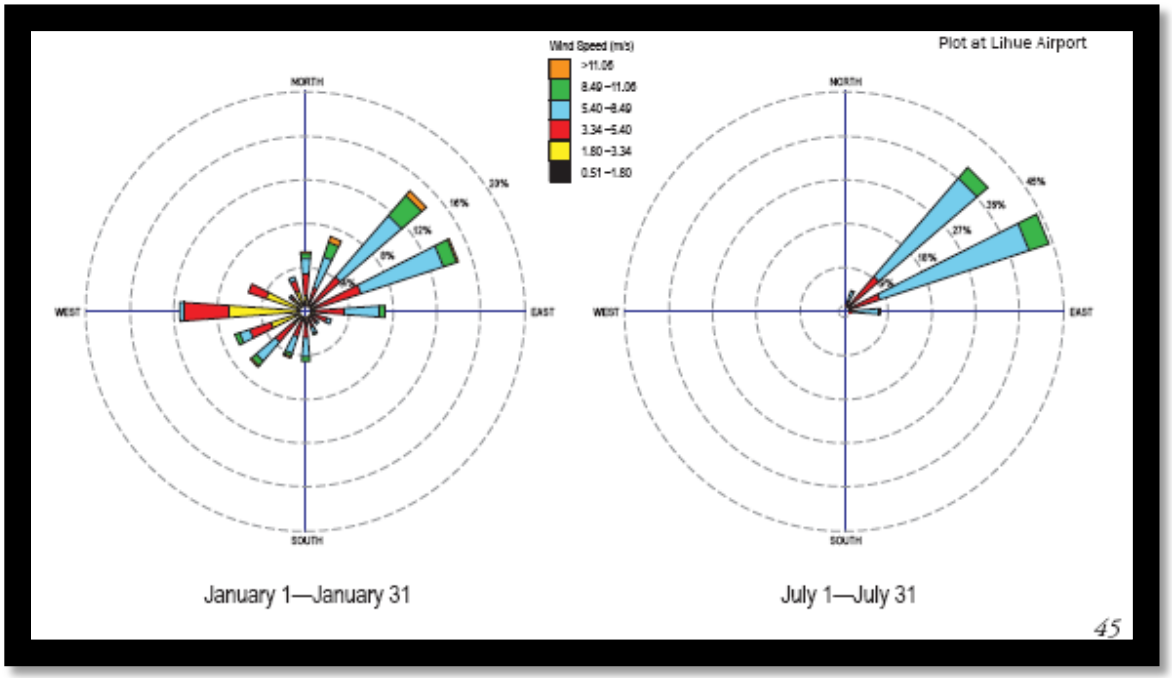
Path of the Sun

- Orient roof surfaces to provide maximum exposure for solar water heating and photovoltaic (PV) systems
- Minimize surfaces facing east and west to control solar exposure and heating of interior spaces
- Provide overhands and eaves that can offer effective shading and keep the sun's radiant heat from penetrating building walls and windows
- Incorporate skylights and solar tubes for natural day lighting
- Endure light and air access for neighboring units
- Design outdoor lighting systems using fewer, but more effective lighting fixtures that require the least amount of energy, including solar powered lighting
- Encourage homeowners to operate energy efficient appliances, including ENERGY STAR, to reduce power consumption – and utility bills



Natural Ventilation and Shade

- Advocate construction practices that enable healthy indoor air quality
- Orient buildings to take advantage of prevailing trade winds for the best overall distribution of air moment with interior spaces
- Place windows for cross ventilation and select window shapes and types for efficient wind cooling
- Reduce heat islands by decreasing the amount of black top (asphalt) paving and by greening the landscape and planting shade trees



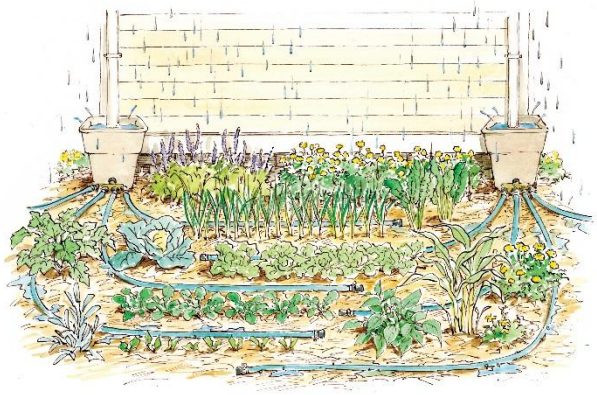
Model Home Representations

The following are representative strategies that can be put together, as appropriate for the site and building type, to produce a home that uses less energy, reduces carbon footprint, and is gentler on the environment that typical construction.

- Provide outdoor spaces screened and shaded
- Backyard garden
- Outdoor wash up area
- Water catchment for irrigation
- Design overhangs to shade house
- Open floor plan on first floor for air circulation throughout the house
- Heat generating rooms on leeward side of house and well-ventilated
- Control panel to monitor water and electricity use
- Casement windows to let in prevailing winds

Water use

- Advocate construction practices that reduce water usage such as water catchments for irrigation and ENERGYSTAR appliances.
- Develop sustainable landscape guideline incorporating use of plant materials that are durable an appropriate to Lima Ola's leeward climate, while also being visually appealing and non-invasive



Solid Waste and Recycling

- Provide homeowner awareness on programs to promote recycling as an important part of the community culture
- Encourage on-site residential composting

Topography Sensitive Design

- Use topography to create continuous green space connectivity, intergrading access to views
- Use differences in elevation to increase a sense of privacy between homes
- Ensure that roadway, sidewalk, and path gradients meet ADA requirements

Urban Design

- Locate community facilities within walking or biking distance from homes to reduce car usage
- Design community spaces for flexible use
- Face buildings toward the street to create inviting entrances

Sustainable Transportation

- Provide a safe route to Eleele Elementary school and to school bus stops
- Integrate recreation areas for easy access from homes
- Integrate paths and sidewalks to promote pedestrian-friendly walkways

Mauka-Makai Views

- Preserve important natural vistas
- Use environmental reference points to reinforce a sense a sense of place and connection to nature

EXHIBIT 2

Infrastructure Delivery Plan for Lima Ola Workforce Housing

INFRASTRUCTURE DELIVERY PLAN

FOR

Lima Ola Workforce Housing

ELEELE, KAUAI, HAWAII

TMK: (4) 2-1-001:054

Prepared for:

County of Kauai Housing Agency

Piikoi Building

4444 Rice Street

Lihue, Hawaii 96766

Prepared by:

Community Planning & Engineering, Inc.

1286 Queen Emma Street

Honolulu, Hawaii 96813

I. Introduction

In February, 2010 the County of Kauai purchased 75 acres of land (Figure 1) from McBryde Sugar Co. The land was acquired for the purpose of developing affordable workforce housing for the people of Kauai.

Mayor Bernard P. Carvalho Jr. selected Lima Ola to be a part of the County of Kauai's Holo Holo 2020 plan. The Holo Holo 2020 plan calls for all organizations, businesses, residents, and visitors on Kauai to be part of creating an island that is sustainable, values native culture, has a thriving and healthy economy, cares for all – keiki to Kupuna, and has a responsible and user-friendly government.

The residential community planned for Lima Ola will integrate residential living, environmental sustainability, and affordability on a significant scale of development. Thoughtful planning concepts will be utilized to better encourage active and healthy lifestyles, with viable options to walk or bike, and lessen reliance on nonrenewable resources for transportation and home energy. Lima Ola is not seen as a standalone development, but one that will create linkages to the surrounding community. Lima Ola's development is expected to bring greater economic vitality and civic energy to the area.

Figure 1

Figure 2

April 2017

II. Purpose

The purpose of this Infrastructure Delivery Plan (IDP) is to identify the timing of infrastructure needs to support the build-out of 550 new affordable housing units of Lima Ola.

Infrastructure refers to the range of service, and facilities needed to support society. For the purposes of this, IDP, we will be discussing three types of infrastructure: physical, social, and green.

- Physical infrastructure includes transportation, and utilities.
- Social infrastructure includes links to community services such as health, education, and emergency services
- Green infrastructure is a connected network of multi-functional greenspace that delivers environmental, social, and economic benefits, including improving quality of life
    - Some infrastructure items will serve multiple categories. For example, a new bus stop will benefit physical (transportation), social (link community to services), and green (promote less energy use and walking).

The timing in the delivery of infrastructure is an important component to the development. The delivery of infrastructure at the right levels, type, and sequencing is essential to the implementation of a sustainable community.

To achieve the proper delivery of infrastructure, the IDP identifies the infrastructure requirements for the development and incorporates comments received during pre-development from various departments of the County and State government, as well as the community.

The IDP will be monitored and updated by the Kauai County Housing Agency (KCHA) annually.

The IDP includes the following:

- Master Plan
- Phasing of Infrastructure Development
- Schedule
- Budget and Financing

III. Master Plan

In March of 2012, Kimura International, Inc. completed the Master Plan for Lima Ola. Since then, the Master Plan has been placed through a value engineering process by Community Planning and Engineering, Inc., resulting in many cost-saving revisions. Additional revisions have occurred from consultations made with other government departments and from community input. Throughout this process, Lima Ola's main objectives, engineering, and phasing have remained constant.

The full build-out of Lima Ola may take up to 20 years to complete. The exact timing of events to reach the completion of Phase 4 of Lima Ola cannot be predicted with precision.

Each phase of Lima Ola is planned for a mix of housing options, and should proceed in a way that will add on to the existing infrastructure and services of previous phases. During each phase KCHA will be able to capitalize on most current financing options, the most innovative, sustainable designs and materials available, and adjust to current market needs.

Main Objectives

- 100% affordable housing with a wide range of housing options.
    - Design a community that fosters social interaction.
    - Design a community that supports healthy living.
    - Design and develop a "green" community that is environmentally sustainable.
    - Design and develop a community that serves as a prudent public investment for Kauai.
- Engineering
    - Design as "balanced" site
    - Design roadway connections to Kaumualii Highway and Halewiliwili road (via Mahea).
- Development Phases
    - Four phases of development in all aspects of the project (on and offsite infrastructure, unit delivery).
    - Land Banking

Land Banking

Lima Ola is planned as a four phased development. Phase 1 construction should commence in early 2018. Full build-out could span 20 years. Certain elements of Lima Ola infrastructure are planned to be developed by the County of Kauai with other elements constructed by third-party developers as a means to meet entitlement conditions for affordable housing. As a land bank, Lima Ola would provide entitled land to expedite affordable housing production.

IV. Development Phases

Development of Lima Ola will move from east to west, over a projected 20 year span. (Figure 3) Each phase of development infrastructure will build on the previous phases of development.

- **Phase 1**
  - Approximately 25 acres
  - 38 single family homes
  - 111 multi-family units
  - Civil on and off-site work, community park, off-site roadway improvements, multi-use facility, bus stop and shelter.

Phase 1 Physical Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Utilities (water, sewer, power, commun-ications)	Phase 1 has utility capacity within close proximity of the project. Tie-in points for future phases must be well marked for future tie-ins.	Site work contractor will be required to provide As-Built Drawings in CAD.	Commence utilities prior to Phase 1 before vertical construction.
Roadways	Intersection at Mahea Road and Kaumualii Highway has been designated a hazardous condition that requires improvements. Coordination is required between Hawaii Department of Transportation (HDOT), County Public Works Department, and design engineers.	Construction entry thru Mahea Road via Halewili Road until improvements are made to Kaumualii intersection. Recommendations found in Traffic Impact Analysis Report (TIAR), as well as comments by HDOT, will need to be constructed.	Commence Kaumualii and Mahea intersection improvements prior to vertical construction
Civil Site Work	Site disturbance - vacant lots/areas creating dust, and/or runoff.	Civil site contractor to establish Storm Water Prevention Plan to be reviewed by County of Public Works Department and Department of Health (HDOT). Follow recommendations submitted in May 2016 letter by HDOH, and June 2016 comments by HDOH, Kauai District Health Office	Prior to issuance of Grading Permit.

Phase 1 Social Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Community Interaction	Areas for community to meet and socialize.	Build a multi-use facility where the community can gather for interaction; Construct wide sidewalks for walking and biking fronting homes; Construct a community park with spaces and uses for multiple age groups.	Build community park with Phase 1 vertical construction.

Phase 1 Green Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Leisure	Park area for recreation and leisure for residents of Lima Ola.	Construct community park for residents with walkways from all areas.	Build community park in conjunction with Phase 1 vertical construction.
Green Building/Low Impact Development (LID)	Concrete and impervious materials typically used in development.	Design grass swales and multi-functioning landscape areas.	Pre-development planning
Recycling	Environmental cost for one-time use materials.	Allow for recycled materials and have recycling bins available within the development.	Pre-development planning
Solar Heat	Heating of surfaces.	Provide shade trees, landscaping with appropriate native landscaping, minimal road widths.	Pre-development planning
Transportation	Reliance on automobile use, carbon footprint of development.	Install wide sidewalks for walking and biking; Install bus stop and shelter in close proximity to community.	Install walkways in conjunction with Phase 1 site work. Have bus stop completed prior to/or in conjunction with completion of units.

- **Phase 2**
  - Approximately 21 Acres
  - 75 Single Family Homes
  - 97 Multi-Family Units
  - Civil site-work, off-site water system

Phase 2 Physical Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Utilities	Water storage needed to supply Phases 2, 3 and 4	Per Lima Ola Water Master Plan: Provide a 300,000 gallon water storage tank, 350 GPM booster pump, and 16" transmission waterline along Kaumualii Highway interconnecting the Hanapepe and Eleele service zones.	Construct water storage upgrades in conjunction with Phase 2 improvements.
Roadway	Traffic patterns may change over time. Impacts discussed in current Traffic Impact Analysis Report (TIAR) of Phase 2 may need to be update.	A TIAR should address the impacts of development of Phase 2. TIAR will be shared with HDOT and County of Kauai Public Works and County of Kauai Transportation Agency.	TIAR update to be completed prior to civil site work for Phase 2. Roadway work to be completed as recommended by TIAR, HDOT and County of Kauai.
Civil Site Work	Site disturbance - vacant lots/areas creating dust, and/or runoff.	Civil site contractor to establish Storm Water Prevention Plan to be reviewed by County of Public Works Department and HDOH. Follow recommendations submitted in	Prior to issuance of Phase 2 Grading Permit; grass disturbed areas as soon as reasonably possible.

		May 2016 letter by HDOH, and June 2016 comments by HDOH, Kauai District Health Office	

Phase 2 Social Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Community Interaction	Areas for community to meet and socialize.	Seamless transition of sidewalks and paths linking Phases 1 and 2, parks, transportation, and community center.	Build with Phase 2 civil site work.

Phase 2 Green Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Leisure	Park area for recreation and leisure for residents of Lima Ola.	Link Phase 2 to park and community center.	Construct with Phase 2 civil site work.
Green Building/Low Impact Development (LID)	Concrete and impervious materials typically used in development.	Design grass swales and multi-functioning landscape areas.	Pre-development planning.
Recycling	Environmental cost to one-time use materials.	Allow for recycled materials and have recycling bins available within the development.	Pre-development planning.
Solar Heat	Heating of surfaces.	Provide shade trees, landscaping with appropriate native landscaping, minimal road widths.	Pre-development planning.
Transportation	Reliance on automobile use, carbon footprint of development.	Install wide sidewalks for walking and biking; Install bus stop and shelter in close proximity to community.	Install sidewalks in conjunction with Phase 2 civil site work; bus stop will be completed with Phase 1.

- **Phase 3**
  - Approximately 17 Acres
  - 34 Single Family Homes
  - 102 Multi-Family Units
  - Civil site-work

Phase 3 Physical Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Civil Site Work	Site disturbance - vacant lots/areas creating dust, and/or runoff.	Civil site contractor to establish Storm Water Prevention Plan (SWPP) to be reviewed by County Public Works Department and HDOH. Follow recommendations submitted in May 2016 letter by HDOH and June 2016 comments by	Prior to issuance of Phase 3 Grading Permit.

		HDOH, Kauai District Health Office	
Civil Site Work	Site disturbance – storm water runoff.	Site work will need to be designed for pre-established detention areas and/or other accepted procedure. Establish storm water detention area early in site-work phase.	Pre-planning of Phase 3 civil work.
Roadway	Traffic patterns may change over time. Impacts discussed in current Traffic Impact Analysis Report (TIAR) of Phase 2 may be invalid.	TIAR should address the impacts of development of Phase 2. TIAR will be shared with HDOT and County Public Works Department and County of Kauai Transportation Agency.	TIAR update to be completed prior to civil site work for Phase 2. Roadway work to be completed as recommended by TIAR, HDOT and County of Kauai.

Phase 3 Social Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Community Interaction	Areas for the community of meet and socialize	Seamless transition of sidewalks and paths linking Phases 1, 2, and 3, parks, transportation, and community center.	Install with Phase 3 civil site work.

Phase 3 Green Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Leisure	Park area for recreation and leisure for residents of Lima Ola	Link Phase 3 units to park and community center.	Construct with civil site work.
Green Building/Low Impact Development (LID)	Concrete and impervious materials typically used in development	Design grass swales and multi-functioning landscape area.	Pre-development planning.
Recycling	Environmental cost for one-time use materials.	Allow for recycled materials and have recycling bins available within the development	Pre-development planning.
Solar Heat	Heating of surfaces causing high utility use	Provide shade trees, landscaping with appropriate native landscaping, minimal road widths	Pre-development planning.
Transportation	Reliance on automobile use, carbon footprint of development	Install wide sidewalks for walking and biking; Install bus stop and shelter in close proximity to community.	Install sidewalks and paths in conjunction with Phase 3 civil site work; bus stop will be completed with Phase 1.

- **Phase 4**
  - Approximately 11 Acres
  - 18 Single Family Homes
  - 75 Multi-Family Units
  - Civil site-work, off-site roadway improvements

Phase 4 Physical Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Roadway	Per the current TIAR, it is assumed that another entry and exit point will be required.	Construct new intersection improvements at Kaumaulii highway at north end of development.	Commence Kaumualii and Laulea Highway improvements with civil site work.
Civil Site Work	Site disturbance - vacant lots/areas creating dust, and/or runoff.	Civil site contractor to establish SWPP to be reviewed by County Public Works Department and HDOH. Follow recommendations in May 2016 letter by HDOH, and June 2016 comments by HDOH, Kauai District Health Office	Prior to issuance of Grading Permit. Grass disturbed areas as soon as reasonably possible.

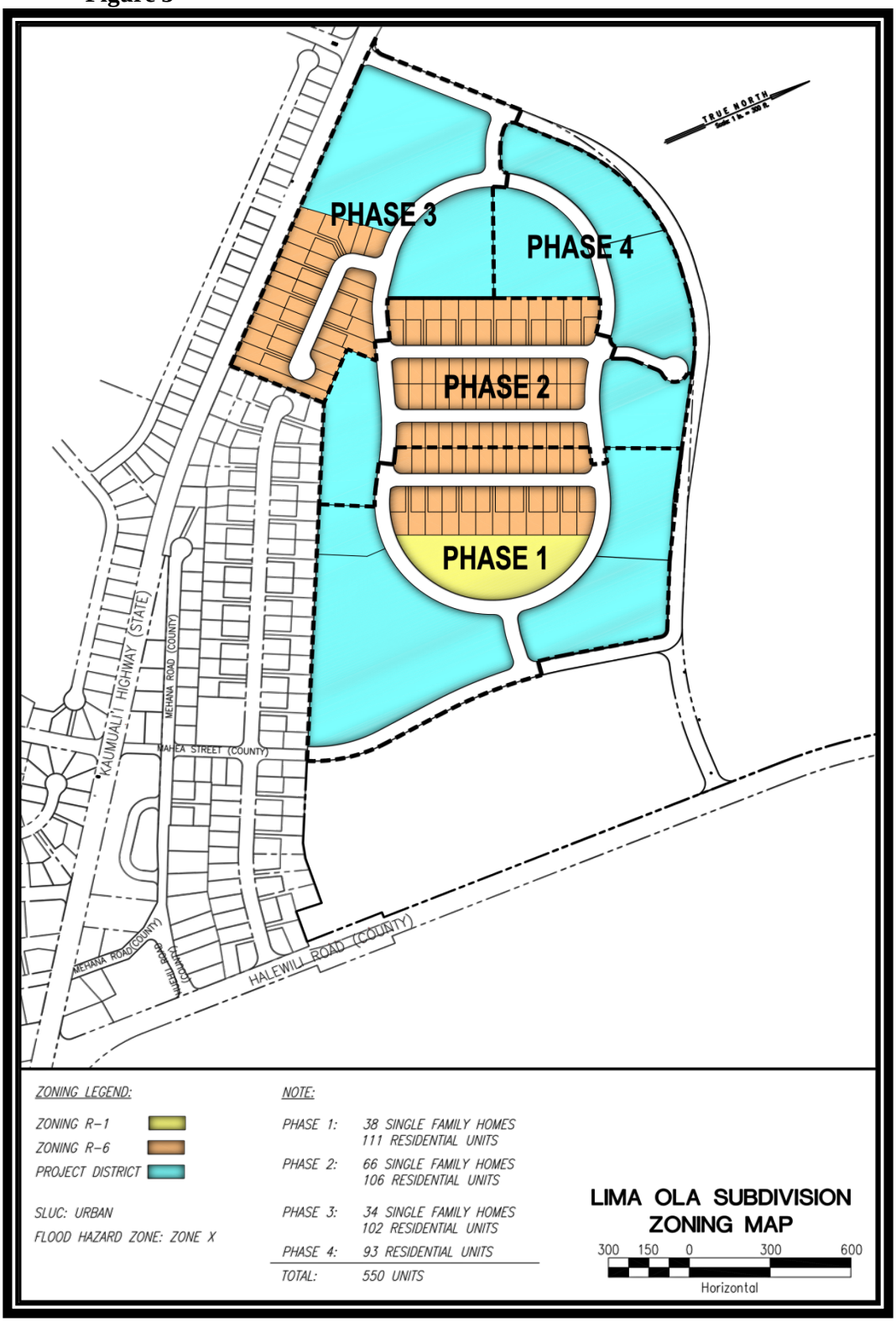
Phase 4 Social Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Community Interaction	Areas for community to meet and socialize	Seamless transition of sidewalks and paths linking Phases 1, 2, 3, and 4, parks, transportation, and community center.	Build with Phase 4 civil site work.

Phase 4 Green Infrastructure

Item	Key Issues	Provisions/Mitigations	Timing/Triggers
Leisure	Park area for recreation and leisure for residents of Lima Ola	Link Phase 4 to park and community center.	Construct with Phase 4 civil site work.
Green Building/Low Impact Development (LID)	Concrete and impervious materials typically used in development	Design grass swales and multi-functioning landscape areas.	Pre-development planning.
Recycling	Environmental cost for one-time use materials	Allow for recycled materials and have recycling bins available within the development	Pre-development planning.
Solar Heat	Heating of surfaces causing high utility use	Provide shade trees, landscaping with appropriate native landscaping, minimal road widths	Pre-development planning.
Transportation	Reliance on automobile use, carbon footprint of development	Install wide sidewalks for walking and biking; Install bus stop and shelter in close proximity to community.	Install sidewalks and paths in conjunction with Phase 4 civil site work; bus stop will be completed with Phase 1.

Figure 3


PHASE 3
PHASE 4
PHASE 2
PHASE 1
TRUE NORTH
KAUMUALII HIGHWAY (STATE)
MEHANA ROAD (COUNTY)
MAHEA STREET (COUNTY)
MEHANA ROAD (COUNTY)
HALEWILI ROAD (COUNTY)
HALEWILL ROAD (COUNTY)
ZONING LEGEND:
ZONING R-1
ZONING R-6
PROJECT DISTRICT
SLUC: URBAN
FLOOD HAZARD ZONE: ZONE X
NOTE:
PHASE 1: 38 SINGLE FAMILY HOMES
111 RESIDENTIAL UNITS
PHASE 2: 66 SINGLE FAMILY HOMES
106 RESIDENTIAL UNITS
PHASE 3: 34 SINGLE FAMILY HOMES
102 RESIDENTIAL UNITS
PHASE 4: 93 RESIDENTIAL UNITS
TOTAL: 550 UNITS
LIMA OLA SUBDIVISION
ZONING MAP
300 150 0 300 600
Horizontal

V. Schedule

The exact sequence of events or schedule that may occur over the next 20 years – the full build-out of Lima Ola infrastructure - is directly linked to the latest market analysis, financing options, designs, and materials – and cannot be predicted with certainty.

The schedule for Phase 1 of Lima Ola, with a relatively close construction date, can be projected with more accuracy and is highlighted in the schedule below. Future phases are shown in general terms.

Predevelopment	**Responsible/Issued by**
Boundary Amendment	Land Use Commission
General Plan Map Designation Change	Kauai County Planning Department
Zoning Map District Change	Kauai County Planning Department
Draft Plans and Specifications	Community Planning and Engineering, Inc. (CPE)
Class IV Zoning Permit	Kauai County Planning Commission
Finalize Financing	Hawaii Housing Finance Development Corporation
Final Plans and Specifications	CPE
Grading Permit	Kauai County Public Works
NPDES Permit	Department of Health
Invitation for Bid Civil Site Work	Kauai County Housing Agency (KCHA)
Issue Civil Site Work Contract	KCHA
Complete Storm Water Prevention Plan	Civil Contractor
Community Update Preconstruction	KCHA, Contractor, CPE
Establish Community Advisory Committee for Multi-Use Building	KCHA

Month from Start	**Task**
Month 1	Issue Notice to Proceed to Civil Contractor
Month 3	Install BMPs
Month 4	Begin off-Site Infrastructure
Month 5	Begin On-Site Infrastructure
Month 6	Establish Storm Water Detention Area and Rough Grade
Month 7	Request for Proposals for Block Lot Development Team(s)
Month 7	Select Block Lot Development Team(s)
Month 10	Complete Rough Grading and Utility Work
Month 11	Fine Grade, Install Interior Roadways and Hardscaping
Month 12	Complete Development Agreement for Development Team(S)
Month 12	Community Engagement on Vertical Development
Month 14	Complete Site Work
Month 14	Draft Plans and Specifications for Vertical Development
Month 16	Update NPDES Permit/New NPDES Permit and SWPP
Month 18	Obtain Building Permits
Month 19	Begin Vertical Development of Block Lot(s)
Month 23	Begin Vertical Development of Multi-Use Building
Month 29	Complete Multi-Use Building
Month 31	Complete First Units for Rental/Sale
Continual	Stabilize disturbed areas

Predevelopment Task Phases 2, 3, and 4
Update Market Study

Identify Funding Sources
Update Traffic Impact Analysis Report
Update Water Master Plan
Community Engagement Meetings
Update Budget Forecast
Obtain Class IV Zoning Permit
Obtain NPDES Permit
Obtain Grading Permits
Obtain Building Permits

VI. Budget and Financing

Budget
The rough order of magnitude on the cost of infrastructure shown below has been calculated using conceptual plans by CPE and latest pricing data available.

Units Per Phase Single Family (SF), Multi-Family (MF)	**550 Units at Full Buildout**	**38 SF, 111 MF 149 Total**	**75 SF, 97 MF 172 Total**	**34 SF, 102 MF 136 Total**	**18 SF, 75 MF 93 Total**
Item	**Pre-Development**	**Phase 1**	**Phase 2**	**Phase 3**	**Phase 4**
Land Acquisition (2010 Purchase of $2,534,723)	$2,534,723	$0	$0	$0	$0
Planning & Feasibility	$232,239	$0	$0	$0	$0
Preliminary Engineering & Entitlements	$541,402	$208,354	$0	$0	$0
Marketing Consultant	$64,123	$65,000	$65,000	$65,000	$65,000
Engineering Design	$0	$961,980	$477,000	$568,500	$378,400
On-Site Work & Infrastructure*	$0	$17,208,616	$9,923,541	$6283,115	$8,970,056
Off-Site Work & Infrastructure**	$0	$1,650,000	$4,312,500	$0	$1,875,000
Total	**$3,372,487**	**$20,093,950**	**$14,778,041**	**$6,916,615**	**$11,288,456**
Estimated Cost Per Unit		**$134,859**	**$85,919**	**$50,857**	**$121,381**

*On-Site Work: site grading, roads, mainline utilities, hardscape, landscaping, and community center.
**Off-Site Work: Phase 1 Kaumualii intersection improvements at Mahea Road, Phase 2 Water System Phase 4 Kaumualii intersection improvements at Kaumualii Highway and North Mahea Road.

Funding

Phase 1 funding is a public - public partnership between the County of Kauai and Hawaii Housing Financing Development Corporation (HHFDC) and is detailed in the table below. Funding for future phases will be determined during pre-development planning.

Funding Sources Phase 1

Total Cost	**$23,466,437**
CIP Bond (land acquisition and planning)	$2,766,962
Housing Encumbered (HCDRF 211)	$1,775,859
County Bond	$6,000,000
HHFDC DURF	$13,000,000
Grand Total:	$23,542,821

EXHIBIT 3

Agricultural Impact Assessment

AGRICULTURAL IMPACT ASSESSMENT

PREPARED FOR THE STATE LAND USE COMMISSION

ON BEHALF OF

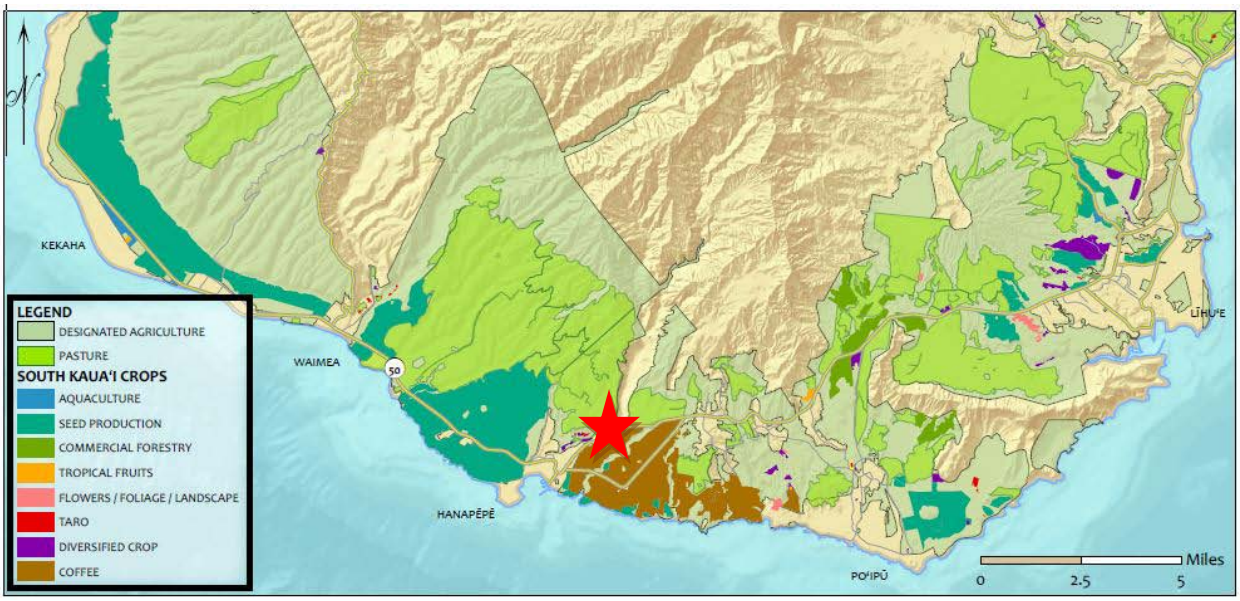
COUNTY OF KAUAI, HOUSING AGENCY

LIMA OLA WORKFORCE HOUSING PROJECT

ELEELE, KAUAI

TMK (4) 2-1-001:054

LAND USE COMMISSION DOCKET A17-802



PREPARED BY ISLAND PLANNING

1405 WAIANUENUE AVE

HILO, HI 96720

1. INTRODUCTION

This report addresses the impacts on agriculture land use associated with the proposed County of Kauai Housing Agency development of Lima Ola Workforce Housing (Project) near Eleele on Kauai's south shore.. The material below covers the following information:

- project location, description, and required approvals;
- current agricultural conditions on the Island of Kauai
- current agricultural use of the project site and the impact of the project on current coffee farming operations;
- the impact of the project on future farming operations on Kauai; and
- consistency of the project with State and County policies related to agricultural land.

2. PROJECT LOCATION, DESCRIPTION AND REQUIRED APPROVALS

a. Project Location and TMK (4) 2-1-001:54

The project area is located in Eleele, on Kauai's south side (Figure 1). The Tax Map Key for the site is: (4)2-1-001:54

Figure 1: Lima Ola Work Force Housing Location Map. Parcel is now designated as TMK (4) 2-1-001:054 for County tax purposes

b. Project Description

The County of Kauai Housing Agency is proposing the development of Lima Ola Workforce Housing, consisting of 75 acres of land owned by the County of Kauai, identified as TMK (4) 2-1-001:54. 100% of the units developed on the Lima Ola parcel will be affordable housing. The proposed development of Lima Ola is planned in four phases with the focus on commencing Phase 1 in early 2018. Lima Ola will feature green sustainable energy features, vegetated drainage swales, landscaped areas, and bike and pedestrian paths.

Phase 1 of the Lima Ola development consists of 149 residential units, 38 single-family and 111 multi-family units, a multi-purpose building, Community Park, detention basin, and upgrades to the Mahea Road and Kaumualii intersection, along with a bus stop and shelter. Future phases 2, 3, and 4 will consist of 351 new residential units and types of housing may be subject to change as future market demands and housing needs are determined.

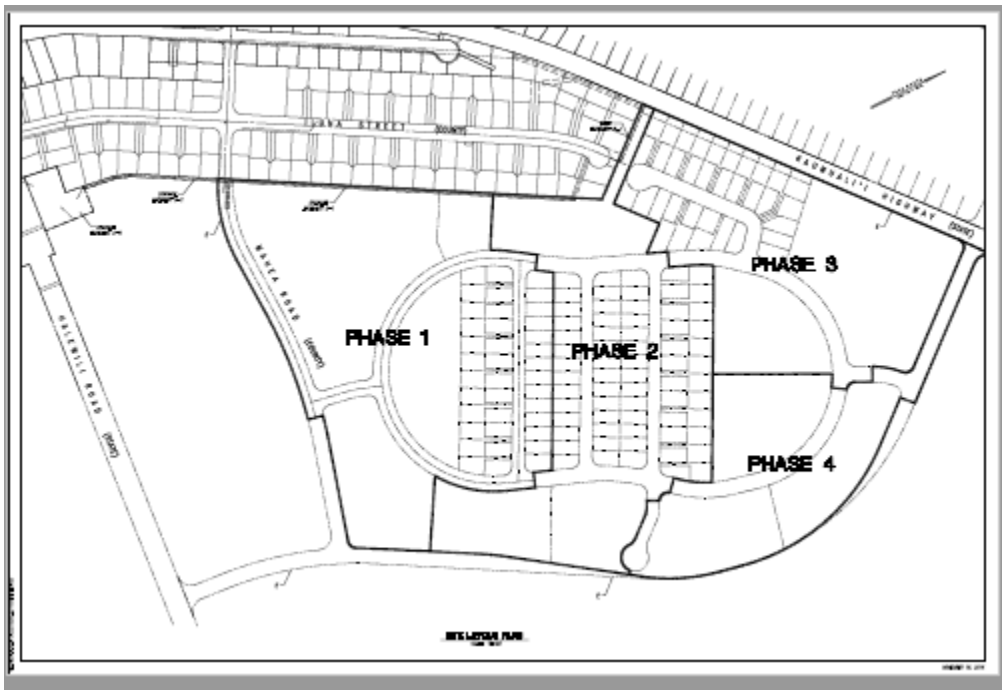


Figure 2: Lima Ola Preliminary Phasing Plan

c. Required Approvals

State Land Use District Boundary Amendment

The SLUD Boundary Amendment will redistrict of approximately 75 acres from the Agricultural District to Urban District.

General Plan Amendment

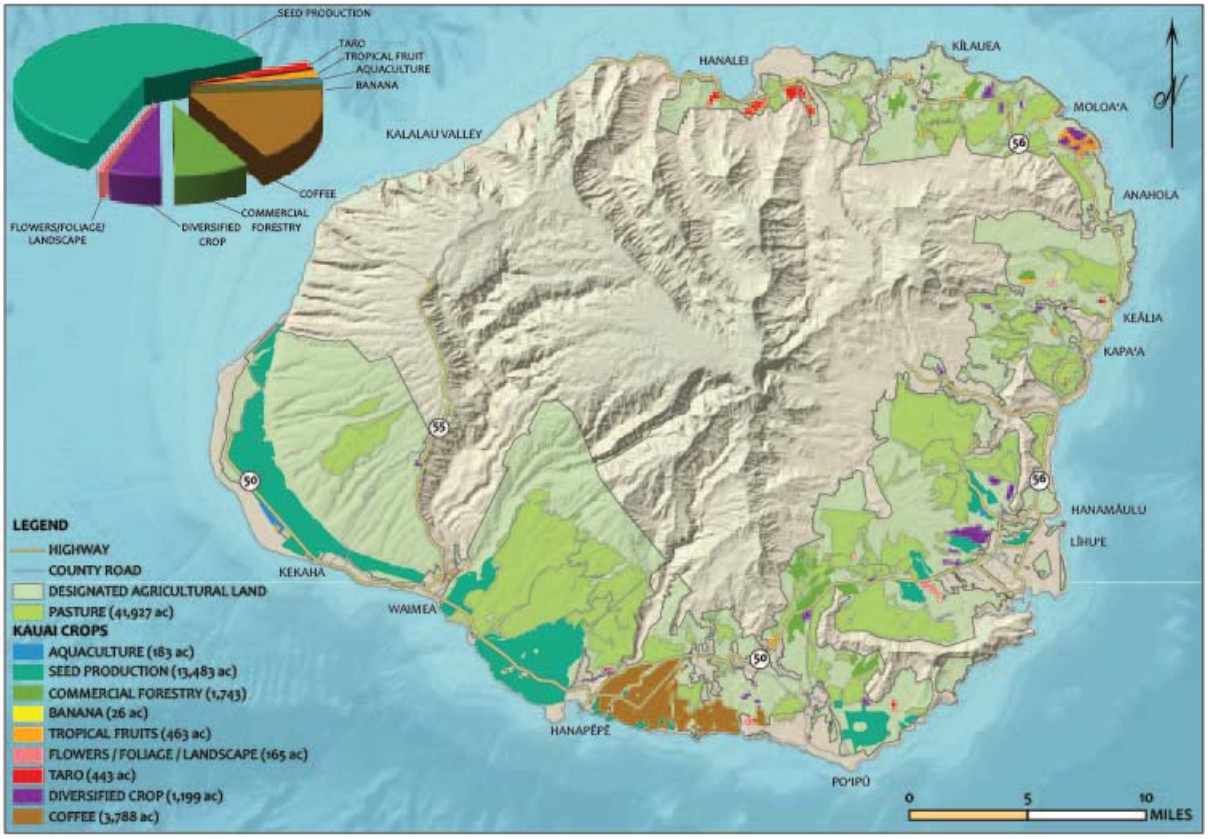
Amendment to the General Plan will be required to proceed with change to from Agricultural to Residential.

Change of Zone

A change in zoning boundary for the project area from Agricultural to Residential use, done a the County level

3. Overview of Agricultural Activity on the Island of Kauai

In 2015 the State Department of Agriculture (DOA) published a new Statewide Agricultural Land Use Baseline for the State of Hawaii. The report used aerial images and farm visits to provide maps and summaries of Hawaii's current agricultural production footprint. The report focused on commercial farm operations over three acres in size and included smaller parcels where they were clustered or could be easily identified from digital aerial sources.



KAUA'I CROP SUMMARY-2015

Figure 3: 2015 Kauai Crop Map; Source Statewide Agricutural Land Use Baseline; DOA

2015 Kauai Crop Summary	
Crop Type	**Acres**
Aquaculture	**183**
Banana	**26**

Coffee	**3,788**
Commercial forestry	**1,743**
Diversified Crops	**1,198**
Flowers Foliage Landscape	**165**
Seed Production	**13,299**
Taro	**443**
Tropical Fruits	**463**
Crop Total	**21,310**
Pasture	**41,934**
Total Agriculture	**63,244**

Corn seed production and research constitutes more than half of the land in crop production on Kauai. Only about 25% of their farmable land is in active production at any time with the remainder being in used of buffer zones or are farmed only seasonally. Coffee is the second largest crop on Kauai, the bulk of which is grown by Kauai Coffee LLC in a mechanically harvested plantation setting.

Commercial forestry includes both small scale plantings of exotic hardwoods on several North Shore properties and larger short rotation plantings of primarily eucalyptus that are currently being harvested and burned to prove energy to the Kauai electrical grid.

The diversified crop category includes a range of crop types including areas that grow rotational vegetables and often contain a mix of diverse farm crops, like fruit trees, cacao, small patches of banana etc. that are accessory to most small farm operations. The biggest concentration of these crops can be found at Moloaa on the east side of the island, in the Kilauea area of the North Shore and on Grove Farm land outside of Lihue. This category of crops are generally grown by small, independent farmers and marketed at local farmers markets and through direct sales to local stores and restaurants.

Kauai is the largest producer of wet land taro in the state with roughly 450 acres of production. This amounts to over 70% of the total state production of this important Hawaiian stable.

4. AGRICULTURAL CONDITIONS AT PROJECT SITE

a. Soil Type, Characteristics, and Topography

The project site slopes gently from the makai (seaward) direction from west to east. The project site ranges in elevation from approximately 275 to 175 feet above mean sea level (msl), and has an average slope of four percent (4%) grade (County of Kauai Housing Agency, 2012; Kimura International, 2010). The site is bound by Kaumualii Highway to the northwest, residential development to the west, Halewili Road to the south, and agricultural lands to the east.

The Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (Foote et. Al., 1972) presents details on the soils present on the island of Kauai. The predominate soil type at the project site includes Makaweli silty clay loam, 0 to 6% slopes

(MgB). This soil is a dusky-red to dark reddish-brown friable silty clay loam or stony silty clay loam surfaced layer with dusky-red, friable silty loam and silty clay loam subsoil. MgB has moderate permeability, slow runoff and a slight erosion hazard. A small portion of the project site includes Makaweli silty clay loam, 6-12% slopes (MgC). This soil type is similar to MgB, except it has medium runoff potential and its erosion hazard is moderate (See Figure 4).

Figure 4: Soil Types on the project site

b. Climate Conditions

Hawaii has a mild *semi*tropical climate that is due primarily to three factors: (1) Hawai'i's mid-Pacific location near the Tropic of Cancer, (2) the surrounding warm ocean waters that vary little in temperature between the winter and summer seasons, and (3) the prevailing northeasterly trade winds that bring air having temperatures that are close to those of the surrounding waters.

The average temperature on Kauai is 75.9 degrees Fahrenheit, with an average total precipitation of 37.44 inches. The months of the year with the most rainfall occur from October through March (Western Region Climate Center, 2008).

The project site is located on the leeward side of the island which is generally characterized as dry and sunny. The site is located where median annual rainfall ranges between 29.44 to 34.44 inches (County of Kauai Housing Agency, 2012).

The prevailing winds on Kauai (known as trade winds) are from the east-northeast, with a mean wind speed of 13.1 mph (Western Regional Climate Center, 2008). The trade winds prevail approximately nine months a year. During the winter months, the winds tend to be less predictable, with longer periods of light and variable winds and occurrences of "Kona" winds associated with weather fronts and storms.

c. Soil Ratings/Agricultural Productivity

There are multiple ways to assess the soil qualities and potential productivity of Hawaii's agricultural lands. Four classification systems that are commonly used to rate soils in Hawaii include:

- Land Study Bureau Soil Rating System (LSB)
- Land Capability Grouping,
- Agricultural Lands of Importance to the State of Hawaii (ALISH) and
- Important Agricultural Lands (IAL).

i. Land Study Bureau

The LSB soil rating system ranks soils in six different categories from "A" to "E" and "Unclassified". The LSB rating for lands under the Lima Ola project are primarily "A" with a small amount of "B" soils located in small areas where slope and drainage impact growing conditions.

Kauai has 9,218 ac of "A" class land within its state Agricultural land use district. This amounts to 6.4% of the agriculturally designated lands on the island. Most of this high quality "A"land is located on the South Shore where well aged soils, persistent sunshine and available irrigation systems made for some of the state's highest sugar yielding fields in the state. The largest concentration of "A" class soils in the state is located on Maui (30,943 ac.) followed by Oahu (16,023 ac.).

ii. Land Capability Grouping (USDA Rating)

The Land Capability Classification was done in 1972 by the USDA with assistance from the University of Hawaii Soil Mapping Survey. This system rates soils according to eight levels, ranging from the highest classification level "I" to the lowest "VIII". Productivity assessments were done largely for the main crops being grown in the state including sugar, pineapple, pasture and woodlands. This system designated 20.6% (381,600 ac) of the LUC Agricultural land in the state as I, II or III

The Makaweli soil types found at the project site has a non-irrigation rating of IV, and, with irrigation, a rating of II.

iii. Agricultural Lands of Importance to the State of Hawaii (ALISH)

The ALISH system was part of a nation soil mapping effort to inventory important ag lands. National criteria were used and adapted by the USDA, UH College of Agriculture and Human Resources and the State Department of Agriculture. Lands were classified in three broad

categories including Prime, Unique and Other. Final maps were adopted by the State Board of Agriculture in 1977.

Lands under the Lima Ola project are designated Prime.

iv. Important Agricultural Lands (IAL)

The identification and designation of Important Agricultural Lands (IAL) was first proposed at the 1978 Constitutional Convention and subsequently approved by voters in the same year. Enacted as Article XI, Section 3, of the constitution of the State of Hawaii, the State is required to conserve and protect agricultural lands promote diversified agriculture, increase agricultural self-sufficiency, and assure the availability of suitable lands.

Criteria considered in nominating lands as Important Agricultural Lands (IAL) include:

1. Land with soil qualities and growing conditions that support food, fiber, or energy crops;
2. Land identified under previous soil productivity rating systems, such as the Agricultural Land of Importance to the State of Hawaii (ALISH) system;
3. Land associated with traditional Hawaiian crops or distinctive agricultural ventures
4. Land with sufficient water for viable agriculture;
5. Land for which IAL is consistent with the general, development, and community plans;
6. Land currently in agricultural use;
7. Land that contributes critical mass for agricultural operations; and
8. Land with or near infrastructure conducive for agricultural productivity.

Under the above criteria, the project area would meet the basic requirement of an IAL designation. It contains productive soils that were designated as Prime under the State ALISH soil ranking system and A and B lands under the Land Study Bureau Soil Productivity rating system.. It is in active coffee production and is served by a regional irrigation water system. It is also located in close proximity to agricultural infrastructure, including field roads, processing facilities and retail outlets for the crop.

Kauai County's Office of Planning has spent years preparing an IAL Plan for their island that has yet to be submitted to the LUC for approval. Their current draft of proposed IAL maps does not identify the subject Lima Ola property as a candidate for IAL designation. Conversations with Planning department staff indicate that the property was left out of the IAL because it was purchased by the County for the sole purpose of developing Workforce Housing and that this use would have broader social and community benefits than it would if it was regulated to remain in agricultural use.

5. LOCATIONAL ADVANTAGES AND DISADVANTAGES FOR FARMING THE SUBJECT PROPERTY

a. Local Conditions

The project area is on soils that are generally supportive of a variety of agricultural uses. Irrigation systems are in place to accommodate the use of drip irrigation to feed the existing coffee orchard and the Kapa Reservoir at the mauka side of the property provides stable access to irrigation waters for other coffee lands nearby Irrigation transmission lines run down the middle of the Lima Ola property and will need to be relocated as the project progresses and coffee production is phased out to make way for affordable workforce housing.

The subject property is close to residential areas to the west that require sound farming practices to avoid dust and other agricultural drift from impacting residential use. The prevailing winds can bring dust from agricultural into the community.

b. Kauai Island Local Food Market

Most of Kauai's agricultural production is for export purposes including seed corn and coffee. There are, however, a growing number of small farmers trying to focus on the production of local food in the form of vegetables, fruit and beef. These include both full and part time farmers, many of whom live and farm on the east and north sides of Kauai with the biggest concentration of growers at Moloaa.

Farmers on Kauai are best situated for supplying the Kauai Island market because there will be minimal hauling/transportation charges. The Kauai market is relatively small with only 67,000 full-time residents plus visitor traffic. As with agriculture around the rest of the state, Kauai suffers from a lack of willing new farmers who will do what is necessary to produce year-round supplies at commercial volumes to address the demand of local produce

c. Honolulu Market

All farmers on Kauai are at a disadvantage in competing against farmers on Oahu for supplying the Honolulu market due to the interisland shipping costs, delays and extra handling. In comparing barge and air-cargo services, shipping by barge is less expensive and larger loads can be shipped, but the shipments are slow and infrequent. Air service is faster and frequent, but it is far more expensive and capacities are limited. In 2008, Oahu had a *de facto* population of about 934,300 residents and visitors. Thus, the Honolulu market is over six times larger than the Kauai market.

d. Mainland Market

Compared to Hawaii, the mainland market is massive: in 2010, the U.S. population totaled 308.7 million. In supplying this market with products that can be carried by container ship because they have long shelf-lives (e.g., canned fruit), farmers on Kauai are competitive with farmers on Oahu and the other islands. Even though freight from Kauai must first be barged to Honolulu and then transferred onto a container ship, Matson's overseas shipping service includes an inter-island barge service at no additional fee. Except for some minor port charges, Matson charges a common fare for all islands.

In the case of fresh products that must be shipped by air to the mainland because of their short shelf-lives, farmers on Kauai are at a disadvantage compared to farmers on Oahu because most mainland air cargo is shipped via the Honolulu International Airport. Compared to farmers on Oahu, Kauai farmers encounter additional costs, delays, and handling for interisland air-cargo service and for transferring the fresh products from small interisland aircraft to large overseas aircraft.

In the U.S. mainland market, farmers in Hawai'i must also compete against farmers on the mainland and in Mexico, Central and South America, the Caribbean, Australia, New Zealand, Southeast Asia, etc. Most of the competing farm areas have lower production and delivery costs than Hawaii does. Competing against Mexico is particularly difficult given the North America Free Trade Agreement (NAFTA) and Mexico's proximity to major U.S. markets.

e. Summary

Farmers in Kauai are well-situated to supply the Kauai Island market. And compared to other farmers in Hawai'i, they can also compete reasonably well in supplying mainland markets, as long as their products have long shelf-lives and can be shipped by surface vessel.

However, compared to farmers on Oahu, they are at a disadvantage in supplying the Honolulu market. Furthermore, they are at a disadvantage supplying mainland markets if their products have short shelf-lives and must be shipped by air. Farmers on Kauai are at a disadvantage in competing against the low-cost producers who supply mainland markets in areas with a lower cost of living.

6. SURROUNDING LAND USES

To the east and south of the project area lands that are used for coffee production by Kauai Coffee. The coffee is part of over 3,000 ac. planted by A&B in the mid 1990's and now leased to Kauai Coffee LLC which is owned by Massimo Zanetti Beverage USA Inc, an Italian based company and one of the largest coffee roasters in the US.

To the west and partially to the north of Kauai Coffee are residential communities. Kaumualii Highway is directly to the north of the development area (See figure 5 for detail).

7. IMPACT OF PROJECT ON CURRENT FARMING CONDITIONS

a. Impact on Coffee Farming Operations, Kauai Coffee LLC

The project area was sold to the County of Kauai by McBryde Sugar Company/A&B Companies in 2010. At that time Kauai Coffee Company (KCC) was a subsidiary of A&B Companies. The project area was sold to the county expressly for residential use. When the orchard was leased by A&B to Kauai Coffee LLC, the new operator was fully aware that this project was in the pipeline and would be removed from farming as the residential development was phased in. This understanding was documented in a License Agreement executed concurrent with the County's purchase.

The development of Lima Ola is not anticipated to significantly impact coffee operations at Kauai Coffee. production. Kauai Coffee LLC currently farms >3000 acres of mostly contiguous land between Lawai and Eleele. The 75 acres of coffee crop to be lost due to the Lima Ola project, represents less than three (3%) percent of the total area farmed in coffee by Kauai Coffee. Further, based on discussions with Kauai Coffee LLC management, the variety of crop planted on the subject property is known as yellow catuai. This variety is makes up the bulk of the crop planted on the Kauai plantation. Other varieties include Kauai Blue Mountain and Arabica. Future plans include producing more of the higher value coffees and reducing the footprint of the catuai variety. Additional coffee plantings are planned within existing fields to improve overall production per acre on the farm as a whole. In preparation for eventual displacement, coffee trees have been planted and remain in waiting at the Kauai Coffee LLC nursery.

The lack of affordable housing has made it more difficult for Kauai Coffee to recruit and retain employees. Development of County work force housing at Lima Ola may help secure some portion of the labor pool needed to keep Kauai Coffee operational.

8. IMPACT ON FUTURE FARMING OPERATIONS

Kauai has approximately 140,000 acres of agricultural land, of which some 128,000 acres have sufficient water for farm uses. The County of Kauai's Important Agricultural Land Study identified approximately 53,000 acres on the island as meeting all criteria for Important Agricultural Lands. Currently, less than 10,000 of the 53,000 acres are dedicated to food and timber production. An estimated total of 21,000 acres would be needed to achieve food self-sufficiency for the County's population. In sum, the land area analyzed as IAL has 2.5 times the acreage needed to support the population of Kauai.

Due to the abundance of suitable agricultural land on Kauai, and the size of the project area (75 acres), the development of Lima Ola is not expected to measurably impact current or future agriculture production on Kauai.

9. CONSISTENCY WITH STATE AND COUNTY POLICIES

The *Hawaii State Constitution*, the *Hawaii State Plan*, and the *State Agriculture Functional Plan*, call directly or implicitly for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured.

In regard to plantation agriculture, the acreage to be disrupted by the Lima Ola project will be too small to negatively affect current or realistic future coffee plantation operations. There is ample acreage of fallow land in the IAL area to make up for the area loss due to the development of the Lima Ola project area.

With regard to diversified crop farming, there is no current or recent farming on the property. Again, IAL lands lay fallow within close proximity of the project area.

With regard to ranching, the site has no history as having been used for ranching or pasture land. Due to arid, and rocky conditions, the project site is not, well suited for ranching.

The development of the project area would meet the criteria established in the County of Kauai General Plan and would be consistent with the General Plan Vision (County of Kauai, 2000). Kauai's General Plan Vision describes Kauai as a "rural environment of towns separated by broad open spaces," as well as "a rural place whose population size and economy have been shaped to sustain Kauai's natural beauty, rural environment and lifestyle."

The development would also be consistent with the stated vision by maintaining a rural environment with the project site, and providing the needed development for housing to sustain the environment and lifestyle of Kauai. The residents of Kauai will benefit by fulfilling a significant need for affordable housing, while maintaining the qualities of development identified in the General Plan (i.e., developing within the vicinity of established residential and commercial communities).

The project area is currently zoned and designated as "Agriculture" within the county zoning maps and general plan. However, the update to the general plan designates the project area as "Residential". Further, a 201H application was submitted by Kauai County Housing Agency to the Kauai County Council asking for an exemption to changes in the zoning maps and general plan designation. The 201H application was approved by the Kauai County Council in August of 2016.

Report Summary

There will be a short-term impact in current agricultural activities with the development of Lima Ola. Short term impacts include: the planting of new coffee trees and installing drip irrigation in new fields. Long term positive affects can be expected with the attraction and retention of employees at Kauai Coffee Company and other surrounding businesses due to better housing options at affordable rates.

EXHIBIT4

Lima Ola Workforce Housing Assessment of Relationship to Land Use Plans, Policies and Controls

LIMA OLA WORKFORCE HOUSING ASSESSMENT OF RELATIONSHIP TO LAND USE PLANS, POLICIES, & CONTROLS

Prepared For:
Community Planning and Engineering

Prepared By:
Environet, Inc.
1286 Queen Emma Street
Honolulu, HI 96813

April 2017

INTRODUCTION

This document identifies the key federal, state and county land use policies and plans that relate to the proposed Lima Ola Workforce development located at Tax Map Key (TMK) (4) 2-1-001:054 in the town of ʻEleʻele, Kauaʻi. This document provides an analysis of how the proposed development has been planned in accordance with applicable land use policies and controls.

1.1 STATE LAND USE PLANS AND POLICIES

1.1.1 STATE OF HAWAIʻI

State of Hawai'i Land Use Law Chapter 205, HRS

Chapter 205, Hawaiʻi Revised Statutes (HRS) promulgates the State Land Use Law. This law is intended to preserve, protect, and encourage the development of lands in the State of Hawaiʻi for uses that are best suited to the public health and welfare of its people. The state Land Use Commission (LUC) classifies all land into four districts: Urban, Conservation, Agriculture, and Rural.

Discussion:

The project site is designated within the State LUC Agricultural District. While the proposed project would be used for residential purposes, the County of Kauaʻi has identified the project site as the most suitable location for the proposed affordable housing community since the proposed project site is located directly adjacent to existing residential development, and within close proximity to job centers, schools, commercial/industrial areas, as well as transportation networks and public utilities. Further, the county and the current agricultural user at the proposed project site has determined that sufficient alternative lands are available in the area, as well as additional lands in the county, for the existing and planned commercial agricultural use demand. Since the proposed project site is greater than 15 acres a petition to amend the Agricultural land use district boundary into the Urban District would be necessary.

Hawaii Administrative Rules (HAR) Title 15-Chapter 15: Land Use Commission Rules

HAR 15-15 include the rules that govern the practice and procedures before the state LUC.
HAR 15-15-18: Standards for determining "U" Urban District Boundaries provides the standards for use within Urban District Boundaries.

Discussion:

The proposed project is planned to be reclassified from the Agricultural District to Urban, as defined in §15-15-18. The following analysis looks at the applicability of the proposed project site to be included in the Urban District.

§15-15-18 (1): It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related land uses;

(2) It shall take into consideration the following specific factors:

(A) Proximity to centers of trading and employment except where the development would generate new centers of trading and employment;
(B) Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection; and
(C) Sufficient reserve areas for foreseeable urban growth;

(3) It shall include lands with satisfactory topography, drainage, and reasonably free from the danger of any flood, tsunami, unstable soil condition, and other adverse environmental effects;

(4) Land contiguous with existing urban areas shall be given more consideration than non-contiguous land, particularly when indicated for future urban use on state or county general plans or county community plans or development plans;

(5) It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the state and county general plans or county community plans or development plans;

(6) It may include lands which do not conform to the standards in paragraphs (i) to (5):
(A) When surrounded by or adjacent to existing urban development; and
(B) Only when those lands represent a minor portion of this district;
(7) It shall not include lands, the urbanization of which will contribute toward scattered spot urban development, necessitating unreasonable investment in public infrastructure or support services; and

(8) It may include lands with a general slope of twenty per Cent or more if the commission finds that those lands are desirable and suitable for urban purposes and that the design and construction controls, as adopted by any federal, state, or county agency, are adequate to protect the public health, welfare and safety, and the public's interests in the aesthetic quality of the landscape.

Discussion:

The proposed project is located directly adjacent to existing residential development, and within close proximity to commercial/industrial uses, as well as major transportation routes. The proposed project site is also in close to proximity to public services such as schools, medical facilities, and employment centers. Utilities such as electricity, potable water, cable and sewer are also all available at the project site. Development of the project site for residential use would not result in a scattered spot urban development since it would include a connected residential subdivision located directly adjacent to existing residential use. The proposed project site is not located in a tsunami or inundation zone and would include permanent onsite drainage controls that would mitigate stormwater / flood risk in accordance with county drainage standards. The project would be designed to ensure that the planned development would not result in increased flood risk to the existing environment. Construction activities would comply with state and county rules, including a stormwater pollution prevention plan and compliance with applicable provisions of the Clean Water Act.

Hawai'i State Plan, Chapter 226, HRS

The Hawai'i State Plan, Chapter 226, HRS was developed as a guideline for the future growth of the State of Hawai'i. The State Plan identifies goals, objectives, policies, and priorities for the development and growth of the state. It provides a basis for prioritizing and allocating the limited resources such as public funds, services, human resources, land, energy, and water. The State Plan establishes a system for the formulation and program coordination of state and county plans, policies, programs, projects, and regulatory activities. The State Plan also facilitates the integration of all major state and county activities. The proposed project would be in conformance with the State Plan's objectives and policies for socio-cultural advancement with regard to housing. Specifically, the proposed project would fulfill the following objectives of the State Plan:

- *Provide greater opportunities for Hawai'i's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and non-profit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawai'i's population.*

- *Effectively accommodate the housing needs of Hawai'i's people.*

- *Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.*

- *Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.*

- *Foster a variety of lifestyles traditional to Hawai'i through the design and maintenance of neighborhoods that reflect the culture and values of the community.*

Hawai'i Revised Statues, Chapter 201H

HRS Section 201H-38, was enacted into law to provide a process whereby an affordable housing project may be granted exemptions from any statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, zoning and construction standards that do not negatively affect the health and safety of the general public. The Kaua'i County Housing Agency administers this law for the County of Kaua'i. Typical exemptions may include but are not limited to General Plan, Development Plan, and Zoning District designations, zoning district and subdivision requirements (e.g., undergrounding of utilities, parking requirements, lot size, street design), relief from park dedication requirements, and various fees.

Affordable housing projects are eligible for exemption if more than half (51%) of the units are made affordable to income target groups established by county rules, based on guidelines provided by the United States Department of Housing and Urban Development (HUD). The target groups are defined as a percentage (usually 80-140%) of the median income for Kaua'i as determined by HUD. Additional requirements apply, and a project and developer must be determined as eligible by the Housing Agency for 201H consideration.

Discussion:

Since all of the residential units included in the Proposed Action would be affordable housing, the Proposed Action would be eligible for exemptions included in HRS Section 201H. Proposed exemptions requested under HRS Section 201H are presented in FEA.

Environmental Impact Statements Chapter 343, HRS

Compliance with Chapter 343, HRS is required.

§343-5 Applicability and Requirements. *(a) Except as otherwise provided, an environmental assessment shall be required for actions that:*

Propose the use of the state or county lands or the use of state or county funds, other than funds to be used for feasibility or planning studies for possible future programs or projects that the agency has not approved, adopted, or funded, or funds to be used for the acquisition of unimproved real property; provided that the agency shall consider environmental factors and available alternatives in its feasibility or planning studies; provided further that an environmental assessment for proposed uses under section [205-2(d)(10)] or [205-4.5(a)(13)] shall only be required pursuant to Section 205-5(b).

HRS, Chapter 343, defines the State of Hawai'i's environmental review process by which an environmental impact statement must be conducted to identify any potential impacts that could result from a proposed action involving state or county lands or funds.

Discussion:

The County of Kaua'i is titled to the land within the project site; therefore, an environmental review under HRS Chapter 343 is required because the project entails the use of county lands. A draft and final environmental assessment (EA) have been prepared, together with a Finding of No Significant Impact (FONSI), by the county Housing Agency in order to meet HRS Chapter 343 requirements. The FEA-FONSI has been processed and approved by the state Office of Environmental Quality Control (OEQC).

Environmental Impact Statement Rules Title 11, Chapter 200, HAR

HAR Title 11, Chapter 200 provides the procedures, definitions and criteria for completing environmental assessments and environmental impact statements in compliance with HRS 343.

Discussion:

Evaluation of the potential environmental, social and economic impacts from the Proposed Action have followed the applicable procedures, definitions and criteria outlined in HAR 11-200. The analysis is included in the FEA-FONSI dated July, 2016.

1.2 COUNTY LAND USE PLANS AND POLICIES

1.2.1 COUNTY OF KAUAʻI

1.2.1.1 GENERAL PLAN

Pursuant to the provisions of the Charter for the County of Kauaʻi, the General Plan sets forth policies to govern the future physical development of the county. The General Plan is intended to improve the physical environment of the county and the health, safety and general welfare of Kauaʻi's people.

Discussion:

The General Plan guides the location and character of new development through graphic and textual policy. The County's existing General Plan was approved in 2000. Section 6.5 "West Side" describes the land use policy and vision for ʻEleʻele. The agricultural zoned land located east of ʻEleʻele was not designated for future residential development in Chapter 6 or on the Land Use Map. However, the following policies support affordable housing development and the compact form of new communities:

> 5.1.1. (b) Promote compact urban settlements in order to limit public service costs and to preserve open space.
>
> 5.1.2. (d) In the outlying West Side and North Shore districts, plan for additional residential use to meet regional demands for housing.
>
> 5.1.2. (e) Expansion contiguous to an existing town or residential community is preferred over a new residential community.
>
> 8.1.10 (a) Increase the supply of affordable rental housing, as indicated by market conditions.
>
> 8.1.10 (b) Increase opportunities for moderate- and low-income households to become homeowners. Work from the bottom up, serving the 35 percent of residents whose income is 80 percent of the median or less. The intent is to move families out of expensive rental subsidy programs into home ownership, developing housing at a very low cost through self-help programs and reduced-rate mortgage financing.

The Planning Department began updating the General Plan in 2015 and a draft is undergoing Planning Commission and Council review. The draft Future Land Use Map designates Lima Ola as "residential community" and sets policy supporting the eastward expansion of Port Allen and ʻEleʻele.

1.2.1.2 HANAPĒPĒ-ʻELEʻELE COMMUNITY DEVELOPMENT PLAN

The Hanapēpē-ʻEleʻele Community Development Plan of 1974 sets forth goals and policies to guide future development in the area. Chapter V: Policy Implications: Programming for Change discusses planning for housing in the area:

"Residential development in the study area should occur on State lands or in other areas such as that proposed by McBryde (A&B) where economic hardship is not created by removal of cane lands."

Discussion:

The proposed Lima Ola project area is located on former cane lands purchased from McBryde, but now operated by Kaua'i Coffee Company under a license agreement with the County. Kaua'i Coffee Company is aware of the proposed Lima Ola development and has indicated that the change of land use at the proposed project area from commercial agriculture to residential use would not significantly impact agricultural production since Kaua'i Coffee has access to enough alternate land in the area. Therefore, the proposed development is congruent with the Hanapēpē-'Ele'ele Community Development Plan and is not anticipated to result in significant impacts to agricultural use / resources in the area.

1.2.1.3 KAUA'I COUNTY CODE

The Kaua'i County Code 1987, as amended, was prepared pursuant to the authority of Section 4.05 of the Kaua'i County Charter, and sets forth guidelines and rules for various County functions, including development standards, taxation, County administration organization and other matters affecting the general public.

Chapter 8 of the Kaua'i County Code: CZO

The purpose of the CZO is to provide regulations and standards for land development and the construction of buildings and other structures in the County of Kaua'i (County of Kaua'i, 2015a). The project site is located in the Agricultural District.

Discussion:

The project site is currently zoned for agricultural use under county zoning regulations. While the proposed project would be used for residential purposes, the County of Kaua'i has identified the project site as the most suitable location for the proposed affordable housing community, and has allocated sufficient alternative lands in the area, as well as additional lands in the county, for agricultural use. Proposed exemptions from the County CZO, as well as Chapter 9 of the County Code are discussed in the FEA-FONSI.

EXHIBIT 5

Preliminary Drainage Analysis for Lima Ola Workforce Housing Development

PRELIMINARY DRAINAGE ANALYSIS
FOR
Lima Ola Workforce Housing Development

ELEELE, KAUAI, HAWAII
TMK: (4) 2-1-001:054

Prepared for:
County of Kauai Housing Agency
Piikoi Building
4444 Rice Street
Lihue, Hawaii 96766

Prepared by:
Community Planning & Engineering, Inc.
1286 Queen Emma Street
Honolulu, HI 96813

TABLE OF CONTENTS

SECTION 1 INTRODUCTION **3**

1.1 Project Background 3
1.2 Purpose and Scope 3
1.3 Site Description 3
1.3.1 *Location* 3
1.3.2 *Climate* 5
1.3.3 *FIRM* 5
1.3.4 *Topography* 5
1.3.5 *Soils* 5

SECTION 2 EXISTING DRAINAGE CONDITIONS **7**

SECTION 3 PROPOSED DRAINAGE CONDITIONS **9**

SECTION 4 DRAINAGE ANALYSIS **12**

4.1 Storm Drainage Criteria 12
4.1.1 *Storm Water Runoff* 12
4.1.2 *Estimating Storage Basin for Detention* 12
4.2 Existing Drainage Analysis 12
4.2.3 *Hydrology* 12
4.3 Proposed Drainage Analysis 13
4.3.1 *Hydrology* 13
4.3.2 *Proposed On-Site Detention Basin* 13
4.3.3 *Water Quality* 14

SECTION 5 SUMMARY **16**

SECTION 6 REFERENCES **17**

LIST OF EXHIBITS

EXHIBIT 1 – Location Map 4
EXHIBIT 2 – Web Soil Survey Map 6
EXHIBIT 3 – Existing Drainage Conditions 8
EXHIBIT 4 – Developed Drainage Conditions 10
EXHIBIT 5 – Lima Ola Offsite Drainage Plan 11
EXHIBIT 6 – Proposed On-site Detention Basin 15

APPENDIX

APPENDIX A – Drainage Design Data and Calculations

SECTION 1 INTRODUCTION

1.1 Project Background

The County of Kauai currently owns and plans to develop a 72-acre parcel in Eleele on the island of Kauai, Hawaii. The parcel of land was purchased by the County of Kauai from McBryde Sugar Company with the stipulation of developing the area into an affordable housing community. The land has a long history in agricultural production, previously used for sugarcane cultivation and currently being used by Kauai Coffee Company under a licensed agreement with the County of Kauai. The agreement states that Kauai Coffee Company will vacate the land when the County of Kauai proceeds with the development project.

The proposed affordable housing community will be called Lima Ola. The development will consists of 550 residential units (single family, multi-family and senior resident units), a community center and park, bike and pedestrian paths, landscaped areas, and an on-site detention basin.

1.2 Purpose and Scope

The purpose of this analysis is to determine the impact the proposed development would have on the existing drainage system. Impacts will be mitigated to meet the County of Kauai Storm Drainage Standards.

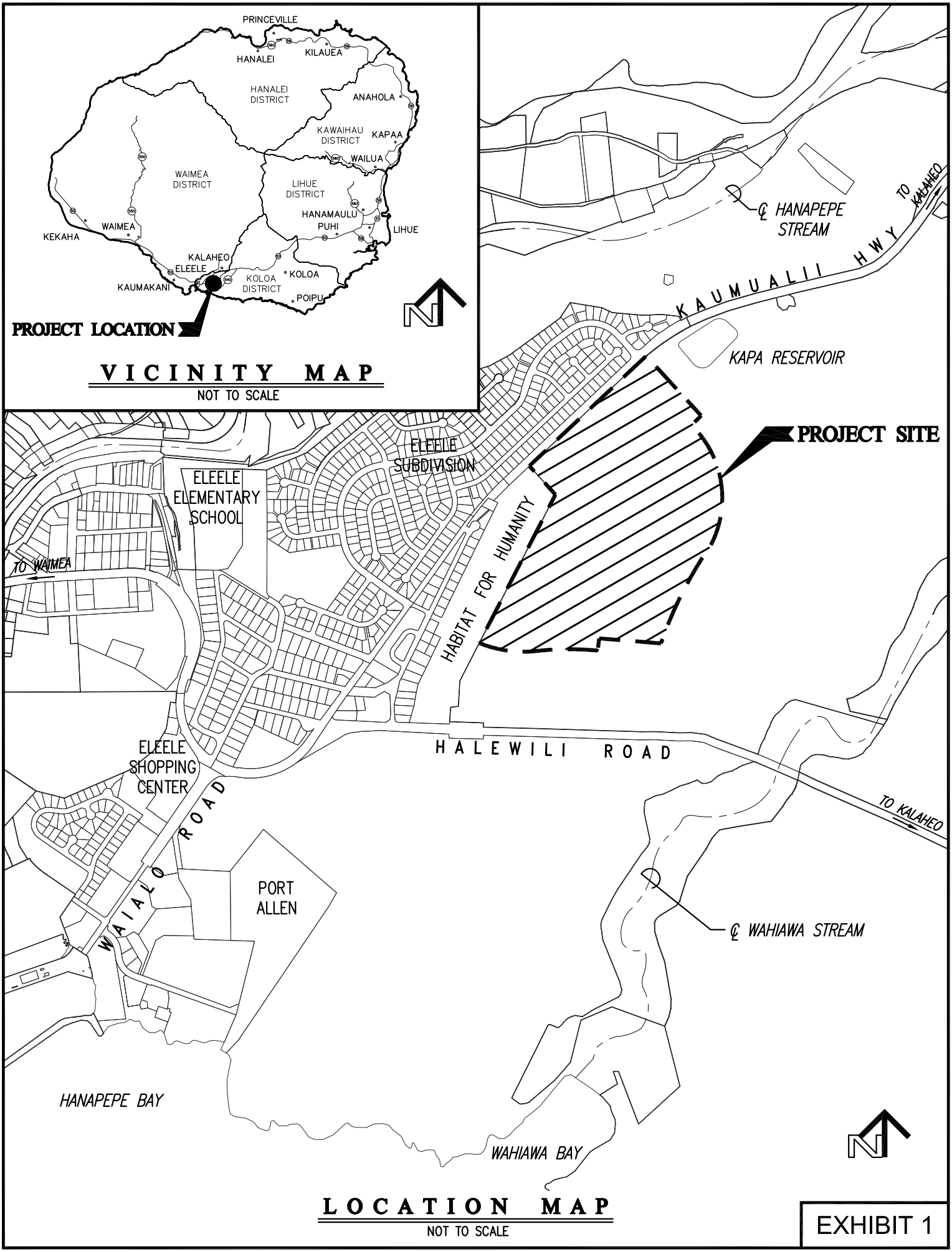
The scope of this analysis is to determine the changes in the drainage areas over the project site, determining the runoff generated and its effects to the downstream drainage facilities.

1.3 Site Description

1.3.1 Location

Lima Ola is located on the south side of the island of Kauai, Hawaii in the Eleele area. The proposed development is mauka of Halewili Road and east of Kaumualii Highway, and consists of approximately 72 acres of land within Tax Map Key (4) 2-1-001: 054.

Refer to **EXHIBIT 1 – LOCATION MAP**.


PRINCEVILLE
HANALEI
KILAUEA
HANALEI DISTRICT
ANAHOLA
KAWAIHAU DISTRICT
KAPAA
WAILUA
WAIMEA DISTRICT
LIHUE DISTRICT
HANAMAULU
PUHI
LIHUE
WAIMEA
KEKAHA
KALAHEO
ELEELE
KAUMAKANI
KOLOA
KOLOA DISTRICT
POIPU
PROJECT LOCATION
VICINITY MAP
NOT TO SCALE
℄ HANAPEPE STREAM
TO KALAHEO
KAUMUALII HWY
KAPA RESERVOIR
PROJECT SITE
ELEELE SUBDIVISION
ELEELE ELEMENTARY SCHOOL
TO WAIMEA
HABITAT FOR HUMANITY
HALEWILI ROAD
ELEELE SHOPPING CENTER
WAIALO ROAD
PORT ALLEN
TO KALAHEO
℄ WAHIAWA STREAM
HANAPEPE BAY
WAHIAWA BAY
LOCATION MAP
NOT TO SCALE
EXHIBIT 1

1.3.2 Climate

The proposed development is located on the leeward side of the island, which is generally characterized as dry and sunny with the area typically receiving northeastern trade winds. The median annual rainfall ranges from 29.5 to 34.4 inches. The average daily minimum and maximum temperature in January is 63 degrees F and 76 degrees F, and the average daily minimum and maximum temperature in August is 67 degrees F and 85 degrees F.

1.3.3 FIRM

According to the Flood Insurance Rate Map (FIRM), Kauai County Panel 1500020287 F dated November 26, 2010; the project area is in Flood Zone X, which designates areas determined to be outside of the 0.2% annual chance floodplain (500-year).

1.3.4 Topography

The topography of the project area gently slopes from mauka to makai, with an average slope of 4 percent. Elevations range between 285 feet to 170 feet above mean sea level.

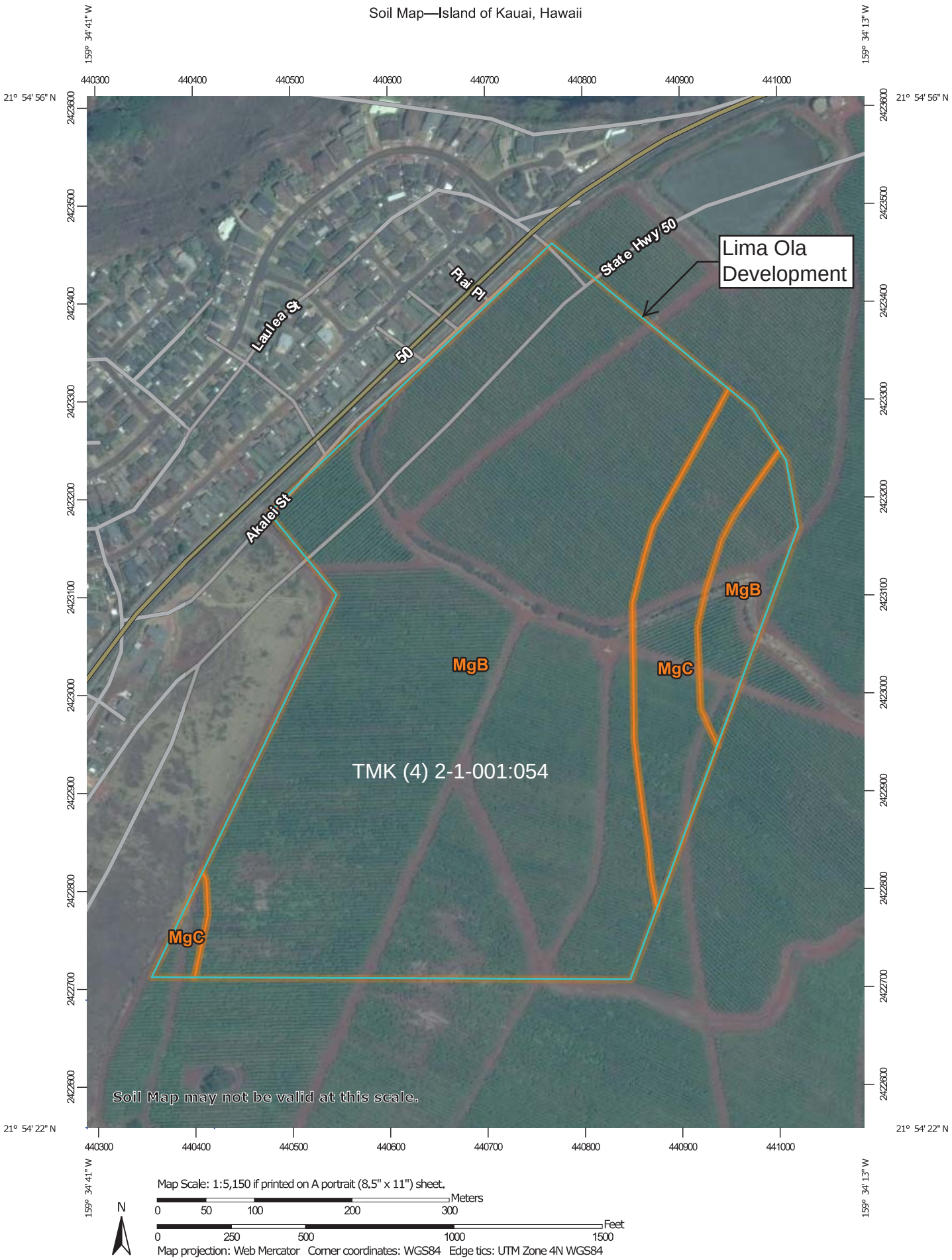
1.3.5 Soils

The "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii" prepared by the Soil Conservation Service (SCS), dated 1972 was used to identify the soil(s) located within the drainage area. The project site consists of two types of soil within the Makaweli series.

The Makaweli Series is the main type of soil found throughout the project site. These soils originated from volcanic ash and are characterized as a well-drained soil type with moderate permeability. The substratum is classified as soft, consisting of weathered basic igneous rock. Approximately 85 to 90 percent of the project area consists of Makaweli silty clay loam (MgB), 0% to 6% slopes, which is classified as having a slow runoff rate and being a slight erosion hazard. The remaining portion of the project area consists of Makaweli silty clay loam (MgC), 6% to 12% slopes, which is classified as having a medium runoff rate and being a moderate erosion hazard.

Refer to **EXHIBIT 2 – WEB SOIL SURVEY MAP**.

Soil Map—Island of Kauai, Hawaii



Map Scale: 1:5,150 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 4N WGS84

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

EXHIBIT 2

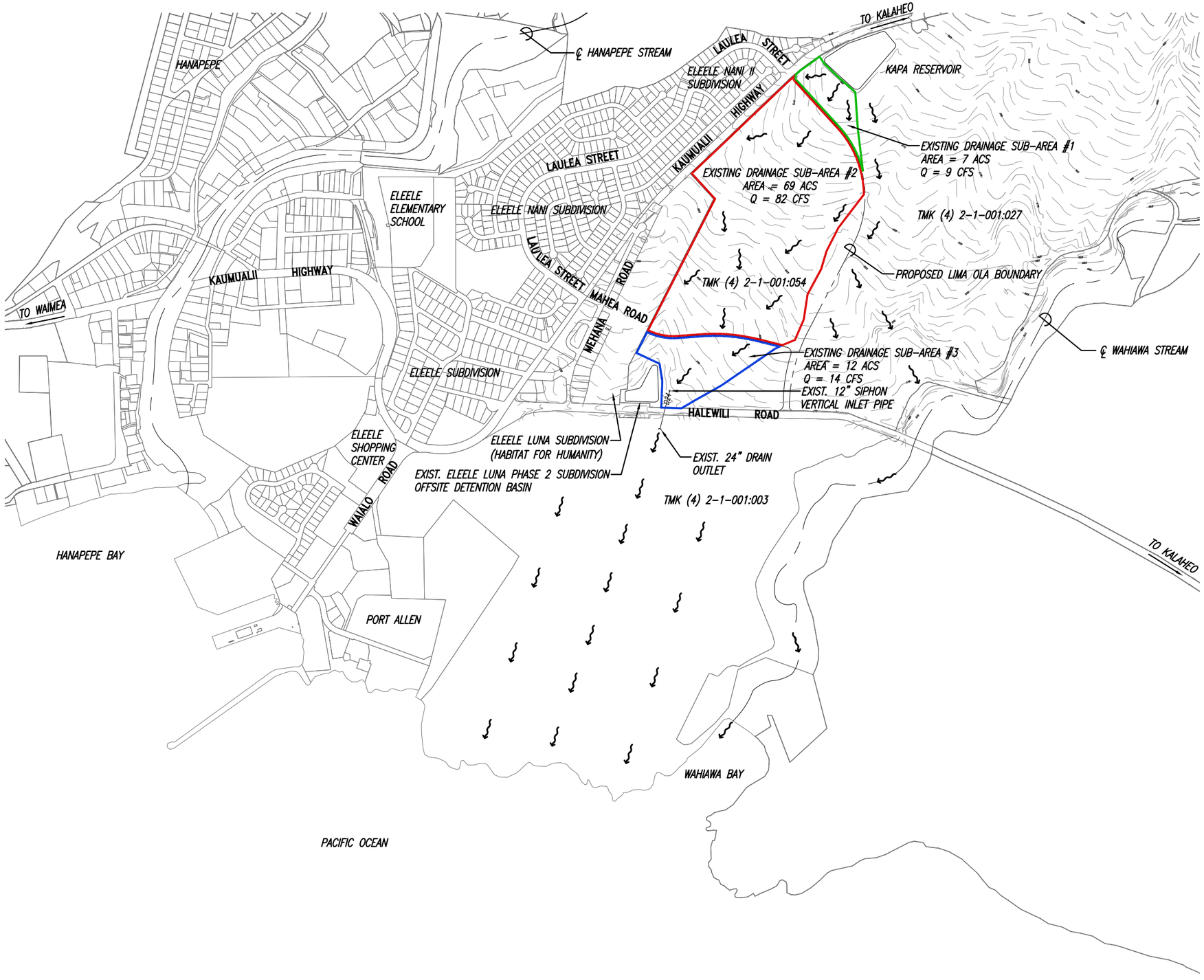
SECTION 2 EXISTING DRAINAGE CONDITIONS

The project area is located within the Wahiawa watershed, which covers approximately 5,200 acres. The existing drainage pattern of the project area follows the natural terrain (typically mauka to makai) downstream towards the Pacific Ocean.

Under current conditions, the existing drainage area encompasses approximately 88 acres of land and generates a peak discharge of 105 cfs for a 2-year, 24-hour storm interval, based on the TR 55 method. Runoff generated from the existing drainage area sheet flows downstream into an existing 12-inch siphon vertical inlet pipe located to the east of the existing Eleele Luna Subdivision offsite detention basin. Additionally runoff generated from the existing Eleele Nani and Eleele Luna subdivisions also utilizes that 12-inch siphon vertical inlet pipe to discharge flow. Accumulated storm water that enters into the 12-inch inlet pipe flows into a 24-inch drain pipe, which outlets runoff on the south side of Halewili Road. The outflow from the 24-inch drain pipe, sheet flows over the natural terrain, ultimately discharging into the Pacific Ocean.

Pertaining to the proposed project area, the existing drainage area consists of the three drainage sub-areas. Existing drainage sub-area #1 consists of the mauka portion of land offsite of the project area, which is approximately 7 acres and generates 9 cfs. Existing drainage sub-area #2 encompasses approximately 69 acres of the proposed Lima Ola development and generates 82 cfs. Existing drainage sub-area #3 consists of the makai portion of land offsite of the project area, which is approximately 12 acres and generates 14 cfs. Runoff generated from drainage sub-area #1 sheet flows into drainage sub-area #2, where runoff sheet flows into drainage sub-area #3 and into the 12-inch siphon vertical inlet pipe, ultimately discharging runoff into the Pacific Ocean.

Refer to **EXHIBIT 3 – EXISTING DRAINAGE CONDITIONS.**



TRUE NORTH
Scale: 1 in. = 1000 ft.

400 200 0 400 800
Graphic Scale in Feet

EXISTING DRAINAGE CONDITIONS
SCALE: 1"=1000'

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LIMA OLA WORKFORCE HOUSING DEVELOPMENT

ELEELE, KAUAI, HAWAII

OWNER & DEVELOPER: COUNTY OF KAUAI
TAX MAP KEY: (4) 2-1-001:054

EXHIBIT 3
EXISTING DRAINAGE CONDITIONS

SECTION 3 PROPOSED DRAINAGE CONDITIONS

Runoff generated from the Lima Ola Development will enter a drainage pipe network and be directed into a proposed on-site detention basin. Based on the TR 55 method, the peak discharge for the proposed drainage conditions was determined to be 115 cfs for the 2-year, 24-hour storm interval.

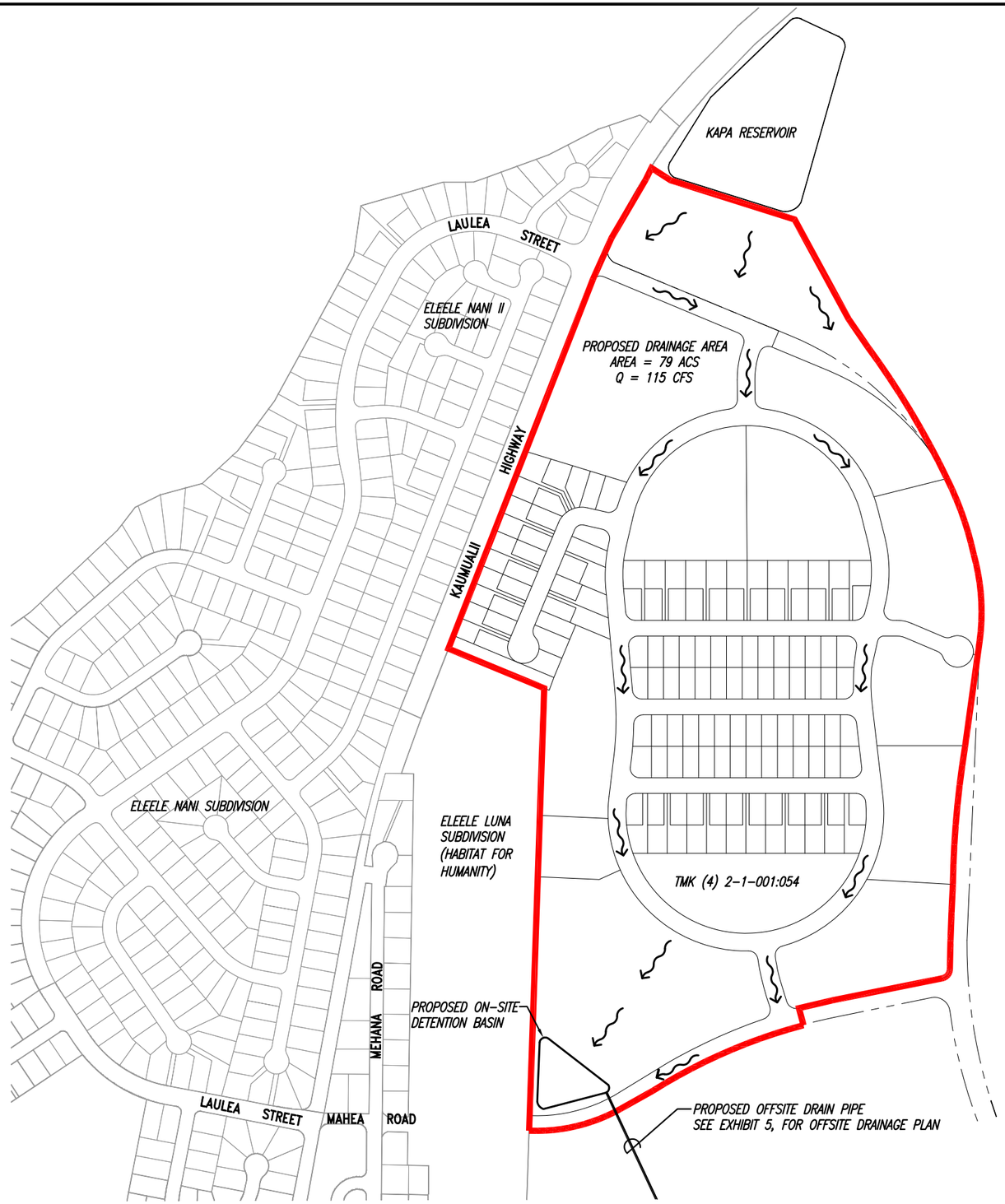
The proposed pipe network will consists of drain inlets, drain manholes, and approximately 1,110 linear feet of 24-inch drain pipe and 4,650 linear feet of 36-inch drain pipe. Final sizing of the proposed pipe network will be done during the design phase of the project.

The on-site detention basin is proposed to be located at the southwest corner of the development and designed to limit the proposed discharge rate to the existing discharge rate. The discharge from the on-site detention basin will be piped offsite across Halewili Road. The detention basin will be designed in accordance with the County of Kauai, Department of Public Works, Storm Water Runoff System Manual, dated July 2001 and the TR-55 Manual.

In addition, to contain generated storm runoff, the proposed development will also incorporate low impact development and sustainable features such as grass swales along the roadways to treat the surface water runoff and reduce flow velocities.

The proposed drainage conditions will accommodate storm water runoff generated from within the proposed Lima Ola development and in addition, the mauka portion of land offsite of the project area, approximately 7 acres. Existing runoff from this portion of land naturally sheet flows onto the Lima Ola project area. The Lima Ola development will account for the existing runoff generated from this portion of land, therefore not disturbing existing drainage patterns. As for other offsite portions of land, existing drainage patterns are to remain in existing conditions. The proposed Lima Ola development will have no adverse drainage impact to the remaining abutting properties.

Refer to **EXHIBIT 4 – DEVELOPED DRAINAGE CONDITIONS** and **EXHIBIT 5 – LIMA OLA OFFSITE DRAINAGE PLAN.**



DEVELOPED DRAINAGE CONDITIONS

SCALE: 1"=400'

DRAINAGE FLOW PATH

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LIMA OLA WORKFORCE HOUSING DEVELOPMENT

ELEELE, KAUAI, HAWAII

OWNER & DEVELOPER: COUNTY OF KAUAI
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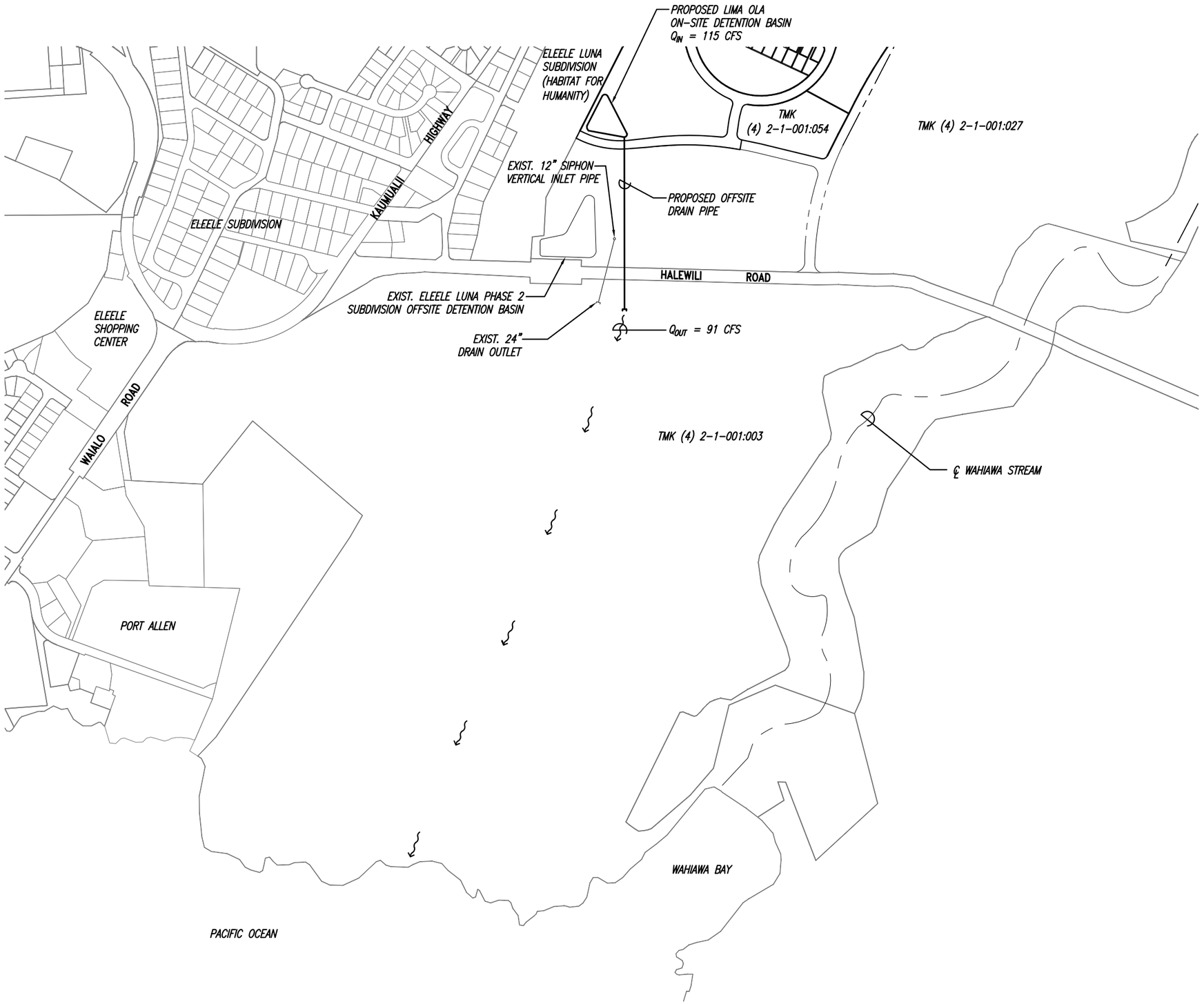
EXHIBIT 4
DEVELOPED DRAINAGE CONDITIONS



LIMA OLA OFFSITE DRAINAGE PLAN

SCALE: 1"=600'

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LIMA OLA WORKFORCE HOUSING DEVELOPMENT

ELEELE, KAUAI, HAWAII

OWNER & DEVELOPER: COUNTY OF KAUAI
TAX MAP KEY: (4) 2-1-001:054

EXHIBIT 5
LIMA OLA OFFSITE DRAINAGE PLAN

SECTION 4 DRAINAGE ANALYSIS

4.1 Storm Drainage Criteria

4.1.1 Storm Water Runoff

The proposed Lima Ola development will have a tributary drainage area less than 100 acres, which is defined as a local drainage system according to the County of Kauai Storm Drainage Standards. In accordance with the drainage standard, the local drainage system shall be designed to convey the peak runoff of a 2-year recurrence interval storm with minimal disruption to the development. The Soil Conservation Service's Technical Release 55 (TR 55), Urban Hydrology for Small Watersheds, was used to establish the design criteria and determine the peak discharge runoff rates for the proposed project.

4.1.2 Estimating Storage Basin for Detention

The local drainage system for the Lima Ola Development will include an on-site detention basin to control discharges to downstream areas. In accordance with the County of Kauai Storm Drainage Standards, the detention basin shall be sized using the 2-year, 24-hour recurrence interval storm. Chapter 6, Storage Volume for Detention Basins from the Soil Conservation Service's Technical Release 55 (TR 55), Urban Hydrology for Small Watersheds, was used to estimate the detention volume required to maintain the existing downstream storm water flow.

4.2 Existing Drainage Analysis

4.2.3 Hydrology

Peak discharge was based on the storm recurrence interval of a 2-year, 24-hour storm event. The Peak Discharge Equation is as follows:

$q_p = q_u A_m Q F_p$

Where, q_p = Peak discharge (cfs)
q_u = Unit peak discharge (csm/in)
A_m = Drainage area (mi^2)
Q = Runoff (in)
F_p = Pond and swamp adjustment factor

Worksheets 2 through 4 included in Appendix D of the TR-55 Manual were used to calculate the peak discharge for the existing drainage conditions. Using the methods presented in chapters 2 through 4 of the TR-55 manual, determination of the peak discharge takes into consideration such factors as drainage area, a weighted runoff curve number, time of concentration, and rainfall frequency.

As a result of the TR-55 method, the peak discharge for the existing drainage conditions was calculated to be 105 cfs for the 2-year, 24-hour storm interval.

Refer to **APPENDIX A – DRAINAGE DESIGN DATA AND CALCULATIONS.**

4.3 Proposed Drainage Analysis

4.3.1 Hydrology

Determination of the peak discharge for the proposed drainage conditions was based on the same methodology as the determination for the existing drainage conditions. Therefore, as a result of the TR-55 method, the peak discharge for the proposed developed drainage conditions was calculated to be 115 cfs for a 2-year, 24-hour storm interval.

Refer to **APPENDIX A – DRAINAGE DESIGN DATA AND CALCULATIONS.**

4.3.2 Proposed On-Site Detention Basin

The proposed Lima Ola Development will include an on-site detention basin to reduce the proposed development discharge rate to match the existing discharge rate. Through the TR-55 method, the peak discharge rate was determined to be 105 cfs under existing drainage conditions. The makai portion of land offsite of the project, which generates 14 cfs of runoff, will remain in existing condition. Therefore the proposed on-site detention basin will be designed to discharge at a rate to match the runoff generated from the remaining portion of the existing drainage area, which is 91 cfs. Under proposed drainage conditions, the peak discharge rate was determined to be 115 cfs for a 2-year, 24-hour storm recurrence interval.

The on-site detention basin will be considered part of the local drainage system for the Lima Ola Development and will be designed to convey the peak runoff of a 2-year, 24-hour recurrence interval storm. Worksheet 6a of the TR-55 Manual was used to estimate the storage volume required for the proposed on-site detention basin. The required storage volume was calculated using the peak discharge rate of the proposed developed condition as the inflow hydrograph and the peak discharge rate of the existing conditions as the outflow hydrograph for the detention basin. The storage volume required for the on-site detention basin is 2.81 ac-ft.

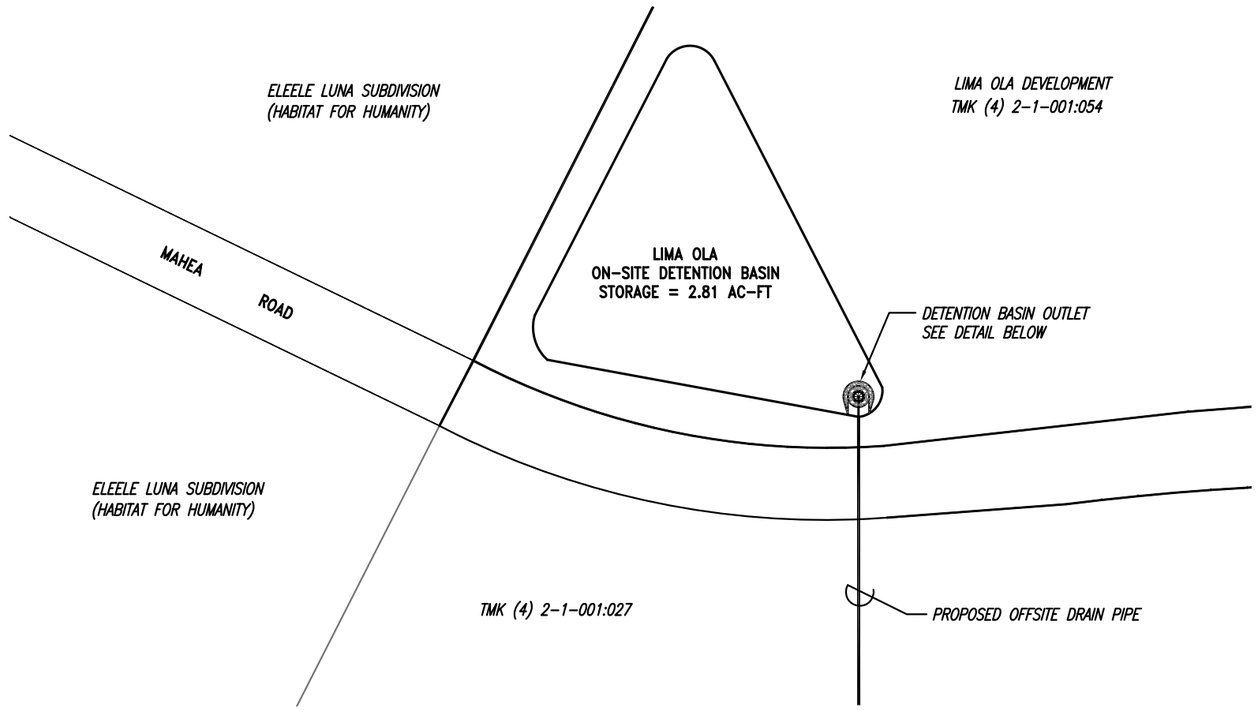
Refer to **APPENDIX A – DRAINAGE DESIGN DATA AND CALCULATIONS.**

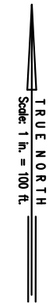
4.3.3 Water Quality

Water quality will be incorporated into the design of the Lima Ola on-site detention basin. The outlet for the detention basin will integrate a perforated riser inside of a drainage manhole and will be designed to limit the outflow of the detention basin to existing flow rates to meet water quality requirements established by the County of Kauai Storm Drainage Standards.

To aid water quality within the Lima Ola Development, grass swales will be constructed along the roadways throughout the development to help treat surface water runoff and reduce flow velocities into the on-site detention basin. Also the Lima Ola Development will include a community park, which will also act as a sediment basin to assist in water quality for the development.

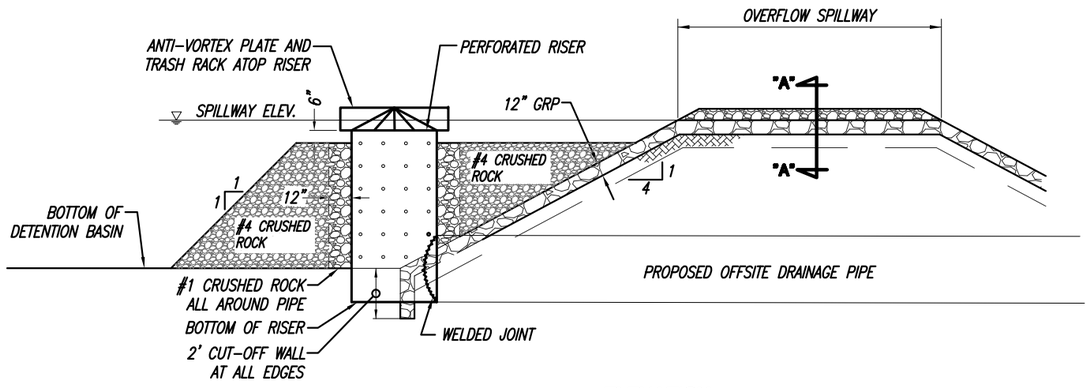
Refer to **EXHIBIT 6 – PROPOSED ON-SITE DETENTION BASIN.**



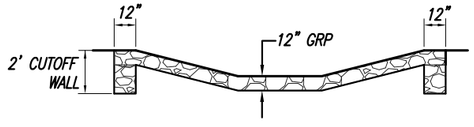


PROPOSED ON-SITE DETENTION BASIN

SCALE: 1"=100'



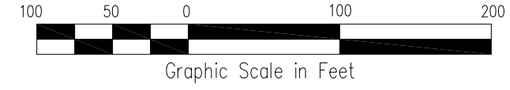
ELEVATION



SECTION "A-A"

DETAIL - DETENTION BASIN OUTLET

NOT TO SCALE



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LIMA OLA WORKFORCE HOUSING DEVELOPMENT

ELEELE, KAUAI, HAWAII

OWNER & DEVELOPER: COUNTY OF KAUAI
TAX MAP KEY: (4) 2-1-001:054

EXHIBIT 6
PROPOSED ON-SITE DETENTION BASIN

SECTION 5 SUMMARY

The County of Kauai is proposing to develop a 72-acre parcel of land into an affordable housing community called Lima Ola. The proposed development will include 550 residential units (single family, multi-family and senior resident units), a community center and park, bike and pedestrian paths, landscaped areas, and an on-site detention basin. Currently the parcel of land is occupied with coffee fields by Kauai Coffee Company under a licensed agreement with the County of Kauai, which states that the Kauai Coffee Company is able to vacate the land until the County of Kauai proceeds with the proposed development project.

This Preliminary Drainage Analysis evaluated the existing drainage conditions and storm drainage facilities within the project area. Currently, the existing drainage area consists of approximately 88 acres of land and generates a peak discharge of 105 cfs based on a 2-year, 24-hour storm interval. Runoff generated from this drainage area sheet flows downstream into an existing 12-inch siphon vertical inlet pipe, located directly to the east of the existing Eleele Luna Subdivision offsite detention basin. Runoff that enters through the existing 12-inch pipe flows through a 24-inch drain pipe and outlets on the south side of Halewili Road, ultimately discharging into the Pacific Ocean.

An evaluation of the proposed drainage conditions was also performed to determine the impact of changes in the drainage conditions within the project site and to provide a conceptual drainage plan for the Lima Ola Development. The proposed drainage area will include the Lima Ola development and in addition, the mauka portion of land offsite of the project area, which is approximately 7 acres and naturally sheet flows runoff onto the Lima Ola project area. The proposed drainage area will be a total of approximately 79 acres and generate a peak discharge of 115 cfs based on a 2-year, 24-hour storm interval. The runoff generated from the Lima Ola Development will enter a drainage piping network that will direct runoff into an on-site detention basin. The on-site detention basin will be required to have a storage volume of 2.81 ac-ft and be designed to detain the proposed development runoff and discharge the runoff that matches the existing flow rate. The proposed development will also incorporate low impact development features such as grass swales to treat surface runoff and reduce flow velocities, along with other methods to assist in water quality for the development. The Lima Ola Development will not disturb upstream existing drainage conditions and will have no adverse drainage impacts to abutting properties.

The result of the proposed drainage system for the Lima Ola Development will be mitigated to handle the increase in storm runoff to match the existing drainage conditions. Therefore, there would be no adverse impact to areas downstream of the project area.

SECTION 6 REFERENCES

1. *Rainfall-Frequency Atlas of the Hawaiian Islands for Areas to 200 Square Miles, Durations to 24 Hours, and Return Periods from 1 to 100 Years*, Technical Paper No. 43, U.S. Commerce Department, Weather Bureau, Washington D.C., 1962.

2. *Storm Water Runoff System Manual*, Department of Public Works, County of Kauai, July 2001.

3. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*, U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C., August 1972.

4. *Urban Hydrology for Small Watersheds*, Technical Release 55, U.S. Department of Agriculture, Natural Resources Conservation Service, Second Edition, Washington, D.C., June 1986.

APPENDIX A

DRAINAGE DESIGN DATA AND CALCULATIONS

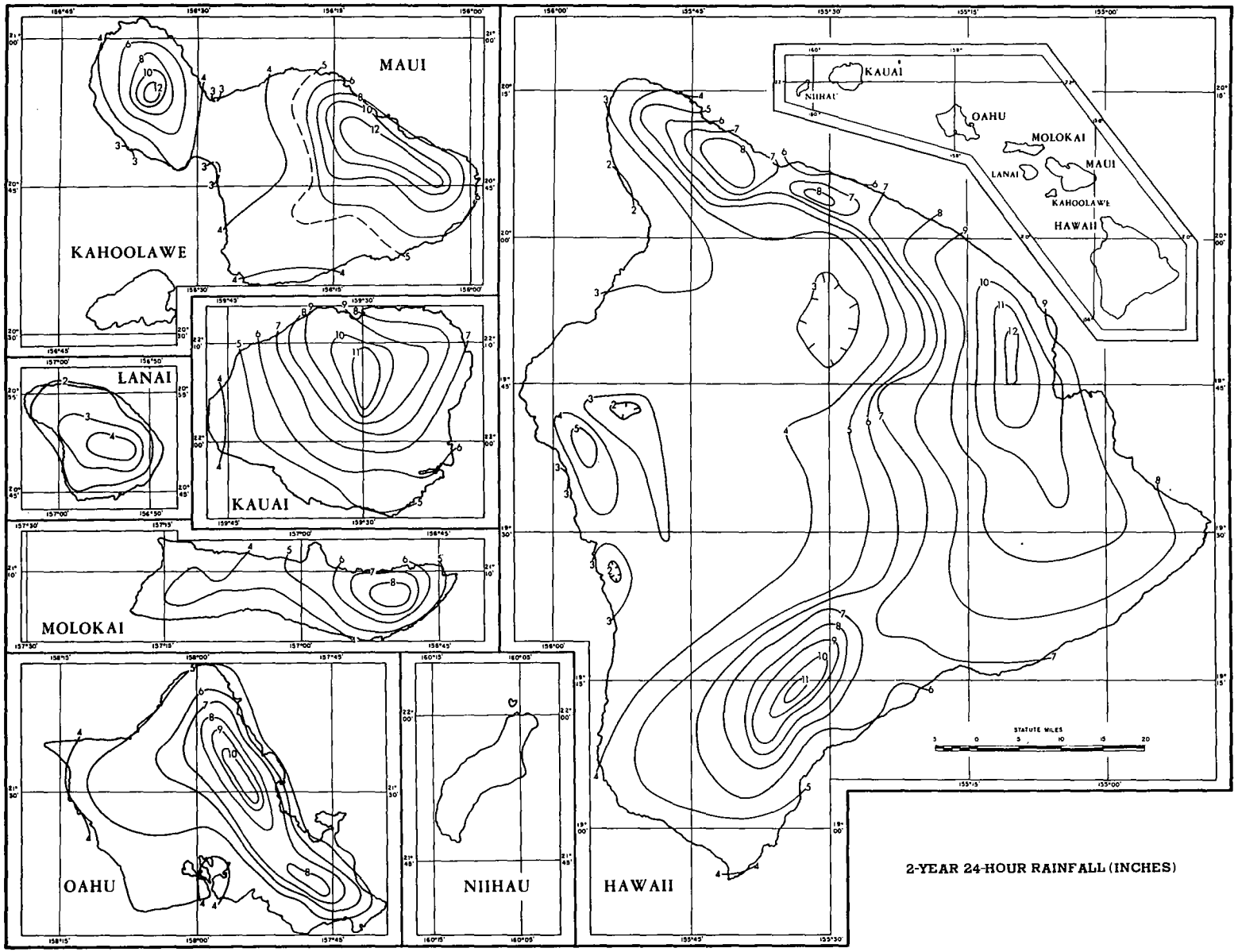
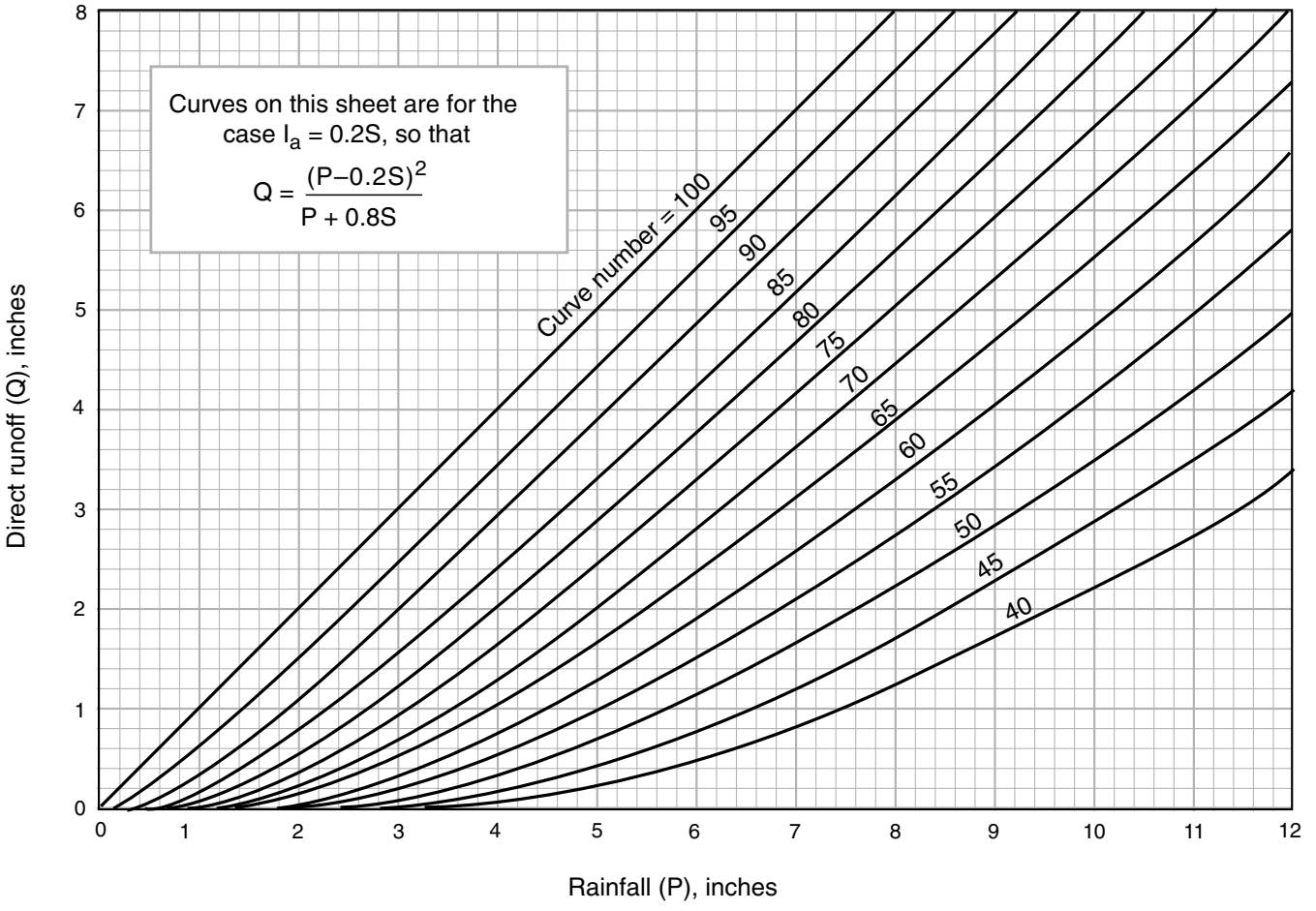


FIGURE 51.—2-yr. 24-hr. rainfall (in.)

Figure 2-1 Solution of runoff equation.



Cover type

Table 2-2 addresses most cover types, such as vegetation, bare soil, and impervious surfaces. There are a number of methods for determining cover type. The most common are field reconnaissance, aerial photographs, and land use maps.

Treatment

Treatment is a cover type modifier (used only in table 2-2b) to describe the management of cultivated agricultural lands. It includes mechanical practices, such as contouring and terracing, and management practices, such as crop rotations and reduced or no tillage.

Hydrologic condition

*Hydrologic condition i*ndicates the effects of cover type and treatment on infiltration and runoff and is generally estimated from density of plant and residue cover on sample areas. *Good* hydrologic condition indicates that the soil usually has a low runoff potential for that specific hydrologic soil group, cover type, and treatment. Some factors to consider in estimating the effect of cover on infiltration and runoff are (a) canopy or density of lawns, crops, or other vegetative areas; (b) amount of year-round cover; (c) amount of grass or close-seeded legumes in rotations; (d) percent of residue cover; and (e) degree of surface roughness.

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2/]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1/]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2/]	Hydrologic condition [3/]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

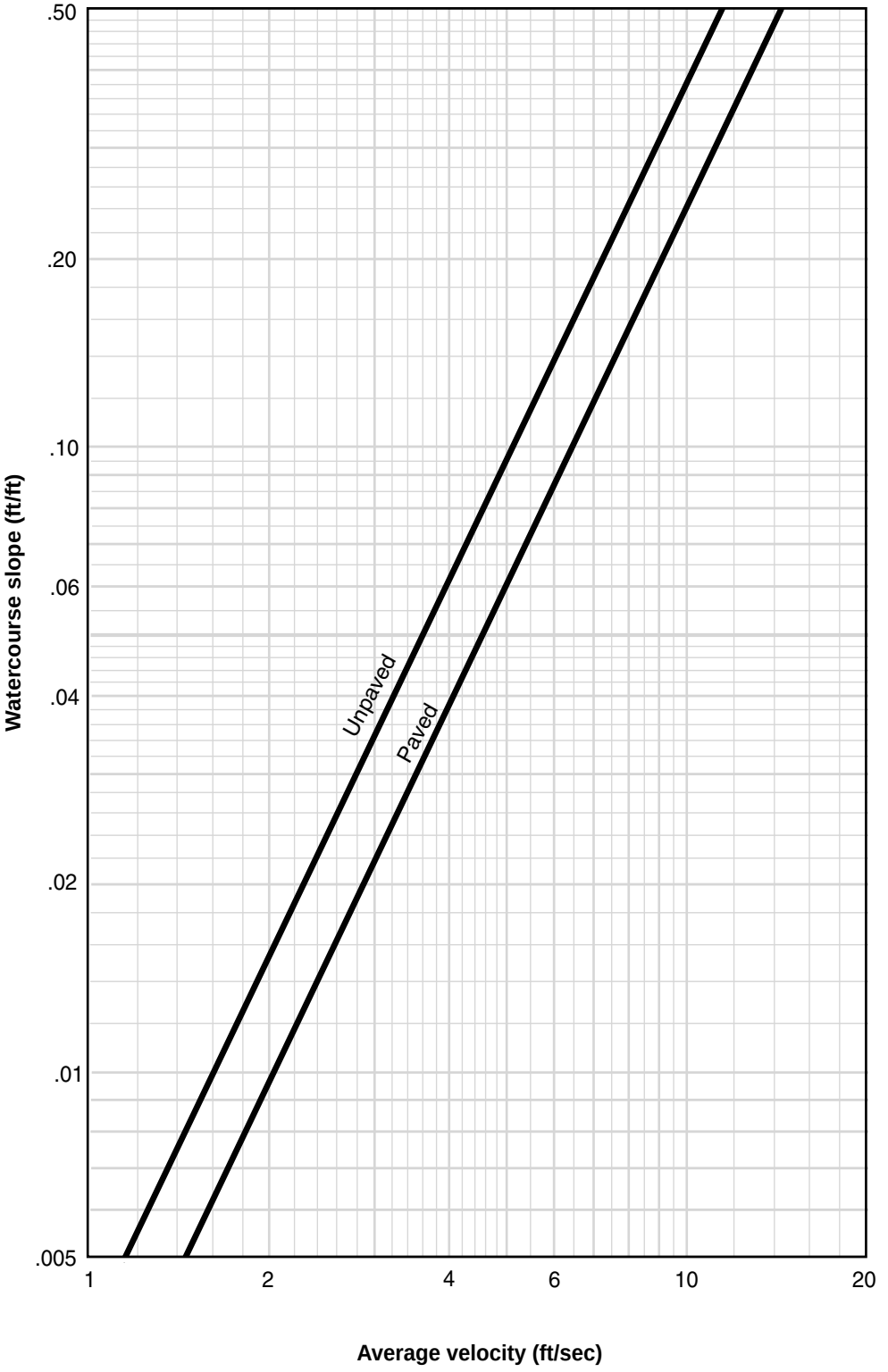
[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Figure 3-1 Average velocities for estimating travel time for shallow concentrated flow



Sheet flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. These n values are for very shallow flow depths of about 0.1 foot or so. Table 3-1 gives Manning's n values for sheet flow for various surface conditions.

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n [1/]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2/]	0.24
Bermudagrass .	0.41
Range (natural)	0.13
Woods:[3/]	
Light underbrush	0.40
Dense underbrush	0.80

1 The n values are a composite of information compiled by Engman (1986).

2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.

3 When selecting n , consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overtop and Meadows 1976) to compute T_t:

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}} \qquad \text{[eq. 3-3]}$$

where:

T_t = travel time (hr),
n = Manning's roughness coefficient (table 3-1)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ft)

This simplified form of the Manning's kinematic solution is based on the following: (1) shallow steady uniform flow, (2) constant intensity of rainfall excess (that part of a rain available for runoff), (3) rainfall duration of 24 hours, and (4) minor effect of infiltration on travel time. Rainfall depth can be obtained from appendix B.

Shallow concentrated flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from figure 3-1, in which average velocity is a function of watercourse slope and type of channel. For slopes less than 0.005 ft/ft, use equations given in appendix F for figure 3-1. Tillage can affect the direction of shallow concentrated flow. Flow may not always be directly down the watershed slope if tillage runs across the slope.

After determining average velocity in figure 3-1, use equation 3-1 to estimate travel time for the shallow concentrated flow segment.

Open channels

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bankfull elevation.

Chapter 4 Graphical Peak Discharge Method

This chapter presents the Graphical Peak Discharge method for computing peak discharge from rural and urban areas. The Graphical method was developed from hydrograph analyses using TR-20, "Computer Program for Project Formulation—Hydrology" (SCS 1983). The peak discharge equation used is:

$$q_p = q_u A_m Q F_p \qquad \text{[eq. 4-1]}$$

where:

q_p = peak discharge (cfs)
q_u = unit peak discharge (csm/in)
A_m = drainage area (mi^2)
Q = runoff (in)
F_p = pond and swamp adjustment factor

The input requirements for the Graphical method are as follows: (1) T_c (hr), (2) drainage area (mi^2), (3) appropriate rainfall distribution (I, IA, II, or III), (4) 24-hour rainfall (in), and (5) CN. If pond and swamp areas are spread throughout the watershed and are not considered in the T_c computation, an adjustment for pond and swamp areas is also needed.

Peak discharge computation

For a selected rainfall frequency, the 24-hour rainfall (P) is obtained from appendix B or more detailed local precipitation maps. CN and total runoff (Q) for the watershed are computed according to the methods outlined in chapter 2. The CN is used to determine the initial abstraction (I_a) from table 4-1. I_a / P is then computed.

If the computed I_a / P ratio is outside the range in exhibit 4 (4-I, 4-IA, 4-II, and 4-III) for the rainfall distribution of interest, then the limiting value should be used. If the ratio falls between the limiting values, use linear interpolation. Figure 4-1 illustrates the sensitivity of I_a / P to CN and P.

Peak discharge per square mile per inch of runoff (q_u) is obtained from exhibit 4-I, 4-IA, 4-II, or 4-III by using T_c (chapter 3), rainfall distribution type, and I_a / P ratio. The pond and swamp adjustment factor is obtained from table 4-2 (rounded to the nearest table value). Use worksheet 4 in appendix D to aid in computing the peak discharge using the Graphical method.

Figure 4-1 Variation of I_a / P for P and CN

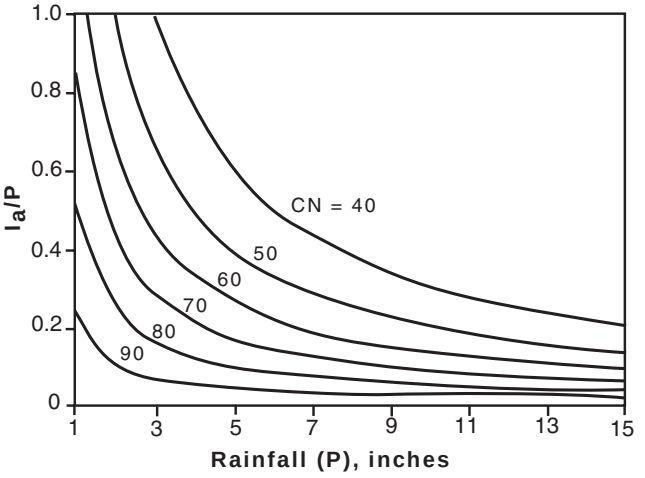


Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Table 4-2 Adjustment factor (F_p) for pond and swamp areas that are spread throughout the watershed

Percentage of pond and swamp areas	F_p
0	1.00
0.2	0.97
1.0	0.87
3.0	0.75
5.0	0.72

Limitations

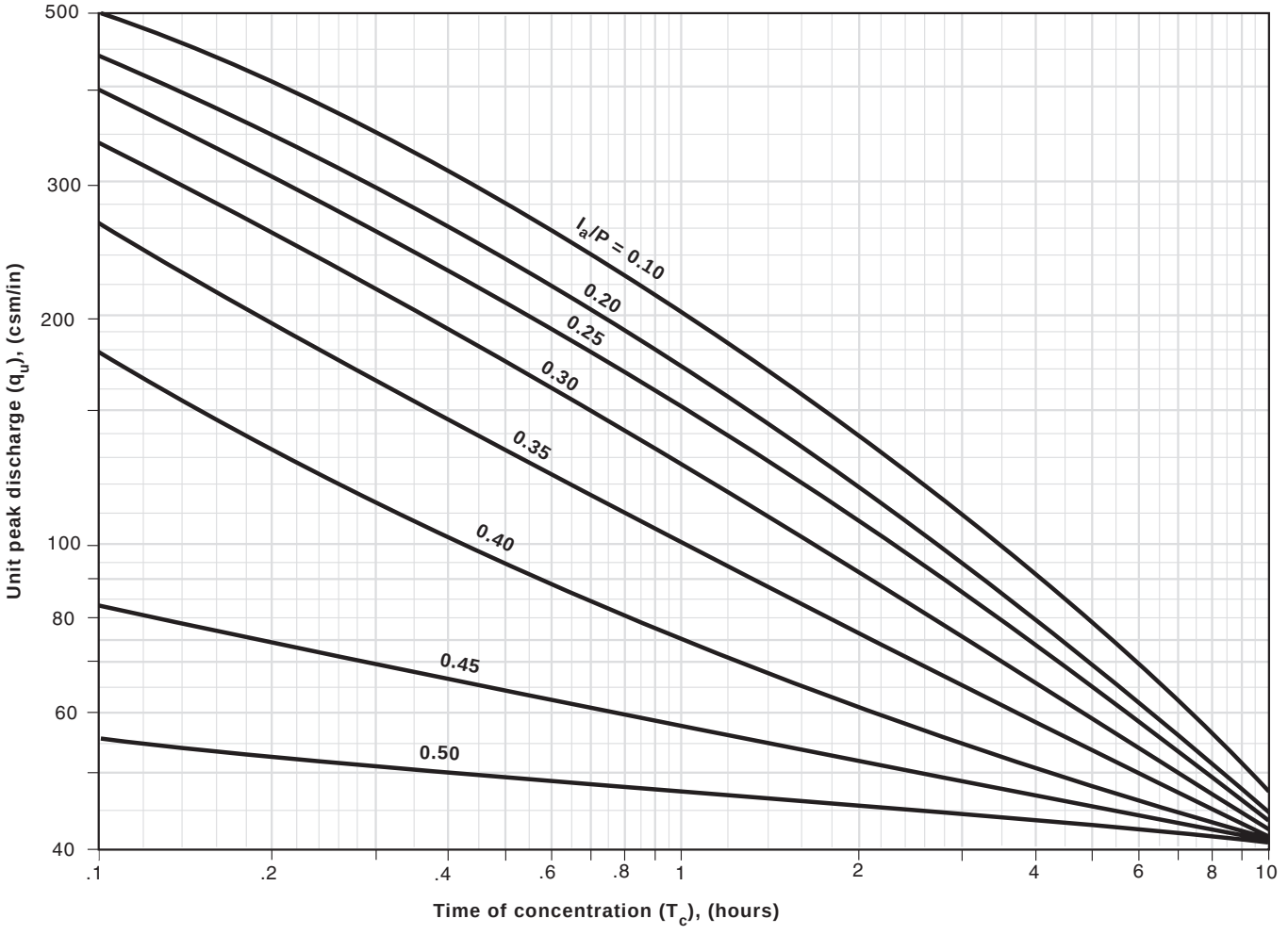
The Graphical method provides a determination of peak discharge only. If a hydrograph is needed or watershed subdivision is required, use the Tabular Hydrograph method (chapter 5). Use TR-20 if the watershed is very complex or a higher degree of accuracy is required.

- The watershed must be hydrologically homogeneous, that is, describable by one CN. Land use, soils, and cover are distributed uniformly throughout the watershed.
- The watershed may have only one main stream or, if more than one, the branches must have nearly equal T_C' s.
- The method cannot perform valley or reservoir routing.
- The F_p factor can be applied only for ponds or swamps that are not in the T_c flow path.
- Accuracy of peak discharge estimated by this method will be reduced if I_a / P values are used that are outside the range given in exhibit 4. The limiting I_a / P values are recommended for use.
- This method should be used only if the weighted CN is greater than 40.
- When this method is used to develop estimates of peak discharge for both present and developed conditions of a watershed, use the same procedure for estimating T_c.
- T_c values with this method may range from 0.1 to 10 hours.

Example 4-1

Compute the 25-year peak discharge for the 250-acre watershed described in examples 2-2 and 3-1. Figure 4-2 shows how worksheet 4 is used to compute q_p as 345 cfs.

Exhibit 4-I Unit peak discharge (q_u) for NRCS (SCS) type I rainfall distribution



A-1:
EXISTING DRAINAGE CONDITIONS

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Lima Ola Workforce Housing		04/20/17
Location	**Checked**	**Date**
Eleele, Kauai, Hawaii		

Check one: ☑ Present ☐ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area ☐ acres ☐ mi² ☑ %	Product of CN x area
Makaweli (MgB) Group B	Row Crops, Straight Row (SR)	81			85	6885
Makaweli (MgC) Group B	Row Crops, Straight Row (SR)	81			15	1215
1/ Use only one CN source per line				**Totals** ➡	100	8100

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8100}{100} = 81$; **Use CN** ➡ 81

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	2	100	
Rainfall, P (24-hour)	in	4.8	12	
Runoff, Q	in	2.81	9.58	

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1/]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2/]	Hydrologic condition [3/]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Lima Ola Workforce Housing		04/20/17
Location	**Checked**	**Date**
Eleele, Kauai, Hawaii		

Check one: ☑ Present ☐ Developed

Check one: ☑ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

Segment ID	Existing	
1. Surface description (table 3-1)	Cultivated Soils: Residue Cover >20%	
2. Manning's roughness coefficient, n (table 3-1)	0.17	
3. Flow length, L (total L † 300 ft) ft	300	
4. Two-year 24-hour rainfall, P_2 in	4.8	
5. Land slope, s ft/ft	0.04	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	0.27 +	= 0.27

Shallow concentrated flow

Segment ID	Existing	
7. Surface description (paved or unpaved)	Unpaved	
8. Flow length, L ft	3207	
9. Watercourse slope, s ft/ft	0.04	
10. Average velocity, V (figure 3-1) ft/s	3.2	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t hr	0.28 +	= 0.28

Channel flow

Segment ID		
12. Cross sectional flow area, a ft^2		
13. Wetted perimeter, p_w ft		
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft		
15 Channel slope, s ft/ft		
16. Manning's roughness coefficient, n		
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s		
18. ~~Flow~~ length, L ft		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t hr	+	=

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr 0.55

Worksheet 4: Graphical Peak Discharge method

Project	By	Date
Lima Ola Workforce Housing		04/20/17
Location	**Checked**	**Date**
Eleele, Kauai, Hawaii		

Check one: ☑ Present ☐ Developed

1. Data

Drainage area ..... A_m = 0.1375 mi^2 (acres/640)

Runoff curve number .....CN = 81 (From worksheet 2)

Time of concentration ..... T_c = 0.55 hr (From worksheet 3)

Rainfall distribution ..... = I (I, IA, II III)

Pond and swamp areas sprea throughout watershed ..... = 0 percent of A_m (0 acres or mi^2 covered)

	Storm #1	Storm #2	Storm #3
2. Frequency ..... yr	2	100	
3. Rainfall, P (24-hour) ..... in	4.8	12	
4. Initial abstraction, I_a ..... in (Use CN with table 4-1)	0.469	0.469	
5. Compute I_a / P	0.098	0.04	
6. Unit peak discharge, q_u ..... csm/in (Use T_c and I_a / P with exhibit 4– I)	270	270	
7. Runoff, Q ..... in (From worksheet 2) Figure 2-6	2.81	9.58	
8. Pond and swamp adjustment factor, F_p ..... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond ans swamp area.)	1.00	1.00	
9. Peak discharge, q_p ..... ft^3/s	104.33	355.66	

(Where $q_p = q_u A_m Q F_p$)

A-2:
PROPOSED DRAINAGE CONDITIONS

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Lima Ola Workforce Housing		04/20/17
Location	**Checked**	**Date**
Eleele, Kauai, Hawaii		

Check one: ☐ Present ☑ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Figure 2-3	CN [1/] Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
Makaweli Group B	Residential	85			56.39	4793.15
Makaweli Group B	Community Park (Poor Condition)	79			3.06	241.74
Makaweli Group B	Roadway	89			8.25	734.25
Makaweli Group B	Landscape	61			4.30	262.3
Makaweli Group B	Row Crops, Straight Row (SR)	81			7	567
				Totals ➡	79	6598.44

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{6598.44}{79} = 83.52$; **Use CN** ➡ 84

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	2	100	
Rainfall, P (24-hour)	in	4.8	12	
Runoff, Q	in	3.09	9.98	

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2/]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1/]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2/]	Hydrologic condition [3/]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Lima Ola Workforce Housing		04/20/17
Location	**Checked**	**Date**
Eleele, Kauai, Hawaii		

Check one: ☐ Present ☑ Developed

Check one: ☑ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID		
1. Surface description (table 3-1)			
2. Manning's roughness coefficient, n (table 3-1)			
3. Flow length, L (total L † 300 ft) ..... ft			
4. Two-year 24-hour rainfall, P_2 ..... in			
5. Land slope, s ..... ft/ft			
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t ..... hr		+	=

Shallow concentrated flow

	Segment ID	Lima Ola	Lima Ola Park	
7. Surface description (paved or unpaved)		Unpaved	Unpaved	
8. Flow length, L .....ft		3953	499	
9. Watercourse slope, s ..... ft/ft		0.04	0.01	
10. Average velocity, V (figure 3-1) ..... ft/s		3.2	1.6	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t ..... hr		0.343	+ 0.087	= 0.43

Channel flow

	Segment ID		
12. Cross sectional flow area, a ..... ft^2			
13. Wetted perimeter, p_w ..... ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ..... ft			
15 Channel slope, s ..... ft/ft			
16. Manning's roughness coefficient, n			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V .....ft/s			
18. ~~Flow~~ length, L ..... ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t ..... hr		+	=

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... Hr 0.43

Worksheet 4: Graphical Peak Discharge method

Project	By	Date
Lima Ola Workforce Housing		04/20/17
Location	**Checked**	**Date**
Eleele, Kauai, Hawaii		

Check one: ☐ Present ☑ Developed

1. Data

Drainage area ..... A_m = 0.1234 mi^2 (acres/640)

Runoff curve number .....CN = 84 (From worksheet 2)

Time of concentration ..... T_c = 0.43 hr (From worksheet 3)

Rainfall distribution ..... = I (I, IA, II III)

Pond and swamp areas sprea throughout watershed ..... = 0 percent of A_m (0 acres or mi^2 covered)

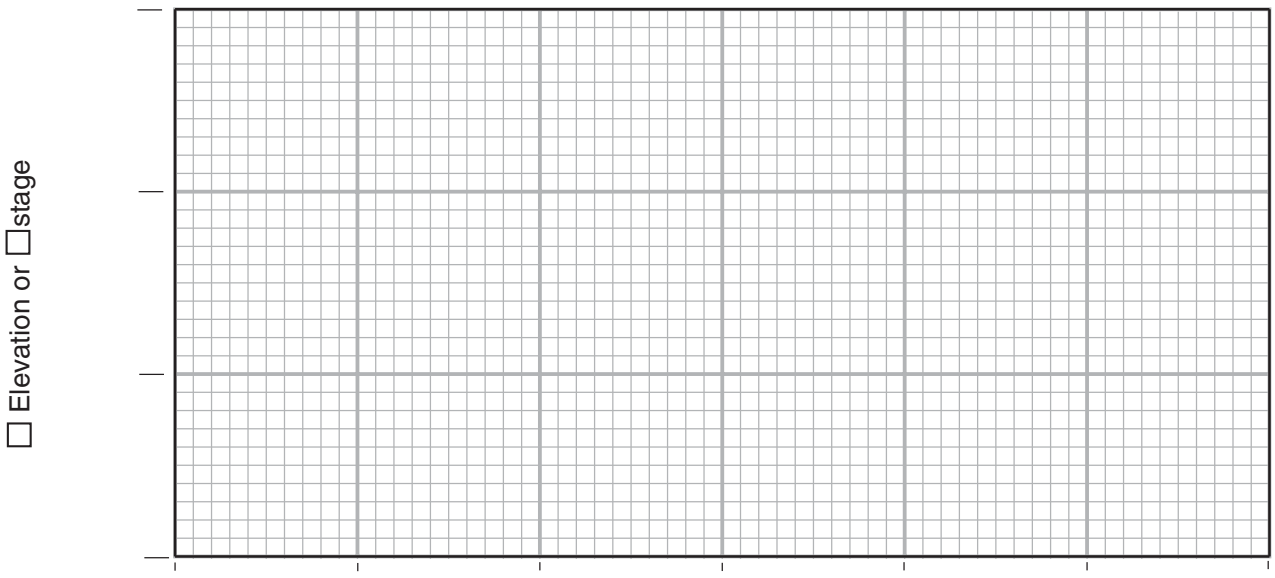
	Storm #1	Storm #2	Storm #3
2. Frequency ..... yr	2	100	
3. Rainfall, P (24-hour) ..... in	4.8	12	
4. Initial abstraction, I_a ..... in (Use CN with table 4-1)	0.381	0.381	
5. Compute I_a / P	0.079	0.032	
6. Unit peak discharge, q_u ..... csm/in (Use T_c and I_a / P with exhibit 4– I)	300	300	
7. Runoff, Q ..... in (From worksheet 2) Figure 2-6	3.09	9.98	
8. Pond and swamp adjustment factor, F_p ..... (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond ans swamp area.)	1.00	1.00	
9. Peak discharge, q_p ..... ft^3/s	114.39	369.46	

(Where $q_p = q_u A_m Q F_p$)

Worksheet 6a: Detention basin storage, peak outflow discharge (q_o) known

Project	By	Date
Lima Ola Workforce Housing		04/20/17
Location	**Checked**	**Date**
Eleele, Kauai, Hawaii		

Check one: ☐ Present ☑ Developed



1. Data:
   Drainage area ..... A_m = 0.1234 mi^2
   Rainfall distribution type (I, IA, II, III) = I

	1st Stage	2nd Stage
2. Frequency ..... yr	2	
3. Peak inflow discharge q_i ..... ft^3/s (from worksheet 4 or 5b)	115	
4. Peak outflow discharge q_u ..... ft^3/s [1/]	91	
5. Compute $\frac{q_o}{q_i}$	0.84	
6. $\frac{V_s}{V_r}$ ..... (Use $\frac{q_o}{q_i}$ with figure 6-1)	0.138	
7. Runoff, Q ..... in (From worksheet 2)	3.09	
8. Runoff volume V_r..... ac ft ($V_r = QA_m$ 53.33)	20.34	
9. Storage volume, V_s ..... ac-ft ($V_s = V_r (\frac{V_s}{V_r})$)	2.81	
10. Maximum storage E_{max} (from plot)		

[1/] 2nd stage q_o includes 1st stage q_o.