PRELIMINARY ENGINEERING REPORT INCLUDING TRAFFIC IMPACT ANALYSIS REPORT

APPENDIX

I

DRAFT FINAL

PRELIMINARY ENGINEERING REPORT

HŌKŪAO 201H HOUSING PROJECT

Lanai City, Lanai, Hawaii

TMK: (2) 4–9–002:061 por.,
TMK: (2) 4–9–014:001por.,
TMK: (2) 4–9–014:009 por., and
TMK: (2) 4–9–014:011 por.

JANUARY 28, 2019

PREPARED FOR:

Pūlama Lāna`i
733 Bishop Street, Suite 2000
Honolulu, Hawaii 96813

R. M. TOWILL CORPORATION
SINCE 1930

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(RMTC Ref: 1-22770-00)

1. GENERAL

1.1 Background

The proposed Hōkūao 201H Housing Project comprises approximately 50 acres of land in the Kamoku Ahupuaa of Lana'i Island. The irregularly shaped project area is located immediately west of and downslope from Lana'i City center. The site is bounded on the east by Fraser Avenue and two church parcels; on the north by 9th Street and a dirt road. Most of the western boundary is marked by the chain-link fence boundary of the wastewater treatment plant, while the southern boundary follows 12th Street and Awalua Avenue as Shown on Figure 1-1.

The proposed project has been titled "Hōkūao 201H Housing Project" identified on tax maps as TMK: (2) 4–9–002:061 por., TMK: (2) 4–9–014:001por., TMK: (2) 4–9–014:009 por., and TMK: (2) 4–9–014:011 por.

TMK: (2) 4–9–002:061 is a large parcel of approximately 16,124 ac. and includes both undeveloped lands and abandoned pineapple fields.
TMK: (2) 4–9–014:001 is an approximately 84 ac. parcel that is currently used for storage, the Pulama Lana'i Nursery, and community gardens for Lana'i residents.
TMK: (2) 4–9–014:009 comprises approximately 25.65 ac. and is the location of the island's original power plant, now abandoned, and the graded yard used to store shipping containers.
TMK: (2) 4–9–014:011 is a smaller parcel of approximately 18.7 ac. Immediately abutting the proposed enhancements to 9th Street extending into the project site.

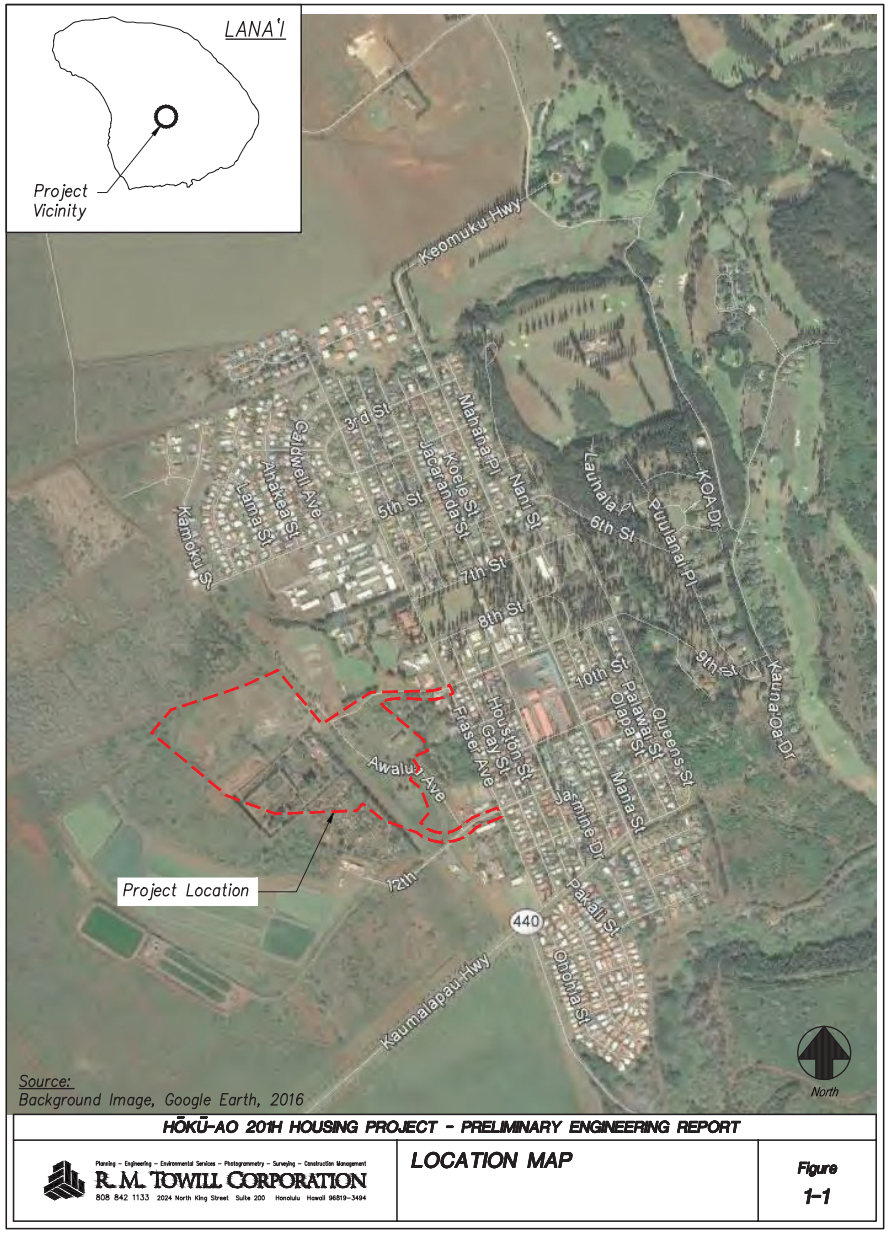
The parcels comprising the proposed Hōkūao Housing project area are owned by Lana'I Resorts, LLC?.

The project is sited close to Dole Park to take advantage of its walkable proximity to shops, groceries, educational, and entertainment venues. The project visually and physically connects to the town via 9th Street and 12th Avenue road extensions, continuing the existing street grid pattern into the new development. 9th Street will also have a wide concrete bike/walk path connecting the community to Fraser Avenue.

Along the Northeast boundary bordering the school fields, the project provides a one-acre park, a 1,500 square foot pavilion, comfort stations, and 100 parking stalls for use by the facility and as overflow parking for events at Lana'i School field.

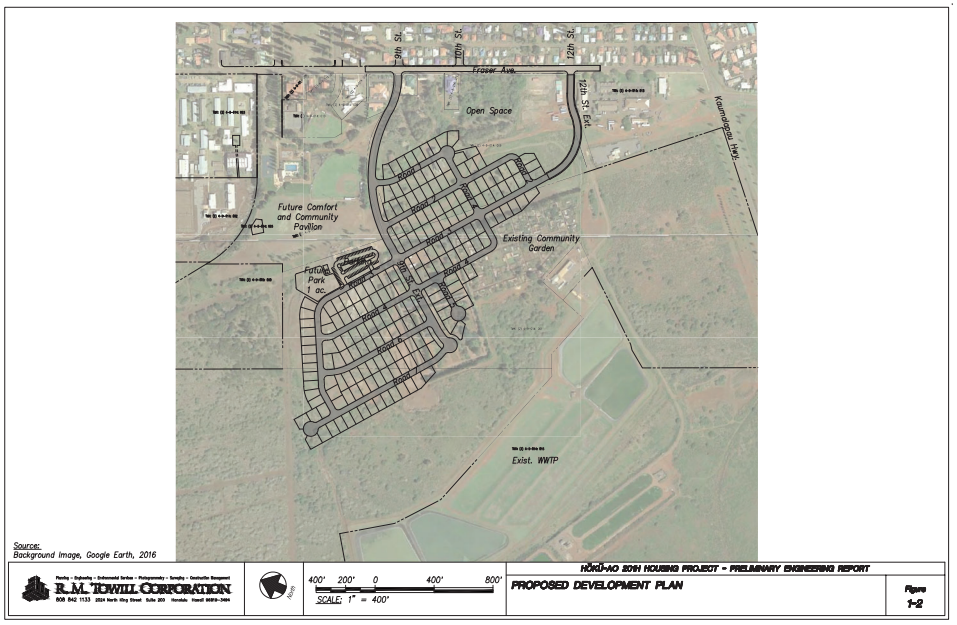
The Hōkūao project proposes construction of 200 single family homes, comprised of 102 affordable homes exclusively for purchase by buyers falling within the HUD 2018 low-income guidelines, and 98 market-rate homes. All lots will typically be 6,000 sf minimum, with a few 6,100 sf lots on irregularly shaped corners as shown on **Figure 1-2**.

Most of the project area's topography consists of flat to gently sloping open, patchy forest and scrub lands. An existing drainage swale on the western boundary of the site carries storm water away from the existing town and community center. On the western flank, the project sets back from the existing wastewater treatment plant with a 600 foot buffer between the closest lot and the WWRF boundary.



1.2 Objectives and Scope

This Preliminary Engineering Report provides a summary of the traffic, water, wastewater and electrical/telecommunications demands and storm water runoff impacts due to the proposed improvements. The report will identify impacts of the proposed improvements on the existing offsite regional roadway, water, wastewater, drainage and electrical/communication facilities.



2. EXISTING CONDITIONS

2.1 Site Characteristics

The study area (project) is in Lana'i City and includes the undeveloped lands and abandoned pineapple fields, Pulama Lana'i Nursery and community gardens and an abandoned power plant.

2.2 Topography and Soil

Most of the project area topography consists of flat to gently sloping open, patchy forest and scrub lands as shown on **Figure 2-1**. The approximate range of ground slopes and elevations, estimated from a previous aerial topography map, is 3% to 20% and ~1520 ft. to ~1610 ft. msl.

Based on the U.S. Soil Conservation Service Soil Survey (1972), the majority of existing soils within the project site are classified as Waihuna Clay (WoA). Waihuna Clay has slopes that range from 0%-3%. This type of soil generally has a surface layer, about 18-inches thick, of dark brown, very sticky and very plastic clay. The lower layer can vary to more than 50-inches thick and consists of dark brown, very stick and very plastic clay and silty clay that has sub angular blocky structure. Permeability is moderately slow, runoff is slow, and erosion hazard is no more than slight. The soil is strongly acid in the surface layer as a result of pineapple culture, but it is neutral to medium acid in the rest of the profile. It is prone to cracking when the soil dries.

The eastern and western portions of the site are classified as Lahaina Silty Clay (LaB). Slopes range from 3%-7%, with a surface layer of dark reddish-brown, silty clay, about 15-inches thick. Permeability is moderate, runoff is slow, and erosion hazard is slight. The soil is medium acid in the surface layer and slightly acid to medium acid in the subsoil.

Minute portions of the northern eastern and central part of the site are classified as Lahaina Silty Clay 0%-3% (LaA) and Lahaina Silty Clay 7%-15% (LaC). These soils have characteristics similar to Lahaina Silty Clay (LaB). On the portions with slopes ranging from 0%-3%, the soil runoff is slow and the erosion hazard is no more than slight. On the portions with slopes ranging from 7%-15%, the runoff is medium and the erosion hazard is moderate. The soils map indicating the various types of soils within the project limits is shown on **Figure 2-2**.

2.3 Climate

The project site is located in central Lanai, and receives a moderate amount of rainfall each year. The average annual rainfall is approximately 34 inches. The wettest month is January, with an average monthly total of approximately 5 inches. The driest month is August, with an average total of 1.5 inches. The average annual air temperature is approximately 69 degrees F.

2.4 Existing Roadway System

The existing roadways in the vicinity of the project include Kaumalapau Highway (State Department of Transportation, DOT), Fraser Avenue (County), 9th St. (County), and 12th St. (County) as shown on **Figure 2-3**. The existing traffic conditions are also discussed in the attached Traffic Impact Analysis (Attachment 1).

2.5 Existing Water System

The Lanai Water Company (LWC) privately owns the domestic water system servicing the proposed. The existing regional schematic water system consists of a 12-inch waterline on Frasier Avenue.

The water for this system is provided by existing groundwater sources and the water quality has met all State of Hawaii regulations for drinking water. All water quality monitoring required by the State of Hawaii Department of Health, Safe Drinking Water Branch, Annual Consumer Confidence Reports are provided to all customers.

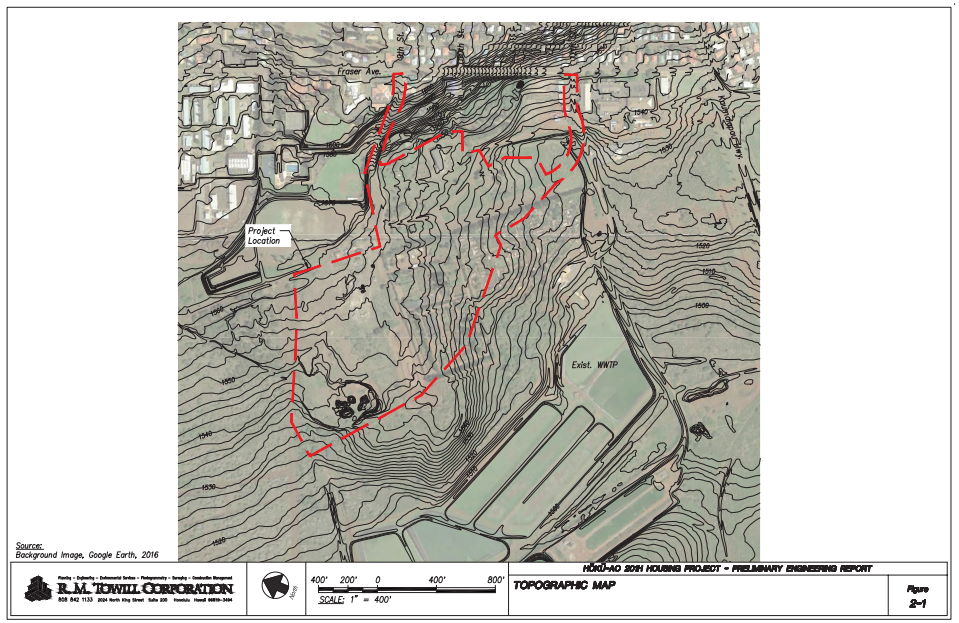
2.5.1 Existing Water Demands

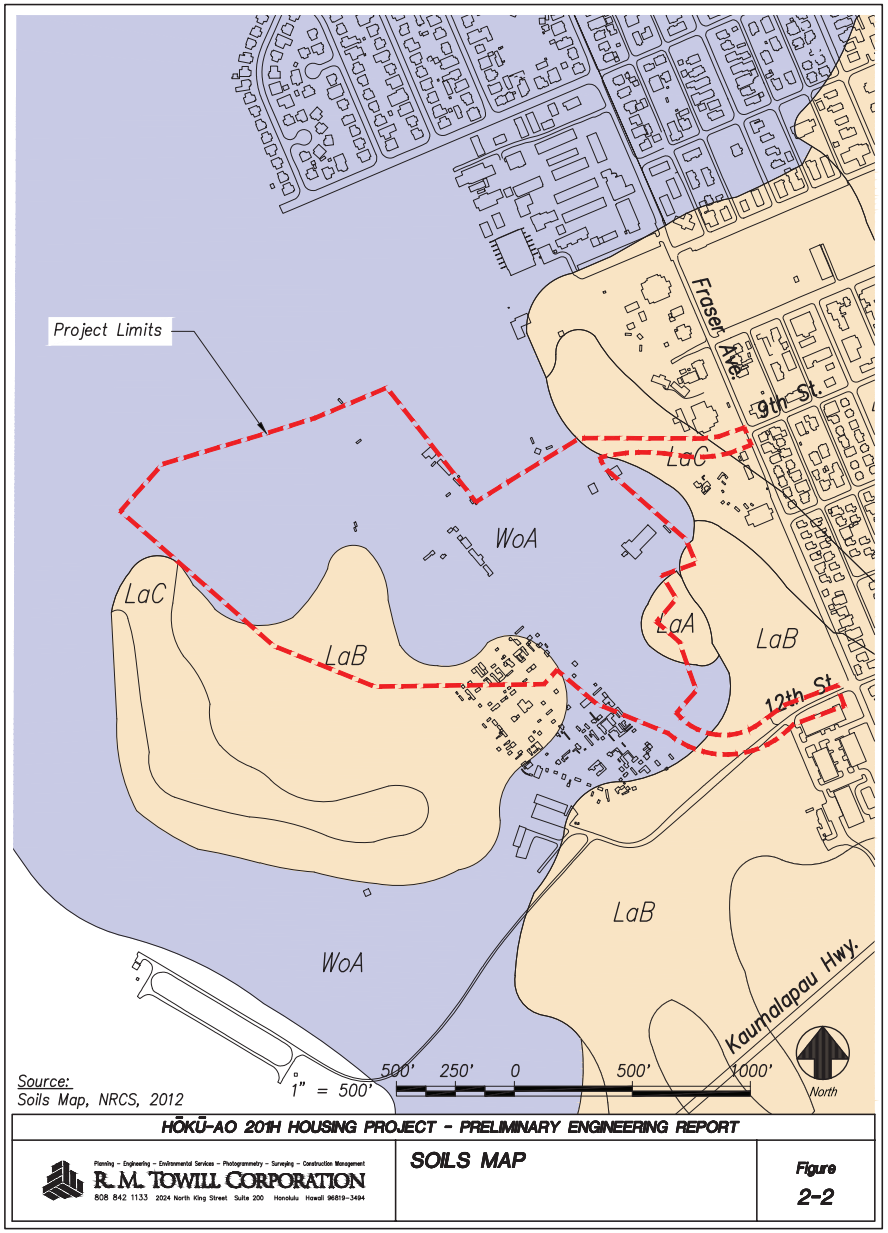
The site includes the Pulama Lana'i Nursery and community gardens which are the only users of water on the site. The nursery and community gardens will be relocated south of the project site.

2.5.2 Existing Water Source and Storage

The water system for Lanai is owned and operated by the Lanai Water Company and is divided into nine (9) aquifer systems for the island. The Project falls within the Leeward Aquifer.

Water feeding the area is pumped primarily from Well No. 3, 6 and 8, which are located to the east of the project site, on the slopes of Lanaihale. The pumped water is stored in a 0.75 million gallon (MG) Koele Tank and the 2 MG tank. Water pressure exceeds 80 psi in some areas of this system, and individual pressure reducing valves are required. Fire flows are adequate for all service areas. The existing water system and regional schematic water system are shown on **Figure 2-4** and **Figure 2-5**.





2.6 Existing Wastewater System

The existing wastewater system flows through or adjacent to the proposed project to the wastewater treatment plant. The existing wastewater system is shown on **Figure 2-6**.

2.6.1 Existing Wastewater Demands

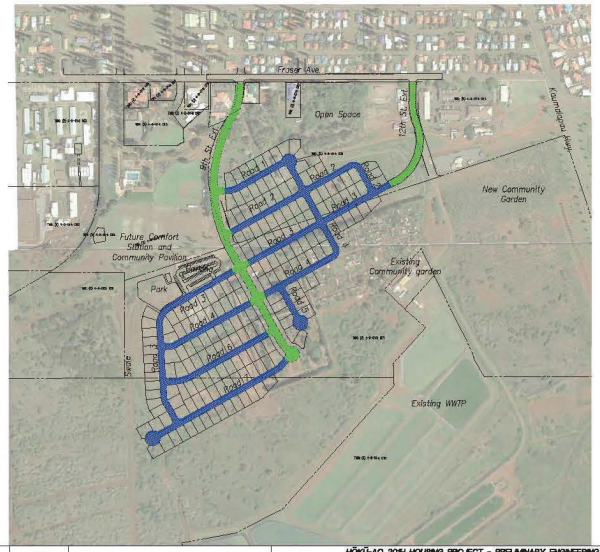
The project site does not presently generate any wastewater demand.

2.6.2 Existing Wastewater Treatment

Based on as-built plans of the Lanai Sewerage System and Waialua Annex Subdivision, sewer mains are located in Fraser Ave., as well as the County's major sewer collector lines which are located through the proposed project. Existing 10-inch and 12-inch sewer lines route sewage from the existing residential subdivision along 5th Street to the 15-inch interceptor sewer which discharges to the wastewater reclamation facility west of the project site. The existing main along Fraser Avenue consists of an 8" pipe of unidentified material, and the collector lines are a 10" vitrified clay pipe, and a 12" pipe of unidentified material.

The 8" main serves the portion of Lanai City below Ilima Ave., between 8th and 12th streets. The 10" collector line serves the entire half of Lanai City to the north of 7th street. The 12" collector line serves the western portion of Lanai City, below Fraser Ave. The collector lines merge and flow to the Lanai Wastewater Reclamation Facility (WWRF). The existing 10-inch and 12-inch collector lines will need to be relocated within proposed street right of ways and connected back to the 15-inch interceptor sewer going to the WWRF. Easements within privately owned residential lots will not be accepted by the County.

Per the County's Department of Environmental Management, Wastewater Reclamation Division, the capacity of the Lanai WWRF is 0.50 million gallons per day (mgd). The actual average daily flow is approximately 0.315 mgd, and allocations totaling 0.395 have been granted to existing development. The project is located just north of the boundary of the WWRF.



LEGEND:

- 50' R/W (9th and 12th St. Extensions)
- 40' R/W (Neighborhood Roads)

Source:
Background Image, Google Earth, 2016

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400' 200' 0 400' 800'
SCALE: 1" = 400'

HŌKŪ-AO 20H HOUSING PROJECT - PRELIMINARY ENGINEERING REPORT

PROPOSED ROADWAY PLAN

Figure 2-3

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500' 250' 0 500' 1000'
SCALE: 1" = 500'

HŌKŪ-AO 20H HOUSING PROJECT - PRELIMINARY ENGINEERING REPORT

EXISTING WATER SYSTEM

Figure 2-4

2.7 Existing Storm Water Runoff Patterns

Runoff from the project area generally sheet flows west towards the Lanai City WWRF and then south towards Kaumalapau Highway. Runoff from portions of the project flows north towards 5th Street. The Koele and Lanai City drainage systems mauka of the project area convey storm runoff away from the project. The Federal Emergency Management Agency has designated the area as Zone X, Area of Minimal Flood Hazard as shown in **Figure 2-7**.

2.7.1 Existing Regional Drainage System

Based on the Lanai City DMP and Koele DMP, there are three major sub watersheds that contribute flows to Kapano Gulch. Kapano/Lanai City, Kapano, and Kaumalapau sub watersheds and consists of drainage areas greater than 100 acres and were studied for impacts to Lanai City and other downstream areas.

The Kapano/Lanai City sub watershed shown as Watershed Designation 2 on **Figure 2-8**, has an area of 161 acres that drains into an interceptor ditch along the boundary between Lanai City and Koele Resort. The interceptor ditch starts at 6th Street, runs above Queens Street, across 9th Street and the mauka extension of Kaumalapau Road, and eventually drains into Kapano Gulch just above Lanai City.

The Kapano sub watershed shown as Watershed Designation 3 has an area of 386 acres and makes up Kapano Gulch. It begins approximately 1.6 miles mauka of the project site, and drains into the Palawai Basin near the southern end of Lanai City. The length to width ratio for Kapano Gulch is approximately 1.7.

The Kaumalapau sub watershed shown as Watershed Designation 6 has an area of 105 acres, and lies between Dole Park and Kaumalapau Road.

2.7.2 Existing Drainage System

As described in the Lanai City Drainage Master Plan, runoff from the land mauka of the project is conveyed by drain pipes and along Frasier Avenue, and streets parallel to Frasier Avenue, to the ditch along Kaumalapau Road that turns south, mauka of Manele Road, and which flows to Kapano Gulch. Kapano Gulch runs along the south side of Lanai City and drains into two dry, abandoned reservoirs before entering Palawai Basin through a series of abandoned irrigation ditches.

The Palawai Basin is a large plateau area, approximately 4.5 miles in diameter, which floods for prolonged periods of time during the rainy season.

Runoff from the site generally sheet flows to the south-southwest, following the existing ground slope towards the WWRF and then towards Kaumalapau Highway. The northern areas flow towards 5th Street. The existing drain areas and drainage system are shown on **Figure 2-9 and 2-10**.

2.8 Existing Electrical and Telecommunications System

The sole electric utility serving the island of Lanai is Maui Electric Company which operates and is regulated under a tariff approved by the State Public Utilities Commission (PUC). Similarly, Hawaiian Telecom (HTCO) operates and is regulated under a tariff approved by the PUC and was the sole provider of telecommunications services until the advent of cable television. Subsequently, Spectrum (fka Oceanic Time Warner Cable), which is not regulated by the State PUC but is a franchisee of the Department of Commerce and Consumer Affairs (DCCA), has become a competitor to HTCO and, similar to HTCO, can offer broadband, cable television and telephone signals.

2.8.1 Existing Power Generation

Maui Electric Co.'s (MECO) existing generation system, on the Island of Lanai, is currently capable of providing approximately 9.4 Megawatts (Mw) of power (based on MECO's 30 January 2018 Availability of Supply letter). In 2017, peak demand on the Island of Lanai, as indicated in their letter, was 5.4 Mw.

2.8.2 Existing Electrical and Telecommunications Distribution System

Under rights granted under the Kingdom of Hawaii, in MECO's case, and during the government of the Territory of Hawaii, in HTCO's case, the infrastructure of both these companies may occupy public rights-of-ways. It has come to be generally accepted that the term "infrastructure" includes both overhead and underground facilities. Hawaii Revised Statute Article 440G-8.2, established the ability for cable franchisees to occupy, subject to the rules and regulations imposed on the PUC-regulated utilities, to occupy public rights-of-ways.

On Lanai, the majority of the land and roadways are privately owned. The utility companies have received grants of easement from the landowner, formerly Lana'i Company and presently Pulama Lana'I, for some of their joint utility poleline

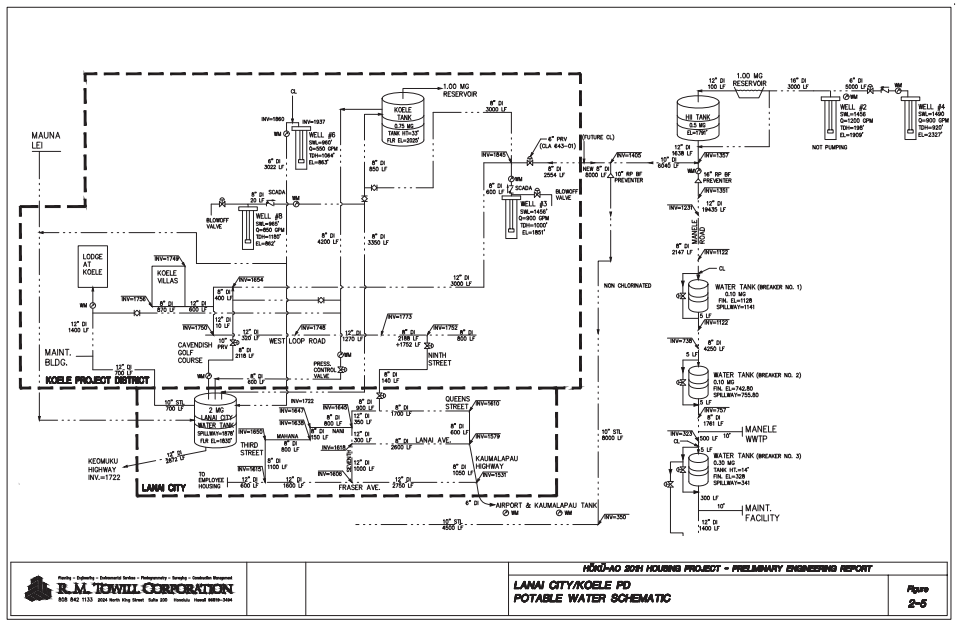
installations on Lanai and utilize existing roadways in a manner similar to County-dedicable roadways as shown on **Figure 2-11**. It should be noted that some of these grants of easement contain a "one-time" relocation clause, which obligates the respective utility companies to relocate the existing overhead facilities, at their cost, in exchange for a new perpetual grant-of-easement. It should further be noted that as of mid-October 2018, under a PUC Decision and Order (D& O), with the exception of the Island of Kauai, ownership of existing joint pole facilities was concentrated into the respective electrical utility companies serving those Islands. Existing utility pole lines that support only telecommunication cables are still owned by HTCO. Under the same PUC D & O, all franchised telecommunications companies desiring to attach to existing or new, overhead utility pole facilities would now lease attachment space from the respective electric utility companies instead of becoming joint pole owners.

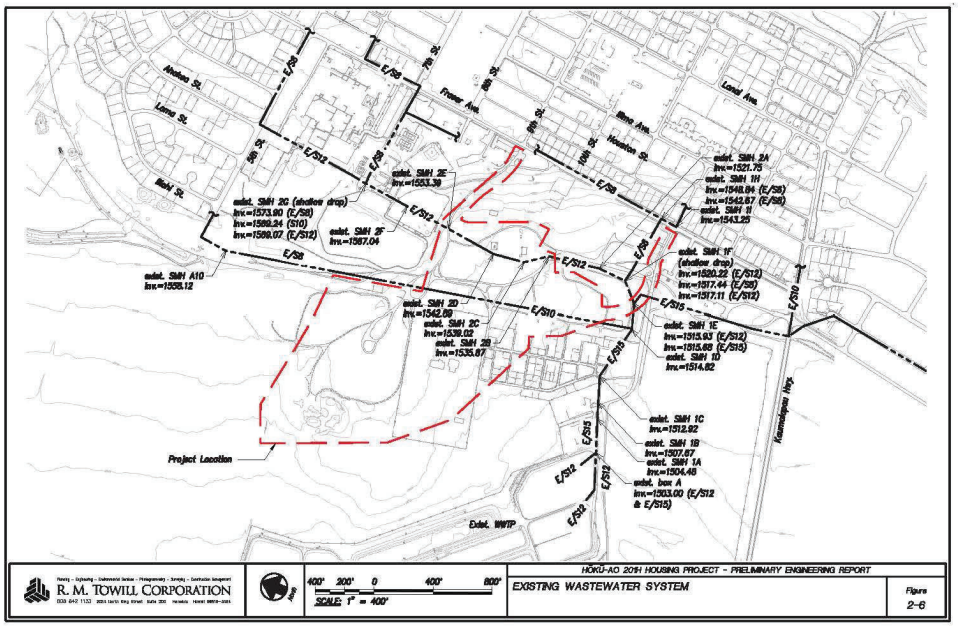
To obtain approval to attach to existing telecommunication-only utility pole lines, Spectrum must lease space from HTCO, as the utility pole owner.

MECO's, HTCO's, and Spectrum's existing facilities serving Lanai consist mainly of aerial cables attached to overhead utility pole lines along most of the roadways in the Lanai City.

2.8.3 Existing Electrical Substation

A MECO 12.47-2.4 kV substation and incoming and outgoing overhead lines are currently situated within the proposed subdivision footprint. This substation and the 2.4 kV overhead lines currently provide service to the existing Lana'i City residences and must be relocated outside of the proposed subdivision prior to development occurring.





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HŌKŪ-AO 201H HOUSING PROJECT - PRELIMINARY ENGINEERING REPORT

EXISTING WASTEWATER SYSTEM

Figure 2-6

NFIP

PANEL 0500F

FIRM

FLOOD INSURANCE RATE MAP

MAUI COUNTY, HAWAII

PANEL 500 OF 825

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MAUI COUNTY	150003	0500	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
1500030500F

MAP REVISED
SEPTEMBER 19, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Planning - Engineering - Environmental Services - Photogrammetry - Surveying - Construction Management

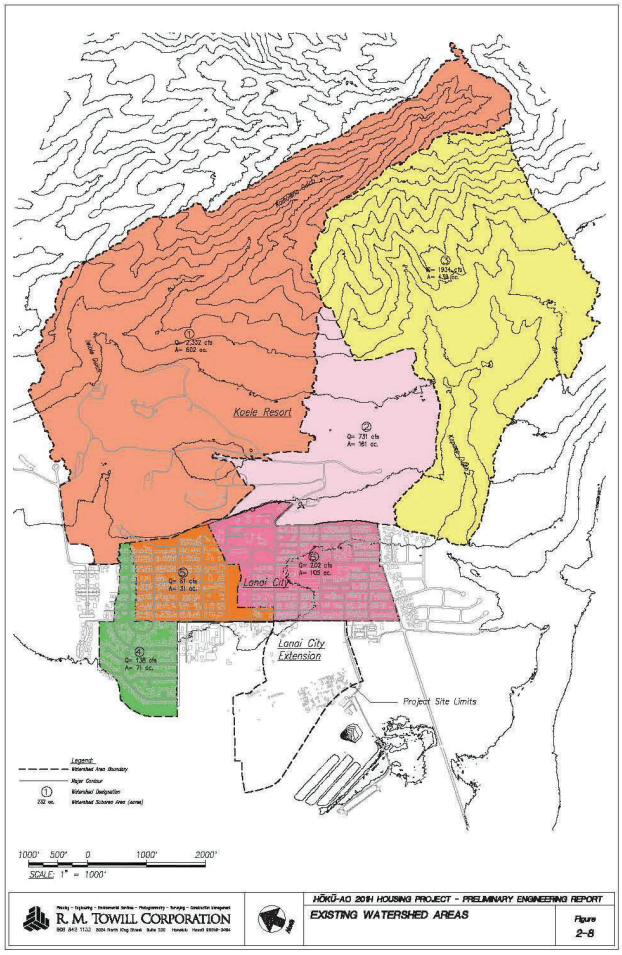
R. M. TOWILL CORPORATION

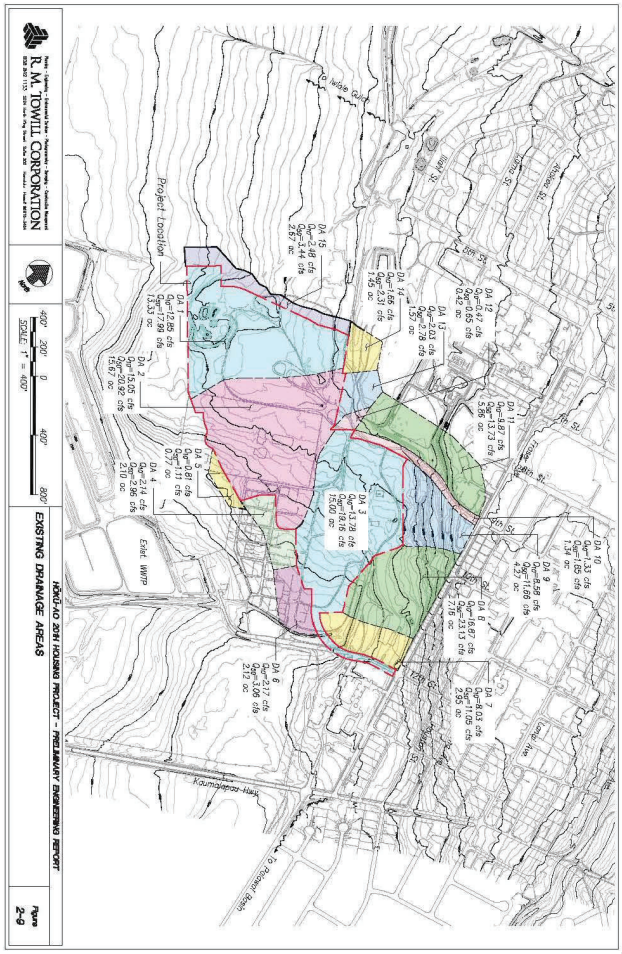
808.842.1133 2024 North King Street Suite 200 Honolulu Hawaii 96819-3464

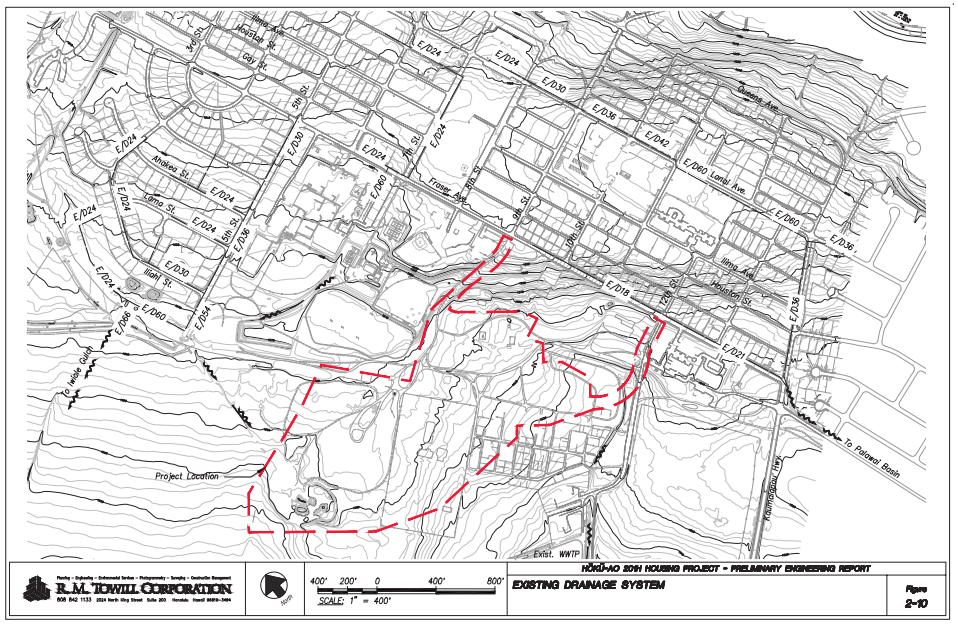
HŌKŪ-AO 201H HOUSING PROJECT - PRELIMINARY ENGINEERING REPORT

FEMA FLOOD MAP

Figure 2-7


Koele Resort
Lanai City
Lanai City Extension
Project Site Limits
Legend
Watershed Area Boundary
Major Contour
Watershed Designation
Watershed Delineated Area (acres)
1000' 500' 0 1000' 2000'
SCALE 1" = 1000'
R. M. TOWILL CORPORATION
HŌKŪ-AO 20IH HOUSING PROJECT - PRELIMINARY ENGINEERING REPORT
EXISTING WATERSHED AREAS
Figure 2-8


R. M. TOWILL CORPORATION
SCALE 1" = 400'
400' 200' 0 400' 800'
HŌKŪ-AO 20IH HOUSING PROJECT - PRELIMINARY ENGINEERING REPORT
EXISTING DRAINAGE AREAS
Figure 2-9
Project Location
Existing WWTP
Kaumalapau Hwy
To Harbor
To Manele Gulch



Planning • Engineering • Environmental Services • Photogrammetry • Surveying • Construction Management

R. M. TOWILL CORPORATION

828 Fort Street Mall Suite 600 Honolulu, Hawaii 96813-3864

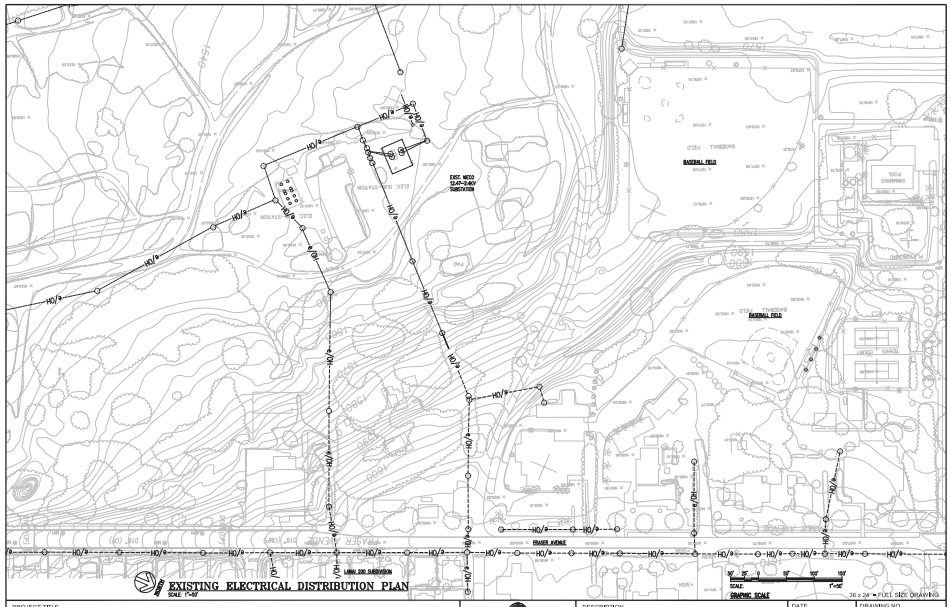
400' 200' 0 400' 800'

SCALE: 1" = 400'

HŌKŪ-AO 201H HOUSING PROJECT - PRELIMINARY ENGINEERING REPORT

EXISTING DRAINAGE SYSTEM

Figure 2-10



PROJECT TITLE

HŌKŪ-AO 201H HOUSING PROJECT

Ronald N.S. Ho & Associates, Inc.
Electrical Engineers
711 Kapiolani Boulevard, Suite 1501
Honolulu, Hawaii 96813

DESCRIPTION

EXISTING ELECTRICAL DISTRIBUTION PLAN

DATE: OCT 2016

SCALE: 1"=50'

DRAWING NO.: 2-11

3. APPROACH AND CRITERIA

This report analyzes the estimated increase in traffic, water, wastewater and electrical demand and drainage requirements due to the proposed residential housing. The proposed increases for water are not reduced by the historical information to for the nursery and community gardens which will be relocated. The existing nursery and community gardens are metered.

Infrastructure is typically designed for maximum estimated usage. The proposed improvements studied in this report consist of 200 single family housing units of which 102 are affordable homes and a 1-acre park.

3.1 Traffic

The criteria for the Traffic analysis are provided in the attached Traffic Impact Analysis (Attachment 1).

3.1.1 Traffic Level of Service

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study.

3.1.2 Vehicular Level of Service for Signalized Intersections (HCM 6th Edition)

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0

E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

3.1.3 Vehicular Level of Service for Unsignalized Intersections (HCM 6th Edition)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

3.2 Water

Proposed water demand estimates and water system design will be derived from the County of Maui's Department of Water Supply Water System Standards (*Reference 7*). Conformance with the County standards provides accepted criteria for water system planning and design, although the water system, inclusive of water source, storage, and piping, will remain privately owned and will not be subject to all County requirements.

3.2.1 Water Demand Criteria

The water demand criteria from the County of Maui Water Supply Standards is provided in **Table 3-1** and a summary of the water demand criteria is presented in ***Table 3-2***.

Table 3-1 County of Maui Water Supply Standards

DIVISION 100 - PLANNING

Table 100-18 - DOMESTIC CONSUMPTION GUIDELINES

AVERAGE DAILY DEMAND*

ZONING DESIGNATION	HAWAII	KAUAI	MAUI	OAHU
RESIDENTIAL:				
Single Family or Duplex	400 gals/unit	500 gals/unit	600 gals/unit or 3000 gals/acre	500 gals/unit or 2500 gals/acre
Multi-Family Low Rise	400 gals/unit	350 gals/unit	560 gals/unit or 5000 gals/acre	400 gals/unit or 4000 gals/acre
Multi-Family High Rise	400 gals/unit	350 gals/unit	560 gals/unit	300 gals/unit
COMMERCIAL:				
Commercial Only	3000 gals/acre	3000 gals/acre	6000 gals/acre	3000 gals/acre
Commercial/Industrial Mix	--	5000 gals/acre	140 gals/1000 sq. ft.	100 gals/1000 sq. ft.
Commercial/Residential Mix	--	3000 gals/acre	140 gals/1000 sq. ft.	120 gals/1000 sq. ft.
RESORT (To include hotel for Maui only)	400 gals/unit (1)	350 gals/unit	350 gals/unit or 17000 gals/acre	350 gals/unit or 4000 gals/acre
LIGHT INDUSTRY:	4000 gals/acre	4000 gals/acre	6000 gals/acre	4000 gals/acre
SCHOOLS, PARKS:	4000 gals/acre or 60 gals/student	4000 gals/acre or 60 gals/student	1700 gals/acre or 60 gals/student	4000 gals/acre or 60 gals/student
AGRICULTURE:		2,500 gals/acre	5000 gals/acre	4000 gals/acre

* - Where two or more figures are listed for the same zoning, the daily demand resulting in higher consumption use shall govern the design unless specified otherwise.
(1) - Subject to special review and control by the Manager.

Table 3-2: Water Demand Criteria

Flow Parameter	Units	Value	Source
Average Daily Water Demand by Capita			
Single Family or Duplex	gpd/unit	600 [1]	DWS
Park	acre	1,700[1]	DWS
Legend			
gpd/unit=gal / day / unit			
gpd/acre = gal / day / acre			
DWS = "County of Maui Department of Water Supply Standards)			

1 Single family or Duplex demands set at 600 gpd/unit and Park set at 1,700 gpd/acre per (County of Maui Department of Water Supply Standards).

3.3 Wastewater

The proposed wastewater demand estimates and wastewater system design will be derived from the County of Maui's Water Reclamation Division Wastewater (WRD) Flow Standards (Reference 6), or WRD approved Sewer Studies for similar facilities where practicable.

3.3.1 Wastewater Demand Criteria

A summary of the wastewater demand criteria is presented in ***Table 3-3***.

Table 3-3: Wastewater Demand Criteria

Flow Parameter	Units	Value	Source
Average Daily Wastewater Demand by Capita			
Average Daily Per Capita Demand			
- Single Family or Duplex (@ 4cpu)	gpd/capita	80 [1]	WRD
- Park (@ 4 cps)	gpd/capita	5[1]	Other[1]
Legend			
gpd/capita = gal / day / capita			
cpu = capita / unit			
cps = capita / parking stall			
WRD = "County of Maui Standards of the Water Reclamation Division"			

1 Per capita usage set at 80 for single family or duplex based on County of Maui Standards of the Water Reclamation Division (Standards use 4 capita per single family or duplex unit which equates to 320 gallons per day per unit). Per capita usage set at 5 for park and capita per car set at 4 based on the approved Central Maui Regional Park Sewer Study (the park study used 4 capita per vehicle which equated to 20 gallons per day per parking stall and 50% usage at any given time).

3.4 Drainage Hydrology and Hydraulics

The hydrologic and hydraulic criteria used in this report conform to the requirements of the *Rules for the Design of Storm Drainage Facilities in the County of Maui* (County Drainage Standards).

3.4.1 Hydrology

The hydrologic criteria used in this report is described in 15-04-05 Hydrologic Criteria of the County Drainage Standards. **Table 3-4** describes the Strom Recurrence Criteria of the County Drainage Standards and **Table 3-5** describes the runoff coefficients used.

A composite runoff coefficient (C) is calculated by taking the weighted average of the impervious and pervious land areas within the study area for both, the existing and proposed conditions. The composite runoff coefficient will be used to calculate the runoff value in both conditions. The increase in runoff will be derived from the difference between the existing and proposed conditions (primarily due to an increase in impervious area in the proposed condition). For the purpose of calculating increases in runoff in the immediate onsite drainage areas, the composite C method will be more conservative than applying the published minimum runoff coefficients for built-up areas from Table 3 of the County Drainage Standards.

Table 3-4: Storm Recurrence Criteria

Drain Area	Storm Recurrence	Method
Onsite Drain Area (< 100 acres)	10-Year, 1-Hour	Rational Method
Regional Drain Area (> 100 acres)	100-Year, 24-Hour	NRCS Hydrograph Method

Table 3-5: Runoff Coefficient

Land Use	Runoff Coefficient (C)
Unimproved Areas	0.30
Commercial	0.85
Residential Areas	0.50
Roadways	0.95

3.4.2 Hydraulics

The hydraulic criteria used in this report is described in 15-40-06 Design Standards of the County Drainage Standards.

3.5 Electrical/Telecommunications/Street Lighting

3.5.1 Electrical/Telecommunications

The electrical criteria used in this report conform to the planning practices of the Maui Electric Company and Hawaiian Telcom.

3.5.2 Street Lighting

Illumination for the roadways will be designed to meet County of Maui requirements and Illuminating Engineering Society (IES) RP-8 criteria.

4. PROPOSED CONDITIONS

4.1 General

The Hōkūao project proposes construction of 200 single family homes, comprised of 102 affordable homes and 98 market-rate homes and a 1-acre park, a future 1,500 square foot pavilion with 100-parking stalls. All lots will typically be 6,000 sf minimum, with a few 6,100 sf lots on irregularly shaped corners. The proposed improvements studied herein include new roadway, water, sewer, drainage and electrical/telecommunication infrastructure to serve the project.

4.1.1 Affordable Housing

The proposed project includes 102 affordable homes exclusively for purchase by buyers falling within the HUD 2018 low-income guidelines.

4.1.2 Design Character

The character of the homes will reflect the existing design vernacular of Lana'i City. House size will be between 900 and 1500 sf; with hipped or gable roofs, covered front lanais, board & batten siding, large trim profiles, and other design details matching historic Lanai buildings. The houses will also have enclosed garages and driveway to minimize street parking.

4.2 Traffic

4.2.1 Proposed Traffic Conditions

The Project entails the development of 200 residential units, one-acre park, 1,500 square foot pavilion, comfort station, and 100 parking stalls. Of the 200 single-family homes, 133 will be comprised of affordable homes and 67 will be comprised of market-rate homes. As a conservative measure, a 1-acre park will be assumed to include the amenities identified. Vehicular traffic to the Project will be provided by two (2) existing accesses along Fraser Avenue at 9th Street and at 12th Street. The Project is anticipated to generate approximately 147(221) AM(PM) trips and study intersections are forecast to operate at conditions similar to Base Year 2024 during both peak hours with all manual turning movements operating at LOS C or better during the AM and PM peak hours of traffic.

The proposed traffic conditions are described in the attached Traffic Impact Assessment.

4.3 Water

4.3.1 Proposed Water Demands

Based on the County of Maui Department of Water Supply Standards of 600 gallons per day per single family unit and 1,700 gallons per acre for a park, the proposed average daily domestic water demand for the 200 single family units and the 1-acre park with future 1,500 square foot pavilion with comfort stations and parking is estimated to be 121,700 GPD.

Table 4-1 Water Demand Calculations

Use Type	Number of Units or Acres	Demand Per Unit or Acre (gpd)	Demand
Residential Units	200	600	120,000
Park	1.0	1,700	1,700
Total			121,700

4.3.2 Proposed Water System

The existing domestic water system will provide water service to the project through a new connection to the 12-inch water main on Frasier Avenue. Proposed water distribution mains along the new roads will be 8-inch to 12-inch in diameter to ensure adequate fire protection flows can be provided. Water pressure exceeds 80 psi in some areas of this system and individual pressure reducing valves are required. The proposed water system improvements shown on ***Figure 4-1***.

4.3.3 Impacts to Regional Water Facilities

The estimated total water demand of the project is 121,700 GPD. The LWC has indicated in the attached letter dated ____ in Appendix 3, that "the project will have a long-term, reliable supply of water in accordance with Chapter 14.12, Water Availability, Maui Code, upon completion of new source development. The Lanai

Company is in the process of permitting the development of Well #7 which is anticipated to be the source of water for the project."