Miki Basin Industrial Park
Environmental Assessment

Exhibit I

Water Master Plan
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I. INTRODUCTION

The Water Master Plan for Pūlama Lāna’i Miki Basin 200-Acre Industrial Park provides the basic information for the design of the water distribution system for the Miki Basin 200-Acre Industrial Park (Industrial Park) based on zoning requirements. The purpose of this master plan is to identify and review the condition of the existing water distribution system and analyze the existing system for projected water demands.

The Industrial Park consists of approximately 200 acres of agricultural zoned lands. Pūlama Lāna’i is in the process of rezoning the area for light and heavy industrial lands. The project area is located directly south of Lana’i Airport within the Palawai Irrigation Grid (see Exhibit 1: Location Map). The majority of Miki Basin is currently undeveloped with the exception of the Maui Electric Company (MECO) Miki Basin substation and a portion of the 20-acre approved subdivision which is currently used by Pūlama Lāna’i. Pūlama Lāna’i is in the process of finalizing condominium documents for the 20-acre industrial condominium subdivision. A timeline for development of the 20-acre subdivision has not been established.

II. EXECUTIVE SUMMARY

Water for Miki Basin is currently provided by the Manele Water System which is owned, operated and maintained by the Lana’i Water Company. The system, sourced by Wells No. 2 (State Well No. 5-4953-001) and 4 (State Well No. 5-4952-002), currently services Manele, Hulopoe and the Palawai Irrigation Grid. Water from the wells is either stored in the existing 0.5 MG Hi’i Tank or 1.0 MG concrete Hi’i Reservoir or fed directly into the distribution system depending on need. The existing Manele Water System consists of 10-inch, 12-inch and 16-inch transmission mains. The Manele Water System is interconnected with the Lana’i City Water System. During emergencies, the Lana’i City System can supply water to the Manele Water System by opening a valve.

The existing average daily water usage of the system is currently estimated at 418,000 gallons per day (gpd). The operation of Lanai Farms, which was anticipated to begin in late 2018, will increase average water usage to a total of approximately 469,000 gpd.

In accordance with the Water System Standards, available source capacity is governed by the well with the smallest pumping unit. Well No. 2 can be outfitted with a pump with a capacity of up to 1,200 gallons per minute (gpm) while Well
No. 4 has a pump capacity of 900 gpm. Since Well No. 4 has the smaller pump capacity, available source capacity for the water system is governed by Well No. 4, which has an average day pumping capacity of 576,000 gpd, which is equivalent to a maximum day pumping capacity of 864,000 gpd. Once this capacity is used/committed, construction of a new well will be required.

Since development plans for the Industrial Park are not yet available, proposed water use for buildout of the Industrial Park is based on the proposed land use and an estimated developable area for each parcel. The developable area of each parcel estimates that up to 70 percent of the total parcel area will require water; the remaining 30 percent will consist of areas with no water use such as roads and parking areas.

The proposed average day demand for full buildout of the Industrial Park, including existing use is 1,309,000 gpd. The existing water system does not have adequate source capacity and reservoir storage to support full buildout of the Industrial Park. In addition, the transmission mains do not meet Water System Standards for fire flow protection.

The following improvements will be required to support full buildout of the Industrial Park:
- Drilling a new source or multiple sources to obtain a total minimum pump capacity of 1,546 gpm.
- Construction a new storage tank with a minimum capacity of 500,000 gallons.
- Upsizing of an existing 12-inch water main between Hi’i Tank and the Kalawai Pressure Reducing Valve to a 16-inch main or installation of a parallel 6-inch water main to meet fire flow requirements. Alternatively, the construction of a new storage tank could provide fire flow protection in additional to storage capacity.
- Construction of new 16-inch distribution mains to provide service to currently undeveloped areas.

III. EXISTING WATER SUPPLY AND DISTRIBUTION SYSTEM

Water for Miki Basin is currently serviced by the Manele Water System (Public Water System 237) which is owned, operated and maintained by Lana’i Water Company (see Exhibit 2: Existing Water System). Manele Water System services Manele, Hulopoe and the Palawai Irrigation Grid.

1. SOURCE

Water is provided by Wells No. 2 (State Well No. 5-4953-001) and 4 (State Well No. 5-4952-002) and either stored in the existing 0.5 MG Hi’i Tank or 1.0 MG concrete Hi’i Reservoir or fed directly into a 12-inch transmission main depending on need.

a. Well No. 2 has a pump capacity of 500 gallons per minute (gpm) or an average day capacity of 320,000 gallons per day (gpd) based on an operating time of 16 hours. According to the 2011 Lana’i Water Use and Development Plan, the well can be outfitted with a pump with a capacity of up to 1,200 gpm or an average day capacity of 768,000 gpd.

b. Well No. 4 has a pump capacity of 900 gpm or an average day capacity of 576,000 gpd.

c. The existing average daily water usage from the Manele Water System is currently estimated at 418,000 gpd. The operation of Sensei Farms, which was anticipated to start in late 2018, will increase water usage to approximately 469,000 gpd at full operation.

d. The Water System Standards requires sources be able to meet maximum day demand with an operating time of 16 hours, assuming that the largest pumping unit is down. Since Well No. 2 has the larger pump capacity of the two wells, available source capacity for the system is governed by Well No. 4. Based on the existing water use, an average day capacity of 107,000 gpd is available to support the development of the Industrial Park.

e. Lana’i has a sustainable yield of 6 million gallons per day (MGD), with 3 MGD allocated to both the Leeward and Windward aquifer sectors. The majority of the pumping wells are located in the Leeward Aquifer. According to the Lana’i Water Company Periodic Water Report, the current moving average pumping is 1.53 MGD.

2. STORAGE

a. 500,000 gallon Hi’i Tank (O.F. Elev = 1823’)

Serves as the water distribution storage tank for Manele, Hulopoe and the Palawai Irrigation Grid.
b. 1,000,000 gallon Hi’i Reservoir (O.F. = 1823’)
   Primarily serves as storage for the two well water sources to supply water into the distribution system

3. TRANSMISSION
   a. A 12-16-inch high density polyethylene (HDPE) transmission main transports water from the 500,000 gallon Hi’i Tank into the Manele Water System. The 12-inch main splits at a junction to serve both Manele and Palawai Irrigation Grid.
   b. To Manele and Hulopoe – From the junction, the 12-inch line feeds into three pressure breaker storage tanks that service Manele.
   c. To Palawai Irrigation Grid – From the junction, the waterline upsizes to a 16-inch main that delivers water to the Palawai Irrigation Grid area. The existing 12-inch Kalawai Pressure Reducing Valve (PRV) downstream of the junction reduces the pressure in the waterline to 95 psi.

4. CONNECTION TO OTHER WATER SYSTEMS
   a. The Manele Water System is interconnected with the Lana’i City Water System. During emergencies, the Lana’i City System can supply water to the Manele Water System by opening a valve.

IV. LAND USE
   Pūlāma Lana’i is in the process of rezoning approximately 200 acres of land from agriculture to light and heavy industrial as shown in Exhibit 3: Proposed Land Use:

   Light Industrial 100 ac
   Heavy Industrial 100 ac
   Total 200 ac

   This conceptual plan is intended to provide a basis for the design of the water system and may not reflect the final development densities. Since development plans for the Industrial Park are not yet available, proposed water use for buildout of the Industrial Park is based on the proposed land use and an estimated developable area for each parcel. The developable area of each parcel estimates that up to 70 percent of the total parcel area

   will require water; the remaining 30 percent will consist of areas with no water use such as roads and parking areas.

V. SAFE DRINKING WATER SYSTEM DESIGN CRITERIA
   As outlined in the County of Maui Water System Standards, the following criteria are used in determining the minimum requirements for the safe drinking water system.
   1. CONSUMPTION GUIDELINES
      a. The average daily demand for industrial land uses for planning purposes is 6,000 gallons / acre.
   2. DEMAND FACTORS
      a. Maximum Daily Demand = 1.5 x Average Day
      b. Peak Hour Demand = 3.0 x Average Day
   3. FIRE FLOW REQUIREMENTS
      a. Light Industrial = 2,000 gpm for 2 hour duration
      b. Heavy Industrial = 2,500 gpm for 2 hour duration
   4. PIPELINE SIZING
      a. Maximum daily flow plus fire flow with a residual pressure of 20 psi at critical fire hydrant.
      b. Peak hour flow with a minimum residual pressure of 40 psi.
      c. In determining the carrying capacity of the mains, the “C” values to be applied are:

      \[
      \begin{array}{|c|c|}
        \hline
        \text{Size} & \text{“C”} \\
        \hline
        4” & 6” & 100 \\
        8” & 12” & 110 \\
        16” & 20” & 120 \\
        \hline
      \end{array}
      \]
d. The maximum velocity in transmission mains (without fire flow) is 20 feet per second. The maximum velocity in distribution mains with fire flow shall be 10 feet per second.

e. Maximum static or pumping pressure, whichever is greater, shall not exceed 125 psi.

f. Ductile iron pipe is required by County of Maui Department of Water Supply Standards and is recommended for this project. The design pressures for ductile iron pipe are as follows:
   i. Maximum design working pressure = 250 psi
   ii. Maximum desirable working pressure = 125 psi
   iii. Maximum expected working pressure = 150 psi

g. The working pressure for distribution mains servicing residences:
   i. Maximum = 125 psi
   ii. Minimum = 40 psi

h. In-line pressure reducing valves for distribution mains are required where pressure exceeds 125 psi.

i. Cleanouts are required at the end of all transmission and distribution waterlines.

j. Sampling spigots: For collection of water samples to determine water quality at dead ends of pipeline.

5. RESERVOIR CAPACITY

   a. Meet maximum day consumption. Reservoir fills at the beginning of the 24-hour period with no source input to the reservoir.

   b. Meet maximum day consumption plus fire flow for duration of fire. Reservoir ¾-full, with credit for incoming flow from pumps.

   c. Minimum reservoir size shall be 100,000 gallons. Reservoir size shall be as specified in Section 105.10 – RESERVOIR, Subsection A – Size.

d. Where there are two or more reservoir serving the same system, the design shall be made on the basis of combined protection by all facilities available.

6. PUMP CAPACITY

   a. Meet maximum day demand with an operating time of 16 hours simultaneously with maximum fire flow required independent of the reservoir. The standby unit may be used to determine the total flow required.

   b. Meet maximum day demand during the duration of the fire plus fire demand less ¾ of reservoir storage.

   c. Meet maximum day demand with an operating time of 16 hours with the largest pumping unit considered out of service.

VI. INDUSTRIAL PARK WATER DEMAND

1. Based on the proposed zoning and an estimated developable area of 70 percent of the total area, the proposed average day demand for full buildout, including existing use is 1,309,000 gpd (see Exhibit 4: Water Flow Summation and Exhibit 5: Water Demand Map).

2. Based on the source capacity of Well No. 4, the system will require an additional average day capacity of 733,000 gpd to support full buildout of the Industrial Park.

3. The existing system does not meet the Water System Standards criteria for pipe sizing based on a maximum of 2,500 gpm for Fire Flow plus Maximum Daily flow with a maximum velocity of 10 feet per second. The system also does not meet the criteria for the Peak Hour flow with a minimum residual pressure of 40 psi.

4. Exhibit 6: Water System Nodal Map shows the overall water system facilities and nodal map.
VII. PROPOSED SAFE DRINKING WATER SYSTEM (BASED ON LAND USE/ZONING)

1. WATER SOURCE
   a. Construction of another water source will be required when the average daily demand exceeds 576,000 gpd, which is equivalent to a maximum daily demand of 864,000 gpd. The new well will support the outstanding development of the Industrial Park. The current average daily water usage is 418,000 gpd. The operation of Lanai Farms, which was anticipated to start in late 2018, will increase water usage to approximately 489,000 gpd. Accordingly, an average daily use of 107,000 gpd is available for future development within the Industrial Park without having to construct a new well.

   b. Well Pump Sizing
      i. Existing average day capacity = 576,000 gpd
         Existing maximum day capacity = 864,000 gpd
      ii. Full buildout average day demand = 1,309,000 gpd
          Full buildout maximum day demand = 1,963,500 gpd
      iii. Additional average day capacity required = 733,000 gpd
          Additional maximum day capacity required = 1,099,500 gpd
          1,099,500 gallons / 16 hours / 60 min = 1,146 gpm
          Total required pump capacity = 1,146 gpm
          Full buildout of the Industrial Park will require the development of a new well or multiple wells with a total minimum total capacity of 1,146 gpm.

   c. Source Options
      The Lana’i Water Use and Development Plan (WUDP) discusses the following options for development of a new well to meet future water demand requirements:
      i. Drill a Leeward high level well between Hi’i Tank and Well 3

ii. Well 7 is currently out of service. Recommisioning the well would provide reliability for both the Lana’i City system and the Irrigation Grid.

   iii. Install a permanent interconnection with the Lana’i City System.

2. RESERVOIR CAPACITY
   a. Case A: Meet maximum day demand in 24-hours
      Capacity required = 1,963,500 gallons
      Case B: Meet maximum day + fire flow, reservoir ¾ full
      Max day rate = 1,963,500 gpd = 1364 gpm
      Fire flow = 2,500 gpm
      Max day rate + fire flow for 120 minutes
      = 3,864 gpm x 120 min
      = 463,680 gallons
      Size required = 463,680 * ¾ = 347,760 gallons
      Case A governs:
      Minimum Reservoir Capacity = 2,000,000 gallons
      Existing Reservoir Capacity = 1,500,000 gallons
      Additional Storage Required = 500,000 gallons
      Construction a new storage tank for the Industrial Park could also satisfy fire protection requirements for the Industrial Park. In order to provide service to the Industrial Park, the tank would need to be located at a minimum elevation of 1,414 feet.

3. TRANSMISSION/DISTRIBUTION MAINS
   a. Offsite Improvements
      i. The following options are proposed to meet fire flow requirements:
         1. Option 1. Upsize the existing 12-inch waterline between Hi’i Tank and the Palawai PRV to a 16-inch main. The main is located alongside the
mountainside and may be difficult to access, presenting challenges during construction.

2. Option 2. Provide a parallel 6-inch waterline between Hi’i Tank and the Palawai PRV.

3. Option 3. Construct a new storage tank for Miki Basin to provide fire protection for the Industrial Park. The new storage tank could also provide the additional required storage.

4. Option 4. Consider other fire protection systems that do not use water. Distribution mains would be limited to supplying only potable safe drinking water.

ii. While Lanai Water Company has replaced and has abandoned sections of the Palawai Irrigation Grid, there remains sections that are in need of repair, replacement or possible abandonment. Since the condition and use of these pipes are unknown, those pipes were excluded from this evaluation. A conditional assessment and analysis for those pipes should be conducted separately.

b. Onsite Improvements
Full buildup of Industrial Park will require the installation of 16-inch waterlines within the development (see Exhibit 5: Water Demand Map). The new waterline will connect to the existing water system at Miki Road.

VII. COST CONSIDERATIONS

Budgetary cost for the water improvements are provided in Appendix B.
EXHIBIT 1

PÜLAMA LĀNAI MIKI BASIN 200 ACRE INDUSTRIAL PARK
LOCATION MAP
AKINAKA & ASSOCIATES, LTD.
SCALE: AS SHOWN

EXHIBIT 2
EXISTING WATER SYSTEM

WELL NO. 4
STATE WELL NO. 5-4952-002
CAPACITY = 900 GPM
GROUND EL. = 1316'
DEPTH = 1178'

WELL NO. 2
STATE WELL NO. 5-4953-001
CAPACITY = 500 GPM
GROUND EL. = 1335'
DEPTH = 812'

HI RESERVOIR
1.0 MG RESERVOIR
SPILLWAY EL. = 1823'
FLOOR EL. = N/A

HI TANK
0.5 MG RESERVOIR
SPILLWAY EL. = 1823'
FLOOR EL. = 1791'

KAU MALAPAUA HWY
MIKI AIRPORT
PALAWAI IRRIGATION BASIN
MIKI BASIN LĀNAI CITY
HULOPOE MANELE ROAD
MANELE ROAD
LAMA LĀN'I MIKI BASIN 200-ACRE INDUSTRIAL PARK
EXHIBIT 5
WATER DEMAND MAP
PREPARED FOR: LĀNA‘I MIKI BASIN 200-ACRE INDUSTRIAL PARK
DATE: MARCH 2019
PREPARED BY:
NOT TO SCALE FOR DISCUSSION PURPOSES ONLY

LAHAINA AIRPORT
KAUMALAPA HWY
MIKI ROAD
HEAVY INDUSTRIAL 420,000 GPD
LIGHT INDUSTRIAL 273,000 GPD
LIGHT INDUSTRIAL 147,000 GPD
0.5 HI TANK
HI RESERVOIR
WELL NO. 2
WELL NO. 4
20 ACRE CONSOLIDATION

LAMA LĀN'I MIKI BASIN 200-ACRE INDUSTRIAL PARK
EXHIBIT 6
WATER SYSTEM NODAL MAP
PREPARED FOR: LĀNA‘I MIKI BASIN 200-ACRE INDUSTRIAL PARK
DATE: MARCH 2019
PREPARED BY:
NOT TO SCALE FOR DISCUSSION PURPOSES ONLY
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### APPENDIX A

**Water Calculations**
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**Notes:**
- Week 1 to Week 14 are labeled as Week 1 to Week 14 for clarity.
- Each week is represented by a number from 0 to 13.
- The table contains placeholders for specific data points, which are not listed here.
- For a full dataset, please refer to the original document or report.
# APPENDIX B

## 0% Construction Costs

## PULAMA LANAI MIKI BASIN

### 200 ACRE INDUSTRIAL PARK

## 0% CONSTRUCTION COSTS FOR PROPOSED WATER IMPROVEMENTS

<table>
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<th>QTY</th>
<th>UNIT</th>
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<td><strong>OFFSITE IMPROVEMENTS</strong></td>
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<tr>
<td>Well Studies, including environmental and hydrologic studies for siting exploratory well</td>
<td>Lump Sum</td>
<td>Lump Sum</td>
<td>$ 250,000.00</td>
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<td>Exploratory Well, including siting, drilling and testing</td>
<td>1</td>
<td>Each</td>
<td>Each</td>
<td>$ 1,000,000.00</td>
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<td>Well Construction, including reaming of exploratory well, drilling, installation of casing and pump installation</td>
<td>1</td>
<td>Each</td>
<td>Each</td>
<td>$ 2,300,000.00</td>
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<td>500,000 gallon Concrete Reservoir, including grading, backfill, subbase, base course, structural fill, liners, piping &amp; fittings to exterior face of footing, ladders, railing hatched, vents, finishes and all appurtenances and incidentals</td>
<td>1</td>
<td>Each</td>
<td>Each</td>
<td>$ 3,000,000.00</td>
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<td>Upsize existing 12-inch waterline to 16-inch waterline between Hi Tank and Palawai PRV</td>
<td>7,840</td>
<td>LF</td>
<td>$ 600.00</td>
<td>$ 4,704,000.00</td>
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<td>6-inch parallel waterline between Hi Tank and Palawai PRV</td>
<td>7,840</td>
<td>LF</td>
<td>$ 550.00</td>
<td>$ 4,312,000.00</td>
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<td><strong>ONSITE IMPROVEMENTS</strong></td>
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<td>16-inch water line along Miki Road within the parcel, including trench excavation, cushion and backfill, fittings and connections to existing water lines</td>
<td>2,875</td>
<td>LF</td>
<td>$ 200.00</td>
<td>$ 575,000.00</td>
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<td>16-inch water line along Road A, including trench excavation, cushion and backfill, fittings and connections to existing water lines</td>
<td>2,620</td>
<td>LF</td>
<td>$ 200.00</td>
<td>$ 524,000.00</td>
</tr>
<tr>
<td>Contingency (20%)</td>
<td></td>
<td></td>
<td></td>
<td>$ 219,800.00</td>
</tr>
<tr>
<td><strong>TOTAL ONSITE IMPROVEMENTS</strong></td>
<td></td>
<td></td>
<td></td>
<td>$ 1,318,800.00</td>
</tr>
</tbody>
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