

**LAUNIUPOKO WATER COMPANY, INC.**

**YOUR DRINKING WATER PROVIDER**

August 3, 2023

M. Kaleo Manuel  
Deputy Director  
Commission on Water Resource Management  
1151 Punchbowl Street, Suite 227  
Honolulu, HI 96813

Re: Launiupoko Water Use Applications

Dear Deputy Director Manuel:

This joint letter from Launiupoko Water Company, Inc. ('LWC') and Launiupoko Irrigation Company Inc. ('LIC') is submitted with the following water use permits for:

<b>Applicant</b>	<b>App Type</b>	<b>Well Name</b>	<b>Well No.</b>
<b>Launiupoko Water Co.</b>	<b>GWUPA-E</b>	<b>Launiupoko 1</b>	<b>6-5138-001</b>
<b>Launiupoko Water Co.</b>	<b>GWUPA-E</b>	<b>Launiupoko 2</b>	<b>6-5137-001</b>
<b>Launiupoko Water Co.</b>	<b>GWUPA-E</b>	<b>Launiupoko 3</b>	<b>6-5238-001</b>
<b>Launiupoko Water Co.</b>	<b>GWUPA-N</b>	<b>Launiupoko 1</b>	<b>6-5138-001</b>
<b>Launiupoko Water Co.</b>	<b>GWUPA-E</b>	<b>Launiupoko 2</b>	<b>6-5137-001</b>
<b>Launiupoko Water Co.</b>	<b>GWUPA-E</b>	<b>Launiupoko 3</b>	<b>6-5238-001</b>
<b>Launiupoko Irrigation Co.</b>	<b>GWUPA-E</b>	<b>Kauaula Tunnel</b>	<b>6-5236-001</b>
<b>Launiupoko Irrigation Co.</b>	<b>SWUPA-E</b>	<b>Kauaula Stream Intake</b>	<b>957</b>
<b>Launiupoko Irrigation Co.</b>	<b>SWUPA-N</b>	<b>Kauaula Stream Intake</b>	<b>957</b>
<b>Launiupoko Irrigation Co.</b>	<b>SWUPA-E</b>	<b>Launiupoko Stream</b>	<b>955</b>

<b>Launiupoko Irrigation Co.</b>	<b>GWUPA-E</b>	<b>LIC 1</b>	<b>6-5138-001</b>
<b>Launiupoko Irrigation Co.</b>	<b>GWUPA-N</b>	<b>LIC 1</b>	<b>6-5138-001</b>
<b>Launiupoko Irrigation Co.</b>	<b>GWUPA-E</b>	<b>Lahaina Shaft Pump A</b>	<b>6-5240-003</b>
<b>Launiupoko Irrigation Co.</b>	<b>GWUPA-N</b>	<b>Lahaina Shaft Pump A</b>	<b>6-5240-003</b>
<b>Launiupoko Irrigation Co.</b>	<b>GWUPA-N</b>	<b>LIC 2</b>	<b>Pending</b>
<b>Launiupoko Irrigation Co.</b>	<b>GWUPA-N</b>	<b>Lahaina Shaft Pump B</b>	<b>6-5240-002</b>

#### Potable and Non-Potable Combined Summary

In the review of the draft preliminary LWC and LIC applications, CWRM staff requested a combined summary of both systems that includes.

*Combined Potable and Non-Potable Supply & Demand*, attached hereto as Exhibit A summarizes the actual source use and existing requested use for each GWUPA and SWUPA-E being submitted for both potable and non-potable use, as requested. Actual consumption for the 12-month WMA period is also shown for both potable and non-potable uses. LWC and LIC's existing use request for potable and non-potable amount is 3.3 mgd total, 675,000 gpd potable, and 2.6 mgd non-potable for its existing 375 potable connections and 407 non-potable connections. The requested 3.3 mgd amount is comprised of 1,311,039 gpd (1.3 mgd) of groundwater and 1,987,643 gpd (2 mgd) of surface water.

Tables 1 and 2 provide a summary of the requested surface water and groundwater sources with amounts per source.

<b>Combined Surface Water Requested Amount</b>	<b>Existing (gpd)</b>	<b>New Use Request (gpd)</b>	<b>Total Existing and New Use Requested (gpd)</b>
Launiupoko Stream	340,325	0	340,325
Kauau'ula Stream	1,647,318	2,100,000	3,647,318
<b>Total Surface Water Requested</b>	<b>1,987,643</b>	<b>2,100,000</b>	<b>3,987,643</b>

*Table 1 Surface*



<b>Combined Groundwater Requested Amount</b>	<b>Existing AVG GPD</b>	<b>APU New Use Request AVG GPD</b>	<b>TOTALS</b>
LWC Wells 1, 2 and 3 (potable)	675,000	125,000	800,000
LIC Well 1 (non-potable)	242,051	400,000	642,051
Lahaina Shaft A Pump (non-potable)	393,988	1,500,000	1,893,988
Lahaina Shaft B Pump (non-potable) (non-potable, future)	N/A	100,000	100,000
LIC Well 2 (non-potable, future)	N/A	100,000	100,000
<b>Total Groundwater Requested</b>	<b>1,311,039</b>	<b>2,225,000</b>	<b>3,536,039</b>

*Table 2 Groundwater*

Existing Use: The Launiupoko Aquifer System has a sustainable yield of 7 mgd. See Staff Submittal dated June 14, 2022. There are three municipal water purveyors within the Launiupoko Aquifer System: LWC, LIC and the County DWS. The County DWS owns and operates four wells within the Launiupoko Aquifer System with a 12-month MAV of 0.541 mgd: Waipuka 1 (0.181 mgd), Waipuka 2 (0.138 mgd), Kanaha Well 1 (0.098 mgd) and Kanaha Well 2 (0.124 mgd). Id. at 20. The total of LWC and LIC's requested existing groundwater amount (1.3 mgd), the County DWS estimated requested amount (0.541 mgd), other well owners/operators (0.28 mgd<sup>1</sup>) is [2.1 mgd], or 30% of the 7 mgd sustainable yield, without factoring in the development tunnels.

CWRM's WMA FOF for the Lahaina Sector, assumes the full amount of discharge from development tunnels as a 100% withdraw from the aquifer without any recharge. CWRM estimates a 4.01 mgd estimated yield from the development tunnels in the Launiupoko aquifer. [Table 12.] Using 100% of 4.01 mgd consumes more than half (57%) of the aquifer's sustainable yield. The 4.01 mgd plus the 2.1 mgd drawn by LWC, LIC and the County DWS is 87% of the aquifer's sustainable yield. CWRM's development tunnel assumptions should be fully vetted as this source is greatly impacting future proposed uses. The water from development tunnels flows directly into streams and increases the baseflow for all down-stream uses. Once the water is in the stream, some will go to recharge, some to in-stream and off-stream uses. It is challenging to get concrete numbers for development, however these numbers have too great of an impact leave as rough estimates and not vet more thoroughly.

Proposed New Use: Concurrent SWUPA-N and GWUPA new are submitted with the existing use application. LWC requests an additional 125,000 gpd for its 133 APUs. LIC requests an additional 2.1 mgd of ground and surface water for

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<sup>1</sup> See Staff Submittal dated June 14, 2022 at 53 (Table 16 Launiupoko Aquifer Well List).

its 276 APUs. LIC and LWC recognize that the new use requests, when added to the existing demand on the aquifer, exceed CWRM's calculations and assumption for the sustainable yield. During the WMA designation process, CWRM's assumptions evolved, and will likely continue to evolve as more data is available. The new use applications are submitted in abundance of caution, in the event that CWRM processes new and use application concurrently.

#### Number of Meters vs Customers

The following is provided in response to CWRM's request for clarification on the variation on the number of connections, number of customers, etc. between LIC and LWC review of the draft SWPUA-E and GWUPA existing use, they requested clarification on the number of connections, number of customers, etc.

LIC has 407 metered connections, including 4 kuleana users. The homeowners associations have multiple meters for the common area irrigation, so the Existing User, or number of customers is less than the number of connections. LIC service area is larger than LWC's. LIC APU count is 276 vs LWC's 133. There are also lots with only non-potable meters, including the 4 kuleana users.

LWC has 375 metered connections and the same number of customers. Of the 375 customers, 315 have both potable and non-potable meters.

## LAUNIUPOKO WATER COMPANY, INC.

### LWC Company and System Description

Launiupoko Water Company, Inc (LWC) is a public water system regulated by the Hawaii Public Utilities Commission (PUC) <sup>2</sup> and State of Hawaii Department of Health (PWS 251) that provides the potable drinking water and fire protection systems for the Launiupoko region of West Maui. LWC's service area defined by plat TMK 4-7-01 as shown on LWC Exhibits 4 and 6 covers approximately 6,000 acres of which approximately 3,000 acres are zoned Conservation. The 3,000 acres zoned Agriculture by the State and County was previously cultivated for sugar cane by Pioneer Mill Company, Ltd.

LWC's sloping terrain climbs from 20 feet above sea level to over 800 feet msl. LWC currently has 375 active customers with service connections.<sup>3</sup> Agricultural zoning allows for two farm dwellings on each lot. LWC provides the potable and fire protection needs for the residences of these communities. 315 of these properties are dually served by Launiupoko Irrigation Company, Inc. (LIC) with non-potable water for their irrigation needs.

There are an additional 133 undeveloped lots with service laterals and 1 County Park without service connections that are identified as Authorized Planned Users by TMK in Schedule A attached to the GWUPA that will require potable water service in the future. These new uses are supported by a GWUPA New Use application submitted concurrently with the LWC Existing Use application.

The sources of the LWC system consist of three deep groundwater wells, Well 1 (State Well No. 6-5138-01), Well No. 2 (State Well No. 6- 5137-01), and Well 3 (State Well No. 6-5238-01). The water storage reservoirs consist of 2 glass-fused-to-steel tanks. A 400,000 gallon control tank is located at the Well 1 site (Tank No. 1) and a 100,000 gallon tank (Tank No. 2) is located at an approximate elevation of 835 feet msl. Potable water provided to customers is a blend of water sourced from all three wells. A third 500,000 gallon storage tank site is being established at the 835 foot msl. Planning and design is underway.

The transmission and distribution of the water is regulated by 2 motor control buildings equipped with SCADA systems that control the wells and

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<sup>2</sup> Applicant obtained its Certificate of Public Convenience and Necessity ("CPCN") to operate as a public utility providing potable water utility service, pursuant to Decision and Order No. 20274 entered on June 27, 2003 in Docket No. 02-0196

<sup>3</sup> The Staff Submittal dated June 14, 2022 estimated that LWC had 280 active potable service connections. See Staff Submittal dated June 14, 2022 at 24.

chlorination, and booster pumps to manage the potable demands of the region. There are 142 fire hydrants and 6 staged pressure reducing valve stations installed.

The daily system monitoring, reporting and monthly billings are performed by West Maui Land Company ('WML') staff.

#### LWC Potable Supply and Demand

LWC GWUPA Exhibit 2: Potable Supply & Demand shows the monthly and average daily pumpage for LWC's 3 wells combined and the corresponding metered consumption by month based on customer billings.

#### Maintenance and System Efficiency

LWC has established several protocols to improve operations and minimize water losses. Daily readings and site inspections with system readings are the initial steps to help management identify potential problems, the management reviews both the online scada information along with the daily field staff reports. Any issues can be addressed swiftly. WML office staff is available to receive customer calls on leaks or service related issues. After-hours emergency service is available and many spare parts are inventoried for such repairs. Annually our staff performs the Water Loss Audit which also helps management assess the performance our system.

System loss as shown on LWC GWUPA Exhibit 2 is defined here as the difference between total metered consumption and total metered pumpage which is comprised of stored water, daily discharged water, fire hydrant flushing, line breaks, and any use for fire protection. LWC has recently completed a System Loss Audit with CWRM rating the various components of loss in detail which is available upon request. The Water Loss Audit is attached the GWUPA.

The biggest system loss issue for LWC has been with a material defect in the service laterals made of high-density polyethylene (HDPE). The 139 HDPE service laterals were installed in the older subdivisions and have been rupturing, starting as a small pin hole leak to a larger crack. These leaks have been challenging to identify. The laterals are deep, with portions under paved roads and costly to replace. LWC began program for replacing the HDPE laterals to copper in 2012. As of 2023 LWC has replaced approximately 75% of the HDPE with copper.

Special Considerations/Situations

- Well No. 2 (State Well No.6- 5137-01): During the 12 month period prior to WMA designation, Launiupoko Well 2 incurred mechanical problems and needed a replacement valve that took an unusually long time to obtain due to supply chain issues. Hence, the estimated volume pumped for Well 2 is based on the daily average for the 4 months that fell within the WMA calendar as shown on LWC GWUPA Exhibit 1.
- High Demand: LWC's unusually high potable water demand is due primarily to the lack of supply of non-potable irrigation water from LIC. The higher demand is due to climatic conditions and regulatory limitation of stream water for off-stream non-potable use. During the WMA 12-month calendar, LIC's ability to compensate for stream water shortages with diesel generated pumped ground water was limited by noise constrained pumping hours, cost, and mechanical issues. As shown below and on GWUPA Exhibit C: *LIC vs LWC Consumption 2017-2022*, the trend of potable water consumption increased from 705 GPD per user by more than double to 1,991 GPD per user over the 6 years.

POTABLE AND NON-POTABLE  
VOLUME OF WATER SOLD 2017-2022

	VOLUMES OF POTABLE AND NON POTABLE WATER SOLD					
	2017	2018	2019	2020	2021	2022
<b>POTABLE</b>	<b>LWC VOLUME OF WATER SOLD</b>					
Number of Customers	330	337	350	355	366	375
LWC Total Metered Use	84,936,498	85,930,465	119,089,329	145,634,817	164,611,710	241,690,000
<b>LWC Use (mgd)</b>	<b>0.2327</b>	<b>0.2354</b>	<b>0.3263</b>	<b>0.3990</b>	<b>0.4510</b>	<b>0.6622</b>
LWC Use Per Customer	705	699	932	1,124	1,232	1,766
<b>NON POTABLE</b>	<b>LIC VOLUME OF WATER SOLD</b>					
Number of Customers	399	400	401	402	403	403
LIC Total Metered Use	651,084,835	588,542,419	553,836,846	477,839,493	545,303,000	451,443,000
<b>LIC Use (mgd)</b>	<b>1.7838</b>	<b>1.6124</b>	<b>1.5174</b>	<b>1.3091</b>	<b>1.4940</b>	<b>1.2368</b>
LIC Use Per Customer	4,471	4,031	3,784	3,257	3,707	3,069

## *LAUNIUPOKO IRRIGATION CO., INC*

### LIC Company and System Description

Launiupoko Irrigation Company, Inc (LIC) is regulated by the Hawaii Public Utilities Commission (PUC)<sup>4</sup> and provides non-potable water service to customers in the Launiupoko region of West Maui. LIC's service area covers approximately 8,500 acres located within plats TMK 4-7-01 and TMK 4-6-18 as shown in LIC GWUPA Attachment 8. Of the 8,500 acres, 3,000 acres are zoned Conservation with the balance in agriculture previously cultivated for sugar cane by Pioneer Mill Company, Ltd.

Applicant's customers include owners of agricultural lots in several agricultural zoned subdivisions which allow 2 farm dwellings per lot and one user located on Kamehameha Schools land. Additionally, LIC's system provides non-potable water to several kuleana homesteads within the service area identified by TMK on LIC Schedule A. There are currently approximately 407 active service connections, including the 4 kuleana users as described on LIC Schedule A.

There are an additional 267 Authorized Planned Units that will require non-potable water service in the future. These new uses are supported by the SWUPA and GWUPA New Use applications submitted concurrently with LIC's Existing Use applications. See Schedule A attached to the GWUPA & SWUPA. The estimated proposed use demand was calculated using 50% of the total APU land acres multiplied by 3,400 gpd/acre to arrive at a demand of 2.1 mgd.

### LIC Sources

LIC's distributed non-potable water is a blend of surface and groundwater from four (4) different sources:

- Launiupoko Stream 955
- Kauaula Stream 957
- LIC Well 1 State Well No. 6-5138-001('LIC 1'); and
- Lahaina Shaft Pump A State Well No. 6-5240-003 ('A Pump')

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<sup>4</sup> LIC obtained its Certificate of Public Convenience and Necessity ("CPCN") to operate as a public utility providing non-potable water utility service, pursuant to Decision & Order No. 20424 entered on September 10, 2003 in Docket No. 02-0203.

Groundwater from LIC 1 and Pump A are used when surface water is insufficient to meet demand. Accordingly, the amount of groundwater used to meet existing uses is dependent on rainfall and the availability of stream flow.

Interim instream flow standards (IIFS) are established on Launiupoko Stream and Kauaula Stream. The IIFS on Launiupoko Stream is equivalent to an estimated flow of 0 cubic feet per second (0 million gallons per day). See Staff Submittal dated March 20, 2018 at 27.

There are two IIFSs on Kauaula Stream. The first, located below the main diversion (Reg. 957.6) near an altitude of 1,540 feet, is established at an estimated flow of 5.2 cubic feet per second (3.36 million gallons per day) based on USGS estimates of total flow Q90. Id. Pursuant to the Commission's order, "due to the uncertainty of existing hydrogeologic conditions of Kaua'ula Stream, this interim IFS will be subject to a conditional release of water and monitoring by Commission staff" and "should an estimated flow of 5.2 cubic feet per second not be sufficient, the interim IFS may be revised by a future Commission action." Id.

The second, located below the kuleana users near an altitude of 270 feet, is established at an estimated flow of 6.35 cubic feet per second (4.1 million gallons per day) based on USGS estimates of total flow Q70 and seepage losses. Pursuant to the Commission's order, "due to the uncertainty of existing hydrogeologic conditions of Kaua'ula Stream, this interim IFS will be subject to a conditional release of water and monitoring by Commission staff" and "should an estimated flow of 6.35 cubic feet per second not be sufficient, the interim IFS may be revised by a future Commission action."

Since the establishment of the two IIFSs on Kauaula Stream in 2018, there has been insufficient water for LIC users, including kuleana tenants, Kamehameha Schools and LIC's 400+ customers. LIC had been practicing adaptive management practices to ensure that the kuleana users and KS lessee received water. In a letter dated March 15, 2022 CWRM notified LIC that a \$5000 day fine would be imposed if LIC did not ensure that the IIFS. LIC immediately complied upon receipt of the letter in early April. There were a few days when all water flowed into the stream, no water was diverted and still fell short of the IIFS. The kuleana users and KS tenant did not receive water. CWRM acted quickly and on April 19, 2022, CWRM Approved: "Temporary Relief from the Interim Instream Flow Standard for Kaua'ula Stream, Kaua'ula Stream, Lahaina, Maui, to Provide for the Continued Diversion of 300,000 Gallons Per Day During Low-Flow Conditions to Kuleana Users and Kamehameha School Tenants Whose Sole Source of Water is Kaua'ula Stream." After the 300,000 released, the IIFS must be met before LIC deliver water to its 402 customers on

the south side of the Kaua'ula Stream. The Temporary Relief has been extended several times and is in place until Dec. 31, 2023.

Commission staff intends to amend the IIFS on Kauaula Stream to better represent the current flows of the stream using the data they have obtained over the five years since the IIFS was set (2018). LIC is grateful to Commission staff for their work and outreach to the community, including LIC. The amendment of the IIFS will mean more water available to users, including LIC.

Both Launiupoko and Kauaula Streams collect their water from watersheds in two separate valleys on conservation land owned by Makila Land Co., LLC. The water is diverted from the streams and transported via a system of dams, tunnels, metal pipes, and concrete ditches to the Launiupoko and Kauaula Reservoirs where it is then distributed to lots below by a system of underground PVC pipes and filters. Individual service laterals for the non-potable (irrigation) water are extended from the water source to each lot. Part of the distribution system includes the system formerly used for sugar cane irrigation.

Ground water pumped from both the A pump skimming well and LIC Well 1 is stored in the Makila reservoir and pumped to the higher elevation Kauaula and Launiupoko reservoirs where it is then filtered and distributed to customers.

#### Non-potable Supply and Demand

LIC Exhibit 2 to the GWUPA and SWUPA: *Non Potable Sources and Uses* describes the non-potable sources and uses, i.e supply and demand, of the LIC system for the 12-month period prior to WMA designation.

System loss in the blended surface and ground water system is difficult to measure, so a conservative allowance of 12% loss was factored into the total supply of stream water from both sources.

#### System Efficiency

LIC has been challenged with the redesign and construction of a blended system of gravity supplied stream water and a pumped and boosted groundwater supplement. The pumping operations have been operated by diesel pumps and generators. Engineering, planning and permitting for permanent power to LIC 1 and A Pump is moving forward. Infrastructure is in place for LIC 1, and HECO is actively pulling the lines. LIC 1 should have permanent power before the end of the year. Power to the A Pump is stalled with SHPD review of the pole installation. Once the pumps have permanent power, an interconnected SCADA system will be installed.

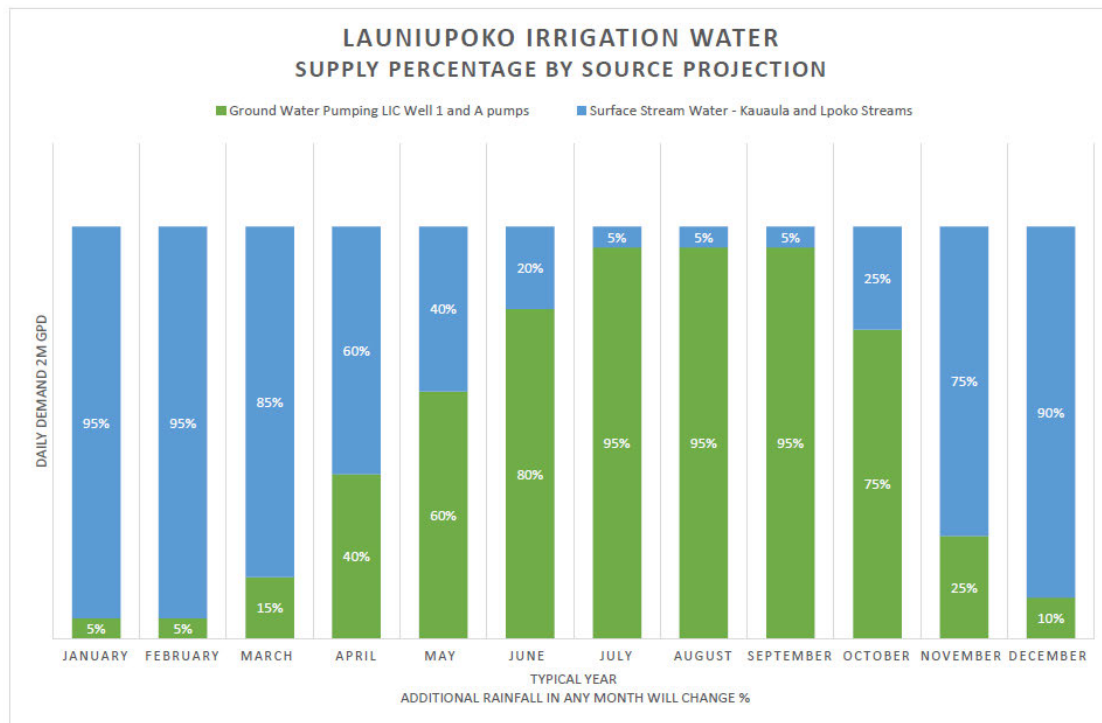


LIC has also established several protocols to improve operations and minimize water losses, meet the regulatory obligations for the stream flows and manually manage the pressure at various locations. Daily readings and site inspections with system readings are the initial steps to help management identify potential problems, the management reviews both the online streamflow information along with the daily field staff reports of reservoir levels and status of all the pumps. Office staff are available to receive customer calls on leaks or service-related issues. After-hours emergency service is available on call and many spare parts are inventoried for such repairs.

Due to the age of the 3 reservoirs used for storage and some of the transmission ditches, leaks are evident, and this is the most challenging area LIC has to address. A major assessment and leak repair was performed on the Kauaula reservoir this summer while flows were low. Future reservoir linings are anticipated.

#### Special Considerations/Situations

- A Pump Requested Amount: The A Pump skimming well was not in service for 7 of the 12 months period prior to designation, but was in continuous service from March, 2022. The estimated volume pumped for the A-Pump is based on the daily average for 12 full months of pumping as described in GWUPA Exhibit 1: *LIC Ground Water Use*.
- LIC Well 1 Requested Amount: LIC 1 pumping was suspended for all but 3 months of the WMA period pending the a PUC rate increase. PUC granted a temporary rate intended to cover the cost of fuel for pumping.
- Overall Requested Amount: LIC is existing requesting 2.3 mgd based on a 7 year consumption prior to the 2018 IIFS. This request is still subject to the IIFS. LIC uses both ground and surface water to meet demand. Availability of surface water fluctuates greatly with weather conditions. The groundwater from A Pump and LIC 1 provide water when after meeting the IIFS and the 300,000 gpd for KS tenant and kuleana use, the flows are insufficient to meet demand. There will be some months where 100% of the demand can be met with surface water, some months when there's a blend of surface and ground water, and some months that will be 100% ground water. The table below is a graphical representation of the fluctuating conditions on the sources.



- Increased Demand: The expectation for continued decline in surface water requires a compensating increase in groundwater withdrawal to meet demand. If LWC demand decreases because there is no non-potable water readily available for irrigation use, LIC demand should increase respectively. Historically this is shown on SWUPA and GWUPA Exhibit C: *LIC vs LWC Consumption 2017 -2022*, attached.
- Low Consumption: Unusually low non-potable consumption for LIC in 2021 was due to constrained supply due to IIFS regulation, limitations on pumping due to generator noise. Put simply, there was limited availability, so the consumption was low. This shortage of non-potable water increased consumption of potable water in 2021/2022 for irrigation use. As shown on Exhibit B: *LIC 7 Year History and Forward Estimate*, real non-potable demand without such constraints is closer to 2.0 MGD. As new non-potable sources were brought online, and the PUC provided temporary relief with a rate that is intended to cover the cost of fuel, non-potable demand has increased, and potable demand is reduced.
- Irrigation Benefits. LIC provides non-potable water at its 407 connections. The water is used for irrigation, which then recharges the aquifer. CWRM's WMA FOF report discussed the changing re-charge to

the aquifer after the sugar plantation ceased operations. Soil stabilization counteracts the erosive influences of rainfall, runoff, and wind on bare soil. In the arid west Maui climate, with the mountain rising from the sea, it is critical to the health of the reef and streams to keep the mauka slopes stabilized. Many have witnessed the brown water after the first storm impacts fire ravaged area. Temperatures and cloud drip are also positively impacted by greenery. Greenery helps to cool the environment and mitigate global warming. Most importantly, irrigation around homes provides critical fire buffers.



*Fire Buffer Areas: 2018 Fire path around irrigated and non-irrigated areas.*

Deputy Director Manuel  
August 3, 2023  
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In closing, LIC and LWC have compiled the best data that was available to them as municipal water suppliers. Neither company has data on specific customer uses after the meter and can only provide information on the metered amounts. Screen shots from RPT Pictometry of the TMK parcels with some supplemental photos provided by owners or taken by staff are included in the applications for the requested existing end use photos.

Please contact me with any questions

Regards,

Launiupoko Water Company, Inc.



Glenn E Tremble  
Secretary/Treasurer

Launiupoko Irrigation Company, Inc.



Peter K Martin  
President

Attachments to the letter:

Exhibit A, B, C

## EXHIBIT A

LAUNIUPOKO WATER COMPANY AND LAUNIUPOKO IRRIGATION COMPANY  
SUMMARY OF COMBINED POTABLE AND NON POTABLE  
GWUPA and SWUPA-E APPLICATIONS

LAUNIUPOKO POTABLE AND NON POTABLE WATER USE SUMMARY						COMMENTS
SUMMARY OF EXISTING AND REQUESTED USE (Average Gallons Per Day) [1]						
GWUPA	SWUPA-E	Potable or Non Potable	Max GPD based on Pump Capacity or Stream Flow [2]	REQUESTED USE (avg. GPD over 12 mos)	ACTUAL SOURCE USE for WMA 12 Months (GPD)	
LWC Wells 1,2 & 3		Potable	1,584,000	675,000	636,019	Well 2 incurred mechanical issues and was down for 8 of 12 WMA months. Requested use includes Well 2 avg daily use for the 4 months of WMA period in service .
	Total Potable (LWC)			675,000	636,019	
LIC Well 1		Non Potable	720,000	242,051	76,461	Well 1 pumping was suspended for all but 3 months of WMA period pending PUC rate increase to allow pumping. Requested use is based on a full 12 month period and shown on LIC Exhibit 1.
Lahaina Shaft A Pump		Non Potable	2,016,000	393,988	82,642	A-Pump was only operational for 5 of the 12 month WMA period, but operated continuously thereafter. Requested use is based on full 12 month period as shown on LIC Exhibit 1.
	Launiupoko Stream	Non Potable	Max that can be stored	340,325	340,325	Requested Use is existing use.
	Kauaula Stream	Non Potable	Max that can be stored after IIFS is met.	1,647,318	1,163,853	Requested Use is 2017 use based on actual consumption prior to IIFS per Exhibit B, or the maximum allowed after IIFS at the time is met
	Total Non Potable (LIC)			2,623,682	1,663,281	See Exhibits B & C which show the true demand, unconstrained by supply interruption, to be 2.0 MGD. Demand during the 12 month WMA period was constrained by supply due to limited pumping and drought.
TOTAL SOURCE				3,298,682	2,299,300	
[1] Based on data provided in GWUPA and SWUPA-E applications.						
[2] Max GPD is listed to indicate source flexibly for equipment maintenance and repair, volatile stream flows, and modified IIFS						
SUMMARY OF EXISTING CONSUMPTION						
Launiupoko Water Company		Potable			558,127	See LWC Exhibit 2 for detail
Launiupoko Irrigation Company		Non Potable			1,457,510	See LIC Exhibit 2 for detail
TOTAL CONSUMPTION					2,015,637	



## EXHIBIT C

POTABLE AND NON-POTABLE  
VOLUME OF WATER SOLD 2017-2022

	VOLUMES OF POTABLE AND NON POTABLE WATER SOLD					
	2017	2018	2019	2020	2021	2022
<b>POTABLE</b>	<b>LWC VOLUME OF WATER SOLD</b>					
Number of Customers	330	337	350	355	366	375
LWC Total Metered Use	84,936,498	85,930,465	119,089,329	145,634,817	164,611,710	241,690,000
<b>LWC Use (mgd)</b>	<b>0.2327</b>	<b>0.2354</b>	<b>0.3263</b>	<b>0.3990</b>	<b>0.4510</b>	<b>0.6622</b>
LWC Use Per Customer	705	699	932	1,124	1,232	1,766
<b>NON POTABLE</b>	<b>LIC VOLUME OF WATER SOLD</b>					
Number of Customers	399	400	401	402	403	403
LIC Total Metered Use	651,084,835	588,542,419	553,836,846	477,839,493	545,303,000	451,443,000
<b>LIC Use (mgd)</b>	<b>1.7838</b>	<b>1.6124</b>	<b>1.5174</b>	<b>1.3091</b>	<b>1.4940</b>	<b>1.2368</b>
LIC Use Per Customer	4,471	4,031	3,784	3,257	3,707	3,069

LAUNIUPOKO IRRIGATION COMPANY INC  
7 YEAR SUPPLY AND DEMAND FORWARD ESTIMATE

## LAUNIUPOKO IRRIGATION COMPANY, INC.

	LIC 7-YEAR CONSUMPTION HISTORY							FUTURE DEMAND (6)			%
	2016 (1)	2017 (1)	2018	2019	2020	2021	2022	2023	2024	2025	
<b>Uses:</b>											
LIC Metered Consumption	650,303,485	651,084,835	588,542,419	553,836,846	477,839,493	545,303,000	451,443,000	561,807,000	617,987,000	679,786,000	
Kuleana Use (Kauaula Stream)	(2) 48,000,000	(2) 48,000,000	(2) 48,000,000	(2) 48,000,000	(3) 43,326,242	41,500,693	57,761,866	55,000,000	55,000,000	55,000,000	
Total LIC Use	698,303,485	699,084,835	636,542,419	601,836,846	521,165,735	586,803,693	509,204,866	616,807,000	672,987,000	734,786,000	100%
LIC total Blended Use MGD	1.91	1.92	1.74	1.65	1.43	1.61	1.40	1.69	1.84	2.01	
<b>Sources:</b>											
<u>Ground Water</u>											
From LWC 2 & 3	[7] 8,369,700	8,369,700	40,523,800	178,882,254	120,869,229	334,559					
From LIC 1					148,861,090	18,412,552	75,554,258	63,302,898	102,785,795	164,584,795	
From A-Pump							75,810,170	63,302,898	80,000,000	80,000,000	
Total Ground Water	8,369,700	8,369,700	40,523,800	178,882,254	269,730,319	18,747,111	151,364,428	126,605,795	182,785,795	244,584,795	33%
Ground Water gal/day	22,931	22,931	111,024	490,088	738,987	51,362	414,697	346,865	500,783	670,095	
<u>Surface Water</u>											
(4) From Launiupoko Stream (gal)	126,653,905	89,444,000	174,944,800	155,537,000	110,397,910	130,035,000	99,566,000	110,909,630	110,909,630	110,909,630	15%
Launiupoko gal/day	346,997	245,052	479,301	426,129	302,460	356,260	272,784	303,862	303,862	303,862	
(5) From Kauaula Stream (gal)	563,279,880	601,271,135	421,073,819	267,417,592	141,037,506	438,021,582	258,274,438	379,291,575	379,291,575	379,291,575	52%
Kauaula Gal/day	1,543,233	1,647,318	1,153,627	732,651	386,404	1,200,059	707,601	1,039,155	1,039,155	1,039,155	
Total Surface Water	689,933,785	690,715,135	596,018,619	422,954,592	251,435,416	568,056,582	357,840,438	490,201,205	490,201,205	490,201,205	
Surfaced Water gal/day	1,890,230	1,892,370	1,632,928	1,158,780	688,864	1,556,319	980,385	1,343,017	1,343,017	1,343,017	
<b>Daily Average Use Per Connection</b>											
(6) Number of Connections incl HOA	385	399	400	401	402	403	403	404	404	404	
Avg Use Per Connection Per Day (gal)	4,969	4,800	4,031	3,784	3,257	3,707	3,069	3,810	4,191	4,610	

## Notes:

- (1) Estimated customer demand without source limitations is 2.0 mgd. Post-2017 supply problems plagued LIC limiting the amount of water available to customers due to IIFS, prolonged drought, and insufficient ground water pumping ability requiring water rationing.
- (2) Estimated at 4.0 mg/month
- (3) Includes only 5 months of data Aug-Dec 2020 totaling 15,326,242 gal . Remaining months estimated at 4.0 MG/mo
- (4) 2016 estimated based on 6-year daily average
- (5) Kauaula stream water is calculated to make up 100% of demand not supplied by Lpoko stream & ground water.
- (6) Future demand in 2023-2025 fo 1,039,155 is based on the same 12 month average for Kau stream calculated for the 12 month WMA period, assuming the same average supply of surface water with the balance made up by ground water.
- (7) 2016 is estimated based on 2017



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

APPLICATION FOR GROUND WATER USE PERMIT

FORM GWUPA

- ☐ New Use
- ☐ Modification of WUP No. \_\_\_\_\_
- ☒ Existing Use

For Official Use Only:

For detailed instructions on filling out this application form completely, refer to the attached instructions. Incomplete applications will not be accepted for processing.

APPLICANT INFORMATION

1. APPLICANT INFORMATION

Name/Company  
Launiupoko Water Company, Inc

Contact Person  
Glenn Tremble

Mailing Address  
305 E. Wakea Ave., Ste 100  
Kahului, HI 96732

Phone  
808-877-4202

Fax  
808-877-9409

E-mail  
[Redacted]

2. SOURCE LANDOWNER INFORMATION

Name/Company  
Makila Land Co. LLC

Contact Person  
Peter Martin

Mailing Address  
305 E. Wakea Ave., Ste 100  
Kahului, HI 96732

Phone  
808-877-4202

Fax  
808-877-9409

E-mail  
[Redacted]

SOURCE INFORMATION

3. ISLAND  
Maui

4. AQUIFER SYSTEM AREA  
LAUNIUPOKO

4A. SUSTAINABLE YIELD FOR ITEM 4  
7.0 MGD

5. SOURCE INFORMATION

Attach additional sheets, if necessary.

Well Number (if known)	Well Name	Existing or Proposed?	TMK	Flowmeter installed?
6-5138-001	Launiupoko 1	Existing	4 - 7 - 001 : 026 zone sector plat parcel	<input checked="" type="checkbox"/> Yes, date installed 03 / 15 / 04 <input type="checkbox"/> No
6-5137-01	Launiupoko 2	Existing	4 - 7 - 001 : 0368 zone sector plat parcel	<input checked="" type="checkbox"/> Yes, date installed 06 / 25 / 02 <input type="checkbox"/> No
6-5238-01	Launiupoko 3	Existing	4 - 7 - 001 : 053 zone sector plat parcel	<input checked="" type="checkbox"/> Yes, date installed 03 / 15 / 09 <input type="checkbox"/> No
			zone sector plat parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No
			zone sector plat parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No
			zone sector plat parcel	<input type="checkbox"/> Yes, date installed / / <input type="checkbox"/> No

USE INFORMATION


6. TOTAL QUANTITY OF WATER REQUESTED: In the space below, enter total from Box M in Item 11 (Table 1) of this application.  
675,000 gallons per day, averaged over 1 year

7. USE: ☐ Agriculture ☒ Domestic ☐ Industrial  
Check all that apply. ☐ Irrigation ☐ Military ☐ Municipal


8. LOCATION OF WATER USE: Show the location of the use on a map, attached as a .pdf to this application.  
See Item 11 (Table 1, column B) of this application. See Exhibits 4,5 and Attachment GWUPA 8

**Note 2:** Signing below indicates that the signatories understand and affirm that the information provided on this application is accurate and true to the best of their knowledge. Further, the signatories understand that: (1) if necessary, further information may be required before the application is considered complete; (2) if a water use permit is granted by the Commission, this permit is subject to any existing legal uses, changes in sustainable yields and instream flow standards, reserved uses as defined by the Commission, and Hawaiian Home Lands' future uses; and (3) the applicant is responsible for paying the public notice fees associated with this application. Additionally, as stated in Note 1, above, HRS § 174C-51(1) the landowner shall be the joint applicant in the event the applicant is a lessee, licensee, developer or any person with a terminable interest or estate in the land that is the water source of the permitted water.

9. APPLICANT

  
Signature  
Glenn E Tremble  
Print Name  
8/1/23  
Date

10. SOURCE LANDOWNER/JOINT APPLICANT (if applicable)

  
Signature  
Peter K Martin  
Print Name  
8/1/23  
Date



USE INFORMATION									
11. TABLE 1: LAND USE CONSISTENCY (Attach additional copies, if necessary.)									
LAND USE CONSISTENCY						EFFICIENCY OF USE			
A	B	C	D	E	F	G	H	I	J
PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: <ul style="list-style-type: none"><li>Property tax map, showing location of use referenced to established property boundaries.</li><li>Photograph of the area of use.</li></ul>	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
USES THAT REQUIRE POTABLE (DRINKING) WATER									
	4 - 7 - 01 : zone sector plat parcel	AG	<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input checked="" type="checkbox"/> No	AG	<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input checked="" type="checkbox"/> No	375 UNITS	1800	675,000	See Exhibit 1 Existing Use, Exhibit 3: Table 1 Attachment GWIUPA 11 Table 1 and cover
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
TOTAL POTABLE USE								K 675000	GPD
USES THAT DO NOT REQUIRE POTABLE WATER									
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
	- - : zone sector plat parcel		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No		<input type="checkbox"/> Yes, date approved: / / <input type="checkbox"/> Yes, not acquired <input type="checkbox"/> No				
TOTAL NON-POTABLE USE								L	GPD
TOTAL QUANTITY OF WATER REQUESTED (sum of total potable use and total non-potable use) =								M 675,000	GPD
Please explain if there are any limitations (e.g., legal, contractual) on the proposed water use(s) described in Table 1. Ref. HRS § 174C-51(5).									
The Company received its Certificate of Public Convenience and Necessity to operate as a public utility from the Hawaii Public Utility Commission. Pursuant to Decision and Order No. 20274 filed on June 27, 2003 in Docket No. 02-0196.									
[1] The LWC service area defined by TMK 4-7-01 totals approximately 6,300 acres of which 3,000 acres are conservation area. See Exhibit 5: LWC Service Area Map.									
[2] Potable water distributed to LWC's customers is a blend of stored ground water pumped from LWC's 3 wells. Monthly pumpage for each well is shown on Exhibit 1.									

USE INFORMATION (continued)

12. TABLE 2: AGRICULTURE/IRRIGATION INFORMATION  
List all crops that will be grown, including landscape and golf course irrigation uses. Copy Table 2 and attach additional sheets to complete your list, if necessary.

A	B	C	D	E	F	G	H	I
TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: <ul style="list-style-type: none"><li>Property tax map with an outline around the area of each irrigation use listed in this table.</li><li>Photograph of the area of each use.</li></ul>	CROP	TOTAL ACREAGE	NET IRRIGATED ACREAGE	BEGIN GROWTH PERIOD (month)	END GROWTH PERIOD (month)	IRRIGATION SYSTEM (refer to instructions)	IRRIGATION PRACTICE (refer to instructions)	COMMENTS (Continue comments below, if more space is needed.)
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								
____ - ____ - ____ : ____ zone sector plat parcel								

Comments (continued from Column I). Please clearly indicate the crop (i.e., the row in table) these comments relate to.

OTHER PERTINENT INFORMATION

13. TABLE 3: ALTERNATIVES ANALYSIS

	A. Analysis of <i>potable</i> alternatives Attach additional sheets if necessary.	B. Analysis of <i>non-potable</i> alternatives Attach additional sheets if necessary.
Municipal sources	LWC (PWS #251) has a PUC-approved service area totaling approximately 3,300 acres. Potable service from Maui County DWS has been requested but denied for new lots within this service area, so new municipal sources are not an option.	
Wastewater reuse	All LWC's existing customers have IWS(sep ic) systems with varying tank sizes, so treatment for irrigation use is limited to leach field design. The County does not serve this area with R-1 water for irrigation use, and R-1 water is not useable for potable use.	
Ditch system	Not appropriate for potable use. Cost of treatment of ditch water for potable use makes it infeasible.	
Desalinization	Desalinization is expensive technology, and not feasible for LWC at this time. Desalinized water would be a much higher cost to the consumer and requires waste disposal of concentrate. Additionally, approximately 35% additional pumping is required to offset R.O concentrate disposal.	
Surface water	Instream uses, interim IFS, and existing non-potable off-stream uses account for substantially all of this potential source. Even if water was available, development of a surface water treatment plant near the service area is cost prohibitive.	
Other	Catchment as an alternative is not pra	

14. PUBLIC INTEREST

§174C-2(C), HRS states: *The state water code shall be liberally interpreted to*[a] *obtain maximum beneficial use of the waters of the State for purposes such as domestic uses, aquaculture uses, irrigation and other agricultural uses, power development, and commercial and industrial uses. However, [b] adequate provision shall be made for the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation. Such objectives are declared to be in the public interest.*

Explain how the use in your application is consistent with items [a] and [b] above.

- a) LWC provides municipal ground water for residential potable needs. The ground water is treated for safe domestic consumption and distributed to approximately 375 consumers for their domestic use, which is a public trust purpose. Municipal uses and public water supply are declared to be in the public interest.
- b) LWC's uses are considered "municipal uses", providing potable water service to the Launiupoko region of Maui which the County of Maui is unable to service. LWC's existing wells

15. KA PA'AKAI ANALYSIS:

- a. Please provide the identity and scope of cultural, historical, and natural resources in which traditional and customary Native Hawaiian rights are exercised in this area.

Ka Pa'akai: See Exhibit 7 Ka Pa'akai for Launiupoko Wells 1,2,& 3

- b. Identify the extent to which those resources, including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.

Ka Pa'akai: See Exhibit 7 Ka Pa'akai for Launiupoko Wells 1,2,& 3

- c. What feasible action, if any, could be taken to reasonably protect Native Hawaiian rights?

Ka Pa'akai: See Exhibit 7 Ka Pa'akai for Launiupoko Wells 1,2,& 3

OTHER PERTINENT INFORMATION

16. INTERFERENCE WITH THE RIGHTS OF THE DEPARTMENT OF HAWAIIAN HOME LANDS  
Explain how the use of water will not interfere with the rights of the Department of Hawaiian Home Lands, as provided in section 221 of the Hawaiian Homes Commission Act.

DHHL does not have a reservation in the Launiupoko aquifer. There are no DHHL lands within LWC's service area that would draw from the Launiupoko aquifer. Hence. LWC's existing use

17. INTERFERENCE WITH ANY EXISTING LEGAL USES  
Explain how the use of water will not interfere with any other existing legal use(s) of water.

LIC's municipal withdrawal of ground water for domestic use by its customers is legally authorized by the Dept. of Health and regulated by the PUC under the terms of its CPCN granted

18. EFFICIENCY  
☒ If a water conservation plan was prepared, please attach to this application.

☒ If no water conservation plan was prepared, please explain how your use of water will be as efficient as possible.  
LWC's potable water is stored within storage tanks that undergo annual inspection to prevent leakage, and annual water audits are performed. A replacement plan is in place to upgrade

19. PUBLIC WATER SYSTEM INFORMATION  
Check the appropriate box or boxes.  
☒ PUC-Regulated Private System / ☐ Non-PUC-Regulated Private System / ☐ Not a Public Water System  
☐ Intended dedication to Honolulu Board of Water Supply or to County of Maui, Department of Water Supply.  
☒ If a Level-1 validated AWWA water loss audit was completed, please attach.

20. CHAPTER 343  
This project proposes:  
☐ Use of state or county lands, or use of state or county funds  
☐ Use within a state conservation district  
☐ Use within a shoreline setback area  
☐ Use within a national or Hawaii registered historic site  
☐ Use within the Waikiki Special District  
☐ The construction, expansion or modification of helicopter facility  
☐ A wastewater treatment unit  
☐ Waste-to-energy facility  
☐ Landfill  
☐ Oil refinery  
☐ Power-generating facility  
☒ None of the above 11 items  
☒ If none of the above 11 items are applicable, no 343 compliance is necessary  
☐ An Environmental Assessment was completed, and  
☐ An Environmental Impact Statement was required and has been accepted (attach letter of acceptance). Publication date in The Environmental Notice:  
☐ A Finding of No Significant Impact has been determined (attach letter). Publication date in The Environmental Notice:

21. TABLE 4: 12-MONTH AVERAGE CALCULATION AS OF THE DATE OF DESIGNATION. FOR EXISTING USES ONLY.

MM/YY	Average Daily Pumpage for the Month (Gallons per Day)	Check one per row			
		Metered	Estimated	Active but unknown	Inactive
8/2021 - 7/2022	SEE EXHIBIT 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**INSTRUCTIONS FOR FILLING OUT APPLICATION FOR GROUND WATER USE PERMIT**

This application form is to be used for **both** existing uses in newly designated ground water management areas and proposed new uses, including modifications of existing ground water use permits.

Most questions can be addressed by visiting our website at <http://www.hawaii.gov/dlnr/cwrn> or by contacting the Ground Water Regulation Branch at 587-0225 or by e-mail at [dlnr.cwrn@hawaii.gov](mailto:dlnr.cwrn@hawaii.gov).

The current application form link is here: <https://files.hawaii.gov/dlnr/cwrn/forms/GWUPA.pdf>

**REQUIREMENTS FOR A COMPLETE APPLICATION**

- a. Fill in the most recent application form. An updated fillable PDF can be found at <https://files.hawaii.gov/dlnr/cwrn/forms/GWUPA.pdf>
- b. We require a digital copy to be circulated for review. If you are unable to submit a digital copy, print in ink or type the information on the application form but be aware that there will be delays in processing your application.
- c. E-mail a PDF of the application to [dlnr.cwrn@hawaii.gov](mailto:dlnr.cwrn@hawaii.gov) A check for the non-refundable filing fee of \$25 payable to Department of Land and Natural Resources can be dropped off at 1151 Punchbowl Street, Room 227, Honolulu 96813, or mailed to P.O. Box 621, Honolulu, HI 96809. Please attach a printed copy to this filing fee check. Note that government agencies as applicants are not required to pay this filing fee.
- d. The applicant is responsible for paying the cost of publishing any required public notices associated with this application, and unlike the application fee, government agencies are *not* exempt from this. The cost for public notices is approximately \$1000.00. Commission staff will pay this fee up front and will provide instructions later regarding your reimbursement of this cost. Failure to reimburse the Commission will result in non-action on your water use permit application.
- e. Attach photos showing the well source(s), meter(s) (if applicable), and end use area(s).
- f. The water user and the landowner of the source location (“source landowner”) must sign the application form.

**INSTRUCTIONS FOR COMPLETING THE APPLICATION FORM**

**PAGE 1**

**APPLICANT INFORMATION**

In accordance with the Hawaii Water Code, both the applicant and the person who owns the property where the water source is located are required to apply for a water use permit. §174C-51(1)(B), HRS, states, *In the event a lessee, licensee, developer, or any other person with a terminable interest or estate in the land, which is the water source of the permitted water, applies for a water permit, the landowner shall also be stated as a joint applicant for the water permit.*

- 1. **APPLICANT INFORMATION** Fill in the applicant’s contact information. This should be the person who will be responsible for all conditions of the water use permit. If this is for multiple sources and it doesn’t fit on the table, please attach a separate sheet listing these sources.
- 2. **SOURCE LANDOWNER INFORMATION** Fill in the information for the landowner of the property where the proposed ground water source (e.g., well, modified spring, tunnel, shaft, etc.) is located. If this is for multiple sources and different landowners, please attach a separate sheet listing these landowners and their acknowledgement regarding this application.

**SOURCE INFORMATION**

- 3. **ISLAND** Indicate the island on which the source is located.
- 4. **AQUIFER SYSTEM AREA** The name of the aquifer system area where the source is located. <https://dlnr.hawaii.gov/cwrn/info/maps/>
- 4A. **SUSTAINABLE YIELD** The sustainable yield for the aquifer system area.
- 5. **SOURCE INFORMATION**
  - **WELL NUMBER** If the source already has a state-assigned well number, enter the state well number here.
  - **WELL NAME** If the source has a name, enter the name here. Otherwise, assign a short name that will differentiate it from other wells. This should be the same as the name listed on the accompanying well construction / pump installation permit application, where applicable.
  - **SOURCE TMK** Fill in the current Tax Map Key number of the parcel on which the source resides.
  - **FLOWMETER INFORMATION** You must have a flowmeter to accurately indicate that your water usage is in compliance with your proposed approved allocation. Check either “Yes” or “No.” If you answer “Yes,” write in the date the flowmeter was installed month/day/year in the space provided. The definition of a working flowmeter is a water meter with a totalizer that gives the total quantity of water used from a source.

**WATER USE INFORMATION**

- 6. **TOTAL QUANTITY OF WATER REQUESTED** Enter the amount of water requested as gallons per day (GPD) averaged over one year from Box M of Table 1.
- 7. **USE(S)** Check all the boxes that apply for the use. Refer to the instructions for Table 1: Land Use Consistency/Efficiency of Use, Item 1: Purpose/Water Use Category below to determine which water use categories to use.
- 8. **LOCATION OF WATER USE(S)** Show the location of the use on a map. This is essential for agricultural uses and will be attached to your water use permit, if approved.

**APPLICANT SIGNATURES REQUIRED**

- 9. **APPLICANT** The applicant must sign and date the application.
- 10. **SOURCE LANDOWNER** The source landowner must also sign and date the application.

**PAGE 2**

**USE INFORMATION**

**Note that you will need to fill out each section for potable and non-potable needs separately. This means that even though your source is defined as potable, you may have end use needs that don’t require potable water, such as landscape irrigation. This will help the Commission determine whether or not non-potable alternatives are available for your non-potable needs.**

- 11. **Table 1: USE INFORMATION** Provide information on all of the uses you are applying for or seeking to modify to. In the space provided below the table or on a separate sheet, explain whether there are any limitations [e.g., a contract or other legal agreement(s)] on your water use(s), as required by §174C-51(5), HRS.

**A. PURPOSE / WATER USE CATEGORY** For each purpose of use, choose one of the categories listed in the table below and enter the appropriate code in the space provided (e.g., AGRAQ, IRRGC, etc.)

<b>AGRICULTURE</b> AGRAQ      Aquatic Plants & Animals AGRCP      Crops & Processing AGRLI      Livestock & Processing, and Pasture AGRON      Ornamental & Nursery Plants AGROTH    Other	<b>DOMESTIC</b> DOM          Single & Multi Low-Rise & High-Rise Household DOMN        Domestic (Non-residential) DOMNCB     Commercial Businesses DOMNRI      Religious Institutions DOMNHOS    Hospitals DOMNHOT    Hotels DOMNOB      Office buildings DOMNOTH    Domestic Non-Residential - Other DOMNSC      Schools
<b>IRRIGATION</b> IRRGC      Golf Course IRRHM      Habitat Maintenance IRRHOT      Hotel IRRLA      Landscape/Water Features IRROTH      Other IRRPCA      Parks IRRSC      Schools	<b>INDUSTRIAL</b> INDEL        Geothermal, Thermoelectric Cooling, Power Development INDFP        Fire Protection INDMI        Mining, Dust Control INDOTH       Industrial – Other
<b>MILITARY</b> MIL          Military	<b>MUNICIPAL</b> MUNCO       County MUNPR       Privately-owned but defined as public water system by MUNST       DOH State

- B. USE TMK** Enter the tax map key (TMK) number for the parcel of land over which the use is applied. There should only be one parcel for each line. Also, attach:
- C. STATE LAND USE DISTRICT** Write in the name of the current land use district. To find the Land Use District, contact the Land Use Commission at (808) 587-3822.
- D. CDUP REQUIRED?** Check the appropriate box. If a Conservation District Use Permit (CDUP) is required and you have a CDUP applicable to this project, check “Yes” and write in the date approved in the space provided (month/day/year). If your parcel is in a conservation district, as indicated in Column C of this table, contact the Office of Conservation and Coastal Lands at (808) 587-0328 to find out if a CDUP is required.
- E. COUNTY ZONING CODE** To find out the County Zoning Code for Oahu, contact the City and County of Honolulu at 768-8041. For Maui County, contact at 270-7253.
- F. SMAP REQUIRED?** Check the appropriate box. If a Special Management Area Permit (SMAP) is required, and you have an SMAP applicable to this project, check “Yes” and write in the date approved in the space provided (month/day/year). To find out if your parcel is in a Special Management Area and requires an SMAP, for Oahu contact the City and County of Honolulu Department of Planning and Permitting or for Maui County contact the Planning Department.
- G. UNITS or NET ACREAGE** This is the total number of units or the net number of acres as a basis for calculating your requested allocation. “Unit” can mean a dwelling unit, number of people, acres, number of animals, etc. Some examples of units or acreages to enter in this column would be 400 dwelling units, 500 people, or 3.74 acres.
- H. GPD/UNIT or GPD/ACRE** (GPD = gallons per day) Enter the gallons per day per unit (GPD/unit) or gallons per day per acre (GPD/acre) for each water use category listed in Column A.
- I. QUANTITY OF USE** Enter the quantity of water use in gallons per day (GPD). Justification (see Column J) for the quantity requested may depend on the information provided in columns G and H of this table.
- J. JUSTIFICATION FOR QUANTITY OF WATER REQUESTED** Explain how you are justifying the quantity of water requested for each use, in Column I of this table. Attach additional sheets, if necessary, showing how the proposed quantity was calculated. For all proposed irrigation uses, you are required to also complete Item 12 (Table 2) of the application.
- K. TOTAL POTABLE USE NEEDS** Add the quantities listed in the Column I for proposed potable water use. Enter the total quantity in gallons per day (GPD) in Box K.
- L. TOTAL NON-POTABLE USE NEEDS** Add the quantities listed in Column I for proposed uses that do not require potable water. Enter the total quantity of proposed non-potable water use in gallons per day (GPD) in Box L.
- M. TOTAL QUANTITY OF WATER REQUESTED** Add the totals in Box K and Box L, and enter the sum in Box M. The quantity in Box M should be the same as the amount entered under Item 6 on the page 1 of the application.

**PAGE 3**

**12. TABLE 2: AGRICULTURE/IRRIGATION INFORMATION**

On Table 2, provide the information requested for all of the plant types or other needs such as aquaculture, etc. Enter only one plant and one parcel number (TMK) per line. For multiple crops, list each one as a separate line item. All uses you are applying for must be listed. Attach additional copies of Table 2, if necessary.

- A. TMK FOR LOCATION OF USE** Enter the parcel number where the crop is/will be grown. Also, attach a map with an outline around the area(s) of use(s) and a photograph of each area of proposed use.
- B. CROP** Enter the crop type
- C. TOTAL ACREAGE** Enter the total acreage of the parcel listed.
- D. NET IRRIGATED ACREAGE** Enter the acreage that the specific crop will be grown.
- E. BEGIN GROWTH PERIOD (MONTH)** This is the month of the start of the growth cycle.
- F. END GROWTH PERIOD (MONTH)** This is the month of the end of the growth cycle.
- G. IRRIGATION SYSTEM** Enter one of the following:
- TRICKLE, DRIP  
TRICKLE, SPRAY  
MULTIPLE SPRINKLERS



SPRINKLER, CONTAINER NURSERY  
SPRINKLER, LARGE GUNS  
SEEPAGE, SUBIRRIGATION  
CROWN FLOOD  
FLOOD (TARO)  
OTHER – Please describe in the space provided for comments (Column I and/or below the table).

- H. IRRIGATION PRACTICE** Enter one of the following:  
IRRIGATE TO FIELD CAPACITY  
APPLY A FIXED DEPTH PER IRRIGATION  
DEFICIT IRRIGATION  
OTHER – Please describe in the space provided for comments (Column I and/or below the table).

**PAGE 4**

**13. TABLE 3: ALTERNATIVES ANALYSIS**

You should address every alternative and explain why each alternative is or is not available for your potable and non-potable water needs. Note that simple “not available” answers are not acceptable. If the alternative is not feasible, please explain.

**Municipal sources** Please contact your County’s Department of Water Supply to identify if a municipal source is available to supply water to your area of need.

**Wastewater reuse** Please contact your County’s Wastewater Division to identify if reuse water is available to supply water to your area of need.

**Ditch system** Please identify whether a ditch system is available to supply water to your area of need. You can contact the Department of Agriculture, but you should also identify private ditch systems and the availability of that source as well.

**Desalinization** Please explain why drilling a well deeper or finding an alternative source of saline water and desalinizing is not a feasible alternative.

**Surface water** is defined in §174C-3, HRS as: *...both contained surface water—that is, water upon the surface of the earth in bounds created naturally or artificially including, but not limited to, streams, other watercourses, lakes, reservoirs, and coastal waters subject to state jurisdiction—and diffused surface water—that is, water occurring upon the surface of the ground other than in contained waterbodies. Water from natural springs is surface water when it exits from the spring onto the earth’s surface.*

**Other** Other alternatives may include stormwater reclamation, rainwater catchment, or other alternatives not already listed above.

**14. PUBLIC INTEREST**

Explain in the space provided or on a separate sheet why the use(s) on your application are consistent with the public interest.

**15. KA PA’AKAI ANALYSIS**

In the case of Ka Pa’akai O Ka’Aina vs. the Land Use Commission, State of Hawaii, it was determined that an analysis must be conducted for the following items:

- a. The identification and scope of cultural, historical, and natural resources in which traditional and customary Native Hawaiian rights are exercised in the area.
- b. The identification of the extent to which those resources listed in item a., including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.
- c. The determination of the feasible action, if any, that could be taken to reasonably protect Native Hawaiian rights.

**PAGE 5**

**16. INTERFERENCE WITH THE RIGHTS OF THE DEPARTMENT OF HAWAIIAN HOME LANDS**

Explain in the space provided or on a separate sheet how the use(s) of water will not interfere with the rights of the Department of Hawaiian Home Lands, as provided in section 221 of the Hawaiian Homes Commission Act. To inquire about potential interference, you may contact the Department of Hawaiian Home Lands main line at 620-9500, or the DHHL Planning Office at 620-9480. You may also visit their website at [dhhl.hawaii.gov](http://dhhl.hawaii.gov), where you can review DHHL’s Island Plans, Regional Plans, and their Water Policy Plan.

The State Water Code in §174C-101(a), HRS [Native Hawaiian water rights], states: *Provisions of this chapter shall not be construed to amend or modify rights or entitlements to water as provided for by the Hawaiian Homes Commission Act, 1920, as amended, and by chapters 167 and 168, relating to the Molokai irrigation system. Decisions of the commission on water resource management relating to the planning for, regulation, management, and conservation of water resources in the State shall, to the extent applicable and consistent with other legal requirements and authority, incorporate and protect adequate reserves of water for current and foreseeable development and use of Hawaiian home lands as set forth in section 221 of the Hawaiian Homes Commission Act.*

**17. INTERFERENCE WITH ANY EXISTING LEGAL USES**

Explain in the space provided or on a separate sheet how the use(s) of water will not interfere with any other existing legal use(s) of water.

**18. EFFICIENCY**

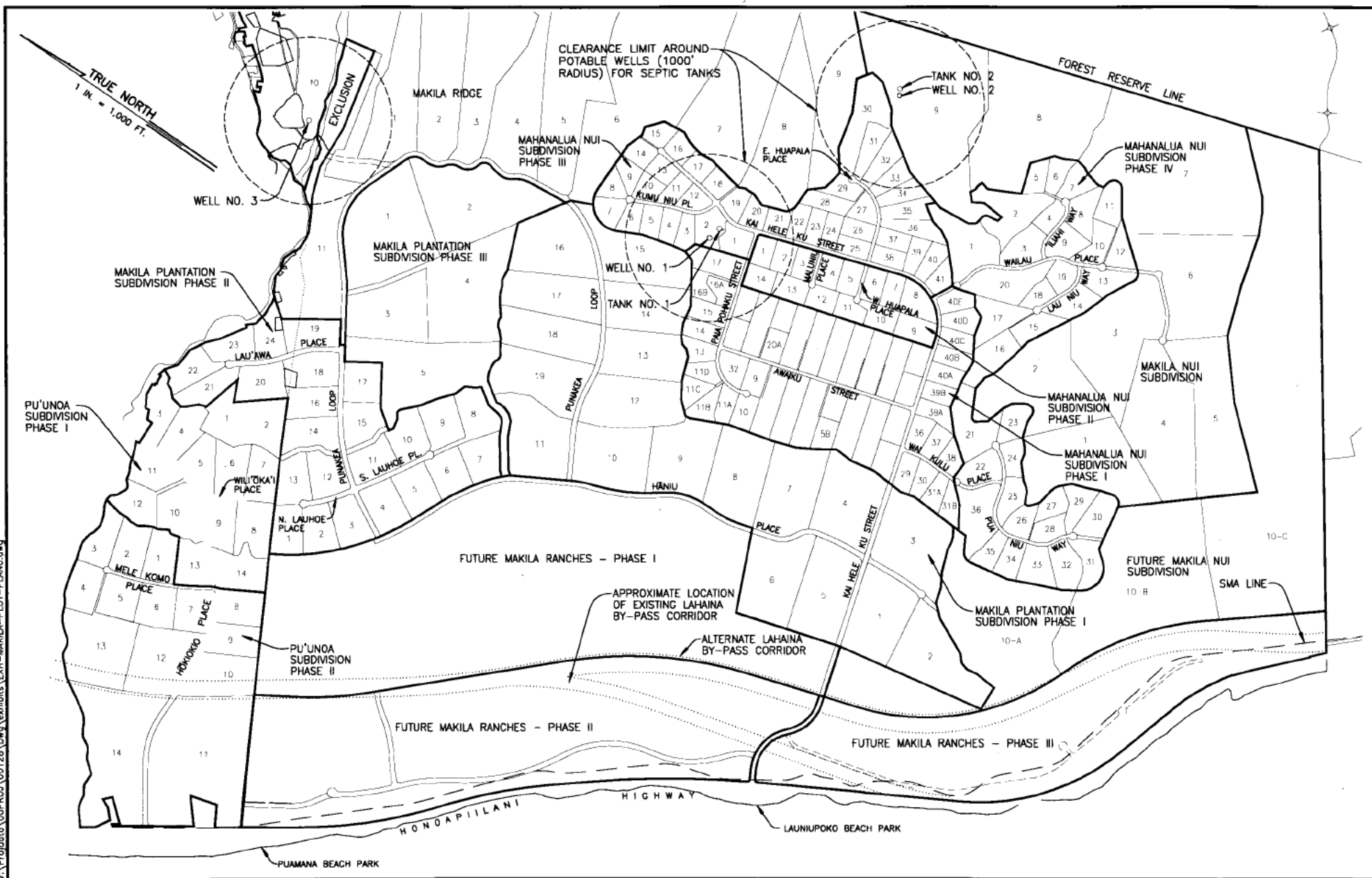
A **conservation plan** should describe any conservation measures that will be used to ensure that your water use is or will be efficient, and is different from a water shortage plan. Conservation measures may include, but are not limited to, water reuse or recycling systems, monitoring the water distribution system for pressure drops that are indicative of leaks or line breaks, or use of drought-tolerant and xeriscape landscape plants.

**19. PUBLIC WATER SYSTEM INFORMATION**

Check the appropriate box or boxes relating to your water system.

20. **CHAPTER 343** If an Environmental Assessment was completed, fill in the dates of publication and acceptance. For additional information about the proposed uses checkboxes, refer to [http://luc.state.hi.us/docs/hrs\\_343.pdf](http://luc.state.hi.us/docs/hrs_343.pdf)
21. **TABLE 4: 12-MONTH MOVING AVERAGE CALCULATION AS OF THE DATE OF DESIGNATION. FOR EXISTING USES ONLY.**
- For existing use permit applications, list the pumpage for the 12 months prior to designation. Also identify how that measurement was taken.





## EXHIBIT 1

## LAUNIUPOKO WATER COMPANY, INC

## AVERAGE DAILY USE

<b>LAUNIUPOKO WATER COMPANY INC</b>									
<b>AVERAGE DAILY PUMPAGE (12 Mo Prior To WMA)</b>									
MM/YY	LWC Well 1 (Gallons)	Average Pumped Per day (GPD)	LWC Well 2 (Gallons) [1]	Average Pumped Per day (GPD)	LWC Well 3 (Gallons)	Average Pumped Per day (GPD)	Total Monthly Pumpage	Average Pumped Per day (GPD)	Metered
08/21	8,044,000	259,484	10,000		7,733,000	249,452	15,787,000	509,258	Yes
09/21	11,497,000	383,233	-		6,843,000	228,100	18,340,000	611,333	Yes
10/21	8,855,000	285,645	-		7,519,000	242,548	16,374,000	528,194	Yes
11/21	11,745,000	391,500	-		7,354,000	245,133	19,099,000	636,633	Yes
12/21	8,933,000	288,161	17,000		3,481,000	112,290	12,431,000	401,000	Yes
01/22	7,629,000	246,097	12,000		3,495,000	112,742	11,136,000	359,226	Yes
02/22	10,097,000	360,607			5,420,000	193,571	15,517,000	554,179	Yes
03/22	15,295,000	493,387	42,000		8,145,000	262,742	23,482,000	757,484	Yes
04/22	12,518,000	417,267	1,479,000	49,300	9,589,000	319,633	23,586,000	786,200	Yes
05/22	9,971,000	321,645	2,394,000	77,226	7,353,000	237,194	19,718,000	636,065	Yes
06/22	19,557,000	651,900	1,967,000	65,567	8,206,000	273,533	29,730,000	991,000	Yes
07/22	13,308,000	429,290	1,294,000	41,742	12,345,000	398,226	26,947,000	869,258	Yes
Total	137,449,000	4,528,217	7,215,000	233,834	87,483,000	2,875,165	232,147,000	7,639,829	Yes
12 Month Avg (Actual)	11,454,083	377,351	601,250	19,486	7,290,250	239,597	19,345,583	636,019	Yes
12 Month Avg (Calculated)	11,454,083	377,351	601,250	[1] 58,459	7,290,250	239,597	19,345,583	675,407	Yes
[1] Launiupoko Well 2 incurred mechanical issues in the first 8 months of this 12 month period with a broken valve that took a long time to replace due to supply chain issues. The average daily pumping after repair was approximately 58,459 gpd.									

# LWC Well 1\_.4MG Tnk 1





**LWC 1 Launiupoko 1 No. 6-5138-001**



**TMK 4-7-001:026**





# LWC Well 2





**LWC 2 Launiupoko 2 No. 6-5137-01**

**TMK 4-7-001:038**





# LWC Well 3



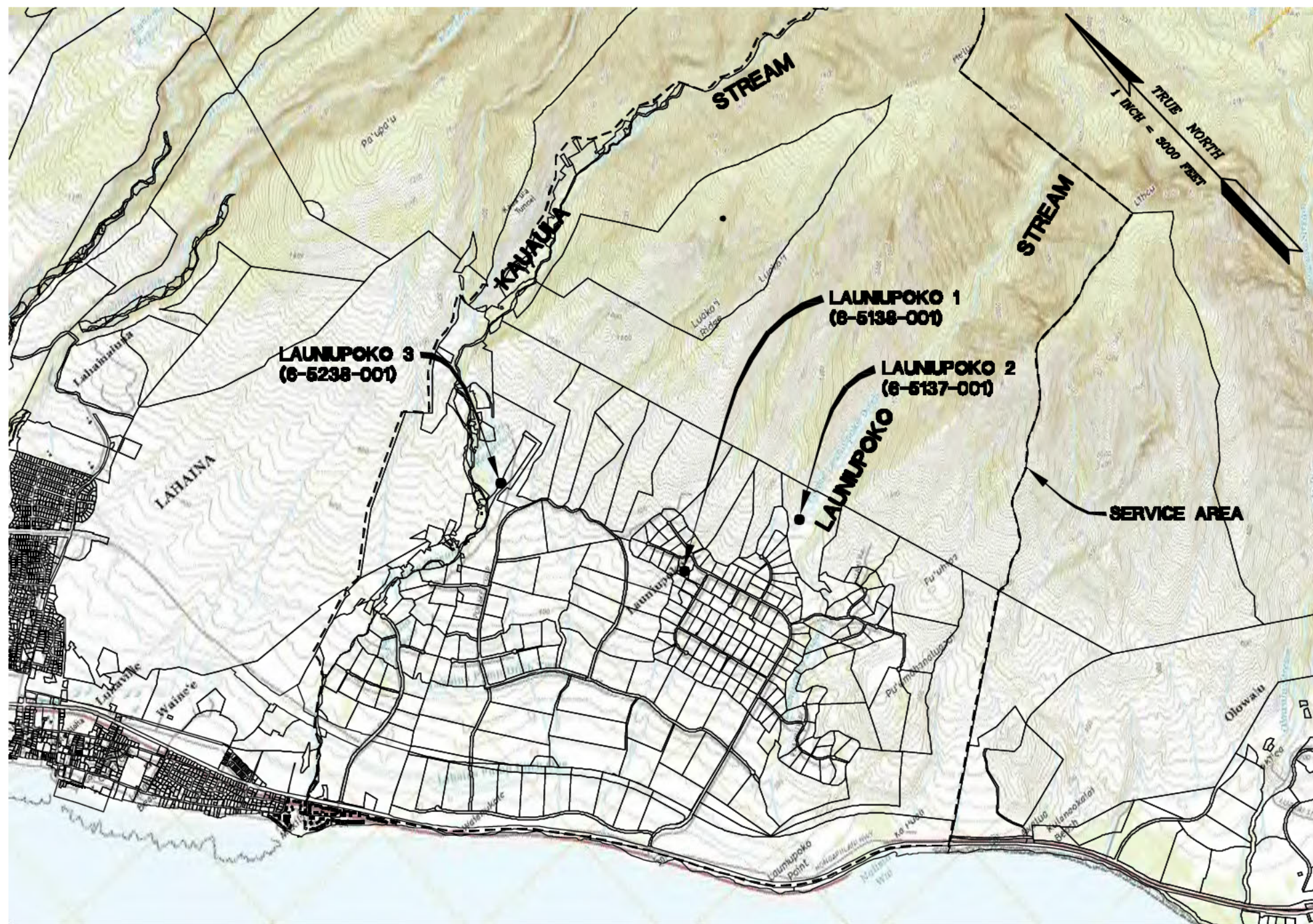


**LWC 3 Launiupoko 3 No. 6-5238-01**

**TMK 4-7-001:053**



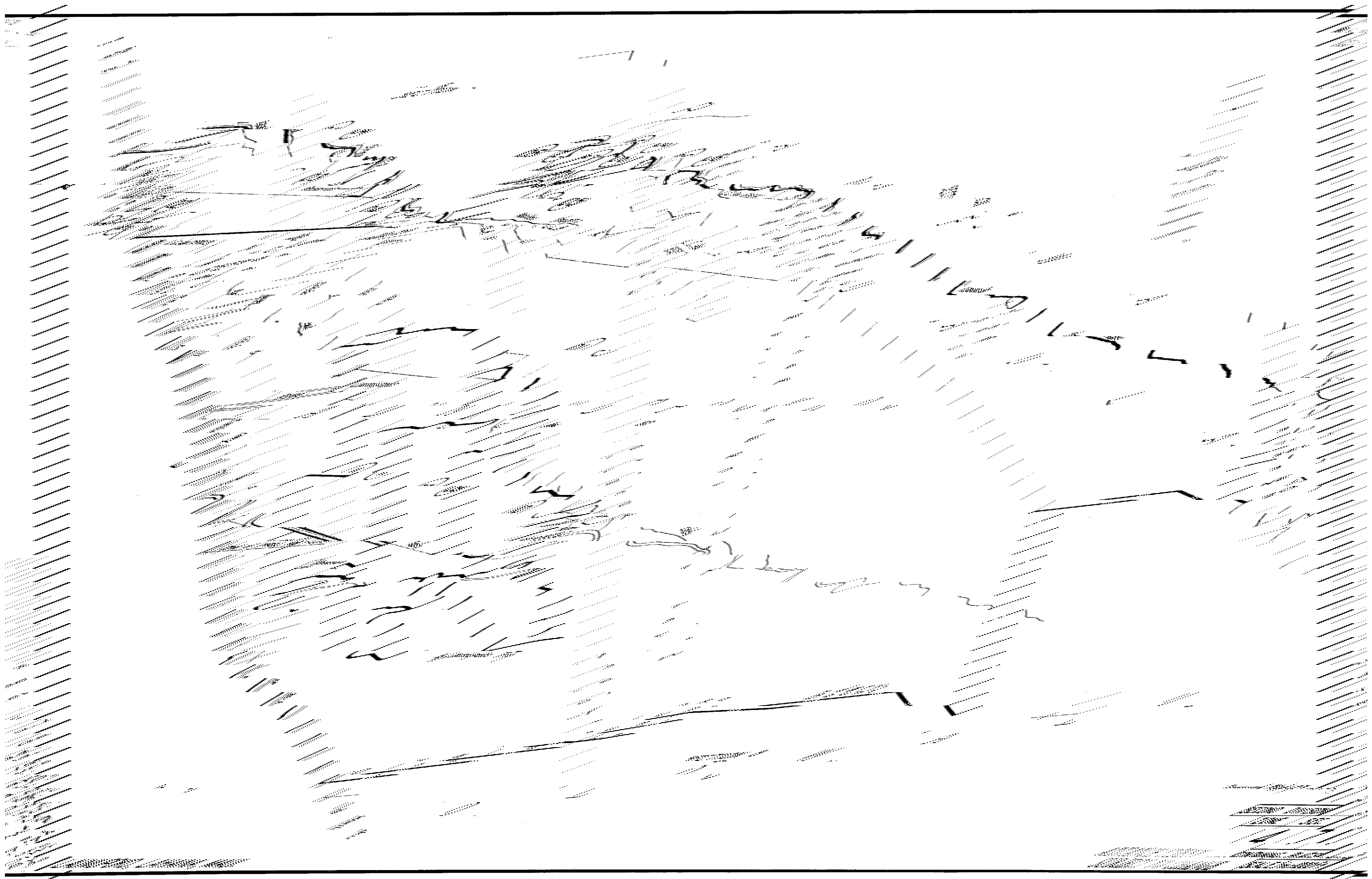




0 3000 6000 9000 12000  
SCALE: 1 INCH = 3000 FEET

ATTACHMENT GWUPA 8  
USGS - LAHAINA QUAD/TMK MAP  
LAUNIUPOKO POTABLE SOURCES





USE INFORMATION									
11. TABLE 1: LAND USE CONSISTENCY (Attach additional copies, if									
LAND USE CONSISTENCY						EFFICIENCY OF USE			
A	B	C	D	E	F	G	H	I	J
PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: •Property tax map, showing location of use referenced to established property boundaries. •Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	AVERAGE QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
USES THAT REQUIRE POTABLE (DRINKING) WATER									
MUNPR	TMK: zone/sector/plat/parcel	AG	X No	AG	X No				
MUNPR	470010250001	AG	No	AG	No	24.28	18	442	
MUNPR	470010250002	AG	No	AG	No	1.52	1,271	1,933	
MUNPR	470010290001	AG	No	AG	No	16.42	0	0	
MUNPR	470010290002	AG	No	AG	No	10.93	10	113	
MUNPR	470010300000	AG	No	AG	No	115.07	1	167	
MUNPR	470010310001	AG	No	AG	No	21.07	39	814	
MUNPR	470010310002	AG	No	AG	No	5.53	127	705	
MUNPR	470010320000	AG	No	AG	No	25.87	16	422	
MUNPR	470010330000	AG	No	AG	No	27.76	172	4,767	
MUNPR	470010350001	AG	No	AG	No	23.48	0	0	
MUNPR	470010350002	AG	No	AG	No	5.76	125	721	
MUNPR	470010360000	AG	No	AG	No	62.79	26	1,626	
MUNPR	470010370001	AG	No	AG	No	35.76	67	2,398	
MUNPR	470010370002	AG	No	AG	No	5.60	568	3,181	
MUNPR	470010380001	AG	No	AG	No	49.57	0	0	
MUNPR	470010380002	AG	No	AG	No	1.89	73	138	
MUNPR	470010390001	AG	No	AG	No	150.82	0	0	
MUNPR	470010390002	AG	No	AG	No	6.39	758	4,842	
MUNPR	470010410001	AG	No	AG	No	15.88	33	518	
MUNPR	470010410002	AG	No	AG	No	10.59	18	195	
MUNPR	470010420001	AG	No	AG	No	10.02	19	187	
MUNPR	470010420002	AG	No	AG	No	5.06	66	333	
MUNPR	470010440001	AG	No	AG	No	20.85	445	9,280	
MUNPR	470010440002	AG	No	AG	No	6.67	16	110	
MUNPR	470010450001	AG	No	AG	No	45.60	147	6,704	
MUNPR	470010450002	AG	No	AG	No	5.00	163	815	
MUNPR	470010460000	AG	No	AG	No	41.935	1	724	
MUNPR	470010470001	AG	No	AG	No	23.91	1	24	
MUNPR	470010470002	AG	No	AG	No	2.30	15	34	
MUNPR	470010480001	AG	No	AG	No	43.13	16	688	
MUNPR	470010480002	AG	No	AG	No	5.00	227	1,135	
MUNPR	470010490000	AG	No	AG	No	69.29	90	6,207	
MUNPR	470010500001	AG	No	AG	No	25.70	0	0	
MUNPR	470010500002	AG	No	AG	No	5.00	230	1,151	
MUNPR	470010500003	AG	No	AG	No	10.00	0	0	
MUNPR	470010520001	AG	No	AG	No	9.21	224	2,061	
MUNPR	470010520002	AG	No	AG	No	3.43	494	1,693	
MUNPR	470010530001	AG	No	AG	No	31.23	7	205	
MUNPR	470010530002	AG	No	AG	No	3.09	37	116	
MUNPR	470010540001	AG	No	AG	No	13.10	26	340	
MUNPR	470010540001	AG	No	AG	No	incl above	0	0	
MUNPR	470010560000	AG	No	AG	No	40.35	18	713	
MUNPR	470010570001	AG	No	AG	No	34.79	36	1,238	
MUNPR	470010570002	AG	No	AG	No	7.96	299	2,382	
MUNPR	470030010000	AG	No	AG	No	5.10	433	2,207	
MUNPR	470030040000	AG	No	AG	No	6.80	1,065	7,237	
MUNPR	470030050000	AG	No	AG	No	5.32	0	0	
MUNPR	470030060000	AG	No	AG	No	4.98	1,528	7,617	
MUNPR	470030080000	AG	No	AG	No	5.02	1,146	5,754	

## EXHIBIT 3

LAUNIUPOKO WATER COMPANY INC  
LAND USE CONSISTENCY, EFFICIENCY AND CONSUMPTION BY TMK

A	B	C	D	E	F	G	H	I	J
PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: •Property tax map, showing location of use referenced to established property boundaries. •Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	AVERAGE QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
<b>USES THAT REQUIRE POTABLE (DRINKING) WATER</b>									
MUNPR	TMK: zone/sector/plat/parcel	AG	X No	AG	X No				
MUNPR	470030090000	AG	No	AG	No	5.45	1,085	5,914	
MUNPR	470030100000	AG	No	AG	No	5.11	1,890	9,664	
MUNPR	470030110000	AG	No	AG	No	6.11	977	5,972	
MUNPR	470030120000	AG	No	AG	No	5.58	4	20	
MUNPR	470030130000	AG	No	AG	No	5.58	381	2,124	
MUNPR	470030140000	AG	No	AG	No	5.16	1,237	6,385	
MUNPR	470030150000	AG	No	AG	No	5.18	2,284	11,822	
MUNPR	470030160000	AG	No	AG	No	5.1	437	2,246	
MUNPR	470030170000	AG	No	AG	No	5.86	189	1,107	
MUNPR	470030190000	AG	No	AG	No	5.43	1,757	9,536	
MUNPR	470030200000	AG	No	AG	No	5.03	0	0	
MUNPR	470030210000	AG	No	AG	No	5.00	1,124	5,620	
MUNPR	470030220000	AG	No	AG	No	5.07	846	4,291	
MUNPR	470030240000	AG	No	AG	No	5.01	404	2,024	
MUNPR	470030260000	AG	No	AG	No	5.00	107	536	
MUNPR	470030270000	AG	No	AG	No	5.77	86	495	
MUNPR	470030290001	AG	No	AG	No	36.28	0	14	
MUNPR	470030290002	AG	No	AG	No	2.03	1	1	
MUNPR	470030300001	AG	No	AG	No	3.66	0	0	
MUNPR	470030300002	AG	No	AG	No	2.49	3,599	8,950	
MUNPR	470030310000	AG	No	AG	No	22.68	27	611	
MUNPR	470090010001	AG	No	AG	No	0.97	1,408	1,369	
MUNPR	470090010002	AG	No	AG	No	1.40	1,182	1,658	
MUNPR	470090020000	AG	No	AG	No	2.56	1,693	4,333	
MUNPR	470090020000	AG	No	AG	No	incl above	0	0	
MUNPR	470090030000	AG	No	AG	No	2.30	143	328	
MUNPR	470090040002	AG	No	AG	No	1.49	577	859	
MUNPR	470090050001	AG	No	AG	No	0.49	1,047	511	
MUNPR	470090050002	AG	No	AG	No	1.58	904	1,425	
MUNPR	470090060001	AG	No	AG	No	2.19	1,057	2,315	
MUNPR	470090060002	AG	No	AG	No	incl above	896	1,963	
MUNPR	470090070001	AG	No	AG	No	1.82	92	168	
MUNPR	470090070002	AG	No	AG	No	0.69	1,276	884	
MUNPR	470090080000	AG	No	AG	No	2.20	147	324	
MUNPR	470090090000	AG	No	AG	No	2.53	305	773	
MUNPR	470090090000	AG	No	AG	No	incl above	incl above	0	
MUNPR	470090100000	AG	No	AG	No	2.42	246	595	
MUNPR	470090110001	AG	No	AG	No	1.77	1,637	2,895	
MUNPR	470090110002	AG	No	AG	No	0.60	1,500	906	
MUNPR	470090120000	AG	No	AG	No	2.45	740	1,810	
MUNPR	470090130001	AG	No	AG	No	1.44	1,170	1,679	
MUNPR	470090130002	AG	No	AG	No	0.57	2,186	1,237	
MUNPR	470090140001	AG	No	AG	No	1.76	0	0	
MUNPR	470090140002	AG	No	AG	No	0.50	242	121	
MUNPR	470090150000	AG	No	AG	No	2.51	1,200	3,013	
MUNPR	470090160000	AG	No	AG	No	2.59	247	640	
MUNPR	470090170000	AG	No	AG	No	2.00	451	902	
MUNPR	470090180000	AG	No	AG	No	2.15	6,162	13,236	
MUNPR	470090190001	AG	No	AG	No	1.34	1,722	2,303	
MUNPR	470090190002	AG	No	AG	No	0.66	3,011	1,993	
MUNPR	470090200001	AG	No	AG	No	1.32	0	0	
MUNPR	470090200002	AG	No	AG	No	0.68	4,921	3,356	

EXHIBIT 3

LAUNIUPOKO WATER COMPANY INC  
LAND USE CONSISTENCY, EFFICIENCY AND CONSUMPTION BY TMK

A	B	C	D	E	F	G	H	I	J
PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: •Property tax map, showing location of use referenced to established property boundaries. •Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	AVERAGE QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
USES THAT REQUIRE POTABLE (DRINKING) WATER									
MUNPR	TMK: zone/sector/plat/parcel	AG	X No	AG	X No				
MUNPR	470090210001	AG	No	AG	No	0.68	0	0	
MUNPR	470090210000	AG	No	AG	No	1.32	742	982	
MUNPR	470090220000	AG	No	AG	No	2.14	163	349	
MUNPR	470090230000	AG	No	AG	No	2.15	82	177	
MUNPR	470090240001	AG	No	AG	No	1.12	2,250	2,516	
MUNPR	470090240002	AG	No	AG	No	0.97	104	100	
MUNPR	470090250001	AG	No	AG	No	1.22	164	200	
MUNPR	470090250002	AG	No	AG	No	0.80	3,133	2,503	
MUNPR	470090260001	AG	No	AG	No	1.34	476	635	
MUNPR	470090260002	AG	No	AG	No	0.78	2,397	1,870	
MUNPR	470090270001	AG	No	AG	No	0.75	3,583	2,698	
MUNPR	470090270002	AG	No	AG	No	1.29	401	518	
MUNPR	470090280000	AG	No	AG	No	2.08	515	1,070	
MUNPR	470090290002	AG	No	AG	No	1.03	219	225	
MUNPR	470090300001	AG	No	AG	No	1.21	312	377	
MUNPR	470090310001	AG	No	AG	No	0.70	433	304	
MUNPR	470090310002	AG	No	AG	No	0.70	6,320	4,443	
MUNPR	470090320001	AG	No	AG	No	1.51	1,505	2,267	
MUNPR	470090320002	AG	No	AG	No	0.74	267	198	
MUNPR	470090330001	AG	No	AG	No	0.67	597	398	
MUNPR	470090330002	AG	No	AG	No	1.56	1,503	2,349	
MUNPR	470090340000	AG	No	AG	No	2.03	957	1,946	
MUNPR	470090350001	AG	No	AG	No	4.35	90	389	
MUNPR	470090350002	AG	No	AG	No	2.76	344	948	
MUNPR	470090360001	AG	No	AG	No	2.77	220	610	
MUNPR	470090360002	AG	No	AG	No	1.34	0	0	
MUNPR	470090370001	AG	No	AG	No	4.01	183	735	
MUNPR	470090370002	AG	No	AG	No	2.03	0	0	
MUNPR	470090380001	AG	No	AG	No	2.08	893	1,857	
MUNPR	470090380002	AG	No	AG	No	incl above	150	313	
MUNPR	470090390001	AG	No	AG	No	1.04	199	206	
MUNPR	470090390002	AG	No	AG	No	1.04	1,392	1,441	
MUNPR	470090400001	AG	No	AG	No	1.17	2,664	3,115	
MUNPR	470090400002	AG	No	AG	No	1.17	3,336	3,900	
MUNPR	470090430001	AG	No	AG	No	1.16	1,786	2,062	
MUNPR	470090430002	AG	No	AG	No	0.88	916	810	
MUNPR	470090440001	AG	No	AG	No	1.44	4,835	6,972	
MUNPR	470090450001	AG	No	AG	No	1.08	209	225	
MUNPR	470090450002	AG	No	AG	No	1.08	1,650	1,776	
MUNPR	470090460001	AG	No	AG	No	1.76	208	366	
MUNPR	470090460002	AG	No	AG	No	0.59	249	147	
MUNPR	470090470001	AG	No	AG	No	1.26	258	326	
MUNPR	470090470002	AG	No	AG	No	1.00	2,785	2,785	
MUNPR	470090480001	AG	No	AG	No	0.50	558	279	
MUNPR	470090480002	AG	No	AG	No	1.50	203	305	
MUNPR	470090490001	AG	No	AG	No	0.16	5,464	847	
MUNPR	470090490002	AG	No	AG	No	1.90	513	976	
MUNPR	470090500000	AG	No	AG	No	2.58	325	840	
MUNPR	470090510000	AG	No	AG	No	2.15	421	906	
MUNPR	470090520001	AG	No	AG	No	1.00	1,602	1,602	
MUNPR	470090520002	AG	No	AG	No	1.14	285	324	
MUNPR	470090530001	AG	No	AG	No	0.08	6,294	497	

EXHIBIT 3

LAUNIUPOKO WATER COMPANY INC  
LAND USE CONSISTENCY, EFFICIENCY AND CONSUMPTION BY TMK

A	B	C	D	E	F	G	H	I	J
PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: •Property tax map, showing location of use referenced to established property boundaries. •Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	AVERAGE QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
USES THAT REQUIRE POTABLE (DRINKING) WATER									
MUNPR	TMK: zone/sector/plat/parcel	AG	X No	AG	X No				
MUNPR	470090530002	AG	No	AG	No	0.02	265,541	5,842	
MUNPR	470090540001	AG	No	AG	No	1.00	542	542	
MUNPR	470090540002	AG	No	AG	No	0.79	1,568	1,242	
MUNPR	470090550001	AG	No	AG	No	1.99	196	390	
MUNPR	470090550002	AG	No	AG	No	0.45	348	156	
MUNPR	470090560001	AG	No	AG	No	1.19	179	213	
MUNPR	470090560002	AG	No	AG	No	0.88	1,221	1,071	
MUNPR	470090570000	AG	No	AG	No	2.28	450	1,024	
MUNPR	470090580000	AG	No	AG	No	2.00	472	944	
MUNPR	470090590001	AG	No	AG	No	0.67	230	153	
MUNPR	470090590002	AG	No	AG	No	1.57	273	429	
MUNPR	470090600001	AG	No	AG	No	1.00	308	308	
MUNPR	470090600002	AG	No	AG	No	1.00	379	379	
MUNPR	470090610001	AG	No	AG	No	1.53	203	310	
MUNPR	470090610002	AG	No	AG	No	0.40	1,272	513	
MUNPR	470090620000	AG	No	AG	No	2.02	90	182	
MUNPR	470090630000	AG	No	AG	No	2.20	1,853	4,079	
MUNPR	470090650001	AG	No	AG	No	1.08	481	519	
MUNPR	470090660001	AG	No	AG	No	0.56	3,368	1,890	
MUNPR	470090660002	AG	No	AG	No	1.59	217	346	
MUNPR	470090670001	AG	No	AG	No	1.37	167	230	
MUNPR	470090670002	AG	No	AG	No	0.99	6,814	6,739	
MUNPR	470090680002	AG	No	AG	No	0.79	1,047	830	
MUNPR	470090680002	AG	No	AG	No	incl above	0	0	
MUNPR	470090690001	AG	No	AG	No	2.46	76	187	
MUNPR	470090690002	AG	No	AG	No	0.78	181	140	
MUNPR	470090700001	AG	No	AG	No	1.32	344	453	
MUNPR	470090700002	AG	No	AG	No	1.07	686	733	
MUNPR	470090710001	AG	No	AG	No	2.00	739	1,478	
MUNPR	470090710002	AG	No	AG	No	0.99	1,665	1,651	
MUNPR	470090720001	AG	No	AG	No	2.20	534	1,173	
MUNPR	470090730001	AG	No	AG	No	0.80	521	417	
MUNPR	470090730002	AG	No	AG	No	1.62	129	208	
MUNPR	470090740001	AG	No	AG	No	1.03	1,757	1,816	
MUNPR	470090740002	AG	No	AG	No	1.40	83	117	
MUNPR	470090750001	AG	No	AG	No	2.28	929	2,118	
MUNPR	470090750002	AG	No	AG	No	0.75	352	263	
MUNPR	470090760001	AG	No	AG	No	2.61	316	826	
MUNPR	470090760002	AG	No	AG	No	1.00	258	258	
MUNPR	470090770001	AG	No	AG	No	3.15	109	342	
MUNPR	470090770002	AG	No	AG	No	1.01	1,440	1,452	
MUNPR	470090780001	AG	No	AG	No	3.06	2,777	8,493	
MUNPR	470090780002	AG	No	AG	No	0.94	1,299	1,217	
MUNPR	470090790001	AG	No	AG	No	1.28	192	245	
MUNPR	470090790002	AG	No	AG	No	1.58	5,193	8,190	
MUNPR	470090800001	AG	No	AG	No	1.95	924	1,796	
MUNPR	470090800002	AG	No	AG	No	0.58	838	484	
MUNPR	470090810000	AG	No	AG	No	2.15	946	2,033	
MUNPR	470100020002	AG	No	AG	No	1.01	189	190	
MUNPR	470100030001	AG	No	AG	No	1.76	863	1,520	
MUNPR	470100030002	AG	No	AG	No	0.99	346	341	
MUNPR	470100080001	AG	No	AG	No	4.60	258	1,184	

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LAUNIUPOKO WATER COMPANY INC  
LAND USE CONSISTENCY, EFFICIENCY AND CONSUMPTION BY TMK

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PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: •Property tax map, showing location of use referenced to established property boundaries. •Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	AVERAGE QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
USES THAT REQUIRE POTABLE (DRINKING) WATER									
MUNPR	TMK: zone/sector/plat/parcel	AG	X No	AG	X No				
MUNPR	470100080002	AG	No	AG	No	4.60	355	1,630	
MUNPR	470100090001	AG	No	AG	No	1.06	140	149	
MUNPR	470100090002	AG	No	AG	No	2.51	80	200	
MUNPR	470100100001	AG	No	AG	No	2.00	362	725	
MUNPR	470100100001	AG	No	AG	No	incl above	0	1,439	
MUNPR	470100100002	AG	No	AG	No	5.25	233	1,226	
MUNPR	470100120001	AG	No	AG	No	1.38	178	245	
MUNPR	470100130000	AG	No	AG	No	2.28	232	529	
MUNPR	470100140000	AG	No	AG	No	2.42	288	698	
MUNPR	470100150000	AG	No	AG	No	2.40	558	1,338	
MUNPR	470100160000	AG	No	AG	No	2.27	343	779	
MUNPR	470100170000	AG	No	AG	No	2.32	179	415	
MUNPR	470100180001	AG	No	AG	No	0.51	333	170	
MUNPR	470100180002	AG	No	AG	No	2.93	1,020	2,988	
MUNPR	470100190000	AG	No	AG	No	3.23	105	339	
MUNPR	470100190000	AG	No	AG	No	incl above	0	0	
MUNPR	470100200001	AG	No	AG	No	1.69	387	655	
MUNPR	470100210000	AG	No	AG	No	2.32	23	54	
MUNPR	470100220001	AG	No	AG	No	1.82	360	654	
MUNPR	470100230001	AG	No	AG	No	1.00	1,861	1,861	
MUNPR	470100230002	AG	No	AG	No	1.40	2,053	2,868	
MUNPR	470100260001	AG	No	AG	No	0.89	110	98	
MUNPR	470100260002	AG	No	AG	No	2.42	299	724	
MUNPR	470100270001	AG	No	AG	No	1.25	519	648	
MUNPR	470100270002	AG	No	AG	No	0.79	953	752	
MUNPR	470100280001	AG	No	AG	No	1.53	987	1,508	
MUNPR	470100280002	AG	No	AG	No	0.50	4,165	2,082	
MUNPR	470100300001	AG	No	AG	No	1.30	653	851	
MUNPR	470100310001	AG	No	AG	No	1.30	191	249	
MUNPR	470100310002	AG	No	AG	No	1.14	0	0	
MUNPR	470100320000	AG	No	AG	No	2.05	84	172	
MUNPR	470100330000	AG	No	AG	No	2.02	9	19	
MUNPR	470100340001	AG	No	AG	No	1.29	400	515	
MUNPR	470100340002	AG	No	AG	No	0.78	632	493	
MUNPR	470100350000	AG	No	AG	No	2.02	264	534	
MUNPR	470100360001	AG	No	AG	No	0.99	582	573	
MUNPR	470100360002	AG	No	AG	No	1.02	624	637	
MUNPR	470100370001	AG	No	AG	No	1.01	1,199	1,212	
MUNPR	470100380000	AG	No	AG	No	2.19	121	266	
MUNPR	470100390000	AG	No	AG	No	2.07	55	113	
MUNPR	470100400001	AG	No	AG	No	1.22	2,057	2,504	
MUNPR	470100400002	AG	No	AG	No	0.89	1,456	1,297	
MUNPR	470100410001	AG	No	AG	No	1.13	5,242	5,924	
MUNPR	470100410002	AG	No	AG	No	0.87	222	194	
MUNPR	470100420001	AG	No	AG	No	1.27	1,056	1,343	
MUNPR	470100420002	AG	No	AG	No	0.78	2,193	1,711	
MUNPR	470100430001	AG	No	AG	No	0.99	309	306	
MUNPR	470100440001	AG	No	AG	No	1.13	289	328	
MUNPR	470100440002	AG	No	AG	No	1.00	426	426	
MUNPR	470100450002	AG	No	AG	No	0.59	1,443	857	
MUNPR	470100460001	AG	No	AG	No	0.99	350	347	
MUNPR	470100470000	AG	No	AG	No	2.02	59	119	

EXHIBIT 3

LAUNIUPOKO WATER COMPANY INC  
LAND USE CONSISTENCY, EFFICIENCY AND CONSUMPTION BY TMK

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PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: •Property tax map, showing location of use referenced to established property boundaries. •Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	AVERAGE QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
USES THAT REQUIRE POTABLE (DRINKING) WATER									
MUNPR	TMK: zone/sector/plat/parcel	AG	X No	AG	X No				
MUNPR	470100480001	AG	No	AG	No	1.08	1,613	1,740	
MUNPR	470100490001	AG	No	AG	No	1.01	2,784	2,806	
MUNPR	470100500001	AG	No	AG	No	1.01	951	961	
MUNPR	470100500002	AG	No	AG	No	1.01	969	979	
MUNPR	470100510001	AG	No	AG	No	1.05	177	187	
MUNPR	470100510002	AG	No	AG	No	1.05	318	336	
MUNPR	470100520000	AG	No	AG	No	2.74	850	2,330	
MUNPR	470100530000	AG	No	AG	No	2.23	168	375	
MUNPR	470100540000	AG	No	AG	No	8.62	41	350	
MUNPR	470100550001	AG	No	AG	No	1.15	777	893	
MUNPR	470100560001	AG	No	AG	No	2.37	317	751	
MUNPR	470100560002	AG	No	AG	No	0.79	141	111	
MUNPR	470100570000	AG	No	AG	No	2.57	226	581	
MUNPR	470100580002	AG	No	AG	No	1.90	134	255	
MUNPR	470100590001	AG	No	AG	No	0.81	178	143	
MUNPR	470100590002	AG	No	AG	No	2.05	74	152	
MUNPR	470100600001	AG	No	AG	No	2.28	132	301	
MUNPR	470100600002	AG	No	AG	No	0.60	1,659	995	
MUNPR	470100610000	AG	No	AG	No	2.03	150	304	
MUNPR	470100620000	AG	No	AG	No	2.02	190	384	
MUNPR	470100630001	AG	No	AG	No	1.79	1,439	2,579	
MUNPR	470100630002	AG	No	AG	No	0.27	1,145	305	
MUNPR	470100640001	AG	No	AG	No	1.15	1,128	1,300	
MUNPR	470100640002	AG	No	AG	No	1.15	771	889	
MUNPR	470100650000	AG	No	AG	No	2.01	251	504	
MUNPR	470100670000	AG	No	AG	No	8.48	35	297	
MUNPR	470100670003	AG	No	AG	No	2.75	98	270	
MUNPR	470100680000	AG	No	AG	No	4.33	288	1,246	
MUNPR	470100690001	AG	No	AG	No	1.00	484	484	
MUNPR	470100690002	AG	No	AG	No	1.04	389	404	
MUNPR	470100700000	AG	No	AG	No	2.22	75	166	
MUNPR	470100700001	AG	No	AG	No	1.67	253	422	
MUNPR	470100700002	AG	No	AG	No	0.50	1,904	952	
MUNPR	470100710001	AG	No	AG	No	1.75	918	1,603	
MUNPR	470100710002	AG	No	AG	No	0.54	2,453	1,312	
MUNPR	470100720000	AG	No	AG	No	2.79	163	454	
MUNPR	470100730001	AG	No	AG	No	2.07	81	167	
MUNPR	470100730002	AG	No	AG	No	1.59	180	286	
MUNPR	470100740001	AG	No	AG	No	1.92	1,030	1,979	
MUNPR	470100740002	AG	No	AG	No	1.24	861	1,070	
MUNPR	470100760001	AG	No	AG	No	2.56	199	509	
MUNPR	470100770001	AG	No	AG	No	2.04	742	1,510	
MUNPR	470100770002	AG	No	AG	No	0.73	264	192	
MUNPR	470100780001	AG	No	AG	No	1.83	109	200	
MUNPR	470100780002	AG	No	AG	No	1.83	44	81	
MUNPR	470100790001	AG	No	AG	No	1.30	216	281	
MUNPR	470100790002	AG	No	AG	No	1.94	512	993	
MUNPR	470100800001	AG	No	AG	No	4.16	60	248	
MUNPR	470100800002	AG	No	AG	No	1.32	471	621	
MUNPR	470100810001	AG	No	AG	No	3.57	48	171	
MUNPR	470100810002	AG	No	AG	No	1.47	136	200	
MUNPR	470100820001	AG	No	AG	No	0.58	2,931	1,709	



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LAUNIUPOKO WATER COMPANY INC  
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USES THAT REQUIRE POTABLE (DRINKING) WATER									
MUNPR	TMK: zone/sector/plat/parcel	AG	X No	AG	X No				
MUNPR	470100820002	AG	No	AG	No	1.44	235	338	
MUNPR	470100830001	AG	No	AG	No	0.68	232	157	
MUNPR	470100830002	AG	No	AG	No	1.73	52	91	
MUNPR	470110010000	AG	No	AG	No	15.32	30	462	
MUNPR	470110020000	AG	No	AG	No	16.91	23	384	
MUNPR	470110030000	AG	No	AG	No	12.13	5	59	
MUNPR	470110040000	AG	No	AG	No	16.19	65	1,056	
MUNPR	470110050001	AG	No	AG	No	3.00	414	1,243	
MUNPR	470110060000	AG	No	AG	No	16.21	886	14,362	
MUNPR	470110060000	AG	No	AG	No	incl above	0	0	
MUNPR	470110070002	AG	No	AG	No	3.98	57	227	
MUNPR	470110080000	AG	No	AG	No	15.50	351	5,439	
MUNPR	470110090001	AG	No	AG	No	8.51	62	529	
MUNPR	470110090002	AG	No	AG	No	1.10	133	146	
MUNPR	470110100000	AG	No	AG	No	15.16	0	0	
MUNPR	470110110000	AG	No	AG	No	15.15	11	162	
MUNPR	470110120001	AG	No	AG	No	3.86	96	371	
MUNPR	470110120002	AG	No	AG	No	11.62	392	4,551	
MUNPR	470110130001	AG	No	AG	No	3.00	254	762	
MUNPR	470110130002	AG	No	AG	No	9.50	0	0	
MUNPR	470110140000	AG	No	AG	No	12.49	229	2,856	
MUNPR	470110140000	AG	No	AG	No	incl above	0	0	
MUNPR	470110150001	AG	No	AG	No	12.27	220	2,697	
MUNPR	470110170000	AG	No	AG	No	12.95	96	1,242	
MUNPR	470110180001	AG	No	AG	No	6.21	161	997	
MUNPR	470110180002	AG	No	AG	No	6.75	99	665	
MUNPR	470110190001	AG	No	AG	No	8.99	113	1,017	
MUNPR	470110190002	AG	No	AG	No	6.45	17	111	
MUNPR	470120010000	AG	No	AG	No	5.04	80	404	
MUNPR	470120020000	AG	No	AG	No	5.03	1,285	6,470	
MUNPR	470120030000	AG	No	AG	No	5.17	68	353	
MUNPR	470120040000	AG	No	AG	No	5.82	117	682	
MUNPR	470120050000	AG	No	AG	No	5.43	3,512	19,076	
MUNPR	470120060000	AG	No	AG	No	5.17	318	1,647	
MUNPR	470120070000	AG	No	AG	No	5.11	1,083	5,533	
MUNPR	470120080000	AG	No	AG	No	5.80	1,510	8,754	
MUNPR	470120090000	AG	No	AG	No	6.09	17	105	
MUNPR	470120100000	AG	No	AG	No	5.66	119	673	
MUNPR	470120110000	AG	No	AG	No	5.11	68	350	
MUNPR	470120120000	AG	No	AG	No	5.12	1,254	6,420	
MUNPR	470120130000	AG	No	AG	No	5.02	599	3,010	
MUNPR	470120140000	AG	No	AG	No	5.75	1,134	6,521	
MUNPR	470120150000	AG	No	AG	No	5.05	230	1,164	
MUNPR	470120160000	AG	No	AG	No	5.20	189	985	
MUNPR	470120170000	AG	No	AG	No	5.02	155	779	
MUNPR	470120180000	AG	No	AG	No	5.40	392	2,116	
MUNPR	470120190000	AG	No	AG	No	5.42	277	1,499	
MUNPR	470120200000	AG	No	AG	No	5.60	319	1,786	
MUNPR	470120210000	AG	No	AG	No	4.43	247	1,093	
MUNPR	470120220000	AG	No	AG	No	4.48	485	2,171	
MUNPR	470120240000	AG	No	AG	No	4.17	638	2,658	
MUNPR	470130010001	AG	No	AG	No	3.05	645	1,971	

## EXHIBIT 3

LAUNIUPOKO WATER COMPANY INC  
LAND USE CONSISTENCY, EFFICIENCY AND CONSUMPTION BY TMK

A	B	C	D	E	F	G	H	I	J
PURPOSE / WATER USE CATEGORY (See the Instructions for water use category descriptions.)	TMK FOR LOCATION OF USE ATTACH THE FOLLOWING: •Property tax map, showing location of use referenced to established property boundaries. •Photograph of the area of use.	STATE LAND USE DISTRICT	CDUP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	COUNTY ZONING CODE	SMAP REQUIRED? Check the appropriate box, and write in the date approved, if applicable.	UNITS OR NET ACREAGE	GPD/UNIT or GPD/ACRE	AVERAGE QUANTITY OF USE (GPD)	JUSTIFICATION FOR QUANTITY OF WATER REQUESTED (If applicable, attach additional sheets showing how the quantity was calculated.) For irrigation uses, fill in Table 2.
<b>USES THAT REQUIRE POTABLE (DRINKING) WATER</b>									
<b>MUNPR</b>	<b>TMK: zone/sector/plat/parcel</b>	<b>AG</b>	<b>X</b> No	<b>AG</b>	<b>X</b> No				
MUNPR	470130030000	AG	No	AG	No	25.25	0	0	
MUNPR	470130090001	AG	No	AG	No	8.01	1,309	10,477	
MUNPR	470130090002	AG	No	AG	No	3.14	39	123	
MUNPR	470130090003	AG	No	AG	No	8.07	132	1,065	
MUNPR	470130100001	AG	No	AG	No	0.46	3,867	1,760	
MUNPR	470130100002	AG	No	AG	No	1.27	27	34	
MUNPR	470130110000	AG	No	AG	No	17.70	0	0	
MUNPR	470140030001	AG	No	AG	No	4.76	502	2,391	
MUNPR	470140030002	AG	No	AG	No	3.53	0	0	
MUNPR	470140030003	AG	No	AG	No	6.35	0	0	
MUNPR	470140050000	AG	No	AG	No	13.06	0	0	
MUNPR	470140100000	AG	No	AG	No	12.80	0	0	
MUNPR	470140110000	AG	No	AG	No	11.16	2	17	
MUNPR	470140120000	AG	No	AG	No	37.73	48	1,802	
TOTAL LWC POTABLE CONSUMPTION K								558,127 GPD	
<b>USES THAT DO NOT REQUIRE POTABLE (DRINKING) WATER</b>									
			Yes, date approved: ____/____/____		Yes, date approved: ____/____/____				
			Yes, not acquired		Yes, not acquired				
			No		No				
TOTAL NON POTABLE USE L								GPD	
TOTAL QUANTITY OF WATER REQUESTED BASED ON PUMPAGE OF 3 LWC WELLS (sum of total potable use and total non-potable use) = M								675,000 GPD See GWUPA Exhibit 1 for LWC.	
Please explain if there are any limitations (e.g., legal, contractual) on the proposed water use(s) described in Table 1. Ref. HRS § 174C-51(5).									
SEE GWUPA for LAUNIUPOKO WATER COMPANY INC. for information on this section and cover letter explaining justification.									

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK****Source:**

Launiupoko 1	6-5138-001	Total Existing Meters	375
Launiupoko 2	6-5137-001	Lots with 2 Meters	7
Launiupoko 3	6-5238-001		

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
1	470010250001	24.28	470010020001	85.571
2	470010250002	1.52	470010020002	6.022
3	470010290001	16.42	470010170000	5.697
4	470010290002	10.93	470010230000	8.772
5	470010300000	115.07	470010390003	2.000
6	470010310001	21.07	470010430000	26.416
7	470010310002	5.53	470010510000	25.251
8	470010320000	25.87	470010520001	9.214
9	470010330000	27.76	470010520002	3.429
10	470010350001	23.48	470010520003	13.002
11	470010350002	5.76	470010530001	31.226
12	470010360000	62.79	470010530002	3.086
13	470010370001	35.76	470010530003	26.600
14	470010370002	5.60	470010540002	6.614
15	470010380001	49.57	470010570003	8.075
16	470010380002	1.89	470020040000	1.777
17	470010390001	150.82	470020120000	2.018
18	470010390002	6.39	470030030000	0.147
19	470010410001	15.88	470030060000	4.984
20	470010410002	10.59	470030070000	5.039
21	470010420001	10.02	470030080001	5.022
22	470010420002	5.06	470030080002	incl above
23	470010440001	20.85	470030100000	5.114
24	470010440002	6.67	470030230000	5.007
25	470010450001	45.60	470030250000	5.017
26	470010450002	5.00	470030280000	36.280
27	470010460000	41.935	470030290003	6.009
28	470010470001	23.91	470030300003	6.696
29	470010470002	2.30	470030330000	0.410
30	470010480001	43.13	470040010000	1.660
31	470010480002	5.00	470040040000	1.560
32	470010490000	69.29	470040050000	0.642

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
33	470010500001	25.70	470040060000	0.29
34	470010500002	5.00	470040070000	0.197
35	470010500003	10.00	470040080000	0.042
36	470010520001	9.21	470040090000	0.025
37	470010520002	3.43	470040100000	0.232
38	470010530001	31.23	470050010000	4.48
39	470010530002	3.09	470050030000	0.35
40	470010540001	13.10	470050040000	0.675
41	470010540001	incl above	470050050000	0.45
42	470010560000	40.35	470050060000	0.39
43	470010570001	34.79	470050070000	1.15
44	470010570002	7.96	470050080000	0.36
45	470030010000	5.10	470050090000	3.178
46	470030040000	6.80	470060010000	4.29
47	470030050000	5.32	470060030000	0.79
48	470030060000	4.98	470060040000	15.74
49	470030080000	5.02	470090040001	1.003
50	470030090000	5.453	470090180001	1.279
51	470030100000	5.11	470090180002	0.856
52	470030110000	6.112	470090290001	1.027
53	470030120000	5.58	470090300002	0.960
54	470030130000	5.58	470090310001	0.703
55	470030140000	5.162	470090370003	1.091
56	470030150000	5.18	470090440002	0.832
57	470030160000	5.14	470090640000	0.072
58	470030170000	5.857	470090650002	1.029
59	470030190000	5.43	470090680001	3.001
60	470030200000	5.025	470100010002	0.635
61	470030210000	5.00	470100020001	1.083
62	470030220000	5.073	470100120002	0.791
63	470030240000	5.008	470100290001	1.286
64	470030260000	5.00	470100290002	0.803
65	470030270000	5.77	470100430002	1.116
66	470030290001	36.28	470100450001	1.420
67	470030290002	2.03	470100490002	1.008
68	470030300001	3.66	470100550002	1.916
69	470030300002	2.49	470100580001	0.535

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
70	470030310000	22.68	470100580003	0.210
71	470090010001	0.97	470110050002	13.055
72	470090010002	1.40	470110070001	11.955
73	470090020000	2.56	470110090003	5.554
74	470090020000	incl above	470110150002	3.058
75	470090030000	2.298	470110160000	15.656
76	470090040002	1.49	470110200000	0.289
77	470090050001	0.49	470120230000	4.279
78	470090050002	1.58	470130010002	3.275
79	470090060001	2.19	470130010003	20.379
80	470090060002	incl above	470130020001	3.766
81	470090070001	1.82	470130020002	2.620
82	470090070002	0.69	470130020003	15.777
83	470090080000	2.20	470130040000	25.202
84	470090090000	2.53	470130050000	25.68
85	470090090000	incl above	470130060001	3.219
86	470090100000	2.42	470130060002	2.430
87	470090110001	1.77	470130060003	20.786
88	470090110002	0.60	470130070001	1.967
89	470090120000	2.45	470130070002	1.532
90	470090130001	1.44	470130070003	22.936
91	470090130002	0.57	470130080001	2.584
92	470090140001	1.76	470130080002	2.135
93	470090140002	0.50	470130080003	21.716
94	470090150000	2.51	470130100003	15.752
95	470090160000	2.59	470140010000	16.168
96	470090170000	2.00	470140020000	14.926
97	470090180000	2.15	470140040000	13.448
98	470090190001	1.34	470140060000	13.002
99	470090190002	0.66	470140070000	12.783
100	470090200001	1.32	470140080000	12.355
101	470090200002	0.68	470140090000	12.583
102	470090210001	0.68	470140120001	4.023
103	470090210000	1.32	470140120002	2.349
104	470090220000	2.14	470140120003	1.842
105	470090230000	2.15	470140120004	4.075
106	470090240001	1.12	470140120005	4.849

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
107	470090240002	0.97	470140120006	3.07
108	470090250001	1.22	470140120007	2.501
109	470090250002	0.80	470140120008	2.314
110	470090260001	1.34	470140120009	12.708
111	470090260002	0.78		
112	470090270001	0.75		
113	470090270002	1.29		
114	470090280000	2.08		
115	470090290002	1.03		
116	470090300001	1.21		
117	470090310001	0.70		
118	470090310002	0.70		
119	470090320001	1.51		
120	470090320002	0.74		
121	470090330001	0.67		
122	470090330002	1.56		
123	470090340000	2.03		
124	470090350001	4.35		
125	470090350002	2.76		
126	470090360001	2.77		
127	470090360002	1.34		
128	470090370001	4.01		
129	470090370002	2.03		
130	470090380001	2.08		
131	470090380002	incl above		
132	470090390001	1.04		
133	470090390002	1.04		
134	470090400001	1.17		
135	470090400002	1.17		
136	470090430001	1.16		
137	470090430002	0.88		
138	470090440001	1.44		
139	470090450001	1.08		
140	470090450002	1.08		
141	470090460001	1.76		
142	470090460002	0.59		
143	470090470001	1.26		

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
144	470090470002	1.00		
145	470090480001	0.50		
146	470090480002	1.50		
147	470090490001	0.16		
148	470090490002	1.90		
149	470090500000	2.58		
150	470090510000	2.15		
151	470090520001	1.00		
152	470090520002	1.14		
153	470090530001	0.08		
154	470090530002	0.02		
155	470090540001	1.00		
156	470090540002	0.79		
157	470090550001	1.99		
158	470090550002	0.45		
159	470090560001	1.19		
160	470090560002	0.88		
161	470090570000	2.28		
162	470090580000	2.00		
163	470090590001	0.67		
164	470090590002	1.57		
165	470090600001	1.00		
166	470090600002	1.00		
167	470090610001	1.53		
168	470090610002	0.40		
169	470090620000	2.02		
170	470090630000	2.20		
171	470090650001	1.08		
172	470090660001	0.56		
173	470090660002	1.59		
174	470090670001	1.37		
175	470090670002	0.99		
176	470090680002	0.79		
177	470090680002	incl above		
178	470090690001	2.46		
179	470090690002	0.78		
180	470090700001	1.32		

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
181	470090700002	1.07		
182	470090710001	2.00		
183	470090710002	0.99		
184	470090720001	2.20		
185	470090730001	0.80		
186	470090730002	1.62		
187	470090740001	1.03		
188	470090740002	1.40		
189	470090750001	2.28		
190	470090750002	0.75		
191	470090760001	2.61		
192	470090760002	1.00		
193	470090770001	3.15		
194	470090770002	1.01		
195	470090780001	3.06		
196	470090780002	0.94		
197	470090790001	1.28		
198	470090790002	1.58		
199	470090800001	1.95		
200	470090800002	0.58		
201	470090810000	2.15		
202	470100020002	1.01		
203	470100030001	1.76		
204	470100030002	0.99		
205	470100080001	4.60		
206	470100080002	4.60		
207	470100090001	1.06		
208	470100090002	2.51		
209	470100100001	2.00		
210	470100100001	incl above		
211	470100100002	5.25		
212	470100120001	1.38		
213	470100130000	2.28		
214	470100140000	2.42		
215	470100150000	2.397		
216	470100160000	2.268		
217	470100170000	2.32		



ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
218	470100180001	0.51		
219	470100180002	2.93		
220	470100190000	3.23		
221	470100190000	incl above		
222	470100200001	1.69		
223	470100210000	2.32		
224	470100220001	1.82		
225	470100230001	1.00		
226	470100230002	1.40		
227	470100260001	0.89		
228	470100260002	2.42		
229	470100270001	1.25		
230	470100270002	0.79		
231	470100280001	1.53		
232	470100280002	0.50		
233	470100300001	1.30		
234	470100310001	1.30		
235	470100310002	1.14		
236	470100320000	2.05		
237	470100330000	2.02		
238	470100340001	1.29		
239	470100340002	0.78		
240	470100350000	2.016		
241	470100360001	0.99		
242	470100360002	1.02		
243	470100370001	1.01		
244	470100380000	2.19		
245	470100390000	2.069		
246	470100400001	1.22		
247	470100400002	0.89		
248	470100410001	1.13		
249	470100410002	0.87		
250	470100420001	1.27		
251	470100420002	0.78		
252	470100430001	0.99		
253	470100440001	1.13		
254	470100440002	1.00		

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)

**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
255	470100450002	0.59		
256	470100460001	0.99		
257	470100470000	2.02		
258	470100480001	1.08		
259	470100490001	1.01		
260	470100500001	1.01		
261	470100500002	1.01		
262	470100510001	1.05		
263	470100510002	1.05		
264	470100520000	2.74		
265	470100530000	2.227		
266	470100540000	8.618		
267	470100550001	1.15		
268	470100560001	2.37		
269	470100560002	0.79		
270	470100570000	2.57		
271	470100580002	1.90		
272	470100590001	0.81		
273	470100590002	2.05		
274	470100600001	2.28		
275	470100600002	0.60		
276	470100610000	2.03		
277	470100620000	2.02		
278	470100630001	1.79		
279	470100630002	0.27		
280	470100640001	1.15		
281	470100640002	1.15		
282	470100650000	2.01		
283	470100670000	8.48		
284	470100670003	2.75		
285	470100680000	4.33		
286	470100690001	1.00		
287	470100690002	1.04		
288	470100700000	2.22		
289	470100700001	1.67		
290	470100700002	0.50		
291	470100710001	1.75		

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
292	470100710002	0.54		
293	470100720000	2.79		
294	470100730001	2.07		
295	470100730002	1.59		
296	470100740001	1.92		
297	470100740002	1.24		
298	470100760001	2.56		
299	470100770001	2.04		
300	470100770002	0.73		
301	470100780001	1.83		
302	470100780002	1.83		
303	470100790001	1.30		
304	470100790002	1.94		
305	470100800001	4.16		
306	470100800002	1.32		
307	470100810001	3.57		
308	470100810002	1.47		
309	470100820001	0.58		
310	470100820002	1.44		
311	470100830001	0.68		
312	470100830002	1.73		
313	470110010000	15.32		
314	470110020000	16.91		
315	470110030000	12.13		
316	470110040000	16.19		
317	470110050001	3.00		
318	470110060000	16.21		
319	470110060000	incl above		
320	470110070002	3.98		
321	470110080000	15.50		
322	470110090001	8.51		
323	470110090002	1.10		
324	470110100000	15.16		
325	470110110000	15.15		
326	470110120001	3.86		
327	470110120002	11.62		
328	470110130001	3.00		

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
329	470110130002	9.50		
330	470110140000	12.49		
331	470110140000	incl above		
332	470110150001	12.27		
333	470110170000	12.95		
334	470110180001	6.21		
335	470110180002	6.75		
336	470110190001	8.99		
337	470110190002	6.45		
338	470120010000	5.04		
339	470120020000	5.03		
340	470120030000	5.17		
341	470120040000	5.82		
342	470120050000	5.43		
343	470120060000	5.17		
344	470120070000	5.11		
345	470120080000	5.80		
346	470120090000	6.09		
347	470120100000	5.66		
348	470120110000	5.11		
349	470120120000	5.12		
350	470120130000	5.02		
351	470120140000	5.75		
352	470120150000	5.05		
353	470120160000	5.20		
354	470120170000	5.02		
355	470120180000	5.40		
356	470120190000	5.42		
357	470120200000	5.60		
358	470120210000	4.43		
359	470120220000	4.48		
360	470120240000	4.17		
361	470130010001	3.05		
362	470130030000	25.25		
363	470130090001	8.01		
364	470130090002	3.14		
365	470130090003	8.07		

ATTACHMENT TO:GWUPA  
#11 Table 1 (B)

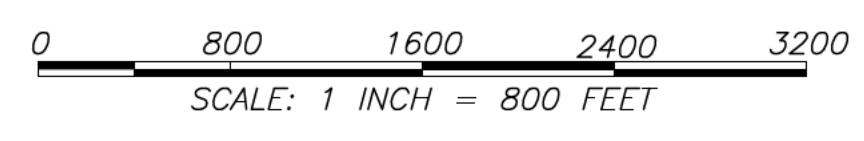
**SCHEDULE A: USER LIST BY TMK**

	User TMK	Gross Acreage	Authorized Planned TMK	Gross Acreage
366	470130100001	0.46		
367	470130100002	1.27		
368	470130110000	17.70		
369	470140030001	4.76		
370	470140030002	3.53		
371	470140030003	6.35		
372	470140050000	13.06		
373	470140100000	12.80		
374	470140110000	11.16		
375	470140120000	37.73		





LWC SERVICE AREA = 3,300 ACRES±  
CONSERVATION AREA = 3,000 ACRES±



LAUNIUPOKO WATER CO., INC. EXHIBIT - SERVICE AREA	
SCALE 1 INCH = 800 FEET	DATE 9/28/21
WEST MAUI LAND COMPANY, INC. 305 E. WAKEA AVENUE, SUITE 100 KAHULUI, MAUI, HAWAII 96732	

LWC Water System Improvements Rate.dwg



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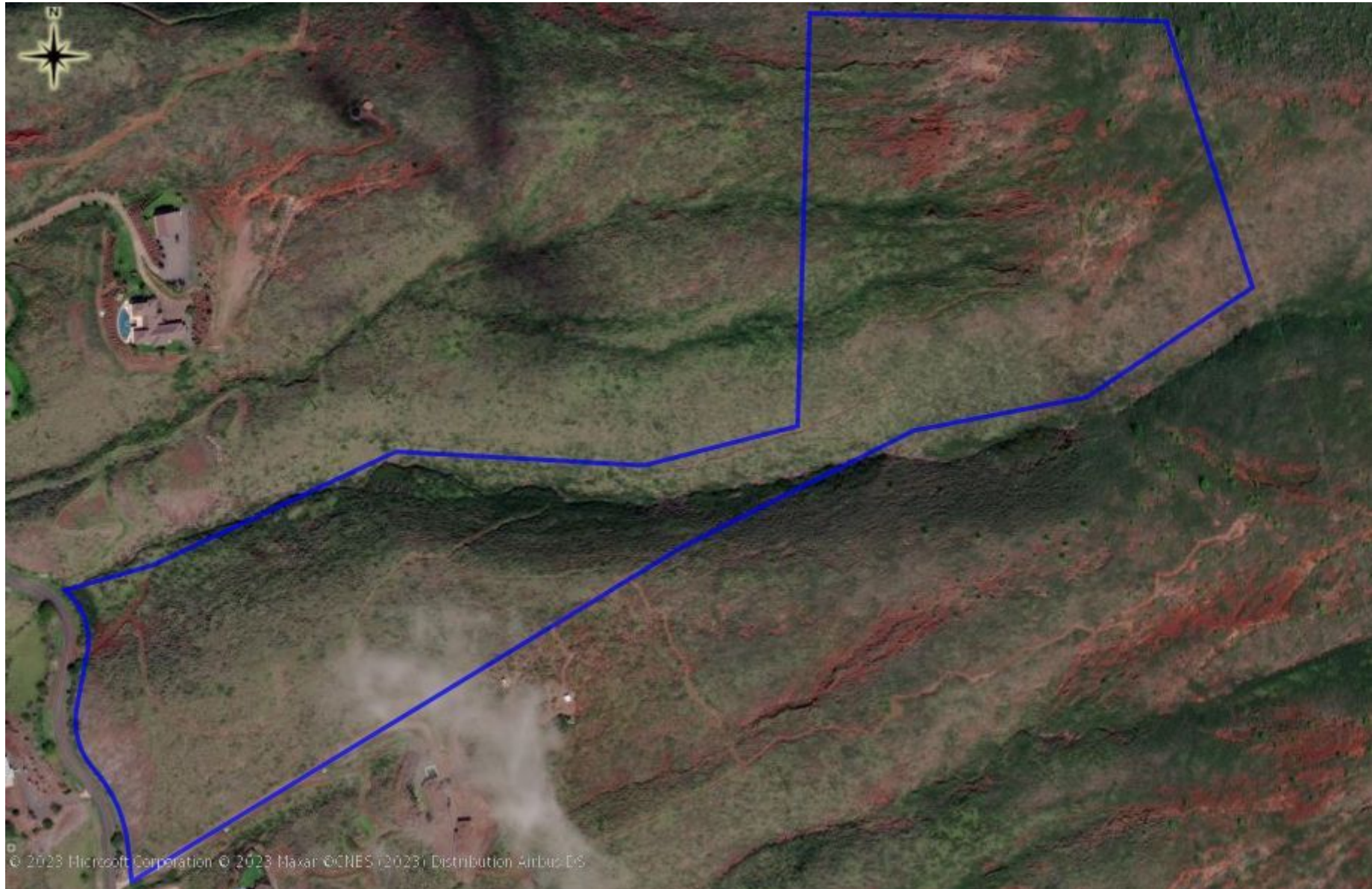


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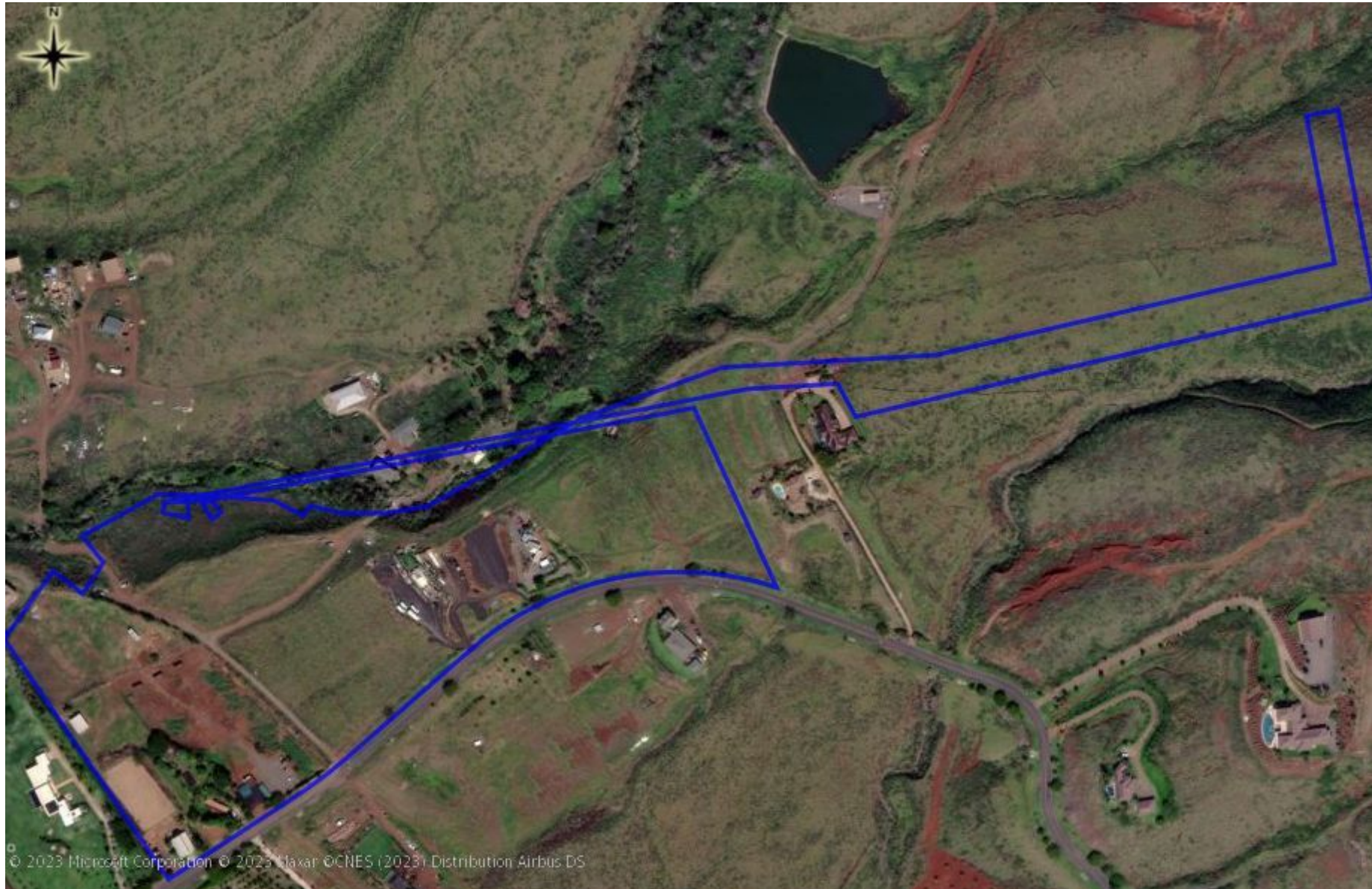


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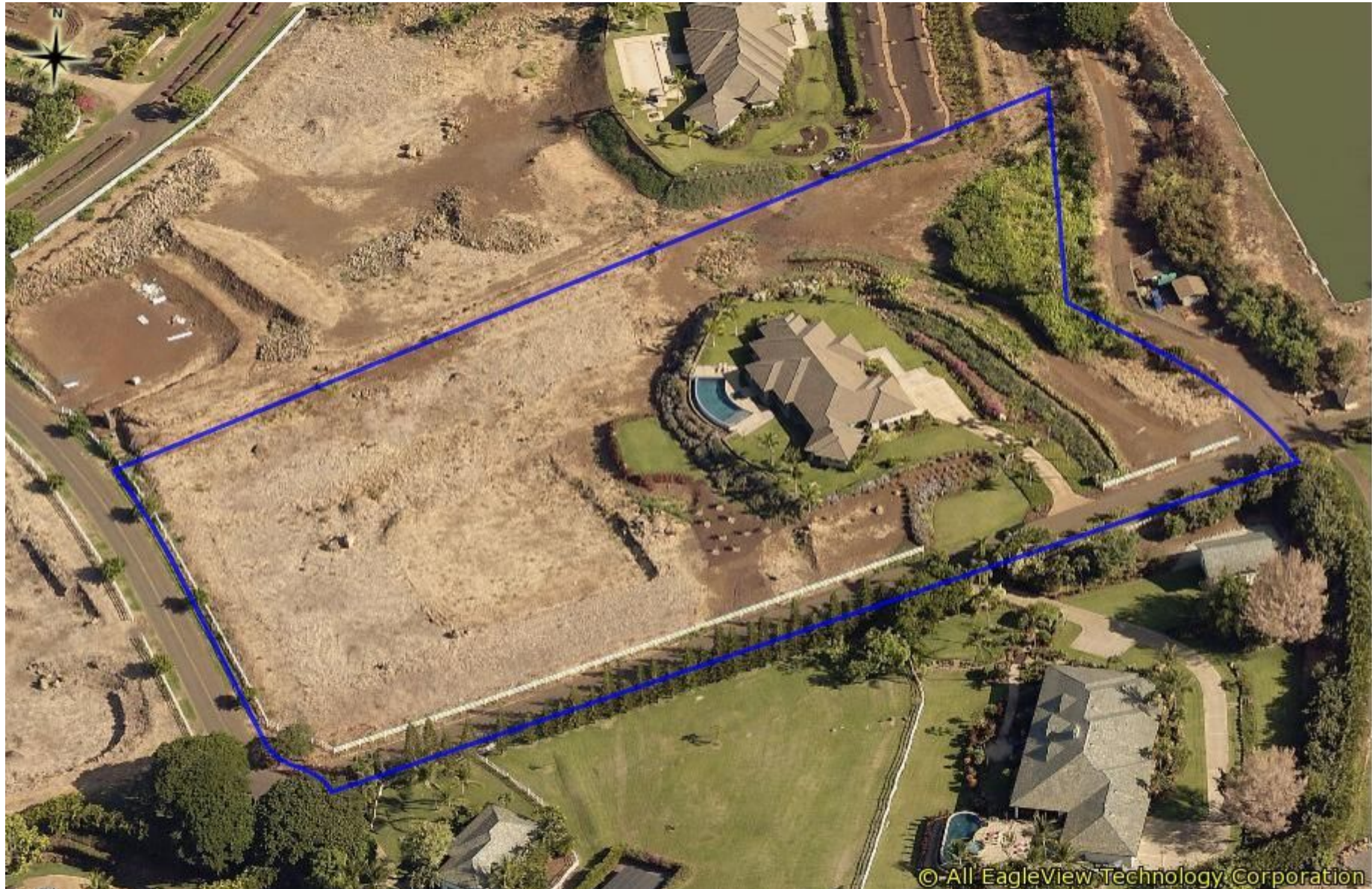


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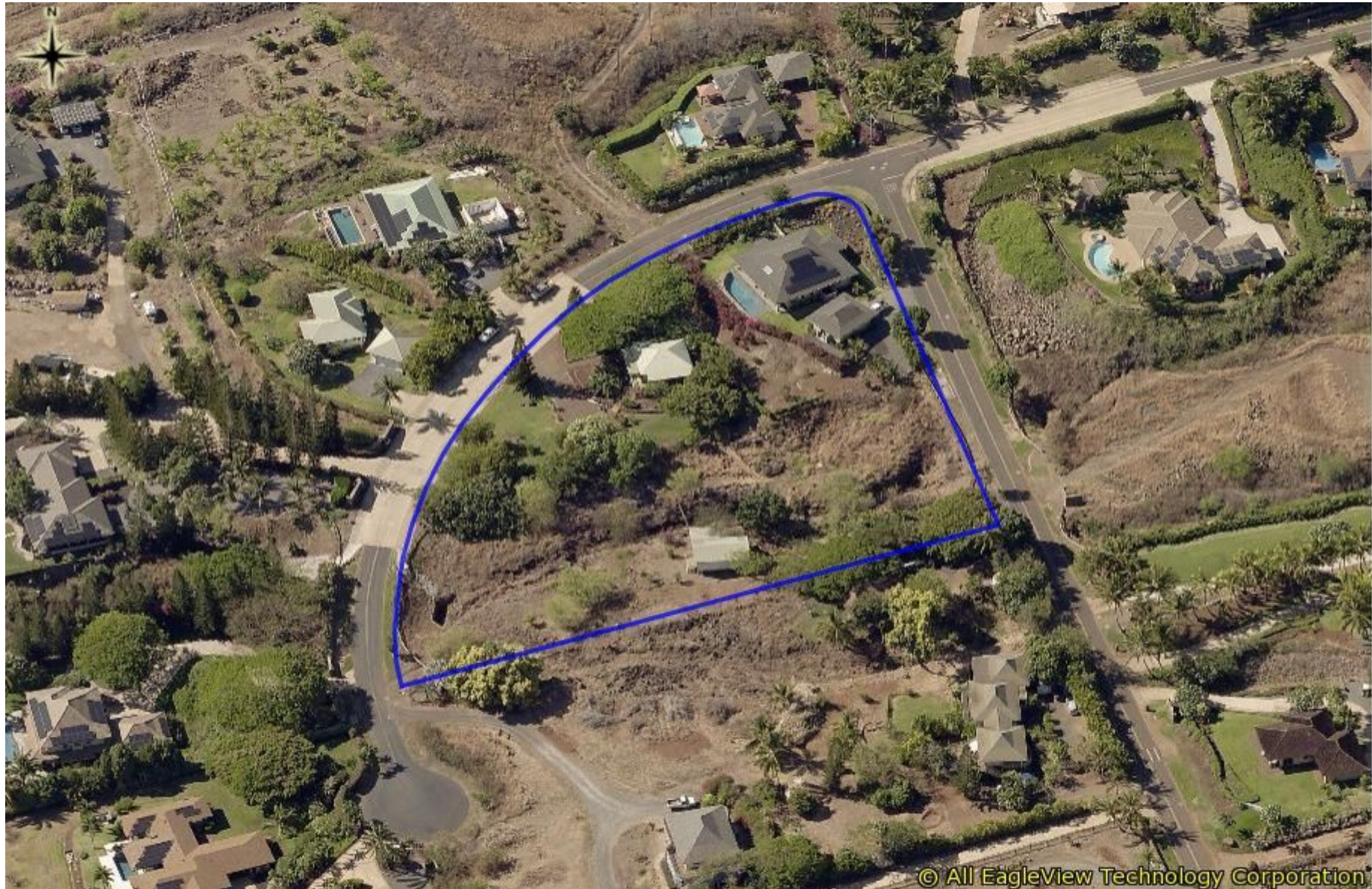


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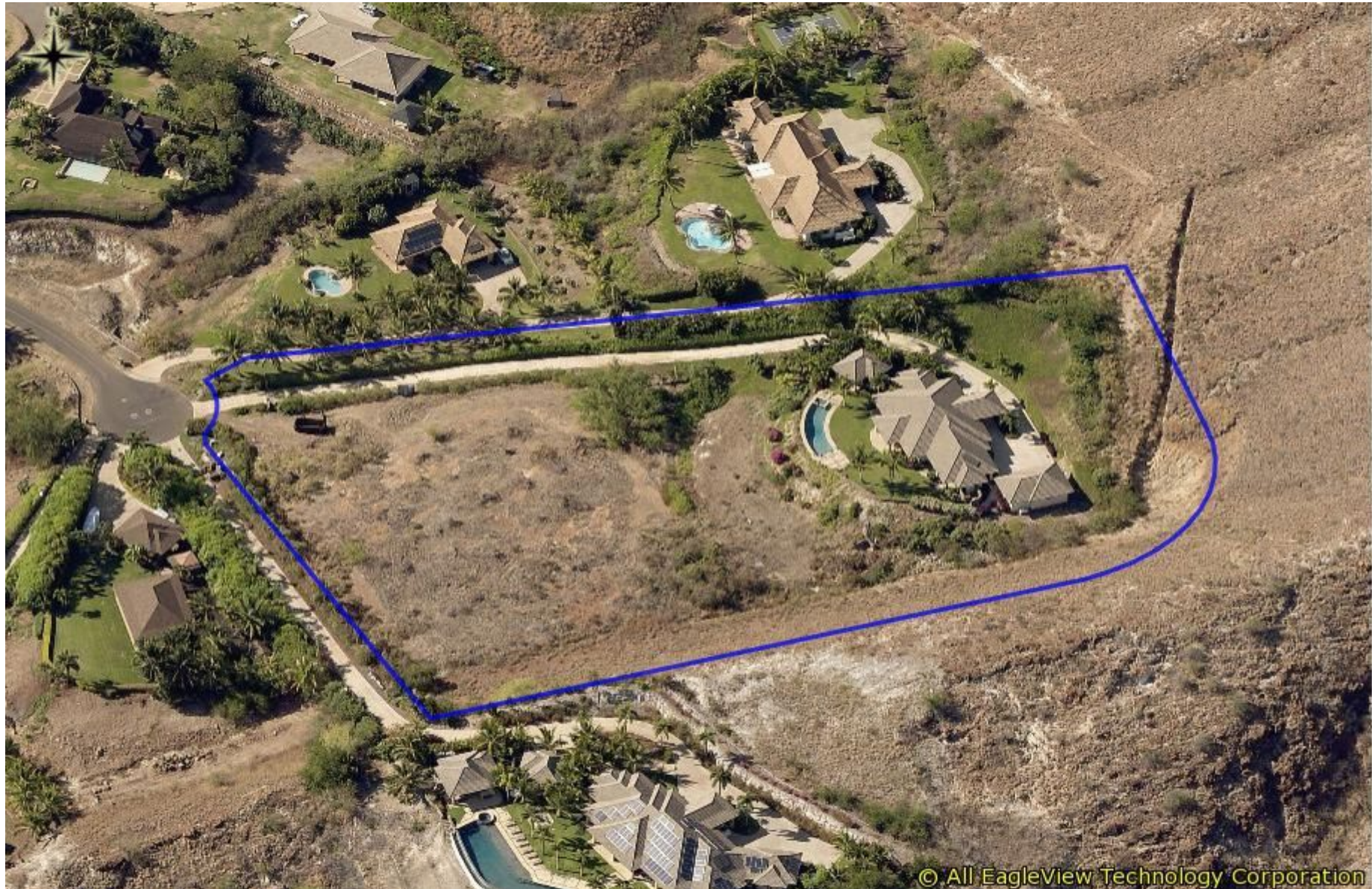
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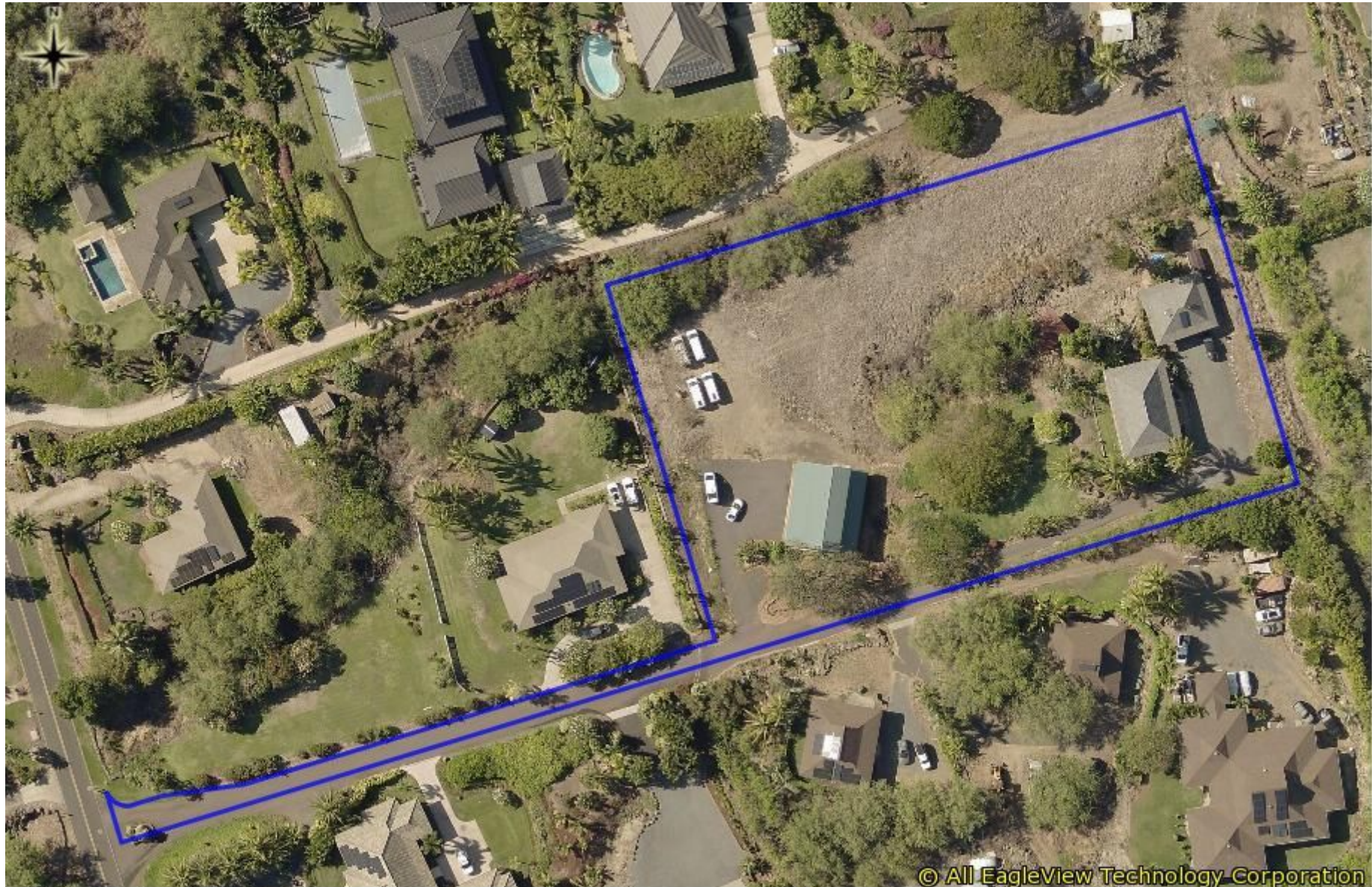


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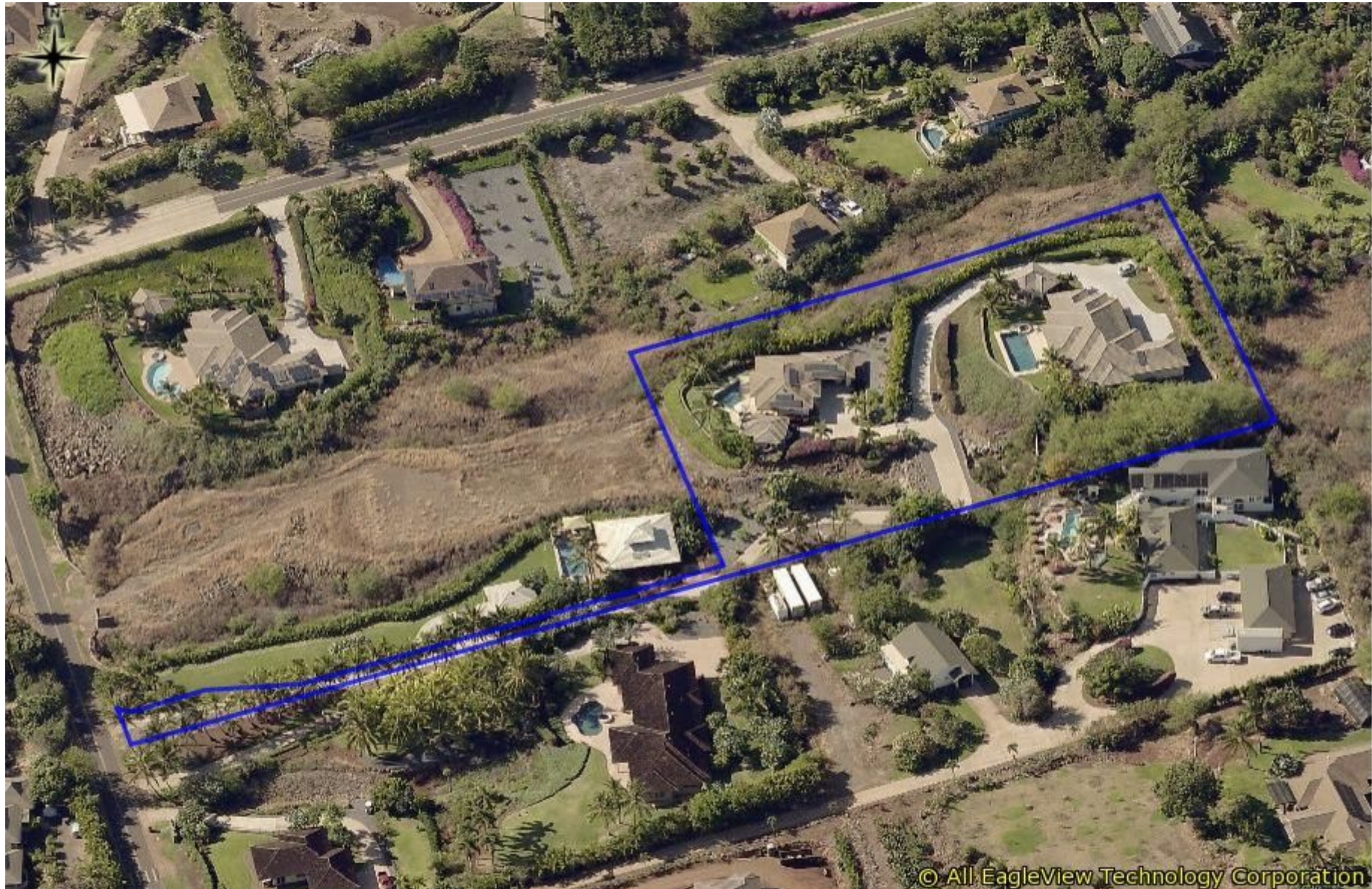


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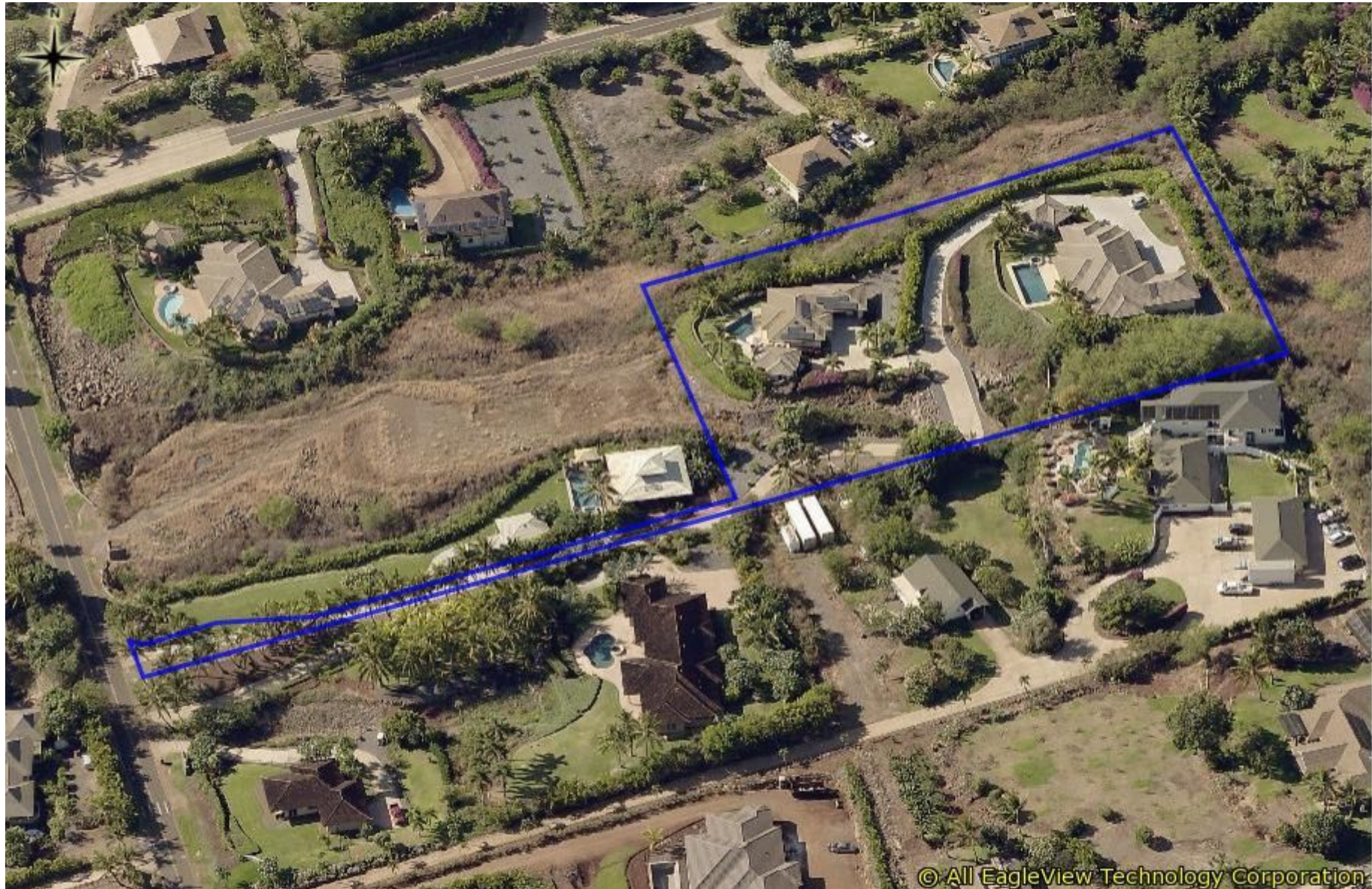
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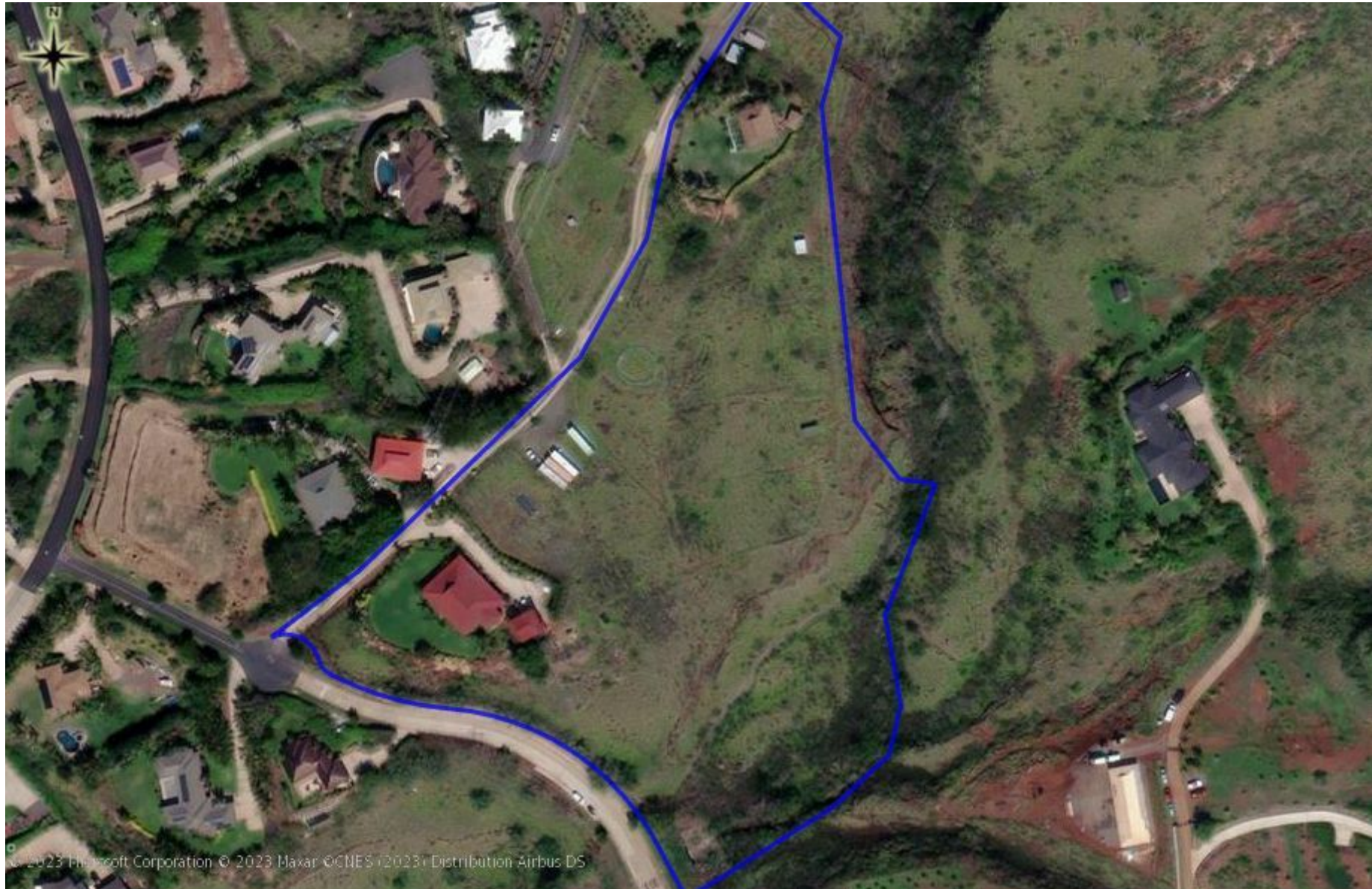


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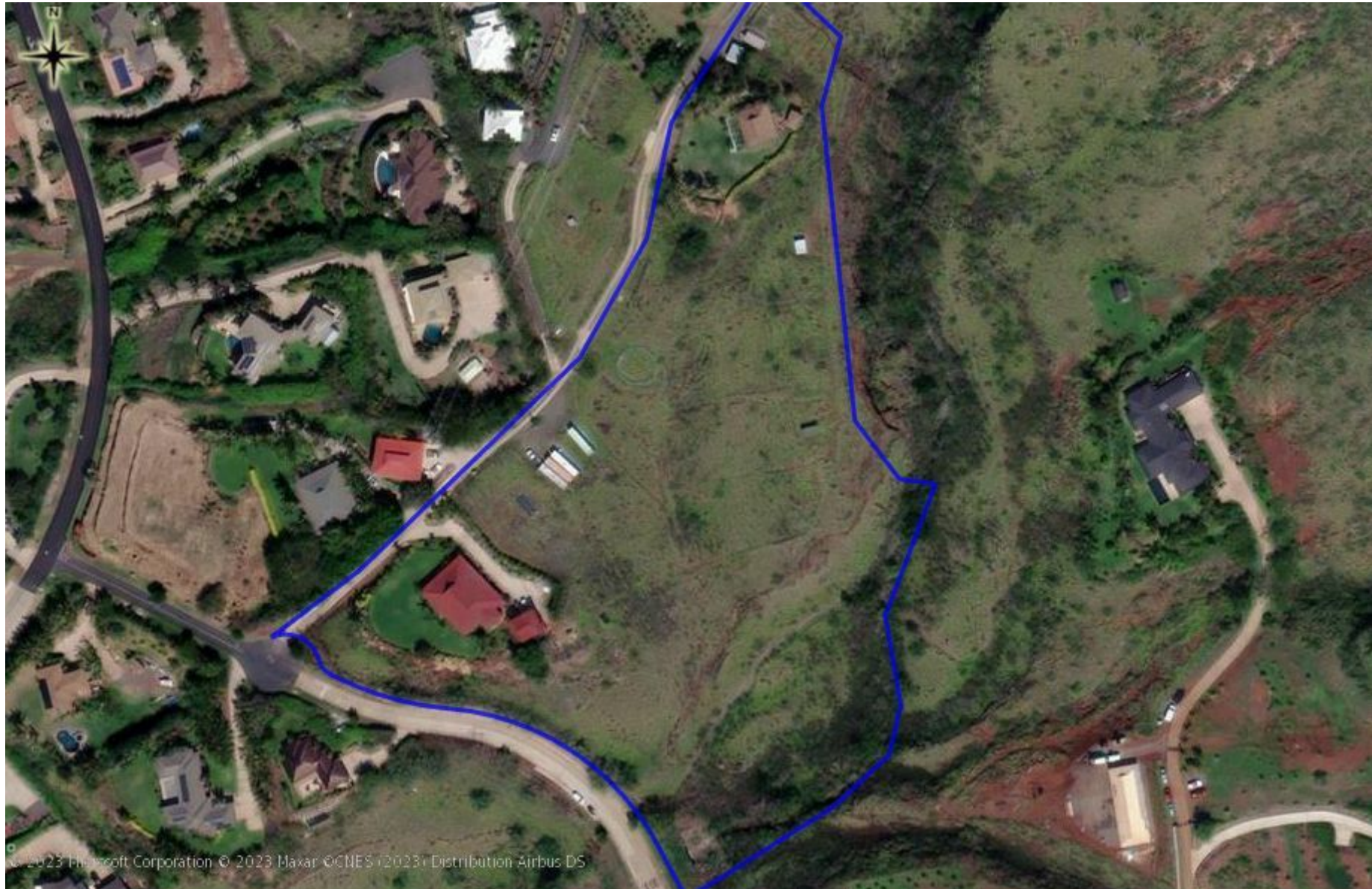


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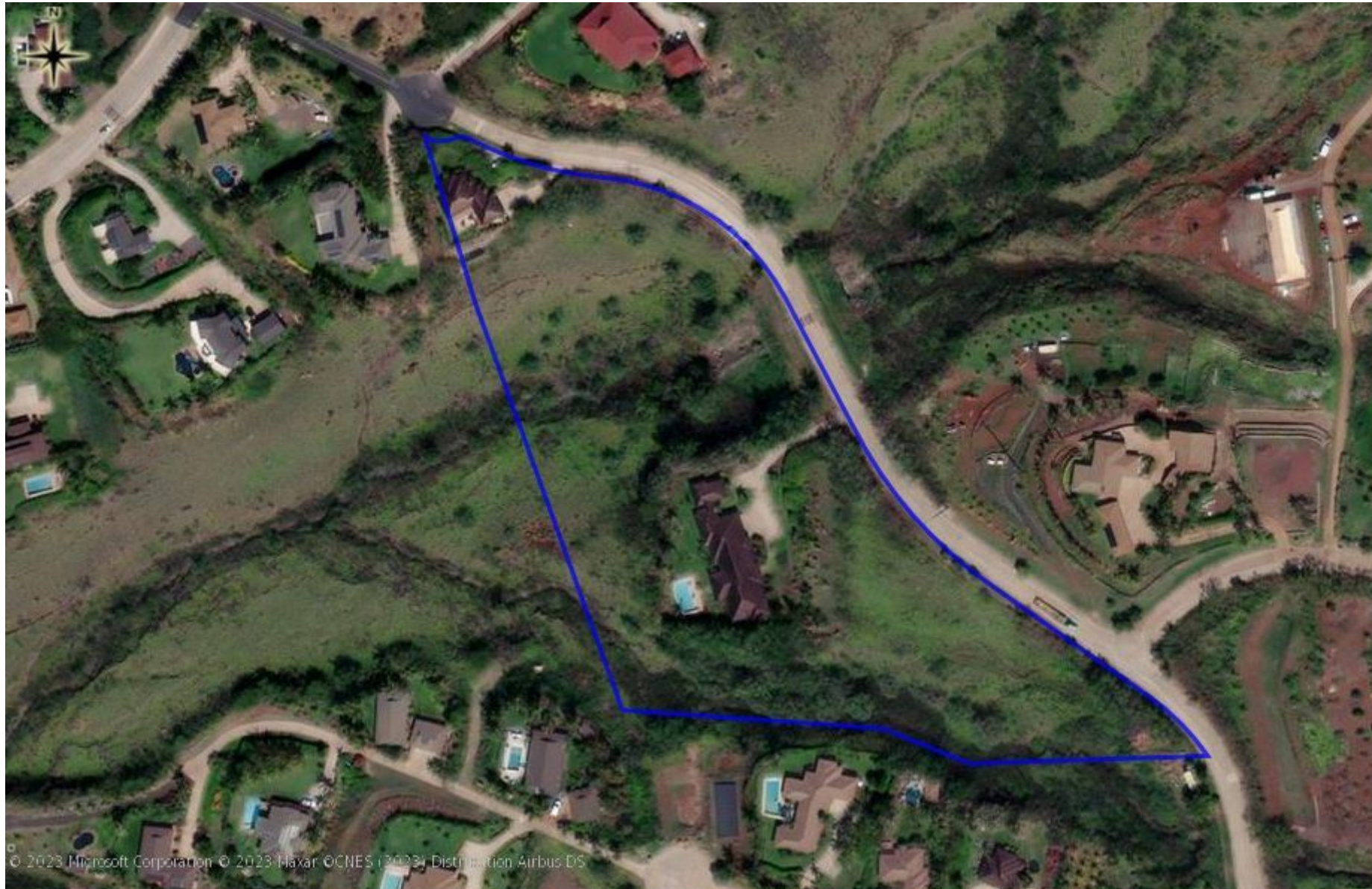


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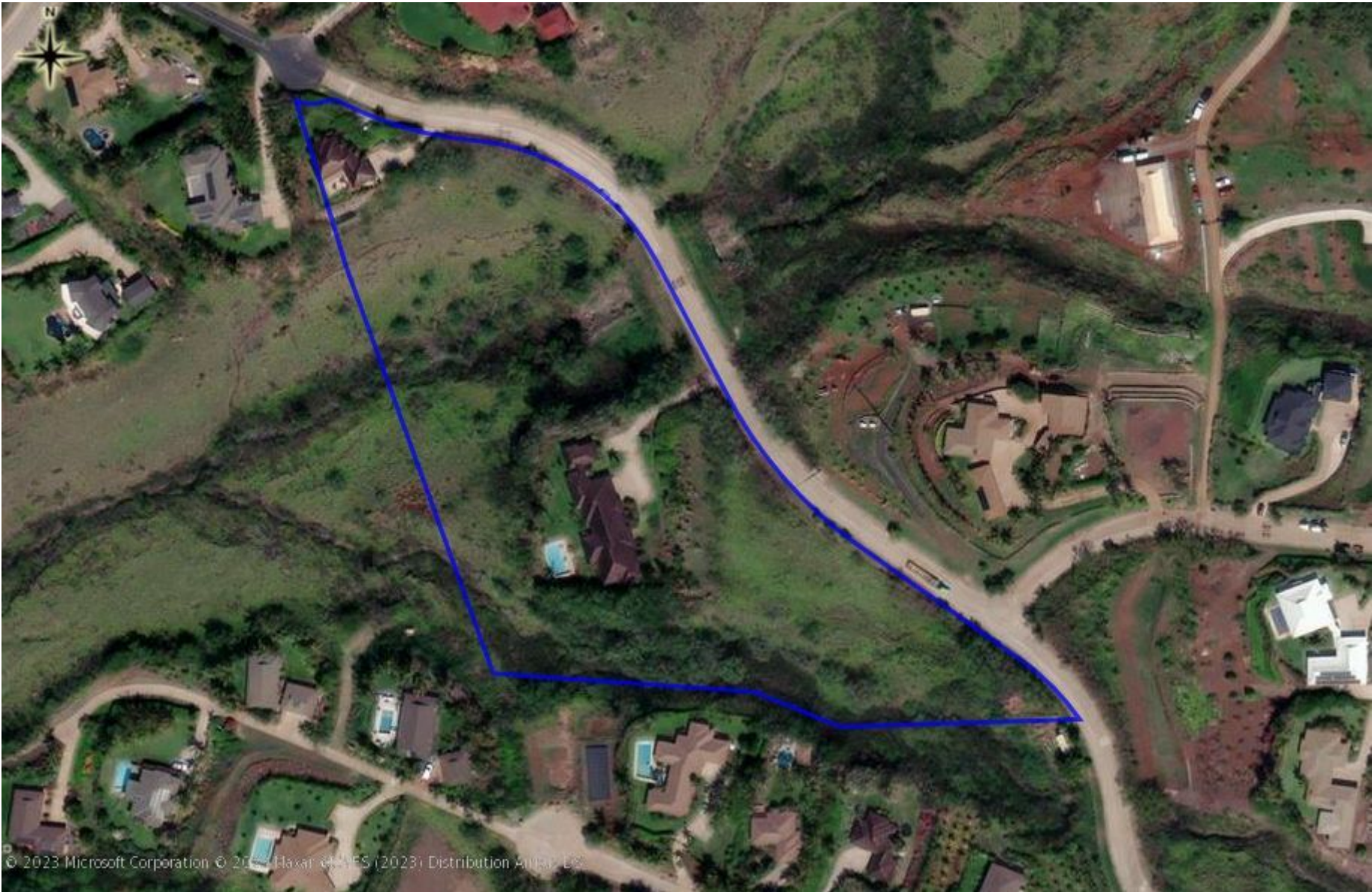


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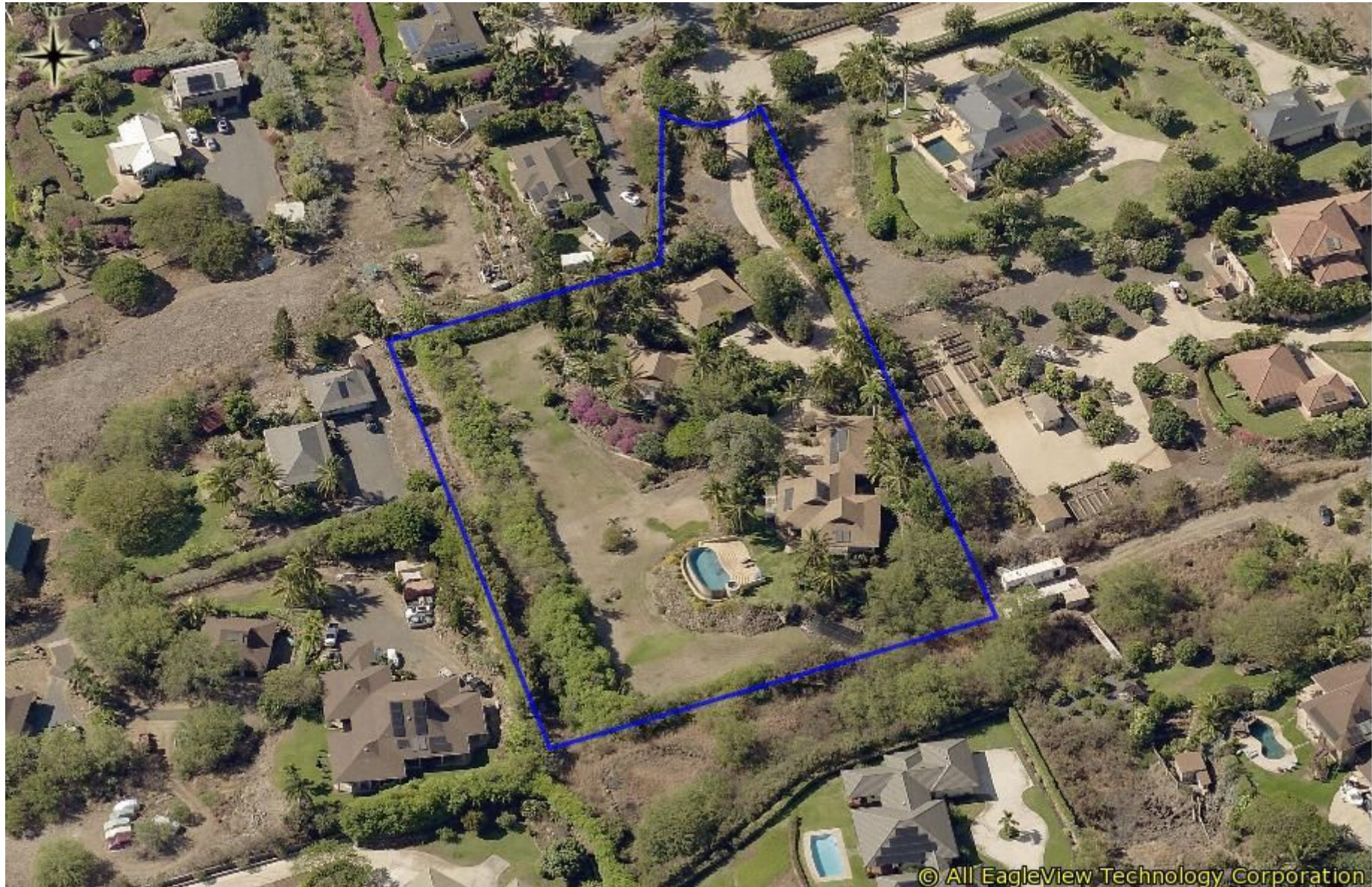


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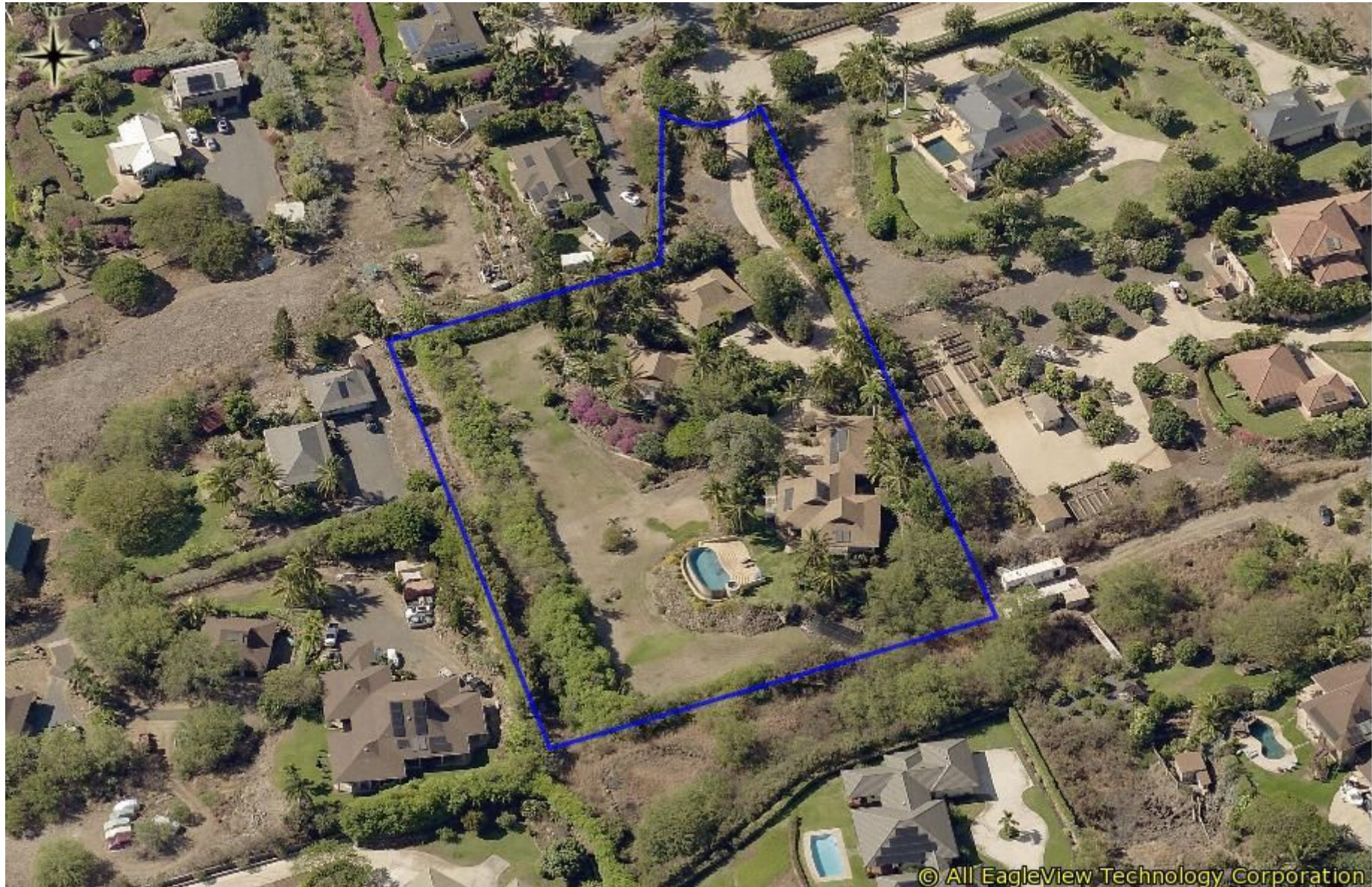


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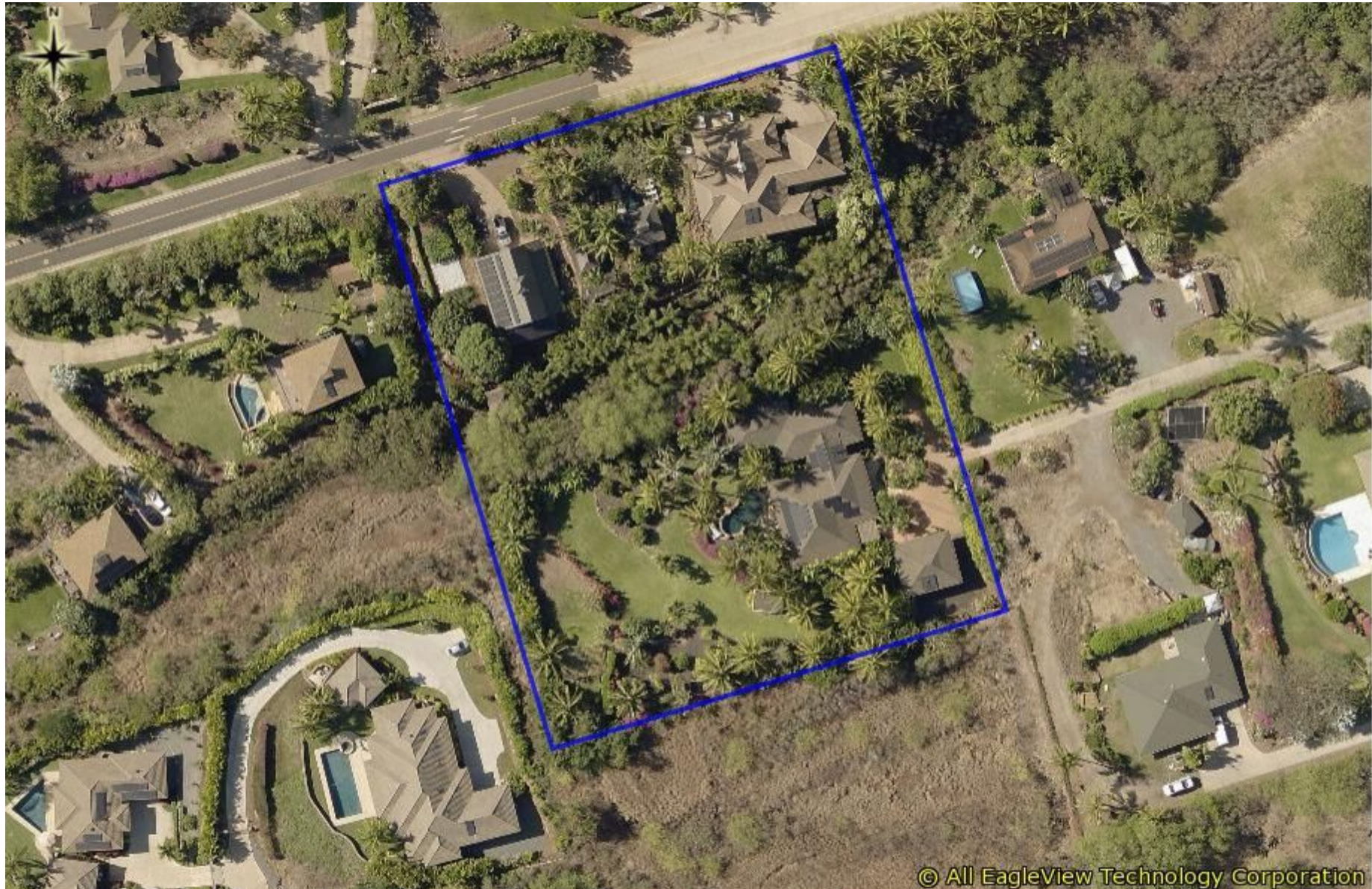
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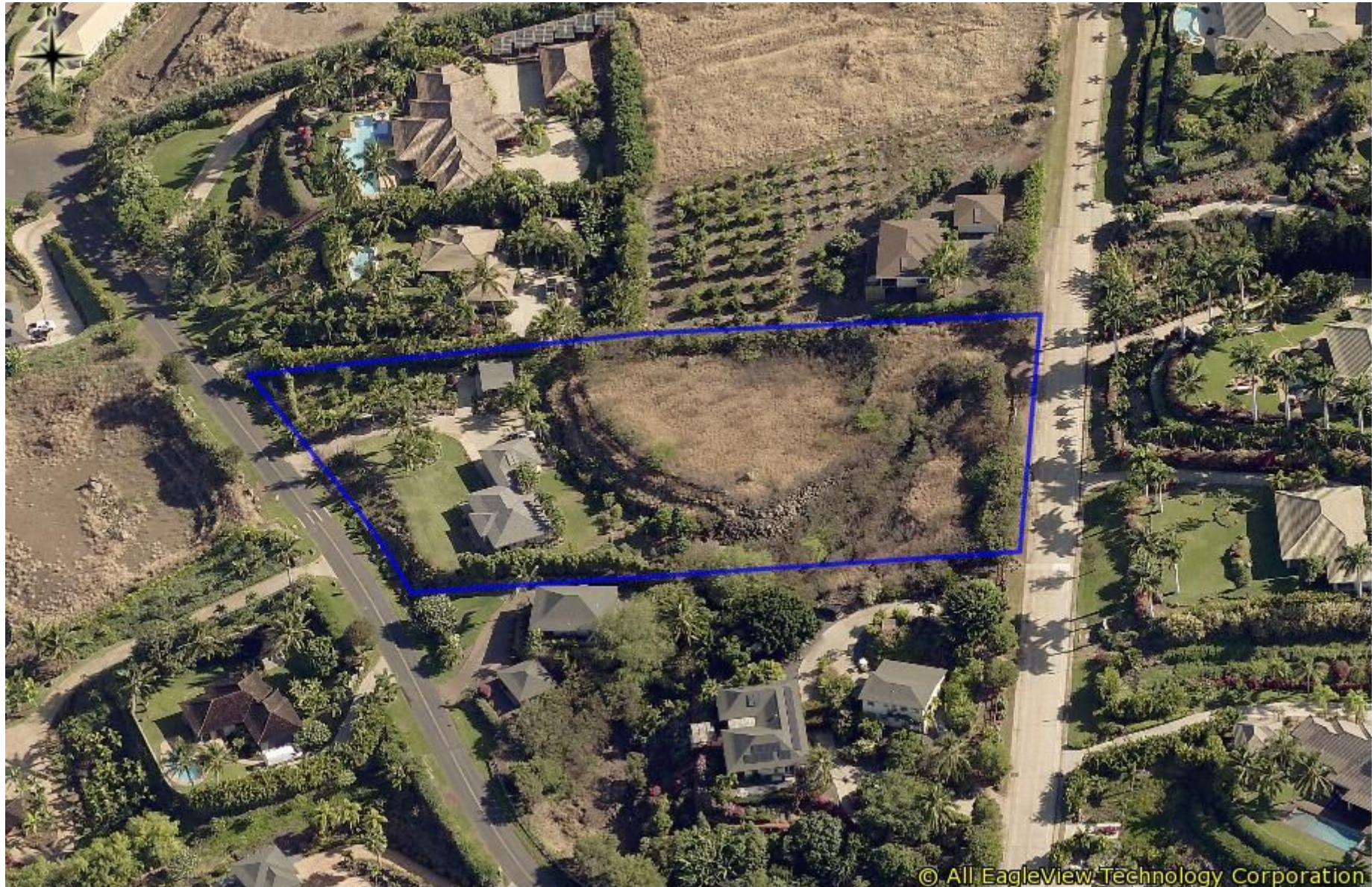
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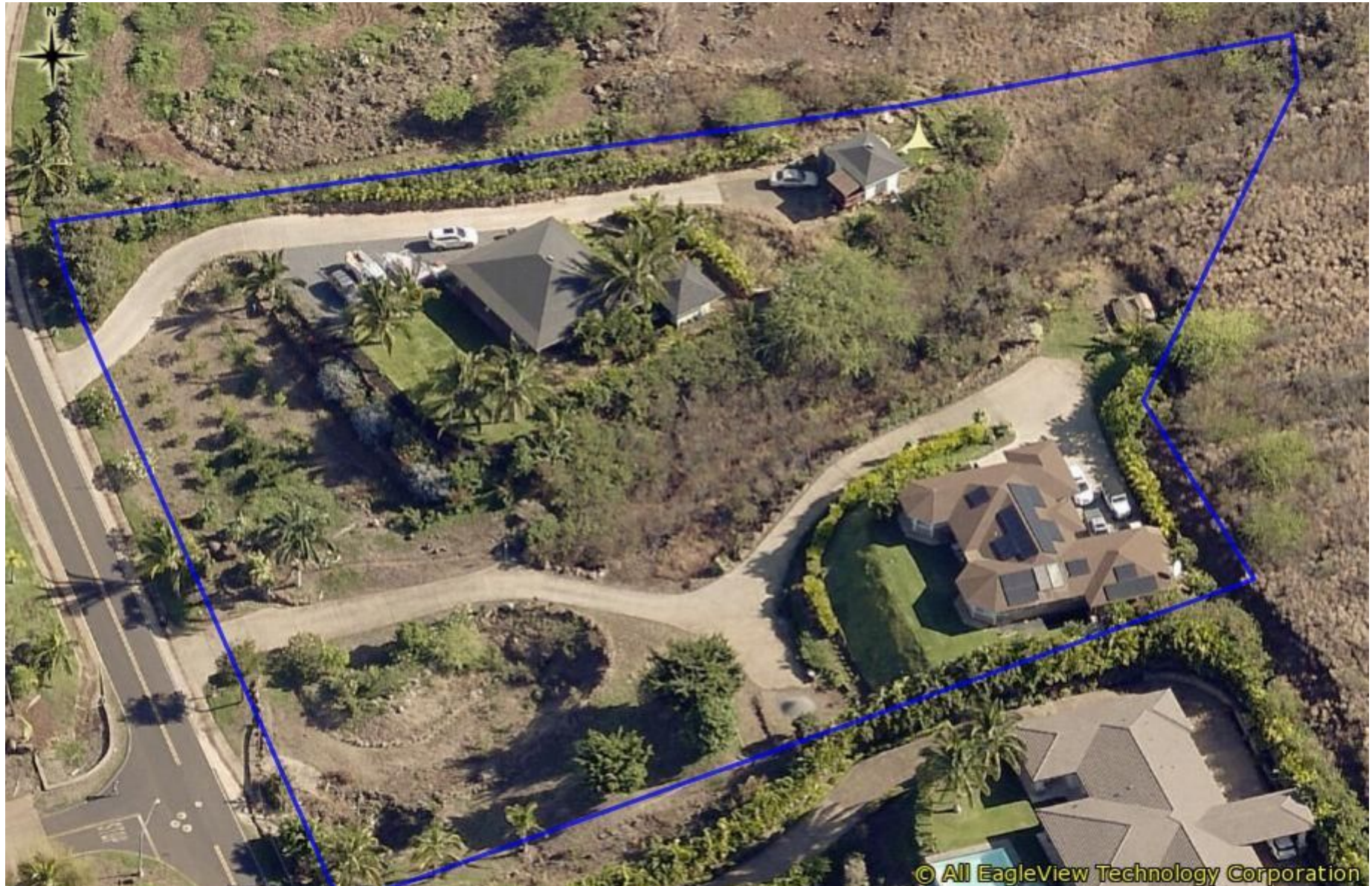


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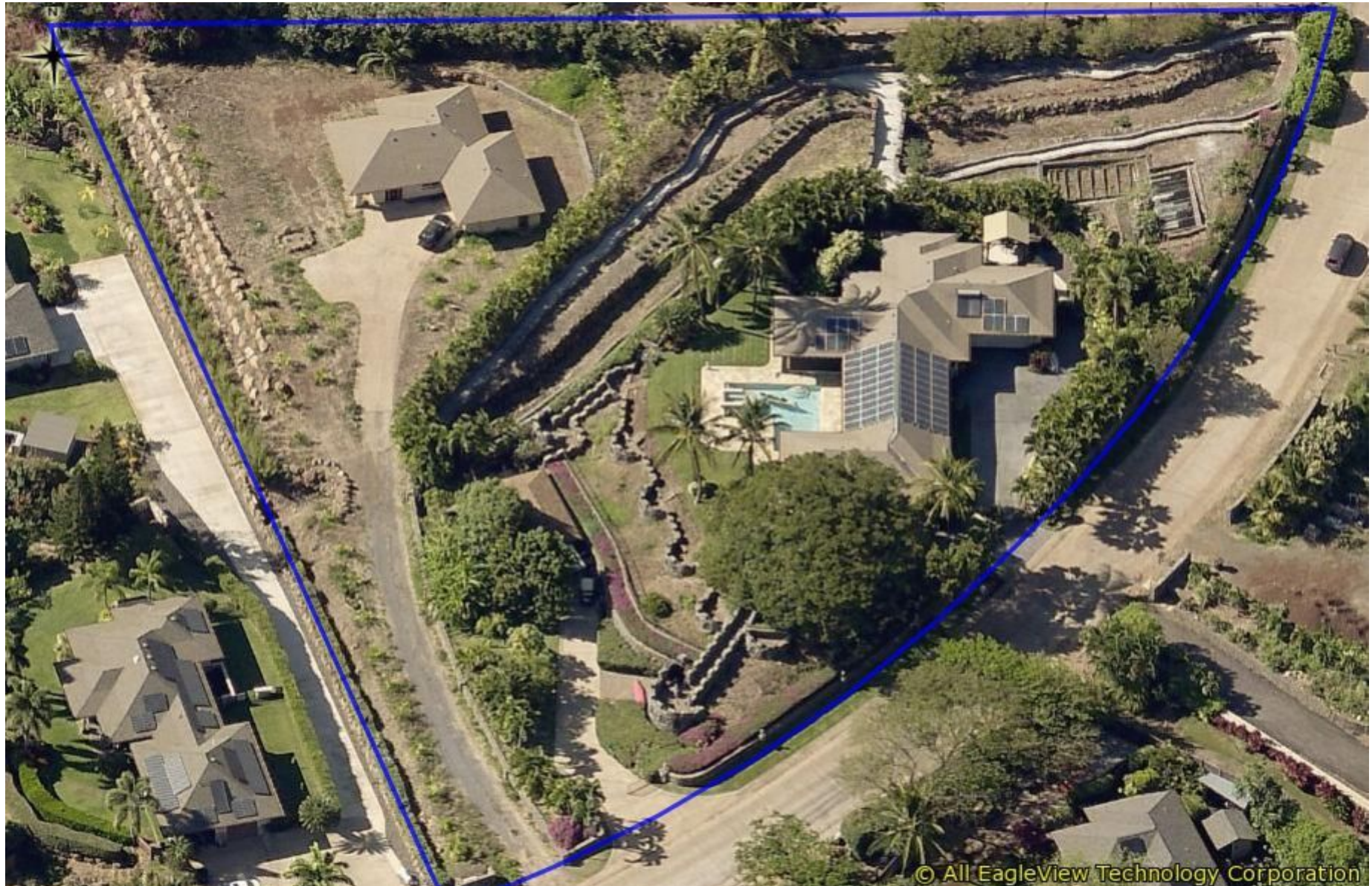


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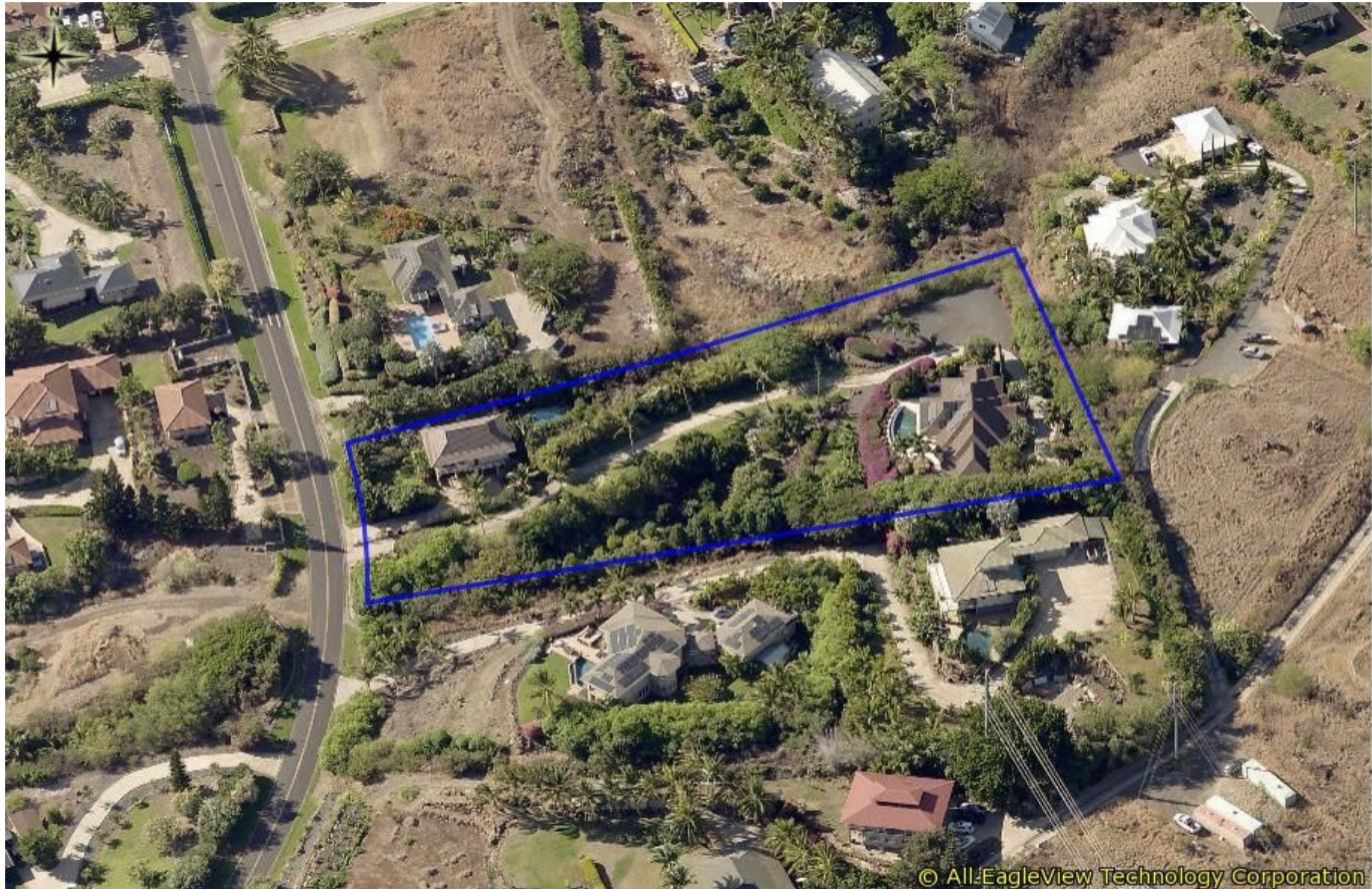
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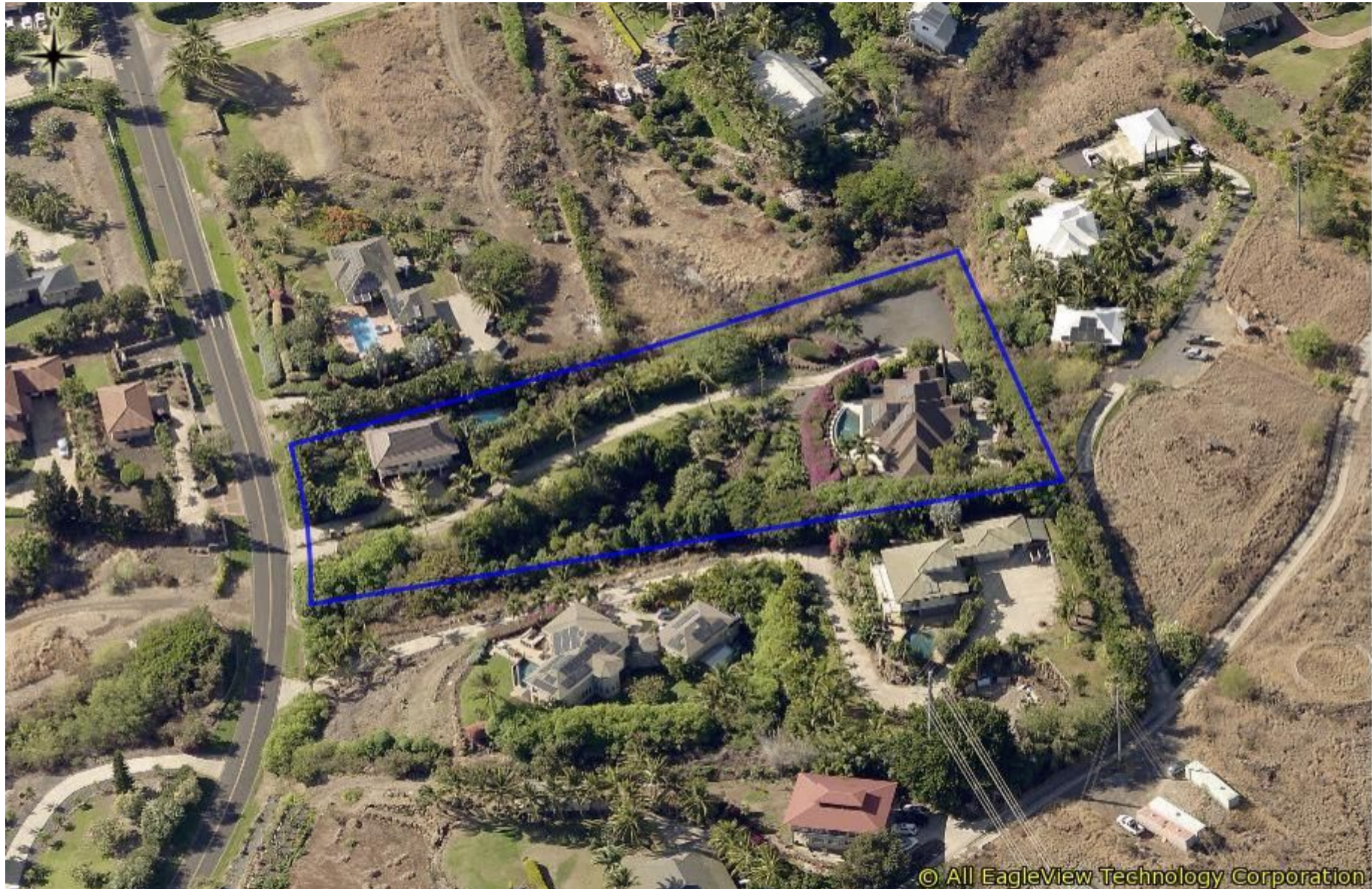


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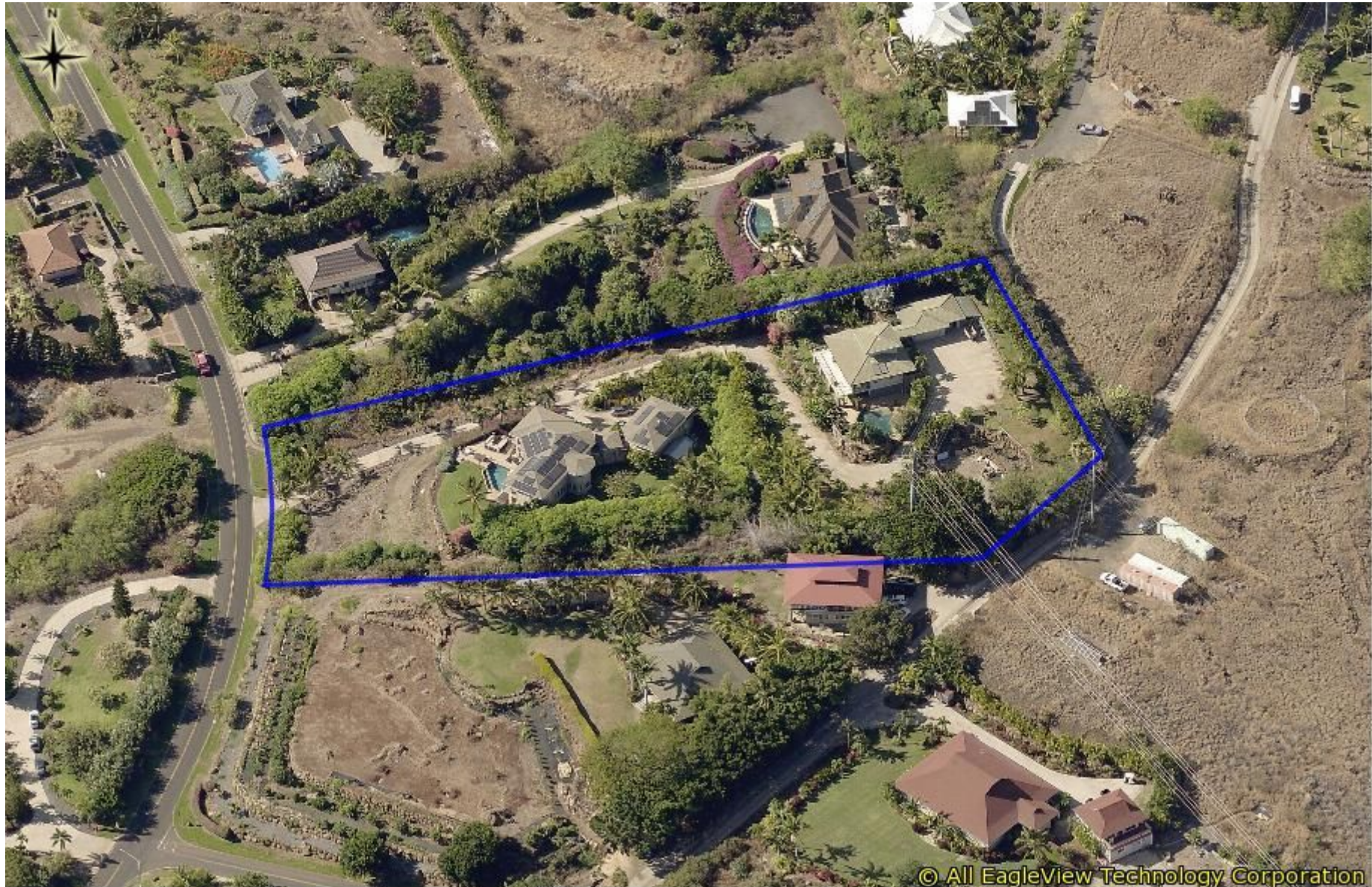


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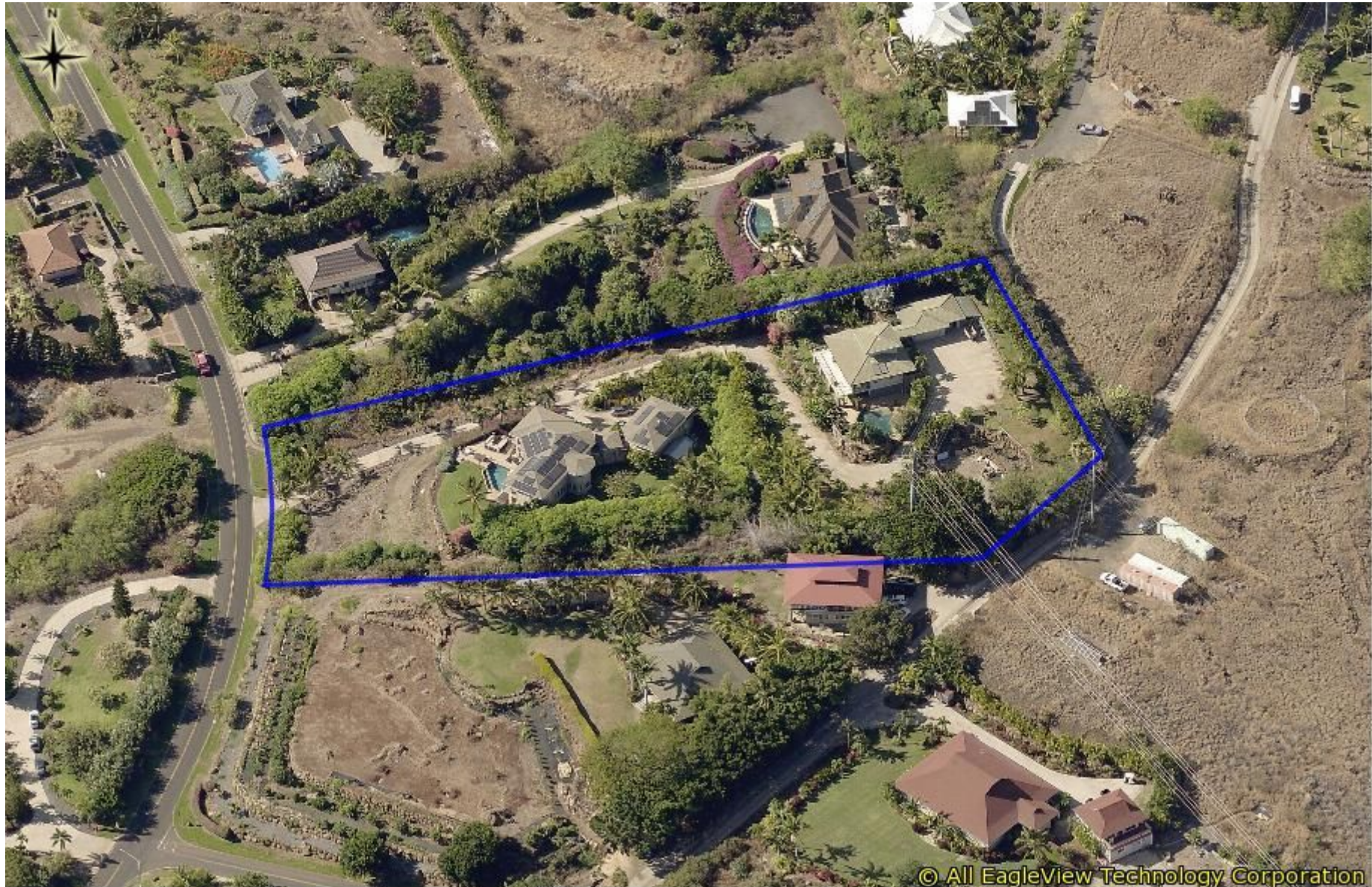


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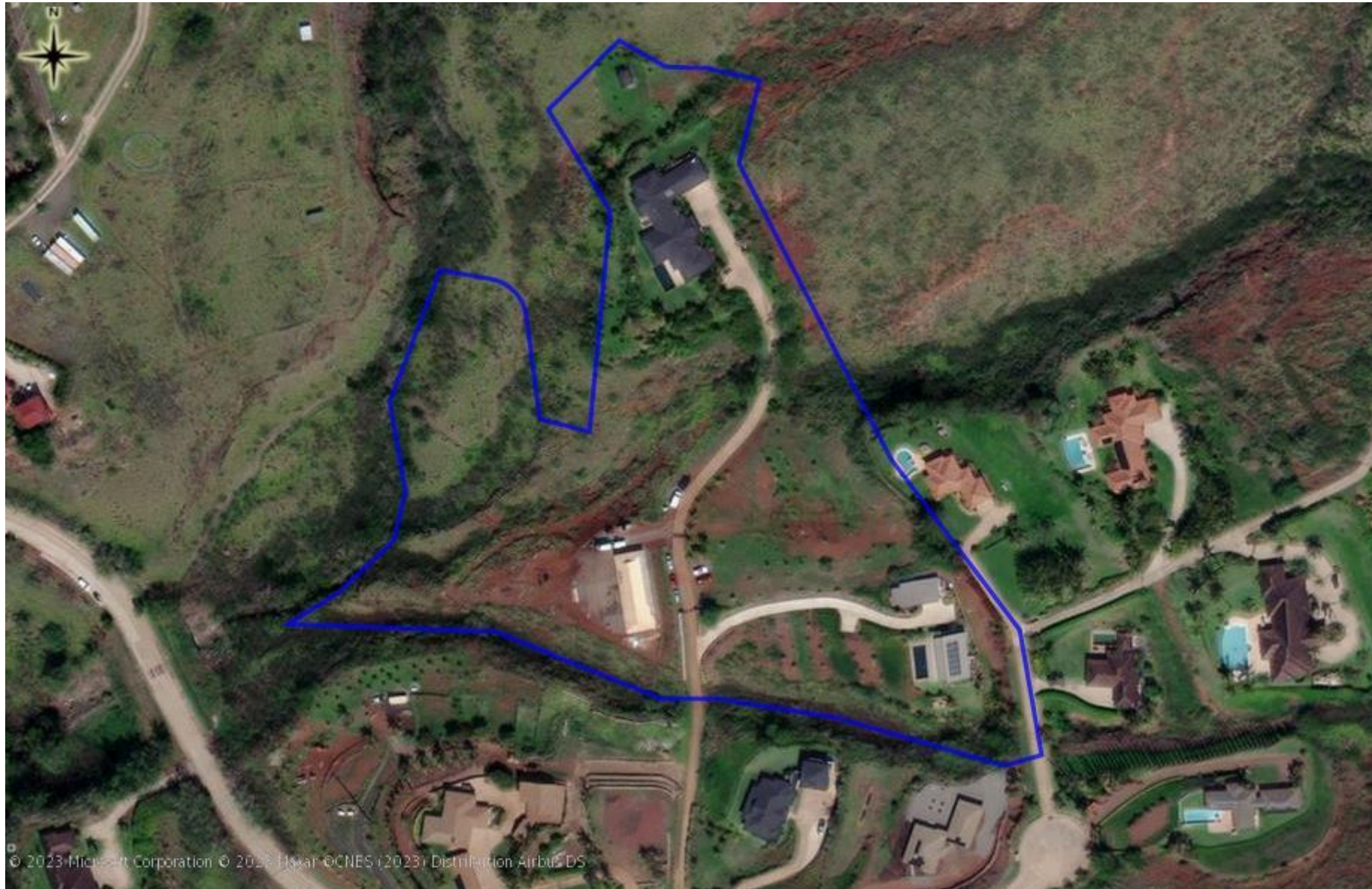


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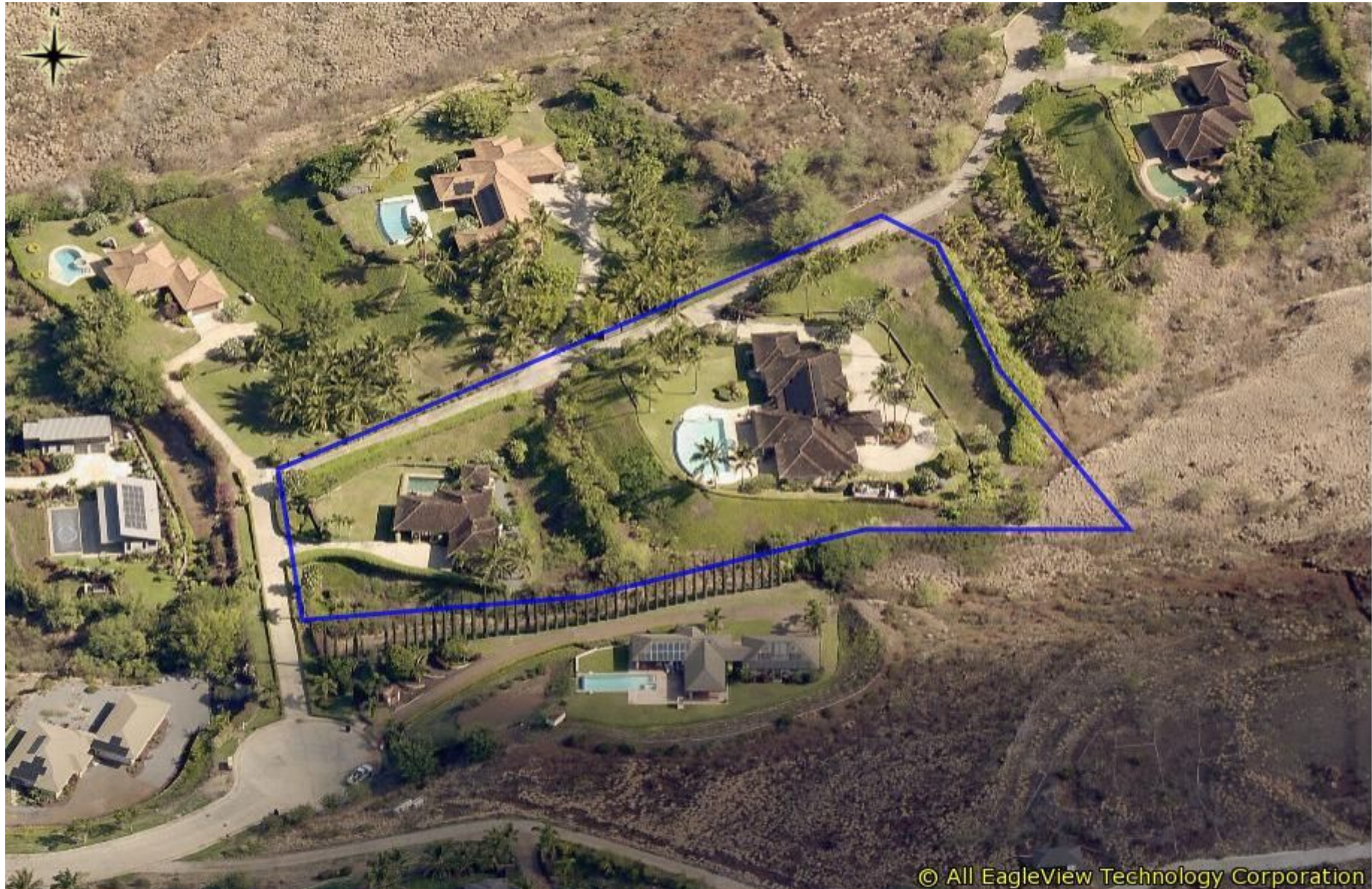


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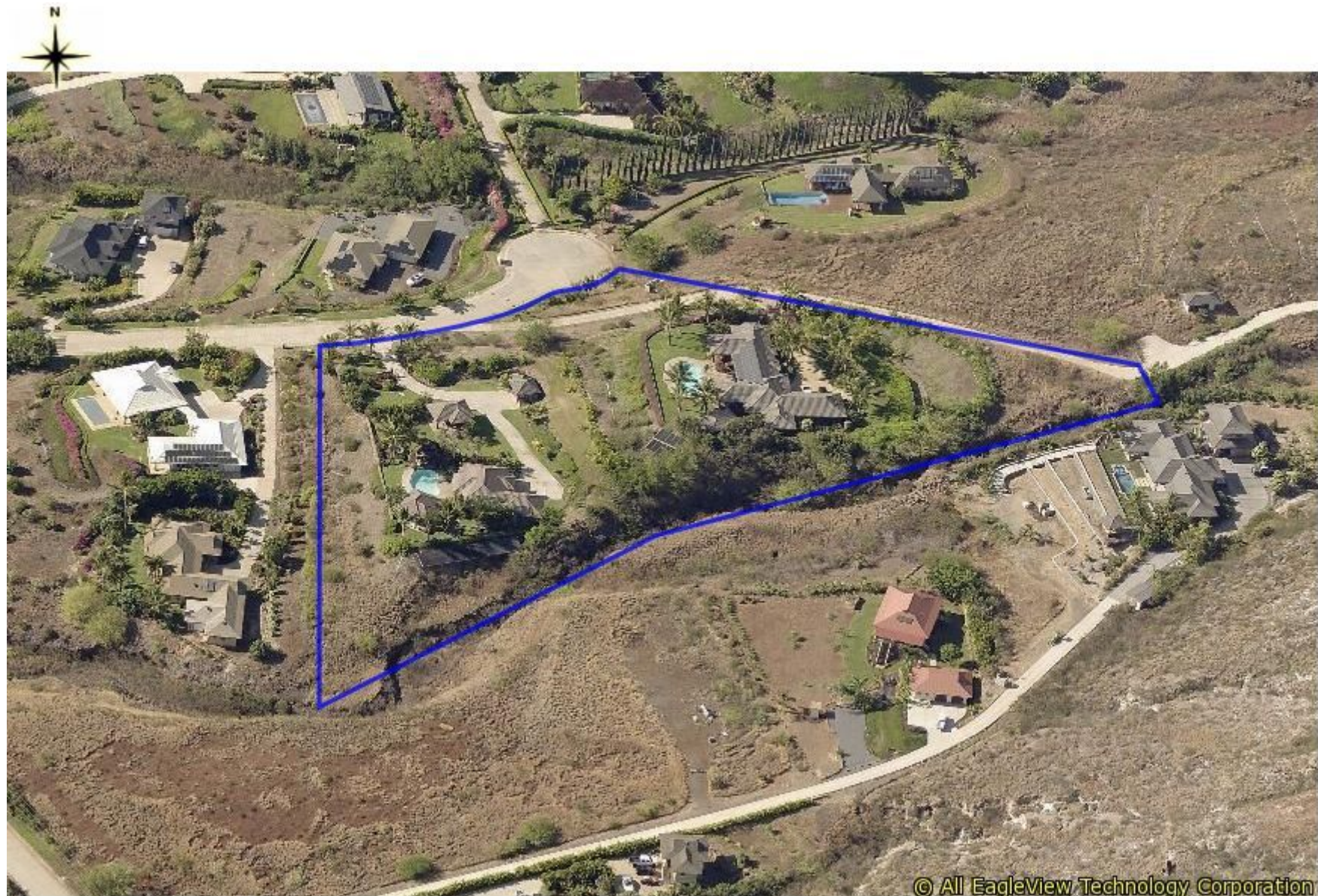


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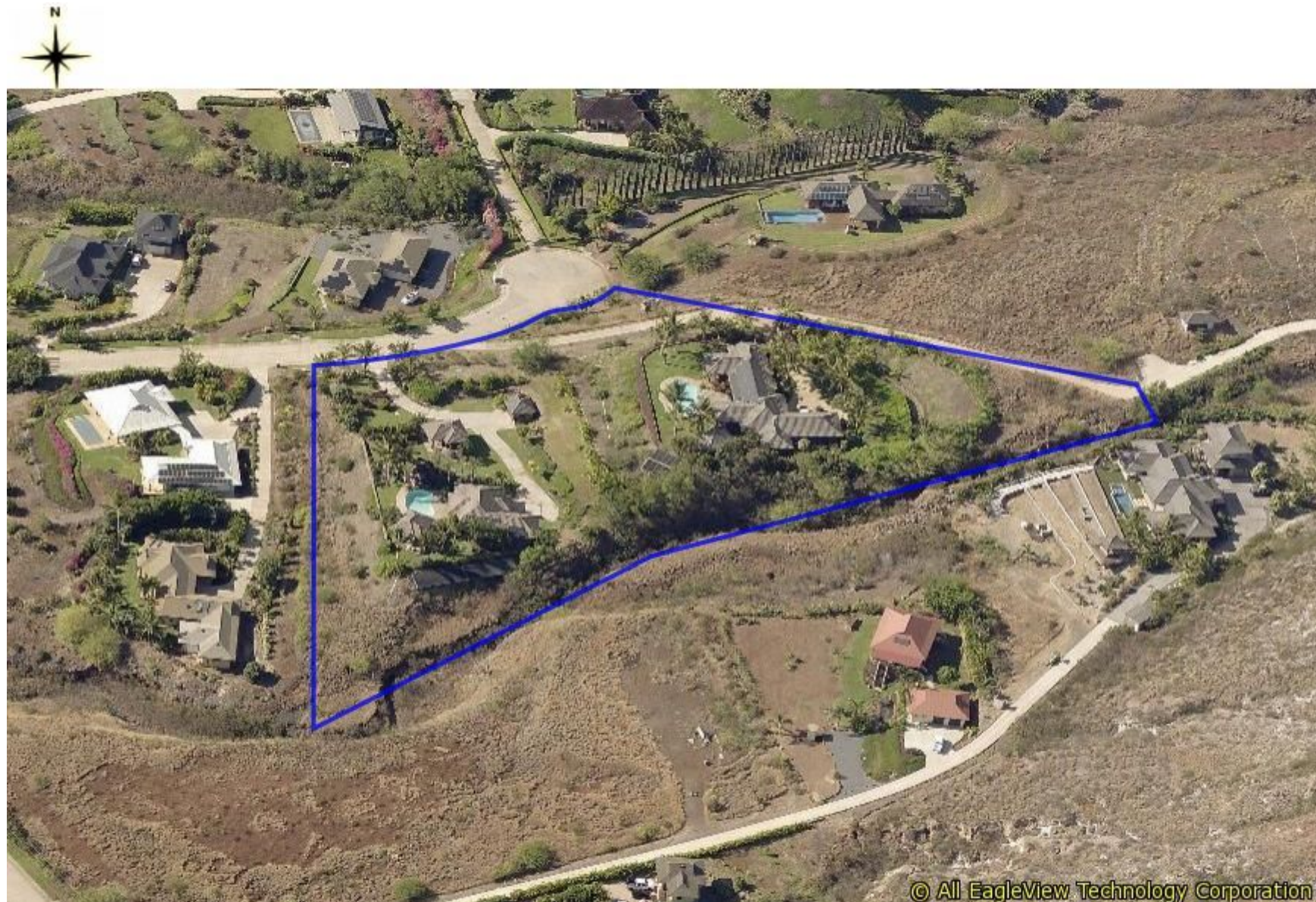


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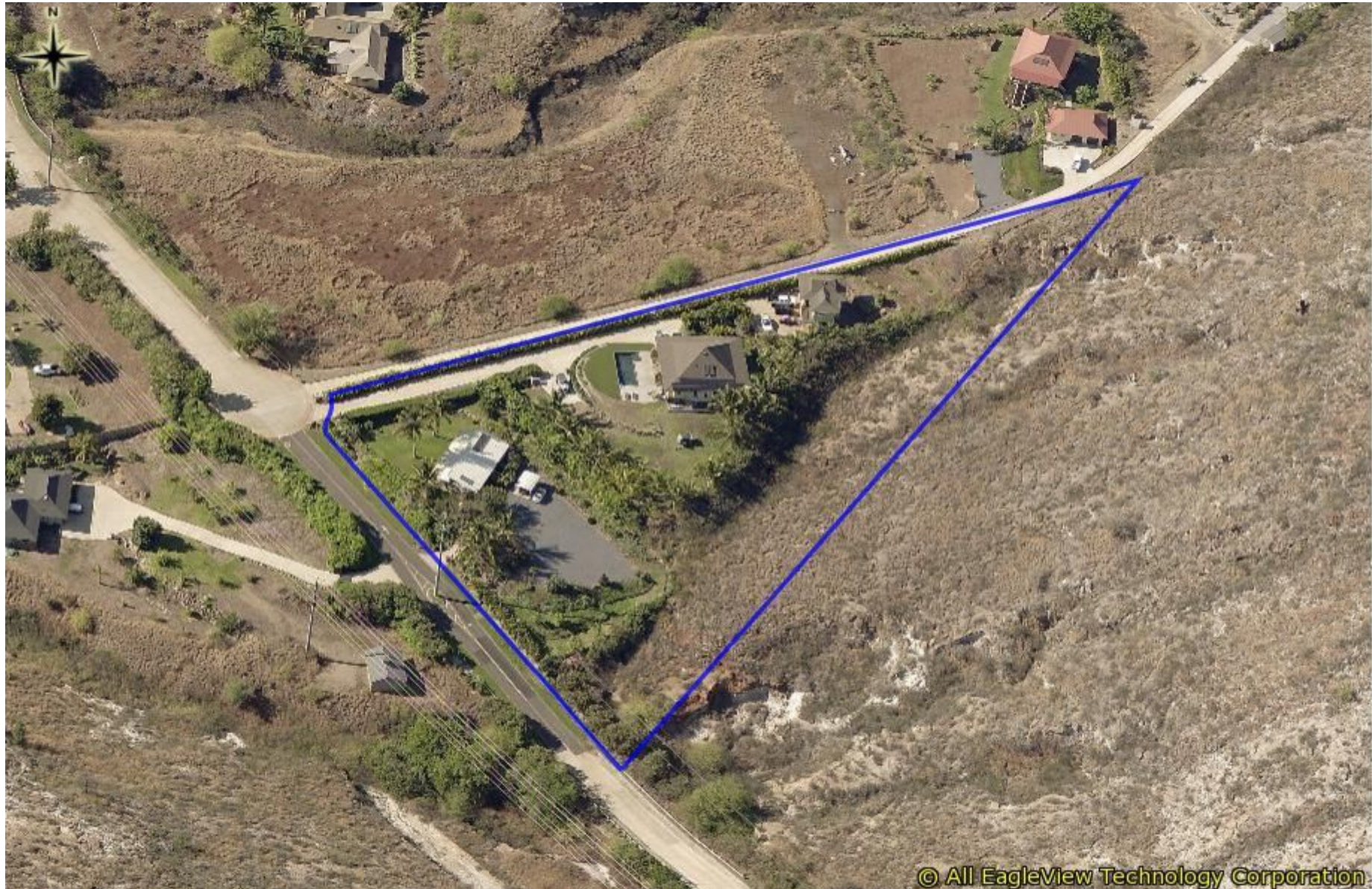
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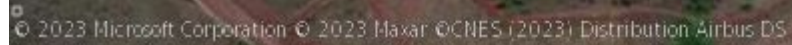




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**EXHIBIT 2****LAUNIUPOKO WATER COMPANY, INC.****SUPPLY DEMAND**

<b>LAUNIUPOKO WATER COMPANY</b>							
<b>MONTHLY WATER SUMMARY</b>							
<b>READ DATES</b>	<b>Total Monthly Pumpage</b>	<b>Average Pumped Per day</b>	<b>TOTAL CUSTOMER USAGE</b>	<b>Average usage per day</b>	<b>Average usage per connection</b>	<b>Avg. Gross Loss Incl. Storage</b>	<b>Gross Loss % of Pumped</b>
9/1/2021	15,787,000	509,258	14,530,946	468,740	1,250	40,518	8%
10/1/2021	18,340,000	611,333	16,531,607	551,054	1,469	60,280	10%
11/1/2021	16,374,000	528,194	14,636,185	472,135	1,259	56,059	11%
12/1/2021	19,099,000	636,633	16,709,508	556,984	1,485	79,650	13%
12/31/2021	12,431,000	401,000	10,789,894	348,061	928	52,939	13%
2/1/2022	11,136,000	359,226	9,805,874	316,319	844	42,907	12%
3/1/2022	15,517,000	589,893	14,258,678	509,239	1,358	80,655	14%
4/1/2022	23,482,000	725,226	19,500,937	629,062	1,677	96,164	13%
5/2/2022	23,586,000	786,200	19,971,113	665,704	1,775	120,496	15%
6/1/2022	19,718,000	636,065	17,947,597	578,955	1,544	57,110	9%
7/1/2022	29,730,000	991,000	26,725,016	890,834	2,376	100,166	10%
8/1/2022	26,947,000	869,258	22,309,067	719,647	1,919	149,611	17%
<b>TOTAL</b>	<b>232,147,000</b>	<b>636,019</b>	<b>203,716,422</b>	<b>558,127</b>	<b>1,488</b>	<b>77,892</b>	<b>12%</b>





## MEMORANDUM

**To:** M. Kaleo Manuel, Deputy Director  
Commission on Water Resource Management

**Fr:** Trisha Kehaulani Watson, J.D., Ph.D.  
Honua Consulting, LLC

**Re:** *Ka Pa'akai* Analysis Memo  
Launiupoko Water Co. GWUPA  
TMKs: [2] 4-7-001:026, -038, and -053

**Date:** September 26, 2022

---

### Executive Summary

Launiupoko Water Company, Inc. has applied to the State of Hawaii Department of Land and Natural Resources Commission on Water Resource Management (CMRW) for Ground Water Use Permit for Existing Use (GWUPA) in Launiupoko. The application is for the existing use of three wells in Launiupoko. This *Ka Pa'akai* analysis was completed by Honua Consulting, LLC for consideration by CWRM.

A full *Ka Pa'akai* analysis was completed. There were no cultural resources (archaeological resources) identified in the project area. There were also no traditional or customary practices identified within the boundaries project area, although practitioners identified practices in the surrounding area. Best management practices should be implemented to ensure that no unanticipated affects to cultural resources occur and that there is a mechanism in place for practitioners to report any such potential occurrences to the project.

The applicant may want to consider a cursory archaeological field investigation of the project area prior to the start of construction to identify any potential surface cultural resources and also consider environmental monitoring of the nearshore marine system to ensure that the action does not impact the coastal environment's nutrient budget.





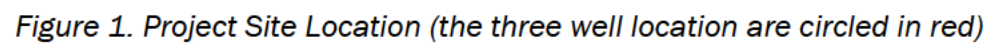
### **Proposed Action**

Launiupoko Irrigation Company, Inc. has applied to the State of Hawaii Department of Land and Natural Resources Commission on Water Resource Management (CMRW) for Ground Water Use Permit for Existing Use (GWUPA) in Launiupoko. The application is for the existing use of three wells in Launiupoko.

- Well Number 6-5138-001 “Launiupoko 1” TMK [2] 4-7-001:026
- Well Number 6-5137-01 “Launiupoko 2” TMK [2] 4-7-001:038
- Well Number 6-5238-01 “Launiupoko 3” TMK [2] 4-7-001:053

Research and ethnographic data were aggregated the necessary information to complete this *Ka Pa‘akai* analysis.







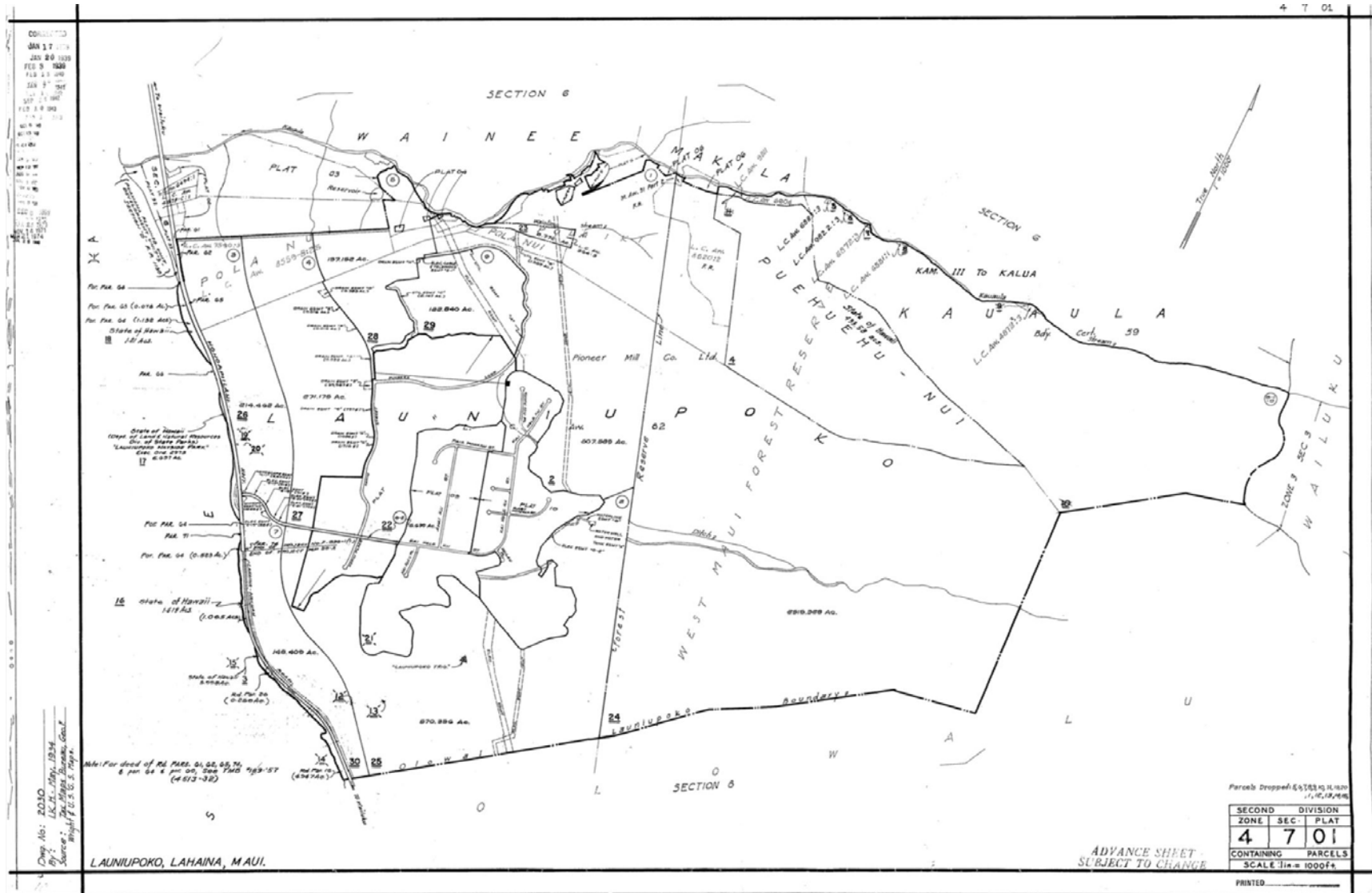


Figure 2. TMK of the project area





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Figure 4. Well Launiupoko 1 and Tank



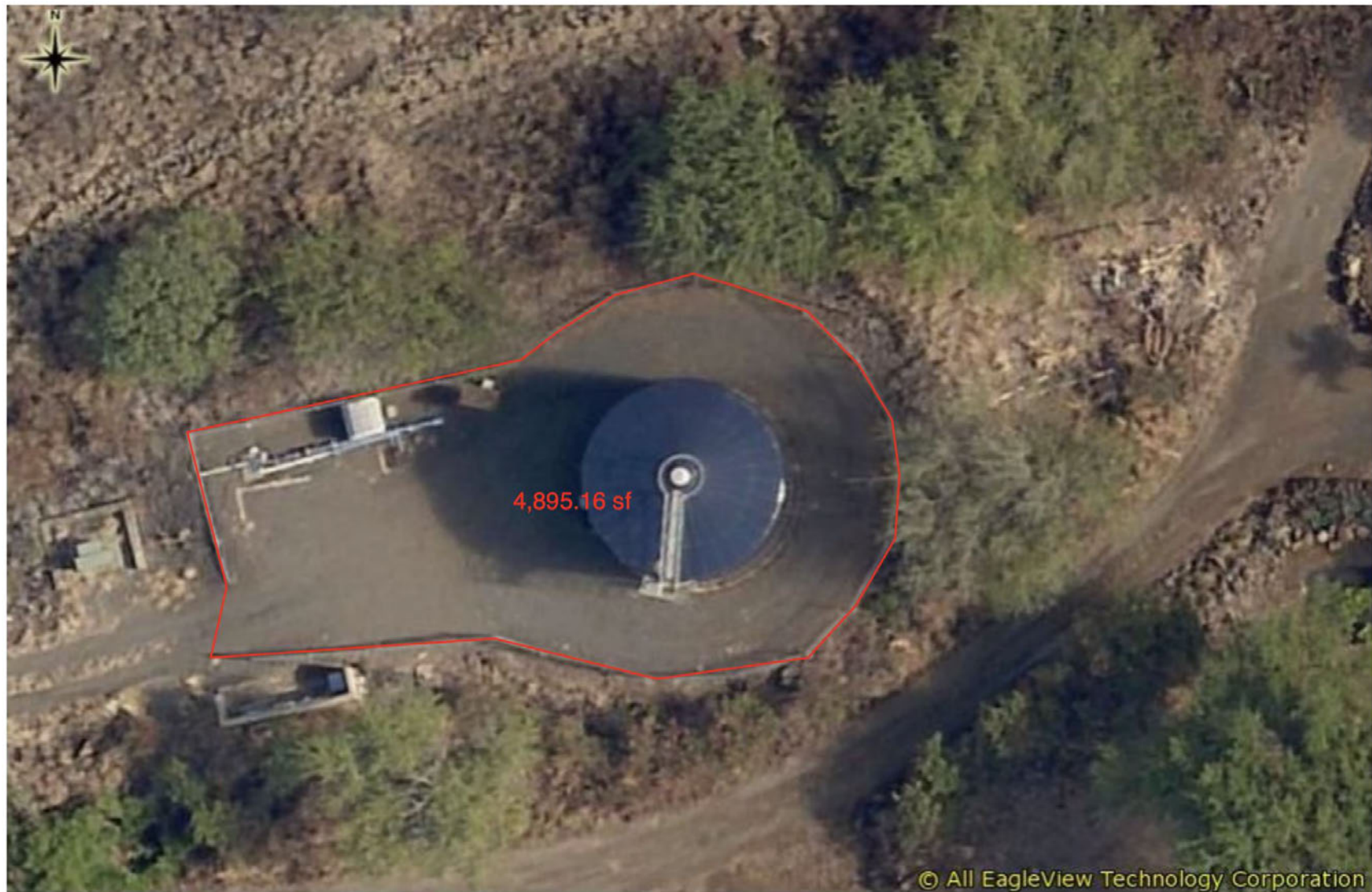


Figure 5. Well Launiupoko 2 and Tank





*Figure 6. Well Launiupoko 3 and Tank*





## Background and Compliance Standards

The State and its agencies have an obligation to preserve and protect Native Hawaiians' customarily and traditionally exercised rights to the extent feasible.<sup>1</sup> State law further recognizes that the cultural landscapes provide living and valuable cultural resources where Native Hawaiians have and continue to exercise traditional and customary practices, including hunting, fishing, gathering, and religious practices. In *Ka Pa'akai*, the Hawai'i Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through:

- 1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;
- 2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
- 3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

The appropriate information concerning Launiupoko ahupua'a was collected, focusing on areas near or adjacent to the project area.

## Background Research

Honua Consulting, as part of its standard methodology, identifies wai (fresh water) sources within a project area and in the surrounding geographic extent and treats these resources as "cultural resources" under *Ka Pa'akai*. Honua also identifies and consults on potential impacts a project will have on cultural practices that utilize or are otherwise associated with wai.

Fresh water (wai) is of tremendous significance to Native Hawaiians. It is closely associated with a variety of Hawaiian gods. According to traditional accounts, Kāne and Kanaloa were the "water finders:" "Ka-ne and Kanaloa were the water-finders, opening springs and pools over all the islands, each pool known now as Ka-Wai-a-ke-Akua (The water provided by a god)" (Westervelt 1915: 38). Kāne is widely known to be closely associated with all forms of water, as outlined in the mele "He Mele No Kane."

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<sup>1</sup> Article XII, Section 7 of the Hawai'i State Constitution, *Ka Pa'akai O Ka 'Āina v. Land Use Commission*, 94 Haw. 31 [2000](*Ka Pa'akai*), Act 50 HSL 2000.





There was no element more important or precious than water. There was no god more powerful than Kāne. Pua Kanahale recounts the oli “‘O Kāne, ‘o wai ia alī‘i o Hawai‘i?” and notes of the oli: “The chant begins with Kāne and focuses on this deity as the connective force of all the po‘e akua, or god family. All the entities mentioned in each paukū, or verse, are a manifestation of Kāne” (2011: 24). The association between water and Kāne is logical considering certain interpretations of Hawaiian mythology identify Kāne as the most powerful of all the Hawaiian gods.

Further investigation into the relationship between Kāne and Pele would be appropriate and helpful. Some interpretations identify Kāne as Pele’s father (Westervelt 1915). A full analysis of the different perspectives on Pele and Kāne would be helpful to refining an approach in developing community education programs for geothermal energy and culture. A brief analysis is provided below.

He Mele No Kane asks:

E ui aku ana au ia oe,  
Aia i hea ka Wai a Kane?  
Aia i lalo, i ka honua, i ka Wai hu,  
I ka wai kau a Kane me Kanaloa-  
He waipuna, he wai e inu,  
He wai e mana, he wai e ola,  
E ola no, ea!

One question I ask of you:  
Where flows the water of Kane?  
Deep in the ground, in the gushing spring,  
In the ducts of Kane and Kanaloa,  
A well spring of water, to quaff,  
A water of magic power- The water of life!  
Life! O give us this life!

This mele and other mo’olelo are clear: Kāne is water. It is deeply valued among the Hawaiian people. The only exceptions may be mist, known to be associated with Lilinoa, and snow, associated with Poliahu. There is an extensive body of traditional knowledge about the expeditions of Kāne and Kanaloa during which Kāne drove his ‘ō‘ō (digging stick) into the earth in search of water.

There is heightened sensitivity regarding water on Maui, where the project is located. Contemporaneous protections around water as a “public trust resource” extend back to the Kingdom, where the concept of owning water contradicted Hawaiian cultural values and traditions. Under the monarchy, control of water was reserved for use by the people who lived on and worked the land. The use of surface water was strictly controlled through the kapu system to ensure that all land tenants enjoyed an abundant availability of water. Farming, particularly kalo or taro, occurred regularly, especially in places with notably fertile lands like those found in the watersheds of Maui. As early as 1839, the public use of water was codified by Kamehameha III. His “Respecting Water for Irrigation” law stated: “In all places which are watered by irrigation, those farms which have not formally received a division



of water, shall, when this new regulation respecting lands is circulated, be supplied in accordance with this law, the design of which is to correct in full all those abuses which men have introduced. All those farms which were formally denied a division of water, shall receive their equal proportion. Those bounties which God has provided for the several places should be equally distributed, in order that there may be an equal distribution of happiness among all those who labor in those places” (Cited in *Reppun v. Board of Water Supply*, 656 P.2d 57 1982). This public right eventually found its way into existing law, where the Hawaii Water Code continues to recognize and protect traditional farming and mahi ‘ai (farmers).

It is critical for this *Ka Pa‘akai* analysis to consider impacts to cultural practices, even when the practices may take place outside the project area if project activities within the project area have the potential to impact traditional practices and customs. In this particular case, it is appropriate to carefully consider the impact water usage may have on farmers and other practitioners within the watershed(s) from which the water for this project will be drawn. Even though this project area is near the shoreline, if the water usage potentially results in an allocation of water that diverts those resources from cultural and/or traditional uses, that potential impact should be considered. Based on the information provided by the client, there is no evidence that water usage of this well will impact traditional or customary practices. It should be noted though practitioners contacted for this analysis expressed concern about potential impacts to water availability for farming mauka (uplands) of the project area. This is further discussed in the “Ethnographic Data” section of this memo.

In addition to the analysis of water provided above, a listing of place names as provided in the newly released book *‘Oahu‘ohu nā Mauna o ‘E‘eka* is provided below comprehensively. The book, published in late September 2022, was commissioned by the North Beach-West Maui Benefit Fund Inc. and developed by a cultural scholar in consultation with kūpuna and area descendants and represents a comprehensive listing of valued places in West Maui. In his foreword, attorney Lance D. Collins writes of the community’s collaborative efforts in the development and publication of this text, stating: “The HK West Maui Community Fund expresses its profound gratitude to the North Beach-West Maui Benefit Fund for agreeing to publish this important work for a general, public audience. Both organizations hope this project will continue to deepen interested in the study and understanding of West Maui and its peoples as well as the collecting of traditional place-names throughout Hawai‘i.” As the assemblage of place names below was collected by the community, it is surely a comprehensive and contemporaneous collection of community and cultural knowledge.

*Table 1. Listing of all place names for Launiupoko provided in ‘Oahu‘ohu nā Mauna o ‘E‘eka (2022)*

Name	Meaning and Description
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<b>Auau</b>	<p>‘Au‘au</p> <p>Literally, to bathe.</p> <p>Channel between Maui and Lāna‘i</p>
<b>Awalua</b>	<p>Awa-lua</p> <p>Literally, double harbor.</p> <p>Shoreline region in the ahupua‘a of Launiupoko.</p>
<b>Hau</b>	See Kai o Hau
<b>Hawaii Route 30</b>	See Honoapiilani Highway.
<b>Helu</b>	<p>“Lit. Scrath or count.” /PNOH/</p> <p>Peak (4,685 feet) between the valleys of Kaua‘ula and Launiupoko, moku of Lahaina.</p>
<b>Hipa</b>	See Pu‘u Hipa.
<b>Honoapiilani Highway</b>	<p>Honoapi‘ilani</p> <p>Hono-a-Pi‘ilani</p> <p>Literally, Bay(s) of Pi‘ilani.</p> <p>Hawai‘i Route 30, which extends south from the town of Wailuku [Wailuku] toward Mā‘alaea, turns west into the moku of Lahaina, and continues north through to the moku of Kā‘anapali, terminating in the ahupua‘a of Honokōhau.</p>
<b>Hono o na Moku</b>	<p>Hono o nā Moku</p> <p>Literally, Bay of Islands.</p> <p>A poetic name for the seas found between the islands of Maui, Lāna‘i, and Moloka‘i.</p> <p>Variant: Hawaii Route 30</p>
<b>Kapuali</b>	<p>Kapū‘ali</p> <p>Ka-pūali</p>



	<p>Literally, the pu‘ali (‘pū‘ali. 1. N. Warrior, soldier, so called because Hawaiians fighters tied (pū‘ali) their malos at the waist so that no flap would dangle for a foe to seize; army, host, multitude... 2. Nvt. To gird tightly about the waist, as of malo-clad warriors, or as corseted women; compressed, constricted in the middle; grooved, notched; irregularly shaped, as taro; notch; tight belt ... 6. N. Irregularly shaped raine. 7. N. Vague term for an adopted man or boy who had no servants.” /HD/)</p> <p>Shoreline area between Kūlanaokala‘i and Nālimawai in the ahupua‘a of Launiupoko.</p>
<b>Keahuiki</b>	<p>Ke-ahu-iki</p> <p>Literally, the small altar/cairn.</p> <p>Point in the ahupua‘a of Launiupoko.</p>
<b>Kulanaokalai</b>	<p>Kūlanaokala‘i Kūlana-o-ka-la‘i</p> <p>Literally, site of serenity.</p> <p>Shoreline area in the ahupua‘a of Launiupoko.</p>
<b>Lahaina</b>	<p>Pronunciation and meaning underdetermined, perhaps: “lahaina n. 1. A variety of sugar cane, usually free tasseling, heavy stooling, and with rather semi erect to recumbent growth; large, long heavy tops...2. A variety of sweet potato...3. Poising; leaping.” /HD/; or, lā hainā—merciless sun.</p> <p>The name of one of three moku of Maui Komohana. Lahaina is also the name of the kalana found in the moku of Lahaina. From</p>



	<p>1820 to 1845, Lahaina was the capital of the Hawaiian Kingdom.</p> <p>Although scholars provide evidence that an older pronunciation for Lahaina was “Lāhainā,” most modern-day scholars choose the spelling that reflects modern-day pronunciation, “Lahaina.” Even in the vast majority of her works, native Hawaiian speaker and renowned scholar Mary Kawena Pukui chose to represent this place name without diacritical markings, as have other contemporary scholars. This is likewise reflected in the pronunciations of residents, kūpuna, and in recordings of mānaleo. “...ua waiho kapalua wale iho no o Lahaina I ka lai, ma Kona hoopuni ia ana e na mokupuni, nolaila man kekahi inoa ona, oia hoi na Honoapiilani, a me he mea la, ekolu inoa o kea kulanakauhale, he oiaio no, ekolu wale inoa, o Lele Kona inoa kahiko, o Lahaina, he inoa you ia, a o na Honoapiilani, he inoa mum no ia. [...Lahaina in the calm is bordered on two sides as it is surrounded by the islands; that’s where on of its names comes from Nāhonoapi’ilani, and it’s as if this town has three names, it’s true, only three names; Lele is its ancient name, Lahaina is a new name, and Nāhonopi’ilani is a former name.]” /Ke Au Okoa, Buke 7, Helu 28, 26 ‘Okakopa 1871/</p> <p>Variants: Lāhainā, Lāhaina, Raheina</p>
<b>Launiupoko</b>	<p>Literally, short-fronded coconut (trees).</p> <p>Ahupua’a, valley, and stream in the moku of Lahaina. The valley is found beneath the peaks of Ke’eke’ehia on the north and Līhau on the south.</p>



	Variant: Olaniupoko
<b>Liha</b>	<p>Meaning underdetermined, perhaps: “liha. 1. n. Nit, louse egg. Also lia. 2. Same as liliha; dreaded, fearful.” /HD/</p> <p>Peark below Lihau, found between the valleys of Launiupoko and Olowalu.</p>
<b>Lihau</b>	<p>“Ī.hau. 1. nvi. Gentle cool rain that was considered lucky for fishermen (Ul. 241); moist and fresh, as plants in the dew or rain; cool, fresh, as dew-laden air ... 2. N. A variety of sweet potato (no data).” /HD/</p> <p>Storied mountain and peak (4,193 feet) between the valleys of Launiupoko and Olowalu.</p> <p>“Ma ia po no ua hala aku la ua kamaeu nei mauka, a ua hele pololei aku oia a hiki i ka hale o na makua pono i o Lihau e noho mai ana me na manao o ka pihoihoi no keia owela o ke ahi ma ke kai a ia Mekanikeoe i hiki aku ai malaila ua loli ae la kona mau helehelena e like me ka nui nohea oia aina Lihau a oia ka kona makuakane Puukilea i pane ae ai i kana wahine Punahoa Auhea oe e kuu wahine? [That night this mischievous one disappeared inland, and he went directly to the house of Lihau’s own parents, who were sitting there wondering about the flow of fire upon the ocean. As Mekanikeoe arrived, his features changed to match that of the youthful beauty of the land, Lihau, and that is how her father Pu’ukilea responded to his wife Punahoa. Say, my wife?]” /Ka Leo o ka Lahui, Buke 2, Helu 942, 16 Mei 1894/</p> <p>“He wahine ui io maoli no keia. Aohe lua e loaa ai kona ui ma Maui a puni, koe wale o</p>



	<p>Waialohiikalauakolea, ke aliwahine i hanaiia iluna o ka piko o ke kuahiwi o Haleakala. O keiki kaikamahine hoi o Lihau, oia ke kaikamahine a Pa'upa'u ame Aalaloloa, he mau alii nui no na kuahiwi o Maui komohana; a he mau kupua nohoi laua me kekahi keiki keia na Kalikoluamea (k) ame Kupulanakehau (w). A mamuli o Lihau ula ke koahanau o Wakea i heaia ai keiki kaikamahine o Lihau. [This was truly an exceedingly beautiful woman. Her beauty was unmatched around Maui, except for that of Wai'alohiikalau"ākōlea, the princess who was raised upon the peak of the mountain of Haleakalā. As for this girl Pīhau, she was the daughter of Pa'upa'u and 'A'alaloloa, chiefs of the mountains of Maui Komohana; and these two were also demigods of sorts. And they were all family from within the line of Līhau'ula, a sibling of Wāke. They were children of Kahikoluamea (m) and Kupulanakēhau (f). It was after Līhau'ula, the sibling of Wākea, that this girl was called Līhau.]” / <i>Ka Na'i Aupuni</i>, Buke 3, Helu 115, 10 Iune 1907/</p> <p>Variant: Lihauwaiekeekeikalani</p>
<b>Lihauawaiekeekeikalani</b>	<p>Literally, Līhau of the waters that recede into the heavens.</p> <p>A name for Līhau, the moutain and peak (4,193 feet) between the valleys of Launiupoko and Olowalu. See <i>also</i>: Līhau.</p> <p>Regarding Lahaina: “Kona Maui Hiohiona: Ua paku ia mai oia e ka lalani mauna o Lihaukaiekeekeikalani, ka maina nona na lehua kaulana e lei ia'i e na kamalii o kakou iloko o kona mau la, a i piiuniia mai hoi e na mokupuni eha.... [Its attributes: It is</p>



	<p>partitioned by the mountain line of Līhauwai‘eke‘ekeikalani, the mountain to which belongs the famed lehua worn as garlands by our children during its days, and surrounded by the four islands....]” / <i>Ke Au Okoa</i>, Buke 7, Helu 28, 26 ‘Okakopa 1871/</p>
<b>Luakoi</b>	<p>Luako‘i Lua-ko‘i</p> <p>Literally, adze quarry/pit.</p> <p>Ridge and peak (3,000 feet) between the valleys of Launiupoko or Kaua‘ula.</p>
<b>Mahanaluanui</b>	<p>Pu‘u Māhanaluanui Pu‘u Māhana-lua-nui</p> <p>“Lit. Large twin hills.” /PNOH/</p> <p>Large hill (129 feet) in the ahupua‘a of PLauniupoko, aloha known as “Launiupoko Hill.”</p> <p>Variant: Launiupoko Hill.</p>
<b>Nalimawai</b>	<p>Nālimawai Nā-lima-wai</p> <p>“Lit., the five waters.” /PNOH/</p> <p>Shoreline area and bay between Kapū‘ali and Launiupoko point in the ahupua‘a of Launiupoko.</p> <p>Variant: Nalima Wai</p>
<b>Olauniupoko</b>	See Launiupoko
<b>Onehali</b>	<p>One-hali</p> <p>Literally, carried sand.</p> <p>Area mentioned in mele in the context of the ahupua‘a of Launiupoko.</p>



	<p>“Kuu makuakane mai ke one loa la e Onehali, / Mai ka la hoao kunono la e Kulanaokalani, / E makahehi ana i na lehua o Lihau.... [ My father from the long beach of Onehali, / From the bright scorching sun of Kūlanaokala“i, / Admiring the lehua of Līhau... ]” / <i>Ka Nupepa Kuokoa</i>, Buke 3, Helu 22, 28 Mei 1864/</p>
<b>Pahee</b>	<p>“pahe’e 1. Vi. Slippery, smmoth, as a surface; soft, satiny; to slide, slip, skid; sliding, slipping ... 2. N. Cleared area, bare dirt. 3. N. Spear throwing 4. N. Shallow hole or grave as for flexed burial. 5. Same as pāhe’ehe’e, seaweed.” /HD/</p> <p>Fishing area in the ahupua’a of Launiupoko.</p>
<b>Pioneer Mill Company</b>	<p>Historic sugar mill in the town of Lahaina, moku of Lahaina.</p>
<b>Puhiama</b>	<p>Puhi’a’ama Puhi-‘a’ama</p> <p>Meaning undetermined, perhaps: puhi’a’ama – to blow bits of ‘a’ama crab (as chum) to bake ‘a’ama crab, or, to bake an “‘a’ama” variety of eel.</p> <p>Shoreline fishing shrine in the ahupua’a of Launiupoko.</p> <p>“...oiai e lawai’a ana makou i kahi ahiahi ma Puhiaama he Ko-a mamali Oio ia, ke ike ala oe e Mr. Lunahooponopono, he wahi Ko-a lawai’a ia mawaho o kela lae aa o Launiupo [sic], mahope mai o kahi puali o Kahea, kahi no au e holoholo mau ai i ke a’o kula olelo Baritania [sic] i ko Olowalu kamalii.... [... while we were fishing one evening at Puhi’a’ama, it is a fishing ground for young ‘ō’io, you know it, Mr. Editor; it is a fishing</p>



	<p>Shrine beyond that rough point of Launiupoko, after a certain ravine called Kāhea, the place where you would always travel to teach Olowalu's children at the English language school....]" /<i>Ka Nupepa Kuokoa</i>, Buke 40, Helu 18, 2 Mei 1902/</p>
<b>Puu Hipa</b>	<p>Pu'u Hipa</p> <p>Literally, Hipa hill: "Hila is said to have been a mythological character." /PNOH/ Perhaps related to: Hipakāne – Aries.</p> <p>Prominent hill (1,002 feet) i the ahupua'a of Launiupoko, found above Pu'u Māhanaluanui.</p> <p>Variant: Puuhipa</p>
<b>Puu Papai</b>	<p>Pu'u Papa'i / Pu'u Pāpa'i</p> <p>Pronunciation and meaning undetermined, perhaps: pu'u papa'i – temporary hut hill; or pu'u pāpa'i – pāpa'i crab hill.</p> <p>An 'auwai and area in the valley of Kaua'ula, kalana of Lahaina. Aloha, a point along the boundary between the ahupua'a of Launiupoko and the ahupua'a of Polanui in the kalana of Lahaina.</p> <p>"Course I of the Launiupoko / Polanui boundary runs 'along boundary line between this land and Polanui to stake Puupapai...' Elevation about 485 ft." / Place Names (ULUK)/</p> <p>Variant: Puupapai</p>

In addition to the above listed place names, historic resources identify cultural practices that occurred in Launiupoko. The primary practices identified in Launiupoko were fishing, specifically nehu fishing, shark fishing, and fishing at Puhiaama (spelled Puhiaama in 'Ohu'ohu





*nā Mauna o 'E'eka*). Additional, war practices were known to occur in this ahupua'a. "Ka Moololo o Piilani" printed in the February 23, 1884, Nupepa Kuokoa provides an account in Hawaiian about fighting practices that occurred in Launiupoko.





Figure 7. Original image of Nupepa Kuukua from Feberuari 23, 1884





## **Ethnographic Data**

Individuals with lineal and cultural ties were invited to be interviewed. Two cultural descendants were interviewed regarding this project.

A summary of each interview was sent first to the individual interviewed for review. Upon approval from the interviewee. Consent to participate in the assessment is obtained from each individual. Consent is obtained verbally or in writing and kept on file with Honua Consulting.

Descendants have been reluctant to participate in interviews, but during informal discussions, area residents express concern about the landowner. They also unofficially noted that cultural practices occur in the Launiupoko ahupua'a, specifically farming, but declined to participate in an official capacity. It is unfortunate that they declined to be interviewed, but these claims are inconsistent with text from Native Planters of Old Hawaii which stated of Launiupoko, "Although there is a sizable stream bed and deep valley here, there is no visible evidence of wet taro cultivation, and the Hawaiian planters at Olowalu say that lo'i never existed in Launiupoko. It is possible that there may have been a few terraces on the level land at the base of the valley, but this is wholly arid land now and covered with dense brush" (Handy, Handy, and Pukui, 103). Considering this text, it would have been extremely helpful for this memo to have had additional, formal comments from these area practitioners.

The interviewee who did participate provided important information about the project area and larger geographic extent. This information was followed up on with extensive research and incorporated throughout the body of the assessment.

## **Interview with Elmer Ka'ai**

**Interviewer:** Trisha Kehaulani Watson

**Interviewee:** Elmer Ka'ai

**Date:** 6/01/2023

**Location:** In person

## **Biography**

Mr. Ka'ai is a government and community affairs director. He was born and raised in Honolulu, where he currently lives today.

## **General Discussion**

Mr. Ka'ai is associated with the project area through genealogy and cultural descent. He noted that the area, due to its geographic qualities, was targeted previously to be developed. The





current development, from a Native Hawaiian perspective, is an eye-sore since there aren't many Native Hawaiians who live there.

### **Cultural Resources**

Mr. Ka'ai said that there were cultural resources in the area before the current development. He said that there were previously lo'i in the area as well as residences, but he doesn't believe they were as extensive as they were in other places.

### **Traditions and Customs**

Mr. Ka'ai notes that he knows some families farm in the area. He is not sure how many. He believes those farming areas are cultural resources, especially because many of the farmers are long descendants of the area.

### **Impacts**

Mr. Ka'ai did not know what impacts the project could cause on cultural resources, but he believes there could be some. Any construction activity has the potential to impact archaeological resources or burials that may be in the area. Mr. Ka'ai knows that due to West Maui's extensive use by Hawaiians, there are iwi across West Maui, particularly in areas that were heavily inhabited, like coastal areas and agricultural areas.

### **Mitigation Measures and Recommendations**

Mr. Ka'ai could not provide any mitigation measures against potential impacts. Mr. Kaaai did recommend that cultural advisors be present during the project. This should include lineal descendants. Mr. Ka'ai has strong concerns about more development coming to the area. He expressed strong concern about the use of surface water for homes that do not appear to be for local families, but he had less concern over ground water use from wells. He also believes that should the project proceed, the Commission should put strong limits on the use of water for landscaping. He notes that other places (like Las Vegas) do not allow for landscaping and limit new housing to hardscaping or xeriscaping. He thinks it's inappropriate to have lush yards with foreign plants when there are ongoing water shortages and Hawaiians struggling to maintain lo'i that they need to feed their families with.



## Interview with Hinaleimoana Wong-Kalu

**Interviewer:** Trisha Kehaulani Watson

**Interviewee:** Hinaleimoana Wong-Kalu

**Date:** 6/01/2023

**Location:** In person

### Biography

Hinaleimoana Kwai Kong Wong-Kalu, known affectionately as “Kumu Hina”, is a Native Hawaiian māhū – a traditional third gender person who occupies "a place in the middle" between male and female, as well as a modern transgender woman. She is known for her work as a kumu hula, a filmmaker, and as a community leader in the field of Kanaka Maoli language and cultural preservation. She teaches Native Hawaiian philosophy and traditions while promoting cross-cultural alliances throughout the Pacific Islands. Described as a "powerful performer with a clear, strong voice", she has been hailed as a cultural icon, and is a prominent leader in our community today.

Kumu Hina was born in the Nu‘uanu district of O‘ahu, but she is a lineal descendant of West Maui. Her maternal side of the family lived in Honokohau. She is a lineal descendant to the Honokahua burial preserve, with ‘ohana buried there. Her family had a home in Napili – Honokōwai where she spent a lot of her time growing up.

She attended Kamehameha Schools and the University of Hawai‘i at Mānoa, where she began her activism journey. She is a founder of the Kulia Na Mamo transgender health project, a former Hawaiian language kumu at Leeward Community College, and candidate for the Office of Hawaiian Affairs, notably being one of the first transgender candidates for statewide political office in the United States. She also served as the Chair of the O‘ahu Island Burial Council and was cultural director of Hālau Lokahi Public Charter School. She is a recipient of the National Education Association Ellison Onizuka Human and Civil Rights Award, Native Hawaiian Community Educator of the year, and a White House Champion of Change. Recently, USA Today named Wong-Kalu one of ten Women of the Century from Hawai‘i. In 2020, Kumu Hina directed, produced and narrated *Kapaemahu*, an animated short film based on the Hawaiian story of four legendary māhū who brought the healing arts from Tahiti to Hawai‘i.

### Overview

Ms. Wong-Kalu has lineal ties to West Maui. She recounts how the water diversions in the area directly led to her family’s inability to farm their lo‘i. The result was an inability to use their land to sustain themselves and this forced them to from their subsistence lifestyle, which they had been practicing for generations.





### **General Discussion**

As a cultural and lineal descendent of West Maui and a highly regarded cultural practitioner, Ms. Wong-Kalu brings a critical perspective of how such diversion practices have long adversely affected Hawaiian families in West Maui and how its adversely effected traditional practices and ways of life.

### **Cultural Resources**

Ms. Wong-Kalu emphasized how all of West Maui is interconnected. From an ecological standpoint, it's one region with a series of overlapping resources. The water is a cultural resource, and a very important one. The food that comes from these lo'i feeds families. This food is a cultural resource too. As are the places, which have been used for generations, as sites of cultural practices.

### **Traditions and Customs**

Ms. Wong-Kalu notes that West Maui was an important, thriving community of kānaka. Each bay and valley had a thriving community where the 'ohana lived and flourished. While farming was among the most important practice, every practice associated with Hawaiian living occurred in West Maui.

### **Impacts**

These kānaka were largely forced out by development and the plantations. Then plantations became housing. She doesn't think the water should be diverted at all, because of the impacts it has on Hawaiians.

### **Mitigation Measures and Recommendations**

Ms. Wong-Kalu did not provide any mitigation measures for the action, she just strongly believes water should be left for the families that live on the land.





## Analysis

As previously noted in this memo, in *Ka Pa‘akai*, the Hawai‘i Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through the following three-part test:

- 1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;
- 2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
- 3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

*The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area.*

Through the research and ethnographic data collected for this analysis, cultural practices were identified in the surrounding geographic extent, with few were identified in the project area itself, specifically farming. There are numerous identified traditions or customs in the surrounding area, including fishing and traditional fighting practices.

*The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action.*

Of the identified cultural resources and traditional and customary practices that occur in the surrounding project area, the potential that the proposed action would affect or impair these resources is negligible.

*The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.*

As the potential for effect or impairment of cultural resources (including practices) is negligible as this is an existing use and the wells are already constructed. Nonetheless, best management practices should be implemented to ensure that no unanticipated affects to cultural resources occur and that there is a mechanism in place for practitioners to report any such potential occurrences to the project.







**LAUNIUPOKO WATER COMPANY INC.****WATER CONSERVATION POLICY**

Wise water use is essential to ensure there is enough water to serve everyone. All customers are strongly encouraged to adopt as many of the following water conservation measures as are applicable.

**1) Indoor Applications**

- (1) Replace all old, inefficient toilets, inefficient bathroom faucets, aerators and showerheads with WaterSense labeled models. WaterSense labeled products are 20 percent more water-efficient and perform as well as or better than standard models.
- (2) Giving a home's main bathroom a high-efficiency makeover by installing a WaterSense labeled toilet, showerhead, and faucet aerator can pay for itself in as little as 1 year.

**2) Outdoor Applications**

- (1) If you have a non-potable meter, use it for outdoor irrigation rather than potable water. It will make the most of what little surface water Mother Nature provides and will reduce ground water withdrawal from the aquifer.
- (2) Use drip irrigation for hedges, orchard plants and trees, vegetable and ornamental flower gardens.
- (3) Water lawns only at dawn or dusk to reduce evaporation and set timers to minimize sprinkler use.
- (4) Maintain your sprinkler system, replace broken heads, check for and repair leaks, adjust timers for rain. Replacing a clock-based controller with a WaterSense labeled irrigation controller can reduce an average home's irrigation water use by up to 30 percent and can save an average home up to 15,000 gallons of water annually.
- (5) Add mulch around shrubs and plants to help reduce evaporation. See article by Dominic Pastillo on our website for tips <https://westmauiwater.com/conservation> .
- (6) Wash your car at an automated car wash that recycles water or use a bucket instead of a hose.



- (7) Use a broom or blower instead of a hose to clean sidewalks, patios and driveways.
- (8) Design new landscaping for new dwellings or additions to favor drought tolerant design that minimizes lawn area and uses native and low water, drought resistant plants.

Please see the following websites for additional conservation measures

<https://westmauiwater.com/conservation>

<https://www.epa.gov/watersense/statistics-and-facts>

To report a water waste concern, please contact us at (808) 877-4202 or [utility@westmauiwater.com](mailto:utility@westmauiwater.com).



## AWWA Free Water Audit Software v5.0

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This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and target loss reduction levels.

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

**Please begin by providing the following information**

Name of Contact Person:

Email Address:

Telephone | Ext.:

Name of City / Utility:

City/Town/Municipality:

State / Province:

Country:

Year:  Calendar Year

Audit Preparation Date:

Volume Reporting Units:

PWSID / Other ID:

**The following guidance will help you complete the Audit**

All audit data are entered on the [Reporting Worksheet](#)

<input type="text"/>	Value can be entered by user
<input type="text"/>	Value calculated based on input data
<input type="text"/>	These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: ☐ 0.25% ☒ Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

<p><b><u>Instructions</u></b></p> <p>The current sheet. Enter contact information and basic audit details (year, units etc)</p>	<p><b><u>Reporting Worksheet</u></b></p> <p>Enter the required data on this worksheet to calculate the water balance and data grading</p>	<p><b><u>Comments</u></b></p> <p>Enter comments to explain how values were calculated or to document data sources</p>	<p><b><u>Performance Indicators</u></b></p> <p>Review the performance indicators to evaluate the results of the audit</p>	<p><b><u>Water Balance</u></b></p> <p>The values entered in the Reporting Worksheet are used to populate the Water Balance</p>	<p><b><u>Dashboard</u></b></p> <p>A graphical summary of the water balance and Non-Revenue Water components</p>
<p><b><u>Grading Matrix</u></b></p> <p>Presents the possible grading options for each input component of the audit</p>	<p><b><u>Service Connection Diagram</u></b></p> <p>Diagrams depicting possible customer service connection line configurations</p>	<p><b><u>Definitions</u></b></p> <p>Use this sheet to understand the terms used in the audit process</p>	<p><b><u>Loss Control Planning</u></b></p> <p>Use this sheet to interpret the results of the audit validity score and performance indicators</p>	<p><b><u>Example Audits</u></b></p> <p>Reporting Worksheet and Performance Indicators examples are shown for two validated audits</p>	<p><b><u>Acknowledgements</u></b></p> <p>Acknowledgements for the AWWA Free Water Audit Software v5.0</p>

If you have questions or comments regarding the software please contact us via email at: [wlc@awwa.org](mailto:wlc@awwa.org)







## AWWA Free Water Audit Software: System Attributes and Performance Indicators

WAS v5.0

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Water Audit Report for: **MAHANLUA NUI WATER SYSTEM (251)**

Reporting Year: **2022**    **1/2022 - 12/2022**

\*\*\* YOUR WATER AUDIT DATA VALIDITY SCORE IS: 68 out of 100 \*\*\*

### System Attributes:

Apparent Losses:	3.703	MG/Yr
+ Real Losses:	25.759	MG/Yr
= <b>Water Losses:</b>	<b>29.462</b>	<b>MG/Yr</b>

? Unavoidable Annual Real Losses (UARL): **See limits in definition** MG/Yr

Annual cost of Apparent Losses: **\$9,518**

Annual cost of Real Losses: **\$44,605**

Valued at **Variable Production Cost**

[Return to Reporting Worksheet to change this assumption](#)

### Performance Indicators:

Financial:

Non-revenue water as percent by volume of Water Supplied: **11.1%**

Non-revenue water as percent by cost of operating system: **8.0%**

Real Losses valued at Variable Production Cost

Operational Efficiency:

Apparent Losses per service connection per day: **27.06** gallons/connection/day

Real Losses per service connection per day: **N/A** gallons/connection/day

Real Losses per length of main per day\*: **4,833.66** gallons/mile/day

Real Losses per service connection per day per psi pressure: **N/A** gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): **25.76** million gallons/year

? Infrastructure Leakage Index (ILI) [CARL/UARL]:

\* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

AWWA Free Water Audit Software: User Comments	
Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.	
General Comment:	
<u>Volume from own sources:</u>	Consumption History Report 2/1/2022-12/31/2022 - Customer# Well, Location# Well 01, Well 02, Well 03
<u>Vol. from own sources: Master meter error adjustment:</u>	
<u>Water imported:</u>	
<u>Water imported: master meter error adjustment:</u>	
<u>Water exported:</u>	
<u>Water exported: master meter error adjustment:</u>	
<u>Billed metered:</u>	Consumption History Report 2/1/2022-12/31/2022 - Filtered by Service code: Potable Use & Rate code PW1
<u>Billed unmetered:</u>	
<u>Unbilled metered:</u>	
<u>Unbilled unmetered:</u>	Monthly total Coliform testing, annual hydrant maintenance, Fires, hit hydrants
<u>Unauthorized consumption:</u>	
<u>Customer metering inaccuracies:</u>	
<u>Systematic data handling errors:</u>	
<u>Length of mains:</u>	Measured by engineer
<u>Number of active AND inactive service connections:</u>	Consumption History Report P/E 12/31/2022 - Filtered by Service code: Potable Use & Rate code PW1 - sorted by Meter size
<u>Average length of customer service line:</u>	
<u>Average operating pressure:</u>	Average pressure from taken from various locations in the system
<u>Total annual cost of operating water system:</u>	P&L January through December 2022 - Total Operating Expenses
<u>Customer retail unit cost (applied to Apparent Losses):</u>	
<u>Variable production cost (applied to Real Losses):</u>	Production Expense report - chemicals & electricity(pumping) divided by Total System Input Volume



## AWWA Free Water Audit Software: Water Balance

WAS v5.0

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Water Audit Report for: **MAHANLUA NUI WATER SYSTEM (251)**

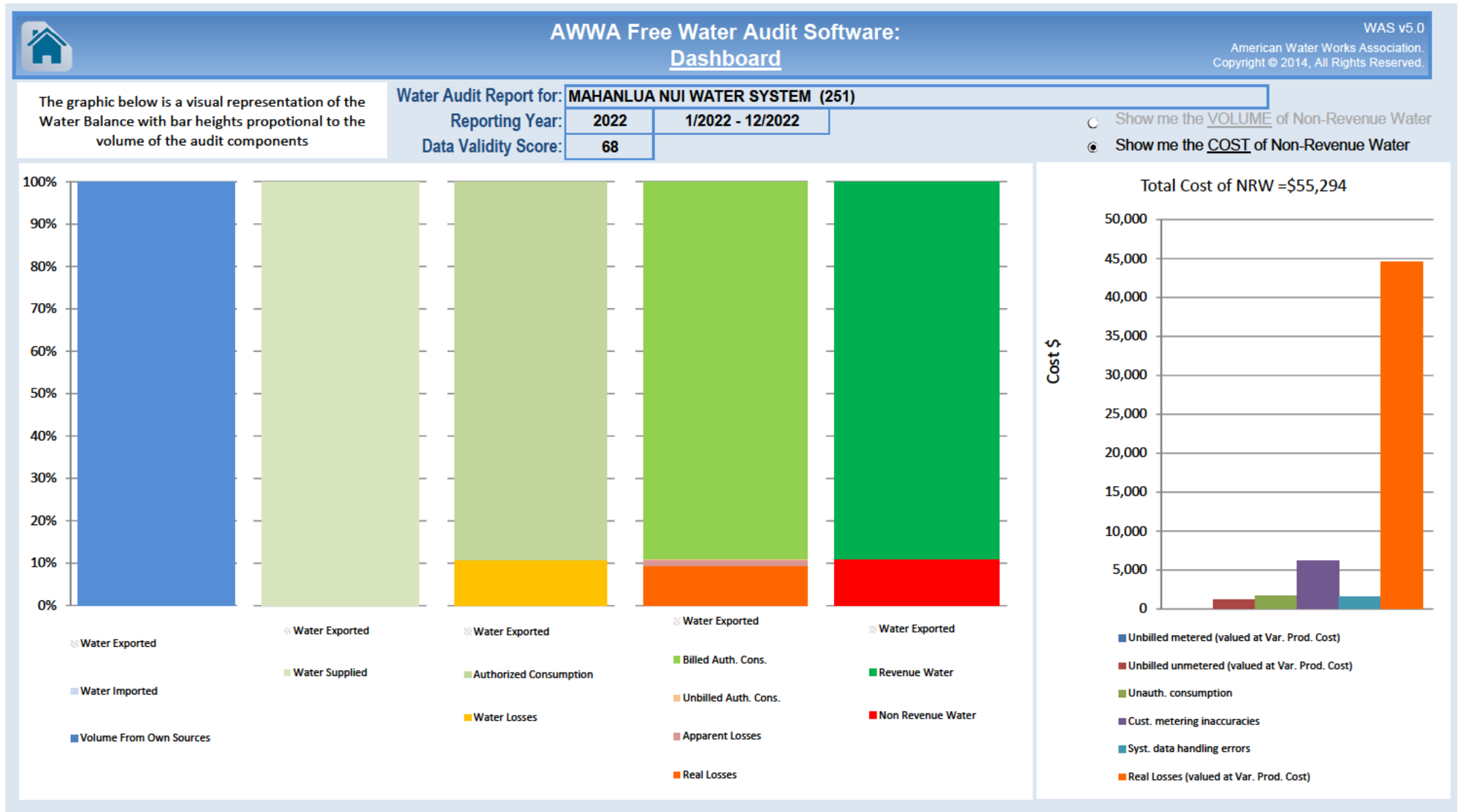
Reporting Year: **2022**

**1/2022 - 12/2022**

Data Validity Score: **68**

Own Sources (Adjusted for known errors)  270.394	System Input 270.394	Water Exported 0.000	Billed Water Exported				Revenue Water 0.000
		Water Supplied  270.394	Authorized Consumption  240.932	Billed Authorized Consumption  240.256	Billed Metered Consumption (water exported is removed)  240.256	Revenue Water  240.256	
					Billed Unmetered Consumption  0.000		
				Unbilled Authorized Consumption  0.676	Unbilled Metered Consumption  0.000		Non-Revenue Water (NRW)  30.138
					Unbilled Unmetered Consumption  0.676		
			Water Losses  29.462	Apparent Losses  3.703	Unauthorized Consumption  0.676		
					Customer Metering Inaccuracies  2.427		
					Systematic Data Handling Errors  0.601		
				Real Losses  25.759	Leakage on Transmission and/or Distribution Mains Not broken down		
		Leakage and Overflows at Utility's Storage Tanks Not broken down					
Leakage on Service Connections Not broken down							







LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

AWWA Free Water Audit Software: **Grading Matrix**

WAS 5.0  
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The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
<b>WATER SUPPLIED</b>											
<b>Volume from own sources:</b>	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy.	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M30 methodology.
Improvements to attain higher data grading for "Volume from own sources" component		<u>to qualify for 2</u> Organize and launch efforts to collect data for determining volume from own sources	<u>to qualify for 4</u> Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		<u>to qualify for 6</u> Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		<u>to qualify for 8</u> Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10</u> Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		<u>to maintain 10</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system; tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component		<u>to qualify for 2</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	<u>to qualify for 4</u> Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		<u>to qualify for 6</u> Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		<u>to qualify for 8</u> Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		<u>to qualify for 10</u> Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		<u>to maintain 10</u> Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy.	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component  (Note: usually the water supplier selling the water - the Exporter - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.)		<u>to qualify for 2</u> Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	<u>to qualify for 4</u> Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		<u>to qualify for 6</u> Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		<u>to qualify for 8</u> Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10</u> Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		<u>to maintain 10</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component		<u>to qualify for 2</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	<u>to qualify for 4</u> Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		<u>to qualify for 6</u> Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		<u>to qualify for 8</u> Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		<u>to qualify for 10</u> Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility, at least every five years.		<u>to maintain 10</u> Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy.	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component <i>(Note: usually if the water utility being audited sells (Exports) water to a neighboring purchasing Utility it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.)</i>		<u>to qualify for 2</u> Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	<u>To qualify for 4</u> Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		<u>to qualify for 6</u> Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		<u>to qualify for 8</u> Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10</u> Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		<u>to maintain 10</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component		<u>to qualify for 2</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	<u>to qualify for 4</u> Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		<u>to qualify for 6</u> Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		<u>to qualify for 8</u> Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		<u>to qualify for 10</u> Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		<u>to maintain 10</u> Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate; remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records exist, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducted by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	<u>to qualify for 2</u> Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	<u>to qualify for 4</u> Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		<u>to qualify for 6</u> Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		<u>to qualify for 8</u> Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		<u>to qualify for 10</u> Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 90% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		<u>to maintain 10</u> Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for just fed upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average future count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts being to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component		<u>to qualify for 2</u> Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population, thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	<u>to qualify for 4</u> Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sales with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		<u>to qualify for 6</u> Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significantly reduce the number of unmetered accounts		<u>to qualify for 8</u> Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		<u>to qualify for 10</u> Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		<u>to maintain 10</u> Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist, and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component		<u>to qualify for 2</u> Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	<u>to qualify for 4</u> Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping the number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		<u>to qualify for 6</u> Draft a new written policy regarding billing exemptions based upon consensus or criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		<u>to qualify for 8</u> Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		<u>to qualify for 10</u> Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		<u>to maintain 10</u> Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex. water used in periodic testing of unmetered fire connections), but other uses (ex. miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component		<u>to qualify for 5</u> Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. <u>to qualify for 2</u> Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex. fire hydrant flushings).	<u>to qualify for 5</u> Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. <u>to qualify for 4</u> Evaluate the documentation of events that have been observed. Meet with user groups (ex. for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		<u>to qualify for 5</u> Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, unmetered consumption is usually a relatively small quality component, and other larger-quality components should take priority.	<u>to qualify for 8 or 10</u> Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	<u>to qualify for 8</u> Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		<u>to qualify for 10</u> Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		<u>to maintain 10</u> Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	Conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex. tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component		<u>to qualify for 6</u> Use accepted default of 0.25% of volume of water supplied. <u>to qualify for 2</u> Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex. unauthorized fire hydrant openings)	<u>to qualify for 5</u> Use accepted default of 0.25% of system input volume <u>to qualify for 4</u> Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex. unauthorized fire hydrant openings)		<u>to qualify for 5</u> Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	<u>to qualify for 6 or greater</u> Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	<u>to qualify for 8</u> Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		<u>to qualify for 10</u> Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		<u>to maintain 10</u> Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	<u>to qualify for 2</u> Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	<u>to qualify for 4</u> Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		<u>to qualify for 6</u> Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		<u>to qualify for 8</u> Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		<u>to qualify for 9</u> Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	<u>to qualify for 10</u> Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to plot improving metering technology.	<u>to maintain 10</u> Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors	Note: all water utilities incur some amount of this error. Even in water utilities with unmeasured customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customer escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component		<u>to qualify for 2</u> Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	<u>to qualify for 4</u> Finalize written policy and procedures for activation of new billing accounts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		<u>to qualify for 6</u> Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedure internal annual audit process.		<u>to qualify for 8</u> Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		<u>to qualify for 10</u> Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		<u>to maintain 10</u> Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component		<u>to qualify for 2</u> Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	<u>to qualify for 4</u> Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		<u>to qualify for 6</u> Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		<u>to qualify for 8</u> Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		<u>to qualify for 10</u> Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		<u>to maintain 10</u> Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought on line to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component	Note: The number of Service Connections does not include fire hydrant leadlines connecting the hydrant to the water main	<u>to qualify for 2</u> Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	<u>to qualify for 4</u> Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		<u>to qualify for 6</u> Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include a total for at least five years prior to audit year.		<u>to qualify for 8</u> Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		<u>to qualify for 10</u> Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		<u>to maintain 10</u> Continue with standardization and random field validation to improve knowledge of system.



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line	Note: If customer water meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Gratings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gratings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility, and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	Either of two conditions can be met for a grading of 10 a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Worksheet asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet. b) Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component		to qualify for 2 Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4 Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.	to qualify for 6 Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.	to qualify for 8 Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.	to qualify for 10 Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.	to maintain 10 Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.				
Average operating pressure		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breach pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breach pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component		to qualify for 2 Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics.	to qualify for 4 Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.	to qualify for 6 Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.	to qualify for 8 Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.	to qualify for 10 Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.	to maintain 10 Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for realtime pressure data calibration, and averaging.				



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guessimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component		<u>to qualify for 2</u> Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	<u>to qualify for 4</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6</u> Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		<u>to qualify for 8</u> Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		<u>to qualify for 10</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10</u> Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses)	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M30 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component		<u>to qualify for 2</u> Formalize the process to implement water rates, including a secure documentation procedure. Onsite a current, formal water rate document and gain approval from all stakeholders.	<u>to qualify for 4</u> Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		<u>to qualify for 6</u> Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	<u>Launch effort to fully meter the customer population and charge rates based upon water volumes</u>	<u>to qualify for 8</u> Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to qualify for 10</u> Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to maintain 10</u> Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses)	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guessimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M30 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis, or 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If a] applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component		<u>to qualify for 2</u> Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	<u>to qualify for 4</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6</u> Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		<u>to qualify for 8</u> Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgeable third-party at least once every three years.		<u>to qualify for 10</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10</u> Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively





## AWWA Free Water Audit Software: Customer Service Line Diagrams

WAS v5.0

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### Average Length of Customer Service Line

The three figures shown on this worksheet display the assignment of the Average Length of Customer Service Line,  $L_p$ , for the three most common piping configurations.

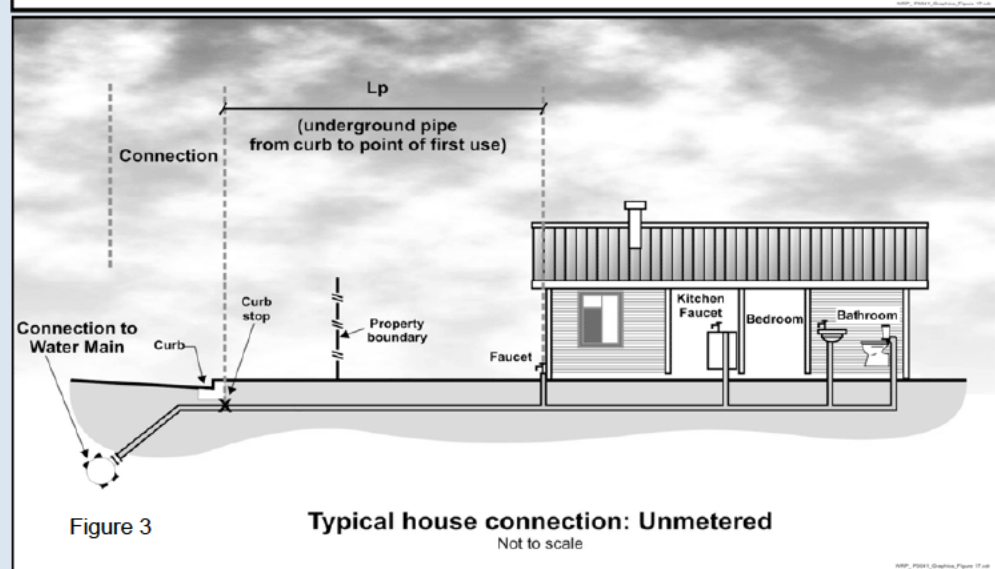
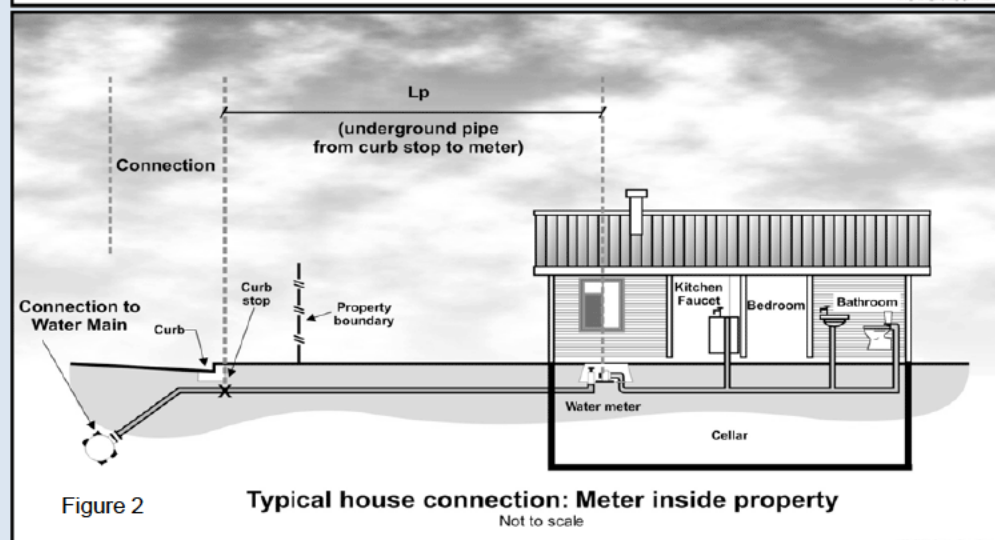
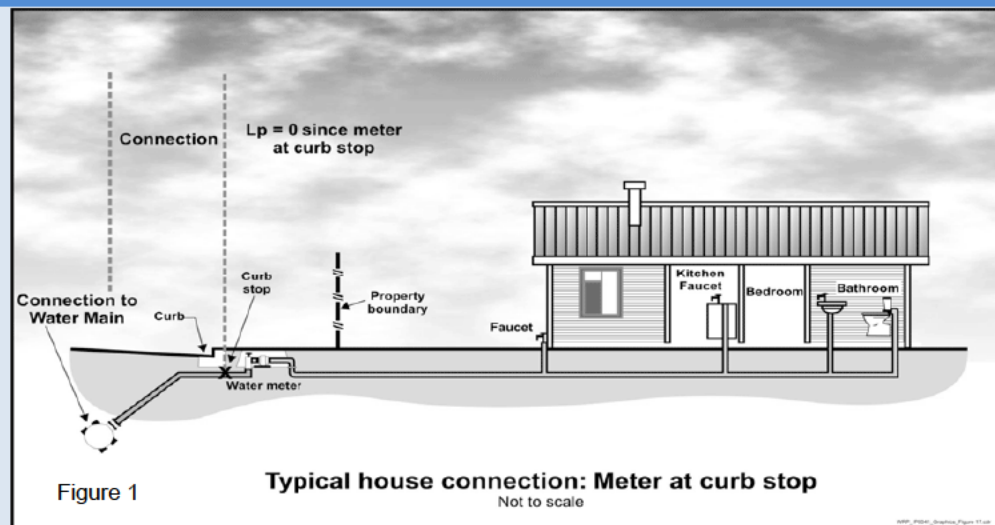
**Figure 1** shows the configuration of the water meter outside of the customer building next to the curb stop valve. In this configuration  $L_p = 0$  since the distance between the curb stop and the customer metering point is essentially zero.

**Figure 2** shows the configuration of the customer water meter located inside the customer building, where  $L_p$  is the distance from the curb stop to the water meter.

**Figure 3** shows the configuration of an unmetered customer building, where  $L_p$  is the distance from the curb stop to the first point of customer water consumption, or, more simply, the building line.

In any water system the  $L_p$  will vary notably in a community of different structures, therefore the average  $L_p$  value is used and this should be approximated or calculated if a sample of service line measurements has been gathered.

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## AWWA Free Water Audit Software: Definitions

WAS v5.0

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Item Name	Description
<p><b>Apparent Losses</b></p> <p>Find</p>	<p>= unauthorized consumption + customer metering inaccuracies + systematic data handling errors</p> <p>Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water usage profile) as well as systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use).</p> <p>NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.</p>
<p><b>AUTHORIZED CONSUMPTION</b></p> <p>Find</p>	<p>= billed water exported + billed metered + billed unmetered + unbilled metered + unbilled unmetered consumption</p> <p>The volume of metered and/or unmetered water taken by registered customers, the water utility's own uses, and uses of others who are implicitly or explicitly authorized to do so by the water utility; for residential, commercial, industrial and public-minded purposes.</p> <p>Typical retail customers' consumption is tabulated usually from established customer accounts as billed metered consumption, or - for unmetered customers - billed unmetered consumption. These types of consumption, along with billed water exported, provide revenue potential for the water utility. <b>Be certain to tabulate the water exported volume as a separate component and do not "double-count" it by including in the billed metered consumption component as well as the water exported component.</b></p> <p>Unbilled authorized consumption occurs typically in non-account uses, including water for fire fighting and training, flushing of water mains and sewers, street cleaning, watering of municipal gardens, public fountains, or similar public-minded uses. Occasionally these uses may be metered and billed (or charged a flat fee), but usually they are unmetered and unbilled. In the latter case, the water auditor may use a default value to estimate this quantity, or implement procedures for the reliable quantification of these uses. This starts with documenting usage events as they occur and estimating the amount of water used in each event. (See Unbilled unmetered consumption)</p>
<p><b>Average length of customer service line</b></p> <p>View Service Connection Diagram</p> <p>Find</p>	<p>This is the average length of customer service line, <math>L_p</math>, that is owned and maintained by the customer; from the point of ownership transfer to the customer water meter, or building line (if unmetered). The quantity is one of the data inputs for the calculation of Unavoidable Annual Real Losses (UARL), which serves as the denominator of the performance indicator: Infrastructure Leakage Index (ILI). The value of <math>L_p</math> is multiplied by the number of customer service connections to obtain a total length of customer owned piping in the system. The purpose of this parameter is to account for the unmetered service line infrastructure that is the responsibility of the customer for arranging repairs of leaks that occur on their lines. In many cases leak repairs arranged by customers take longer to be executed than leak repairs arranged by the water utility on utility-maintained piping. Leaks run longer - and lose more water - on customer-owned service piping, than utility owned piping.</p> <p>If the customer water meter exists near the ownership transfer point (usually the curb stop located between the water main and the customer premises) this distance is zero because the meter and transfer point are the same. This is the often encountered configuration of customer water meters located in an underground meter box or "pit" outside of the customer's building. The Free Water Audit Software asks a "Yes/No" question about the meter at this location. If the auditor selects "Yes" then this distance is set to zero and the data grading score for this component is set to 10.</p> <p>If water meters are typically located inside the customer premise/building, or properties are unmetered, it is up to the water auditor to estimate a system-wide average <math>L_p</math> length based upon the various customer land parcel sizes and building locations in the service area. <math>L_p</math> will be a shorter length in areas of high density housing, and a longer length in areas of low density housing and varied commercial and industrial buildings. General parcel demographics should be employed to obtain a composite average <math>L_p</math> length for the entire system.</p> <p>Refer to the "Service Connection Diagram" worksheet for a depiction of the service line/metering configurations that typically exist in water utilities. This worksheet gives guidance on the determination of the Average Length, <math>L_p</math>, for each configuration.</p>
<p><b>Average operating pressure</b></p> <p>Find</p>	<p>This is the average pressure in the distribution system that is the subject of the water audit. Many water utilities have a calibrated hydraulic model of their water distribution system. For these utilities, the hydraulic model can be utilized to obtain a very accurate quantity of average pressure. In the absence of a hydraulic model, the average pressure may be approximated by obtaining readings of static water pressure from a representative sample of fire hydrants or other system access points evenly located across the system. A weighted average of the pressure can be assembled; but be sure to take into account the elevation of the fire hydrants, which typically exist several feet higher than the level of buried water pipelines. If the water utility is compiling the water audit for the first time, the average pressure can be approximated, but with a low data grading. In subsequent years of auditing, effort should be made to improve the accuracy of the average pressure quantity. This will then qualify the value for a higher data grading.</p>
<p><b>Billed Authorized Consumption</b></p>	<p>All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.</p>
<p><b>Billed metered consumption</b></p> <p>Find</p>	<p>All metered consumption which is billed to retail customers, including all groups of customers such as domestic, commercial, industrial or institutional. <b>It does NOT include water supplied to neighboring utilities (water exported) which is metered and billed. Be sure to subtract any consumption for exported water sales that may be included in these billing roles. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.</b> The metered consumption data can be taken directly from billing records for the water audit period. The accuracy of yearly metered consumption data can be refined by including an adjustment to account for customer meter reading lag time since not all customer meters are read on the same day of the meter reading period. However additional analysis is necessary to determine the lag time adjustment value, which may or may not be significant.</p>
<p><b>Billed unmetered consumption</b></p> <p>Find</p>	<p>All billed consumption which is calculated based on estimates or norms from water usage sites that have been determined by utility policy to be left unmetered. This is typically a very small component in systems that maintain a policy to meter their customer population. However, this quantity can be the key consumption component in utilities that have not adopted a universal metering policy. <b>This component should NOT include any water that is supplied to neighboring utilities (water exported) which is unmetered but billed. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.</b></p>



Item Name	Description
<b>Customer metering inaccuracies</b>  <input type="button" value="Find"/>	<p>Apparent water losses caused by the collective under-registration of customer water meters. Many customer water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. This occurrence is common with smaller residential meters of sizes 5/8-inch and 3/4 inch after they have registered very large cumulative volumes of water, which generally occurs only after periods of years. For meters sized 1-inch and larger - typical of multi-unit residential, commercial and industrial accounts - meter under-registration can occur from wear or from the improper application of the meter; i.e. installing the wrong type of meter or the wrong size of meter, for the flow pattern (profile) of the consumer. For instance, many larger meters have reduced accuracy at low flows. If an oversized meter is installed, most of the time the routine flow will occur in the low flow range of the meter, and a significant portion of it may not be registered. It is important to properly select and install all meters, but particularly large customer meters, size 1-inch and larger.</p> <p>The auditor has two options for entering data for this component of the audit. The auditor can enter a percentage under-registration (typically an estimated value), this will apply the selected percentage to the two categories of metered consumption to determine the volume of water not recorded due to customer meter inaccuracy. Note that this percentage is a composite average inaccuracy for <u>all</u> customer meters in the entire meter population. The percentage will be multiplied by the sum of the volumes in the Billed Metered and Unbilled Metered components. Alternatively, if the auditor has substantial data from meter testing activities, he or she can calculate their own loss volumes, and this volume may be entered directly.</p> <p>Note that a value of zero will be accepted but an alert will appear asking if the customer population is unmetered. Since all metered systems have some degree of inaccuracy, a positive value should be entered. A value of zero in this component is valid only if the water utility does not meter its customer population.</p>
<b>Customer retail unit cost</b>  <input type="button" value="Find"/>	<p>The Customer Retail Unit Cost represents the charge that customers pay for water service. This unit cost is applied routinely to the components of Apparent Loss, since these losses represent water reaching customers but not (fully) paid for. Since most water utilities have a rate structure that includes a variety of different costs based upon class of customer, a weighted average of individual costs and number of customer accounts in each class can be calculated to determine a single composite cost that should be entered into this cell. Finally, the weighted average cost should also include additional charges for sewer, storm water or biosolids processing, <u>but only if</u> these charges are based upon the volume of potable water consumed.</p> <p>For water utilities in regions with limited water resources and a questionable ability to meet the drinking water demands in the future, the Customer Retail Unit Cost might also be applied to value the Real Losses; instead of applying the Variable Production Cost to Real Losses. In this way, it is assumed that every unit volume of leakage reduced by leakage management activities will be sold to a customer.</p> <p>Note: the Free Water Audit Software allows the user to select the units that are charged to customers (either \$/1,000 gallons, \$/hundred cubic feet, or \$/1,000 litres) and automatically converts these units to the units that appear in the "WATER SUPPLIED" box. The monetary units are United States dollars, \$.</p>
<b>Infrastructure Leakage Index (ILI)</b>  <input type="button" value="Find"/>	<p>The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). The ILI is a highly effective performance indicator for comparing (benchmarking) the performance of utilities in operational management of real losses.</p>
<b>Length of mains</b>  <input type="button" value="Find"/>	<p>Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant). It is also recommended to include in this measure the total length of fire hydrant lead pipe. Hydrant lead pipe is the pipe branching from the water main to the fire hydrant. Fire hydrant leads are typically of a sufficiently large size that is more representative of a pipeline than a service connection. The average length of hydrant leads across the entire system can be assumed if not known, and multiplied by the number of fire hydrants in the system, which can also be assumed if not known. This value can then be added to the total pipeline length. Total length of mains can therefore be calculated as:</p> <p>Length of Mains, miles = (total pipeline length, miles) + [ {(average fire hydrant lead length, ft) x (number of fire hydrants)} / 5,280 ft/mile ] or Length of Mains, kilometres = (total pipeline length, kilometres) + [ {(average fire hydrant lead length, metres) x (number of fire hydrants)} / 1,000 metres/kilometre ]</p>
<b>NON-REVENUE WATER</b>  <input type="button" value="Find"/>	<p>= Apparent Losses + Real Losses + Unbilled Metered Consumption + Unbilled Unmetered Consumption. This is water which does not provide revenue potential to the utility.</p>
<b>Number of active AND inactive service connections</b>  <input type="button" value="Find"/>	<p>Number of customer service connections, extending from the water main to supply water to a customer. Please note that this includes the actual number of distinct piping connections, including fire connections, whether active or inactive. This may differ substantially from the number of customers (or number of accounts). <b>Note: this number does not include the pipeline leads to fire hydrants - the total length of piping supplying fire hydrants should be included in the "Length of mains" parameter.</b></p>
<b>Real Losses</b>  <input type="button" value="Find"/>	<p>Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.</p>
<b>Revenue Water</b>	<p>Those components of System Input Volume that are billed and have the potential to produce revenue.</p>
<b>Service Connection Density</b>  <input type="button" value="Find"/>	<p>=number of customer service connections / length of mains</p>



Item Name	Description
<b>Systematic data handling errors</b>  <div>Find</div>	<p>Apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure, and permitting/activation of new accounts; and any type of data lapse that results in under-stated customer water consumption in summary billing reports.</p> <p><b>Systematic Data Handling Errors result in a direct loss of revenue potential. Water utilities can find "lost" revenue by keying on this component.</b></p> <p>Utilities typically measure water consumption registered by water meters at customer premises. The meter should be read routinely (ex: monthly) and the data transferred to the Customer Billing System, which generates and sends a bill to the customer. <u>Data Transfer Errors</u> result in the consumption value being less than the actual consumption, creating an apparent loss. Such error might occur from illegible and mis-recorded hand-written readings compiled by meter readers, inputting an incorrect meter register unit conversion factor in the automatic meter reading equipment, or a variety of similar errors.</p> <p>Apparent losses also occur from <u>Data Analysis Errors</u> in the archival and data reporting processes of the Customer Billing System. Inaccurate estimates used for accounts that fail to produce a meter reading are a common source of error. Billing adjustments may award customers a rightful monetary credit, but do so by creating a negative value of consumption, thus under-stating the actual consumption. Account activation lapses may allow new buildings to use water for months without meter readings and billing. Poor permitting and construction inspection practices can result in a new building lacking a billing account, a water meter and meter reading; i.e., the customer is unknown to the utility's billing system.</p> <p>Close auditing of the permitting, metering, meter reading, billing and reporting processes of the water consumption data trail can uncover data management gaps that create volumes of systematic data handling error. Utilities should routinely analyze customer billing records to detect data anomalies and quantify these losses. For example, a billing account that registers zero consumption for two or more billing cycles should be checked to explain why usage has seemingly halted. Given the revenue loss impacts of these losses, water utilities are well-justified in providing continuous oversight and timely correction of data transfer errors &amp; data handling errors.</p> <p>If the water auditor has not yet gathered detailed data or assessment of systematic data handling error, it is recommended that the auditor apply the default value of 0.25% of the Billed Authorized Consumption volume. However, if the auditor <u>has</u> investigated the billing system and its controls, and <u>has</u> well validated data that indicates the volume from systematic data handling error is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations and select an appropriate grading. <u>Note:</u> negative values are not allowed for this audit component. If the auditor enters zero for this component then a grading of 1 will be automatically assigned.</p>
<b>Total annual cost of operating the water system</b>  <div>Find</div>	<p>These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the drinking water supply and distribution system. It should include the costs of day-to-day upkeep and long-term financing such as repayment of capital bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. Depending upon water utility accounting procedures or regulatory agency requirements, it may be appropriate to include depreciation in the total of this cost. This cost should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.</p>
<b>Unauthorized consumption</b>  <div>Find</div>	<p>Includes water illegally withdrawn from fire hydrants, illegal connections, bypasses to customer consumption meters, or tampering with metering or meter reading equipment; as well as any other ways to receive water while thwarting the water utility's ability to collect revenue for the water. Unauthorized consumption results in uncaptured revenue and creates an error that understates customer consumption. In most water utilities this volume is low and, if the water auditor has not yet gathered detailed data for these loss occurrences, it is recommended that the auditor apply a default value of 0.25% of the volume of water supplied. However, if the auditor has investigated unauthorized occurrences, and has well validated data that indicates the volume from unauthorized consumption is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations. Note that a value of zero will not be accepted since all water utilities have some volume of unauthorized consumption occurring in their system.</p> <p>Note: if the auditor selects the default value for unauthorized consumption, a data grading of 5 is automatically assigned, but not displayed on the Reporting Worksheet.</p>
<b>Unavoidable Annual Real Losses (UARL)</b>  <div>Find</div>	<p>UARL (gallons)=(5.41Lm + 0.15Nc + 7.5Lc) xP, or UARL (litres)=(18.0Lm + 0.8Nc + 25.0Lc) xP</p> <p>where: Lm = length of mains (miles or kilometres) Nc = number of customer service connections Lp = the average distance of customer service connection piping (feet or metres) (see the Worksheet "Service Connection Diagram" for guidance on determining the value of Lp) Lc = total length of customer service connection piping (miles or km) Lc = Nc X Lp (miles or kilometres) P = Pressure (psi or metres)</p> <p>The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). Striving to reduce system leakage to a level close to the UARL is usually not needed unless the water supply is unusually expensive, scarce or both.</p> <p>NOTE: The UARL calculation has not yet been proven as fully valid for very small, or low pressure water distribution systems. If,</p> <p><u>in gallons:</u> (Lm x 32) + Nc &lt; 3000 or P &lt; 35psi</p> <p><u>in litres:</u> (Lm x 20) + Nc &lt; 3000 or P &lt; 25m</p> <p>then the calculated UARL value may not be valid. The software does not display a value of UARL or ILI if either of these conditions is true.</p>



<div>Item Name</div>	<div>Description</div>
<div>Unbilled Authorized Consumption</div> <div>Find</div>	<p>All consumption that is unbilled, but still authorized by the utility. This includes Unbilled Metered Consumption + Unbilled Unmetered Consumption. See "Authorized Consumption" for more information. For Unbilled Unmetered Consumption, the Free Water Audit Software provides the auditor the option to select a default value if they have not audited unmetered activities in detail. The default calculates a volume that is 1.25% of the Water Supplied volume. If the auditor has carefully audited the various unbilled, unmetered, authorized uses of water, and has established reliable estimates of this collective volume, then he or she may enter the volume directly for this component, and not use the default value.</p>
<div>Unbilled metered consumption</div> <div>Find</div>	<p>Metered consumption which is authorized by the water utility, but, for any reason, is <u>deemed by utility policy</u> to be unbilled. This might for example include metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. <b>It does <u>not</u> include water supplied to neighboring utilities (water exported) which may be metered but not billed.</b></p>
<div>Unbilled unmetered consumption</div> <div>Find</div>	<p>Any kind of Authorized Consumption which is neither billed or metered. This component typically includes water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, etc. In most water utilities it is a small component which is very often substantially overestimated. <b>It does NOT include water supplied to neighboring utilities (water exported) which is unmetered and unbilled – an unlikely case.</b> This component has many sub-components of water use which are often tedious to identify and quantify. Because of this, and the fact that it is usually a small portion of the water supplied, it is recommended that the auditor apply the default value, which is 1.25% of the Water Supplied volume. Select the default percentage to enter this value.</p> <p>If the water utility <u>has</u> carefully audited the unbilled, unmetered activities occurring in the system, and has well validated data that gives a value substantially higher or lower than the default volume, then the auditor should enter their own volume. However the default approach is recommended for most water utilities.</p> <p>Note that a value of zero is not permitted, since all water utilities have some volume of water in this component occurring in their system.</p>
<div>Units and Conversions</div>	<p>The user may develop an audit based on one of three unit selections:</p> <div><div>1) Million Gallons (US)</div><div>2) Megalitres (Thousand Cubic Metres)</div><div>3) Acre-feet</div></div> <p>Once this selection has been made in the instructions sheet, all calculations are made on the basis of the chosen units. Should the user wish to make additional conversions, a unit converter is provided below (use drop down menus to select units from the yellow unit boxes):</p> <div><div>Enter Units:</div><div>Convert From...</div><div>Converts to.....</div><div>1</div><div>Million Gallons (US)</div><div>=</div><div>3.06888329</div><div>Acre-feet</div><div>(conversion factor = 3.06888328973723)</div></div>
<div>Use of Option Buttons</div>	<div><div>To use the default percent value choose this button</div><div>To enter a value choose this button and enter the value in the cell to the right</div><div><div>Pcnt:</div><div>Value:</div><div>1.25%</div><div></div><div></div></div><div><p><b>NOTE:</b> For Unbilled Unmetered Consumption, Unauthorized Consumption and Systematic Data Handling Errors, a recommended default value can be applied by selecting the Percent option. The default values are based on fixed percentages of Water Supplied or Billed Authorized Consumption and are recommended for use in this audit unless the auditor has well validated data for their system. Default values are shown by purple cells, as shown in the example above.</p><p>If a default value is selected, the user does not need to grade the item; a grading value of 5 is automatically applied (however, this grade will not be displayed).</p></div></div>
<div>Variable production cost (applied to Real Losses)</div> <div>Find</div>	<p>The cost to produce and supply the next unit of water (e.g., \$/million gallons). This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It may also include other miscellaneous unit costs that apply to the production of drinking water. It should also include the unit cost of bulk water purchased as an import if applicable.</p> <p>It is common to apply this unit cost to the volume of Real Losses. However, if water resources are strained and the ability to meet future drinking water demands is in question, then the water auditor can be justified in applying the Customer Retail Rate to the Real Loss volume, rather than applying the Variable Production Cost.</p> <p>The Free Water Audit Software applies the Variable Production costs to Real Losses by default. However, the auditor has the option on the Reporting Worksheet to select the Customer Retail Cost as the basis for the Real Loss cost evaluation if the auditor determines that this is warranted.</p>
<div>Volume from own sources</div> <div>Find</div>	<p>The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of <u>treated</u> drinking water that entered the distribution system. Often the volume of water measured at the effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, etc. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.</p>



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Item Name	Description
<b>Volume from own sources: Master meter and supply error adjustment</b> <input type="button" value="Find"/>	<p>An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common; thus a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration.</p>
<b>Water exported</b> <input type="button" value="Find"/>	<p>The Water Exported volume is the bulk water conveyed and sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling the water, i.e. the exporter. If the water utility who is compiling the annual water audit sells bulk water in this manner, they are an exporter of water.</p> <p>Note: The Water Exported volume is sold to wholesale customers who are typically charged a wholesale rate that is different than retail rates charged to the retail customers existing within the service area. Many state regulatory agencies require that the Water Exported volume be reported to them as a quantity separate and distinct from the retail customer billed consumption. For these reasons - and others - the Water Exported volume is always quantified separately from Billed Authorized Consumption in the standard water audit. <b>Be certain not to "double-count" this quantity by including it in both the Water Exported box and the Billed Metered Consumption box of the water audit Reporting Worksheet. This volume should be included only in the Water Exported box.</b></p>
<b>Water exported: Master meter and supply error adjustment</b> <input type="button" value="Find"/>	<p>An estimate or measure of the volume in which the Water Exported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived exported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of error in their metered data, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. Corrections to data gaps or other errors found in the archived data should also be included as a portion of this meter error adjustment.</p>
<b>Water imported</b> <input type="button" value="Find"/>	<p>The Water Imported volume is the bulk water purchased to become part of the Water Supplied volume. Typically this is water purchased from a neighboring water utility or regional water authority, and is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water supplier selling the water to the utility conducting the water audit. The water supplier selling the bulk water usually charges the receiving utility based upon a wholesale water rate.</p>
<b>Water imported: Master meter and supply error adjustment</b> <input type="button" value="Find"/>	<p>An estimate or measure of the volume in which the Water Imported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived imported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some level of meter inaccuracy, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived metered data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment.</p>
<b>WATER LOSSES</b> <input type="button" value="Find"/>	<p>= apparent losses + real losses</p> <p>Water Losses are the difference between Water Supplied and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission systems, pressure zones or district metered areas (DMA); if one of these configurations are the basis of the water audit.</p>





## AWWA Free Water Audit Software: Determining Water Loss Standing

WAS v5.0

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Water Audit Report for: **MAHANLUA NUI WATER SYSTEM (251)**

Reporting Year: **2022** 1/2022 - 12/2022

Data Validity Score: **68**

### Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	Level II (26-50)	Level III (51-70)	Level IV (71-90)	Level V (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

*For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.*



Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities in gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

**Note:** this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

**General Guidelines for Setting a Target ILI**  
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		





## Level 1 Validation Summary Notes/Certificate

This document includes detailed notes about utility practices as reviewed during third-party level-one water audit validation.

### Call Information

Utility	Validator
System Name: Mahanalua Nui (251)	Validator: Neal Fujii, Nicholas Ing
Audit Period: CY2022	Validator Qualifications: Equivalent to AWWA CA-NV Level 1 Validator Certification
System Participants: Lea Tamayose, Alin Peterson (Launiupoko Water Co.)	<b>Validator General Comments:</b> This is the first water audit validation interview for Mahanalua Nui (Launiupoko) water system by CWRM staff. Validator recommends that Launiupoko Water Co. conduct source meter testing, large customer meter testing, leak detection surveys, and establish DMAs in suspected high-leakage areas of the distribution system.
Call Date: 6/30/2023	LWC staff reports that the Mahanalua Nui system is a fairly new system, built around year 2000. The system is supplied by 3 wells and has 2 tanks. All wells have flowmeters and Tank 1 has a effluent meter. There are booster pumps in the system which are used operationally to transfer water between the two tanks to meet the customer demands. This system has SCADA systems to control wells and tank levels. There is also a separate non-potable irrigation system that serves the same service area.

### Past Year's Activity:

Data Management	Loss Recovery
<ul style="list-style-type: none"> <li>Completed an AWWA water audit and a Level-1 water audit validation.</li> <li>In the process of updating the SCADA</li> <li>Continue to upgrade customer meters to convert all AMR to cellular technology – LWC goal is to have complete conversion to cellular.</li> <li>In 2022 LWC changed the well flowmeters at Well 1 and Well 3 and at the booster pumps.</li> <li>Customer meters suspected to be inaccurate are field tested by LWC crew using a volumetric "bucket test."</li> </ul>	<ul style="list-style-type: none"> <li>System staff have responded to and repaired reported leaks in the system during the past year.</li> <li>LWC staff monitors for leakage comparing the Tank 1 effluent meter volume with the customer consumption served by Tank 1.</li> <li>LWC also compares tank levels with pumpage volumes daily to monitor for leaks.</li> <li>In 2022 LWC repaired a main leak coming from Tank 2.</li> <li>Ongoing replacement of HDPE service laterals with copper when the LWC field crew is excavating in the vicinity.</li> <li>Suspected leaks are investigated using acoustic listening equipment.</li> <li>LWC has a thermal camera that can help detect changes in surface temperature, which can indicate a water leak (e.g., below a road surface)</li> </ul>



### Opportunities:

#### Data Management

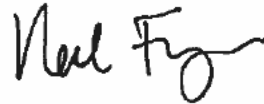
- Volumetric source meter testing can improve the reliability of the VfOS volumes.
- Customer meter testing can improve the reliability of the BMAC volumes
- LWC is in the process of implementing IAMGIS asset management system, expected to be completed in 2023.
- See Loss Control Planning tab in AWWA Free Water Audit Software for guidance.


#### Loss Recovery

- Conduct leak detection surveys.
- Establish district metered areas in suspected high-leakage areas.
- See Loss Control Planning tab in AWWA Free Water Audit Software for guidance.

### Selected Metrics & Signatures:

Metric	Units	Value
Miles of Mains		14.6
Count of Service Connections		375
Variable Production Cost	\$/MG	\$1,732
Customer Retail Unit Cost	\$/kgal	\$2.57
Real Losses per Connection per Day	gal/conn/day	n/a
Real Losses per Mile of Main	gal/mile/day	4,834
Cost of Real Losses per Mile of Main	\$/mile/yr	-
Infrastructure Leakage Index	Ratio	n/a
Apparent Losses per Connection per Day	gal/conn/day	27.06
Cost of Apparent Losses per Connection	\$/conn/yr	

Validator Signature:  Name: \_\_\_\_\_

Utility Executive Signature:  Name: Glenn Tremblay



### Validation Call Notes

Audit Input	Grade	Audit Input Notes	Data Validity Grade Notes
Volume from Own Sources	6	<p><b>Source Meter Profile:</b> Badger electromagnetic flowmeters on wells. Well 1 and Well 3 meters changed in 2022.</p> <p><b>Derivation:</b> Pumpage report from billing software query.</p> <p><b>Comments:</b> The Mahanalua Nui water system is supplied by 3 wells (6-5138-001, 6-5137-001, 6-5238-001). Water is pumped into two steel tanks: Tank 1 (0.428MG), Tank 2 (0.107 MG). Input derivation from supporting documents confirmed (Consumption History Report Customer# Well, Location# Well 01, Well 02, Well 03). Note that there is an existing independent non-potable water system (irrigation) which also shares the same service area. Exclusion of non-potable volumes confirmed.</p>	<p><b>Approximate Percent of Volume Metered:</b> 100%</p> <p><b>Approximate Percent Tested and/or Calibrated:</b> 0%</p> <p><b>Calibration Frequency:</b> None.</p> <p><b>Volumetric Testing Frequency:</b> None.</p> <p><b>Volumetric Testing Method:</b> n/a.</p> <p><b>Comments:</b> Well 1 and Well 3 meters replaced in October 2022.</p>
Volume from Own Sources Master Meter and Supply Error Adjustment	n/a	<p><b>Derivation:</b> Select or Enter</p> <p><b>Change in Storage Considered:</b> No.</p> <p><b>Comments:</b> Select</p>	<p><b>Source Meter Read Method:</b> SCADA.</p> <p><b>Source Meter Read Frequency:</b> Continuous and manually read daily.</p> <p><b>Data Review Practices:</b> Each business day.</p> <p><b>Real-Time Storage Level Monitoring:</b> Yes.</p> <p><b>Comments:</b> No calibration has been conducted in the last 5 years.</p>
Water Imported	n/a	<p><b>Import Meter Profile:</b> n/a</p> <p><b>Derivation:</b> n/a</p> <p><b>Comments:</b> n/a</p>	<p><b>Approximate Percent of Volume Metered:</b> n/a</p> <p><b>Approximate Percent Tested and/or Calibrated:</b> n/a</p> <p><b>Calibration Frequency:</b> n/a</p> <p><b>Volumetric Testing Frequency:</b> n/a</p> <p><b>Volumetric Testing Method:</b> n/a</p> <p><b>Comments:</b> n/a</p>
Water Imported Master Meter and Supply Error Adjustment	n/a	<p><b>Derivation:</b> n/a</p> <p><b>Comments:</b> n/a</p>	<p><b>Import Meter Read Method:</b> n/a</p> <p><b>Import Meter Read Frequency:</b> n/a</p> <p><b>Data Review Practices:</b> n/a</p> <p><b>Comments:</b> n/a</p>
Water Exported	n/a	<p><b>Export Meter Profile:</b> n/a</p> <p><b>Comments:</b> n/a</p>	<p><b>Approximate Percent of Volume Metered:</b> n/a</p> <p><b>Approximate Percent Tested and/or Calibrated:</b> n/a</p> <p><b>Calibration Frequency:</b> n/a</p> <p><b>Volumetric Testing Frequency:</b> n/a</p> <p><b>Volumetric Testing Method:</b> n/a</p> <p><b>Comments:</b> n/a</p>



LWC ATTACHMENT TO GWUPA E : # 19  
AWWA LOSS AUDIT

Water Exported Master Meter and Supply Error Adjustment	n/a	Derivation: n/a Comments: n/a	Export Meter Read Method: n/a Export Meter Read Frequency: n/a Data Review Practices: n/a Comments: n/a
Billed Metered Authorized Consumption	6	Derivation: Consumption history report from billing system filtered by Service Code: Potable Use & Rate Code PW1. Customer Meter Profile: All meters are AMR or cellular capable. The largest meter is 1.5", with most meters being 5/8". Read Frequency: Monthly. Reading Technology: Mixture of AMR and cellular. Age Profile: Most of the original meters have been upgraded from AMR to cellular. Comments: Enter	Approximate Percent Metered: 100% Small Meter Testing Practices: Reactive – complaint based or flagged-consumption testing only. Number of Small Meters Tested: n/a Large Meter Testing Practices: None. Number of Large Meters Tested: n/a General Replacement Practices: Ongoing via meter conversion project and upon failure. Billing Data Review: Standard billing QC, plus review of volumes by use type each billing cycle. Comments: No additional comments.
Billed Unmetered Authorized Consumption	n/a	Profile: n/a Derivation: n/a Comments: Select	Policy for Metering Exemptions: n/a Comments: n/a
Unbilled Metered Authorized Consumption	n/a	Profile: n/a Derivation: n/a Comments: Select	Policy for Billing Exemptions: n/a
Unbilled Unmetered Authorized Consumption	5	Profile: HI default value was applied. Comments: UUAC includes weekly line flushing at the end of the dead-end sections in the system that do not have active consumption, monthly coliform testing, annual hydrant testing, and fire department uses.	Comments: Default grade applied. Changed to 0.25% for during validation call.
Unauthorized Consumption	5	Comments: Default input applied.	Comments: Default grade applied.
Customer Metering Inaccuracies	7	Derivation: Inferred from reference data (manufacturer, anecdotal test results) but not derived from test data analysis & calculation. Comments: LWC always has 10 to 15 meters in stock so ready to replace.  *See BMAC comments regarding meter testing & replacement activities.	Customer Meter Testing: Customer request, billing anomalies, or visual inspection. Customer Meter Replacement: Upon failure or if testing shows inaccurate reading, meters are upgraded to cellular technology. LWC staff estimates that at least 10 meters are changed every month. Comments: Customer metering inaccuracy changed from 0.25% to 1.00% during validation call.
Systematic Data Handling Errors	5	Comments: Default input applied.	Comments: Default grade applied.



Length of Mains	7	<p><b>Derivation:</b> Totaled from CAD based map.</p> <p><b>Hydrant Laterals Included:</b> No.</p> <p><b>Comments:</b> LWC is currently implementing IAMGIS asset management system. NOTE: LoM changed based on e-mail from LT on 7-13-23.</p>	<p><b>Map Format:</b> Digital.</p> <p><b>Asset Management Systems:</b> Not currently in place.</p> <p><b>Map Update Process:</b> Accomplished through normal work order processes.</p> <p><b>Comments:</b> No additional comments.</p>
Number of Service Connections	9	<p><b>Derivation:</b> Standard report run from billing system.</p> <p><b>Basis for Query:</b> Filtered by Service code: Potable Use &amp; Rate Code PW1 – sorted by meter size.</p> <p><b>Comments:</b> Note that for this audit period only the active services connections were counted.</p>	<p><b>Field Validation:</b> Accomplished through normal meter reading processes.</p> <p><b>Estimate of Error:</b> 10%.</p> <p><b>Comments:</b> No additional comments.</p>
Average Operating Pressure	3	<p><b>How Pressure is Maintained:</b> Water is pumped to two tanks and gravity fed to distribution. PRVs control system pressure.</p> <p><b>Pressure Range:</b> 40 psi to 130 psi</p> <p><b>Derivation:</b> Inferred from observations of pressure readings in field or review of pressure measurements.</p> <p><b>Comments:</b> Select</p>	<p><b>Pressure Data Collection:</b> Routine inspections of PRVs located in high pressure areas or problem areas.</p> <p><b>Real-Time Monitoring:</b> No real-time monitoring currently in place.</p> <p><b>Hydraulic Model:</b> None currently in place.</p> <p><b>Comments:</b> No additional comments.</p>
Annual Operating Cost	10	<p><b>Derivation:</b> From official financial reports.</p> <p><b>Comments:</b> No additional comments.</p>	<p><b>Auditing Practices:</b> Annually by a third party CPA.</p> <p><b>Comments:</b> No additional comments.</p>
Customer Retail Unit Cost	9	<p><b>Rate Structure:</b> Tiered rate structure</p> <p><b>Derivation:</b> Simple average of 3 tiered rates.</p> <p><b>Comments:</b> There is a power cost adjustment calculated and added to rates. Each tier has the same adjustment but a different base rate to calculate an applied rate. Tiered base rate + power cost adjustment = applied rate.</p>	<p><b>M36 Review:</b> Input calculations have not been reviewed by an M36 water loss expert.</p> <p><b>Comments:</b> No additional comments.</p>
Variable Production Cost	8	<p><b>Primary Costs:</b> Own sources only.</p> <p><b>Secondary Costs:</b> None currently included.</p> <p><b>Comments:</b> Chemicals &amp; electricity (pumping) divided by volume of water supplied.</p>	<p><b>M36 Review:</b> Primary costs only. Input calculations have not been reviewed by an M36 water loss expert.</p> <p><b>Comments:</b> No additional comments.</p>