



FUKUNAGA & ASSOCIATES, INC.
CONSULTING ENGINEERS

MEMORANDUM

TO: Michelle Sorensen, Brown and Caldwell
Craig Lekven, Brown and Caldwell

FROM: Andrew Amuro

DATE: May 1, 2020

SUBJECT: Naalehu Wastewater Collection System Improvements
Final Preliminary Engineering

1. GENERAL PROJECT DESCRIPTION

The County of Hawaii (COH) is scheduled to close three large capacity cesspools (LCCs) in the town of Naalehu on the southeast side of the Big Island. The Naalehu town area is shown on **Figure 1**. To accomplish the closure, the COH has tasked Brown and Caldwell (B&C) with the planning and preliminary engineering for a wastewater treatment plant (WWTP) to serve the properties impacted by the LCC closure. Fukunaga and Associates, Inc. (FAI) has been tasked with investigating options for the collection system to convey the wastewater from the impacted properties to the proposed WWTP. The focus of the project is to close the LCCs as expediently and economically as possible; however, the Consent Order also requires 30 connections to the WWTP in addition to the Brewer properties currently served by the LCCs.

Three properties requested connection to the County sewer system and are presented in **Figure 1**. These properties are:

- Iglesia ni Cristo Church (TMK 9-5-009:079)
- Punalu'u Bakery (TMK 9-5-025:037; owned by La'i LLC)
- Hana Hou Restaurant (TMK 9-5-021:005; owned by Fujimoto, Drake S.)

These properties are not connected to the former Brewer sewer system. The church property is located on the Hilo side of the former Brewer house lots and can be connected to the collection system by adding a sewer within the State right-of-way (ROW) (see Section 2) or by adding a sewer within an easement behind the property if the County chooses to extend the sewer to this property. The Punalu'u Bakery and Hana Hou Restaurant are located on the Kona side of the former Brewer house lots. This side of Naalehu town, to the west of the concrete-lined drainage canal, is considered the "commercial" side of town. The collection system can be designed to accommodate connection of these two commercial properties and will serve to define the western extent of the collection system.

2. GENERAL CRITERIA

The COH will be the owner of the collection system; therefore, the sewer system will meet COH standards and be accessible for maintenance. Preference is to construct sewers within the County ROW as much as possible unless other factors make placing the pipes within easements on private property or in the State ROW much more practical from economic and engineering standpoints. The COH prefers sewers not be within easements due to future access challenges when maintenance and repairs are needed. It is also recommended that the collection system not be located in a State ROW if possible due to the lengthy review and approval time needed for the Use and Occupancy Agreement (UOA). This was emphasized by the State Department of Transportation Highways Division (DOT-H) in their Environmental Assessment (EA) pre-consultation comment to stay out of the State ROW unless there is no other feasible means of routing the sewer. The collection system will require a crossing of the State ROW to convey the sewage from the community Mauka of the highway to the WWTP site that is Makai of the highway; however, DOT-H tends to take less time when reviewing ROW crossings, especially if they are done using trenchless installation techniques.

3. TOPOGRAPHY

The topography of the Naalehu area is presented in **Figure 2**. The proposed location of the wastewater treatment plant is upgradient of the lowest of the former Brewer properties. The ground elevation of the WWTP site is approximately 690 ft MSL while the ground elevation of the lowest Brewer house lot is about 645 ft MSL, an elevation difference of 45 feet. A gravity sewer at this depth is technologically possible using micro tunneling techniques for construction; however, a wastewater pump station will be more feasible to convey the wastewater to the WWTP due to the cost of micro tunneling a relatively short distance. The micro tunneling option can be investigated in the event that an acceptable wastewater pump station location cannot be found.

4. POTENTIAL WASTEWATER PUMP STATION LOCATIONS

As noted in the previous section, the former Brewer properties in Naalehu would most likely be served by a pump station due to the topography. When investigating potential sites for a wastewater pump station (WWPS), priority was placed on sites that are on County or State lands to minimize land acquisition issues, or large private parcels where a portion can be purchased by the County in hopes of minimizing impact to the landowner. The potential WWPS sites are listed in Table 1, and shown on **Figure 3**.

Table 1: Potential WWPS Sites

TMK	Owner	Current Use	Class	Size (sq ft)	Notes
9-5-008:012	Chinese Society Church	Church	Agricultural	186,001	Requires land from the owner and/or easement for WWPS site, utilities and road. Requires sewer and force main in State ROW. WWPS can be set back away from houses. Located at lowest point of the collection system. Within 550 feet of school property line. Longest distance for transmission to proposed WWTP location.
9-5-008:048	Kuahiwi Contractors Inc.	Storage/ Baseyard	Agricultural	534,307	Requires land from the owner and/or easement for WWPS site, utilities and road. WWPS can be set back away from most residents. Within 300 feet of school property line. Located near lowest point of the collection system requiring approx. 15 foot wet well.
9-5-009:006	State of Hawaii	Naalehu School	Residential	534,481	Site is frequented by the public. Residents have indicated sensitivity to wastewater facility at a school. Located at lowest point of the collection system.
9-5-021:023	County of Hawaii	Naalehu Park	Residential	279,176	Site is frequented by the public. Residents may be sensitive to wastewater facility at a park. Requires sewer in State ROW. Located upgradient of some of the former Brewer properties.
9-5-021:035	Thy Word Ministries – Waikoloa Faith Ctr	Vacant	Residential	134,949	Requires land acquisition from the owner and access easement or dedicated County road. Routing would most likely have sewer within State ROW. WWPS can be set back away from most houses.
9-5-024:007	‘O Ka’u Kakou Inc.	Senior Center	Residential/ Commercial	84,680	Facility currently in construction, timing to coordinate location could be difficult. Residents may be sensitive to wastewater facility within senior center campus.
9-5-024:011	County of Hawaii	LCC Location	Residential	10,347	Site is surrounded by houses. Facilities will be relatively close to property line. Residents may be sensitive to wastewater facility in residential area. Located up-gradient of the lowest Brewer properties requiring 30+ foot deep wet well.

Two of the potential sites appear to be more favorable than the others, the County site located within the former Brewer house lots (TMK 9-5-024:011) and the Kuahiwi Contractors site (TMK 9-5-008:048). The remaining parcels were eliminated from consideration at this time but can be re-visited in the future if needed. The Naalehu School and Naalehu Park sites would likely face the most public opposition due to proximity to areas frequented by the general population for recreation and education. The Chinese Society Church and Thy Word Ministries sites would require land acquisition after negotiation with the landowner and a UOA within the State ROW. Both processes would be time consuming and the land acquisition depends on the landowner's willingness to cede some of their land to the County. The new senior center parcel is currently in construction, making the timing to negotiate the WWPS site difficult and may possibly incur construction delays that would also factor into the land negotiations.

A. Pump Station on County Parcel TMK 9-5-024:011

The County site would be the most favorable from a timing standpoint. It does not require land acquisition and would minimize work in the State ROW by limiting construction to a single crossing of Mamalahoa Highway. However, since this site is up-gradient from the collection system low point, this site will require deeper sewers and a very deep pump station wet well. Construction on this site would be more challenging due to the narrow site and the existing sewers and LCC that would have to remain in operation until the collection system and WWTP are completed. These utilities, especially the existing sewer pipes, would have to be protected during construction as heavy vehicles and machinery enter and leave the site. The condition of the existing pipes may require additional protection such as supplemental concrete cover and/or partial replacement depending on condition. A proposed layout of a pump station on the County parcel is shown in **Figure 4**.

The need to trench for the deep influent sewer and the deep wet well may result in flow from the LCC being diverted to these trenches due to the lower resistance to flow through the ground to those excavated areas. Using mud walls for groundwater control would hinder the flow of sewage from the LCC into the ground and probably reduce the capacity of the LCC. Therefore, septage pumping for the duration of the pump station construction would most likely be required until the collection system and WWTP are complete. This would be a significant cost to the construction. In addition, should there be unforeseen delays in completion of the collection system and/or WWTP, the additional septage handling due to the delay could result in a significant construction change order for the additional pumping.

The on-site stormwater may be more difficult to contain due to the small area. Pervious pavement, if geotechnical investigation shows this type of pavement is permissible, would be used to minimize hard surfaces on the site. The only hard pavement area required would be the area designated for refueling of the generator. The grade of the site would be adjusted to minimize flow of off-site stormwater. Grade adjustment walls are anticipated along the property lines on the south and west sides of the parcel to raise the ground elevation.

This site is surrounded by residences directly adjacent to the property line on the east, south and west. The north side is bordered by Opukea Street. Due to the narrow site, the house structures are only about 60 feet from the proposed pump station location. The ambient noise from odor control ventilation fans and electrical switches could be a nuisance to the residents if not mitigated. The standby generator would also produce noise during testing and operation. This would require additional sound insulation for the generator and other equipment on the site.

A passive odor control system can be used to eliminate the need for a mechanical fan; however, passive systems rely on the collection system to be at a higher pressure than atmosphere to force the foul air through the odor control system. When the collection system becomes pressurized, odors can begin to leak out of the wet well hatches and nearby manholes so they must also be gasketed or sealed. A forced-air odor control system using a mechanical fan to draw air out of the pump station would keep the wet well and collection system at negative pressure, thus minimizing the chance that odors escape from nearby manholes and hatches.

Electrical and water utilities are located just off-site on Opukea Road. The HELCo transformer for the site can be located within an easement just off the County road. Water for fire protection could be from existing hydrants (pending analysis by a fire protection engineer). Water service is anticipated to be similar to a residential unit to provide wash down and general housekeeping hose bibbs.

This site poses several risks during construction that could add significantly to the cost and time to construct the pump station. The site is also narrow and cannot be configured optimally to mitigate noise, which could be significant to the homeowners directly adjacent to the site.

B. Pump Station on Portion of Kuahiwi Contractors, Inc. Parcel TMK 9-5-008:048

The Kuahiwi Contractors site is private property and would require time to negotiate the subdivision or easement for the WWPS site and access roadway; however, similar to the County site, work in the State ROW can be limited to a single crossing of the highway. The anticipated size of the site is about 8000 to 9000 square feet. A proposed pump station layout and site are presented in **Figure 5**. A larger area may be needed if soil conditions require a larger area to mitigate on-site stormwater flows. This is smaller than the County parcel above but the dimensions can be optimized to provide the area needed for the facility. This site is located at the low point of the collection system, which would keep the sewers and pump station wet well at more typical depths. Locating the WWPS on a portion of the Kuahiwi Contractors site would allow sewerage of the Iglesia ni Cristo Church that requested connection but will place it at the farthest point from the WWTP, thus increasing the force main and sewer lengths required. An access road or driveway would also be needed to the site. A gravel drive would minimize the impervious surface area but can be susceptible to erosion during heavy rains.

The pump station would be placed close to the south property line, the low side of the parcel. The far south east or Hilo corner of the parcel is the lowest point where stormwater from this parcel and possibly some adjacent parcels collect before entering a drainage culvert under Mamalahoa

Highway. Anecdotal reports from residents indicate the highway floods at the storm drain during heavy or sustained rains. There is also a swale that appears to divert stormwater from cattle and horse pens on the site toward the far south east corner. It is recommended that the County not encroach into the far south east corner to maintain the current storm drainage pattern from the site. An aerial view of the area is shown in **Figure 6**. On-site stormwater can be contained by making the site large enough for impoundments and by using pervious pavement where possible depending on geotechnical investigation data. The only road area requiring hard surfacing is the area designated for re-fueling the generator. Grade adjustment walls are anticipated along the perimeter of the pump station site to raise the grade on the south side and lower the grade on the north side to even out the elevation of the site and minimize inflow of off-site storm water.

The site would be bordered on the south by residences unless the pump station is moved further interior of the parcel. If the pump station site is located against the south property line, the pump station could be as close as 80 feet from the house structures. Similar to the County parcel, the ambient noise from equipment could be a nuisance to the residents if not mitigated. This parcel would allow the County to obtain a more optimally configured site that would allow an additional motor control center (MCC) room that would not only mitigate noise issues from electrical switches, but also allow the valuable electrical equipment to be secured in a locked room. The MCC room can be integrated into the generator building. Noise from the odor control system could also be an issue, especially from the fan that would operate continuously. However, the site can be optimally sized to allow sound attenuating enclosures around the fan or around the entire odor control system. Therefore, a passive odor control system as discussed above for the County parcel site is probably not needed at this site.

Running electrical utility and communication lines would be more costly for this site since the closest pole would be on Ohai Road. HELCo would charge the County to run utility lines to their transformer near the pump station site. As an alternative, the HELCo transformer and meter can be placed within an easement near Ohai Road and the County would own the power lines going into the site. This option is mentioned in case HELCo prefers not to own the power lines going into the site or requires road improvements that would not be favorable to the County. This would require discussion with and approval by HELCo and would have to be analyzed further by an electrical engineer.

A potable water line would be required at the site for wash down and general housekeeping. In addition, a hydrant for fire protection would be needed. The potable water pipe in Naalehu appear to be 6-inch diameter. The new potable water line to the site would maintain the 6-inch size to maximize the water flow in case of fire or other emergency requiring water.

This site is preferred from an engineering standpoint because it is at the low side of the collection system and does not entail unknowns during construction such as breakage of existing utilities or need for septage pumping for unknown duration. It can also be optimally configured to mitigate noise and odors.

5 COLLECTION SYSTEM DESIGN

The town of Naalehu is divided by a concrete flood control canal into an east side (Hilo side) where the majority of the properties are residences, and a west side (Kona side) where the majority of the properties are commercial. The town is also divided in the Mauka (mountain) and Makai (ocean) directions by the Mamalahoa Highway. The collection system will convey the wastewater to the proposed WWTP that is located on the Makai-Kona side of Naalehu. The Naalehu collection system will be analyzed as two distinct systems, one serving the former Brewer house lots located on the Mauka-Hilo side to allow closure of the LCCs, and the gravity sewer located on the Kona side to transport the sewage to the proposed WWTP. An added benefit would be provision of sewer service to the two restaurants requesting connection. The church on the Hilo side that requested service falls outside of this area. The County has expressed a desire to accommodate their request; however, depending on the location of the WWPS, connection of the church may have to be deferred.

C. Former Brewer House Lots

The former Brewer house lots are located on the Mauka-Hilo side as shown in **Figure 7**. The houses are on a hillside with a slope of 8% to 9%, ranging in elevation from about 780 ft MSL to 645 ft MSL. The steep hillside results in houses located on the downhill side of the street being below the elevation of the street. Sewage from houses on the uphill side can flow easily by gravity to a sewer in the street. On the downhill side; however, the lateral serving the home is lower than a typical depth sewer (typically designed with 4 feet to 5 feet cover). Four options were investigated to address the low-lying properties; use of easements on private property, vacuum sewers, individual grinder pump stations at low-lying properties, and deep sewers to allow gravity flow from the low-lying properties.

i. Easements

The use of easements was eliminated as a viable option at this time. An initial investigation of the house lots along the backyard property lines where an easement would be most beneficial revealed extensive homeowner improvements. As part of sewer construction and easement terms, the improvements can be removed and the homeowners can be ordered to keep improvements off of the easements. However, over time it is likely that the homeowners' memory of the easement locations would fade and various improvements may be placed over the easement, hindering access by the County for repairs and maintenance.

ii. Vacuum Sewers

The use of vacuum sewers was also eliminated at this time. Vacuum sewers use a sealed sewer system that produces suction to move the wastewater from low or flat areas. Research into these types of systems revealed that it is not cost effective to sewer the uphill houses by gravity and the downhill houses by vacuum because of the need for a sealed piping system

for vacuum service. Serving some house by conventional gravity and some by vacuum would require two sewer collection systems in the County ROW.

The vacuum interface valve that would be located on each property requires frequent maintenance checks to ensure proper operation. These checks should be done by trained maintenance personnel but since these valves would be on private property, the responsibility would fall on the homeowner to hire trained personnel or obtain training on the system. Another drawback is that the vacuum interface valves typically fail open to minimize the chance of spills. A failed valve will therefore result in the County-owned vacuum pumping system to run constantly (normal operation would be intermittent to save energy). County maintenance personnel would not be able to readily find the faulty valve since they would not have right-of-entry onto the individual properties. Also, since there is no spill or “problem” with the sewer at the individual property with the faulty valve, there is no incentive to correct the problem in a timely manner. Remote telemetry can be added to the vacuum interface valves to monitor the valves via SCADA but these would also require periodic maintenance on private property and would add to the cost of the system for monitoring at every property.

iii. Individual Grinder Pump Stations

The original concept developed for Brewer before the company dissolved was to have individual grinder pump stations at the low-lying properties. This type of system consists of a small pump station at each downhill home. As the pump station fills with sewage, the high wastewater level starts a pump that evacuates the station and discharges into the gravity sewer system on the street. Houses on the uphill side of the street would discharge sewage by gravity into the collection system. The advantage of individual grinder pump stations is the ability to keep the collection system as shallow as possible.

Disadvantages of this system are the need to maintain the pumps and valves on private property and the energy used to pump the wastewater. Another disadvantage is the potential for spills when there are mechanical failures such as, power outages, pump breakdowns, level switch malfunctions, and clogs within the pump. Similar to the vacuum sewer system, the mechanically intensive nature of individual grinder pump stations requires trained maintenance personnel to perform regular checks on the system. However, since the system belongs to the homeowner, it is their responsibility to either hire a maintenance service or obtain the necessary training. Unlike the vacuum system, the pump stations are not “fail safe” and will result in sewage backup in the home or a spill on the homeowner’s property that would prompt them to seek corrective action. A rough life-cycle cost analysis of an individual grinder pump unit resulted in an annual cost burden of \$850 per house on the homeowners.

The subsurface conditions of the area at the depths required for the sewers is yet to be investigated. If the deep gravity sewers (see below) are not feasible due to unfavorable conditions; such as, lava tubes, then the sewers may have to be kept as shallow as possible. This option is feasible and will be kept in consideration in the event that subsurface

conditions require it, but is not the preferred option due to the disadvantages, especially the cost burden on the homeowners.

iv. Deep Gravity Sewers

The majority of the collection system sewer mains can be kept within the County or State ROW and fed by gravity if the pipes are deep below the low point of the low-lying parcels. Sewers constructed in the County of Hawaii must adhere to the *Wastewater System Design Standards of the City and County of Honolulu*, which requires review and approval for sewers deeper than 15 feet due to higher soil loading and potential difficulty when repairs are needed. A preliminary layout of a gravity sewer system, as shown in **Figure 7**, resulted in sewer depths of about 20 to 25 feet at the deepest point on the upper portions of Ohai Road and Nahele Street, and 15 to 18 feet at the deepest point on Lokelani Street and Kilika Street. These depths are based on running a lateral from the lowest point on a house lot up to the street. This was used as the basis because there are houses with sinks and outhouses at the back of the lot that are assumed to be connected to the existing collection system. The soil depth to rock in the area as reported by USGS and verified by past geotechnical investigations is 40 to 60 inches; therefore, excavation for the deep gravity sewers would be mainly in rock.

A sewer along the highway or easements would be needed to service the houses on the State highway between Kukui Road and Ohai Road. The depth, length and direction of flow for this sewer would depend on the location of a pump station. The depth of the sewer on Opukea Street depends on the location of a sewage pump station (see Section 4). As a worse case, the manhole fronting the County-owned parcel (TMK 9-5-024:011) on Opukea Street would have an invert about 30 feet deep if a pump station is constructed on that site due to the elevation of the house at the corner of Ohai Road and Mamalahoa Hwy (TMK 9-5-024:001), the lowest point of the former Brewer community. Although 30 feet is rather deep, it is not unheard of at the entrance to pump stations in Honolulu which are often 3 stories deep. At the Kuahiwi Contractors site (TMK 9-5-008:048) the ground elevation is about the same as the house at Ohai Road and Mamalahoa Hwy resulting in sewers that are at a more reasonable depth of about 15 feet.

This option is feasible and will be considered further. Despite the depth of the sewers in the County ROW, the advantage of not burdening the homeowners with the cost of maintaining the pumping system in Section 5-A-iii, above, makes this option preferred over the individual grinder pump option.

D. Gravity Sewer from Force Main to WWTP

The primary purpose of the sewer on the Kona side of Naalehu is to convey the wastewater from the Brewer house lots to the WWTP. A gravity sewer on Kaalaiki Road can be used to collect the wastewater discharged from a pump station servicing the housing area on the Hilo side of the

drainage canal at either the County parcel on Opukea Street or the Kuahiwi Contractors site. The force main can be run entirely Mauka of the highway, cross the drainage canal, and discharge into a manhole when it reaches Kaalaiki Road. An easement would be required from the drainage canal to the County road. There is an existing access and utility easement located on a parcel owned by La'i LLC (TMK 9-5-025:039) that goes from Kaalaiki Road to the canal. This would be the recommended method of conveying the sewage to the WWTP to keep construction in the State ROW to a minimum. The force main route is discussed further in the next section.

Two commercial properties requested connection to the new collection system. These were the Punaluu Bake Shop (TMK 9-5-025:037) and Hana Hou Restaurant (TMK 9-5-021:005). These properties can be connected to the collection system via the gravity sewer running down Kaalaiki Road, across the highway, and down Naalehu Spur Road to the WWTP site. There are potentially an additional eight properties that would be newly accessible along this sewer route depending on the disposition of Naalehu Spur Road, which is privately owned by Kuahiwi Contractors, Inc. If the road is dedicated to the County or an easement in favor of the County spans the entire road width, then both sides of Naalehu Spur Road would be newly accessible. If the sewer easement is only on one side of the road, assumed to be the Hilo side to allow connection of Hana Hou Restaurant (TMK 9-5-021:005), then only the Hilo-side properties would be newly accessible. The proposed Kona-side collection system is presented in **Figure 8**.

E. Force Main from Brewer House Lots to Gravity Sewer on Kona Side

A force main will be needed to convey the wastewater from the WWPS that serves the former Brewer house lots to the gravity sewer going to the WWTP on the Kona side. The force main can be kept out of the State ROW by running the pipe along easements and County roads. **Figure 8** shows the possible force main routes from the County parcel and the Kuahiwi Contractors sites. The approximate force main lengths from the County parcel and Kuahiwi Contractors parcel are 1300 LF and 2800 LF, respectively.

Both WWPS options will require crossing the concrete drainage canal that divides the Kona side of Naalehu from the Hilo side. The force main can go either above the canal on a support structure, or under the canal. There is an existing pedestrian bridge crossing the canal that can be reconstructed and used to support the new force main; however, the County DEM is not in favor of this option due to the possibility of the structure impeding flow through the canal and ownership of the bridge structure being a burden on DEM personnel who are not set up for bridge inspection and maintenance duties. Routing the force main under the canal can be done by either cutting the concrete canal structure and laying the pipe in an open trench or tunneling under the canal. Cutting the structure poses some risk should a rain storm occur while the trench is open or repaired concrete is curing. Tunneling would be costly due to the depth and equipment needed to micro-tunnel or the shoring required to excavate under the structure. Further discussions with a geotechnical engineer will be needed to determine the best method to cross the canal while

limiting risk during construction. For planning purposes, it will be assumed that the canal crossing will be approximately 100 LF using micro-tunneling as a worse case.

6 COLLECTION SYSTEM COSTS AND RECOMMENDATIONS

Planning level capital costs were developed for the collection system options developed above. The costs are presented in Table 2. Basis for the costs are presented in Table 3. Cost basis numbers are from recent past project construction and bid costs inflated to the current year.

Table 2: Collection System Costs

Deep Gravity Sewer at House Lots	\$12 million
Individual Grinder Pumps at House Lots	\$9 million
WWPS at County Parcel	\$7.1 million + \$1.3 million FM = \$8.4 million
WWPS at Kuahiwi Contractors	\$4.9 million + \$2.8 million FM = \$7.7 million
Canal Crossing (Tunneled)	\$0.7 million
Gravity Sewer from FM to Proposed WWTP	\$3.3 million

Table 3: Cost Basis

	Unit Cost
Deep WWPS at County Parcel	\$7.1 million
Typical WWPS at Kuahiwi Contractors Parcel	\$4.9 million
Gravity Sewers	\$1100/LF
Deep Gravity Sewers in Rock	\$1600/LF
Deep Sewers (Tunneled)	\$7000/LF
Sewer Force Mains (not including tunneled section under canal)	\$1000/LF

Note: Cost of individual grinder pump system based on design cost estimate of \$5.6 million prepared in 2012 inflated to 2020 at 6% average inflation ($\$5.6\text{m} \times 1.06^{(2020-2012)} = \9 million)

The overall recommendation for the collection system is to use deep gravity sewers for the former Brewer housing area. Two backyard easements would be used to connect four properties to the collection system. These easements have already been surveyed and are located on the south side of TMK 9-5-024:009 and TMK 9-5-024:010. These easements would expedite implementation by avoiding the need for a sewer in the State ROW to serve three of the properties. Two commercial properties requested connection to the new collection system. These were the Punaluu Bake Shop (TMK 9-5-025:037) and Hana Hou Restaurant (TMK 9-5-021:005). These properties can be connected to the collection system via a gravity sewer running down Kaalaiki Road, across the highway, and down Naalehu Spur Road. There are up to an additional fifteen properties that would be newly accessible along this sewer route. The newly accessible house lots along with the newly accessible properties along the sewer to serve the commercial lots brings the total newly accessible properties to 39, exceeding the number identified in the Consent Order. If the WWPS is located on the County parcel, the overall estimated cost of the system would be \$24.4 million. If the the WWPS

is located on the Kuahiwi Contractors site, overall estimated cost would be \$23.7 million. The recommended collection system options are presented in **Figure 9 and 10**.

If using deep sewers in the former Brewer house lots is not feasible due to subsurface conditions, the estimated cost of the collection system would be \$21.4 million if the WWPS is on the County parcel, and \$20.7 million if the WWPS is on the Kuahiwi Contractors site. However, there would be added cost for the homeowners with parcels below the road of approximately \$850 per year per house to maintain the pumps. A summary of the overall costs is presented in Table 4.

Table 4: Overall Planning Level Cost Estimates

	Deep Gravity Sewers	Individual Pumps
County WWPS at County Parcel	\$24.4 million	\$21.4 million
County WWPS at Kuahiwi Contractors Site	\$23.7 million	\$20.7 million

7 COLLECTION SYSTEM PHASING

The collection system can be constructed in phases to expedite the closure of the LCCs. As a minimum, the collection system would have to intercept the existing sewers entering the LCCs and convey the sewage to a pump station. To minimize the need for temporary facilities that would be removed when the collection system is completed in a second phase, it would be beneficial to construct the permanent WWPS as part of Phase 1. Phase 1 would therefore consist of the following:

- a. Construct Gravity Sewer on Kaalaiki Road and Naalehu Spur Road to the WWTP
- b. Construct the WWPS and force main
- c. Construct the gravity sewer on Opukea Street and Ohai Road to intercept existing sewers and connect to the WWPS

The sewer system for the proposed Phase 1 is presented in **Figures 11 and 12**. Sub-phases “a” and “b” can be done concurrently; however, intercepting the existing sewer system should be done at the end of Phase 1. This is so that if there are issues encountered when constructing the sewers, the main WWPS and means of conveying the flow to the WWTP will be in place so that bypass pumping to the WWPS can be used if needed. If the main WWPS and conveyance sewers to the WWTP were not in place, the contractor would have a more difficult time with bypass pumping to the WWTP or would have to truck sewage if a problem occurs. The new WWPS would be close enough to allow temporary piping to be routed from the problem area into the wet well.

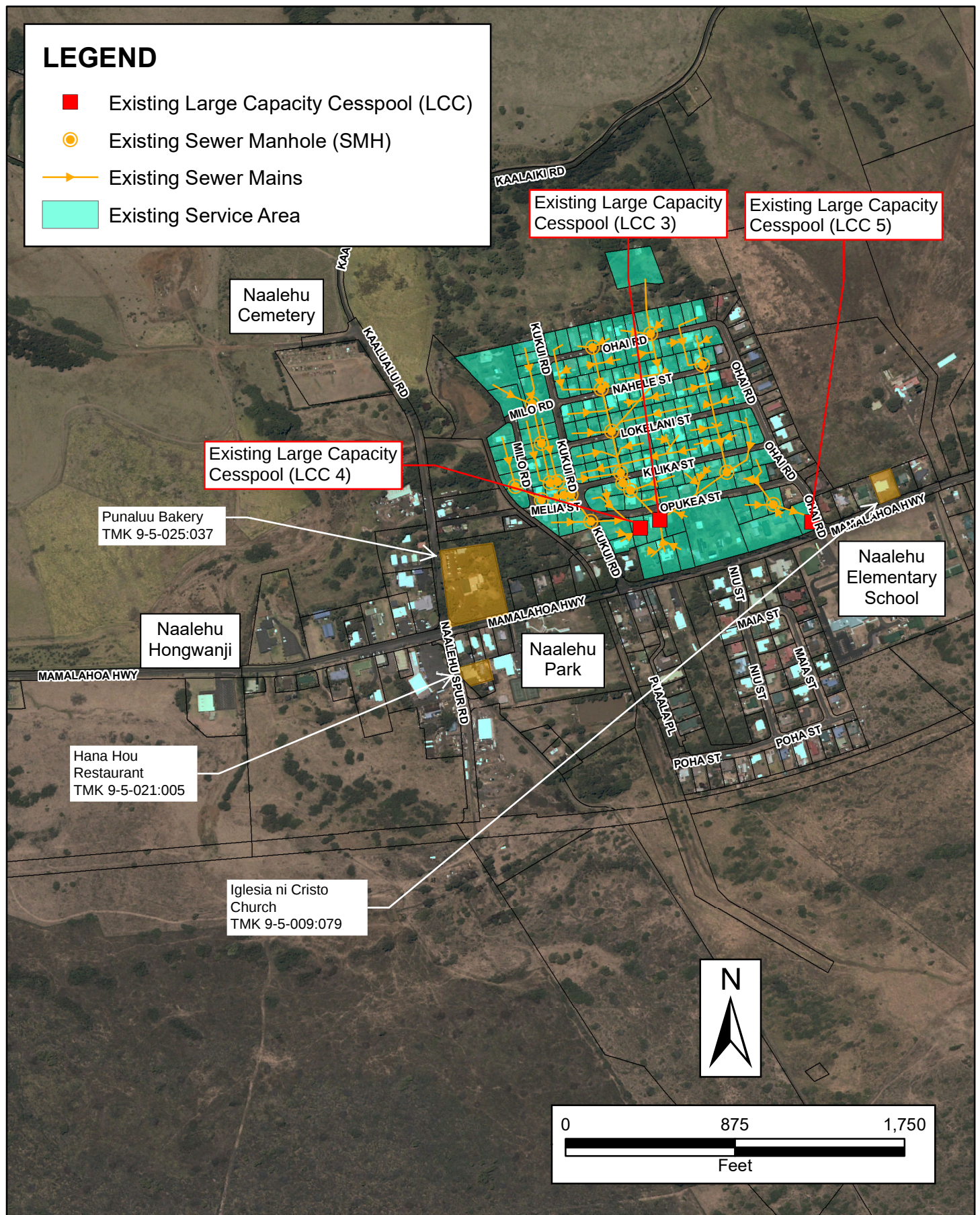
The cost to implement Phase 1 would be about \$15.3 million with the WWPS on the County parcel, and about \$15.1 million with the WWPS on the Kuahiwi Contractors site (not including land acquisition costs). A phased cost summary is presented in Table 5.

Table 5: Phased Cost Summary

	Deep Gravity Sewers		Individual Pumps	
	County Parcel	Kuahiwi Parcel	County Parcel	Kuahiwi Parcel
Phase 1	\$15.3 million	\$15.1 million	\$12.3 million	\$12.1 million
Phase 2	\$9.1 million	\$8.6 million	\$6.1 million	\$5.6 million
Total	\$24.4 million	\$23.7 million	\$18.4 million	\$17.7 million

LEGEND

- Existing Large Capacity Cesspool (LCC)
- Existing Sewer Manhole (SMH)
- Existing Sewer Mains
- Existing Service Area



From:

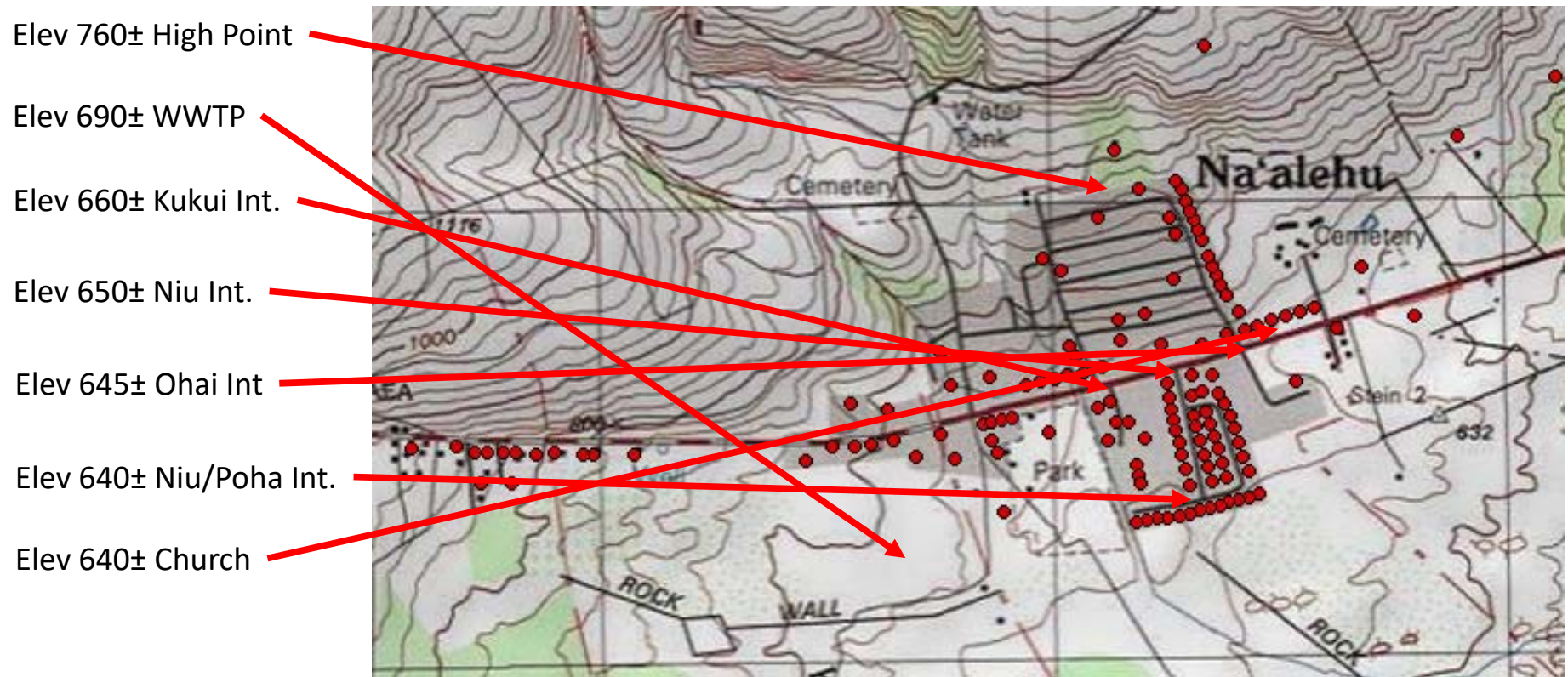


SCALE AS SHOWN
JOB NO.: 151494

NAALEHU WASTEWATER TREATMENT PLANT
Existing Naalehu Wastewater System

FIGURE
1

Figure 2: Naalehu Topography



Source: Onsite Sewage Disposal Systems - Hawaii [arcgis rest services Infrastructure MapServer 26]



Figure 3: Possible WWPS Locations

KUAAHIWI CONTRACTORS SITE
Approx size = 8,250 sf (110 ft x 75 ft)

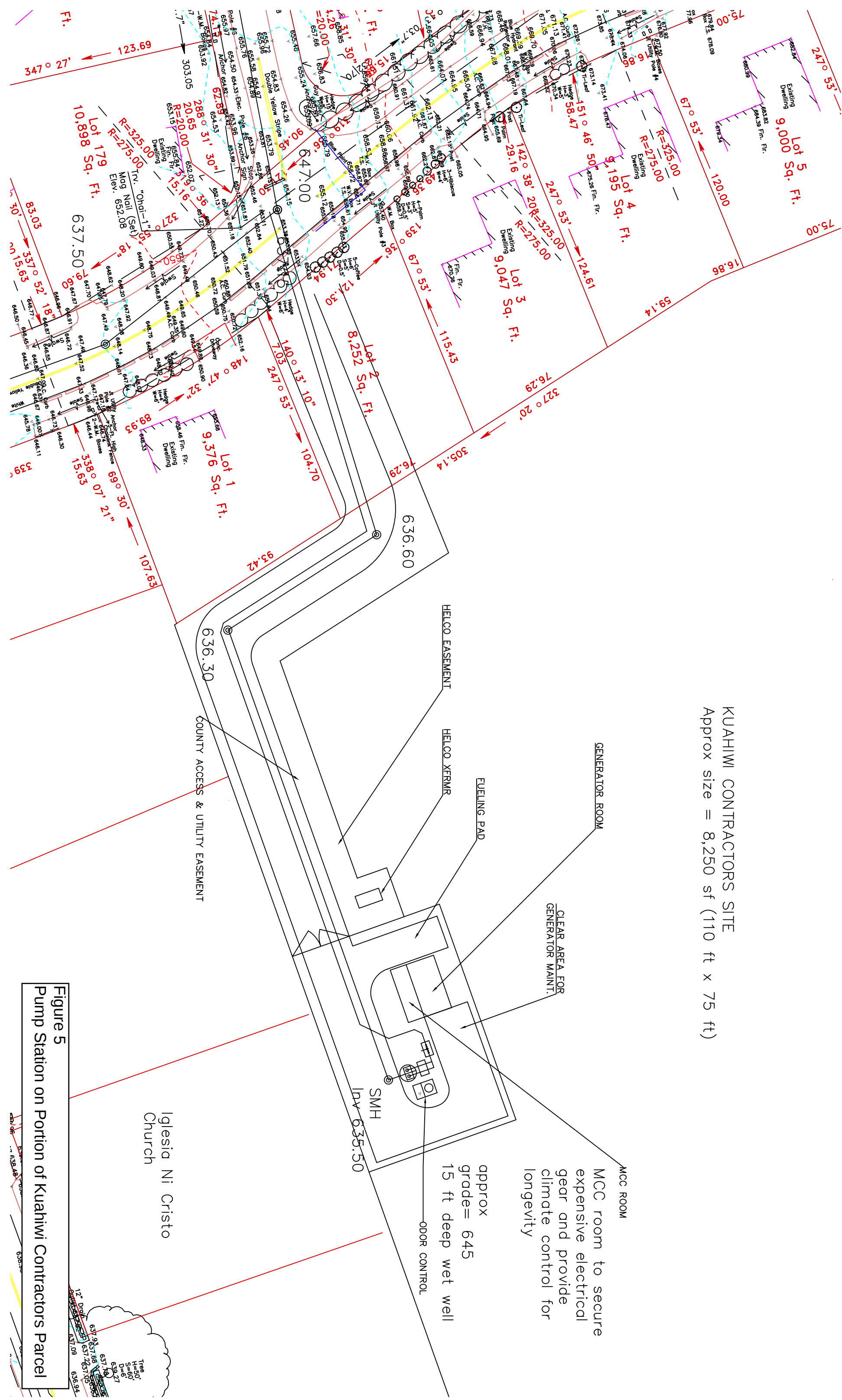


Figure 5
Pump Station on Portion of Kuahiwi Contractors Parcel

Figure 6
Kuahiwi Contractors Site

Legend

Proposed
WWPS site

Appears to be a
swale

Box culvert under
hwy (approx 4'x4')

Anecdotal reports
of flooding over
hwy at culvert

Google Earth

300 ft

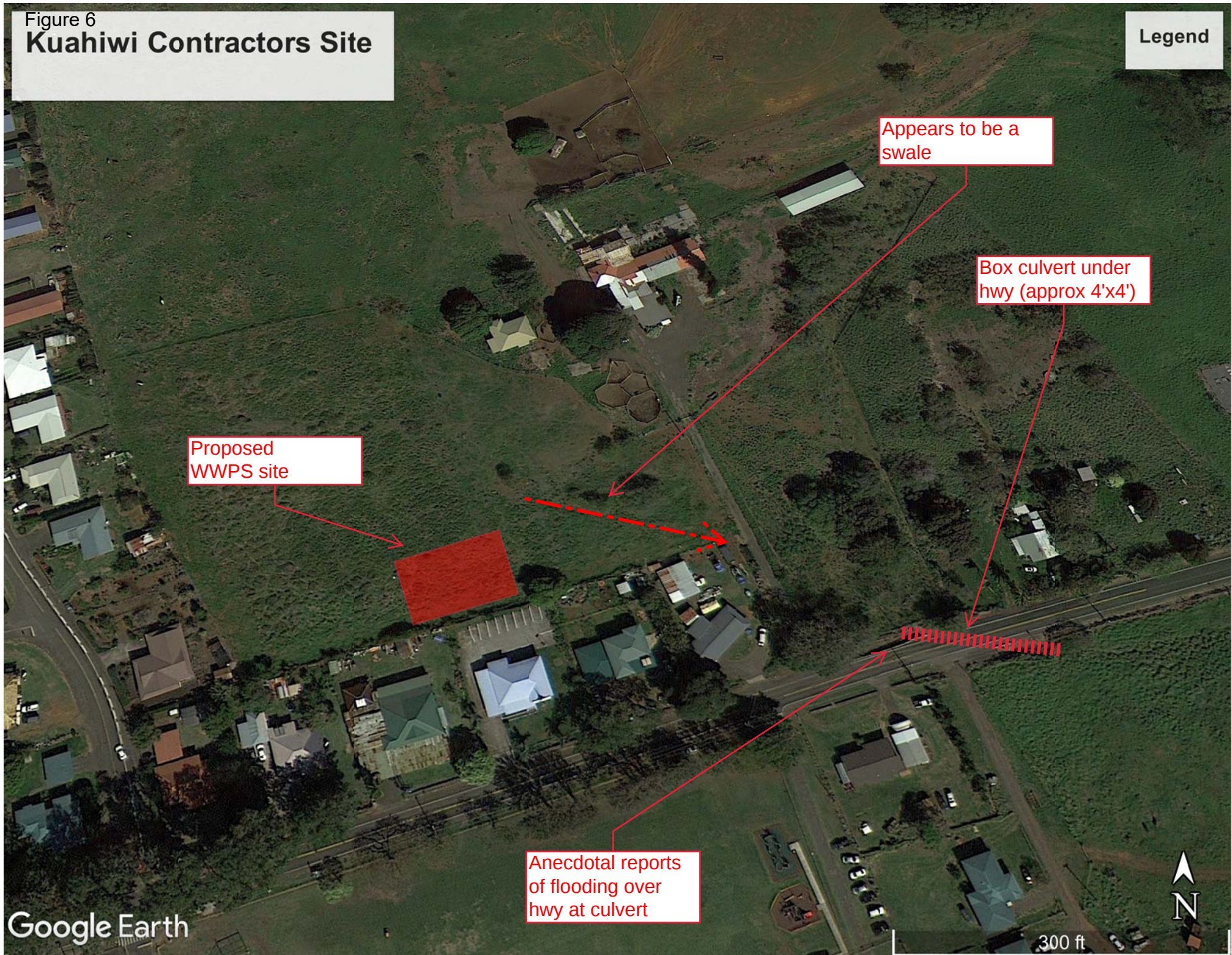


Figure 7: Former Brewer House Lots Collection System

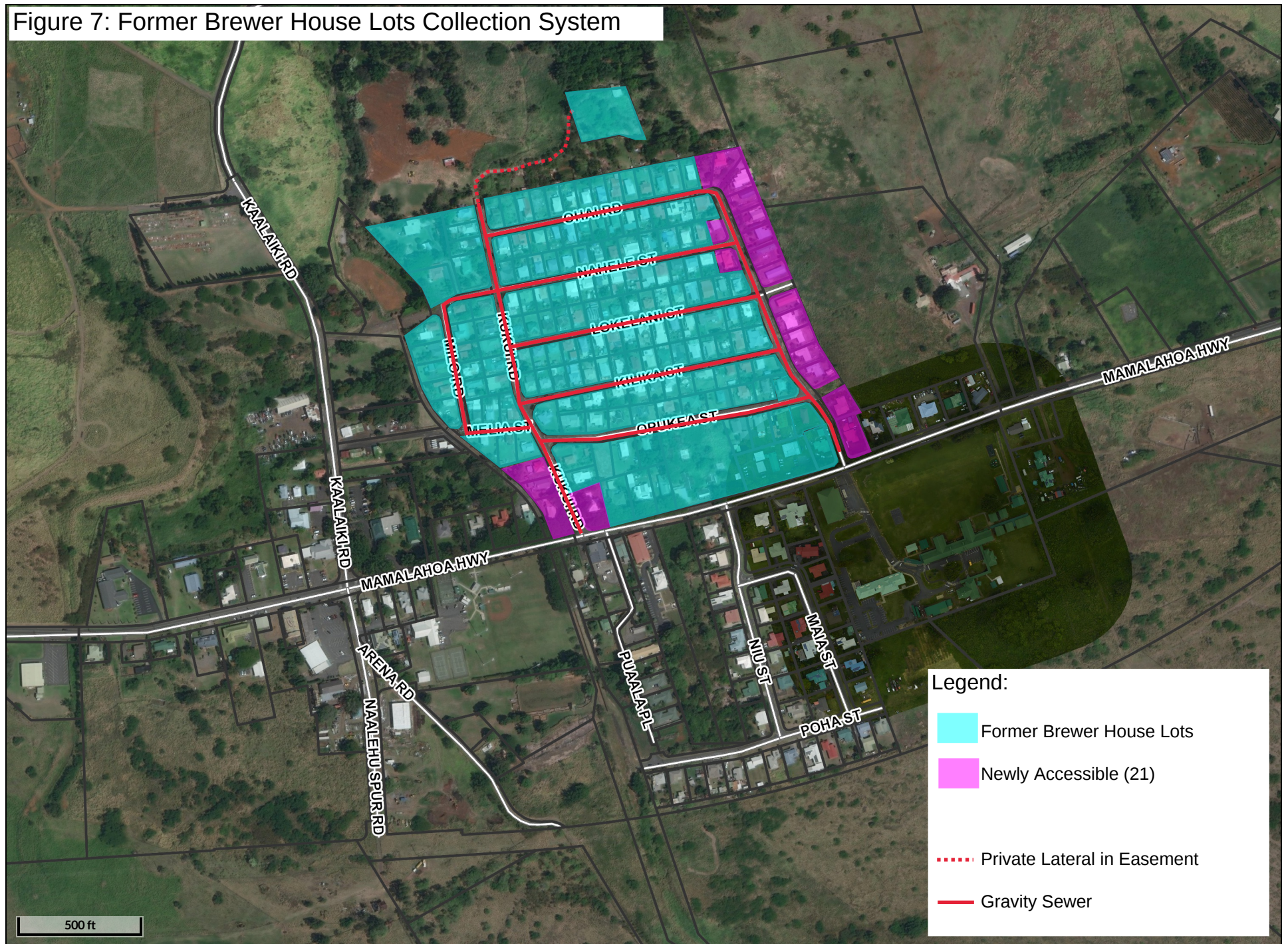
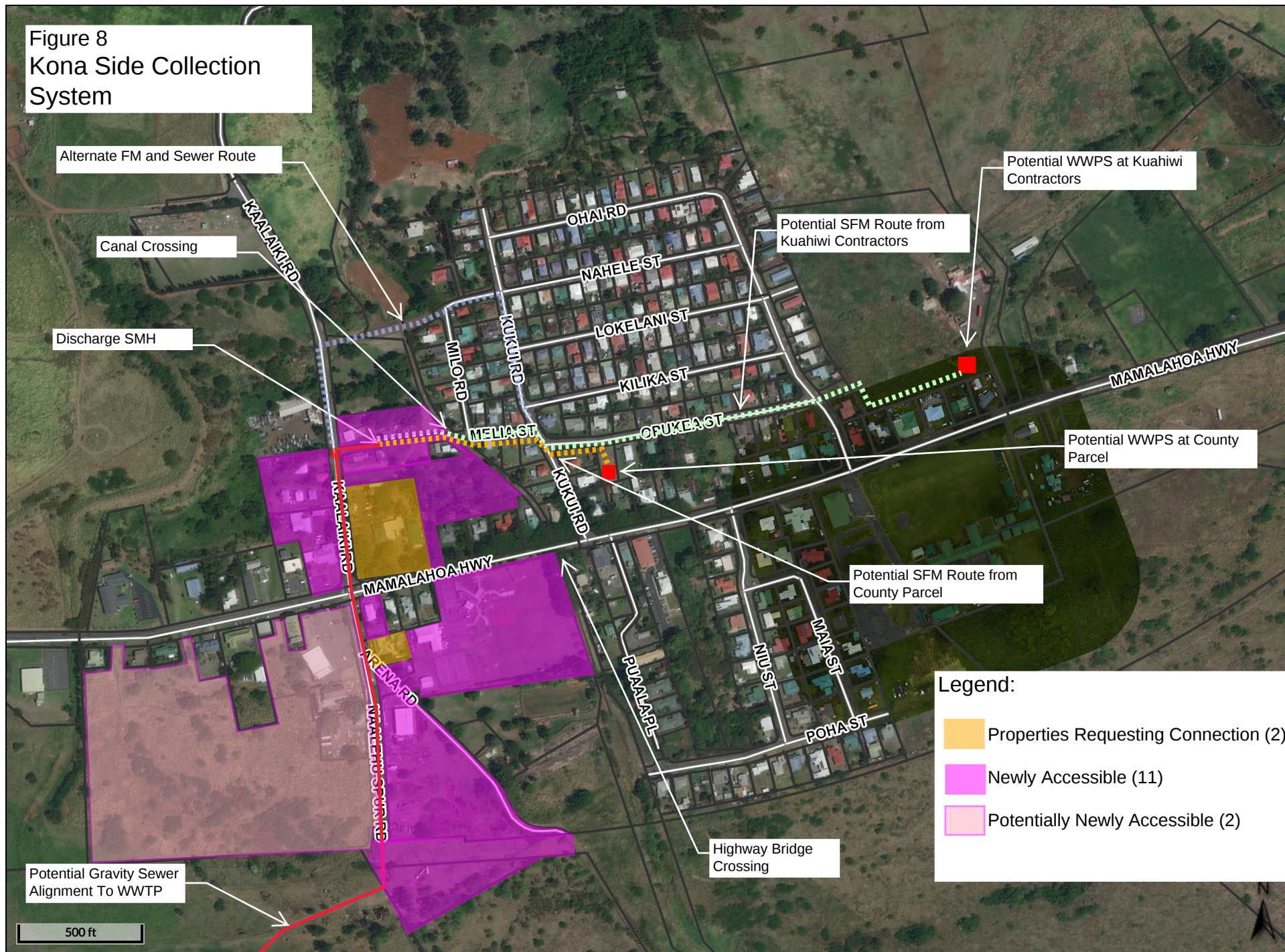


Figure 8
Kona Side Collection
System



**SFM Channel Crossing at Melia St
Sewer Easement on Hilo Side of Naalehu Spur Rd**

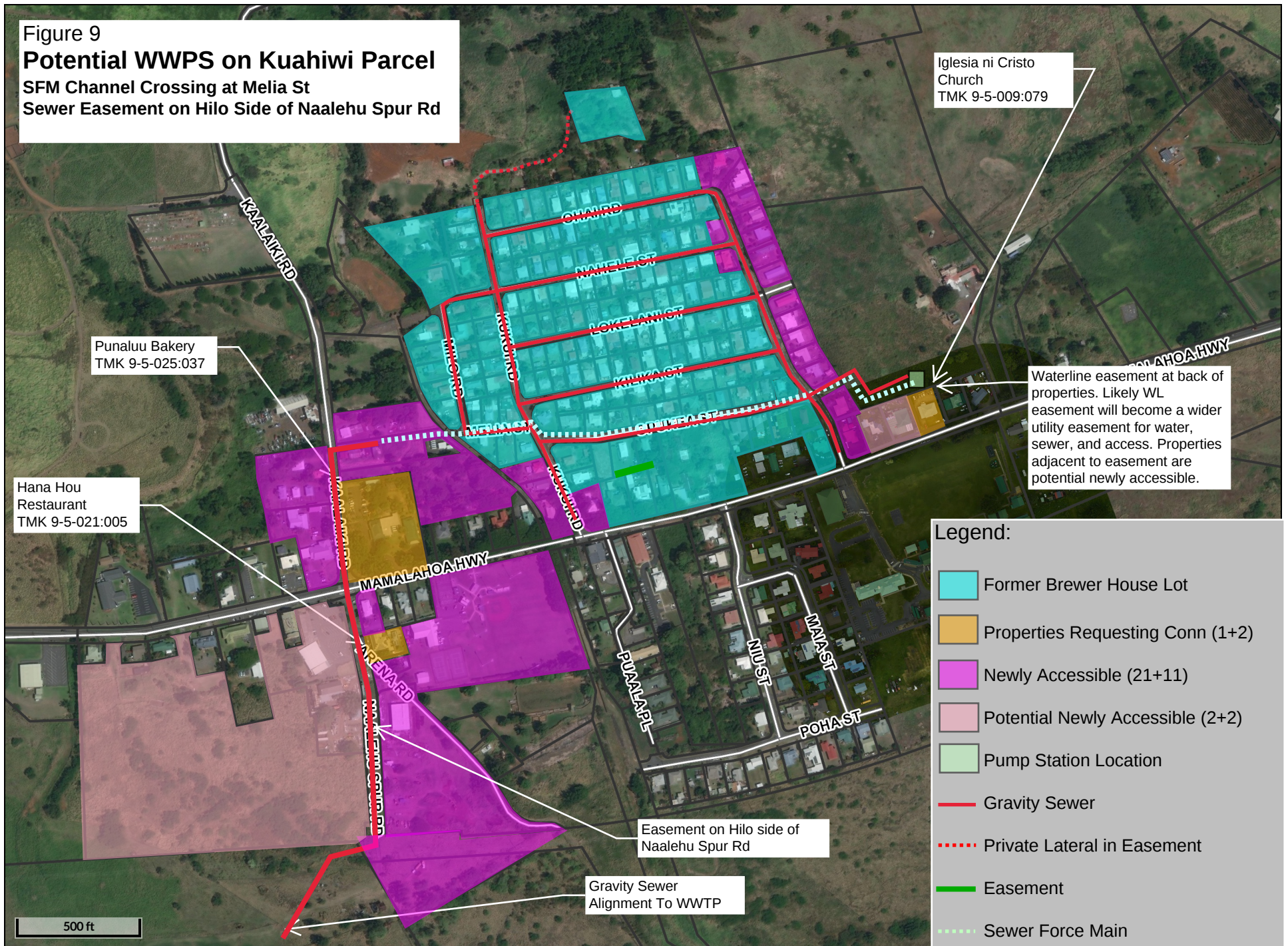
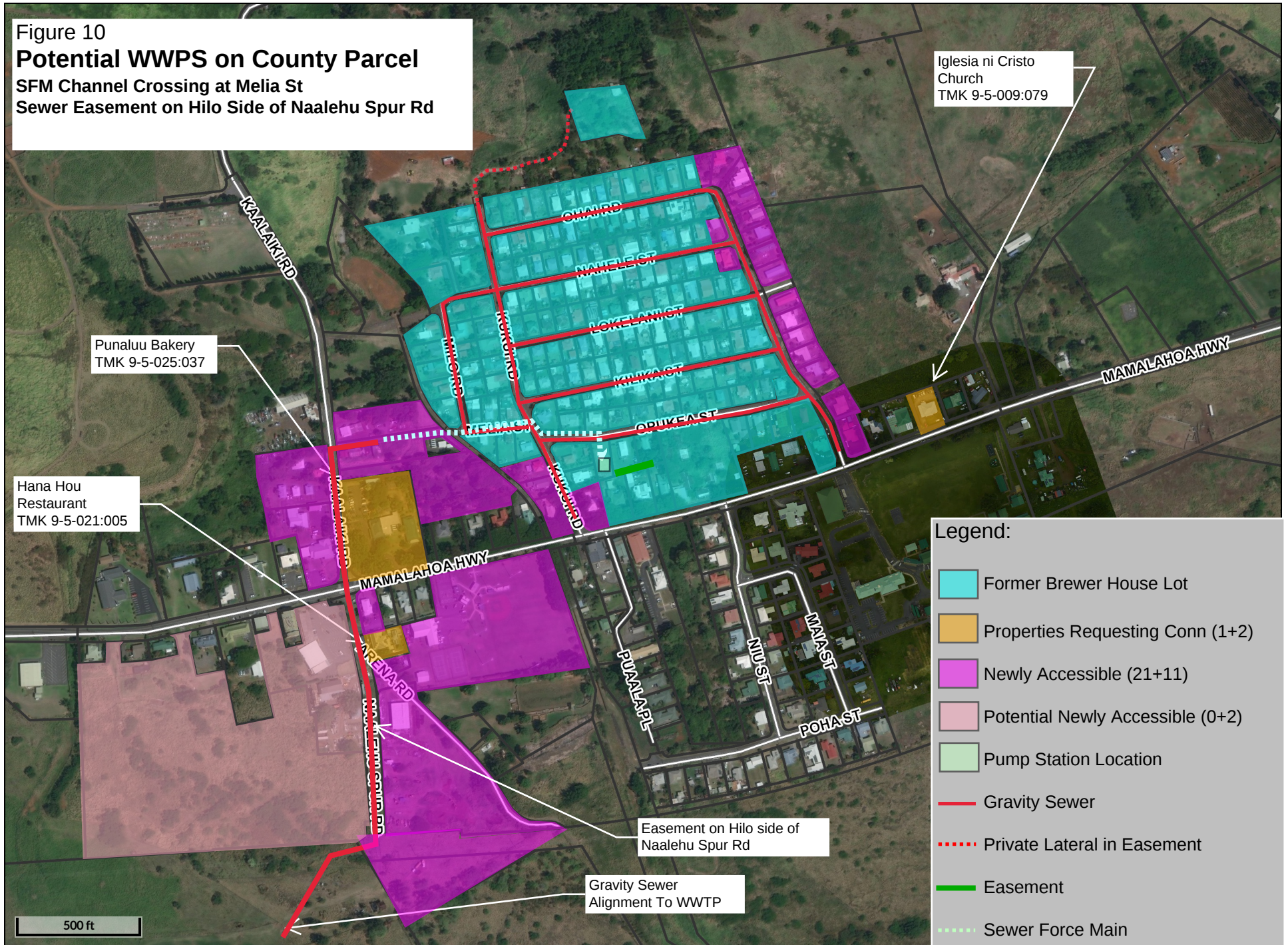


Figure 10

Potential WWPS on County Parcel

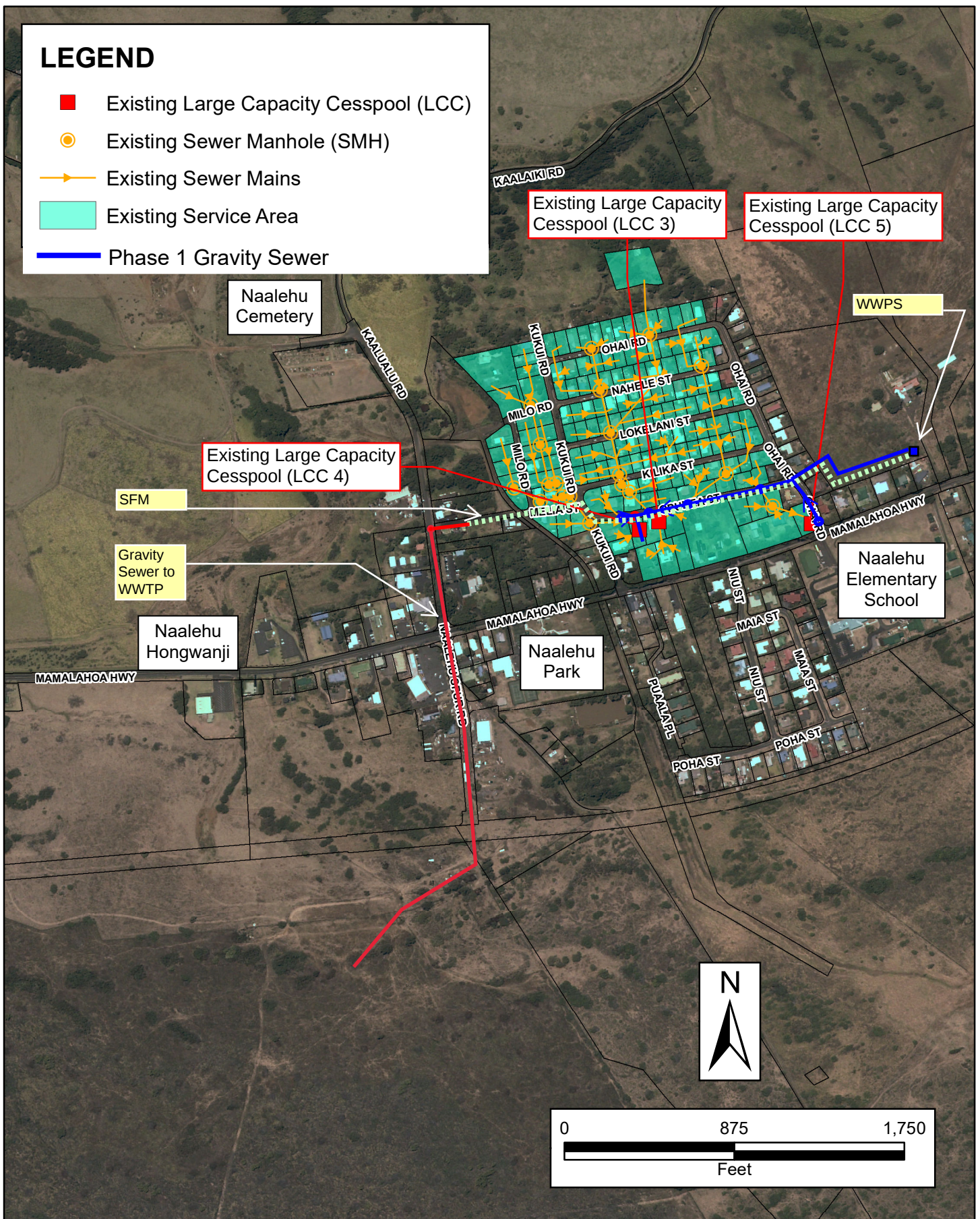
SFM Channel Crossing at Melia St

Sewer Easement on Hilo Side of Naalehu Spur Rd



LEGEND

- Existing Large Capacity Cesspool (LCC)
- Existing Sewer Manhole (SMH)
- Existing Sewer Mains
- Existing Service Area
- Phase 1 Gravity Sewer



From:

**Brown AND
Caldwell**

SCALE AS SHOWN

JOB NO.: 151494

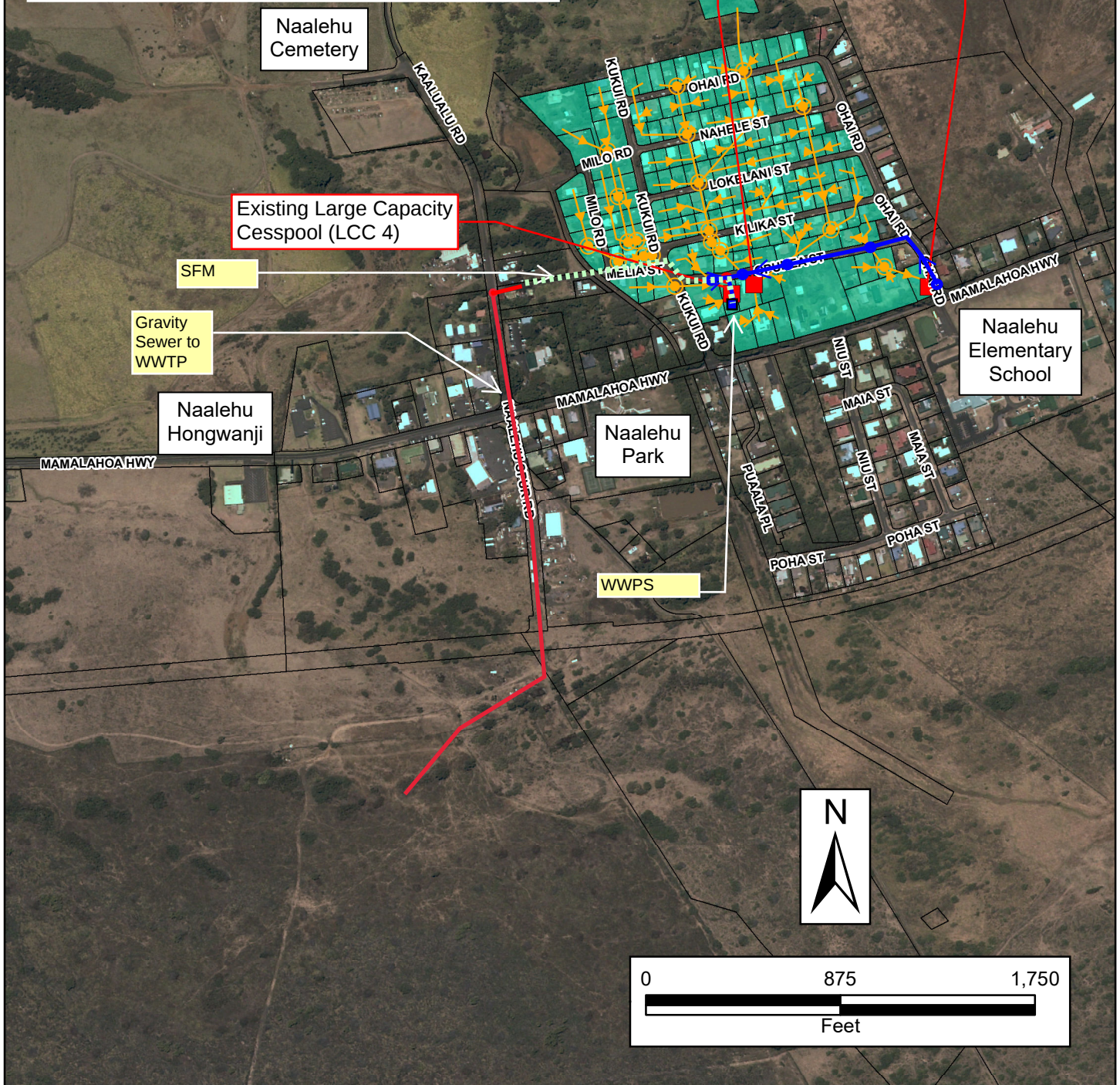
Proposed Phase 1
WWPS at Kuahiwi Contractors Site

FIGURE

11

LEGEND

-  Existing Large Capacity Cesspool (LCC)
-  Existing Sewer Manhole (SMH)
-  Existing Sewer Mains
-  Existing Service Area
-  Phase 1 Gravity Sewer



Appendix

Pump Station Cost Estimates

Pump Station Option Summary Table

County Parcel Vertical Shaft Machine	\$	7,700,000	*
County Parcel Dig and Shore	\$	7,100,000	
Kuahiwi Site Minimum VSM	\$	6,100,000	* #
Kuahiwi Site Minimum Dig and Shore	\$	4,900,000	#
Kuahiwi Site Large, Dig and Shore	\$	5,600,000	#

Notes:

* Includes full cost of mobilizing VSM to Hawaii. If VSM is used for any other purposes (e.g., trenchless pipe installation, deep SMHs etc.) then mobilization cost will get distributed,

Does not include cost of stormwater control that may be required due to flooding issues at SE corner of site

County Parcel

Vertical Shaft Machine (Herrenknecht VSM 8000 at 4.5 m diameter)

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				\$ 800,000.00	\$ 800,000
Clearing and grubbing	10,000	sf		\$ 8.00	\$ 3.00	\$ 11.00	\$ 110,000
Machine setup	1	LS				\$ 60,000.00	\$ 60,000
Wet well shaft	35	ft	\$ 15,000.00	\$ 12,000.00	\$ 3,000.00	\$ 30,000.00	\$ 1,050,000
Haul Spoils	230	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 4,830
Septage pumping (keep LCC low)	2	mo	\$ 6,000.00	\$ 4,800.00	\$ 1,500.00	\$ 12,300.00	\$ 24,600
Septage hauling	2	mo		\$ 14,400.00	\$ 3,000.00	\$ 17,400.00	\$ 34,800
Concrete mat foundation	20	cy	\$ 750.00	\$ 225.00	\$ 12.00	\$ 987.00	\$ 19,740
Wet well structure; 8' dia, 9" wall	31	ft	\$ 500.00	\$ 100.00	\$ 250.00	\$ 850.00	\$ 26,350
Wet well base	1	ea	\$ 1,750.00	\$ 800.00	\$ 300.00	\$ 2,850.00	\$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	\$ 950.00	\$ 450.00	\$ 85.00	\$ 1,485.00	\$ 5,940
Wet well hatch, ss and aluminum	1	ea	\$ 2,300.00	\$ 500.00	\$ 90.00	\$ 2,890.00	\$ 2,890
Wet well interior coating	1000	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 115,000
Wet well exterior moisture prot	1045	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 25,080
Engineered backfill	140	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ 15,260
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	\$ 3,000.00	\$ 1,800.00	\$ 180.00	\$ 4,980.00	\$ 9,960
Disch elbows and guides	2	ea	\$ 1,500.00	\$ 1,200.00	\$ 180.00	\$ 2,880.00	\$ 5,760
Valve vault structure	1	ea	\$ 925.00	\$ 250.00	\$ 180.00	\$ 1,355.00	\$ 1,355
Emergency pump conn vault	1	ea	\$ 925.00	\$ 250.00	\$ 180.00	\$ 1,355.00	\$ 1,355
Gate Valve, 6"	5	ea	\$ 910.00	\$ 175.00	\$ 85.00	\$ 1,170.00	\$ 5,850
Check valve, 6"	2	ea	\$ 1,050.00	\$ 175.00	\$ 85.00	\$ 1,310.00	\$ 2,620
Quick connect hose coupling	1	ea	\$ 400.00	\$ 100.00	\$ 85.00	\$ 585.00	\$ 585
90 bend, FExFE, 6"	3	ea	\$ 1,005.00	\$ 150.00	\$ 85.00	\$ 1,240.00	\$ 3,720
Tee, FExFE, 6"	1	ea	\$ 1,250.00	\$ 225.00	\$ 85.00	\$ 1,560.00	\$ 1,560
45 bend, MJ, 6"	4	ea	\$ 935.00	\$ 150.00	\$ 85.00	\$ 1,170.00	\$ 4,680
Wye, MJ, 6"	2	ea	\$ 1,270.00	\$ 225.00	\$ 85.00	\$ 1,580.00	\$ 3,160
Plug, MJ, 6"	1	ea	\$ 685.00	\$ 75.00	\$ 85.00	\$ 845.00	\$ 845
DI pipe, FE, 6"	80	LF	\$ 185.00	\$ 25.00	\$ 15.00	\$ 225.00	\$ 18,000

DI pipe, MJ, 6"	150	LF	\$ 180.00	\$ 25.00	\$ 15.00	\$ 220.00	\$ 33,000
Sewer trench excavation, soft	270	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ 8,640
Sewer trench excavation, rock	110	cy		\$ 175.00	\$ 35.00	\$ 210.00	\$ 23,100
Haul Spoils	380	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 7,980
Trench Shoring, 0-10 ft	2200	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ 22,000
Trench Shoring 10-20 ft	2200	sf	\$ 2.50	\$ 7.00	\$ 3.00	\$ 12.50	\$ 27,500
Trench Shoring 20-27 ft, rock	1540	sf	\$ 3.50	\$ 9.00	\$ 5.00	\$ 17.50	\$ 26,950
Septage pumping (keep LCC low)	1.5	mo	\$ 6,000.00	\$ 4,800.00	\$ 1,500.00	\$ 12,300.00	\$ 18,450
Septage hauling	1.5	mo		\$ 14,400.00	\$ 3,000.00	\$ 17,400.00	\$ 26,100
Influent sewer, 14" DI, lined	110	LF	\$ 260.00	\$ 45.00	\$ 25.00	\$ 330.00	\$ 36,300
Reinf conc jkt	6.3	cy	\$ 950.00	\$ 350.00	\$ 55.00	\$ 1,355.00	\$ 8,537
CLSM Backfill	285	cy	\$ 300.00	\$ 5.00	\$ 10.00	\$ 315.00	\$ 89,775
Backfill	41	cy	\$ 20.00	\$ 42.00	\$ 10.00	\$ 72.00	\$ 2,952
Deep manhole (27 ft)	1	ea	\$ 7,500.00	\$ 3,300.00	\$ 1,500.00	\$ 12,300.00	\$ 12,300
Manhole interior coating	355	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 40,825
SMH exterior moisture protection	410	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 9,840
Odor control unit	1	ea	\$ 7,150.00	\$ 6,000.00	\$ 400.00	\$ 13,550.00	\$ 13,550
Generator Bldg	320	sf	\$ 250.00	\$ 265.00	\$ 10.00	\$ 525.00	\$ 168,000
Roofing membrane	5.8	sq	\$ 3,000.00	\$ 2,000.00	\$ 170.00	\$ 5,170.00	\$ 29,986
Block sealant and paint	700	sf	\$ 11.00	\$ 10.00	\$ 4.00	\$ 25.00	\$ 17,500
Acoustic insulation	700	sf	\$ 90.00	\$ 20.00	\$ 5.00	\$ 115.00	\$ 80,500
Acoustic louvers	144	sf	\$ 245.00	\$ 50.00	\$ 60.00	\$ 355.00	\$ 51,120
Generator w/base mounted tank	1	ea	\$ 127,000.00	\$ 35,000.00	\$ 800.00	\$ 162,800.00	\$ 162,800
Conc inertia pad for generator	6	cy	\$ 950.00	\$ 450.00	\$ 85.00	\$ 1,485.00	\$ 8,910
Conc fueling pad	3.5	cy	\$ 750.00	\$ 225.00	\$ 12.00	\$ 987.00	\$ 3,455
Pervious pavement road	5000	sf	\$ 50.00	\$ 30.00	\$ 9.00	\$ 89.00	\$ 445,000
3' Grade adjustment wall	360	LF	\$ 625.00	\$ 475.00	\$ 5.00	\$ 1,105.00	\$ 397,800
Fence	426	LF	\$ 45.00	\$ 35.00	\$ 5.00	\$ 85.00	\$ 36,210
Gate	1	ea	\$ 950.00	\$ 500.00	\$ 30.00	\$ 1,480.00	\$ 1,480
2" water service	120	LF	\$ 75.00	\$ 9.00	\$ 2.00	\$ 86.00	\$ 10,320
2" water meter box	1	ea	\$ 250.00	\$ 200.00	\$ 15.00	\$ 465.00	\$ 465
Water meter	1	LS				\$ 1,500.00	\$ 1,500

General civil site work	10000	sf				\$ 20.00	\$ 200,000
HELCO xfrmr and fees	1	LS				\$ 125,000.00	\$ 125,000
SCADA and security system	1	LS				\$ 95,000.00	\$ 95,000
Electrical, incl instrumentation	1	LS				\$ 377,310.60	\$ 377,311
Adder for deeper sewers	2000	lf	\$ 105.00	\$ 235.00	\$ 125.00	\$ 465.00	\$ 930,000

SUBTOTAL	\$ 5,906,945
CONTINGENCY (30%)	\$ 1,772,083
TOTAL	\$ 7,679,028

County Parcel
Conventional Dig and Shore

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				\$ -	\$ -
Clearing and grubbing	10,000	sf		\$ 8.00	\$ 3.00	\$ 11.00	\$ 110,000
Mud walls for water control	75	cy	\$ 600.00	\$ 200.00	\$ 200.00	\$ 1,000.00	\$ 75,000
Excavation soft material	296	cy		\$ 164.71	\$ 85.00	\$ 249.71	\$ 73,914
Excavation rock	80	cy		\$ 500.00	\$ 175.00	\$ 675.00	\$ 54,000
Haul Spoils	376	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 7,896
Septage pumping (keep LCC low)	4	mo	\$ 6,000.00	\$ 4,800.00	\$ 1,500.00	\$ 12,300.00	\$ 49,200
Septage hauling	4	mo		\$ 14,400.00	\$ 3,000.00	\$ 17,400.00	\$ 69,600
Shoring, 0-10 ft	800	sf	\$ 45.00	\$ 200.00	\$ 120.00	\$ 365.00	\$ 292,000
Shoring 10-20 ft	640	sf	\$ 65.00	\$ 320.00	\$ 200.00	\$ 585.00	\$ 374,400
Shoring 20-35 ft, rock	720	sf	\$ 160.00	\$ 320.00	\$ 225.00	\$ 705.00	\$ 507,600
Concrete mat foundation	20	cy	\$ 750.00	\$ 225.00	\$ 12.00	\$ 987.00	\$ 19,740
Wet well structure; 8' dia, 9" wall	31	ft	\$ 500.00	\$ 100.00	\$ 250.00	\$ 850.00	\$ 26,350
Wet well base	1	ea	\$ 1,750.00	\$ 800.00	\$ 300.00	\$ 2,850.00	\$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	\$ 950.00	\$ 450.00	\$ 85.00	\$ 1,485.00	\$ 5,940
Wet well hatch, ss and aluminum	1	ea	\$ 2,300.00	\$ 500.00	\$ 90.00	\$ 2,890.00	\$ 2,890
Wet well interior coating	1000	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 115,000
Wet well exterior moisture prot	1045	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 25,080
Engineered backfill	295	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ 32,155
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	\$ 3,000.00	\$ 1,800.00	\$ 180.00	\$ 4,980.00	\$ 9,960
Disch elbows and guides	2	ea	\$ 1,500.00	\$ 1,200.00	\$ 180.00	\$ 2,880.00	\$ 5,760
Valve vault structure	1	ea	\$ 925.00	\$ 250.00	\$ 180.00	\$ 1,355.00	\$ 1,355
Emergency pump conn vault	1	ea	\$ 925.00	\$ 250.00	\$ 180.00	\$ 1,355.00	\$ 1,355
Gate Valve, 6"	5	ea	\$ 910.00	\$ 175.00	\$ 85.00	\$ 1,170.00	\$ 5,850
Check valve, 6"	2	ea	\$ 1,050.00	\$ 175.00	\$ 85.00	\$ 1,310.00	\$ 2,620
Quick connect hose coupling	1	ea	\$ 400.00	\$ 100.00	\$ 85.00	\$ 585.00	\$ 585
90 bend, FExFE, 6"	3	ea	\$ 1,005.00	\$ 150.00	\$ 85.00	\$ 1,240.00	\$ 3,720
Tee, FExFE, 6"	1	ea	\$ 1,250.00	\$ 225.00	\$ 85.00	\$ 1,560.00	\$ 1,560

45 bend, MJ, 6"	4	ea	\$ 935.00	\$ 150.00	\$ 85.00	\$ 1,170.00	\$ 4,680
Wye, MJ, 6"	2	ea	\$ 1,270.00	\$ 225.00	\$ 85.00	\$ 1,580.00	\$ 3,160
Plug, MJ, 6"	1	ea	\$ 685.00	\$ 75.00	\$ 85.00	\$ 845.00	\$ 845
DI pipe, FE, 6"	80	LF	\$ 185.00	\$ 25.00	\$ 15.00	\$ 225.00	\$ 18,000
DI pipe, MJ, 6"	150	LF	\$ 180.00	\$ 25.00	\$ 15.00	\$ 220.00	\$ 33,000
Sewer trench excavation, soft	270	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ 8,640
Sewer trench excavation, rock	110	cy		\$ 175.00	\$ 35.00	\$ 210.00	\$ 23,100
Haul Spoils	380	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 7,980
Trench Shoring, 0-10 ft	2200	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ 22,000
Trench Shoring 10-20 ft	2200	sf	\$ 2.50	\$ 7.00	\$ 3.00	\$ 12.50	\$ 27,500
Trench Shoring 20-27 ft, rock	1540	sf	\$ 3.50	\$ 9.00	\$ 5.00	\$ 17.50	\$ 26,950
Septage pumping (keep LCC low)	1.5	mo	\$ 6,000.00	\$ 4,800.00	\$ 1,500.00	\$ 12,300.00	\$ 18,450
Septage hauling	1.5	mo		\$ 14,400.00	\$ 3,000.00	\$ 17,400.00	\$ 26,100
Influent sewer, 14" DI, lined	110	LF	\$ 260.00	\$ 45.00	\$ 25.00	\$ 330.00	\$ 36,300
Reinf conc jkt	6.3	cy	\$ 950.00	\$ 350.00	\$ 55.00	\$ 1,355.00	\$ 8,537
CLSM Backfill	285	cy	\$ 300.00	\$ 5.00	\$ 10.00	\$ 315.00	\$ 89,775
Backfill	41	cy	\$ 20.00	\$ 42.00	\$ 10.00	\$ 72.00	\$ 2,952
Deep manhole (27 ft)	1	ea	\$ 7,500.00	\$ 3,300.00	\$ 1,500.00	\$ 12,300.00	\$ 12,300
Manhole interior coating	355	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 40,825
SMH exterior moisture protection	410	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 9,840
Odor control unit	1	ea	\$ 7,150.00	\$ 6,000.00	\$ 400.00	\$ 13,550.00	\$ 13,550
Generator Bldg	320	sf	\$ 250.00	\$ 265.00	\$ 10.00	\$ 525.00	\$ 168,000
Roofing membrane	5.8	sq	\$ 3,000.00	\$ 2,000.00	\$ 170.00	\$ 5,170.00	\$ 29,986
Block sealant and paint	700	sf	\$ 11.00	\$ 10.00	\$ 4.00	\$ 25.00	\$ 17,500
Acoustic insulation	700	sf	\$ 90.00	\$ 20.00	\$ 5.00	\$ 115.00	\$ 80,500
Acoustic louvers	144	sf	\$ 245.00	\$ 50.00	\$ 60.00	\$ 355.00	\$ 51,120
Generator w/base mounted tank	1	ea	\$ 127,000.00	\$ 35,000.00	\$ 800.00	\$ 162,800.00	\$ 162,800
Conc inertia pad for generator	6	cy	\$ 950.00	\$ 450.00	\$ 85.00	\$ 1,485.00	\$ 8,910
Conc fueling pad	3.5	cy	\$ 750.00	\$ 225.00	\$ 12.00	\$ 987.00	\$ 3,455
Pervious pavement road	5000	sf	\$ 50.00	\$ 30.00	\$ 9.00	\$ 89.00	\$ 445,000
3' Grade adjustment wall	360	LF	\$ 625.00	\$ 475.00	\$ 5.00	\$ 1,105.00	\$ 397,800
Fence	426	LF	\$ 45.00	\$ 35.00	\$ 5.00	\$ 85.00	\$ 36,210

Gate	1	ea	\$ 950.00	\$ 500.00	\$ 30.00	\$ 1,480.00	\$ 1,480
2" water service	120	LF	\$ 75.00	\$ 9.00	\$ 2.00	\$ 86.00	\$ 10,320
2" water meter box	1	ea	\$ 250.00	\$ 200.00	\$ 15.00	\$ 465.00	\$ 465
Water meter	1	LS				\$ 1,500.00	\$ 1,500
General civil site work	10000	sf				\$ 20.00	\$ 200,000
HELCO xfrmr and fees	1	LS				\$ 125,000.00	\$ 125,000
SCADA and security system	1	LS				\$ 95,000.00	\$ 95,000
Electrical, incl instrumentation	1	LS				\$ 379,844.85	\$ 379,845
Adder for deeper sewers	2000	lf	\$ 105.00	\$ 235.00	\$ 125.00	\$ 465.00	\$ 930,000

SUBTOTAL	\$ 5,455,754
CONTINGENCY (30%)	\$ 1,636,726
TOTAL	\$ 7,092,480

**Kuahiwi Contractors Site, Minimum
Vertical Shaft Machine (Herrenknecht VSM 8000 at 4.5 m diameter)**

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				\$800,000.00	\$800,000
Clearing and grubbing	8,000	sf		\$8.00	\$3.00	\$11.00	\$88,000
Machine setup	1	LS				\$60,000.00	\$60,000
Wet well shaft	18	ft	\$15,000.00	\$12,000.00	\$3,000.00	\$30,000.00	\$540,000
Haul Spoils	103	cy		\$13.00	\$8.00	\$21.00	\$2,163
Concrete mat foundation	20	cy	\$750.00	\$225.00	\$12.00	\$987.00	\$19,740
Wet well structure; 8' dia, 9" wall	15	ft	\$500.00	\$100.00	\$250.00	\$850.00	\$12,750
Wet well base	1	ea	\$1,750.00	\$800.00	\$300.00	\$2,850.00	\$2,850
Wet well top slab, 12'x12'x10"thk	4	cy	\$950.00	\$450.00	\$85.00	\$1,485.00	\$5,940
Wet well hatch, ss and aluminum	1	ea	\$2,300.00	\$500.00	\$90.00	\$2,890.00	\$2,890
Wet well interior coating	500	sf	\$85.00	\$20.00	\$10.00	\$115.00	\$57,500
Wet well exterior moisture prot	440	sf	\$12.00	\$10.00	\$2.00	\$24.00	\$10,560
Engineered backfill	64	cy	\$47.00	\$42.00	\$20.00	\$109.00	\$6,976
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	\$3,000.00	\$1,800.00	\$180.00	\$4,980.00	\$9,960
Disch elbows and guides	2	ea	\$1,500.00	\$1,200.00	\$180.00	\$2,880.00	\$5,760
Valve vault structure	1	ea	\$925.00	\$250.00	\$180.00	\$1,355.00	\$1,355
Emergency pump conn vault	1	ea	\$925.00	\$250.00	\$180.00	\$1,355.00	\$1,355
Gate Valve, 6"	5	ea	\$910.00	\$175.00	\$85.00	\$1,170.00	\$5,850
Check valve, 6"	2	ea	\$1,050.00	\$175.00	\$85.00	\$1,310.00	\$2,620
Quick connect hose coupling	1	ea	\$400.00	\$100.00	\$85.00	\$585.00	\$585
90 bend, FExFE, 6"	3	ea	\$1,005.00	\$150.00	\$85.00	\$1,240.00	\$3,720
Tee, FExFE, 6"	1	ea	\$1,250.00	\$225.00	\$85.00	\$1,560.00	\$1,560
45 bend, MJ, 6"	4	ea	\$935.00	\$150.00	\$85.00	\$1,170.00	\$4,680
Wye, MJ, 6"	2	ea	\$1,270.00	\$225.00	\$85.00	\$1,580.00	\$3,160
Plug, MJ, 6"	1	ea	\$685.00	\$75.00	\$85.00	\$845.00	\$845
DI pipe, FE, 6"	80	LF	\$185.00	\$25.00	\$15.00	\$225.00	\$18,000
DI pipe, MJ, 6"	150	LF	\$180.00	\$25.00	\$15.00	\$220.00	\$33,000

Sewer trench excavation, soft	700	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ 22,400
Sewer trench excavation, rock	0	cy		\$ 175.00	\$ 35.00	\$ 210.00	\$ -
Haul Spoils	700	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 14,700
Trench Shoring, 0-10 ft	9400	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ 94,000
Trench Shoring 10-20 ft	1880	sf	\$ 2.50	\$ 7.00	\$ 3.00	\$ 12.50	\$ 23,500
Trench Shoring 20-27 ft, rock	0	sf	\$ 3.50	\$ 9.00	\$ 5.00	\$ 17.50	\$ -
Septage pumping (keep LCC low)	0	mo	\$ 6,000.00	\$ 4,800.00	\$ 1,500.00	\$ 12,300.00	\$ -
Septage hauling	0	mo		\$ 14,400.00	\$ 3,000.00	\$ 17,400.00	\$ -
Influent sewer, 14" DI, lined	470	LF	\$ 260.00	\$ 45.00	\$ 25.00	\$ 330.00	\$ 155,100
Reinf conc jkt	0	cy	\$ 950.00	\$ 350.00	\$ 55.00	\$ 1,355.00	\$ -
CLSM Backfill	0	cy	\$ 300.00	\$ 5.00	\$ 10.00	\$ 315.00	\$ -
Engineered Backfill	41	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ 4,469
Manhole (10 ft)	3	ea	\$ 3,900.00	\$ 1,800.00	\$ 600.00	\$ 6,300.00	\$ 18,900
Manhole interior coating	180	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 20,700
SMH exterior moisture protection	152	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 3,648
SFM trench excavation, soft	0	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ -
Haul Spoils	0	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ -
Trench Shoring, 0-10 ft	0	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ -
SFM, 6" DI, coated and lined	0	LF	\$ 180.00	\$ 25.00	\$ 15.00	\$ 220.00	\$ -
Engineered Backfill	0	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ -
Odor control unit	1	ea	\$7,150.00	\$6,000.00	\$400.00	\$13,550.00	\$13,550
Generator Bldg	520	sf	\$250.00	\$265.00	\$10.00	\$525.00	\$273,000
Roofing membrane	8.4	sq	\$3,000.00	\$2,000.00	\$170.00	\$5,170.00	\$43,428
Block sealant and paint	1105	sf	\$11.00	\$10.00	\$4.00	\$25.00	\$27,625
Acoustic insulation	700	sf	\$90.00	\$20.00	\$5.00	\$115.00	\$80,500
Acoustic louvers	144	sf	\$245.00	\$50.00	\$60.00	\$355.00	\$51,120
Generator w/base mounted tank	1	ea	\$127,000.00	\$35,000.00	\$800.00	\$162,800.00	\$162,800
Conc inertia pad for generator	6	cy	\$950.00	\$450.00	\$85.00	\$1,485.00	\$8,910
Conc fueling pad	3.5	cy	\$750.00	\$225.00	\$12.00	\$987.00	\$3,455
Pervious pavement road	5000	sf	\$ 50.00	\$ 30.00	\$ 9.00	\$89.00	\$445,000
3' Grade adjustment wall	370	LF	\$ 625.00	\$ 475.00	\$ 5.00	\$1,105.00	\$408,850
Fence	360	LF	\$45.00	\$35.00	\$5.00	\$85.00	\$30,600

Gate	1	ea	\$950.00	\$500.00	\$30.00	\$1,480.00	\$1,480
6" water service	500	LF	\$ 120.00	\$ 25.00	\$ 15.00	\$ 160.00	\$ 80,000
6" detector check in vault	1	ea	\$ 8,000.00	\$ 6,000.00	\$ 1,000.00	\$ 15,000.00	\$ 15,000
Fire standpipe	1	ea	\$ 1,500.00	\$ 900.00	\$ 20.00	\$ 2,420.00	\$ 2,420
2" water service	120	LF	\$ 75.00	\$ 9.00	\$ 2.00	\$ 86.00	\$ 10,320
2" water meter box	1	ea	\$ 250.00	\$ 200.00	\$ 15.00	\$ 465.00	\$ 465
Water meter	1	LS				\$ 1,500.00	\$ 1,500
General civil site work	8000	sf				\$20.00	\$160,000
HELCO xfrmr and fees	1	LS				\$225,000.00	\$225,000
SCADA and security system	1	LS				\$95,000.00	\$95,000
Electrical, incl instrumentation	1	LS				\$406,364.33	\$406,364
Additional gravel road	17,000	sf	\$1.75	\$1.60	\$0.75	\$4.10	\$69,700
						SUBTOTAL	\$4,675,323
						CONTINGENCY (30%)	\$1,402,597
						TOTAL	\$6,077,920

**Kuahiwi Contractors Site, Minimum
Conventional Dig and Shore**

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				\$ -	\$ -
Clearing and grubbing	8,000	sf		\$ 8.00	\$ 3.00	\$ 11.00	\$ 88,000
Excavation soft material	175	cy		\$ 164.71	\$ 85.00	\$ 249.71	\$ 43,699
Excavation rock	0	cy		\$ 500.00	\$ 175.00	\$ 675.00	\$ -
Haul Spoils	175	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 3,675
Shoring, 0-10 ft	640	sf	\$ 45.00	\$ 200.00	\$ 120.00	\$ 365.00	\$ 233,600
Shoring 10-18 ft	384	sf	\$ 65.00	\$ 320.00	\$ 200.00	\$ 585.00	\$ 224,640
Shoring 20-35 ft, rock	0	sf	\$ 160.00	\$ 320.00	\$ 225.00	\$ 705.00	\$ -
Concrete mat foundation	20	cy	\$ 750.00	\$ 225.00	\$ 12.00	\$ 987.00	\$ 19,740
Wet well structure; 8' dia, 9" wall	15	ft	\$ 500.00	\$ 100.00	\$ 250.00	\$ 850.00	\$ 12,750
Wet well base	1	ea	\$ 1,750.00	\$ 800.00	\$ 300.00	\$ 2,850.00	\$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	\$ 950.00	\$ 450.00	\$ 85.00	\$ 1,485.00	\$ 5,940
Wet well hatch, ss and aluminum	1	ea	\$ 2,300.00	\$ 500.00	\$ 90.00	\$ 2,890.00	\$ 2,890
Wet well interior coating	480	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 55,200
Wet well exterior moisture prot	445	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 10,680
Engineered backfill	136	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ 14,824
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	\$ 3,000.00	\$ 1,800.00	\$ 180.00	\$ 4,980.00	\$ 9,960
Disch elbows and guides	2	ea	\$ 1,500.00	\$ 1,200.00	\$ 180.00	\$ 2,880.00	\$ 5,760
Valve vault structure	1	ea	\$ 925.00	\$ 250.00	\$ 180.00	\$ 1,355.00	\$ 1,355
Emergency pump conn vault	1	ea	\$ 925.00	\$ 250.00	\$ 180.00	\$ 1,355.00	\$ 1,355
Gate Valve, 6"	5	ea	\$ 910.00	\$ 175.00	\$ 85.00	\$ 1,170.00	\$ 5,850
Check valve, 6"	2	ea	\$ 1,050.00	\$ 175.00	\$ 85.00	\$ 1,310.00	\$ 2,620
Quick connect hose coupling	1	ea	\$ 400.00	\$ 100.00	\$ 85.00	\$ 585.00	\$ 585
90 bend, FExFE, 6"	3	ea	\$ 1,005.00	\$ 150.00	\$ 85.00	\$ 1,240.00	\$ 3,720
Tee, FExFE, 6"	1	ea	\$ 1,250.00	\$ 225.00	\$ 85.00	\$ 1,560.00	\$ 1,560
45 bend, MJ, 6"	4	ea	\$ 935.00	\$ 150.00	\$ 85.00	\$ 1,170.00	\$ 4,680
Wye, MJ, 6"	2	ea	\$ 1,270.00	\$ 225.00	\$ 85.00	\$ 1,580.00	\$ 3,160
Plug, MJ, 6"	1	ea	\$ 685.00	\$ 75.00	\$ 85.00	\$ 845.00	\$ 845

DI pipe, FE, 6"	80	LF	\$ 185.00	\$ 25.00	\$ 15.00	\$ 225.00	\$ 18,000
DI pipe, MJ, 6"	150	LF	\$ 180.00	\$ 25.00	\$ 15.00	\$ 220.00	\$ 33,000
Sewer trench excavation, soft	700	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ 22,400
Sewer trench excavation, rock	0	cy		\$ 175.00	\$ 35.00	\$ 210.00	\$ -
Haul Spoils	700	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 14,700
Trench Shoring, 0-10 ft	9400	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ 94,000
Trench Shoring 10-20 ft	1880	sf	\$ 2.50	\$ 7.00	\$ 3.00	\$ 12.50	\$ 23,500
Trench Shoring 20-27 ft, rock	0	sf	\$ 3.50	\$ 9.00	\$ 5.00	\$ 17.50	\$ -
Septage pumping (keep LCC low)	0	mo	\$ 6,000.00	\$ 4,800.00	\$ 1,500.00	\$ 12,300.00	\$ -
Septage hauling	0	mo		\$ 14,400.00	\$ 3,000.00	\$ 17,400.00	\$ -
Influent sewer, 14" DI, lined	470	LF	\$ 260.00	\$ 45.00	\$ 25.00	\$ 330.00	\$ 155,100
Reinf conc jkt	0	cy	\$ 950.00	\$ 350.00	\$ 55.00	\$ 1,355.00	\$ -
CLSM Backfill	0	cy	\$ 300.00	\$ 5.00	\$ 10.00	\$ 315.00	\$ -
Engineered Backfill	41	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ 4,469
Manhole (10 ft)	3	ea	\$ 3,900.00	\$ 1,800.00	\$ 600.00	\$ 6,300.00	\$ 18,900
Manhole interior coating	180	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 20,700
SMH exterior moisture protection	152	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 3,648
SFM trench excavation, soft	0	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ -
Haul Spoils	0	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ -
Trench Shoring, 0-10 ft	0	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ -
SFM, 6" DI, coated and lined	0	LF	\$ 180.00	\$ 25.00	\$ 15.00	\$ 220.00	\$ -
Engineered Backfill	0	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ -
Odor control unit	1	ea	\$ 7,150.00	\$ 6,000.00	\$ 400.00	\$ 13,550.00	\$ 13,550
Generator Bldg	520	sf	\$ 250.00	\$ 265.00	\$ 10.00	\$ 525.00	\$ 273,000
Roofing membrane	8.4	sq	\$ 3,000.00	\$ 2,000.00	\$ 170.00	\$ 5,170.00	\$ 43,428
Block sealant and paint	1105	sf	\$ 11.00	\$ 10.00	\$ 4.00	\$ 25.00	\$ 27,625
Acoustic insulation	700	sf	\$ 90.00	\$ 20.00	\$ 5.00	\$ 115.00	\$ 80,500
Acoustic louvers	144	sf	\$ 245.00	\$ 50.00	\$ 60.00	\$ 355.00	\$ 51,120
Generator w/base mounted tank	1	ea	\$ 127,000.00	\$ 35,000.00	\$ 800.00	\$ 162,800.00	\$ 162,800
Conc inertia pad for generator	6	cy	\$ 950.00	\$ 450.00	\$ 85.00	\$ 1,485.00	\$ 8,910
Conc fueling pad	3.5	cy	\$ 750.00	\$ 225.00	\$ 12.00	\$ 987.00	\$ 3,455

Pervious pavement road	5000	sf	\$ 50.00	\$ 30.00	\$ 9.00	\$89.00	\$445,000
3' Grade adjustment wall	370	LF	\$ 625.00	\$ 475.00	\$ 5.00	\$1,105.00	\$408,850
Fence	360	LF	\$ 45.00	\$ 35.00	\$ 5.00	\$ 85.00	\$ 30,600
Gate	1	ea	\$ 950.00	\$ 500.00	\$ 30.00	\$ 1,480.00	\$ 1,480
6" water service	500	LF	\$ 120.00	\$ 25.00	\$ 15.00	\$ 160.00	\$ 80,000
6" detector check in vault	1	ea	\$ 8,000.00	\$ 6,000.00	\$ 1,000.00	\$ 15,000.00	\$ 15,000
Fire standpipe	1	ea	\$ 1,500.00	\$ 900.00	\$ 20.00	\$ 2,420.00	\$ 2,420
2" water service	120	LF	\$ 75.00	\$ 9.00	\$ 2.00	\$ 86.00	\$ 10,320
2" water meter box	1	ea	\$ 250.00	\$ 200.00	\$ 15.00	\$ 465.00	\$ 465
Water meter	1	LS				\$ 1,500.00	\$ 1,500
General civil site work	8000	sf				\$ 20.00	\$ 160,000
HELCO xfrmr and fees	1	LS				\$ 225,000.00	\$ 225,000
SCADA and security system	1	LS				\$ 95,000.00	\$ 95,000
Electrical, incl instrumentation	1	LS				\$ 407,214.53	\$ 407,215
Additional gravel road	17,000	sf	\$ 1.75	\$ 1.60	\$ 0.75	\$ 4.10	\$ 69,700

SUBTOTAL	\$ 3,785,292
CONTINGENCY (30%)	\$ 1,135,588
TOTAL	\$ 4,920,880

**Kuahiwi Contractors Site, Large
Conventional Dig and Shore**

DESCRIPTION	QTY	UM	MATERIAL	LABOR	EQUIPMENT	UNIT COST	TOTAL
Mobilization	1	LS				\$0.00	\$ -
Clearing and grubbing	8,000	sf		\$8.00	\$3.00	\$11.00	\$ 88,000
Excavation soft material	175	cy		\$164.71	\$85.00	\$249.71	\$ 43,699
Excavation rock	0	cy		\$500.00	\$175.00	\$675.00	\$ -
Haul Spoils	175	cy		\$13.00	\$8.00	\$21.00	\$ 3,675
Shoring, 0-10 ft	640	sf	\$45.00	\$200.00	\$120.00	\$365.00	\$ 233,600
Shoring 10-18 ft	384	sf	\$65.00	\$320.00	\$200.00	\$585.00	\$ 224,640
Shoring 20-35 ft, rock	0	sf	\$160.00	\$320.00	\$225.00	\$705.00	\$ -
Concrete mat foundation	20	cy	\$750.00	\$225.00	\$12.00	\$987.00	\$ 19,740
Wet well structure; 8' dia, 9" wall	15	ft	\$500.00	\$100.00	\$250.00	\$850.00	\$ 12,750
Wet well base	1	ea	\$1,750.00	\$800.00	\$300.00	\$2,850.00	\$ 2,850
Wet well top slab, 12'x12'x10"thk	4	cy	\$950.00	\$450.00	\$85.00	\$1,485.00	\$ 5,940
Wet well hatch, ss and aluminum	1	ea	\$2,300.00	\$500.00	\$90.00	\$2,890.00	\$ 2,890
Wet well interior coating	480	sf	\$85.00	\$20.00	\$10.00	\$115.00	\$ 55,200
Wet well exterior moisture prot	445	sf	\$12.00	\$10.00	\$2.00	\$24.00	\$ 10,680
Engineered backfill	136	cy	\$47.00	\$42.00	\$20.00	\$109.00	\$ 14,824
Subm Pumps, 400 gpm, 80 ft TDH	2	ea	\$3,000.00	\$1,800.00	\$180.00	\$4,980.00	\$ 9,960
Disch elbows and guides	2	ea	\$1,500.00	\$1,200.00	\$180.00	\$2,880.00	\$ 5,760
Valve vault structure	1	ea	\$925.00	\$250.00	\$180.00	\$1,355.00	\$ 1,355
Emergency pump conn vault	1	ea	\$925.00	\$250.00	\$180.00	\$1,355.00	\$ 1,355
Gate Valve, 6"	5	ea	\$910.00	\$175.00	\$85.00	\$1,170.00	\$ 5,850
Check valve, 6"	2	ea	\$1,050.00	\$175.00	\$85.00	\$1,310.00	\$ 2,620
Quick connect hose coupling	1	ea	\$400.00	\$100.00	\$85.00	\$585.00	\$ 585
90 bend, FExFE, 6"	3	ea	\$1,005.00	\$150.00	\$85.00	\$1,240.00	\$ 3,720
Tee, FExFE, 6"	1	ea	\$1,250.00	\$225.00	\$85.00	\$1,560.00	\$ 1,560
45 bend, MJ, 6"	4	ea	\$935.00	\$150.00	\$85.00	\$1,170.00	\$ 4,680
Wye, MJ, 6"	2	ea	\$1,270.00	\$225.00	\$85.00	\$1,580.00	\$ 3,160
Plug, MJ, 6"	1	ea	\$685.00	\$75.00	\$85.00	\$845.00	\$ 845
DI pipe, FE, 6"	80	LF	\$185.00	\$25.00	\$15.00	\$225.00	\$ 18,000

DI pipe, MJ, 6"	150	LF	\$180.00	\$25.00	\$15.00	\$220.00	\$ 33,000
Sewer trench excavation, soft	700	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ 22,400
Sewer trench excavation, rock	0	cy		\$ 175.00	\$ 35.00	\$ 210.00	\$ -
Haul Spoils	700	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ 14,700
Trench Shoring, 0-10 ft	9400	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ 94,000
Trench Shoring 10-20 ft	1880	sf	\$ 2.50	\$ 7.00	\$ 3.00	\$ 12.50	\$ 23,500
Trench Shoring 20-27 ft, rock	0	sf	\$ 3.50	\$ 9.00	\$ 5.00	\$ 17.50	\$ -
Septage pumping (keep LCC low)	0	mo	\$ 6,000.00	\$ 4,800.00	\$ 1,500.00	\$ 12,300.00	\$ -
Septage hauling	0	mo		\$ 14,400.00	\$ 3,000.00	\$ 17,400.00	\$ -
Influent sewer, 14" DI, lined	470	LF	\$ 260.00	\$ 45.00	\$ 25.00	\$ 330.00	\$ 155,100
Reinf conc jkt	0	cy	\$ 950.00	\$ 350.00	\$ 55.00	\$ 1,355.00	\$ -
CLSM Backfill	0	cy	\$ 300.00	\$ 5.00	\$ 10.00	\$ 315.00	\$ -
Engineered Backfill	41	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ 4,469
Manhole (10 ft)	3	ea	\$ 3,900.00	\$ 1,800.00	\$ 600.00	\$ 6,300.00	\$ 18,900
Manhole interior coating	180	sf	\$ 85.00	\$ 20.00	\$ 10.00	\$ 115.00	\$ 20,700
SMH exterior moisture protection	152	sf	\$ 12.00	\$ 10.00	\$ 2.00	\$ 24.00	\$ 3,648
SFM trench excavation, soft	0	cy		\$ 25.00	\$ 7.00	\$ 32.00	\$ -
Haul Spoils	0	cy		\$ 13.00	\$ 8.00	\$ 21.00	\$ -
Trench Shoring, 0-10 ft	0	sf	\$ 2.00	\$ 5.00	\$ 3.00	\$ 10.00	\$ -
SFM, 6" DI, coated and lined	0	LF	\$ 180.00	\$ 25.00	\$ 15.00	\$ 220.00	\$ -
Engineered Backfill	0	cy	\$ 47.00	\$ 42.00	\$ 20.00	\$ 109.00	\$ -
Odor control unit	1	ea	\$7,150.00	\$6,000.00	\$400.00	\$13,550.00	\$ 13,550
Generator Bldg	520	sf	\$250.00	\$265.00	\$10.00	\$525.00	\$ 273,000
Roofing membrane	8.4	sq	\$3,000.00	\$2,000.00	\$170.00	\$5,170.00	\$ 43,428
Block sealant and paint	1105	sf	\$11.00	\$10.00	\$4.00	\$25.00	\$ 27,625
Acoustic insulation	700	sf	\$90.00	\$20.00	\$5.00	\$115.00	\$ 80,500
Acoustic louvers	144	sf	\$245.00	\$50.00	\$60.00	\$355.00	\$ 51,120
Generator w/base mounted tank	1	ea	\$127,000.00	\$35,000.00	\$800.00	\$162,800.00	\$ 162,800
Conc inertia pad for generator	6	cy	\$950.00	\$450.00	\$85.00	\$1,485.00	\$ 8,910
Conc fueling pad	3.5	cy	\$750.00	\$225.00	\$12.00	\$987.00	\$ 3,455
Pervious pavement road	7000	sf	\$ 50.00	\$ 30.00	\$ 9.00	\$89.00	\$623,000

3' Grade adjustment wall	484	LF	\$ 625.00	\$ 475.00	\$ 5.00	\$1,105.00	\$534,820
Fence	480	LF	\$45.00	\$35.00	\$5.00	\$85.00	\$ 40,800
Gate	1	ea	\$950.00	\$500.00	\$30.00	\$1,480.00	\$ 1,480
6" water service	500	LF	\$ 120.00	\$ 25.00	\$ 15.00	\$ 160.00	\$ 80,000
6" detector check in vault	1	ea	\$ 8,000.00	\$ 6,000.00	\$ 1,000.00	\$ 15,000.00	\$ 15,000
Fire standpipe	1	ea	\$ 1,500.00	\$ 900.00	\$ 20.00	\$ 2,420.00	\$ 2,420
2" water service	120	LF	\$ 75.00	\$ 9.00	\$ 2.00	\$ 86.00	\$ 10,320
2" water meter box	1	ea	\$ 250.00	\$ 200.00	\$ 15.00	\$ 465.00	\$ 465
Water meter	1	LS				\$ 1,500.00	\$ 1,500
General civil site work	15000	sf				\$20.00	\$ 300,000
HELCO xfrmr and fees	1	LS				\$225,000.00	\$ 225,000
SCADA and security system	1	LS				\$95,000.00	\$ 95,000
Electrical, incl instrumentation	1	LS				\$475,340.03	\$ 475,340
Additional gravel road	17,000	sf	\$1.75	\$1.60	\$0.75	\$4.10	\$ 69,700
SUBTOTAL							\$ 4,307,588
CONTINGENCY (30%)							\$ 1,292,276
TOTAL							\$ 5,599,864