Puakō Hawaii Community Feasibility Study and Preliminary Engineering Report
Results and Recommendations

Project: Clean Water for Reefs Puakō
Date: Updated May 19, 2017
Prepared By: AQUA Engineering for Coral Reef Alliance

Executive Summary

To prevent harmful nutrients, bacteria, and pathogens from negatively impacting Puakō's coral reefs, CORAL contracted AQUA Engineering, an expert in wastewater technology, to outline the different wastewater treatment options for the Puakō community. Three alternatives were evaluated to replace cesspools and septic tanks. This is a summary of the results and recommendation.

Introduction

AQUA investigated three alternatives as possible solutions for Puakō's wastewater issue:

1. Installation of Aerobic Treatment Units (ATUs) at an individual property level
2. Installation of a collection system connecting homes to an onsite treatment plant
3. Installation of a collection system connecting to the Mauna Lani Treatment Facility

Each alternative was evaluated against criteria that included: overall timeline, capital costs, environmental benefits including effluent quality and re-use, ongoing maintenance costs, and permitting. This information was then used to establish a professional recommendation for the best wastewater system for Puakō's coral reefs and community.

Alternative 1: Installation of ATUs at homes with cesspools and septic tanks

Two manufactures of ATU's were used to provide product information and pricing. These units operate by collecting raw wastewater from the residence into a single tank where it is cycled between stages for treatment with the resulting effluent being discharged into a leach field.

- *Timing and permitting:* Potentially fastest timeline; permitting conducted for each lot; requires minimum permitting.
- *Water Reuse:* Not feasible; the remaining effluent is released directly into the ground where it interacts with the water table and has high potential of infiltrating to the reef.
- *Environmental impact:* Requires proper operation and maintenance to reduce nutrients. This would be difficult to consistently achieve. Does not remove bacteria and pathogens.

Alternative 2: Installation of a collection system connecting to a private onsite treatment facility.

Land where both the new treatment facility and the irrigation site needs to be identified.

- *Timing and permitting:* Potentially longest timeline, recycle water permit, EA and SMA permits.
- *Water Reuse:* Will reuse the water for irrigation of grass or suitable crop to further reduce the nutrients in the effluent.
- *Environmental impact:* Removes the most nutrients from the effluent.

Alternative 3: Installation of a collection system connecting homes to Mauna Lani Treatment Facility.

This option has two identified routes to connect the community to the facility. Route A- requires

connecting to an existing sewer main in the Mauna Lani resort which leads to the treatment facility. Route B- The pipeline continues to the east, following the fire access road leading to Ho'ohana Rd, connecting it directly to the Facility.

- *Timing and permitting:* Some permitting and coordination with Hawaii American Water and various entities within the Mauna Lani development. This process requires Special Management Area (SMA) and Environmental Assessment (EA) permits. While less permitting is required than in Alternative 2, the additional coordination with the Mauna Lani and HAW will add to the overall time for this alternative.
- *Water Reuse:* Currently reusing effluent. There is no guarantee this facility will continue using the effluent in the future and may begin utilizing permitted injection wells.
- *Environmental impacts:* Does not remove nutrients, but the effluent is used to irrigate sod and other plants thus reducing the nutrients from the effluent.

Evaluation Summary

The following summary table provides a side-by-side comparison of the alternatives evaluation:

Evaluation Criteria	ATUs	Onsite Treatment Facility	Mauna Lani Facility
Nitrogen mg/L	10-20	10*	10-20*
Phosphorous mg/L	3-6	1*	3-6*
Timeline (months)	18-30	24-48	18-30
Removes pathogens	Maybe	Yes	Yes
Reuse	No	Yes	Maybe
Suitable for all properties	No	Yes	Yes
Capital Cost (millions)	$8,039,800	$11,428,700	Route A: $12,615,900 Route B: $13,343,600
O&M (monthly)	$292	$101	$139
40-year Net Present Value	$22,369,900	$17,904,800	$20,766,500
Soft Costs	$1,221,660	$2,023,699	$1,973,300
Total Project Cost	$9,261,140	$13,452,399	$14,589,200 (Route A)

*Phosphorous and nitrogen may be removed by crop uptake in irrigation.

Please note the capital costs listed in the above table do not include project soft costs. Project soft costs include engineering design, construction management, administration, legal, land purchase, and environmental services. These costs are added to the capital cost listed above to obtain the total project cost. Costs are inclusive of improvements for both Puakō and Waialea.

AQUA's Recommendation

It should be noted that all the alternatives will improve current conditions impacting the environment and will improve the quality of effluent discharged. Based on the information outlined in the feasibility study and preliminary engineering report an evaluation matrix was completed (collaboratively developed by AQUA and the Clean Water for Reefs Puakō Advisory Committee) to provide a total score for each alternative. Given this information the best option to improve the quality of Puakō-Mauna Lani reef and surrounding waters is Alternative 2: Installation of a private onsite treatment facility for Puakō.