

# Climate Action, Resilience, and Environment Committee on 2022-01-05 9:00 AM

Meeting Time: 01-05-22 09:00

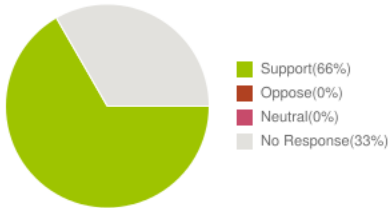
## eComments Report

Meetings	Meeting Time	Agenda Items	Comments	Support	Oppose	Neutral
Climate Action, Resilience, and Environment Committee on 2022-01-05 9:00 AM	01-05-22 09:00	4	3	2	0	0

### Sentiments for All Meetings

The following graphs display sentiments for comments that have location data. Only locations of users who have commented will be shown.

#### Overall Sentiment



# Climate Action, Resilience, and Environment Committee on 2022-01-05 9:00 AM

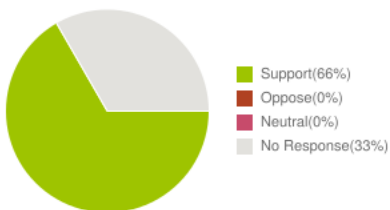
01-05-22 09:00

Agenda Name	Comments	Support	Oppose	Neutral
CARE-1(10) Rule 7(B) WASTEWATER DISPOSAL IN MA'ALAEA (CARE-1(10))	2	1	0	0
CARE-1(11) Rule 7(B) MA'ALAEA MAUKA LAND PURCHASE (CARE-1(11))	1	1	0	0

## Sentiments for All Agenda Items

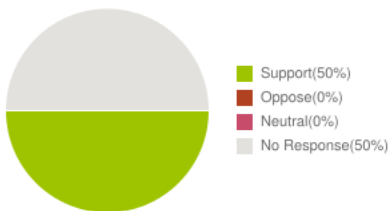
The following graphs display sentiments for comments that have location data. Only locations of users who have commented will be shown.

### Overall Sentiment



### Agenda Item: eComments for CARE-1(10) Rule 7(B) WASTEWATER DISPOSAL IN MA'ALAEA (CARE-1(10))

### Overall Sentiment



### Robin Knox

Location:

Submitted At: 8:58am 01-05-22

I would like to thank Chair King and the committee for making time to hear the presentation and to consider the possibility of holistic, full life cycle, sustainable solutions that address an array of concerns including wastewater treatment and disposal, watershed management and erosion control, ocean protection and ocean water quality management, water conservation and reuse, soil enhancement, and carbon sequestration and climate change mitigation. Ma'alaea has the potential to be a shining example to the island, state, and the world of how to implement truly sustainable practices.

### Travis Liggett

Location:

Submitted At: 8:50pm 01-04-22

Aloha Councilmembers,

I am writing in support of bold action by the County of Maui to fund a regional wastewater reclamation facility in Ma'alaea.

Included please find a preliminary proposal for a list of partners to realize a regional system, as well as my presentation slides for the 1/5/2022 Care Committee meeting.

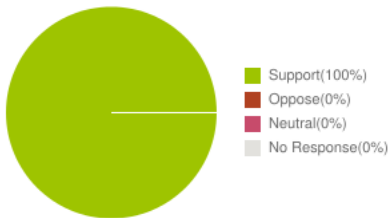
Mahalo for all your hard work!

Sincerely,

Travis Liggett  
President, Reef Power LLC  
www.reefpowermaui.com  
www.instagram.com/reefpowermaui  
(808) 757-5984

Agenda Item: eComments for CARE-1(11) Rule 7(B) MA'ALAEA MAUKA LAND PURCHASE (CARE-1(11))

Overall Sentiment



**Robin Knox**

Location:

Submitted At: 8:59am 01-05-22

I would like to thank Chair King and the committee for making time to hear the presentation and to consider the possibility of holistic, full life cycle, sustainable solutions that address an array of concerns including wastewater treatment and disposal, watershed management and erosion control, ocean protection and ocean water quality management, water conservation and reuse, soil enhancement, and carbon sequestration and climate change mitigation. Ma'alaea has the potential to be a shining example to the island, state, and the world of how to implement truly sustainable practices.



# Ma'alaea Wastewater Reclamation System

Maui County Council CARE Committee

January 5, 2022

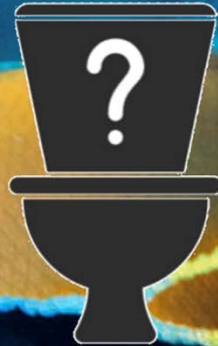
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 [@reefpowermaui](https://www.instagram.com/reefpowermaui)



# FlushAware

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## MA'ALAEA CONDO RESIDENT POLLUTION LOADING DATA

Percent reuse disposal	0
Percent injection disposal	100
Estimated average daily injection flow per resident (gal/day)	102
Estimated average yearly injection flow per resident (gal/year)	37,379
Average all condo total injection flow per day (gal/day)	88,685
Yearly injected Total Nitrogen and Phosphorus nutrient mass (lbs/year)	7,596
Yearly injected wastewater fecal <i>coliform</i> cell counts (MPN/year)	27,257,403,612

Ma'alaea Condo Residences	Average injected flow/day (gallons/day)	injected TN concentration (mg/L)	injected TP concentration (mg/L)	Total injected nutrients / year lbs/year
<b>Hono Kai</b>	7,500	24.4	2.95	624
<b>Island Sands</b>	11,000	12.9	4.9	596
<b>Ka Nai A Nalu</b>	18,000	24.6	4.58	1,599
<b>Lauloa</b>	10,000	21.6	3.98	779
<b>Ma'alaea Banyans</b>	7,485	25.5	5.28	701
<b>Ma'alaea Kai</b>	6,500	11.9	1.82	271
<b>Ma'alaea Mermaid</b>	4,200	26.9	3.7	391
<b>Ma'alaea Yacht</b>	9,500	34.5	3.78	1,107
<b>Makani A Kai</b>	6,000	10.59	1.4	219
<b>Milowai</b>	8,500	40.8	9.75	1,308
<b>TOTAL:</b>	88,685			7,596



Ma'alaea Condo Residences		<i>injected coliform</i> cell counts (MPN/100mL)		total inj. <i>coliform</i> cell counts / resident (MPN/year)
<b>Hono Kai</b>	>=	1600	>=	2,263,903,954
<b>Island Sands</b>		2		2,829,880
<b>Ka Nai A Nalu</b>	<	2	<	2,829,880
<b>Lauloa</b>		17		24,053,980
<b>Ma'alaea Banyans</b>	<	20	<	28,298,799
<b>Ma'alaea Kai</b>		16000		22,639,039,544
<b>Ma'alaea Mermaid</b>	<	2	<	2,829,880
<b>Ma'alaea Yacht</b>		4		5,659,760
<b>Makani A Kai</b>	≧	1600	≧	2,263,903,954
<b>Milowai</b>		17		24,053,980
		<b>TOTAL:</b>		27,257,403,612





Maalaea  
Maalaea

Maalaea Small Boat Harbor

Maui Golf & Sports Park

Maui Ocean Center, The Aquarium of Hawaii

Calypso

Kana'io

Maalaea Banyans

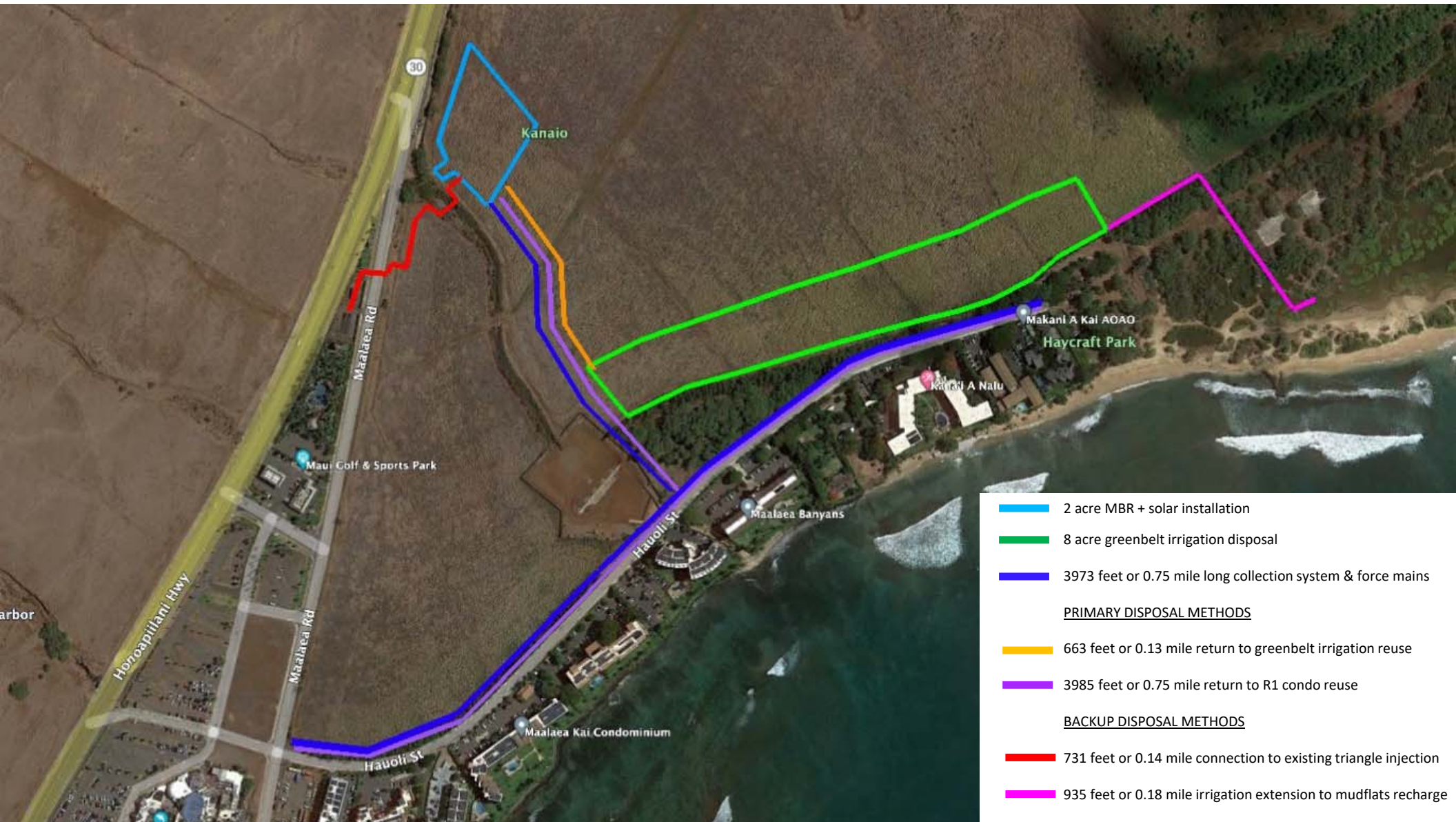
Kana' A Nalu

Haycraft Park

Palalau

MECO - Maalaea Generating Station

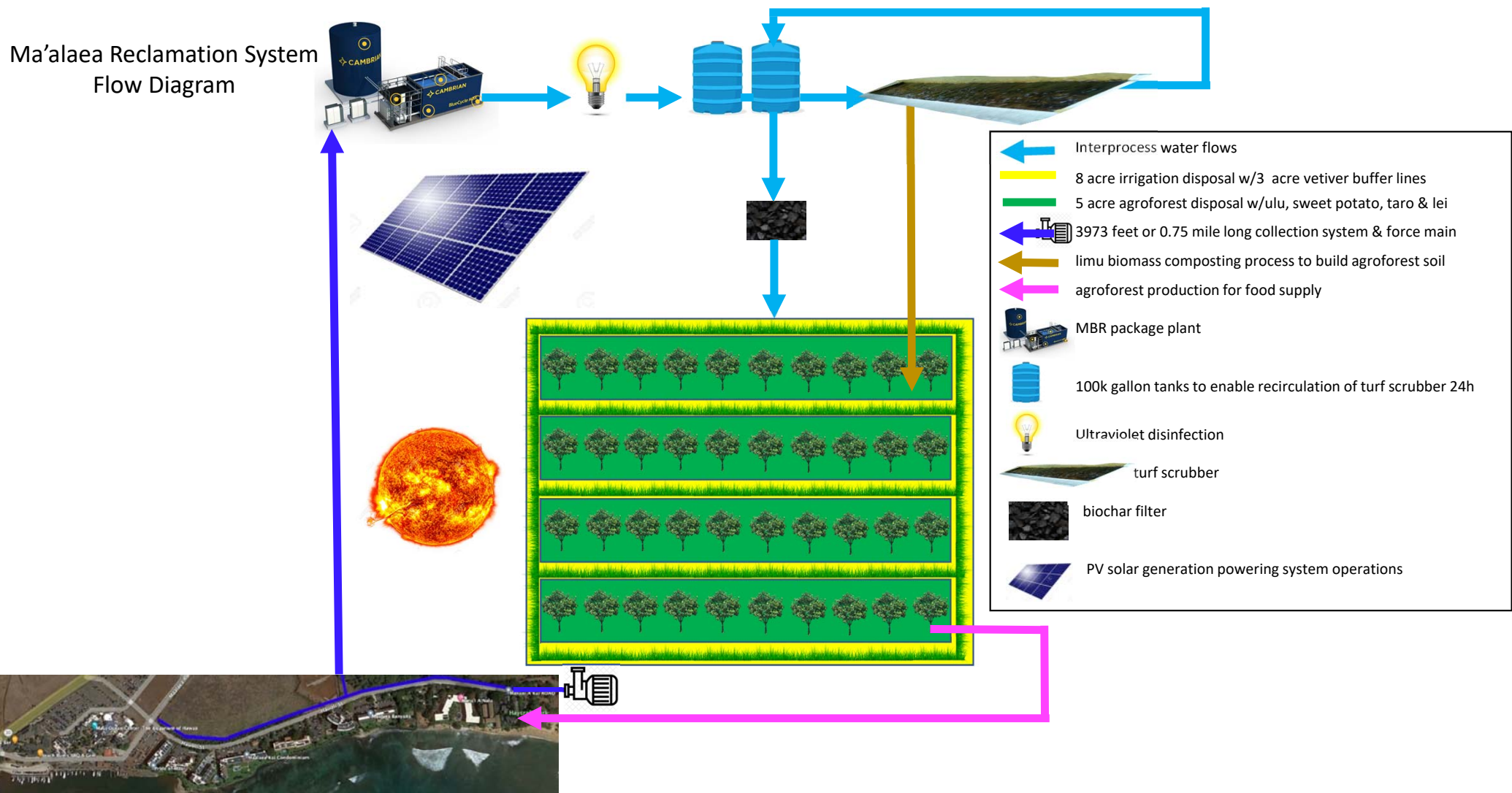




- 2 acre MBR + solar installation
  - 8 acre greenbelt irrigation disposal
  - 3973 feet or 0.75 mile long collection system & force mains
- PRIMARY DISPOSAL METHODS
- 663 feet or 0.13 mile return to greenbelt irrigation reuse
  - 3985 feet or 0.75 mile return to R1 condo reuse
- BACKUP DISPOSAL METHODS
- 731 feet or 0.14 mile connection to existing triangle injection
  - 935 feet or 0.18 mile irrigation extension to mudflats recharge



# Ma'alaea Reclamation System Flow Diagram



- Interprocess water flows
- 8 acre irrigation disposal w/3 acre vetiver buffer lines
- 5 acre agroforest disposal w/ulu, sweet potato, taro & lei
- 3973 feet or 0.75 mile long collection system & force main
- limu biomass composting process to build agroforest soil
- agroforestry production for food supply
- MBR package plant
- 100k gallon tanks to enable recirculation of turf scrubber 24h
- Ultraviolet disinfection
- turf scrubber
- biochar filter
- PV solar generation powering system operations









Ma'alaea Regional Wastewater Reclamation System  
Pre-Preliminary Project Proposal Draft v23.0

January 4, 2022



<b>1.0 PROJECT SUMMARY .....</b>	<b>1</b>
<b>2.0 PROPOSED PROJECT PARTNERS &amp; ROLES.....</b>	<b>3</b>
2.1 MA'ALAEA COMMUNITY MEMBERS .....	3
2.2 MA'ALAEA VILLAGE ASSOCIATION WASTEWATER TASKFORCE / PETER CANNON & TAPANI VUORI ✓.....	3
2.3 MA'ALAEA TRIANGLE ASSOCIATION / TAPANI VUORI ✓.....	3
2.4 MAUI OCEAN CENTER / TAPANI VUORI ✓.....	4
2.5 SUBJECT MATTER EXPERTISE & LEGAL COUNSEL FOR PERMITTING.....	4
2.6 MAUI NUI MARINE RESOURCE COUNCIL / MICHAEL FOGARTY ✓.....	4
2.7 WASTEWATER ALTERNATIVES AND INNOVATIONS & PARTNERS / STUART COLEMAN & JOACHIM SCHNEIDER ✓.....	5
2.8 MEMBRANE BIOREACTOR TREATMENT SYSTEM PROVIDER CANDIDATES .....	5
2.8.1 Epic Cleantec.....	5
2.8.2 Cambrian Innovation .....	5
2.8.3 Smith & Loveless.....	5
2.9 WATER QUALITY CONSULTING, INC. / ROBIN KNOX ✓.....	6
2.10 VALLEY ISLE PUMPING / SAL MARINO ✓.....	6
2.11 STEVE PARABICOLI ✓.....	6
2.12 SUNSHINE VETIVER & RIDGE TO REEFS / JOHN ASTILLA & PAUL STURM ✓.....	7
2.13 SMITHSONIAN AFFILIATED TURF SCRUBBER AUTHORITIES / DR. DEAN CALAHAN & TIMOTHY GOERTE MILLER .....	7
2.14 BORN AND RAISED EARTH LLC ✓.....	7
2.15 REEF POWER LLC / TRAVIS LIGGETT ✓.....	8





Maalaea  
Maalaea

Maalaea Small Boat Harbor

Maui Golf & Sports Park

Maui Ocean Center, The Aquarium of Hawaii

Calypso

Kanaio

Maalaea Banyans

Kana'i A Nalu

Haycraft Park

MECO - Maalaea Generating Station

Palalau







**@flushaware**

**@reefpowermaui**



January 4, 2022

**1.0 PROJECT SUMMARY**..... 1

**2.0 PROPOSED PROJECT PARTNERS & ROLES** ..... 3

2.1 MA'ALAEA COMMUNITY MEMBERS..... 3

2.2 MA'ALAEA VILLAGE ASSOCIATION WASTEWATER TASKFORCE / PETER CANNON & TAPANI VUORI  ..... 3

2.3 MA'ALAEA TRIANGLE ASSOCIATION / TAPANI VUORI  ..... 3

2.4 MAUI OCEAN CENTER / TAPANI VUORI  ..... 4

2.5 SUBJECT MATTER EXPERTISE & LEGAL COUNSEL FOR PERMITTING..... 4

2.6 MAUI NUI MARINE RESOURCE COUNCIL / MICHAEL FOGARTY  ..... 4

2.7 WASTEWATER ALTERNATIVES AND INNOVATIONS & PARTNERS / STUART COLEMAN & JOACHIM SCHNEIDER  ..... 5

2.8 MEMBRANE BIOREACTOR TREATMENT SYSTEM PROVIDER CANDIDATES ..... 5

    2.8.1 Epic Cleantec ..... 5

    2.8.2 Cambrian Innovation..... 5

    2.8.3 Smith & Loveless ..... 5

2.9 WATER QUALITY CONSULTING, INC. / ROBIN KNOX  ..... 6

2.10 VALLEY ISLE PUMPING / SAL MARINO  ..... 6

2.11 STEVE PARABICOLI  ..... 6

2.12 SUNSHINE VETIVER & RIDGE TO REEFS / JOHN ASTILLA & PAUL STURM  ..... 7

2.13 SMITHSONIAN AFFILIATED TURF SCRUBBER AUTHORITIES / DR. DEAN CALAHAN & TIMOTHY GOERTEMILLER ..... 7

2.14 BORN AND RAISED EARTH LLC  ..... 7

2.15 REEF POWER LLC / TRAVIS LIGGETT  ..... 8

**3.0 PROJECT PLANNING** ..... 9

3.1 PROJECT SCHEDULE ..... 9

3.2 PROJECT BUDGET ..... 9

**4.0 NONPROFIT VEHICLE STRUCTURE SKETCH [MA'ALAEA WATER COMPANY 501(C)(12)]** ..... 10

4.1 [MA'ALAEA WATER COMPANY 501(C)(12)] (MWC) PROPOSED BOARD MEMBERSHIP ..... 10

    4.1.1 Potential sources for as few as three, with an ideal range of 7-9 voting user-members for MWC board ..... 10

    4.1.2 Seven non-voting subject matter expert board member organizations / individuals ..... 10

4.2 PROPOSED MWC CONTRACTORS: TASKING ..... 10

FIGURE 1 MA'ALAEA REGIONAL WASTEWATER RECLAMATION SYSTEM VILLAGE OVERVIEW ..... 2

## 1.0 Project Summary

Ma'alaea Village in Maui Island, Hawaii, is the location of 11 out of the 14 injection well licensees permitted on the island by the Underground Injection Well Control Program of the state Safe Drinking Water Branch. The community needs a regional wastewater reclamation facility that meets resident and local business needs while eliminating problematic wastewater disposal methods in Ma'alaea, quantified in Appendix A.. This document describes a collaboration between a number of interested parties in the implementation of a regional reclamation facility that incorporates Membrane Bioreactor (MBR) package plant technology to remove BOD and TSS, UV disinfection to kill pathogens like *coliform*, a turf scrubber growing native limu to polish nutrients, and a biochar filter to remove trace contaminants like pharmaceuticals. The water is discharged into irrigation disposal methods, including native agroforestry that can provide a food supply, and vetiver buffer zones to retain problematic constituents of runoff like sediment. Draft system summary diagrams are show in Figure 1 below.

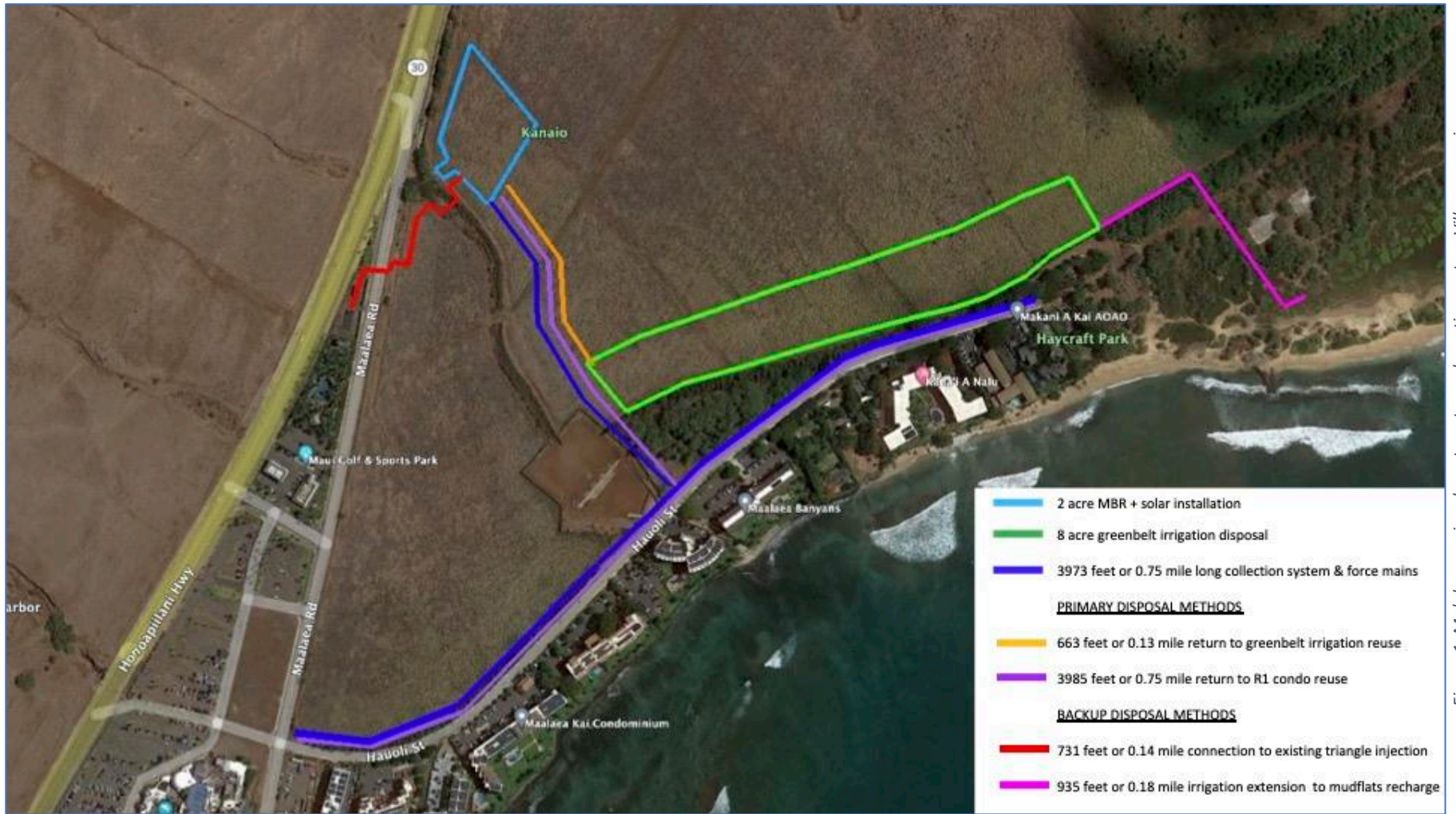


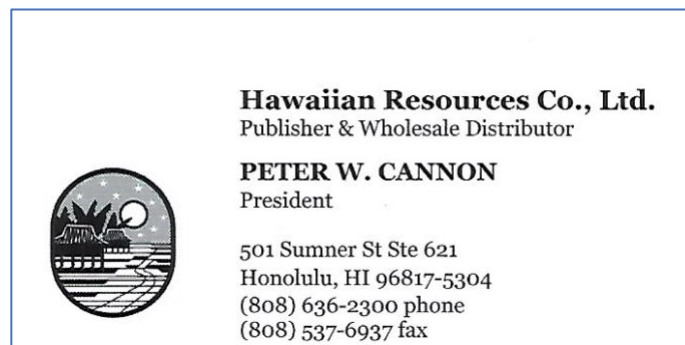
Figure 1. Ma'alaea regional wastewater reclamation system Village overview

## 2.0 Proposed Project Partners & Roles

### 2.1 Ma'alaea Community Members

Ma'alaea community members are the customers in this project, and three or more future reclamation system users may volunteer to act as voting user-members on the board of a new 501(c)(12) nonprofit for cooperatives that is well suited for a community-owned and operated wastewater utility service, which may act as the legal and financial vehicle to own and operate a new Hawaii utility service: The Ma'alaea Water Company 501(c)(12) [or some other more creative or fitting name]. The Ma'alaea Village Association may be used as the vehicle to disseminate a call for board members to serve in this new 501(c)(12) nonprofit that may own and operate their own regional reclamation system.

### 2.2 Ma'alaea Village Association wastewater taskforce / Peter Cannon & Tapani Vuori



The Ma'alaea Village Association has been operating a taskforce for many years in an effort to realize a solution to their outdated injection well disposal methods. This taskforce holds a lot of value in the composition and expertise presented in its membership, under the leadership of Peter Cannon and Tapani Vuori. This group may act as a review body for the execution of a regional reclamation system by soliciting comments from members on major project plans and documents.

### 2.3 Ma'alaea Triangle Association / Tapani Vuori

The Ma'alaea Triangle Association has as members the commercial units in the Ma'alaea Triangle, the gas station and mini golf course. The MTA represents the interests of the entities who conduct business there and will be core customers and ratepayers in a new reclamation system. Under the direction of Tapani Vuori, the MTA may play a central role in the definition, execution and operation of a regional facility.



## 2.4 Maui Ocean Center / Tapani Vuori ✓

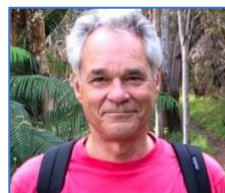


Maui Ocean Center is the anchor organization of the Ma'alaea Triangle, and the Center under the direction of Tapani Vuori is very active in the stewardship of Ma'alaea. The Triangle is one of 11 licensed injection well facilities in Ma'alaea and may play a leadership role in defining a new system. Tapani may provide executive review and oversight on the formulation of the system to be implemented, and the configuration of a managing nonprofit organization.

## 2.5 Subject matter expertise & legal counsel for permitting

If a new utility is owned by a cooperative nonprofit with users as its voting board members, it is possible that the utility may be exempt from the requirement of obtaining a Certificate of Public Convenience and Necessity from the Hawaii Public Utilities Commission. Subject matter and legal experts are needed who are familiar with various permitting processes including National Environmental Policy Act & Hawaii Environmental Policy Act Environmental Impact Assessments, Hawaii Department of Health wastewater facility Engineer & Owner Certification, Hawaii Special Management Area permitting, Maui County Zoning & Flood Confirmation and Department of Public Works Grading & Grubbing and Building permits.

## 2.6 Maui Nui Marine Resource Council / Michael Fogarty ✓





Mike Fogarty

*Treasurer*

Mike started his flying career as a bush pilot in Alaska; he retired in 2014 as a Captain for Alaska Airlines. During visits to Maui, Mike obtained his SCUBA certification. Shortly after retirement, Mike moved to Maui and led MNMRC in obtaining its 501c3 designation. He continues to develop MNMRC's corporate structures, and oversees its fiscal management. He has a Bachelor's Degree from Western Illinois University and Certificate of Financial Management from Cornell University.

Maui Nui Marine Resource Council is very active in Ma'alaea watersheds and they are a very well respected and substantial local marine resource nonprofit organization with the institutional muscle memory that is essential to facilitating the organization of a new nonprofit [Ma'alaea Water Company] to act as the permitting signatory organization for a new regional wastewater reclamation system in Ma'alaea. Michael Fogarty, Maui Nui treasurer, has agreed to informally "foster" this new nonprofit organization. The organization of a regional system under the umbrella of a nonprofit organization is a requirement of Mahi Pono to lease land for the treatment facilities and irrigation disposal acreage in a regional reclamation system, so a nonprofit organizational structure is required for project viability.



	<b>Executive Director - WAI Board of Directors</b>
<b>STUART COLEMAN</b>	stuart@waicleanwater.org
	Stuart Coleman, MFA, worked for ten years as the Hawaiian Islands Regional Manager of the Surfrider Foundation, overseeing five Chapters and hundreds of volunteers across the state. He has led coalitions to help shape policy and pass landmark legislation to reduce pollution of Hawai'i's coastal areas, including the nation's first and only bill to create smoke-free beaches & parks and the first bill to ban oxybenzone in sunscreens. Stuart also helped pass legislation to reduce wastewater pollution and mandate the upgrade of cesspools across Hawai'i. He currently serves on the state's Cesspool Conversion Working Group and on the Advisory Board of the University of Hawai'i at Mānoa's Sea Grant Program. Along with being a public speaker, teacher and freelance writer, Stuart is also the award-winning author of three books about modern Hawaiian history, surfing and culture, including Eddie Would Go, Fierce Heart and Eddie Aikau: Hawaiian Hero.
	<b>Project Coordinator</b>
<b>JOACHIM SCHNEIDER</b>	joachim@waicleanwater.org
	Joachim Schneider, MS, has been working in the wastewater field in Hawai'i in different capacities since 2017. He started as an intern for two wastewater consulting firms before completing his graduate studies at the University of Hawai'i at Mānoa, where he also worked as a research assistant. His thesis research investigated an innovative wastewater treatment method that will be employed at the second-largest treatment plant in Hawai'i. Before joining WAI, he worked as a project manager and design engineer for a private wastewater consulting company, where he oversaw the entire life cycle of various civil and environmental engineering projects.

WAI is a highly qualified technical nonprofit organization based in Oahu that has already invested a significant amount of work developing an understanding of appropriate wastewater technologies for a package plant in Ma'alaea, including the Membrane Bioreactor (MBR) system. WAI may play a leadership role in facilitating the implementation system elements, focusing on MBR package plant as the central treatment component of a regional Ma'alaea system.

## 2.8 Membrane Bioreactor treatment system provider candidates

MBR providers under consideration include:

2.8.1 Epic Cleantec San Francisco, California [epiccleantec.com](http://epiccleantec.com)

[Epic Cleantec MBR - Decentralized Wastewater Overview.pdf](#)

2.8.2 Cambrian Innovation Massachusetts [cambrianinnovation.com](http://cambrianinnovation.com)

[Cambrian BlueCycle MBR.pdf](#)

2.8.3 Smith & Loveless Kansas [smithandloveless.com](http://smithandloveless.com)

[Smith & Loveless Titan MBR.pdf](#)

## 2.9 Water Quality Consulting, Inc. / Robin Knox ✓



Water Quality Consulting, Inc. under the direction of Robin S. Knox is regarded as one of Maui's most informed and experienced regulatory authorities. Robin may consult on a limited basis regarding permitting strategy, permit application documentation, and overall technical design and implementation strategies.

## 2.10 Valley Isle Pumping / Sal Marino ✓



### VALLEY ISLE PUMPING

Valley Isle Pumping (VIP) under the direction of Sal Marino currently conducts service operations on the existing wastewater treatment and disposal methods in Ma'alaea Village. He has an established longtime relationship with local customers, with a very high reputation all around. Sal has expressed interest in VIP becoming the primary contractor for the operation and administration of a regional wastewater reclamation system in Ma'alaea, to be performed under a long term contract with the managing nonprofit organization [Ma'alaea Water Company]. VIP may conduct administrative management including customer billing, as well as physical maintenance of the system including force main conveyances and sludge removal.

## 2.11 Steve Parabicoli ✓

Steve Parabicoli is widely regarded as one of Maui's top authorities on the physical implementation of wastewater treatment hardware. As former superintendent of wastewater operations and director of reuse for the County of Maui, Steve has decades of experience in hardware installation and daily operations of major wastewater reclamation systems. Steve may provide technical review and sanity checks on system design and implementation.



## 2.12 Sunshine Vetiver & Ridge to Reefs / John Astilla & Paul Sturm



John Astilla at Sunshine Vetiver has in cooperation with Paul Sturm at Ridge to Reefs developed a system for irrigation disposal of reuse wastewater using vetiver grass as the primary receiving organism to achieve high rates of water disposal while reinforcing the landscape with deep root systems that trap sediment before runoff can reach the ocean. John and Paul have on the ground experience with reuse irrigation projects and biochar filters. Their expertise may be leveraged to the maximum extent possible with potential leadership roles on implementing a biochar filter for trace contaminant removal, and planning & installing a reuse irrigation agroforest with vetiver buffer for water disposal.

## 2.13 Smithsonian affiliated turf scrubber authorities / Dr. Dean Calahan & Timothy Goertemiller

Turf scrubber researchers with a present or former affiliation with the Smithsonian Institution, the organization that originated the invention, include Dr. Steven "Dean" Calahan and Timothy Goertemiller. These algae experts can provide consultation on engineering and design of a recirculating reuse wastewater turf scrubber configuration that employs native Hawaiian freshwater macroalgae limu to polish nutrients from reuse water before irrigation, while generating biomass that can be composted and applied to agroforestry installations to rebuild soil over time that has been depleted by industrial agriculture on the landscape in the past. These researchers are currently partnered with Reef Power LLC on a pilot demonstration of turf scrubber nutrient polishing coupled with an irrigation disposal test agroforest.

## 2.14 Born and Raised Earth LLC



"Born and Raised Earth is a global collective that aims to mitigate environmental stressors & promote shared understanding through collaboration & the catalyzing of small, but necessary projects." BaRE has supported multiple projects by Reef Power LLC. BaRE can provide philosophical guidance for the project with incremental funding to advance the body of work and partnerships required to implement a regional wastewater reclamation system in Ma'alaea to eliminate injection.

## 2.15 Reef Power LLC / Travis Liggett

Reef Power LLC is a local Maui small business dedicated to the resolution of problematic wastewater disposal methods with an eye on closed loop ecological solutions that enlist life forms like freshwater Hawaiian stream macroalgae and legacy native Hawaiian food plants like 'ulu/breadfruit, taro and sweet potatoes, to solve wastewater disposal problems. Travis is working to develop a living "life support" system that can provide a food source while eliminating injection well discharges that harm reefs.



 **Reef Power LLC**  
**Travis A. Liggett**  
President

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**REEF**  
**POWER**

## 3.0 Project Planning

### 3.1 Project Schedule

Project planning may be divided into twelve consecutive fiscal quarters:

Phase # / initiation / kickoff: activities & deliverables

Phase 1 / FY2022 Q1 / 10-1-21: Identify technologies, establish partners & NP structure, draft agreements

Phase 2 / FY2022 Q2 / 1-1-22: Execute nonprofit & partnerships, deliver system engineering design concept, establish permit strategy, baseline budget, baseline schedule & ID critical path

Phase 3 / FY2022 Q3 / 4-1-22: Develop detailed construction plans, submit completed permit applications

Phase 4 / FY2022 Q4 / 7-1-22: Navigate permitting processes to completion, conduct pre-procurement

Phase 5 / FY2024 Q3 / 4-1-24: Initiate procurement & prepare for physical operations

Phase 6 / FY2024 Q4 / 7-1-24: Break ground, install hardware, plant trees, turn on the system 10-1-2024

### 3.2 Project Budget

System installation budgets were baselined in the 2019 Brown & Caldwell Ma'alaea feasibility report, but the estimates have a high degree of uncertainty with actual costs ranging from 50% to 200% of the projections in the report. In order to obtain a lower level of uncertainty in cost estimates, an addendum to the Brown & Caldwell feasibility study will be ordered to conduct a preliminary design of the collection system, pump station, and forcemain. The scope of the preliminary design would include:

- LIDAR-enabled topographic survey of the roadways, pipeline easements and pump station location.
- Evaluation of each of the existing condo wastewater systems to determine how and where they would connect to the new sewer.
- Develop preliminary plan and profile of the new sewer lines.
- Develop preliminary design of the pump station and forcemain.
- Develop more-detailed "Class 3" cost estimates. By completing the preliminary design work the cost estimate accuracy can be increased to about -20% to +30%. There will still be unknowns and contingencies, but they will be smaller.

The process of refining cost estimates is a work in progress that will be advanced by a fact finding Phase 1 investment in a Brown & Caldwell feasibility report addendum to obtain an actual hard project cost.

Budgetary elements will include:

- wastewater pump station
- conveyance piping & service laterals
- civil site work
- reuse irrigation & plantings
- turf scrubber & recirculation tank
- biochar filter
- solar & electrical equipment
- engineering, construction management & project administration
- redundant & backup disposal methods like condo R1, Triangle injection, or mudflat wetland recharge
- MBR package plant operated by Cambrian Innovation under a WEPA/DBOOM agreement.

## 4.0 Nonprofit Vehicle Structure Sketch [Ma'alaea Water Company 501(c)(12)]

### 4.1 [Ma'alaea Water Company 501(c)(12)] (MWC) Proposed Board Membership

As few as three voting board member individuals must be resident condo deed holders, or potentially leaders of Triangle business customers, who may comprise users of a future regional reclamation system. The minimum of three voting user members could theoretically be deeded co-owners of the same condo. Additionally, 7 nonvoting subject matter expert members may advise in plotting the course of MWC.

The MVA wastewater taskforce may review and provide feedback on all MWC decisions and documentation.

#### 4.1.1 Potential sources for as few as three, with an ideal range of 7-9 voting user-members for MWC board

- Hono Kai
- Island Sands
- Ka Nai A Nalu
- Lauhoa
- Ma'alaea Banyans
- Ma'alaea Kai
- Ma'alaea Mermaid
- Ma'alaea Yacht
- Makani A Kai
- Milowai
- Ma'alaea Triangle Association / Tapani Vuori
- Ma'alaea Village Association / Peter Cannon

#### 4.1.2 Seven non-voting subject matter expert board member organizations / individuals

- Wastewater Alternatives & Innovations / Stuart Coleman
- Maui Nui Marine Resource Council / Michael Fogarty
- Water Quality Consulting, Inc. / Robin Knox
- Steve Parabolicoli
- Valley Island Pumping / Sal Marino
- Born and Raised Earth LLC / Jamie Kranberg
- Reef Power LLC / Travis Liggett

### 4.2 Proposed MWC contractors: tasking

- WAI & Cambrian Innovations/ Stuart Coleman: system concept design, project technical support
- VIP / Sal Marino: collection & conveyance operation & management, customer billing, sludge disposal
- R2R, Sunshine Vetiver, RPL or [as-yet undefined organization]: irrigation reuse install, maintenance
- Reef Power LLC: project development, system design, engineering administration, hardware execution
- [Subject matter & legal experts] NEPA & HEPA EAs, HI DOH Cert., COM Planning & DPW, SMA: permits
- [Engineering design / licensed PE experts]: detailed design, planning, construction documentation
- [Licensed construction firm(s)]: situate service road, grading, site preparation, system installation

**APPENDIX A**  
**DETAILED FLOW & WATER QUALITY DATA**  
**ON MA'ALAEA INJECTION WELLS**

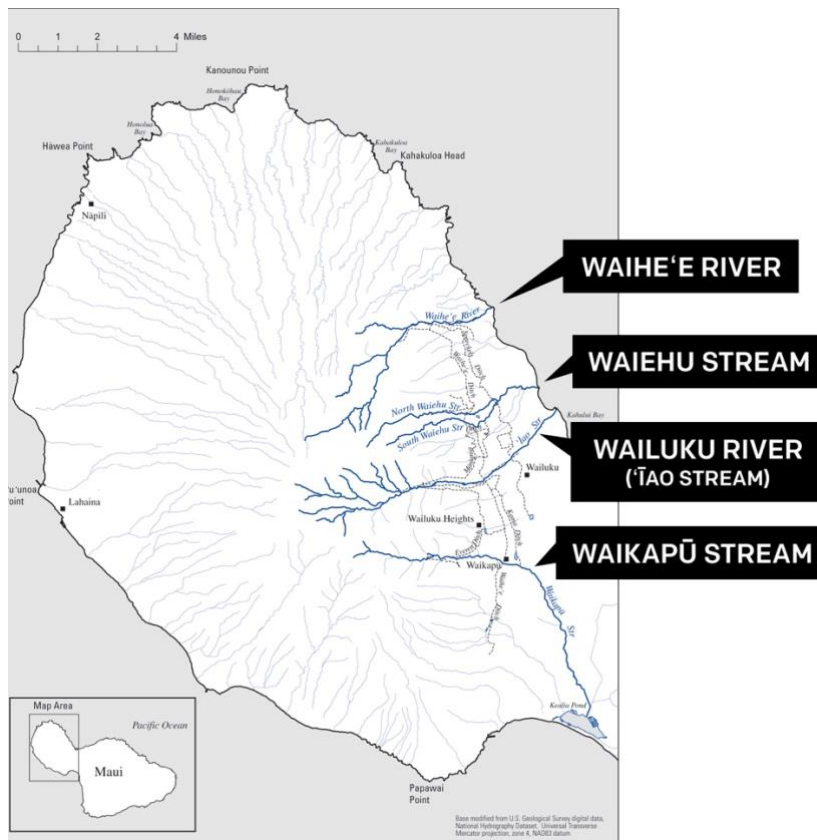
# DRINKING WATER SOURCES:

**From County of Maui:** "If you live in Upcountry Maui, your water is surface water from the streams in East Maui. It's treated and disinfected at one of our three water treatment facilities (**Kamole**, **Piihola**, **Olinda**) before it's delivered to your home. Customers in Haiku get their water from the Haiku or Kaupakalua wells and/or the **Kamole Weir**. Hana and Molokai also use groundwater. Lahaina has a mix of surface water and groundwater. The water treatment facilities for West Maui are located above Lahainaluna School and near the Kapalua Airport.

For Central Maui (Kahului, Wailuku, Waihe'e, Waikapū, Waiehu, Ma'alaea, Kihei, Wailea, Makena, Sprecklesville and Paia) your water is from surface and groundwaters of **Na Wai Eha**, Maui's Four Great Waters of West Maui, which includes the 'Īao Aquifer under the West Maui Mountains. That water is naturally filtered by lava rocks, disinfected, and sent to your home. A small amount of filtered surface water is added to the Central System at the **lao WTF**."

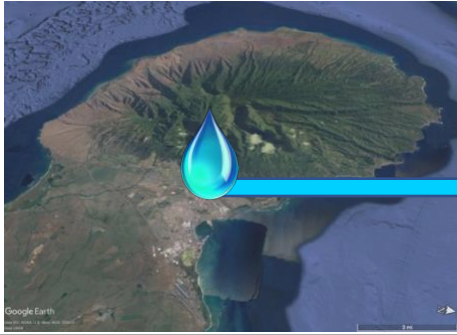
The lao and Waihee aquifer region has been designated by the Commission on Water Resources Management as a "water management area" due to over pumping. This points out that water reuse can alleviate stress on our primary drinking water source for Central & South Maui.

## **Na Wai Eha**, The Four Great Waters of West Maui





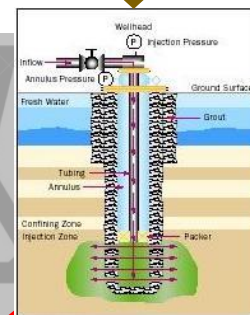
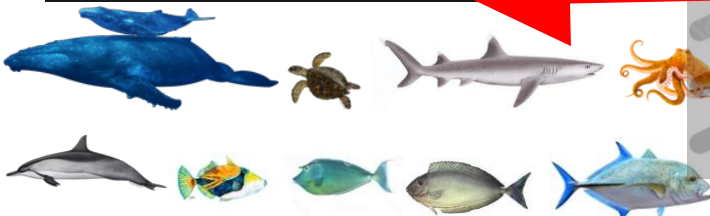
# MA'ALAEA VILLAGE CONDO DISPOSAL



1. Drinking water is transported from the rivers and groundwaters of Na Wai Eha, Maui's Four Great Waters of West Maui, to Ma'alaea Village, where it enters the resident's condo and is used for household activities and flushed down the toilet or drain.
2. Untreated wastewater flows into a devoted wastewater treatment package plant in each of 10 condo facilities where levels of treatment are performed from primary to secondary, with various levels of disinfection.
3. The totality (100%) of the primary or secondary wastewater discharges into groundwater via very nearshore injection wells.
4. The wastewater of varying treatment levels flows a very short distance through groundwater toward the Pacific Ocean, where it emerges often through the reef itself, via openings that present as direct pathways from the contaminated groundwater to the reef, similar to the flow shown with green dye in the video below.



This Green Dye Shows Path of Sewage Into Coral Reef at Kahekili Beach in Maui  
542 views • 146 22, 2019



*fecal coliform*



# MA'ALAEA VILLAGE CONDOMINIUM DISPOSAL METHOD:

100%  **NEARSHORE INJECTION WELLS**

VISUALIZATION OF THE NEARSHORE WASTEWATER INJECTION WELL PLUME FLOWING INTO THE PACIFIC OCEAN NEAR CONDOMINIUM **NEARSHORE INJECTION WELLS** IN MA'ALAEA, MAUI



# MA'ALAEA CONDO RESIDENT POLLUTION LOADING DATA

Percent reuse disposal	0
Percent injection disposal	100
Estimated average daily injection flow per resident (gal/day)	102
Estimated average yearly injection flow per resident (gal/year)	37,379
Average all condo total injection flow per day (gal/day)	88,685
Yearly injected Total Nitrogen and Phosphorus nutrient mass (lbs/year)	7,596
Yearly injected wastewater fecal <i>coliform</i> cell counts (MPN/year)	27,257,403,612



100% of wastewater is discharged into very nearshore injection wells for Ma'alaea condo residents.

Ma'alaea Condo Residences	Average injected flow/day (gallons/day)	injected TN concentration (mg/L)	injected TP concentration (mg/L)	Total injected nutrients / year (lbs/year)
<b>Hono Kai</b>	7,500	24.4	2.95	624
<b>Island Sands</b>	11,000	12.9	4.9	596
<b>Ka Nai A Nalu</b>	18,000	24.6	4.58	1,599
<b>Lauloa</b>	10,000	21.6	3.98	779
<b>Ma'alaea Banyans</b>	7,485	25.5	5.28	701
<b>Ma'alaea Kai</b>	6,500	11.9	1.82	271
<b>Ma'alaea Mermaid</b>	4,200	26.9	3.7	391
<b>Ma'alaea Yacht</b>	9,500	34.5	3.78	1,107
<b>Makani A Kai</b>	6,000	10.59	1.4	219
<b>Milowai</b>	8,500	40.8	9.75	1,308
<b>TOTAL:</b>	<b>88,685</b>			<b>7,596</b>

Injected wastewater flows from the Ma'alaea condo residences approaches 1000K gallons/day, with The latest available Underground Injection Control water quality data reports showing average nutrient concentrations very high with the highest condos at 40.8 mg/L Total Nitrogen and 9.75 mg/L Total Phosphorus. Detailed UIC water quality reports [here](#).

Ma'alaea Condo Residences	Ave. inj. nutrients / resident / year (lbs/year)	Average inj. flow / resident (gallons/year)	Average inj. flow / resident (gallons/day)
<b>Hono Kai</b>	8.5	37,379	102
<b>Island Sands</b>	5.5	37,379	102
<b>Ka Nai A Nalu</b>	9.1	37,379	102
<b>Lauloa</b>	8.0	37,379	102
<b>Ma'alaea Banyans</b>	9.6	37,379	102
<b>Ma'alaea Kai</b>	4.3	37,379	102
<b>Ma'alaea Mermaid</b>	9.5	37,379	102
<b>Ma'alaea Yacht</b>	11.9	37,379	102
<b>Makani A Kai</b>	3.7	37,379	102
<b>Milowai</b>	15.8	37,379	102

Using average wastewater flowrate per resident of just over 100 gallons per day, we have derived from Underground Injection Control Program water quality reports, municipal flow and census data calculations of the yearly loading of dissolved nutrients per resident of each Ma'alaea condo facility. Each resident generates and injects an estimated 37K gallons/per year and a range of 4 to 16 pounds of combined Total Nitrogen and Phosphorus. Detailed UIC water quality reports [here](#).

Ma'alaea Condo Residences		<i>injected coliform</i> cell counts (MPN/100mL)		total inj. <i>coliform</i> cell counts / resident (MPN/year)
<b>Hono Kai</b>	>=	1600	>=	2,263,903,954
<b>Island Sands</b>		2		2,829,880
<b>Ka Nai A Nalu</b>	<	2	<	2,829,880
<b>Lauloa</b>		17		24,053,980
<b>Ma'alaea Banyans</b>	<	20	<	28,298,799
<b>Ma'alaea Kai</b>		16000		22,639,039,544
<b>Ma'alaea Mermaid</b>	<	2	<	2,829,880
<b>Ma'alaea Yacht</b>		4		5,659,760
<b>Makani A Kai</b>	≥	1600	≥	2,263,903,954
<b>Milowai</b>		17		24,053,980
<b>TOTAL:</b>				<b>27,257,403,612</b>

Fecal *coliform* injected cell counts, by volume and total injected, are shown in this table. Values range from <2 Most Probable Number of colony forming (or infection forming) units of bacteria per 100mL wastewater, up to 16,000 MPN/100mL, with total yearly cells per resident ranging from less than 2.8M cells, up to 22 Billion cells. Detailed UIC water quality reports [here](#).

# RESIDENT NUTRIENT LOADING DISPOSAL METHOD COMPARISON

	Yearly Gallons not reused	Effluent Total Nitrogen Concentration	HAR 11-54 open coastal water quality standard "do not exceed more than 2% of the time" (2014) Total Nitrogen Concentration	Effluent Total Nitrogen concentration multiples of open coastal standard	Effluent Total Phosphorous Concentration	HAR 11-54 open coastal water quality standard "do not exceed more than 2% of the time" (2014) Total Phosphorous Concentration	Effluent Total Phosphorus concentration multiples of open coastal standard
DISPOSAL METHOD	Gal/resident/year	(mg/L)	(mg/L)	X multiples	(mg/L)	(mg/L)	X multiples
Kahului WWRF	36,389	10.47	0.35	30	1.17	0.06	20
Kihei WWRF	9,818	11.25	0.35	32	0.864	0.06	14
Lahaina WWRF	20,696	6.28	0.35	18	0.216	0.06	4
Pukalani WWRF	1,118	13.1	0.35	37	0.35	0.06	6
Septic	37,261	< 82	0.35	< 234	< 22	0.06	< 367
Cesspool	37,261	< 90	0.35	< 257	< 20	0.06	< 333
Hono Kai	37,261	24.4	0.35	70	2.95	0.06	49
Island Sands	37,261	12.9	0.35	37	4.9	0.06	82
Ka Nai A Nalu	37,261	24.6	0.35	70	4.58	0.06	76
Lauloa	37,261	21.6	0.35	62	3.98	0.06	66
Ma'alaea Banyans	37,261	25.5	0.35	73	5.28	0.06	88
Ma'alaea Kai	37,261	11.9	0.35	34	1.82	0.06	30
Ma'alaea Mermaid	37,261	26.9	0.35	77	3.7	0.06	62
Ma'alaea Yacht	37,261	34.5	0.35	99	3.78	0.06	63
Makani A Kai	37,261	10.59	0.35	30	1.4	0.06	23
Milowai	37,261	40.8	0.35	117	9.75	0.06	163

This nutrient pollution loading data summary table shows a comparison between Maui residential disposal methods of the resident average gallons per year not reused, effluent nutrient concentrations, and the number of times higher a given effluent nutrient concentration is than the Hawaii Administrative rules 11-54 (c)(s) values that limit Total Nitrogen and Total Phosphorus nutrient concentrations allowed by law in open coastal waters.

[\*\*KAHULUI-WAILUKU WWRF UIC REPORT\*\*](#)

[\*\*KIHEI WWRF UIC REPORT\*\*](#)

[\*\*LAHAINA WWRF UIC REPORT\*\*](#)

[\*\*MAUI COUNTY D.E.M. MUNICIPAL FLOWRATE DATA\*\*](#)

[\*\*HAWAII DOH SEPTIC TANK & CESSPOOL ESTIMATES\*\*](#)

[\*\*PUKALANI WWRF DATA\*\*](#)

[\*\*MA'ALAEA INJECTION WELL UIC REPORTS\*\*](#)

[\*\*HAWAII ADMINISTRATIVE RULES 11-54 \(b\) \(3\) Open Coastal Water Criteria\*\*](#)

# RESIDENT FECAL *coliform* LOADING DISPOSAL METHOD COMPARISON

DISPOSAL METHOD	Yearly Gallons not reused		Effluent <i>coliform</i> Cell Counts	<i>coliform</i> EPA freshwater recreation standard Cell Counts (1976)		Effluent <i>coliform</i> Cell Counts
	Gal/resident/year		MPN/100mL water	MPN/100mL water		MPN/resident/year
Kahului WWRF	36,389	>	2419.6	200	>	3,332,923,119
Kihei WWRF	9,818		248.9	200		92,506,220
Lahaina WWRF	20,696	<	1	200	<	783,420
Pukalani WWRF	1,118	<	1	200	<	42,314
Septic	37,261	<	160,000,000	200	<	225,676,194,470,394
Cesspool	37,261	<	100,000,000	200	<	141,047,621,543,996
Hono Kai	37,261	>=	1600	200	>=	2,256,761,945
Island Sands	37,261		2	200		2,820,952
Ka Nai A Nalu	37,261	<	2	200	<	2,820,952
Lauloa	37,261		17	200		23,978,096
Ma'alaea Banyans	37,261	<	20	200	<	28,209,524
Ma'alaea Kai	37,261		16,000	200		22,567,619,447
Ma'alaea Mermaid	37,261	<	2	200	<	2,820,952
Ma'alaea Yacht	37,261		4	200		5,641,905
Makani A Kai	37,261	≧	1,600	200	≧	2,256,761,945
Milowai	37,261		17	200		23,978,096

This fecal *coliform* indicator bacterial pollution loading data summary table shows a comparison between Maui residential disposal methods of resident average gallons per year not reused, effluent fecal *coliform* cell counts, and yearly fecal *coliform* cell count loading per resident. Also shown for comparison are the US EPA values that limit recreational fecal *coliform* cell counts that have been allowed by federal law.

[KAHULUI-WAILUKU WWRF UIC REPORT](#)

[KIHEI WWRF UIC REPORT](#)

[LAHAINA WWRF UIC REPORT](#)

[MAUI COUNTY D.E.M. MUNICIPAL FLOWRATE DATA](#)

[HAWAII DOH SEPTIC TANK & CESSPOOL ESTIMATES](#)

[PUKALANI WWRF DATA](#)

[MA'ALAEA INJECTION WELL UIC REPORTS](#)

[US EPA \*coliform\* STANDARD FOR RECREATION](#)