Reef Power LLC

a Maui small business, presents:

Bill 52 mandating universal municipal wastewater disinfection in Maui

Travis Liggett

travis@reefpowermaui.com

(808) 757-5984

Agriculture, Diversification, Environment and Public Transportation
Maui County Council Committee
1:30 pm October 19, 2023

Anticipated Bill 52 CD1 language:

"Municipal wastewater effluent discharged or reused by the County must meet Hawaii state R-1 reuse standards for fecal coliform bacteria; the County must allocate sufficient funding for the implementation of this subsection so that its implementation does not cause any increases in sewage rates for residents."

Average plant flow, reuse and injection rates for Maui's three major WWRFs

recent plant flow gal/day	recent reuse gal/day	recent injection gal/day	injection wells #	WWRF
5,558,460	195,852	**5,362,608**	**8**	**Kahului**
3,631,600	1,623,830	**2,007,770**	**3**	**Kihei**
4,426,900	1,272,931	**3,153,969**	**4**	**Lahaina**
		10,524,347	**15**	**TOTAL**

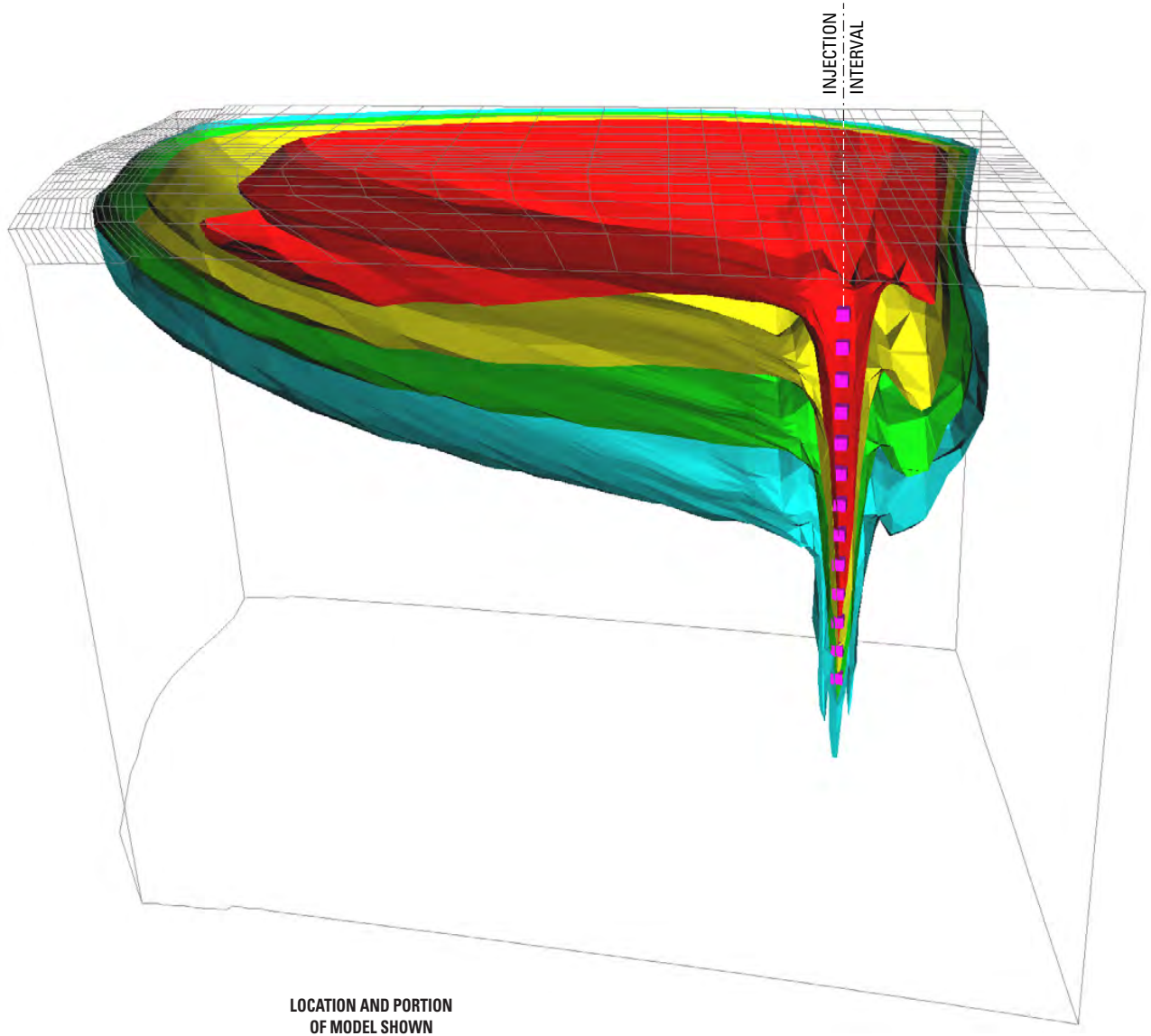
Disinfection history for Maui's three major Wastewater Reclamation Facility injection well discharges

WWRF	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Kahului														
Kihei														
Lahaina														

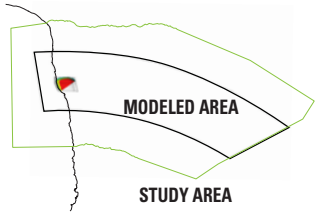
CHLORINE DISINFECTION

ULTRAVIOLET DISINFECTION

NO DISINFECTION



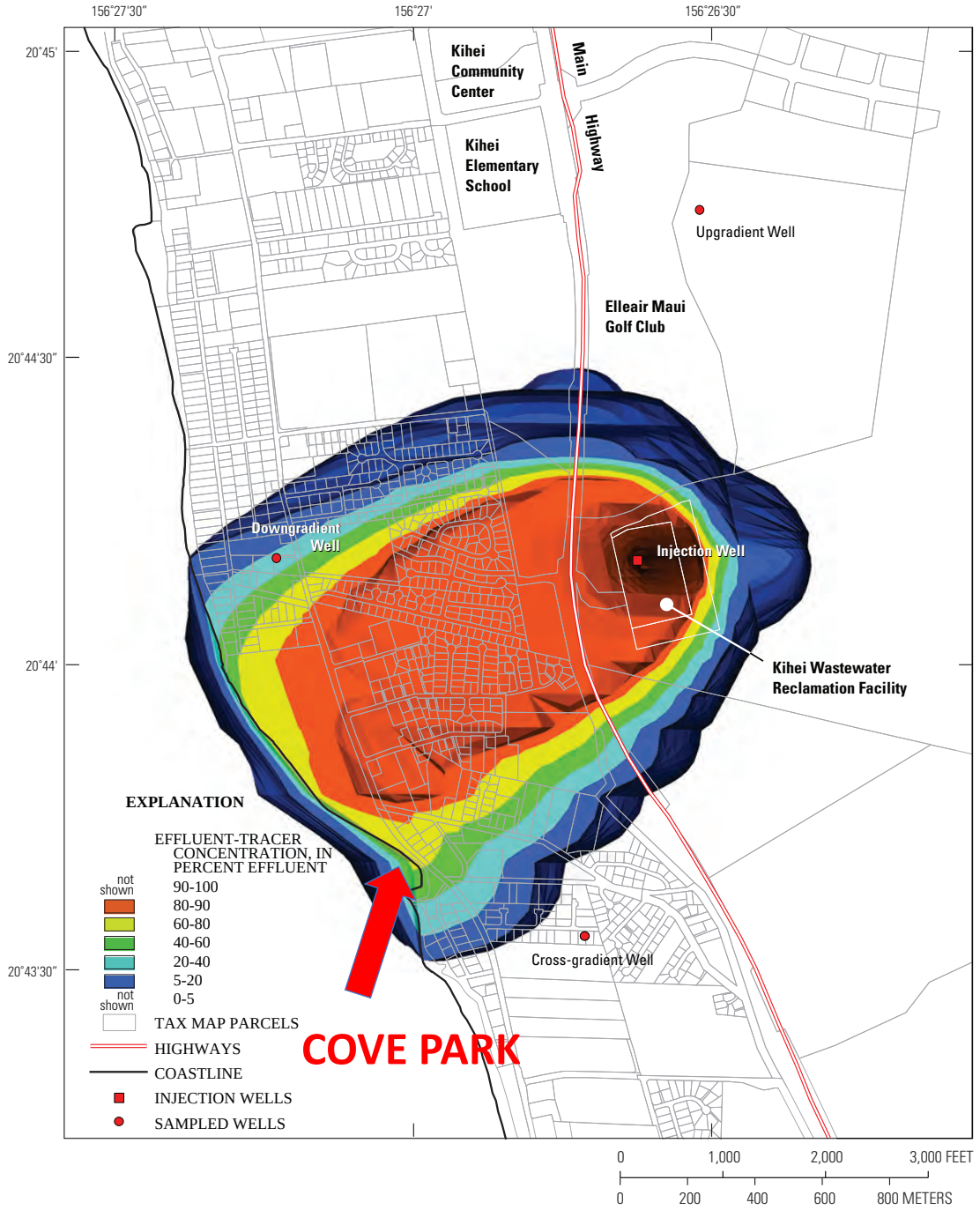
LOCATION AND PORTION OF MODEL SHOWN
(see figure 20)



EFFLUENT-TRACER CONCENTRATION, IN PERCENT EFFLUENT

80
60
40
20

[Hunt 2007 link]



[Hunt 2007 link]

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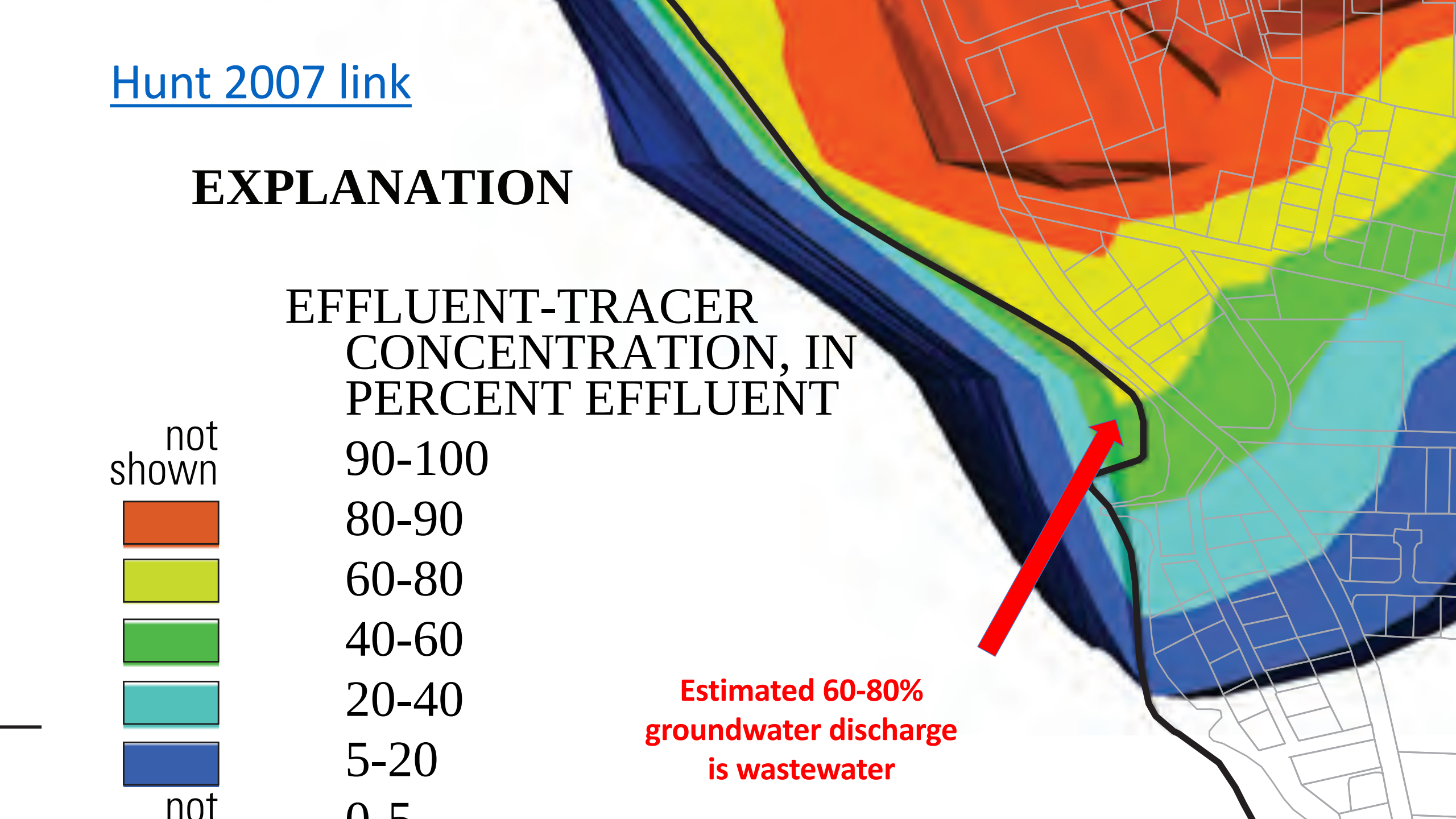


State of Hawaii

Department of Health

State of Hawaii, Department of Health
Clean Water Branch

COVE PARK *enterococcus* MEASUREMENTS BY HI DOH RECENTLY SHOW FREQUENT SPIKES NEAR OR ABOVE THE "BEACH ACTION VALUE" OF 130 MPN/100mL

4 out of 74 measurements in 2021-2022 exceeded the Beach Action Value

August 17, 2022 — 364 MPN — 100 surfers

Location Identifier	000703
Location Name	Cove Park
Island	Maui
Latitude Decimal Degrees	20.727503
Longitude Decimal Degrees	-156.449739

Sample No	MD12152102
Clostridium Qualifier	
Clostridium Results	0008
Enterococci Qualifier	
Enterococci Results	137

Date	12/15/2021
Time	9:30 AM
Temperature	25.40
Salinity	32.63
Dissolved Oxygen	05.65
Dissolved Oxygen Saturation	083.00
pH	08.06
Turbidity	0011.20
Comments	Sunny, calm, 1 ft shore break, 100 surfers, many homeless people

December 15, 2021 — 137 MPN — 100 surfers

Location Identifier	000703
Location Name	Cove Park
Island	Maui
Latitude Decimal Degrees	20.727503
Longitude Decimal Degrees	-156.449739

Sample No	MD09082102
Clostridium Qualifier	
Clostridium Results	0005
Enterococci Qualifier	
Enterococci Results	137

Date	9/8/2021
Time	9:30 AM
Temperature	27.00
Salinity	31.35
Dissolved Oxygen	06.30
Dissolved Oxygen Saturation	093.90
pH	08.14
Turbidity	0003.84
Comments	Sunny, calm, 2 ft shore break, 50 people, 100 surfers, many homeless people

September 8, 2021 — 137 MPN — 100 surfers

Location Identifier	000703
Location Name	Cove Park
Island	Maui
Latitude Decimal Degrees	20.727503
Longitude Decimal Degrees	-156.449739

Sample No	MD09012102
Clostridium Qualifier	
Clostridium Results	0002
Enterococci Qualifier	
Enterococci Results	124

Date	9/1/2021
Time	10:00 AM
Temperature	27.20
Salinity	32.57
Dissolved Oxygen	06.26
Dissolved Oxygen Saturation	096.00
pH	08.09
Turbidity	0005.08
Comments	Sunny, calm, 3 ft shore break, 200 surfers, many homeless people

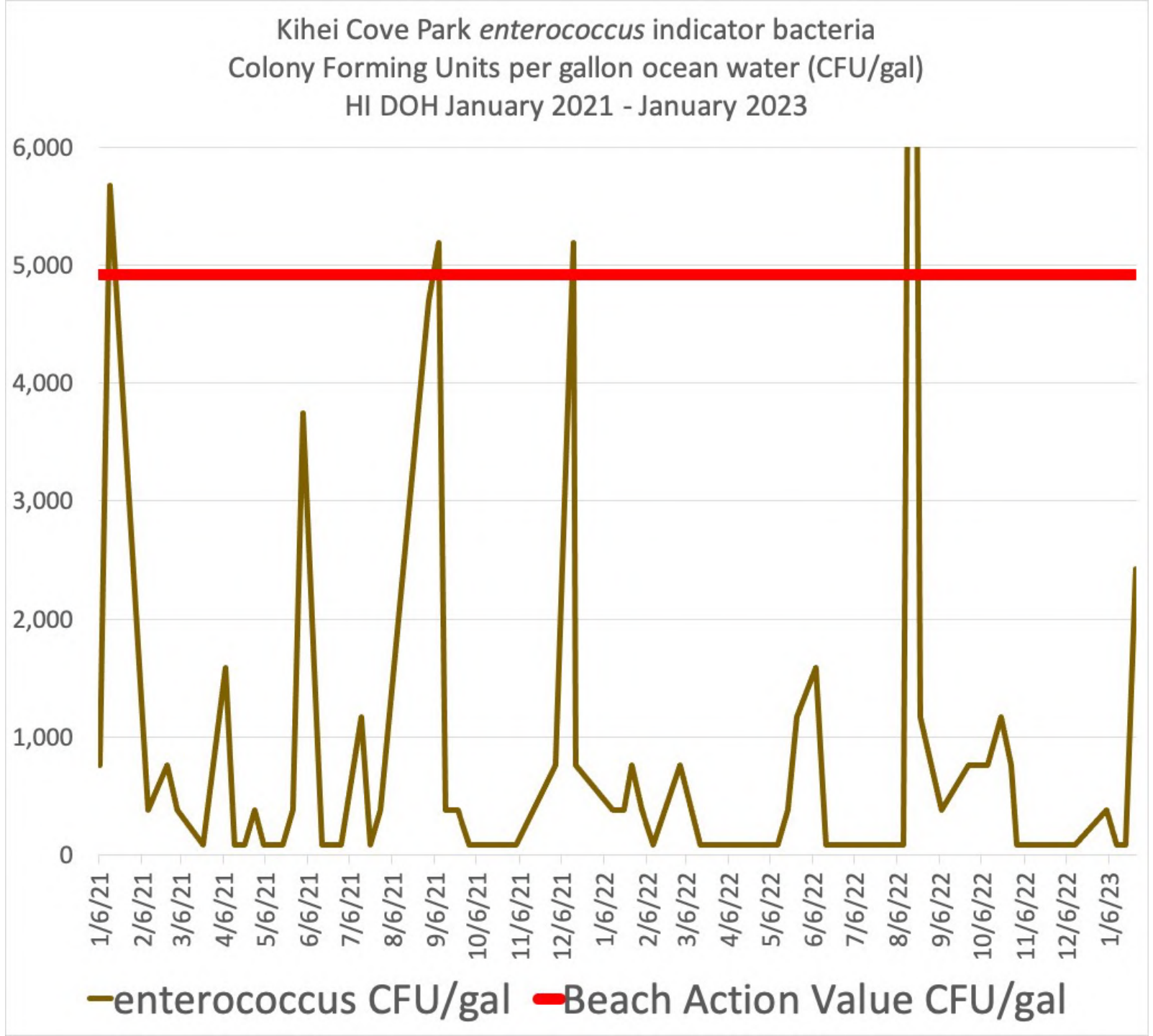
September 1, 2021 — 124 MPN — 200 surfers

Location Identifier	000703
Location Name	Cove Park
Island	Maui
Latitude Decimal Degrees	20.727503
Longitude Decimal Degrees	-156.449739

Sample No	MD05231802
Clostridium Qualifier	
Clostridium Results	0006
Enterococci Qualifier	>
Enterococci Results	2005

Date	5/23/2018
Time	9:20 AM
Temperature	26.00
Salinity	31.19
Dissolved Oxygen	06.36
Dissolved Oxygen Saturation	093.40
pH	07.92
Turbidity	0003.67
Comments	Calm, sunny, 1-2 ft shore break, 100 people, rising tide

May 5, 2018 — >2005 MPN — 100 people


Kihei Cove Park *enterococcus* indicator bacteria
Colony Forming Units per gallon ocean water (CFU/gal)
HI DOH January 2021 - January 2023
6,000
5,000
4,000
3,000
2,000
1,000
0
1/6/21
2/6/21
3/6/21
4/6/21
5/6/21
6/6/21
7/6/21
8/6/21
9/6/21
10/6/21
11/6/21
12/6/21
1/6/22
2/6/22
3/6/22
4/6/22
5/6/22
6/6/22
7/6/22
8/6/22
9/6/22
10/6/22
11/6/22
12/6/22
1/6/23
enterococcus CFU/gal
Beach Action Value CFU/gal

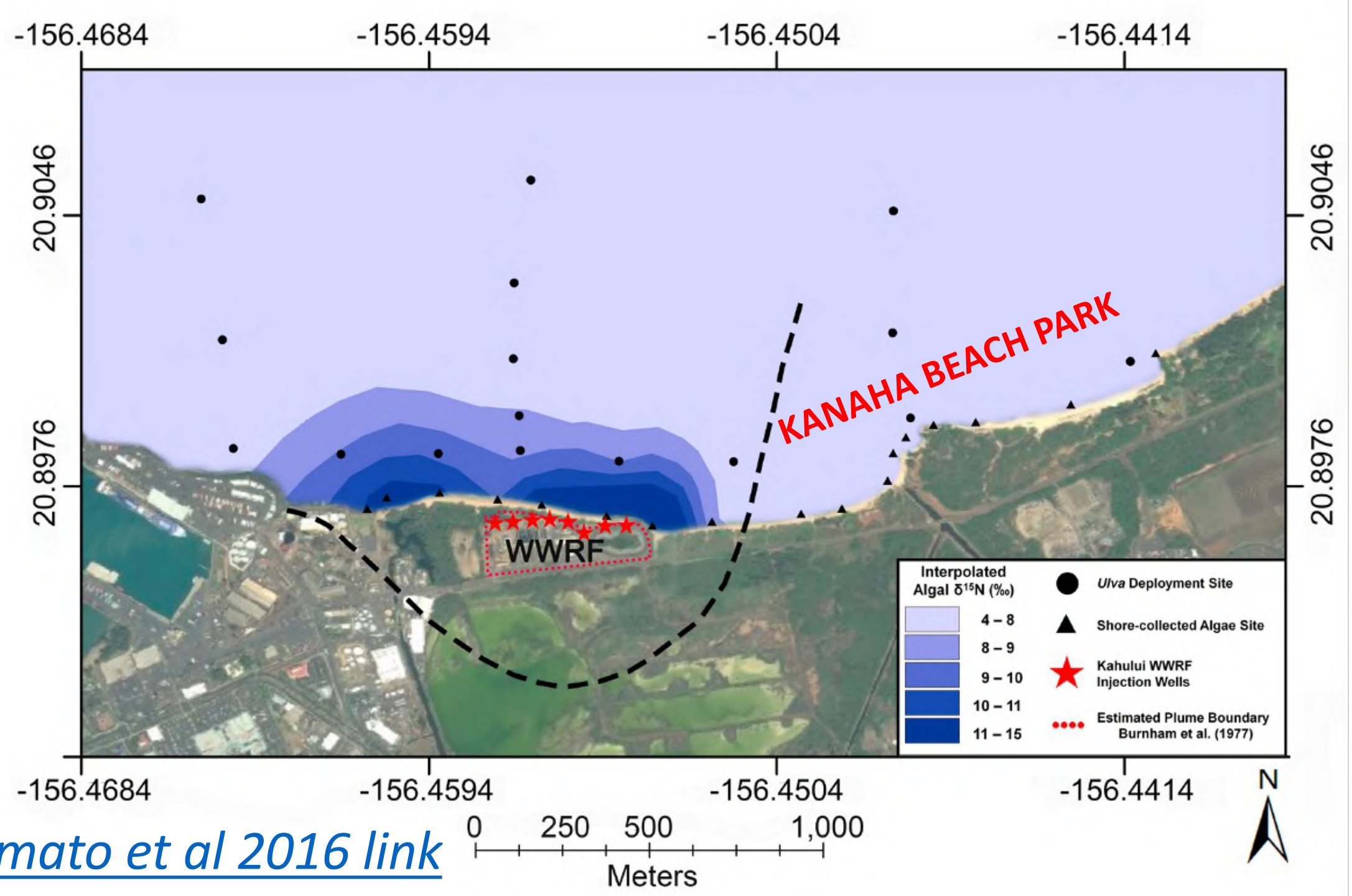
LIST OF PATHOGENIC (ILLNESS-CAUSING) LIFE FORMS COMMONLY FOUND IN INFECTED WASTEWATER, SUCH AS R-3 INJECTED IN KIHEI AND KAHULUI

The list of pathogenic microbial species commonly found in non-disinfected wastewater is long and alarming, shown in the **U.S. NIH list** below.

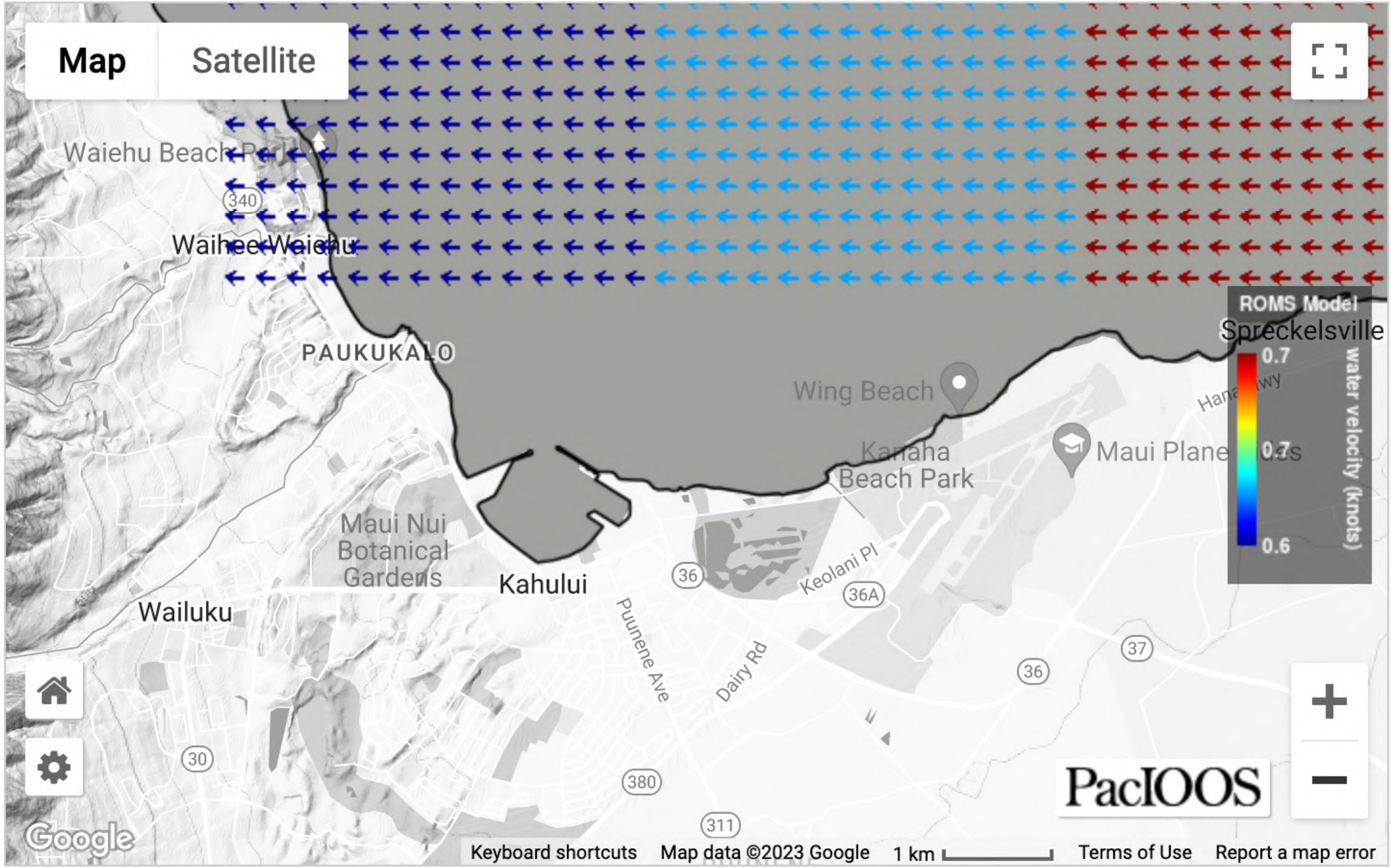
Respiratory infections such as COVID-19 and **skin infections** can be caused by water borne pathogens.

The major pathogens of concern in municipal wastewater and diseases or illness associated with them:

Name of pathogen	Major disease or symptoms
Bacteria	
Campylobacter jejuni	Gastroenteritis
Escherichia coli	Gastroenteritis
Salmonella spp.	Salmonellosis, typhoid, paratyphoid
Shigella spp.	Bacillary dysentery
Staphylococcus	Skin Infections, bacteremia, toxic shock syndrome, septic arthritis
Streptococcus	Cellulitis, Pink eye, meningitis, pneumonia, endocarditis, necrotizing fasciitis
Vibrio cholerae	Cholera
Yersinia spp.	Gastroenteritis
Viruses	
Adenovirus	Upper respiratory infection and gastroenteritis
Astrovirus	Gastroenteritis
Coxsackie virus	Meningitis, pneumonia, fever
Echovirus	Meningitis, paralysis, encephalitis, fever
Hepatitis virus	Infectious hepatitis, miscarriage, and death
Human calicivirus	Epidemic gastroenteritis with severe diarrhea
Polio virus	Poliomyelitis
Reovirus	Respiratory infections, gastroenteritis
Rotavirus	Acute gastroenteritis with severe diarrhea
TT hepatitis	Hepatitis
COVID-19	Acute respiratory illness
Protozoa	
Balantidium coli	Balantidiasis
Cryptosporidium spp.	Cryptosporidiosis
Entamoeba histolytica	Acute amoebic dysentery
Giardia duodenalis	Giardiasis
Toxoplasma gondii	Toxoplasmosis



[Amato et al 2016 link]


Map
Satellite
Waiehu Beach Park
340
Waihee-Waiehu
PAUKUKALO
Wing Beach
Kanaha Beach Park
Maui Plane
Maui Nui Botanical Gardens
Kahului
Wailuku
Keolani Pl
36
36A
37
Puunene Ave
Dairy Rd
30
380
311
ROMS Model
Spreckelsville
0.7
0.6
water velocity (knots)
PacIOOS
Google
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SURFRIDER FOUNDATION

TABLE 1: PERCENT OF NORTH MAUI SAMPLES EXCEEDING HEALTH STANDARDS (>130 MPN/100ML)

[2022 report link]

SITE NAME	TOTAL SAMPLES	MAXIMUM BACTERIA (MPN ENTEROCOCCUS/100ML)	% HIGH BACTERIA (>130 MPN/100ML)
Kapukaulua/Baldwin Beach	10	98	0%
Hoʻokipa Beach Park E	11	41	0%
Kūʻau Bay/Tavares Bay	10	62	0%
Kahului Treatment Plant	10	41	0%
Kanahā/Kalialinui Stream	11	10	0%
Kanahā Beach	11	121	0%
Waiehu Stream	11	20	0%
Waiheʻe Beach Park	11	20	0%
Kūʻau Cove/Mama's Beach	12	175	9%
Wawau Point/Baby Beach	11	175	9%
Hoʻokipa Beach Park W	11	447	9%
Pāʻia Bay	11	545	9%
Sugar Cove	9	201	11%
Māliko Bay	11	765	18%
Kahului Harbor	10	2,400	20%
Wailuku Stream	11	4,366	27%

Table 1. Indicates the percentage of total samples taken at respective sites that exceeded HDOH health standards for *Enterococcus* bacteria (>130 mpn/100mL). Note that the number of total samples is not consistent across sites.

SURFRIDER FOUNDATION

KEY OUTCOMES

[2022 report link]

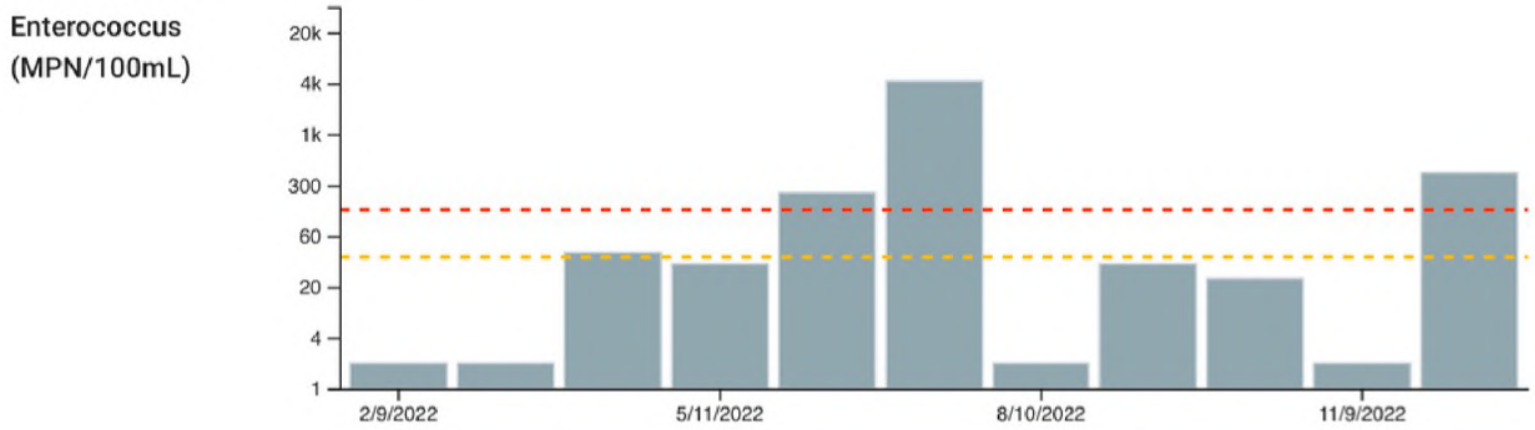
PRIORITY SAMPLE SITE: WAILUKU RIVER

Since 2017, BWTF monitoring has indicated high bacteria levels at the mouth of the Wailuku River and the surf spot Paukukalo. In 2022, 27% of the samples collected at this site exceeded health standards. Two important factors seem to contribute to the high bacteria readings. First, the Wailuku River site is located at the mouth of a river and thus receives high amounts of land-based runoff. Secondly, this area has a high density of coastal cesspools that likely contribute to high bacteria readings, particularly during heavy rain events.

27%

OF WAILUKU RIVER SAMPLES IN 2022 EXCEEDED HEALTH STANDARDS FOR BACTERIAL COUNTS

Wailuku River Results



County of Maui not planning to invest in disinfection of injected effluent in Kahului until FY2026. Estimated cost of UV disinfection install in Kahului $6 - 20 mil.

Wailuku-Kahului Wastewater Reclamation Facility (WWRF) Upgrade to R-1 (CBS-1169)

The plan to upgrade the Kahului/Wailuku WWRF to R-1 is only in the preliminary planning stages. We do not have any preliminary plans, or formal cost estimates at this time. The preliminary estimate in the six year CIP was based on the one channel expansion in Lahaina that cost approximately $6 million. An actual cost estimate will be prepared once we get closer to design contracts.

We have listed it as a potential project on our six year Capital Improvement Program. At this point in time it is not required until the recycled water force main (CBS-1171) and pump station (CBS-5034) projects are constructed to transfer water to the central valley and the water could be used by customers. These other projects are also on the six year schedule and have design contracts issued and the EIS is in process. The current time line is our best estimate, it is not required to be completed by FY2028. It is dependent on other projects as well as other approvals (mayor's office, County Council, etc.) Note that funding for projects is only approved on a year to year basis during the County Budget process.

County of Maui
Fiscal Year 2022-2027 Capital Improvement Program

CBS No: CBS-1169

Project Name: Wailuku-Kahului Wastewater Reclamation Facility (WWRF) Upgrade to R-1

Department: Department of Environmental Management

District: Wailuku-Kahului

Project Type: Sewer

Anticipated Life: 30 years

Prior Years	Appr	Ensuing	Subsequent Years					Total
Expend/Encb	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	6-Year
0	0	0	0	0	0	1,800,000	0	1,800,000

PROJECT DESCRIPTION

The primary objective for this project is to modify the Wailuku-Kahului Wastewater Reclamation Facility to produce a R-1 quality reclaimed water for the Wailuku-Kahului service area. This includes construction of ultraviolet disinfection basins, on-site storage, a pump station and all related piping and electrical to connect to the proposed force main.

PROJECT JUSTIFICATION

Use of reclaimed water will result in the conservation of potable water resources, preservation of brackish water resources and reduction of treated effluent discharged into injection wells.

STRATEGIC PLAN ALIGNMENT

Department's Strategic Plan	Countywide Priority Results
Sustain Reliable Wastewater Infrastructure Ensure Facilities Meet Future Needs Provide Reliable Wastewater Service	A Suitable Public Infrastructure A Strong, Diversified Economy A Prepared, Safe, and Liveable County A Healthy and Sustainable Community

Operating Impact Narrative

Addition of this treatment capability will require an additional position to manage the system, and extra costs for electricity and materials to operate the disinfection system and pumps.

Benefits of installing ultraviolet wastewater disinfection for injection well discharges in Kahului and Kihei

- Reef safe
- No residual chemicals
- Reliable operation
- Established technology
- Affordable installation, operation and maintenance
- Kills or inactivates pathogens
- Protects marine life
- Protects swimmers, surfers and divers in receiving waters
- Gets ahead of NPDES requirements and/or litigation
- Provides protection against personal injury litigation, i.e. class-action lawsuit
- Prevents infections to reduce hospital occupancy
- Demonstrates initiative on the part of Maui County
- Reflects the will of the people
- Inspires the youth
- Renews faith in government
- Creates local economic activity
- Restore Maui's image as a pristine ocean recreation destination
- Sets an example for other legislatures and municipalities

REUSE GUIDELINES

Volume 1: Recycled Water Facilities

Prepared by
Hawai'i State Department of Health
Wastewater Branch
January 2016
(Replaces May 15, 2002 Version)

D. R-1 Recycled Water

In order to be classified as R-1 recycled water, wastewater must be oxidized, filtered and disinfected as follows:

3. Disinfection

The disinfection process, when combined with filtration, must have demonstrated inactivation and/or removal of 99.999 percent of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least resistant to disinfection as the polio virus may be used for purposes of demonstration.

b. UV Disinfection

1) When using media filtration:

a) The design UV dose shall be 100 mJ/cm² or greater under maximum daily flow; and

b) The filtered UV transmittance shall be 55 percent or greater at 254 nanometers (nm).

2) When using membrane filtration:

a) The design UV dose shall be 80 mJ/cm² or greater under maximum daily flow; and

b) The filtered UV transmittance shall be 65 percent or greater at 254 nanometers (nm).

3) The minimum acceptable design requirements and commissioning of new UV disinfection systems shall comply with the *NWRI UV Guidelines*.

4) A UV system that is Title 22 certified by California is acceptable to the DOH.

4. Fecal Coliform

a. The median density measured in the disinfected effluent shall not exceed 2.2/100 milliliters using the bacteriological results of the last seven days for which analyses have been completed;

b. The density shall not exceed 23/100 milliliters in more than one sample in any 30-day period; and

c. No sample shall exceed 200/100 milliliters.

d. Frequency of sampling and analysis:

1) Sampling and analysis shall be done daily for fecal coliform when R-1 is being used as allowed (i.e. not directly disposed).

2) If approved by the Director, sampling frequency may be reduced to weekly sampling based on:

a) Use of R-1 when a lower class of recycled water is allowed;
b) Volume of R-1 used;
c) Disinfection or filtration method used;
d) Demonstrated disinfection quality and reliability;
e) Sampling location; and
f) Other factors as determined by the DOH.

Hawaii DOH 2016 Reuse Guidelines link

Maui can pay for UV upgrades in Kahului with a FY2024 State Revolving Fund award 50% loan / 50% grant to reduce the Maui County taxpayer burden by half

Or a private individual, nonprofit or company can donate ~$6 - 20 mil for UV in Kahului through a COM Memorandum of Agreement

PROPOSED PROJECT FOR SRF FUNDING FORM

State Fiscal Year 2024

Project Title: Kahului-Wailuku Wastewater Reclamation Facility ultraviolet disinfection installation to achieve R-1 reuse effluent quality to facilitate irrigation reuse

County/Applicant: County of Maui

Estimated Cost: $20,000,000 Estimated Start Date: July 1, 2024

Project Description:

This project will fund detailed design and installation of new ultraviolet disinfection capacity at the Kahului-Wailuku Wastewater Reclamation Facility, to comply with potential Maui County Council legislation mandating disinfection of all municipal wastewater discharges in Maui to State of Hawaii Department of Health R-1 reuse standards

Place an "X" next to each item that applies.
The project description must contain information supporting the applicable items.

1. Water Quality Protection		
X	Corrects surface water quality impairment or eliminates/prevents ground water contamination.	12 pts.
2. Green Infrastructure		
X	a. Water reuse facility providing R1 or R2 water and/or reuse transmission and/or distribution system.	10 pts.
X	b. Energy Efficiency or Renewable Energy: Uses energy efficient components (eg: motors, pumps, blowers, photovoltaic panels etc.) that reduce energy consumption of a major component by 20% or more; or provides for renewable energy (methane conversion, etc.) or other environmentally innovative technologies (eg: hydroelectric turbine at outfall line to generate electricity) to reduce energy consumption of the plant or major component by 20% or more.	8 pts.
X	c. Promotes sustainable infrastructure to withstand the effects of rising sea levels due to climate change and provides adaptation for coastline inundation.	7 pts.
	d. Provides for wastewater sludge reuse.	7 pts
	e. Energy audit.	3 pts.
3. Compliance and Enforcement		
X	Project necessary to achieve compliance with federal or state compliance issue, consent decree, or court order.	5 pts.
4. Project Need		
	a. Secondary treatment for wastewater treatment plant.	4 pts.
	b. Sewer collection system rehabilitation or replacement, infiltration/inflow correction.	4 pts.
	c. Large capacity cesspool and landfill liner projects.	4 pts.
	d. Stormwater equipment, wastewater facilities.	3 pts.

Total Points (for DOH use):	42

Bill 52 proposed amendment #1:

Implementation schedule

- Lahaina – immediate upon Bill being signed
- Kihei – January 2024
- Kahului – January 2026

Bill 52 proposed amendment #2:

Monitoring requirements

- Daily?
- Weekly?
- Monthly?

Bill 52 proposed amendment #3:

Free R-1 water

- Make R-1 water 100% free of charge to all current and future reuse customers,
  or only to nonprofit organizations operating irrigation reuse fire break installations
- Will encourage increased reuse
- Will encourage new R-1 permit applications

Estimating the cost of free R-1 reuse water

Estimated current R-1 reuse water revenue ~$600,000 / year

Estimated injected water value ~$1,500,000 / year

Estimated total value of all municipal effluent in Maui ~$2,100,000 / year

August 2022	Kahului	Kihei	Lahaina	Total	R-1 Value	R-1 Value	Cost of free R-1
flow data	gal/day	gal/day	gal/day	gal/day	$/day	$/year	
reuse flow	302,690	1,942,393	1,775,529	4,020,612	$1,729	$631,035	lost actual revenue
injection	5,124,810	1,725,607	2,783,471	9,633,888	$4,143	$1,512,039	lost potential revenue
plant flow	5,427,500	3,668,000	4,559,000	13,654,500	$5,871	$2,143,074	total value of free R-1

Bill 52 proposed amendment #4:

Bonus and/or raise for DEM Wastewater Reclamation Division employees

- Motivates extra work for new disinfection & reuse
- Rewards heroic public health service
- Encourages recruitment & retention

Formula for large-scale irrigation reuse fire breaks

- Bill 52: Free R-1 for nonprofit fire break work
- Free or low cost lease from landowners
- Large scale funding: private philanthropic, federal

Ask for Maui County Council

- Bill 52 with free R-1 for nonprofit fire break work
- Support MRWRS in FY2025 budget deliberations


?
FlushAware
Do you know what happens to the water that goes down the toilet and drain?
Learn About Your Maui Island Wastewater Disposal Method
FlushAware.com

REEF POWER

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travis@reefpowermaui.com

FlushAware.com

@flushaware

DESIGN LEGEND

- EXISTING TOPO
- PROPOSED TOPO
- FM — PROPOSED SEWER FORCE MAIN
- W — PROPOSED R1 IRRIGATION WATER
- PROPOSED GREENBELT
- PROPOSED GRUBBING AREA
- EXISTING WIND BREAK
- PROPOSED ALGAE TURF SCRUBBER
- PROPOSED SOLAR PANELS
- IRRIGATION WATER STORAGE POND

PROJECT SITE PLAN
SCALE: 1" = 200'

N

GRAPHIC SCALE (ENG)
200 0 100 200 400 800
(IN FEET)
1" = 200'0"

ECOSOLUTIONS LLC
www.ecosoldesigns.com
ADDRESS: 2620 KANAKANUI ROAD
KIHEI, MAUI, HI 96753
PHONE: 808.268.9444

stamp:

consultant:

client contact:

project address:
MA'ALAEA VILLAGE
MA'ALAEA ROAD
WAILUKU, HI 96793

project title:
MA'ALAEA REGIONAL WASTEWATER RECLAMATION SYSTEM (MRWRS)

content:
OPTION A
SITE PLAN

MOVING BED BIOREACTOR (MBBR)

revision:	date:

drawn by: DHW
checked by: MOL
date: SEPTEMBER 3, 2023
scale: AS SHOWN
sheet no.: 1 OF 1
project no.: 22-014
drawing no.: ECO 1

ADEPT Committee

From: Travis Liggett <info@maalaeawastewater.org>
Sent: Wednesday, October 18, 2023 6:00 PM
To: ADEPT Committee
Cc: Gabe Johnson; Axel I. Beers; Kate Griffiths
Subject: Ma'alaea Wastewater Association presentation ADEPT Committee 10/19/2023
Attachments: Ma'alaea Wastewater Association ADEPT October-19-2023.pdf

Aloha ADEPT Committee Members and Staff,

Attached please find my presentation for the ADEPT Committee hearing at 1:30 pm on Thursday October 19, 2023.

Please confirm that the document opens and displays properly.

I will be discussing irrigation reuse greenbelt fire break plans in Ma'alaea and across Maui, including how potential Bill 52 legislation fits into the big picture.

Please call (808) 757-5984 if you have any questions.

Mahalo,

Travis Liggett

Executive Director
Ma'alaea Wastewater Association
info@maalaeawastewater.org