

A Comparison of the Fecal Indicator Bacteria *Enterococci* Among O‘ahu Recreational Waters and Wai Kai Lagoon

Prepared by Drs. Susan Brown, Daniel McGlinn, and Heather Spalding

Aquatic Research Consultants, LLC

Charleston, South Carolina

Feb 1, 2025

Under the Clean Water Act (CWA), the Hawai‘i State Department of Health (HIDOH) is required to report a summary of Hawai‘i’s water quality every two years. One of the primary water quality standards for recreational waters in Hawai‘i is the fecal indicator bacteria (FIB) *Enterococci*, as recommended by the EPA. *Enterococci* are not harmful, but often co-occur with other harmful microorganisms and are an indicator of water quality. *Enterococci* are expressed as colony forming unites (CFU) or most probable number (MPN) per 100 ml, depending on the analytical method used. Two different recreational water quality criteria for *Enterococci* were recommended by the EPA, and subsequently adopted and amended by HIDOH since 2012. The water quality criteria stipulate that: 1) the geometric mean of *Enterococci* concentrations over any 30-day period should not exceed 35 CFU or MPN/100 ml and, 2) the Statistical Threshold Value (STV) of *Enterococci* should not exceed 130 CFU or MPN/100 ml and the frequency of samples exceeding the STV over the same 30 day period should not be more than 10%. The high number of sampling sites and the infrequency of sampling within 30 days in Hawai‘i resulted in the HIDOH Clean Water Branch (CWB) adopting an *Enterococci* concentration of 130 CFU or MPN/100 ml in a single sample as the Beach Action Value (BAV), which then requires further action. This BAV is specific to coastal beaches and excludes inland waters. Upon a finding of 130 CFU or MPN/100 ml in any discrete sample, the CWB will collect a follow up sample the next day and issue a notification. Methods for the detection of *Enterococci* require a minimum of 24 hours to provide results. If the follow-up sample does not exceed the BAV, then routine monitoring will continue, and the notification is updated. Additional information can be found on the [Hawai‘i Beach Monitoring Program website](https://health.hawaii.gov/cwb/beach-monitoring-program/) (<https://health.hawaii.gov/cwb/beach-monitoring-program/>).

The goal of this report is to compare *Enterococci* levels from monthly monitoring in the Wai Kai Lagoon with available water quality data for O‘ahu’s recreational waters. Water quality data for O‘ahu’s coastal waters were available for the period during which Haseko has routinely collected data at the Wai Kai Lagoon (January 2012 – May 2024). Historically, the HIDOH CWB posts water quality data on Hawaiian beaches on its website under “Water Quality Data” (<https://health.hawaii.gov/cwb/beach-monitoring-program/>). At present, the website is in the process of being upgraded and data are unavailable to the public via the server. However, data can be requested via email. Current water quality advisories are posted and can be found online at the [CWB website](https://eha-cloud.doh.hawaii.gov/cwb/#!/landing) (<https://eha-cloud.doh.hawaii.gov/cwb/#!/landing>).

Additional water quality resources are provided by the [Surfrider Foundation Oahu Blue Water](#)

[Task Force \(https://oahu.surfrider.org/bwtfreport\)](https://oahu.surfrider.org/bwtfreport). The Blue Water Task Force collects samples for *Enterococci* at 24 sites around O‘ahu every other week and posts an annual report summarizing the data.

Here we present a summary of the Hawai‘i State Department of Health Clean Water Branch *Enterococci* data for sites with at least 30 sampling events between 2012-2024 and data for Kai Wai Lagoon over the same time period. The reported data are quantified as both the number of samples taken and the number of samples exceeding the two threshold criteria (Tables 1, 2), and graphically over time by site (Figures 1-34). **In summary, the Wai Kai Lagoon has not exhibited any significant signs of the fecal indicator bacteria (FIB) *Enterococci*, and did not exceed the Beach Action Value (BAV) of MPN/100 ml (Table 1, Figure 2) since monitoring began in 2012.**

TABLES

Table 1. Sites sampled more than 30 times by HDOH CWB that did not exceed the Beach Action Value (BAV) of MPN/100 ml from 2012-2024 (shown as green sites in Figure 1). Data includes the total number of samples over the 12-year period, and the number of samples that exceeded 35 MPN *Enterococci* /100 ml . Due to the infrequency of sampling at some sites, the *Enterococci* data between 35-130 MPN/100 ml listed are from discreet samples instead of the geometric mean over a 30-day period.

Site	Location	No. of samples 2012-2024	Samples with 35-130 MPN/100 ml	Samples with >130 MPN/100 ml
A	Bellows (all sites)	41	1	0
B	Diamond Head Beach	110	0	0
C	Ewa Beach Residential	64	0	0
D	Ewa Beach Park	31	0	0
E	Hawai'i Kai	38	1	0
F	Kahala Beach	142	5	0
G	Kahe Point	134	4	0
H	Kalama Beach	91	3	0
I	Kokololio	74	3	0
J	Maili Beach Park	392	2	0
K	Makaha Beach	388	2	0
L	Malaekahana	71	1	0
M	Mokuleia	45	1	0
N	Nanakuli Beach Park	381	0	0
O	Oneawa Beach and at Castles	66	5	0
P	Oneula Beach	70	1	0
Q	Pipeline	55	4	0
R	Pounders	66	1	0
S	Pupukea at Three Tables	57	3	0
T	Tonggs	44	4	0
U	White Plains Beach	334	2	0
	Wai Kai Lagoon	143*	3	0

***Six replicates per sample**

Table 2. Sites sampled more than 30 times by HDOH CWB that exceeded the Beach Action Value (BAV) of MPN/100 ml of *Enterococci* from 2012-2024. Data include the total number of samples over the 12-year period and the number of samples that exceeded 130 MPN/100 ml. Due to the infrequency of sampling at some sites, the *Enterococci* data shown between 35-130 MPN/100 ml are from discreet samples instead of the geometric mean over a 30-day period.

Site	Location	No. of Samples 2012-2024	Samples with 35-130 MPN/100 ml	Samples with >130 MPN/100 ml
1	Ala Moana Beach Park (all sites)	916	15	5
2	Ala Moana Lagoon	399	8	3
3	Chuns Reef	361	1	2
4	Haleiwa Beach Park	400	4	3
5	Hanauma Beach Park	373	15	9
6	Kaalawai Beach	31	2	3
7	Kaelepulu Pond (all sites)	233	66	63
8	Kahanamoku Beach	434	23	10
9	Kailua Beach Park	411	10	8
10	Kapaeloa Beach	47	1	1
11	Kapiolani Park	101	3	2
12	Kawaikui Beach Park	37	3	3
13	Keehi Lagoon	68	22	14
14	Ko'olina Lagoons	443	9	5
15	Kualoa Beach	324	23	8
16	Kuhio Beach	430	32	11
17	Laniakea	252	6	2
18	Lanikai Beach	418	7	10
19	Makapuu	394	5	1
20	Manners	76	0	1
21	Maunaloa Beach Park	52	3	1
22	Moana Beach	420	19	2
23	Pokai Bay	391	13	6
24	Public Bath Beach, Waikiki	87	9	4
25	Punaluu	31	14	7
26	Sandy Beach	403	0	2
27	San Souci	420	2	2
28	Sharks Cove (Snorkeling Spot)	51	5	3
29	Sunset	355	4	2
30	Tavern Beach	95	1	1
31	Waimanalo Beach	530	6	5
32	Waimea Bay Shoreline	297	11	2

FIGURES

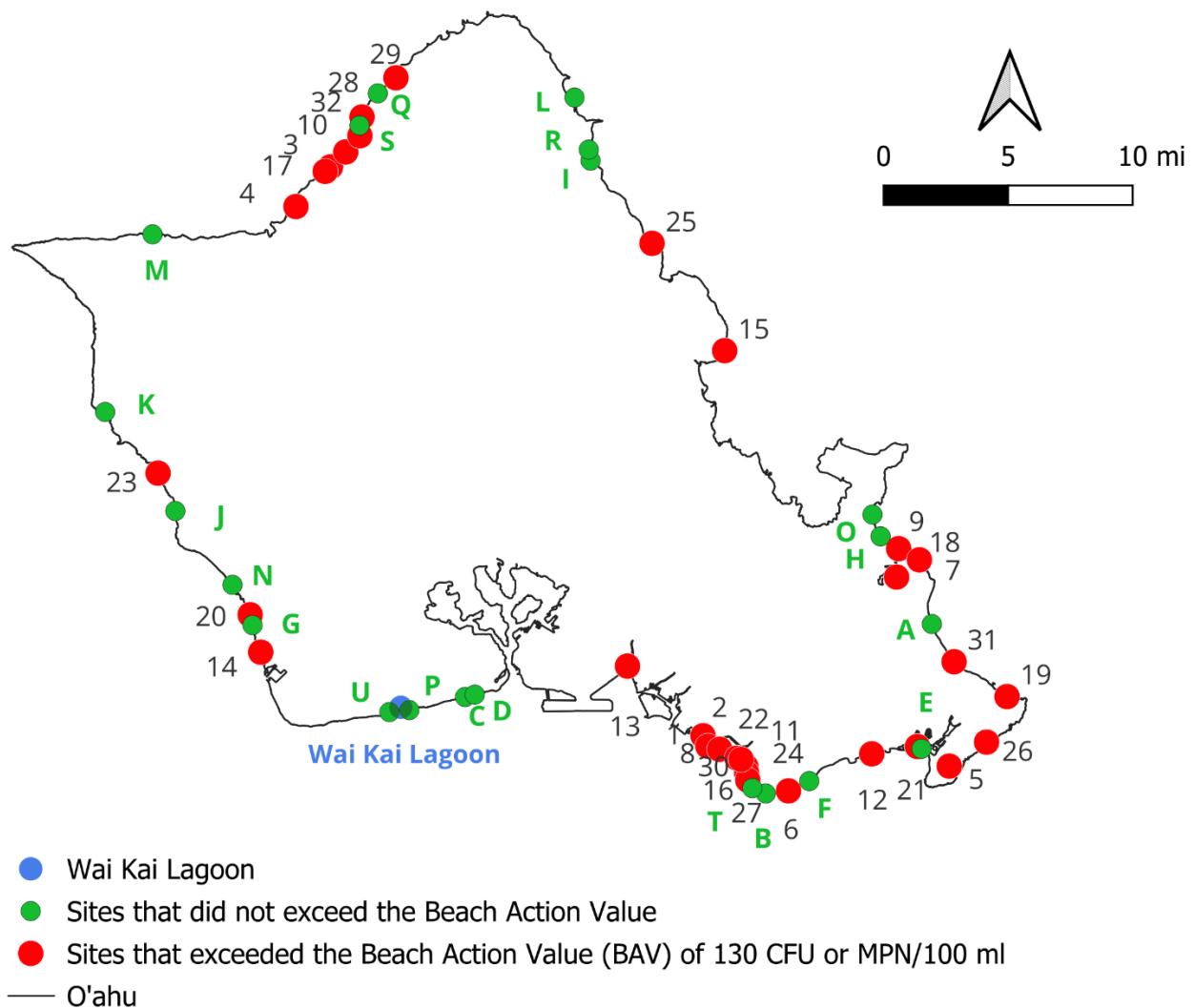


Figure 1. Station locations sampled at least 30 times by the HDOH CWB for the presence of the fecal indicator bacteria (FIB) *Enterococci* at O'ahu beaches from 2012-2024. Locations shown in green and labeled A-U did not exceed the Beach Action Value (BAV) of 130 MPN/100 ml. Stations shown in red and labeled 1-32 exceeded the BAV at least once. The location of the Wai Kai Lagoon is shown in blue. The locations and data for the monitored stations are listed in Tables 1 and 2.

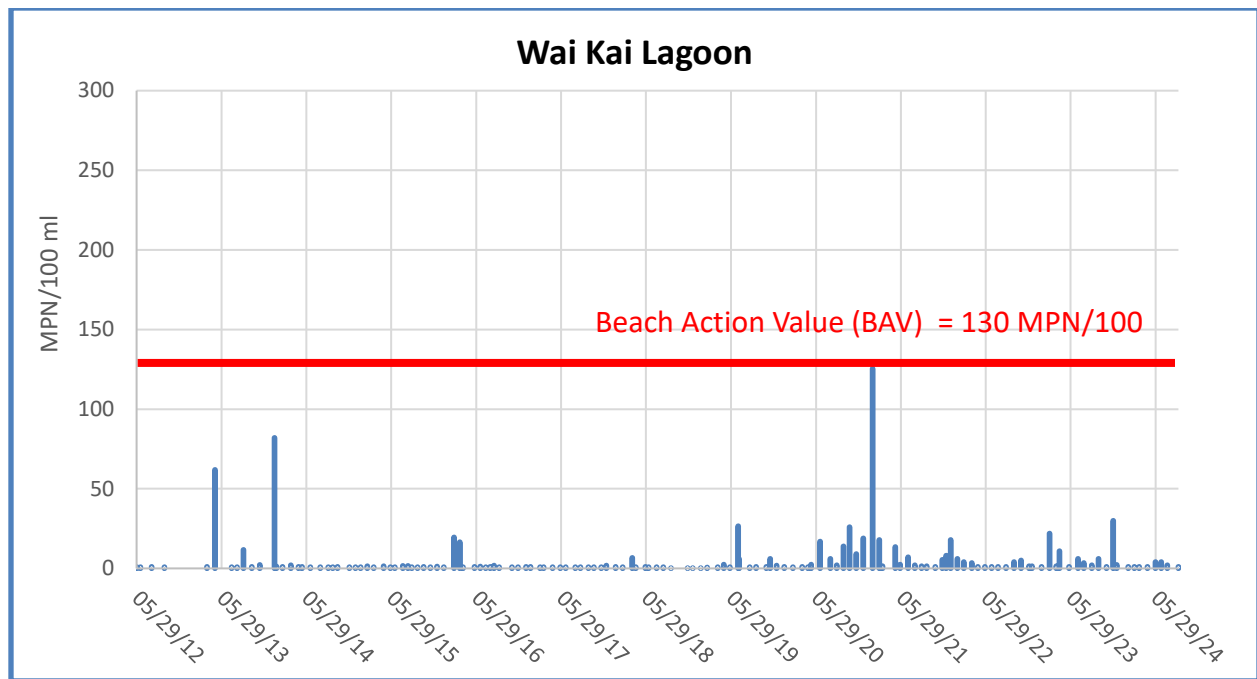


Figure 2. Wai Kai Lagoon

Since 2012, the Wai Kai Lagoon (Lagoon) has not exhibited any significant signs of the fecal indicator bacteria (FIB) *Enterococci*. It is important to note that, to date, the Wai Kai Lagoon has not been used to its full capacity, and the levels of contamination may rise when more people are utilizing this recreational lagoon. However, the majority of the Lagoon became available for recreational use in March 2023, and there has not been a concurrent increase in FIB. Routine monitoring will continue while the Lagoon and the properties around it are developed.

Figures 3-34. Time series plots of the sites monitored by the Clean Water Branch from 2012-2024 that exceeded the Beach Action Value (BAV) of 130 CFU or MPN/100 ml. The BAV is represented by a red line in each plot. Numerical values are shown in Table 2.

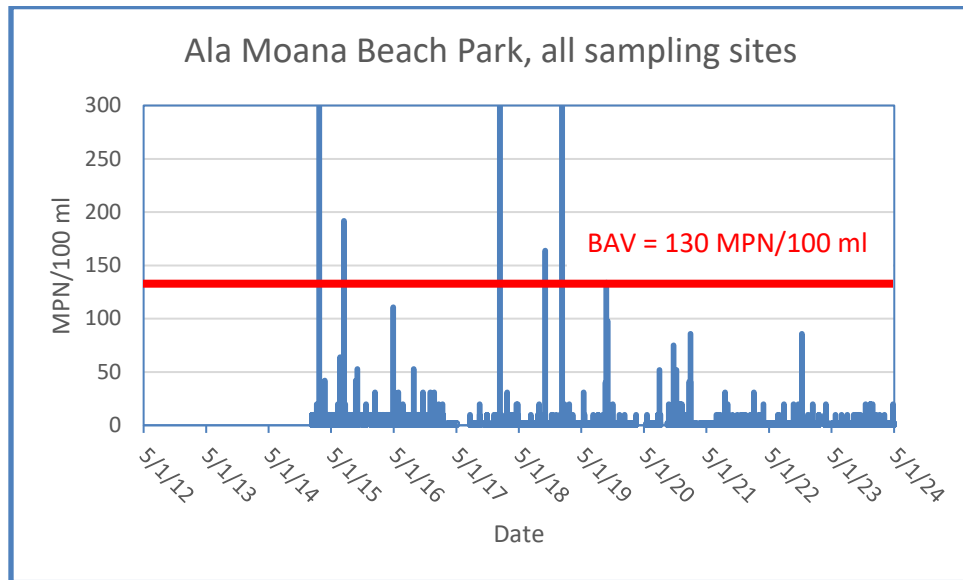


Figure 3. Site 1 (Ala Moana Beach Park, all sampling sites)

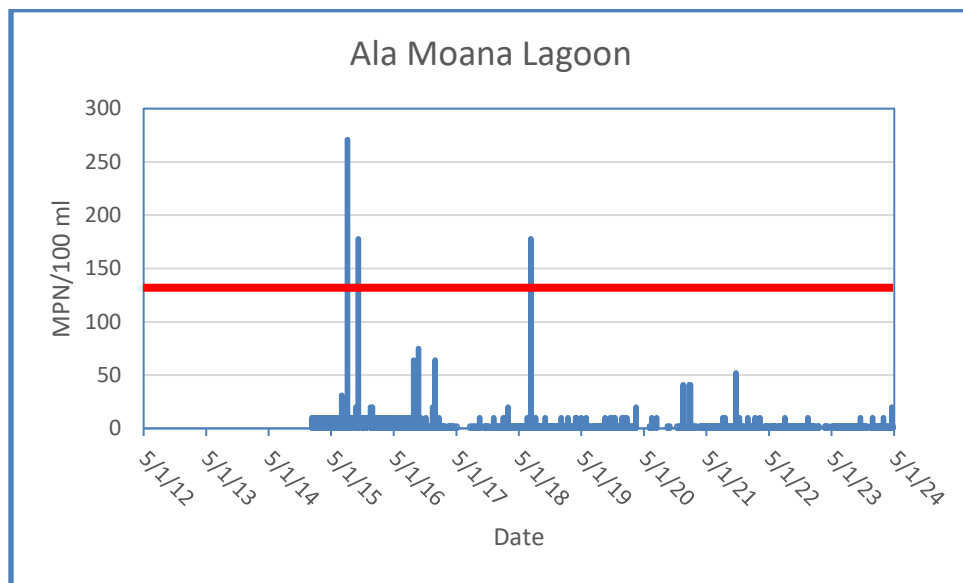


Figure 4. Site 2 (Ala Moana Lagoon)

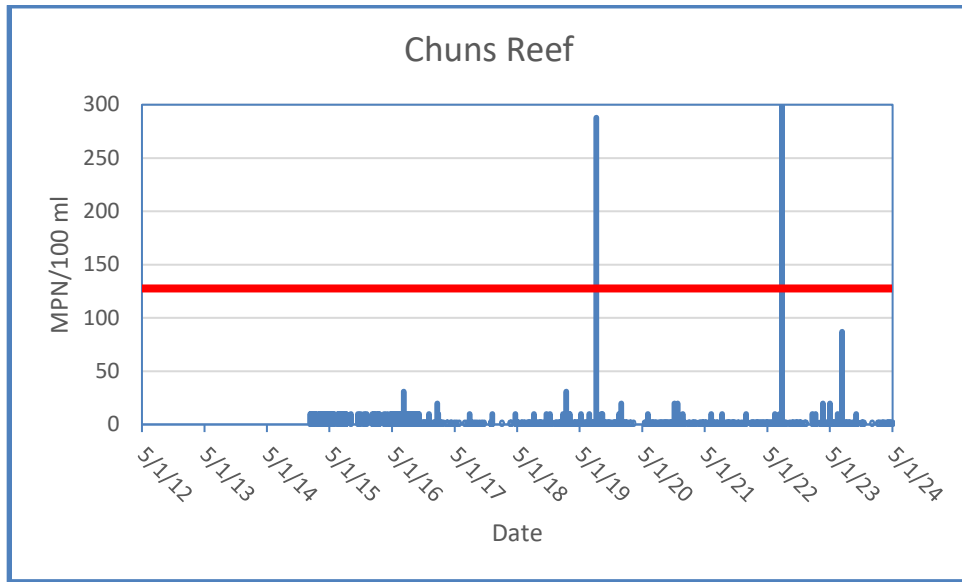


Figure 5. Site 3 (Chuns Reef)

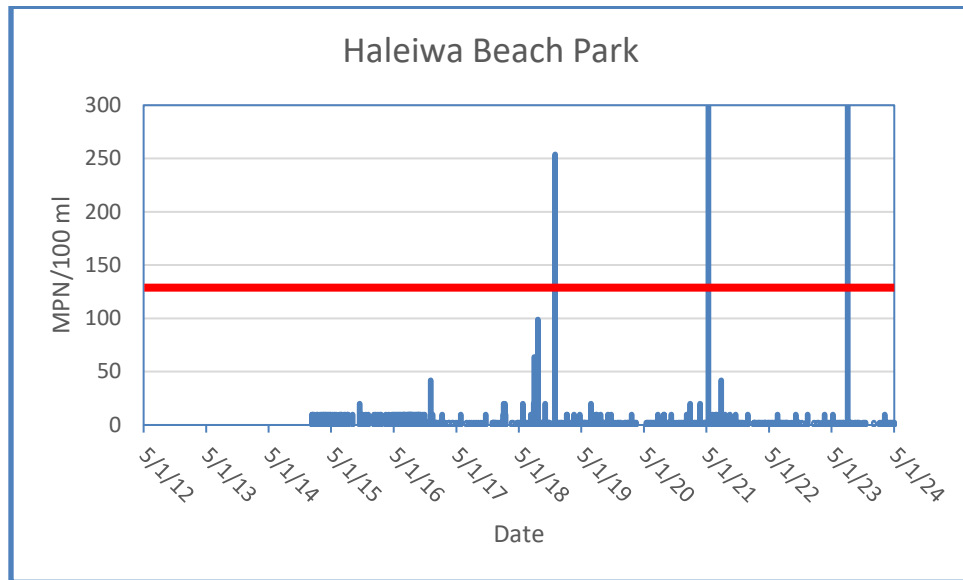


Figure 6. Site 4 (Haleiwa Beach Park)

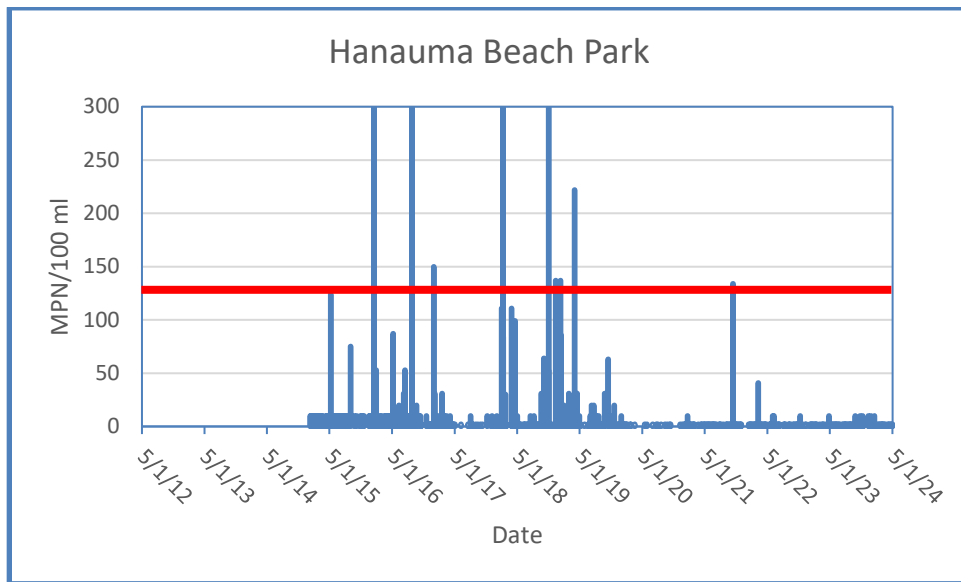


Figure 7. Site 5 (Hanauma Beach Park)

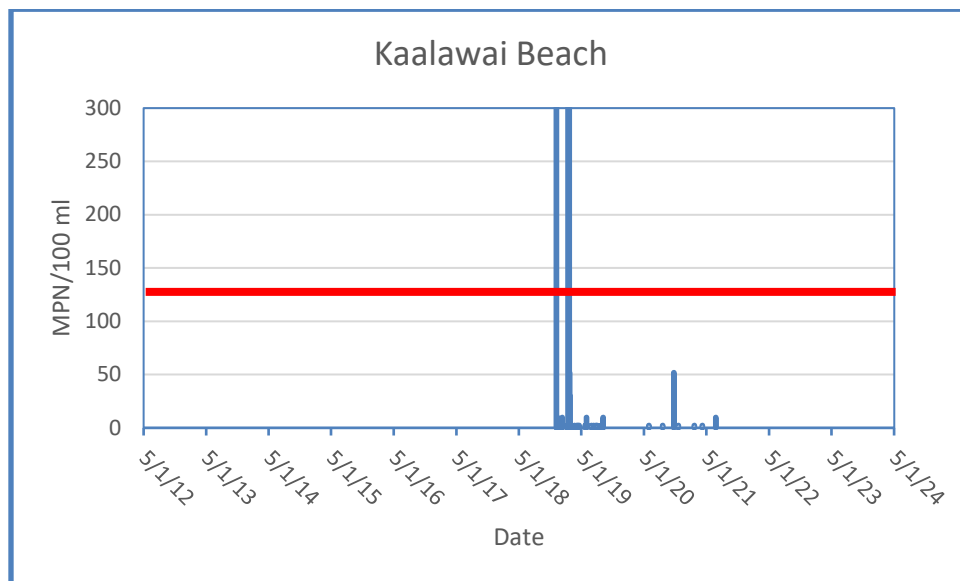


Figure 8. Site 6 (Kaalawai Beach)

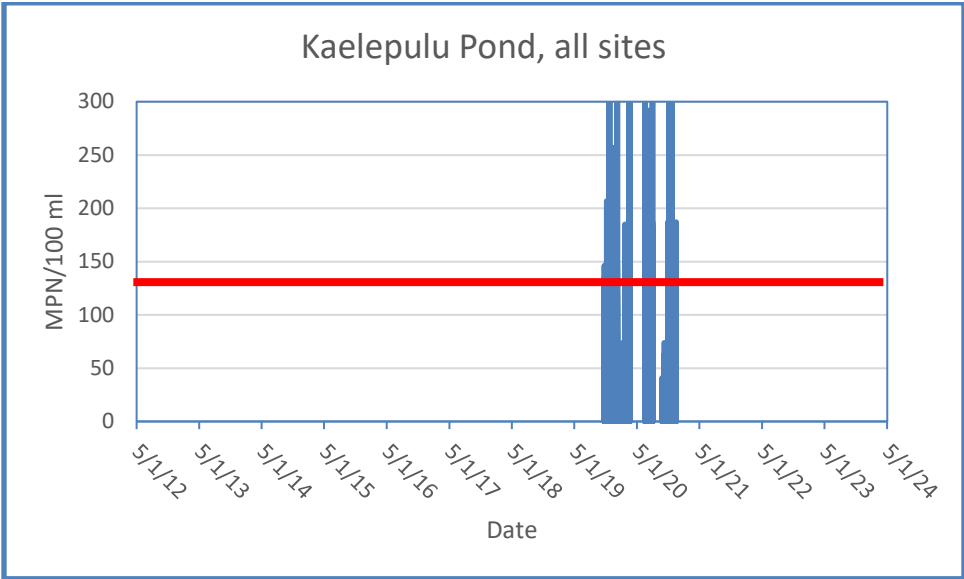


Figure 9. Site 7 (Kaelepulu Pond, all sites)

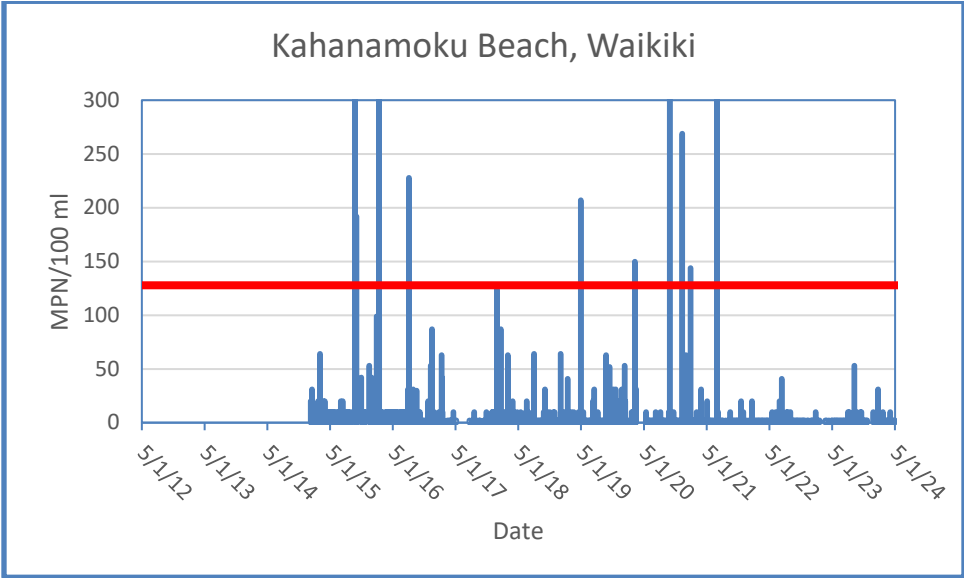


Figure 10. Site 8 (Kahanamoku Beach, Waikiki)

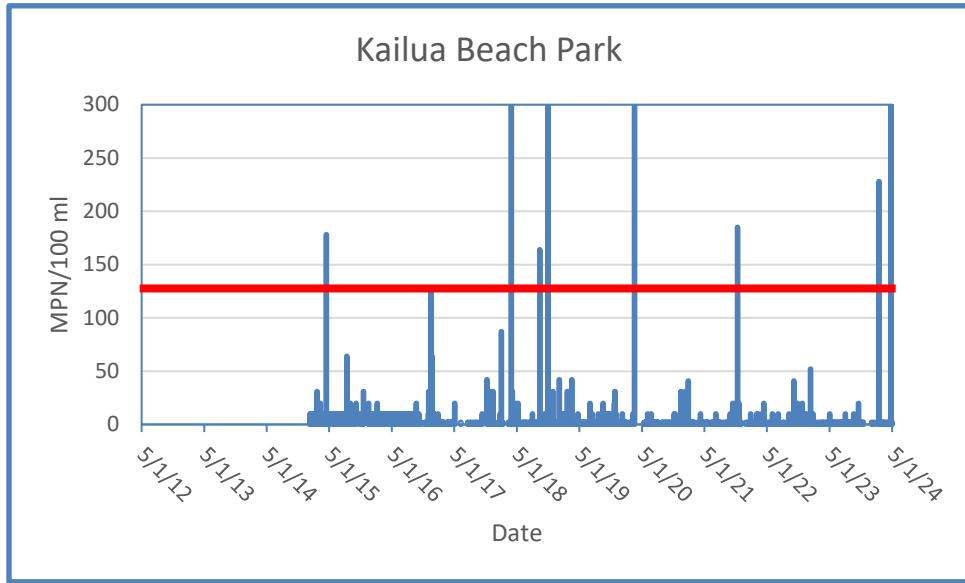


Figure 11. Site 9 (Kailua Beach Park)

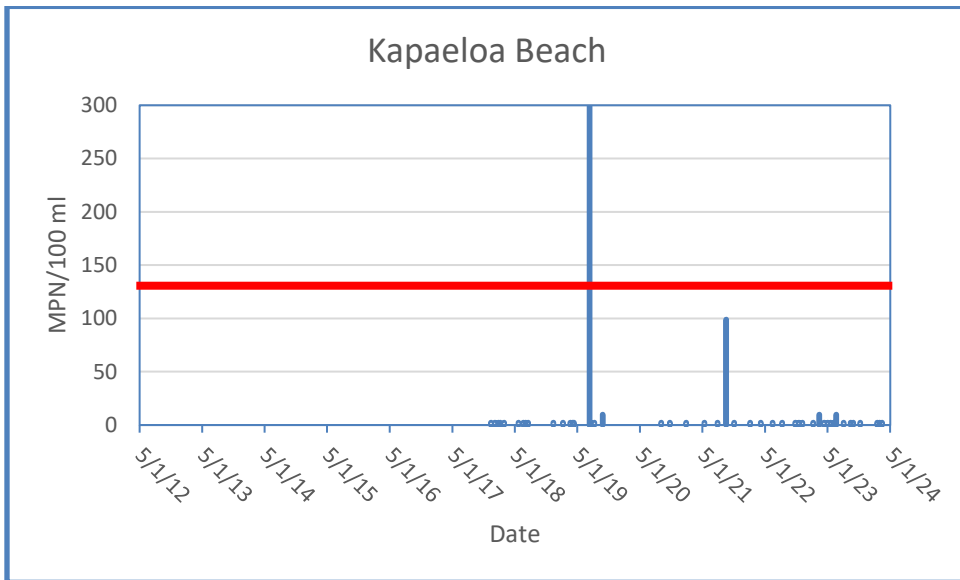


Figure 12. Site 10 (Kapaeloa Beach)

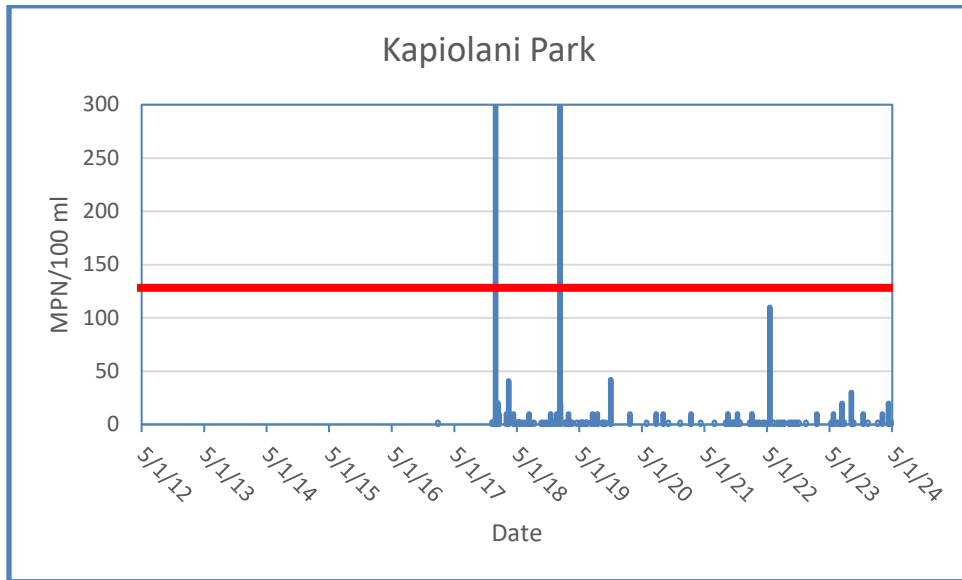


Figure 13. Site 11 (Kapiolani Park)

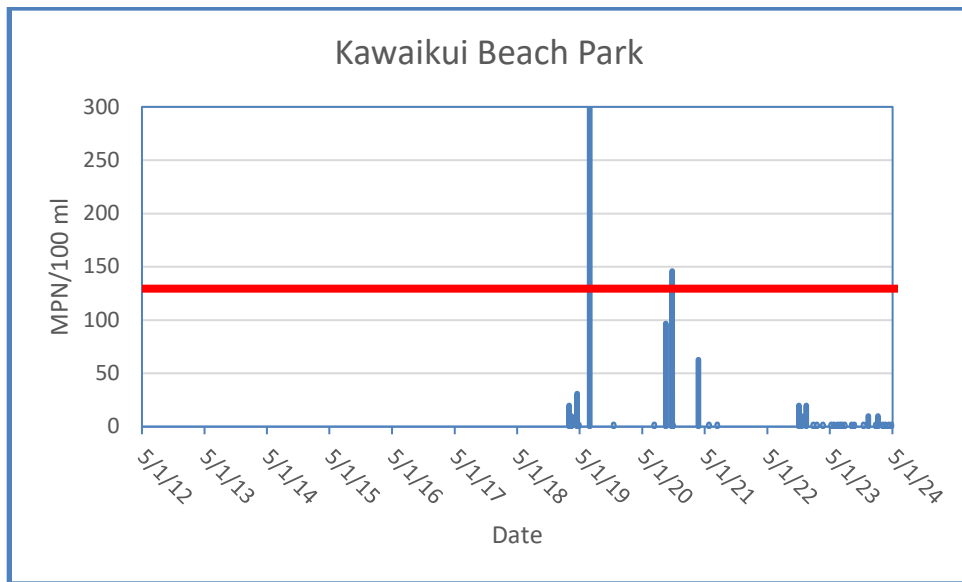


Figure 14. Site 12 (Kawaikui Beach Park)

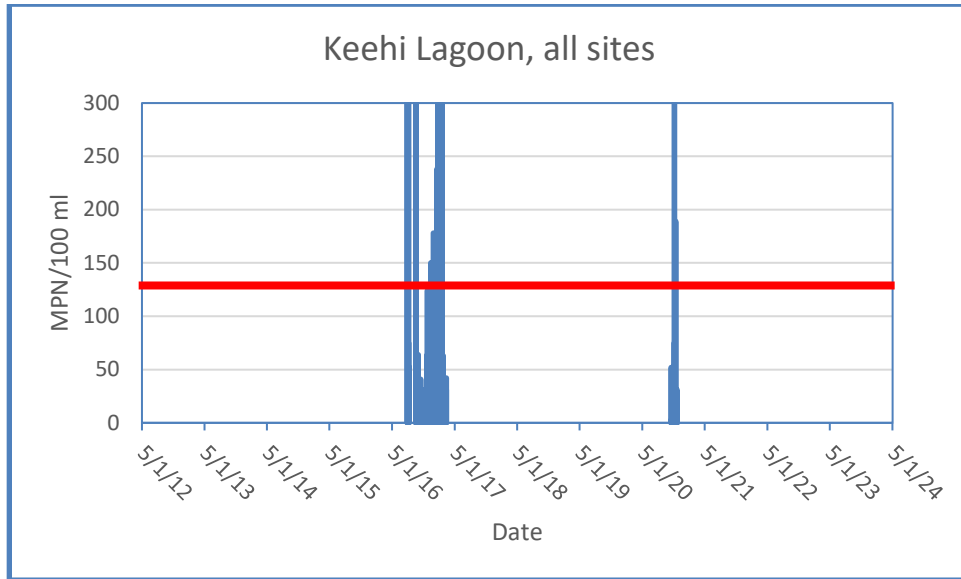


Figure 15. Site 13 (Keehi Lagoon, all sites)

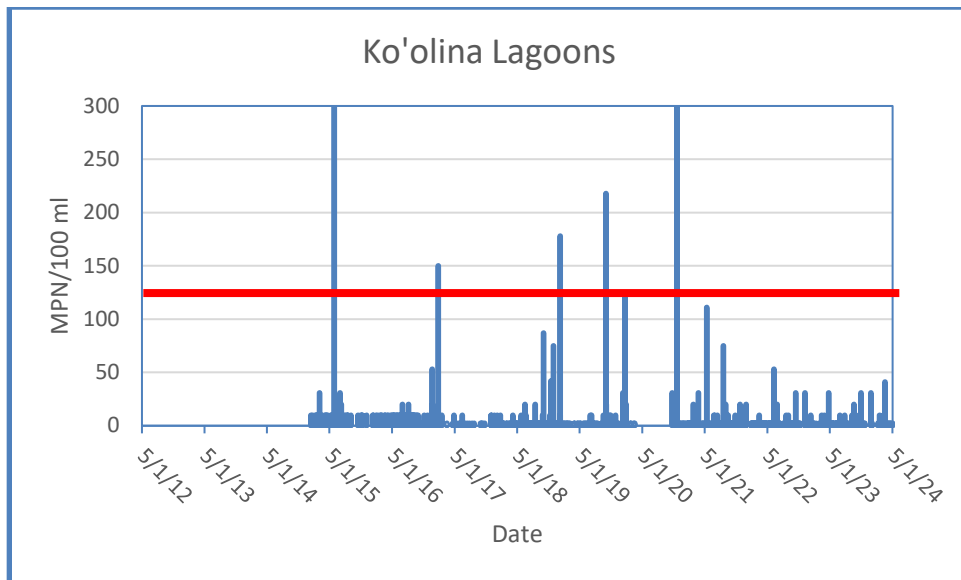


Figure 16. Site 14 (Ko'olina Lagoons)

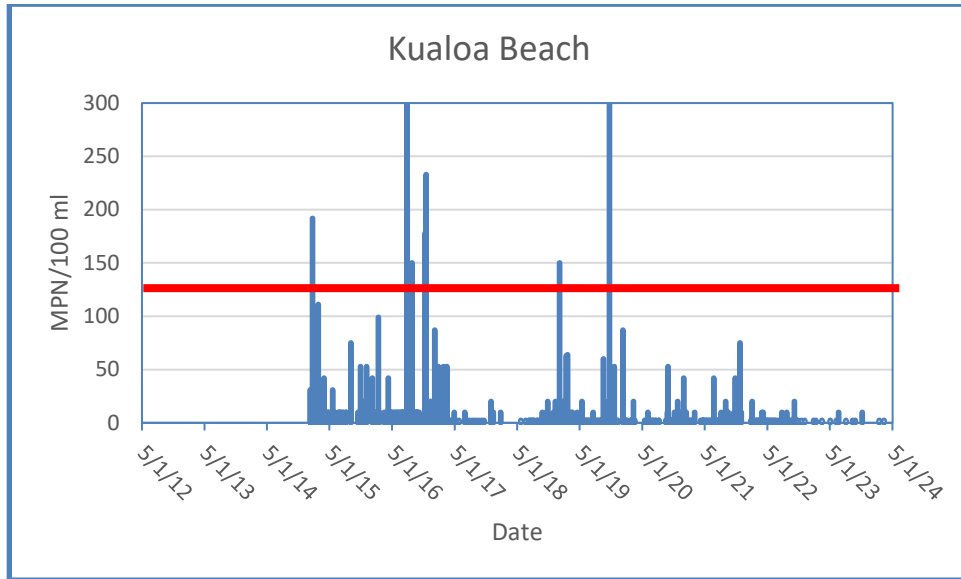


Figure 17. Site 15 (Kualoa Beach)

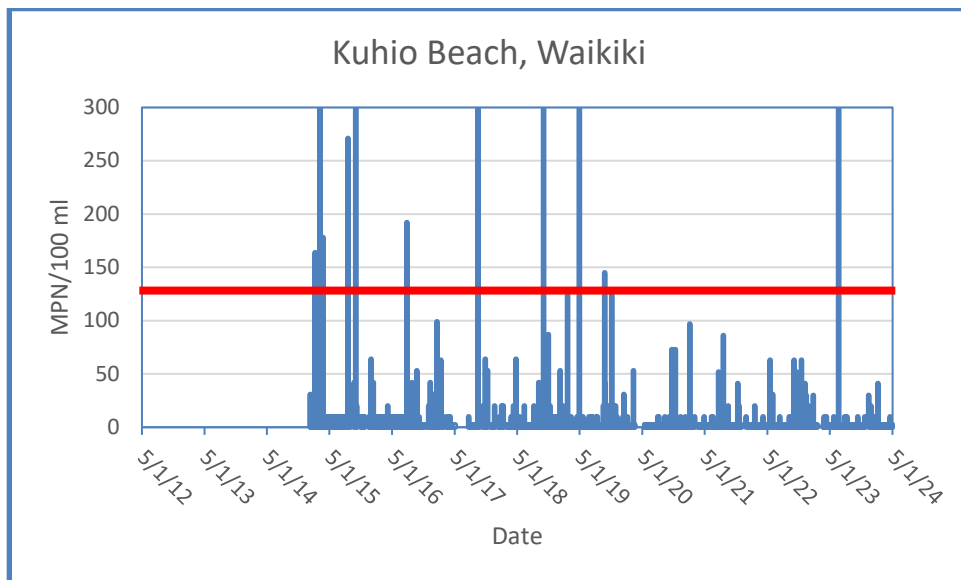


Figure 18. Site 16 (Kuhio Beach, Waikiki)

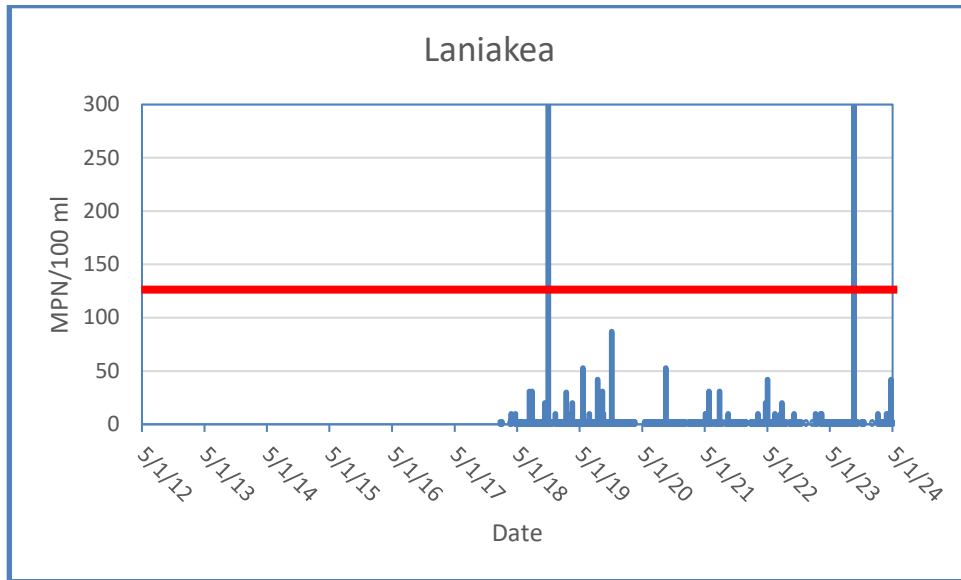


Figure 19. Site 17 (Laniakea)

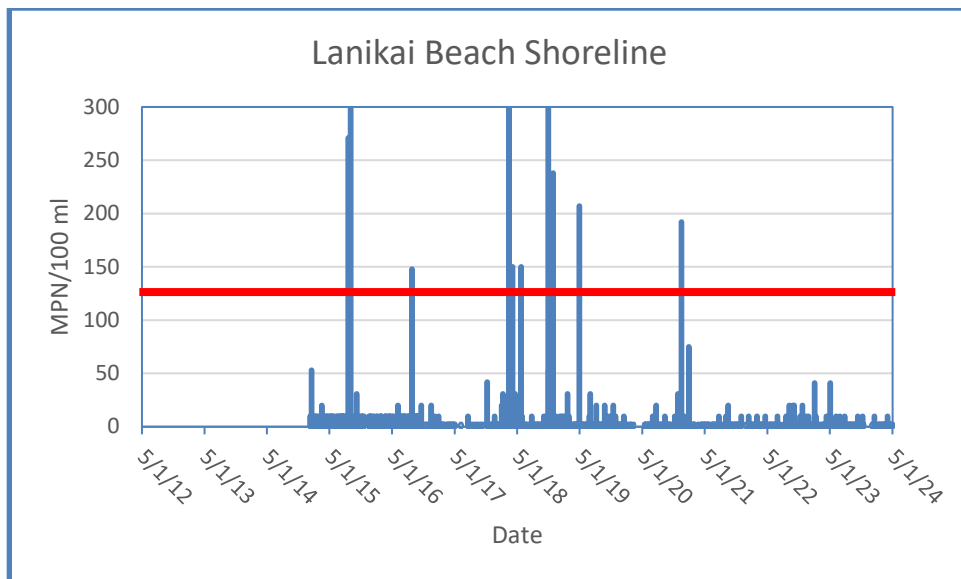


Figure 20. Site 18 (Lanikai Beach Shoreline)

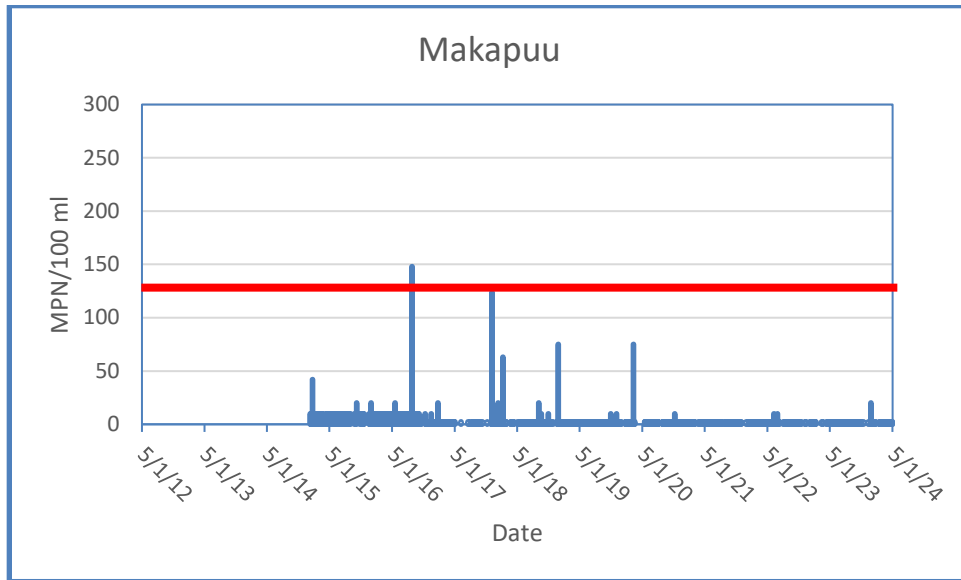


Figure 21. Site 19 (Makapuu)

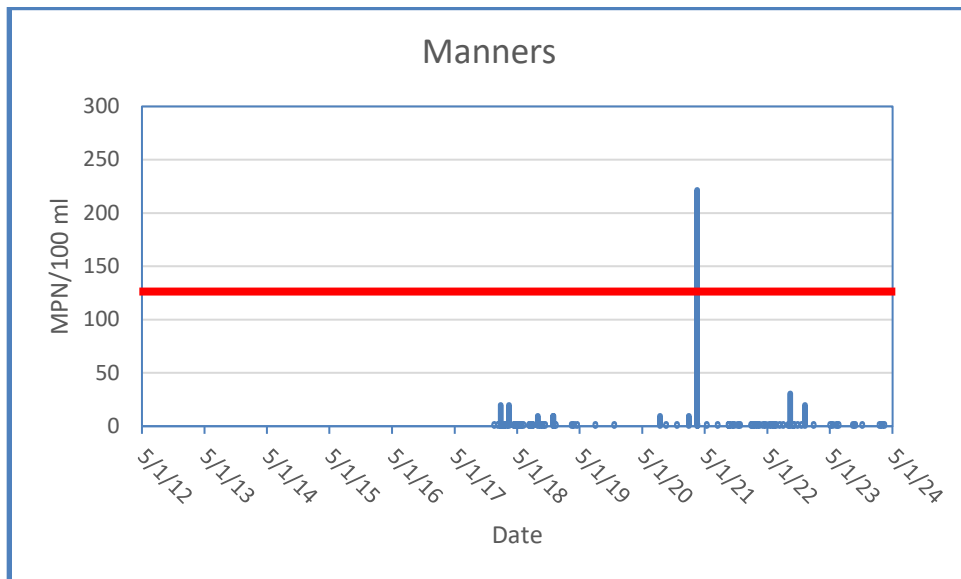


Figure 22. Site 20 (Manners)

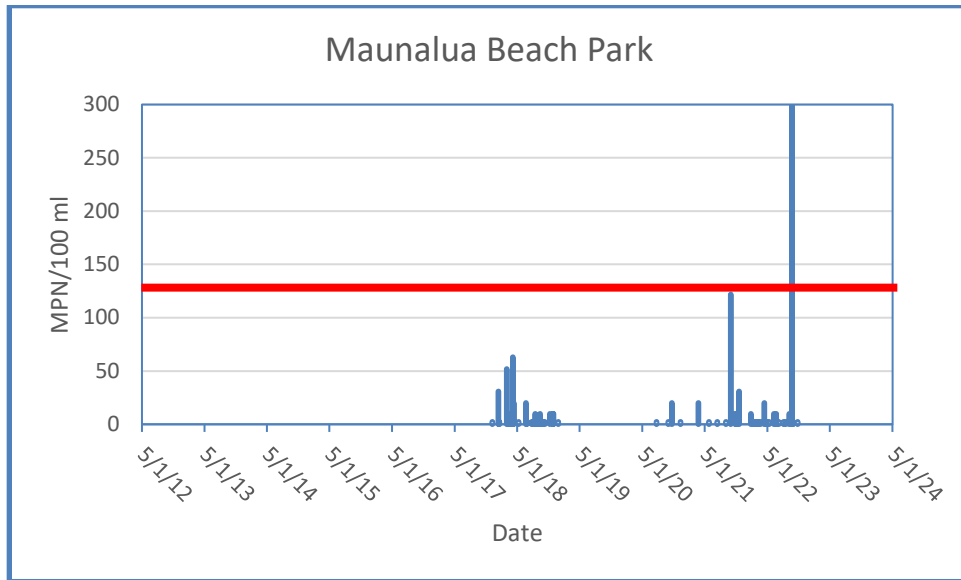


Figure 23. Site 21 (Maunaloa Beach Park)

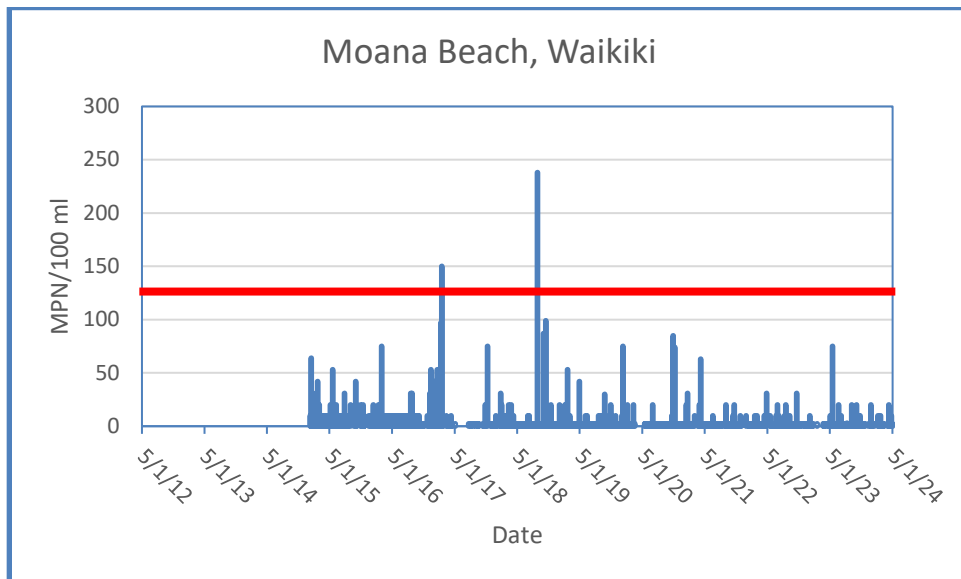


Figure 24. Site 22 (Moana Beach, Waikiki)

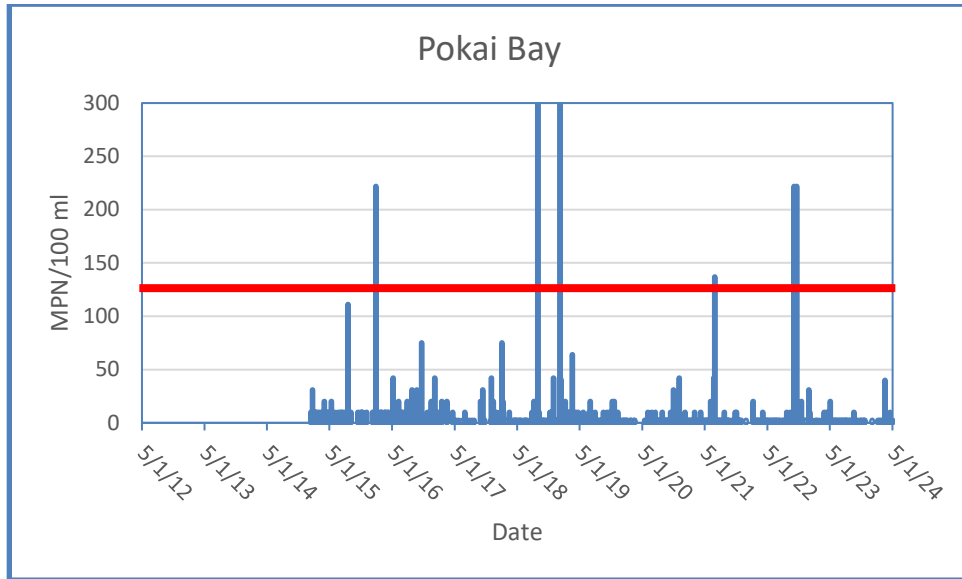


Figure 25. Site 23 (Pokai Bay)

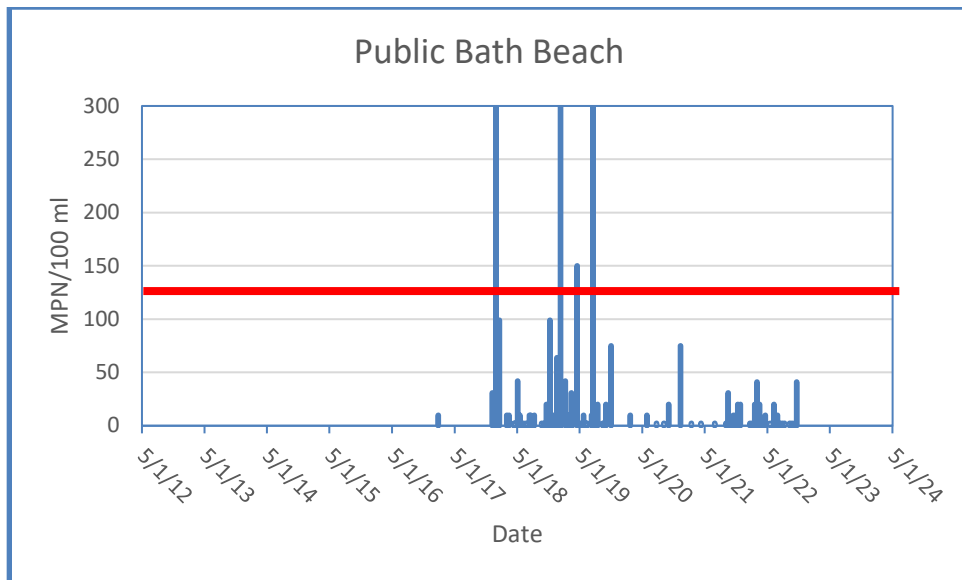


Figure 26. Site 24 (Public Bath Beach)

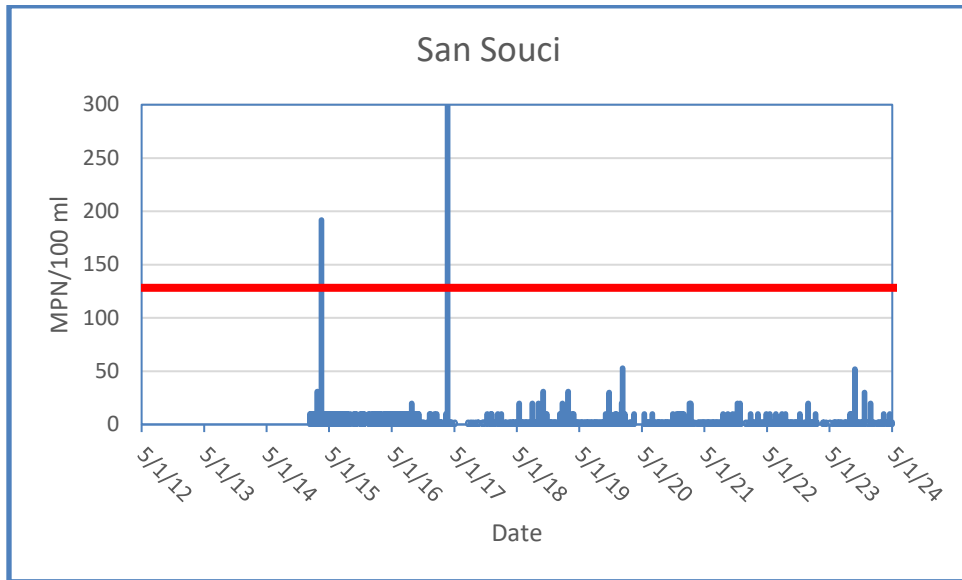


Figure 29. Site 27 (San Souci)

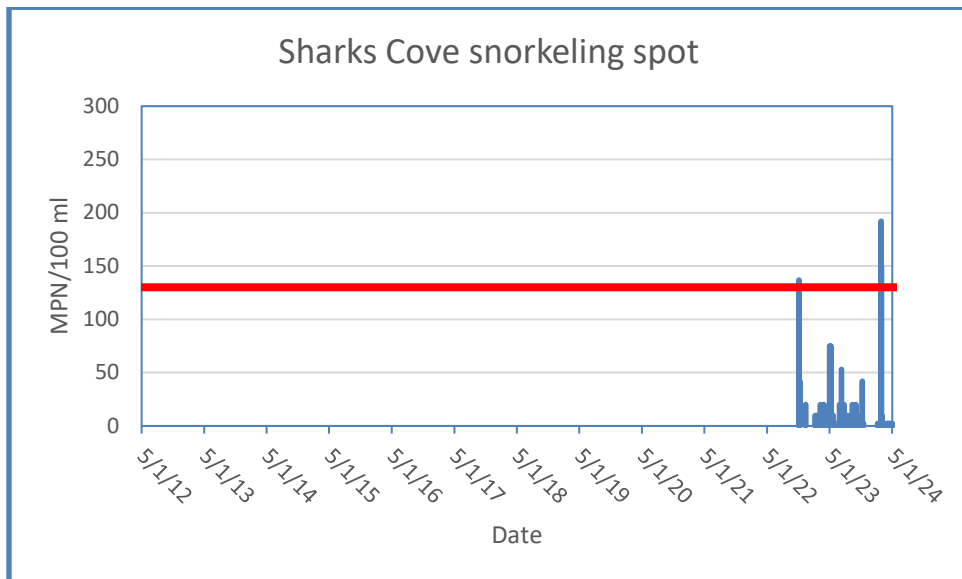


Figure 30. Site 28 (Sharks Cove snorkeling spot)

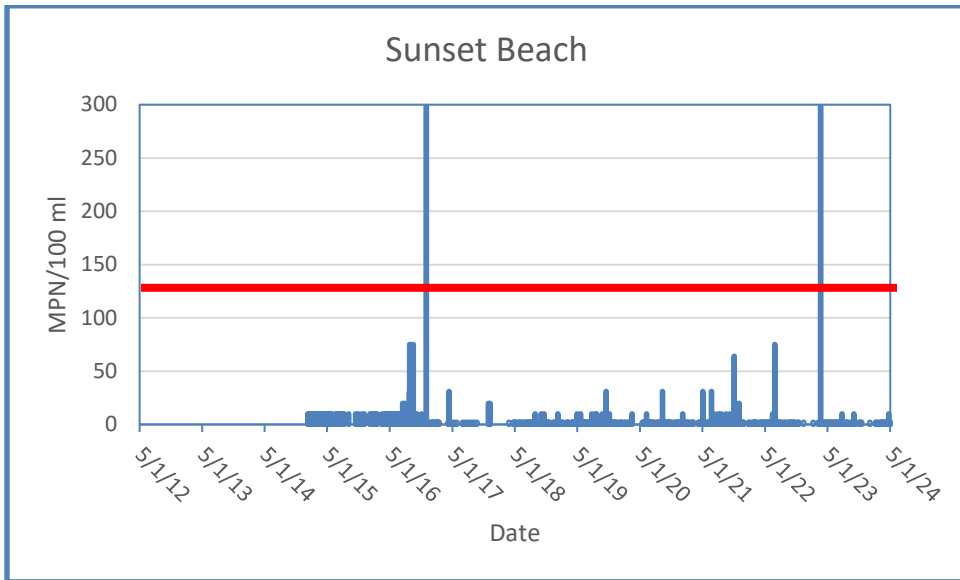


Figure 31. Site 29 (Sunset Beach)

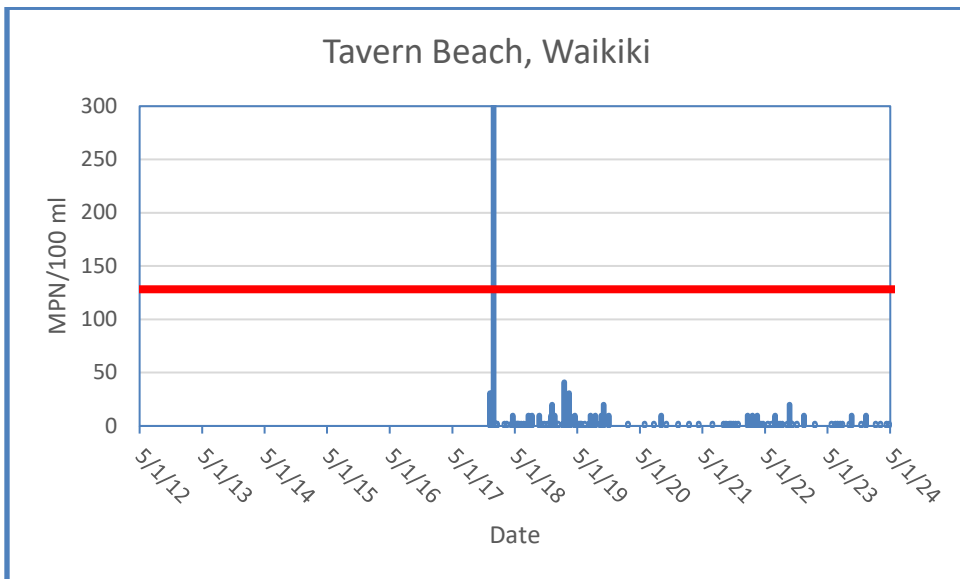


Figure 32. Site 30 (Tavern Beach, Waikiki)

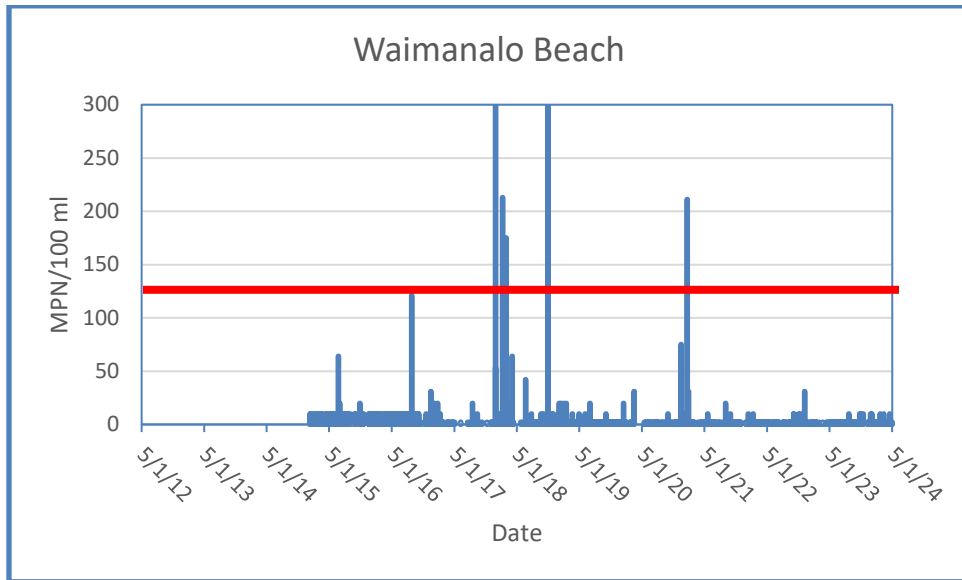


Figure 33. Site 31 (Waimanalo Beach)

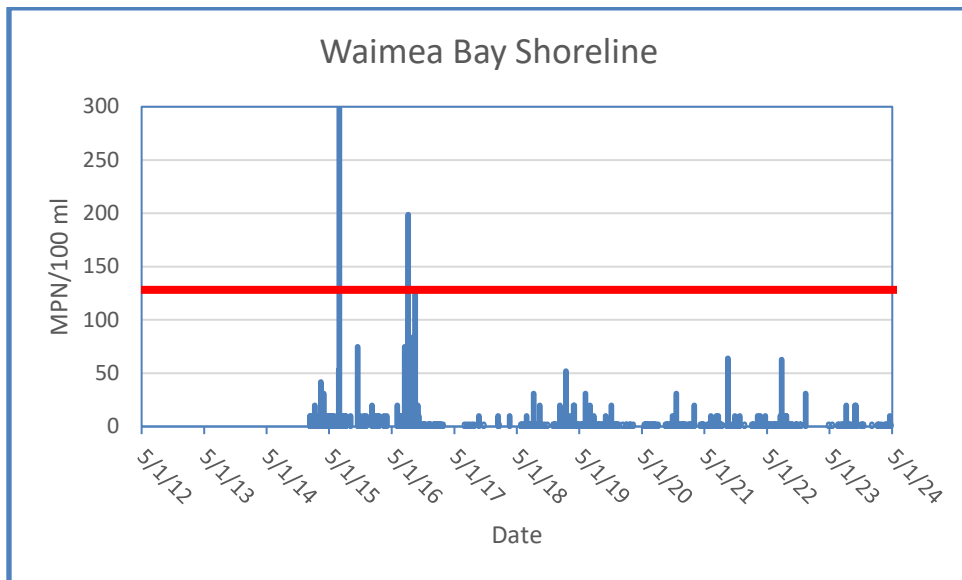


Figure 34. Site 32 (Waimea Bay Shoreline)