Comparison of Bacterial Contamination Between O`ahu Water Bodies and Wai Kai Lagoon

The Pacific Islands Ocean Observing System posts data on Hawaiian beaches related to water quality and collected by a number of government and academic institutions (go to the following website: www.oos.soest.hawaii.edu/erddap/tabledap/cwb_water_quality.html). These data include *Enterococcus* bacteria levels determined by the State of Hawai`i Clean Water Branch. Bacteria levels for several O`ahu beaches (see map on next page) are available at this website for the period during which Haseko has been collecting comprehensive water quality and biological data at the Wai Kai Lagoon (June 2014 – May 2016).

The plots presented below present these data and the data collected for the Wai Kai Lagoon on a single scale to permit easy comparison of the levels found in the Wai Kai Lagoon with those found on these O`ahu beaches. The vertical units (CFU/100ml) are "colony forming units" per 100 ml of the water sample collected, determined by examinations of 24-hour culturing of dilutions of the water samples on nutrient media designed specifically to encourage the growth of these bacteria.

The State of Hawai`i Clean Water Branch regulations (Hawai`i Administrative Rules §11-54-8(b)) specify a value of 35 CFU/100ml as the level below which recreational waters in the state should normally remain to ensure the safety of users. Using this regulatory "safe level" as a comparison point, these data show, for example, that swimmers at Kahanamoku Beach in Waikīkī or Kualoa Beach on the windward side are more than 10 times more likely than swimmers in Wai Kai Lagoon to come into contact with water contamination levels above this safe level. Swimmers at Hanauma Beach Park or Lanikai Beach are more than 5 times more likely to contact water above this level than swimmers in the Wai Kai Lagoon.

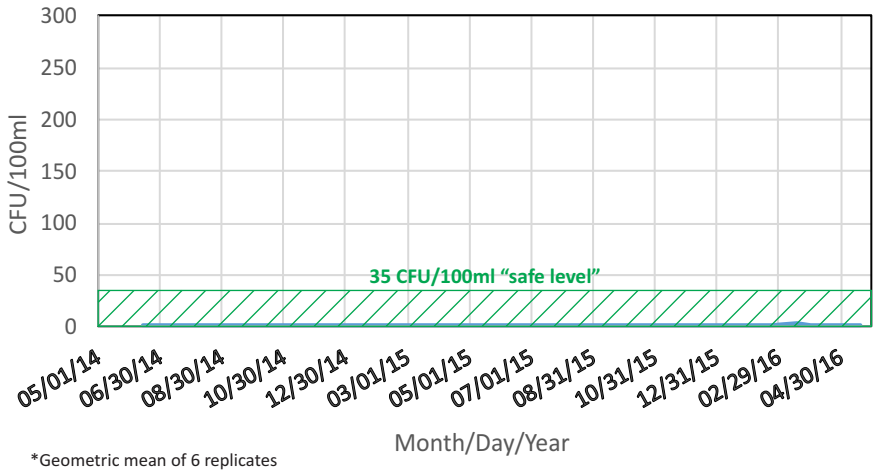
Similar data were collected between 2006 and 2013 at various locations along the Ala Wai Canal for the City of Honolulu and are reported in the Civil Beat (http://www.civilbeat.org/2013/05/19127-data-ala-wai-bacteria-levels-off-the-charts/). The plots of these data from the Civil Beat report are reproduced below after the lagoon and beach data. Two plots are shown for each of the four sites surveyed, one that shows the extent of the high contamination levels found in the water and one that only extends to 500 CFU/100ml to show the approximate frequency that the levels exceed the "safe limit" of 33 CFU/100ml, which was changed after this survey to the current value of 35 CFU/100ml. As shown in these plots, the bacterial contamination commonly exceeds by orders of magnitude the 33 CFU/100 ml levels, and, at most or all of these locations, the levels are above this level more than they are below it.

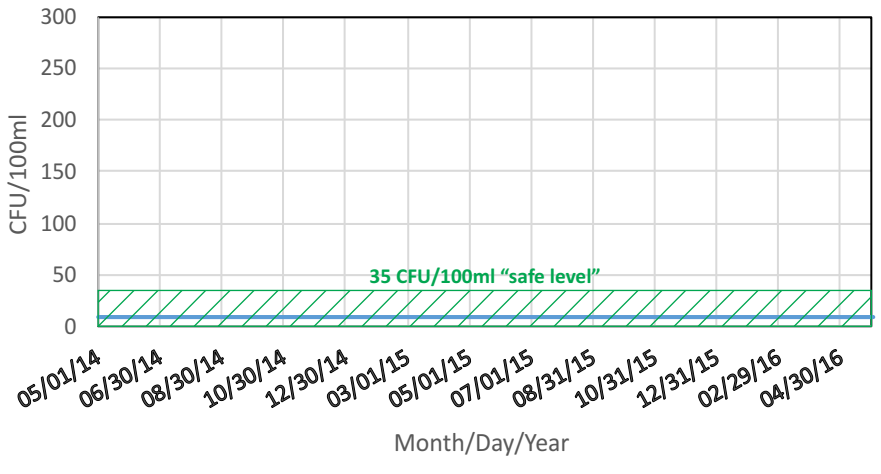
It is important to note that, to date, the Wai Kai Lagoon is not used to its full capacity, and the levels of contamination may rise when more people are using this recreational lagoon. However, unlike many other water bodies included in this report, the Wai Kai Lagoon is not intended to be primarily a swimming venue. Users will be encouraged to participate in kayaking, canoeing, stand-up-paddling, and other watercraft sports that can benefit from the calm, enclosed water of the lagoon, but intensive swimming is not anticipated. Thus, it is likely that the lagoon water will remain relatively contamination-free even after it is used to its full capacity.

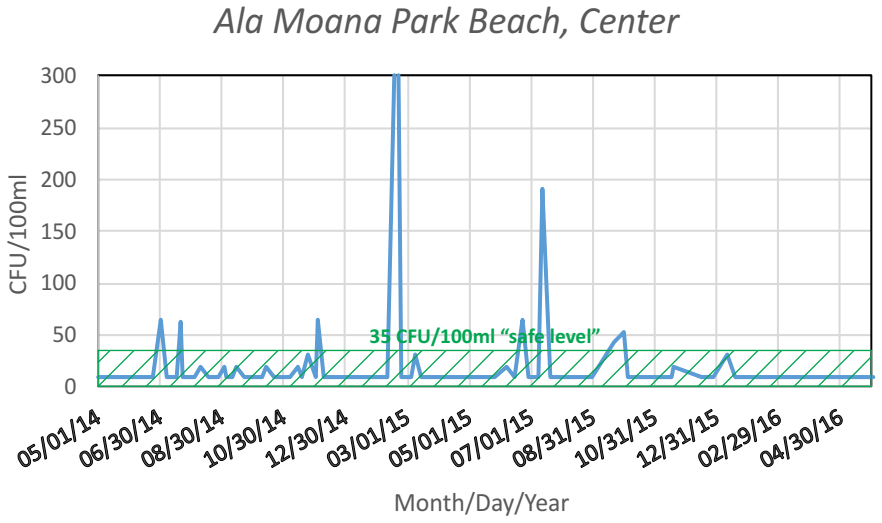
Sample Stations for Bacterial Contamination Monitoring of O`ahu Beaches

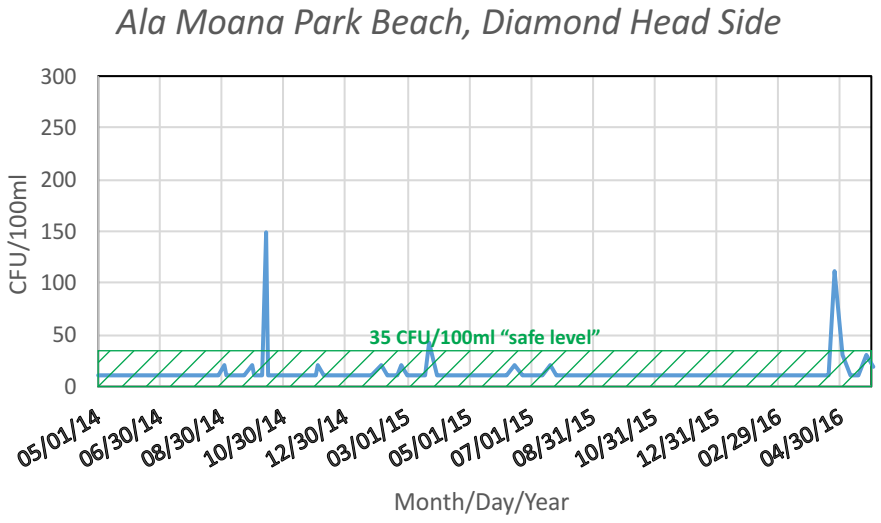


South O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)

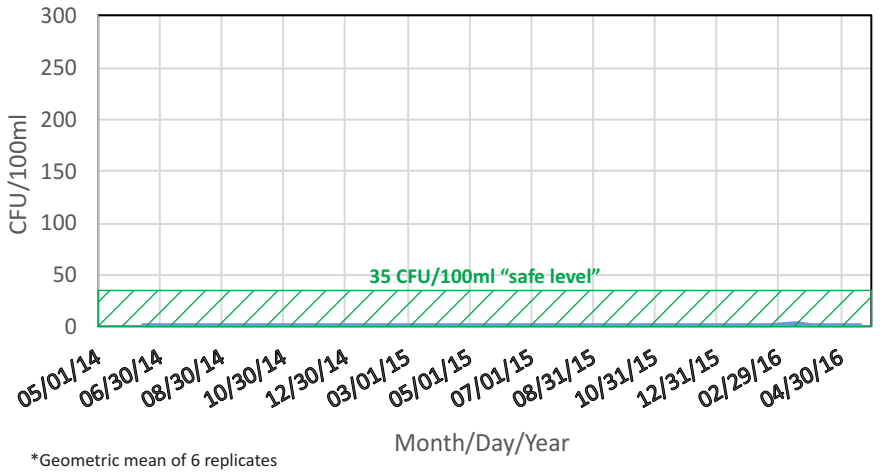


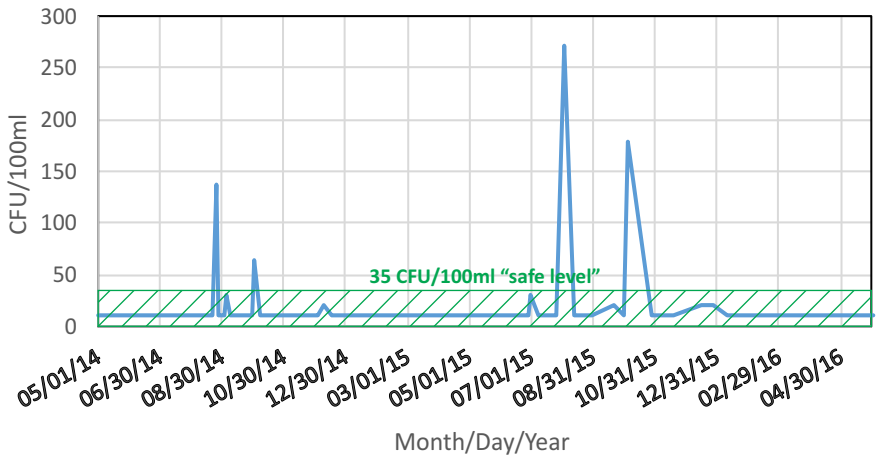


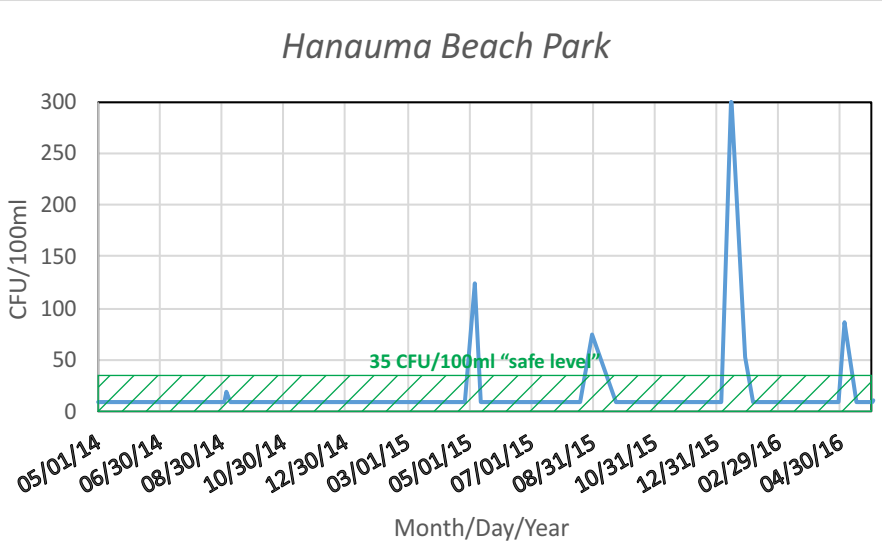


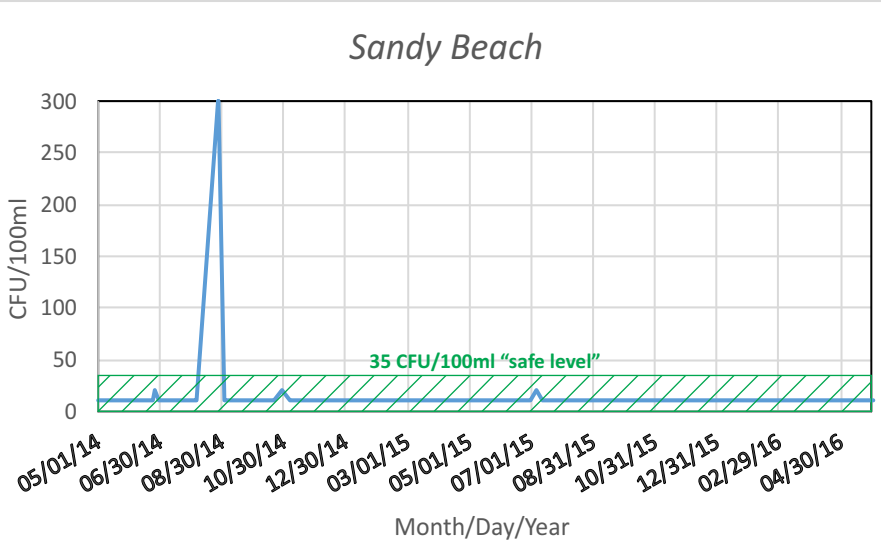


South O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)

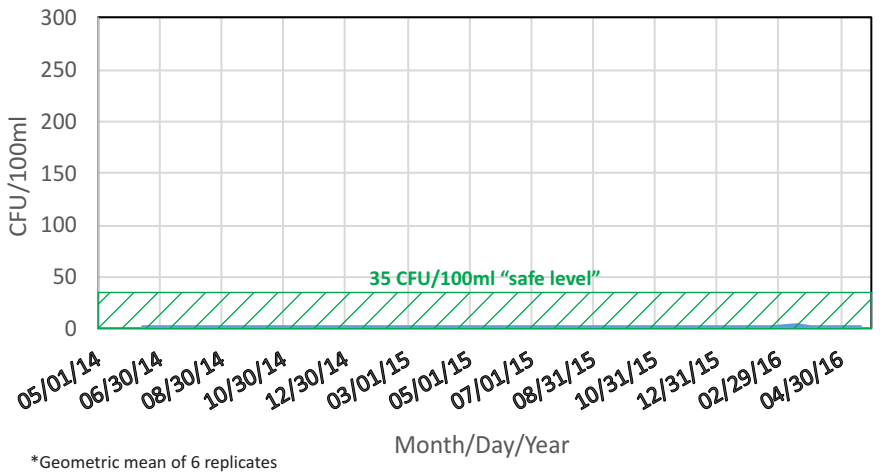


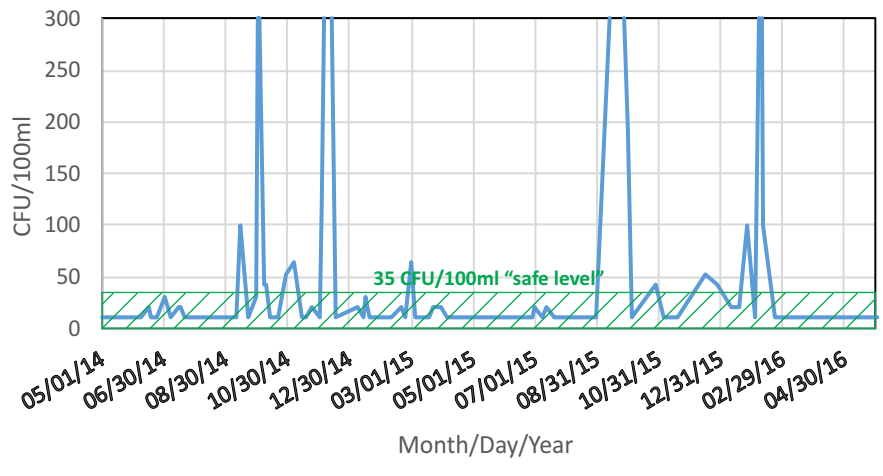


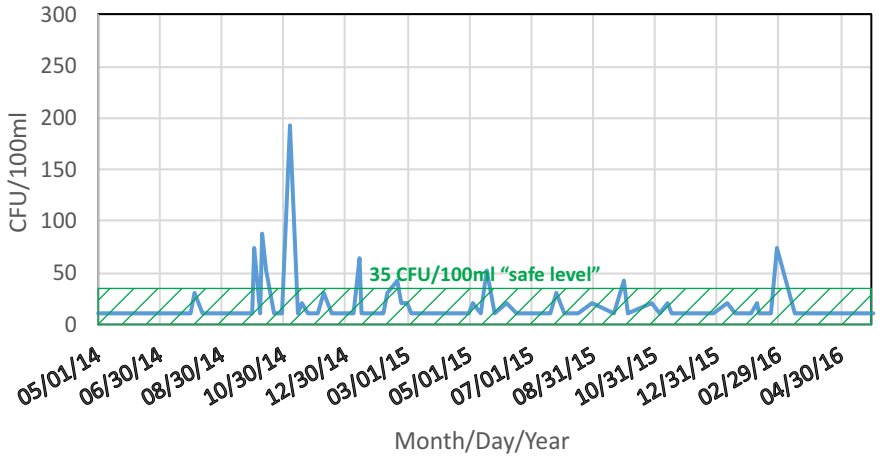


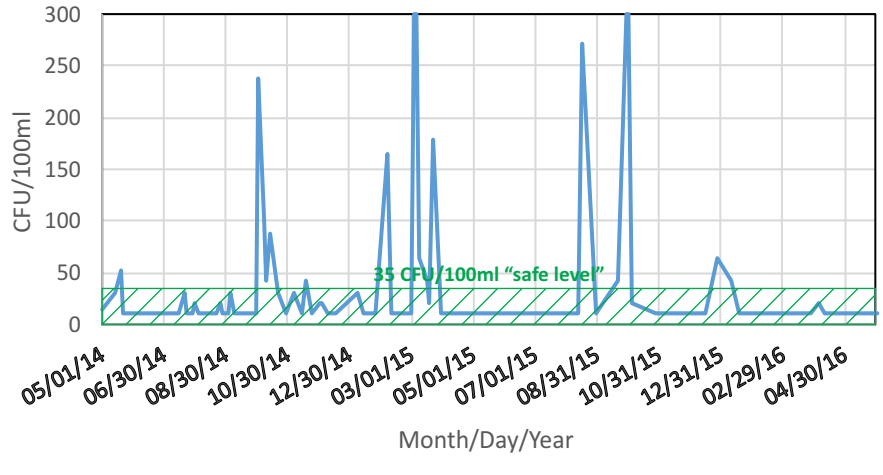


Waikiki Beach *Enterococcus* Levels
(June 2014 - May 2016)

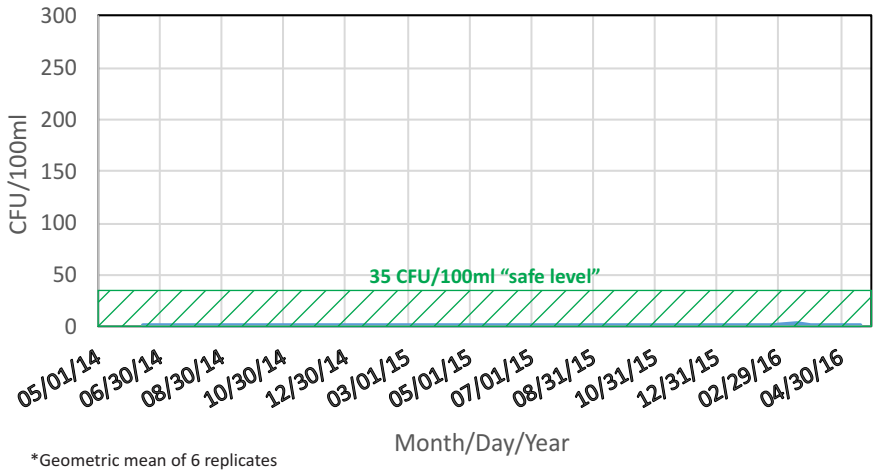


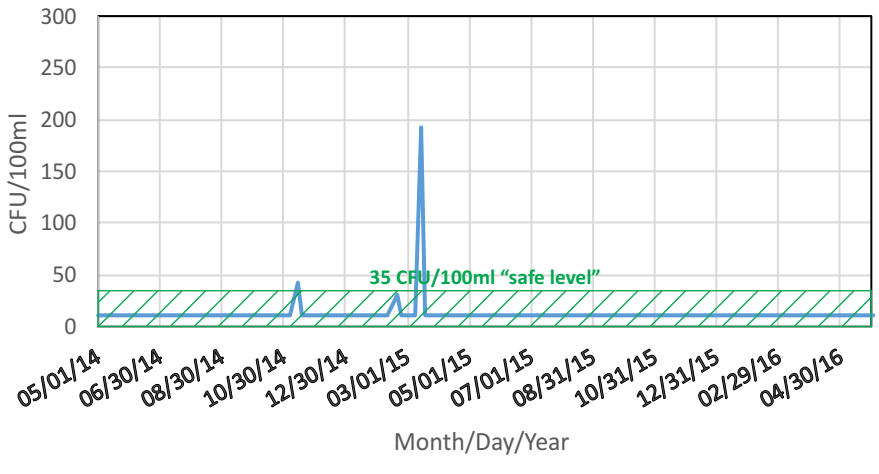




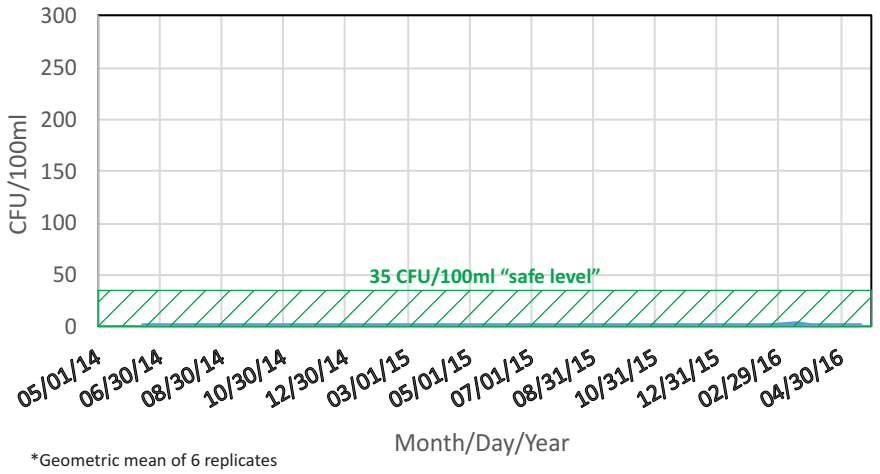


Waikiki Beach *Enterococcus* Levels
(June 2014 - May 2016)

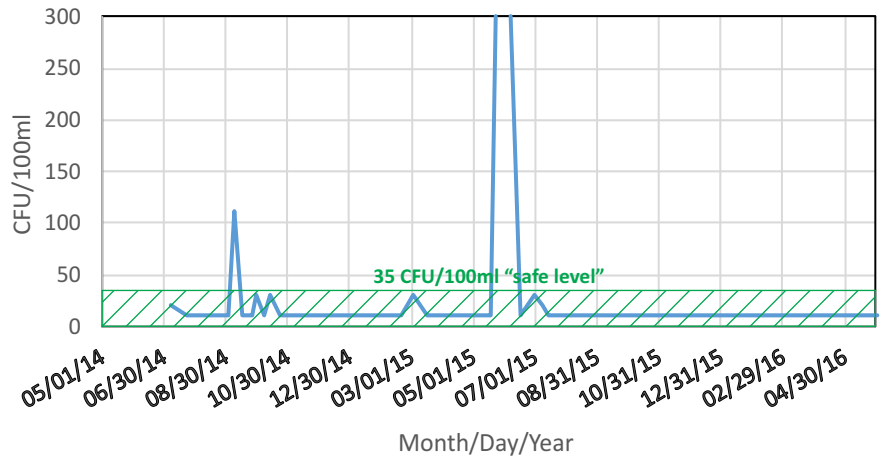


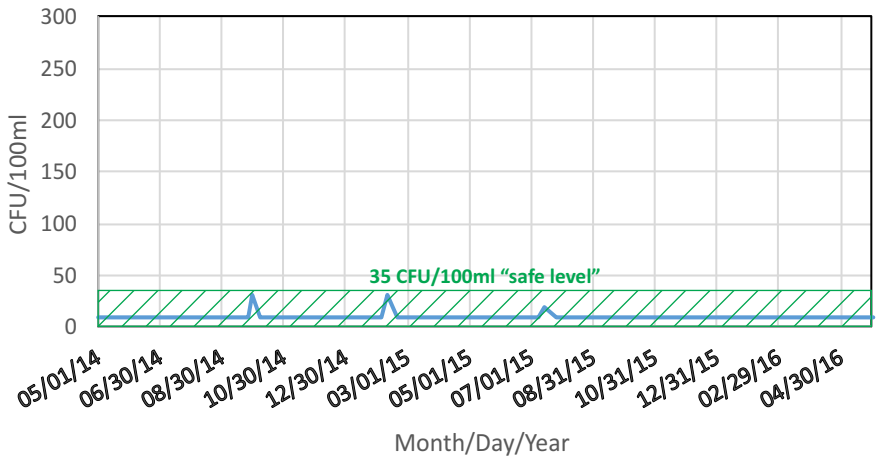


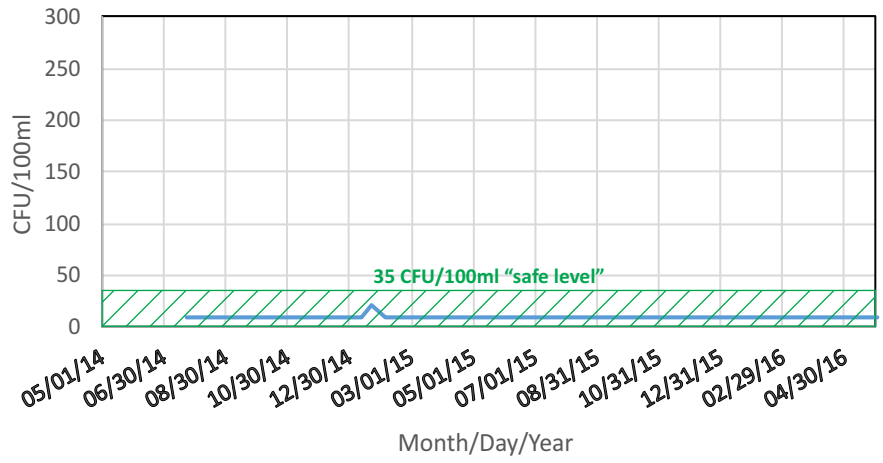
West O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)



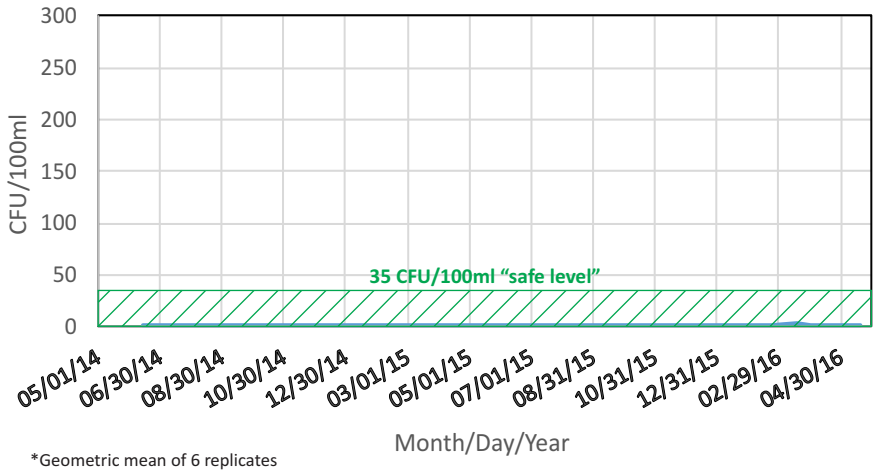
*Geometric mean of 6 replicates

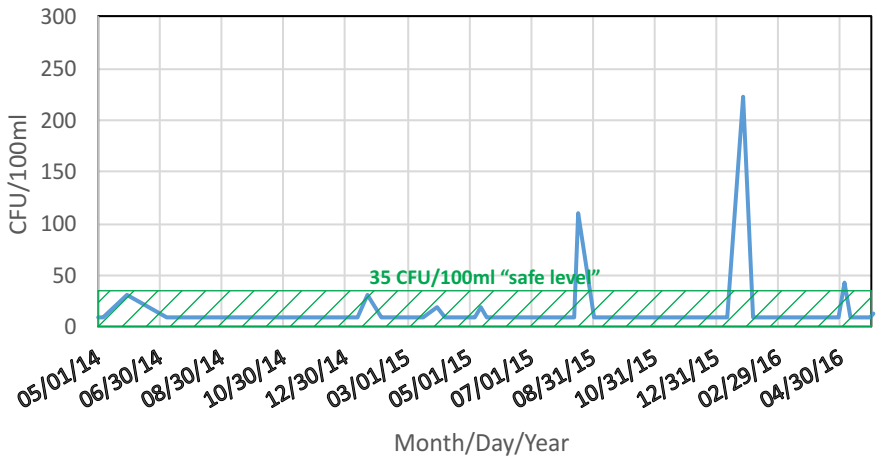


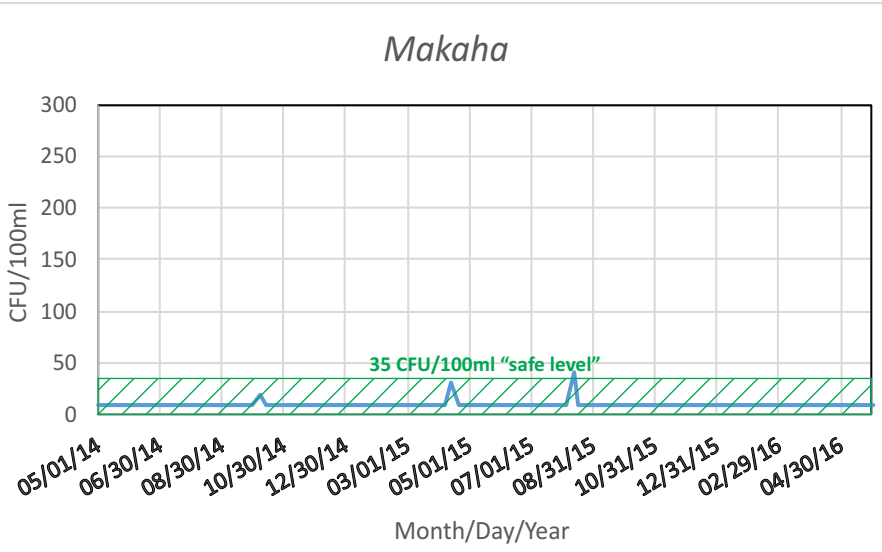




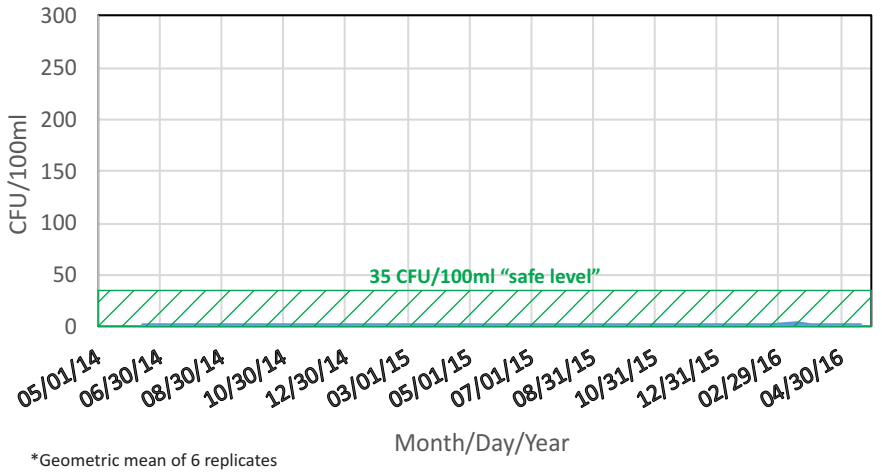
West O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)

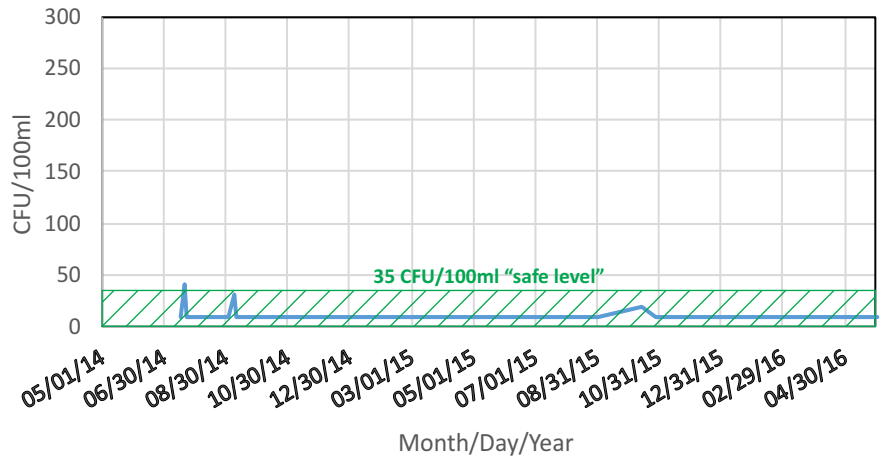


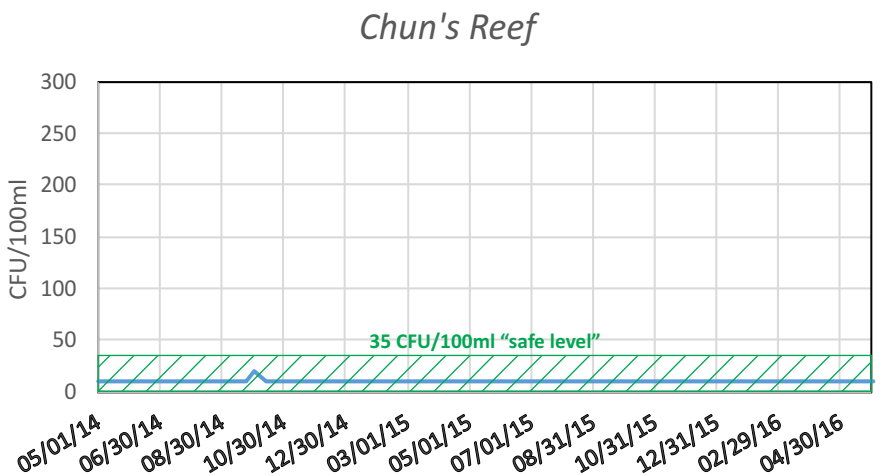


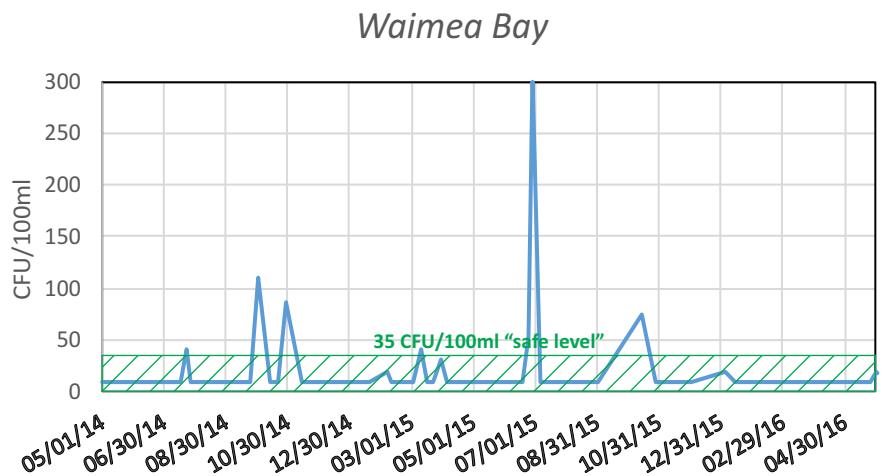


North Shore O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)

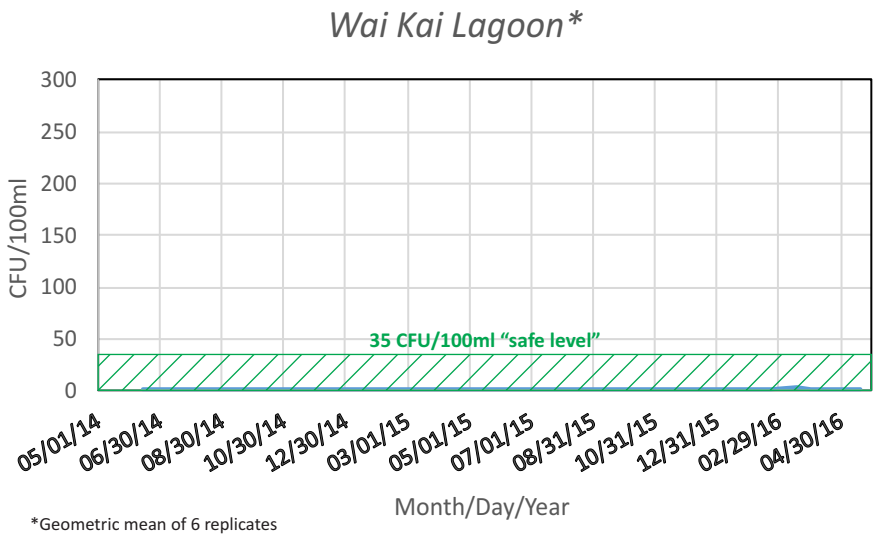


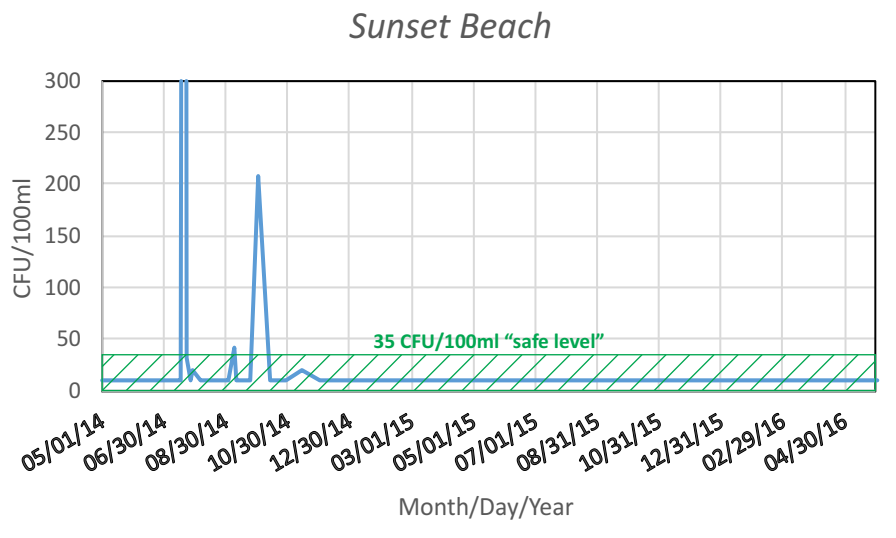




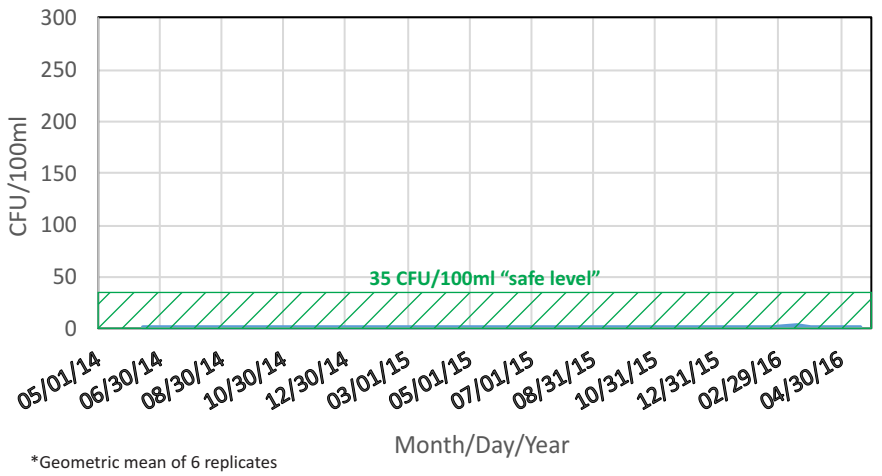


North Shore O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)

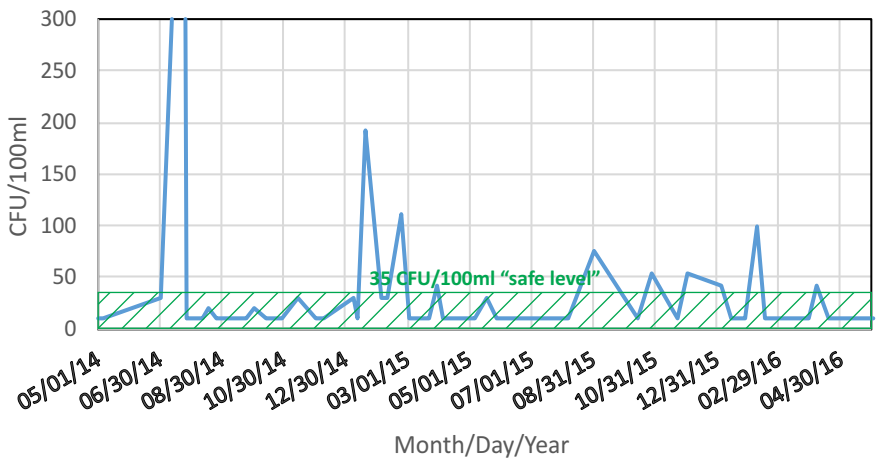


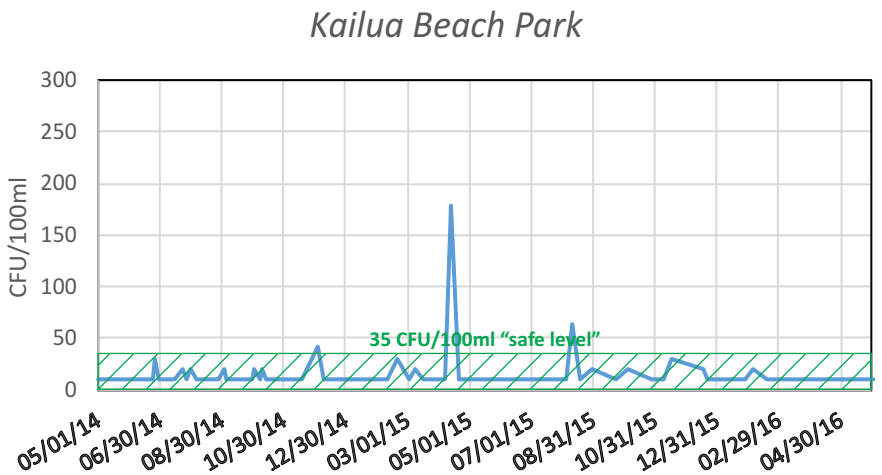


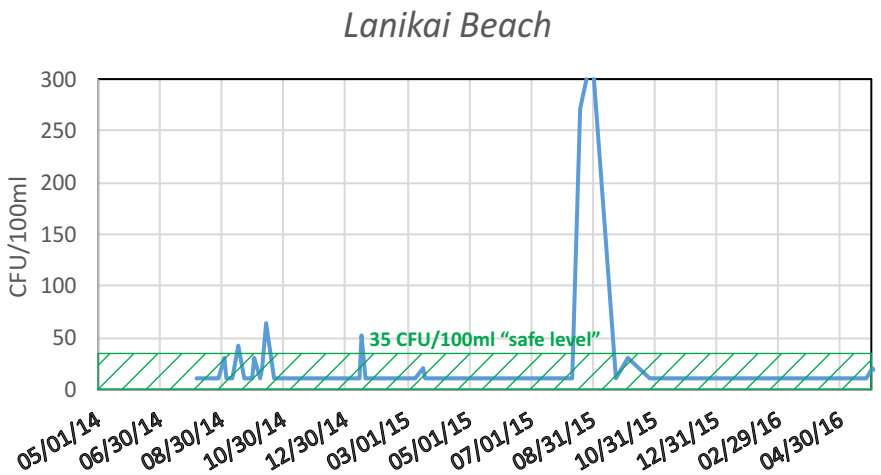
Windward O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)



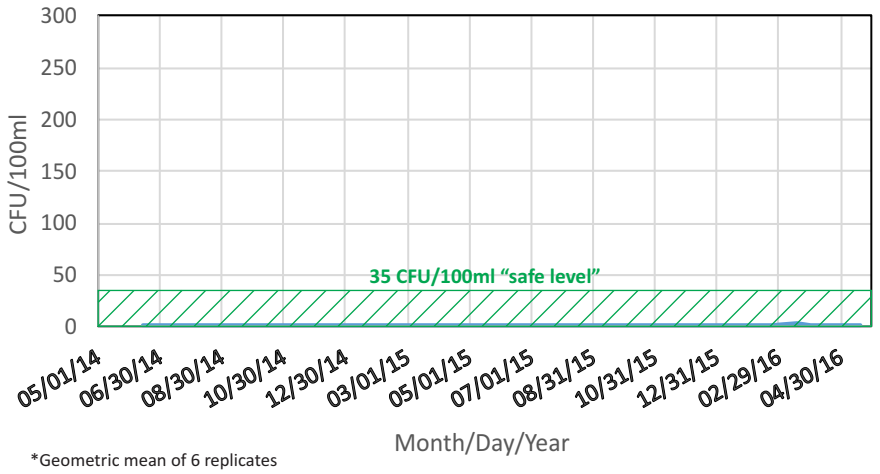
*Geometric mean of 6 replicates

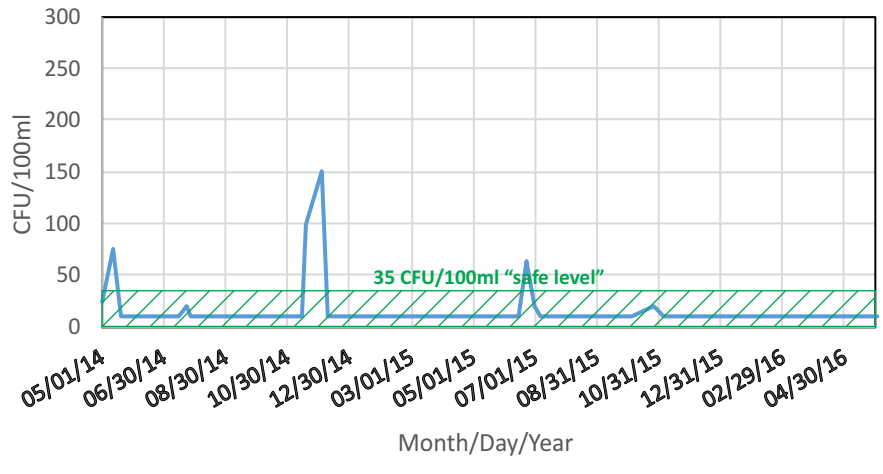


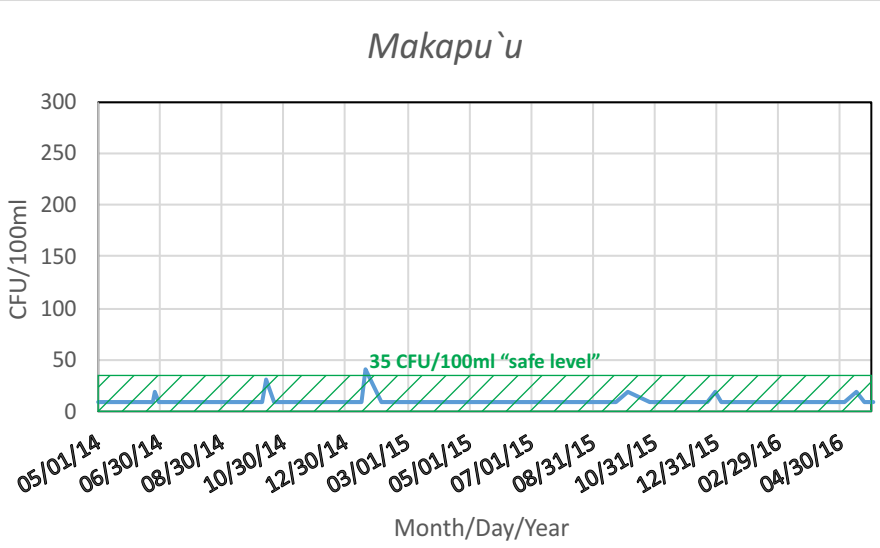




Windward O`ahu Beach *Enterococcus* Levels (June 2014 - May 2016)







Ala Wai Canal *Enterococcus* Levels (2006 - 2013)

