



Northwest Aquatic Eco-Systems

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Bruce,

I reviewed the data you sent me a number of times and have concluded the following:

1. One important fact to remember when trying to analyze your data is that these sampling dates are simply a snapshot of what was occurring during any particular sampling event. The Ocean Shores waterways are generally shallow water bodies that are not stratified so changes in basic water chemistry parameters can fluctuate considerably within a 24 hour cycle as a result of surface winds and rain events. All of your data is basically the same as that produced during the Ocean Shores KCM study. No real alarming changes have occurred. The parameters you are monitoring provides your group and the City a basic response to a property owners question as to whether the water quality has changed statistically enough from the past KCM study to the present condition to warrant a concern. After reviewing your past yearly sampling results and comparing those results with the past KCM study, my response would be no. The next question addresses the need to continue sampling in 2017. If the goal of your sampling is to provide real time data to residents addressing water quality issues specifically related to the parameters you are currently sampling, then proceeding in 2017 would be prudent. If your goal is to ensure residents that the water quality has not really changed statistically from the KCM study then your past year of sampling has accomplished that task. If you decide sampling is not to be continued in 2017, the ability to spot sample should remain an option if water quality issues or public concerns surface that may warrant such action, i.e. fish kills. Even the noted high conductivity readings during 2015 were not duplicated during 2016. Your limited parameter spikes that were noted were short lived events that did not carry over into the next sampling date except for the high conductivity readings noted during 2015. Even those results were not duplicated during 2016.
2. **Dissolved Oxygen** – Oyehut (State Route 116) is the only sampling site that consistently produced low dissolved oxygen values. I am not familiar with this site but will visit the site on my next trip to Ocean Shores. Both the Grand Canal North and Bass Canal sites exhibited below average DO levels but these results are not surprising considering the rich organic sediments present and stagnant waters associated with both sites.
3. **Specific Conductance** - These readings typically fluctuate depending on rainfall and all appear to be within a normal range except for sampling events noted in the Blue Heron, Grow Old Passage and Party Pup Passage Canals on 9/2015 & 10/2015. These readings far exceeded the historical established baselines and were elevated above 1,000 uS/cm. Whatever environmental factors were responsible for these spikes, the condition exceeded 30 days.
4. **pH** – pH readings can change drastically over a 24 hour time frame if an algae bloom is occurring or overcast is persistent. Such environmental factors are common occurrences

associated with Ocean Shores. Waters experiencing planktonic blooms typically exhibit a higher pH during the sunlight hours. During photosynthesis (sunlight hours), algae produce oxygen by utilizing sunlight and CO₂. The removal of CO₂ from the water often elevates the pH. During respiration (nighttime hours or overcast), algae consume oxygen and produce CO₂. This tends to reduce the water's pH. Typically daylight hours produce the highest pH readings while readings taken just prior to sunrise produce the lowest pH. Extended overcast also increases the production of CO₂ resulting in a lower pH. Lakes susceptible to algae blooms typically experience pH levels above 9.0. Some lakes exceed 10 ppm. All of the pH readings recorded throughout Ocean Shores are within ranges typically noted for waterbodies that experience mild to severe blooms.

5. **Temperature**– No unusual findings.

In general, the water quality throughout the Ocean Shores waterways is typical of most man made shallow systems that experience high summer water temperatures and slow water exchange during the mid summer months. The surrounding native wildlife that adds tremendous value to the Ocean Shores experience also has a tendency at times to stress the system. Although the waterways experience algal blooms, these blooms are short lived and have historically proven to be non-toxic events. In addition, all waters within the system are refreshed during the winter rainy season as new fresh water circulates through the system.

It is extremely difficult to evaluate the true health of the Occam Shores water system without additional data. In order to truly evaluate the current water quality, sampling directed at phosphorous levels, chlorophyll levels and secchi disc readings need to be conducted so that current data can be compared with data obtained during the KCM study. Once collected, the current trophic level can be compared with the level established through the KCM study. A lake's trophic level is an industry standard that evaluates the eutrophication rate of a waterbody. Trophic states are based on lake fertility. Lakes are classified based on the amount of available nutrients (Phosphorus and Nitrogen) for organisms. More fertile lakes have more nutrients and therefore more plants and algae. Seasonal sampling at a number of stations system wide would provide enough data to make the comparison. Laboratory samples could be collected through your current volunteer group and analyzed. Cost of laboratory work would be in the \$1,000.00/\$1,500.00 range.

NWAE would donate up to \$750.00 in a matching fund effort to help assist with the project.

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