

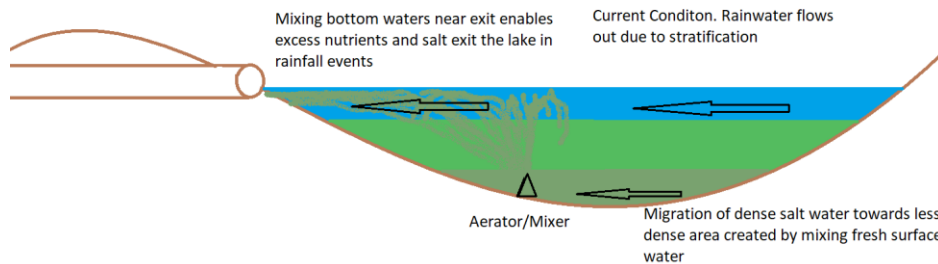
Option to Reduce High Nutrient and Salt Levels – Mixing Waters near Lake Exit.



Why? - Potential to reduce both salt and high nutrient levels in lake. Both major issues.

Theory.

Currently 60% of all rainwater falls directly on the lake surface. With little mixing, the majority of freshwater exits the lake without mixing due to stratification.



Mixing bottom and surface waters breaks the stratification increasing both nutrient and salt levels at surface. Modelling indicates a doubling of salt at the surface. With the corresponding salt reduction at depth, migration of adjacent dense bottom waters can provide infeed to the system.

Mixing to occur only during peak flushing - reducing in lake salt/nutrient concentration.

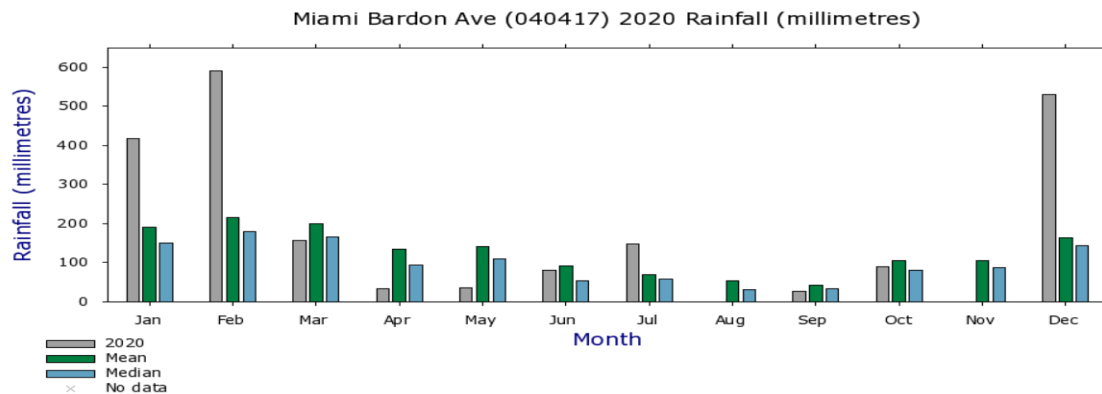
Test Case.

Lake water level to top of Retaining wall

Water Surface Area. 18.42 HA = 184,200 sq/m

$184200 \times .25 \text{ M} = 46,000$ cubic meters of water exiting with elevated salt/nutrient levels.

In 2020, 2m of rainfall and 1.6m from catchment = 3.6m of water exiting in 1 year highlighting the potential of numerous flushing events.



Key Points.

- The only other option to provide similar benefits is the expensive shallowing of the lake.
- Mixer pump only running in high exit flows.
- Minimum run time - lower maintenance costs.
- Minimum Equipment costs- Example -large compressor with 3 bubble aerators - under 20k
- Possible automation – pump turned on by high water level sensor.
- No physical pump out requiring approval - process replicating other healthy lake and waterways which all have elevated nutrient flows in peak rainfall periods.

Drawbacks.

- Residual nutrients may be left in water column.

This can be minimised by:

- Existing Phoslock treatment reducing bottom nutrients.
- Positioning aerators at 9m depth instead of bottom and/or closer to pipe exit reducing the possibility of residual nutrients.
- Timing Phoslock top up after rainfall events to cap residual nutrients.