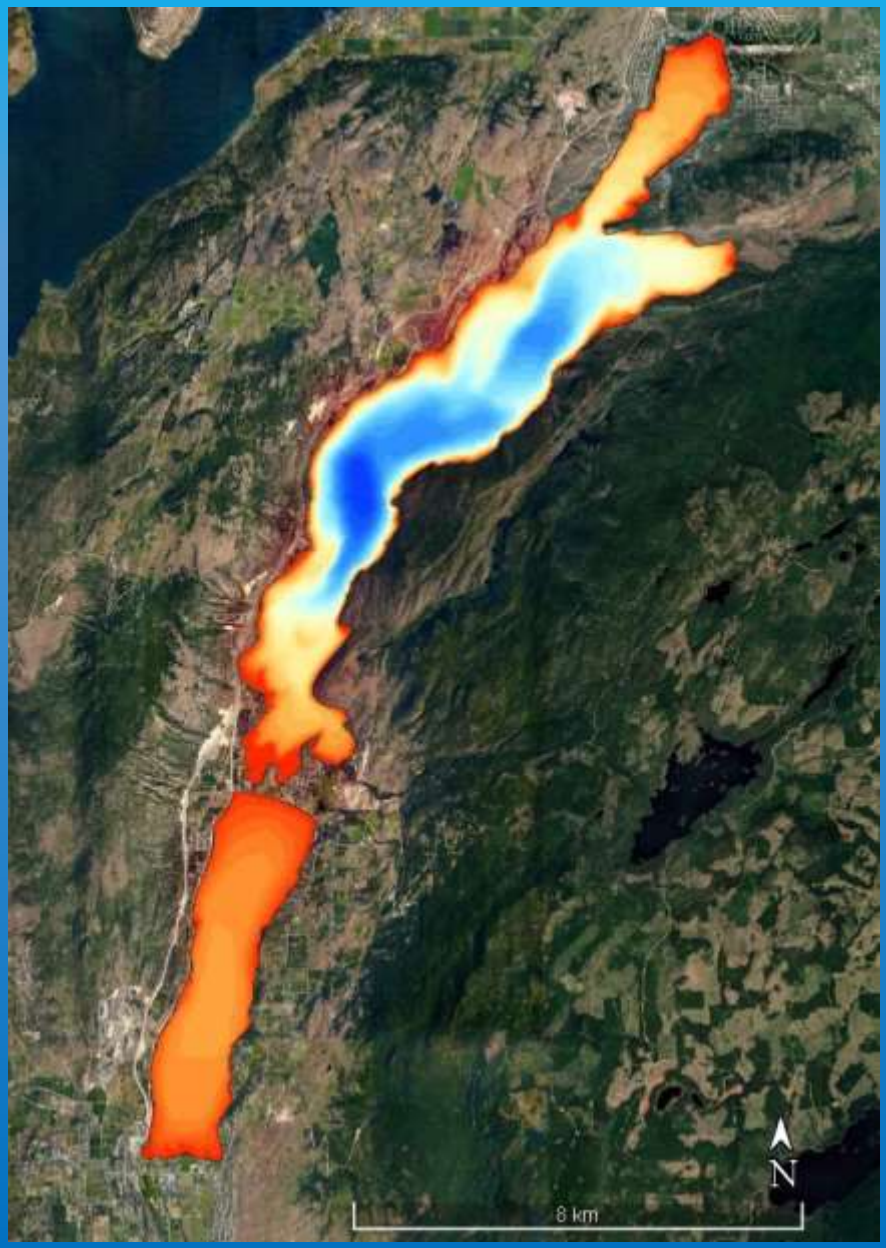
Boat Impact Studies on Kalamalka Lake 2017, 2019 and Sediment Study 2018

FUNDED BY:

RDNO DoC DLC
GVW OCCP



WHAT HAS BEEN ACCOMPLISHED FOR KALAMALKA LAKE?

- On-going annual growing season monitoring 1999 - present
- Two sediment studies + stormwater study (2017 2018)
- Boat Capacity Study (2016)
- Boat wake impact study (2019)
- Also Cosens Bay septage study (2014-2015) Bailey/Boltres study (2018-2019) and more….

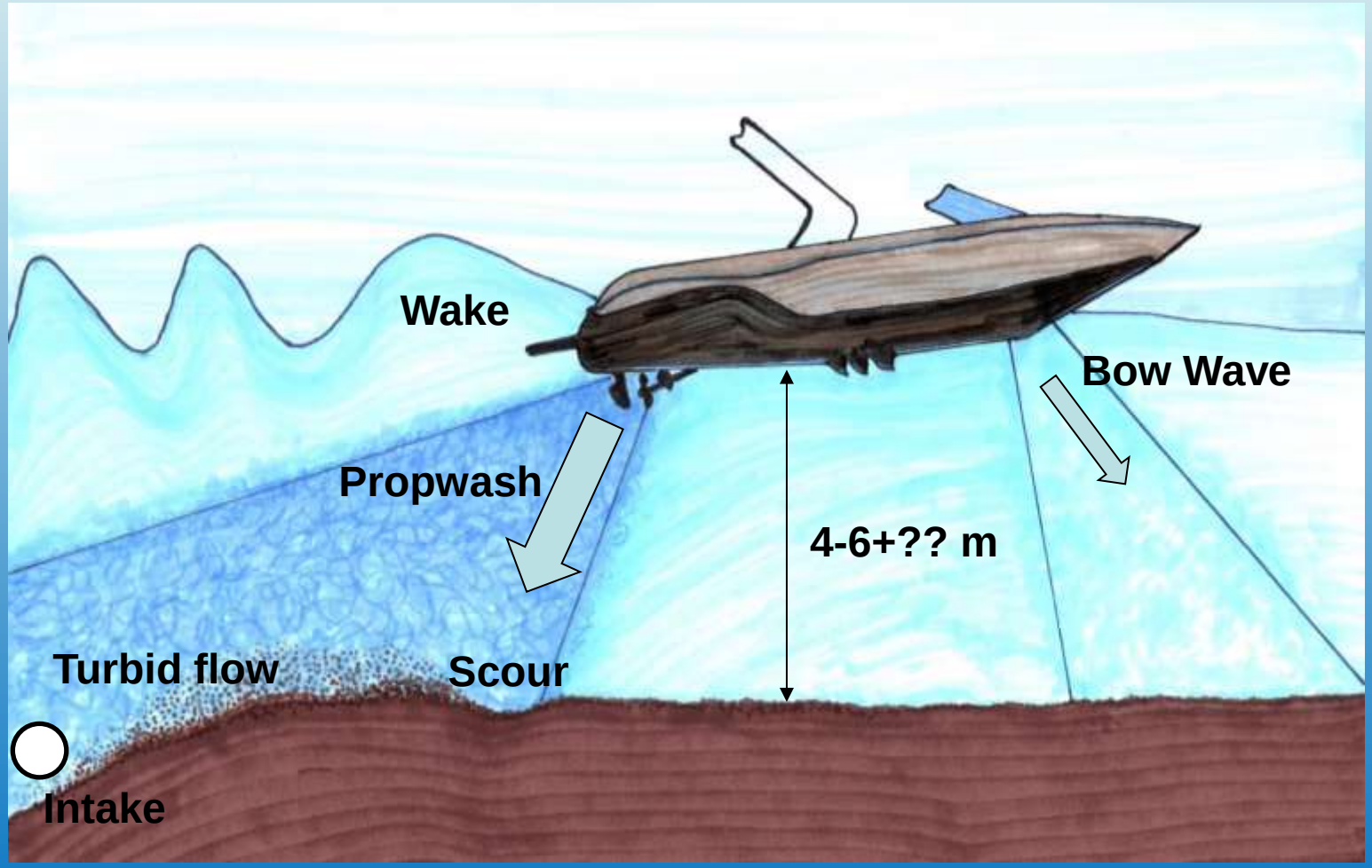
WHAT ARE LAKE SEDIMENT RISKS?

- Sediments store contaminants (hydrocarbons, metals, pathogens pesticides) from watershed and water column – a contaminant storehouse that can accumulate to exceedance concentrations

- Contaminants in surface sediments can be re-suspended by turbulence

- Contaminants buried by 5 cm in deep water (low turbulence) ~~are~~ were sealed off

POWER BOAT PROPWASH CAN CREATE TURBID DENSITY CURRENTS



2018 NORTH ARM SEDIMENT CORES

- Sediment cores showed Coldstream Creek a key source of metals, PAH, E. coli both past and present (the creek gets stormwater, and agricultural runoff)
- Sediment traps showed chromium, copper, iron, and nickel exceedances = ongoing metal loading/resuspension to Kalamalka Lake

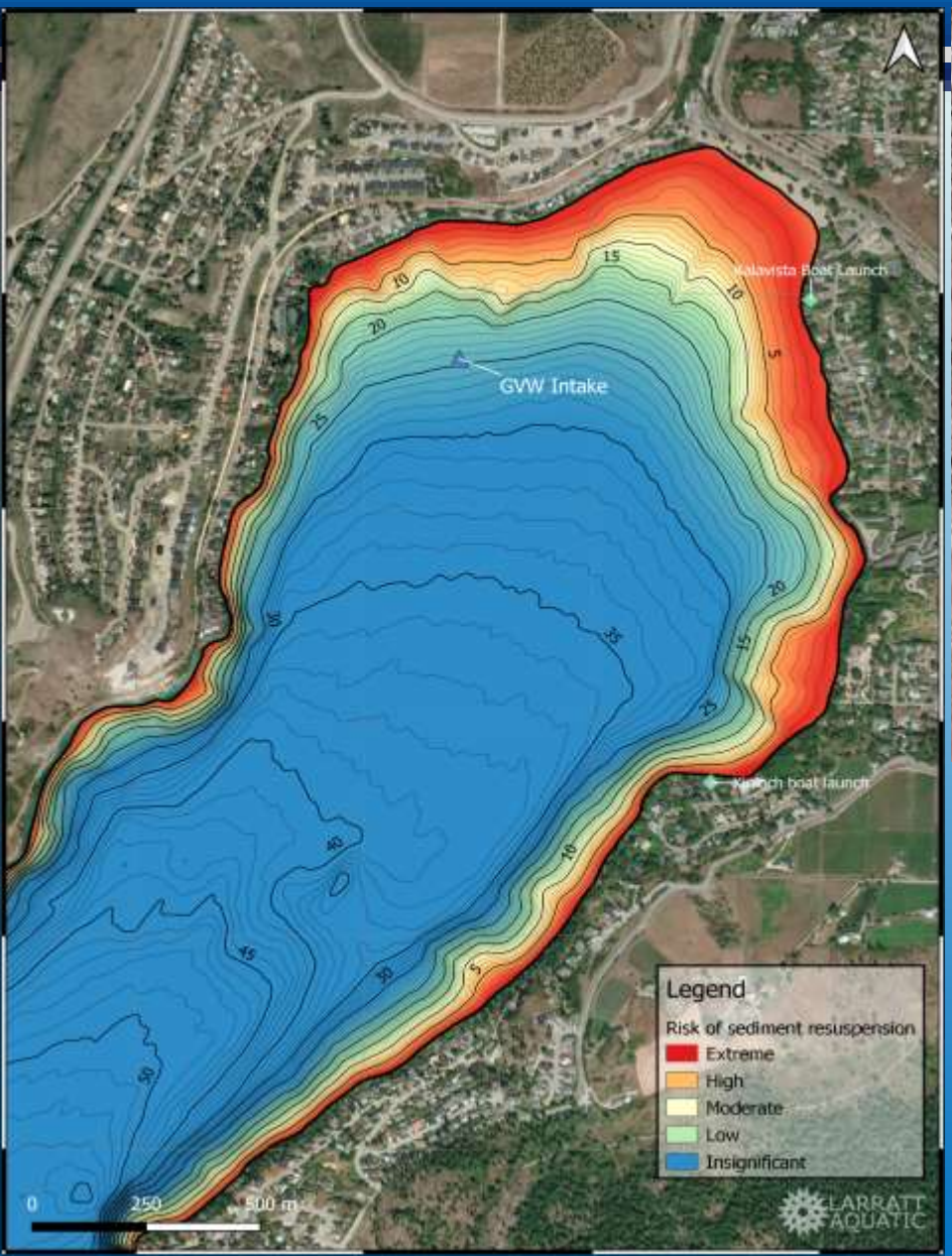
Contaminated sediments were found:

- Along the Coldstream Creek plume path
- Stormwater outfall areas
- Marinas + Oyama channel

Sediment Trap

Sediment Core

SEDIMENT CONTAMINANT TRAVEL TIMES TO INTAKES



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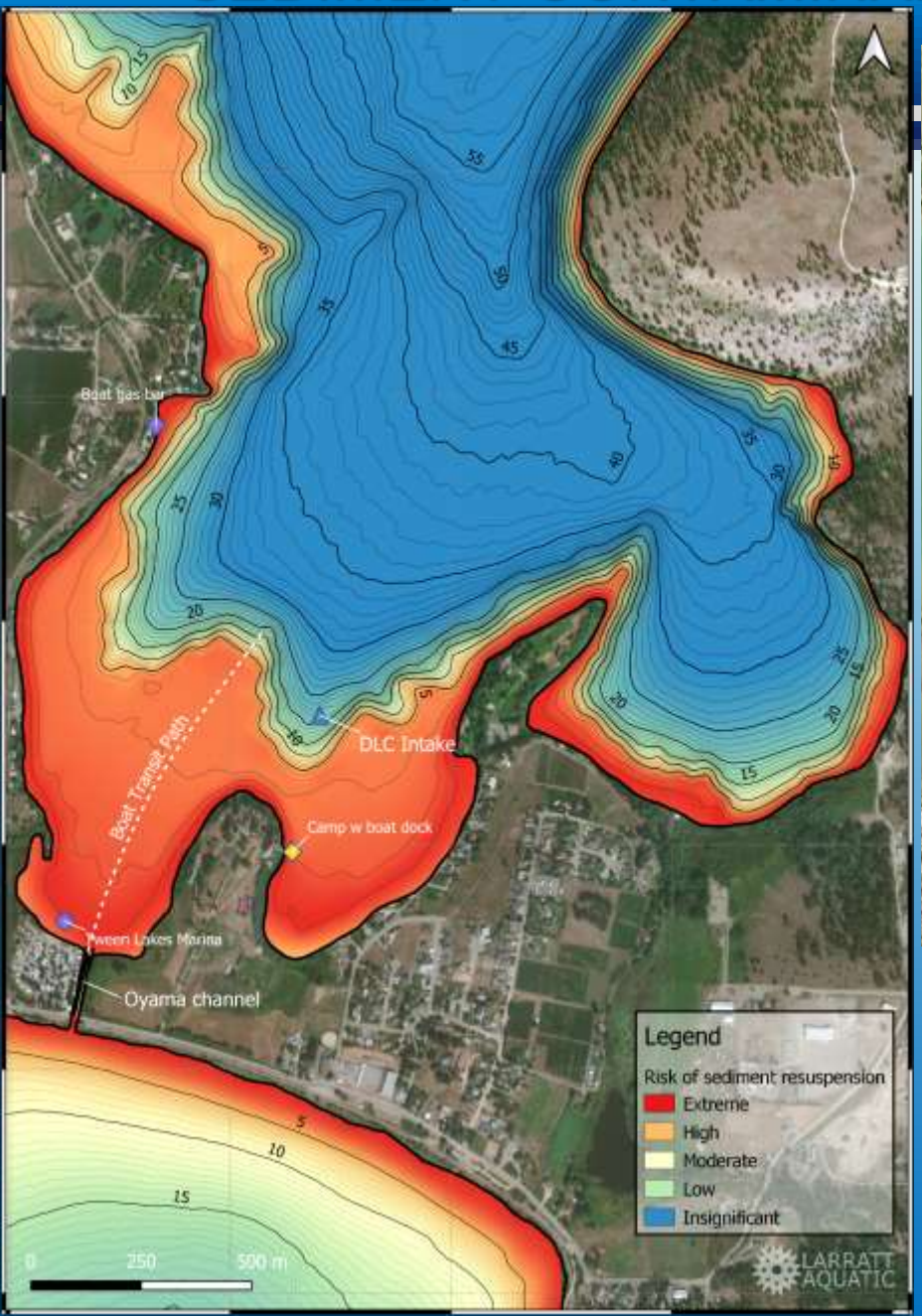
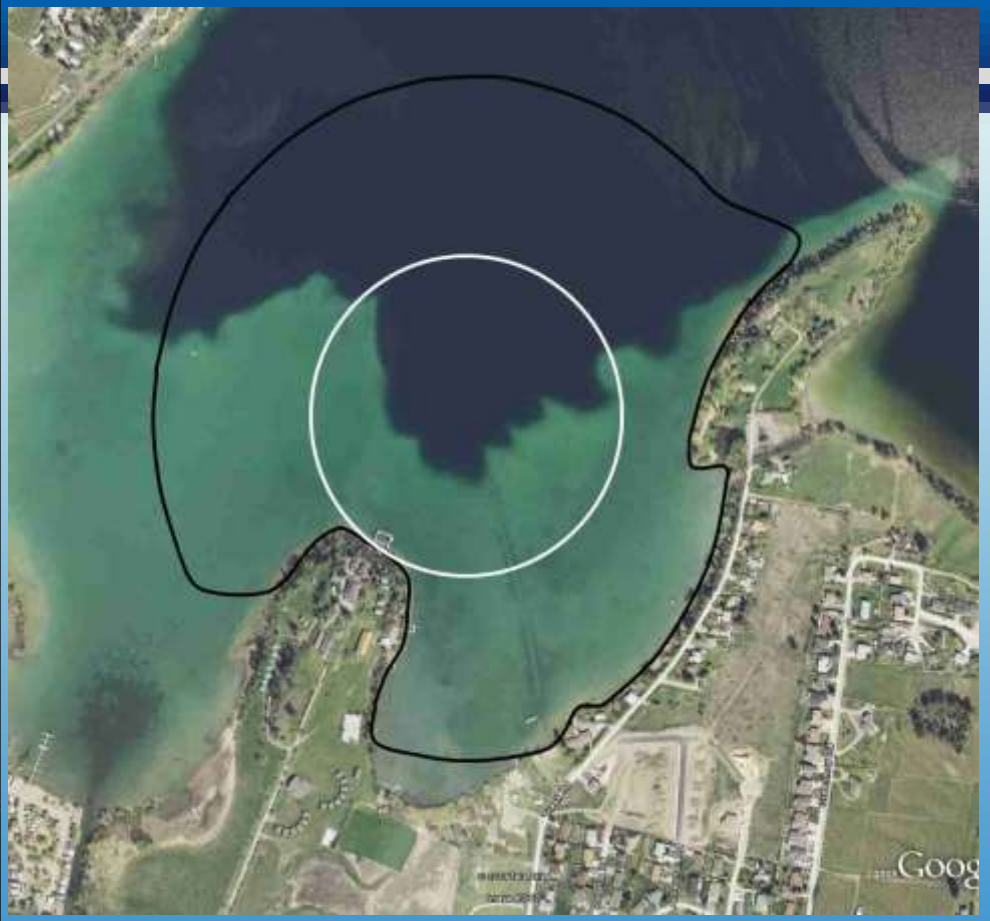
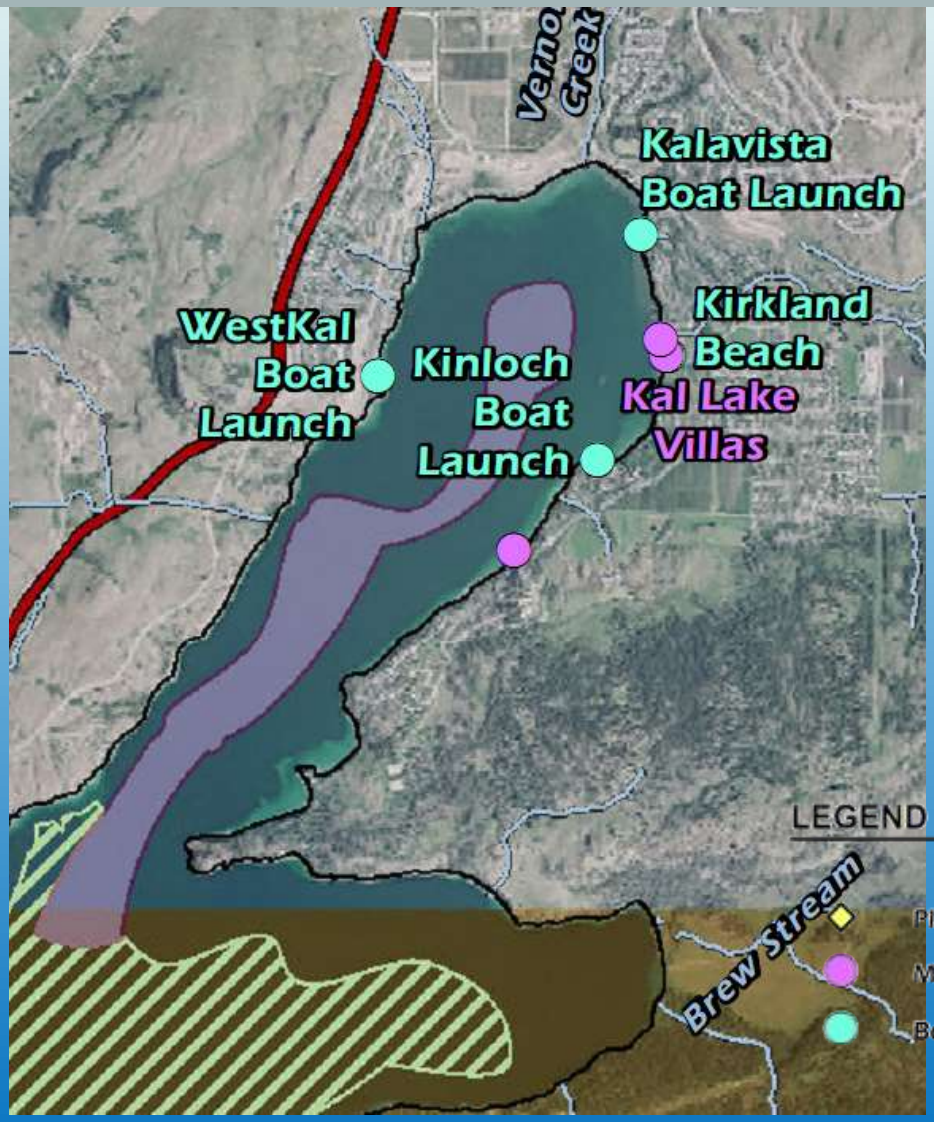




WHAT DOES IT ALL MEAN?



We recommend powercraft should:

1. Occur in locations that reduce both source water and environmental risk
2. Commuting corridors should be developed
3. Establish boat carrying capacity
4. Propwash, wake and wave safeguards are needed
5. Paddlecraft in no-wake shallow zones
6. Spill safeguards should be developed

WHAT DOES IT ALL MEAN?

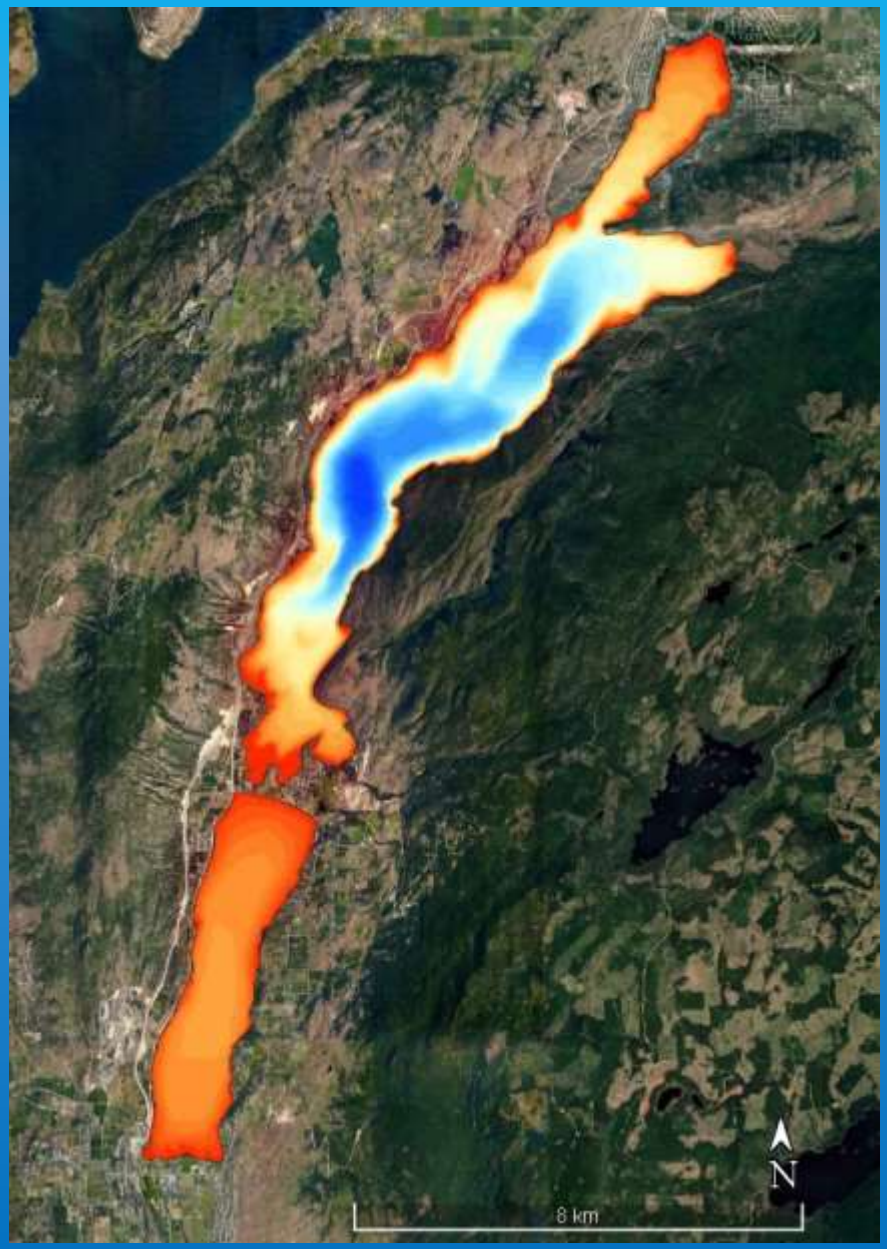
- Minimize stormwater contaminants (minimize outfalls/discharges esp. in the intake protection zone)
- Watershed protection is essential (prevent runoff, protect riparian areas)
- ROV Kal Lake boat sediment disturbance in 2019
- Minimize marina contaminants (refueling, cleaning solvents, paint, greywater)
- Make respectful boating easy (guidance buoys marking transit corridors, info signage?)
- Keep 60+ m away from shore in 4-6m (20’) of water

ACTIONS TAKEN

A Game-Changer - large powerboat impacts on mobilizing stormwater contaminated sediments.

H. Larratt and J. Self 2019.

FUNDERS:
RDNO GVW DLC
Casa Loma Resort



Boat trial photographs

Figure 6: Sediment plume from water-ski boat in <2 m of water

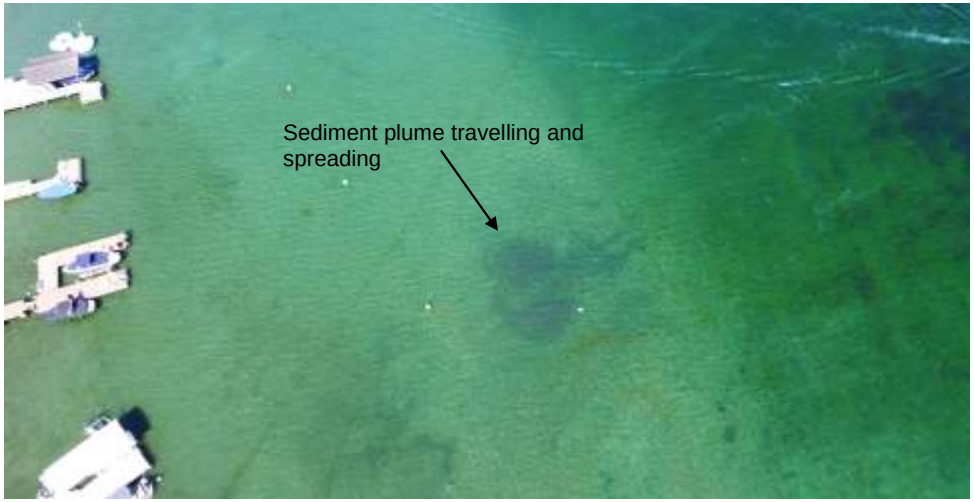


Figure 7: sediment plume from water-ski boat after 3 minutes

- Water-ski boat had measurable impact 4 m depth
- Operator did not notice turbidity

Casa Loma Bay, Okanagan Lake

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Boat trial photographs

Figure 3: Sediment plume from wake-surf boat in 2 m deep water (top) and same location after 3 minutes (bottom)

- Wake-board boat had measurable impact and boater noticed the plume in shallow water
- Propwash turbulent jet had measurable impact at 6 m depth

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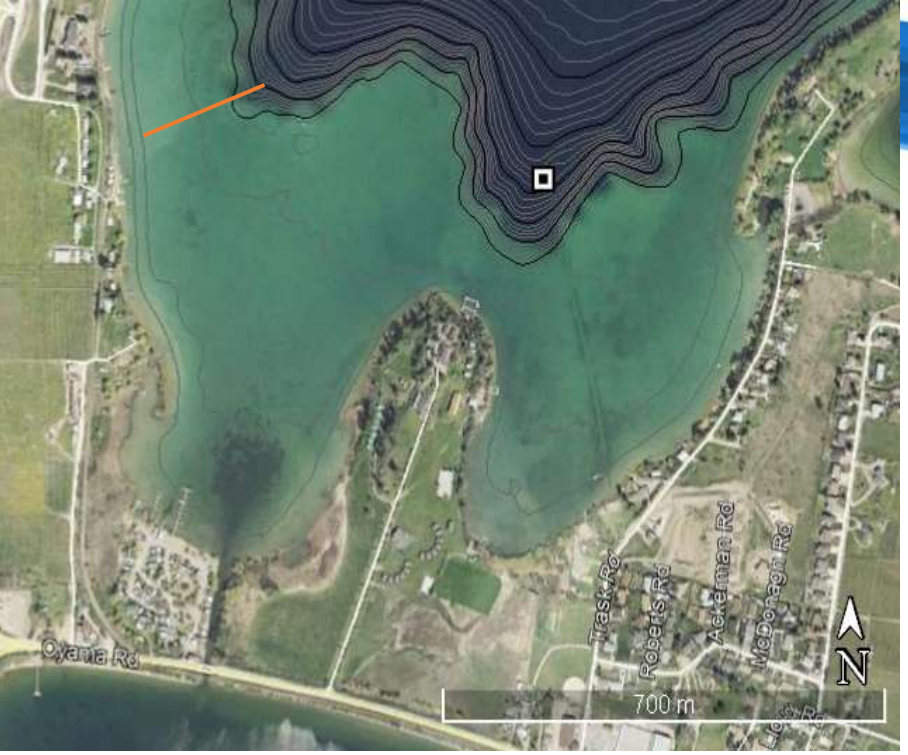
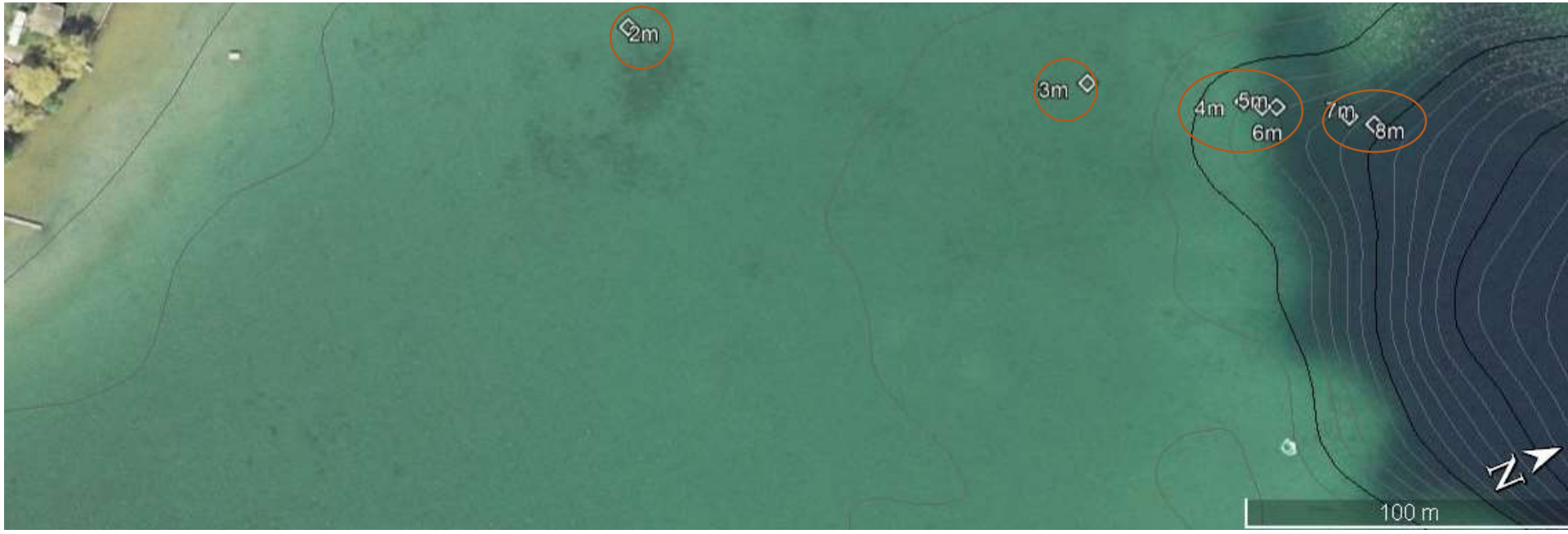
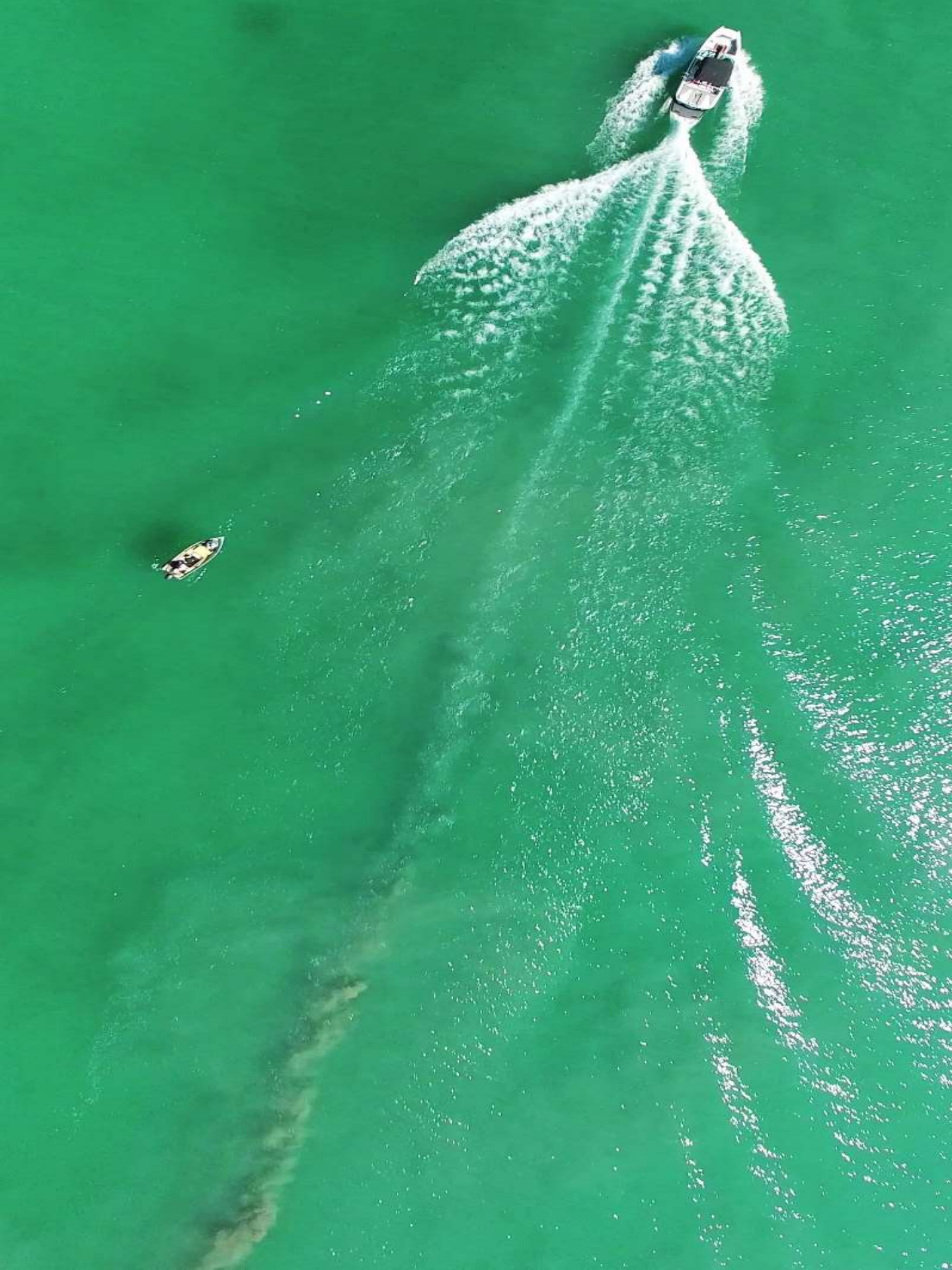


South Kalamalka –position of intake and boat trial buoy line





Wake-board boat propwash impact at 2 m depth

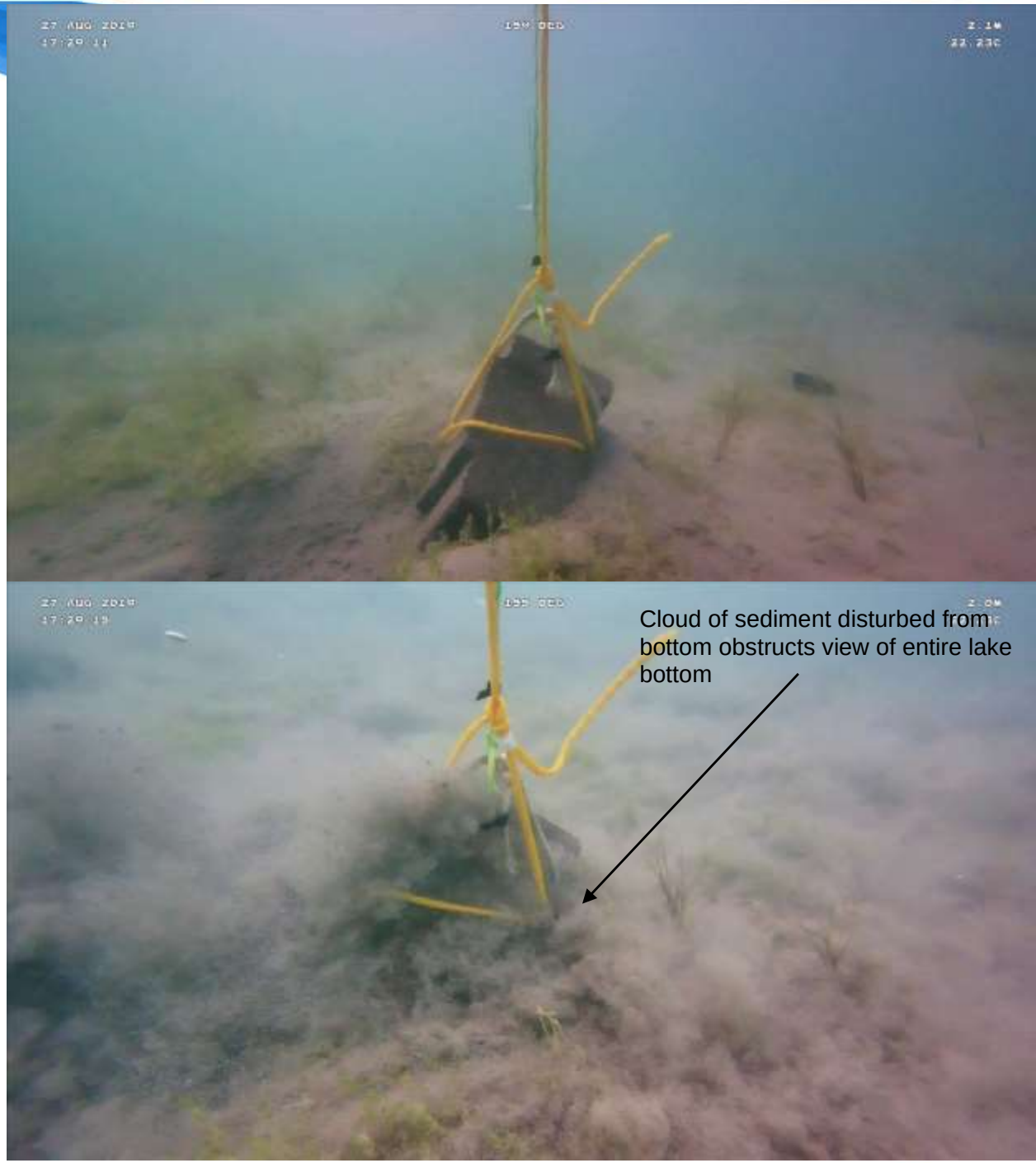


Figure 5: Before (top) and after (bottom) impact of boat wake on sediments at 2 m

Summary

- Beyond 5 m in Okanagan Lake, there was no visible sediment re-suspension (turbidity >30 – 50 +) but the propwash impacted the bottom at 8 m in Kalamalka Lake
- Using aerial imagery, the dual impact of the prop-wash and boat wake on the sediment were demonstrated. The prop-wash created a very intense sediment plume throughout the water column that was visible at the lake surface. The wake impact created parallel ribs of turbid water that spread out from the boat path.

It happens….

In addition to impacts generated during the trial, aerial imagery revealed the presence of scars on the lake bottom caused by previous boat disturbances.

What to DO?

We conclude that *powerboats should operate in deep water, and transit slowly to water deeper than <6-7 m (20-25'), while paddlecraft should restrict their activities to water shallower than 6 m.* This would reduce risk of collision, preserve environmental habitat values *and protect drinking water intakes.*

HOW to DO?

Educational information could include:

An App bundle showing:

- Intake positions, or intake protection zone only
- Powerboat play zones >6-7m (20-25') water depth
- Powerboat transit zones < 6-7 m water depth
- Paddlecraft zone >1 and <6 m depth

Signage: with lots of graphics to be read while waiting in boat launch queue, humorous ("6m under" "make great waves")

Volunteers (with coffee?) explaining water issues

Make sure the Province know where the intakes and IPZ'z are!

Bylaw: IPZ + Boat zone bylaw (W1) + License of occupation?

Marine Park:- Ecological Reserves Act like Shuswap Lake Marine Provincial Park

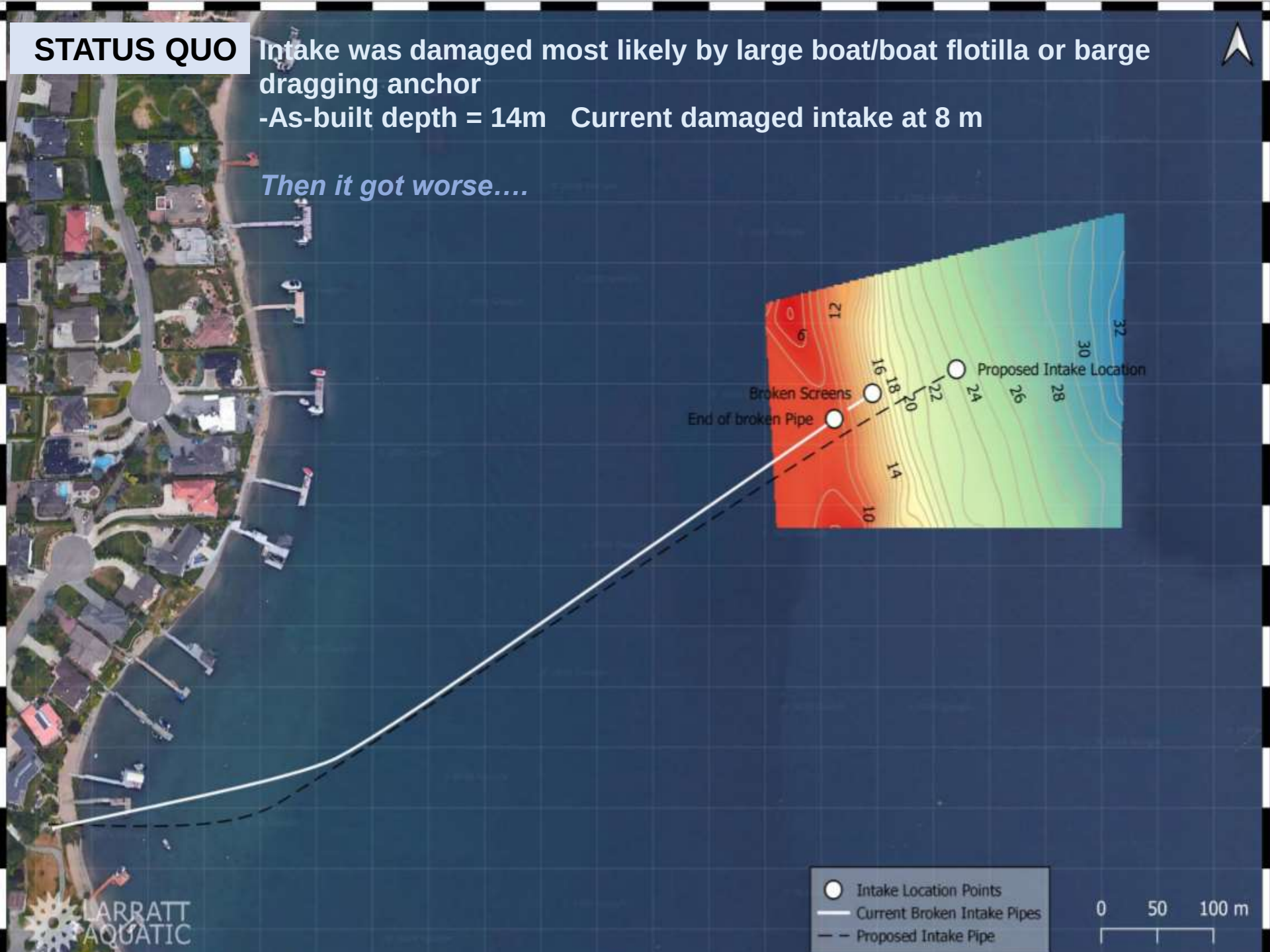
Seek Blue Flag Status?

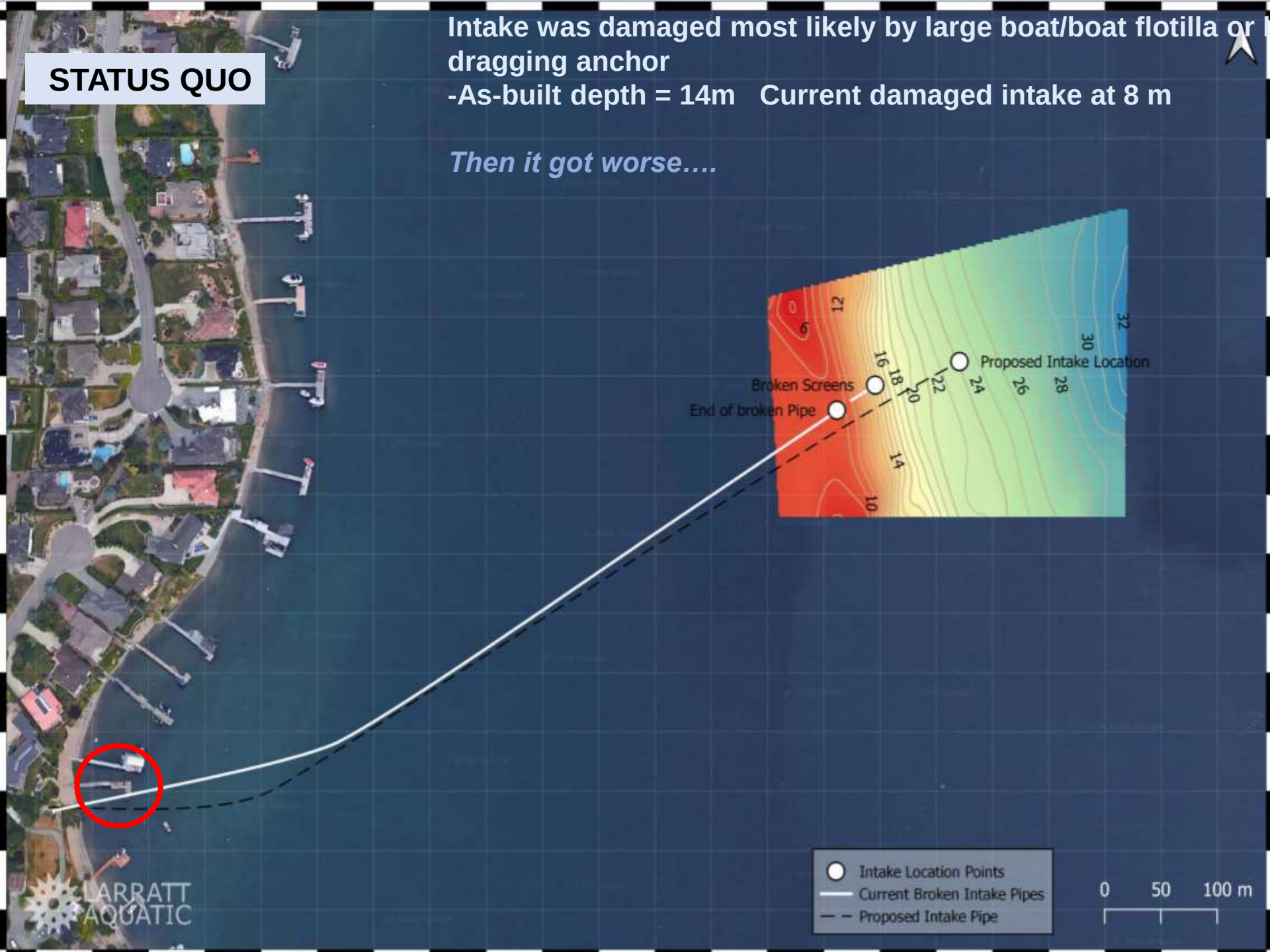
Your Ideas?

STATUS QUO

Intake was damaged most likely by large boat/boat flotilla or barge dragging anchor
-As-built depth = 14m Current damaged intake at 8 m

Then it got worse….




STATUS QUO
Intake was damaged most likely by large boat/boat flotilla or dragging anchor
-As-built depth = 14m Current damaged intake at 8 m
Then it got worse….
Proposed Intake Location
Broken Screens
End of broken Pipe
0
6
12
10
14
16
18
20
22
24
26
28
30
32
Intake Location Points
Current Broken Intake Pipes
Proposed Intake Pipe
0
50
100 m
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BE WAKE SMART!

PLEASE PREVENT LARGE WAKES IN SHALLOW WATERS

Island Lake is a shallow lake with many islands (Average depth 12.2ft – Atlas of Alberta Lakes)

Large wakes impact shorelines and other users

Large wakes also stir up bottom sediment deposits impacting water quality

"Resuspension of lake bottom sediments will release nutrients that can fuel cyanobacteria blooms increasing their duration, frequency and intensity."
– May 2020, Heather Larrat, R.P. Biologist, Larrat Aquatic Consulting

SOLUTION

- Limit water recreation to designated deep areas
- Minimum 20 ft. depth. Use your depth finder
- Refer to depth map below for highlighted use areas
- Minimum of 200 ft. from shorelines when using a watercraft for recreation
- Maximum speed of 10km when within 200 ft. of shore

LET'S MAINTAIN A HEALTHY LAKE WE CAN ALL ENJOY

Your Kalamalka Lake research is helping other lakes

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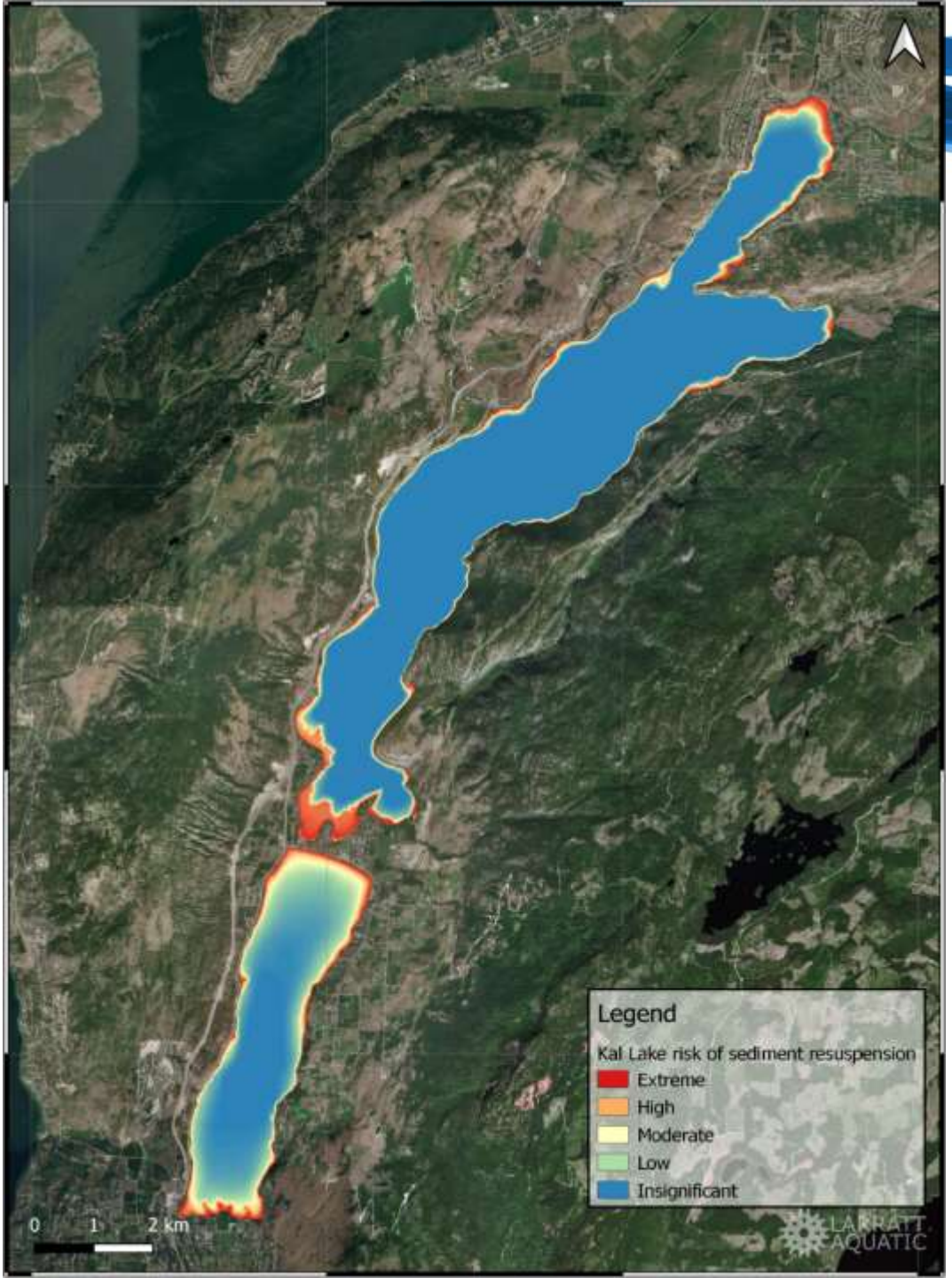

There lots of places to play…

Thank you -

Questions?
Comments?

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