



# Zebra Mussel Eradication- Lake Winnipeg Harbours

Wednesday, April 13<sup>th</sup>, 2016



**ASI Group**  
MARINE · WATER



**ASI Marine**

- Commercial Diving
- Remotely Operated Vehicle (ROV) inspections
- Marine Geophysical Surveying and Underwater Mapping



**ASI Water**

- Bio-fouling
- Operations
- Engineering
- Laboratory

# Background

- October 2013 – Manitoba Department of Water and Conservation Stewardship are notified of possible zebra mussel discovery.
- Survey completed on harbours within Lake Winnipeg by Department of Water and Conservation Stewardship staff to determine if mussels were present in other harbours.
- Zebra mussels discovered at four isolated harbours within the South Basin of Lake Winnipeg
- Vector of infestation unknown.
- Winter freeze prevented further investigation in 2013.

# Choices/Decisions



- Government left with difficult decision on how to proceed.
- Limited information, isolated areas, mussels found only amounted to a handful of individuals
- How did they get there??
- Are these isolated occurrence's connected to pleasure craft mobility?
- Is Greater Lake Winnipeg colonized?
- What is the cost of an eradication attempt? Is it possible?
- What is the cost of doing nothing?

# Lower South Basin

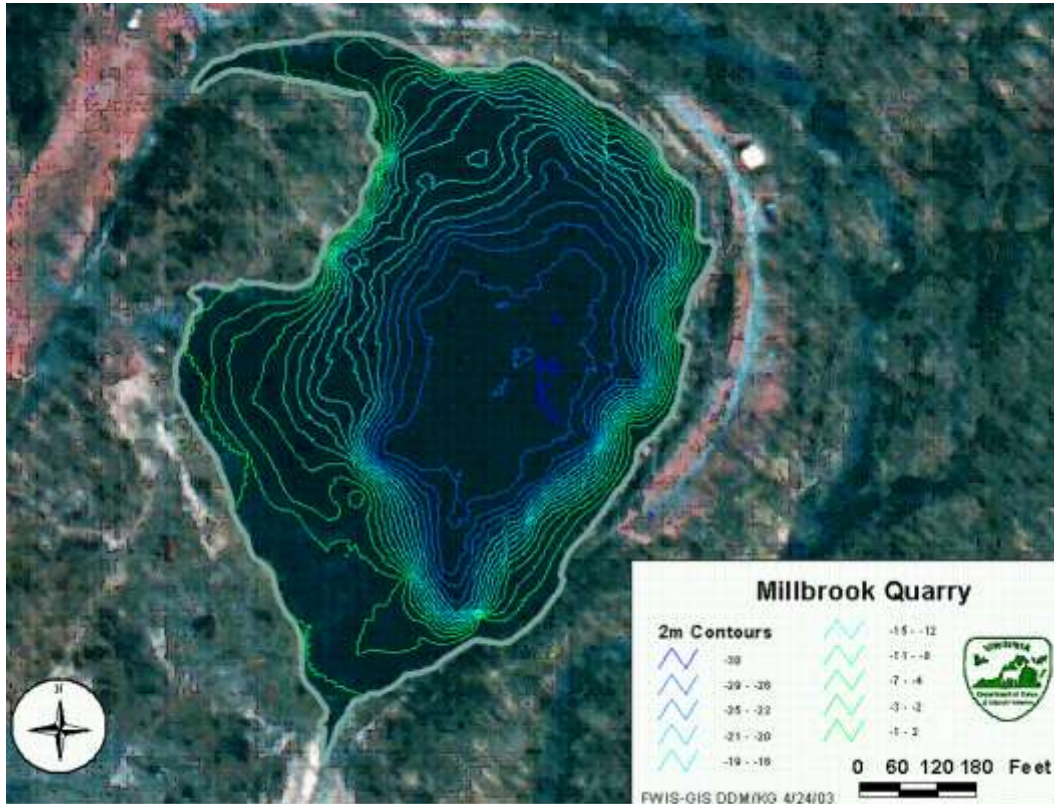


# The Path Forward

- March 2014 Province decides to proceed with eradication attempt.
- Access to and from impacted harbours restricted until eradication completed.
- ASI Group approached to design treatment strategy using Potash as the control agent.
- ASI Group had successfully eradicated mussel populations from Millbrook Quarry located in the Commonwealth of Virginia in 2006.
- Site visit to assess the logistics.



# Millbrook Quarry



- Successful eradication within open water body.
- Quarry not fed from surface water supply, only groundwater.
- Only chance of success eradication at infested harbours was to replicate the Millbrook Quarry experience.
- Greatest difference and potential barrier to success is the exposure to open water at Lake Winnipeg.

# Winnipeg Beach





# Silver Harbour



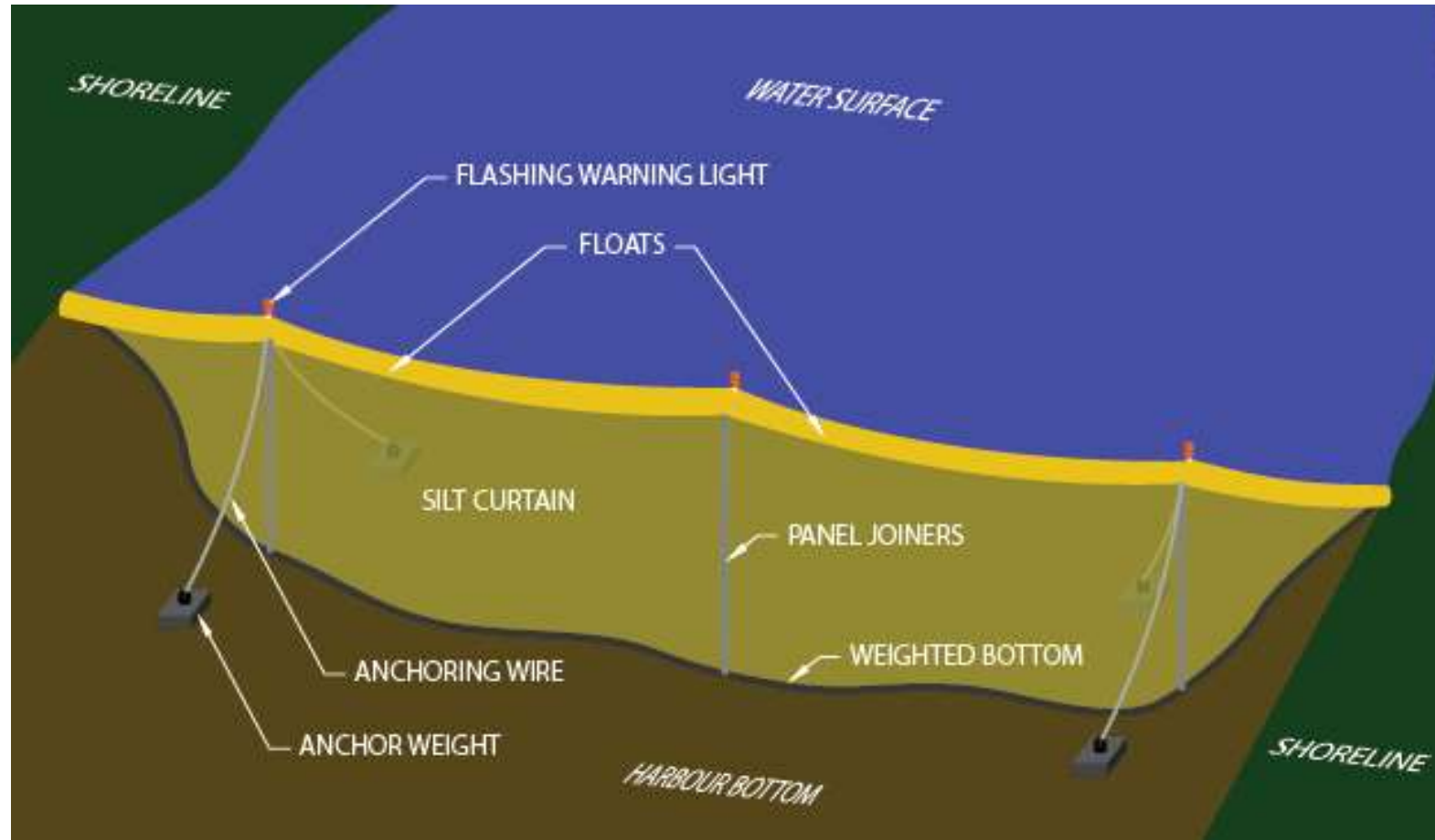


# Proposed Strategy



- ASI proposes to replicate Millbrook Quarry experience by isolating each harbour from Greater Lake Winnipeg.
- Isolation achieved by deployment of silt curtains fitted with floatation at the surface and ballast chain at the bottom.
- Once isolated each harbour would be charged with 100 mg/L K<sup>+</sup> via the addition of KCL 20%.
- Proposed methodology accepted by the Province.

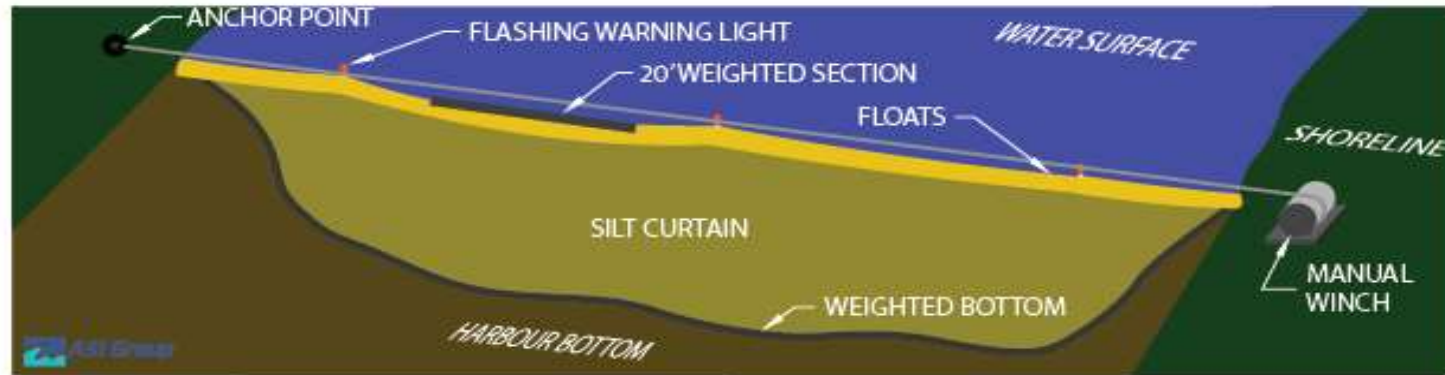
# Typical Silt Curtain Installation



# Problems!!!!

- Design and preparation for the project continued on this basis.
- In early May the proposed treatment became public knowledge.
- Backlash was strong particularly from groups impacted by restricted harbour access.
- ASI was tasked with redesign of the silt curtain structure to allow access in and out of treated harbours by water users.
- ASI engineers and Marine staff completed in-house review and design modification to create a retractable silt curtain.

# Typical Silt Curtain Installation



TYPICAL SILT CURTAIN RAISED



TYPICAL SILT CURTAIN LOWERED



# Typical Silt Curtain Installation



## Phase 1: Potash Charge



- Mobilized to site May 19.
- Proceeded to set up injection and storage facilities.
- Launched boats.
- Prepared hose for use.
- Met with all stakeholders.
- Conservation officers

# Phase 1: Potash Charge (Temporary Tank Farm)





# Phase 1: Potash Charge (Hose Assembly)



# Phase 1: Potash Charge (Methodology)



- Potash delivered to the site each morning.
- Approximately 5,200 USG per shipment.
- 20% KCL solution
- Tanks connected in parallel to provide continuous daily supply.
- Potash gravity fed from storage tanks to booster pumps.
- Supply pumps loaded in series.
- Minimum of 11,900 USG pumped each day.



## Phase 1: Potash Charge (Methodology)



- Potash entered Sealander via 360 rotating irrigation fitting.
- Distributed to each harbour via diffuser assembly.
- Diffuser depths set at 10 ft.

## Phase 1: Potash Charge (Methodology)



- Depending on size, each harbour divided into treatment zones.
- Zones treated individually per day.
- Length of hose changed depending on zone being treated.
- Flow rates between 90 – 120 l/min.
- Background samples collected prior to commencement of treatment.
- Charge activities begun on May 24 and concluded on June 8.

## Phase 1: Potash Charge (Methodology)



- Samples collected daily.
- Concentrations in each harbour characterized via depth samples
- Analyzed for K<sup>+</sup>, Temp
- Collected at key locations within each harbour.
- GPS coordinates logged.

## Phase 2: Bioassay (Set up)



- Permit from Conservation and Water Stewardship obtained to move 4000 zebra mussels into the Province of Manitoba.
- Installed once charge activities had been completed on a given harbour.
- Total of 35 bioassays deployed via Bio-Tubes.
- Recovery bath installed at Gimli harbour with water supply from Lake Winnipeg.



## Phase 2: Bioassay (Deployment)



- Installed along transects closely following original sampling locations.
- Locations marked with buoys and fixed in place via cinder blocks and 5/8" rope.
- Bioassay chambers placed at various depths along each buoy.



## Phase 2: Bioassay (Deployment)



- Mussels checked periodically for signs of K+ intoxication.
- Affected mussels removed in groups of 10 and transferred to recovery chamber, containing untreated water.
- Mussels in recovery chamber were examined at 24 hour and 48 hour intervals to determine latent mortality.
- Mussels which did not recover after 48 hours were deemed to have died.

# Final Results Winnipeg Beach



- Charge activities begun on May 24 and concluded on May 30.
- 191,000 litres of KCl (20%) added to harbour during charge period.
- Target concentration of 100 mg/L K+ maintained throughout the harbour.
- Water Temperatures (9.8 C – 20.5 C)
- 100% mortality reached at all Bioassays by June 1.
- Technical challenges were encountered due to adverse weather conditions which extended the charge period.

# Final Results Balsam Bay



- Charge activities begun and completed on May 27.
- 9500 litres of KCl (20%) added to harbour during charge period.
- Target concentration of 100 mg/L K+ maintained throughout the harbour.
- Water temperatures (13.9 C to 20.0 C)
- 100% mortality reached at all Bioassays by June 1.
- No significant issues encountered during this application.

# Final Results Gimli Harbour



- Charge activities begun on May 31 and concluded on June 12.
- 435,000 litres of KCl (20%) added to harbour during charge period.
- Target concentration of 100 mg/L K+ maintained throughout the harbour but not consistently.
- Water Temperatures (9.8 C – 20.5 C)
- Curtain failure occurred on June 8 which did not get repaired until June 11.
- Concentrations were significantly depleted and required re-charge.
- 100% mortality finally reached at all Bioassays by June 12.



## Final Results Silver Harbour



- Charge activities begun on June 6 and concluded on June 9.
- 144,000 litres of KCl (20%) added to harbour during charge period.
- Target concentration of 100 mg/L K+ maintained throughout the harbour.
- Water Temperatures (11.4 C – 18.0 C)
- 100% mortality finally reached at all Bioassays by June 12.



# Conclusions

- Eradication attempt was successful in each treated harbour,  
**BUT.....**
- Further confirms viability of open water body treatments.
- Impressive response time by the Province to implement this project!!!!!!

Thank-you



***ASI Group***

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