

# Mactaquac River Restoration Study



# Introduction

- Mactaquac River Restoration Study: Year long study by Hatch Consultants, Amec Foster Wheeler, Stantec, and exp (SJRSRG).
- Mandate: Provide engineering and cost estimates for 3 End of Life Options for Mactaquac Generating Facility.
- Presentation Objective: Describe technical challenges and proposed mitigation measures for Option 3 – Dam Removal.

Proposed solutions described in this presentation maybe modified by ongoing studies (CRI), consultation and subject to an environmental review process.

# Presentation Plan

Presentation will cover following aspects of Option 3:

- Drawdown Sequence- draining of the Headpond
- Dam Removal - demolition of Facility
- Shoreline Interventions - modification to infrastructure and restoration / protection of exposed areas

# Mactaquac River Restoration Study



# Mactaquac Dam

## Headpond:

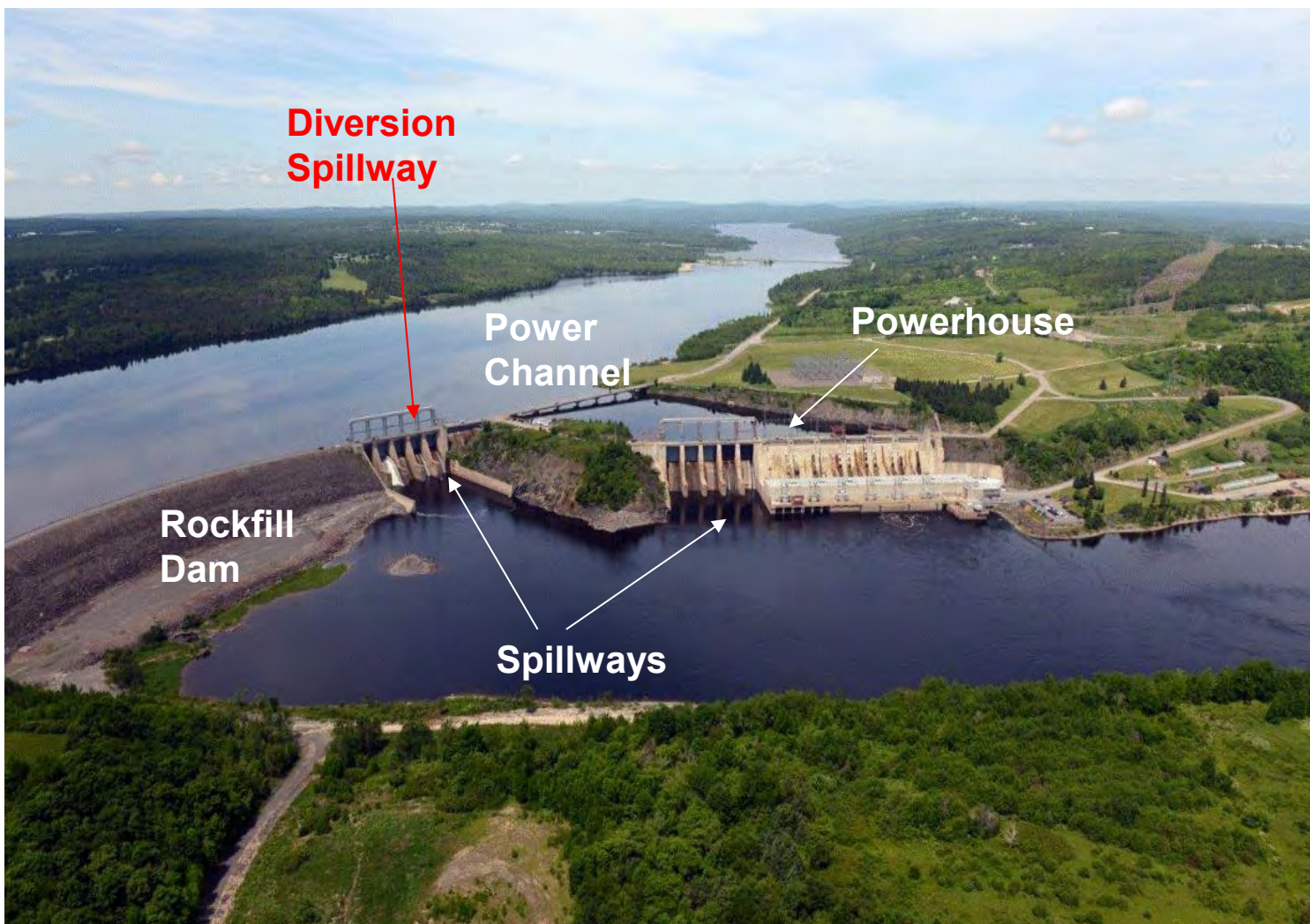
- MGS is 25<sup>th</sup> largest reservoir by volume (Canada)
- Headpond covers 84 km<sup>2</sup> and is 96 km long
- Impounds 1307 million cubic metres water, max depth 39.6 m
- Average daily inflow 815 cms,

## Dam:

- Main dam is 55 m high, 518 m long
- Operating head 35.4 m
- 672 MW installed capacity, run of the river installation
- Operation since in 1968
- Projected End Of Life is 2030



# Mactaquac Dam Drawdown



# Drawdown

- Drawdown involves lowering Headpond water level from EL 39. m to EL 5 m (approx. river level@ MGS)
- Criteria for draining Headpond:
  - Safe & controlled release
  - No flooding downstream
  - Permit natural erosion of sediment
  - Subject to results of river science research (ongoing)
  - Subject to regulatory review (future)

## Drawdown Scenario's Investigated

- 3 year release (slow)
  - Prolonged disturbance
  - Water level drop 0.6 m/mth
- 7 day (fast)
  - Potential flooding
  - High construction safety risk
  - Water level drop 5 m/day
- 7 month (medium), currently being studied
  - Technically achievable (safe)
  - Limits the duration disturbance
  - Optimal construction DD / water level drop 0.5 m /day



## Drawdown Modelling

- Hydro dynamic modelling of Headpond and SJ River system by CRI.
- Modelling for slow and fast draw downs have been completed (Qualitative assess).
- Most of sediment transport occurs in last stage of DD /old river channel
- Ending DD in period of high flow preferred

## Drawdown Sequence (7 month)

**Phase 1** – Draw Headpond down to EL 24 m using the Spillways  
Storage reduced by 900 M m<sup>3</sup> or 70% (1 month)

- Monthly summer inflows 350 to 770 cms
- DD Release adds 350 cms to outflow
- Spring freshet flow > 2200 cms

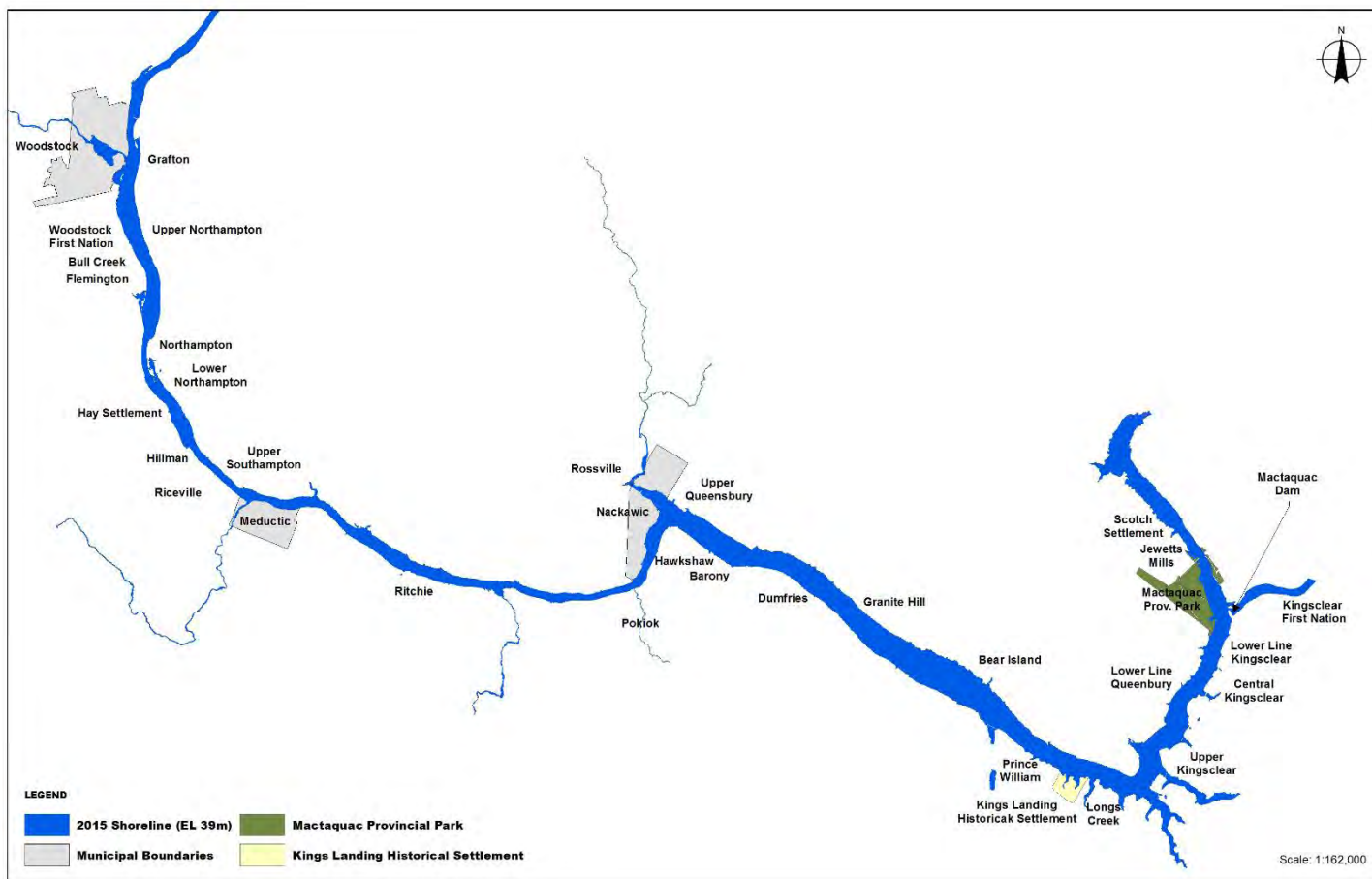
**Phase 2** – Draw Headpond down to EL 5 m by demolishing  
Diversion Spillway in stages (6 months)

- River diverted through the diversion spillway until rockfill dam is removed.
- River is restored to free flowing

## Drawdown – Lowering Headpond

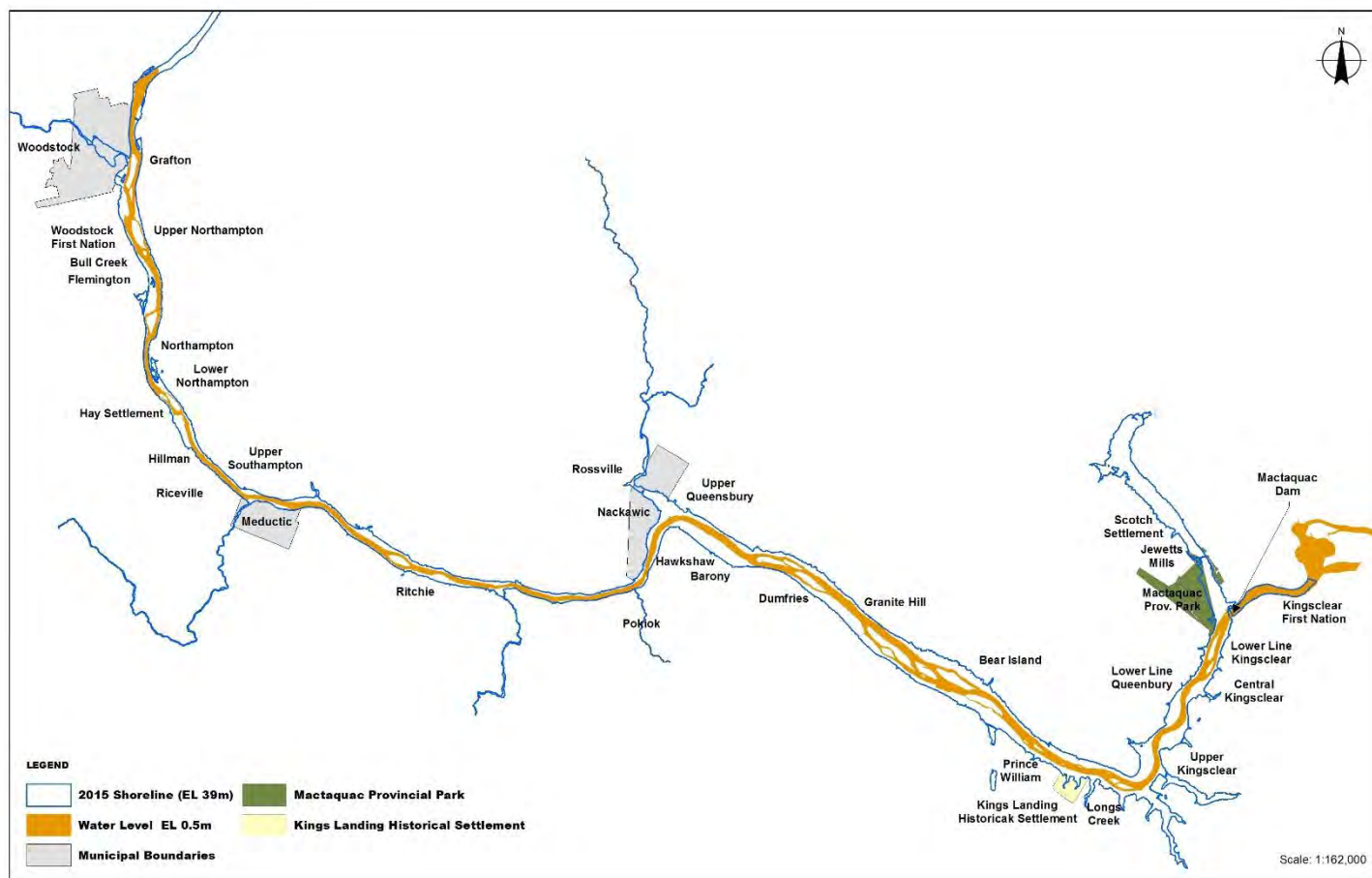


# Drawdown- Headpond EL 39 m

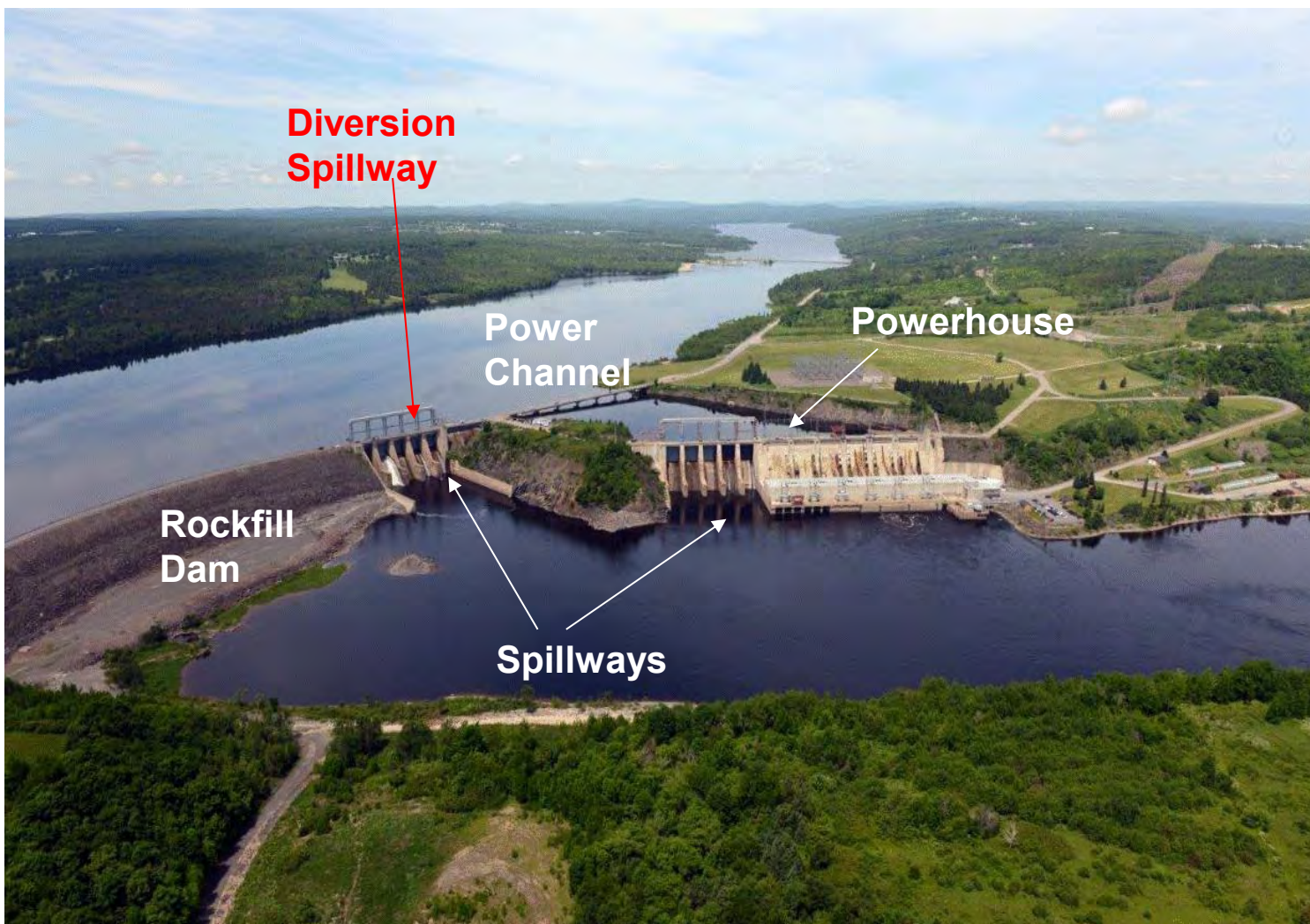




# Drawdown – Headpond EL 5 m



# Mactaquac Dam Removal





## Dam Removal - Historical

### Elwha Dam:

- Elwha removed 2011 – 2012, part of largest dam removal in North America
- Reservoir Vol – 10M m<sup>3</sup>
- Height – 33 m
- Drawdown – 3 months
- Sediment 25 M m<sup>3</sup>



Elwha Dam-2011



## Dam Removal - Historical





## Dam Removal - Historical

Elwha River – late 2012:



## Dam Removal - Historical

Condit Dam 15 MW

- Condit removed 2011 – 2012,
- Reservoir Vol- 1.6 M m<sup>3</sup>
- Height – 30 m
- Drawdown- 2 hrs





## Dam Removal - Historical



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Énergie NB Power

**HATCH**

**SJR** SOLUTIONS GROUP



exp.



Stantec

## Dam Removal Features

Decommissioning of Dam	Description
Diversion Spillway	Remove gates and structure to river level. Used to divert river flow while lowering headpond
Powerhouse	Remove superstructure and equipment, fill voids with concrete
Main Spillway, Intake Structure	Remove gates and superstructure, backfill
Rockfill dam	Remove rockfill dam, stockpile waste rock in intake channel
Switchyard	Remove equipment, cable, and demolish yard



## Dam Removal Sequence

- Step 1 – Diversion Spillway is demolished in stages to lower the water in the Headpond
- Step 2- River is flowing through Diversion Spillway
- Step 3 – Powerhouse and Spillway structures demolished, Dam is removed.

The demolition sequence is illustrated in following model animation.

# Demolition Sequence Animation

- Video
- [3 Mactaquac - Option 3 Draft 3.avi](#)

## Shoreline Interventions

Interventions in the headpond are necessary to maintain current functionality of infrastructure after drawdown. Potentially affected infrastructure was identified through input studies and CER process. Major inputs into the Engineering study included;

- Regulated I/O inventory review (CRI)
- Causeway culvert inventory
- Residential water wells, I/O, Built infrastructure inventories, (CER)
- Bathymetry, LIDAR, aerial mapping
- Submerged structure inventory (GHD)

## Shoreline Interventions Features

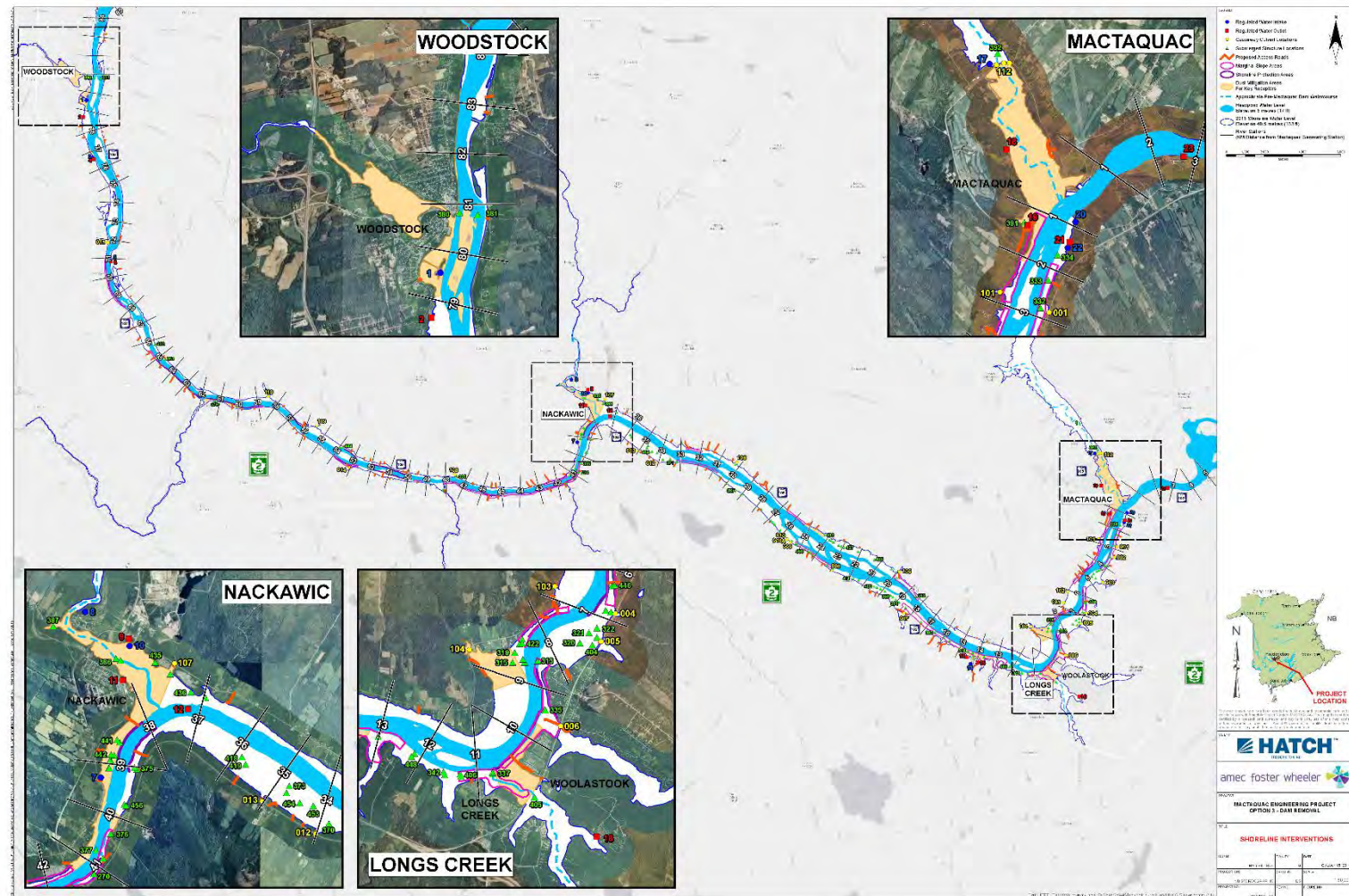
Shoreline Interventions (Headpond)	Mitigation Description
Culvert Replacement	Replace causeway culverts at 18 locations along Highways 102,105, 616.
Residential Water Wells	Monitor, maintain 700 (registered) private water wells.
Shoreline Protection	Install 21 km of erosion protection along future SJ River course.
Shaping & Grading Slopes	Grade and vegetate 4.2 km <sup>2</sup> of marginal slopes to prevent instability in drawdown zone.
Surface Water Management	Extend 170 drainage channels from existing tributaries to new SJ River edge.



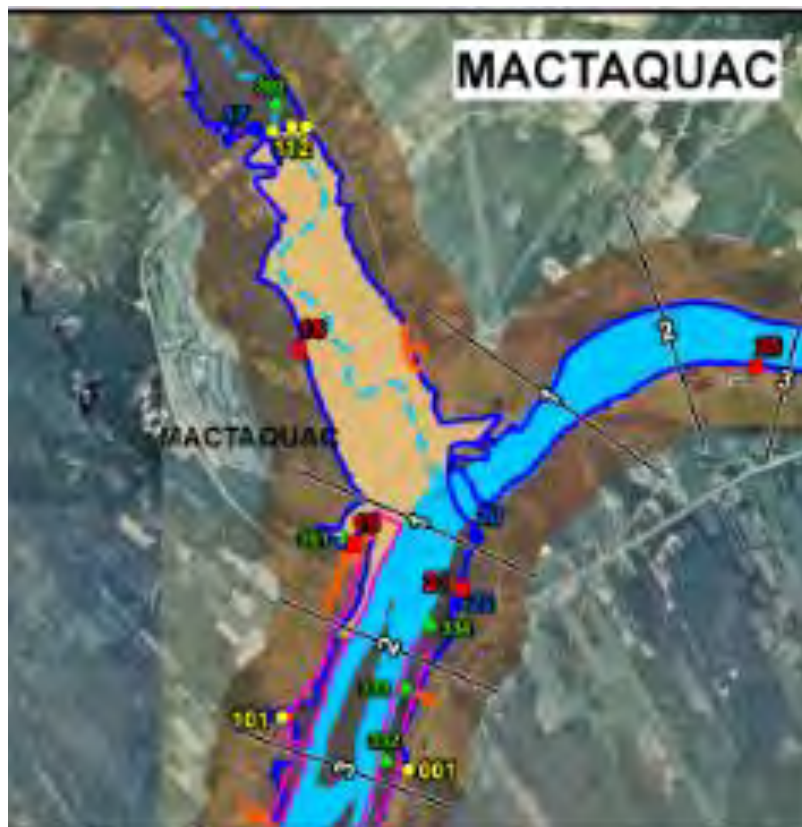
## Shoreline Interventions

Shoreline Interventions (Headpond)	Description
Ice Jam Mitigation	Construct ice control structure at MGS, and or ice booms (Preliminary concept).
Regulated Water Intakes	Modify 5 groundwater, extend 5 surface water intakes.
Regulated Waste Water Outfalls	Extend 14 wastewater outfalls on HP and SJ River.
Dust Control Measures	Hydro seed 1000 ha to control dust at key receptor locations. Allow for monitoring & add hydro seeding.
Demolition of Submerged Structures	Maintain drainage in draw down zone (125 culverts), remove remnants of 2 bridges.

# Shoreline Intervention Map



## Shoreline Intervention Details



### Interventions:

- Ice control structure
- New river crossing
- Dust control (arm)
- Regulated I/O extensions (6)
- Causeway culvert (2)
- Submerged structures (culverts)
- Marginal slope grading



## Shoreline Intervention Details

- Dust Control
- Causeway Culvert (3)
- Regulated I/O (5)
- Submerged structures (culverts)
- Erosion Protection





# Construction

Expected time limes for construction

- Pre- draw down Shoreline Interventions - 2 years
- Primary DD – 7-24 months
- Demolition- 2 years

Total Project Duration approx. 5 to 6.5 years

## QUESTIONS