Preliminary Assessment of Options

for the Long-Term Viability of the

MEMRAMCOOK RIVER CAUSEWAY

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EXECUTIVE SUMMARY

The Memramcook River causeway and associated gates and supporting structures were built in 1973 and have been deteriorating from weather conditions and salt water ever since. Over the years, this has altered the natural ecosystem in the 400 km^2 watershed and contributed to the elimination of several kilometres of upstream estuary, affecting the tidal range fish migrations and nutrient exchange in the river system. The causeway will soon reach a point where it will need significant repairs and upgrades. Planning must begin immediately to modify, repair or remove the existing causeway to ensure its next 50 to 100-year life span.

The mission of Petitcodiac Riverkeeper is to lead in the restoration, protection and promotion of the ecological integrity of the Petitcodiac and Memramcook watersheds and the Shepody Bay estuary. We have been calling attention to the deterioration of the Memramcook River causeway for many years and are committed to working with government and other key stakeholders to prevent further damage. We bring extensive knowledge and experience in river causeway long-term viability assessment, close working relationships with the community as well as a collaborative approach that will ensure that all key stakeholders are engaged in the process and supportive of the outcomes.

There are two key goals for this project: 1) To reduce the impacts of climate change and the aging causeway on the Memramcook River, its watershed, ecosystem, dykes, surrounding land and property and 2) To foster sustainable economic growth for the community by building an eco-tourism industry around the Memramcook River.

This report contains data collected by the Petitcodiac Riverkeeper on the current state of the infrastructure that is the Memramcook Causeway as well as a preliminary assessment of options to repair, modify or remove the infrastructure. This report is intended to begin a dialogue with the public to best understand the concerns and opportunities in the community. This report is not comprehensive but is rather a starting point for further dialogue and data collection.

THE CURRENT STRUCTURE

The Memramcook River Causeway was built in 1973, serves as a roadway to connect the communities on the East and West side of the river. The causeway has altered the passage of water which has affected the natural ecosystem of the 400 km^2 watershed. The causeway has gates that are operated electronically by the Province of New Brunswick to control this passage of water. The gates are closed when tides are high and are opened when tides are low. The gate schedule is in place to help reduce the impacts of high tide to surrounding agricultural land and to aid in the passage of fish.

THE ISSUE

The Memramcook River Causeway and the opening and closing of its gates have altered the passage of water which has resulted in erosion below and immediately downstream of the structure. This erosion is estimated to be 15 ft by 15 ft and it is reasonable to assume that major repairs will need to be done to ensure the longevity of the structure and public safety.

Since its construction the causeway has not had major repair or reconstruction in 44 years. This is abnormal for similar such structures including the Tantramar Causeway which had major repairs and reconstruction of its gates in 1991/1992, 36 years after its construction. The Tantramar Causeway supports a drainage basin of similar size to Memramcook at 360 km^2 compared to 350 km^2. It is known that the 2 large metal gates, their guides in the concrete and the entire superstructure are in need of major repairs in the near future. A thorough assessment of options should be completed before any major repairs are done to the structure to ensure it's viability and longevity on the Memramcook River.

ADJUSTMENTS TO LAWS AND REGULATIONS

In recent years laws of regulations have been updated that may affect the Memramcook causeway. This table below is a summary of changes identified through preliminary assessments of the causeway and it's operation.

NAME OF ACT OR REGULATION	PREVIOUS VERSION OF ACT OR REGULATION	CURRENT VERSION OF ACT OR REGULATION
Fisheries Act[1]	Protection for commercial, recreational and aboriginal fisheries	Protection of all fish and all fish habitat
Fisheries Act	No provision to restore degraded habitat and restore fish stocks	Increased focus on habitat restoration and rebuilding of fish stocks
Fisheries Act	No provisions to include Indigenous participation in decision making	Indigenous traditional knowledge provided must inform habitat decisions
New Brunswick Environmental Impact Assessment	Registration required for projects that had been built but never assessed for environmental impacts to be reviewed by the department before receiving major upgrades or repairs	Removed
Canadian Navigable Waters Act[2]	The Act regulates major works and obstructions on navigable waters of the schedule	Expanding the Act to regulate major works and obstructions on all navigable waters, even those not on the schedule
Canadian Navigable Waters Act	Indigenous knowledge and traditional use of the waters not considered	Consideration of Indigenous knowledge and traditional use of the waters
Canadian Navigable Waters Act	Difficult to add waters to the list of scheduled waters (the schedule)	An easier way to add waters to the list of scheduled waters (the schedule)

[1] https://www.dfo-mpo.gc.ca/campaign-campagne/fisheries-act-loi-sur-les-peches/introduction-eng.html

[2] https://www.tc.gc.ca/eng/programs-632.html

ASSESSMENT OF OPTIONS

Research and data collected on the Memramcook River Causeway lead to three options for consideration. Each option presents itself with different impacts and structural upgrades or reconstruction that are required to maintain the safety and security of people and the surrounding environment.

Option 1: Repair - Status Quo

The Memramcook Causeway is repaired to maintain its function and role on the river. It will require major renovations and continual maintenance through the opening and closing of the gates to allow for control of tide and fish passage.

Infrastructure Requirements:

- Major repairs to erosion of soil below structure
- Major repairs to structure and reconstruction of the gates

Ongoing measures include:

- Overseeing the opening and closing of the gates

Impacts:

With the status quo option the impacts to the river and surrounding community remain. The causeway has altered the flow of water, which has had significant negative effects on the surrounding ecosystem. The opening and closing of the gates creates large fluctuations in sediments and bacteria which are stressful to aquatic organisms and has led to the elimination of many species once present in the river, including many species of fish that were historic to the region. The species that remain are periodically blocked passage to over 85% of the Memramcook River by the closed gates. The buildup of sediment downstream has reduced the width of the river, and is affecting the Shepody Bay mudflats which are critical habitat for migrating birds.

Communities across New Brunswick are developing climate adaptation plans to help reduce the impacts of climate change which will increase the quantity of extreme weather events. These extreme weather events such as storms and floods may lead to failure in the electronic control system for the gates. In this case the gates would need to be operated manually by an operator who may not be able to arrive on site due to possible obstructions or flooding. If the gates are not manually operated this could increase the impacts of major storm events to the surrounding region of the causeway.

Option 2: Partial reconstruction

In this option the Memramcook Causeway is kept and the gates on the Causeway are opened permanently. This option is an intermediary between options one and three which results in a combination of impacts and benefits from both of these options.

Infrastructure Requirements:

- Major repairs to erosion of soil below structure
- Reconstruction of the dykes or purchase of agricultural land

Impacts:

In this option the causeway remains but the gates are no longer used to control the flow of water. The free passage of water reduces the large fluctuations in sediment creating a more stable environment for species. With the gates no longer closed, fish are no longer blocked and have free access along the river. The river narrows at the point of the causeway which will continue to affect the flow of water.

It is expected that the opening of the gates will begin a restoration process along the river, however, the impacts and potential for this restoration have not been fully assessed for the purposes of this preliminary report. Limitations to restoration will be present due to the narrowing and blockage that the causeway presents even with the gates left open.

With this option, tide levels are expected to rise along the river. The impacts that this will have to surrounding land is unknown. Preliminary research indicates that the agricultural land along the river is more productive and more valuable to farmers than similar agricultural land in the regions immediately next to it. Higher tides could result in flooding of some of these lands along the river. More data must be collected to properly map and assess flood risk. To mitigate the risk of flooding, Acadian dykes could be moved, and reconstructed along the river. This would allow the river to benefit from restoration while also benefiting farmers and landowners in the region. Further assessment should be done to understand if the structure is capable of handling the additional stress of having the gates open 24/7 or if additional upgrades would need to be made to make this a viable option.

Option 3: Removal

In this option the causeway is removed entirely and a bridge is built in its place to maintain access to communities on both sides of the river.

Infrastructure Requirements:

- Major repairs to erosion of soil below structure
- Major infrastructure construction of new bridge
- Destruction and removal of current structure

Impacts:

Removing the causeway and building a bridge in its place will maintain access to the communities East and West of the river while promoting the river's ecological health. The river is allowed to return to its most natural state and with that, habitat recovery begins. This option is most likely to result in the largest benefits to the river and its surrounding ecosystem.

Further assessments should be carried out to understand what potential changes could be expected for the river. For the years following the removal of the causeway community members could expect to see the return of fish species, birds and other animals that once frequented the area.

As with the previous option, higher tides are expected which could result in the flooding of lower lying lands. Further data needs to be collected to understand flood risk. The reconstruction of the dykes along the river could help to mitigate these risks.

ASSESSING COSTS

Cost assessment for the options presented in this report are challenging at this time. As with any preliminary assessment, more data collection is necessary for a comprehensive understanding of the repair or construction needs. The following is a comparison of costs from similar projects in the region to help provide a rough guide.

The approximate cost for the necessary upgrades to the current structure are estimated between 2 and 5 million based on similar upgrades done to the Tantramar Causeway in 1991.

The approximate cost for the reconstruction of dykes along the Memramcook River is $250,000/km based on construction of dykes along the Petitcodiac River for the opening of the causeway gates. Lidar, GIS mapping and stakeholder meetings with the Department of Transportation and Infrastructure can help us to estimate how many km of dykes are needed along the Memramcook river to provide a better overall estimate of the costs.

There are currently no similar projects in recent years that have repaired the type of erosion present below the Memramcook Causeway. Further meetings with government stakeholders can help assess the cost burden associated with repairing this damage.

The costs associated with building a bridge are unknown at this time with the data currently available. It is expected however, that the cost to build a bridge would exceed the costs related to the other options presented in this report.

POTENTIAL COMMUNITY AND CULTURAL IMPACTS

The primary focus of this report is to present options for infrastructure renewal on the Memramcook River. Throughout this assessment different community and cultural concerns were brought to the attention of our researchers and will require communication with community and stakeholders to understand the full impacts of each option presented.

Impacts should be assessed for the Memramcook River Causeway and its effect on the Mi'kmaq community who have used the land for hundreds of generations. The impact of the causeway has changed the river system which has affected the traditional use of the land including the use of the river for canoes and access to fishing. Indigenous maps can help us to better understand and communicate the significance that this area has had to the local indigenous community. It has been brought to the attention of the Riverkeeper that research into species at risk assessments for the area immediately surrounding should be completed to understand plants and sacred herbs that may be at risk from the current causeway infrastructure. Further communication and outreach should be done with Fort Folly First Nation to help understand and communicate the potential cultural impacts that each options proposes for the local indigenous community.

The Memramcook River Causeway is in the centre of Fort Folly First Nations traditional territory. Memramcook is derived from the Mi'kmaq name Amlamgog which means, 'many and variegated rivers'. Today Fort Folly's reservation is part of the Dorchester community. The original site was Beaumont near the mouth of the Memramcook River which is designated as a local historic place. Fort Folly's current Chief is Rebecca Knockwood, she was elected in 2013 and has seen the change the Petitcodiac and Memramcook causeways have had on the natural function of these rivers. Through its habitat recovery program, Fort Folly is committed to the restoration of the Petitcodiac and Memramcook watersheds and the species that are part of the indigenous ecosystem.

In addition to the traditional and continued significance the land has to the indigenous population, Acadians have strong cultural ties to the location as well. Memramcook is well known for its historical Acadian dykes which could be more heavily negatively impacted by certain options presented. Certain options may require that the Acadian dykes be reconstructed to better stand up to the changing conditions along the river, as well as the growing impacts of climate change.

Further research should be conducted to understand the tourism potential in the region with regards to each of the options. Ecotourism is a growing industry that could benefit the surrounding communities while promoting positive conditions for the river and its ecosystem. The tourism potential could also promote the historical and cultural uses of the land with the Mi'kmaq and Acadian communities.

Finally, the Petitcodiac Riverkeeper has also acknowledged the need for Lidar data to create a comprehensive GIS map of the area. This technology allows us to make estimations of the effects of increased water passage in the region surrounding the river. It can help us assess which areas may be at higher risk than others for flooding.

CONTACT US

This report is part of an on-going project to assess options for the long-term viability of the Memramcook River Causeway. If you have feedback to offer on the process so far, or if you would like to be added to the contact list for future community discussions and follow-up on this project please contact Krysta Cowling at info@petitcodiac.org.