

Route 117 Rehabilitation Kouchibouguac National Park

Canadian Consulting Engineers Award
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What's inside

Introduction	1
Q.1 Innovation	3
Q.2 Complexity	5
Q.3 Social and Economic Benefits	7
Q.4 Environmental Benefits	9
Q.5 Meeting Client's Needs	9



Introduction

75-Word Project Summary

As part of a national infrastructure improvement initiative, Parks Canada Agency needed to rehabilitate 23.7 km of highway along Route 117 in Kouchibouguac National Park. Stantec's realignment and road widening solution brought the roadway up to current geometric design standards, meaning Park users and residents now have a safe passage for year-round use of Route 117. Aquatic and amphibian habitats were also restored through extensive culvert replacement and strategic installation of amphibian crossings.



Q.1 Innovation

This project had two main objectives: to provide a safe, reliable roadway for the next 20 years, and to facilitate the restoration of aquatic habitats and fauna conservation.

We began the project with a thorough field investigation to understand the condition of existing pavement structure, overall drainage of the road bed, and the drainage and flow characteristics of the land next to the roadway. We explored four rehabilitation options and developed cost benefit analysis and life cycle costing. The results of these analysis formed the guiding principles for the selected full reconstruction design. Some innovative aspects of the project include:

- **Alternative Geometric Design:** Based on the posted speed and projected traffic volumes calculated at 2750 vehicles per day the road was classified as a rural collector. This data along with horizontal and vertical geometric requirements informed our design decisions to widen sections of the road while maintaining the existing roadway alignment. This resulted in minimal impacts on the existing landscape, sensitive ecosystem, park users and environmental footprint of the works.
- **Using Warm Mix Asphalt:** To meet the 20-year design life requirement, we needed a more stringent asphalt mix compared to what is used on most conventional roadways. The closest aggregate source,

however, was 100 km from site. Understanding the delicate balance of temperatures involved in laying asphalt, we used warm mix asphalt. This versatile product cools at a lower temperature than traditional asphalt mixtures, allowing for longer haul times from plant to the site, improved workability, and less emissions. It can be used for longer durations and on days when the air quality on site is less than ideal.

- **Reuse of Material:** By creatively reusing existing materials, we reduced haulage distances (given the remote location of the National Park) and avoided the volume of waste disposal and stockpile sites used—ultimately leading to cost savings.

We reused granular materials from the existing pavement structure. The excavated material was utilized as backfill and embankment materials for the roadway section widening. Milling the existing pavement along the roadway—an environmentally conscious practice of removing and grinding pavement for reuse—generated more than 41,500 m³ of recycled asphalt, which we recycled to be incorporated in the base course asphalt and shoulder materials. Roughly 25,000 m³ of reusable topsoil material was stockpiled at the construction limits and re-incorporated during restoration activities, eliminating the need to import material.



Truck convoy for placement of roadway aggregates



Amphibian Crossing - construction of cast-in-place tunnel



This project involved placement of enough granular roadway materials to fill 65 Olympic-sized pools!

Q.2 Complexity

More than 165,000 people visit Kouchibouguac National Park each year to take in the area's natural beauty. Maintaining the experience for visitors and the traveling public was critical to the success of this project.

- **Volume of Work:** This project involved 2,000 linear metres of new culverts, placement of 340,000 tonnes of granular roadway materials (enough to fill 65 Olympic sized pools) and 50,000 tonnes of asphalt. Moving this volume of product to, from, and around the construction site was a challenge given the active site use and remote location.
- **Tight Schedule:** The required 25-week project timeline necessitated a 24/7 construction schedule. To facilitate uninterrupted flow and traveler safety through the park, at least one traffic lane was kept open during the day and two lanes at night. This required well-coordinated construction site activities and a clear set of contract documents.
- **Cost Constraints:** Given the size and remote project location, the transportation of suitable aggregates for asphalt mixes, granular base/subbase and bedding/backfilling had the potential to increase costs significantly as the closest aggregate source was 100 km from the site. Significant reuse of aggregate materials reduced the cost substantially.
- **Environmental Sensitivity:** Replacement design of 64 culvert crossings including fish passage at 32 locations, was guided by the following strict criteria:
 - Maintaining the existing drainage footprint below the ordinary high water mark.
 - Excluded the placement of temporary or permanent fill materials below the ordinary high water mark.
 - Maintaining existing channel alignments.
 - Reduction, and in most cases removal of all obstructions to fish passage.





165,000

The number of visitors to Kouchibouguac National Park each year

Q.3 Social and Economic Benefits

The rehabilitation of Route 117 ties directly into the overall mandate of Parks Canada Agency to protect nationally significant natural resources, and ensure its ecological integrity for future generations. Social and economic benefits include:

- **Improved community connection.** Route 117 is the main corridor for fishing villages located in the northeast part of the New Brunswick. The Province boasts a thriving lobster industry with \$700 million in export sales in 2015. Communities such as Escuminac, Baie-Ste-Anne, and Pointe-Sapin make an important contribution to this, exporting to other provinces in Canada, USA, Europe, and Asia.
- **Potential for increased revenue through improved access.** The Park is an important contributor to the provincial economy both directly through its facilities, locations and services, and indirectly in the surrounding communities through spending on accommodations, restaurants, and tourism. Route 117 provides a safe, pleasant passage through the Park for visitors and the traveling public, and demonstrates a continued commitment to improving provincial infrastructure and our National Parks.
- **Lessens economic impact caused by severe weather events.** Today's scientists suggest that New Brunswick can anticipate an increase in intense precipitation events; larger fluctuations in river runoff and groundwater availability. Roadway site drainage was a key design consideration to not only avoid environmental impact on wetlands, bogs, and salt marshes but also reduce costly effects on community infrastructure as a result of severe weather events.
- **Supports year-round recreational activities for 165,000 visitors.** Including camping, swimming, biking, hiking, canoeing and kayaking.
- **Promotes the importance of conservation and protecting species at risk.** Provides a rejuvenated aquaculture and fauna setting enhancing Park experience.



Drift fencing to direct amphibians to designated crossings



Corrugated steel culvert prior to removal



New twin 2400mm culverts at Polly's Creek

Q.4 Environmental Benefits

- **Material Reuse.** Milled asphalt was recycled and used in the new asphalt mix, shoulder material and parking areas within the Park. We reused suitable excavated materials for backfill and embankments, (including topsoil), to reduce the volume of surplus material being transported off site, emissions, and overall fuel consumption.
- **Safe Removal of Hazardous Material.** The existing asbestos-covered corrugated steel culvert pipe and Creosote-treated wood culverts were removed and disposed of at an approved facility. This reduced the risk to aquatic species, habitat, vegetation and wetland environments by eliminating the potential exposure to environmental contaminants.
- **Fish Passage.** 32 of the 64 replaced culverts featured fish baffles (current deflectors) which provide fish movement, helping fish to complete migration (which happens against the current), and provides them with a refuge during the spring and autumn high tides. As such, the roadway no longer prevents marine and freshwater fish and other aquatic species from reaching spawning grounds, nursery, and food supply.
- **Amphibian Crossings.** Park biologists have found that amphibians and wood turtles—a species at risk—routinely crossed the highway at three peak times during the year, all linked to breeding patterns. Four amphibian crossings, or tunnels were designed and strategically installed under the road along the 23.7 km route reducing highway-caused mortality.
- **Waste Reduction.** Use of warm mix asphalt allowed for longer haul times to get the material from the plant to the site and improved the workability of the material for a longer duration. This resulted in energy savings and reduced carbon footprint.

Q.5 Meeting Client's Needs

Route 117 was prioritized as part of a national initiative by Parks Canada Agency to have all its paved roadways in fair to good condition by 2020. Our job was to improve the safety of the roadway while helping to revive the Parks aquatic and amphibian habitat, all while maintaining visitor experience. Here's how we did it:

- **Reconstruction to meet 20-year design life.** We recommended and designed a full reconstruction of the roadway. Road widening modernized the roadway to current geometric design standards.
- **Resilient design.** Considering hydrologic impacts of climate change was an important component of our design. We assessed overall drainage including road bed drainage challenges, as well as the drainage and flow characteristics of the land adjacent to the roadway.
- **Respecting the sensitive ecosystem of the Park.** We reduced waste by reusing the existing pavement materials in the new design where possible. We also designed for the installation of 64 new culverts underneath Route 117, reconnecting five streams whose flow had become obstructed, allowing aquatic habitat to resume their natural migratory patterns.
- **Minimizing traffic impacts during construction.** Much of construction took place during peak visitation/traffic season of the Park. Work in this timeframe had to ensure that cumulative traffic delay was no more than 10 minutes. To achieve this, a rigorous traffic management plan was developed in the contract documents that included the requirements of 24 hours a day, 7 days a week work schedule.