

**Fisheries Challenges Associated with Ray Gibbon Drive at  
Riel Pond and the Sturgeon River in St. Albert, Alberta**

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## Abstract

Ray Gibbon Drive, west of St. Albert, Alberta, currently functions as a two lane arterial roadway constructed to alleviate local traffic congestion and provide an alternate commuting route for the residents of St. Albert. Planning took place over 30 years, prolonged primarily because of environmental concerns. After four years of concentrated effort, two roadway sections are now open to traffic, linking St. Albert to west Edmonton and northwest Alberta.

Ray Gibbon Drive passes through Riel Pond (an existing storm pond and former sewage lagoon with contaminated substrate), crosses the slow-moving Sturgeon River and runs adjacent to Big Lake (in Lois Hole Centennial Provincial Park) and Riel Marsh, both sensitive bird habitats. Because of the project's location, site sensitivities and a long history of public interest, the City of St. Albert required an environmental assessment and federal and provincial agencies (Department of Fisheries and Oceans, Transport Canada, Alberta Sustainable Resource Development and Alberta Environment) required environmental approvals.

Construction challenges included: Construction of the roadway over an abandoned landfill with the risk of leakage of leachate; the need to work in Riel Pond (which discharged to the Sturgeon River) while not releasing contaminated bottom sediments, or a non-native fish species (threespine stickleback) discovered in the Pond; scheduling all work outside the period April to July (inclusive) imposed by fish and other breeding wildlife sensitivities (which led to challenging work conditions); and the need to compensate for lost fish habitat as a result of placing piers and abutments in the Sturgeon River. This last challenge was accentuated by the realization that the only suitable location for compensatory fish habitat was a reach of riverbank that had been formerly disturbed to construct one of the Riel Pond containment berms, leading to the need to relocate an entire pond berm. Operational issues included the requirement for the permanent outfall(s) to be screened to prevent release of the very small, non-native threespine stickleback and their eggs.

Mitigative measures and studies included several inventories to characterize fish populations in Riel Pond; designing temporary pond dewatering systems to assist with construction but prevent escape of sediments and non-native fish; characterization of lost riverine fish habitat; creation of 6,000 sq. m. of new pike rearing habitat; and post-construction monitoring of the compensatory habitat for a ten year period (ongoing). This project was closely monitored throughout by very attentive environmental special interest groups concerned with potential impacts to valued natural resources. The road opened for traffic in 2007 with achievement of all environmental protection measures despite the numerous challenges.

## Introduction

St. Albert, Alberta is located just ten minutes north west of the City of Edmonton. Founded in 1861 by Father Albert Lacombe, St. Albert is the oldest, non-fortified community in Alberta and was the largest agricultural settlement west of Winnipeg. Today, St. Albert is a bustling city with more than 57,000 residents with the majority of these residents commuting daily into Edmonton. However, prior to 2007, only a single four lane expressway, St. Albert Road, connected St. Albert to northwest Edmonton resulting in an extremely congested roadway.

Numerous traffic analyses over a period of nearly 40 years by several jurisdictions have confirmed the need for a new commuter route between the two cities. Planning for a western roadway has been ongoing since the 1960's and various locations have been proposed within several corridors. Common characteristics of all the alignments for the roadway in the vicinity of the City's west boundary are a crossing of the Sturgeon River and a route paralleling the shoreline of Big Lake, albeit at varying distances. The result of the long-term evaluation and planning process was the design and construction of Ray Gibbon Drive which adds traffic capacity for St. Albert and the surrounding region.

Today Ray Gibbon Drive connects in the south to the northwest leg of Anthony Henday Drive, (the Edmonton Ring Road) and to Giroux Road on the west side of St. Albert, and will eventually connect to Highway 2 to the north of St. Albert, covering a length of over 20 kilometres. This will both relieve traffic congestion on St. Albert Road and will also act as a western bypass route for St. Albert.

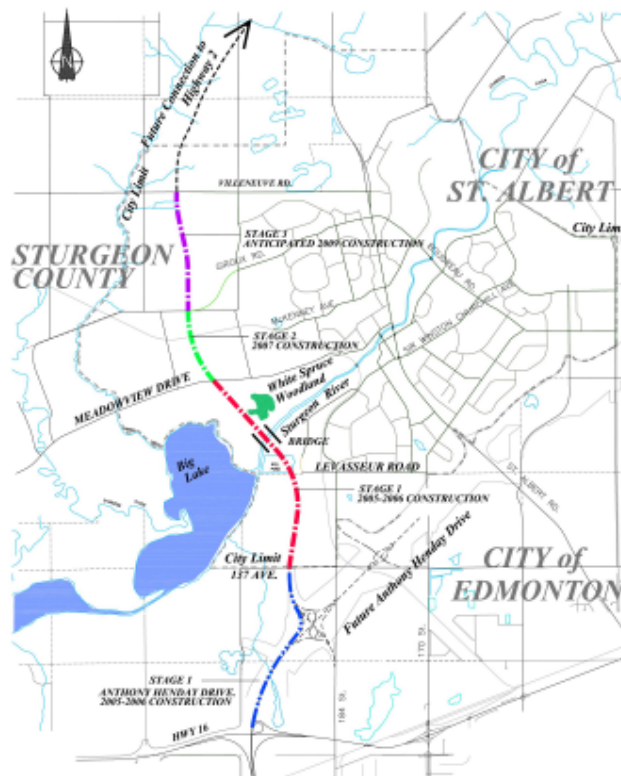


Figure 1: Project Context Map

In 1999 the City of St. Albert retained ISL Engineering and Land Services to complete the detailed route location study and planning for a future Ray Gibbon Drive. Upon achievement of this task, this commission was extended in 2001 to include the preliminary and detailed design of the approved route and ground was broken in 2004 on the first stage of the project with a new bridge over the Sturgeon River. Since then two stages of this roadway as well as three connecting roadways and intersection improvements have been constructed to connect St. Albert to Ray Gibbon Drive, and the third and final section is presently being designed and tender documents prepared for construction in 2009.

## **Project Design**

The roadway was designed as a four lane divided arterial roadway with curb and gutter on both sides and a design speed of 70 km per hour. However, during the course of the project the Alberta Government committed to taking over the roadway with the intention of eventually converting it to an 8-lane freeway. As such, the design incorporated future plans for the roadway conversion. The roadway was constructed as the first half (two lanes) of the four lanes with pre-grading of the second two lanes. All intersections were constructed with widening for auxiliary lanes, channelization for right turns and fully signalized. Street lighting was provided along the route and a crossing of an existing CN track was accommodated with an at-grade railway crossing. A storm sewer system was constructed to convey the storm water from catch basins along the roadway to storm water management facilities. A total of three storm water management facilities have been designed and constructed so far in the form of storm water ponds with fore-bays and storm water outfalls to Big Lake and the Sturgeon River. One of these involved an existing utilitarian rectangular storm water pond, designed in the 1980s as a sewage lagoon but commissioned as a storm pond. For this project, the pond was modified again with installation of a causeway for the roadway and one cell enhanced with soft landscaping, curving some of the straight edges, creating shallower slopes and a peninsula to provide for and encourage water bird nesting habitat. The other two were new facilities that were naturalized by constructing shallows close to the banks to encourage the growth of aquatic plants and spreading wetland soils where available. The bridge was designed as two separate, two span concrete structures, the foundations of which are able to carry three lanes in each direction. All in-river construction for both structures was completed at one time, including pile foundations and piers to avoid intruding into the river environment twice. Superstructure was completed for two lanes to match the roadway. An existing multi-use trail was also modified to allow passage under the bridge and connect the City with the Big Lake Natural Area and provide access to the provincial park.

## **Regulatory Consultation and Approvals**

Owing to the proximity of the new road project to Big Lake and other environmentally sensitive and fish-bearing features, many permits were required from various agencies. The environmental permitting process required by municipal, provincial and federal agencies for the construction included the following:

### **City of St. Albert**

In response to the interest that Ray Gibbon Drive and similar, past proposed alignments had generated among St. Albert citizens, the City resolved to listen to the environmental issues raised by members of the public and identified stakeholders, examine them and attempt to

address all pertinent issues through mitigative measures. St. Albert's Municipal Development Plan states that the City should require an environmental impact assessment for any proposed development that would adversely affect any identified natural area. The Environmental Impact Assessment, public consultation process, and mitigation plans addressed the City's requirements.

## **Province of Alberta**

### *Alberta Water Act*

As the proposed project included earthworks within the channel of the Sturgeon River, a temporary stream diversion for in-stream pier construction, drainage of roadway runoff into the Sturgeon River, and disturbance to wetlands, the project required permits pursuant to the Alberta Water Act and submission of a "Notice pursuant to the Code of Practice for Watercourse Crossings and for outfalls". The Water Act is administered by Alberta Environment.

### *Alberta Environmental Protection and Enhancement Act*

Construction of the proposed stormwater management facilities required a permit pursuant to the Alberta Environmental Protection and Enhancement Act, administered by Alberta Environment.

### *Public Lands Act*

The Province of Alberta owns the bed and bank of all permanent lakes, watercourses and permanent wetlands in the province, unless specifically exempted in land parcel titles. The Province claimed ownership of the bed and banks of Sturgeon River, Big Lake and Riel Marsh, all within or adjacent to the project area. As infrastructure for the proposed project was to be situated on Crown lands, several Licenses of Occupation were required. An approval to modify the Sturgeon River shoreline was also required. The Public Lands Act is administered by Alberta Sustainable Resource Development.

## **Government of Canada**

### *Canadian Environmental Assessment Act (CEAAAct)*

Projects that require certain federal permits, or that are located on federal lands or that are funded by identified federal government departments or agencies, are subject to an environmental review pursuant to CEAAAct. There were no federal lands or federal funding involved in the Ray Gibbon Drive project; however federal permits were required, triggering an environmental review by a Responsible Authority (RA). Fisheries and Oceans Canada (DFO) was appointed the Lead RA for the project and was responsible for coordinating the environmental screening process. The City prepared an Environmental Impact Assessment document to provide supporting information requested by the DFO to assist in the federal environmental screening of the project.

### *Fisheries Act*

The Sturgeon River crossing required an authorization pursuant to the Fisheries Act from DFO. A Fisheries Assessment was prepared for the project and an application was submitted. In October 2004, DFO issued the City of St. Albert an Authorization (No. AB-02-1191 NEB) for the installation of a bridge over the Sturgeon River, as part of the construction of Ray Gibbon Drive. Requirements of the Authorization included construction of compensatory fish habitat as well as implementation of monitoring programs to determine whether mitigation measures were followed and to assess the performance of the created compensatory habitat.

### *Navigable Waters Protection Act (NWPA)*

The Sturgeon River crossing required a permit from the Canadian Coast Guard pursuant to the NWPA. The permit set out structure height restrictions to allow passage of self propelled boats such as canoes. The type of vessel provided for is reflective of the shallow depths of the Sturgeon River. The permit also required maintenance of an unobstructed 10 metre wide river channel opening at all times during construction.

## **Environmental Impacts**

There were several environmental sensitivities and risks that were brought to the forefront during the planning process, by the City and concerned members of the public, including some special interest groups that were apprehensive about the road and potential impacts on the Sturgeon River, it's floodplain and Big Lake. These included:

- The proximity of the new roadway to Big Lake, a large environmentally sensitive wetland bordering St. Albert. The water body is about 8 km in length and 3 km at its widest point. Big Lake supports more than 235 bird species including such at risk species as Trumpeter Swans, Sprague's Pipits, Peregrine Falcons, Short-eared Owls and Bald Eagles and is recognized as a Globally-Significant Bird Habitat.
- The crossing of Riel Pond, originally designed as a sewage lagoon and then functioning as a storm water management facility. This construction is shown in Figure 2 which also shows the bridge in the top-right corner of the figure, Riel Marsh on the left hand side of the figure and the corner of Big Lake in the top left corner of the figure.
- The crossing of the Sturgeon River, a 260 km long river that begins at Hoople Lake and flows east to the North Saskatchewan River. This river is very slow moving and supports many aquatic species, including forage and sport fish and numerous water bird species.
- The proximity of the new roadway to the Riel Marsh, a large marsh to the south of Riel Pond.
- The new roadway traverses an abandoned City of St. Albert landfill and there were concerns about leachate escape as a result of the weight of fill placed on the landfill.
- A white spruce stand that would be in close proximity to the road that was known to support a diversity of sensitive bird and wildlife species.

In recognition of the environmental sensitivities at and near the project location and the need to obtain federal, provincial and municipal environmental approvals, Spencer Environmental Management Services Ltd. (Spencer) were retained by ISL as the project environmental consultant. Spencer completed an environmental impact assessment of the entire project and developed the necessary applications and approval packages for the relevant federal, provincial and municipal agencies. The objective of the environmental assessment exercise was to obtain, interpret and format the required environmental information in a manner sufficient to meet all municipal, provincial and federal environmental assessment processes and to support all required environmental permit applications. The City also wished to examine all pertinent environmental issues raised by St. Albert citizens during the public consultation portion of the environmental assessment exercise.

Outcomes of the environmental assessment exercise included the identification of the following potential negative impacts, relevant to fish and aquatic resources:

- Negative impacts to fish and aquatic resources including the direct loss of 6000 sq. m. of fish habitat from bridge placement of piers and abutments.
- Release of sedimentation or contamination of habitat as a result of accidental spill of hydrocarbons or other hazardous materials during construction or operation.

- Release of contaminants from Riel Pond, a storm water facility that was possibly formerly used as a sewage lagoon, whose sediments contained several contaminants including arsenic in the bottom sediments.
- Escape of the non-native fish, threespine stickleback from Riel Pond into Riel Marsh, and ultimately the Sturgeon River, during construction of Riel Pond as a stormwater management facility.
- Contamination of the Sturgeon River through release of landfill leachate displaced by weight of road fill.

Figures 2 and 3 illustrate the area of the Sturgeon River, Big Lake and Riel Pond and March affected by the construction.



*Figure 2: Construction of Sturgeon River Bridge and Causeway over Riel Pond*



*Figure 3: Construction of Sturgeon River Bridge*

## **Construction Windows and Timing Restrictions**

Like many projects involving work within watercourses, a restricted activity period existed for instream work. The restricted activity period defined by Alberta Environment for this reach of the Surgeon River is April 15 to June 30. This restriction affected scheduling of in-stream bridge work and the fish habitat creation work further upstream. An additional scheduling challenge was the requirement to comply with construction timing windows developed specifically for this project. The location of the project in the vicinity of several natural features important to sensitive breeding birds (Riel Marsh, Riel Pond, Sturgeon River, Big Lake and the White Spruce Stand) created potential for construction noise to adversely affect bird nesting success. The federal Migratory Birds Convention Act prohibits disturbance of nesting birds and active nests of certain species. To protect all nesting birds, two areas were designated as areas in which no construction activity could occur during the period 01 April to 31 July. Given the long winters in this part of Alberta, this restriction greatly reduced the available construction season and added one year to the overall schedule.

The following table summarizes the potential negative impacts during construction.



Table 1: Construction Activities and Associated Potential Impacts Summary

Construction Activities	Potential Impacts				
	The Harmful Alteration, Disruption or Destruction (HADD) of fish habitat	Potential impacts to river/marsh water quality	Potential release of sediments and threespine stickleback from Riel Pond	Potential contamination of the Sturgeon river because of landfill leachate	Other potential impacts
Construction of bridge over the Sturgeon River	✓	✓		✓	
Construction of fish habitat compensation area		✓			
Construction activity within Riel Pond	✓	✓			
Dewatering of Riel Pond	✓	✓	✓		
Other construction activities		✓		✓	✓

During the environmental impact assessment, two positive environmental impacts of the project were identified:

- Additional treatment of stormwater prior to discharge from Riel Pond.
- Introduction of an additional, permanent water source for Riel Marsh, which appeared to have been adversely affected by land use changes in the general vicinity.

## Fisheries Compensation

As a condition of the Authorization from Fisheries and Oceans Canada, fisheries habitat compensation was required. To mitigate the direct loss of approximately 6000 sq. m. of fish habitat occurring as a result of placement of the bridge abutments and piers, the City of St. Albert constructed a comparable area of compensatory fish habitat along the south shore of the Sturgeon River, upstream of the Ray Gibbon Drive Bridge crossing and just downstream of the River's outlet from Big Lake.

Excavation of the fish habitat compensation area was undertaken between December 9, 2005 and January 20, 2006, well outside the established restricted activity period for in-stream construction activities (i.e., 15 April to 30 June). Prior to the initiation of excavation (30 November 2005), a silt curtain was installed in the river, stretching from above to below the limits of the compensatory fish habitat area. The silt curtain isolated the compensatory habitat work site from the main Sturgeon River channel, ensuring that the construction of the habitat compensation area did not result in the sedimentation of water in the main channel. Measurements taken by Pisces during spring time runoff demonstrated the effectiveness of the curtain.



*Figure 4: Downstream view of Fish Habitat Compensation Area, Silt Fence in Foreground at 1:5 Year Flood Elevation and Silt Curtain in River (silt curtain approximates former shoreline)*

The compensatory fish habitat work consisted of:

- Stripping and stockpiling of wetland/aquatic soils and topsoil from the shoreline and bank, respectively.
- Excavating the existing river bank and adjacent berm to expand the width of the river.
- Creating a new riverbank slope.
- Applying native soils salvaged from the original shore of the Sturgeon River to areas below normal water level to encourage the establishment of native aquatic plant communities.
- In March 2006, installing silt fencing at the 1:5 year flood level of the Sturgeon River along the length of the fish compensation area. This silt fence was inspected at least weekly in conjunction with the silt fencing at the bridge construction area and was subject to regular maintenance to prevent siltation of the main channel.

The end result was the creation of 4,000 sq. m. of fish habitat having a minimum depth of 0.9m during normal high water levels and an additional 2,000 sq. m. of habitat available during 1:5 year flood events. The habitat is intended to serve primarily as young northern pike rearing habitat and possibly also as spawning habitat. Following the completion of work, the project engineer surveyed the fish habitat compensation area. That survey confirmed that the correct depths and slopes had been achieved (see drawing next page, Sturgeon River Fish Habitat Compensation Area As-Built X-Sections) and that the area of habitat created was in accordance with the DFO Authorization.

The new riverbank slope at the fish habitat compensation area, above the river's 1:5 year flood level, was finished (i.e., topsoiled and seeded) in August 2006. Since that time, vegetation has

become well established along the slope. In October 2007, full ground cover had established on those slopes and soils were stable enough to allow removal of the silt fencing.



*Figure 5: Completed Fish Habitat Compensation Area, Two Growing Seasons Post-Construction*

Performance monitoring of the fish habitat compensation area, as specified in the Authorization, is ongoing. Results from the first year of the monitoring program demonstrated that northern pike were utilizing the habitat compensation area as rearing habitat (Pisces Environmental 2008).

## **Monitoring and Mitigation Measures during Construction**

For all work undertaken in the Sturgeon River certain fisheries-specific monitoring was completed, as required by DFO and Alberta Environment. Pisces Environmental Consulting Services Ltd. (Pisces) monitored the Sturgeon River for increased sediment levels during the in-stream work, including the installation and removal of the isolation berms at the bridge site and the excavation of the fish habitat compensation area.



*Figure 6: Silt Curtain Installed at Bridge Site*

## **Construction of Bridge over Sturgeon River**

To accommodate construction of the bridge abutments and bridge piers, isolation berms were installed along the north and south bank of the Sturgeon River in the fall of 2004. Turbidity levels were monitored in the river during berm installation (and removal). Work was suspended on three occasions when turbidity levels exceeded the allowable limit. In situations when a specific source of sediment was identified, remedial action was taken immediately. In all cases, work was allowed to continue only when turbidity levels returned to background levels.

Installation of the isolation berms used the relatively new technique of placing fill on geotextile fabric that was floated on the water surface. As fill accumulated, the geotextile sank and formed a barrier wrapped around the fill. This method effectively isolated the berm from river water and reduced potential for increased turbidity. It was intended to also facilitate berm removal, however, problems were encountered during removal, primarily owing to the timing of removal. The berms were removed when the shallow waters were frozen and the fabric was frozen to the river bottom. This plus reduced visibility in the water resulted in the fabric ripping and making removal of all of the fabric and the fill impossible. The contractor has since been back in the water twice removing berm and fabric remnants.

The area inside the south bank isolation berm was dewatered in November 2004 and fish were salvaged. Three fish species were recorded in the area isolated by the south berm: fathead minnow (*Pimephales promelas*), brook stickleback (*Culaea inconstans*) and the non-native three spine stickleback (*Gasterosteus aculeatus*). All salvaged fathead minnows and brook stickleback were transferred to the river side of the silt curtain. The one captured three spine stickleback was retained as a preserved specimen.

The north bank isolation area was dewatered on 09 December 2004. Pisces was on-site to conduct fish salvage, but no fish were recorded. To accommodate fish passage and human navigability of the Sturgeon River during construction of the bridge, the width of the river was never restricted by greater than one third, as per the DFO and Navigable Waters specifications.



*Figure 7: Fish Salvage in North Bank Isolation Area*

## **Water Quality Monitoring in Riel Pond**

During fill placement in Riel Pond a water quality monitoring program was undertaken by Aquality Environmental Consulting Ltd. (Aquality). The primary objective of the monitoring program was to ensure that the water being discharged from Riel Pond to the Sturgeon River (through an existing outlet culvert) was within acceptable limits for water quality guidelines for the protection of aquatic life. Water turbidity was used as the main indicator of water quality and maximum allowable turbidity levels were established. Numerous silt curtains were installed to control movement of suspended sediments. Measurements were generally made on both sides of all silt curtains and on the pond side of the outlet culvert. If turbidity levels reached the maximum allowable level, Aquality contacted the project team and the need for remedial action was discussed. Remedial measures available included the shut down of construction equipment until turbidity reached acceptable levels.

In addition to the water quality monitoring by Aquality and to ensure that no threespine stickleback or stickleback eggs were being released from Riel Pond, a geotextile-lined gabion basket was constructed to filter discharge from the outlet of Riel Pond to the Sturgeon River. The basket was inspected daily by site personnel and weekly by Mainstream Aquatics Ltd. Although there were many freshwater shrimp caught in the geotextile, requiring filter cleaning out on a regular basis, the baskets preventing stickleback from entering the Sturgeon River. No

fish were ever observed in the filter. As soon as the new, permanent outfall was installed it became the means of achieving the pond water levels required for work within the pond. The outfall was therefore filled with a custom design small mesh screen to prevent release of threespine stickleback and stickleback eggs. The presence of the threespine stickleback continues to be an issue for the operation of Riel Pond as the road's stormwater management facility. DFO has insisted that the outfalls on the pond continue to be fitted with screens to prevent the escape of stickleback. The small mesh presents some operational challenges as the screens require frequent cleaning.



*Figure 8: Geotextile-Lined Gabion Basket Filtration Device at Outlet of Riel Pond to Sturgeon River*

## **Erosion Control**

Erosion control, and the associated reduction of risk of sedimentation, was a primary focus of the environmental monitoring program throughout the construction of the project, particularly in the area surrounding the bridge construction area. Erosion control methods used at the bridge site consisted primarily of silt fencing, coconut matting and silt curtains. Combined, these measures were effective in minimizing the potential for deposition of eroded sediments into surface water. Erosion control methods were inspected at least once weekly, to confirm that they were functioning as intended. When deficiencies in existing erosion control methods were observed, or when it was determined that additional erosion control was required, the environmental monitor directed the Contractor accordingly.

Throughout construction, disturbed areas (exposed soils) were re-vegetated as soon as possible following completion of activity in the area. Particular attention was paid to ensuring the lower slopes of the Sturgeon River banks were re-vegetated immediately following completion of work in that area.



*Figure 9: Installation of Coconut Matting Adjacent to Bridge*



*Figure10: Re-vegetated Banks adjacent to Bridge*

## **Public Consultation**

The City of St. Albert was committed to open and continuous dialogue with the public throughout the planning, design and construction of this project. Because of its environmentally sensitive nature, the project was of interest to many members of the public. Although the majority of the citizens of St. Albert were in support of the new roadway, having been frustrated by a congested daily commute into Edmonton, they wished to see the roadway developed in an appropriate manner. A small group of citizens, and one special interest group in particular, the Big Lake Environmental Support Society (BLESS), opposed the project. Several stakeholder and public meetings were held throughout the planning, design and construction of the project as well as open meetings with St. Albert City Council to discuss project progress and budgets. Ongoing, intense lobbying of provincial and federal government agencies by a small number of individuals resulted in frequent communication between the City and numerous regulators regarding site conditions, implementation of environmental measures and environmental monitoring. It also required that all design and construction personnel employ a heightened awareness of site sensitivities and the governing environmental mitigation measures and regulations.

## **Conclusions**

Regular inspections indicate that the compensatory fisheries habitat created is continuing to naturalize. The presence of young northern pike in autumn 2007 indicates that at least at this early stage, the habitat is functioning as designed.

During construction, there were a few isolated instances of sediment introduction into the Sturgeon River, however, those instances were infrequent, minor and, in all cases, remedial measures were implemented as soon as possible. The silt mitigation processes therefore worked well during construction with few incidents of additional turbidity during the construction.

Although construction is completed on the first two stages and the road is open as a two lane arterial, the City remains committed to continuing several mitigation measures. Many of the erosion and sedimentation control measures remain in place and will do so until vegetation has become sufficiently established to stabilize all soils. Monitoring of the fish habitat compensation area will continue in 2008 and beyond, with results of that monitoring to be submitted to DFO on an annual basis.

The environmental monitoring program implemented by the City of St. Albert was successful in overseeing the implementation of mitigation commitments. Further, it promoted compliance with conditions outlined in all environmental permits, approvals and authorizations, including the Authorization by Fisheries and Oceans Canada (No. AB-021191 NEB).