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A new **bridge** for the St. Lawrence

Environmental Assessment

Summary Report

Assessment of Effects and Mitigation Measures



April 2013

Transport Canada

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Environmental Assessment**

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EXECUTIVE SUMMARY

This report covers the second phase in the environmental assessment process, i.e. the description of the effects that the project will have on the environment and proposed mitigation measures. Part one dealt with a description of the project and the environment.

To identify the potential effects of the project, the relationships between the various project phases and the environmental components were established. For each effect, the significance of the effect was assessed according to three parameters, intensity, duration and scope. Mitigation measures were identified to reduce the significance of the effects and ensure that the residual effects are not significant within the meaning of the *Canadian Environmental Assessment Act*, S.C. 1992, c. 37 (CEAA).

Because the project design is at the preliminary phase, a number of environmental effects will be considered during the upcoming design phases in order to reduce the impacts during the work. Additional studies are also planned during the process to refine the analysis of certain effects.

In terms of the physical environment, the main effects have to do with soil, groundwater and surface water quality. Because of soil and groundwater contamination, measures must be implemented to avoid the spread of contaminants into the environment. As a large proportion of the construction work will take place in or near the water, a number of mitigation measures must be put in place to limit dispersal of suspended solids and contaminants in the water. Water quality will be monitored throughout the work to ensure that requirements are met. In short, the effects on the physical environment are considered non-significant once the proposed mitigation measures are taken into account. As for air quality and greenhouse gases, measures will be taken to mitigate the effects during the construction phase. For the operations phase, the changes in atmospheric emissions can be established at the subsequent design stages, once the supply and configuration of mass transit options is known.

During construction of the structures, there is a danger that wetlands along the riverbank will be disrupted. Measures must be taken to limit such losses and a compensation project for the ecological functions must be developed. Effects on the fish habitat, migratory birds and endangered species are expected during the construction and deconstruction phases. The project may result in the disruption, deterioration and loss of fish habitats that are deemed sensitive. A compensation program will be required to mitigate those effects, where applicable. Nesting of migratory birds may be disturbed during the work. Restriction periods will be in effect in order to minimize the disruptions. Species at risk (peregrine falcon and American eel) may also be impacted by the project. The peregrine falcon nesting site will have to be relocated, however the

river currents near the work are not expected to prevent eel migration. Species with provincial status are also found in the area. Specific measures will have to be taken to mitigate the effects on the brown snake, lake sturgeon, American shad, chain pickerel and rosyface shiner. Once the mitigation measures and compensation projects are taken into account, the effects on the biological environment are considered non-significant.

In terms of the human environment, the main effects are on the sound environment and archeology. The surrounding sound environment will be affected both by the construction work and by operation of the infrastructures. Considering the sensitive areas, noise mitigation measures are planned for both phases. A noise management program must be in place from the outset of the work in order to comply with requirements. Because there is a recognized archeological site at the foot of the bridge, measures will have to be taken to preserve the integrity of the remains. The environmental effects on the human environment are considered non-significant once the mitigation measures are taken into account.

An analysis of the cumulative effects and the effects of the environment on the project has also shown that the project does not have significant residual effects. An emergency response plan will also have to be implemented to limit the effects of accidents and malfunctions.

To ensure that environmental requirements are met, Transport Canada and the private partner will have to put in place an environmental management system, whereby monitoring and supervision of mitigation measures and the performance objectives set during the environmental assessment will be ensured, providing accountability, where necessary.

Based on the information contained in this report, the responsible authorities will be in a position to make a decision pursuant to subsection 20(1) of the CEEA.

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GLOSSARY

Abcissa:	Coordinate used to express the position of a point on the x-axis of a Cartesian coordinate system.
Abutment:	Support structure located at the end of a bridge which also links the structure to the land.
Air draught:	Vertical distance between the waterline and the highest point of a ship structure: the masthead.
Aquatic plant community:	Sea or riverbed with vegetation.
Avian fauna:	See Avifauna.
Avifauna:	All species of birds in a given region.
Bathymetric chart:	A hydrographic map showing the contours of submerged areas of the sea floor or lake beds and sometimes riverbeds.
Bathymetry:	Measurement of water depths to determine the topography of sea or riverbeds.
Biodiversity:	All living organisms in a given region considered in terms of variety of species, variability within each species and variability of ecosystems.
Buffer zone:	Controlled outlying area of an ecological reserve that serves as a transition between the reserve (partially or fully restricted) and the occupied space.
Cantilever:	Bridge whose main beams extend beyond and overhang and in turn support a shorter beam.
Chloride:	Combination of chlorine and another non-oxygen element.
Civil engineering structures:	Bridges and crossing structures.
Climate change	Changes in climate that are directly or indirectly attributed to a human activity that alters the composition of the Earth's atmosphere and exacerbates the natural variability of the climate observed over comparable periods of time.
Coffer-dam:	Temporary dam used to allow work to be done below water level.
Conductivity:	Opposite of resistivity, measurement of which makes it possible to determine overall mineralization of water.
Deck:	Horizontal part of the frame of a bridge located beneath the roadway.
Downstream:	Occurring after the bridge, in the direction from which water is moving.
Draught:	Quantity or volume of water displaced by a ship.
Federal land:	Land that is the sole property of the State.
Fish fauna:	See Ichtyofauna.

Geomatics:	Discipline involving managing and using sciences and technologies to acquire, store, process and distribute geographic data.
Herbaceous field:	Field dominated by natural herbaceous vegetation, may be used extensively or uncultivated.
Herpetofauna:	All reptiles and amphibians found in an area.
Hibernaculum:	Winter habitat of certain small animals and insects.
Hydraulic regime:	All variations in the state and characteristics of an aquatic formation that repeat regularly in time and space and go through cyclical (e.g. seasonal) variations.
Hydrodynamic regime:	All of the sedimentary parameters, e.g. erosion, transportation of solid matter and sedimentation, that change according to the season, flow, tides, wind and ice.
Hydrogeological:	Related to hydrogeology, the circulation of water in the subsoil.
Hydrographic chart:	A chart primarily designed to show the topography of a submerged area of land, but also generally showing above-water elements.
Hydrometric station:	A facility for measuring elevation and a section for measuring flow of a channel.
Ice control structure:	The Champlain Bridge ice control structure is a structure located upstream of and parallel to the bridge which controls the formation of ice jams in the La Prairie Basin and thus facilitates shipping.
Ice jam:	Obstruction of a watercourse by an accumulation of ice.
Ichthyofauna:	All species of fish forming a population.
Jetty:	Construction forming a roadbed extending into the water in order to provide access to a work site or the other riverbank.
Laminar:	Characterizing a flow that is not turbulent.
Lentic:	Characterizing freshwater in which the water circulates slowly or not at all (lakes, ponds, canals, etc.).
Leq _T :	Equivalent continuous noise level. This parameter corresponds to the level of continuous noise with the same sound energy as discontinuous noise during a time interval (T). It therefore makes it possible to take into account dynamic fluctuations in noise level. The parameter is largely used in environmental noise, because noise sources are often variable, such as the noise generated by vehicles travelling over highway infrastructures.
Lithophile:	Describes chemical elements that have a great affinity for oxygen and halogens that are preferably found in the lithosphere.
Lithophilous species:	Species that spawn on a coarse substrate (gravel, rock, blocks) or in fast-flowing water.
Low-water period:	Period when the minimum level of a watercourse is observed.

L _x %:	Statistical noise parameters. Statistical analysis makes it possible to measure variations in noise levels for an analysis period. The statistical values are usually indicated as a percentage of the measurement period. The values commonly used are: L1%, L10%, L50%, L90%, L95% and L99%. For instance, L1% is the noise level reached or exceeded during 1% of the analysis period, i.e. for 1% of the time, the noise level was above this value and for 99% of the time, the noise level was below that value.
Multi-use path:	Lane intended for use by cyclists, pedestrians, roller-bladers and others using non-motorized forms of transportation on a dedicated site or separated from motor traffic by a physical barrier.
Navigation clearance:	Maximum space provided by a navigable waterway for passage of vessels.
Nitrate:	Common name for sodium nitrate.
Nitrite:	Salt of nitrous acid.
Noise barrier:	Screen of varying compositions that make it possible to reduce noise levels perceived.
Organochlorine:	A chlorine derivative product.
Phytolithophilous species:	Species that spawn on varied material beds, organic or not, with vegetation present.
Pier:	Intermediate supports of a bridge's deck.
Poplar stand:	Area planted with poplar trees.
Private partner:	Company that takes responsibility for completing and operating the New Bridge for the St. Lawrence. The private partner will be supported by contractors during the construction period.
Sheet pile:	Wood, steel or concrete piece in thin sections with grooves enabling them to be interlaced.
Silt:	Very fine moving detrital sediment or mineral of organic/mineral origin with grains less than 0.06 mm in diameter.
Spawning area:	Area of an aquatic environment where spawning and fertilization of the eggs of an animal species takes place.
Spawning ground:	An aquatic area where a species of fish lays and fertilizes its eggs.
Special status species	Species protected under the <i>Species at Risk Act</i> or the <i>Loi sur les espèces menacées ou vulnérables</i> .
Survey:	In the archaeological sense, a local exploration technique used in an area to detect the presence of relevant and useable elements from a historical standpoint.
Topography:	Configuration of the land surface.
Turbidity:	Characteristic of water with reduced transparency due to the presence of fine suspended particles of natural origin or due to pollutants.

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Upstream:	Occurring before the bridge, in the direction from which water is moving.
Water table:	Surface level of groundwater with or without flow from the outside.
Wind erosion:	Change in the landform caused by the wind.

1 INTRODUCTION

This report summarizes the information found in Part II of the Environmental Assessment Report on the New Bridge for the St. Lawrence project, which provided a description of the project's effects on the environment and proposed mitigation measures. The first report and summary provide a description of the project and the environment.

Blank pages have been inserted intentionally to facilitate printing and reading of the report.

1.1 APPROACH

Given the progress on the New Bridge for the St. Lawrence project design, the responsible authorities decided to adopt an objective-based approach to carrying out the environmental assessment.

An objective-based environmental assessment makes it possible to adapt the project when details are not yet defined or will be determined at a later date. The objectives are identified as design and performance criteria in Section 4 of this report.

1.2 LEGAL FRAMEWORK

The new Canadian Environmental Assessment Act (2012), S.C. 2012, c. 19, s. 52 (CEAA (2012)) was enacted on June 29, 2012 and came into effect on July 6, 2012. The CEAA (2012) offers an updated, modern approach that responds to Canada's current economic and environmental context. It implements central elements of the Government's plan for Responsible Resource Development to modernize the regulatory system and allow for natural resources to be developed in a responsible and timely way for the benefit of all Canadians (Canadian Environmental Assessment Agency, 2012). It focuses on federal areas of jurisdiction and consequently on the potential adverse environmental effects that are within federal jurisdiction. Projects falling under CEAA (2012) for the purposes of environmental assessment are generally those that are "designated" by the Act.

On July 6, 2012, the Minister for the Environment designated the New Bridge for the St. Lawrence project, on which the environmental assessment process had begun under the former Canadian Environmental Assessment Act, S.C. 1992, c. 37 (CEAA), pursuant to subsections 14(2) and 124(2) of CEAA (2012). Therefore, the project's environmental assessment is based on the CEAA.

2 PUBLIC AND FIRST NATIONS CONSULTATION APPROACH

As part of the New Bridge for the St. Lawrence project screening process, the responsible authorities determined that public participation was desirable pursuant to subsection 18(3) of the CEEA.

An initial consultation was held from March 15 to April 4, 2012 to collect comments from the public regarding the draft environmental assessment guidelines for the project.

The public was consulted again in December 2012 at six "open house" information sessions held in Brossard, Verdun and Nuns' Island. The sessions, hosted by Transport Canada, were designed to inform and consult the public, specifically the residents immediately affected, regarding the project description and the physical, biological and human environments. At the same time, Transport Canada collected concerns from the public via the Canadian Environmental Assessment Registry until January 15, 2013.

In addition, a meeting between the Kahnawake Mohawk Council and Transport Canada was held in October 2012 to present the project and the environmental assessment process. Further meetings are possible until the end of the environmental assessment.

This report will also be subject to public consultations in the spring of 2013. Concerns raised at this time will be incorporated into the screening report.

2.1 CONCERNS RAISED

Because the responsible authorities felt that public participation in the screening process was required under subsection 18(3) of the CEEA, they are required to take public comments into consideration before making a decision under subsection 20(1) of the Act. The following sections provide a summary of the concerns raised during the consultation periods. All of the concerns raised and the position of the responsible authorities in relation to the concerns are found in Appendix 1 of Part II of the Environmental Assessment Report.

2.1.1 Environmental assessment guidelines

During the consultations, the public raised some concerns about the draft environmental assessment guidelines. The concerns centred on five themes:

- ▶ Human health;
- ▶ Automobile traffic and related consequences;
- ▶ Modal shift;
- ▶ Contaminated soil and sediment;
- ▶ Other options for new bridge construction.

These concerns were taken into account in developing the final version of the guidelines.

2.1.2 Primary concerns regarding the environmental assessment

The main concern raised by the people residing in the vicinity of the New Bridge for the St. Lawrence was without a doubt the impact of noise, during both construction and operations.

During construction, residents are worried about the constant noise of heavy machinery as well as the potential failure to comply with current standards. During bridge operations, they are worried that the new bridge will see an increase in traffic and that there will therefore be an increase in noise from automobile and heavy truck traffic.

The second concern raised was regarding air quality, in particular an increase in dust.

2.1.3 Aspects outside the scope of the environmental assessment

A number of topics of interest unrelated to the scope of the environmental assessment but directly related to construction of the New Bridge for the St. Lawrence were raised. They are:

Mass transit

Mass transit is a priority for everyone. The participants wanted to have more information about the proposals being considered or studied.

Method of construction

Some people are worried that construction of a new bridge would be more bothersome than refurbishing the existing bridge, particularly due to the noise from pile driving over long periods.

Architecture

A number of people indicated that the bridge should make an architectural statement so that it forms a local landmark and an international reference point.

Tolls

Tolls are an issue for people who use the Champlain Bridge every day. They worry about the price of crossing and the method of payment. Older individuals recall when the tollbooths slowed traffic. The public, particularly residents of the South Shore, are strongly opposed to charging a toll.

Method of management

People wondered what type of management method Transport Canada would adopt for the bridge construction and management. There was fear that a public-private partnership (PPP) would lead to excessive, unjustified costs designed to line the pockets of private interests.

Bicycle path (Route verte)

Some people expressed a desire to see the existing bridge kept and converted into a bicycle path.

3 APPROACH

The methodological approach used to assess environmental effects includes two main phases, namely, identification and assessment of potential effects.

Identification of potential effects consists in identifying the components of the physical, biological and human environments that are likely to be impacted by the project's activities;

The assessment of potential effects consists of defining the scope of the effects associated with project execution. The significance of an effect on a component of the environment is based on three parameters: intensity, duration and scope.

The identification of potential effects takes into account the following elements:

- ▶ The project's technical characteristics and proposed working methods as determined at this stage of the process;
- ▶ Knowledge of the environment;
- ▶ Lessons learned from similar projects;
- ▶ Environmental concerns associated with the project.

Finally, the significance of the residual effects is assessed, taking into account the application of mitigation measures. Following the application of mitigation measures, significant or non-significant residual effects may remain:

Non-significant: signifies a residual effect that is temporary and/or low-return, short-lived and/or limited in scope, and has little or no impact on the environmental component.

Significant: signifies that, despite mitigation measures, the residual effect has a permanent impact on the environmental component.

4 SUMMARY OF EFFECTS

This section presents a summary of effects for each component. The sensitive areas are identified for each component (see Figure 1 for their location), and the effects and mitigation measures are described. Each sub-section contains a description of the performance objectives and the method to be used to monitor them.

4.1 Soil, sediment and groundwater

Sensitive areas

The following areas are deemed sensitive for soil, sediment and groundwater:

- ▶ Sud-Ouest Business Park (contaminated soil, sediment and groundwater);
- ▶ Lesser La Prairie Basin (contaminated sediment);
- ▶ Brossard wetlands (soil).

Description of effects and background

Soil, sediment and groundwater will be affected by the presence of contamination, potential erosion and risks of spills during the construction and operations phases of the project.

In the pre-construction, construction, post-construction and operations phases, soil, sediment and groundwater will be affected by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Relocation and protection of public utility infrastructures;
- ▶ Land clearing and soil stripping;
- ▶ Excavation, earthwork;
- ▶ Work in aquatic environments (construction and post-construction);
- ▶ Management of waste and hazardous materials (all phases);
- ▶ Machinery transportation, operation and maintenance (all phases);
- ▶ Infrastructure maintenance and repair.

The inventory of the environment identified areas in which soil and groundwater are contaminated, mainly in the Sud-Ouest Business Park. Work in these areas has the potential to remobilize contaminants and affect uncontaminated soil and groundwater, and create a health hazard. The exposure of surfaces and berms will increase erosion caused by wind and rain. Accidental oil leaks from equipment could also contaminate soil and groundwater, as can the presence of lead or other contaminants during deconstruction.

Work in water could lead to remobilization of contaminated sediment, mainly in the Sud-Ouest Business Park and Lesser La Prairie Basin sectors.

Finally, the use of road salt during the operations phase could result in chloride contamination of soil near infrastructures.

Mitigation measures

Before the work

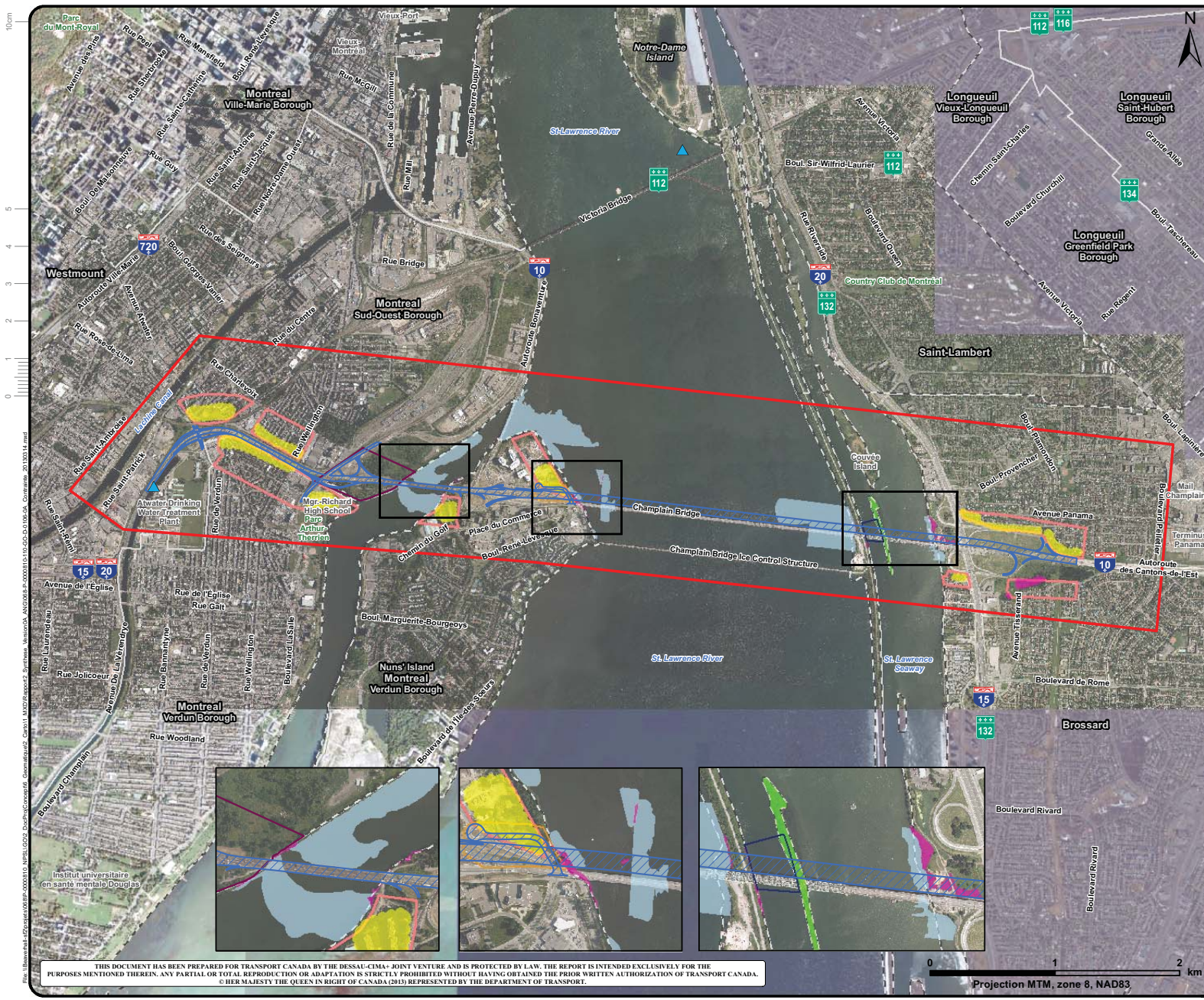
Because the exact quality of the soil is not known at this stage, the level of soil contamination must be characterized once the areas to be excavated are defined. A program for managing contaminated soil and excavated material must be developed at the preliminary engineering and specification preparation stage to ensure that the contaminated soil is treated or disposed of in accordance with current regulations.

Materials must also be characterized when the deconstruction plans and specifications are being developed, to identify and quantify the sectors containing asbestos and lead. Additional measures may then have to be defined.

During the work

Mitigation measures will be implemented when work begins to limit the dispersion of contaminated soil and reduce erosion, including the following:

- ▶ Isolate and preserve the organic soil layer so that it may be reused in places where the topsoil has been stripped;
- ▶ Dispose of excavated material at a site designated for that purpose;
- ▶ Stabilize exposed areas susceptible to erosion (using a geotextile membrane, straw or seeding);
- ▶ Construct piers in confined and dewatered environments (e.g., using cofferdams);
- ▶ Immediately remove excavated sediment whose contaminant concentration is known to an approved site;
- ▶ Excavated sediment that cannot be removed must be immediately placed for temporary storage on a waterproof surface and covered for protection from the elements (e.g., sediment from uncharacterized piers);
- ▶ Keep the site free of waste at all times including empty containers of any kind unless they are stored in a sealed repository designed for this purpose,
- ▶ When contamination levels exceed criterion B of the Quebec Soil Protection and Contaminated Sites Rehabilitation Policy, all trucks leaving the worksite must pass through a vehicle wheel-washing facility;
- ▶ Store and dispose of contaminated soil and sediment at authorized sites and comply with the related federal and provincial requirements;



Legend

- Study area
- Projected infrastructure right-of-way
- Municipal limits
- Borough limits

Sensitive areas

- Contaminated soil
- Wetlands
- Air quality sensitive area
- Sensitive fish habitat
- Protected avifauna habitat
- Seaway channel
- Drinking water intake
- Noise-sensitive area
- Archaeological site (Le Ber site)

SOURCES :

- Archeology : Arkéos, 2013
- Aquatic vegetation : Environnement Illimité inc., 2012
- Vegetation units : Field inventory, CIMA 2012
- Property and right-of-way limit : Transport Canada, 2012
- Orthophotographs : © Montreal Metropolitan Community, 2005-2011
- Satellite images : (c) 2010 Microsoft Corporation and its data suppliers



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Figure 1
Sensitive Areas

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Prepared	Ghislain Pothier	Discipline	Geomatic
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- ▶ Maintain transportation vehicles and construction equipment in good working order to prevent leaks of oil, fuel or other pollutants;
- ▶ Prohibit access to the site to any mobile equipment that leaks oil. Keep a vehicle maintenance log;
- ▶ The private partner must plan construction on the Island of Montreal in collaboration with the operator of the containment system for the Western sector of the Sud-Ouest Business Park;
- ▶ An emergency kit for hydrocarbon spills must be available on the equipment at all times;
- ▶ In the event of a spill on land, the emergency response plan will be implemented:
 - Prompt notification of Environment Canada (1.866.283.2333) and MDDEFP (1.866.694.5454) early warning networks as well as St. Lawrence Seaway Management Corporation's emergency response and shipping management teams;
 - Elimination of the source of the spill;
 - Implementation of environmental protection measures (absorbent material);
 - Clean up of the affected area;
 - Disposal of contaminated soil.

In operation

Some design criteria may be considered at the preliminary engineering phase to mitigate the effects of road salt used during the project:

- ▶ Meltwater will not be discharged directly into sensitive areas such as wetlands (see Figure 1) and a method for treating meltwater will be studied;
- ▶ The geometry of the structures must limit the accumulation of snow and ice on the infrastructures.

A road salt management plan must be developed to mitigate the environmental effects of road salt while maintaining road safety. The plan will be based on the Code of Practice for the Environmental Management of Road Salts (Environment Canada, 2004). There are no Canadian recommendations on chloride content in soil.

Performance objective

No performance objective for soil and sediments was established. Contaminated soil management will comply with Canadian Council of the Ministers of the Environment recommendations (1999a).

Performance monitoring

Although no objective has been established, soil and sediment quality monitoring will be required to comply with requirements for the management of contaminated soil and sediment. Excavated soil will be characterized and classified based on level of contamination before it is taken off the project right-of-way. Depending on the level of contamination, the soil may be:

- ▶ Reused on the site as fill material;
- ▶ Sent to a landfill site as fill;
- ▶ Treated and/or disposed of at an authorized site.

Groundwater must also be monitored to ensure that it is not contaminated as a result of the project. Sampling upstream and downstream of the work sites on the Island of Montreal will be carried out on a regular basis.

4.2 Surface water quality and hydrology

Sensitive areas

The following areas are deemed sensitive with respect to surface water quality and hydrology:

- ▶ St. Lawrence River (suspended solids and other contaminants);
- ▶ Aqueduct Canal (drinking water source).

Description of effects and background

During the work and operations phases of the project, water quality will be affected by the introduction of suspended solids (potentially including contaminants), petroleum hydrocarbons and de-icing salts into the receiving environment.

During the pre-construction, construction, post-construction and operations phases, water quality will be affected by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Land clearing and soil stripping;
- ▶ Excavation, earthwork;
- ▶ Work in aquatic environments (construction and post-construction);
- ▶ Management of waste and hazardous materials (all phases);
- ▶ Machinery transportation, operation and maintenance (all phases);
- ▶ Deconstruction of existing bridges;
- ▶ Infrastructure maintenance and repair.

Work carried out in water, including the construction of temporary facilities and bridge piers, could result in resuspension of sediment in the river. Work on the riverbank, owing to its nature, could produce soil particles in surface water through runoff or excavation de-watering. Accidental petroleum hydrocarbon spills could also contaminate surface water. Resuspension of contaminants is possible, given that some sectors where work will be done are currently contaminated.

Finally, the use of road salt during the operations phase could result in negligible chlorine contamination in the river.

The risk of drinking water intake contamination was considered. The Aqueduct Canal is the City of Montreal's primary source of drinking water and must be protected from any contamination during work. Protective measures are required. The water intake for the Le Royer plant is located in the main channel of the river upstream from Notre Dame Island over 2 km from the study area. Because of the implementation of mitigation measures, the river's ability to purify itself, the flow of the channel and the low concentration of contaminated sediments in the sector (Greater La Prairie Basin), no effect on the intake is expected.

Mitigation measures

Before the work

Flow and ice regime modelling must be conducted following preliminary engineering to predict potential effects of the project on these elements. Additional measurements may then be required.

During the work

Mitigation measures will be implemented when work begins to prevent the introduction of suspended solids and contaminants to surface water, including the following:

- ▶ Take all necessary precautions to prevent the migration of fine particulate matter to the aquatic environment above the immediate work area, using proven work methods (block or sheet pile cofferdams);
- ▶ Encourage the use of turbidity curtains to prevent sediment transport in the water;
- ▶ Stabilize exposed areas susceptible to erosion (using a geotextile membrane, straw or seeding);
- ▶ Divert drainage ditches towards stable vegetated areas, located more than 20 m from the natural high water mark. If it is impossible to divert the ditch, potential sediment loading from the structures must be controlled by means of a suitable and effective system to prevent leaching;
- ▶ Install settling and runoff capture ponds along work areas to prevent erosion and migration of fine sediment to the river or Aqueduct Canal (for work on Highway 15);
- ▶ Pump water out of excavations and discharge it in compliance with applicable federal, provincial and municipal regulations or call a specialized firm for pumping and final disposal;
- ▶ Prohibit access to the site to any mobile equipment that leaks oil. Keep a vehicle maintenance log;
- ▶ Use vegetable oil in equipment that will be used to work near water during long period of time;
- ▶ Keep equipment at least 60 m from the river when not in use or when the site is closed;
- ▶ Maintain transportation vehicles and construction equipment in good working order to prevent leaks of oil, fuel or other pollutants;
- ▶ Prohibit access to the site to any mobile equipment that leaks oil;

- ▶ An emergency kit for hydrocarbon spills must be available on the equipment at all times. Kits must be available on the site at all times to deal with larger spills in aquatic environments;
- ▶ To prevent any risk of contaminant leaching, bituminous concrete (asphalt) must not be used as fill material in an aquatic environment because it is a potential source of hydrocarbons;
- ▶ In the event of a spill in an aquatic environment, the emergency response plan will be implemented:
 - Prompt notification of Environment Canada (1.866.283.2333) and MDDEFP (1.866.694.5454) early warning networks as well as St. Lawrence Seaway Management Corporation's emergency response and shipping management teams;
 - Notification of municipalities downstream with water intakes that could be affected by the spill;
 - Elimination of the source of the spill;
 - Implementation of environmental protection measures (absorbent berms);
 - Clean up of the affected area.
- ▶ Additional measures are required for work near the Aqueduct Canal :
 - Isolate water affected by work in the littoral sector of the Aqueduct Canal from raw water needed to supply the filtration plant by a method that minimizes sediment suspension from the canal bed;
 - Ensure that no contamination reaches the property of the Aqueduct Canal whether via storm sewers, contaminated soil, leachate from contaminated soil, or any other form of contamination;
 - If work is required near the Aqueduct Canal, this work must be performed within a contained enclosure in order to prevent suspended solids from spreading into the air and water;
 - Access to the banks of the Aqueduct Canal is prohibited;
 - If barges are used on the Aqueduct Canal, the following measures are required:
 - No combustion engine may be used in the waters of the canal;
 - Launching ramps are prohibited. Barges must be raised by crane.
 - All work on or near the Aqueduct Canal must be approved by the City of Montreal. Additional measures may be identified at a later date;
 - Debris is to be recovered by means of a tarpaulin stretched under the work area and removed as soon as possible.

In operation

Some design criteria may be considered at the preliminary engineering phase to mitigate the effects of road salt used during the project:

- ▶ Meltwater will not be discharged directly into sensitive areas such as wetlands, sensitive fish habitats or migratory bird sanctuaries (see Figure 1) and a method for treating meltwater will be studied.
- ▶ The geometry of the structures must limit the accumulation of snow and ice on the infrastructures.

A road salt management plan must be developed to mitigate the environmental effects of road salt while maintaining road safety. The plan will be based on the Code of Practice for the Environmental Management of Road Salts (Environment Canada, 2004). It should be noted that road salt that will be used on the new infrastructures and which will be discharged into the river will make only a negligible contribution (in the order of 0.002%) to the concentration currently found in the river (22 mg/L). The Canadian recommendation for chlorine in fresh water is a maximum concentration of 120 mg/L (Canadian Council of the Ministers of the Environment, 1999b).

Performance objective

It was determined that to reduce the impact on surface water quality, the concentration of suspended solids during the work must not exceed 25 mg/L or be 25 mg/L higher than the upstream value (for comparison purposes, historic suspended solids concentrations are between 1.5 and 13 mg/L depending on the season and sectors in the Greater La Prairie Basin; see section 4.1.5.1).

Performance monitoring

The performance objective will be monitored and measured via a network of sampling stations located upstream and downstream of the sites to determine the degree to which the site is impacting the river's natural concentration of suspended solids. The number of stations in the network, the distance between the stations, their exact location and the frequency of readings will be determined based on the work site's parameters, such as river flow and environmental sensitivity. During the work, water quality will be measured several times a day using an in situ method calibrated by laboratory measurements. Monitoring will be done on an ongoing basis in the areas where work is to be done and in open water (sampling will not be done when ice is present). The final monitoring protocol will be developed during preparation of the final plans and specifications.

Where the threshold is exceeded, an alarm system will be triggered so that the appropriate corrective action can be taken quickly, such as:

- ▶ Modify work methods and eliminate the source of the contaminant;
- ▶ Clean the settling ponds and other protective equipment.

Although monitoring targets suspended solids, the samples taken will also enable monitoring for other contaminants, particularly in work sectors where contaminated soil is located nearby (Island of Montreal) or contaminated sediment is located in the vicinity (Lesser La Prairie Basin and Nuns' Island).

Monitoring data and corrective measures implemented will be available to the public via a website.

4.3 Air quality (local scale)

Sensitive areas

The following areas¹ are considered air quality-sensitive based on the direction of prevailing winds:

- ▶ Areas 1, 2 and 3 in Sud-Ouest Montreal;
- ▶ Areas 4a and 4b on Nuns' Island;
- ▶ Areas 5, 6 and 7 in Brossard.

Description of effects and background

For this project, air quality will be affected both while the work is under way and during operation. Dispersed dusts, both fine (less than 2.5 microns) and total suspended particles, and atmospheric contaminants will affect air quality near the work areas and sensitive residential areas (less than 500 m from these work areas).

An air quality sampling station will be established on Nuns' Island at least 12 months before work begins in order to determine the baseline level of atmospheric contaminants in the sector. Data from nearby stations will also be used to establish the baseline. This data, combined with the project technical specifications (geometry, location, work methods), will allow accurate modeling of the dispersion of atmospheric contaminants and establishment of the areas of prime concern. At the same time, the data recorded will be used to prepare a regional picture of how particles and atmospheric contaminants are dispersed during the operations phase.

Air quality will be affected during the pre-construction, construction, post-construction and operations phases by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Traffic and navigation maintenance, installation of signage;
- ▶ Excavation, earthwork;
- ▶ Management of waste and hazardous materials (all phases);
- ▶ Machinery transportation, operation and maintenance (all phases);
- ▶ Deconstruction of existing bridges;
- ▶ Infrastructure maintenance and repair.

¹ Sensitive areas are the same for air quality and noise climate.

Mitigation measures

During these activities, mitigation measures such as the following will be in effect:

- ▶ All during work in urban environments, daily cleaning of the streets used by vehicles and machinery to remove any accumulation of loose materials and other debris.
- ▶ Apply a dust suppressant (water or a dust suppressant approved by the Bureau de normalisation du Québec) on gravel traffic lanes when the quantity of dust raised when a vehicle passes exceeds 40 mg/m^3 .
- ▶ Stabilize reworked sectors to limit wind erosion by seeding them or by covering them with straw or geotextile, depending on how advanced the work is.
- ▶ Cover piles of material with geotextile if they are not in use for more than 24 hr.
- ▶ Use adequate signage and impose appropriate maximum speeds to reduce dust emissions on access roads and work surfaces.
- ▶ Establish a truck route that avoids residential sectors.
- ▶ Fires and waste burning on or near the construction site are prohibited at all times.

Performance objective

To reduce the impact on air quality, it has been determined that work shall meet a threshold of $30 \text{ }\mu\text{g/m}^3$ for 2.5-micron fine particles and $120 \text{ }\mu\text{g/m}^3$ for total particles² (24 hr-average) 50 m from the right-of-way.

Performance monitoring

The performance objective will be monitored and measured by sampling stations around the worksites to identify the contribution of the effects of the worksite on the dispersion of dust. The stations will be installed based on the wind direction, the type of work and the presence of sensitive areas. The most dust is raised during excavation, earthwork and deconstruction of structures. Monitoring will be conducted every two weeks from April to October in the areas where the work has taken place. Furthermore, the Nun's Island's air quality sampling station will allow monitoring globally air quality in the sector.

Where the threshold is not met, corrective mitigation measures such as these shall be implemented:

- ▶ Modify work methods by using equipment with dust capture systems;
- ▶ Install protective tarps when the work generates dust;
- ▶ Encourage the use of wet sprays to limit dust;
- ▶ Redesign work areas to reduce the amount of dust raised (move piles of material, etc).

Monitoring data and corrective measures implemented will be available to the public via a website.

² The Communauté métropolitaine de Montréal criterion is $150 \text{ }\mu\text{g/m}^3$ but the maximum acceptable level according to national objectives is $120 \text{ }\mu\text{g/m}^3$.

4.4 Air quality and Greenhouse Gas

It is difficult at this stage of the project to establish the traffic parameters on the new structure, and thus to know what traffic flows will be. Traffic studies are under way. These flows will depend to a great extent on the public transportation provided and the type of transportation proposed.

Simulations of variations in greenhouse gas emissions show that there may be, despite increased traffic flows at rush hour, a reduction in greenhouse gas emissions if these increases in flow are accompanied by better fluidity or higher speeds than were the situation in 2012.

Discussions under way between Transport Canada and the Metropolitan Transport Agency (AMT) will lead to a concerted approach to efficient public transportation on the new bridge.

After the preliminary engineering stage, it will be possible to adjust speed and traffic flow parameters for the future scenario and thus define changes in greenhouse gas emissions compared to the situation in 2012.

On a larger scale, greenhouse gas emissions during the work will be offset to make the worksite “carbon neutral”. During the construction phase, annual emissions will be calculated based on the number of kilometres travelled by the machinery and transportation of materials and excavations. Compensation may take the form of buying carbon credits or of carrying out independent projects (such as planting trees).

4.5 Vegetation and wetlands

Sensitive areas

The following areas are considered to be sensitive for vegetation and wetlands:

- ▶ Emergent nearshore marshes;
- ▶ The common reed swamp along the shore at Brossard.

Description of effects and background

Vegetation and wetlands will be affected during the pre-construction, construction, post-construction and operations phases by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Relocation and protection of public utility infrastructures;
- ▶ Land clearing and soil stripping;
- ▶ Excavation and earthwork;
- ▶ Work in aquatic environments;
- ▶ Deconstruction of existing bridges;
- ▶ Presence of infrastructure.

Construction work will cause a loss of vegetation mainly from uncultivated shrubland and grassland (9,100 m²) and from poplar stands (3,425 m²). Potential wetland losses are estimated at 4,300 m² for the common reed swamp. Losses of emergent nearshore marshes (2,000 m²) are calculated in with the losses of fish habitat because they are below the high-water mark.

Mitigation measures

The Federal Policy on Wetland Conservation (Environment Canada, 1991) recommends a three-pronged approach: Avoid, minimize and compensate losses of wetlands.

Before the work

To meet the Policy, project design must avoid or minimize, as much as possible, encroachments onto wetlands by the piers and abutments of the new structures.

During the work

Mitigation measures will be implemented from the start to mitigate effects on vegetation, in particular:

- ▶ Specimens of rough water-horehound and Laurentian water horehound will be transplanted when possible to similar habitats;
- ▶ All necessary measures will be taken to protect those trees and shrubs that are to be maintained from any damage or mutilation (i.e., installation of a protective perimeter);
- ▶ In case of drought, trees maintained on the worksite will be irrigated.

At the end of the project, the work areas will be seeded with native species. Particular attention will be paid to naturalizing the banks to recreate suitable habitats, including those for wildlife.

Compensation

A compensation plan will be needed to replace the ecological functions of 4,300 m² of wetlands. The details of the plan will be determined once the preliminary engineering is completed.

Performance objective

No performance objectives have been set for vegetation and wetlands.

Monitoring and follow-up

A five-year follow-up will be required under the wetlands compensation plan to validate whether environments that have been improved, reclaimed or created are functioning.

Revegetation after the project will also be monitored for two years. The proportion of follow-up will be calculated and more plants will be planted if the proportion drops below 90%.

4.6 Fish and habitats

Sensitive areas

The following areas³ are considered to be sensitive for fish habitat:

- ▶ Type 2, 13 and 22 habitats along the eastern shore of Nuns' Island (moving water and banks with good potential for spawning, nurseries and feeding);
- ▶ Type 4 habitats along the shore at Brossard (quality seagrass beds with potential for spawning and nurseries);
- ▶ Type 12 and 16 habitats near the Seaway dike (quality aquatic plant communities with potential for nurseries and feeding);
- ▶ Type 13 habitats along the western shore of Nuns' Island (moving water with potential for spawning and feeding).

Description of effects and background

The project will result in deterioration, disruption and destruction of the fish habitat. The impacts will be caused in particular by permanent and temporary encroachments on fish habitats considered to be sensitive, as well as by potential modifications to the hydraulic regime during the work and the operations phase. These modifications will be specified when the plans and specifications have been prepared and the simulations executed.

Fish habitat will be affected during the construction, post-construction and operations phases by the following activities:

- ▶ Land clearing and soil stripping;
- ▶ Excavation and earthwork;
- ▶ Work in aquatic environments (construction and post-construction);
- ▶ Machinery transportation, operation and maintenance (all phases);
- ▶ Deconstruction of existing bridges;
- ▶ Infrastructure maintenance and repair;
- ▶ Presence and use of infrastructure.

According to the worst-case scenario, all the work on this project (construction and operation of the new bridge and deconstruction of the existing bridge) will destroy 5,865 m², degrade 12,050 m² and disturb 34,200 m² of fish habitat. Permanent and temporary losses in the sensitive areas represent 2% of the sensitive areas found in the study area. Resuspension of sediments in the river water could return particles to the water and disturb habitat quality. The presence of temporary structures

³ The location of habitats is shown in Figure 73 of Part I of Environmental Assessment Report which describes the project and the environment.

and piers is likely to modify flow speeds and affect the migration of fish in the study area. Vibrations associated with the use of explosives could cause mortality among certain fish.

One species of concern under the *Species at Risk Act*, the American eel, and four species protected under the Quebec's legislation (American shad, chain pickerel, lake sturgeon and rosyface shiner) occurring in the study area could be affected in the same way as the other species.

Mitigation measures

Before the work

Once the structures have been designed and before construction begins, the ice regime and flows will be modeled in order to predict the effects of the temporary structures and new piers. Modifications to flow conditions should not have any effect on flow patterns and speeds in the main fish migratory routes (Greater La Prairie Basin and Nuns' Island channel). Additional measures may be required.

The report of net losses will have to be reviewed once the plans and specifications are completed.

During the work

Mitigation measures will be implemented as soon as the work begins to prevent suspended material and contaminants from entering surface water. These are listed in the section on surface water. As well, measures specific to fish habitat are planned, principally the following:

- ▶ Perform work in the water outside of sensitive periods for fish species present in the waterways. Periods of restriction will be identified for fish habitats felt to be sensitive (Figure 1) and will take into account the species of fish that are found in them and their use (reproduction, nurseries, migration, etc). Ranges of protection will be adapted to the species and the fragility of the environment;
- ▶ Ensure, at all times, the free circulation of water and a sufficient volume of water to maintain fish habitat functions (feeding, nursery, spawning) downstream from the work area. Take the measures needed to prevent impacts (i.e., flooding, dewatering, material in suspension, erosion, etc.) upstream and downstream from the work area;
- ▶ Restore the banks and beds of the watercourses affected by the work to their original state (granulometry, bed profile, etc.) after dismantling of the temporary structures throughout the disturbed areas;
- ▶ Limit the installation of riprap along the banks of watercourses up to the natural high water mark (2-year return period), and revegetate the riparian buffer starting at the riprap boundary using recognized bioengineering techniques favouring overhanging shrub and herbaceous layers. Replanting must be done as soon as possible after grading work is complete, with preference given to indigenous species;

- ▶ Recover all fish captured in the cofferdams and immediately return them to the aquatic environment to prevent any fish mortality;
- ▶ Install a structure (e.g., screen) at the opening of the pumping hose to prevent intake of fish;
- ▶ Do not dispose of any debris, concrete waste or wet mortar in the aquatic environment. All debris accidentally introduced into the aquatic environment must be removed as quickly as possible;
- ▶ Comply with Fisheries and Oceans Canada (1998) standards for the use of explosives near or in aquatic environments. If it is not possible to comply with Fisheries and Oceans Canada's requirements regarding explosives, an application to destroy fish by means other than fishing must be submitted to Fisheries and Oceans Canada.

Compensation

In compliance with the Fisheries Act, a compensation plan approved by Fisheries and Oceans Canada will be implemented to replace habitats destroyed by permanent and temporary encroachments. The details of the plan will be known at a later stage and will be part of the requirements for the authorization under the Fisheries Act that will be issued by Fisheries and Oceans Canada.

Performance objective

The design of temporary structures shall maintain speeds of flow similar to that found in each type of habitat (see Table 26 in Part I of Environmental Assessment Report). Additional measures may be required if speeds are not maintained.

Performance monitoring

The performance objective will be monitored and measured using current meters (at least two) installed upstream and downstream from the jetty. Measurements will be taken after construction of the jetty to validate the model. The final monitoring protocol will be developed during preparation of the final plans and specifications.

If the objective is not met, appropriate corrective measures will have to be implemented such as:

- ▶ Adding another culvert to the jetty;
- ▶ Modifying the flow pattern.

4.7 Terrestrial wildlife

Sensitive areas

The following areas are considered to be sensitive for terrestrial wildlife:

- ▶ The Seaway dike;
- ▶ The spaces on either side of the Nuns' Island bridge, where brown snakes are found.

Description of effects and background

With respect to the project, terrestrial wildlife will be affected by the work itself and by habitat loss.

The wildlife will be affected during the pre-construction, construction, post-construction and operations phases by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Land clearing and soil stripping;
- ▶ Deconstruction of existing bridges;
- ▶ Presence of infrastructure.

The construction will cause a loss of terrestrial habitats for mammals and herpetofauna (13,000 m² of terrestrial vegetation and 6,300 m² of wetlands). The mammals will be bothered by the work and will have to move to get some peace and quiet. The habitat of the brown snake, a species liable to be designated as threatened or vulnerable in Quebec, in the project right-of-way will be disturbed and there are risks of mortality for this species and for other species of herpetofauna.

Mitigation measures

Before the work

To reduce risks of mortality, the brown snake population will be moved to a similar habitat nearby before the work starts. The perimeter of the work areas will be fenced to keep them from coming back. The fences will also be effective for certain mammals and the other species of herpetofauna.

During the work

The measures implemented before the work will prevent most effects on terrestrial wildlife. During the work, the fences must be kept in place.

After the project, the work areas will be restored to their natural state, and this process will create new habitats suitable for terrestrial wildlife.

Performance objective

No performance objectives have been set for terrestrial wildlife.

Monitoring and follow-up

Brown snake movement will be monitored twice-yearly over a four-year period to confirm that the snakes have adapted to their new habitat.

4.8 Avifauna

Sensitive areas

The following areas are considered to be sensitive for avifauna:

- ▶ Cuvée Islands Migratory Bird Sanctuary;
- ▶ Nuns' Island waterfowl gathering area;
- ▶ Peregrine falcon nesting site on the Champlain Bridge;
- ▶ Rocky islets near Nuns' Island.

Description of effects and background

With respect to the project, avifauna will be affected by the work itself and by habitat loss.

Avifauna will be affected during the pre-construction, construction, post-construction and operations phases by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Land clearing and soil stripping;
- ▶ Work in aquatic environments (construction and post-construction);
- ▶ Deconstruction of existing bridges;
- ▶ Presence of infrastructure.

The construction work will cause a temporary or permanent loss of terrestrial and aquatic habitats for avifauna (13,000 m² of terrestrial vegetation, 6,300 m² of wetlands and 37,000 m² of grasslands) including certain protected habitats (migratory bird sanctuary and waterfowl gathering area). Birds using the sector could also be disturbed during the nesting period (mid-April to mid-August in this sector). Peregrine falcons, a species of concern nesting on the Champlain Bridge, will have to be moved while the work is under way. Certain rocky islets near Nuns' Island that may be used by common terns will no longer be suitable for nesting during the work.

Chimney swifts are a threatened species, but they are quite common in urban environments because they nest or rest in unused chimneys (COSEWIC, 2007). It is extremely rare for them to be confirmed to be nesting in a hollow tree. This would require very large diameter (50 cm plus) tree, and these are very rare or nonexistent in the study area. As specified in Section 4.4.5 of Part I of the Environmental Assessment Report, the habitats encountered are mainly natural early succession environments colonized by pioneer flora typical of unused land in a metropolitan region. No effects are anticipated because the habitat found it not a favourable place for it to nest.

The type of structure planned for the New Bridge for the St. Lawrence could also affect the rate of avian mortality. The presence of guy cables and architectural lighting increase the risks of avian mortality, especially during periods of nocturnal migration.

Mitigation measures

Before the work

The preliminary engineering will have to consider effects on birds, especially in the choice of the type of structure. For example, the following should be considered:

- ▶ Low intensity, short wavelength lights should be considered rather than red and yellow lights. Light standards should be directed downwards;
- ▶ Any required signal light system design should be designed with flashing lights.

During the work

Mitigation measures will be implemented as soon as work begins to prevent the destruction or disturbance of nests, eggs or birds, in particular:

- ▶ Carry out or start work outside nesting times for birds whose nesting schedule normally ranges from mid-April to mid-August in the study area;
- ▶ Work on and in the vicinity of the Couvée Islands migratory bird sanctuary must be performed in accordance with Environment Canada requirements;
- ▶ Manage, relocate and if necessary add falcon nesting boxes depending on the sectors of activity. Retain the services of an expert on birds of prey to advise the private partner and encourage coexistence between workers and this species whenever possible;
- ▶ Verify the peregrine falcon nest on the bridge before starting deconstruction. If there are nesting birds, organize a 250 m exclusion zone centred on the nest until the end of the nesting period, or approx. 75 days after egg-laying;
- ▶ Work with Environment Canada's Peregrine Falcon Recovery Team on an appropriate way to install nesting boxes. Artificial peregrine falcon nesting boxes must be moved to or installed under the structure of the new bridge or in a suitable site nearby.

Performance objective

No performance objectives have been set for avifauna.

Monitoring and follow-up

With a cable-stayed bridge, it would be appropriate to establish a monitoring program for avian mortality, especially during periods of migration. The program is even more necessary because bird carcasses on the lanes can have an impact on highway safety.

4.9 Infrastructure and buildings

Sensitive areas

The following area is considered to be sensitive for infrastructure, land and buildings:

- ▶ Access to Nuns' Island.

Description of effects and background

Infrastructure, land and buildings will be affected during the pre-construction, construction and post-construction phases by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Traffic and navigation maintenance, installation of signage;
- ▶ Relocation and protection of public utility infrastructures;
- ▶ Excavation and earthwork;
- ▶ Construction of infrastructure;
- ▶ Deconstruction of existing bridges;
- ▶ Machinery transportation, operation and maintenance (all phases).

The work areas and detours may encroach on private land along the right-of-way. Vibrations associated with construction work such as soil compaction and driving pilings and sheet-pilings may damage buildings and infrastructure. Trucking may have an effect on road structure. Finally, the road network in the sector may have problems with dirty lanes and with congestion associated with closing certain stretches. Considering that Nuns' Island is indeed an island, access while work is underway may be limited both for local traffic and for emergency vehicles. This access problem does not exist for Montreal and Brossard because they have several access routes.

No expropriations are planned at this stage of project development, but one piece of private land may be acquired.

Mitigation measures

Mitigation measures will be implemented during the project, including:

- ▶ Minimize encroachment of by-passes onto private land. The private partner must come to an agreement with property owners with respect to encroachment on private land;
- ▶ The public will be informed of the work and the detours provided. Alternate routes will be proposed;
- ▶ At least one access to Nuns' Island, and preferably two, will be maintained at all times on the local road and highway systems;

- ▶ Favour the right-of-way corridor as the principal access to the construction zones and, as far as possible, limit the movement of machinery to the work areas located within this corridor;
- ▶ The private partner must ensure that underground infrastructure is clearly identified in the plans and in the field;
- ▶ Perform an inspection before any work likely to cause damage and adjust work methods in consequence;
- ▶ The private partner must establish an alternate transportation system and organize parking near the worksite restricting access to the local network;
- ▶ When working in urban areas, remove loose material and other debris on a daily basis from streets used by vehicles and machinery;
- ▶ When the work is done, the private partner shall rehabilitate the land and infrastructure.

Monitoring

There will not be any specific monitoring for this factor. A website and a telephone line will be available to provide information and record complaints from citizens. Any adjustments implemented will be published there as well.

4.10 Commercial navigation

Sensitive areas

The following area is considered to be sensitive for commercial navigation:

- ▶ The Seaway channel.

Description of effects and background

With respect to the project, work could encroach on the Seaway channel and affect commercial navigation.

Commercial navigation could be affected during the pre-construction, construction, post-construction and operations phases by the following activities:

- ▶ Navigation maintenance, installation of signage;
- ▶ Excavation and earthwork;
- ▶ Construction of infrastructure;
- ▶ Work in aquatic environments (construction);
- ▶ Deconstruction of existing bridges;
- ▶ Infrastructure maintenance and repair.

Obstructions due to construction could reduce clearance in the Seaway. Work on and near the dike could compromise its watertightness.

Mitigation measures

Before the work

Transport Canada and the St. Lawrence Seaway Management Corporation have to negotiate a memorandum of understanding to set the conditions regarding work on the dike and above the Seaway while maintaining safe commercial navigation. A lease will also be needed to establish work areas on the dike. Discussions are under way between Transport Canada and the Corporation.

During the work

The conditions agreed upon must be met for the duration of the work, including maintaining navigation clearance.

Monitoring

The St. Lawrence Seaway Management Corporation will enforce the private partner's compliance with the conditions of the memorandum of understanding.

4.11 Recreational / tourist activities and recreational boating

Sensitive areas

The following areas are considered to be sensitive for tourist and recreational activities and recreational boating:

- ▶ Lesser La Prairie Basin (recreational boating and tourist and recreational activities);
- ▶ The Route Bleue around Nuns' Island (recreational boating).

Description of effects and background

Tourist and recreational activities and recreational boating will be affected during the pre-construction, construction and post-construction phases by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Traffic and navigation maintenance, installation of signage;
- ▶ Relocation and protection of public utility infrastructures;
- ▶ Land clearing and soil stripping;
- ▶ Construction of infrastructure;
- ▶ Work in aquatic environments (post-construction);
- ▶ Deconstruction of existing bridges;
- ▶ Transportation, operation and maintenance of machinery (post-construction).

The work areas may encroach on the bike paths that cross the project right-of-way on Nuns' Island and in Montreal and Brossard. Traffic on the path along the Seaway and the Estacade (Route Verte #1) may also be hindered during the work. Work in the water will limit recreational boating, fishing and windsurfing in these sectors. Itineraries on the Route Bleue (Lesser La Prairie Basin and Nuns' Island) will be affected. Passing under the structures will be prohibited during construction periods and this could detract from land- and water-based recreational activities.

It is also quite probable that there will be heavy traffic on the river during the work to move materials, workers and barges. A navigation management plan will be needed.

Mitigation measures

During the work

Mitigation measures will be implemented during the project, in particular:

- ▶ When possible, keep a cycling link open at all times between the South Shore and Montreal, including Nuns' Island;
- ▶ When possible, inform users of cycling links of safe detours and closure periods. As for recreational boating, provide one or more marked channels to ensure safe passage and have the required notices to shipping issued through Canadian Coast Guard's Marine Communications and Traffic Services;
- ▶ Issue notices to boaters regarding temporary and permanent obstructions;
- ▶ Remove the piers of the present bridge so as not to cause any obstacles to recreational boating.

Monitoring

A website and a telephone line will be available to provide information and record complaints from users. Any adjustments implemented will be published there as well.

With respect to navigation, Transport Canada's Navigable Waters Protection Program will enforce conditions attached to authorizations under the Navigable Waters Protection Act. Worksite visits will be carried out to ensure compliance with temporary mitigation measures and, if necessary, the needed adjustments will be demanded to ensure the safety of recreational boating and commercial navigation.

During deconstruction of the piers of the existing bridge, bathymetric surveys will be required to ensure that the remains of the piers do not cause any obstacle to navigation.

4.12 SOUND ENVIRONMENT

Sensitive areas

The following areas are considered to be noise-sensitive:

- ▶ Areas 1, 2 and 3 in Sud-Ouest Montreal;
- ▶ Areas 4a and 4b on Nuns' Island;
- ▶ Areas 5 and 7 in Brossard.

Description of effects and background

The sound environment will be affected during the work and operations phases of the project. The noise from the work and traffic will have an effect on the sound environment near the work areas and in sensitive residential areas (less than 300 m from the right-of-way).

Noise sampling and modelling have shown that the sound environment in a number of sectors (Figure 1) will deteriorate if no anti-noise measures are taken. Machinery, driving pilings and other construction activities will increase noise from time to time during the work. Highway traffic on the new infrastructure could modify the present sound environment and affect human health.

The sound environment will be affected during all phases by the following activities:

- ▶ Site mobilization and construction of temporary facilities;
- ▶ Traffic and navigation maintenance, installation of signage;
- ▶ Machinery transportation, operation and maintenance (all phases);
- ▶ Presence and use of infrastructure.

Mitigation measures

During the work, mitigation measures such as the following will be in place to reduce noise:

- ▶ Install temporary anti-noise screens when machinery exceeds the standards in effect (percussion drills, compressors);
- ▶ Locate worksite facilities to block sound dispersion (worksite trailer between sensitive areas and the worksite);
- ▶ Install mufflers on noisy equipment (percussion drill covered with an insulating tarp);
- ▶ When possible, permanent noise barriers will be installed before construction work begins in order to maintain an appropriate sound environment.

Performance objective

To reduce the effect on the sound environment, the following thresholds will have to be met: sound level exceeded 10% of the time (L10%) must not exceed 75 dBA during the day; must not exceed ambient noise levels when work is not taking place +5 dBA in the evening and at night.

During the operations phase, traffic noise must not exceed 60 dBA or an increase of 1 dBA above 55 dBA, or anti-noise measures must be implemented in the affected areas.

Performance monitoring

Performance objectives during the work will be monitored and measured by noise sampling stations located 5 m from sensitive areas over 24-hour periods using calibrated sound level meters. These latter will be moved as the work progresses.

In situations where the thresholds would be exceeded, corrective measures such as these shall be implemented:

- ▶ Modify work methods by using equipment with mufflers;
- ▶ Modify work schedules;
- ▶ Install temporary anti-noise screens.

Monitoring data and corrective measures implemented will be available to the public via a website.

When the infrastructures are in operation, acoustic monitoring will be conducted after one, five and ten years to ensure that anti-noise measures are effective. This monitoring program will take place in each sensitive area and will show where corrective measures are required.

4.13 Heritage and archaeology

Sensitive areas

The following areas are considered to be sensitive for archaeology and heritage:

- ▶ The Manoir Le Ber archaeological site (BiFj-01);
- ▶ Area P-1 in Brossard;
- ▶ The site of a prehistoric First Nations burial ground (BiFj-49).

Description of effects and background

Infrastructure construction could destroy archaeological remains in sensitive areas. Following an assessment of the potential effects of the project, it was determined that no effects are expected on the site where the First Nations burial ground (BiFj-49) was discovered, given how far it is from the work areas.

Archaeology and heritage will be affected during the construction and operations phases by the following activities:

- ▶ Land clearing and soil stripping;
- ▶ Excavation and earthwork;
- ▶ Construction of infrastructure;
- ▶ Presence of infrastructures.

Mitigation measures

Before the work

As the project is near an archaeological site, design criteria will have to be considered during the preliminary engineering stage. Project design will have to minimize the encroachment of the abutment and redevelopment of René-Lévesque Boulevard on the Le Ber archaeological site (BiFj-01). As well, Transport Canada will have to discuss with the government of Quebec and the City of Montreal how to promote the historical character of the site.

An archaeological inventory survey will have to be conducted in the P-1 area of archaeological potential. Should archaeological remains be discovered, a site assessment will be made and a recommendation will be issued on the measures to be taken to either protect the site or conduct a dig (see Figure 1).

During the work

Mitigation measures will be implemented when the work begins in identified areas of archaeological potential to limit potential loss or disturbance of remains, in particular:

- ▶ If soil is excavated to construct the infrastructure base, backfill should be mechanically stripped down to the level of the ancient soil, and then a checkerboard dig of the areas affected should be conducted. Ancient soils are found at a depth of approximately 1 m in this sector. Exploratory stripping should be carried out under archaeological supervision;
- ▶ If soil is not excavated for the construction of the new infrastructure, a protective layer could be spread over the existing soil to seal the site;
- ▶ Any discovery of archaeological remains must immediately be communicated to the MCCQ.

Performance objective

No performance objectives have been set for archaeology and heritage.

Performance monitoring

It is recommended that an archaeologist be on site during excavation work in areas of archaeological potential. The work must stop if artefacts are found, the site must be assessed and a recommendation issued with respect to the measures needed to either protect them or conduct a dig.

4.14 Project integration with its environment

Sensitive areas

The following area is considered to be sensitive for project integration with its environment:

- ▶ The landscape of the Montreal region.

Description of effects and background

The presence of the infrastructures will have an effect on the Montreal landscape both locally and regionally.

Mitigation measures

Before the work

Project design needs to integrate the project with its urban environment in order to conserve existing strengths and to improve on the weaknesses of the site of this major infrastructure. The following measures are recommended:

- ▶ The New Bridge for the St. Lawrence should showcase the dominant role that it plays in the Montreal landscape and strengthen its effect as a visual landmark for the region, while having an appropriate aesthetic impact;
- ▶ Visual experiences of the river and the city from the bridge must be maintained (i.e., by using see-through cable barriers);
- ▶ The project must emphasize and consolidate the existing network of bike trails and the scenic views it provides;
- ▶ Residual spaces should be landscaped so that they contribute to an entranceway to the city;
- ▶ Study improving connectivity between Sud-Ouest and Verdun;
- ▶ Include a link below the bridge structure to connect the bike and walking trails on the banks.

All of these measures are included in the actions that would contribute to optimal integration of the new bridge project into the contemporary urban context that focuses on quality of lifestyles, value of the riverfront and emblematic perspectives of Montreal's downtown.

Performance objective

There is no performance objective associated with this component.

4.15 CUMULATIVE EFFECTS

The analysis of cumulative effects was carried out for three major elements: water, quality of life and special status species. The main points in the analysis are presented below.

Water

All measures will be taken to maintain a sediment load that is below the standard threshold during the work. Accordingly, the expected cumulative effect on the water quality component is considered non-significant once all mitigation measures are taken into account. Monitoring of water quality will, however, be necessary to confirm the effectiveness of the measures implemented.

Quality of life

The opening of highways 30 and 50 will alleviate pressure on the Montreal transportation network, particularly regional transportation. Maintaining mass transit capacity will also make it possible to alleviate some of the congestion. Coordination of the various job sites and stakeholders will ensure that traffic flow is maintained and that the work is appropriately staggered.

Accordingly, the expected cumulative effects on the infrastructure, sound environment and air quality components are considered non-significant once the mitigation measures are taken into account.

Special status species

Special status species mean species that are protected under the Species at Risk Act or under the Quebec's *la Loi sur les espèces menacées ou vulnérables* (Threatened or Vulnerable Species Act).

The brown snake is at the northern boundary of its North American habitat. The North American population is considered sizeable, although population groups are isolated and very localized. COSEWIC does not consider the species to be at risk in Canada. Measures will be taken during the main road projects to ensure that the species is protected. Accordingly, the expected cumulative effect is considered non-significant once all mitigation measures are taken into account.

The various works may disrupt nesting of the peregrine falcon; however the species is known to return to nesting sites annually even when nesting is disturbed. The Quebec population is growing, rising from 58 nesting pairs in 2005 to 98 in 2010. During the work, the peregrine falcon will be able to nest on structures nearby (Jacques Cartier Bridge, St. Joseph's Oratory, the Université de Montréal). Accordingly, the expected cumulative effect is considered non-significant once all mitigation measures are taken into account.

4.16 DEFICIENCIES AND ACCIDENTAL SPILLS

Accidents that must be covered by an emergency response plan include spills of oil and other hazardous materials and the failure of anti-erosion and anti-sedimentation measures. All necessary precautions will be taken to avoid deficiencies and accidents during every phase of the project and to minimize the possible effects on the environment when accidents do happen. An environmental emergency response plan will be developed and will make it possible to mitigate the effects of malfunctions and spills.

5 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan is designed to describe the minimum requirements that must be met by the private partner in order to minimize the effects that the structural design and construction activities may have on the environment. The plan includes the environmental monitoring program, the environmental follow-up program and the emergency response plan.

The private partner is required to develop an environmental management system (EMS), which will be based on the latest version of ISO 14001:2004 standard requirements (Canadian Standards Association, 2009).

EMS implementation has the following objectives:

- ▶ Project activities shall be carried out in accordance with the environmental and sustainable development policy that has been established for the project, in compliance with Transport Canada's specific requirements;
- ▶ Project activities shall comply with environmental legislation, third-party agreements, Transport Canada requirements and any other applicable requirements;
- ▶ Project activities shall meet the performance criteria and targets set out in the preceding stages of the process including this environmental assessment;
- ▶ All programs, plans, procedures and documentation required for projection execution shall be provided;
- ▶ All planned procedures and mitigation measures (in particular those identified in this environment assessment) shall be followed and their implementation controlled in order to report on their effectiveness;
- ▶ Any non-compliance issues shall be identified and corrected and the required corrective and preventive action taken;
- ▶ A report on the effectiveness of the EMS shall be provided to ensure continuous improvement through the commitment of the private partner's senior management to providing the resources necessary to achieve this.

The conditions for EMS implementation and ISO 14001 certification could be incorporated into the tenders and form an integral part of contracts. Further, it is strongly recommended that the EMS be integrated with the project's quality management and health and safety management systems. A verification and audit system will be established to ensure that the EMS meets these objectives.

6 ADDITIONAL ENVIRONMENTAL STUDIES

The environmental assessment identified environmental effects and the resulting mitigation measures. In some cases, the effects cannot be quantified with precision owing to a lack of data and the stage of the project. Once project design has reached a more advanced stage, additional studies will make it possible to pinpoint the effects and proposed mitigation measures. The following additional environmental studies were identified in this environmental assessment, and must be done before work begins:

- ▶ Establishment of the benchmark in the study area to provide a final and accurate portrait of the following components before work begins:
 - Surface water;
 - Groundwater;
 - Air (sampling over a 12-month period at a minimum);
 - Soil characterization.
- ▶ Modelling, taking the project's configuration into account, to provide an accurate assessment of the effects on the following components:
 - Dispersion of contaminants and greenhouse gas emissions;
 - Noise;
 - Flow and ice regime near temporary works and piers.
- ▶ Bird mortality study if a cable-stayed structure is used.

Other studies may be required as the project develops.

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