Ponts JACQUES CARTIER + CHAMPLAIN Bridges Canada

Parsons
Tetra Tech
Amec Foster Wheeler

Deconstruction of existing Champlain Bridge

Targeted Environmental Analysis

Final Report
Volume 2, sections 4 to10
Assessment of Effects and Mitigation Measures

November 2019
Contrat No 62555

Ponts
JACQUES CARTIER +
CHAMPLAIN
Bridges
Canada

DECONSTRUCTION OF EXISTING CHAMPLAIN BRIDGE

(2017-2022)

Contract No. 62555

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Executive Summary

The 2013 environmental assessment (EA) includes the deconstruction of the Existing Champlain Bridge, and this targeted environmental analysis (TEA) is being conducted to update the 2013 EA. Whereas Volume 1 covered the description of the project and the environment, this report constitutes Volume 2 of the TEA of the Existing Champlain Bridge deconstruction project and features a description of the project's environmental effects and proposed mitigation measures.

To determine the project's potential effects, correlations between the project's various phases and environmental components have been identified. Each effect's significance has been assessed using three parameters: intensity, duration and extent. Mitigation measures were identified to reduce the significance of the anticipated effects. The mitigation measures presented in the 2013 EA have been reviewed, adapted and enhanced to specifically reflect the effects of deconstruction, as well as take into account the best practices in 2019 and the lessons learned during the New Bridge's construction work.

The main effects on the physical environment components pertain to air, soil, groundwater and surface water quality. The presence of soil, sediments and groundwater, though only slightly contaminated, means that measures must be implemented to avoid disseminating pollutants in the environment. Since a large part of the deconstruction work will take place in or near water, several mitigation measures will be required to limit the dispersion of suspended solids and contaminants in the water. Water quality will be monitored throughout the construction period to ensure compliance with all requirements. Lastly, due to the presence of contaminants on the bridge, several mitigation measures must be implemented to minimize the effects on air quality and human health. Following the analysis that was done, the effects on the physical environment were deemed negligible in light of the proposed mitigation measures. With respect to air quality and greenhouse gas emissions, measures will be taken to mitigate the effects during the deconstruction period.

With respect to the effects on the biological environment, the creation of jetties may disrupt wetlands along the St. Lawrence. Measures must be taken to limit this disruption, and an ecological function compensation project must be developed. Effects are also expected on the habitats of fish, migratory birds and endangered species during the construction period. The project could lead to serious damages to fragile fish habitats. A compensation program will be required to mitigate those effects. Migratory bird nesting could also be disrupted during the construction period. Restriction periods will be implemented to minimize such disruptions. Endangered species (Peregrine Falcon and American Eel) could also be affected during the project. The Peregrine Falcon's nesting sites must be moved and the river currents near the jetties must not impede the migration of the American Eel and other fish species. Species with a provincial protection status are also present. Specific measures must be taken to mitigate effects on the Brown Snake, Lake Sturgeon, American Shad, Chain Pickerel and Rosyface Shiner. In light of the mitigation measures and compensation projects that will be implemented, the effects on the biological environment are deemed negligible.

With regard to the human environment, the main effects will be noise pollution due to deconstruction work and material transportation. Mitigation measures are planned within sensitive areas during both activities. A noise management program must be implemented as soon as construction work begins to ensure compliance to all requirements. Some recreational activities may also be disrupted, but measures will be implemented to ensure user safety and minimize any inconvenience. Effects on human environments were deemed negligible and will be addressed with the proper mitigation measures.

The analysis of the project's cumulative and environmental effects also revealed that said project did not feature significant residual effects.

To comply with environmental requirements, PJCCI will require the selected contractor to implement an environmental management system. Said system will enable to track and monitor the mitigation measures and performance objectives set during the TEA, as well as produce reports when needed.

Lastly, PJCCI will also provide community benefits such as material recovery, asset enhancement (a shoreline development project for recreational and commemorative purposes), Envision certification and an R&D project using materials or components taken from the Existing Bridge.

Project Team

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List of Acronyms

ABBREVIATIONS	FULL NAME
AADT	Annual average daily traffic
AARQ	Atlas of Amphibians and Reptiles of Québec
AB	As built
AMQ	Association maritime du Québec
AONQ	Québec Breeding Bird Atlas (Atlas des oiseaux nicheurs du Québec)
ARCDW	Act Respecting the Conservation and Development of Wildlife
ARTVS	Act Respecting Threatened or Vulnerable Species
BAnQ	Bibliothèque et Archives nationales du Québec
BCA	Breeding conservation area
CABIN	Canadian Aquatic Biomonitoring Network
CBC	Christmas Bird Count

CCDG	Cahier des charges et devis généraux of the MTQ (in French only)
CCG	Canadian Coast Guard
CCME	Canadian Council of Ministers of the Environment
CDPNQ	Centre de données sur le patrimoine naturel du Québec
CEAA	Canadian Environmental Assessment Agency
CIS	Canadian Ice Service
cm	Centimetre
CNESST	Commission des normes, de l'équité, de la santé et de la sécurité du travail
CNWA	Canadian Navigable Waters Act
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Department of Fisheries and Oceans Canada
DNA	Deoxyribonucleic acid
DU	Ducks Unlimited
EA	Environmental assessment
ECCC	Environment and Climate Change Canada
ÉPOQ	Étude des populations d'oiseaux du Québec (study of Quebec bird populations)
EPT	Ephemeroptera-Plecoptera-Trichoptera
EQA	Environment Quality Act
FEL	Frequent effect level
GCQ	Groupe Chiroptères du Québec
GHG	Greenhouse gases
GPS	Global positioning system
ha	hectare
HBI	Hilsenhoff Biotic Index
HWM	High-water mark
IAS	Invasive alien species
IBA	Important Bird Areas Canada
IDS	L'Île-des-Soeurs (Nuns' Island)
INAC	Indigenous and Northern Affairs Canada
INFC	Infrastructure Canada
JCCBI	The Jacques Cartier and Champlain Bridges Incorporated
kg	Kilogram
km	Kilometre

km2	Square kilometre
m	Metre
m^2	Square metre
m^3/s	Cubic metres per second
MBCA	Migratory Birds Convention Act, 1994
MBS	Migratory bird sanctuary
MCK	Mohawk Council of Kahnawake
MDDEFP	Ministère du Développement durable, de l'Environnement, des Forêts et des Parcs
MDDEP	Ministère du Développement durable, de l'Environnement et des Parcs
MELCC	Ministère de l'Environnement et de la Lutte contre les changements climatiques
MFFP	Ministère de la Faune, des Forêts et des Parcs
mt	Metric tonne
MTQ	Ministère des Transports du Québec (Quebec Ministry of Transport)
NBSL	New Bridge over the Saint Lawrence
NCC	Nature Conservancy of Canada
No.	Number
NOL	No effect level
OEL	Occasional effect level
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PEL	Probable effect level
PTA	Consortium of Parsons, Tetra Tech and Amec Foster Wheeler
RM	Residual materials
SARA	Species at Risk Act
SEG	Permit for scientific, educational and wildlife management purposes
SLSMC	St. Lawrence Seaway Management Corporation
sq. ft.	Square foot
SS	Suspended matter
SSL	Signature on the Saint Lawrence
TC	Transport Canada
TEA	Targeted Environmental Analysis
TOC	Total organic carbon
TP	Total phosphorus

TTC	Tetra Tech/Cima
µm	Micrometre
WGA	Waterfowl gathering area
ZIP	Zone d'intervention prioritaire (Priority intervention zone)

Glossary

Decking	Flat horizontal surface enabling vehicles to drive over; can be made of various materials such as steel, wood or concrete
Driven piles	Steel or concrete tube driven into the ground with a pile driver to reinforce a foundation when soil is of lower quality
Cofferdam	Temporary dam put in place to allow work below water level
Gantry crane	Steel structure on rails for lifting and moving loads.
Corbelling	Bridge construction technique of adding or removing bridge sections sequentially
Asphalt surface	Surface course, bitumen
Paired truss girders	Steel truss beams assembled in triangular shape
Cantilever	Bridge whose main beams extend in cantilever and support a reduced span beam in return
Temporary pile group	Row of steel piles or supports driven into the ground, forming a rigid barrier so that one side of the barrier can be excavated
Leveling	Leveling of a land feature. With regard to piers, it refers to the level at which they are cut from their foundation
Floe	Any relatively flat fragment of ice 20 m or more across
Left bank and right bank	The lateralization of the banks of a body of water (river, stream, torrent, creek) by an observer looking in the direction of flow, i.e. from upstream to downstream. The left bank is then located to the observer's left, and the right bank to his right. In this report, South Shore, right bank and Brossard side are equivalent and identify the same geographic point, as do the notions of North Shore, left bank and Nuns' Island side.

4 INFORMATION SESSIONS

4.1 PUBLIC AND STAKEHOLDER INFORMATION

The information process implemented by JCCBI for the TEA provided several opportunities and means for the general public and stakeholders to access information about the project, as well as convey their interests and concerns. The initial phase took place in spring 2019 as part of the development of the TEA and material recovery, enhancement and R&D programs. This phase involved the following steps and activities:

DATES	ACTIVITIES
Starting in March 2019	Meetings with targeted stakeholders to outline the project, available documentation and the means at their disposal to convey their comments online or in person.
April 2019	Creation of an advisory committee composed of stakeholders representing a range of interests to produce opinions and recommendations to PJCCI with regard to the project's development, as well as the public and stakeholder information process.
May 1, 2019	Beginning of the public information period announced through a press conference and social media campaign, along with targeted invitations (emails, announcements, mailings).
May 8, 2019	TEA and relevant documentation posted on JCCBI's website; feedback modules integrated (online questionnaires and discussion forum) to enable citizens and interest groups to submit their comments.
May 8 and 9, 2019	Open house public consultations at the Centre for Sustainable Development in Montreal, including themed presentations, in particular on compensation for fish habitats. These meetings also aim to reach individuals and groups interested in the various environmental and sustainable development measures and programs. Feedback collection tools will also be available on site.
May 11 and 13, 2019	Open house public consultations on Nuns' Island (Verdun borough) and in the City of Brossard. These activities specifically aim to reach citizens and companies that may be concerned by the inconveniences associated with the construction site. Feedback collection tools will also be available on site.
June 30, 2019	Deadline to submit comments online.

Additional themed workshops and information sessions and tools are slated to begin in fall 2019 to provide more information about specific aspects of the project's implementation.

With regard to the TEA, JCCBI sought, among other objectives, to get feedback during the May meetings and through the online forms on the proposed mitigation measures for the deconstruction project, as well as on the analysis of cumulative effects, in order to improve the project.

4.1.1 DESCRIPTION OF ACTIVITIES AND PARTICIPATION

The consultation was held between May 8 and June 30, 2019. The community was asked to comment on the following five aspects:

- Sustainable development
- Environmental protection
- Materials reclamation
- Research and development
- Enhancement of shoreline and Ice Control Structure.

4.1.1.1 Tools used

The following tools were used:

4.1.1.1.1 Online platform

An online participation platform associated with JCCBI's website was created with two aims in mind: inform residents through numerous documents and information sheets, and enable comments through three mechanisms, each one in a separate tab:

- Questionnaires: Participants were given the opportunity to respond to five online questionnaires, each dealing with an aspect of the project;
- Brainstorming: Allowed participants to suggest ways of enhancing the 7 hectares of shoreline that had been freed up by the deconstruction of the bridge as well as the 2-km Ice Control Structure by entering their ideas on a geographic map in the form of images, text and themed pins;
- Ideas: This section called on the participants' creativity by proposing that they suggest possible avenues of action to reuse or reclaim the 300,000 tonnes of materials generated by the deconstruction.

4.1.1.1.2 Open house

Residents were also invited to obtain information on the Champlain Bridge deconstruction project and talk to the JCCBI teams during a four-day open house. Residents learned more about each aspect and talked directly to JCCBI representatives. A questionnaire identical to the one on the Web platform was also filled out by participants during the open house. Posters and explanatory pamphlets were used to support questions with information on the context of the site as well as the project phases.

In addition, three discussion workshops were held during the May 8 and 9 open houses at the Centre for Sustainable Development in Montreal. The purpose of the three workshops was to further discussions on the reclamation of materials, compensation projects for the loss of fish habitats, and research and development.

4.1.1.2 Promotion of activities

Several promotional activities were held to ensure maximum exposure and participation at the open houses and the online platform.

4.1.1.2.1 Media relations

JCCBI's annual technical briefing was held on May 1 to which numerous journalists were invited.

Media interviews generated over 40 articles and coverage on the deconstruction of the Existing Champlain Bridge by various media.

4.1.1.2.2 Communication by e-mail

E-mails were sent out on May 8 to over 400 stakeholders on the public participation process for the deconstruction of the Existing Champlain Bridge. Some of the stakeholders include Action citoyenne de L'Île-des-Sœurs, the Nuns' Island Owners' and Residents' Association, fish harvesters' associations, marinas, companies offering boat or kayak tours, Association des Réseaux cyclables du Québec, Route verte, Vélo Québec, the CRÉ de Montréal, Nature Conservancy of Canada (NCC), Equiterre, the David Suzuki Foundation, Greenpeace, Nature Action, birdwatching clubs, as well as many cities, universities and associations.

Reminder e-mails were sent on June 5 to the stakeholders and those who had registered to remind participants and invite them to get involved.

4.1.1.2.3 Communication campaign

A vast multi-platform advertising campaign was held from May 1 to 13. Ads were placed in local newspapers (The Suburban, Courrier du Sud, Le Reflet, Le Soleil de Châteauguay, La Relève, Messager de LaSalle, Hebdos IDS/Verdun), on the radio (98.5 FM, Rouge FM, Énergie, The Beat, CJAD), and in national newspapers (Journal de Montréal, Le Devoir, The Gazette, La Presse +). A campaign on social media was also held.

4.1.1.3 Participation

A total of 3,353 persons visited the Web platform between May 8 and June 30 to learn about the various aspects of the project. Some 192 questionnaires were filled out during the open houses, both on the platform and on paper. The open houses attracted over 500 visitors: 53 persons on May 8 and 53 persons on May 9 at the Centre for Sustainable Development (Photo 19), 109 persons on Nuns' Island on May 11 (Photo 20), and over 300 persons in Brossard on May 13 (Photo 21).

Photo 19 - Open house at the Centre for Sustainable Development in Montreal

Photo 20 - Open house on Nuns' Island

Photo 21 - Open house in Brossard

4.1.2 CONCERNS RAISED DURING THE CONSULTATION SESSIONS

One section of the online questionnaire had six questions on environmental issues and potentially living next to the work site. Forty-six respondents said they reviewed the TEA. Thirty-two respondents had consulted the information sheet, while 28 had read the study summary. Eleven persons had read the entire study.

Regarding the question on residents' level of concern with respect to the work site's impact on the environment, Table 46 and Table 47 below show all the responses from the 80 respondents. Despite the fact that the concerns were fairly varied, the strongest ones pertained to plants and wildlife, air quality, and species at risk. In general, these concerns are consistent with those made verbally during the four-day open houses, with leaning slightly toward preserving the quality of the air and the sound environment for Nuns' Island and Brossard residents.

Table 46 - Level of concern associated with work site impacts

2.2 ON A SCALE OF 1 TO 5 (1= NOT CONCERNED, 5= EXTREMELY CONCERNED), PLEASE INDICATE YOUR LEVEL OF CONCERN WITH THE WORK SITE'S IMPACTS FOR THE FOLLOWING ASPECTS. CHECK THE BOX THAT CORRESPONDS TO YOUR CHOICE FOR EACH ASPECT.	1	2	3	4	5	DON'T KONW
Soil and water quality	3	3	7	27	44	0
Plants and wildlife	0	8	11	43	44	0
Species at risk	3	3	11	19	47	0
Recreational activities on the St. Lawrence	11	17	18	13	20	1
Tranquillity near the work site	7	11	19	20	26	0
Air quality during the project	7	4	10	16	45	0
Traffic disruptions during the project	7	9	18	13	35	1

Table 47 - Main concerns

2.3 WHAT IMPACT CONCERNS YOU THE MOST? CHECK THE BOX CORRESPONDING TO YOUR SELECTION (ONE ONLY).	
Soil and water quality	15
Plants and wildlife	20
Species at risk	9
Recreational activities on the St. Lawrence	0
Tranquillity near the work site	3
Air quality during the project	25
Traffic disruptions during the project	12

4.1.2.1 Air quality during the project

Twenty-five respondents to the questionnaire mentioned that air quality during the project was the aspect that concerned them the most. This was expressed during the open house, at Nuns' Island and especially Brossard. This aspect was also extensively covered by the media. Main concerns

Residents mentioned being worried about their health over the short and long term because of dust, lead, silica and asbestos particles that may be emitted during the deconstruction. People wanted air quality to be strictly controlled and that the protection of work site employees and residents be deemed critical and of the utmost importance. Some also suggested that crushing and sawing, the main activities that generate dust, be done away from the shoreline, namely, far from residential neighbourhoods. Some were also worried about particles ending up in gardens and of whether outdoor activities could continue to be pursued during deconstruction. Others suggested that emission dispersion modelling be done. Lastly, residents said they would like to be informed in advance of times when there may be particulate emissions and to be made aware of monitoring results, ideally in real time.

4.1.2.2 Plants and wildlife

Twenty persons responded that their main concern involved plants and wildlife around the project area. During the open houses, several people asked questions about wetland and fish habitat compensation projects, along with the protection of the cliff swallows and peregrine falcons nesting on the bridge. Some residents mentioned the importance of maintaining biodiversity and that dust and noise would disturb wildlife populations. There were suggestions to reconstitute spawning grounds and nesting sites on St. Lawrence islands to protect them from human activity.

4.1.2.3 Soil and water quality

About 15 persons mentioned that soil and water quality were their main concerns. The comments were that if soil and water quality is well protected, flora and fauna will be as well. Residents were worried about possible soil and water contamination during deconstruction work.

4.1.2.4 Traffic disruptions during the project

About a dozen persons mentioned that traffic disruptions were their main concern. In this respect, some of the concerns that were expressed were that the project was being carried out at the same time as work on the bridge-tunnel, the REM project, Highway A10, etc. Residents, especially from Nuns' Island, mentioned the many disruptions, detours and closures in the past few years. Some suggested to promote the use of barges to transport materials.

4.1.2.5 Tranquillity near the work site

Several persons mentioned that the sound environment was their main concern, all the more so as they have been directly impacted by the construction of the New Bridge in the last few years. Numerous residents came to obtain information on this topic during the open houses. Simulations had been done on the basis of certain deconstruction assumptions, and residents would like to know how noise would be controlled and monitored during the project.

4.1.2.6 Recreational activities on the St. Lawrence

No respondent mentioned on the questionnaire that this was their main concern. Relatively few questions were asked in this respect during the open house. Residents were instead asking when the bike path under the bridge would be reopened and about the long detours that are currently in place.

4.1.2.7 Species at risk

A few persons mentioned that species at risk were their main concern. Relatively few questions were asked in this respect during the open houses. Residents mentioned that Nuns' Island had many green spaces that contributed to their quality of life, and that they wished to preserve the birds and fish with whom they shared the area.

4.1.3 COMMENTS TAKEN INTO ACCOUNT IN THE PROJECT

Generally speaking, the mitigation measures proposed in the TEA meet citizens' concerns.

With respect to air quality, real-time monitoring at the work site boundaries will enable compliance with the criteria for the target parameters and the corrective measures to be implemented in a very short timeframe will ensure that the criteria at the stations in the community are observed. This monitoring is very strict and significant penalties are provided in the contract.

With respect to noise, a requirement asking that the noise from nearby work sites be taken into account was added to ensure that total noise levels comply with the standards.

Traffic noise is not as significant as during the construction of the New Bridge, and several mitigation measures have been drawn up to require that roads furthest from residential areas be used, to have transport done during non-peak hours, and to limit disruptions on the local road network.

Numerous mitigation measures will be used to protect plants and wildlife as well as species at risk, with compensation programs being implemented in this respect.

Measures regarding water and soil quality will ensure that quality is maintained during the project. Strict monitoring is also required in this respect.

Lastly, several mitigation measures will be implemented to ensure that recreational activities are maintained, both on the St. Lawrence and the shorelines.

4.2 FIRST NATIONS CONSULTATION

4.2.1 CONSULTATION APPROACH

JCCBI, together with DFO and TC, undertook to hold consultations with the Mohawk Council of Kahnawake and the Mohawk Council of Kanesatake in relation to the project.

The objectives of the consultation approach include:

- Transparent communication at appropriate times in view of sharing information on the project;
- Identify, together with the community, the potential effects of the project and appropriate mitigation or compensation measures;
- Respond to concerns raised throughout the project, during the preparatory phases as well as during the actual deconstruction;
- Provide feedback on the project's execution as well as on the application and efficiency of the mitigation measures, in particular by communicating the monitoring and follow-up results;
- Take into account the concerns and issues raised during decision-making.

The main consultation milestones are as follows:

- Initiating consultations and meetings with the Council to present the overall deconstruction project (February to April 2019);
- Meetings and discussions on compensation projects (since March 2019);
- Transmission of preliminary TEA for comment (May 2019);
- Transmission of preliminary design of potential jetties and of fishways in order to obtain comments and hold meetings (summer 2019);
- Meetings to present the successful contractor's environmental management plan (2020);
- Presentation of successful contractor's monitoring plan (2020);
- Transmission of information on permit applications (DFO and TC) and request for comments on authorization criteria (2020).

4.2.2 MEETINGS AND CONSULTATIONS HELD TO DATE

To date, several discussions and meetings have been held with the Mohawk Council of Kahnawake. JCCBI has sent several correspondences to the Mohawk Council of Kanesatake since February 2019.

The main points brought up with the Mohawk Council of Kahnawake at the initial meetings in spring 2019 involved the general presentation of the project, the anticipated impacts, and the mitigation measures that will be implemented. An overview of the environmental monitoring was presented, as well as how JCCBI will ensure compliance with the application of the mitigation measures. The potential jetties and the fishways that will be included to enable fish migration were also covered. The types of compensation for the loss of fish habitat were discussed, and surveys are currently under way for a project on the reserve (see section 6.4.2 for more details).

The TEA was submitted for comment in May 2019. MCK submitted comments and questions, and JCCBI recently sent its responses. These are described in the section that follows.

JCCBI intends to continue this type of exchange throughout the project in order to address the community's concerns in relation to the project's execution.

4.2.3 MAIN CONCERNS RAISED AND INCLUSION OF COMMENTS

The preliminary version of the TEA was sent to MCK to obtain their comments. These mainly involved the use of a temporary jetty compared to other solutions to reach areas to be deconstructed that are in shallower water, the effects of the jetties on aquatic habitats and fish movement and the monitoring of these effects, contamination, the presence of certain status species, the cumulative effects, and compensation projects.

4.2.3.1 Temporary jetties

MCK asked for additional explanations in order to understand why the use of a temporary bridge, which has fewer impacts and does not affect the migration of fish, was not required rather than leaving a temporary jetty as an option.

JCCBI has carried out an exhaustive analysis of the different methods that can be used to access the different work sites. There is always the possibility that the Contractor uses methods other than the construction of jetties, including the construction of a temporary bridge. However, the use of jetties is not prohibited for the following reasons:

- Because of the low vertical clearance available and the site conditions (current, ice, bedrock), the construction of a temporary bridge under the deck of the existing one would be very complex. The fact that there is little overburden on the Nuns' Island side makes it impossible to use driven piles. The use of small bored socketed piles could be considered. However, and again considering the low vertical clearance, the construction would be complex since the pile drilling equipment would encounter operating difficulties;
- The implementation of a temporary access via a jetty has the advantage of allowing the submerged portion of the piers to be demolished in a work area that is confined within the embankment, thus making it possible to deconstruct said piers without having to build additional cofferdams;
- The possible re-use of the materials available following the dismantling of SSL's jetties reduces the environmental effects (reduction of transport: GHG, sound environment, air quality) during the construction of a new jetty for the deconstruction;
- The construction of a temporary bridge could increase the impacts on the sound environment associated with pile driving.

4.2.3.2 Effects of jetties on fish habitat and movement and monitoring of these effects

The first point mentioned is the lack of bathymetric data in an area, which could affect the results of the hydraulic simulations that were done. JCCBI carried out this bathymetric survey, which will be sent to the contractors so that they can consider it during the hydraulic simulations they must conduct based on their work method. This will enable realistic forecasts on habitat impacts.

The second point involves the use of 2018 habitat data when the New Bridge jetties are in place, rather than 2012 data without the jetties to assess the types of habitat that are impacted and the required compensation. This approach was used, following discussions with DFO, since the habitats have attained a certain level of equilibrium with the jetties in place, and that the time between their removal and the creation of new jetties for deconstruction will be very short, and therefore the 2018 conditions will not significantly change during this short span of time.

The third point deals with the barrier effect created by the jetties as a result of the increase in flow velocity over a short distance. Migratory fish movements are part of fish life cycles and are highly complex, especially in an ecosystem such as that of the St. Lawrence River. They depend on several parameters that naturally fluctuate, including flow, velocity, bathymetry, existing substrate, water temperature, etc. To minimize the potential impact, fishways will be created in the Nuns' Island jetty. The design criteria of the jetties have been optimized based on experience with the current jetties. It is important to mention that fish can use migration routes other than the one on the Nuns' Island shore, in particular the Nuns' Island channel as well as the right shore of the Greater La Prairie Basin.

MCK also asked for additional details on the design criteria for the above fishways and the monitoring of the passage of fish that will be implemented. These design criteria are presented in Section 6.3.1.4.1 The two required fishways will be wider than those in the New Bridge jetty and will have the appearance of a natural body of water, which should improve passage conditions. Monitoring was also set up jointly with DFO based on the monitoring experience with the New Bridge jetties. The contractor will be in charge of the monitoring. Section 7.3.2 provides more details in this regard.

4.2.3.3 Contaminants

MCK raised concerns about the current level of information on the various contaminants present or potentially present at the sites or on the bridge being deconstructed, and whether said level is adequate for the contractor to draw up its method. MCK was also wondering why the contractor was made responsible for part of this characterization.

JCCBI mentioned that the state of knowledge of the project area is important and, at this stage, it is considered sufficient for the needs of the project. Sound management of the contaminated soil, water, materials and sediments is an important issue in this project and JCCBI's requirements include several measures aimed at ensuring that the Contractor's management of said materials during the work will be effective. The requirements set out in the contract documents have been developed to ensure sound management of the contaminated materials and specific measures have been identified in this regard. The conduct, by the Contractor, of an additional characterization prior to the commencement of the work will make it possible to acquire precise data in function of the working methods provided by the Contractor to implement the work. In addition, to ensure sound management of the contaminated materials until they reach their final disposal site, JCCBI will require from the Contractor a high-performance traceability system that comprises real-time tracking of the trucks up to the time when they reach the materials' final disposal site.

Finally, JCCBI will require a characterization at the end of the work to ensure that the standards are complied with and the requirements are met.

Regarding the potential presence of contaminants on the structure (lead, asbestos), additional surveys were completed in the spring of 2019 to document the presence of such contaminants on the bridge structure. Said study has been conducted and is integrated into the final version of the TEA. An additional survey was done recently to document the presence of asbestos in the asphalt pavement. The results show that there is no asbestos in the pavement.

4.2.3.4 Presence of status species

MCK submitted comments regarding the presence of certain macroinvertebrates (hickorynut) in the work area and the need for additional surveys before work is started.

The hickorynut is associated with the fine substrates consisting of mud, sand, gravel or silt. This sedentary species is generally found at depths ranging from 1.5 to 5 m but would be tolerant to large fluctuations in depth (up to 10 m), particularly in the St. Lawrence River. The areas where the jetties would be implemented mainly consist of coarse substrates and are therefore not favorable to the establishment of this species.

It should be noted, however, that this species has been listed on Schedule 1 of the SARA with the designation "endangered." For this reason, specific mitigation measures could be put forward to ensure that the project does not impact this species and does not jeopardize its recovery.

4.2.3.5 Cumulative effects

MCK asks for better consideration of the cumulative effects that occur one after the other in this same sector of the river. Additional information was added to the section on cumulative effects.

4.2.3.6 Compensation projects

MCK asked about the appropriateness of conducting a compensation project in the Lac Saint-Pierre area, which is located about 100 km downstream of the impacted area. There were comments that considering the impacts of several projects around the Champlain Bridge, the compensation project should be located nearby, where the community is involved in traditional activities. MCK noted that it is not in favour of this compensation option.

Besides the Lac Saint-Pierre project, JCCBI will carry out certain compensation projects near the impacted area (partial removal of the dike and Brossard docks and removal of almost all the piers), as well as a project in the Kahnawake reserve. Section 6.4.2 presents more details on these projects along with the reasons that led to the selection of the Lac Saint-Pierre project.

4.2.4 CONCLUSION

Given the implementation of the proposed mitigation and monitoring measures, it was concluded that the project is not likely to create significant negative environmental effects on the current use of lands and resources for traditional purposes.

5 ENVIRONMENTAL EFFECTS ASSESSMENT METHOD

The method used to update the assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge is the same as the one used in the 2013 EA. It is included in the sections below to make the document easier to read.

5.1 ASSESSMENT METHODOLOGY

5.1.1 IDENTIFICATION AND ASSESSMENT OF EFFECTS

The methodology used for the assessment of environmental effects consists of two main stages: the identification of potential effects and the assessment of potential effects.

The identification of potential effects consists in determining the components of the physical, biological and human environments likely to be affected by project activities. This is done using an interrelationships grid that presents valued ecosystem components on the vertical axis and project execution activities on the horizontal axis.

The assessment of potential effects then consists in defining the significance of the effects associated with the execution of the project. The significance of an effect on an environmental component is based on three parameters, i.e. its intensity, its duration and its extent.

The three parameters are assessed based on the definitions provided in section 5.1.2 and by using the multicriteria matrix in Table 48.

Lastly, the significance of residual effects is assessed while considering the application of mitigation measures.

5.1.2 DETERMINATION OF THE SIGNIFICANCE OF AN ENVIRONMENTAL EFFECT

5.1.2.1 Intensity of the effect

The intensity of the effect corresponds to the component's level of disturbance. Three levels have been defined:

Low: Little change to the component's characteristics. Difficult to quantify;

Moderate: Change to some of the component's characteristics. The change may be quantifiable;

High: Change to all of the component's main characteristics. This change is quantifiable.

5.1.2.2 Duration of effect

Precise duration of the temporal dimension of the effect. The terms *permanent*, *temporary* and *momentary* are used to qualify this period of time:

Momentary: The effect disappears quickly;

Temporary: The effect is felt during a project activity or at most during the execution of the project;

Permanent: The effect has an ongoing impact following deconstruction.

5.1.2.3 Extent of effect

The extent qualifies the spatial dimension of the effect that is generated by an action in the environment. It refers to the distance or surface area where the disturbance will be felt. The terms *regional*, *local* and *limited* are used to qualify the extent:

Limited: The extent is limited when the work only affects an environmental element near the project;

Local: The extent is local when the action affects the study area;

Regional: The extent is regional when the action goes beyond the study area.

5.1.2.4 Assessment of potential effect

These three parameters are integrated into a multicriteria matrix in order to assess the potential effect based on three categories:

Significant effect (S): Means that the effect is permanent and affects the integrity, diversity and longevity of the element. Such an effect significantly or irremediably alters the quality of the environment;

Non-significant effect (NS): Means that the effect is perceptible, temporary and/or has a low recurrence rate, has only a slight effect on the environmental component, and the latter is not irreversibly affected. Such an effect is of short duration and/or limited in scope;

Negligible effect (N): Means that there is no or almost no effect, the effect does not affect the environmental component in an observable or quantifiable manner, and it is similar to a natural effect that can occur randomly. Such an effect is generally of short duration and is limited in scope.

Table 48 - Multicriteria analysis to determine the potential effect

INTENSITY	EXTENT	DURATION		
		MOMENTARY	TEMPORARY	PERMANENT
Low	Limited	N	N	NS
	Local	N	N	NS
	Regional	N	NS	S
Moderate	Limited	N	NS	NS
	Local	NS	NS	S
	Regional	NS	S	S
High	Limited	NS	S	S
	Local	NS	S	S
	Regional	S	S	S

N: Negligible; NS: Not significant; S: Significant.

5.1.3 MITIGATION

Mitigation measures were assessed in the 2013 EA and are reviewed and updated here as necessary.

The CEAA defines mitigation as:

> *The elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means (CEAA).*

Once the environmental effects have been identified and assessed, mitigation measures are determined to reduce the magnitude of the significant and non-significant effects. These measures are designed to mitigate or correct the negative effects to allow the project to be better integrated into the environment.

5.1.4 RESIDUAL EFFECTS

After implementing mitigation measures, the magnitude of the environmental effects can then be re-assessed; these then become residual environmental effects, representing the effect that remains once the mitigation measures have been applied. Following the implementation of the mitigation measures, significant or non-significant residual effects may remain:

Non-significant residual effect: Means that the residual effect is temporary and/or has a low rate of recurrence and/or is of limited extent, or that it has little or no effect on the environmental component;

Significant residual effect: Means that despite the use of mitigation measures, the residual effect permanently affects the environmental component.

6 ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

6.1 IDENTIFICATION OF POTENTIAL EFFECTS RELATED TO THE PROJECT

The potential effects of the project have been identified based on the grid shown in Table 49. The grid shows, on the y-axis, the environmental components that were part of the description of the environment (Volume 1, Chapter 3), and on the x-axis, the sources of impact associated with the project execution stages. Table 50 presents the sources of the impacts and the relationship between them and the project components as identified below.

The project components are described in Chapter 2 (Volume 1) of the TEA.

The identification of potential effects takes the following into account:

- The technical characteristics of the project and the planned work methods as known at this stage of the process;
- Knowledge of the environment;
- The lessons learned from similar projects, in particular the construction of the New Champlain Bridge;
- The community's concerns regarding the project.

6.2 ASSESSMENT OF POTENTIAL EFFECTS RELATED TO THE PROJECT

Table 51, Table 52 and Table 53 present the assessment of the potential environmental effects, the required mitigation measures, and an assessment of the residual effects that may remain after the measures have been applied for the deconstruction of the Existing Champlain Bridge. A summary of these effects is found in Chapter 8.

To properly assess some of the potential effects listed in tables 51, 52 and 53, a more detailed analysis was done on some of the components. This assessment namely required detailed simulations or analyses, which are presented in the following subsections. The analyses namely involve fish and fish habitat (section 6.2.1), traffic (6.2.2), the sound environment (6.2.3), air quality (6.2.4), GHG (6.2.5), navigation (6.2.6) and quality of life (6.2.7).

The mitigation measures identified in Table 51, Table 52 and Table 53 were grouped into four categories:

- Conception criteria that will be considered and integrated when preparing plans and specifications for the works, identified by "CC" in Table 51, Table 52 and Table 53. A discussion of these criteria is presented in section 6.3.1;
- Performance criteria with a defined objective, identified as "CP" in Table 51, Table 52 and Table 53. The main lines of the monitoring program are presented in section 7.2;
- Current mitigation measures from industry standards, government guides and the lessons learned during the New Champlain Bridge construction project. These measures are indicated by the acronyms "MPO," "CCDG" and "NC" in Table 51, Table 52 and Table 53 listed in section 6.3.2. The DFO measures are those recommended by the Department and reflect practices from 2018. The CCDG is the General Specifications of the Ministère des Transports du Québec (MTQ). It is a contractual part of all construction contracts under the responsibility of the MTQ and contains several specific measures to protect the environment. NC is the acronym for the MTQ's construction standards. These standards consist of several volumes, one of which is specific to environmental aspects;

- Specific mitigation measures identified by "P" in Table 51, Table 52 and Table 53 and listed in section 6.3.3;

The mitigation measures, taken from the 2013 EA, have been updated in this TEA to specifically reflect the effects associated with the deconstruction of the Existing Champlain Bridge. The update consisted of the following:

- Conducting workshops with Infrastructure Canada to benefit from the lessons learned during the construction of the New Champlain Bridge;
- Adding measures according to the specificities and issues identified during the updates of the various environmental components;
- Adapting the measures according to the possible deconstruction methods;
- Adapting the measures according to the best practices in force in 2019;
- Removing measures that were not relevant to deconstruction.

All the mitigation measures were included in the request for proposals that was launched in early 2019 in order to select the contractor who will be in charge of the deconstruction of the Existing Champlain Bridge. This contractor will have to produce its own reference project by including all of the above measures in the design. JCCBI shall conduct a review and analysis to ensure that all the measures and objectives mentioned in this document have been fully integrated in the proposed work methods. Note that new measures may be required from DFO and TC when issuing their permits.

Use of a monitoring protocol, the broad lines of which are presented in Chapter 7 of this document, will ensure that a) the mitigation measures are in fact in place and b) the performance objectives have been met.

A summary of all the potential effects and applicable mitigation measures is found in Chapter 8.

Table 49 - Interrelationships between the environmental components and the project

ENVIRONMENTAL COMPONENT		PRE-DECONSTRUCTION		DECONSTRUCTION							POST-DECONSTRUCTION	
		Work site mobilization and construction of temporary installations	Maintaining traffic and navigability and installation of signage	Soil stripping and tree clearing	Excavation, earthworks	Dismantlement of structures	Work in aquatic environments (creation of jetties and demolition of piers)	Management of waste and hazardous materials	Machinery transport, operation and maintenance	Temporary closure of work site	Work in aquatic environment (removal of jetties)	Work site demobilization and dismantlement of temporary installations
Physical environment												
Soil and sediment quality		X		X	X		X	X	X		X	X
Surface water quality		X		X	X	X	X	X	X		X	X
Hydrology and hydraulics							X					
Groundwater quality		X			X		X	X	X			X
Air quality and GHG		X	X		X	X		X	X			X
Biological Environment												
Land	Vegetation	X		X								
	Aquatic vegetation						X					
	Wetlands			X	X							
Fish and habitats				X	X	X	X		X	X	X	
Herpetofauna and habitats		X		X		X						X
Birds and habitats		X		X		X	X				X	X
Mammals		X		X								
Special status species		X		X		X	X				X	X
Human Environment												
Commercial shipping			X		X	X	X					
Recreational and tourism activities and pleasure boating		X	X	X		X	X		X		X	X
Sound environment		X	X			X	X		X		X	
Traffic and infrastructures			X		X	X	X		X		X	
Archeology and heritage				X								
Land and buildings					X							

Table 50 - Relationships between the project components and the activities listed in the effects grid

ACTIVITIES	DESCRIPTION OF WORK
Pre-deconstruction phase	
Work site mobilization and construction of temporary installations	▶ Installation of work site trailers, sanitary services and hookups ▶ Installation of work, materials storage and waste areas ▶ Installation of temporary production areas, if required ▶ Construction of temporary accesses to mobilization areas and parking
Maintaining traffic and navigability, installation of signage	▶ Detour and closure (if required) of traffic lanes and bicycle paths ▶ Detour and closure (if required) of recreational waterways ▶ Installation of signage
Deconstruction phase	
Soil stripping and tree clearing	▶ Site preparation ▶ Tree clearing ▶ Surface stripping ▶ Topsoil storage
Excavation, earthworks	▶ Excavation, cut, fill and earthworks ▶ Segregation and management of contaminated soil and sediment ▶ Water segregation and contaminated water management
Dismantlement of structures	▶ Deconstruction of various sections of the bridge (except for the piers and footings) ▶ Dismantlement of steel structures ▶ Dismantlement of concrete structures ▶ Debris crushing
Work in aquatic environments	▶ Construction of temporary structures (e.g. cofferdam, jetty) ▶ Removal or cutting of piers ▶ Demolition of footings ▶ Saw slurry management
Management of waste and hazardous materials	▶ Management of debris and waste, including the various materials from the deconstruction of the bridge ▶ Management of hazardous materials (lead, asbestos)
Machinery transport, operation and maintenance	▶ Movement of machinery, vehicles and barges ▶ Vehicle and machinery maintenance ▶ Transportation of materials by land and river ▶ Lighting during the work
Temporary closure of the work site	▶ Stabilization of work areas in the event of temporary closure in the winter
Post-deconstruction phase	
Work in aquatic environments	▶ Dismantlement of temporary installations in aquatic environments (jetties)
Work site demobilization and dismantlement of temporary installations	▶ Dismantlement of temporary installations ▶ Restoration of storage areas ▶ Site reclamation

Table 51 - Assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge – Physical environment

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
1	Pre-deconstruction	Work site mobilization and construction of temporary installations	Soil and sediment quality	When setting up the work site, accidental oil or fuel spills could affect the quality of soils and sediments.	Low	Temporary	Limited	Not significant	CCDG 10.4.2 P-9, P-11, P-12 and P-129	Not significant
2	Pre-deconstruction	Work site mobilization and construction of temporary installations	Soil and sediment quality	Earthworks and levelling carried out in an aquatic environment (dock, jetty, etc.) for the preparation of the work site could result in the dispersion of contaminated sediment.	High	Temporary	Limited	Significant	MPO-5 and MPO-35 P-129	Not significant
3	Pre-deconstruction	Work site mobilization and construction of temporary installations	Soil and sediment quality	Setting up the work site and the temporary installations could cause the soil to be stripped and thus increase erosion.	Low	Temporary	Limited	Not significant	MPO-6 and MPO-8 CCDG 10.4.3.3.2 and CCDG 10.4.3.5 NC 9.4.3.1, NC 9.4.3.2 and NC 9.4.3.3 P-13	Not significant
4	Pre-deconstruction	Work site mobilization and construction of temporary installations	Surface water quality	Potential increase in suspended matter concentrations in surface water through the disturbance of sediment in the Greater and Lesser La Prairie Basin.	Moderate	Temporary	Regional	Significant	CP-3	Not significant
5	Pre-deconstruction	Work site mobilization and construction of temporary installations	Surface water quality	Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Moderate	Temporary	Regional	Significant	MPO-5, MPO-6, MPO-7, MPO-8 and MPO-35	Not significant
6	Pre-deconstruction	Work site mobilization and construction of temporary installations	Surface water quality	Potential contamination of St. Lawrence River through the input of soils carried by runoff from disrupted surfaces. Potential increase in suspended matter concentrations in surface water. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Moderate	Temporary	Local	Not significant	MPO-5, MPO-6, MPO-7, MPO-8, MPO-11, MPO-13 and MPO-35 CCDG 10.4.3.1, CCDG 10.4.3.3.1, CCDG 10.4.3.3.2 and CCDG 10.4.3.3.3 NC 9.4.3.1 P-24 CP-3	Not significant
7	Pre-deconstruction	Work site mobilization and construction of temporary installations	Groundwater quality	When transporting construction materials and during work site preparation, accidental oil or fuel spills could affect the quality of groundwater.	Moderate	Permanent	Limited	Not significant	CCDG 10.4.2 P-9, P-10, P-34, P-67 and P-70	Not significant
8	Pre-deconstruction	Work site mobilization and construction of temporary installations	Air quality	The construction of temporary installations may result in a temporary degradation of air quality through fugitive dust emissions, some of which may contain contaminants.	Moderate	Temporary	Local	Not significant	P-19, P-100 and P-86 CCDG 12.4 CP-2, CP-5 and CP-8	Not significant
9	Deconstruction	Soil stripping and tree clearing	Soil and sediment quality	Stripping and clearing will result in bare soil, thus increasing erosion.	Moderate	Temporary	Limited	Not significant	MPO-6 and MPO-8 CCDG10.4.3.3.2 and CCDG 10.4.3.5 NC 9.4.3.1, NC 9.4.3.2 and NC 9.4.3.3 P-13, P-106 and P-109	Not significant
10	Deconstruction	Soil stripping and tree clearing	Soil and sediment quality	Stockpiling of contaminated soil may cause the contamination of soil and sediment found under or near the piles.	Moderate	Permanent	Limited	Not significant	NC 9.3.3.4	Not significant
11	Deconstruction	Soil stripping and tree clearing	Surface water quality	Potential contamination of St. Lawrence River through the input of soils carried by runoff from disrupted surfaces. Potential increase in suspended matter concentrations in surface water. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats. Note: The Migratory Bird Sanctuary Regulations prohibit the introduction of toxic substances into migratory bird habitats.	Moderate	Temporary	Local	Not significant	MPO-5, MPO-6, MPO-7, MPO-8, MPO-11, MPO-13 and MPO-35 CCDG 10.4.3.1, CCDG 10.4.3.3.1, CCDG 10.4.3.3.2 and CCDG 10.4.3.3.3 NC 9.4.2 and NC 9.4.3.1 P-24 CP-3	Not significant
12	Deconstruction	Excavation, earthworks	Soil and sediment	Excavation work may expose waste.	Moderate	Temporary	Limited	Not significant	P-33 and P-129	Not significant

Table 51 - Assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge – Physical environment

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
			quality							
13	Deconstruction	Excavation, earthworks	Soil and sediment quality	Excavation and stockpiling of contaminated soil may cause the contamination of soil and sediment found under or near excavation areas and piles.	Moderate	Permanent	Limited	Not significant	NC 9.3.3.4 P-35, P-36 and P-129 CC-3	Not significant
14	Deconstruction	Excavation, earthworks	Surface water quality	Pumping water from excavations may contaminate watercourses.	Low	Temporary	Limited	Negligible	MPO-16 CP-4	Not significant
15	Deconstruction	Excavation, earthworks	Surface water quality	Excavation and earthworks will modify the drainage pattern and may result in increased runoff and an inflow of suspended matter in watercourses. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats. Note: The Migratory Bird Sanctuary Regulations prohibit the introduction of toxic substances into migratory bird habitats.	Low	Temporary	Limited	Negligible	MPO-35 CCDG 10.4.3.3.1, CCDG 10.4.3.3.2 and CCDG 10.4.3.3.3 NC 9.4.3.1, NC 9.4.3.2 and NC 9.4.3.3 CP-3	Not significant
16	Deconstruction	Excavation, earthworks	Groundwater quality	The excavation of contaminated soils or sediments below the level of the water table may cause groundwater to become contaminated.	Moderate	Temporary	Limited	Not significant	P-20, P-33 and P-34	Not significant
17	Deconstruction	Excavation, earthworks	Air quality	During excavation work, surfaces that have been stripped and piles of granular materials may generate dust that could affect air quality, especially in dry weather conditions.	Low	Temporary	Limited	Negligible	MPO-11 P-32, P-116 and P-118 CP-2, CP-5 and CP-8	Not significant
18	Deconstruction	Dismantlement of structures	Surface water quality	Debris or saw slurry from the dismantlement of the deck or structures is likely to end up in the St. Lawrence, thus affecting the quality of the surface water in the area. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Moderate	Temporary	Local	Not significant	MPO-5, MPO-14, MPO-15, MPO-16, MPO-18, MPO-25, MPO-35 and MPO-38 CP-3, CP-5, CP-6, CP-8 and CP-9	Not significant
19	Deconstruction	Dismantlement of structures	Surface water quality	The presence of lead and other contaminants in the structure is likely to contaminate surface water.	Moderate	Temporary	Local	Not significant	MPO-25	Not significant
20	Deconstruction	Dismantlement of structures	Air quality	Deconstruction work may result in the temporary degradation of air quality through fugitive dust emissions, some of which may contain contaminants.	Moderate	Temporary	Local	Not significant	P-19, P-90, P-91, P-92, P-100 and P-118 CP-2, CP-5, CP-6, CP-8 and CP-9	Not significant
21	Deconstruction	Dismantlement of structures	Air quality	Bridge – Sections with steel spans (Section 6 (2W to 2E)) Deconstruction may temporarily degrade air quality through fugitive dust emissions, which may contain lead particles.	Low	Temporary	Local	Not significant	P-90, P-91, P-92, P-114 and P-120 CP-2, CP-5, CP-7 and CP-8	Not significant
22	Deconstruction	Dismantlement of structures	Air quality	Concrete spans over land (5E to 13E) Unless mitigation measures are continuously applied, deconstruction work may result in a frequent degradation of air quality, including the emission of dust and certain contaminants.	High	Temporary	Local	Not significant	P-90, P-91, P-92, P-114, P-115, P-116, P-117, P-118, P-119 and P-120 CP-2, CP-5, CP-6, CP-8 and CP-9	Not significant
23	Deconstruction	Dismantlement of structures	Air quality	Concrete spans over land (44W to 41W) Unless mitigation measures are continuously applied, deconstruction work may result in an occasional degradation of air quality, including the emission of dust and certain contaminants.	Moderate	Temporary	Local	Not significant	P-90, P-91, P-92, P-114, P-115, P-116, P-117, P-118, P-119 and P-120 CP-2, CP-5, CP-6, CP-8 and CP-9	Not significant
24	Deconstruction	Dismantlement of structures	Air quality	Mobilization areas and temporary jetties – Brossard Unless mitigation measures are continuously applied, deconstruction work may result in a frequent degradation of air quality, including the emission of dust and certain contaminants.	High	Temporary	Local	Not significant	P-90, P-91, P-92, P-115, P-116, P-117, P-118, P-119 and P-120 CP-2, CP-5, CP-6, CP-7, CP-8 and CP-9	Not significant
25	Deconstruction	Dismantlement of structures	Air quality	Mobilization areas and temporary jetty – Nuns' Island Unless mitigation measures are continuously applied, deconstruction	Moderate	Temporary	Local	Not significant	P-90, P-91, P-92, P-115, P-116, P-117, P-118, P-119 and P-120	Not significant

Table 51 - Assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge – Physical environment

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
				work may result in an occasional degradation of air quality, including the emission of dust and certain contaminants.					CP-2, CP-5, CP-6, CP-8 and CP-9	
26	Deconstruction	Work in aquatic environments	Soil and sediment quality	In-water works for the creation of temporary jetties and cofferdams may result in the resuspension of contaminated sediments. Barge movements could raise contaminated sediment	High	Temporary	Local	Significant	MPO-3, MPO-10 and MPO-11 P-20, P-54 and P-55	Not significant
27	Deconstruction	Work in aquatic environments	Soil and sediment quality	In-water works on the dike and on flood plains for the deconstruction of footings and foundations may result in the dispersion of contaminated sediments.	High	Temporary	Local	Significant	P-20 and P-53	Not significant
28	Deconstruction	Work in aquatic environments	Surface water quality	Potential increase in suspended matter concentrations in surface water through the disturbance of sediment in the La Prairie basins when creating the jetties and removing the piers. Barge movements could raise contaminated sediment. The discharge of barge bilge water could contaminate surface water. Potential increase in organic and inorganic contaminant levels in surface water through the disruption of sediment in the Greater and Lesser La Prairie Basins. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Moderate	Temporary	Local	Not significant	MPO-5, MPO-6, MPO-7, MPO-8 and MPO-35 P-20 and P-122 CP-3	Not significant
29	Deconstruction	Work in aquatic environments	Surface water quality	Underwater sawing of existing bridge piers is likely to generate saw slurry that may end up in the St. Lawrence and affect water quality. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Moderate	Momentary	Local	Not significant	MPO-5, MPO-14, MPO-15, MPO-16, MPO-18, MPO-35 and MPO-38 CP-3	Not significant
30	Deconstruction	Work in aquatic environments	Surface water quality	Residue and waste may be released into the St. Lawrence and affect water quality.	Moderate	Momentary	Local	Negligible	MPO-5 and MPO-25 P-51	Not significant
31	Deconstruction	Work in aquatic environments	Hydrology and hydraulics	The creation of temporary jetties and gradual removal of the piers will modify water conditions	Low	Permanent	Limited	Not significant	P-110 CC-6	Not significant
32	Deconstruction	Work in aquatic environments	Groundwater quality	If excavations are required to remove footings and foundations on flood plains and the dike, the excavation of contaminated soil or sediment under the water level may result in groundwater contamination.	Moderate	Temporary	Limited	Not significant	P-20 and P-33	Not significant
33	Deconstruction	Management of waste and hazardous materials	Soil and sediment quality	The temporary storage and removal of concrete, steel debris, asphalt concrete and othersat unauthorized locations could result in the degradation of the quality of native soils.	Moderate	Temporary	Limited	Negligible	CCDG 7.11, CCDG 11.4.7 and CCDG 11.4.7.2.1 NC 9.3.3.1, NC 9.3.3.2, NC 9.3.3.3 and NC 9.3.3.4 P-59, P-60 and P-95	Not significant
34	Deconstruction	Management of waste and hazardous materials	Soil and sediment quality	Debris containing asbestos and lead are likely to be found during deconstruction of the bridge structure.	Moderate	Temporary	Limited	Not significant	P-79, P-129 and P-130	Not significant
35	Deconstruction	Management of waste and hazardous materials	Surface water quality	The accidental release of oil, other hazardous products or waste into the St. Lawrence is likely to affect surface-water quality. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Moderate	Momentary	Limited	Negligible	CCDG 7.11, CCDG 10.4.2 and CCDG 10.4.3.1 P-9, P-58, P-59, P-67 and P-81	Not significant
36	Deconstruction	Management of waste and hazardous materials	Groundwater quality	The storage and removal of concrete and steel debris at unauthorized locations could result in the degradation of groundwater quality.	Moderate	Permanent	Limited	Not significant	CCDG 7.11, CCDG 10.4.3.3.2, CCDG 11.4.7 and CCDG 11.4.7.2.1 NC 9.3.3.1, NC 9.3.3.2, NC 9.3.3.3 and NC 9.3.3.4 P-34, P-59 and P-60	Not significant

Table 51 - Assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge – Physical environment

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
37	Deconstruction	Management of waste and hazardous materials	Air quality	Poor management of volatile waste may cause emissions of contaminants into the atmosphere.	Moderate	Temporary	Limited	Negligible	CCDG 11.4.7, CCGD 11.4.7.2.1 and CCDG 11.4.7.3.1 P-57	Not significant
38	Deconstruction	Management of waste and hazardous materials	Air quality	Debris containing asbestos and lead are likely to be found during deconstruction of the bridge structures.	Moderate	Temporary	Local	Not significant	P-79 and P-114 CC-24	Not significant
39	Deconstruction	Machinery transport, operation and maintenance	Soil and sediment quality	Truck traffic outside contaminated areas may cause a contamination of soils adjacent to the work area. Accidental spills could occur during machinery maintenance at the work site.	Moderate	Permanent	Local	Not significant	CCDG 11.4.7 NC 9.3.2 P-69	Not significant
40	Deconstruction	Machinery transport, operation and maintenance	Soil and sediment quality	When transporting materials (by land and water), accidental oil or fuel spills could affect the quality of work site soils and of St. Lawrence sediment.	Low	Permanent	Limited	Not significant	CCDG 10.4.2 P-9, P-10 and P-67	Not significant
41	Deconstruction	Machinery transport, operation and maintenance	Soil and sediment quality	When transporting construction materials (by land and water), accidental oil or fuel spills could affect the quality of work site soils and of St. Lawrence sediment.	Moderate	Temporary	Limited	Not significant	CCDG 7.11, CCDG 10.4.3.1 and CCDG 10.4.3.3.1 P-9, P-10, P-58, P-67 and P-80	Not significant
42	Deconstruction	Machinery transport, operation and maintenance	Surface water quality	Leaks from machinery and vehicles used near or on water and from equipment used for in-water works are likely to contaminate surface water. During machinery maintenance, accidental oil or fuel spills could affect surface water quality. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Moderate	Temporary	Local	Not significant	CCDG 7.11. CCDG 10.4.2 and CCDG 10.4.3.1 P-9, P-10, P-58, P-59, P-61, P-67 and P-68	Not significant
43	Deconstruction	Machinery transport, operation and maintenance	Surface water quality	The use of barges and other equipment on water could affect water quality. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Low	Permanent	Local	Not significant	CCDG 10.4.3.1, CCDG 7.11 and CCDG 10.4.2 P-9, P-10, P-58, P-67 and P-68	Not significant
44	Deconstruction	Machinery transport, operation and maintenance	Groundwater quality	When transporting deconstruction materials and during machinery operation and maintenance, accidental oil or fuel spills could affect groundwater quality.	Moderate	Permanent	Local	Not significant	CCDG 7.11, CCDG 10.4.2 and CCDG 10.4.3.1 P-9, P-10, P-34, P-58, P-67 and P-70	Not significant
45	Deconstruction	Machinery transport, operation and maintenance	Air quality	Vehicular and machinery traffic on temporary roads is likely to generate dust at the work site and nearby areas.	Moderate	Temporary	Local	Not significant	CCDG 12.4, CCDG 12.4.1.1 and CCDG 12.4.1.2 P-8, P-9, P-10, P-11, P-12, P-63, P-64, P-65, P-66, P-104, P-115 and P-117 CP-2, CP-5 and CP-8	Not significant
46	Deconstruction	Machinery transport, operation and maintenance	Air quality	The lighting required for the works will create light pollution along the work sites	Moderate	Temporary	Local	Not significant	P-111	Not significant
47	Deconstruction	Machinery transport, operation and maintenance	Air quality	Transporting debris by truck over the road network will disperse atmospheric contaminants.	Moderate	Temporary	Regional	Not significant	P-64, P-65, P-115 and P-117	Not significant
48	Deconstruction	Machinery transport, operation and maintenance	Air quality	Use of machinery and equipment as well as truck transport will generate greenhouse gases	Low	Temporary	Regional	Not significant	P-66	Not significant
49	Post-deconstruction	Work in aquatic environments	Soil and sediment quality	In-water works involving the removal of temporary jetties may result in the excavation of contaminated sediments that will have to be managed by the contractor	Moderate	Permanent	Local	Significant	MPO-3, MPO-10 and MPO-11 P-20, P-54, P-55 and P-131	Not significant
50	Post-	Work in aquatic environments	Surface water quality	Removal of temporary structures is likely to result in sediment	Moderate	Temporary	Local	Not significant	MPO-5, MPO-14, MPO-15, MPO-16, MPO-18,	Not significant

Table 51 - Assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge – Physical environment

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
	deconstruction			resuspension and the release of debris into the St. Lawrence, which will affect water quality. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.					MPO-35 and MPO-38 P-24 CP-3	
51	Post-deconstruction	Work site demobilization and dismantlement of temporary installations	Soil and sediment quality	The contaminants at the work site may degrade soil quality.	Low	Permanent	Limited	Not significant	CCDG 7.11 P-70 and P-129	Not significant
52	Post-deconstruction	Work site demobilization and dismantlement of temporary installations	Surface water quality	Site restoration is likely to generate sediment resuspension affecting water quality. Changes in water quality may cause a degradation in fish, migratory bird, wildlife and special-status species habitats.	Low	Temporary	Local	Negligible	MPO-9, MPO-10, MPO-11, MPO-12 and MPO-13 CCDG 10.4.3.3.1, CCDG 10.4.3.3.2 and CCDG 10.4.3.4 NC 9.4.3.3 P-105 CP-3	Not significant
53	Post-deconstruction	Work site demobilization and dismantlement of temporary installations	Groundwater quality	Contaminated work site soils may degrade groundwater quality.	Moderate	Permanent	Limited	Not significant	CCDG 7.11 NC 9.3.3.4 P-9, P-10, P-34, P-67 and P-70	Not significant

(1) See tables 82, 87, 88, 89 and 90 for mitigation measures details

Table 52 – Assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge – Biological environment

NO.	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURES (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
54	Pre-deconstruction	Work site mobilization and construction of temporary installations	Terrestrial vegetation	Possible loss of terrestrial and riparian vegetation due to the creation of storage areas for materials and access roads. The surface area will vary based on the work methods proposed by the private partner.	Moderate	Temporary	Limited	Not significant	CCDG 11.2.5, CCDG 11.2.6.1, CCDG 11.2.7.1 and CCDG 11.2.7.1.1 NC 9.3.1	Not significant
55	Pre-deconstruction	Work site mobilization and construction of temporary installations	Herpetofauna and habitats	Potential mortality of herpetofauna individuals and disruption of habitat during the construction of temporary installations in the Nuns' Island Bridge and Seaway dike areas.	Moderate	Temporary	Limited	Not significant	NC 9.5.3 P-5, P-7 and P-23	Not significant
56	Pre-deconstruction	Work site mobilization and construction of temporary installations	Birds and habitats	Disruption of bird habitat during the construction of temporary installations (St. Lawrence shoreline and Seaway dike).	Moderate	Temporary	Local	Not significant	P-3A and P-3B	Not significant
57	Pre-deconstruction	Work site mobilization and construction of temporary installations	Mammals	Disruption of mammals in the work right-of-way.	Low	Temporary	Local	Negligible	No special measures given the species that are present and that the disturbed individuals should be able to leave the affected areas.	Not significant
58	Pre-deconstruction	Work site mobilization and construction of temporary installations	Special status species of plants and wildlife	Potential mortality of individuals and disruption of brown snake habitat on the Island of Montreal, Nuns' Island and the Seaway dike.	High	Temporary	Limited	Significant	P-5 and P-6	Not significant
59	Deconstruction	Soil stripping and tree clearing	Terrestrial vegetation	Loss of terrestrial and riparian vegetation following the clearing required for certain jetties and mobilization areas	Moderate	Permanent	Limited	Not significant	CCDG 11.2.5, CCDG 11.2.6.1, CCDG 11.2.7.1, CCDG 11.2.7.1.1, CCDG 11.2.7.1.2 and CCDG 11.2.7.1.3 NC 9.4.2 P-106 and P-107	Not significant
60	Deconstruction	Soil stripping and tree clearing	Wetlands	Loss of wetlands following clearing and stripping of the right-of-way needed to install the jetty on the Nuns' Island side: 1,041 m^2 of emergent marsh.	High	Permanent	Limited	Significant	MPO-3, MPO-11, MPO-16 and MPO-35 CCDG 10.4.3.3.1, CCDG 10.4.3.3.2, CCDG 10.4.3.3.3 and 10.4.3.4 CC-1	Not significant
61	Deconstruction	Soil stripping and tree clearing	Fish and habitats	Sediment runoff from shoreline work may disrupt fish habitats downstream of the work, especially in lentic flow zones	High	Temporary	Local	Significant	MPO-7, MPO-8, MPO-30A, MPO-31A, MPO-35 and MPO-36 NC 9.3.1 and NC 9.4.2	Not significant
62	Deconstruction	Soil stripping and tree clearing	Fish and habitats	Contaminant leaching from contaminated shoreline sites could affect fish health.	High	Temporary	Regional	Significant	MPO-8 NC 9.4.2 P-24	Not significant
63	Deconstruction	Soil stripping and tree clearing	Herpetofauna and habitats	Potential mortality of herpetofauna individuals and disruption of habitat during the construction of temporary installations in the Nuns' Island Bridge and Seaway dike areas.	Moderate	Permanent	Limited	Not significant	P-5, P-7 and P-23 NC 9.5.3	Not significant
64	Deconstruction	Soil stripping and tree clearing	Birds and habitats	Potential disruption of bird habitat and possible accidental destruction of nests, eggs or birds.	High	Temporary	Local	Significant	CCDG 11.2.7.1 P-3A, P-3B and P-21	Not significant
65	Deconstruction	Soil stripping and tree clearing	Mammals	Temporary loss of habitat.	Low	Temporary	Limited	Negligible	No special measure	Not significant
66	Deconstruction	Soil stripping and tree clearing	Special status species of plants and wildlife	Potential mortality of individuals and loss of potential water-horehound habitat on the South Shore side and for the brown snake on Nuns' Island and the Seaway dike.	High	Permanent	Limited	Significant	P-5, P-6, P-22 and P-23	Not significant
67	Deconstruction	Excavation, earthworks	Wetlands	Excavation and earthworks will modify the drainage pattern near wetlands, which may decrease their quality and result in	Moderate	Permanent	Limited	Not significant	MPO-8 CCDG 10.4.3.3.1, CCDG 10.4.3.3.2 and CCDG	Not significant

Table 52 – Assessment of the environmental effects of the Champlain Bridge deconstruction project – Biological environment (cont'd)

NO.	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURES (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
				potential losses.					10.4.3.3.3	
68	Deconstruction	Excavation and earthworks	Terrestrial vegetation (invasive alien species – IAS)	Excavation work is likely to be carried out in areas contaminated with IAS and cause them to spread	Moderate	Permanent	Local	Not significant	P-132 and P-133	Not significant
69	Deconstruction	Excavation, earthworks	Fish and habitats	Sediment runoff from shoreline work may disrupt fish habitats downstream of the work, especially in areas of slower flow, where sediments can settle	High	Temporary	Local	Significant	MPO-5, MPO-6, MPO-7, MPO-8, MPO-12, MPO-32, MPO-35 and MPO-36 CCDG 10.4.3.1, CCDG 10.4.3.3.1, CCDG 10.4.3.3.2, CCDG 10.4.3.3.3, CCDG 10.4.3.4 and CCDG 10.4.3.5 NC 9.4.3.1 and NC 9.4.3.3	Not significant
70	Deconstruction	Excavation, earthworks	Fish and habitats	The excavation of contaminated fill may result in leaching and/or surface runoff of contaminants originating from contaminated sites on the shoreline. These may affect fish health.	High	Temporary	Regional	Significant	MPO-5, MPO-6, MPO-7, MPO-8 and MPO-35 P-24	Not significant
71	Deconstruction	Dismantlement of structures	Fish and habitats	Deconstruction of the Champlain Bridge can generate debris that can fall into the aquatic environment, which can alter fish habitat if not recovered	Moderate	Permanent	Local	Significant	MPO-1 and MPO-25	Not significant
72	Deconstruction	Dismantlement of structures	Herpetofauna and habitats	Herpetofauna habitats under the bridge structure will be disrupted and destroyed during deconstruction work.	Moderate	Permanent	Limited	Not significant	CCDG 7.11 P-7-52	Not significant
73	Deconstruction	Dismantlement of structures	Birds and habitats	Bird habitats, primarily that of the Cliff Swallow, located on the bridge structure will be disrupted and destroyed during deconstruction work.	High	Permanent	Limited	Significant	P-3A and P-3B	Not significant
74	Deconstruction	Dismantlement of structures	Special status species of plants and wildlife	Peregrine falcon nesting on the Champlain Bridge may be disrupted during work.	High	Temporary	Local	Significant	P-71 and P-72	Not significant
75	Deconstruction	Dismantlement of structures	Special status species of plants and wildlife	Deconstruction of the Champlain Bridge will affect Peregrine Falcon artificial nesting boxes and could affect rough water-horehound habitat on the banks of the South Shore as well as brown snake habitat on Nuns' Island and the Seaway dike.	High	Permanent	Limited	Significant	P-6, P-23, P-71 and P-72	Not significant
76	Deconstruction	Work in aquatic environments	Aquatic vegetation	Jetty construction may encroach in aquatic vegetation, including grass beds, which serve as fish and bird habitats.	Moderate	Permanent	Limited	Not significant	MPO-1 P-3B	Not significant
77	Deconstruction	Work in aquatic environments	Aquatic vegetation	Aquatic vegetation around the piles will be destroyed during excavation work inside the cofferdams to remove the footings.	Moderate	Permanent	Limited	Not significant	MPO-14	Not significant
78	Deconstruction	Work in aquatic environments	Fish and habitats	Sediment resuspension by jetties construction or moving barges may disrupt fish habitats downstream of the work. The discharge of barge bilge water could contaminate fish habitats.	High	Temporary	Local	Significant	MPO-1, MPO-3, MPO-4, MPO-5, MPO-9, MPO-11, MPO-14, MPO-16, MPO-22, MPO-23, MPO-24, MPO-25, MPO-33, MPO-34 and MPO-35 CCDG 10.4.1 P-122	Not significant
79	Deconstruction	Work in aquatic environments	Fish and habitats	Pier demolition and the presence of jetties could possibly alter fish habitat through changes in flow velocities (altering migration) and an increase in the water level. The presence of jetties could have an effect on flow depths and velocities at the SSL compensation project.	High	Temporary	Local	Significant	MPO-1, MPO-2, MPO-3, MPO-10, MPO-38 and MPO-43 P-123 and P-134 CC-6 and CC-6b	Not significant
80	Deconstruction	Work in aquatic	Fish and habitats	In-water works, including barge traffic, may disturb fish habitat,	Moderate	Temporary	Regional	Significant	MPO-1, MPO-2, MPO-3 and MPO-10	Not significant

Table 52 – Assessment of the environmental effects of the Champlain Bridge deconstruction project – Biological environment (cont'd)

NO.	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURES (1)	SIGNIFICANCE OF RESIDUAL EFFECTS
		environments		in particular during spawning and migration periods.						
81	Deconstruction	Work in aquatic environments	Fish and habitats	Work that causes vibrations in water may disturb fish.	Moderate	Temporary	Local	Not significant	MPO-1, MPO-2 and MPO-3	Not significant
82	Deconstruction	Work in aquatic environments	Fish and habitats	The construction of temporary jetties and other works could possibly cause a loss of 64,484 m² of fish habitat. The construction of a jetty at Nuns' Island could encroach on the SSL compensation project.	High	Temporary	Local	Significant	MPO-1, MPO-2, MPO-3, MPO-10, MPO-13, MPO-30, MPO-31, MPO-37 and MPO-39 P-134 CC-6b	Not significant
83	Deconstruction	Work in aquatic environments	Birds and habitats	In-water works may disrupt aquatic birds that use the study area, especially in and around the Couvée Islands migratory bird sanctuary and the La Prairie Basin waterfowl gathering area (Nuns' Island).	Moderate	Temporary	Local	Not significant	P-3B, P-21 and P-108	Not significant
84	Deconstruction	Work in aquatic environments	Special status species of plants and wildlife	The temporary structures required for pier demolition could affect potential habitats for special-status fish, as well as grass beds serving as habitats, feeding areas and shelter for some special-status migratory birds.	Moderate	Temporary	Local	Not significant	MPO-1, MPO-2, MPO-3, MPO-5, MPO-10, MPO-14, MPO-15, MPO-16, MPO-18, MPO-19, MPO-20, MPO-21, MPO-22, MPO-23, MPO-24, MPO-33, MPO-34, MPO-35, MPO-38 and MPO-39 P-3B	Not significant
85	Deconstruction	Work in aquatic environments	Special status species of plants and wildlife	Pier demolition could destroy Laurentian water-horehound plants on the Nuns' Island side.	High	Permanent	Limited	Significant	P-22 and P-23	Not significant
86	Deconstruction	Machinery transport, operation and maintenance	Fish and habitats	Potential accidental spills of hydrocarbons and other products may be harmful to fish and fish habitat.	Moderate	Momentary	Local	Not significant	CCDG 10.4.2, CCDG 10.4.3.1 and CCDG 11.4.7 NC 9.3.2 P-9, P-10, P-61 and P-67	Not significant
87	Deconstruction	Temporary closure of work site	Fish and habitats	Erosion and inflow of sediment in the surrounding environment if temporary stabilization measures are not implemented before the work site is temporarily closed	Moderate	Temporary	Local	Not significant	MPO-40, MPO-41 and MPO-42	Not significant
88	Post-deconstruction	Work in aquatic environments	Fish and habitats	Jetty removal may affect aquatic habitats and fish due to the suspended matter generated during the works.	Moderate	Temporary	Local	Not significant	MPO-1, MPO-2, MPO-3, MPO-5, MPO-10, MPO-35, MPO-37 and MPO-39	Not significant
89	Post-deconstruction	Work in aquatic environments	Fish and habitats	In-water works may disturb fish, in particular during spawning and migration periods.	Moderate	Temporary	Regional	Significant	MPO-1, MPO-10 and MPO-25	Not significant
90	Post-deconstruction	Work in aquatic environments	Birds and habitats	In-water works for jetty removal may disrupt aquatic birds that use the study area, especially in and around the Couvée Islands migratory bird sanctuary and the La Prairie Basin waterfowl gathering area (Nuns' Island).	Moderate	Temporary	Local	Not significant	P-3B and P-21	Not significant
91	Post-deconstruction	Work in aquatic environments	Special status species of plants and wildlife	Jetty removal may affect potential habitats for status fish due to the suspended matter generated during the works.	Moderate	Permanent	Limited	Not significant	MPO-1, MPO-2, MPO-3, MPO-5, MPO-10 and MPO-35 P-3B	Not significant

(1) See tables 82, 87, 88, 89 and 90 for mitigation measures details

Table 53 – Assessment of the environmental effects of the deconstruction of the Existing Champlain Bridge – Human environment

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE(1)	SIGNIFICANCE OF RESIDUAL EFFECTS
92	Pre-deconstruction	Work site mobilization and construction of temporary installations	Recreational and tourism activities and pleasure boating	Continued use of the same bike path right-of-ways to carry out the activities, as well as certain riverside areas used to practice recreational activities (e.g. wading, windsurfing, kayaking).	High	Temporary	Local	Significant	P-1 and P-2 CC-9 and CC-10	Not significant
93	Pre-deconstruction	Work site mobilization and construction of temporary installations	Sound environment	Work site mobilization activities could increase noise levels in sensitive areas	Moderate	Temporary	Local	Not significant	P-4, P-98, P-99, P-125, P-126 and P-128 CCDG 10.4.4.1, CCDG 10.4.4.2 and CCDG 10.4.4.3 NC 9.9.1.3, NC 9.9.1.4, NC 9.9.2, NC 9.9.2.1, NC 9.9.2.2, NC 9.9.3.1, NC 9.9.3.2 and NC 9.9.3.3 CP-1	Not significant
94	Pre-deconstruction	Maintaining traffic, navigability and installation of signage	Commercial shipping	Disruption of commercial shipping on the St. Lawrence Seaway	High	Temporary	Regional	Significant	P-18 and P-89	Not significant
95	Pre-deconstruction	Maintaining traffic, navigability and installation of signage	Recreational and tourism activities and pleasure boating	Rerouting, closure and temporary changes to recreational boating lanes and bicycle paths.	Moderate	Temporary	Local	Not significant	P-15	Not significant
96	Pre-deconstruction	Maintaining traffic and installing signage	Sound environment	Traffic detours may possibly affect noise levels in residential neighbourhoods near roads used by trucks	High	Temporary	Local	Significant	P-98 and P-99 CCDG 10.4.4.1, CCDG 10.4.4.2 and CCDG 10.4.4.3 NC 9.9.1.3, NC 9.9.1.4, NC 9.9.2, NC 9.9.2.1, NC 9.9.2.2, NC 9.9.3.1, NC 9.9.3.2 and NC 9.9.3.3 CP-1	Not significant
97	Pre-deconstruction	Maintaining traffic and installing signage	Traffic and infrastructures	Possible partial closure of some accesses.	High	Temporary	Regional	Significant	CCDG 10.3.1 and CCDG 10.3.4.3 P-16, P-17, P-101, P-102 and P-121	Not significant
98	Deconstruction	Soil stripping and tree clearing	Recreational and tourism activities and pleasure boating	Continued use of the same bike path right-of-ways to carry out the activities, as well as certain riverside areas used to practice recreational activities (e.g. wading, windsurfing, kayaking).	Low	Temporary	Local	Negligible	P-1 and P-2 CC-9 and CC-10	Not significant
99	Deconstruction	Soil stripping and tree clearing	Archeology and heritage	Stripping could affect archeological remains that are incidentally discovered	High	Permanent	Local	Significant	P-26 and P-40	Not significant
100	Deconstruction	Excavation, earthworks	Commercial shipping	Possibility of Seaway dike watertightness being compromised.	High	Temporary	Regional	Significant	P-18	Not significant
101	Deconstruction	Excavation, earthworks	Traffic and infrastructures	Work may damage the local and regional infrastructures, including the road network.	Low	Temporary	Limited	Negligible	CCDG 7.11 P-27 and P-28	Not significant
102	Deconstruction	Excavation, earthworks	Land and buildings	Possibility of damage on land adjacent to the work footprint.	Low	Temporary	Limited	Negligible	CCDG 7.11 P-14 and P-38	Not significant
103	Deconstruction	Dismantlement of structures	Commercial shipping	Bridge deconstruction work over the Seaway could affect commercial shipping.	High	Temporary	Regional	Significant	P-18, P-73 and P-89	Not significant
104	Deconstruction	Dismantlement of structures	Recreational and tourism activities and pleasure boating	The deconstruction of bridge structures could result in the partial or complete closure of bicycle paths under the bridge, including access to certain riverside areas used for recreational activities (e.g. wading, windsurfing,	High	Temporary	Local	Significant	P-1 and P-2	Not significant

Table 53 – Assessment of the environmental effects of the Champlain Bridge deconstruction project – Human environment (cont'd)

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE(1)	SIGNIFICANCE OF RESIDUAL EFFECTS
				kayaking).						
105	Deconstruction	Dismantlement of structures	Recreational and tourism activities and pleasure boating	Access to riverside areas near the bridge will be restricted, limiting or preventing recreational activities, in particular during the dismantling of bridge structures.	Low	Temporary	Limited	Negligible	P-1 and P-2	Not significant
106	Deconstruction	Dismantlement of structures	Sound environment	Operation of machinery for the deconstruction of bridge structures will increase noise levels and vibrations near the work.	High	Temporary	Limited	Significant	P-98, P-99, P-124, P-125, P-126, P-127 and P-128 CCDG 10.4.4.1, CCDG 10.4.4.2, CCDG 10.4.4.3 and CCDG 11.4.4.1.1 NC 9.9.1.3, NC 9.9.1.4, NC 9.9.2, NC 9.9.2.1, NC 9.9.2.2, NC 9.9.3.1, NC 9.9.3.2 and NC 9.9.3.3 CP-1	Not significant
107	Deconstruction	Dismantlement of structures	Traffic and infrastructures	Bridge deconstruction will require temporary road closures or detours (Boul. René-Lévesque, Highway 132 and onramps).	Low	Temporary	Regional	Significant	CCDG 10.3.1 and CCDG 10.3.4.3 P-16, P-17 and P-121	Not significant
108	Deconstruction	Work in aquatic environments	Commercial shipping	Dismantling the footings, foundations and piers near the Seaway could adversely affect commercial shipping. Barge traffic could affect commercial shipping.	High	Temporary	Regional	Significant	P-18, P-44 and P-89	Not significant
109	Deconstruction	Work in aquatic environments	Recreational and tourism activities and pleasure boating	The dismantlement of the footings, foundations and piers, including the creation and presence of jetties or cofferdams, as well as the presence of barges, could adversely affect pleasure boating.	High	Temporary	Local	Not significant	P-2 and P-74	Not significant
110	Deconstruction	Work in aquatic environments	Sound environment	Machinery operation and traffic related to jetty construction could increase noise levels near the work.	High	Temporary	Limited	Significant	P-4, P-98, P-99, P-124, P-125, P-126 and P-128 NC 9.9.3.1, NC 9.9.3.2 and NC 9.9.3.3 CP-1	Not significant
111	Deconstruction	Work in aquatic environments	Traffic and infrastructures	The transport of materials for the creation of temporary jetties and the transport by truck of materials and structures resulting from the dismantlement of the bridge could affect traffic on certain roads	High	Temporary	Local or regional	Not significant (regional network) and significant (local network)	CCDG 10.3.1 and CCDG 10.3.4.3 P-16, P-17, P-101, P-102 and P-121	Not significant
112	Deconstruction	Machinery transport, operation and maintenance	Recreational and tourism activities and pleasure boating	The waterway transport of materials removed from the bridge could adversely affect pleasure boat traffic.	Moderate	Temporary	Local	Not significant	P-2, P-96 and P-97	Not significant
113	Deconstruction	Machinery transport, operation and maintenance	Sound environment	Vehicular and machinery traffic will increase noise levels near work areas.	High	Temporary	Limited	Significant	P-98 and P-99 CCDG 10.4.4.1, CCDG 10.4.4.2 and CCDG 10.4.4.3 NC 9.9.1.3, NC 9.9.1.4, NC 9.9.2, NC 9.9.2.1, NC 9.9.2.2, NC 9.9.3.1, NC 9.9.3.2 and NC 9.9.3.3 CP-1	Not significant
114	Deconstruction	Machinery transport, operation and maintenance	Traffic and infrastructures	Work-related traffic, in particular on Nuns' Island, will increase congestion on the local network.	High	Temporary	Local	Significant	P-62, P-63, P-101, P-102 and P-121	Not significant
115	Deconstruction	Machinery transport, operation and	Traffic and infrastructures	The transport of materials may damage surrounding roads as well as soil local roads during the work.	Moderate	Temporary	Local	Not significant	CCDG 7.11 P-8 and P-27	Not significant

Table 53 – Assessment of the environmental effects of the Champlain Bridge deconstruction project – Human environment (cont'd)

NO	PROJECT PHASE	PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	DESCRIPTION OF ENVIRONMENTAL EFFECTS	INTENSITY	DURATION	EXTENT	ASSESSMENT OF POTENTIAL EFFECT	REQUIRED MITIGATION MEASURE(1)	SIGNIFICANCE OF RESIDUAL EFFECTS
		maintenance								
116	Post-deconstruction	Work in aquatic environments	Recreational and tourism activities and pleasure boating	Remnants of the Champlain Bridge piers may present a hazard for pleasure boating.	Low	Permanent	Limited	Not significant	P-74 and P-75	Not significant
117	Post-deconstruction	Work in aquatic environments	Recreational and tourism activities and pleasure boating	Temporary disruption of recreational boating lanes during in-water works for the removal of the temporary jetties.	Moderate	Temporary	Local	Not significant	P-2	Not significant
118	Post-deconstruction	Work in aquatic environments	Sound environment	Machinery operation and traffic related to the removal of the temporary jetties will increase noise levels near the work and on roads used to transport the materials off site.	High	Temporary	Limited	Significant	P-98 and P-99 NC 9.9.3.1, NC 9.9.3.2 and NC 9.9.3.3 CP-1	Not significant
119	Post-deconstruction	Work in aquatic environments	Traffic and infrastructures	The transport of materials when removing the temporary jetties will affect traffic on some roads	High	Temporary	Local	Significant	CCDG 10.3.1 and CCDG 10.3.4.3 P-16, P-17 and P-121	Not significant

(1) See tables 82, 87, 88, 89 and 90 for mitigation measures details

6.2.1 DESCRIPTION OF EFFECTS – FISH AND FISH HABITAT

The construction of jetties in a watercourse can impact several components of the environment and the analysis of effects requires the use of hydraulic simulation.

6.2.1.1 Impact of deconstruction jetties

Deconstruction work may require that three jetties be built under the Existing Champlain Bridge, as shown in Figure 40.

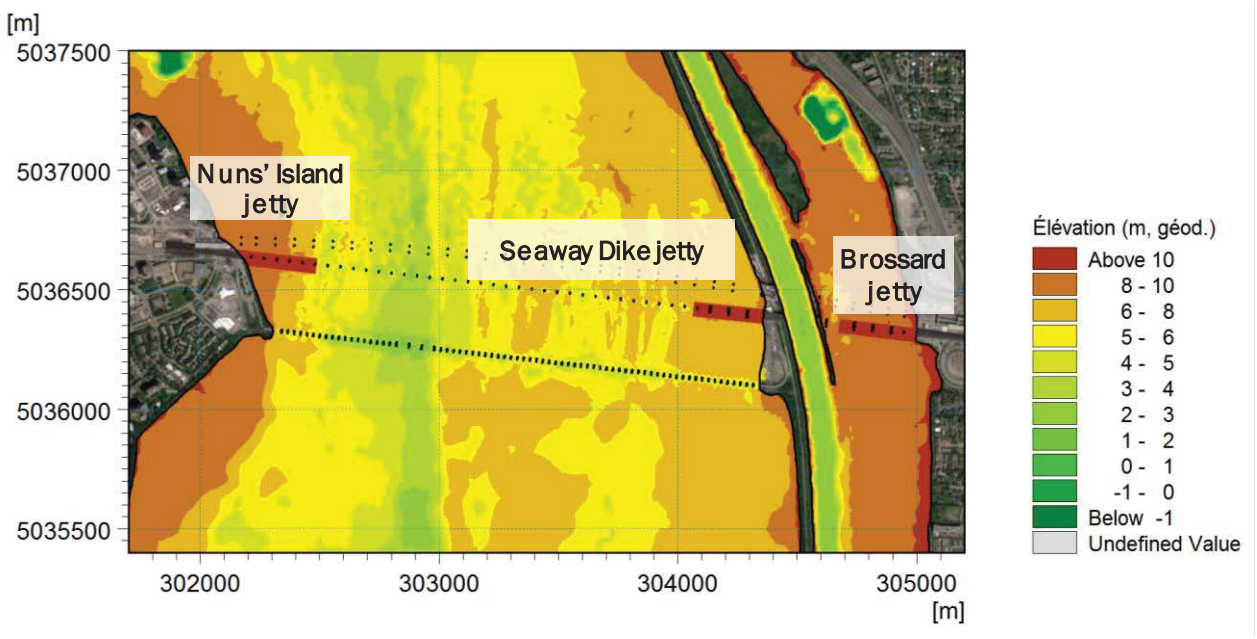


Figure 40 - Deconstruction jetties for the Existing Champlain Bridge

6.2.1.1.1 Configuration of deconstruction jetties

The jetties were included in the digital model (Appendix 13 presents more details on the methodology that was used). The preliminary jetty design includes the following elements:

- Crest width: 50 m;
- Crest height: 13.0 m;
- Side slope: 1V:1.5H.

6.2.1.1.2 Modelling scenarios

To assess the impact of the jetties on the hydrodynamic conditions of the St. Lawrence River, the two following states were compared:

1. Prior to deconstruction: construction jetties for the New Champlain Bridge removed and piers of the Existing Champlain Bridge and New Champlain Bridge in place[1];
2. Start of deconstruction: three deconstruction jetties and piers of the Existing bridge and New Bridge in place.

The hydrodynamic conditions found with these two configurations were simulated for low flow Q_{2-7} and flow rates for 1:2-year and 1:100-year floods (Table 54).

Table 54 - Modelling scenarios for assessing the impact of the deconstruction jetties

SCENARIO	DESCRIPTION	$QT_{@LASALLE}$	$Q_{BRAS\ NORD*}$	$Q_{BRAS\ SUD**}$	H_{AVAL}
		(m^3/s)	(m^3/s)	(m^3/s)	(m)
1	Low flow $Q_{2,7}$	6,895	3,103	3,792	5.33
2	1:2-year flood	11,325	5,096	6,229	7.42
3	1:100-year flood	13,260	5,967	7,293	8.33

Note: QT: total flow at the station; Q: flow in the north or south arm; H: water level
* North Arm: Arm of St. Lawrence north of Île aux Chèvres
** South Arm: Arm of St. Lawrence south of Île aux Hérons

6.2.1.1.3 Results

6.2.1.1.3.1 Flow velocities

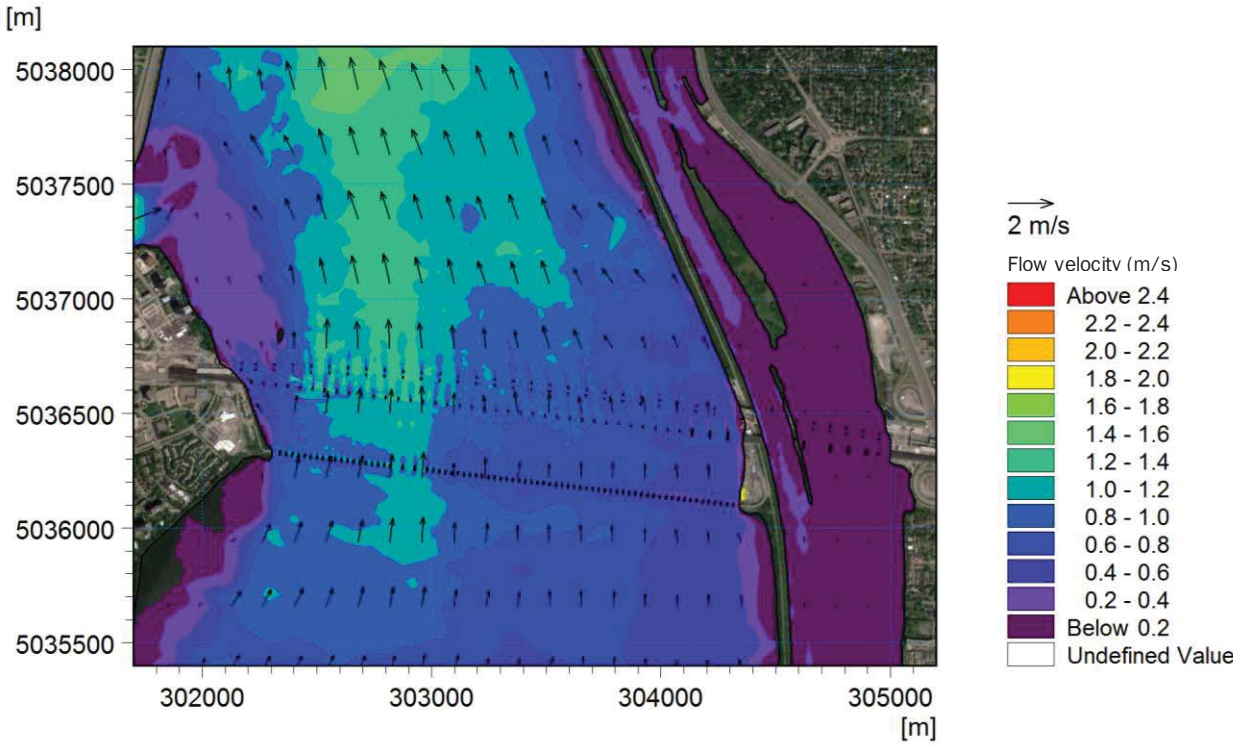
The velocity fields obtained with and without the deconstruction jetties are found in Figure 41, Figure 42 and Figure 43 for the three scenarios in Table 54.

In general, the jetties create a calmer area in their wake along with somewhat accelerated flow around their end point. This effect is more pronounced for the Nuns' Island jetty, which is located in a flow passage with a naturally higher velocity.

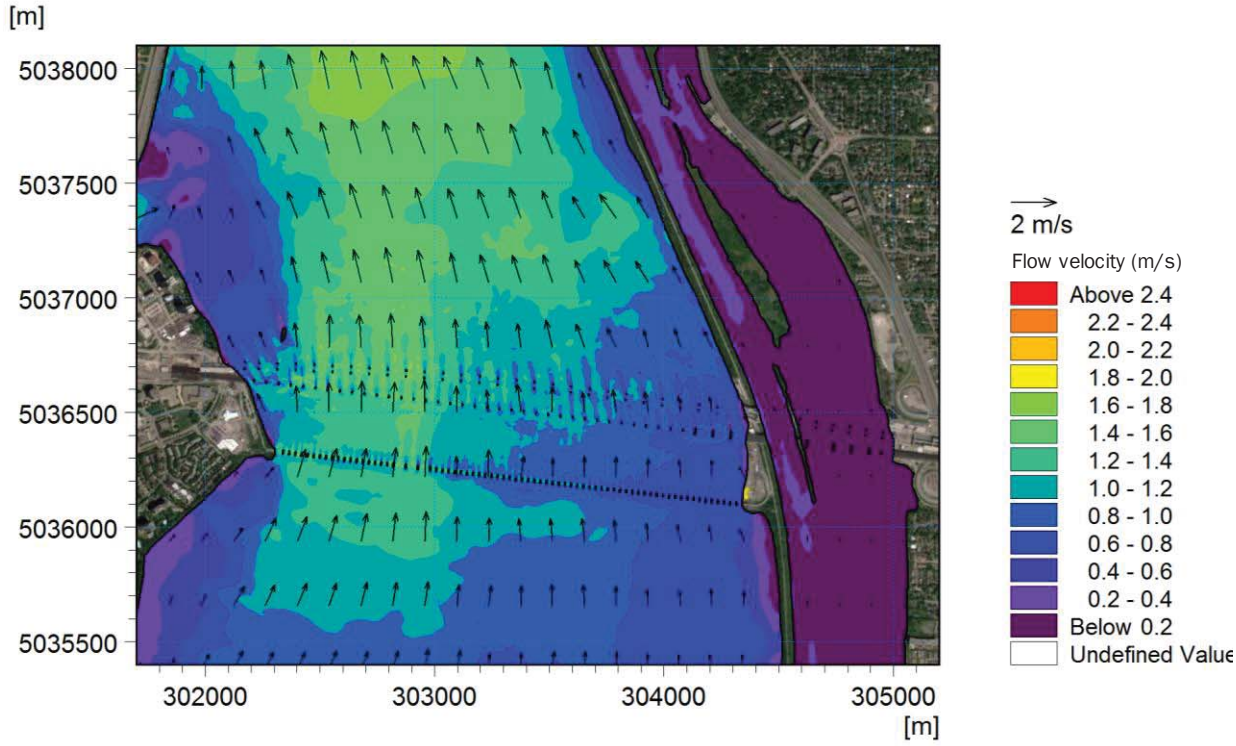
The narrowing of the flow section created by the Nuns' Island and Seaway Dike jetties has the effect of increasing velocity. However, this increase in velocity is limited to the bridge area and diminishes quickly. Downstream of Nuns' Island, the velocity fields with and without jetties are basically identical.

To better understand the changes brought by the deconstruction jetties on the site's hydrodynamic conditions, Figure 44 summarizes the results obtained in terms of differences in velocity. Positive differences (in blue) represent increased flow, while negative differences (in green) represent a decrease. Differences of ±0.05 m/s are considered negligible and are not shown.

[1] On October 30, 2019, SSL requested an extension of the authorization period from DFO to leave certain jetties or parts of jetties thereof in place beyond the authorized date of December 31, 2019. According to the information in this email, the Nuns' Island jetty would be completely removed in September 2020, as would the Seaway dike jetty. The Brossard jetty would be completely removed in August 2020. If DFO authorizes this extension, the construction and decommissioning piers could potentially co-exist for a period of time if the deconstruction contractor chooses to begin their implementation in August, at the end of the restriction period. The call for proposals and DFO's upcoming authorization for deconstruction will take this situation into account.

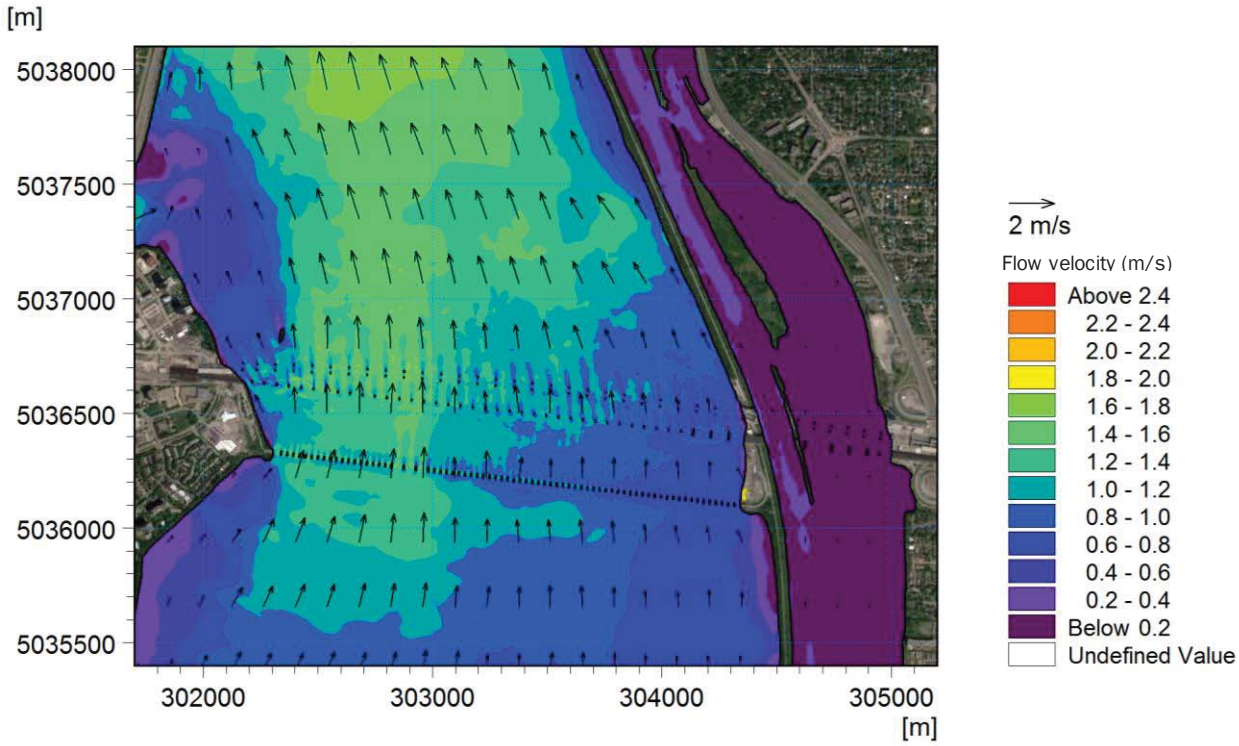


a) Without jetties

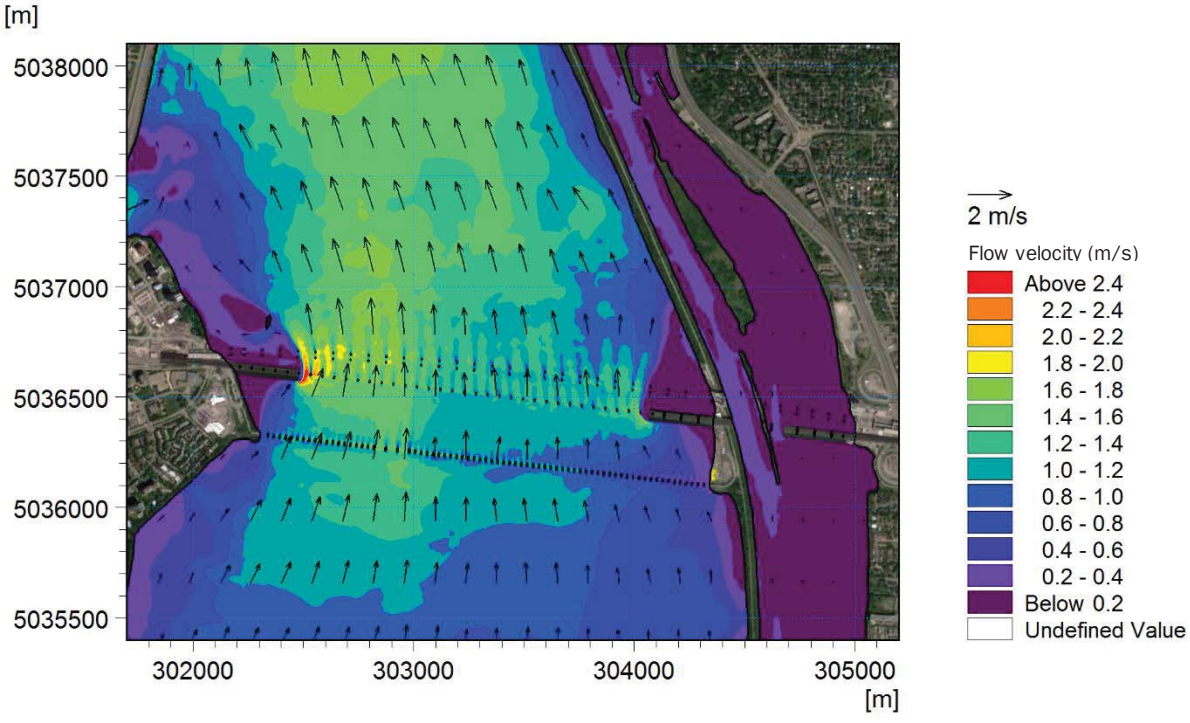


b) With jetties

Figure 41 - Velocity fields for low flow Q2-7 (6,895 m³/s)

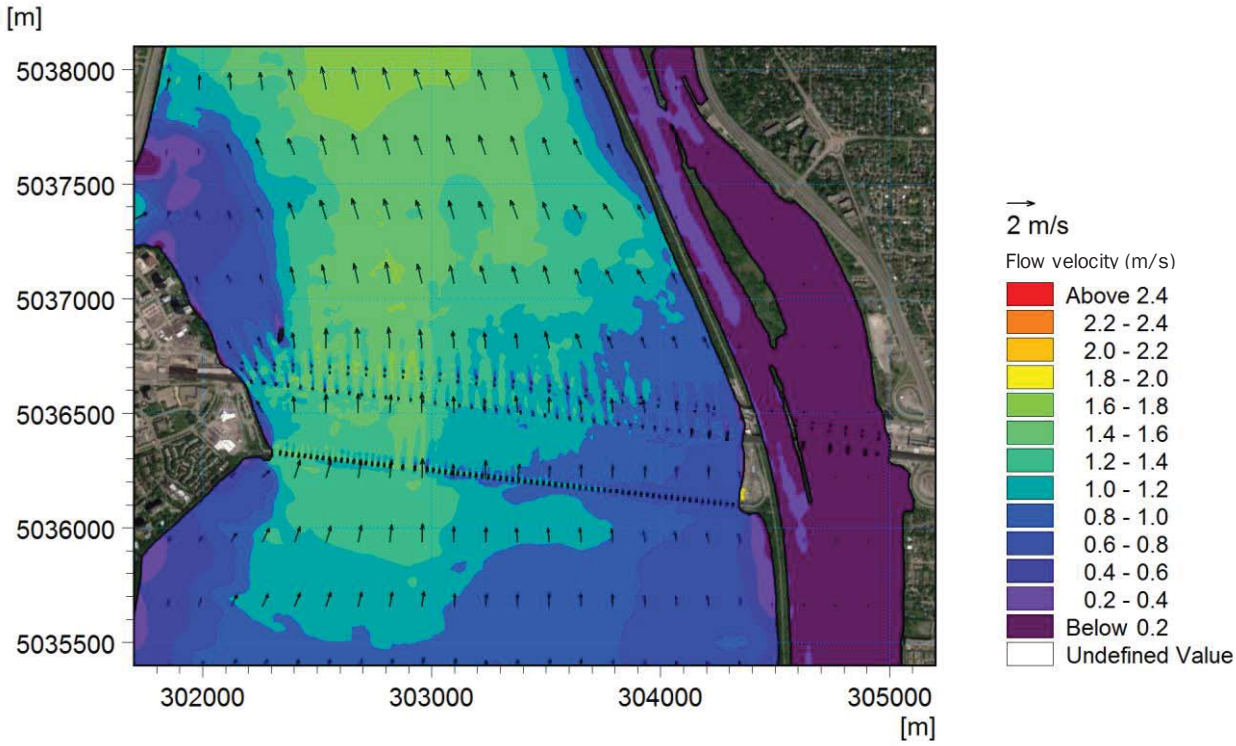


a) Without jetties

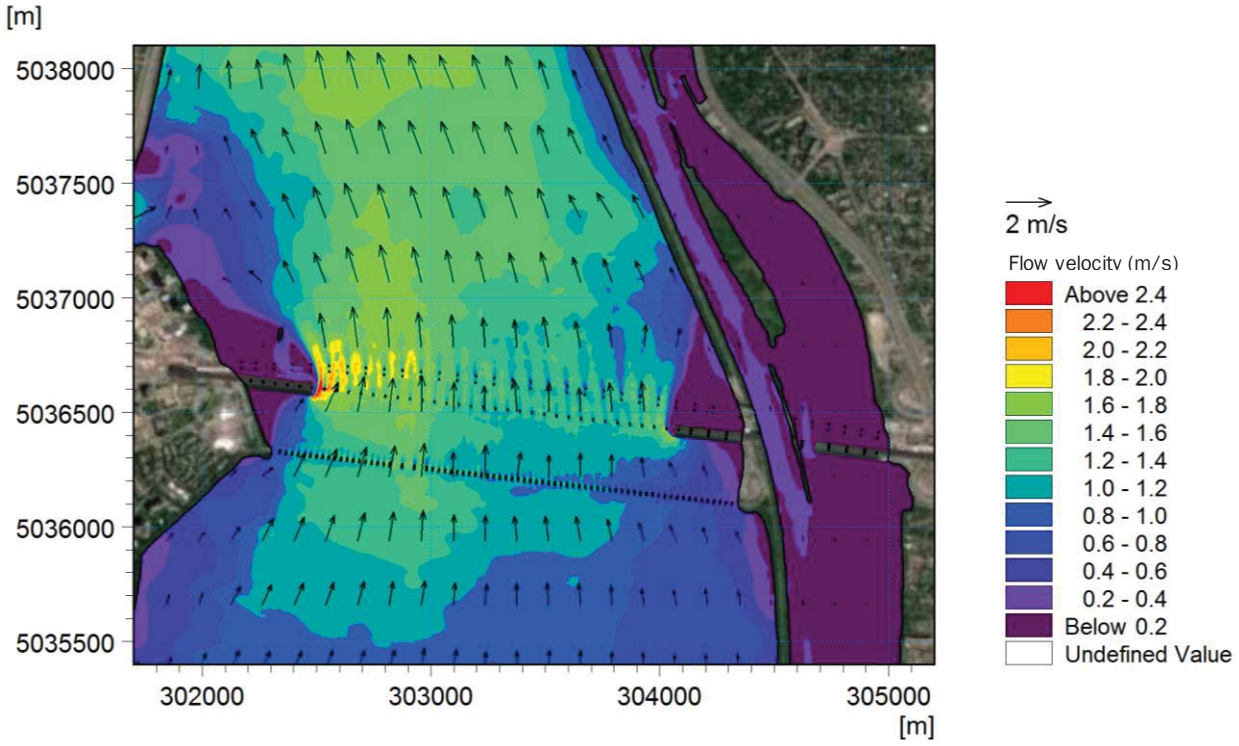


b) With jetties

Figure 42 - Velocity fields for the flow rate for a 1:2-year flood (11,325 m³/s)



a) Without jetties



b) With jetties

Figure 43 - Velocity fields for the flow rate for a 1:100-year flood (13,260 m³/s)

As previously noted, the effect of the jetties is no longer felt downstream of Nuns' Island. On the upstream side, a certain reduction in velocity can be noted along the shores of the Greater La Prairie Basin. However, the increase in velocity in the middle of the flow section, where the Ice Control Structure is located, is modest, with values below 0.10 m/s.

The Seaway channel is virtually unaffected by the jetty on the Brossard side. The nipping off of the flow section in the Lesser La Prairie Basin creates a slight increase in the water level upstream, which has the effect of directing the flow slightly more toward the Seaway. Based on the modelling results, the velocities in a narrow strip on the left bank increase by at most 0.07 m/s. Maximum velocities around the jetty are roughly 0.4 m/s.

The increase in flow velocity at the end of the jetties (up to 0.8 m/s) and in the middle of the St. Lawrence (0.1 m/s) could have an impact on the migration of certain species of fish. As a mitigation measure, fishways should therefore be created in the proposed Nuns' Island jetty to mitigate this impact. Section 6.3.1.4.1 presents the details of these fishways and their effect. The increase in flow velocity should not have an impact on the erosion of the St. Lawrence riverbed, which is made up of coarse substrate in this area, nor in relation to the shore, since the increase is not felt near the shoreline. Moreover, a decrease in flow velocity is noted near the shore upstream and downstream of the jetties. Like the SSL jetties, this slowdown will create a localized reduction in the quality of fast-water habitats and will temporarily favour the creation of grass beds, as observed in 2018 upstream of the SSL Nuns' Island jetty (section 3.2.2.1 in Volume 1). Habitat changes are likely to benefit species that more particularly use calm water habitats, such as the northern pike, the yellow perch, the smallmouth bass and the largemouth bass. Many of these species are also valued. After the dismantling of the jetties, the natural current conditions will be restored and the sediments accumulated during the work will probably be carried downstream, in natural sedimentation sectors.

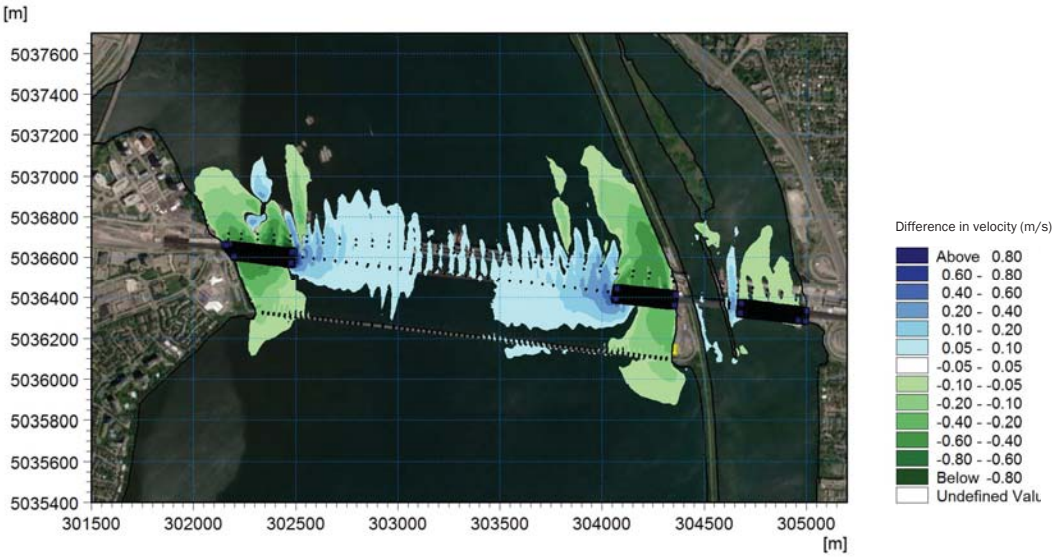
6.2.1.1.3.2 Water levels

Figure 45 is presented similarly to Figure 44, but this time for water levels[2]. Differences of ±0.02 m are considered negligible and are not represented.

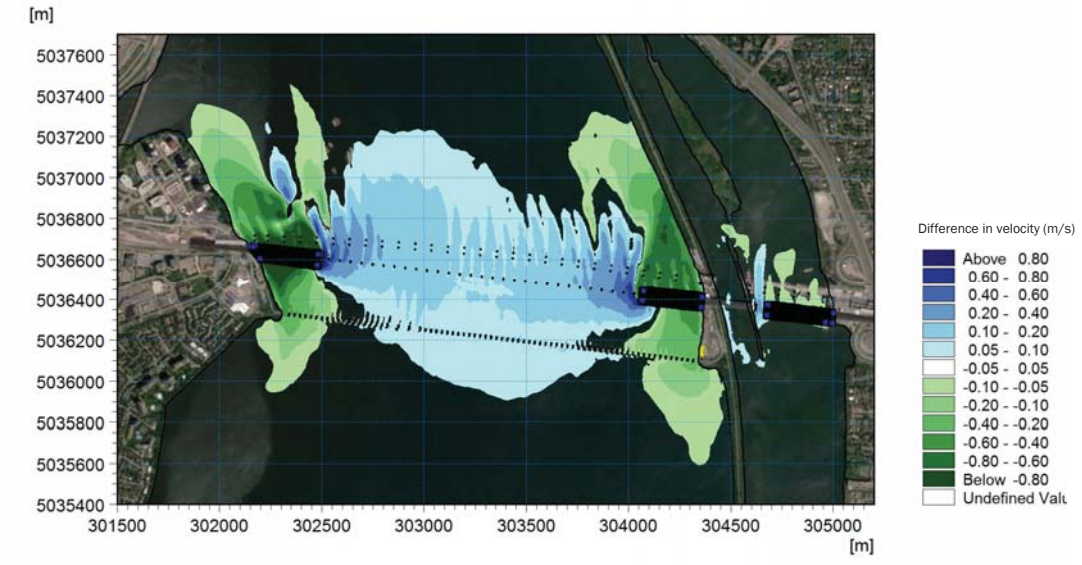
Downstream of the jetties, besides the areas located directly in the wake of the jetties, no changes can be seen in the three modelled scenarios. Upstream, the effect of the jetties on water levels increases with the flow rate. Hence, in low flow, the increases in level are localized and below 0.03 m upstream of the Ice Control Structure. For the two flood flows, the increases in level extend across the Greater La Prairie Basin, but the maximum values that are attained are low, i.e. roughly 0.04 m and 0.06 m for the 1:2-year and 1:100-year floods, respectively. Given the natural variability of the levels recorded at hydrometric station 020A041 located in the study area (see Figure 2.6 in Appendix 13), these differences can be considered negligible.

The greatest variations in water level will be noted near the Nuns' Island jetty. The water depth at that location is mostly under 2 m. Therefore, the variations in water level near this jetty will be roughly 10%, a variation of 2 to 20 cm more upstream and less downstream of the jetty.

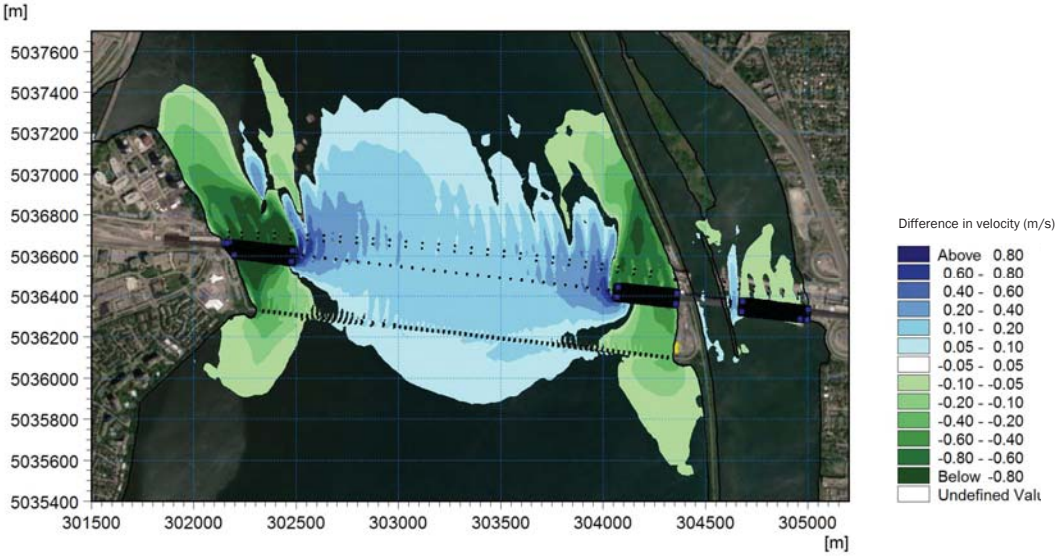
[2] Contrary to the velocities, a general view of the water levels is not presented because the changes created by the jetties are not very visible.



a) Low flow $Q_{2\text{-}7}$ of 6,895 m³/s

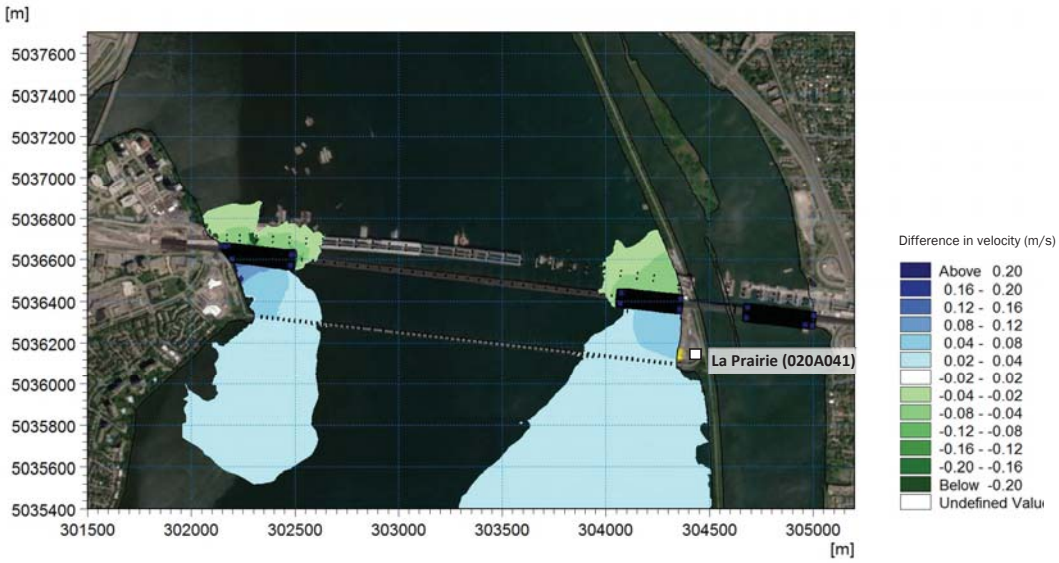


b) Flood flow (1:2-year flood) of 11,325 m³/s

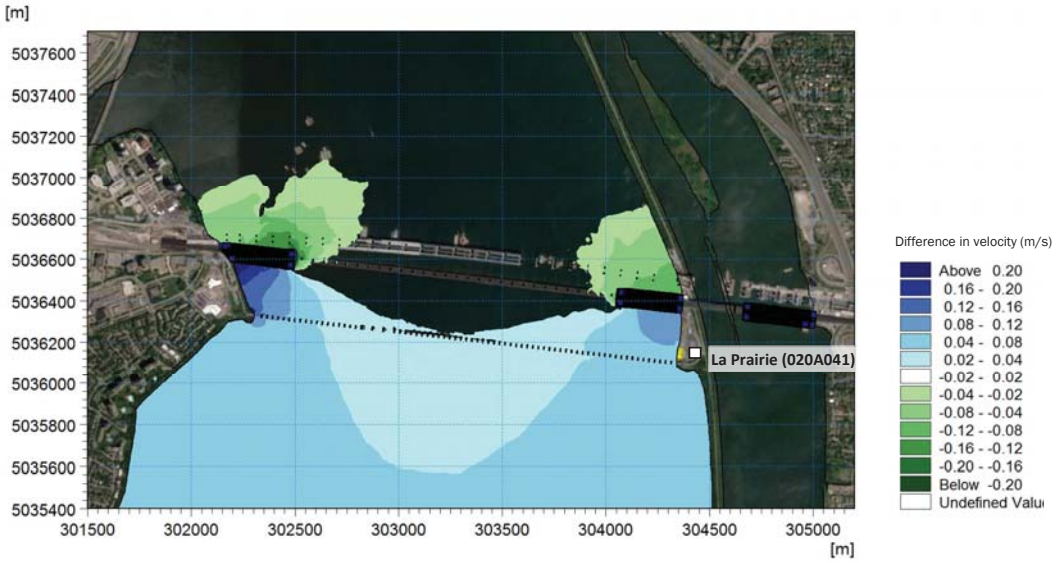


c) Flood flow (1:100-year flood) of 13,260 m³/s

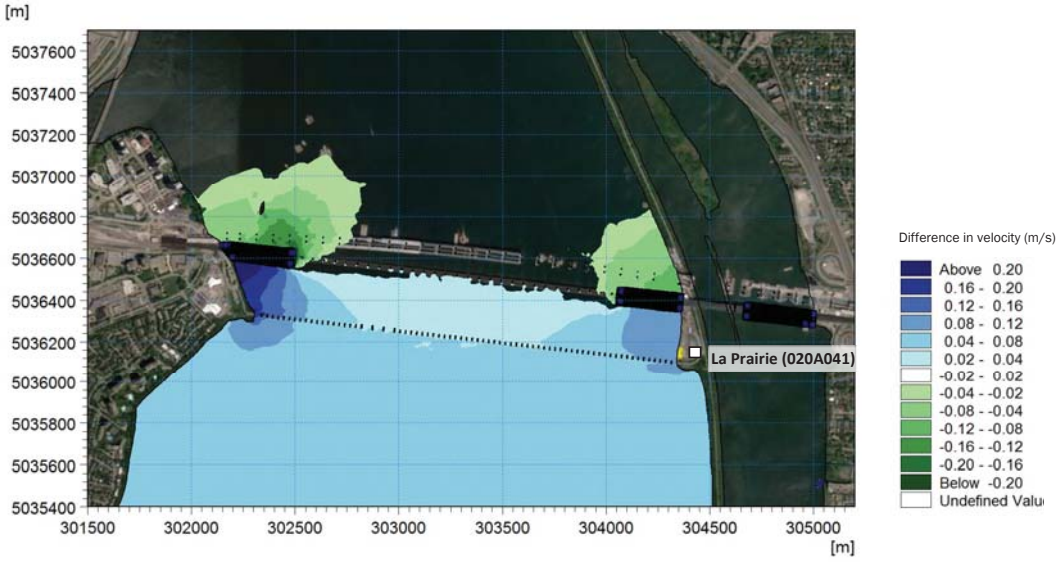
Figure 44 – Differences in velocity caused by the presence of deconstruction jetties



a) Low flow $Q_{2\text{-}7}$ of 6,895 m³/s



b) Flood flow (1:2-year flood) of 11,325 m³/s



c) Flood flow (1:100-year flood) of 13,260 m³/s

Figure 45 – Differences in level caused by the presence of deconstruction jetties

The impact in the change in water level will be similar to what was observed with the SSL jetty, namely, a temporary and localized change in the type of fish habitat (Map 9 in Volume 1). Once the jetties have been removed at the end of the work, water levels and flow velocities should return to roughly what was characterized in 2012.

6.2.1.2 Hydraulic impact of jetties on the SSL fish habitat development

SSL intends to implement a compensatory development for fish habitat losses related to the construction of the New Champlain Bridge. The compensation project is located immediately upstream of the Existing Champlain Bridge (black boundaries on Figure 46). The period for carrying out the development has still not yet been determined, but it is likely that it will be done before or during the deconstruction of the Existing Champlain Bridge.

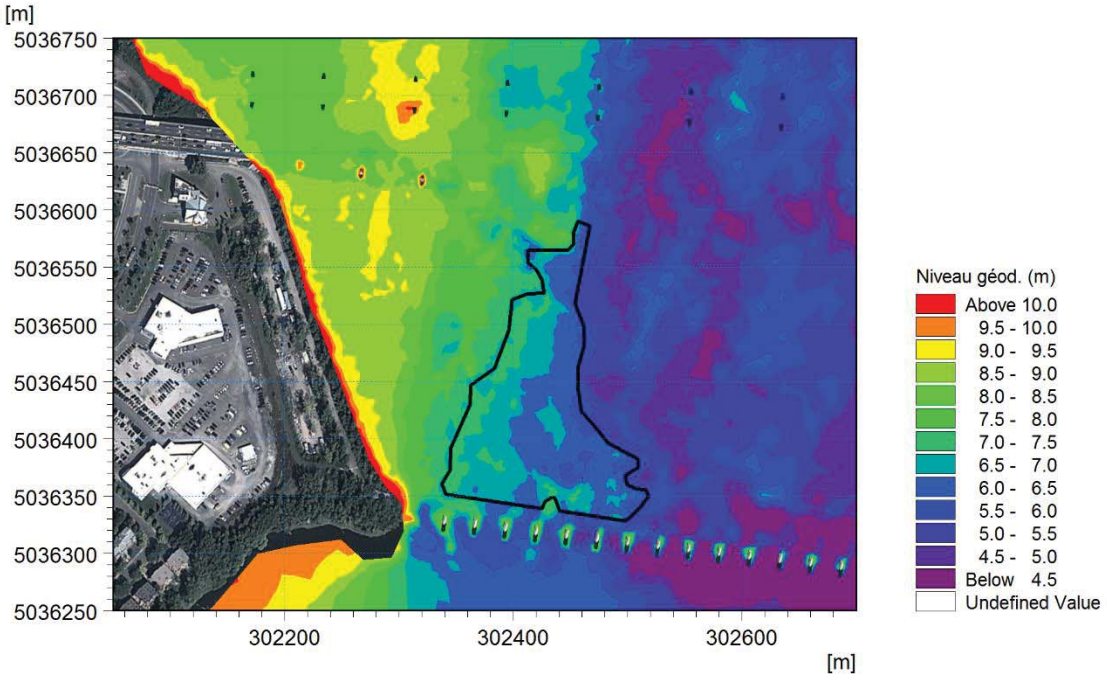


Figure 46 - Bathymetry and location of SSL development

To analyze flow conditions in the compensatory development area, the model's bathymetry was modified to integrate that of the development (riverbed raised by about 50 cm by adding various materials) and two scenarios have been modelled: (1) Low flow $Q_{2\text{-}7}$ (6,895 m³/s) and (2) average 2-year flow (9,325 m³/s). Note that the final development may be slightly modified since the downstream end of the development is located under the future deconstruction jetty on the Nuns' Island side.

Figures 44 and 45 show the differences in flow velocity and water levels generated by the presence of the jetties in the study area, including the SSL development area.

Figure 47 compares the simulated velocity fields and water levels in the developed area, with the deconstruction jetties, for the two flow rates under study.

As previously mentioned, the proposed jetty on the Nuns' Island side has a localized impact on the flow conditions of the St. Lawrence River. There is a reduction in flow velocities upstream of the jetty that is partially felt in the SSL development area. On average, the simulated decrease in velocities in

the SSL development area is 0.1 m/s for low flow (Figure 47a), and 0.15 to 0.20 m/s for the average 2-year flow (Figures 47b).

In terms of flow depths, the west jetty creates a slight increase in water levels in the SSL development area. For low flow (Figures 47c and 47d), the water level increase is 2 cm on average, and for the average 2-year flow (Figure 47d), it is 5 cm on average.

The effects of the jetty on SSL development are minimal. The modelled current velocities (0.6 to 1.2 m/s) in the presence of the jetty always meet the MPO criterion (0.5 to 1.5 m/s). In terms of depth, the average increase in water level of 5 cm above the compensatory development is not expected to have a significant impact on the managed spawning ground.

6.2.1.3 Hydraulic impact following deconstruction

Once the Existing Champlain Bridge has been deconstructed, some piers and footings could remain in place. The hydraulic simulations related to this situation have targeted certain areas of interest, namely, the conditions related to the SSL compensatory development as well as conditions at the two docks (Estacade and Brossard docks), which will be partially dismantled to recreate habitats that will be used for compensation projects for bridge deconstruction. The latter were used to develop the compensation project designs, which are found in Section 6.4.2.

6.2.1.3.1 Hydraulic impact on the SSL fish habitat development

Table 55 provides the minimum, average and maximum flow velocities and depths modelled over the SSL development.

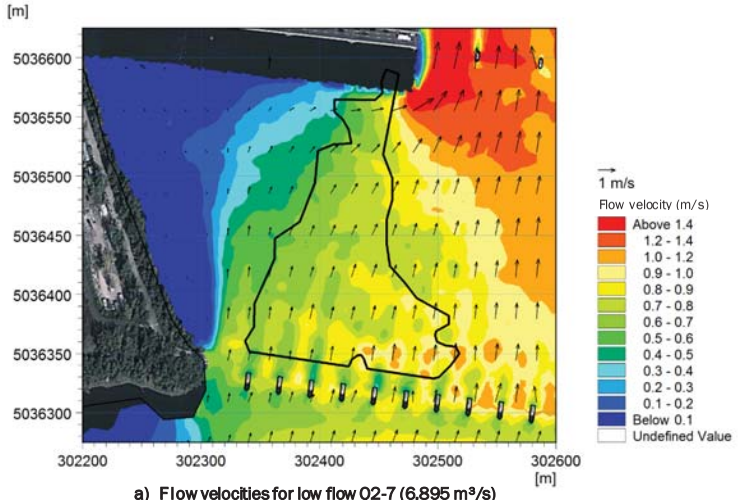
Figure 48 shows the modelling results obtained for low flow $Q_{2,7}$ (6,895 m³/s) and the average 2-year flow (9,325 m³/s). The results are presented in terms of flow velocity and water level for each flow rate. The development perimeter is delineated in black on each figure.

For low flow $Q_{2,7}$, the flow velocities are from 0.6 m/s to 1.2 m/s, with an average value of 0.9 m/s. For the average 2-year flow, the range of simulated velocities is 0.8 to 1.4 m/s, with an average of 1.0 m/s.

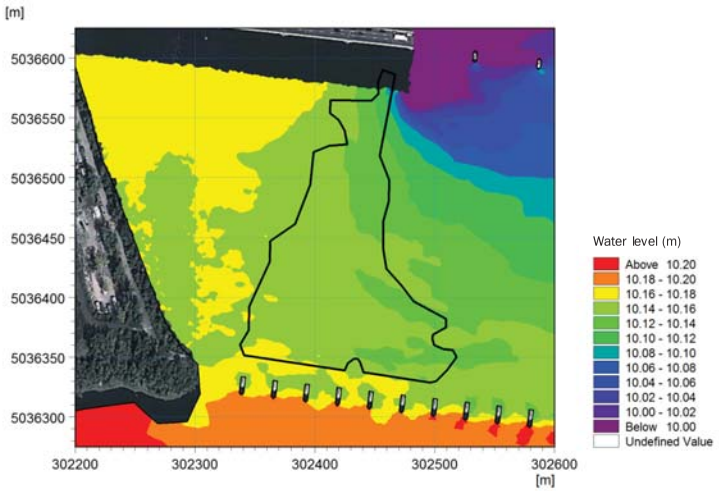
Flow depths range from 2.1 to 4.1 m for low flow and 2.7 to 4.8 m for average flow. The average values are 3.0 and 3.6 m, respectively.

Table 55 - SSL Development – Flow velocities and depths

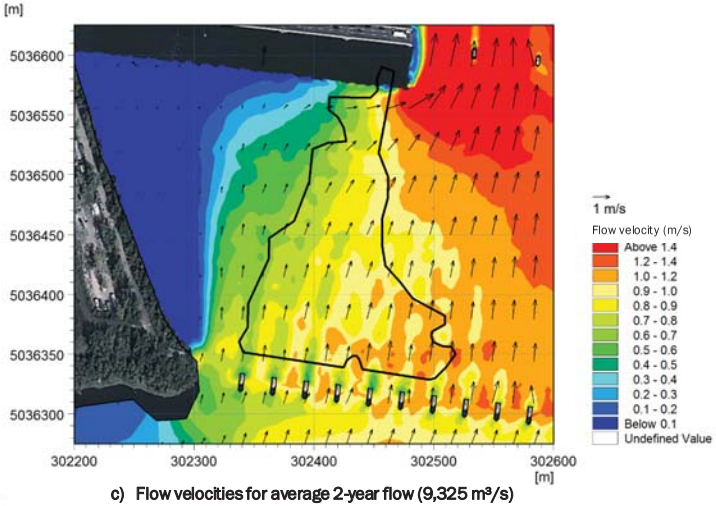
FLOW	VELOCITY (M/S)		DEPTH (M)	
$Q_{2,7}$ (6,895 m³/s)	Minimum	0.6	Minimum	2.1
	Average	0.9	Average	3.0
	Maximum	1.2	Maximum	4.1
$Q_{2,moy}$ (9,325 m³/s)	Minimum	0.8	Minimum	2.7
	Average	1.0	Average	3.6
	Maximum	1.4	Maximum	4.8



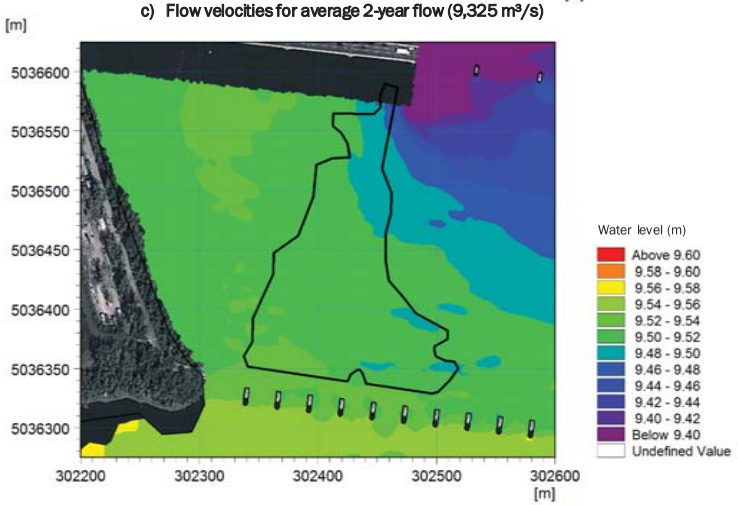
a) Flow velocities for low flow Q2-7 (6,895 m³/s)



b) Flow depths for low flow Q2-7 (6,895 m³/s)

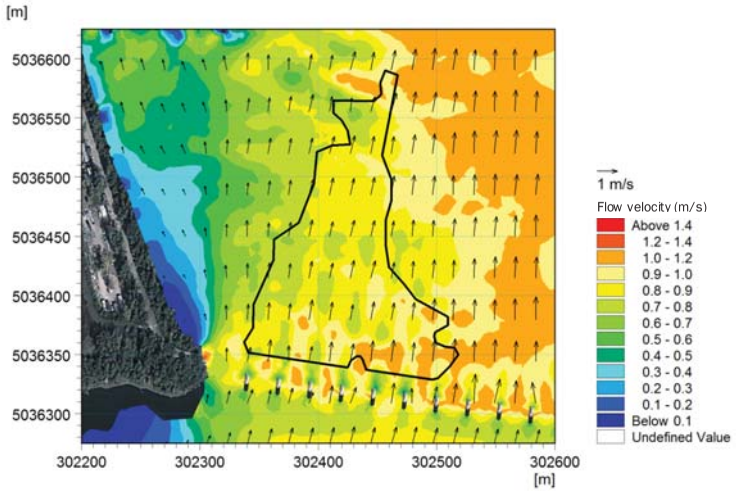


c) Flow velocities for average 2-year flow (9,325 m³/s)

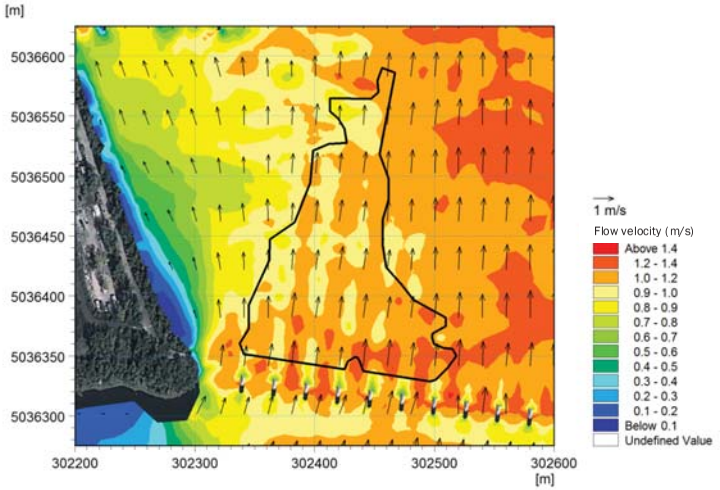


d) Flow depths for average 2-year flow (9,325 m³/s)

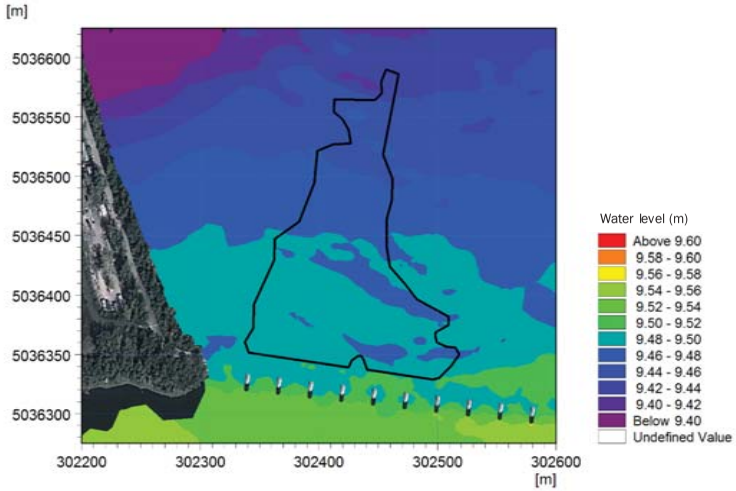
Figure 47 - SSL developments – Flow velocities and water level for low flow Q2,7 and average 2-year flow with deconstruction jetties



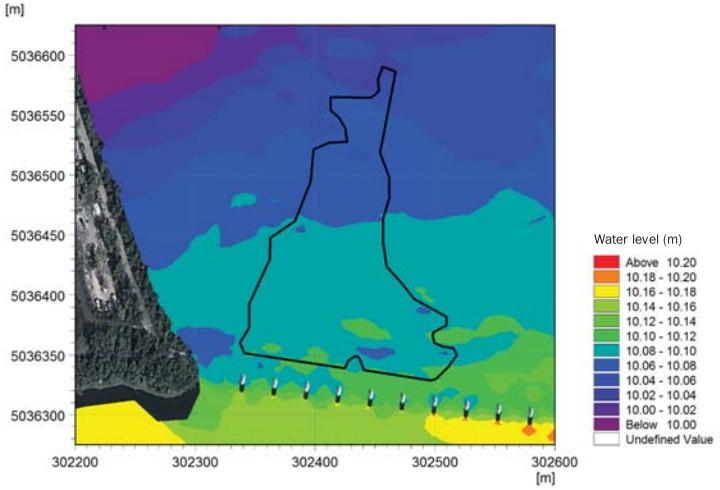
a) Flow velocities for low flow $Q_{2\text{-}7}$ (6,895 m³/s)



b) Flow velocities for average 2-year flow (9,325 m³/s)



c) Flow depths for low flow Q2-7 (6,895 m³/s)



d) Flow depths for average 2-year flow (9,325 m³/s)

Figure 48 - SSL developments – Flow velocities and water level for low flow Q2,7 and average 2-year flow (after deconstruction of the Existing Champlain Bridge)

6.2.2 DESCRIPTION OF EFFECTS – TRAFFIC

Transportation of materials is a major activity in the deconstruction of the Existing Champlain Bridge, and traffic effects are complex and require special analysis. It must be flexible and allow materials to be transported to reclamation sites with minimum disruption to residents and traffic.

The way the materials will be transported is subject to the methods and sequences that will be chosen for the deconstruction of the various sections of the Existing Champlain Bridge, the type of reclamation that will be favoured, and the destinations selected for materials recovery. Mobilization/demobilization of the three jetties must also be considered, since a large volume of materials is involved that must be moved over a short period of time.

The following points are therefore factors that will directly influence the method used for transporting the materials:

- The methods used for the deconstruction and removal of bridge components;
- Mobilization and demobilization of jetty materials;
- Possible access to the different parts of the bridge during demolition work;
- Type and location of materials reclamation (recovery, recycling);
- Inconveniences for nearby residents.

For the mobilization and demobilization of the three jetties, the origin and destination of the materials still needs to be determined. However, some of the materials from the jetties built for the New Champlain Bridge may be reused to minimize truck travel.

The following characteristics must be taken into account in relation to transportation:

- Size and weight of materials being transported;
- Location (work areas) required for handling the materials;
- The structural capacity of the Ice Control Structure for materials transport;
- Load restrictions related to the road network and in particular the New Champlain Bridge, Ice Control Structure, and metropolitan area bridges;
- Limitations (size and load) of trucks;
- Capacity of road network to absorb an additional volume of trucks (congestion);
- The presence of major disruptions already present on the road network;
- Schedules to follow to avoid creating inconveniences for residents;
- Location of intermediate processing sites.

For the purposes of the TEA, the highest impact scenario, i.e. two years of work, was used and the chosen mode of transport is the truck (highest impact scenario). Note that scenarios are being studied regarding the duration of the deconstruction work, which should be two or three years. The duration of the work will have an impact on the rate at which the materials being transported are generated and incidentally on the generation of movement associated with truck traffic. For the purposes of the TEA, the scenario with the greatest impact, i.e. two years of work, was used. These trucks will travel from the deconstruction work sites to the reclamation/storage site and will come back empty.

6.2.2.1 Hypotheses

6.2.2.1.1 Materials being transported

As described in the draft design for the deconstruction of the Existing Champlain Bridge, the materials to be transported will mainly consist of the following:

- Steel from sections of the full structure, parts that have been dismantled or cut, modular trusses and truss systems, the frame of concrete sections and prestressing cables in the deck;
- Concrete from girders, concrete covered with CFRP, pieces of concrete and crushed concrete from slabs and piers;
- Mobilization and demobilization materials from the three jetties on Nuns' Island (IDS), Brossard and the St. Lawrence Seaway dike;
- Other materials such as lights, asphalt concrete, electrical boxes, the signalling system, wiring, the structural monitoring system, etc.

The assessment more specifically deals with transportation of the first three types, given their relative significance, in terms of quantity.

For the purposes of this assessment, the total quantity of materials to be transported originating from the bridge is determined based on a load of 275,000 t, including 250,000 t of concrete and 25,000 t of steel (metal spans, trusses, reinforcing steel).

In addition to this are the materials required to build the three jetties. The estimated quantities are roughly:

- 133,400 tonnes for the Nuns' Island jetty;
- 183,300 tonnes for the Seaway dike jetty;
- 133,100 tonnes for the Brossard jetty.

6.2.2.1.2 Road transport

Road transport consists in using various trailers based on the type of materials and their size. The use of road transport allows the materials to be removed from the deconstruction work area quickly and continuously based on the transportation infrastructures located near the site.

Transportation by truck has the advantage of being extremely flexible and of being able to reach virtually all the regional reclamation sites. It enables transport directly from the point of origin to the final destination without any change in method. It can also easily tailor supply (capacity) to demand. However, the use of trucks transfers a significant portion of the costs to the public since it uses subsidized public infrastructures at a low cost. The use of trucks can also cause certain inconveniences based on the level of traffic, such as noise, dust, and an impact on road surfaces. Specific measures can be taken to mitigate some of these inconveniences. More details in this respect can be found in sections 6.2.3 and 6.2.4.

The use of barges for some components could allow the number of trucks to be reduced. However, since the assessment deals with the scenario with the greater impact, it is assumed that all the transportation will be done by truck. Use of barges by the contractor would automatically reduce the impact described in this section.

6.2.2.1.3 Trucking network

Figure presents the trucking network, which largely corresponds to the road network. The green sections represent the transit network, which trucks may use without any restrictions. Some restrictions may apply to Nuns' Island given the local network characteristics.

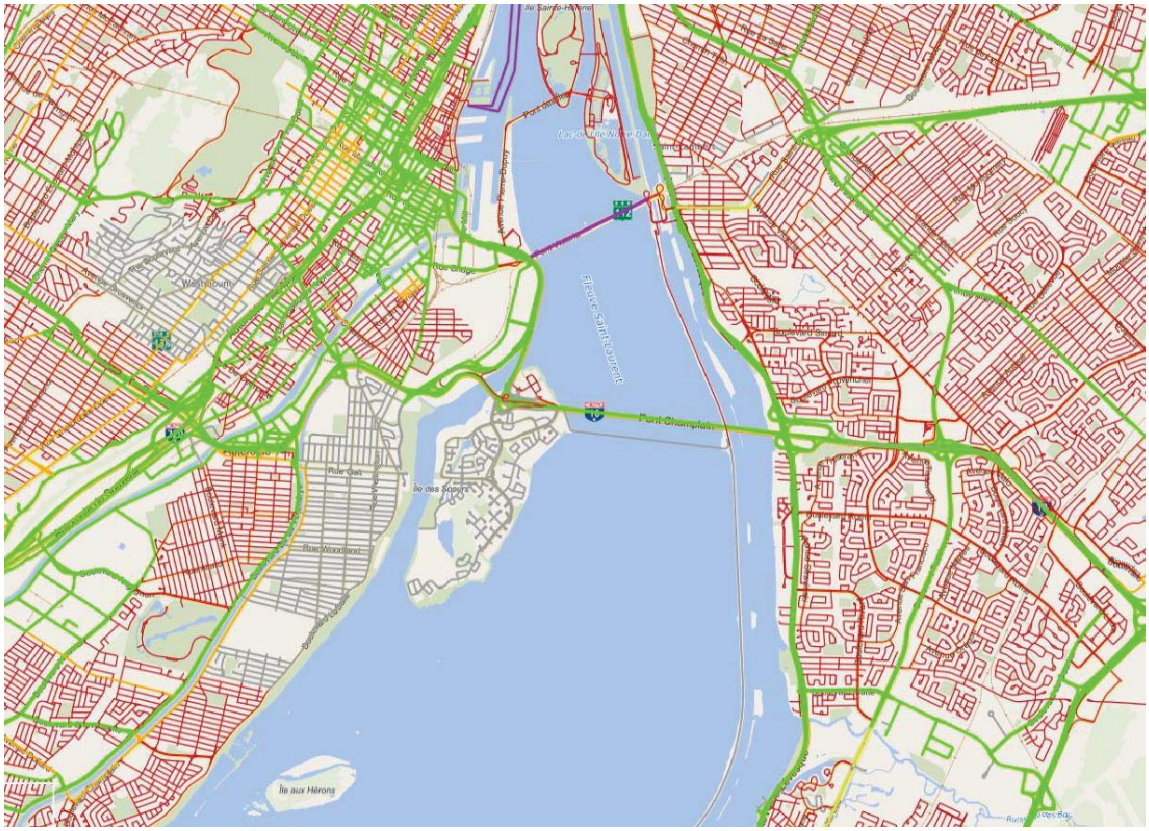


Figure 49 - Trucking network under the MTQ's jurisdiction

6.2.2.1.4 Road network capacity in the metropolitan area

The Existing Champlain Bridge is located in the middle of a road network characterized by high traffic. The metropolitan area thoroughfares represent constraints at rush hour, given the recurring congestion.

In fact, very high annual average daily traffic (AADT) can be observed on several sections of highway around the Existing Champlain Bridge. An overview of the AADT in 2017 is presented in Table 56. Trucks generally account for close to 10% of the traffic on these major thoroughfares.

In addition, during the period of time when deconstruction work will take place on the Existing Champlain Bridge, major work is being planned in the Louis-H.-La Fontaine Tunnel, which could have the effect of altering the traffic patterns that are currently observed. It will be more difficult to cross the St. Lawrence during this time. In addition, there may be new major work sites, including one at the Honoré-Mercier Bridge.

Table 56 - 2017 AADT

MAXIMUM TRAFFIC OBSERVED (2017)	
SECTION	**AADT**
A-40 (between the Décarie Expressway and Highway 15)	208,000
Décarie Expressway	188,000
A-20 (between the Turcot Interchange and St-Pierre)	139,000
A-15 (between Nuns' Island and the Turcot Interchange)	100,000
Louis-H.-Lafontaine Tunnel	124,000
Highway 132 (between the Existing Champlain Bridge and Victoria Bridge)	91,000
A-15 (south of the Existing Champlain Bridge)	68,000
A-10 (west of Highway 30)	81,000
A-30 (between Highway 10 and Highway 20)	81,000
Route 112-116 (between Highway 30 and Route 134)	75,000
A-20 (east of Highway 30)	91,000
A-15 (between Metropolitan Boulevard and Rivière des Prairies)	196,000
A-40 (between Décarie and Highway 25)	182,000
A-40 (between Highway 25 and the Charles-de-Gaulle Bridge)	143,000

The New Champlain Bridge will present an advantage for truck traffic compared to the current situation. In fact, the New Bridge will have three traffic lines in each direction operating at all times during business hours, which is not currently the case. Thus, the recurring congestion caused by the reserved bus lane both in the morning and the afternoon should be reduced, which should improve traffic conditions, depending on future actual demand.

If the trucks transporting deconstruction materials are stuck in traffic, transportation efficiency, costs and the environment will be significantly impacted. Note that the road networks in question are congested and that any added volume (especially heavy vehicles with low acceleration) automatically degrades the level of service, increases travel times for all users, and extends the rush hours at both ends. To make the transportation of the materials by truck as efficient as possible, transport needs to take place outside of the busiest times of the day while minimizing impacts on local residents.

Looking at the breakdown of hourly traffic in Figure , transportation would be easier between 7 p.m. and 5 a.m. However, it may be possible to have materials transported between 10 a.m. and 3 p.m. on certain thoroughfares. In fact, there is a decrease in hourly traffic between the morning and afternoon rush hours. Trucks could then travel on the road network during this time, under certain conditions and on certain routes.

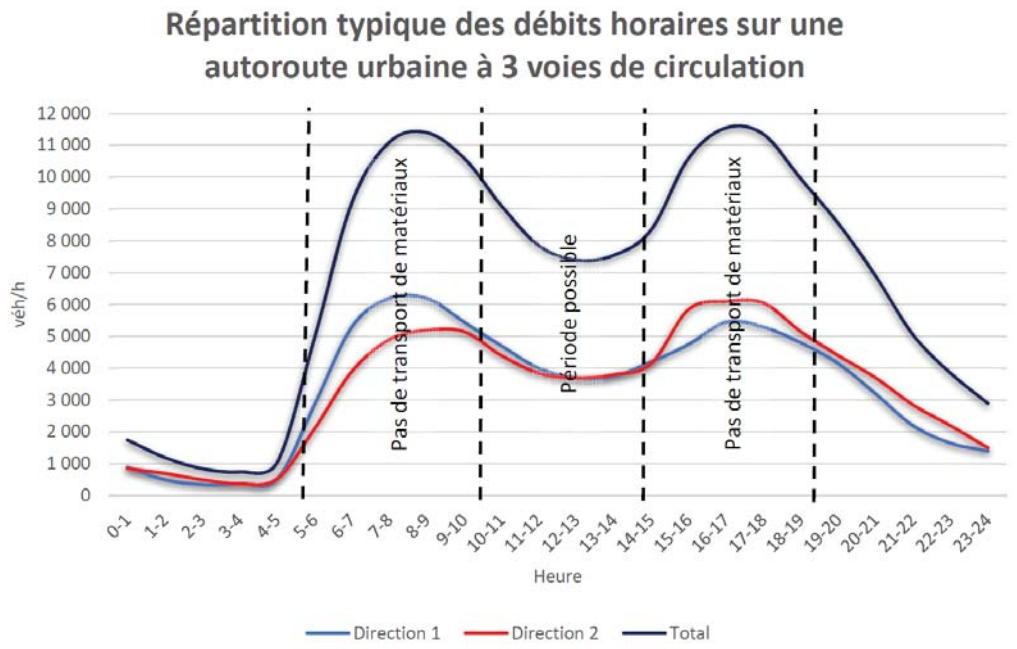


Figure 50 - Level of congestion in the afternoon – road network around the Existing Champlain Bridge

Figure shows the typical level of congestion on a business day on the road network next to the Existing Champlain Bridge in late afternoon. The gradation level is from green to red. The approaches to the Existing Champlain Bridge are seen to be congestion, on both the south-bound and the north-bound sides. The congestion noted on the South Shore is caused by the reserved bus lane. However, as mentioned, with the New Champlain Bridge, this reserved lane will be separate from the traffic lanes.

Source: https://www.toutmontreal.com/avoir/circulation.html

Figure 51 - Level of congestion in the afternoon – road network around the Existing Champlain Bridge

In addition, it is important to take into account that deconstruction work on the Existing Champlain Bridge will take place at the same time as major repair work on the Louis-H.-La Fontaine Tunnel as well as possibly major work on the Honoré-Mercier Bridge, which may alter traffic patterns between Montreal and the South Shore.

6.2.2.1.5 Road transportation equipment

The types of trailers that are currently found can vary widely depending on the materials being transported. For bulk materials (concrete pieces or crushed concrete), dump trailers could be used. However, pieces and parts that will be dismantled into long or non-standard pieces, both steel and concrete, will require the use of flatbed trucks. Extendable trailers could be used to transport parts of a non-standard size.

Special vehicles will have to be used to transport very large pieces (Photo 22). This type of trailer requires a road escort and could justify disruptions or complete lane closures at specific times and for brief periods for safety reasons. In addition, these vehicles cannot travel on the road at any time of the day, and it is highly unlikely that such loads can use the New Champlain Bridge.

Photo 22 - Transporting large pieces

6.2.2.1.6 Bridge deconstruction work

The estimated number of trucks is based on the use of the following vehicles:

- Dump trucks (with a strap) with an index of 37 metric tonnes for the payload;
- Flatbed trucks with an index of 34 metric tonnes;
- Three-axle trailers that can normally carry a 30,900-kg and 26,400-kg load during the thaw season.

Given the volume of materials to be transported, the number of trucks required to make trips to the reclamation centres is estimated at about 7,500 using 37- and 34-tonne trucks (draft design report), and about 8,900 for 30.9-tonne three-axle trailers (new model being considered).

Table 57 - Number of trailers

TYPE OF TRAILER	PAYLOAD (TONNES)	PRODUCTS (TONNES)	NUMBER OF TRUCKS (ROUNDED OFF)
Dump trailer	37	250,000	7,500
Flatbed truck	34	25,000	
Three-axle trailer	30.9	275,000	8,900

The contractor will decide on the type of truck being used. For the purposes of this assessment, and to determine the maximum number of trucks per day, the following assumptions are used:

- Three-axle trailer with a capacity of 30.9 tonnes;
- Duration of work: 24 months (52x2 weeks);
- Four weeks off a year;
- Five days of transport per week;
- Number of days of transport: 96 weeks x 5: 480 days.

The average number of trucks per day would be 8,900 / 480 = 19 trucks.

Given that transport will not be evenly spread out for the duration of the work (more intense during pier demolition), a 30% increase is applied to determine a maximum number of 25 trucks per day.

Given the materials to be transported based on the mobilization areas at the work site, the following breakdowns are obtained:

- 75% of materials will pass through Nuns' Island (IDS and dike areas): 19 trucks per day;
- 25% of materials will pass through Brossard: 6 trucks per day.

It must also be taken into account that the trucks will be making return trips and coming back empty from the reclamation site. Therefore, the total number of trips on public roads would be doubled. Table 58 presents a summary for the Nuns' Island and Brossard areas.

Table 58 - Number of trucks

TRAILER	TOTAL	NUNS' ISLAND AREA	BROSSARD AREA
Average number of trailers per day	19	14	5
Average number of **trips** per day	38	28	10
Marked-up number of trailers (30%)	25	19	6
Marked-up number of **trips** per day	50	38	12

6.2.2.1.7 Jetty mobilization and demobilization

The number of trucks for transporting jetty materials was estimated on the basis of three-axle tractor trailers with a capacity of 30.9 tonnes (Table 59), as for the deconstruction of the bridge. An assumption that work would last four months for mobilization and four months for demobilization was retained for the estimated number of trucks per day. During this period, work would be done on business days only, on the basis of 22 days per months.

The worst-case scenario is considered for the purposes of the assessment, namely that the contractor must bring in all the jetty materials and that no materials from the SSL jetties are recovered.

Table 59 - Number of trucks for jetty construction (4 months)

JETTY	TONNE	TOTAL NUMBER OF TRUCKS	NUMBER OF TRUCKS PER DAY (RETURN TRIP) (4 months)
Nuns' Island	133,400	4,318	99
Dike	183,300	5,933	135
Brossard	134,100	4,340	99
Total	450,800	14,591	333

The number of trucks per day is much higher than for bridge deconstruction because of the duration of these activities. In fact, jetty mobilization and demobilization activities have to be completed over a short period of time before and after bridge deconstruction work.

For the purposes of the study, it can be assumed that only trucks transporting materials from the Nuns' Island and dike jetties will partially use Nuns' Island on the local road network and the New Champlain Bridge. Given that the Nuns' Island and dike jetties are built at the same time, this represents about 234 trucks per day. The trucks used for work on the Brossard jetty should remain on the South Shore and will not be using the local road network (99 trucks per day).

The pace of jetty mobilization and demobilization work can be stepped up by increasing the number of trucks per day. However, the associated environmental impacts (noise, dust, etc.) must be taken into account. As comparison, construction work on the current Nuns' Island jetty (New Champlain Bridge) resulted in the use of 350 trucks per day for 3 to 4 months.

Various scenarios are also possible if the contractor does not carry out the mobilization and demobilization work on the different jetties at the same time. For the purposes of the study, the four-month scenario with simultaneous construction of the Nuns' Island and dike jetties is retained, with round-the-clock transport on business days. For the Brossard jetty, the transport of materials should not affect Nuns' Island and work can be done at the same time as the other jetties or not. Note that jetty demobilization will also last four months upon completion of bridge deconstruction work.

6.2.2.1.8 Routes and constraints

The previous section served to determine the number of trucks that will be required during jetty mobilization and demobilization as well as during bridge deconstruction work. Therefore, three situations need to be considered: more traffic over a short period of time (jetty construction), less traffic, but over a much longer time period (bridge deconstruction), and more traffic for another short period for jetty demobilization.

Locally, removal by truck of deconstruction-related debris and materials from the Existing Champlain Bridge will be done from both ends, i.e. Nuns' Island and Brossard. Transportation from the St. Lawrence Seaway dike will likely be done via the Ice Control Structure.

It can also be assumed that the steel parts will be transported to the South Shore without returning to the Island of Montreal, given that the steel structure is located there.

6.2.2.1.8.1 Nuns' Island

Truck routes

As shown on Figure , there is a work and mobilization area near and on Nuns' Island. It includes the New Champlain Bridge work site (red hatching) as well as the work site for the deconstruction of the Existing Champlain Bridge (in blue).

For bridge deconstruction, the materials removed from the area will have to be transported using a route on the Island of Montreal or toward the South Shore. For jetty demobilization, trucks transporting materials will have to go to the South Shore. Note that work on the REM rapid transit system near the work site may have an impact on the situation. This is an additional work site that may affect work and that will have to be taken into account (cumulative effects).

Figure 52 - Nuns' Island work area

At the west exit of the Ice Control Structure on the Nuns' Island side, the New Champlain Bridge can be accessed toward the South Shore or Highway 15 to the north.

To get to the South Shore, trucks must use the onramps to the New Champlain Bridge or Boulevard René-Lévesque and Boulevard de L'Île-des-Soeurs. The blue route on Figure 53 should be favoured. It corresponds to the onramp to the New Champlain Bridge. The other two routes in red should be reserved for exceptional cases (e.g. work on Boulevard René-Lévesque). In fact, both work on the REM rapid transit system and the deconstruction of the Existing Champlain Bridge could result in temporary closures of the onramp shown in blue.

Figure 53 - Truck routes on Nuns' Island, south sector

To access Highway 15 north, trucks will need to use the north side of Nuns' Island via Boulevard René-Lévesque and the traffic circle, as shown on Figure 54 (in yellow).

In the event that Boulevard René-Lévesque is closed under the Existing Bridge, other routes (in red) are available. One of these potential routes (red dotted line) is through a residential neighbourhood and should not be retained.

Figure 54 - Routes on Nuns' Island, north sector

The trucks should return empty using other routes, depending on where they came from: trucks coming from either the South Shore or Highway 15 that will be using the local road network to access the Ice Control Structure.

Figure 55 and Figure respectively show the routes for trucks coming from the north and south.

Figure 55 - Route on Nuns' Island for trucks coming from the north

Once again, for trucks coming from the north via Highway 15, the dotted line route should not be used.

Figure 56 - Routes on Nuns' Island for trucks coming from the South Shore

There are two possible routes for trucks coming from the South Shore. In fact, from the traffic circle, trucks can take Boulevard de la Pointe Nord and Rue Jacques-le-Ber, or heard toward Boulevard de l'Île-des-Soeurs. The first route is much shorter and is preferred. However, the route with the solid red line may have to be taken when Boulevard René-Lévesque is closed under the Existing Champlain Bridge.

Disruptions and mitigation measures

During the deconstruction of the Existing Bridge, the section of Boulevard René-Lévesque under the bridge will have to be temporarily closed. In addition, for work on the REM rapid transit system, the southbound onramp to the New Champlain Bridge from the eastern tip of Nuns' Island may have to be closed for a certain time.

The number and duration of these closures will have to be limited as much as possible, especially for Boulevard René-Lévesque, and a detour will have to be created. Ideally, the transportation of materials will have to be limited during these closures as the detour routes are much longer. These closures should ideally either take place at night or over one weekend. This should create minimal impacts on the transportation of materials.

Lastly, signallers should be present to manage truck traffic at the work site. Based on the type of truck used, the pavement should be widened at some locations. The trucks need enough room to enter and leave the Ice Control Structure.

6.2.2.1.8.2 Brossard

On the Brossard side, there is already a work area for the construction of the New Champlain Bridge, which will be recovered in part for the deconstruction, as shown on Figure .

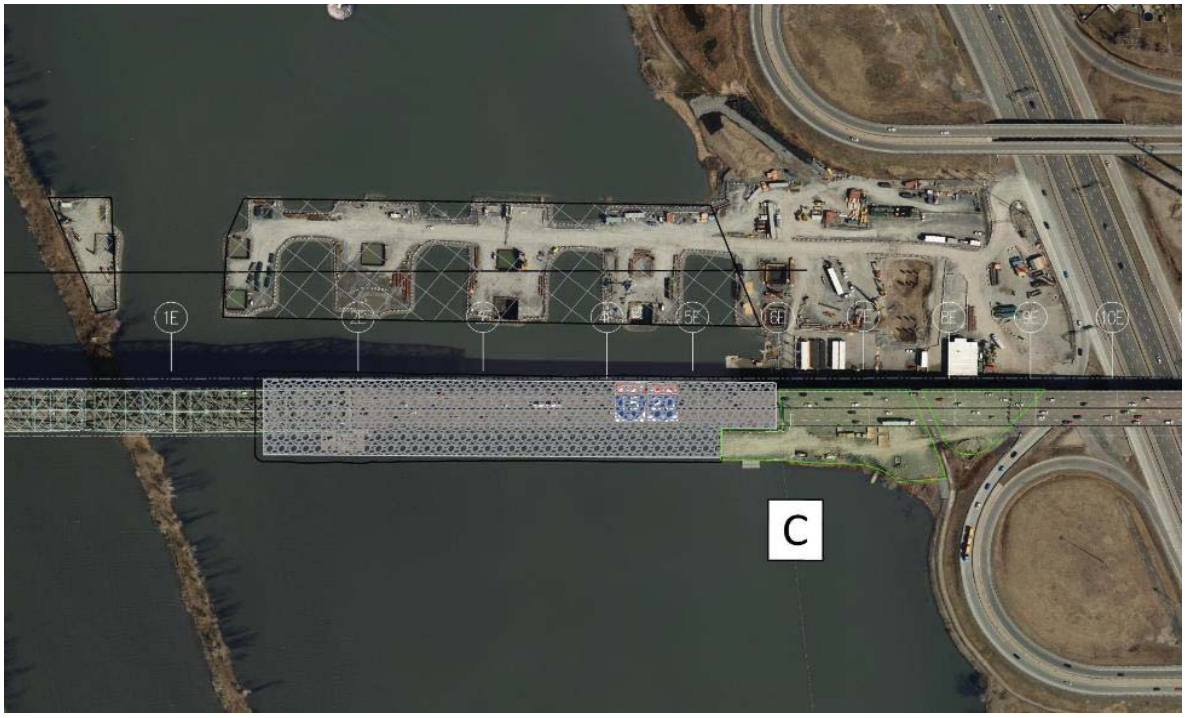


Figure 57 - Work area on the South Shore

For purposes of deconstruction work on the Existing Champlain Bridge, the work area is modified since the work space will be across from the Existing Bridge. The current access to the New Bridge work area could be used, as shown on Figure . It is located about mid-way from an onramp and an offramp on the Highway 132 West service road.

Truck routes

The only way to access the site is to take Highway 132 West and use the service road (Boulevard Marie-Victorin). Since the service road is one-way, access to the area is more complicated and involves much longer routes for trucks, depending on where they are coming from. From this work area, trucks will use the different highway onramps.

Figure 58 - Work area north of Highway 132

For this work area, trucks will not take any roads under municipal jurisdiction but rather highway ramps which trucks are already taking.

There is also a work area south of Highway 132 (in the Highway 10 corridor) for the deconstruction of the Champlain Bridge approaches (in blue on Figure). The main access is also through a one-way service road on Highway 132 East. The length of the trucks' return-trip routes can vary depending on where the trucks are coming from. Another possible access would be from the onramp to the New Champlain Bridge toward Highway 132 East from Montreal.

From this work area, trucks could travel to Highway 132 East (red route) or take the New Champlain Bridge (yellow route).

Figure 59 - Work area south of Highway 132

Similarly, for this work area, trucks will not take any roads under municipal jurisdiction but rather highway ramps which trucks are already taking.

Disruptions and mitigation measures

During the deconstruction of the Champlain Bridge, there will be Highway 132 and service road (Boulevard Marie-Victorin) closures. The number and duration of these closures will have to be limited as much as possible and detours will have to be created. However, given the importance of these thoroughfares, they cannot remain closed for very long (overnight or on the weekend).

During the closures, transportation of materials will have to be restricted. Since these are short-term closures, the impact on the transportation of materials should be minimal.

Long-term disruptions may be required for the deconstruction of the bridge piers. No lanes will be closed, although lane widths may be reduced.

Signallers should be present to manage truck traffic at work sites. Based on the type of truck used, the pavement should be widened at some locations.

Lastly, speeds should be reduced on service roads near the work site.

6.2.2.2 Potential impact on traffic

The road network around the Champlain Bridge is heavily used. In fact, daily traffic volume is very high and high hourly volumes are also noted, as shown on Table 56. However, the number of potential trucks on the highway network in relation to total traffic remains low. This is in addition to existing truck traffic, which makes up 10% of total traffic.

On this road network, the potential impact on traffic is not so much the number of trucks per day but rather the trucks' characteristics (slow acceleration given their load), thereby slowing down traffic even more when there is congestion.

On Nuns' Island, not all of the municipal roads are capable of handling a large number of trucks. Some routes are preferable over others. In addition, inconveniences such as noise, dust and dirt on roads must be taken into account and mitigation measures implemented. This will especially apply during jetty mobilization and demobilization given that daily truck traffic will be higher than during bridge deconstruction work and that the trucks will be operating around the clock.

Given that not all of the parameters are known for the time being, the first action required by the contractor, depending on its projected work schedule and the time of year when it will begin building the jetties, will be to prepare a traffic management plan that shows the roads to take, disruptions, reduced speeds, etc. This plan must be prepared jointly with JCCBI and take into account the other work sites that will be operating at the same time in the area (e.g. REM, work on Boulevard René-Lévesque on Nuns' Island). The contractor will be responsible for updating the noise study with its deconstruction scenario and schedule in order to make sure to comply with noise levels.

In addition, it should be remembered that during deconstruction work on the Existing Champlain Bridge other major infrastructure projects will be under way at the same time, including the REM project on Nuns' Island and major repairs to the Louis-H.-La Fontaine Tunnel. These work sites will affect traffic patterns and complicate the crossing of the St. Lawrence.

In addition to the above management plan, the following mitigation measures will have to be observed:

- Bridge deconstruction materials: transport materials between 10 a.m. and 3 p.m. or between 7 p.m. and 11 p.m. to avoid the rush hour and nighttime;
- Transport materials only on business days (Monday to Friday) and avoid holidays;
- Limit the duration of closures on Boulevard René-Lévesque under the Existing Champlain Bridge during deconstruction and limit the closures to nights and weekends. During these closures, limit the transportation of bridge deconstruction materials;
- Limit the duration of closures on Highway 132 under the Existing Champlain Bridge during deconstruction and limit the closures to nights and weekends. During these closures, limit the transportation of bridge deconstruction materials;
- Use flaggers to manage truck traffic at work sites;
- Reduce speed around the work area;
- Use the routes with the least impact shown on Figure 53 (blue route), Figure 54 (yellow route), Figure 55 (red route) and Figure (yellow route), except in special cases.

6.2.3 DESCRIPTION OF EFFECTS – NOISE SIMULATIONS AND VIBRATIONS ASSESSMENT

Given the many assumptions to be considered in assessing changes to the acoustical environment noise and vibration) during the project, a detailed analysis was done. The analysis is based on sound simulations and vibrations assessment and makes it possible to establish the sound and vibration levels that will be generated in nearby sensitive areas. The following section presents the approach, the assumptions and results of the noise simulations and the vibrations assessment.

6.2.3.1 General description of approach

The deconstruction project is divided into three major stages:

- Construction of Nuns' Island jetty (site A'), Seaway Dike jetty (site B') and Brossard jetty (site C') to access sections of the bridge to be deconstructed;
- Bridge deconstruction and materials handling at mobilization areas (sites A to D);
- Jetty removal (sites A', B' and C').

Based on the information presented above, four mobilization areas (Figure) were selected for modelling purposes (Table 60).

Table 60 - Mobilization areas for modeling

IDENTIFICATION OF MOBILIZATION AREA	LOCATION	ACTIVITIES
A'	Nuns' Island	Jetty construction/removal
B'	Seaway dike	
C'	Brossard (north of Highway 132)	
A	Nuns' Island	Bridge deconstruction
B	Seaway dike	
C	Brossard (north of Highway 132)	
D	Brossard (south of Highway 132)	

Assumptions regarding the times of use or operation in each mobilization area are presented in Table 61. The activities have been divided into two categories:

- Jetty construction/removal. During jetty construction (at the start of the project – 4 months) and removal (at the end of the project – 4 months), activities are expected to occur continuously (24 hours);
- Bridge deconstruction. During bridge deconstruction (about 2 to 3 years), the mobilization areas will be operating only during the day (all activities) and evening (transport of materials only).

Table 61 - Summary of proposed schedule for the deconstruction of the Existing Champlain Bridge

ACTIVITY	IDENTIFICATION OF MOBILIZATION AREA	ACTIVITY PERIOD		TIME OF OF USE
		START	END	
Jetty construction/removal	A'	Before/after bridge deconstruction[1]		24 h
	B'			
	C'	Before/after bridge deconstruction		24 h
Bridge deconstruction	A	Month 13	Month 17	Day and evening[2]
	B	Month 1	Month 25	Day and evening[2]
	C and D	Month 2	Month 3	Day and evening[2]
		Month 16	Month 22	Day and evening[2]

1. Assuming that the construction (4 months) and removal (4 months) of the Nuns' Island and Seaway Dike jetties will be done at the same time. Dates based on the restriction period for in-water works.
2. Daytime: 7 a.m. to 7 p.m.; Evening: 7 p.m. to 11 p.m.

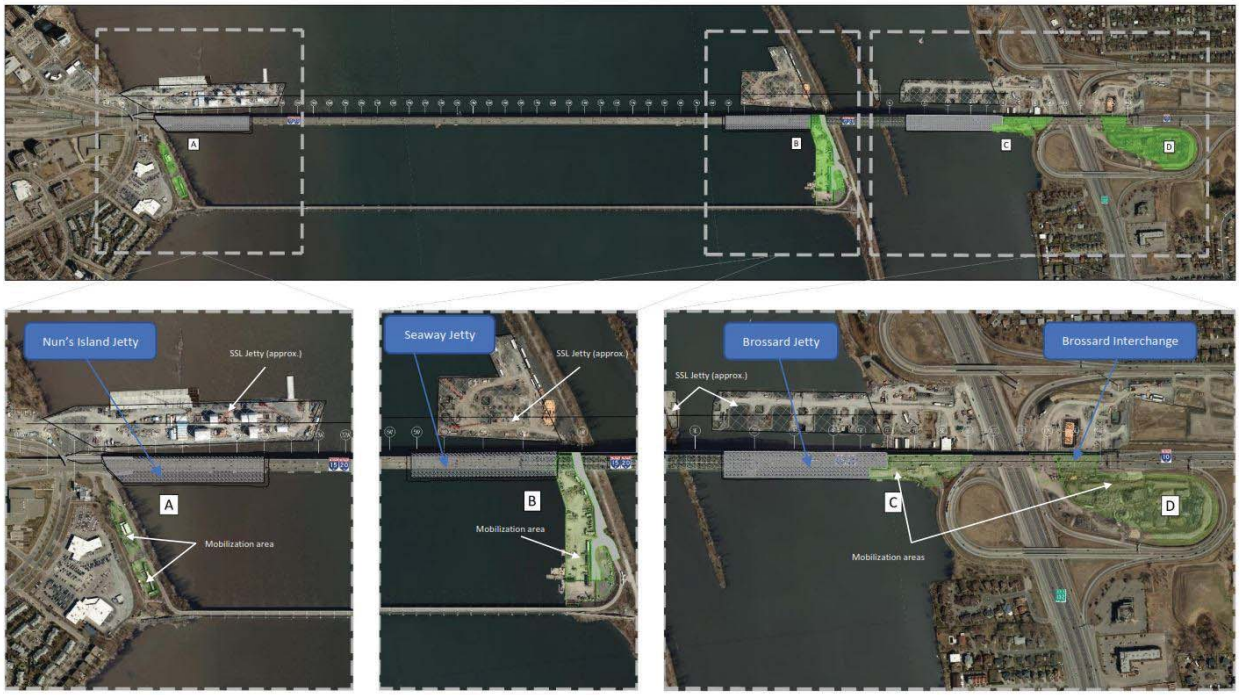


Figure 60 - Mobilization areas for the deconstruction of the Existing Champlain Bridge

6.2.3.2 Sources of noise and vibration

The noise and vibration caused by the deconstruction of the Existing Champlain Bridge will come from two main sources:

- Heavy equipment used in the deconstruction mobilization areas;
- Traffic from heavy trucks travelling in and out of the areas to remove materials generated by bridge deconstruction (noise only).

6.2.3.2.1 Equipment

In order to conduct a noise and vibration assessment and based on the activities occurring in the mobilization areas, a list of what is considered to be the probably most used equipment on site has been prepared.

6.2.3.2.2 Jetty construction and removal

During jetty construction and removal, the main activities will involve the transport of materials for building and removing the jetties.

Table 62 lists the types and quantities of equipment planned for the construction and removal of a jetty at a specific site.

Table 62 - Planned equipment for jetty construction/removal

EQUIPMENT	QUANTITY
Front-end loader	2
Compressor	2
Back hoe	1
Generator	1
Bulldozer	2
Compactor / Vibratory Roller	2

6.2.3.2.3 Bridge deconstruction

During bridge deconstruction, large sections of the bridge will be moved to the mobilization areas and reduced to smaller pieces to be transported to reclamation sites.

Table 63 lists the types and quantities of equipment planned for these activities in a given mobilization area.

Table 64 summarizes the noise emission levels for the equipment used in the acoustic model and Table 65 presents vibration level considered in the evaluation.

Table 63 - Planned equipment for bridge deconstruction

EQUIPMENT	QUANTITY
Hydraulic breaker	3
Shear jaw	3
Front-end loader	3
Compressor	2
Back hoe	1
Generator	1
Bulldozer	1
Crane	2

Table 64 - Summary of noise emission levels from identified sources

EQUIPMENT	NOISE EMISSION LEVEL[A]			ACOUSTIC USAGE FACTOR (%)[B C]
	MEASURE	NOISE LEVEL (DBA)	D_{REF} (M)	
Hydraulic breaker	Leq, 30 s	85	15	10
Shear jaw	Leq, 30 s	74	15	40
Front-end loader	Leq, 30 s	85	15	40
Compressor	Leq, 30 s	75	15	40
Back hoe	Leq, 30 s	80	15	40
Generator	Leq, 30 s	75	15	50
Bulldozer	Leq, 30 s	85	15	40
Crane	Leq, 30 s	75	15	16
Compactor / Vibratory Roller	Leq, 30 s	80	15	20

A. Source: Ministère des Transports du Québec, Table 9.9-1 in Construction Standards, Chapter 9
B. Source: FHWA. Road construction noise model.
C. The acoustic usage factor represents the percentage of time a machine is operating at full power when a noise-generating operation is under way.

Table 65 - Vibration source amplitudes for construction equipment

EQUIPMENT	$VCP_{RÉF}$ [A] [in/s]	E_{REF} [ft-lb]	E_{EQUIP} [ft-lb]
Hydraulic breaker	0,240	5 000[B]	10 000[C]
Bulldozer	0,089	-	-
Compactor / Vibratory Roller	0,210	-	-
Loaded truck	0,076	-	-

A Reference PPV at 25 ft, source: CALTRANS Manual.
B Rated energy of reference hydraulic breaker, source: CALTRANS Manual.
C Hydraulic breaker assessed at a rated energy of 10000 ft-lbs.

6.2.3.2.3.1 Other activities

Some deconstruction activities cannot be modelled due to the non-standard equipment being used and the potential variations in operating modes used by the successful contractor. These activities include, without being limited to:

- Deconstruction on the bridge deck, such as removal of asphalt or other deconstruction operations;
- Deconstruction of piers and footings performed on the river, such as sawing concrete piers;
- Movement of transport barges on the river.

6.2.3.2.4 Traffic

Section 6.2.2 on traffic served to determine truck traffic associated with the main activities: jetty construction and removal and bridge deconstruction. This section also identified the most likely routes from the mobilization areas to the road network, via local roads.

The truck routes are shown on Figure and Figure for Nuns' Island and Figure for Brossard. They should be used throughout the project, unless there are exceptional circumstances.

As noted for Nuns' Island (Figure and Figure), the routes were divided into two categories: Inbound and Outbound. There are several possible routes for each direction. The most likely routes were used for the simulations and are based on potential constraints, as well as the direction the materials will be travelling.

Routes located furthest from residential areas are favoured and should be used by the contractor. Other routes should only be used in exceptional cases.

For the sound environment simulation, the potential maximum hourly traffic for each route was determined and the effects of truck traffic were not assessed after trucks merge into normal highway traffic (see truck routes marked by the grey dotted line).

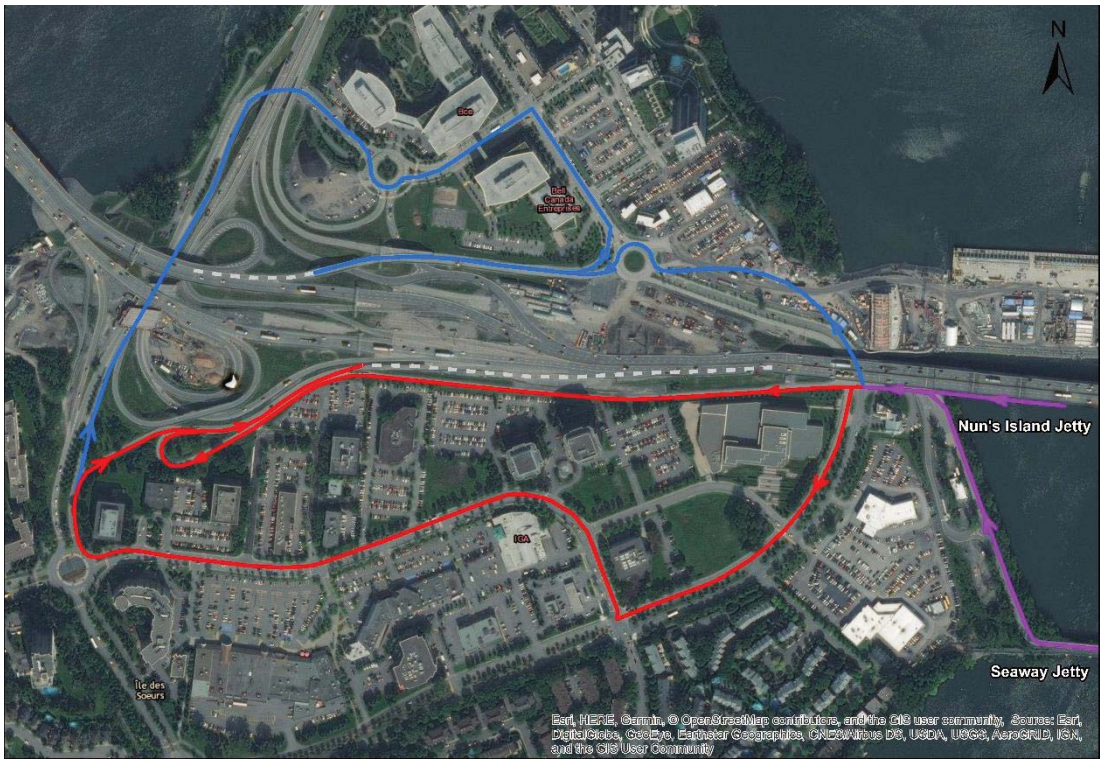


Figure 61 - Potential truck routes – Outbound from Nuns' Island

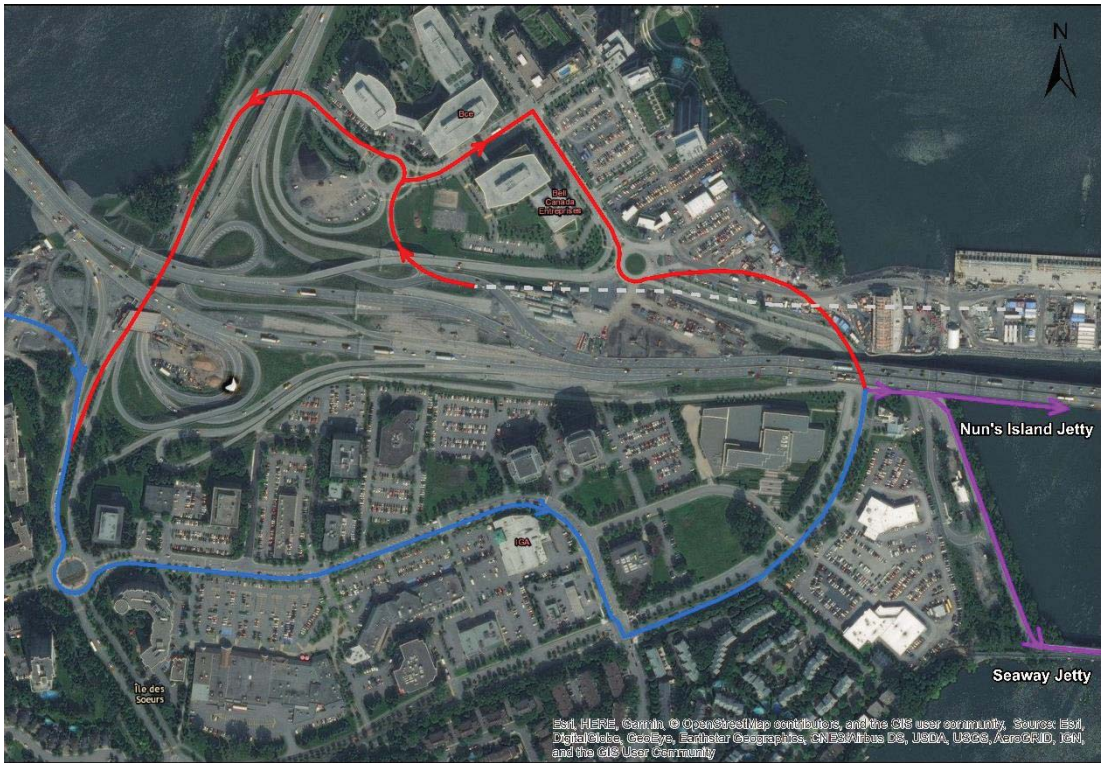


Figure 62 - Potential truck routes – Inbound to Nuns' Island

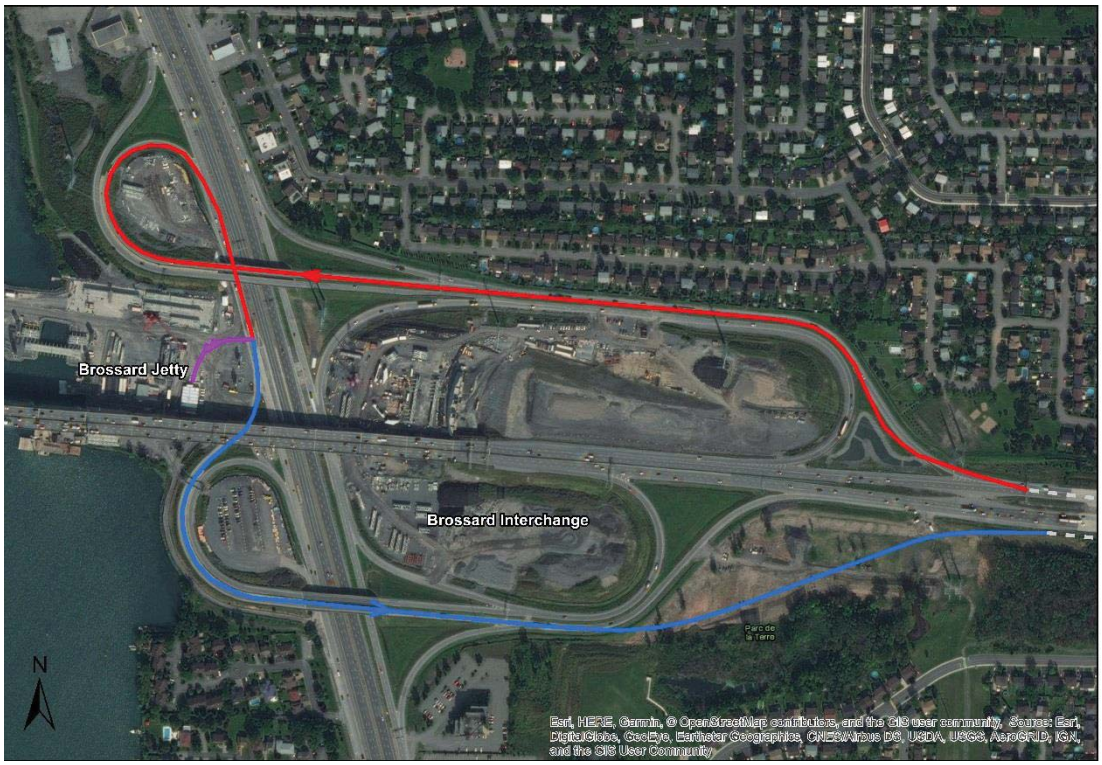


Figure 63 - Potential truck routes for Brossard

6.2.3.2.5 Jetty construction and removal

Truck traffic is expected 24 hours a day during jetty construction and removal. Based on the traffic study and the proposed schedule, forecasts for the number of inbound and outbound trucks for each mobilization area are presented in Table 66. Maximum hourly traffic is presented in Table 66.

Table 66 - Summary of truck traffic during jetty construction and removal

SECTION	MODELLED SPEED (KM/H)	TWO-WAY DAILY TRAFFIC[A]	NUMBER OF TRAFFIC HOURS	AVERAGE HOURLY TRAFFIC BY DIRECTION	MAXIMUM HOURLY TRAFFIC BY DIRECTION[B]
Nuns' Island	30	234	24	5	7
Nuns' Island jetty	15	99	24	2	3
Seaway Dike jetty	15	135	24	3	4
Brossard[C]	30	99	24	2	3

A. Number of trucks per day in both directions.
B. Maximum hourly traffic is considered as equal to 1.5 times the average hourly traffic.
C. Because of the route and site layout, truck traffic from both Brossard sub-areas (C and D) was combined.

6.2.3.2.6 Bridge deconstruction

During bridge deconstruction, traffic will not be as heavy as for work on the jetties. Based on the traffic study and the proposed schedule, forecasts for the number of inbound and outbound trucks for each mobilization area are presented in Table 67.

The maximum hourly traffic is equal to the values presented in Table 67 for daytime (10 a.m. to 3 p.m.) and evening (7 p.m. to 11 p.m.).

Table 67 - Summary of truck traffic during bridge deconstruction

SECTION	MODELLED SPEED (KM/H)	TWO-WAY DAILY TRAFFIC[A]	NUMBER OF TRAFFIC HOURS	AVERAGE HOURLY TRAFFIC BY DIRECTION	MAXIMUM HOURLY TRAFFIC BY DIRECTION[B]
Nuns' Island	30	38	9	2	3
Seaway Dike jetty	15	38	9	2	3
Brossard[C]	30	12	9	1	1

A. Number of trucks per day in both directions.
B. Maximum hourly traffic is considered as equal to 1.5 times the average hourly traffic.
C. Because of the route and site layout, truck traffic from both Brossard sub-areas (C and D) was combined.

6.2.3.3 Noise modelling and assessment

6.2.3.3.1 Description of the model

Noise levels were modelled using CadnaA[3], a noise prediction software program. The software is used to create a complex acoustic model based on multiple sources of noise such as stationary objects, roads, railway tracks and aircraft. The software has numerous modules used to anticipate levels of noise caused by sound emissions from specific sources. The modelling takes the following into account:

[3] Marketed by Datakustik GmbH.

- Source sound power level and directivity;
- Attenuation based on distance;
- Source-receptor geometry, including heights and elevations;
- Effects of barriers such as buildings and the surrounding topography;
- Ground and air (atmospheric) attenuation.

6.2.3.3.2 Estimation of the L_{10} metric

The acoustic model presents noise level forecasts based on the LA_{eq}[4] parameter corresponding to the baseline level in the road sector. To calculate LA_{10} levels in keeping with the MTQ criterion, a +3 dB adjustment factor must be used. This method for estimating LA_{10} (LA_{eq} +3 dB) is recognized and used in noise modelling for road construction projects.

6.2.3.3.3 Modeled scenarios

Based on the proposed deconstruction schedule, six scenarios have been identified and modelled. Various acoustic scenarios were assessed since not all of the mobilization areas are expected to be in operation at the same time. These scenarios consider a set of potential sources of noise generated by deconstruction that can produce noise at any specific point in time.

Due to the same assumptions of equipment usage and truck traffic, the stages of jetty construction and jetty removal were evaluated under one representative scenario. Table 68 lists the deconstruction mobilization areas considered in each modeled scenario as well as the corresponding activities.

The maximum hourly truck traffic for each scenario depends on the type of deconstruction activity involved. As indicated in section 6.2.3.2.4, multiple routes have been determined for Nuns' Island inbound and outbound traffic (in purple on Figure and Figure). Conservative estimates were made to assess worst-case noise levels based on the assumption that there are trucks on all possible inbound and outbound routes. When segments of multiple routes overlap, the traffic count on the overlapped segment is equal to the highest maximum hourly traffic for these routes.

Table 68 - Modeled scenarios for noise assessment

SCENARIO	MOBILIZATION AREA USED	ACTIVITY	NUMBER OF HOURS OF USE
1	A and B	Jetty construction and removal	24 h
2	C	Jetty construction and removal	24 h
3	B	Bridge deconstruction	Day and night
4	B, C and D	Bridge deconstruction	Day and night
5	A and B	Bridge deconstruction	Day and night
6	A, B, C and D	Bridge deconstruction	Day and night

[4] Equivalent continuous sound pressure level. Since the sound level of a source varies over time, the energy average must be calculated over a given period of time (Leq) in order to observe and compare different values. When this value is A-weighted, it is called LAeq.

6.2.3.4 Assessment criteria

Table 69 presents the assessment criteria for each receptor (see Figure and Figure for receptor location). The noise levels for these receptors were determined based on a review of gathered information presented in section 3.3.7. Although there are municipal criteria for nuisances, the analysis is based on MTQ criteria (2018) since this method is more standardized and widely used in the transport industry.

To be conservative, the LA_{10} baseline values are equal to the lowest possible value based on:

- Proximity of the receptor in relation to the measurement locations indicated in the 2013 EA;
- Proximity of the receptor in relation to the measurement areas indicated in the sound environment monitoring reports for the construction of the New Champlain Bridge[5].

Figure 64 - Locations of noise receptors representative of Nuns' Island

[5] LA_{10} levels were assessed as being equal to LA_{eq} + 3 dB based on construction noise reports (MTQ, 2018).

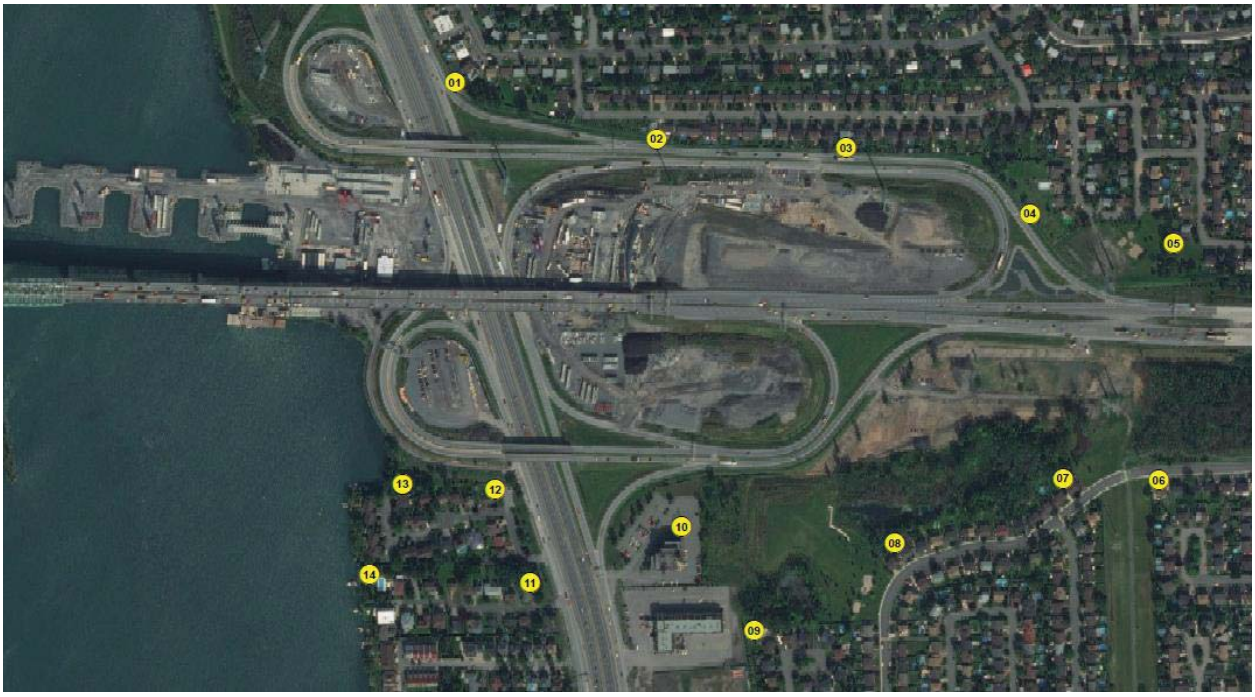


Figure 65 - Locations of noise receptors representative of Brossard

Table 69 – Receptor noise limits

RECEIVING LOCATION			MEASURE	DAY		EVENING		NIGHT	
AREA	ID NUMBER	TYPE		BASELINE DATA (DBA)	LIMIT (DBA)	BASELINE DATA (DBA)	LIMIT (DBA)	BASELINE DATA (DBA)	LIMIT (DBA)
Île-des-Sœurs	AR01	Residential	L_{10}	67	75	62	67	60	65
	AC02	Commercial	L_{10}	67	80	62	67	60	None[A]
	AC03	Commercial	L_{10}	67	80	62	67	60	None[A]
	AR03a	Residential	L_{10}	67	75	62	67	60	65
	AC04	Commercial	L_{10}	67	80	62	67	60	None[A]
	AC05	Commercial	L_{10}	67	80	62	67	60	None[A]
	AR06	Residential	L_{10}	60	75	55	60	55	60
	AR07	Residential	L_{10}	60	75	55	60	55	60
	AR08	Residential	L_{10}	60	75	55	60	55	60
	AR09	Residential	L_{10}	60	75	55	60	55	60
	AR10	Residential	L_{10}	60	75	55	60	55	60
	AR11	Residential	L_{10}	60	75	56	61	57	62
	AR12	Residential	L_{10}	60	75	56	61	57	62
	AC13	Commercial	L_{10}	60	80	56	61	57	None[A]
Brossard	BR01	Residential	L_{10}	65	75	65	70	61	66
	BR02	Residential	L_{10}	65	75	64	69	60	65
	BR03	Residential	L_{10}	65	75	64	69	60	65
	BR04	Residential	L_{10}	65	75	65	70	61	66
	BR05	Residential	L_{10}	64	75	65	70	61	66
	BR06	Residential	L_{10}	55	75	60	65	58	63
	BR07	Residential	L_{10}	55	75	60	65	58	63
	BR08	Residential	L_{10}	55	75	60	65	58	63
	BR09	Residential	L_{10}	55	75	60	65	58	63
	BR10	Residential	L_{10}	55	75	60	65	58	63
	BR11	Residential	L_{10}	63	75	60	65	60	65
	BR12	Residential	L_{10}	63	75	60	65	60	65
	BR13	Residential	L_{10}	63	75	60	65	60	65
	BR14	Residential	L_{10}	63	75	60	65	60	65

A. No nighttime limit has been set for commercial sectors.

6.2.3.5 Assessment results

6.2.3.5.1 Jetty construction and removal

Jetty construction and removal were modelled for scenarios 1 and 2 based on the assumptions found in Table 66. According to the assumptions, construction will take place 24/7, with Table 70 listing the noise levels determined for each receptor during the day, evening and at night. Figures showing noise contours for scenarios 1 and 2 are presented in Appendix 16.

Table 70 - Noise levels during the day, evening and at night based on jetty construction and removal scenarios

RECEPTOR			L_{A10} [DBA]		
AREA	ID	TYPE	SCENARIO 1	SCENARIO 2	CRITERION (MTQ)[B]
Nuns' Island	AR01	Residential	57	-[A]	65
	AC02	Commercial	57	-[A]	67 [C]
	AC03	Commercial	57	-[A]	67 [C]
	AR03a	Residential	54	-[A]	65
	AC04	Commercial	65	-[A]	67 [C]
	AC05	Commercial	64	-[A]	67 [C]
	AR06	Residential	57	-[A]	60
	AR07	Residential	56	-[A]	60
	AR08	Residential	59	-[A]	60
	AR09	Residential	47	-[A]	60
	AR10	Residential	57	-[A]	60
	AR11	Residential	54	-[A]	62
	AR12	Residential	51	-[A]	62
	AC13	Commercial	59	-[A]	61 [C]
Brossard	BR01	Residential	48	59	66
	BR02	Residential	46	55	65
	BR03	Residential	44	52	65
	BR04	Residential	36	43	66
	BR05	Residential	41	48	66
	BR06	Residential	41	47	63
	BR07	Residential	42	49	63
	BR08	Residential	44	50	63
	BR09	Residential	35	44	63
	BR10	Residential	46	54	63
	BR11	Residential	47	51	65
	BR12	Residential	48	58	65
	BR13	Residential	49	60	65
	BR14	Residential	49	57	65

Notes:
[A] The resulting noise levels are considered insignificant due to the distance between the noise source and the receptors.
[B] The limit corresponds to the lowest limit during the day, evening and at night. In general, nighttime has the most stringent criteria.
[C] The limit indicated for this receptor corresponds to the evening, since there are no limits for commercial receptors in MTQ criteria.

6.2.3.5.2 Bridge deconstruction

Bridge deconstruction was modelled according to scenarios 3 to 6 based on the assumptions listed in Table 71.

Table 71 - Deconstruction scenarios for sound environment modelling

SCENARIOS ID [A]	MOBILIZATION AREA IN OPERATION [B]	OPERATING TIMES
3	B	Day and night
4	B, C and D	Day and night
5	A and B	Day and night
6	A, B, C and D	Day and night

Based on the above, deconstruction activities should take place during the day and evening only[6]. The noise levels determined for each receptor are listed in Table 72, Table 73, Table 74 and Table 75. The noise contours for each modelled scenario are presented in Appendix 16.

Table 72 - Noise levels based on scenario 3 for bridge deconstruction

RECEPTOR			MODEL RESULTS L_{A10} (DBA)		CRITERIA (MTQ)	
AREA	ID	TYPE	DAY	EVENING	DAY	EVENING
Nuns' Island	AR01	Residential	44	44	75	67
	AC02	Commercial	51	51	80	67
	AC03	Commercial	52	52	80	67
	AR03a	Residential	49	49	75	67
	AC04	Commercial	56	56	80	67
	AC05	Commercial	51	51	80	67
	AR06	Residential	45	45	75	60
	AR07	Residential	43	43	75	60
	AR08	Residential	50	50	75	60
	AR09	Residential	42	42	75	60
	AR10	Residential	51	51	75	60
	AR11	Residential	49	49	75	61
	AR12	Residential	48	48	75	61
	AC13	Commercial	55	55	80	61
Brossard	BR01	Residential	50	48	75	70
	BR02	Residential	48	45	75	69
	BR03	Residential	46	43	75	69
	BR04	Residential	37	34	75	70
	BR05	Residential	43	40	75	70
	BR06	Residential	43	41	75	65
	BR07	Residential	44	41	75	65
	BR08	Residential	45	43	75	65
	BR09	Residential	35	33	75	65
	BR10	Residential	48	46	75	65
	BR11	Residential	49	47	75	65
	BR12	Residential	50	48	75	65
	BR13	Residential	51	49	75	65
	BR14	Residential	51	50	75	65

[6] There should be no activities at night during deconstruction.

Table 73 - Noise levels based on scenario 4 for bridge deconstruction

RECEPTOR			MODEL RESULTS L_{A10} (DBA)		CRITERIA (MTQ)	
AREA	ID	TYPE	DAY	EVENING	DAY	EVENING
Nuns' Island	AR01	Residential	44	44	75	67
	AC02	Commercial	51	51	80	67
	AC03	Commercial	52	52	80	67
	AR03a	Residential	49	49	75	67
	AC04	Commercial	56	56	80	67
	AC05	Commercial	51	51	80	67
	AR06	Residential	45	45	75	60
	AR07	Residential	43	43	75	60
	AR08	Residential	50	50	75	60
	AR09	Residential	42	42	75	60
	AR10	Residential	51	51	75	60
	AR11	Residential	49	49	75	61
	AR12	Residential	48	48	75	61
	AC13	Commercial	55	55	80	61
Brossard	BR01	Residential	62	60	75	70
	BR02	Residential	59	56	75	69
	BR03	Residential	56	53	75	69
	BR04	Residential	47	44	75	70
	BR05	Residential	53	50	75	70
	BR06	Residential	53	49	75	65
	BR07	Residential	55	51	75	65
	BR08	Residential	58	54	75	65
	BR09	Residential	57	53	75	65
	BR10	Residential	62	59	75	65
	BR11	Residential	59	56	75	65
	BR12	Residential	62	59	75	65
	BR13	Residential	61	59	75	65
	BR14	Residential	56	53	75	65

Table 74 - Noise levels based on scenario 5 for bridge deconstruction

RECEPTOR			MODEL RESULTS L_{A10} (DBA)		CRITERIA (MTQ)	
AREA	ID	TYPE	DAY	EVENING	DAY	EVENING
Nuns' Island	AR01	Residential	57	55	75	67
	AC02	Commercial	56	55	80	67
	AC03	Commercial	54	53	80	67
	AR03a	Residential	52	51	75	67
	AC04	Commercial	64	62	80	67
	AC05	Commercial	65	62	80	67
	AR06	Residential	58	56	75	60
	AR07	Residential	57	55	75	60
	AR08	Residential	58	56	75	60
	AR09	Residential	46	45	75	60
	AR10	Residential	56	54	75	60
	AR11	Residential	51	50	75	61
	AR12	Residential	48	48	75	61
	AC13	Commercial	56	56	80	61
Brossard	BR01	Residential	50	48	75	70
	BR02	Residential	48	45	75	69
	BR03	Residential	46	43	75	69
	BR04	Residential	37	34	75	70
	BR05	Residential	43	40	75	70
	BR06	Residential	43	41	75	65
	BR07	Residential	44	41	75	65
	BR08	Residential	45	43	75	65
	BR09	Residential	35	33	75	65
	BR10	Residential	48	46	75	65
	BR11	Residential	49	47	75	65
	BR12	Residential	50	48	75	65
	BR13	Residential	51	49	75	65
	BR14	Residential	51	50	75	65

Table 75 - Noise levels based on scenario 6 for bridge deconstruction

RECEPTOR			MODEL RESULTS L_{A10} (DBA)		CRITERIA (MTQ)	
AREA	ID	TYPE	DAY	EVENING	DAY	EVENING
Nuns' Island	AR01	Residential	57	55	75	67
	AC02	Commercial	56	55	80	67
	AC03	Commercial	54	53	80	67
	AR03a	Residential	52	51	75	67
	AC04	Commercial	64	62	80	67
	AC05	Commercial	65	62	80	67
	AR06	Residential	58	56	75	60
	AR07	Residential	57	55	75	60
	AR08	Residential	58	56	75	60
	AR09	Residential	46	45	75	60
	AR10	Residential	56	54	75	60
	AR11	Residential	51	50	75	61
	AR12	Residential	48	48	75	61
	AC13	Commercial	56	56	80	61
Brossard	BR01	Residential	62	60	75	70
	BR02	Residential	59	56	75	69
	BR03	Residential	56	53	75	69
	BR04	Residential	47	44	75	70
	BR05	Residential	53	50	75	70
	BR06	Residential	53	49	75	65
	BR07	Residential	55	51	75	65
	BR08	Residential	58	54	75	65
	BR09	Residential	57	53	75	65
	BR10	Residential	62	59	75	65
	BR11	Residential	59	56	75	65
	BR12	Residential	62	59	75	65
	BR13	Residential	61	59	75	65
	BR14	Residential	56	53	75	65

6.2.3.6 Summary of results

An assessment of the potential noise impacts due to the deconstruction of the Champlain Bridge was conducted. The results are as follows:

- Based on the results of the assessment presented in Section 6.2.3.5.1, jetty construction and deconstruction will not generate noise exceeding the limits indicated in Section 4.1.1.1;
- Based on the results of the analysis in Section 6.2.3.5.2, work in the mobilization areas will not generate any noise that exceeds the limits indicated in Section 4.1.1.1.

The selected contractor will have to redo the modelling based on its work schedule. If noise limits are likely to be exceeds, mitigation measures will have to be implemented. These include reducing the pace of certain activities and installing temporary acoustic screens. More details are provided in sections 7.2.1 and 8.13 of this study.

6.2.3.7 Vibration assessment

6.2.3.7.1 Description of the model

A review of project methods and equipment has been conducted based on the information presented in Section 6.2.3.2. Table 76 lists the equipment that is considered to represent significant vibration sources and that is proposed to be employed at specific staging sites.

Table 76 - Equipment considered for the vibration assessment

EQUIPMENT	STAGING SITE						
	A'	B'	C'	A	B	C	D
Hydraulic Breakers	No	No	No	Yes	Yes	Yes	Yes
Bulldozer	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Compactor/Vibratory Roller	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loaded Trucks	Yes	Yes	Yes	Yes	Yes	Yes	Yes

6.2.3.7.2 Methodology

Vibration impacts for activities on site were predicted based on reference levels and propagation models established and published in the Transportation and Construction Vibration Guidance Manual (CALTRANS Manual) (California Department of Transportation, 2013). The methodologies described in *Section 7* of the CALTRANS Manual were used to identify the Zone of Influence (ZOI). A soil Class III was considered representative of the project areas[7]. Table 65 lists the reference levels used in the assessment.

6.2.3.7.3 Assessment criteria

Limits for vibration levels on buildings, due to construction activities, exist within the context of multiple international standards. However, the City of Montreal does not have a criterion for vibrations from construction activities. It does have a regulation governing excavation in rock when in proximity of buildings, which is focused on the use of blasting methods – City of Montreal Regulation E-6 (R.R.V.M. c. E-6 *Règlement sur les excavations*). Based on a review of criteria that would applicable to the context of the project, it is recommended that the adopted criteria for the assessment of vibration impacts from the deconstruction of the Existing Champlain Bridge be the municipal code of the City of Toronto By-Law 514-2008 (By-Law 514).

The City of Toronto By-Law 514 regulates vibrations from construction and demolition activities and provides limits on maximum allowable peak particle velocity (PPV) vibration levels at receptors due to construction activities. Table 77 presents construction vibration limits.

[7] As defined in *Table 17* of the CALTRANS Manual, Soil Class III is described as "Hard soils: dense compacted sand, dry consolidated clay, consolidated glacial till, some exposed rock. (cannot dig with shovel, need pick to break up)"(California Department of Transportation, 2013). Therefore, from the table, the applicable vibration attenuation rate is represented with an "n"-value of 1.1.

Table 77 - City of Toronto by-law construction vibration limits

RANGE OF FREQUENCY [HZ]	MAXIMUM ALLOWABLE PEAK PARTICLE VELOCITY [MM/S]
<4 Hz	8
4 Hz – 10 Hz	15
> 10 Hz	25

The limits from By-Law 514 are expressed within this document as Vibration Alert Levels, which identify the value of instrumentation readings (in the case of vibration monitoring) at which project operations must cease.

The vibration assessment described in this section was conducted to identify the ZOI as defined in By-Law 514, and a limit of PPV at 5 mm/s was retained. The ZOI is defined in By-Law 514 as: "The area of land within or adjacent to a construction site, including any buildings or structures, that potentially may be impacted by vibrations emanating from a construction activity where the peak particle velocity measured at the point of reception is equal to or greater than 5 mm/sec at any frequency or such greater area where specific site conditions are identified by the professional engineer in a study contemplated in Subsection C3(a)."

6.2.3.7.4 Assessment results

Based on the methodology described above, the setback distances for each of the anticipated pieces of equipment to reach the 5 mm/s PPV criterion were calculated, as shown in Table 78.

Table 78 - Zone of Influence setback distance for equipment by activity site

EQUIPMENT	ZOI SETBACK DISTANCES FOR EACH ACTIVITY SITE [M]						
	A'	B'	C'	A	B	C	D
Hydraulic Breakers	-	-	-	12.3	12.3	12.3	12.3
Bulldozer	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Compactor/Vibratory Roller	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Loaded Trucks	3.2	3.2	3.2	3.2	3.2	3.2	3.2

Based on the information presented above, the following findings were made:

- The vibration ZOI where vibration levels may exceed 5 mm/s is estimated to be up to 8.0 m during jetty construction and removal;
- The vibration ZOI where vibration levels may exceed 5 mm/s is estimated to be up to 12.3 m for deconstruction and materials processing at all sites.

6.2.3.7.5 Summary of results

Based on the findings presented in the previous section and the distances between the selected sensitive receptors and the staging sites, it is predicted that the receptors are located outside of the vibration ZOI extended by the deconstruction works.

It should be noted that the dropping of large components of the bridge structure on site was not analyzed. Dropping of large pieces from height is not recommended, as it can induce large vibration events with an unpredictable footprint.

6.2.4 DESCRIPTION OF EFFECTS – AIR QUALITY

The emissions generated by the deconstruction of the Existing Bridge will depend on the methods and equipment used by the contractor, as well as the latter's choice of routes for accessing and leaving the site. Table 79 provides a summary of the bridge sections and the most likely deconstruction methods for each section (see Figure 1 in Volume 1, Section 2.1 for the location of the bridge sections).

Table 79 - Deconstruction activities

SECTION	DESCRIPTION	LENGTH (M)	DECONSTRUCTION ACTIVITY
44W to 41W 40W to 35W	Concrete spans over land Concrete spans over projected jetty	496	Standard demolition using jackhammers and shear jaws
35W to 5W	Concrete spans over water	1,653	Lowering spans onto a barge using cranes on a barge and breaking up spans into pieces in the temporary storage areas (Nuns' Island jetty or Seaway Dike)
5W to 1W 1-E	Concrete spans over land or a projected jetty Metal portion over the St. Lawrence Seaway over water (estimated at 40 days)	763.45	Lowering section 6 suspended span with a jack. Lowering other spans with cranes on land and breaking up spans into pieces at temporary storage areas.
2E to 5E 5E to 13E	Concrete spans over projected jetty Concrete spans over land	528.07	Standard demolition using jackhammers and shear jaws

These activities will mainly generate the following emissions:

- NO_x, SO_2, CO and PM_{tot} from the use of diesel-powered heavy-duty construction equipment;
- Particulates from sawing and road traffic.

Exhaust emissions from heavy equipment used in deconstruction work are similar to those produced by road traffic on the New Bridge and other anthropogenic sources in the study area. Emissions from the vehicles that will use the New Bridge on a daily basis (about 110,000 to 137,000 vehicles/day) and from other anthropogenic sources in the study area are much greater than those from the extra 50 trucks and deconstruction equipment. Given the above, the simulations do not take into account the emissions that will be generated by vehicles and deconstruction equipment during the bridge deconstruction activities.

In addition, an estimated 333 trips per day will be required over four months to construct the jetties to be used for the project. The same number of trips and timeframe will be required to remove the jetties at the end of the project. The jetty construction for the New Bridge was of a similar order of magnitude, which leads to the hypothesis that the associated vehicle emissions will also be of a similar order of magnitude for the project.

It should be noted that ECCC determined that the impacts of the New Bridge construction for certain air quality parameters, NO_x, SO_2 and CO, were negligible compared to regional conditions (Dessau-Cima+, 2013). Consequently, monitoring of these parameters was interrupted after the first year of construction. Given that construction was carried out using equipment similar to that planned for the deconstruction of the Existing Bridge, and that both bridges are of similar magnitude, as are the jetties, it is assumed that the monitoring of NO_x, SO_2 and CO during the project will not be required. With respect to the main parameter of concern, particulate emissions, for the project, the ambient air management and monitoring plan (AAMMP) will be implemented during the deconstruction activities as well as the construction and removal of the jetties.

The assessment of impacts on air quality will focus on particles in the form of dust emitted during deconstruction activities. Table 80 summarizes the deconstruction activities, emissions from each and the potential impact on air quality in residential areas before mitigation measures are applied. The impact assessment is based on the experience of the specialists and takes into account the following factors:

- Weather conditions, including wind;
- Location of emission sources and their proximity to sensitive residential areas;
- Type and scope of deconstruction work at each site (based on current knowledge).

Table 80 - Emissions at Bridge Sections and potential impact on sensitive receptors

SECTION	DESCRIPTION	ACTIVITY	EMISSIONS CONSIDERED	POTENTIAL IMPACT ON RESIDENTIAL AREAS
5W to 44W	Demolition of concrete spans over water, land and jetty	Sawing and cutting	Particulates and silica	Minimal to medium
		Use of hydraulic hammers		
		Use of shear jaws		
Section 6	Steel portion over the St. Lawrence Seaway	Sawing and cutting	Particulates and lead	Minimal
5E to 13E	Concrete spans over land	Sawing and cutting	Particulates and silica	High – Brossard area
		Use of hydraulic hammers		
		Use of shear jaws		

Activities in the mobilization areas are also likely to emit particles. Other emissions could also come from handling deconstruction materials such as the lead in the paint of certain steel components, and silica from concrete sawing.

Table 81 summarizes the types of activities in the mobilization areas and the emissions likely to be generated by the activities, along with an assessment of the potential impact on neighbouring residential areas.

Table 81 - Mobilization areas, considered emissions and potential to impact sensitive receptors

LOCATION	DESCRIPTION	ACTIVITY	EMISSIONS CONSIDERED	POTENTIAL IMPACT ON RESIDENTIAL AREAS
Nuns' Island	Jetty near the shore and land section under the bridge, around the access road.	Crushing concrete parts and cutting steel parts; loading trucks. Based on estimates, 25,000 t of concrete and 500 t of steel will be processed.	Particulates and silica	Medium impact potential to residential area on Nun's Island 250 m to the south of the jetty area
Seaway dike	Jetty on the St. Lawrence from the Seaway Dike and the Ice Control Structure dock	Crushing concrete parts and cutting steel parts; loading trucks. Based on estimates, 160,000 t of concrete and 10,000 t of steel will be processed.	Particulates, silica and lead	Minimal potential. Possible impacts to residential areas located 800 m to the northeast in Brossard on moderate to high wind days
Brossard, north of Highway 132	Land section and jetty under the bridge, around the access road.	Crushing concrete parts and cutting steel parts; loading trucks. Based on estimates, 53,000 t of concrete and 10,000 t of steel will be processed.	Particulates, silica and lead	Medium to High impact potential to residential areas located in Brossard 400 m to the southeast and 50 m to the south
Brossard, south of Highway 132	Land portion in Brossard	Crushing concrete parts and cutting steel parts; loading trucks. Based on estimates, 13,000 t of concrete and 100 t of steel will be processed. The site is not paved and vehicles using it could generate dust. **Note:** The area may possibly only be used for setting up facilities and for storage.	Particulates and silica	High impact potential to residential areas located in Brossard 200 m to the north and 150 m to the southeast

Toxicology fact sheets on particulate matter, silica and lead are provided in a technical note in Appendix 15.

Based on an assessment of deconstruction source locations, along with a review of prevailing winds, five key residential area receptors were identified that could potentially be impacted by emissions from deconstruction activities (Figure 66).

Figure 66 - Location of areas sensitive

The air quality monitoring program for these sensitive areas is presented in sections 6.3.1.7 and 7.2.3.

6.2.5 DESCRIPTION OF EFFECTS – GREENHOUSE GASES

The GHG emissions related to the project are assessed in accordance with the requirements of ISO 14064-2: *Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements*, and considers the following assumptions:

- Deconstruction of concrete using jaws for the aboveground sections of the bridge and the three jetties;
- Deconstruction of concrete for the bridge sections over water using sawing/depositing on a barge for dismantlement, followed by the use of jaws on the shoreline;
- Deposition of the central arch for dismantlement into transportable components on the shore;
- Reverse deconstruction of other metal sections with dismantlement into transportable components on the shore;
- Processing of materials mainly at the Seaway Ice Control Structure dock;
- Removal of all materials by truck;
- Reuse of New Bridge jetty materials (with temporary storage within a radius of a few kilometres);
- Keep certain piers and footings of the Existing Champlain Bridge in place.

The scope of the assessment includes the following:

- Level 1 emissions – Direct GHG emissions generated at the work site (e.g. barges, cranes, jaws, saws, generators, materials processing, in-situ transport and to the temporary storage areas, dike construction);
- Level 2 emissions – Indirect GHG emissions attributable to purchased energy such as electricity or steam (e.g. electricity consumed by work site facilities);
- Level 3 emissions – Other indirect GHG emissions from sources such as the production of raw materials, delivery or shipping of materials, or employee movement (e.g. delivery of machinery, supply of materials for jetties, shipping of materials for reclamation, employee comings and goings). The scope of level 3 emissions is limited to routes directly associated with the project (first link in the chain).

The emission rates that are used are those usually prescribed for such calculations by recognized standards. The assessment is expressed in tonnes of CO_2 equivalent (t CO_2eq) and includes CO_2, CH_4 and N_2O gases that are the most representative of the emissions that will be generated at the work site (basically vehicles and machinery powered by fossil fuels).

This approach is used to assess the project's total GHG emissions for the three-year work period at 24,000 t CO_2eq. Nationally, these point-source emissions (3 years) could be considered negligible compared to the 704 Mt CO_2eq emitted in Canada in 2016 (ECCC, 2018). At the provincial level, these project emissions are also considered low compared to the 81.7 Mt CO_2eq emitted in Quebec in 2015 (MDDELCC, 2018).

In the draft *2019-2022 Federal Sustainable Development Strategy* (ECCC, 2018), the target of the first goal, *Effective action on climate change*, is to reduce Canada's total GHG emissions by 30% relative to 2005 emission levels. JCCBI is voluntarily complying with the above federal government strategy and is adopting the above target for the deconstruction of the Existing Champlain Bridge.

6.2.6 DESCRIPTION OF EFFECTS – NAVIGATION

6.2.6.1 Commercial shipping

The St. Lawrence Seaway is the only navigable passage for transporting goods between the St. Lawrence River and the Great Lakes. For this reason, commercial shipping in the Seaway cannot be disturbed during the deconstruction of the Existing Champlain Bridge, other than on rare occasions and only after an arrangement has been reached between the stakeholders.

The St. Lawrence Seaway Management Corp. (SLSMC) is the agency responsible for the safe and efficient passage of ocean freight in the Canadian Seaway facilities. Consequently, it prohibits construction work within the limits of the St. Lawrence Seaway during the navigation period, which runs from March to December of each year. The prohibition covers all bridge deconstruction work that will take place within SLSMC's jurisdictional boundaries, unless a technical construction protocol is first received and approved.

Authorization under the CNWA, issued by TC, must be obtained for the project, for both work in the Seaway and on the St. Lawrence.

6.2.6.2 Pleasure boating

Given the shallow water depth and strength of the current, the Greater La Prairie Basin (St. Lawrence sector) has no marked (buoyed) channel for pleasure boating and recreational boating. However, Canadian Coast Guard (CCG) air cushion vehicles (ACV), Saute-Moutons company jet boats and mechanically and non-mechanically powered boats use this part of the St. Lawrence from April to October. Since there are no CCG buoys in these sections of the St. Lawrence and the Lesser La Prairie Basin, boats originating from these areas sailing under the Champlain Bridge do so mainly using local navigation knowledge.

The preferred option for the piers and footings is to level them down to 450 mm below the riverbed for the Greater La Prairie Basin and down to the bedrock for the piers and footings in the Lesser La Prairie Basin. Only two piers near Nuns' Island will partially remain in place in the water so that they can be part of an enhancement project. The levelling height was set at about 6 m above the water level so that the piers can be easily visible. Transport Canada will have to issue authorizations under the Canadian Navigable Waters Act (CNWA) for the overall work, as well as for the piers that will be kept.

Recreational and pleasure boating as well as sport fishing can be maintained in the Greater La Prairie Basin while work is being done. This will require that an information campaign be conducted among organizations and users jointly with the authorities involved, the application of strict navigation measures and the cooperation of monitoring and response organizations to ensure the safety of boaters.

6.2.7 DESCRIPTION OF EFFECTS – QUALITY OF LIFE

In order to assess the effects of the project on quality of life, a set of environmental impacts must be considered. For this TEA, the main vectors used to assess the project's impact on quality of life are the sound environment, air quality and traffic. The following assessment is based on analyses involving these three components (see sections 6.2.2, 6.2.3 and 6.2.4).

6.2.7.1 Sound environment

The main sources of noise resulting from work are the use of heavy machinery in mobilization areas and traffic involving trucks carrying materials from these areas.

Based on the modelling involving 14 sensitive receptors on Nuns' Island and 14 sensitive receptors in Brossard, the project will increase noise levels but these will observe the criteria. It is not expected that the project activities will cause vibration impacts to exceed the limits.

Some noise sources could not be incorporated into the modelling at this stage. However, the activities involved will still have to conform to the limits that apply to sensitive receptors. The contractor will have to model the noise levels of all activities before they are carried out, and assess their effects on sensitive receptors in order to implement the mitigation measures required to ensure that operations are executed within applicable limits.

6.2.7.2 Air quality

The work will cause the emission of particulate matter, including silica and possibly lead. Some mobilization areas will be located near sensitive areas. In addition, some sections of the structure located near sensitive areas will be demolished on site.

The sensitive areas, one on Nuns' Island and four in Brossard, were identified on the basis of emission sources and meteorological data. A series of mitigation and monitoring measures was established to ensure that the emissions respect the defined criteria for air quality criteria for the different parameters.

6.2.7.3 Traffic

Temporary disruptions associated with the work could affect traffic and consequently cause inconveniences for riverside residents and other users of the affected routes. Disruptions will be kept to a strict minimum and will be brief (nights or weekends).

On Nuns' Island, the section of René-Lévesque Blvd. that runs under the bridge will be closed punctually during bridge deck deconstruction (at night or on weekends). In addition, for work on the REM rapid transit system, the Champlain Bridge onramp from the eastern tip of Nuns' Island may have to be closed for a certain time. The number and duration of these closures will be minimized, especially for René-Lévesque Blvd., and detours will have to be set up. Closures on weekdays will only be used as a last resort.

In Brossard, closings of Highway 132 and its service lanes (Marie-Victorin Blvd.) will be required. The number and duration of such closings will be minimized and detour roads will be put in place. Nevertheless, given the importance of these traffic lanes, they cannot be closed on weekdays; only at night or on weekends. Disruptions of long duration could be necessary for pier deconstruction; no lanes will be closed but lane widths may be reduced.

6.2.7.4 Assessment of project impact on quality of life

The criteria used to assess the project's potential impact on quality of life are the same as those applied for the other environmental components; they are defined in Section 5.1.2.

6.2.7.4.1 Assessment of project impact on quality of life on Nuns' Island

6.2.7.4.1.1 Intensity

- Sound environment: The intensity of the noise effects is considered medium since noise levels will increase but not exceed the applicable limits;
- Air quality: The intensity of the potential effect of the particles emitted at the mobilization area is considered medium, given the location of the sensitive area in relation to the emitting sources and meteorological data;
- Traffic: The intensity of the disruption effects is considered medium, taking into account occasional closures, detours that will be set up, and possible REM work, altering the movements of riverside residents and road users that are affected.

In light of the foregoing, the intensity of the potential project impacts on quality of life on Nuns' Island is considered to be medium.

6.2.7.4.1.2 Extent

The extent of the impacts of the three vectors (noise environment, air quality, traffic) on the quality of life on Nuns' Island is considered local. While the impacts will not be perceived at the scale of the study area, one residential area has been identified as being sensitive to the potential impacts on air quality; in addition, 14 sensitive receptors were identified with regard to the noise environment. Lastly, traffic will be disturbed on a few highway sections.

6.2.7.4.1.3 Duration

- Sound environment: The duration of the noise effects is considered temporary since their production will be continuous during certain activities;
- Air quality: Since particulates will be continuously emitted during certain activities, their duration is considered temporary;
- Traffic: The duration of disruptions is considered temporary.

In light of the preceding, the intensity of the potential project impacts on the quality of life on Nuns' Island is considered medium.

6.2.7.4.1.4 Assessment of potential effect

By integrating the assessment of all the criteria described in Table , the potential effect on quality of life on Nuns' Island is considered non-significant. Several mitigation measures are planned (see Table 51, Table 52 and Table 53) to limit the effects on traffic, the sound environment and air quality, thus reducing the effect on quality of life.

6.2.7.4.2 Assessment of the effect of the project on quality of life in Brossard

6.2.7.4.2.1 Intensity

- Sound environment: The intensity of the noise effects is considered medium since noise levels will increase but not exceed the applicable limits;
- Air quality: given the location of the sensitive area in relation to the emitting sources and meteorological data, the intensity of the potential impact of the particulates emitted at the mobilization areas is considered high given the location of some sensitive area in relation to the emitting sources and meteorological data;
- Traffic: The intensity of disruption effects is considered low to medium. There will be some closures, but their number and duration will be minimized, and reduced lane widths during pier deconstruction could contribute to traffic slowdowns. Therefore, the movements of riverside residents and users of affected roads will be disrupted.

In light of the foregoing, the intensity of the potential project impacts on quality of life in Brossard is considered to be medium.

6.2.7.4.2.2 Extent

The extent of the impacts of the three vectors (noise environment, air quality, traffic) on quality of life in Brossard is considered local.

6.2.7.4.2.3 Duration

- Sound environment: The duration of noise levels is considered temporary since they will continue to be generated during certain activities;
- Air quality: Since particulates will be continuously emitted during certain activities, their duration is considered temporary;
- Traffic: The duration of disruptions is considered temporary.

In light of the foregoing, the duration of the potential project impacts on quality of life in Brossard is considered to be temporary.

6.2.7.4.2.4 Assessment of potential effect

By integrating the evaluations of all criteria in Table **Erreur ! Source du renvoi introuvable.**, the potential project impact on quality of life in Brossard at certain times is considered high (e.g., during road closings or particularly dust or noise emitting activities). This is due, in part, to the estimate of potential impact on air quality in the two sensitive areas located to the south. However, the potential impact assessment does not take implementation of mitigation measures and monitoring into account in addition to performance criteria. In terms of air quality, a series of mitigation measures and monitoring, including real time monitoring, will help to reduce the project's impact significantly in the sensitive areas (measures presented in subsection 7.2.3). Some mitigation measures and monitoring are also designed to reduce project impacts on traffic (subsection 6.2. 2) and the noise environment (subsections 6.2. 3 and 7.2.1) as much as possible. Applying all these measures means that the project's residual impact on the quality of life is estimated to be insignificant.

6.3 DESCRIPTION OF MITIGATION MEASURES

The inventory of the environment and impact analysis revealed certain constraints that will have to be considered in drawing up the deconstruction methods for the Existing Champlain Bridge (Table 51, Table 52 and Table 53). Mitigation measures have been drawn up in this respect which are divided into three main categories, as described in Section 6.2: design criteria, standard mitigation measures and specific mitigation measures. These criteria and measures are presented in the following sections.

Note that, as mentioned in Section 6.2, these criteria and measures stem from those in the 2013 EA for the New Champlain Bridge (Dessau-CIMA+, 2013), but have been updated according to 2019 good practices and workshops held with Infrastructure Canada to incorporate the lessons learned during the construction of the New Bridge. Table 82 and Tables 87 through 90 present the 2013 EA design measures and mitigation measures in the left-hand column, and the updated design measures and mitigation measures for the deconstruction project in the right-hand column. A colour code is added to facilitate the analysis (green: design criteria or mitigation measure unchanged with respect to the 2013 EA; yellow: modified design criteria or mitigation measure; red: design criteria or mitigation measure to be removed since it no longer applies to deconstruction; blue: new design criteria or mitigation measure).

6.3.1 ENVIRONMENTAL DESIGN AND PERFORMANCE CRITERIA

Design criteria (CC) and performance criteria (CP) (Table 82) were developed to guide the integration of environmental constraints from the start of the deconstruction method design process, thus allowing the best solution to be optimized and selected. Some of these measures that require more details are presented in the sections that follow.

6.3.1.1 Soil, sediment and groundwater quality (CC-3)

6.3.1.1.1 Soil and sediment quality

Prior studies have identified the presence of contaminated soil and sediment in the work area. The excavated materials generated by the work must be managed in accordance with current regulations, including those of the MELCC. The management of excavated soil shall prioritize its reuse on site provided that contamination levels allow for it. The excess soil and sediment that cannot be reused on site shall be disposed of off site at authorized locations.

6.3.1.1.2 Groundwater quality

The prior studies that were consulted (see section 3.1.1, Volume 1) revealed the presence of groundwater with manganese and chloride concentrations exceeding the benchmarks. It is also likely that other limits may be exceeded during the project. Depending on the depth of the excavations, the groundwater may have to be extracted from the trenches. In such a case, the groundwater will have to be managed in accordance with regulations. Contaminated water will have to be treated on site or handled by a specialized contractor who can treat it off site. Pumped water may not be discharged into the environment if its quality does not meet the benchmarks.

The use of machinery and refuelling of equipment are likely to generate hydrocarbon spills that could affect groundwater quality. Preventive measures will need to be adopted to limit the risk of groundwater contamination, including:

- Keeping equipment in good condition and inspecting it on a regular basis;
- Prohibiting equipment with leaks from accessing the work site;
- Preparing response procedures in the event of a spill.

6.3.1.2 Management of contaminants found in materials (CC-24)

To manage contaminants found in some materials, the general measures for the management of environmental risk posed by contaminants on the bridge to be used during the work include the following:

- Specific control/disposal measures to be defined;
- Materials containing asbestos or lead-based paint must be removed in accordance with industry standards, as defined in the specifications that will be drawn up for the project.
- Additional air quality monitoring for the parameters that are identified will be required;
- All friable or deteriorated asbestos materials and any lead-based paint that is peeling and flaking must be removed before deconstruction work.
- If appropriate handling and transportation techniques are used to minimize dust emissions, paint that is adhering well on the bridge materials to be removed can be left in place. These materials will have to be eliminated in accordance with provincial regulatory requirements.

Table 82 – Design measures and performance criteria

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL DESIGN MEASURE	UPDATED DESIGN MEASURE	NOTE
Protection of wetlands and water quality	None	CC-1	Design civil-engineering structures to comply with the Federal Policy on Wetland Conservation by favouring, in order of importance, loss avoidance, minimization and compensation. If necessary, draw up a compensation plan that includes the creation, development or conservation of a wetland of equivalent ecological function.	Protection of wetlands and water quality – **CC-1**: Design civil-engineering structures to comply with the Federal Policy on Wetland Conservation by favouring, in order of importance, loss avoidance, minimization and compensation. If necessary, draw up a compensation plan that includes the creation, development or conservation of a wetland of equivalent ecological function.	
Contaminated soil management	Not applicable to deconstruction	CC-2	Abutments will be sited in compliance with MDDEFP's policy on the protection of riverbanks, coastlines and flood plains. Abutments will be sited in compliance with MDDEFP's policy on the protection of riverbanks, coastlines and flood plains.	N/A	
Soil, sediment and groundwater quality	Change	CC-3	The project's preliminary design must identify excavation locations so that these areas can be characterized and an environmental management plan for excavated materials can be developed.	Soil, sediment and groundwater quality – **CC-3**: The project's preliminary design must identify excavation locations so that these areas can be characterized and an environmental management plan for excavated materials, sediment and groundwater can be developed.	Groundwater added
Archeology and heritage	Not applicable to deconstruction	CC-4	Bridge design (components D1a and C) must minimize encroachment of permanent (abutment and boulevard) and temporary (detours) structures on the Le Ber archeological site (BiFj-1).	N/A	
Protection of fish habitat	Not applicable to deconstruction	CC-5	Pier design should seek to avoid type 22 zones near the shores of Nuns' Island.	N/A	
Work in aquatic environments	Change	CC-6	CC-6 Following or during the structural design stage (but before start of construction work), conduct flow and ice regime modelling in order to predict potential effects. Additional measures may be required. Changes to flow conditions should not significantly affect flow patterns and velocities in the principal fish migration routes (Greater La Prairie Basin and the Nuns' Island channel).	Work in aquatic environments – **CC-6**: Carry out hydraulic modelling based on the reference project with temporary facilities (2 flows: average 2-year flow and low flow Q_{2-7}) and post-work modelling (2 flows: average 2-year flow and low flow Q_{2-7}). Said modeling shall include the SSL compensatory development immediately upstream of the bridge. The modeling must show that the temporary works do not modify hydraulic conditions on the SSL development such that the target depth and velocity ranges are respectively 2.0 to 3.5 m and 0.5 to 1.5 m/s, for a mean flow between May 1 and June 15.	Request from DFO at the meeting held on January 15, 2019. Catch added considering the SSL compensation project
Work in aquatic environments	Change	CC 6b	CC–6b – Clarification: For the jetty located on the west bank of the Greater La Prairie Basin, the flow velocity in the migration corridors must be between 0.8 and 1.2 m/s during high-water periods. The water depth must be between 0.6 and 1 m during the same periods. Furthermore, rocks and boulders, sills, groins or deflectors will be installed to increase roughness in the migration corridors and thus reduce velocities during high-energy flow conditions. However, care must be taken to ensure that those structures do not impede fish passage during lower-energy flow conditions. Lastly, a minimum depth of 40 cm in the fishways is required during low-water periods; there is no minimum velocity. The flow in the migration corridors will be maintained at all times to create a downstream attraction flow.	Work in aquatic environments – **CC–6b**: Depending on jetty size, include migration corridors integrated into the Nuns' Island jetty. At least two fishways must be created: one near and parallel to the shore, between piers 40W and 39W, as close as possible to pier 40W, and the other parallel to the flow of water, placed between and roughly in the middle of piers 37W and 38W. The fishways must be at least 5 m wide (calculated in relation to a water level of 40 cm at low flow ($Q_{2,7}$)); The fishways must be shaped like a natural watercourse, with the bottom corresponding to the natural riverbed of the river and the sides created with slopes of 1:1,5. The flow velocity in the fishways must be between 0.8 and 1.2 m/s during high-water periods. Rocks and boulders, sills, groins or deflectors may have to be used to increase roughness in the fishways and thus reduce velocities during high-energy flow conditions. However, care must be taken to ensure that those structures do not impede fish passage during lower-energy flow conditions. The fishways (slopes and structures inside the fishways, as the case may be) must be designed to withstand floods likely to occur during the Work as well as ice. A minimum depth of 60 cm in the fishways is required during low-water periods; there is no minimum velocity. The flow in the migration corridors must be maintained at all times to create a downstream attraction flow.	Measure revised to include migratory corridors in the new jetties based on their size, where applicable, and based on DFO specifications.
Aesthetic and visual aspects	Not applicable to deconstruction	CC-7	The New Bridge for the St. Lawrence should reflect the predominant role it plays in the Montreal landscape and enhance its value as a regional landmark with appropriate aesthetics. The views of the city and the river from the bridge will be maintained.	N/A	
Aesthetic and visual aspects	Not applicable to deconstruction	CC-8	The design should promote integration of the project into the urban environment so that existing strengths are maintained and weaknesses minimized during execution of this major infrastructure project.	N/A	

Table 82 – Design measures and performance criteria (cont'd)

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL DESIGN MEASURE	UPDATED DESIGN MEASURE	NOTE
Integration of project into the environment	None	CC-9	Residual spaces will be given high-quality landscaping using native vegetation.	Integration of project into the environment – **CC-9** – Residual spaces will be given high-quality landscaping using native vegetation.	
Integration of project into the environment	None	CC-10	The project should improve and consolidate the existing bike path network and enhance the views from the paths.	Integration of project into the environment – **CC-10** – The project must enhance and consolidate the existing bike network as well as its scenic views.	
Aesthetic and visual aspects	Not applicable to deconstruction	CC-11	Montreal's horizontal links could be enhanced by considering the quality and sizing of the engineering structures (viaducts) at the Atwater, Wellington and LaSalle intersections to improve connectivity between the Sud-Ouest and Verdun boroughs.	N/A	
Aesthetic and visual aspects	Not applicable to deconstruction	CC-12	Consider the possibility of a horizontal link between the Sud-Ouest and Verdun boroughs.	N/A	
Aesthetic and visual aspects	Not applicable to deconstruction	CC-13	Construction of the New Bridge for the St. Lawrence will not interfere with revitalization projects for the banks of the St. Lawrence.	N/A	
Aesthetic and visual aspects	Not applicable to deconstruction	CC-14	Study the possibility of a pedestrian path on both sides of Highway A-10 over Nuns' Island.	N/A	
Birds	Not applicable to deconstruction	CC-15	Low-intensity, short-wavelength lights should be considered rather than red and yellow lights. LED lighting is favoured. Lighting should be directed toward the ground.	N/A	
Birds	Not applicable to deconstruction	CC-16	If obstruction lighting is required, flashing lights should be used.	N/A	
Sound environment	Not applicable to deconstruction	CC-17	Infrastructure design will need to include anti-noise measures where the impact is major in noise-sensitive areas (see Figure 84). The impact noise level is presented in Table 63. Sound mitigation measures should reduce the LAeq (24-hour) residual noise level to an acceptable noise level of 60 dBA. Design criteria are presented in Section 7.3.6.	N/A	
Archeology	Not applicable to deconstruction	CC-18	The bridge design should enhance the historical character of the site when planning landscaping near the abutment.	N/A	
Protection of wetlands and water quality	Not applicable to deconstruction	CC-19	The design must prevent meltwater from being discharged directly into sensitive areas (wetlands, MBS, fish habitats), and that an approach for treating meltwater will be studied.	N/A	
Protection of wetlands and water quality	Not applicable to deconstruction	CC-20	The design must include collection and settling basins for runoff along the land sections of the route.	N/A	
Protection of wetlands and water quality	Not applicable to deconstruction	CC-21	The structural geometry should limit accumulations of snow and ice on the infrastructures in order to reduce the need for de-icing.	N/A	
Groundwater quality	Not applicable to deconstruction	CC-22	Where necessary, the bridge design must take into account the geometry of the containment system in the western sector.	N/A	
Air quality	Not applicable to deconstruction	CC-23	The design of the structures should consider integrating an intelligent traffic-control system linked to sensors that will analyze local air quality.	N/A	
Contaminants on the bridge	New measure	CC-24		If the presence of materials containing asbestos, lead or other contaminants (e.g. silica, bird droppings) is confirmed following the sampling that is under way, the general management measures for the environmental risk presented by contaminants on the bridge that will have to be applied during the work include the following: • Specific control/elimination measures will be defined (see next paragraph); • Materials containing asbestos or lead-based paint must be removed in accordance with industry standards, as defined in the specifications that will be drawn up for the project. • Additional air quality monitoring for the parameters that are identified will be required;	Addition to mitigate the effects of contaminants potentially present on the materials that make up the bridge

Table 82 – Design measures and performance criteria (cont'd)

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL DESIGN MEASURE	UPDATED DESIGN MEASURE	NOTE
				• All friable or deteriorated asbestos materials and any lead-based paint that is peeling and flaking must be removed before deconstruction work. • If appropriate handling and transportation techniques are used to minimize dust emissions, paint that is adhering well on the bridge materials to be removed can be left in place. These materials will have to be eliminated in accordance with provincial regulatory requirements.	

Table 82 – Design measures and performance criteria (cont'd)

<table>
<tr><th>TOPIC</th><th>TYPE OF CHANGE</th><th>NO.</th><th>ORIGINAL MEASURE (DESIGN CRITERION)</th><th>UPDATED MEASURE (DESIGN CRITERION)</th><th>NOTE</th></tr>
<tr><td>Sound environment</td><td>Change</td><td>CP-1</td><td>PC-1 Noise levels associated with site mobilization activities must comply with the following: $L_{10\%}$ = 75 dbA during the day and ambient noise without work +5 dbA in the evening and at night (measured 5 m from sensitive areas). If the limits are not observed, mitigation measures must be implemented as defined in sections 9.9.3.1 and 9.9.3.2</td><td>Sound environment – <u>PC-1</u>: Noise levels must comply with MTQ levels (Volume II, Chapter 9, Section 9.9.1.4 and Table 9.9–1). For noise-sensitive areas: houses, hospitals and schools, parks, hotels, etc., the limits are:
<table>
<tr><td colspan="2">Day [7:00 am – 7:00 pm]</td><td colspan="2">Evening [7:00 pm - 11:00 pm]</td><td colspan="2">Night [11:00 pm - 7:00 am]</td></tr>
<tr><td>L10</td><td>Lmax</td><td>L10</td><td>Lmax</td><td>L10</td><td>Lmax</td></tr>
<tr><td>75 or baseline level +5*</td><td>85 or 90 for impact noise**</td><td>Baseline level +5</td><td>85</td><td>Baseline level +5 (if baseline level <70) or Baseline level +3 (if baseline level >70)</td><td>80</td></tr>
<tr><td colspan="6">* The highest of the two should be the noise level not to exceed
** Impact noise refers to sudden noise.</td></tr>
</table>
Limits for vibrations are:
<table>
<tr><th>RANGE OF FREQUENCY [HZ]</th><th>MAXIMUM ALLOWABLE PEAK PARTICLE VELOCITY [MM/S]</th></tr>
<tr><td><4</td><td>8</td></tr>
<tr><td>4 – 10</td><td>15</td></tr>
<tr><td>> 10</td><td>25</td></tr>
</table></td><td>The change allows MTQ limits for road work to be taken into account. Criteria added for the evening and nighttime and for vibrations.</td></tr>
<tr><td>Air quality</td><td>Change</td><td>CP-2</td><td>PC-2 Do not exceed a threshold of 30 µg/m³ for fine airborne particulate matter less than 2.5 microns in diameter over a 24-hour average ($PM_{2.5}$ 24 hr. average) and an average concentration of total particulate matter over 24 hours of 120 µg/m³ at 50 metres from the footprint. If the limit is not observed, mitigation measures must be implemented such as:
Use equipment fitted with a dust collection system;
Use tarpaulins during dust-producing work;
Cover piled materials with geotextile.
Encourage the use of wet-spray dust control equipment.</td><td>Air quality – <u>CP-2:</u> Airborne particulate matter that is less than 2.5 micrometres in diameter ($PM_{2.5}$) must not exceed 30 ug/m³ on average over a 24-hour period; airborne particulate matter that is less than 10 micrometres in diameter (PM_{10}) must not exceed 50 ug/m³ on average over a 24-hour period; furthermore, an average concentration of total suspended particulates after 24 hours must not exceed 120 ug/m³ at the ambient air quality monitoring stations in the deconstruction project communities.
If the limit is not observed, mitigation measures must be implemented such as:
Use equipment fitted with a dust collection system;
Temporarily interrupt work until mitigation measures are implemented
Use tarpaulins during dust-producing work;
Cover piled materials with geotextile.
Encourage the use of wet-spray dust control equipment.</td><td>Performance criterion added for P_{10}</td></tr>
<tr><td>Water quality</td><td>Change</td><td>CP-3</td><td>PC-3 The work must not produce concentrations of SS in the river in excess of 25 mg/l of existing concentrations. If these concentrations are exceeded, additional mitigation measures must be implemented, such as:
Install a turbidity curtain;
Adjust work methods;
Identify and control sources of SS emissions.</td><td>Water quality – <u>PC-3</u>: The work must not produce concentrations of SS in the river in excess of 25 mg/l of existing concentrations at 100 m and 5 mg/l at 300 m. If these concentrations are exceeded, additional mitigation measures must be implemented, such as:
Install a turbidity curtain;
Adjust work methods;
Identify and control sources of SS emissions.</td><td>Clarification on distances to simplify field measurements and monitoring of this measurement</td></tr>
</table>

Table 82 – Design measures and performance criteria (cont'd)

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL MEASURE (DESIGN CRITERION)	UPDATED MEASURE (DESIGN CRITERION)	NOTE
Water quality	Change	CP-4	CP-4 Pumped water must meet the criteria for discharge in natural environments for all contaminants. Monitoring must be increased in contaminated sectors (Island of Montreal). Where criteria are exceeded, water must be treated or disposed of at an authorized centre.	Water quality – **PC-4**: Pumped water must meet the criteria for discharge in natural environments for all contaminants. Monitoring must be increased in discharge areas. Where criteria are exceeded, water will have to be treated or disposed of at an MELCC-authorized centre.	"Island of Montreal" removed.
Air quality	New measure	CP-5		Airborne concentrations of silica (cristobalite, quartz or tridymite) must not exceed 5 µg/m³ on average over a 24-hour period at the fixed ambient air monitoring stations in the communities.	Criteria added for other periods to simplify the monitoring of measurements in real time and by the contractor
Air quality	New measure	CP-6		Airborne lead concentrations (as TWA) must not exceed 0.5 ug/m³ over a 24-hour period at the ambient air quality monitoring stations found in the bridge deconstruction project communities.	Criteria added for silica since specific to deconstruction.
Air quality	New measure	CP-7		Airborne particulate matter that is less than 2.5 micrometres in diameter must not exceed 35 ug/m³ on average over a 3-hour period; airborne particulate matter that is less than 10 micrometres in diameter must not exceed 88 ug/m³ on average over a 1-hour period; furthermore, an average concentration of total suspended particulates after 1 hour must not exceed 300 ug/m³ at the ambient air quality monitoring stations at the site boundaries.	Criteria added for lead since specific to deconstruction.
Air quality	New measure	CP-8		The opacity of scattered dust must be limited to 40% or less at the site, and 20% or less at the site boundaries. Opacity is the measurement of the reduction in visibility caused by a cloud of dust. For instance, if a cloud of dust obscures background visibility by 20%, the opacity of the visible emissions from the dust cloud is 20%. The Contractor must use proper signage and impose a speed limit that is appropriate for the vehicles to reduce dust emissions on access roads and work surfaces, and must also apply a dust suppressant (type to be approved by the Bureau de normalisation du Québec [BNQ]) in the hour following the quantity of dust that is lifted up when a vehicle passes by exceeding 40 mg/m³ within two metres of the vehicle's direction of wind.	Criteria added for dust plumes.
Air quality	New measure	CP-9		Concentrations of silica (cristobalite, quartz or tridymite) based on an airborne sample of less than 4 micrometres in diameter must not exceed a limit of 0.025 mg/m³ on average over an 8-hour work day. Airborne concentrations of lead must not exceed a limit of 0.05 mg/m³ on average over an 8-hour work day; inhalable particulate concentrations (less than 4 micrometres in diameter) must not exceed a limit of 3 mg/m³ over an 8-hour work day in the workers' work area at the work site.	Criteria added for silica at the work site.

6.3.1.3 Protection of wetlands (CC-1)

Some wetlands were identified alongside Nuns' Island where the west jetty will be built. Since this is federal property, JCCBI will have to make sure that federal policy requirements on wetland conservation (EC, 1991) are observed in the design. One federal policy strategy is:

> *"The Federal Government will develop exemplary practices in support of wetland conservation and sustainable wetland use to be incorporated in the design and implementation of federal programs and in the management of federal lands and waters." (EC, 1991)*

The design will have to consider the following response sequence:

1. Avoid impacts (by moving structures outside wetlands);
2. Minimize encroachment on these environments;
3. Compensate for unavoidable impacts by adopting an approach based on the principle of no net loss of function.

Since the jetty will have to be built under the bridge to access the structures and piers to be deconstructed, it will be hard to avoid or minimize this impact. Based on the worst-case scenario, losses are estimated at about 1,000 m^2 and a compensation project will have to be implemented by JCCBI (see Section 6.4).

6.3.1.4 Protection of fish habitat and water quality (CC-6, CC-6b, CP-3 and CP-4)

6.3.1.4.1 Fishway design

As with wetland protection, the design approach for in-water temporary structures (e.g. jetties) must be based on intervention in the following order: avoidance, minimization, and loss compensation. A compensation plan is being prepared to make up for serious damage to fish caused by the jetties extending over a maximum of 6.5 ha (worst-case scenario) (see Section 6.4).

Given the potential effects of jetties on fish migration, as described in Section 6.2.1, two fishways built into the Nuns' Island jetty will have to be designed. No fishway is needed in the jetties near the dike and on the Brossard side. The first fishway must be located near the shore, parallel to it, between piers 40W and 39W. The second fishway must be located between piers 37W and 38W, perpendicular to the jetty. These fishways will be 5 m wide (calculated in relation to a water level of 40 cm at low flow ($Q_{2\text{-}7}$)). The fishways are shaped like a natural watercourse, with the bottom corresponding to the natural riverbed of the St. Lawrence and the sides created with slopes of 1:1.5. The flow velocity in the fishways must be between 0.8 and 1.2 m/s during high-water periods. Rocks and boulders, sills, groins or deflectors must be installed to increase roughness in the migration corridors and thus reduce velocities during high-energy flow conditions. However, care must be taken to ensure that those structures do not impede fish passage during lower-energy flow conditions. No minimum flow velocity is required in low-water periods. The water must be at least 0.6 m deep in the fishways during low-water periods. The flow in the fishways must be maintained at all times to create a downstream attraction flow.

The design of the fishway on the Nuns' Island side must take the future SSL fish habitat development into account. No encroachment in the new development should be allowed. The jetty must allow optimal water depths and current velocities to be maintained on the spawning ground development.

6.3.1.4.2 Hydraulic modelling

In order to size the fishways based on the previously presented jetty design, DFO required that a hydraulic model be developed. Two flow rates were simulated: the average two-year flood ($Q_{2\ avg}$: 9,325 m^3/s) and the average summer flow ($Q_{2\text{-}7}$: 6,895 m^3/s) for fishways that are 5 m and 7 m wide.

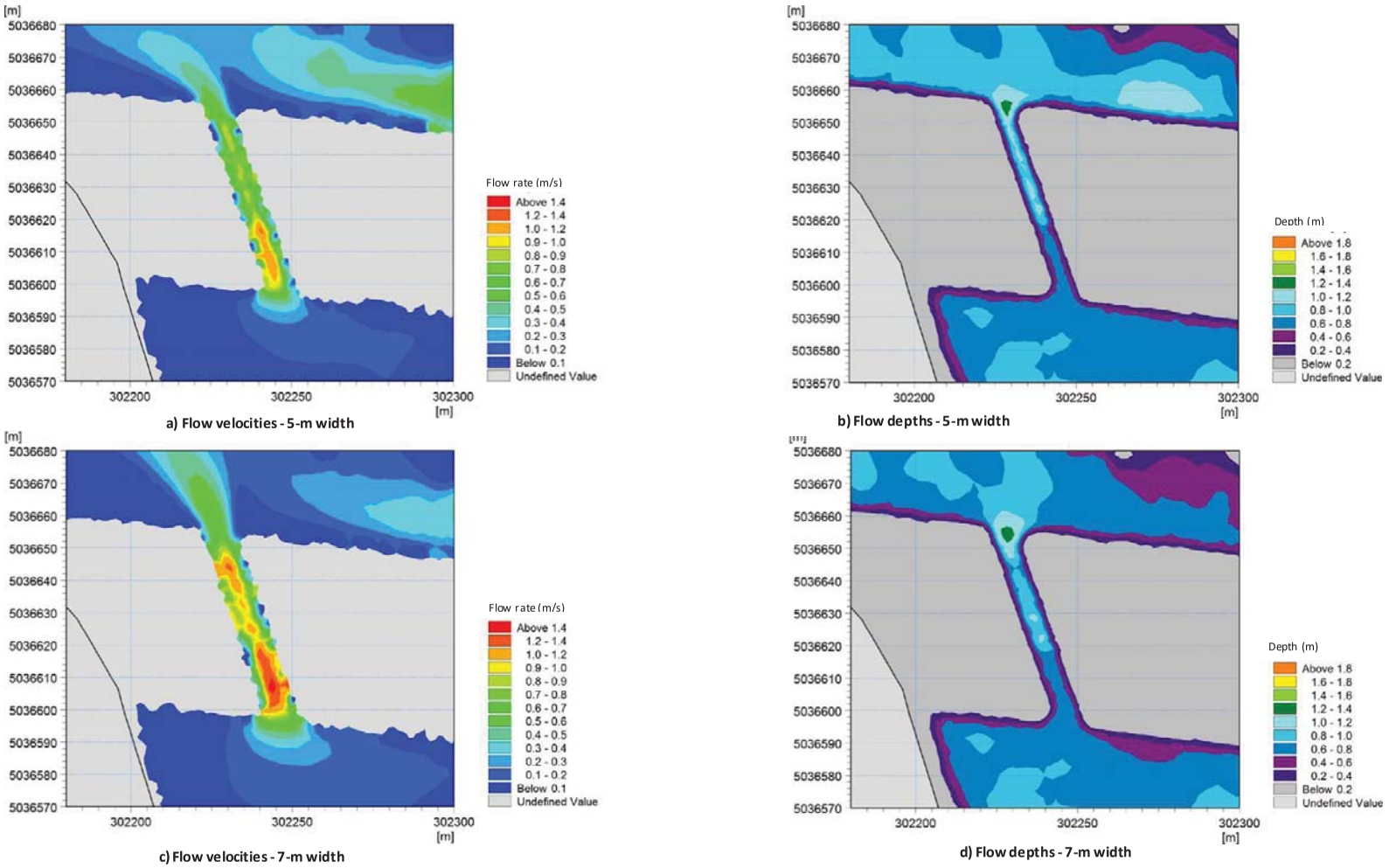
The modelling was done without the SSL jetties since they will no longer be present when the JCCBI jetties are built. The modelling includes the New Bridge piers as well as the SSL development upstream of the Nuns' Island jetty. No developments or added roughness were modelled.

Table 83 presents a summary of the modelling results for flow velocities and depths in the Nuns' Island jetty fishways. Average velocities were calculated in the main corridor of the fishways where flow velocities are greatest (Figure 67 to 70). Therefore, the average velocities modelled in the fishways during flood periods are higher than the DFO criterion (between 0.8 and 1.2 m/s). Flow velocities are lower on either side of the main fishway corridor. Fish will typically use flow areas that facilitate their migration in the fishways. In addition, adding roughness (blocks and cobble) or structures in the fishways (e.g. walls, deflectors) will sufficiently reduce flow velocities to comply with the DFO criterion. Given these results, a minimum width of 5 m will be required in the call for tenders.

Table 83 - Summary of modelling results for the Nuns' Island jetty fishways (LaSalle | NHC, 2019).

FISHWAY	FLOW RATE (M3/S)	WIDTH (M)	VELOCITY MIN (M/S)	VELOCITY MAX (M/S)	VELOCITY MEAN (M/S)	DEPTH MIN (M)	DEPTH MAX (M)	DEPTH MEAN (M)
A	6 895	5	0.6	1.2	0.84	0.7	1.25	0.8
		7	0.85	1.4	0.98	0.65	1.05	0.76
	9 325	5	1	1.65	1.27	1.2	1.7	1.2
		7	1.2	1.75	1.34	1.25	1.7	1.21
B	6 895	5	0.55	1.15	0.76	0.7	1.5	0.91
		7	0.6	1.35	0.89	0.65	1.55	0.9
	9 325	5	1.1	1.75	1.28	1.25	2.1	1.27
		7	1.1	1.9	1.36	1.15	2.15	1.31

In grey: results exceed DFO design criterion



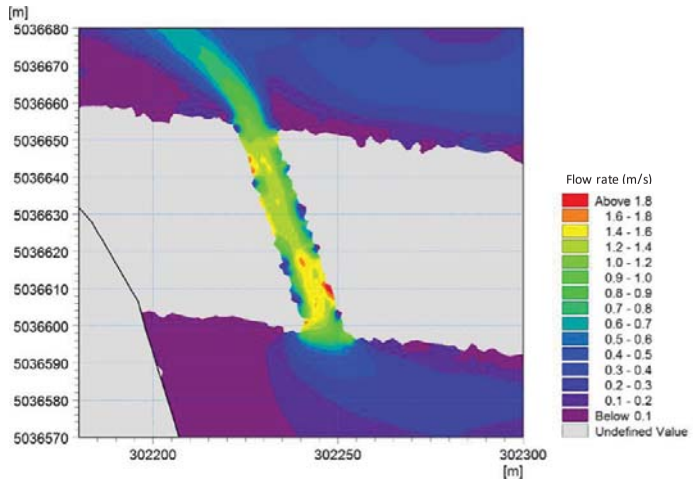
a) Flow velocities - 5-m width

b) Flow depths - 5-m width

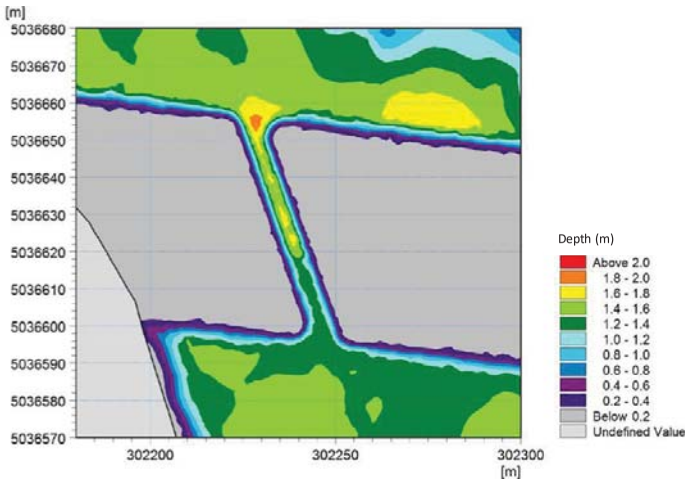
c) Flow velocities - 7-m width

d) Flow depths - 7-m width

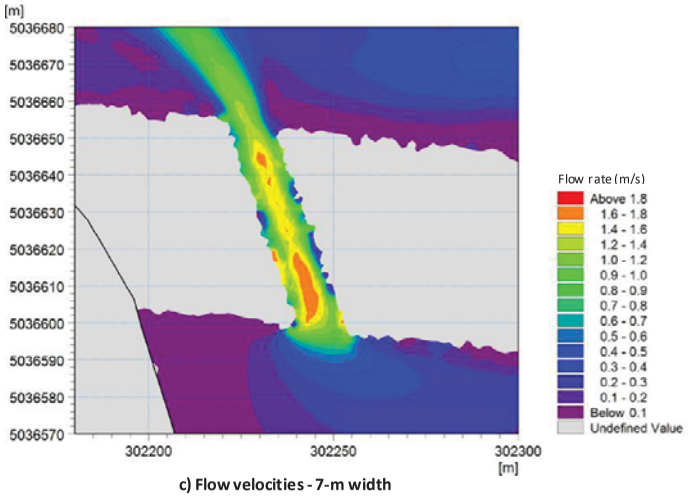
Figure 67 – Mean flow velocities and depths in fishway A (near the shore) for low flow (6,895 m³/s) (LaSalle|NHC, 2019)



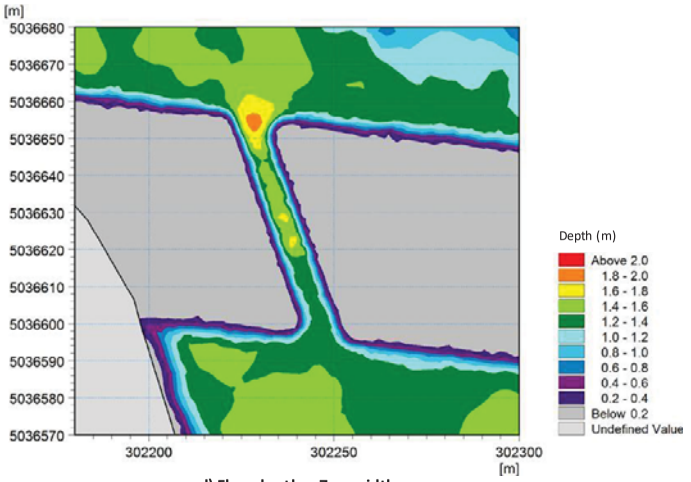
a) Flow velocities - 5-m width



b) Flow depths - 5-m width

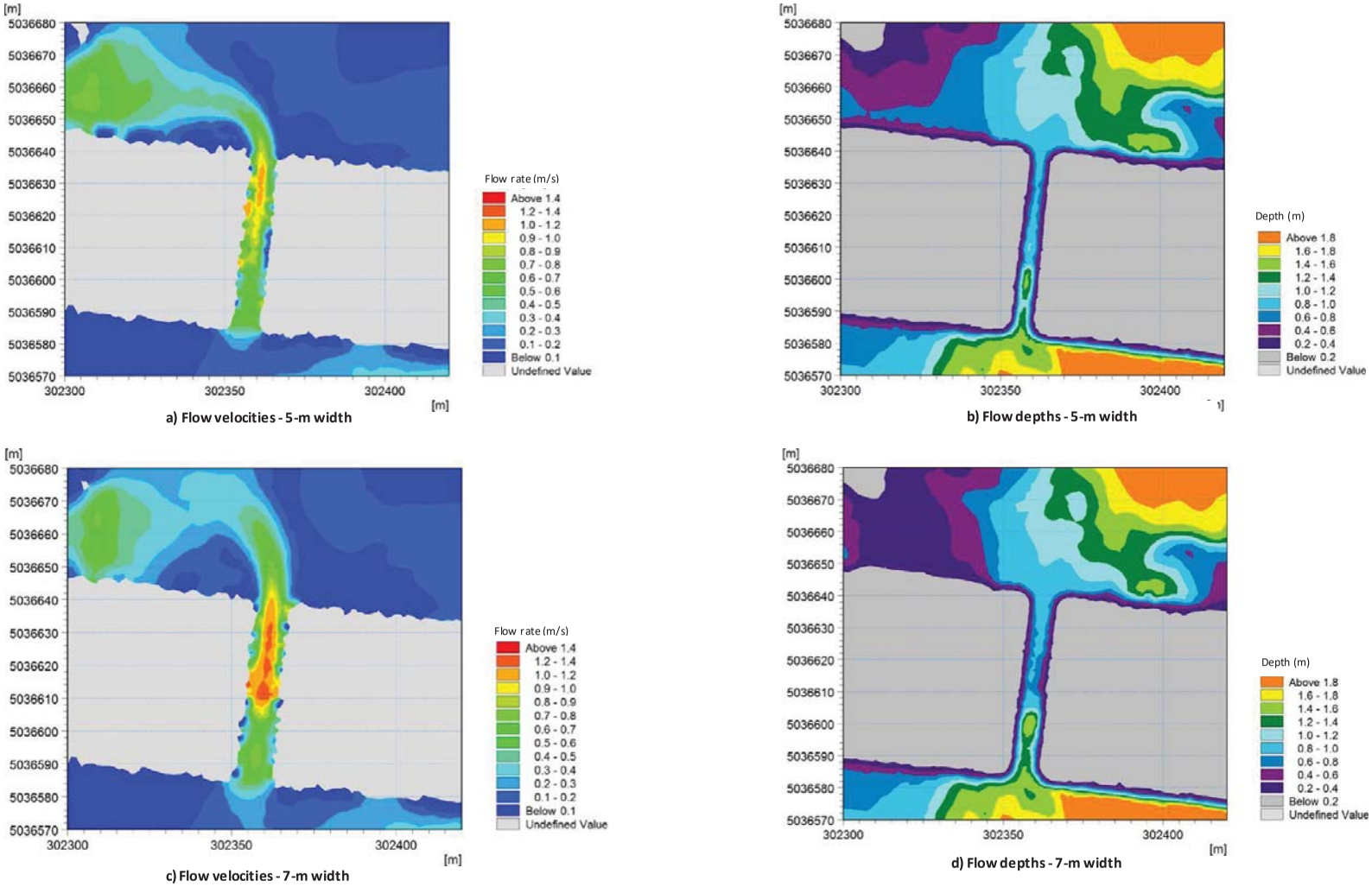


c) Flow velocities - 7-m width



d) Flow depths - 7-m width

Figure 68 – Mean flow velocities and depths in fishway A (near the shore) for average 1:2-year flow (Q = 9,325 m^3/s) (LaSalle | NHC 2019)



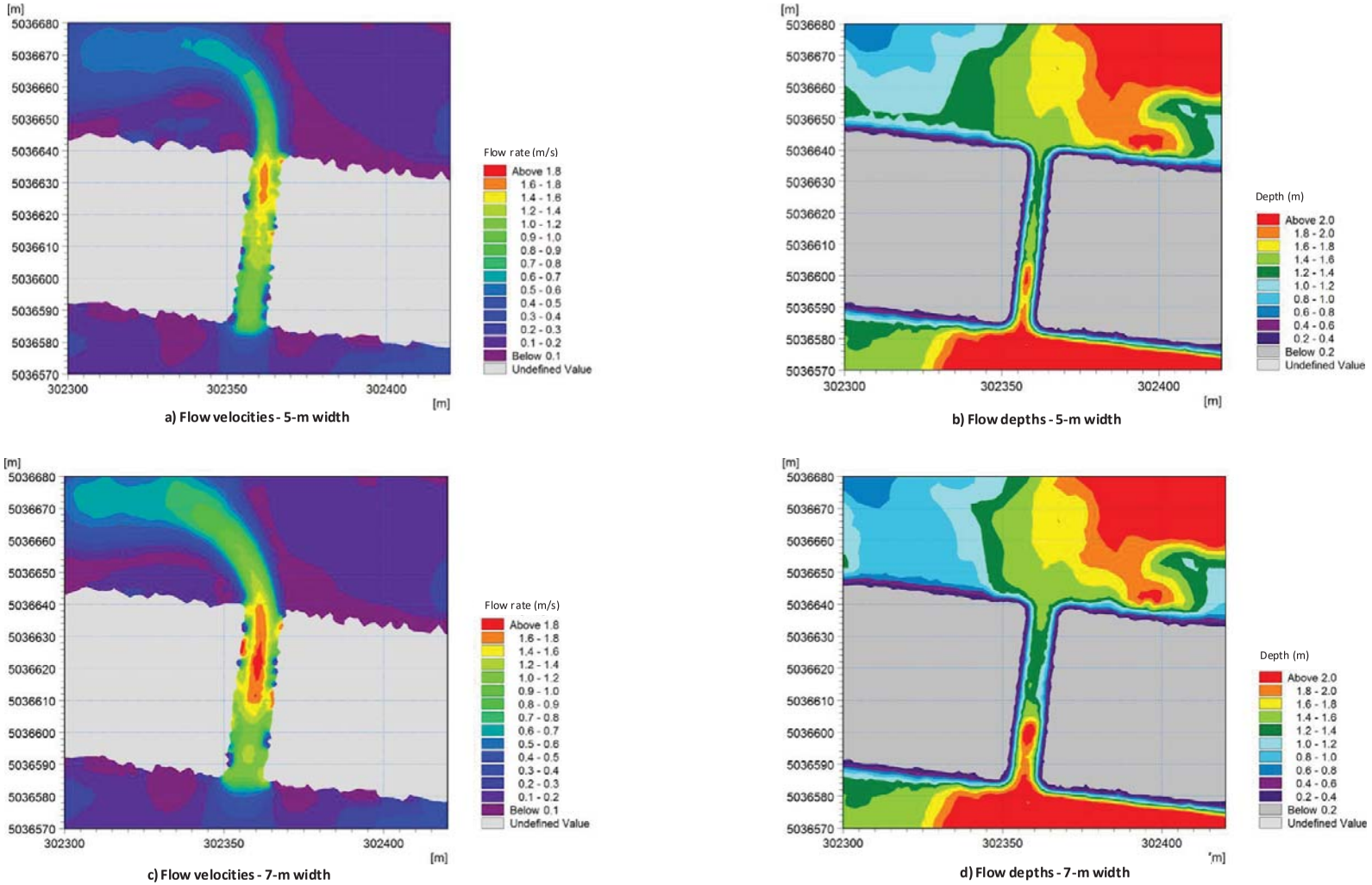
a) Flow velocities - 5-m width

b) Flow depths - 5-m width

c) Flow velocities - 7-m width

d) Flow depths - 7-m width

Figure 69 – Mean flow velocities and depths in fishway B (off shore) for low flow (Q = 6,895 m^3/s) (LaSalle|NHC, 2019)



a) Flow velocities - 5-m width

b) Flow depths - 5-m width

c) Flow velocities - 7-m width

d) Flow depths - 7-m width

Figure 70 – Mean flow velocities and depths in fishway B for average 1:2-year flow ($Q = 9{,}325\ m^3/s$) (LaSalle|NHC, 2019)

Although the modelling done for the design of fishways in the projected jetty indicates that it will be possible to meet DFO design criteria, the contractor's work method is still not known. The contractor will have to redo the hydraulic modelling for the design of fishways in the jetty that it intends to use, if applicable, while complying with the main design criteria that were previously described.

6.3.1.4.3 Water quality monitoring during deconstruction work

The work must not generate suspended solids in the St. Lawrence in excess of 25 mg/l of existing concentrations at 100 m and 5 mg/l at 300 m. If these concentrations are exceeded, additional mitigation measures must be implemented, such as:

- Install a turbidity curtain;
- Adjust work methods;
- Identify and control sources of SS emissions.

Pumped water must meet the criteria for discharge in natural environments for all contaminants. Monitoring must be increased in high-risk areas. Where criteria are exceeded, water must be treated or disposed of at an authorized site.

6.3.1.5 Sound environment (PC-1)

There are noise-sensitive areas near the site, both on Nuns' Island and in Brossard. Noise from deconstruction work will affect these sensitive locations, particularly residential areas.

Construction-related noise limits determined by the MTQ in *Ouvrages routiers, tome II, chapitre 9* (MTQ, 2018) must be respected.

The limits for noise-sensitive areas corresponding to homes, hospitals and schools, parks, hotels, etc., are presented in Table 84.

To avoid exceeding the limits, once the contractor has determined its specific methods, equipment and scheduling, the following steps must be implemented:

- Model the effects of noise emissions generated by work within the work sites on neighbouring noise-sensitive areas;
- Manage changes in activities or equipment used on site by logging them. A change may require reviewing the modelling;
- Ensure that the operating conditions of all equipment at the site comply with the noise mitigation measures recommended by the manufacturer;
- Monitor noise levels as work progresses or when there are significant changes in work methods or equipment.

Table 84 - Summary of MTQ noise limits

AREA AND LAND USE	NOISE LIMITS (DBA) (AMBIENT NOISE AND WORK SITE COMBINED)					
	DAY [7 AM TO 7 PM]		EVENING [7 PM TO 11 PM]		NIGHT [11 PM TO 7 AM]	
	L_{10}	L_{MAX}	L_{10}	L_{MAX}	L_{10}	L_{MAX}
Noise-sensitive areas: homes, hospitals and schools, parks, hotels, etc.	75 or ambient noise +5 (1)	85 or 90 for impact noise (2)	Ambient noise +5	85	Ambient noise +5 (if ambient noise <70) or Ambient noise +3 (if ambient noise >70)	80
Commercial areas: office buildings, stores, etc.	80 or ambient noise +5 (1)	None	Ambient noise +5 (3)	None	None	None
Industrial areas: factories, shops, etc.	85 or ambient noise +5 (1)	None	None	None	None	None

[1] Higher of the two limits

[2] Impact noise refers to sudden intermittent noise.

[3] If applicable, this limit applies during hours of operation for the general public

6.3.1.6 Vibration (CP-1)

Some of the equipment or methods used during the deconstruction of the Existing Champlain Bridge may generate vibrations. Vibrations from construction sites have generally two potential outcomes:

- Low vibration levels (i.e. well below damage levels), when received at a point of reception, may cause annoyance and/or concern for potential damages from vibrations in building structures;
- Sufficiently high vibration levels may damage structures, ranging from cosmetic damages (e.g. cracking of paint, hairline fracture of superficial nature) to more concerning damages (e.g. cracks and fractures of building elements).

The City of Toronto By-Law 514 regulates vibrations from construction and demolition activities and provides limits on maximum allowable peak particle velocity (PPV) vibration levels at receptors due to construction activities. Table 85 presents construction vibration limits.

Table 85 - City of Toronto by-law construction vibration limits

RANGE OF FREQUENCY [HZ]	MAXIMUM ALLOWABLE PEAK PARTICLE VELOCITY [MM/S]
<4 Hz	8
4 Hz – 10 Hz	15
> 10 Hz	25

The limits from By-Law 514 are expressed within this document as Vibration Alert Levels, which identify the value of instrumentation readings (in the case of vibration monitoring) at which project operations must cease.

6.3.1.7 Air quality (CP-2)

The requirements in Table 86 will be used to control particulate emissions during the project. Fixed monitoring stations will be located upstream (based on the direction of the wind) from each sensitive area, in a secure location with electrical power.

Table 86 - Proposed air quality performance requirements

ELEMENT	REQUIREMENTS
CP-2	Fine airborne particulate matter less than 2.5 micrometres in diameter shall not exceed a threshold of 30 ug/m^3 averaged over a 24-hour period; airborne particulate less than 10 micrometres in diameter shall not exceed a threshold of 50 ug/m^3 averaged over a 24-hour period; and an average concentration of total particulate matter after 24 hours shall not exceed 120 ug/m^3 at the project community-based ambient air monitoring stations (fixed stations).
CP-5	Concentrations of silica (cristabolite, quartz or tridymite) in air must not exceed a threshold of 5 ug/m^3 averaged over a 24-hour period at the project community fixed ambient air monitoring stations.
CP-6	Concentrations of lead (in PM_{tot}) in air shall not exceed a threshold of 0.5 ug/m^3 over a 24-hr period at the PROJECT community-based ambient air monitoring stations.
CP-7	Fine airborne particulate matter less than 2.5 micrometres in diameter shall not exceed a threshold of 35 ug/m^3 averaged over a 3-hour period; airborne particulate less than 10 micrometres in diameter shall not exceed a threshold of 88 ug/m^3 averaged over a 1-hour period; and an average concentration of total particulate matter after 1 hour shall not exceed 300 ug/m^3 at the project community-based ambient at the Site boundary.
CP-8	Fugitive dust shall be limited to an opacity of 20% or less on site, and 10% or less at the property boundary. Opacity is a measurement of how much visibility is obscured by a plume of dust. For example, if a plume of dust obscures 20% of the view of the background, the visible emissions from the dust plume is 20% opacity. The contractor shall use mitigation measures to reduce dust emissions on access roads and Work surfaces (which must be of a type approved by the Bureau de normalisation du Quebec (BNQ)), within 1 hour when opacity is exceeds 40% onsite and/or 20% at the Site boundary. It should be noted that it is not the intent to measure opacity continuously; opacity measurements are to be performed when dust levels are observed to have a potential to impact areas outside of the Site boundary.
CP-9	Concentrations of silica (cristabolite and/or quartz) based on a <4 micrometres in diameter sample in air shall not exceed a threshold of 0.025 mg/m^3 averaged over an 8-hour workday; concentrations of lead in air shall not exceed a threshold of 0.05 mg/m^3 averaged over an 8-hour workday; concentrations of respirable particulate (<4 micrometres in diameter) shall not exceed a threshold of 3 mg/m^3 over an 8-hour workday in the breathing zone of workers located on the worksite.

6.3.2 STANDARD MITIGATION MEASURES

Standard mitigation measures consist of proven measures that come, for instance, from publications of recognized environmental assessment bodies. Three sources of current measures were used for the TEA:

- The standard measures proposed by DFO for projects involving in-water works (Table 87);
- The MTQ's "Cahier de charges et devis généraux" (2018; Table 88);
- MTQ standards for road works (Volume II, 2018; Table 89).

The last two were chosen for reference purposes only since they are recognized in the Quebec construction industry. The standard measures from these last two documents are written from a provincial regulatory standpoint; therefore, they will be adjusted to the federal context (names of government departments, legislation and other similar elements).

Since the MTQ's *Cahier de charges et devis généraux (CCDG)* and road works standards are frequently revised, the latest versions will be used during the works. The tables list the measures in effect in the CCDG and 2018 standards.

6.3.3 SPECIFIC MITIGATION MEASURES

Table 90 lists the specific mitigation measures that were identified during the TEA. These measures are largely based on those of the 2013 EA and have been proven during the construction of the New Champlain Bridge.

Table 87 – Standard DFO mitigation measures for work carried out in fish habitat

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL CURRENT MITIGATION MEASURE	UPDATED CURRENT MITIGATION MEASURE	NOTE
General	Change	MPO-1	Perform work outside sensitive periods for fish species present in watercourses.	General – **MPO-1**: The restriction periods to be observed for the various types of habitat are as follows: - 2, 3, 4, 8: April 1 to August 1 - 12, 13, 16, 22: April 1 to July 1 - Other habitats: no period	Dates sent by DFO on February 5, 2019
Temporary structures	Change	MPO-2	Maintain the free flow of water at all times as well as a sufficient inflow of water to preserve fish habitat functions (feeding, rearing, spawning) downstream of the work area. Take the necessary measures to prevent impacts such as flooding, water recession, suspended matter and erosion upstream and downstream of the work area.	Temporary structures – **MPO-2**: Maintain sufficient flow of water and inflow of water at all times to preserve fish habitat functions (feeding, rearing, spawning) downstream of the work area. Take the necessary measures to prevent impacts upstream and downstream of the work area (e.g. flooding, water recession, suspended matter and erosion).	Updated based on the DFO's 2018 list
	Not relevant to deconstruction	MPO-2 2b	Clarification: The design of the jetty east of Nuns' Island must take into account that there is an upstream jetty built by JCCBI. Structures are planned between the two jetties to ensure there is a continuous current and to avoid creating "dead" zones.		
	Change	MPO-3	Temporary structures must be protected from erosion by stabilization, such as by using a suitable geotextile membrane or riprap. Furthermore, these structures must be designed to withstand any flooding that may occur during construction.	Temporary structures – **MPO-3**: Design and stabilize the temporary structures so that they are capable of withstanding floods and ice loading likely to occur during the construction phase and to prevent shoreline and riverbed erosion. Temporary structures must be protected from erosion by stabilization, such as by using a suitable geotextile membrane or riprap.	Update
	New measure	MPO-38		Temporary structures – **MPO-38**: Limit the cumulative encroachment of temporary structures to one-third of the width of the watercourse, measured from the NHWM, in order to restrict increases in current speed by restricting the water flow and thus not obstructing the free passage of fish or causing erosion problems. In the present case, the Small La Prairie Basin and the Greater La Prairie Basin are considered to be two separate bodies of water. The cumulative encroachment of temporary structures may thus reach up to one-third of the width of each basin, unless an agreement has been reached with DFO.	Added 2018 measures sent by DFO
	New measure	MPO-43		Temporary structures – **MPO-43**: Design and stabilize the temporary structures so that they are capable of withstanding floods likely to occur during the construction phase and do not modify water conditions in order to prevent shoreline and riverbed erosion.	Added 2018 measures sent by DFO
Erosion control and resuspension of sediments	Replaced measure	MPO-4	Take all necessary precautions to prevent fine particulate matter from being deposited into the aquatic environment beyond the immediate work area.	Erosion control and resuspension of sediments – **MPO-4**: Take all necessary precautions to prevent fine particulate matter from being deposited into the aquatic environment beyond the immediate work area.	Replaced with measure MPO-35
	Change	MPO-5	Favour the use of turbidity curtains to prevent sediment transport in water.	Erosion control and resuspension of sediments – **MPO-5**: Favour the use of turbidity curtains to encircle the work area in order to confine suspended sediments in it, or any other equivalent efficiency measure. Deploy the curtain to minimize the number of fish caught inside the enclosure.	Updated based on the DFO's 2018 list
	None	MPO-6	Dispose of excavated material at a site designated for that purpose.	Erosion control and resuspension of sediments – **MPO-6**: Dispose of excavated material at a site designated for that purpose.	
	None	MPO-7	Do not carry out earthwork or excavation work close to water during floods or heavy rain.	Erosion control and resuspension of sediments – **MPO-7**: Do not carry out earthwork or excavation work close to water during floods or heavy rain.	
	None	MPO-8	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.	Erosion control and resuspension of sediments – **MPO-8**: 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.	
	New measure	MPO-31A		Erosion control and resuspension of sediments – **MPO-31A**: Limit topsoil stripping, clearing and grading of work areas to the extent strictly necessary.	Added 2018 measures sent by

Table 87 – Standard DFO mitigation measures for work carried out in fish habitat (cont'd)

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL CURRENT MITIGATION MEASURE	UPDATED CURRENT MITIGATION MEASURE	NOTE
					DFO
	New measure	MPO-35		Erosion control and resuspension of sediments – **MPO-35**: Implement effective measures to limit the influx of sediments from the work site to the aquatic environment and ensure their maintenance (e.g. sediment barriers, berms, sediment traps, sedimentation pond, temporary slope stabilization, diverting water towards vegetated areas). The measures must remain effective during high-water periods, heavy rain and freeze-up periods.	Mitigation measure added along with the indication to use deflectors as needed.
	New measure	MPO-32		Erosion control and resuspension of sediments – **MPO-32**: Dispose of excavated material outside of the high-water mark. If required, contain or stabilize the materials (e.g. impermeable lining, sediment barrier) to prevent the influx of sediments into the aquatic environment.	Added 2018 measures sent by DFO
	New measure	MPO-33		Erosion control and resuspension of sediments – **MPO-33**: When work has to be carried out in water, favour isolating the work area so as to work on dry land or limit the influx of sediment into the aquatic environment (e.g. cofferdams, diking and pumping, temporary diversion, turbidity curtain).	Mitigation measure added along with the term "favour" to provide some leeway.
	New measure	MPO-30A		Erosion control and resuspension of sediments – **MPO-30A**: Limit clearing on either side of the high-water mark to the required minimum and maintain the vegetation cover as long as possible before starting work.	Added 2018 measures sent by DFO
Machinery	None	MPO-9	Prohibit stream fording by machinery.	Machinery – **MPO-9**: Prohibit stream fording by machinery.	
Site reclamation	Change	MPO-10	Restore the banks and beds of watercourses affected by the work to their original condition (e.g. grain size, streambed profile) once the temporary structures have been dismantled at all disturbed sites.	Site reclamation – **MPO-10**: Restore the bed and shores of aquatic environments affected by the work to their original condition (e.g. substrate size, streambed profile, vegetation) once the work site has been demobilized over all the affected areas (e.g. temporary structures, access points).	Measure updated in 2019
	Change	MPO-11	Stabilize all reworked areas, particularly on side slopes, as the work is completed. If more time is needed for permanent stabilization, erosion control measures must remain in place to prevent erosion and capture any eroded material.	Site reclamation **MPO-11:** Stabilize all reworked areas, particularly on side slopes, as the work is completed. If more time is needed for permanent stabilization, erosion control measures must remain in place to prevent erosion and capture any eroded material. Hydroseeding is minimally required in mobilization areas and temporary work areas.	Clarifications added
	None	MPO-12	Restore ditches damaged by machinery (e.g. damage to gradient, embankment shoulders).	Site reclamation – **MPO-12:** Restore ditches damaged by machinery (e.g. damage to gradient, embankment shoulders).	
	Change	MPO-13	Limit the use of riprap on the banks of watercourses up to the natural high water mark (two-year return period), and replant the riparian strip from the edge of the riprap using recognized vegetation engineering techniques that encourage overhanging shrub and grass. Replanting must be done as soon as possible after grading work is complete, with preference given to indigenous species.	Site reclamation – **MPO-13**: Limit the use as much as possible of riprap on the shorelines up to the natural high water mark, while favouring vegetation growth on the riverbank at the lowest elevation using recognized vegetation engineering techniques that favour overhanging shrubs and grass. Replanting must be done as soon as possible after grading work is complete, with preference given to indigenous species.	Measure updated in 2019
Cofferdam installation	Change	MPO-14	Favour types of cofferdams that minimize encroachment on fish habitat.	Cofferdam installation – **MPO-14**: Favour types of cofferdams that minimize encroachment on fish habitat (e.g. sheet piles, concrete blocks, sand bags).	Updated based on the DFO's 2018 list
	Change	MPO-15	If the use of stone cofferdams is justified, they must be constructed using clean granular material and a membrane must be installed to ensure that the structure is watertight.	Cofferdam installation – **MPO-15**: If the use of stone cofferdams is justified, they must be constructed using clean granular material that is free of contamination and a membrane must be installed to ensure that the structure is watertight, in order to keep the amount of water to be managed to a minimum.	Updated based on the DFO's 2018 list
	Change	MPO-16	Before being returned to the river, water pumped outside the cofferdams must first be decanted or pumped into vegetation located over 15 metres from the river.	Cofferdam installation – **MPO-16**: Treat water from inside the cofferdam enclosure before it returns to the aquatic environment in order to limit sediment inflow (e.g. buffer vegetation area more than 15 m from the St. Lawrence, settling pond, trench filter, Envirobags, weir container, combination of several methods)	To ensure better water quality Updated based on the DFO's 2018 list
	Replaced measure	MPO-17	Restrict encroachment to no more than one-third the width of the river, calculated from the natural high water mark.	Cofferdam installation – **MPO-17**: Restrict encroachment to no more than one-third the width of the river, calculated from the natural high water mark.	Redundant measure with measure MPO-38, which is more conservative
	Change	MPO-18	Recover any fish trapped in the cofferdams and immediately return them to the	Cofferdam installation – **MPO-18**: Carefully recover any fish trapped in the confined	Updated based on the

Table 87 – Standard DFO mitigation measures for work carried out in fish habitat (cont'd)

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL CURRENT MITIGATION MEASURE	UPDATED CURRENT MITIGATION MEASURE	NOTE
			aquatic environment to prevent fish mortality.	or isolated sections of the work site and immediately return them to the aquatic environment to prevent fish mortality. If any species at risk are likely to be found in the work area, the transfer of fish may require a permit under the Species at Risk Act. In such a case, contact the Fisheries Protection Division at 1-877-722-4828 or by e-mail at habitat-qc@dfo-mpo.gc.ca	DFO's 2018 list
	New measure	MPO-36		Cofferdam installation – **MPO-36**: Favour the use of work methods that improve the quality of the water to be managed (e.g. macadamize the bottom of excavations, trenches and resurgences, install a blinding slab)	Added 2018 measures sent by DFO
	New measure	MPO-39		Cofferdam installation – **MPO-39**: Take the necessary measures to seal the cofferdams and thus minimize the quantity of water to manage	Added 2018 measures sent by DFO
Installation of temporary jetties	Change	MPO-19	Clean material must be used for the construction of a temporary jetty (including the surface of the jetty).	Installation of temporary jetties – **MPO-19**: Clean material that is free of contamination must be used for the construction of a temporary jetty (including the surface of the jetty).	Details
	Replaced measure	MPO-20	Encroachment by the base of the temporary jetties must be limited to no more than one third of the width of the stream, calculated from the natural high water mark (HWM).	Installation of temporary jetties – **MPO-20**: Encroachment by the base of the temporary jetties must be limited to no more than one third of the width of the stream, calculated from the natural high water mark (HWM).	Redundant measure with measure MPO-38, which is more conservative
	None	MPO-21	Install a sediment collection mechanism on the downstream side of the temporary jetties during their installation and dismantling. The approaches must take into account the stream flow of affected watercourses during the dismantling work.	Installation of temporary jetties – **MPO-21**: Install a sediment collection mechanism on the downstream side of the temporary jetties during their installation and dismantling. The approaches must take into account the stream flow of affected watercourses during the dismantling work.	
	New measure	MPO-37		Installation of temporary jetties – **MPO-37**: Favour jetties that minimize encroachment on fish habitat.	Added 2018 measures sent by DFO
	Change	MPO-30	Compensate surface areas that sustained severe damage at a ratio of 1:1.	Installation of temporary jetties – **MPO-30** – Compensate surface areas where fish sustained severe damage	No ratio will be required for this project. The compensation project must allow severe damage to be offset.
	Change	MPO-31	Carry out 2D hydraulic modelling to assess conditions (speed, depth and direction of flow) at the entry, inside and at the exit of each projected migration corridor during the operation of the temporary jetties	Installation of temporary jetties – **MPO-31** – Carry out 2D hydraulic modelling to assess conditions (speed, depth and direction of flow) at the entry, inside and at the exit of each projected migration corridor during the operation of the temporary jetties, minimally for the average 2-year flow and low flow $Q_{2\text{-}7}$.	Details on flows to be modelled
Diking and pumping water from upstream to downstream	Change	MPO-22	Before being returned to the river, dike water pumped from upstream to downstream must be decanted or pumped into vegetation more than 15 metres from the watercourse.	Diking and pumping water from upstream to downstream – **MPO-22**: Before being returned to the river, the pumped water must be decanted or pumped into vegetation more than 15 metres from the river or into a settling pond.	Text adjusted to the deconstruction project
	None	MPO-23	Install a structure (e.g. screen) at the pumping hose inlet to prevent the intake of fish.	Diking and pumping water from upstream to downstream – **MPO-23**: Install a structure (e.g. screen) at the pumping hose inlet to prevent the intake of fish.	
	Change	MPO-24	Direct the pumping hose outlet downstream to limit the risk of causing pockets of erosion to form along the shoreline.	Diking and pumping water from upstream to downstream – **MPO-24**: Direct the pumping hose outlet to limit the risk of causing pockets of erosion to form along the shoreline.	Text adjusted to the deconstruction project
Dismantling of existing works and debris management	None	MPO-25	Do not release any debris, concrete residues or damp mortar into the aquatic environment. Any debris that accidentally enters the water must be removed as quickly as possible.	Dismantling of existing works – **MPO-25:** Do not release any debris, concrete residues or damp mortar into the aquatic environment. Any debris that accidentally enters the water must be removed as quickly as possible.	
Temporary diversion of a watercourse	Not relevant to deconstruction	MPO-26	The free passage of fish must be maintained in the temporary watercourse diversion channel.		No watercourses will be diverted in relation to the works.
	Not relevant to deconstruction	MPO-27	Construct a minimum-flow channel in the temporary diversion to allow preferential flow during low-flow periods.		No watercourses will be diverted in relation to the works.
	Not relevant to	MPO-28	Ensure even, continuous placement of riprap on the banks and bed of the		No watercourses will be

Table 87 – Standard DFO mitigation measures for work carried out in fish habitat (cont'd)

TOPIC	TYPE OF CHANGE	NO.	ORIGINAL CURRENT MITIGATION MEASURE	UPDATED CURRENT MITIGATION MEASURE	NOTE
	deconstruction		temporary stream diversion channel to properly seal the substrate and minimize interstitial flow through the rock.		diverted in relation to the works.
	Not relevant to deconstruction	MPO-29	Ensure a smooth connection between the downstream end of the temporary diversion channel and the natural stream to limit the risk of causing pockets of erosion to form in the opposite bank.		No watercourses will be diverted in relation to the works.
Temporary closure of the work site	New measure	MPO-40		Temporary closure of the work site – **MPO- 40**: Temporarily stabilize and protect the disrupted sites at risk of erosion and of transporting sediment to the aquatic environment using methods suited to the site, the duration of the work site closure, and the time of year.	Added 2018 measures sent by DFO
	New measure	MPO-41		Temporary closure of the work site – **MPO-41** Divert runoff before it reaches disturbed land (e.g. intercepting ditch and dissipation trench toward vegetation areas).	Added 2018 measures sent by DFO
	New measure	MPO-42		Temporary closure of the work site – **MPO-42** Make sure that the measures set up to limit the influx of sediment from the work site to the aquatic environment are working properly and that their maintenance is done before the work site is shut down each day.	Added 2018 measures sent by DFO

Table 88 Standard mitigation measures from MTQ General Specifications and Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
Clean-up and site reclamation	None	7.11	When the work is completed, the contractor must: remove from the footprint not only its own equipment and material but all unused materials, scrap, waste, gravel, whole or crushed stone, wood, stumps and roots; clean up the equipment and materials sites; restore obstructed ditches and watercourses; repair or rebuild demolished or damaged fences and other necessary structures; and dispose of all materials without degrading the site around the work or related structures. Lastly, the contractor must repair any damage to the work site, to public or private property affected by the work, to bodies of water, to camp sites, equipment storage sites, materials storage and supply sites, to the environment, and to forest or agricultural land. The contractor must also restore the forest cover on forest lands in the public domain.	Clean-up and site reclamation – **CCDG 7.11**: When the work is completed, the contractor must: remove from the footprint not only its own equipment and material but all unused materials, scrap, waste, gravel, whole or crushed stone, wood, stumps and roots; clean up the equipment and materials sites; restore obstructed ditches and watercourses; repair or rebuild demolished or damaged fences and other necessary structures; and dispose of all materials without degrading the site around the work or related structures. Lastly, the contractor must repair any damage to the work site, to public or private property affected by the work, to bodies of water, to camp sites, equipment storage sites, materials storage and supply sites, to the environment, and to forest or agricultural land. The contractor must also restore the forest cover on forest lands in the public domain.	
Traffic management	None	10.3.1	Before and during the work, the contractor must take the necessary measures to facilitate and direct the movement of vehicles on the road under construction and on detour roads made necessary by the construction work. Work signage must be maintained anywhere where there is a risk of accident or damage to structures under construction, either directly or indirectly because of the work. For the duration of the work, the contractor must install along the route signage that complies with the Ministère des Transports du Québec's *Tome V – Signalisation routière* part of the "Normes – Ouvrages routiers" series. In addition, the contractor must use the "Traffic Control Person Ahead" sign (T-60) whenever a signal person is directing traffic. The contractor must maintain location and guidance signage at all times. If the configuration of the work site requires this type of signage to be removed or relocated, the contractor must indicate the equipment to be used in the signage plans. The contractor must always ensure safe passage for road users. When traffic must be maintained on the road under construction, the contractor must maintain access to adjacent properties and provide regular road maintenance within the work area. During an authorized extended work suspension period, the contractor is released from performing regular road maintenance where traffic is maintained; however, the contractor is not released from responsibility for its works or for any structure damaged during previous work or damage that may result from such work.	Traffic management – **CCDG 10.3.1:** Before and during the work, the contractor must take the necessary measures to facilitate and direct the movement of vehicles on the road under construction and on detour roads made necessary by the construction work. Work signage must be maintained anywhere where there is a risk of accident or damage to structures under construction, either directly or indirectly because of the work. For the duration of the work, the contractor must install along the route signage that complies with the Ministère des Transports du Québec's "Tome V – Signalisation routière" part of the "Normes – Ouvrages routiers" series. In addition, the contractor must use the "Traffic Control Person Ahead" sign (T-60) whenever a signal person is directing traffic. The contractor must maintain location and guidance signage at all times. If the configuration of the work site requires this type of signage to be removed or relocated, the contractor must indicate the equipment to be used in the signage plans. The contractor must always ensure safe passage for road users. When traffic must be maintained on the road under construction, the contractor must maintain access to adjacent properties and provide regular road maintenance within the work area. During an authorized extended work suspension period, the contractor is released from performing regular road maintenance where traffic is maintained; however, the contractor is not released from responsibility for its works or for any structure damaged during previous work or damage that may result from such work.	
	None	10.3.4.3	Mobile variable message signs (VMS) must be functional throughout the construction period and keep users informed of real-time traffic conditions and obstructions.	Traffic management – **CCDG 10.3.4.3:** Mobile variable message signs (VMS) must be functional throughout the construction period and keep users informed of real-time traffic conditions and obstructions.	
Environmental protection	None	10.4.1	Granular material used in construction of the works must not come from the bed of a body of water or its shores, or from any source situated within 75 m of the aquatic environment (stream, river, lake or ocean).	Environmental protection – **CCDG 10.4.1**: Granular material used in construction of the works must not come from the bed of a body of water or its shores, or from any source situated within 75 m of the aquatic environment (stream, river, lake or ocean).	

Table 88 Standard mitigation measures from MTQ General Specifications and Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
	Change	10.4.2	An emergency spill kit must be available at all times and must include confinement sausages, absorbent rolls, sphagnum and the related containers and material (gloves, etc.) essential to address minor, accidental spills and ensure recovery and storage of contaminated material, as well as the management of contaminated soil and equipment. The kit must include a sufficient number of absorbent rolls to be able to cover the width of the body of water or to contain the petroleum products within a perimeter around the affected machinery. The kit must be easily accessible at all times for rapid response.	Environmental protection – **CCDG 10.4.2**: The contractor shall permanently have on hand an emergency kit for the recovery of petroleum products that includes, without being limited to: • Suitable absorbent materials, including sphagnum, granular absorbents, confinement sausages, absorbent rolls, absorbent pads, booms and equipment for emergency response on water; • Recovery containers; • Recovery bags; • Related accessories, including gloves, safety goggles, masks, a shovel, labels; • Any other items essential for dealing with small-scale accidental spills and ensuring the recovery, storage of soiled materials and management of contaminated soils and materials. If other hazardous materials in liquid form, as defined in the Regulation Respecting Hazardous Materials (CQLR, c. Q-2, r. 32), are used at the work site, the contractor must also have the appropriate materials, including specialized absorbents and neutralizers, to efficiently recover such materials. The kit must include a sufficient number of absorbent rolls to be able to cover the width of the lake, watercourse or wetland, or to contain the spilled products. The contractor must have additional kits for all work carried out alongside lakes, watercourses or wetlands so that they are available at all times for a quick response. A kit must be found at each of these locations if the contractor decides to carry out work simultaneously. Following partial or complete use of a kit, the contractor must take immediate measures to quickly replace the items that were used so that the kit is complete and ready for use.	Update to CCDG 2018; booms and on-water response equipment added
	Change	10.4.3.1	Release into a body of water of waste, oil, chemicals or other similar contaminants originating from a construction site is prohibited. The contractor must dispose of all such waste and scrap, of whatever nature, in compliance with prevailing laws and regulations. Work site access roads, parking and storage areas, and other temporary facilities must be located at least 60 metres from a water environment. The only land clearing permitted is that necessary for performance of the work. Refuelling and mechanical inspection of automotive equipment must not be performed within 15 metres of a body of water. The contractor must prevent all environmental contamination. During the work, the free flow of water must be assured without producing negative hydraulic or environmental impacts. No watercourse may be permanently reduced in width by more than 20%, as measured from the natural high water mark. A watercourse may not be widened when installing parallel culverts.	Environmental protection – **CCDG 10.4.3.1**: Release into a lake, body of water or wetland of waste, oil, chemicals or other contaminants originating from a construction site is prohibited. The contractor must dispose of such waste and contaminants in accordance with prevailing laws and regulations based on the type of contaminant involved. Work site access roads, parking and storage areas, and other temporary facilities must be located at least 60 metres from the above environments. The only land clearing permitted is that necessary for performance of the work. Refuelling and mechanical inspection of automotive equipment must not be performed within 15 metres of a lake, watercourse or wetland. The contractor must prevent all environmental contamination.	Update of mitigation measure in accordance with CCDG 2018 and removal of last two sentences that were not relevant.

Table 88 Standard mitigation measures from MTQ General Specifications and Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
	Change	10.4.3.2.1	Work performed by the contractor must not damage nearby lakes and watercourses, including public and private ditches. To minimize the flow of sediment into lakes and watercourses, during the work the contractor must build and maintain, where required, berm filters and sediment traps upstream from these environments. Furthermore, the contractor must build and maintain, at the start of work, berm filters and sediment traps in a ditch that drains the work area, in compliance with the provisions of Chapter 9 "Mesures d'atténuation environnementales temporaires," in the Ministère des Transports du Québec's *Tome II – Construction routière* part of the "Normes – Ouvrages routiers" series. Temporary berm filters and sediment traps must be dismantled when work is completed, and the area they occupy must be rehabilitated.	Environmental protection – **CCDG 10.4.3.3.1:** Work performed by the contractor must not damage nearby lakes and watercourses, including public and private ditches. To minimize the flow of sediment into lakes and watercourses, during the work the contractor must build and maintain, where required, berm filters and sediment traps upstream from these environments. Furthermore, the contractor must build and maintain, at the start of work, berm filters and sediment traps in a ditch that drains the work area, in compliance with the provisions of Chapter 9 "Mesures d'atténuation environnementales temporaires," in the Ministère des Transports du Québec's *Tome II – Construction routière* part of the "Normes – Ouvrages routiers" series. Temporary berm filters and sediment traps must be dismantled when work is completed, and the area they occupy must be rehabilitated.	CCDG 2018 updated for the section number
	Change	10.4.3.2.2	To limit sediment influx into bodies of water, the contractor must install geotextile sediment barriers in compliance with the provisions of Chapter 9 "Mesures d'atténuation environnementales temporaires," in the Ministère des Transports du Québec's *Tome II – Construction routière* part of the "Normes – Ouvrages routiers" series. The geotextile must be tight and well-anchored and conform to the topography of the ground. Periodic maintenance must be performed on the barriers, including removal of sediment accumulated against the membrane wall. Sediment barriers must be removed and recovered once stripped surfaces have been permanently stabilized. When barriers are removed, areas of sediment accumulation must also be cleaned and permanently stabilized.	Environmental protection – **CCDG 10.4.3.3.2:** To limit sediment influx into bodies of water, the contractor must install geotextile sediment barriers in compliance with the provisions of Chapter 9 "Mesures d'atténuation environnementales temporaires," in the Ministère des Transports du Québec's *Tome II – Construction routière* part of the "Normes – Ouvrages routiers" series. The geotextile must be tight and well-anchored and conform to the topography of the ground. Periodic maintenance must be performed on the barriers, including removal of sediment accumulated against the membrane wall. Sediment barriers must be removed and recovered once stripped surfaces have been permanently stabilized. When barriers are removed, areas of sediment accumulation must also be cleaned and permanently stabilized.	CCDG 2018 updated for the section number
	Change	10.4.3.2.3	Water from dewatering excavations and cofferdams must be discharged into a settling basin or a natural filter, such as an area of vegetation, in accordance with the following requirements: • The settling basin must be designed based on the entry and exit flow; • When the settling basin is 50% full, it must be cleaned; • The natural filter must be located in a grassy field, in a bog or in forest litter; • The contractor must obtain prior authorization from the owner of the land and must move the outlet regularly to distribute sedimentary deposits widely and to avoid destroying vegetation; • In all areas where there is a risk of erosion, the soil must be stabilized; if necessary, a pipe could be laid, a geotextile membrane installed, or riprap laid down; • Temporary settling basins must be dismantled at the end of the work, and the area they occupied must be rehabilitated.	Environmental protection – **CCDG 10.4.3.3.3**: Water from dewatering excavations and cofferdams must be discharged into a settling basin or a natural filter, such as an area of vegetation, in accordance with the following requirements: • The settling basin must be designed based on the entry and exit flow; • When the settling basin is 50% full, it must be cleaned; • The natural filter must be located in a grassy field, in a bog or in forest litter; • The contractor must obtain prior authorization from the owner of the land and must move the outlet regularly to distribute sedimentary deposits widely and to avoid destroying vegetation; • In all areas where there is a risk of erosion, the soil must be stabilized; if necessary, a pipe could be laid, a geotextile membrane installed, or riprap laid down; • Temporary settling basins must be dismantled at the end of the work, and the area they occupied must be rehabilitated.	CCDG 2018 updated for the section number

Table 88 Standard mitigation measures from MTQ General Specifications and Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
		10.4.3.3	The entry and exit points for equipment at a body of water must be situated so as to minimize the impact on banks, soil and plant cover. They must be clearly identified and have proper signage. The contractor must avoid areas where the slope requires vehicles to brake hard. When dismantling temporary access points, granular materials used in the construction of ramps must not be placed close to the body of water. If the ground is damaged, it must be restored to prevent erosion.	Environmental protection – **CCDG 10.4.3.4:** The entry and exit points for equipment at a body of water must be situated so as to minimize the impact on banks, soil and plant cover. They must be clearly identified and have proper signage. The contractor must avoid areas where the slope requires vehicles to brake hard. The supervisor must be notified prior to the use of each temporary access to the shore. The contractor may not do any work on the shore or the littoral of a lake or watercourse outside of the planned and authorized work areas. When dismantling temporary access points, granular materials used in the construction of ramps must not be placed close to the body of water. If the ground is damaged, it must be restored to prevent erosion.	Update to CCDG 2018
		10.4.3.5	Environmental protection – **CCDG 10.4.3.5**: The soil must be stabilized in all areas of the work site where there is a risk of erosion. To prevent erosion on the construction site: • Cleared land left exposed to the elements must be kept to a strict minimum in terms of both area and duration. Land clearing must be limited to the road section under construction. Before the start of work, the contractor must inform the government of the exposure time and the road section to be cleared or stripped; • Runoff from outside the construction site must be intercepted and directed off-site into stabilized locations for the entire construction period; • Slopes must be properly stabilized in compliance with the plans and specifications. If work is suspended during the winter, preventive soil stabilization must be completed in compliance with the plans and specifications.	Environmental protection – **CCDG 10.4.3.5**: The soil must be stabilized in all areas of the work site where there is a risk of erosion. To prevent erosion on the construction site: • Cleared land left exposed to the elements must be kept to a strict minimum in terms of both area and duration. Land clearing must be limited to the road section under construction. Before the start of work, the contractor must inform the government of the exposure time and the road section to be cleared or stripped; • Runoff from outside the construction site must be intercepted and directed off-site into stabilized locations for the entire construction period; • Slopes must be properly stabilized in compliance with the plans and specifications. The contractor must prepare a sketch and description of the temporary and permanent works it intends to carry out to prevent erosion, and give them to the government. If work is suspended during the winter, preventive soil stabilization must be completed in compliance with the plans and specifications.	Update to CCDG 2018
Noise management	None	10.4.4.1 and 10.4.4.2	Activities at the construction site that produce noise levels above the level of ambient noise after work will be covered by a noise management program when performed near noise-sensitive areas. A noise-sensitive area is defined as an area where the noise environment is an essential element to the performance of human activities. This is usually associated with residential, institutional and recreational uses.	Noise management – **CCDG 10.4.4.1 and 10.4.4.2**: Activities at the construction site that produce noise levels above the level of ambient noise after work will be covered by a noise management program when performed near noise-sensitive areas. A noise-sensitive area is defined as an area where the noise environment is an essential element to the performance of human activities. This is usually associated with residential, institutional and recreational uses.	
	None	10.4.4.3	When a noise management program is required, the Contractor must appoint a noise management manager and forward the name to the government before the first site meeting.	Noise management – **CCDG 10.4.4.3**: When a noise management program is required, the Contractor must appoint a noise management manager and forward the name to the government before the first site meeting.	
Tree clearing	None	11.2.5	Trees to be cut down are selected and marked by the supervisor. The Contractor must receive the supervisor's authorization prior to tree felling. Grubbing consists in uprooting stumps to a minimum depth of 300 mm underground. The Contractor must avoid damaging the land or the root zones of trees and shrubs that have been retained and must restore the damaged area.	Tree clearing – **CCDG 11.2.5**: Trees to be cut down are selected and marked by the supervisor. The Contractor must receive the supervisor's authorization prior to tree felling. Grubbing consists in uprooting stumps to a minimum depth of 300 mm underground. The Contractor must avoid damaging the land or the root zones of trees and shrubs that have been retained and must restore the damaged area.	

Table 88 Standard mitigation measures from MTQ General Specifications and Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
	Change	11.2.6	All branches on trees in the work area that interfere with the movement of equipment are to be removed in order to prevent damage to equipment. Branches are considered to interfere when there is no practical alternative to removal at the site. For trees located outside the right-of-way with interfering branches that must be pruned, written permission of the owner must be obtained before tree pruning or treatment is started. The contractor must submit its work plan to the government prior to starting the work. Pruning of interfering branches must comply with BNQ standard NQ 0605–200 "Entretien arboricole et horticole – Partie IV: Élagage des arbres." If damage occurs during pruning, the supervisor must be notified and will recommend appropriate tree treatments.	Tree clearing – **CCDG 11.2.6.1**: All branches on trees in the work area that interfere with the movement of equipment are to be removed in order to prevent damage to equipment. Branches are considered to interfere when there is no practical alternative to removal at the site. For trees located outside the right-of-way with interfering branches that must be pruned, written permission of the owner must be obtained before the start of pruning or tree treatment. The contractor must submit its work plan to the government prior to starting the work. Pruning of interfering branches must comply with BNQ standard NQ 0605–200 "Entretien arboricole et horticole – Partie IV: Élagage des arbres." If damage occurs during pruning, the supervisor must be notified and will recommend appropriate tree treatments.	Change in section number in CCDG 2018
Protection of trees and shrubs	None	11.2.7.1	Protection work concerns trees and shrubs whose projected leaf area is affected during performance of the work. The contractor must take all necessary measures to protect all trees and shrubs that are to be conserved as per the plans and specifications from damage or mutilation.	Protection of trees and shrubs – **CCDG 11.2.7.1**: Protection work concerns trees and shrubs whose projected leaf area is affected during performance of the work. The contractor must take all necessary measures to protect all trees and shrubs that are to be conserved as per the plans and specifications from damage or mutilation.	
	Change	11.2.7.1.1	All heavy equipment movement, storage of materials, excavation and backfill work as well as grubbing must occur at least 2 m from tree trunks and shrubs and at least 3 m from the edge of a wooded area. Only ground-level cutting is permitted within these buffers. At the start of work, a fence must be installed along the protection area and must be kept in place and in good condition throughout the work. The material used for the fence must provide an effective and unbroken boundary. It must be new and weather and tear resistant. Permitted colours are red and orange.	Protection of trees and shrubs – **CCDG 11.2.7.1.1**: At the start of work, the contractor must establish a protection area around the trees, shrubs and wooded areas to be conserved, as per the requirements in Chapter 10, "Arboriculture" in "Tome IV – Abords de route de la collection Normes – Ouvrages routiers." A protective fence must be installed along the protection area and must be kept in place and in good condition throughout the work. The material used for the fence must provide an effective and unbroken boundary. It must be new and weather and tear resistant. Permitted colours are red and orange. No heavy equipment may travel or materials stored inside the protection areas that are set up. The trees and shrubs to be removed in the protection area of a wooded area must be cut to the ground. The contractor must remove the fences around the protection areas once all the work indicated in the plans and specifications has been completed.	Update to CCDG 2018
	None	11.2.7.1.2	Along excavations, damaged roots with a diameter of at least 10 mm of retained trees must be cleanly cut. For trees outside the right-of-way with roots that require cutting, written permission of the owner must first be obtained.	Protection of trees and shrubs – **CCDG 11.2.7.1.1**: Along excavations, damaged roots with a diameter of at least 10 mm of retained trees must be cleanly cut. For trees outside the right-of-way with roots that require cutting, written permission of the owner must first be obtained.	
	None	11.2.7.1.3	Watering of the rooting zone of retained trees is to be done if weather conditions contribute to rapid drying of the topsoil. Watering is to be done in the projected leaf area of trees to a penetration of at least 150 mm into the topsoil. Watering must be phased to facilitate ground penetration and prevent runoff of surface water. There are to be two waterings per week until the excavation is closed or for the duration of the dry spell in the growing season. Each tree needs an average of 1,000 L of water per watering.	Protection of trees and shrubs – **CCDG 11.2.7.1.3**: Watering of the rooting zone of retained trees is to be done if weather conditions contribute to rapid drying of the topsoil. Watering is to be done in the projected leaf area of trees to a penetration of at least 150 mm into the topsoil. Watering must be phased to facilitate ground penetration and prevent runoff of surface water. There are to be two waterings per week until the excavation is closed or for the duration of the dry spell in the growing season. Each tree needs an average of 1,000 L of water per watering.	

Table 88 Standard mitigation measures from MTQ General Specifications and Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
Vibration control	Change	11.4.4.1.1	Particle speed, measured in any of the three wave components (transverse, longitudinal or vertical), must not exceed: • 25 mm/s for residential, commercial and other buildings; • 50 mm/s for water wells. Near fresh concrete, the limits are: • 5 mm/s during concreting and for a 24-hour period following concreting; • 25 mm/s for 48 hours following the end of the 5 mm/s particle velocity period; • 50 mm/s for 72 hours following the end of the 25 mm/s particle velocity period.	Vibration control – **CCDG 11.4.4.1.1**: Particle speed, measured in any of the three wave components (transverse, longitudinal or vertical), must comply with the defined limits based on frequency and depicted in the graph in Figure 2.6.2 of Schedule 2.6 of the Safety Code for the Construction Industry (CQLR, c. S-2.1, r. 4), without exceeding: • 25 mm/s for residential, commercial and other buildings; • 50 mm/s for water wells; • 50 mm/s at existing concrete elements Near fresh concrete, the limits are: • 5 mm/s during concreting and for a 24-hour period following concreting; • 25 mm/s for 48 hours following the end of the 5 mm/s particle velocity period; 50 mm/s for 72 hours following the end of the 25 mm/s particle velocity period.	Update to CCDG 2018
Waste material	Change	11.4.7.2.1 and 11.4.7	Waste disposal outside the right-of-way must be done in compliance with the Environment Quality Act (R.S.Q., c. Q-2) and corresponding regulations. Excess concrete and water used to clean concrete mixers must be disposed of in an area provided for this purpose and in such a way as to avoid environmental contamination. The site must first be approved by the government.	Waste material – **CCDG 11.4.7 and 11.4.7.2.1**: Waste disposal outside the right-of-way must be done in compliance with the Environment Quality Act (R.S.Q., c. Q-2) and corresponding regulations. Excess concrete and water used to clean concrete mixers must be disposed of in an area provided for this purpose and in such a way as to avoid environmental contamination. The site must first be approved by the government.	Update to CCDG 2018 (excess concrete in 11.4.7)
	None	11.4.7.3.1	Waste disposal must be done in compliance with the *Regulation Respecting Hazardous Materials* and the *Environment Quality Act* (R.S.Q., c. Q-2).	Waste material – **CCDG 11.4.7.3.1**: Waste disposal must be done in compliance with the *Regulation Respecting Hazardous Materials* and the *Environment Quality Act* (R.S.Q., c. Q-2).	
Dust suppressant	None	12.4	When vehicles travel over a granular surface and weather conditions generate excessive dust harmful to traffic and the environment (quantity of dust raised in excess of 40 mg/m³ when a vehicle passes by), the surface must be treated with water or a certified dust suppressant. Dust suppression must be carried out near weigh stations and detour roads and on private roads used to transport borrow fill. Dust suppression on foundation materials is to be done with water only, until granulometric analysis results confirm that these materials comply with prevailing regulations. A contractor applying a dust suppressant other than water before receipt of the granulometric results waives all right of recourse, unless samples are taken prior to application of the dust suppressant and in accordance with the procedure specified. A dust suppressant is to be applied on a level surface that has been prepared as per granular surface requirements.	Dust suppressant – **CCDG 12.4**: When vehicles travel over a granular surface and weather conditions generate excessive dust harmful to traffic and the environment (quantity of dust raised in excess of 40 mg/m³ when a vehicle passes by), the surface must be treated with water or a certified dust suppressant. Dust suppression must be carried out near weigh stations and detour roads and on private roads used to transport borrow fill. Dust suppression on foundation materials is to be done with water only, until granulometric analysis results confirm that these materials comply with prevailing regulations. A contractor applying a dust suppressant other than water before receipt of the granulometric results waives all right of recourse, unless samples are taken prior to application of the dust suppressant and in accordance with the procedure specified.	
	None	12.4.1.1	Products used for dust control must be composed of hygroscopic chloride salts such as calcium chloride or magnesium chloride. They must also meet the requirements of BNQ standard 2410–300 “Products Used as Dust Control Agents for Non-Asphalted Roads and Other Similar Surfaces” and be certified by the Quebec Standardization Office (BNQ).	Dust suppressant – **CCDG 12.4.1.1**: Products used for dust control must be composed of hygroscopic chloride salts such as calcium chloride or magnesium chloride. They must also meet the requirements of BNQ standard 2410–300 “Products Used as Dust Control Agents for Non-Asphalted Roads and Other Similar Surfaces” and be certified by the Quebec Standardization Office (BNQ).	
	None	12.4.1.2	Water used for dust suppression must be free of waste and organic matter.	Dust suppressant – **CCDG 12.4.1.2**: Water used for dust suppression must be free of waste and organic matter.	

Table 89 Standard Mitigation Measures from MTQ Road Work Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
Work site development	Change	9.31	Areas set aside for work site development should, where possible, be located on previously cleared or disturbed sites. Such areas must fulfil the following conditions: • Work site access roads, parking and storage areas, camps, work site offices and other temporary facilities must be located at least 60 m from a permanent watercourse or lake, and at least 30 m from an intermittent watercourse. During construction, all stripped areas must be stabilized, and an adequate drainage system must be designed in order to minimize the flow of sediment into nearby lakes, watercourses and wetlands. Granular material used for construction must come from a source (borrow pit) located more than 75 m from a body of water. Elsewhere on Crown land, in addition to complying with prevailing laws and regulations, authorizations for work outside the government department's right-of-way must be obtained, including the signed approval of affected landowners. The location of temporary-use sites related to work site operations (e.g. storage areas for surplus materials) require special attention in order to minimize environmental impacts.	Work site development – **NC.3.1**: Areas set aside for work site development should, where possible, be located on previously cleared or disturbed sites. Such areas must fulfil the following conditions: • Work site access roads, parking and storage areas, camps, work site offices and other temporary facilities must be located at least 60 m from a permanent watercourse or lake, and at least 30 m from an intermittent watercourse. • The main protection provisions apply to public forests, in accordance with the *Sustainable Forest Development Act* (CQLR, Chapter A-18.1) and the *Regulation Respecting Standards of Forest Management for Forests in the Domain of the State* (CQLR, Chapter A-18.1, r. 7). None of the following elements may be placed within 10 metres of the 20-metre wooded strip to be preserved along lakes and watercourses, within 30 metres of an intermittent watercourse, or within wooded strips to be preserved: o Materials to be stored; o Contractor's materials; o Camp sites, work site offices, and weigh station; o Delimbing, cutting and stacking areas; o Disposal sites for materials to be recovered or reused; o Detour roads and access roads (except for river crossings). During construction, all stripped areas must be stabilized, and erosion and sediment control measures must be set up to reduce the influx of sediment into nearby lakes, watercourses and wetlands. Several methods are presented in section 9.4, "Protection of the aquatic environment." Granular material used for construction must come from a source (borrow pit) located more than 75 m from a body of water. Elsewhere on Crown land, in addition to complying with prevailing laws and regulations, authorizations for work outside the government department's right-of-way must be obtained, including the signed approval of affected landowners.	Measure updated based on the 2018 version of Chapter 9, Volume 2 (2018-01-30).
Maintenance and movement of machinery	Change	9.32	Maintenance of machinery and vehicles as well as refuelling and oil replacement must be performed at least 15 m from a watercourse or lake (based on the natural high water mark). Contamination of the aquatic environment must be prevented and emergency measures for accidental spills must be developed. Where work is performed on Crown land, machinery maintenance may not be performed within 60 m of a watercourse. Refuelling and mechanical inspections of pumps, generators and fixed equipment may not be done within 15 m of a watercourse. Where necessary, fuel tanks must be installed on a waterproof structure with a minimum volume of 150% of the capacity of the tank as a safety margin. Surplus concrete and water used to clean concrete mixers must be stored in an area provided for that purpose so as to avoid environmental contamination. The site must have first been approved by the work site supervisor.	Maintenance and movement of machinery – **NC 9.3.2**: Maintenance of machinery and vehicles as well as refuelling and oil replacement must be performed at least 15 m from a watercourse or lake (based on the natural high water mark). Where work is performed on Crown land, machinery and vehicle maintenance may not be performed within 60 m of a watercourse. Refuelling and mechanical inspections of pumps, generators and fixed equipment may not be done within 15 m of a watercourse. Where necessary, fuel tanks must be installed on a waterproof structure with a minimum volume of 110% of the capacity of the tank as a safety margin. Excess concrete and water used to clean concrete mixers must be stored in an area provided for that purpose so as to avoid environmental contamination. The site must have first been approved by the work site supervisor.	Measure updated based on the 2018 version of Chapter 9, Volume 2 (2018-01-30). Addition of reference to CCDG 2018 (section 11.4.7) for surplus concrete
Waste management	None	9.3.3.1	Excess natural materials include excavated material composed of clay, silt, sand, gravel, rock and organic soil, as well as plant debris from land clearing, etc. Before disposing of excess materials outside the MTQ's right-of-way, it is critical to verify whether such material can be used for project-related works such as reuse as backfill, slope reduction, constructing a visual screen or a noise mound, restoring borrow pits or	Waste management – **NC 9.3.3.1:** Excess natural materials include excavated material composed of clay, silt, sand, gravel, rock and organic soil, as well as plant debris from land clearing, etc. Before disposing of excess materials outside the MTQ's right-of-way, it is critical to verify whether such material can be used for project-related works such as reuse as backfill, slope reduction, constructing a visual screen or a noise mound,	

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TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
			a former road corridor, and creating a wildlife habitat. Reuse of natural materials has the added advantage of reducing transportation costs and project budget costs. Where appropriate, disposal of excess materials must comply with municipal regulations, the *Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains* (R.R.Q., c. Q-2, r. 35) and the *Act Respecting the Preservation of Agricultural Land and Agricultural Activities* (R.S.Q., c. S-41.1). Before transporting excess materials to a location outside the right-of-way, authorization must be obtained from the owners of the site or the necessary land must be acquired.	restoring borrow pits or a former road corridor, and creating a wildlife habitat. Reuse of natural materials has the added advantage of reducing transportation costs and project budget costs. Where appropriate, disposal of excess materials must comply with municipal regulations, the Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains (R.R.Q., c. Q-2, r. 35) and the Act Respecting the Preservation of Agricultural Land and Agricultural Activities (R.S.Q., c. S-41.1). Before transporting excess materials to a location outside the right-of-way, authorization must be obtained from the owners of the site or the necessary land must be acquired.	
	Change	9.3.3.2	Materials resulting from the demolition of structures, such as concrete, asphalt, wood and steel, can be: reused in the project as backfill; or recycled (steel and wood). If these materials are neither reusable nor recyclable within the right-of-ways, they must be taken to a disposal site that complies with the *Environment Quality Act* (R.S.Q., c. Q-2) and the *Regulation Respecting the Land Incineration of Residual Materials* (R.R.Q., c. Q-2, r. 19). The MTQ encourages the reuse of waste asphalt and concrete. Asphalt can be recycled in road embankments after being broken up into fragments smaller than 300 mm. The fragments must be completely covered with a minimum 300-mm-thick layer of compactable soil. In any road rehabilitation project, whether the road is asphalt-paved or not, excess materials from excavation or from removal of the pavement structure that are transported outside the right-of-way must be checked for contamination. The *Soil Protection and Contaminated Sites Rehabilitation Policy* and related regulations set out the procedure to follow. For fragmentation of asphalt mixes containing asbestos fibres, the applicable protective measures are found in Section 51 of the *Act Respecting Occupational Health and Safety* (R.R.Q., c. S-2.1), *Regulation Respecting Occupational Health and Safety* (R.R.Q., c. S-2.1, r. 19.01) and the provisions of the *Safety Code for the Construction Industry* (R.R.Q., c. S-2.1, r. 6). Concrete can be recycled in embankments provided it is broken into fragments not exceeding 300 mm. Fragments must be homogeneous, and any reinforcing steel must not exceed the size of the fragment. The fragments must be completely covered with a minimum 300-mm-thick layer of compactable soil. Only concrete and untreated wood may be recycled at a privately owned site. However, the site must receive prior approval from the MDDEFP and comply with municipal by-laws. Disposal outside of the MTQ's right-of-way must be carried out in accordance with the *Environment Quality Act* (R.S.Q., c. Q-2), the *Regulation Respecting the Land Incineration of Residual Materials* (R.R.Q., c. Q-2, r. 19) and at an MDDEFP-approved site. MDDEFP also considers it acceptable to integrate concrete and asphalt aggregates into the production cycle as raw materials. Therefore, concrete aggregate can be recycled into the composition of new concrete, and recycled asphalt can be used for road surfaces and shoulders. Asphalt and concrete can also be temporarily stored in a quarry or sand pit for use in the near future on a road project, subject to compliance with applicable rules and the *Regulation Respecting Pits and Quarries* (R.R.Q., c. Q-2, r. 7). The regulation specifies	Waste management – **NC 9.3.3.2** Materials resulting from the demolition of structures include concrete, asphalt, wood, steel, etc. They can be reused or reclaimed for work as various materials that make up, for instance, fill under paving, bases, subbases and noise mounds, according to their contaminant levels and leaching and lixiviation potential, and in accordance with MELCC's guidelines for managing concrete, brick and asphalt from construction and demolition work and residue from the free stone sector. Steel and wood can also be recovered. If these materials are neither reusable nor recyclable within the right-of-ways, they must be taken to a disposal site that complies with the Environment Quality Act (CQLR, c. Q-2) and the Regulation Respecting the Land Incineration of Residual Materials (CQLR, c. Q-2, r. 19). The MTQ encourages the reuse of waste asphalt and concrete. Asphalt can be recycled in road embankments after being broken up into fragments smaller than 300 mm. Furthermore, the fragments must be completely covered with a minimum 300-mm-thick layer of compactable soil. In any road rehabilitation project, whether the road is asphalt-paved or not, excess materials from excavation or from removal of the pavement structure that are transported outside the right-of-way must be checked for contamination. The Soil Protection and Contaminated Sites Rehabilitation Policy and related regulations set out the procedure to follow. For fragmentation of asphalt mixes containing asbestos fibres, the applicable protective measures are found in Section 51 of the Act Respecting Occupational Health and Safety (CQLR, chapter S-2.1), the Regulation Respecting Occupational Health and Safety (CQLR, chapter S-2.1, r. 19.01) and the provisions of the Safety Code for the Construction Industry (CQLR, chapter S-2.1, r. 6). The measures concern worker training and notification, disposal and transport of residue from the fragmentation of asphalt mixes containing asbestos fibres, work area cleanup, protective devices and clothing, and work area signage. Concrete can be recycled in embankments provided it is broken into fragments not exceeding 300 mm. Fragments must be homogeneous, and any reinforcing steel must not exceed the size of the fragment. The fragments must be completely covered with a minimum 300-mm-thick layer of compactable soil. Only concrete and untreated wood may be recycled at a privately owned site. However, the site must receive prior approval from the MELCC and comply with municipal by-laws. Disposal outside of the MTQ's right-of-way must be carried out at an MELCC-approved site in accordance with the Environment Quality Act	Updated based on 2018 standards Change in certain references to regulations and the guidelines Replace MDDELCC with MELCC

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			that only concrete and asphalt may be stored, that a time limit must be set, that the waste must not interfere with site operations, that the land must be restored to its original condition and that permission must be obtained from MRNF or from the private owner.	(CQLR, chapter Q-2) and the Regulation Respecting the Land Incineration of Residual Materials (CQLR, chapter Q-2, r. 19). Concrete aggregate and asphalt aggregates can be integrated into a production cycle as raw material if the conditions specified in MELCC's guidelines for managing concrete, brick and asphalt from construction and demolition work and residue from the free stone sector (*Lignes directrices relatives à la gestion de béton, de brique et d'asphalte issus des travaux de construction et de démolition et des résidus du secteur de la pierre de taille*) are observed. Therefore, concrete aggregate can be recycled into the composition of new concrete, and recycled asphalt can be used for road surfaces and shoulders. Asphalt and concrete can also be temporarily stored in view of being reused over the short term for a road project, provided that the provisions related to the MELCC's guidelines for managing concrete, brick and asphalt from construction and demolition work and residue from the free stone sector (*Lignes directrices relatives à la gestion de béton, de brique et d'asphalte issus des travaux de construction et de démolition et des résidus du secteur de la pierre de taille*) are observed.	
	None	9.3.3.3	Hazardous materials include chemical waste, hydrocarbons, paint and contaminated soil, as indicated in the Regulation Respecting Hazardous Materials (R.R.Q., c. Q-2, r. 32). Examples of hazardous materials used in construction work include asphalt, gasoline, diesel, oil and grease, as well as any empty containers and waste associated with these materials. These materials must be managed in accordance with the *Regulation Respecting Hazardous Materials* (R.R.Q., c. Q-2, r. 32) and the *Environment Quality Act* (R.S.Q., c. Q-2).	Waste management – **NC 9.3.3.3**: Hazardous materials include chemical waste, hydrocarbons, paint and contaminated soil, as indicated in the Regulation Respecting Hazardous Materials (L.R.Q., c. Q-2, r. 32). Examples of hazardous materials used in construction work include asphalt, gasoline, diesel, oil and grease, as well as any empty containers and waste associated with these materials. These materials must be managed in accordance with the Regulation Respecting Hazardous Materials (L.R.R.Q., c. Q-2, r. 32) and the Environment Quality Act (L.R.S.Q., c. Q-2).	
	Change	9.3.3.4	If contaminated soil is discovered during construction work, the excavated soil must be temporarily placed on an impermeable membrane (e.g. a geotextile membrane). The soil must be covered with an impermeable membrane to prevent leaching and contamination of nearby soil and evaporation of volatile substances (if present in the soil). Contaminated soil must be taken to an MDDEFP-approved site or treatment centre.	Waste management – **NC 9.3.3.4:** If contaminated soil is discovered during construction work, the excavated soil must be temporarily placed on an impermeable membrane (e.g. a geotextile membrane). The soil must be covered with an impermeable membrane to prevent leaching, wind dispersal and contamination of nearby soil and evaporation of volatile substances (if present in the soil). Contaminated soil is not considered to be a hazardous material under the Regulation Respecting Hazardous Materials Regulation (RLQR, chapter Q-2, r. 32). Contaminated soil must therefore be managed in keeping with the Soil Protection and Contaminated Sites Rehabilitation Policy and related regulations, mainly the Land Protection and Rehabilitation. However, under the Regulation Respecting Contaminated Soil Storage and Contaminated Soil Transfer Stations (CQLR, Chapter Q-2, r. 46), soil can only be stored temporarily at the original site. In the event that contaminated soil is accidentally discovered along a linear project (e.g. road project) where it cannot be stored at the original site, a notice must be sent to the MDDELCC no later than 10 days after the soil has been excavated, and the storage period must not exceed 180 days. Storage conditions must be such that the contaminated soil cannot be the source of contamination of water, air or underlying soil. Contaminated soil must be taken to an MDDELCC-approved site.	Measure updated based on the 2018 version of Chapter 9, Volume 2

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TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
Protection of aquatic environment	Change	9.4.2	Grubbing near a watercourse or a lake must be treated as a potential source of silting that could affect the quality of the aquatic environment. The steeper the slope, the greater the risk of silting. Therefore, grubbing in right-of-ways must not take place within 20 metres of the natural high water mark (HWM). The purpose of this standard, from the *Regulation Respecting Standards of Forest Management for Forests in the Public Domain* (R.R.Q., c. F-4.1, r. 7) (Crown lands) and the Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains is to minimize the risk of shoreline erosion by limiting exposure to the elements of shorelines that have been stripped of stabilizing vegetation. Clearing must be kept to a minimum within the 20-metre riparian strip. Only ground-level cutting is permitted, and plant cover must be preserved as long as possible before carrying out earthwork. Within 5 metres of the natural high water mark, the contractor may cut merchantable stems only (those with a diameter greater than 100 mm) and dispose of or recover for commercial or other purposes all trees and burnt or fallen trees. Shrubs and bushes less than 1.5 metres in height at maturity must be preserved. Within the next 15 metres, the contractor may cut all stems to ground level. Heavy machinery may not operate within the 20-metre riparian strip as measured from the HWM, with the exception of areas authorized for the project. Lastly, the limits of the protection zones can be delineated with tape of different colours, especially during winter land clearing.	Protection of aquatic environment – **NC 9.4.2**: Grubbing near a watercourse or a lake must be treated as a potential source of silting that could affect the quality of the aquatic environment. The steeper the slope, the greater the risk of silting. Therefore, grubbing in right-of-ways must not take place within 20 metres of the natural high water mark (HWM). The purpose of this standard from the Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains (CQLR, c. F-2, r. 35) (Crown lands) is to minimize the risk of shoreline erosion by limiting exposure to the elements of shorelines that have been stripped of stabilizing vegetation. Clearing must be kept to a minimum within the 20-metre riparian strip. Only ground-level cutting is permitted, and plant cover must be preserved as long as possible before carrying out earthwork. Only merchantable stems may be cut within the first five metres of the NHWM (those with a diameter greater than 100 mm). The disposal or recovery for commercial or other purposes of all trees and burnt or fallen trees is required. Shrubs and bushes less than 1.5 metres in height at maturity must be preserved. Within the next 15 metres, all stems must be cut to the ground. Heavy machinery may not operate within the 20-metre riparian strip as measured from the HWM, with the exception of areas authorized for the project. Lastly, the limits of the protection zones can be delineated with tape of different colours, especially during winter land clearing.	Removal of the indication "RNI," which is outdated. Measured updated (2018-01-30). Since the RADF came into force on April 1, 2018, it will be replaced with the 2019 version of Chapter 9, Volume 2.
	Change	9.4.3.1	There are several simple measures that can be implemented for effective erosion control on disturbed surfaces and earthwork, whether this involves excavation or backfill. Small protected channels in the transverse sections of slopes, at the base of slopes and in other affected areas will make it possible to collect and control runoff in slopes that are susceptible to erosion. These channels are especially effective in clay materials. However, in mountainous regions, at the start of work, interceptor ditches should be created at the top of excavation slopes. The ditch will collect mountain runoff and direct it towards a stable location. The interceptor ditch will keep runoff from eroding soil from excavated material and prevent gullying on the new slope. In addition, notching the slope by means of crawler tracks compacts the soil and creates microstructures which minimize erosion. The furrows created by notching must follow the contour of the slope, i.e. they should be perpendicular to the incline in order to reduce erosion. This method works well in clay soil but not in sandy soil, which does not hold the furrow as long, or in ground that is too steep and inaccessible to the machinery.	Protection of aquatic environment – **NC 9.4.3.1**: There are several simple measures that can be implemented for effective erosion control on disturbed surfaces and earthwork, whether this involves excavation or backfill. Small protected channels in the transverse sections of slopes, at the base of slopes and in other affected areas will make it possible to collect and control runoff in slopes that are susceptible to erosion. These channels are especially effective in clay materials. However, at the start of work, interceptor ditches should be created at the top of excavation slopes. The ditch will collect mountain runoff and direct it towards a stable location. The interceptor ditch will keep runoff from eroding soil from excavated material and prevent gullying on the new slope. In addition, notching the slope by means of crawler tracks compacts the soil and creates microstructures which minimize erosion. The furrows created by notching must follow the contour of the slope, i.e. they should be perpendicular to the incline in order to reduce erosion. This method works well in clay soil but not in sandy soil, which does not hold the furrow as long, or in ground that is too steep and inaccessible to the machinery.	Measure updated based on the 2018 version of Chapter 9, Volume 2 (2018-01-30), and removal of "in mountainous regions."
	None	9.4.3.2	Temporary stabilization requires an erosion and sediment control plan. The plan must describe the protective work required to minimize erosion and the structures to be protected. Compacted surfaces must be scarified or harrowed before seeding. On Crown lands, regeneration of these areas with commercial species must be done within two years of the end of use. When runoff from ditches approaches a forest watercourse, the runoff must be diverted to an area of vegetation or into settling basins. This diversion must be done at least 20 metres from the watercourse to prevent runoff from flowing directly into the watercourse due to the flow velocity of the runoff. Between the watercourse and this first diversion,	Protection of aquatic environment – **NC 9.4.3.2**: Temporary stabilization requires an erosion and sediment control plan. The plan must describe the protective work required to minimize erosion and the structures to be protected. Compacted surfaces must be scarified or harrowed before seeding. On Crown lands, regeneration of these areas with commercial species must be done within two years of the end of use. When runoff from ditches approaches a forest watercourse, the runoff must be diverted to an area of vegetation or into settling basins. This diversion must be done at least 20 metres from the watercourse to prevent runoff from flowing	

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			the water from the ditches must also be diverted before entering the watercourse. The purpose of these measures is to prevent sediment being deposited in the watercourse (see *Tome I – Conception routière*, Chapter 2, "Cadre environnemental"; see also *Tome IV – Abords de route*, Chapter 6. "Mesures d'atténuation environnementales permanentes").	directly into the watercourse due to the flow velocity of the runoff. Between the watercourse and this first diversion, the water from the ditches must also be diverted before entering the watercourse. The purpose of these measures is to prevent sediment being deposited in the watercourse (see *Tome I – Conception routière*, Chapter 2, "Cadre environnemental"; see also *Tome IV – Abords de route*, Chapter 6. "Mesures d'atténuation environnementales permanentes").	
	None	9.4.3.3	Sediment barriers: Straw bale filters: at the base of a slope, the receiving trench for the straw bales is dug along the contour so as to intercept runoff. The bales must be carefully wedged into the trench for a proper fit. If the cords around the bales are made of rope or string, they must be placed horizontally to avoid contact with the ground. Anchor posts for the straw bales must be flush with the top of the bale so that they do not pose a danger to workers. The anchor post can be made of wood or metal, though wooden stakes are more common. Bales must be inspected frequently, and damaged bales must be promptly repaired or replaced. Accumulated sediment must also be removed to allow the barrier to function properly. Lastly, the bales must be removed when they are no longer needed, and the trench must be filled, levelled and stabilized. Geotextile barrier: periodic maintenance must include sediment removal. The geotextile barrier is removed and recovered once stripped surfaces have been permanently stabilized. On a construction site, sediment barriers may be erected at the following locations: At the base of excavation on the outer side of the ditch; At the mid-point on slopes over 20 metres in length (every 10 metres for long, steep slopes); At the base of an embankment where there is a watercourse or a ditch; At the base of a slope where a source of water causes erosion (e.g. water seepage); Around a temporary accumulation of unstabilized soil located within 60 metres of a watercourse or a lake; Across pits, perpendicular to the flow (with slight gradients and low-water flows). Sediment traps and berm filters: the berm filter must be built across the ditch and high enough to allow the water to flow through. The material used is 70-20 gauge riprap containing no more than 5% of fine material able to pass through a 80 µm sieve. For maximum efficiency, maintenance should be performed frequently on each of these structures. When the sediment trap is 50% full, the accumulated sediment must be removed and, when required, the filter material must be cleaned or replaced. To limit sediment transport into bodies of water or watercourses, at the start of work, one or more berm filters and sediment traps, depending on the length of the pits, the incline, type of soil, etc., must be installed in pits draining the work area. Settling basin: frequent settling basin maintenance is required to ensure maximum efficiency. When the basin is 50% full, sediment must be removed and, when required, the filter material must be cleaned or replaced. Turbidity curtain: at times, it may be necessary to pump disturbed water into vegetation (over 30 metres from the HWL) to minimize sediment suspension during construction and before removing the curtain. To be completely effective, the curtain must be located at least 5 metres from the base of the embankment slope. Prior to installation, a bathymetric profile should be carried out at the installation site so that the height of the curtain can be properly adjusted. There should an allowance of 1 metre to 2 metres over the height of the water column to compensate for fluctuations in water levels and for waves.	Protection of aquatic environment – **NC 9.4.3.3**: Sediment barriers: Straw bale filters: at the base of a slope, the receiving trench for the straw bales is dug along the contour so as to intercept runoff. The bales must be carefully wedged into the trench for a proper fit. If the cords around the bales are made of rope or string, they must be placed horizontally to avoid contact with the ground. Anchor posts for the straw bales must be flush with the top of the bale so that they do not pose a danger to workers. The anchor post can be made of wood or metal, though wooden stakes are more common. Bales must be inspected frequently, and damaged bales must be promptly repaired or replaced. Accumulated sediment must also be removed to allow the barrier to function properly. Lastly, the bales must be removed when they are no longer needed, and the trench must be filled, levelled and stabilized. Geotextile barrier: periodic maintenance must include sediment removal. The geotextile barrier is removed and recovered once stripped surfaces have been permanently stabilized. On a construction site, sediment barriers may be erected at the following locations: • At the base of excavation on the outer side of the ditch; • At the mid-point on slopes over 20 metres in length (every 10 metres for long, steep slopes); • At the base of an embankment where there is a watercourse or a ditch; • At the base of a slope where a source of water causes erosion (e.g. water seepage); • Around a temporary accumulation of unstabilized soil located within 60 metres of a watercourse or a lake; • Across pits, perpendicular to the flow (with slight gradients and low-water flows). • Sediment traps and berm filters: the berm filter must be built across the ditch and high enough to allow the water to flow through. The material used is 70-20 gauge riprap containing no more than 5% of fine material able to pass through a 80 µm sieve. For maximum efficiency, maintenance should be performed frequently on each of these structures. When the sediment trap is 50% full, the accumulated sediment must be removed and, when required, the filter material must be cleaned or replaced. To limit sediment transport into bodies of water or watercourses, at the start of work, one or more berm filters and sediment traps, depending on the length of	

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				the pits, the incline, type of soil, etc., must be installed in pits draining the work area. Settling basin: frequent settling basin maintenance is required to ensure maximum efficiency. When the basin is 50% full, sediment must be removed and, when required, the filter material must be cleaned or replaced. Turbidity curtain: at times, it may be necessary to pump disturbed water into vegetation (over 30 metres from the HWL) to minimize sediment suspension during construction and before removing the curtain. To be completely effective, the curtain must be located at least 5 metres from the base of the embankment slope. Prior to installation, a bathymetric profile should be carried out at the installation site so that the height of the curtain can be properly adjusted. There should an allowance of 1 metre to 2 metres over the height of the water column to compensate for fluctuations in water levels and for waves.	
Protection of wetlands	None	9.5.3	Temporary construction in wetlands is prohibited, whether for storage, parking, bypass roads or work areas. Such structures are to be located on stable land. Where it is impossible to do otherwise, precise studies by environmental specialists must be conducted with respect to the location, working method for construction of the sites, and dismantling and redevelopment of temporary sites in wetlands. The redevelopment plan must provide for the complete rehabilitation of disturbed areas, including removal of all materials and restoration of ground and drainage conditions to allow for recolonization of the site by vegetation.	Protection of wetlands – **NC 9.5.3**: Temporary construction in wetlands is prohibited, whether for storage, parking, bypass roads or work areas. Such structures are to be located on stable land. Where it is impossible to do otherwise, precise studies by environmental specialists must be conducted with respect to the location, working method for construction of the sites, and dismantling and redevelopment of temporary sites in wetlands. The redevelopment plan must provide for the complete rehabilitation of disturbed areas, including removal of all materials and restoration of ground and drainage initial conditions to allow for recolonization of the site by vegetation.	
Protection of sound environment	None	9.9.1.3	The SAE Standard J1075, Sound Measurement – Construction Site must be used for the measurement of construction site noise. Measurement of sound levels produced by a particular piece of equipment on a construction site must be done in accordance with the measurement method described in Measurement of Highway-Related Noise, Final Report FHWA-PD-96-046, Federal Highway Administration (May 1996). This method stipulates that the sound sampling be made at a distance of 15 metres from equipment. In addition, given the range of operations performed by a piece of equipment, measurements should be taken for the different operating modes (up to four possible modes): • Stationary in passive mode (e.g. a truck at idle); • Stationary in active mode (e.g. a bulldozer lifting materials); • Mobile in passive mode (e.g. equipment moving to another area within a site); • Mobile in active mode (e.g. bulldozer moving while pushing debris).	Protection of sound environment – **NC 9.9.1.3**: The SAE Standard J1075, Sound Measurement – Construction Site must be used for the measurement of construction site noise. Measurement of sound levels produced by a particular piece of equipment on a construction site must be done in accordance with the measurement method described in Measurement of Highway-Related Noise, Final Report FHWA-PD-96-046, Federal Highway Administration (May 1996). This method stipulates that the sound sampling be made at a distance of 15 metres from equipment. In addition, given the range of operations performed by a piece of equipment, measurements should be taken for the different operating modes (up to four possible modes): • Stationary in passive mode (e.g. a truck at idle); • Stationary in active mode (e.g. a bulldozer lifting materials); • Mobile in passive mode (e.g. equipment moving to another area within a site); • Mobile in active mode (e.g. bulldozer moving while pushing debris).	
	Change	9.9.1.4	Ambient noise must be determined before the start of work with at least two non-consecutive 24-hour noise samplings conducted in one week, at representative locations along the work area. Ambient noise must be assessed for the daytime (7 a.m. to 7.p.m.), evening (7.p.m. to 11 p.m.) and night (11 p.m. to 7 a.m.). Note that ambient noise is not to be measured within the right-of-way required by the work.	Protection of sound environment – **NC 9.9.1.4**: The maximum recommended noise levels are found in two categories: “overall” noise levels established along the areas to be protected, and “at source” noise levels associated with each equipment used at the work site. If required, the noise management specifications associated with a work site must indicate two types of maximum recommended noise levels, namely, an overall maximum level established along the areas to be protected, and a maximum noise level at source associated with certain equipment. The contractor is required to comply with these maximum levels at all times.	Measure updated based on the 2018 version of Chapter 9, Volume 2

Table 89 Standard Mitigation Measures from MTQ Road Work Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
				Table 9.9–1 presents the maximum recommended noise levels based on the type of land use. These consist of overall noise levels, namely L10 levels which generally cannot exceed the ambient noise level established before the start of construction by more than 3 to 5 dBA. The Lmax noise level is also used specifically for intermittent noise that gets loud quickly, mainly for impact noise (e.g. pile drilling). The maximum recommended noise levels represent the combination of ambient noise and the noise from the work site near the areas to be protected. Ambient noise must be determined before the start of work with at least two non-consecutive 24-hour noise samplings conducted in one week, at representative locations along the work area. Ambient noise must be assessed for the daytime (7 a.m. to 7.p.m.), evening (7.p.m. to 11 p.m.) and night (11 p.m. to 7 a.m.). Note that ambient noise is not to be measured within the right-of-way required by the work.	
	None	9.9.2	When it is necessary to mitigate the noise impact of a road construction project, a noise management program must be developed. The importance of the program is proportional to the duration of the work planned and consists of one or several comprehensive noise control programs and an acoustic monitoring plan.	Protection of sound environment – **NC 9.9.2**: When it is necessary to mitigate the noise impact of a road construction project, a noise management program must be developed. The importance of the program is proportional to the duration of the work planned and consists of one or several comprehensive noise control programs and an acoustic monitoring plan.	
	None	9.9.2.1	The comprehensive program must explain the methodology used to perform one or more construction site activities in compliance with the noise levels permitted in a noise-sensitive area. Any construction site activity that might generate noise that exceeds the ambient noise level without work near sensitive areas must be preceded by the implementation of a comprehensive program. The comprehensive program must include: • A description of the area where the activity takes place, including the location of noise-sensitive areas, housing types and number of floors, and the location of ambient noise measurement points; • An estimate of the noise levels produced by work in sensitive areas, in the form of tables showing current and projected noise levels, and an estimate of the time maximum noise levels will be exceeded; • Identification of mitigation measures, assessment of their effectiveness, implementation procedures for mitigation measures and time limits for installation; • Plans for mitigation measures (e.g. walls, enclosures), if required.	Protection of sound environment – **NC 9.9.2.1**: The comprehensive program must explain the methodology used to perform one or more construction site activities in compliance with the noise levels permitted in a noise-sensitive area. Any construction site activity that might generate noise that exceeds the ambient noise level without work near sensitive areas must be preceded by the implementation of a comprehensive program. The comprehensive program must include: • A description of the area where the activity takes place, including the location of noise-sensitive areas, housing types and number of floors, and the location of ambient noise measurement points; • An estimate of the noise levels produced by work in sensitive areas, in the form of tables showing current and projected noise levels, and an estimate of the time maximum noise levels will be exceeded; • Identification of mitigation measures, assessment of their effectiveness, implementation procedures for mitigation measures and time limits for installation; • Plans for mitigation measures (e.g. walls, enclosures), if required.	
	None	9.9.2.2	Where required, acoustic monitoring must be implemented at the start of work in order to monitor noise levels in the vicinity of the construction site. The acoustic monitoring plan must include the following elements: • Location of noise sampling sites (permanent or temporary sampling stations to be determined); • Type of equipment used for noise sampling; • Measurement methods and times.	Protection of sound environment – **NC 9.9.2.2**: Where required, acoustic monitoring must be implemented at the start of work in order to monitor noise levels in the vicinity of the construction site. The acoustic monitoring plan must include the following elements: • Location of noise sampling sites (permanent or temporary sampling stations to be determined); • Type of equipment used for noise sampling; • Measurement methods and times.	
	Change	9.9.3.1	Here are some examples of mitigation measures that can be applied: • Prohibit work at night; • Plan the noisiest work during less sensitive periods (e.g. daytime);	Protection of sound environment – **NC 9.9.3.1**: Here are some examples of mitigation measures that can be applied: • Evening and night work will be planned to continue with the least noisy work;	Change made to the first measure.

Table 89 Standard Mitigation Measures from MTQ Road Work Standards (2018)

TOPIC	TYPE OF CHANGE	SECTION NO.	ORIGINAL MITIGATION MEASURE	UPDATED MITIGATION MEASURE	NOTE
			• Prohibit certain types of equipment near noise-sensitive areas; • Favour quieter working methods and soundproofed or electric equipment where possible; • Use equipment with good quality mufflers in working order; • Ensure that equipment used on the site is in proper working order; • Limit the power output of the equipment to what is required; • Limit the amount of equipment on the site to what is necessary; • Install variable-intensity reversing alarms (self-adjusting to ambient noise) and, if possible, install reversing alarms only on that equipment covered by the *Safety Code for the Construction Industry* (R.R.Q., c. S-2.1, r. 6) of *An Act Respecting Occupational Health and Safety* (R.S.Q., c S-2.1, s. 3.10.12).	• Plan the noisiest work during less sensitive periods (e.g. daytime); • Prohibit certain types of equipment near noise-sensitive areas; • Favour quieter working methods and soundproofed or electric equipment where possible; • Use equipment with good quality mufflers in working order; • Ensure that equipment used on the site is in proper working order; • Limit the power output of the equipment to what is required; • Limit the amount of equipment on the site to what is necessary; • Install variable-intensity reversing alarms (self-adjusting to ambient noise) and, if possible, install reversing alarms only on that equipment covered by the *Safety Code for the Construction Industry* (R.R.Q., c. S-2.1, r. 6) of *An Act Respecting Occupational Health and Safety* (R.S.Q., c S-2.1, s. 3.10.12).	
	None	9.9.3.2	Here are a few examples of mitigation measures that can be used to minimize noise propagation from a construction site: • Install temporary stationary noise barriers around the site, or mobile barriers around certain equipment; • Install acoustic sheets or curtains; • Arrange construction site trailers or heavy vehicles as noise barriers; • Increase the distance between noisy equipment and noise-sensitive areas.	Protection of sound environment – **NC 9.9.3.2**: Here are a few examples of mitigation measures that can be used to minimize noise propagation from a construction site: • Install temporary stationary noise barriers around the site, or mobile barriers around certain equipment; • Install acoustic sheets or curtains; • Arrange construction site trailers or heavy vehicles as noise barriers; • Increase the distance between noisy equipment and noise-sensitive areas.	
	None	9.9.3.3	In the event of complaints about noise from the construction site, a complaint tracking system will enable the mediator to intervene promptly with both complainants and contractors in order to decide on the required corrective action.	Protection of sound environment – **NC 9.9.3.3**: In the event of complaints about noise from the construction site, a complaint tracking system will enable the mediator to intervene promptly with both complainants and contractors in order to decide on the required corrective action.	

Table 90 – Specific mitigation measures

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
P-1	Change	Unless there are exceptional circumstances, maintain, during the official opening period, a bike link between the South Shore and Montreal, including Nuns' Island. Bike links will be re-established on both sides of Highway 15 when the work is finished.	**P-1** The multi-use path on the New Bridge will allow a bicycle link to be maintained between the South Shore and Nuns' Island. Ensure liaison with the necessary organizations, such as Vélo Québec, regarding other bike paths that may be affected by the work.	Add: "Ensure liaison with the necessary organizations, such as Vélo Québec, regarding the other paths." Remove "Unless there are exceptional circumstances, maintain, during the official opening period."
P-2	Change	When possible, inform bike link users of safe detours and closure periods. For recreational boating, provide one or more marked channels to ensure safe passage and have the required notices to shipping issued through CCG's Marine Communications and Traffic Services.	**P-2** Use a website that issues news announcements to notify social media and users of bike links of safe detours and closure periods. For recreational boating, provide one or more marked channels for the safe passage of watercraft and set up the required materials to mark off navigation channels. The Contractor shall send the relevant information to JCCBI so that the latter can have the necessary navigation notices issued through the CCG's Marine Communications and Traffic Services.	Add: "a website that issues news announcements." Remove "when possible."
P-3A	Change	Conduct work outside nesting times for birds whose nesting schedule normally ranges from mid-April to mid-August in the study area.	**P-3A** Conduct clearing and stripping work outside of bird nesting times for nesting schedules ranging from April 15 to August 15 for the study area, to reduce the risk of any impacts on birds, their nests or eggs.	Details
P-3B	None	Avoid carrying out potentially destructive or disruptive activities during sensitive periods and in sensitive locations in order to reduce the risk of impacting birds, their nests and eggs. If activities cannot be avoided, develop and implement appropriate preventive and mitigation measures to minimize the risk of bycatches and help maintain sustainable migratory bird populations. Bird nesting periods normally range from mid-April to mid-August in the study area.	**P-3B** Avoid carrying out potentially destructive or disruptive activities during sensitive periods and in sensitive locations in order to reduce the risk of impacting birds, their nests and eggs. If activities cannot be avoided, develop and implement appropriate preventive and mitigation measures to minimize the risk of bycatches and help maintain sustainable migratory bird populations. Bird nesting periods range from April 15 to August 15 in the study area.	
P-4	Not applicable to deconstruction	Where feasible, permanent noise barriers will be built before the start of work.	N/A	
P-5	Change	In the spring, install a fence along the construction perimeter (exclosure) and maintain it for the duration of the work. The fence will be designed for the required functions and will be removed as soon as it is no longer needed. Regular inspections will be made along the fence.	**P-5** In spring, i.e. before April 10, install a fence along the construction perimeter (exclosure) and maintain it for the duration of the work. The fence will be designed for the required functions and will be removed as soon as it is no longer needed. Regular inspections will be made along the fence.	Information on the date
P-6	Change	At the end of summer and before start of work, capture brown snakes found on the exclosure and relocate them in suitable habitats outside the site. Relocation should be discussed with the appropriate authorities (MDDEFP).	**P-6** Before the start of work, capture the brown snakes in the exclosure and relocate them outside the site in suitable habitats. Relocation requires a SEG permit and should be discussed with the appropriate authorities (MFFP).	"SEG" added and name of government department changed.
P-7	None	Insofar as possible, avoid work in wetlands suitable for herpetofauna (Nuns' Island Bridge and Seaway Dike) or minimize work in these environments.	**P-7** Insofar as possible, avoid work in wetlands and areas suitable for herpetofauna (Island of Montreal shore, Nuns' Island Bridge and Seaway Dike) or minimize work in these environments.	
P-8	None	When working in urban areas, remove loose material and other debris on a daily basis from streets used by vehicles and machinery.	**P-8** When working in urban areas, remove loose material and other debris on a daily basis from streets used by vehicles and machinery.	
P-9	None	Maintain transportation vehicles and construction equipment in good working order to prevent leaks of oil, fuel or other pollutants and to minimize gaseous emissions and noise.	**P-9** Maintain transportation vehicles and construction equipment in good working order to prevent leaks of oil, fuel or other pollutants or contaminants, and to minimize gaseous emissions and noise.	
P-10	None	Prohibit access to the site to any mobile equipment that leaks oil. Keep a vehicle maintenance log.	**P-10** Prohibit access to the site to any mobile equipment that leaks oil or other contaminants. Keep a vehicle maintenance log.	
P-11	None	Ensure that catalytic converters on all vehicles are in proper working order throughout the construction period.	**P-11** Check whether the catalytic converters on all vehicles are in proper working order throughout the construction period.	
P-12	None	Ensure that contractors and subcontractors are made aware of environmental concerns,	**P-12** Ensure that contractors and subcontractors are made aware of environmental concerns.	

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
		including air quality.		
P-13	None	Isolate and preserve the organic soil layer so that it may be reused in places where the topsoil has been stripped.	**P-13** Isolate and preserve the organic soil layer so that it may be reused in places where the topsoil has been stripped.	
P-14	None	Minimize encroachment of detours on private land. The private partner must come to an agreement with property owners with respect to encroachment on private land.	**P-14** Minimize encroachment of detours on private land. The Contractor must come to an agreement with property owners with respect to encroachment on private land.	
P-15	Change	Install the materials required to mark boat lanes and bike path detours in order to ensure safe passage of cyclists and recreational boaters.	**P-15** Install the materials required to mark boat lanes and bike path detours in order to ensure safe passage of cyclists and recreational boaters. Ensure liaison with the necessary organizations, such as Vélo Québec.	Add: "Ensure liaison with the necessary organizations, such as Vélo Québec."
P-16	None	The public will be informed of the work and planned detours. Alternate routes will be proposed.	**P-16** The public will be informed of the work and planned detours. Alternate routes will be proposed.	
P-17	None	At least one, preferably two, accesses to the Nuns' Island local network will be maintained at all times on the local road and highway network.	**P-17** At least one, preferably two, accesses to the Nuns' Island local network will be maintained at all times on the local road and highway network.	
P-18	None	Work is prohibited during periods when the seaway is open without a memorandum of understanding between TC, SLSMC and the private partner.	**P-18** Work is prohibited during periods when the seaway is open without a memorandum of understanding between TC, SLSMC and the Contractor.	
P-19	Change	Set up a system to monitor atmospheric contaminants in nearby residential areas (Verdun, Sud-Ouest, Nuns' Island and Brossard) during construction work.	**P-19** Set up atmospheric contaminant monitoring and the required related documentation in nearby residential areas (Nuns' Island and Brossard) during construction work.	Revised to take into account the areas affected by deconstruction
P-20	None	When dewatering excavations or confined areas, pump out water and discharge it in compliance with applicable federal, provincial and municipal regulations, or call a specialized firm for pumping and final disposal.	**P-20** When required, pump out water from excavations or confined areas and discharge it in compliance with applicable federal, provincial and municipal regulations, or call a specialized firm for pumping and final disposal.	
P-21	Change	Work on and in the vicinity of the Couvée Islands migratory bird sanctuary must be performed in accordance with EC requirements.	**P-21** No work must be carried out in the Couvée Islands migratory bird sanctuary and nearby work must be performed in accordance with ECCC requirements. No terrestrial encroachment in the MBS shall be permitted. In the event of accidental or voluntary encroachment, the Contractor shall submit an authorization request to ECCC and carry out the compensation required by ECCC; the latter may refuse to grant such authorization.	The work can be done without any encroachment. A restriction must be included in the measures.
P-22	None	Signpost areas where special-status plant species are present and prohibit access during construction work.	**P-22** Signpost areas where special-status plant species are present and prohibit access during construction work.	
P-23	Change	Before the start of work, transplant flora specimens that could be affected by the work to an area that will remain undisturbed.	**P-23** Before the start of work, transplant specimens that could be affected by the work to an area that will remain undisturbed. If a brown snake hibernaculum is discovered during the winter, call an MFFP wildlife conservation officer.	After discussion with the Ecomuseum Zoo.
P-24	Change	Initiate contaminant monitoring in aquatic environments during construction work (see section 9.8.2 for details).	**P-24** Continuously monitor sediment dispersion in aquatic environments during jetty mobilization and demobilization and during all work in aquatic environments	Revised in accordance with DFO's requests and JCCBI's requirements.
P-25	Not applicable to deconstruction	Conduct archaeological surveys in areas affected by the work (see Appendix 3).	N/A	
P-26	None	Any discovery of archaeological remains must immediately be communicated to the Ministère de la Culture et des Communications du Québec. The Mohawk community of Kahnawake must also be advised of any discovery of prehistoric or Aboriginal archaeological remains. Work at the discovery site should stop until an archeologist from the Ministry has completed a qualitative and quantitative assessment.	**P-26** Any discovery of archaeological remains must immediately be communicated to the Ministère de la Culture et des Communications du Québec. The Mohawk community of Kahnawake must also be advised of any discovery of prehistoric or Aboriginal archaeological remains. Work at the discovery site should stop until an archeologist from the Ministry has completed a qualitative and quantitative assessment.	
P-27	None	Use the corridor footprint as the principal access to the construction areas and, whenever possible, limit the movement of machinery to the work areas located within this corridor.	**P-27** Use the corridor footprint as the principal access to the construction areas and, whenever possible, limit the movement of machinery to the work areas located within this corridor.	
P-28	None	The private partner must ensure that underground infrastructure is clearly identified in the plans and protected at the site.	**P-28** The Contractor must ensure that underground infrastructure is clearly identified in the plans and protected at the site.	
P-29	Not applicable to	In the sensitive area of the Le Ber site, if soil is excavated to construct the infrastructure base, backfill should be mechanically stripped down to the level of the ancient soil, and then	N/A	

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
	deconstruction	a checkerboard dig of the areas affected should be conducted. Ancient soils are found at a depth of approximately 1 m in this sector. Ancient soils are found at a depth of approximately 1 m in this sector. 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.		
P-30	Not applicable to deconstruction	An archeological inventory survey will have to be conducted in the P-1 area of archeological potential. Should archeological remains be discovered, a site assessment will be made and a recommendation issued on the measures to be taken to either protect the site or conduct a dig.	N/A	
P-31	Not applicable to deconstruction	The presence of an archeologist is recommended at the work site during excavation work in areas with archeological potential (see Appendix 3).	N/A	
P-32	None	Excavated materials must be kept wet or covered with geotextile.	**P-32** Excavated materials must be kept wet or covered with geotextile.	
P-33	Change	During excavation work, special attention must be paid to the presence of waste in the northern section of the Nuns' Island Bridge (Montreal) and, if necessary, such waste must be removed for disposal (e.g. old barrels) to prevent it from becoming a source of contamination.	**P-33** During excavation work, special attention must be paid to the presence of hazardous or non-hazardous residual materials and, if necessary, such materials must be suitably removed for disposal to prevent them from becoming a source of contamination.	Details
P-34	Change	Groundwater must be monitored for signs of work-related contamination. Periodic sampling will be conducted both upstream and downstream from construction zones on the Island of Montreal.	Periodic sampling will be conducted both upstream and downstream from construction zones on the Island of Montreal.	The Island of Montreal is not included in the study area since it is too far away from the work.
P-35	None	Establish a contaminated soil management plan and ensure that contaminated soil is treated or disposed of in accordance with prevailing regulations.	**P-35** Establish a contaminated soil management plan and confirm that contaminated soil is treated or disposed of in accordance with prevailing regulations.	
P-36	None	Contaminated soil must be piled on a waterproof surface and should be no higher than 2.5 m. The volume of each pile must not exceed 100 m^3 and piles must be covered with a waterproof membrane.	**P-36** Contaminated soil must be piled on a waterproof surface and should be no higher than 2.5 m. The volume of each pile must not exceed 100 m^3 and piles must be covered with a waterproof membrane.	
P-37	Not applicable to deconstruction	The potential presence of methane in the soil must be taken into account in the design of the project's structures (temporary and permanent). Situations likely to cause methane to accumulate in an area (including beneath ground-level infrastructure) or in an enclosed space where there is also an ignition source or in a space or premises even occasionally occupied by a worker or any other person must be avoided.	N/A	
P-38	None	Conduct an inspection before the start of construction of critical work likely to cause damage and adjust the working method accordingly.	**P-38** Conduct an inspection before the start of construction of critical work likely to cause damage and adjust the working method accordingly.	
P-39	Change	Manage, relocate and, if necessary, add falcon nesting boxes depending on the areas of activity. Retain the services of a bird of prey specialist to advise the private partner and encourage coexistence between workers and this species.	**P-39** Retain the services of a bird of prey specialist to advise the contractor and encourage coexistence between workers and this species.	The nesting boxes will be handled by JCCBI and SSL
P-40	None	Archeological remains found on the site during construction must be sent to MCCCF. The Mohawk community of Kahnawake will be informed.	**P-40** Archeological remains found on the site during construction must be sent to MCCCF. The Mohawk community of Kahnawake will be informed.	
P-41	Not applicable to deconstruction	If work is required to temporarily divert the boulevard, a protective layer could be spread over the existing soil to seal the site.	N/A	
P-42	Not applicable to deconstruction	Comply with DFO standards (1998) for the use of explosives near or in aquatic environments.	N/A	No blasting is allowed for deconstruction
P-43	Not applicable to deconstruction	If it is not possible to comply with DFO requirements regarding explosives, authorization to destroy fish by means other than fishing must be obtained from DFO.	PN/A	N/A No blasting is allowed for deconstruction
P-44	None	Negotiate and sign a lease with SLSMC to occupy the space required for the work.	**P-44** Negotiate and sign a lease with SLSMC to occupy the space required for the work.	
P-45	Not applicable	Isolate water affected by work in the littoral sector of the Aqueduct Canal from raw water	N/A	

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
	to deconstruction	needed to supply the filtration plant by a method that minimizes sediment suspension from the canal bed.		
P-46	Not applicable to deconstruction	The private partner must 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.	N/A	
P-47	Not applicable to deconstruction	If work is required near the Aqueduct Canal, it must be performed within a contained enclosure in order to prevent suspended solids from spreading into the air and water.	N/A	
P-48	Not applicable to deconstruction	No access to Aqueduct Canal banks is allowed.	N/A	
P-49	Not applicable to deconstruction	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.	N/A	
P-50	Not applicable to deconstruction	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.	N/A	
P-51	Change	Debris is to be recovered by means of a tarpaulin placed under the work area and removed as soon as possible.	**P-51** Debris is to be recovered by means of a tarpaulin placed under the work area (or any other means or device to attain the same objective) and removed as soon as possible.	Clarification on the means to be used
P-52	Change	During redevelopment, hibernacula for herpetofauna will be created.	**P-52** During redevelopment, determine the appropriateness of creating hibernacula for herpetofauna.	Adjustment given that hibernacula are currently found in the area.
P-53	None	Establish a working method that limits resuspension of contaminated sediment when working in water (e.g. excavation performed inside a cofferdam or protective curtain).	**P-53** Establish a working method that limits resuspension of contaminated sediment (e.g. excavation performed inside a cofferdam or protective curtain).	
P-54	None	Immediately remove excavated sediment with contaminant levels that exceed established criteria to approved sites.	**P-54** Immediately remove excavated sediment with contaminant levels that exceed established criteria to approved sites.	
P-55	None	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).	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).	
P-56	Measure removed	Temporary structures in watercourses must be stabilized for protection against erosion with a geotextile membrane or riprap, for instance. Furthermore, these structures must be designed to withstand any flooding (and ice loading) that may occur during construction.		Removed since equivalent to the MPO-3 measure
P-57	None	Fires and waste burning on or near the construction site are prohibited at all times.	**P-57** Fires and the burning of waste or residual materials on or near the work site are prohibited at all times.	
P-58	None	No isolated machinery or gas-powered equipment is to remain on a cofferdam, a jetty or in the 60-metre riparian strip along watercourses and lakes during work site off-hours. If this requirement cannot be met, adapted environmental measures must be implemented (monitoring, etc.).	**P-58** No isolated machinery or gas-powered equipment is to remain on a cofferdam, a jetty or in the 60-metre riparian strip along watercourses and lakes during work site off-hours. If this requirement cannot be met, adapted environmental measures must be implemented (monitoring, etc.).	
P-59	None	Do not accumulate work site waste within 30 metres of watercourses, or within 60 metres if it contains or may contain contaminants.	**P-59** Do not accumulate work site waste within 30 metres of watercourses, or within 60 metres if it contains or may contain contaminants.	
P-60	None	The operations site must be free of waste at all times, including empty containers of any kind unless they are stored in a sealed repository designed for this purpose.	**P-60** The operations site must be free of waste at all times, including empty containers of any kind unless they are stored in a sealed repository designed for this purpose.	
P-61	Change	In the event of a spill in an aquatic environment, the emergency response plan will be implemented. This plan includes: • Promptly notify the Environment Canada (1-866-283-2333) and Environnement	**P-61** In the event of a spill in an aquatic environment or nearby, the emergency response plan will be implemented. This plan includes: • Promptly notify the Environment Canada (1-866-283-2333) and Environnement Québec (1-	Added: write up spill report and the main points to be included in the report.

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
		Québec (1-866-694-5454) early warning networks and SLSMC's emergency response and shipping management teams, as well as the Mohawk community of Kahnawake; • Notify municipalities downstream with water intakes that could be affected by the spill; • Eliminate the source of the spill; • Implement environmental protection measures (absorbent berms); • Clean up the affected area.	866-694-5454) early warning networks and SLSMC's emergency response and shipping management teams, as well as the Mohawk community of Kahnawake; • Notify municipalities downstream with water intakes that could be affected by the spill; • Eliminate the source of the spill; • Implement environmental protection measures (absorbent berms); • Clean up the affected area. Write up an incident report that minimally includes the following information: • Name of company responsible for the spill; • Date and time of spill; • Type and quantity of spilled product (e.g. 20 litres of hydraulic oil, 5 litres of coolant); • Equipment involved (e.g. hydraulic shovel, bulldozer, plane of light); • Cause of spill (e.g. line break, human error); • Location of spill (e.g. east bank of the Cascapédia river, parking area); • Extent of spill on the ground (m^2); • Type of soil (e.g. topsoil, blasted rock, sand) and quantity of recovered material (m^3); • Quantity of absorbents used (e.g. 20 water-repellent absorbent sheets); • Distance from nearest watercourse (m) or wetland; • Any other information considered relevant.	
P-62	None	The private partner must establish an alternate transportation system and organize parking near the work site restricting access to the local network.	**P-62** The contractor must establish an alternate transportation system and organize parking near the work site restricting access to the local network.	
P-63	None	Use adequate signage and appropriate maximum speeds to reduce dust emissions on access roads and work surfaces.	**P-63** Use adequate signage and appropriate maximum speeds to reduce dust emissions on access roads and work surfaces.	
P-64	None	Place tarps on trucks.	**P-64** Place tarps on trucks.	
P-65	None	Avoid transporting materials through residential neighbourhoods.	**P-65** Avoid transporting materials through residential neighbourhoods.	
P-66	Change	GHG emissions generated by machinery during work will be offset to make this site "carbon neutral." Annual emissions will be calculated based on the number of kilometres travelled by machinery and transportation of materials and excavations. Compensation may take the form of buying carbon credits or of carrying out independent projects.	**P-66** GHG emissions generated by machinery during work will be offset to make this site "carbon neutral." Annual emissions will be calculated based on the number of kilometres travelled by machinery and transportation of materials and excavations. Compensation may take the form of buying carbon credits or of carrying out independent projects. Incentives will be included in the request for proposals, namely: granting the chosen contractor a GHG emissions budget that is below a certain percentage relative to the total assessment for the project and requiring the contractor to quantity and offset GHGs emitted during the work.	Incentives added
P-67	Change	Before the start of work, develop and implement spill response procedures.	**P-67** Before the start of work, when required, develop and implement spill response procedures.	Clarification added
P-68	Change	Use vegetable oil in machinery that will be used for long periods on or near water.	**P-68** Use vegetable oil that is certified 60% biodegradable in 28 days in machinery that will be used for long periods on or near water.	Details on oil to be used
P-69	Change	When contamination levels exceed criterion B of the Quebec Soil Protection and Contaminated Sites Rehabilitation Policy, all trucks leaving the work site must pass through a vehicle wheel-washing station.	**P-69** When contamination levels exceed criterion B in the *Guide d'intervention* – Protection des sols et réhabilitation des terrains, all trucks leaving the work site must pass through a vehicle wheel-washing station. Wash water must be collected and treated to comply with water quality criteria before being discharged.	*Guide d'intervention – Protection des sols et réhabilitation des terrains, July 2016*
P-70	Change	In the event of a spill on land, the emergency response plan will be implemented. This plan includes: • - Prompt notification of Environment Canada (1-866-283-2333) and Environnement Québec (1-866-694-5454) early warning networks as well as SLSMC's emergency response team; • Eliminate the source of the spill; • - Implementation of environmental protection measures (absorbent material); • Clean-up of affected area.	**P-70** In the event of a spill on land, the emergency response plan will be implemented. This plan includes: • Promptly notify the Environment Canada (1-866-283-2333) and Environnement Québec (1-866-694-5454) early warning networks and SLSMC's emergency response and shipping management teams, as well as the Mohawk community of Kahnawake; • Eliminate the source of the spill; • Implement environmental protection measures (absorbent material, rolls, booms); • Clean up and decontaminate the affected area;	Include all contaminated materials, not only soil.

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
		• Disposal of contaminated soil.	• Dispose of contaminated soil, water and materials at MELCC-authorized sites. • Write up an incident report as indicated in measure P-61.	
P-71	Change	Check for peregrine falcon nesting on the bridge before the start of work. If there are nesting birds, set up a 250-metre exclusion zone around the nest until the end of the nesting period (approximately 75 days after egg-laying).	**P-71** Check for Peregrine Falcon nests on the Original Champlain Bridge and on the Samuel De Champlain Bridge before starting work. If any birds are nesting, set up a 250-metre-radius exclusion area based on the nesting stage around the nest until the young have left the nest for good. In such a case, monitoring must be done with the assistance of a bird-of-prey expert to ensure that the birds are not being disturbed, and measures taken if the expert considers that the birds are being disturbed, with said measures including a temporary suspension of work in the area, where applicable. Take into account the specific constraints associated with the nesting period of the Cliff Swallow between April 15 and August 31. All Work is prohibited during the nesting period of the Cliff Swallow if any Cliff Swallows or their nests are found within 20 m of the Work site. If work is to be done in an area where Cliff Swallows are potentially present, at least thirty (30) days before the specific mobilization and at least thirty (30) days before the start of the Cliff Swallow nesting period, check whether there are any Cliff Swallows or their nests within 20 m of the projected Work areas. If nests are found, isolate the nesting areas before the start of the annual nesting period using netting or other similar devices. The protection device must prevent the birds from nesting at that location. Existing nests must systematically removed before installing netting or other materials to avoid inciting Cliff Swallows to penetrate the area. If this is not possible, work must be interrupted and a bird expert consulted in order to set up other mitigation measures aimed at protecting the nests and follow the expert's instructions. When necessary, to ensure adequate work planning during the breeding period in an area where there are nests, prior specific measures such as installing nets (or any other equivalent measure) may be taken, in conjunction with experts, to prevent Cliff Swallows from starting to nest in the work areas.	Clarification regarding the measure for the Peregrine Falcon. Similar measure added for the Cliff Swallow.
P-72	Change	Work with Environment Canada's Peregrine Falcon Recovery Team on an appropriate way to install nesting boxes. As early as possible before demolition of the bridge, move the existing nesting boxes and install new artificial ones for Peregrine Falcons under the structure of the new bridge or at a suitable nearby site in order to limit potential conflicts between bridge maintenance and repair work and falcon nesting.	**P-72** Three Peregrine Falcon nesting boxes have been installed on the Samuel De Champlain Bridge on the east face (toward Brossard) of piers W02, E04 and E02, which were opened in 2019. Concomitantly, in 2019, the Owner closed the nesting box on the Original Champlain Bridge. Depending on the results of this initiative (falcons settling in the new nesting boxes or on the piers of the Original Bridge), special measures will have to be implemented, as defined in measure P-71.	Details
P-73	None	Observe the current provisions of SLSMC's land use lease.	**P-73** Observe the current provisions of SLSMC's land use lease.	
P-74	Change	Keep boaters informed through notices to shipping, and once the work of removing existing bridge piers is completed, carry out a bathymetric survey of these locations.	**P-74** Keep boaters informed through notices to shipping via the CCG's Marine Communications and Traffic Services, and once the work of removing (in whole or in part) existing bridge piers is completed. carry out a bathymetric survey of these locations and send the information to the CCG.	Add: "necessary notices to shipping via the CCG's Marine Communications and Traffic Services" and "send the information to the CCG."
P-75	Change	Restore the bed of the watercourse to its original condition. In exceptional cases, piers must be reduced to at least 2 metres below the low-water level; reference zero on the nautical chart (ZC).	**P-75** Where applicable, restore the bed of the watercourse to its original condition. Unless there is an exception, the footings will have to be removed up to 45 cm below the riverbed in the Greater La Prairie Basin and down to the bedrock in the Lesser La Prairie Basin (see Map 2 in Volume 1 for the level of demolition of each pier).	Adjustment for pier level of demolition
P-76	Not relevant	Perform work in water in an enclosed, dry area.	N/A	Measure not relevant, given that the option of working with cofferdams is already regulated with the measures listed in the previous tables.
P-77	Change	Make sure there are no migratory bird nests or habitats of at-risk species in these locations. Should this be the case, act in compliance with prevailing laws and regulations.	Check for the presence of birds that may be nesting on the Original Champlain Bridge, the Samuel De Champlain Bridge, and on rocky islets near Nuns' Island before starting the Work to	Clarification

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
			avoid disturbing them and prevent bycatches.	
P-78	Measure removed	When restoring abandoned sections, promote renaturalization with a suitable substrate favouring the growth of natural vegetation. Native species will be planted or seeded where natural recovery is not possible.	N/A	Replaced with measure MPO-13
P-79	Change	When developing deconstruction plans and specifications, materials characterizations must be conducted to identify and quantify those areas containing asbestos, lead or any other contaminant. In the event these substances are detected, actions must be devised to deal with the situation.	P-79 When developing deconstruction plans and specifications, materials characterizations must be conducted to identify and quantify those areas containing asbestos, lead or any other contaminant. In the event such substances are found, control/elimination measures must be defined and additional air quality monitoring for these parameters will be required.	Clarifications made
P-80	None	When critical work is being performed, personnel qualified to use the emergency kits will be permanently on site.	P-80 When critical work is being performed, personnel qualified to use the emergency kits will be permanently on site.	
P-81	Change	Asphalt debris must not be reused in aquatic environments.	P-81 Asphalt or concrete debris must not be reused in aquatic environments.	Concrete added
P-82	Not applicable to deconstruction	The bridge operator should consider switching off architectural lighting (abutments, piers, cable stays) or other appropriate measures during the spring and autumn migration periods, especially when visibility is poor, without compromising safety standards. Adjusting the lighting of the cable-stays could reduce the number of birds colliding with the stays; to this end, flexibility should be incorporated into the design of the lighting system to better adapt it to environmental needs (aesthetics, light pollution, bird collisions, navigational aids and air traffic).	N/A	
P-83	Not applicable to deconstruction	Develop the area around the new infrastructure so as to create a suitable habitat for the brown snake.	N/A	
P-84	Not applicable to deconstruction	Consider installing permanent barriers to prevent brown snake road fatalities in areas that are most at risk.	N/A	
P-85	Not applicable to deconstruction	Develop the area around the new abutments so as to create a suitable habitat for herpetofauna.	N/A	
P-86	Change	Before the start of work, set up an air sampling station on Nuns' Island.	P-86 Before the start of work, set up an air sampling station on Nuns' Island. The details related to GHG emission trends are presented in section 6.2.5.	GHG added
P-87	Not applicable to deconstruction	Implement a management program for de-icing salt that minimizes use and maintains safe driving conditions.	N/A	
P-88	Not applicable to deconstruction	The bridge operator will be responsible for informing the public of obstructions and alternate routes.	N/A	
P-89	None	Observe the requirements of SLSMC's land use lease during maintenance and coordinate work with SLSMC.	P-89 Observe the requirements of SLSMC's land use lease during maintenance and coordinate work with SLSMC.	
P-90	None	Where available, use equipment fitted with a dust collection system during maintenance.	P-90 Where available, use equipment fitted with a dust collection system during maintenance.	
P-91	None	Use tarpaulins during dust-producing work.	P-91 Use tarpaulins during dust-producing work.	
P-92	None	Comply with dust emission standards in Montreal Bylaw 90 (*Règlement 90 relatif à l'assainissement de l'air*) for work in the City of Montreal, and with those in the government of Quebec's clean air regulations for the City of Brossard.	Comply with dust emission standards in Montreal Bylaw 90 (*Règlement 90 relatif à l'assainissement de l'air*) for work in the City of Montreal, and with those in the government of Quebec's clean air regulations for the City of Brossard.	
P-93	Not applicable to deconstruction	Since work will be carried out in the same location, the private partner will need to plan construction on the Island of Montreal in collaboration with the operator of the Western sector containment system in the Sud-Ouest Business Park.	N/A	
P-94	Not applicable to	Meltwater will not be directly discharged into sensitive areas such as wetlands.	N/A	

Table 90 – Specific mitigation measures (cont'd)

<table>
<tr><th>NO.</th><th>TYPE OF CHANGE</th><th>ORIGINAL SPECIFIC MITIGATION MEASURE</th><th>UPDATED SPECIFIC MITIGATION MEASURE</th><th>NOTE</th></tr>
<tr><td></td><td>deconstruction</td><td></td><td></td><td></td></tr>
<tr><td>P-95</td><td>Change</td><td>Consider MDDEFP's guidelines for managing concrete, brick and asphalt from construction and demolition work and residue from the free stone sector (Lignes directrices relatives à la gestion de béton, de brique et d'asphalte issus des travaux de construction et de démolition et des résidus du secteur de la pierre de taille).</td><td><u>P-95</u> Consider MELCC's guidelines for managing concrete, brick and asphalt from construction and demolition work and residue from the free stone sector (Lignes directrices relatives à la gestion de béton, de brique et d'asphalte issus des travaux de construction et de démolition et des résidus du secteur de la pierre de taille).</td><td>"MDDEFP" replaced with "MELCC."</td></tr>
<tr><td>P-96</td><td>None</td><td>Marine equipment used to carry out the work and the personnel working aboard such equipment must comply with the provisions of the Canada Shipping Act, 2001 (2001, c. 26) and its Regulations.</td><td><u>P-96</u> Marine equipment used to carry out the work and the personnel working aboard such equipment must comply with the provisions of the Canada Shipping Act, 2001 (S.C. 2001, c. 26) and its Regulations.</td><td></td></tr>
<tr><td>P-97</td><td>None</td><td>Contact CCG at 1-800-463-4393 or cell phone *16 to report any marine emergency.</td><td><u>P-97</u> Contact CCG at 1-800-463-4393 or cell phone *16 to report any marine emergency.</td><td></td></tr>
<tr><td>P-98</td><td>None</td><td>If possible, the noisiest activities (e.g. concrete crushing, heavy truck traffic) will not be located near noise-sensitive areas.</td><td><u>P-98</u> If possible, the noisiest activities (e.g. concrete crushing, heavy truck traffic) will not be located near noise-sensitive areas.</td><td></td></tr>
<tr><td>P-99</td><td>Change</td><td>Barring unusual circumstances, work between 7:00 a.m. and 7:00 p.m. from Monday to Sunday shall not exceed 75 dBA, or the ambient noise level without the work plus 5 dBA, and work between 7:01 p.m. and 6:59 a.m. shall not exceed the ambient noise level without the work plus 5 dBA. Also, barring exceptional situations, very noisy work should be done during the day to avoid disturbing residents close to the work site whenever possible.</td><td><u>P-99</u> Noise levels must comply with MTQ levels (Volume II, Chapter 9, Section 9.9.1.4 and Table 9.9–1) also presented in the EEE (Table 1). For noise-sensitive areas: houses, hospitals and schools, parks, hotels, etc., the limits are:
<table>
<tr><th colspan="2">Day [7:00 am – 7:00 pm]</th><th colspan="2">Evening [7:00 pm - 11:00 pm]</th><th colspan="2">Night [11:00 pm - 7:00 am]</th></tr>
<tr><th>L10</th><th>Lmax</th><th>L10</th><th>Lmax</th><th>L10</th><th>Lmax</th></tr>
<tr><td>75 or baseline level +5*</td><td>85 or 90 for impact noise**</td><td>Baseline level +5*</td><td>85</td><td>Baseline level +5 (if baseline level <70) or Baseline level +3 (if baseline level >70)</td><td>80</td></tr>
<tr><td colspan="6">* The highest of the two should be the noise level not to exceed
** Impact noise refers to sudden intermittent noise.</td></tr>
</table>
Also, barring exceptional situations, very noisy work should be done during the day to avoid disturbing residents close to the work site whenever possible.</td><td>The change allows MTQ limits for road work to be taken into account and criteria added for the evening and nighttime.</td></tr>
<tr><td>P-100</td><td>None</td><td>Activities that create dust will be located so as to minimize the effect on the public.</td><td><u>P-100</u> Activities that create dust will be located so as to minimize the effect on the public.</td><td></td></tr>
<tr><td>P-101</td><td>Change</td><td>Transport Canada and the private partner will work together to develop a transportation management plan in order to maintain a smooth traffic flow on the project's adjacent road network.</td><td><u>P-101</u> A transportation management plan must be prepared to maintain a smooth flow of traffic on the road network next to the project. The plan shall consider third-party work sites under way at the same time. The annexes of École des Marguerite, which will be set up starting in the fall 2019 for about five years at 14 Place du Commerce on Nuns' Island, must also be taken into account.</td><td>Change in responsibility. Addition to take into account the other work sites and the school facilities on Nuns' Island</td></tr>
<tr><td>P-102</td><td>Change</td><td>Transport Canada and the private partner will work together to prepare a transportation management plan for trucking during the construction phase and around the project site.</td><td><u>P-102</u> Measures that may be included in the transportation management plan are: transport outside of peak hours (e.g. between 10 a.m. and 2:30 p.m. or between 7 p.m. and 5 a.m.), avoiding local roads, and using predetermined routes that avoid residential neighbourhoods.</td><td>Adjustment to complete P-101</td></tr>
<tr><td>P-103</td><td>Not applicable to deconstruction</td><td>Keep the bus-only lane operational during the project.</td><td>N/A</td><td></td></tr>
<tr><td>P-104</td><td>None</td><td>Make sure that the pollution abatement systems on vehicles and equipment are operational and meet the regulatory requirements for air quality.</td><td><u>P-104</u> Make sure that the pollution abatement systems on vehicles and equipment are operational and meet the regulatory requirements for air quality.</td><td></td></tr>
<tr><td>P-105</td><td>None</td><td>Where possible, restore demobilized areas to their natural state using native species and a natural slope. Where it is not possible to restore an area to its natural state, the demobilized area must be restored to a state equivalent to its state before the work began.</td><td><u>P-105</u> Where possible, restore demobilized areas to their natural state using native species and a natural slope. Where it is not possible to restore an area to its natural state, the demobilized area must be restored to a state equivalent to its state before the work began.</td><td></td></tr>
<tr><td>P-106</td><td>None</td><td>Minimize the footprint occupied by the work.</td><td><u>P-106</u> Minimize the footprint occupied by the work.</td><td></td></tr>
<tr><td>P-107</td><td>None</td><td>Replant native tree species within the footprint, consistent with safety requirements.</td><td><u>P-107</u> Replant native tree species within the footprint, consistent with safety requirements.</td><td></td></tr>
<tr><td>P-108</td><td>Change</td><td>Special attention will be paid to protecting Common Tern breeding sites (small rocky islets near Nuns' Island) by establishing a buffer exclusion zone.</td><td><u>P-108</u> Special care will be given to protecting Common Tern breeding sites (small rocky islets near Nuns' Island, under the new bridge and further downstream) by establishing a buffer exclusion zone.</td><td>Clarification on location</td></tr>
<tr><td>P-109</td><td>Change</td><td>Install geotextile at the base of fences at the time of installation.</td><td><u>P-109</u> Install geotextile at the bottom of fences as soon as they are installed around a temporary storage site.</td><td>Clarification on location</td></tr>
</table>

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
P-110	None	Temporary project structures must not modify the ice regime in such a way as to cause flooding.	**P-110** Temporary project structures must not modify the ice regime in such a way as to cause ice jams and flooding.	Details
P-111	None	Site lighting will be aimed at the work areas and avoid intrusive light outside the work site.	**P-111** Site lighting will be aimed at the work areas and avoid intrusive light outside the work site.	
P-112	Not applicable to deconstruction	Implement retention and treatment measures respecting City of Montreal bylaw C-1.1 and the MDDEFP rainwater management guide.	N/A	
P-113	Not applicable to deconstruction	Area C of the prehistoric archaeological Site BiFj-49 where Aboriginal remains were found should be fenced outside the work areas.	N/A	
P-114	New measure		**P-114** If materials such as asbestos and lead-based paint are found, remove the materials in accordance with industry standards, as defined in the specifications drawn up for the project. All friable or deteriorated asbestos-containing materials must be removed before proceeding with deconstruction work. Any lead-based paint that is flaking must be removed before deconstruction work. Properly bonded paint may be left on bridge materials to be removed, provided that proper handling and transport methods are used to minimize dust emissions and that said materials are disposed of in accordance with provincial regulatory requirements.	
P-115	New measure		**P-115** • Use watering equipment during deconstruction activities to minimize the production of dust • Control mud and dirt that are carried off or transported outside the enclosures • Minimize the fall of materials at the transfer point • If necessary, use foam- or water-based suppression systems • Secure loads on transport trucks • Minimize handling operations to make sure to keep the number of times when materials are offloaded and handled to a minimum • Use windscreens • Where applicable, use fences or wind barriers in materials handling areas and where storage piles are located • For concrete crushing operations, crushers should be located as far away as possible from sensitive residential areas • Apply a dust control agent (water or dust suppressant approved by the Bureau de normalisation du Québec) on grooved roads when amounts of dust likely to be kicked up by vehicles exceed 40 mg/m^3 • Dust control agents should be spread out near weighing stations and on detour roads used to transport materials • All piles of materials should be covered with geotextile if they must remain in place for more than 48 hours. If they are not used for three or more months, they must be seeded to form a temporary vegetation cover • Handle materials (deposition and management) in piles downstream (based on wind direction) of sensitive areas	
P-116	New measure		**P-116** • Stacking, piling and certain other work should not be done in windy conditions (average hourly sustained wind speeds over 50 km/h) • Cover storage piles with tarp	
P-117	New measure		**P-117** • Consider using a dust/dirt control mechanism (gravel platform, Grizzly, system for washing wheels or asphalted roads) that would be located at the intersection of a non-paved road and an asphalted road and that controls or prevents the transport of dust/dirt off-site by vehicles.	

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
			• When appropriate, pave work site areas to control dust emissions • Ensure the adequate maintenance of unpaved roads • Plan truck routes to avoid residential neighbourhoods • Deconstruction activities that generate dust must be planned so that the dust does not affect road users and the general public • Plan work according to weather conditions (rain to minimize dust emissions, low wind)	
P-118	New measure		**P-118** • Minimize debris fall height • Use barriers to prevent the dispersion of waste or residual materials • Clean local roads daily. • Draw up work practices for loading debris • Avoid prolonged debris storage	
P-119	New measure		**P-119** During activities that generate dust, such as concrete sawing, concrete crushing, and moving and loading materials, apply water spray in large enough quantities to minimize dust emissions. In addition, avoid deconstruction work that generates dust during windy days. In deconstruction areas that are under way near residential areas, water spraying must be done before and during deconstruction.	
P-120	New measure		**P-120** • Maintain equipment in good condition to prevent oil and other leaks and minimize emissions affecting air quality and noise. Make sure that anti-pollution systems are operational and meet air quality requirements. • Truck idling must be minimized (< 5 minutes of idling per 60-minute period).	
P-121	New measure		**P-121** To limit the effects on traffic, the contractor shall apply the following measures: • Bridge deconstruction materials (excluding jetties): transport materials between 10 a.m. and 3 p.m. or between 7 p.m. and 11 p.m. to avoid the rush hour and nighttime; • Transport materials only on business days (Monday to Friday) and avoid holidays; • Limit the duration of closures on Boulevard René-Lévesque under the original Champlain Bridge during deconstruction and limit the closures to nights and weekends. During these closures, limit the transportation of bridge deconstruction materials; • Limit the duration of closures on Highway 132 under the original Champlain Bridge during deconstruction and limit the closures to nights and weekends. During these closures, limit the transportation of bridge deconstruction materials; • Use flaggers to manage truck traffic at work sites; • Reduce speed around the work area; • Use routes with the least impact shown on Figure 53 (blue route), Figure 54 (yellow route), Figure 55 (red route) and Figure 56 (yellow route), except in special cases.	
P-122	New measure		• Apply laws and regulations on barge bilge water management	
P-123	New measure		• Perform a hydraulic simulation to show that the temporary structures (jetties) do not alter hydraulic conditions on the SSL development such that the target velocity and depth ranges are no longer observed. The target depth and velocity ranges are respectively 2 to 3.5 m and 0.5 to 1.5 m/s, for a mean flow between May 1 and June 15.	
P-124	New measure		**P-124** • At all times, favour the use of low noise generating equipment at the work site (e.g. quiet hydraulic hammer, silent core blades for sawing concrete, enclosed generator and	

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
			compressor).	
P-125	New measure		**P-125** • Optimize work site design so as to reduce exposure in sensitive areas to nearby noise. This must include, without being limited to, prioritizing the movement of trucks and equipment at the site that make minimal use of backup alarms, and stationary equipment at the site must be located further away from areas sensitive to noise.	
P-126	New measure		**P-126** • All of the equipment used at the site and installed with a backup alarm must use either variable-intensity alarms, adjustable alarms, or broadband backup alarms. All backup alarms must comply with all applicable regulatory requirements, including, without being limited to, the Safety Code for the Construction Industry (CQLR, S-2.1, r. 4).	
P-127	New measure		**P-127** • Avoid dropping large sections made of metal, concrete or other materials on the ground that could cause excessive vibration.	
P-128	New measure		**P-128** • All trucks must have equipment to limit noise made by rear doors during material unloading operations.	
P-129	New measure		**P-129** • The soil and residual materials dug up by the Contractor shall, insofar as possible, be subject to Reclamation at the Work site. In the event that this is not feasible, the soil and residual materials must be removed from the work site, as per the MELCC's requirements. For Work carried out on federal land, contaminated soils shall be managed in accordance with applicable Standards established by the CCME Soil Quality Guidelines. For Work and the transport of contaminated soils not on federal land, provincial and municipal standards on contaminated soils shall apply.	
P-130	New measure		**P-130** The Contractor shall carry out all Work related to hazardous materials following a procedure centered on efficient dust control (e.g. spraying water). Regarding the handling of hazardous substances, the Contractor shall: • During the work, place materials containing asbestos and asbestos dust in airtight containers appropriate to the type of debris. Debris shall be removed as work progresses using an aspirator equipped with a high-efficiency filter or by wetting the debris before removing it manually. • Handle and dispose of waste or residual materials, used disposable coveralls, used filter cartridges and soiled porous tools (e.g. rags, sponges, mops) as contaminated waste or residual materials. • Place the above waste or residual materials in an airtight container with a label indicating the following information, depending on the hazardous substance. The following is an example for asbestos:  • Ensure dust control when transporting waste or residual materials to the loading area.	

Table 90 – Specific mitigation measures (cont'd)

NO.	TYPE OF CHANGE	ORIGINAL SPECIFIC MITIGATION MEASURE	UPDATED SPECIFIC MITIGATION MEASURE	NOTE
			• Transport hazardous substances in accordance with the *Transportation of Dangerous Substances Regulation* (CQLR, c. C-24.2, r. 43) to a disposal site that accepts this type of waste or residual materials. • Dispose of waste exclusively consisting of silica and pigeon droppings at a standard dry landfill site. • Give JCCBI all documents and waybills, bills of lading and weigh tickets for each load leaving the Site.	
P-131	New measure		**P-131 Removal of jetty and site restoration:** In the specific case of the Lesser La Prairie Basin, given the presence of potentially contaminated in situ loose substrate, the granular material from the jetties must be removed as much as possible without reworking the contaminated riverbed sediment. More specifically, if the granular material has become embedded in the Lesser La Prairie Basin, the clean stone must be removed up to the elevation where it is embedded (and "mixed" with the in situ loose substrate) to a depth of up to 30 cm under the natural river bed level.	
P-132	New measure		**P-132 Invasive alien plant species** Prior to the work, conduct an inventory of invasive alien species and prohibit machinery from entering these areas using appropriate means (such as fences). If excavations are to be done in areas where invasive alien species are found, the colonies must be dug up to about 1 m in depth to recover the parts of the plants that are above and below ground. The soil and plants must then be taken to an authorized engineered landfill site, or buried in a work area and covered with 1 metre of uncontaminated soil or material, except in the case of the common water reed, where the thickness must be 2 metres. If no excavated materials of 2 metres are planned after excavation at that location, an excavation of at least 2 metres is required to remove all the plant rhizomes.	
P-133	New measure		**P-133 Invasive alien plant species** After any operation in an area where invasive alien species are found, it is important to make sure that all machinery components are free of mud and invasive alien species fragments before continuing work elsewhere. Cleaning shall be performed using high-pressure air or other methods such as brushes, brooms, shovels or vacuums. The operation shall be carried out in a washing area where all the solid waste can be contained together. No water shall be used for any cleaning within 30 metres of aquatic habitats, marshes or watercourses.	
P-134	New measure		**P-134 SSL compensatory development** No temporary structure shall encroach into the SSL compensatory development located upstream of the Original Champlain Bridge on the Nuns' Island side.	

6.4 SUMMARY OF LOSSES AND COMPENSATION PROJECTS

6.4.1 SUMMARY OF FISH HABITAT AND WETLAND LOSSES

Several deconstruction scenarios are currently under study with respect to both deconstruction methods and access to piers in shallow water. Only the access scenario with the greatest encroachment on fish habitat was considered for purposes of determining encroachment. This is the scenario that involves creating three jetties: one on the Nuns' Island side, one at the Seaway dike, and one on the Brossard side (Map 12). The jetties will be in place for the duration of the works, i.e. for about three years. The elevation of the jetty work surface is set at 13 m for determining the encroachment surface areas, which corresponds to the water level of a 100-year flood.

6.4.1.1 Fish habitat

Based on the worst-case scenario, installing the jetties will cause serious damages to fish habitat[8] over a total area of 58,622 m² for the duration of the deconstruction work, i.e. for about three years. The maximum encroachment area is increased by 10% to ensure that the contractor that is selected will have a sufficiently large work area. The total fish habitat encroachment area, including the increase of 10%, is 64,486 m², corresponding to about 6,5 ha. The data shown in Table 91 are increased encroachment areas, whereas Map 12 presents the surface areas prior to the 10% increase. Cofferdams may be required for the deconstruction of the piers (including the footings) that are not part of the jetties, but details on this aspect are not yet known. This information will be included in the documents to be provided during the DFO authorization phase, and the encroachments resulting from the use of cofferdams could be included in the summary of losses during the DFO authorization phase, if applicable.

The calculation assumptions are based on the scenario with the greatest encroachment and on the following elements:

- Total encroachment corresponds to the aggregate of the surface areas affected by the creation of the jetties (Nuns' Island, dike and Brossard) for each type of habitat;
- Although the habitats characterized in 2012 are listed in Table 91, only the 2018 habitats (current status of the site) will be considered for purposes of determining losses;
- No temporary encroachment associated with installing cofferdams or other temporary measures has been considered;
- No gain in surface area associated with the complete removal of the piers of the Existing Champlain Bridge was determined in the above summary; however, it is estimated at 4,158.5 m²;
- No permanent encroachment will result from the deconstruction of the Existing Champlain Bridge.

Habitat sensitivity may vary depending on the area and the species of fish inventoried in a specific system (e.g. presence of walleye or lake sturgeon). The following habitats in the study area are considered sensitive or not sensitive by DFO:

[8] This report uses the term "serious damages" from the 2013 Fisheries Act. Although the Act has since been changed and the term currently used refers to a DDD (destruction, damage and disturbance), it does not change the balance of loss and the assessment of the effects of the project.

- Sensitive: 1, 2, 3, 4, 6, 8, 12, 13, 13a, 14, 16, 18, 21 and 22;
- Not sensitive: 5, 7, 9, 10, 11, 15, 17, 19, 20, 23 and 24.

Table 91 - Summary of encroachments by habitat type

TYPE OF HABITAT	SUMMARY OF ENCROACHMENTS					
	NUNS' ISLAND JETTY		BROSSARD JETTY		DIKE JETTY	
	2012 habitat (m²)	2018 habitat (m²)	2012 habitat (m²)	2018 habitat (m²)	2012 habitat (m²)	2018 habitat (m²)
Slow water						
2	89	**2,690**	--	--	--	--
3	--	**14,823**	--	--	--	--
4	--	--	902	**964**	--	--
5	--	--	--	1,194	--	--
8	--	--	--	**8,236**	--	--
9	--	--	18,579	9,579	--	--
Slow water subtotal	89	17,513	19,481	19,973	0	0
Fast water						
12	--	--	--	--	13,855	**11,354**
13	9,931	--	--	--	--	**1,989**
13a	--	**1,874**	--	--	--	--
16	--	--	--	--	5,743	**4,335**
17	4,949	4,491	--	--	--	2,957
20	--	--	--	--	--	--
22	7,516	--	--	--	--	--
Fast water subtotal	22,396	6,365	0	0	19,598	20,635
Undetermined	1,393	--	491	--	1,037	--
TOTAL	23,878		19,973		20,635	

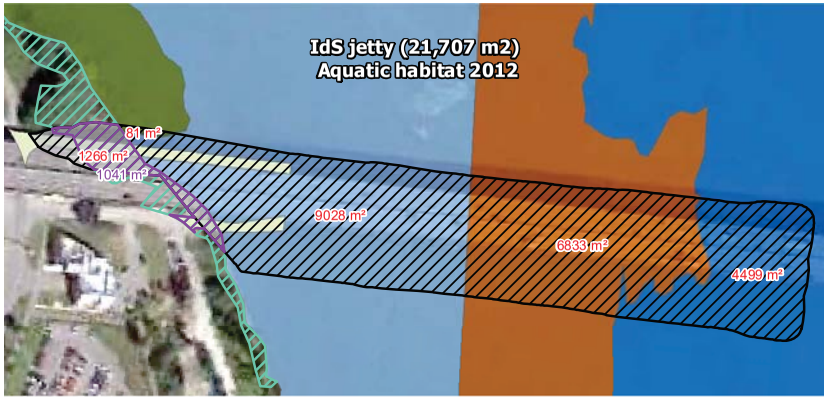
In bold: Sensitive habitat

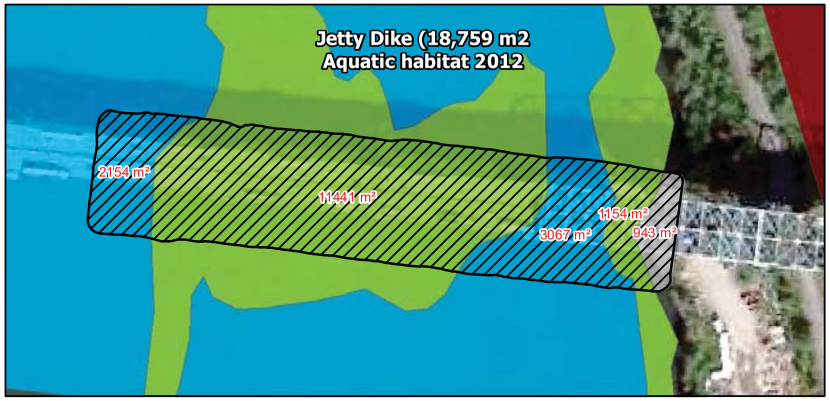
Habitat sensitivity depends, namely, on the habitat functions that are fulfilled (e.g. spawning, rearing, feeding) and the species that are present. Habitats considered sensitive that contain aquatic vegetation (2, 4, 6, 8, 12, 14, 16 and 18) are likely to be used for the spawning and rearing of phytolithophilous and phytophilous species as well as for the feeding of several species. Habitats 3, 13, 13a, 21 and 22 contain no aquatic vegetation but show some sensitivity. Type 13, 21 and 22 habitats present a reproductive potential for lithophilous species in fast water, while type 3 habitats present a reproductive potential for lithophilous species in calm water. Type 3 and 13a habitats represent a significant potential feeding area in the summer. A type 1 habitat is a floodplain that can be used for the spawning of phytolithophilous and phytophilous species.

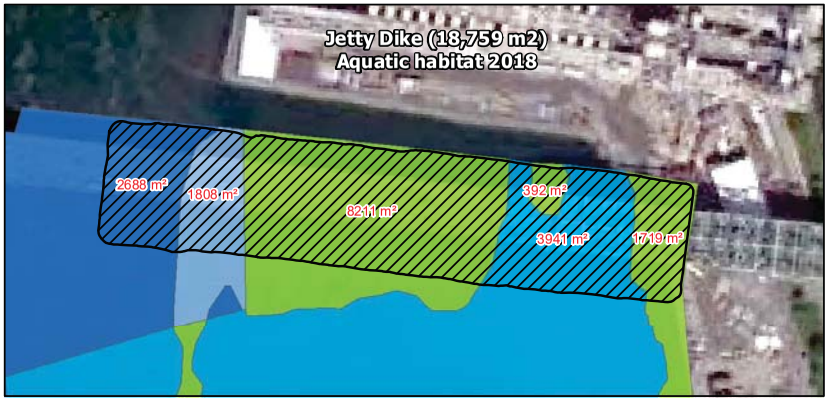
The jetty on the Nuns' Island side will mainly encroach on slow-water habitats, i.e. 17,513 m² entirely in sensitive habitats (types 2 and 3) and 6,365 m² in fast-water habitats. Encroachment in fast water will be in habitats that are type 13a (1,874 m² of sensitive habitat) and 17 (non-sensitive).

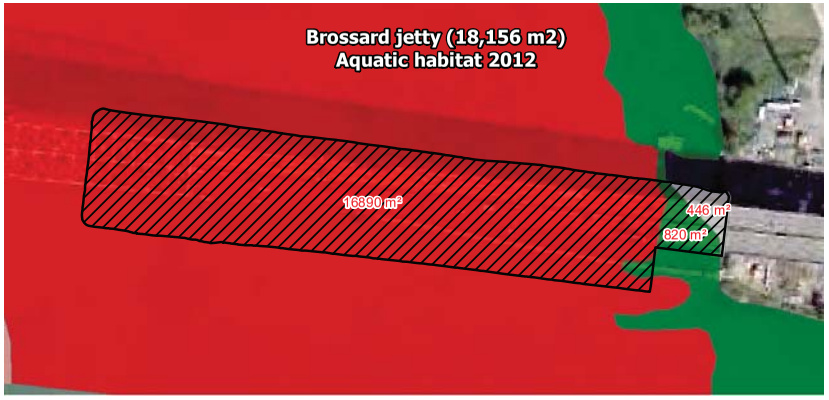
The jetty on the dike side will fully encroach on fast-water habitats, including 17,678 m² in type 12, 13 and 16 sensitive habitats.

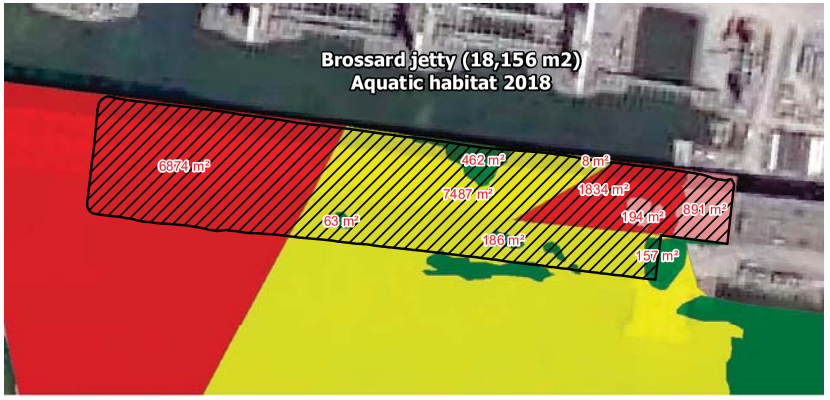
The jetty on the Brossard side will entirely encroach on slow-water habitats, including 9,200 m² in type 4 and 8 sensitive habitats.

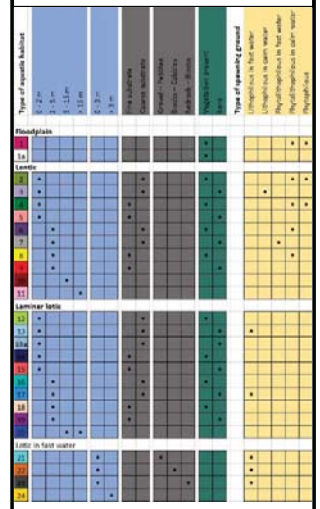












Proposed jetty
Emergent nearshore marsh
Marsh encroachment
Projected IDS access ramps
Non-characterized habitat

N

30 15 0 30 60 m

1:2 500

DECONSTRUCTION OF ORIGINAL CHAMPLAIN BRIDGE (2017-2022)
CONTRAcT No. 62555
MONTREAL, QUEBEC

Encroachment of proposed jetties in the 2012 and 2018 aquatic habitat 100-year flood

march 2019

Coordinate system: NAD83 MTM 8

Base map: Google

Parsons Tetra Tech Amec Foster Wheeler

Map 12

\\TTS350FS2\prj_reg\361161T1\DOC-PROJ\60660CRO\ArcGIS\361181T_Map12_Encroachment_aquatic_habitat_11x17.mxd

It is important to recall that this assessment is exclusively based on the proposed deconstruction scenario (with jetties). The selected contractor may present different scenarios (e.g. deconstruction strategy, work method, access) than those being proposed. The encroachments presented here thus serve as a benchmark for the contractor, meaning that the latter will be able to use work methods with less encroachment, but not more than what is presented in the loss assessment.

6.4.1.2 Wetlands

The study area is characterized by the presence of grass beds near the shore and riparian wetlands. The eastern shore of Nuns' island consists of a few emergent riparian marshes that are below the natural high water mark of the St. Lawrence River (Stantec, 2015). The plant composition of the marsh located in the immediate area of the Nuns' Island jetty and the accesses to it are presented in Table 92.

The jetty and access ramps to the Nuns' Island jetty will encroach on 1,041 m² of the wetland, which already appears to be impacted by the presence of the SSL jetty. Since the above wetland was not delineated during the field surveys in summer 2018, the wetland is considered to still be completely present and the data from the 2013 EA are used.

Table 92 - Vegetation composition of wetlands impacted by the Nuns' Island jetty

STRATUM	DOMINANT PLANT SPECIES		SPECIES COVERAGE (%)	STATUS*
	COMMON NAME	LATIN NAME		
Shrub 15%	Eastern cottonwood	Populus deltoïde	1-2	FACW
	Riverbank grape	Vitis riparia	2-5	FACW
	Thicket creeper	Parthenocissus inserta	2-5	
Herbaceous 60%	Devil's beggarticks	Bidens frondosa	1-2	FACW
	Flowering rush	Butomus umbellatus	1-2	OBL
	Hedge false bindweed	Calystegia sepium subsp. americana	1-2	
	Black medick	Medicago Lupulina	1-2	
	Field mustard	Brassica sp.	2	
	Reed canary grass	Phalaris arundinacea	2-5	FACW
	Grass-leaved water-plantain	Alisma gramineum	2	OBL
	Cinquefoil	Potentilla sp.	1-2	Some FACW
	Common water reed	Phragmites australis subsp. australis	2-40	FACW
	Knotweed	Polygonum sp.	1	Some OBL or FACW
	Water smartweed	Persicaria amphibia var. emersa	1-2	OBL
	Purple loosestrife	Lythrum salicaria	2	FACW
	Black-girdled woolsedge	Scirpus atrocinctus	1-2	FACW
	Narrow-leaved cattail	Typha angustifolia	2-5	OBL

*Status:
OBL: Obligate Wetland Plant for southern Quebec
FACW: Facultative Wetland Plant for southern Quebec
Source: Stantec, 2015.

This wetland area includes two emerging riverside marshes: vegetation units 36 and 35 (Dessau Cima+, 2013) and is located at the end of a larger riverside complex in a completely anthropogenic area. Vegetation unit 35 is dominated by the common water reed (*Phragmites australis*), an invasive alien species, and vegetation unit 36 is dominated by the broad-leaved cattail (*Typha angustifolia*).

These vegetation units form an aquatic plant strip at the base of a fill in an area of the river that is relatively shallow (between 0 and 2 m), hydrologically permanent, and with no retention capacity. This is an area of calm water with no water level variations for most of the year. The productivity of both dominant plants in these marshes is very significant, which makes these marshes nutrient filtration and carbon sequestration zones. The colonies formed by the common water reed and broad-leaved cattail are dense, making them habitats sought by ichthyofauna for reproduction, rest, or hiding from predators, but the aggressivity of the common water reed harms local flora biodiversity.

The riverside functions of the marshes impacted by the work are shown in Table 93.

6.4.2 COMPENSATION PROJECTS FOR FISH HABITAT AND WETLANDS

JCCBI is committed to compensating serious harm to fish and wetlands caused by the presence of temporary jetties for about three years.

The approach used for the search for compensation projects involves two types of structures. First, slow-moving water developments will include a wetlands section to compensate for the loss of wetland and riverside environments as well as fish habitats in slow-moving water. These structures can then be used by both fish and herpetofauna. Second, structures in fast-flowing water will be created to compensate for the habitats of this type of fish affected by the works.

A literature review was first done and about 40 organizations were contacted (e.g. dedicated to wildlife, protection, municipalities, government departments). The search focus was initially around the Existing Champlain Bridge, but very few projects with productivity problems were found in this area. The search area was therefore expanded and extended from Lac Saint-François upstream to Lac Saint-Pierre downstream.

Several improvement concepts were analyzed and discussed with DFO and other stakeholders, and the following projects present characteristics that meet the project needs.

6.4.2.1 Partial dismantlement of Estacade wharf and Brossard service dock

As an initial project, JCCBI is proposing to partially dismantle the Estacade wharf near the Seaway Dike and the service dock on the Brossard side (both of which are owned by JCCBI) (Figure 71). This is a net habitat gain by removing backfill in the immediate area of the Existing Champlain Bridge (Greater and Lesser La Prairie basins), thus constituting an excellent compensation project. The surface area covered by the dismantlement of the two docks is roughly 1.4 ha. This project will only be feasible after the end of deconstruction work on the Existing Champlain Bridge, since these areas are part of the mobilization zones that can be used by the contractor.

Table 93 - Summary of functions of riverside marshes affected by the project

FUNCTIONAL CATEGORY	FUNCTIONS	PRIMARY VALUES	VEGETATION UNIT			
			35 (COMMON WATER REED)		36 (BROAD-LEAVED CATTAIL)	
			Function present (yes/no)	Function affected by project (yes/no)	Function present (yes/no)	Function affected by project (yes/no)
Hydrological	Flow regulation	Dissipation of energy through decreased current and elimination of suspended sediment	Yes	Yes	Yes	Yes
Biochemical cycles	Nutrient conversion	Natural water quality improvement	Yes	Yes	Yes	Yes
		Reduction of excess nutrients	Yes	Yes	Yes	Yes
	Biomass production	Sequestration of atmospheric carbon	Yes	Yes	Yes	Yes
Habitat	Productivity	Feed and support biodiversity	No	–	Yes	Yes
	Wildlife support	Help maintain certain animal populations (e.g. shelter, egg-laying)	Yes	Yes	Yes	Yes
	Biological diversity	Biodiversity (genetic resources)	No	–	Yes	Yes
Climatic	Carbon fixation and CO_2 balance	Maintain existing climatic conditions for the benefit of human activities and society	Yes	Yes	Yes	Yes
	Increased rainfall and humidity affecting microclimate	Maintain existing climatic conditions for the benefit of human activities and society	Yes	Yes	Yes	Yes

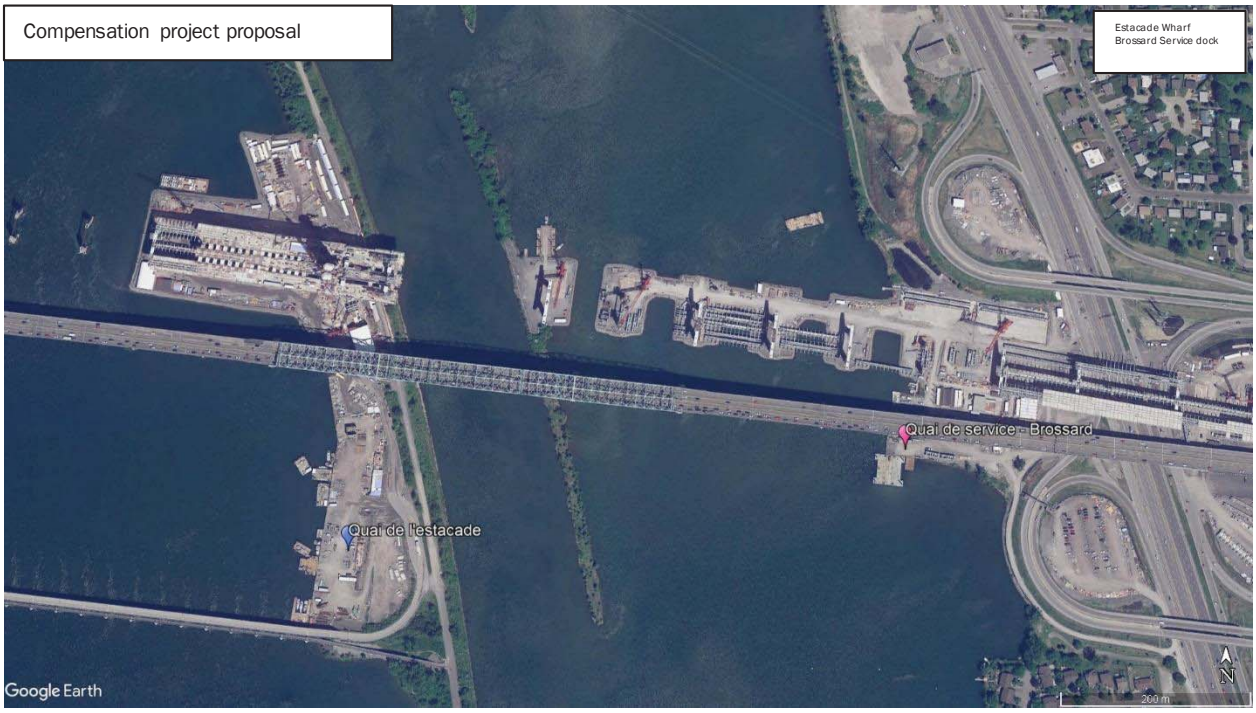


Figure 71 - Location of the Estacade wharf and Brossard Service dock

6.4.2.1.1 Design for the Estacade wharf

Most of the lower section of the wharf will be dismantled. One section south of the existing dock will be kept for future Ice Control Structure inspection or repair work. A concrete wall will be built along the section of the dock that will be kept. Near this section, part of the shore development will have a slope of 1.5H:1V where the rocky embankment will extend up to one metre under the low water mark. In the slope, a plateau will be created slightly below the NHWM in order to plant vegetation that may be used by fish during floods as well as by birds, herpetofauna and small animals out of flood periods.

In a downstream direction, the slope of the shoreline will be 2H:1V and will extend to the end of the high water mark (HWM). From there, the slope will level off to 10H:1V until the bottom of the development reaches the natural bottom about 40 metres further on. In the seasonal drawdown area (difference between high water and low water levels), aquatic and semi-aquatic vegetation will be planted to provide a riverside wetland that can be used by fish during flood periods. In addition, by being close to the Couvée Islands MBS, the development will also be used by waterfowl and other migratory birds. The plant species that will be used will be roughly the same as those found in the emergent marsh on the Nuns' Island side.

The riparian strip will also be developed and will be linked to the Héritage Champlain enhancement project.

6.4.2.1.2 Design for the dock on the Brossard side

The Brossard dock is located at the foot of the Existing Champlain Bridge (Figure 71). The shore will be developed once the fill is removed. The rock embankment with a 2H:1V slope will be 1 m below the water level, which is fairly stable in the Lesser La Prairie Basin. The riparian strip will also be developed and will be linked to the Héritage Champlain enhancement project.

6.4.2.1.3 Current velocity

Current velocities along the two projected compensatory developments were modelled by LaSalle|NHC (2019) for different flows (low flow $Q_{2.7}$ and average 2-year flow) (Table 94 and Figure 72 and Figure 73).

Table 94 - Modelling of flow and depth velocities around the dismantlement of Estacade wharf and the Brossard dock (adapted from La Salle, 2019)

LOCATION	FLOW	VELOCITY (M/S)		DEPTH (M)	
Estacade wharf	$Q_{2.7}$ (6,895 m³/s)	Minimum	0	Minimum	0
		Average	0.1	Average	1.4
		Maximum	0.3	Maximum	2.4
	$Q_{2.avg}$ (9,325 m³/s)	Minimum	0	Minimum	0
		Average	0.1	Average	1.8
		Maximum	0.4	Maximum	3.0
Dock on Brossard side	Q_{avg} (Q = 130 m³/s)	Minimum	0	Minimum	0
		Average	0.03	Average	0.9
		Maximum	0.06	Maximum	1.3

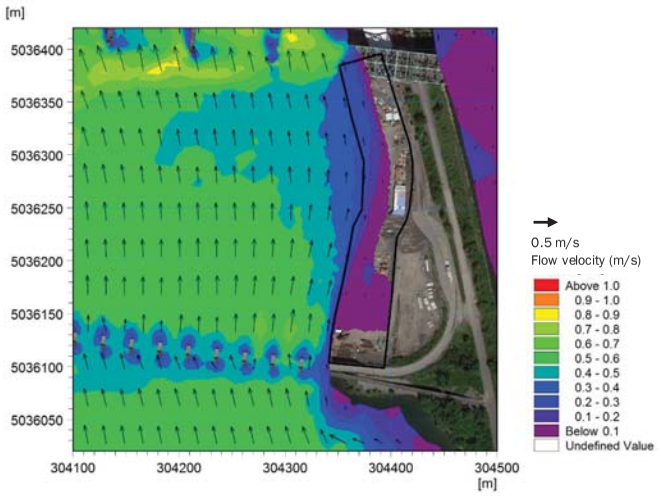
A single flow scenario was studied for the development on the Brossard side since the hydrodynamic conditions in the Lesser La Prairie Basin are related to Seaway operation and do not necessarily follow the hydraulic conditions of the St. Lawrence River. Modelling results show low flow velocities along the two developments, with a maximum simulated value of about 0.4 m/s obtained for the average 2-year flow (9,325 m³/s).

For the development on the Estacade wharf, the average flow depth is 1.4 m/s for low flow and 1.8 m/s for the average 2-year flow. On the Brossard side, the average flow depth in the bay is about 0.9 m. Table 94 shows the minimum, average and maximum flow velocities and depths for the three simulations.

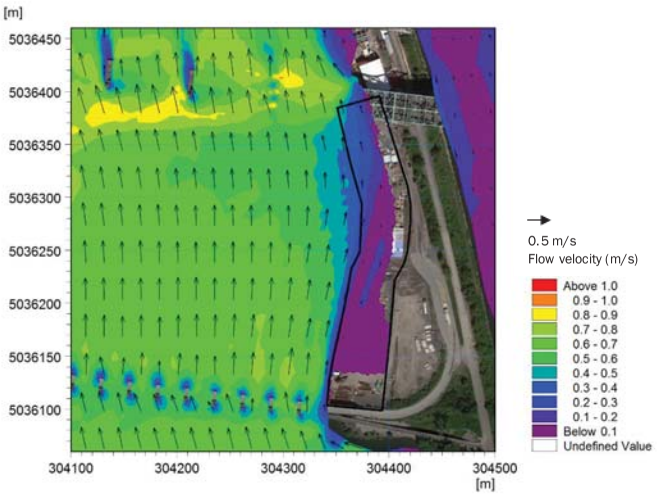
6.4.2.1.4 Summary of gains

This development will result in a total gain of 1.4 hectares in fish habitat equivalent to what is found in the immediate area, i.e. slow-water habitats where vegetation can be established beyond the developed emergent marsh. Once the aquatic vegetation is fully established, the type of developed habitat at the Estacade wharf will be type 12 and type 4 at the Brossard dock.

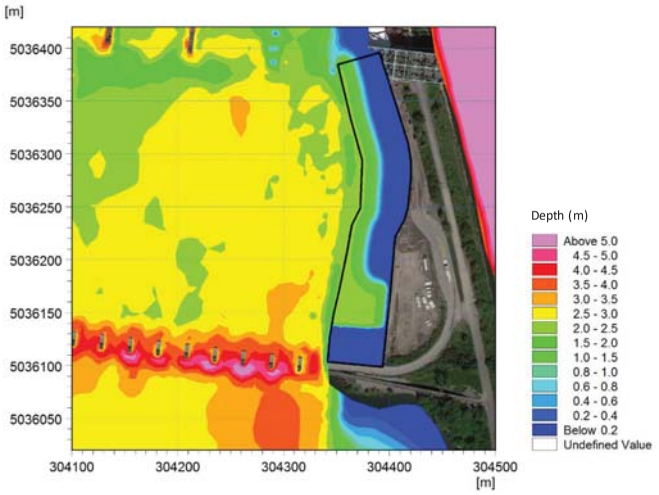
The creation of an aquatic grass bed between the HWM and low water mark (LWM) over about 3,150 m² will amply compensate for the riverside wetland that will be affected over an area of 1,041 m² on the Nuns' Island side.



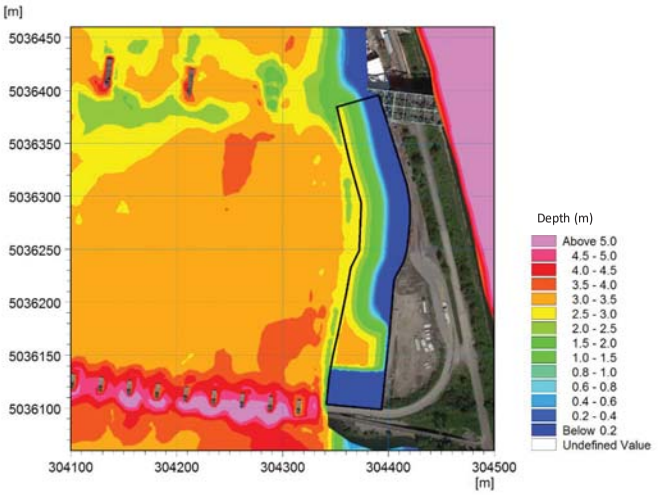
a) Velocity fields for low flow $Q_{2\text{-}7}$ (6,895 m³/s)



b) Flow velocities for average 2-year flow (9,325 m³/s)

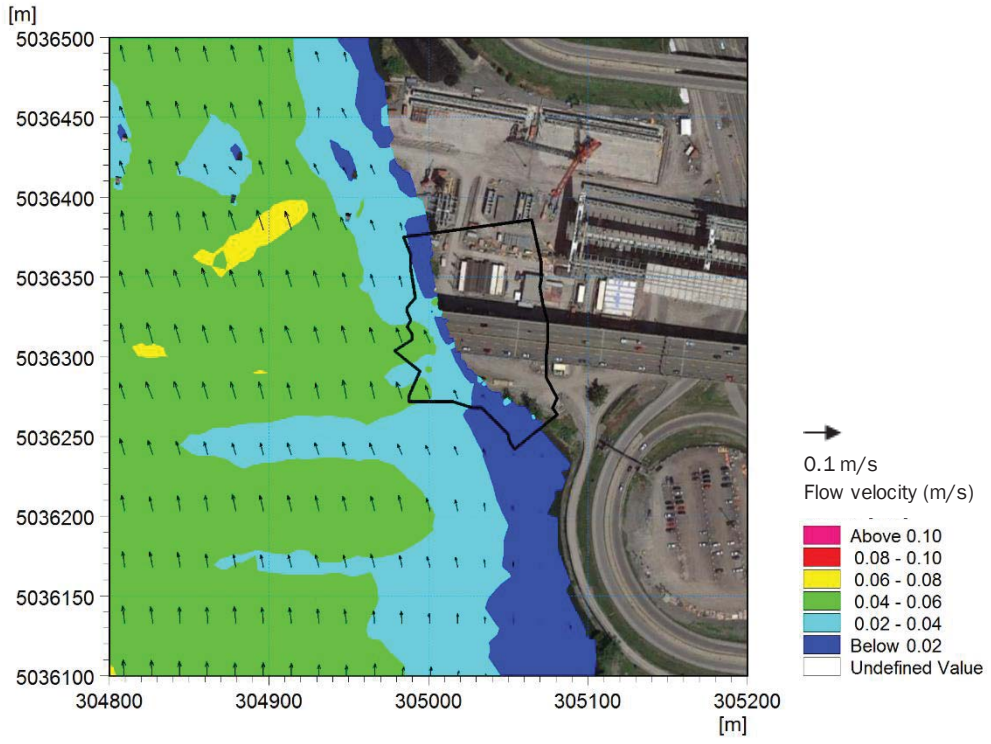


c) Flow depths for low flow Q2-7 (6,895 m³/s)

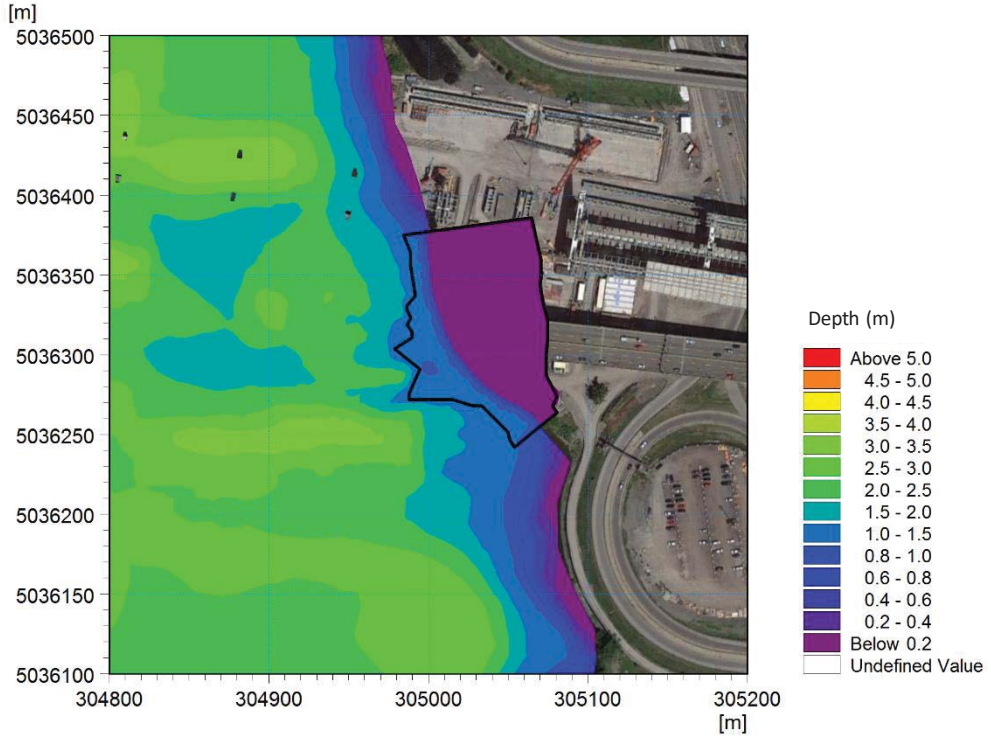


d) Flow depths for average 2-year flow (9,325 m³/s)

Figure 72 - Partial dismantlement of Estacade wharf – Flow velocities and depths for low flow $Q_{2\text{-}7}$ and average 2-year flow (La Salle, 2019)



a) Flow velocities



b) Flow depths

Figure 73 - Partial dismantlement of Brossard dock – Flow velocities and depths for average flow (Q = 130 m³/s) (La Salle, 2019)

6.4.2.2 Complete dismantlement of most of the footings

Most of the footings, except for two piers near Nuns' Island that will be partially preserved for enhancement purposes, will be minimally deconstructed under the St. Lawrence riverbed (see Section 2.1.3.5.1 and Map 2 in Volume 1). Natural substrate will be redeposited around the footings, which will enable small portions of fish habitat to be recovered for each dismantled footing. The gain is estimated at 4,158.5 m^2.

Since the current is relatively strong in the Greater La Prairie Basin, most of the gains would be in fast water (> 0.3 m/s), i.e. about 3,397 m^2 (mainly in type 17 and 20 habitats) and about 761 m^2 in slow water in different types of habitat (3, 5, 8, 9 12, 13a and 16).

6.4.2.3 Development of an aquatic-grass bed in farmland

A project involving the creation of an aquatic-grass bed on former farmland is currently being studied. This project consists in developing farmland that is mainly found below the Lac Saint-Pierre NHWM (St. Lawrence River) into an aquatic grass bed that will serve as a Yellow Perch spawning ground, among other uses. The development, which could be up to 10 hectares in size, is addressing a well-documented problem and a species in decline in Lac Saint-Pierre: Yellow Perch.

6.4.2.3.1 Problematic

The Yellow Perch population in Lac Saint-Pierre and the Lac Saint-Pierre archipelago has been on the decline for several years. An initial five-year moratorium was imposed in 2013 and extended for five more years in 2017. Several factors disadvantage the Yellow Perch, including access to quality spawning habitat on the shore of Lac Saint-Pierre. Several development projects have been carried out in the Lac Saint-Pierre floodplain by the Ministère des Forêts, de la Faune et des Parcs (MFFP) as well as other organizations.

Around Lac Saint-Pierre, about 5,000 ha of farmland are under the 0-2-year flood level, therefore, in the fish habitat. The farmland being targeted for part of the compensation project is no exception, as it is also mostly under the 0-2-year flood level. The land is used for soybean crop farming. This type of crop does not provide adequate spawning support for fish in the spring. In addition, vegetation maintenance alongside the fields limits the habitat potential for aquatic, avian and terrestrial fauna during both flood and non-flood periods.

Developing farmland into a spawning habitat suitable for Yellow Perch would give a boost to the population of this species, which has a precarious status.

6.4.2.3.2 Development concept

The MFFP, which has extensive development experience in the area, has established the elevation (6.2 m) corresponding to the flooded area during the Yellow Perch breeding period, one year out of two. Ichthyological inventories recently conducted by the MFFP reveal the presence of early spawners such as Northern Pike and Yellow Perch, and of species with an interest for recreational fishing such as Walleye, Brown Bullhead and Pumpkinseed in this area. The MFFP has established objectives for the redevelopment of farmland.

The design of the farmland development aims to meet all of these objectives. These consist of:

- Providing an optimal habitat for fish spawning and fry rearing;
- Providing an optimal habitat for the feeding of ducklings and larval fish by maximizing the production of zooplankton;
- Improving nesting conditions for waterfowl and farmland birds in wet grasslands;
- Eliminating the release of fine sediment into Lac Saint-Pierre by creating a permanent grass cover (wet grassland);
- Improving habitat quality for aquatic and semi-aquatic mammals;
- Improving the free passage of fish between Lac Saint-Pierre and spawning grounds.

The land will be profiled to favour a large flooded area during each spring freshet, water recession when waters recede, and maintain a surface water link between the channels (ditches) and the St. Lawrence under low flow conditions. Vegetation will be planted or sown to provide adequate support for the species of fish that use floodplains as a spawning ground.

A surface area of about 10 ha will thus be developed into a multispecies wildlife habitat. The development concept mainly targets Yellow Perch, a species whose declining populations in Lac Saint-Pierre has been well documented. In addition to Yellow Perch, about 40 species of fish are likely to use the floodplain as a spawning habitat. The floodplain could also be used by numerous species of birds, amphibians, reptiles and mammals.

The wetted area on July 3, 2019, seen during a visit to the site, was the inspiration for the development concept. The aim is to maximize the usable surface area for spawning and ensure adequate water depth during the entire spawning period (early and late spawners). More specifically, the development will consist in profiling the middle of the land (main agricultural block). A strip of land of about four metres will be excavated below the 6.2-m elevation around the main agricultural block, thus allowing the flooded acreage to be increased by about 15,000 m^2 during the entire spring flood.

Since Yellow Perch use the roots and branches of immersed trees and shrubs near steep slopes to deposit their string of eggs, during profiling, the slope of certain banks will be increased to recreate this type of habitat. Tree trunks, rock piles, etc. will be placed at several locations in the flood zone to create shelter.

The ditches located east and west of the farmland will be excavated and profiled in order to maintain a certain water level and favour better water flow throughout the year, which will also allow fish to more easily pass through.

The soil that is dug up during soil profiling and the excavation of the ditches will be used to create mounds in land areas that are not below the HWM. These mounds will be formed into small islands that can be used by various species of animals (e.g. birds, reptiles, amphibians). Perches, tree trunks, piles of rocks or other objects can be set up on the mounds to create shelter and habitat suitable to birds, reptiles, amphibians and small mammals.

The vegetation already present in the ditches and flood zones will be maintained. Plants (grasses and shrubs) will be planted or sown on crop land, and land will be stripped to create a grass cover as well as a spawning ground for fish. Plants will namely be chosen based on the wildlife species that are currently found (e.g. Yellow Perch), the fight against invasive alien species, and integration into the landscape. Plants must also be indigenous to the region.

6.4.2.3.3 Summary of gains

Although the farmland is almost entirely flooded during the spring freshet, it does not represent a good habitat for fish (little or no support for spawning). The developments will cover a surface area of about 10 ha. The developed habitats will almost entirely consist of slow-water habitats in shallow water, with aquatic vegetation. These habitats will be mainly type 1 and 4.

6.4.2.4 Development projects in Kahnawake

Two development projects in Kahnawake are currently being studied. The first consists in replacing a culvert that does not enable the free passage of fish in all conditions, and the second involves countering erosion on the adjacent shore between the wetland upstream of the culvert and the St. Lawrence downstream.

These projects provide additional compensation to the farmland development project. Studies are currently under way to assess the feasibility of each project.

6.4.3 CLIFF SWALLOW

Although the Cliff Swallow does not have an endangered or at risk status, the group of insectivorous birds which this species is part of has been experiencing a significant decline for several decades. The reasons for this decline in populations have not yet been determined, and several species of Cliff Swallow have been given or are about to receive species at risk status. However, like most of Canada's migratory birds, Cliff Swallows are protected under the *Migratory Birds Convention Act, 1994*.

JCCBI is developing an ecosystem-based management plan for the Cliff Swallow population on the project area infrastructures in order to determine the mitigation and compensation measures to be implemented in the deconstruction plan for the Existing Champlain Bridge and the Nuns' Island bypass bridge. The management plan will take into account the relocation potential of the population found on the Existing Champlain Bridge toward other nearby infrastructures in order to develop mitigation and compensation measures. As part of the above management plan, JCCBI is currently conducting a study that will enable a compensation scenario to be drawn up during 2019.

6.5 CUMULATIVE EFFECTS

Cumulative effects are the effects on the environment that result from the combination of a project's direct or indirect impacts with those of other previous, current, projected, or eventually foreseeable projects.

Assessing cumulative effects requires certain concepts to be considered that differ from "direct" impact assessment notions. For example, cumulative effects are assessed over a larger (regional) territory, for a longer period of time, both past and future, based on interactions with other past, present or future actions, and not only those caused solely by the action addressed by the TEA. In addition to these differences, cumulative effect assessments are fundamentally similar to "direct" environmental impact assessments, and often rely on established environmental impact assessment practices.

The objectives of the cumulative effect analyses are:

- Determine whether the impact caused by the project under study accrues progressively with the impacts of other past, present or future actions;
- Determine whether the project's impact, combined with other impacts, is liable to cause significant current or future changes to valued ecosystem components following the application of project mitigation measures.

The procedure employed is tailored to the one shown in the Cumulative Effects Assessment Practitioners' Guide published by the Canadian Environmental Assessment Agency (Hegmann *et al.*, 1999). The steps are:

1. Determine the regional challenges:
   - Identify valued environmental components (VEC) and their baseline state;
   - Define the spatial and temporal extent;
   - Identify past, present and future projects.
2. Assess the cumulative effects:
   - Identify the interrelationships between the project, other projects and the VECs;
   - Identify mitigation, monitoring and follow-up measures;
   - Evaluate the significance of the cumulative residual impacts.

6.5.1 DETERMINING THE ISSUES

The corridor of the Existing Champlain Bridge has been the subject of numerous studies over the years. The current environment is well documented, as indicated in Chapter 3 on the receiving environment. Public consultations held in 2013 as part of the 2013 EA allowed the public to submit their concerns regarding the construction of the New Champlain Bridge. This led to identifying issues likely to be affected cumulatively by the project (Table 95). The public consultations held by JCCBI in spring 2019 helped determined the concerns that apply to the deconstruction project, which are similar to those in 2013. Each issue has a separate spatial extent. The past temporal limit was set at 2008 while the upper limit is 2030, except for traffic where the limit is set at 2026, the timeframe for the MTQ's most recent transportation plan.

6.5.1.1 Water

Water quality in the St. Lawrence River has been monitored since the 1980s (Groupe conseil Roche, 1982). The St. Lawrence River supplies several municipalities downstream from the project with water, and much effort has been made to improve water quality over the years. Deconstruction activities could affect areas where sediment presents some contamination and therefore cause chemical contaminants to be mobilized in the St. Lawrence. Furthermore, all work in and near the St. Lawrence could temporarily increase suspended solids.

Table 95 - Identifying issues

ISSUE	VEC	INDICATOR	GEOGRAPHIC AND TEMPORAL EXTENTS
Water	Water quality Sediment Navigation	Suspended solids, metals, hydrocarbons, PAHs	St. Lawrence River from the La Prairie basin to the Boucherville Islands
			2008-2030
Quality of life	Traffic	Network congestion	Regional and local road networks (Montréal and Montérégie)
			2008-2026
	Sound environment	Noise level	Local study area
			2008-2030
	Air quality	Particulate matter	Local study area
			2008-2030
Special status species	Habitat: • Migratory birds • Status species • Herpetofauna	Loss of habitat (Brown Snake, Peregrine Falcon)	Species habitat
			2008-2030
Fish	Fish habitat	Encroachment (serious harm to fish habitat)	St. Lawrence River from the La Prairie basin to the Boucherville Islands
			2008-2030

6.5.1.2 Quality of life

Road congestion and its impact on the sound environment and air quality are aspects of concern to residents living nearby and users of the regional road network. A number of regional road structures require repairs since they are reaching the end of their useful life and will result in a greater number of inconveniences. Conversely, new infrastructure is now completed and in operation (highways A-50, A-30, A-25 and soon the New Champlain Bridge). The project could generate nuisances during deconstruction (transport of materials for the jetties and bridge structures to be dismantled).

6.5.1.3 Special status species

The habitat of a few special status species is found in the study area. The Brown Snake and Peregrine Falcon were retained as issues for the assessment of cumulative effects. The Brown Snake, a species likely to be designated as threatened or vulnerable at the provincial level, is the rarest Quebec snake and found only in the Montreal region. The Peregrine Falcon, a species designated as vulnerable in Quebec and of concern under to the Species at Risk Act, can use anthropogenic structures for nesting, including the Existing Champlain Bridge and now the New Bridge.

6.5.1.4 Fish

The St. Lawrence serves as a habitat to numerous species of interest and status species of fish. The existing habitats support several species at different stages of their life cycle (spawning, feeding, growth). The St. Lawrence is also used as a migration corridor by several species. The project will result in temporary losses of fish habitat due to the presence of jetties.

6.5.2 PAST, PRESENT AND FUTURE PROJECTS

Table 96 presents past, present and future projects inventoried near the study area with an interrelationship with the issues under study. Only major projects were identified. Generally speaking, these mainly include highway projects and commercial and residential projects.

6.5.3 ASSESSMENT OF CUMULATIVE EFFECTS

The effects of past, present and future projects were assessed based on the residual effects of the deconstruction of the Existing Champlain Bridge in order to identify the cumulative effects. Table 97 describes the cumulative effects and specific mitigation measures being proposed.

6.5.3.1.1 Water quality

Several projects are likely to temporarily affect water quality and emit contaminants into the aquatic environment. In general, authorizations for these various projects require the same water quality criteria to be observed as those that will be implemented for deconstruction. The affected area is generally a few hundred metres in size and projects overlap very little or not at all over time. Compliance with the criteria by each project limits cumulative effects both in space and over time. Given the above, the cumulative effect is considered significant but negligible.

6.5.3.1.2 Quality of life – Traffic, air quality and sound environment

Several other projects will be simultaneously carried out in the area around the deconstruction project, which could contribute to increasing the cumulative effects in the area. Other projects were conducted in the past with the same kind of impact on quality of life, which tends to prolong the effects, which therefore accumulate over time. Given the above, measures are included in the project to limit these impacts on quality of life as much as possible. Thus, the criteria to be observed for the sound environment take into account the other adjacent work sites in order to comply with adequate noise levels for pursuing activities in sensitive areas. Similarly for air quality, monitoring takes into account the emissions generated in the project area by other emission sources. Regarding traffic, a traffic plan will be drawn up that takes into account the impacts on the road network from the other work sites.

Given the measures that are already part of the project, the cumulative effect is considered significant but negligible.

6.5.3.1.3 Status species

A few projects have impacted or will impact the Brown Snakes that are present namely on Nuns' Island (such as the REM project and the New Champlain Bridge). Measures pertaining to movement (including creating exclosures) and compensation (construction of hibernacula) have been implemented. The deconstruction project is likely to affect the same area. The same measures will be continued or implemented to prevent Brown Snake mortality associated with machinery movement. Monitoring will be done to confirm that the displaced snakes have properly adapted to their new habitat. Moreover, it is likely that the exclosures created for the New Bridge will remain in place until deconstruction, which will prevent the stress on the snakes of having to relocate again. Given the above, the cumulative effect is considered significant but negligible.

With respect to the Peregrine Falcon, the New Bridge project included adding nesting boxes to relocate the nesting sites from the Existing Champlain Bridge to the New Bridge. The boxes on the Existing Champlain Bridge were closed in 2019 before the start of deconstruction work, with the new boxes being opened on the New Bridge at the same time. The Peregrine Falcons therefore found a new habitat identical to the one before the start of deconstruction. The relocation and nesting will be monitored. Given the above, the cumulative effect is considered non-significant and negligible.

6.5.3.1.4 Fish habitat

In addition to the effects on water quality previously discussed, the various projects that have taken place, or will take place in the area are likely to result in temporary and/or permanent losses of fish habitat. The majority of these projects have generated mainly temporary impacts, for which compensation projects has been carried out. Furthermore, in some cases, mitigation measures and compensation projects have been or will be carried out to offset residual losses of fish habitat.

Compensation projects must target known and documented issues related to fish habitat and should preferably be located close to the habitat losses. In some cases, however, it may be possible and even more appropriate to promote compensation projects in sectors and for species other than those impacted by the work. In the case of the Champlain Bridge deconstruction, part of the compensation projects will be carried out within the project study area (dismantling of the piers and footings of the bridge and the Brossard and Estacade wharves), while the remainder will be located in Lake St. Pierre and will mainly target yellow perch.

In summary:

- There have been many development projects in the Montreal area generating cumulative effects on fish and fish habitat in recent years;
- The losses caused by the Champlain Bridge deconstruction project are essentially temporary in nature and the work site (piers, cofferdams, flattened piers) and the habitats temporarily impacted will be restored;
- Several mitigation measures will be implemented to reduce the temporary impacts of the deconstruction project (e.g. installation of fishways in the Nuns' Island jetty);

- A portion of the habitat losses (see section 6.4.2.1) will be compensated in the vicinity of the deconstruction project, through habitat gain projects with permanent beneficial effects on the same communities of fish species as those temporarily impacted by the project (dismantling of piers and footings of the bridge and wharves at Brossard and Estacade). The dismantling of these anthropogenic structures will make it possible to restore environments that are now purely terrestrial;
- Part of the losses (see section 6.4.2.3) will be compensated by a compensation project located outside (Lake Saint-Pierre) of the project's direct impact zone (Montreal region) and for species other than those affected by the project.

Considering all of these elements, residual effects of the deconstruction project will be added to the cumulative effects generated by the numerous development projects carried out in recent years in the Montreal area, mainly due to the fact that part of the loss of fish habitat will be compensated outside the Montreal area and for species other than those likely to be affected by the project. As mentioned previously, however, it is sometimes not possible to carry out relevant and extensive compensation projects in proximity to the losses of fish habitat. Moreover, the complete dismantling of the bridge (including the piers) and the partial dismantling of the wharves at the Estacade and Brossard will generate direct and permanent gains in fish habitat at the project site. Finally, although the deconstruction project will contribute to increasing the cumulative effects on fish and fish habitat already existing in the Montreal area, it is impossible to avoid the deconstruction of the Champlain Bridge and the resulting residual impacts.

6.5.3.1.5 Conclusion

Considering all of these elements, residual effects of the deconstruction project will be added to the cumulative effects generated by the numerous development projects carried out in recent years in the Montreal area, mainly due to the fact that part of the loss of fish habitat will be compensated outside the Montreal area and for species other than those likely to be affected by the project. As mentioned previously, however, it is sometimes not possible to carry out relevant and extensive compensation projects in proximity to the losses of fish habitat. Moreover, the complete dismantling of the bridge (including the piers) and the partial dismantling of the wharves at the Estacade and Brossard will generate direct and permanent gains in fish habitat at the project site. Finally, although the deconstruction project will contribute to increasing the cumulative effects on fish and fish habitat already existing in the Montreal area, it is impossible to avoid the deconstruction of the Champlain Bridge and the resulting residual impacts.

Tableau 96 - Identification of past, present and future projects

PROJET (PROMOTER) – YEAR	PAST	PRESENT	FUTURE	PROJECT IMPACTS ON VALUED ENVIRONMENTAL COMPONENTS			
				WATER QUALITY / SEDIMENT	SPECIAL STATUS SPECIES HABITAT	QUALITY OF LIFE INFRASTRUCTURE / NOISE ENVIRONMENT / AIR QUALITY	ICHTYFAUNA
Atwater Plant Modernization (MTL) – 2008-2013	X			-	-	Increased circulation during construction (local system)	-
Pointe-Saint-Charles (GC) Industrial Park contaminant containment - Ongoing	X	X	X	-	-	Increased circulation during construction (local system)	-
Bonaventure Highway reconfiguration, misc. repairs, and major works, Phases I, II and III (PJCCI) – 2017-2030		X	X	-	-	Highway congestion due to detours and partial closings (regional network)	-
Work on Champlain Bridge ice boom – permanent reinforcement of pier 18, support apparatus, beams on bays 48-49 – (PJCCI) - 2017—2020 and ice boom repairs – 2022-2030	X	X	X	Increased SPMs in surface water	-	-	Increased SPMs capable of affecting fish and their habitat
Outfall work – Saint Lambert locks (CGVMSL) – 2008-2013	X			Surface water contaminant mobilization Increased SPMs in surface water	-	-	Contaminants in surface water capable of affecting fish and their habitat Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
New Port of Montreal wharfs (APM) – 2009-2011	X			Surface water contaminant mobilization Increased SPMs in surface water	-	-	Contaminants in surface water capable of affecting fish and their habitat Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)

Tableau 96 - Identification of past, present and future projects (continued)

PROJET (PROMOTER) – YEAR	PAST	PRESENT	FUTURE	PROJECT IMPACTS ON VALUED ENVIRONMENTAL COMPONENTS			
				WATER QUALITY / SEDIMENT	SPECIAL STATUS SPECIES HABITAT	QUALITY OF LIFE INFRASTRUCTURE / NOISE ENVIRONMENT / AIR QUALITY	ICHTYFAUNA
BCE Campus – Nuns' Island (Private) – 2007-2009	X			Increased SPMs in surface water	-	Increased road traffic caused by arrival of 3,000 employees (local network)	Contaminants in surface water capable of affecting fish and their habitat Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
Griffintown development (Private) – 2012 ±	X			-	-	Increased road traffic caused by construction of over 3,000 housing units (local network)	-
Reconfiguration of highway 132, 20 and 25 junctions in Longueuil (MTQ) – 2008-2013	X			-	-	Road congestion due to detours and partial closings (regional network)	-
Pointe-Nord development – 2012-2016	X			Bank disturbance and increased SPMs in surface water	Disturbance of brown snake habitat along edge of river	Increased road traffic due to construction of over 600 housing units (Nuns' Island local network). Construction work will cause dust and noise.	Increased SPMs capable of affecting fish and their habitat
Mercier and Champlain Bridge repair work (PJCCI) – 2008-2018	X	X		Increased SPMs in surface water	Disturbance of peregrine falcon habitat	Road congestion due to detours and partial closings (regional network) Increased noise level during construction (Nuns' Island)	Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
Turcot Interchange reconstruction (MTQ) – 2017-2022	X	X	X	-	Disturbance of brown snake habitat (Saint-Jacques cliff)	Road congestion due to detours and partial closings (regional network) Increased noise level during construction	-

Tableau 96 - Identification of past, present and future projects (continued)

PROJET (PROMOTER) – YEAR	PAST	PRESENT	FUTURE	PROJECT IMPACTS ON VALUED ENVIRONMENTAL COMPONENTS			
				WATER QUALITY / SEDIMENT	SPECIAL STATUS SPECIES HABITAT	QUALITY OF LIFE INFRASTRUCTURE / NOISE ENVIRONMENT / AIR QUALITY	ICHTYFAUNA
Major Mercier Bridge repairs (MTQ) - 2018-2020 and construction of Mercier Bridge upstream structure (MTQ) – 2023-2027		X	X	Increased SPMs in surface water	-	Road congestion due to detours and partial closings (regional network) Increased noise level during construction	Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
Drawbridges 19 and 5 in Saint Catherine and major repairs to Saint-Lambert locks (CGVMSL) – 2021-2025			X	Increased SPMs in surface water Surface water contaminant mobilization	-	-	Increased SPMs capable of affecting fish and their habitat Contaminants in surface water capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
Construction of temporary Nuns' Island causeway (PJCCI) – 2013-2018	X			Surface water contaminant mobilization Increased SPMs in surface water	Loss of brown snake habitat (Montreal Island and Nuns' Island)	Road congestion due to detours and partial closings (regional network) Increased noise level during construction (Nuns' Island)	Contaminants in surface water capable of affecting fish and their habitat Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
Dismantlement of temporary Nuns' Island causeway (PJCCI) – 2023-2025			X	Increased SPMs in surface water	-	-	Increased SPMs capable of affecting fish and their habitat Habitat gain due to removal of structures in the water Potential loss of fish habitat (temporary or permanent)
Operation of public transport lanes on New Bridge over the Saint Lawrence (AMT) – 2021 ±			X	-	-	Intermodal transfer on the bridge Increased noise during operation, depending on mode of transport.	-

Tableau 96 - Identification of past, present and future projects (continued)

PROJET (PROMOTER) – YEAR	PAST	PRESENT	FUTURE	PROJECT IMPACTS ON VALUED ENVIRONMENTAL COMPONENTS			
				WATER QUALITY / SEDIMENT	SPECIAL STATUS SPECIES HABITAT	QUALITY OF LIFE INFRASTRUCTURE / NOISE ENVIRONMENT / AIR QUALITY	ICHTYFAUNA
Replacement of rip-rap over Louis-Hippolyte-La Fontaine Bridge-Tunnel (MTQ) – 2013-2015 and major repair work (MTQ) – 2020-2024	X		X	Increased SPMs in surface water	-	Road congestion due to detours and partial closings (regional network) Increased noise level during construction -	Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
REM – Panama and Nuns' Island stations and route (REM) – 2017-2021	X	X	X	Increased SPMs in surface water	-	Road congestion due to detours and partial closings (regional network) Increased noise level during construction -	Temporary loss of habitat associated with jetty. Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
Construction of New Champlain Bridge, including widening of A15 and dismantlement of Nuns' Island Bridge (Infrastructure Canada) – 2015-2020	X	X	X	Surface water contaminant mobilization Increased SPMs in surface water	Loss of brown snake habitat (Montreal Island and Nuns' Island)	Road congestion due to detours and partial closings (regional network) Increased noise level during construction (Nuns' Island)	Contaminants in surface water capable of affecting fish and their habitat Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)
Construction raised lanes over Lachine Canal (City of Montreal) – 2017-2020	X	X	X	-	-	Road congestion due to detours and partial closings (regional network) Increased noise level during construction	-
Rehabilitation and steel structure paint and reinforcement on Jacques-Cartier Bridge (barge) (PJCCI) – 2018-2021	X	X	X	Increased SPMs in surface water	-	-	Increased SPMs capable of affecting fish and their habitat
Reconfiguration of René-Lévesque Blvd. in Nuns' Island – future			x	-	-	Road congestion due to detours and partial closings (regional network) Increased noise level during construction	-

Tableau 96 - Identification of past, present and future projects (continued)

PROJET (PROMOTER) – YEAR	PAST	PRESENT	FUTURE	PROJECT IMPACTS ON VALUED ENVIRONMENTAL COMPONENTS			
				WATER QUALITY / SEDIMENT	SPECIAL STATUS SPECIES HABITAT	QUALITY OF LIFE INFRASTRUCTURE / NOISE ENVIRONMENT / AIR QUALITY	ICHTYFAUNA
Verdun urban beach development (opening planned in 2019)	X	X		Increased SPMs in surface water	-	Increased noise level during construction	Contaminants in surface water capable of affecting fish and their habitat Increased SPMs capable of affecting fish and their habitat Potential loss of fish habitat (temporary or permanent)

Table 97 - Assessment of cumulative effects for the deconstruction of the Existing Champlain Bridge

VALUED ENVIRONMENTAL COMPONENT	RESIDUAL EFFECTS OF THE ORIGINAL BRIDGE DECONSTRUCTION PROJECT	EFFECTS OF PAST, PRESENT AND FUTURE PROJECTS	CUMULATIVE EFFECT	ADDITIONAL MITIGATION MEASURES	CUMULATIVE RESIDUAL EFFECT ANALYSIS AND SIGNIFICANCE
Water quality	Deconstruction work could lead to an increase of suspended matters (SM) in the river. Deconstruction work could introduce contaminants in surface water, thereby affecting water quality.	Increased amount of SM in surface water. Introduction of contaminants in surface water.	Increased amount of particulates in the river. Introduction of chemical contaminants in surface water.	A performance objective was set with regard to water quality (25 mg/L at 100 m and 5 mg/L at 300 m) to mitigate the increase in SM in the river from the project. A baseline condition must be determined before work begins to have a comprehensive picture of the situation and adjust work methods, as needed.	All possible measures will be taken to ensure particulate amounts remain under standard levels throughout the deconstruction work. Consequently, in light of the mitigation measures, the cumulative effect on water quality is deemed negligible. That said, water quality will be monitored to confirm the implemented measures' effectiveness.
Quality of life – Traffic, air quality and soundscape	Traffic issues during the project (lane reductions, intermittent partial closures, truck transportation). Changes in sound levels and air quality near the deconstruction site, mobilization zones and roads used for transportation.	Increased traffic. Congestion during deconstruction work. Increase of noise sources. Changes in air quality	Congestion throughout the road network. Sound level increase in some sensitive areas. Higher dust concentrations during simultaneous work phases.	The contractor must develop a traffic management plan to determine which roads to use and the transportation schedule. This is then submitted to PJCCI. This plan must take into account any nearby construction work, including the REM project. An air quality and sound monitoring program will be implemented.	The anticipated cumulative effects on traffic, soundscape and air quality are deemed negligible in light of mitigation measures.
Special-status species - Brown snake	Temporary loss of habitat (L'Île-des-Sœurs).	Loss of habitat (including on L'Île-des-Sœurs).	Brown snake habitat reduced on L'Île-des-Sœurs.	The brown snake's movement patterns will be monitored to confirm that the displaced snakes have properly adapted to their new habitat.	This species is at the northernmost border of its North American range. While its population is broken down into isolated pockets, it's still considered significant. COSEWIC deems this species to be "not at risk" in Canada. The core projects will implement measures to protect this species.

Table 97 - Assessment of cumulative effects for the deconstruction of the Existing Champlain Bridge (CONT.)

VALUED ENVIRONMENTAL COMPONENT	RESIDUAL EFFECTS OF THE ORIGINAL BRIDGE DECONSTRUCTION PROJECT	EFFECTS OF PAST, PRESENT AND FUTURE PROJECTS	CUMULATIVE EFFECT	ADDITIONAL MITIGATION MEASURES	CUMULATIVE RESIDUAL EFFECT ANALYSIS AND SIGNIFICANCE
					Consequently, in light of the mitigation measure, the cumulative effect is deemed negligible.
Special-status species - Peregrine falcon	Destruction of a potential nesting site on the existing bridge. Disruption of nesting on the existing bridge during deconstruction work.	Disruption of the species' nesting.	Disruption of nesting during consecutive work (original and new bridges).	The measures listed in chart 52 are deemed sufficient.	While the various projects could disrupt the peregrine falcon's nesting, this species is known to revisit nesting sites annually, even if they are disrupted. SSL and PJCCI will coordinate to open and close nesting sites. Consequently, in light of the mitigation measures, the cumulative effect is deemed negligible.
Fish habitat	Deconstruction work could lead to an increase of suspended matters (SM) in the river. Deconstruction work could introduce contaminants in surface water, which may affect fish and their habitats. The project will lead to the temporary loss of habitats due to the addition of jetties, which will be compensated through the implementation of a 6.5 ha project.	Increased amount of SM in surface water. Introduction of contaminants in surface water. Temporary and permanent loss of habitats due to the addition of temporary (jetties) or permanent (new bridge pylons) structures from other projects.	Increased amount of particulates in the river. Introduction of chemical contaminants in surface water. Temporary and permanent loss of habitats, either simultaneously or consecutively.	The measures identified are judged sufficient.	All possible measures will be taken to ensure particulate amounts remain under standard levels throughout the deconstruction work and any temporary loss of fish habitats shall be compensated. Consequently, in light of the mitigation measures, the cumulative effect on the fish habitat segment is deemed negligible. That said, water quality will be monitored to confirm the implemented measures' effectiveness. Moreover, compensatory developments shall also be monitored over five years.

7 ENVIRONMENTAL MANAGEMENT PLAN

7.1 GENERAL

The environmental management plan describes the minimum requirements that the contractor in charge of deconstruction must take into account to minimize the impacts its activities could have on the environment. In the Request for Proposals, JCCBI will require the contractor to develop an Environmental Management System (EMS) based on ISO 14001:2015. JCCBI will put in place a verification and auditing system to ensure that the EMS meets the established objectives.

The successful contractor will have to prepare action plans as part of its EMS involving the following, among other aspects: overseeing and monitoring the reclamation of construction debris; management of and methods for monitoring the passage of fish in the fishways installed in the jetties; management of soil, water, waste and other contaminated materials, including traceability; management of waste and hazardous residual materials, including traceability; management of vegetation, special status plants and IAS; wildlife management; wetlands management; noise and vibration management; air quality and dust management; GHG emissions accounting; all other aspects related to the environmental risk presented by methods and equipment.

The main lines of the EMS were presented in the 2013 EA and will not be reiterated here, except for the environmental monitoring and follow-up programs specific to the deconstruction of the Existing Champlain Bridge.

7.2 ENVIRONMENTAL MONITORING

Environmental monitoring is a set of measures aimed at overseeing the implementation of the mitigation measures identified in Chapter 6. These mitigation measures will be turned into contract clauses in the Request for Proposals, and an audit program will be put in place by JCCBI to ensure that the successful contractor applies the clauses. Some of the mitigation measures were drawn up based on performance criteria. In such a case, the contractor will be responsible for implementing the appropriate measures to comply with them, and the contract will provide penalties in the event of non-compliance. Specific audits will thus be required for such elements. Table 98 presents an overview of the requirements for monitoring the performance criteria identified in the impact assessment. The main elements to be monitored are presented in the following section and may be revised once the deconstruction methods are confirmed.

7.2.1 SOUND ENVIRONMENT AND VIBRATIONS MONITORING

The main sensitive areas that may be impacted by noise generated by the work site are indicated in Figure 64 and Figure 65.

The noise management program must comply at all times with the recommendations in Section 9 of Chapter 9, *Protection de l'environnement durant les travaux*, Tome II, of the MTQ's *Ouvrages routiers*.

Due to the lack of specific guidance related to the monitoring of vibration during construction, a set of guidelines were used as reference documents. These include the City of Toronto By-Law 514-2008 (for vibration limits) and the ISEE Field Practice Guidelines for Blasting Seismographs (International Society of Explosives Engineers, 2015.) and DIN 4150-3 (German Institute for Standardization, 1999.) for specific monitoring methodologies.

7.2.1.1 Management and monitoring plan for vibrations and noise caused by deconstruction

To protect the noise-sensitive areas around the mobilization areas on both shores of the St. Lawrence, the contractor will have to implement a management and monitoring plan for noise and vibrations caused by deconstruction.

This plan must be continuously updated during the project and revised whenever changes occur that may affect its effectiveness. Guidelines for developing and revising the plan are presented below:

- Prepare before the start of deconstruction;
- Revise during deconstruction if traffic, types of equipment or quantity of equipment change;
- Revise during deconstruction if adjustments to deconstruction methods occur;
- Revise during deconstruction if there are complaints from residents in sensitive areas.

The plan must indicate the following elements:

- Site-specific deconstruction methods and equipment;
- Schedule of activities and equipment on site;
- Traffic routes and traffic count during peak traffic times;
- Anticipated noise levels from mobilization areas for specific noise-sensitive areas;
- Proposed mitigation measures for reducing impacts;
- Receipt and handling of complaints, and investigative process.

7.2.1.2 Noise and vibration monitoring activities in the community

7.2.1.2.1 Monitoring of ambient noise conditions

Before the start of any deconstruction activity on site and after the New Bridge has been commissioned, ambient noise levels and vibration will have to be measured in all noise-sensitive areas.

7.2.1.2.2 Monitoring during deconstruction

A the beginning of each major project phase, noise levels will have to be monitored in each noise-sensitive area, and noise levels will be measured during deconstruction or when activities in a given area have changed:

- Jetty construction;
- Bridge deconstruction;
- Jetty deconstruction.

Monitoring will only be done when site conditions are representative of normal operating conditions at each stage. Follow-up monitoring is also recommended at least each month or when changes to site or traffic significantly affect the exposure of noise-sensitive areas to noise. Daily monitoring is applied during noisier work. Records of measures will be kept.

Table 98 - Recommended approach for performance criteria monitoring

COMPONENT	INDICATOR	THRESHOLD VALUE	AT-RISK SECTOR	METHODOLOGY	FREQUENCY	HANDLING INSTANCES OF NON-COMPLIANCE
Air	$PM_{2.5}$	30 ug/m³ 24-hr Averaging Period	Residential Areas 300 m from work areas	BAM 1020 unit: EPA Class III $PM_{2.5}$, PM_{10}, and $PM_{10-2.5}$ Federal Equivalent Method	Continuously during deconstruction work	Additional mitigation measures and reduction at source. Examples: Properly maintain diesel equipment; cover piles of materials; use of dust control products; restriction during high wind.
	PM_{10}	50 ug/m³ 24-hr Averaging Period	Residential Areas 300 m from work areas	BAM 1020 unit: EPA Class III $PM_{2.5}$, PM_{10}, and $PM_{10-2.5}$ Federal Equivalent Method	Continuously during deconstruction work	Additional mitigation measures and reduction at source. Examples: Cover piles of materials; use of dust control products; restriction during high wind.
		88 ug/m³ 1-hr Averaging Period	Work Site Boundary	TSI DustTrak™ DRX Aerosol Monitor 8533 hand-held unit	Continuously during deconstruction work hours	
	PM_{Tot}	120 ug/m³ 24-hr Averaging Period	Residential Areas 300 m from work areas	USEPA 40 CFR Appendix B_to_part_50	Continuously at Brossard site during deconstruction work, including the removal of the steel structure	
	Silica	5 ug/m³ 24-hr Averaging Period	Residential Areas 300 m from work areas	NIOSH 7500 (Modified)	Every 6 days during deconstruction activities	
	Lead	0.5 ug/m³ 24-hr Averaging Period	Residential Areas 300 m from work areas	USEPA 40 CFR Appendix B_to_part_50	Every 24 hours during removal of the steel structure	Additional mitigation measures and reduction at source. Examples: Remove loose paint prior to deconstruction, cover piles of materials; restriction during high

Table 98 - Recommended approach for performance criteria monitoring

COMPONENT	INDICATOR	THRESHOLD VALUE	AT-RISK SECTOR	METHODOLOGY	FREQUENCY	HANDLING INSTANCES OF NON-COMPLIANCE
						wind.
Water quality	SS	25 mg/l at 100 m and 5 mg/l at 300 m beyond the upstream value	St. Lawrence River (La Prairie Basins) upstream and downstream from the site	Continuous turbidity sampling station and correlation between SMs and turbidity	Ongoing, minimally during the mobilization and demobilization of the jetties	Additional mitigation measures and reduction at the source Example: Turbidity curtain
Soundscape	L_{10}	MTQ Volume II, Chart 9.9-1 Day: 75 dBA or ambient noise without construction work plus 5 dB Evening: Ambient noise without construction work plus 5 dB Night: Ambient noise without construction work plus: 5 dB (if ambient noise < 70); or 3 dB (if ambient noise ≥ 70)	Sensitive areas	Method: MTQ Volume II, Chapter 9.9	Daily for work assessed at over 70 dBA near areas	Additional mitigation measures and reduction at the source Examples: Mufflers or acoustic chambers; Electric air compressors; Soundproof hydraulic hammers; Noise-proof concrete saw blade; Temporary sound barriers (portable or fixed).
Vibration	PPV	<4Hz: 8 mm/s 4 to 10 Hz: 15 mm/s >10 Hz: 25 mm/s	Buildings in the area of influence	Method: ISEE Field Practice Guidelines for Blasting Seismographs (DIN 4150-3)	Daily for the buildings in the area of influence	Modification of the working methods

7.2.1.2.3 Noise emissions caused by deconstruction equipment

Equipment will require all the manufacturer's noise-reduction accessories, which must remain in good condition at all times.

The maximum recommended noise levels by type of equipment are specified in Table 9.9-2, Chapter 9, "*Protection de l'environnement durant les travaux*," in Volume II of the MTQ's *Ouvrages routiers*.

7.2.1.3 Measured metrics

All noise monitoring must comply with the criteria in Section 9 of the MTQ's *Protection de l'environnement durant les travaux*, Volume II, Chapter 9.

Noise monitoring in the community must include at least measurements taken for 30 minutes (LAeq, LAF_{10}, LAF_{max}):

All vibration monitoring results must be conducted in accordance to ISEE Field Practice Guidelines for Blasting Seismographs and DIN 4150-3.

All vibration monitoring results must present at a minimum the following information:

- Peak particle velocity on a tri-axial system, with the Longitudinal axis pointing towards the general area of the Work;
- Provide a peak particle velocity measurement in intervals of 5-seconds;
- Provide waveform recording, with a duration of at least 10-secons, for any event with a peak particle velocity higher than 5 mm/s.

7.2.1.4 Complaints

A process for receiving and handling vibration or noise-related complaints will be set up in order to a establish a link between the time the complaint was submitted and the activities taking place at the site. If needed, additional monitoring of the location involved by the complaint will be applied quickly in order to measure the noise and vibration levels from the site.

7.2.1.5 Non-compliances

Whenever an exceedance of the limits identified in:

- For noise: the MTQ's Protection de l'environnement durant les travaux, Tome II, Chapitre 9.9 is reported, this will be deemed as a non-conformity.
- For vibration: the City of Toronto By-Law 514-2008.

Due to the different objectives of the monitoring presented in Section 7.2.1.2 (except for baseline monitoring), there will have to be different thresholds for action, which are described in Table 99.

Table 99 - Systemic approach for non-Conformities

NON-CONFORMITY	TRIGGER	ACTION
Community Monitoring Limits	During Noise Monitoring	Proceed to immediately continue (expand) noise monitoring to confirm exceedance of limits. Take immediate temporary measures to reduce noise levels until permanent mitigation measures are in place. Identify sources and verify why exceedance was not identified at design stage. Perform equipment emissions testing to confirm sources that caused an exceedance. Identify permanent mitigation measures to be implemented. Continue monitoring until exceedance is resolved.
	During vibration monitoring	Stop working immediately. Identify sources and verify why exceedance was not identified at design stage. Identify permanent mitigation measures to be implemented. Continue monitoring until exceedance is resolved.
	Complaint	Take immediate temporary measures to reduce noise and vibration levels (i.e., eliminate or reduce noise and vibration sources) until permanent mitigation measures are in place. Identify sources and verify why exceedance was not identified at design stage. Perform equipment emissions testing to confirm sources that caused an exceedance. Identify permanent mitigation measures to be implemented. Continue monitoring until exceedance is resolved.
Equipment Emissions Limits	During Noise Monitoring	Immediately verify by measurements if limits are exceeded at the closest noise sensitive receptor. If level is exceeded at noise sensitive receptor, remove equipment from operations until it is replaced with compliant equipment or mitigation measures are in place.
	Complaint	Immediately verify by measurements if limits are exceeded at the closest noise sensitive receptor. Take immediate administrative action to reduce noise levels (i.e., eliminate noise sources) until permanent mitigation measures are in place.

7.2.2 WATER QUALITY MONITORING

The contractor will carry out surface water quality monitoring during the deconstruction phase under JCCBI's supervision. The purpose of this program will be to monitor erosion and suspended solids based on turbidity, pH and suspended solids measurement. Metals, oil and grease can also be analyzed to determine whether the work is increasing contaminant mobilization in surface water. The contractor's management plan will help define all the parameters to be analyzed based on the contractor's work method, how monitoring will be done, how water will be treated to comply with criteria and discharge points into the environment. This program will also determine the effectiveness of the applied mitigation measures and adjust them if necessary, in the event of any exceedances.

The monitoring protocol will be based on *Recommendations for the Management of Suspended Solids (SS) During Dredging Activities* (MDDELCC and ECCC, 2016). The performance objective of 25 mg/L of suspended solids at 100 m and 5 mg/L at 300 m will be monitored and measured via a system of sampling stations, upstream and downstream from the work sites, in order to separate background noise (natural levels in the St. Lawrence) from the contribution of the work site effects. The protocol will be drafted at a later date and will be submitted to DFO in advance.

During construction, water quality will be measured by an *in situ* method using turbidity as an indicator of suspended solid concentrations. The relationship between turbidity and suspended solids will be determined on the basis of several measurements in order to define the relationship curve of both parameters in the work areas (Lesser and Greater La Prairie basins). Laboratory measurements will ensure quality control and quality assurance.

The monitoring plan will have to demonstrate compliance with the performance objective at 100 m at all times. As specified in the MELCC and ECCC recommendations, the management criterion applicable 300 m from the work area, which corresponds to an increase of 5 mg/L over ambient concentrations, can be difficult to check accurately on site, given its small value with respect to the measuring device margin of error. These government departments therefore recommend using the criterion to determine the effect of suspended solid dispersion downstream from the work site rather than as an alert threshold. In this case, only the management criterion applied 100 m from the work area constitutes an alert threshold.

Turbidity will be monitored continuously in areas where work is in progress and in open water. Should the limit of 25 mg/L 100 m from the work site be exceeded, an alert system will be triggered that will enable the contractor to quickly apply the appropriate corrective measures. A sample will be taken at the same time and sent to the laboratory to confirm the suspended solid concentration. The corrective actions that are applied will be tracked to ensure they are working properly in the short, medium and long term.

The number of network stations, the distance between stations, their exact location, and reading frequency will be determined based on the work methods chosen by the contractor and St. Lawrence hydraulic conditions near the work site (higher flow velocity in the Greater La Prairie Basin than the Lesser Basin). The final monitoring protocol will be prepared at the final plans and specifications stage and submitted to JCCBI for review.

7.2.3 AIR QUALITY MONITORING

To protect the residential areas likely to be affected by the impacts on air quality, an ambient air monitoring program (AAMP) will be implemented to measure concentrations at both the work site perimeter and in the communities. The measurements at the work site perimeter will tell the contractor whether measures must be taken to control dust during deconstruction activities. The measurements at the community stations will help document the impacts on air quality when the latter does not meet regulatory requirements.

The following elements describe what the AAMP consists of.

7.2.3.1 Proposed conceptual Ambient air management and monitoring program (AAMMP)

The key objectives of the AAMMP are as follows:

- Monitor air quality to ensure that activities are not adversely affecting the area's environment;
- Use monitoring data to ensure the contractor is following best management practices with respect to dust emission control.

Two types of monitoring will be carried out under the AAMMP:

- Fixed station:
    - Monitoring conducted at sites near communities using reference and equivalence sampling methods;
    - The fixed station is located near the community that has been identified as sensitive to air quality effects from deconstruction;
    - Measurements taken at the fixed station serve to collect data on the community's air quality.
- Mobile station:
    - Real-time source monitoring;
    - Specific to particulates (PM_{10}) and done using portable instruments that measure particulate concentrations and will be placed around the perimeter of the work areas (e.g. mobilization area, jetty, access road, deconstruction activities) at a variable position depending on the prevailing winds of the day;
    - Measurements taken with these portable devices (e. g. DustTRAK) will be compared with action thresholds on an hourly basis to assess the quality of the air from the work areas. If an action threshold is exceeded, mitigation measures will be implemented to minimize on-site emissions. The particulate levels of the emitting source will then have to be controlled, and measurements must be put in place quickly enough to prevent limits from being exceeded at the location of the fixed sampling stations.

The proposed locations for the fixed and mobile stations are shown in Figure 74.

Figure 74 - Location of proposed fixed-station and mobile stations for the AAMMP.

7.2.3.2 AAMMP regulatory framework

The regulatory framework for ambient air quality monitoring is based on the following documents:

- Clean Air Regulation (provincial);
- By-law 90 of the Communauté métropolitaine de Montréal (CMM) and associated amendments;
- Ambient air quality criteria from the Ontario Ministry of Environment, Nature Conservation and Parks when the criteria or measurement periods for certain parameters that are not covered by provincial or municipal regulations, for example, silica for the 24-hour period.

Note that the Clean Air Regulation is equivalent to or more restrictive than the CMM's By-law 90. The most restrictive criteria were applied.

7.2.3.3 Fixed station Equivalency and reference method sampling (in community)

The fixed station in Brossard at the boundary of the community located northeast of the Champlain Bridge exit will be used. The station was used until March 31, 2019 to monitor air quality for the construction of the New Bridge and was equipped with an operational weather station. Two other fixed stations will be installed: one on Nuns' Island, south of the on-shore access road, and the other in Brossard, south of the on-shore access road and mobilization area. In addition, fixed stations (BAM-1020 units, i.e. a beta attenuation device for recording dust) could also be installed at the following locations:

- Brossard – community west of the on-shore access road;
- Brossard – community southeast of the second Brossard mobilization area.

The fixed stations measure particulate matter, lead and silica.

Table 100 presents a summary of the potential parameters for the community-based sampling locations.

Table 100 - Potential parameters for community-based sampling stations (fixed stations)

	NUN'S ISLAND AIR MONITORING LOCATION	BROSSARD NORTH AIR MONITORING LOCATION	BROSSARD SOUTH AIR MONITORING LOCATION	BROSSARD SOUTHEAST AIR MONITORING LOCATION	BROSSARD WEST AIR MONITORING LOCATION
Status	Required	Required	Required	Tentative(1)	Tentative(1)
Total airborne particulates and lead		♦			
TSP		♦			
PM_{10}	♦	♦	♦	♦	♦
$PM_{2.5}$	♦	♦			
Silica		♦			

Note: (1) The recommended locations may change if it is found that there will be fewer activities generating emissions in the mobilization areas than what is projected.

7.2.3.4 Mobile station – Perimeter Real-time monitoring

Air quality monitoring (PM_{10}) in real time at the perimeter of the work areas will help quickly determine the atmospheric emissions of the project activities and set up the required mitigation measures. The perimeter of each source will be defined prior to taking measurements in the field. Air quality will be measured daily at locations upwind and downwind of the source as well as near the shore. Real-time data will be compared to site-specific, short-term action levels that have been developed, and this information will be used to assist work site managers in making decisions to mitigate emissions from the work site during activities.

The parameter chosen for real-time monitoring is PM_{10}. This parameter was chosen for the following reasons:

- Mobile dust measurement technologies are limited in the upper range of the particle size they can measure precisely. TSP measurements using these methods tend to be underestimated;
- $PM_{2.5}$ measurements tend to be influenced by regional trends more than local work;
- The PM_{10} size fraction is where health effects start to become more pronounced;
- The PM_{10} size fraction includes enough of the typical construction dust particle size distribution for it to be used as an indicator for dust in general in these types of projects; and
- There are many established ratios of $PM_{2.5}$ to PM_{10} that would enable $PM_{2.5}$ values to be extrapolated if needed.

For deconstruction activities, work site monitoring will be located along the mobilization areas on Nuns' Island and in Brossard, as well as near the jetties and the Seaway dike. On certain days, monitoring could take place along the Brossard shore east of the Seaway dike and jetty areas. The perimeters were defined based on the location of the deconstruction activities, the site characteristics, the community locations, the topography, and meteorological conditions.

Table 101 presents a summary of measures to be taken when intervention thresholds are exceeded at the deconstruction site.

Real-time information on daily exceedances will be provided directly by the contractor to JCCBI (verbal reports followed by written reports for exceedances), and mitigation measures will be implemented by the contractor.

Table 101 - Summary of intervention thresholds for parameters measured in real time and measures to be taken

PARAMETER	INTERVENTION THRESHOLD	MONITORING LOCATION	PERIOD	ACTION REQUIRED AT THE EMISSION SITE, IF THRESHOLD IS EXCEEDED
PM_{10}	66 ug/m³	Downwind near the area where deconstruction is being carried out	1 h	Site continues to operate. The contractor notifies JCCBI of the situation. The contractor determines the cause of sources of potential air emissions. Visible dust plumes at the site are an early indicator and immediate corrective measures must be taken. Measures such as adding water spraying equipment to control airborne dust or changing activity locations may be taken. The contractor must take appropriate measures to correct operations to reduce dust levels at the site.
	88 ug/m³	Downwind near the area where remedial activities are being carried out	Immediate	The contractor must stop work and implement additional mitigation measures until the situation is corrected. A non-compliance is noted if the threshold is exceeded when the work is restarted and the contractor must stop the work again (work can be stopped every hour in addition to a monitoring period until the exceedance situation is corrected) and again implement additional mitigation measures. Note: The stop work order only applies to the portion of the project where real-time monitoring is being done at the site perimeter and not to the entire project (i.e. a materials handling area may be shut down near the community of Brossard; however, all bridge deconstruction work will continue if these activities do not cause any exceedances).
Opacity	40%	At the site, observed from site perimeter	3 minutes (measurement every 15 s); only to be done when real-time monitoring personnel notices that dust levels could potentially impact the areas outside the site perimeter.	The contractor has one hour to correct (implement mitigation measures) the situation that caused the exceedance. After this time, if the monitoring results (based on an additional 3 minutes of monitoring) collected immediately after the implemented mitigation measures still exceed the opacity action level, the contractor will must stop the work and implement additional mitigation measures until the situation is corrected. A non-compliance is noted if the threshold is exceeded when the work is restarted and the contractor must stop the work again (work can be stopped every hour in addition to a monitoring period until the exceedance situation is corrected) and again implement additional mitigation measures. Note that these measures are only to be carried out if there are significant amounts of noticeable dust at the site.
	20%	Site perimeter, observed at site perimeter	3 minutes (measurement every 15 s); only to be done	The contractor has one hour to correct (implement mitigation measures) the situation that caused the exceedance. After this time, if the monitoring results (based on an additional 3 minutes of

			when real-time monitoring personnel notices that dust levels could potentially impact the areas outside the site perimeter.	monitoring) collected immediately after the implemented mitigation measures still exceed the opacity action level, the contractor will must stop the work and implement additional mitigation measures until the situation is corrected. A non-compliance is noted if the threshold is exceeded when the work is restarted and the contractor must stop the work again (work can be stopped every hour in addition to a monitoring period until the exceedance situation is corrected) and again implement additional mitigation measures. Note that these measures are only to be carried out if there are significant amounts of noticeable dust at the site.

Note: Action levels are based on the Ontario criterion of 50 µg/m³ over 24 hours, which is the same as the one used by other regions and organizations (such as Newfoundland and Labrador, British Columbia and the World Health Organization). The intervention threshold value is calculated based on a 10-hour work day and considers an estimated background concentration of 23 µg/m³ for the times (14 hours) when no work is being done. It must be observed for each hour in the work day. The baseline state is based on an annual average value of 23 µg/m³ for 4240 Rue Charleroi, Montreal, from April to December 2013. The action is prorated using the 24-hour criterion for work hours.

Monitoring at the fixed stations will be continuous to ensure there are no exceedances. If an air quality parameter is getting close to one of the limits, the cause of the problem will have to be quickly determined and corrected to stop or prevent any exceedances. If exceedances occur, deconstruction methods will be reviewed along with any other emission source in the area unrelated to the site. If exceedances are project-related, the contractor will have to implement corrective measures.

7.2.4 MONITORING OF EXCESS SOIL

With regard to monitoring the disposal of excess soil, it is proposed that all soil scheduled for offsite disposal be placed in piles. The soil piles must be placed over and covered with waterproof tarps and be no more than 3 m high, after which they will be sampled and disposed of in MELCC-authorized sites authorized based on the results obtained. Excess soil management will be monitored continuously during truck loading, transport manifest preparation and weigh ticket recovery. A traceability system will also be required for contaminated soil disposed of offsite, and must at least include regulatory requirements, a quantity and trip log, carrier identification, and use of transport manifests and dump tickets.

7.2.5 GROUNDWATER MONITORING

Groundwater will have to be monitored throughout the project. A network of observation wells has to be installed in work areas to cover the upstream and downstream parts of the work areas. Groundwater samples must be collected at least twice each year, in the spring and fall, to check for hydrocarbons. The following parameters must be analyzed, as a minimum requirement:

- C_{10}-C_{50} petroleum hydrocarbons;
- Polycyclic aromatic hydrocarbons;
- Monocyclic aromatic hydrocarbons;
- Metals.

Water will have to be extracted from the wells using existing best practices. The results will be compared with existing regulations and included in an annual monitoring report. If any criteria are exceeded, additional mitigation measures will have to be proposed, approved by JCCBI, and put in place to rectify the situation. A water management plan must be drawn up by the contractor, according to the contaminants likely to be found.

7.2.6 BROWN SNAKE MONITORING

The locations of the exclusion barriers at Nuns' Island and the Seaway dike for construction of the New Champlain Bridge will be reviewed and adjusted as needed to ensure adequate protection for the Brown Snake during deconstruction of the Existing Champlain Bridge. At the appropriate time before work is started, a capture campaign via shingle stations will be carried out within the exclosures to extract all the Brown Snake individuals found there. They will be relocated to similar habitats around the capture sites, but outside the exclosures. The barriers in question will be inspected regularly to make sure they retain their tightness. A few shingle stations will be kept and monitored to determine the effectiveness of the exclusion measures.

7.3 ENVIRONMENTAL MONITORING PROGRAMS

Environmental monitoring is a process for tracking changes in certain components affected by the project and for determining the accuracy of the forecasts and environmental issues that have been identified. It is used to verify the effectiveness of the mitigation measures in the TEA over the short, medium and long terms, and for which there may still be some uncertainty.

The elements to be monitored include:

- Fish habitat and wetland compensation;
- Free passage of fish in the Nuns' Island jetty;
- Brown Snake movement and creation of hibernacula;
- Peregrine Falcon nesting;
- Cliff Swallow nesting;
- Plant regrowth;
- State of the habitat around the temporary structures;
- Restoration of riverbed and shores following the deconstruction and dismantlement of the temporary structures.

The monitoring protocols will be defined at a later time and submitted to the authorities involved in due course.

7.3.1 MONITORING OF FISH HABITAT AND WETLAND COMPENSATION

Fish habitat and wetland compensation projects are generally monitored over a five-year period. The precise methods of compensation monitoring will be specified in the compensation program. The monitoring elements and the latter's duration and extent depend on the type of project, chances of success, risk associated with the stability of the developments, and the scope of the improvement project(s). All of this information will be specified once the compensation program is finalized with DFO. The program will be included in the authorizations to be issued by DFO under the Fisheries Act.

The aim of the monitoring program is to determine whether the compensation plan objectives are being met (e.g. spawning ground development, survival of wetlands). The program consists in checking the physical integrity of the development and determining its use by fish. On-site measurements and visual inspections will be required for the monitoring. The as-built plans will be the baseline state for the developments. Any sign of degradation will be documented in writing and precisely situated. Photos and video will also be used to document the state of the developments over time.

To ensure that the improvements are being used by fish, visual observations, roe capture, or experimental fishing could be carried out depending on the type of development that was built. Non-lethal fishing methods will be favoured to prevent harm to the fish population using the new developments. The physical and chemical characteristics of the water at the development site (e.g. pH, dissolved oxygen, water conductivity and temperature) will also be measured to ensure that water quality meets the requirements of the species in question.

If the project involves fish regaining access to a habitat, the free passage of fish will be monitored in the developed channel, culvert or structure to ensure its effectiveness.

Annual monitoring data will be compared to the baseline state and between monitoring years. A monitoring report containing recommendations and corrective measures, if any, will be produced after each monitoring phase. If the developments fail to achieve the objectives set by DFO, corrective actions will be identified and implemented by JCCBI as needed.

7.3.2 MONITORING THE FREE PASSAGE OF FISH IN THE NUNS' ISLAND JETTY

As mentioned in Section 3.2.2.1 of Volume 1, the Nuns' Island channel and the west shore of the Greater La Prairie Basin are major migration routes for species of fish that are highly valued by commercial, sport and aboriginal fisheries, including Lake Sturgeon and Walleye. The issues associated with the passage of fish are very significant. The jetty design in this area should enable optimal conditions for the maintenance of fish migration routes. Like the jetty built by SSL at Nuns' Island, fishways will be built in the deconstruction jetty in this area in order to maintain fish migration routes. The design requirements for these migration routes are described in mitigation measure CC-6b (Table 82). Once the jetty and fishways are in place, the conditions for the passage of fish (monitoring of biological and hydraulic conditions) will be characterized in each migration route.

The purpose of biological monitoring is to at least determine the number of fish that use each fishway, and ideally the species of fish and their range of size. Monitoring must be done annually during fish migration in this section of the St. Lawrence. To cover the upstream migration period of a maximum number of fish species, the monitoring must be done from March 15 (or as soon as ice and flow conditions allow systems to be installed for detecting fish movement and fishway efficiency, but at the latest on April 1) until August 1. The biological monitoring method (e.g. cameras, side-scan sonar) must be compatible with site conditions (turbidity) and included in the protocol.

Hydraulic condition monitoring must enable the validation of fishway design criteria (Section 6.3.1.4.1) and the results of the hydraulic modelling required by DFO (Section 6.3.1.4.2) in terms of depth and velocity for all the flows being modelled in each fishway and at different locations in them. The monitoring protocol must describe the method that will be followed.

The requirements in the protocols for monitoring the hydraulic and biological conditions of the passage of fish in the fishways will be defined jointly with DFO during the authorization phase.

7.3.3 MONITORING OF BROWN SNAKE MOVEMENTS AND THE CREATION OF HIBERNACULA

The Brown Snakes that were relocated during work site supervision will be monitored biannually for four years to confirm their adaptation to their new habitat. More specifically, the level of use of the sites in question by the Brown Snake will be specified in detail through active searches and shingle stations.

One specific mitigation measure consists in creating hibernation sites (hibernacula) during redevelopment work (P-52, Table 90). A hibernaculum could be located on the Seaway dike and be part of asset enhancement work. The development, if required, will be carried out by JCCBI as part of the Héritage Champlain project. The effectiveness of these developments could be monitored by JCCBI using the method described for monitoring Brown Snake movements or, if possible, via the MFFP program (Tessier and Veilleux, 2019) on the acquisition of knowledge for the creation of hibernacula.

7.3.4 MONITORING PEREGRINE FALCON NESTING

For a number of years, Peregrine Falcons have been occasionally nesting on the Existing Champlain Bridge. Since 2002, the pair was incited to nest in one of the three nesting boxes attached to the infrastructure – a measure that allows better management of the nesting site based on maintenance work and the future deconstruction of the bridge.

The nesting boxes on the New Bridge were opened in 2019. Each year during deconstruction, the location of the nesting boxes will be determined based on the work schedule, and JCCBI and SSL will come to a joint agreement so that the boxes are placed at sites beneficial to the Peregrine Falcon. The aim is to avoid potentially disruptive work being done near an occupied nest. However, if work has to be performed within 200 m of an active nest, visual screens will be installed to minimize disruption to the birds and protect workers from possible attacks. The species will be subject to behavioural monitoring throughout the work phase (2020-2023). After the work site is closed, monitoring will continue for three years (2023 to 2025) to check the local return of nesting bird species and measure their reproductive success (SEF, 2014a).

7.3.5 MONITORING OF CLIFF SWALLOW NESTING

JCCBI will conduct monitoring associated with the ecosystem management plan focusing on the Cliff Swallow population on project area infrastructure to assess the effectiveness of the mitigation and compensatory measures put in place. Additional actions could be taken to improve conditions favourable to the Cliff Swallow population. Application of the compensation plan will be monitored over at least five years.

7.3.6 MONITORING PLANT REGROWTH

The planting done upon completion of the project, in particular in the mobilization areas and shores next to the deconstructed bridge, will be monitored to ensure plant recovery. The monitoring will be done in the spring after the planting and 24 months afterwards. Plant survival rates will be assessed following a visual inspection. New plants will have to be planted if the survival rate is less than 90%.

7.3.7 MONITORING THE STATE OF HABITATS AROUND THE TEMPORARY STRUCTURES

Despite the hydraulic modelling, it is difficult to accurately predict the changes in velocity and flow rates in the sections of the St. Lawrence upstream and downstream of the proposed jetties. A monitoring program for the areas upstream and downstream of the created jetties, in particular SSL's development upstream of the Nuns' Island jetty, will help determine whether significant changes to these habitats are caused by the creation of jetties (flow, sedimentation, erosion, bathymetry). TEA data could be used as the baseline state.

The monitoring will have to be done for all the created jetties for the year following jetty construction, for the year preceding their removal, and the year following their removal. The restoration program will have to include work aimed at correcting the impacts associated with the presence of the jetties, if applicable.

7.3.8 MONITORING THE RESTORATION OF THE RIVERBED AND SHORES FOLLOWING THE DECONSTRUCTION AND DISMANTLEMENT OF THE TEMPORARY STRUCTURES.

The riverbed and shores of the St. Lawrence will have to be restored following the deconstruction and dismantlement of the temporary structures. The riverbed will have to be restored to the state it was in before the temporary structures were built. The shores will be restored based on the established plans. This monitoring will be done as riverbed restoration work is completed. For instance, after a footing is demolished, substrate will be put in place to be consistent with the St. Lawrence riverbed. Monitoring will be done while machinery is still nearby to make any corrections in the event the restoration is not optimal. Monitoring of shore restoration may be in line with the monitoring of plant regrowth on the shores, which will extend over a period of 5 years following restoration (years 1, 3 and 5).

8 SUMMARY OF IMPACTS AND MITIGATION MEASURES

This section presents a summary of the project impacts on the valued environment components. For each impact, the sensitive areas are identified, and a description is provided of the impacts and main mitigation measures.

8.1 SOIL, SEDIMENT AND GROUNDWATER

8.1.1 SENSITIVE AREAS

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

- Mobilization areas on Nuns' Island;
- Mobilization area near the Seaway Dike;
- Mobilization areas on the South Shore, in Brossard;
- Locations where piers, abutments, jetties or other structures will require excavation work or the use of heavy machinery;
- Lesser La Prairie Basin;
- Nuns' Island shoreline.

8.1.2 DESCRIPTION OF IMPACTS AND CONTEXT

During the project, soil, sediment and groundwater will be affected during all work phases and by the presence of prior contamination, erosion potential, and risk of spills.

The physical and chemical characteristics of the soil, sediment and groundwater could be affected during all project phases by the following:

- Site mobilization and construction of temporary structures;
- Stripping and tree removal;
- Excavation, earthworks;
- In-water works;
- Management of waste and hazardous materials;
- Machinery transport, operation and maintenance;
- Work site demobilization and dismantlement of temporary structures.

Organic or inorganic contaminants are likely to be remobilized during the project, and certain types of work will favour their migration or dispersion. Furthermore, the use of heavy machinery could cause accidental hydrocarbon spills despite the measures that are in place, and the presence of lead or other contaminants during deconstruction work could affect the soil, sediment and groundwater.

Contaminated soil and sediment management must comply with the recommendations of the CCME (1999a) or MELCC if such materials are sent offsite. A traceability system will be put in place.

8.1.3 MITIGATION

8.1.3.1 Before the start of work

Since the precise quality of the soil and groundwater is not known in several locations at this stage, their level of contamination will have to be assessed once the details of the areas to be excavated are specified (e.g. extent, depth, slope profile, work beneath water table).

The level of sediment contamination varies greatly depending on particle size. It is practically nil when the sediment is coarse and free of organic materials, which is the case for areas with a strong current. The fish habitat map shows the different particle sizes and the current that can be expected at each pier. This information will help anticipate the quality of the riverbed sediment at that location. Given the fragmented state of the data, there is a lack of information on the environmental quality of the sediment around the piers. An additional characterization can be done once the details of the areas to be excavated are provided. Excavated sediment could be stored in sealed containers and samples collected from the containers to ensure proper management.

A contaminated-water management plan at the engineering design stage will ensure that the contaminated water is treated or disposed of in conformance with existing regulations. The contractor must also draw up a spill response plan.

8.1.3.2 During the work

- Minimize the footprint occupied by the work;
- Deconstruct piers in a confined setting when the footing has to be removed under the riverbed (e.g. using cofferdams or within the temporary jetty);
- Treat contaminated water on site or send it off site in accordance with regulations;
- Do not overexcavate the riverbed when removing temporary jetties, and focus on restoring the area to its original state;
- Immediately remove excavated sediment with known contaminant levels to MELCC-approved sites;
- Excavated soil and sediment that cannot be removed directly off site must be immediately placed for temporary storage on a waterproof surface and covered for protection from the elements (e.g. from non-characterized excavated soil);
- When contamination levels exceed criterion B in the MELCC's *Guide d'intervention – Protection des sols et réhabilitation des terrains*, all trucks leaving the work site must pass through a vehicle wheel-washing station;
- Temporarily store on-site and dispose of contaminated soil and sediment at MELCC-authorized sites in compliance with applicable federal and provincial regulations;
- 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;
- 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;
- Have an emergency hydrocarbon spill kit on hand at all times;
- In the event of a spill on land, the emergency response plan will be implemented. This plan includes:

- Promptly notify ECCC (1-866-283-2333) and MELCC (1-866-694-5454) early warning networks as well as SLSMC's emergency response and shipping management teams;
- Eliminate the source of the spill;
- Implement protection measures (absorbent material);
- Clean up the affected area;
- Dispose of contaminated soil.

- Monitor groundwater quality in all work areas involving a network of observation wells set up to characterize water upstream and downstream of the areas.

8.1.3.3 After completion of the work

- Monitor groundwater quality in all work areas that are still accessible for one year after completion of the work;
- If deconstruction work has affected groundwater quality beyond the applicable criteria, set up treatment systems to rehabilitate the water in the affected areas.

8.2 SURFACE WATER QUALITY AND HYDROLOGY

8.2.1 SENSITIVE AREAS

The St. Lawrence is separated into two flow sections in the work areas: the Greater La Prairie Basin (St. Lawrence section) and the Lesser La Prairie Basin (Seaway section). While surface water quality and hydrology are different in the two basins, both are considered to be sensitive areas.

8.2.2 DESCRIPTION OF IMPACTS AND CONTEXT

Water quality will be affected during the work phases by primarily introducing suspended solids and potentially contaminants (e.g. petroleum hydrocarbons) into the receiving environment.

- Water quality will be affected in the pre-deconstruction, deconstruction and post-deconstruction phases by the following:
- Work site mobilization and construction of temporary installations (e.g. jetties);
- Stripping and tree removal;
- Excavation, earthworks;
- In-water works (deconstruction and post-deconstruction);
- Management of waste and hazardous materials (all phases);
- Machinery transport, operation and maintenance (all phases);
- Work site demobilization and dismantlement of temporary structures.

In-water work namely for jetty construction and pier and footing deconstruction is likely to result in sediment resuspension in the water. Use of jetties in the river could carry soil particles into the surface water either through runoff or when pumping water from the excavations. Accidental petroleum hydrocarbon leaks from machinery could also result in surface water contamination.

The risk of contamination of drinking water intakes was taken into account. The Royer Plant water intake is located in the main St. Lawrence channel upstream from Île Notre-Dame more than 2 km from the study area. The implementation of mitigation measures, the river's mixing capacity, the channel flow, and the small quantity of contaminated sediment in the area (Greater La Prairie Basin) are such that no impact is anticipated on the intake.

8.2.3 MITIGATION MEASURES

DFO has updated a list of mitigation measures applicable to the deconstruction of the Existing Champlain Bridge. The following sections present DFO's main mitigation measures in addition to those presented by Dessau-CIMA+ in the 2013 EA. Section 6.3 presents all the mitigation measures that will be implemented during each project phase.

8.2.3.1 Before the start of work

Temporary structures:

- Design the temporary structures so that they are capable of withstanding floods likely to occur during the construction phase and to prevent shoreline and riverbed erosion.

Erosion control and resuspension of sediment:

- Limit clearing on either side of the high-water mark to the required minimum and maintain the vegetation cover as long as possible before starting work.

8.2.3.2 During the work

Temporary structures:

- Limit the cumulative encroachment of temporary structures to one-third of the width of the watercourse, measured from the NHWM, in order to restrict increases in current speed by restricting the water flow and thus avoid creating erosion problems;
- In the present case, the Lesser La Prairie Basin and Greater La Prairie Basin are considered to be two separate bodies of water. The cumulative encroachment of temporary structures may thus reach up to one-third of the width of each basin, unless an agreement has been reached with DFO;
- Stabilize the temporary structures so that they are capable of withstanding floods likely to occur during the construction phase and to prevent shoreline and riverbed erosion;
- Favour the use of work methods that improve the quality of the water to be managed (e.g. macadamize the bottom of excavations, trenches and resurgences, install a blinding slab);
- Take the necessary measures to seal the cofferdams and thus minimize the quantity of water to manage.

Erosion control and resuspension of sediment:

- Limit topsoil stripping, clearing and grading of work areas to the extent strictly necessary;
- Implement effective measures to limit the influx of sediments from the work site to the aquatic environment and ensure their maintenance (e.g. sediment barriers, berms, sediment traps, sedimentation pond, temporary slope stabilization, diverting water towards vegetated areas). The measures must remain effective during high-water periods, heavy rain and freeze-up periods;

- Dispose of excavated material outside of the high-water mark. If required, contain or stabilize the materials (e.g. impermeable lining, sediment barrier) to prevent the influx of sediments into the aquatic environment;
- When work has to be carried out in water, favour isolating the work area so as to work on dry land or limit the influx of sediment into the aquatic environment (e.g. cofferdams, diking and pumping, temporary diversion, turbidity curtain);
- Favour the use of turbidity curtains to encircle the work area in order to confine suspended sediments in it. Use deflectors if required to help maintain the turbidity curtains.

Temporary closure of work site:

- Temporarily stabilize and protect the disrupted sites at risk of erosion and of transporting sediment to the aquatic environment using methods suited to the site, the duration of the work site closure, and the time of year;
- Divert runoff before it reaches disturbed land (e.g. intercepting ditch and dissipation trench toward vegetation areas);
- Make sure that the measures set up to limit the influx of sediment from the work site to the aquatic environment are working properly and that their maintenance is done before the work site is shut down each day.

8.3 AIR QUALITY (LOCAL)

8.3.1 SENSITIVE AREAS

The following residential areas (Figure 66 in Section 6.2.4) are considered to be sensitive to potential impacts on air quality based on the location of the emission sources and the direction of prevailing winds:

Nuns' Island:

- Residential area located about 250 m south of the on-land access road and jetty (I1).

Brossard:

- Residential area located about 200 m northeast of the westernmost mobilization area on land in Brossard, 200 m north of the easternmost mobilization area on land, and 800 m northeast of the Seaway Dike materials handling area (B1);
- Residential area located about 250 m south of the westernmost mobilization area on land in Brossard, 130 m southwest of the easternmost mobilization area on land, and 600 m east of the Seaway Dike materials handling area (B2);
- Residential area located about 150 m southeast of the easternmost mobilization area on land (B3);
- Residential area located about 385 m northeast of the easternmost mobilization area on land (B4).

8.3.2 DESCRIPTION OF IMPACTS AND CONTEXT

Deconstruction will result in particulate emissions, including silica and potentially lead. Some materials could contain asbestos. If so, the materials in question will be removed before deconstruction. The mobilization areas are located close to residential areas.

8.3.3 MITIGATION MEASURES

Mitigation measures for controlling emissions will be implemented to ensure there is no impact on the quality of air of the neighbouring communities. The key measures are listed below:

8.3.3.1 Before and during the work

- Use watering equipment during deconstruction to minimize the generation of dust; runoff will be controlled to reduce emissions of suspended solids;
- Use water and dust suppressants in the mobilization area to control dust emissions from unpaved surfaces and stockpiles;
- Strategically site crushing facilities and stockpiles to minimize the potential effects of dust on neighbouring communities;
- Control mud and dirt deposited by vehicles on paved public roads by setting up on-site control measures and promptly removing loose materials from paved roads;
- Direct vehicles leaving the site away from residential areas;
- Use adequate signage and limit speed to reduce dust emissions on access roads and work site surfaces;
- Use tarpaulins for loaded trucks leaving the site.

8.4 AIR QUALITY (GHG)

8.4.1 SENSITIVE AREAS

The sensitive area is the province as a whole since any GHG emissions will be added to those produced annually by Quebec during the three-year deconstruction.

8.4.2 DESCRIPTION OF IMPACTS AND CONTEXT

GHGs will be emitted through the use of varied machinery and equipment, as well as by truck transport, grouped under the following:

- Machinery transport, operation and maintenance.

Evidently, all activities that use machinery are likely to emit GHGs.

8.4.3 MITIGATION MEASURES

8.4.3.1 During the work

GHGs emitted during the project will be compensated. Annual emissions will be calculated based on the number of kilometres travelled by machinery and transportation of materials and excavations. Compensation may take the form of purchases of carbon credits or independent projects. Some incentives will be included in the request for proposals.

8.5 VEGETATION (WETLANDS, AQUATIC GRASS BEDS, SPECIAL-STATUS PLANT SPECIES, IAS)

8.5.1 SENSITIVE AREAS

The study area is almost exclusively occupied by anthropogenic environments such as road infrastructures, buildings and construction sites for the New Champlain Bridge. The surface area for plant habitats is therefore very limited. The most sensitive environments in the work area are the riverside marshes under the high water level on the east bank of Nuns' Island and the aquatic grass beds.

8.5.2 DESCRIPTION OF IMPACTS AND CONTEXT

Vegetation and wetlands will be affected in the pre-deconstruction, deconstruction and post-deconstruction phases by the following:

- Site mobilization and construction of temporary structures;
- Stripping and tree removal;
- Excavation, earthworks;
- In-water works (deconstruction and post-deconstruction);
- Work site demobilization and dismantlement of temporary structures.

Jetty construction will result in the loss of slightly over 1,000 m² in riverside marshes (sensitive environment). The work will also lead to a very slight loss in vegetation in non-sensitive habitats. The occurrence of rough water-horehound was noted near the location of the Brossard side jetty and St. Lawrence water-horehound just north of the Nuns' Island jetty. The St. Lawrence water-horehound observed offshore of Nuns' Island was protected during construction of the jetty by SSL to avoid impacting it.

Water quality degradation (e.g. significant increase in turbidity) could temporarily disturb riverside marsh vegetation and aquatic grass beds.

8.5.3 MITIGATION MEASURES

The following subsections present the main mitigation measures to be implemented for vegetation protection.

8.5.3.1 Before the start of work

Protection of vegetation:

- Areas set aside for work site development should, where possible, be located on previously cleared or disturbed sites.

Protection of special status species:

- Signpost areas where special-status plant species are present and prohibit access during construction work;

- Before the start of work, transplant plant specimens that could be affected by the work to an area that will remain undisturbed.

Protection of wetlands

- Design civil-engineering structures to comply with the Federal Policy on Wetland Conservation by favouring, in order of importance, loss avoidance, minimization and compensation. If necessary, draw up a compensation plan that includes the creation, development or conservation of a wetland of equivalent ecological function;
- Temporary construction in wetlands is prohibited, whether for storage, parking, bypass roads or work areas. Such structures are to be located on stable land. Where it is impossible to do otherwise, precise studies by environmental specialists must be conducted with respect to the location, working method for construction of the sites, and dismantling and redevelopment of temporary sites in wetlands. The redevelopment plan must provide for the complete rehabilitation of disturbed areas, including removal of all materials and restoration of ground and drainage conditions to allow for recolonization of the site by vegetation.

8.5.3.2 During the work

Protection of vegetation:

- Cordon off a perimeter to protect the trees and bushes to be preserved;
- The contractor must take all necessary measures to protect trees and shrubs that are to be preserved as per the plans and specifications from damage or mutilation;
- Trees to be cut down are selected and marked by the supervisor. The Contractor must receive the supervisor's authorization prior to tree felling;
- Grubbing consists in uprooting stumps to a minimum depth of 300 mm underground. The Contractor must avoid damaging the land or the root zones of trees and shrubs that have been retained and must restore the damaged area;
- All branches on trees in the work area that interfere with the movement of equipment are to be removed in order to prevent damage to equipment. Branches are considered to interfere when there is no practical alternative to removal at the site. For trees located outside the right-of-way with interfering branches that must be pruned, written permission of the owner must be obtained before the start of pruning or tree treatment.

Protection of wetlands

- Release into a lake, body of water or wetland of waste, oil, chemicals or other contaminants originating from a construction site is prohibited. The contractor must dispose of such waste and contaminants in accordance with prevailing laws and regulations based on the type of contaminant involved.

Site restoration:

- It will be important to favour indigenous plant species for renaturalization and to quickly seed and plant to prevent colonization by invasive species;
- Upon completion of the project, the work areas will be seeded and reforested with indigenous species (bushes, plants and trees), if safe to do so. Special attention will be given to river bank naturalization to recreate conducive habitats, including wildlife;

- Limit the use of riprap on the banks of watercourses up to the natural high water mark (two-year return period), and replant the riparian strip from the edge of the riprap using recognized vegetation engineering techniques that encourage overhanging shrub and grass. Replanting must be done as soon as possible after grading work is complete, with preference given to indigenous species.

8.5.3.3 After completion of the work

Plant regrowth will be monitored for two years after the project is over. Survival ratios will be calculated and new vegetation will have to be planted if this ratio falls below 90%.

The fish habitat compensation projects currently under study include plans to create one or more calm water habitat developments (floodplain or riverside marsh). Such developments will therefore include a wetland portion, which will help compensate the functions of the 1,041 m² of wetlands temporarily encroached upon by the jetties.

8.6 FISH AND AQUATIC HABITATS

8.6.1 SENSITIVE AREAS

The entire section of the St. Lawrence in the work area is considered a fish habitat and therefore a sensitive area. Habitat sensitivity varies depending on the species of fish inventoried in a particular system. The habitats considered by DFO as sensitive and non-sensitive in the work area are:

- Sensitive: 1, 2, 3, 4, 6, 8, 12, 13, 13a, 14, 16, 18, 21 and 22;
- Not sensitive: 1a, 5, 7, 9, 10, 11, 15, 17, 19, 20, 23 and 24.

Habitat sensitivity depends, namely, on the habitat functions that are fulfilled (e.g. spawning, rearing, feeding) and the species that are present. Habitats considered sensitive that contain aquatic vegetation (2, 4, 6, 8, 12, 14, 16 and 18) are likely to be used for the spawning and rearing of phytolithophilous and phytophilous species as well as for the feeding of several species.

Habitats 3, 13, 13a, 21 and 22 contain no aquatic vegetation but show some sensitivity. Type 13, 21 and 22 habitats present a reproductive potential for lithophilous species in fast water, while type 3 habitats present a reproductive potential for litophilous species in slow water. Types 3 and 13a habitats represent more of a significant potential feeding area in the summer.

A type 1 habitat is a floodplain that can be used for the spawning of phytolithophilous and phytophilous species.

A fish habitat development will be created by SSL near the work area just upstream of the projected jetty on the Nuns' Island side. This development is also considered a sensitive habitat.

8.6.2 DESCRIPTION OF IMPACTS AND CONTEXT

The project will cause serious damage to fish habitat that will be subject to the mitigation measures described in Section 8.6.3. The impacts will namely be caused by temporary jetty encroachment for the duration of the work (about three years) into fish habitat deemed sensitive, as a result of likely water quality degradation as well as potential changes in the hydraulic regime during the work (e.g. impact on fish migration).

Fish habitat will be affected in the pre-deconstruction, deconstruction and post-deconstruction phases by the following:

- Site mobilization and construction of temporary structures;
- Stripping and tree removal;
- Excavation, earthworks;
- In-water works (deconstruction and post-deconstruction);
- Management of waste and hazardous materials (all phases);
- Machinery transport, operation and maintenance (all phases);
- Work site demobilization and dismantlement of temporary structures.

All the work planned for the project (pre-deconstruction, deconstruction and post-deconstruction) will result in serious damage to roughly 6.5 ha of fish habitat, according to the worst-case scenario.

The presence of jetties and other temporary structures is likely to alter flow velocities and affect fish migration in the study area. Work-related noise and vibrations could result in fish avoiding to some extent the work areas that generate noise and vibration.

As described in Section 3.2.2.1.4.8 of Volume 1 of this study, 21 species of special-status fish are likely to be found in the study area, seven of which were recently identified in the study area. They include the American Shad, American Eel, Striped Bass, Splitnose Rockfish, Copper Redhorse, Lake Sturgeon and Rosyface Shiner. These species could be affected in the same way as the other species.

In-water work namely for jetty construction and pier and footing deconstruction is likely to result in sediment resuspension in the water. Use of jetties in the St. Lawrence could transport soil particles or contaminants to the surface water either through runoff or when pumping water from the excavations. Accidental petroleum hydrocarbon leaks from machinery could also result in surface water contamination and disrupt fish habitat.

8.6.3 MITIGATION MEASURES

Since they are closely linked, most of the mitigation measures that apply to surface water quality also apply to fish habitat. Just like Section 8.2, the following sections present DFO's main mitigation measures that complement those presented by Dessau-CIMA+ in the 2013 EA. A few significant measures specific to fish habitat are also added.

8.6.3.1 Before the start of work

Temporary structures:

- Design the temporary structures so that they are capable of withstanding floods likely to occur during the construction phase and to prevent shoreline and riverbed erosion.

Erosion control and resuspension of sediment:

- Limit clearing on either side of the high-water mark to the required minimum and maintain the vegetation cover as long as possible before starting work.

Measures specific to fish and aquatic habitats:

- Include fishways in the Nuns' Island jetty. The flow velocity in the fishways must be between 0.8 and 1.2 m/s during high-water periods. Furthermore, rocks and boulders, sills, groins or deflectors may have to be used to increase roughness in the fishways and thus reduce velocities during high-energy flow conditions. However, care must be taken to ensure that those structures do not impede fish passage during lower-energy flow conditions. The fishways (slopes and structures inside the fishways, if applicable) must be designed to withstand floods likely to occur during the Work as well as ice. Lastly, a minimum depth of 60 cm in the fishways is required during low-water periods; there is no minimum velocity. The flow in the fishways must be maintained at all times to create a downstream attraction flow. Fishway location and width are found in Section 6.3.1.4.

8.6.3.2 During the work

Temporary structures:

- Favour jetties that minimize encroachment on fish habitat;
- Limit the cumulative encroachment of temporary structures to one-third of the width of the watercourse, measured from the NHWM, in order to restrict increases in current speed by restricting the water flow and thus not obstructing the free passage of fish or causing erosion problems. In the present case, the Lesser La Prairie Basin and Greater La Prairie Basin are considered to be two separate bodies of water. The cumulative encroachment of temporary structures may thus reach up to one-third of the width of each basin, unless an agreement has been reached with DFO;
- Stabilize the temporary structures so that they are capable of withstanding floods likely to occur during the construction phase and to prevent shoreline and riverbed erosion;
- Favour the use of work methods that improve the quality of the water to be managed (e.g. macadamize the bottom of excavations, trenches and resurgences, install a blinding slab);
- Take the necessary measures to seal the cofferdams and thus minimize the quantity of water to manage.

Erosion control and resuspension of sediment:

- Limit topsoil stripping, clearing and grading of work areas to the extent strictly necessary;
- Implement effective measures to limit the influx of sediments from the work site to the aquatic environment and ensure their maintenance (e.g. sediment barriers, berms, sediment traps, sedimentation pond, temporary slope stabilization, diverting water towards vegetated areas). The measures must remain effective during high-water periods, heavy rain and freeze-up periods;
- Dispose of excavated material outside of the high-water mark. If required, contain or stabilize the materials (e.g. impermeable lining, sediment barrier) to prevent the influx of sediments into the aquatic environment;
- When work has to be carried out in water, favour isolating the work area so as to work on dry land or limit the influx of sediment into the aquatic environment (e.g. cofferdams, diking and pumping, temporary diversion, turbidity curtain);
- Favour the use of turbidity curtains to encircle the work area in order to confine suspended sediments in it. Deploy the curtain to minimize the number of fish caught inside the enclosure. Use deflectors if required to help maintain the turbidity curtains.

Temporary closure of work site:

- Temporarily stabilize and protect the disrupted sites at risk of erosion and of transporting sediment to the aquatic environment using methods suited to the site, the duration of the work site closure, and the time of year;
- Divert runoff before it reaches disturbed land (e.g. intercepting ditch and dissipation trench toward vegetation areas);
- Make sure that the measures set up to limit the influx of sediment from the work site to the aquatic environment are working properly and that their maintenance is done before the work site is shut down each day.

Measures specific to fish and aquatic habitats:

- Comply with the work restriction periods based on the type of sensitive habitat:
    - Type 2, 3, 4 and 8 habitats: April 1 to August 1;
    - Type 12, 13, 16 and 22 habitats: April 1 to July 1;
    - Other habitats: No restriction period.
- Recover any fish trapped in the cofferdams and immediately return them to the aquatic environment to prevent fish mortality;
- Install a structure (e.g. screen) at the pumping hose inlet to prevent the intake of fish.

8.6.3.3 After completion of the work

To comply with the Fisheries Act, a compensation plan approved by DFO will be implemented to mitigate the serious harm caused to fish and their habitat, in particular by temporary jetty encroachment during the entire work period (approximately three years). A few compensation projects are currently under study and are presented in Section 6.4.2. As soon as projects have been selected, detailed development plans will be prepared and will be included in the authorization requirements issued by DFO under the Fisheries Act. The methods for monitoring the post-work developments are presented in Section 7.3.1 of this study.

8.7 HERPETOFAUNA

8.7.1 SENSITIVE AREAS

The following areas are deemed sensitive for herpetofauna:

- Seaway dike;
- Nuns' Island.

Both areas are used by the Brown Snake, a special status species. More specifically, these areas are land environments located under the bridge structure and adjacent land that will form part of the work site area.

8.7.2 DESCRIPTION OF IMPACTS AND CONTEXT

In relation to the project, herpetofauna will be affected by the actual work as well as by habitat loss during all project phases by the following activities:

- Site mobilization and construction of temporary structures;
- Stripping and tree removal;
- Deconstruction of the Existing Champlain Bridge;
- Work site demobilization and dismantlement of temporary structures.

The habitat of the Brown Snake, a species likely to be designated threatened or vulnerable in Quebec, in the work site footprint will be disrupted, and there are mortality risks for the species as well as for other herpetofauna species. A hibernaculum may be discovered during the winter.

8.7.3 MITIGATION MEASURES

8.7.3.1 Before the start of work

To minimize the risks of mortality, the Brown Snake population will be relocated to a similar habitat nearby before work begins. The work area perimeters will be protected by a barrier to prevent them from returning. The barriers will also be effective for some mammals and other herpetofauna species.

8.7.3.2 During the work

The measures put in place before work begins will prevent most of the impacts on herpetofauna. During work, barriers must be kept in place and the personnel involved must be made aware of the situation. If a hibernaculum is discovered int he winter, competent authorities will have to be notified immediately.

At the end of the project, the work areas will be renaturalized to recreate habitats suitable for herpetofauna, including hibernacula, if required (as part of the Héritage Champlain project).

8.7.3.3 After completion of the work

Brown Snake movements will have to be monitored over time. Biannual monitoring over a four-year period will confirm that the snakes have properly adapted to their new habitat. This study should also include the hibernacula designed as part of the New Bridge construction project.

8.8 BIRDS

8.8.1 SENSITIVE AREAS

The following areas are deemed sensitive for birds:

- Couvée Islands migratory bird sanctuary (Migratory Bird Sanctuary Regulations, ECCC);
- Waterfowl concentration area on Nuns' Island (Act respecting the conservation and development of wildlife, MFFP);

- Peregrine Falcon nesting site on the Existing Champlain Bridge;
- Cliff Swallow colony on the Existing Champlain Bridge;
- Rocky islets near Nuns' Island.

The sensitive areas for the Peregrine Falcon are mainly found around the sites chosen for installing the nesting boxes. Early in the season the sensitive area extends over a 200-m radius around each falcon nesting box. Attention must also be paid to structural elements that could represent a potential nesting site, such as a platform protected from precipitation by a second structural element. Once the nest location is well established, the sensitive area will be limited to the active nesting site.

The sensitive areas for the Cliff Swallow are first and foremost all the nesting sites usually colonized under the deck of the Existing Champlain Bridge. As mentioned, JCCBI will prepare an ecosystem management plan that will involve monitoring over five years.

8.8.2 DESCRIPTION OF IMPACTS AND CONTEXT

In relation to the project, birds will be affected by the actual work as well as by habitat loss during all project phases by the following activities:

- Site mobilization and construction of temporary structures;
- Stripping and tree removal;
- In-water works;
- Loss of infrastructure;
- Work site demobilization and dismantlement of temporary structures.

Deconstruction work will result in the temporary or permanent loss of terrestrial and aquatic bird habitats. Birds using the area could also be disturbed during the nesting period, which extends from mid-April to mid-August. Note, in particular, that the Peregrine Falcon and Cliff Swallow regularly nest on the Existing Champlain Bridge. Some rocky islets near Nuns' Island that could be used by the Common Tern may also be disturbed during the work.

In addition, in-water works may disrupt aquatic birds that use the study area, especially in and around the Couvée Islands migratory bird sanctuary and the La Prairie Basin waterfowl gathering area (Nuns' Island). Such disturbances could also extend to the aquatic grass beds serving as habitats, feeding and shelter areas for bird migration, a critical time for these populations.

8.8.3 MITIGATION MEASURES

8.8.3.1 Before the start of work

Preliminary engineering will need to take into account the impacts on birds, especially when choosing the type of structure. For example, the following elements should be considered:

- No terrestrial encroachment in the Couvée Islands migratory bird sanctuary (MBS);
- Checking for birds that may be nesting on the Existing Champlain Bridge and on rocky islets near Nuns' Island before work is started to avoid disturbing them and prevent bycatches;

- Working with ECCC's Peregrine Falcon Recovery Team on an appropriate way to install nesting boxes. As early as possible before demolition of the bridge, move the existing nesting boxes and install new artificial ones for Peregrine Falcons under the structure of the New Bridge or at a suitable nearby site in order to limit potential conflicts between bridge maintenance and repair work and falcon nesting. The choice of location must be coordinated between the parties to minimize deconstruction effects;
- Before mid-April of every year, in the areas involved by deconstruction during the nesting period, remove the old nests and install nets covering the bottom of the deck and girders to prevent Cliff Swallows from building new nests.

8.8.3.2 During the work

Some mitigation measures will be implement from the start of the work to avoid destroying or disturbing the nests, eggs or birds, namely:

- Avoid carrying out potentially destructive or disruptive activities during sensitive periods and in sensitive locations (usually ranging from mid-April to mid-August) in order to reduce the risk of impacting birds, their nests and eggs;
- Develop and implement appropriate preventive and mitigation measures to minimize the risk of bycatches and help maintain sustainable migratory bird populations;
- Work on and in the vicinity of the Couvée Islands migratory bird sanctuary must be performed in accordance with ECCC requirements. No terrestrial encroachment in the MBS shall be permitted;
- Special attention will be paid to protecting Common Tern breeding sites (small rocky islets near Nuns' Island);
- Manage, relocate and, if necessary, add falcon nesting boxes depending on the area of activity. Retain the services of a bird of prey specialist to advise the Contractor and encourage coexistence between workers and the peregrine falcon;
- Obtain an MFFP permit for work involving the Peregrine Falcon if needed, and, in such a case, comply with the permit's requirements;
- Check for Peregrine Falcon nesting on the bridge before the start of deconstruction work. If any birds are nesting, set up a 250-m exclusion area based on the nesting stage around the nest until the young have left the nest for good;
- Special attention will be given to protecting Cliff Swallow nests, and specific measures will have to be established to avoid disturbing nesting. Once nesting has been confirmed, set up a 20-metre exclusion zone around the nest until the young have left the nest for good. To ensure work planning during the breeding period marked by the presence of nests, prior specific measures such as installing nets may be taken, in conjunction with experts, to prevent Cliff Swallows from starting to nest in the work areas;
- Throughout the nesting season (2020 through 2023), conduct periodic behaviour monitoring of the Peregrine Falcon pair and Cliff Swallow colony to assess the effectiveness of the measures put in place for inducing their relocation to the New Bridge.

8.8.3.3 After completion of the work

For at least two nesting seasons after the work is completed (2024 to 2025), continue monitoring the behaviour of the Peregrine Falcon pair and Cliff Swallow colony to ensure the sustainability of the measures put in place to induce their nesting on the New Bridge.

8.9 BATS

As no sensitive areas or significant impacts on bats were identified, no specific measures appear to be necessary for this component.

8.10 SPECIAL STATUS SPECIES OF WILDLIFE

The sensitive areas, impact description and mitigation measures for special-status species were addressed in the sections on the various wildlife species.

8.11 COMMERCIAL SHIPPING

8.11.1 SENSITIVE AREAS

The following area is considered sensitive for commercial shipping:

- Seaway channel.

8.11.2 DESCRIPTION OF IMPACTS AND CONTEXT

In relation to the project, work could encroach on the Seaway channel and commercial shipping could be affected throughout all project phases by the following:

- Maintaining traffic and navigability, installation of signage;
- Excavation and earthworks;
- Dismantlement of structures;
- In-water works;
- Machinery transport, operation and maintenance.

Disruptions caused by deconstruction could reduce the Seaway clearance. Work on and near the dike may reduce its watertightness.

8.11.3 MITIGATION MEASURES

8.11.3.1 Before the start of work

JCCBI and the SLSMC will need to negotiate a memorandum of understanding to define the terms and conditions associated with work on the dike and above the Seaway while maintaining safe commercial shipping. Similarly, TC's approval under the CNWA will be required for both commercial shipping and recreational and pleasure boating.

8.11.3.2 During the work

The terms and conditions agreed to with the SLSMC will have to be implemented during the work, including maintaining navigation clearance. The terms and conditions cited upon approval under the CNWA will also have to be observed.

8.12 RECREATIONAL AND TOURISM ACTIVITIES AND PLEASURE BOATING

8.12.1 SENSITIVE AREAS

The following areas are considered sensitive for recreational activities, tourism and pleasure boating:

- Bicycle paths along the South Shore and Seaway dike;
- Lesser La Prairie Basin;
- Greater La Prairie Basin;
- Bicycle paths on Nuns' Island;
- Northeastern shore of Nuns' Island.

8.12.2 DESCRIPTION OF IMPACTS AND CONTEXT

Recreational activities, tourism and pleasure boating will be affected throughout the project phases by the following:

- Site mobilization and construction of temporary structures;
- Maintaining traffic, navigability and installation of signage;
- Stripping and tree removal;
- Dismantlement of structures;
- In-water works;
- Machinery transport, operation and maintenance;
- Work site demobilization and dismantlement of temporary structures.

The work areas could continue to encroach on bicycle paths that cross the project footprint on Nuns' Island and in Brossard. Traffic on the Seaway dike bicycle path is also likely to be interrupted sporadically during the work. In-water works will limit pleasure boating and fishing around the bridge.

Blue Route (Lesser La Prairie Basin and Nuns' Island) and Saute-Moutons itineraries will be affected. Passing under the structures being deconstructed will be prohibited at certain times; as a result, terrestrial and aquatic recreational activities will be suspended at such times in the areas involved.

It is also highly likely that there will be a significant number of ships on the river during the work period to transport materials, workers and barges. A navigation management plan will have to be implemented.

8.12.3 MITIGATION MEASURES

8.12.3.1 During the work

Mitigation measures will be implemented during the project, including:

- Ensuring that the terms and conditions specified in the approval under the CNWA for recreational and pleasure boating are implemented and observed;
- Use a website that issues news announcements to notify users of bike paths of safe detours and closure periods, and act as liaison with the organizations involved (e.g. Vélo Québec). For recreational boating, provide one or more marked channels to ensure safe passage and have the required notices to shipping issued through CCG's Marine Communications and Traffic Services;

- Install the materials required to mark boat lanes and bike path detours in order to ensure safe passage of cyclists and recreational boaters;
- Issue notices to pleasure boaters with regard to temporary and permanent disruptions;
- Remove bridge piers in a way that will not cause any obstacles for pleasure boating.

TC's Navigation Protection Program (NPP) will ensure compliance with the terms and conditions issued in authorizations under the Navigable Waters Protection Act. Work site visits will be conducted to ensure compliance with mitigation measures and, if needed, will require that adjustments be made to ensure safe navigation.

8.12.3.2 After completion of the work

After the piers are deconstructed, bathymetric surveys will be performed to ensure that traces of the piers are not hindering navigation. This information will be forwarded to GCC.

8.13 SOUND ENVIRONMENT AND VIBRATIONS

8.13.1 SENSITIVE AREAS

Several noise-sensitive areas corresponding to residential or residential/commercial areas were identified near the work area.

8.13.2 DESCRIPTION OF IMPACTS AND CONTEXT

Noise and vibration will be generated during three activity periods:

- Jetty construction (Nuns' Island, Seaway Dike and Brossard);
- Bridge deconstruction;
- Jetty removal (Nuns' Island, Seaway Dike and Brossard).

During jetty construction and removal, noise and vibration should be generated 24 hours a day during a short period of time at the beginning (4 months) and end (4 months) of the deconstruction project while transporting materials for the jetties.

Noise and vibration will also be generated by the following deconstruction work: sawing, conventional demolition, use of cranes on barges, and on-land demolition in one of the four temporary mobilization areas.

The noise and vibration from these areas should mainly be caused by the heavy equipment used on site to dismantle large sections in during the day and by truck loading and transport at the work sites scheduled in the daytime and evening.

8.13.3 MITIGATION MEASURES

Mitigation measures may be required for certain activities in order to minimize noise and vibration impacts on neighbouring communities. Noise and vibration mitigation measures must be designed to take into account specific activities in addition to performance criteria.

8.13.3.1 Before the start of work

Before starting deconstruction work and after construction of the New Bridge has been completed, ambient noise measurements will be taken in noise-sensitive areas to collect up-to-date data. Before conducting noise modelling based on the sites and activities in neighbouring areas, mitigation measures (administrative or physical) must be developed to minimize noise and vibration impacts. Administrative measures target the organization of the work, while physical measures consist in using elements such as barriers or low-noise equipment.

8.13.3.2 During the work

Here are some examples of generic mitigation measures that can be applied if necessary:

- Evening and night work will be scheduled to progress with the least noisy work;
- Schedule the noisiest work during less sensitive periods (e.g. daytime);
- Prohibit use of the noisiest equipment near noise-sensitive areas;
- Favour quieter working methods and soundproofed or electric equipment where possible;
- Make sure that the equipment being used has good quality mufflers in working order;
- Ensure that equipment used on the site is in proper working order;
- Limit the power output of the equipment to what is required;
- Limit the amount of equipment on the sites to what is necessary for activities;
- Install variable-intensity reversing alarms (self-adjusting to ambient noise) and, if possible, install reversing alarms only on that equipment covered by the *Safety Code for the Construction Industry* (R.R.Q., c. S-2.1, r. 6) of *An Act Respecting Occupational Health and Safety* (R.S.Q., c S-2.1, s. 3.10.12).

Here are a few examples of mitigation measures that can be used to minimize noise propagation from a construction site:

- Install temporary stationary noise barriers around the site, or mobile barriers around certain equipment;
- Install acoustic sheets or curtains;
- Use construction site trailers or heavy vehicles as noise barriers;
- Increase the distance between noisy equipment and noise-sensitive areas;
- Encourage traffic organization at the work site to minimize the use of backup alarms.

In the event of noise and vibration complaints, a complaint tracking system will enable the mediator to intervene promptly with both complainants and contractors in order to decide on the required corrective action.

8.14 TRAFFIC

8.14.1SENSITIVE AREAS

Sensitive areas in terms of traffic are mainly found in:

- Nuns' Island;
- Brossard.

8.14.2 DESCRIPTION OF IMPACTS AND CONTEXT

The roads that will be used by trucks to transport materials are already heavily congested. Although the daily number of trucks is not high compared to total vehicular traffic on these roads, the fact that the trucks are driving at reduced speed may increase congestion, especially if they are on the roads during peak hours. Traffic will be affected by the following project activities:

- Maintaining traffic and navigability and installation of signage;
- Excavation and earthworks;
- Dismantlement of structures;
- Work in aquatic environments (creation of jetties and demolition of piers);
- Machinery transport, operation and maintenance;
- Work in aquatic environment (removal of jetties).

8.14.3 MITIGATION MEASURES

8.14.3.1 Before the start of work

Before work begins, it will be especially important to implement measures aimed at setting up adequate signage to inform users of traffic disruptions:

- Before and during the work, the contractor must take the necessary measures to facilitate and direct the movement of vehicles on the road to be used and on detour roads made necessary by the construction work;
- Mobile variable message signs (VMS) must be functional throughout the construction period and keep users informed of real-time traffic conditions and obstructions;
- The public will be informed of the work and scheduled occasional detours. Alternate routes will be proposed.

Similarly, a truck traffic management plan will be drawn up and implemented during the work:

- JCCBI and the contractor will work together to develop a transportation management plan to optimize the flow of traffic on the road network adjacent to the project; the partners (the boroughs and MTQ) will also be consulted;
- JCCBI and the contractor will work together to draw up a traffic management plan in the areas adjacent to the project for trucks used during the deconstruction phase. Measures that may be included in the plan are: travel outside of peak hours (e.g. between 10 a.m. and 3 p.m. or between 7 p.m. and 5 a.m.), avoiding local roads, and using predetermined routes that avoid residential neighbourhoods.

In addition to the above management plan, the following mitigation measures will have to be observed:

- Bridge deconstruction materials: transport materials between 10 a.m. and 3 p.m. or between 7 p.m. and 11 p.m. to avoid the rush hour and nighttime;
- Transport materials only on business days (Monday to Friday) and avoid holidays;
- Limit the duration of closures on Boulevard René-Lévesque under the Existing Champlain Bridge during deconstruction and limit the closures to nights and weekends. During these closures, limit the transportation of bridge deconstruction materials;

- Limit the duration of closures on Highway 132 under the Existing Champlain Bridge during deconstruction and limit the closures to nights and weekends. During these closures, limit the transportation of bridge deconstruction materials;
- Use flaggers to manage truck traffic at work sites;
- Reduce speed around the work area;
- Use the routes with the least impact shown on Figure 53 (blue route), Figure 54 (yellow route), Figure 55 (red route) and Figure (yellow route), except in special cases.

8.14.3.2 During the work

The same measures will continue or will be put in place during construction. A Good Neighbourhood Committee will be set up to monitor the effectiveness of the mitigation measures.

9 PROJECT BENEFITS FOR THE COMMUNITY AND JCCBI'S COMMITMENTS

9.1 MATERIALS RECLAMATION

In the draft version of the *2019-2022 Federal Sustainable Development Strategy* (ECCC, 2018), one of the targets of the second goal of *Government greening* is to divert by 2030 at least 90% by weight of the construction and demolition waste from federal government projects. JCCBI is adopting the above target for the deconstruction of the Existing Champlain Bridge.

JCCBI's intention regarding the diversion of construction waste involves the recovery of materials in the following order:

- Maintain certain bridge components in place, such as certain piers or portions of piers (in relation to the development of assets covered in Section 9.2);
- Maximize opportunities for integrating components of the Existing Champlain Bridge in artistic, cultural, research or infrastructure projects (reuse);
- Reclamation of materials through local recycling;
- Reclamation of materials through non-local recycling;
- Recovery of materials as part of daily recovery at engineering landfill sites (ELS);
- Disposal at an ELS.

This order is part of a logical process of GHG emission reduction by limiting the transformation and transportation of part of the construction debris.

It is estimated that the project will mainly generate the following waste:

- Concrete: 250,000 tonnes;
- Steel: 25,000 tonnes;
- Asphalt: 12,000 tonnes.

In addition, approximately 450,800 tonnes of material will be required for the construction of the three temporary jetties.

Summary studies conducted in this respect suggest that almost all of the above waste can be recycled in Montreal, and that the 90% diversion target by weight toward recycling can be attained. This diversion of materials from landfill sites is a major collective benefit by minimizing pressure on existing sites and thus deferring the need to expand the latter or open new ones.

JCCBI intends to first offer certain bridge components to organizations that may use them for purposes of research, public or private infrastructure project, or artistic projects. Following targeted calls for interest, JCCBI intends to identify the components to be removed during the deconstruction work in order to temporarily store them. The final reuse of these components will be determined by way of open competition (e.g. research centres, artists, municipalities, private contractors). The proponents of the selected projects would then take delivery of the components at the temporary storage site.

Another form of material recovery would be to keep certain bridge components in place as a historical reminder or to be transformed for new uses. This form of recovery is covered in the next section on asset development.

9.2 ASSET DEVELOPMENT (HÉRITAGE CHAMPLAIN)

The term "asset development" refers to the enhancement and development of vacant spaces resulting from the deconstruction of the Existing Champlain Bridge. It also covers the various options for keeping bridge components in place as a historical reminder or to be transformed for new public uses.

The principles guiding JCCBI for asset development are taken from the following goals and targets in the draft version of the *2019-2022 Federal Sustainable Development Strategy* (ECCC, 2018):

- Greening government:
    - Waste management (diversion of 90% of construction waste).
- Pristine lakes and rivers:
    - St. Lawrence Action Plan 2011–2026 (biodiversity conservation).
- Healthy wildlife population:
    - Protection of priority species and migratory birds.
- Connecting Canadians with nature:
    - Encouraging contact with nature.

Although the asset development project as such will be separate from the Existing Champlain Bridge deconstruction project, a close link is maintained between the two projects so that some components to be maintained for enhancement purposes are not demolished. For instance, note that some pier sections will be kept in place, as mentioned in Chapter 2 of Volume 1.

The public consultation process described in Chapter 4 helped specify the type of structures to make sure they are harmoniously integrated into adjacent structures and uses. This initiative will create tangible benefits for neighbouring communities and the population in general by opening up new public spaces that are well integrated into the environment.

9.3 ENVISION CERTIFICATION

To have environmental protection efforts recognized by an independent third party as well as ensure economic and social benefits for communities, JCCBI intends to submit the Existing Champlain Bridge deconstruction project to the Envision sustainable development certification protocol. This protocol is particularly well suited to major infrastructure projects, as shown by the platinum certification awarded to the New Champlain Bridge, but its application to a deconstruction project is a first. By aiming for such certification, JCCBI intends to objectively demonstrate the "sustainable" results of its Existing Champlain Bridge deconstruction project.

9.4 RESEARCH AND DEVELOPMENT

PJCCI wishes to take advantage of the Champlain Bridge's deconstruction phase to conduct an R&D project focused on specific elements of the Existing Champlain Bridge. As part of this initiative, PJCCI plans to allow access to certain bridge components to research entities for use in research projects with a direct impact on JCCBI's structures in order to increase their durability. These research projects will also benefit Canada's infrastructure community.

The research and development program would provide an opportunity to conduct experimental studies on actual-scale concrete and steel components that have already been exposed to real-life conditions and typical operations in a northern climate. This will therefore enable to analyze several deterioration and durability issues affecting infrastructures in general, and JCCBI's in particular. Lastly, a range of innovative strengthening and rehabilitation techniques implemented in the Existing Champlain Bridge's components will also be analyzed as part of these research projects.

10 DFO AND TC CONSULTATIONS

The following federal authorities commented on this targeted environmental analysis report:

- Fisheries and Oceans Canada;
- Transport Canada.

Analyse environnementale ciblée

Les Ponts Jacques Cartier et Champlain incorporé, Pêches et Océans Canada et Transports Canada considèrent que le projet de la déconstruction du pont Champlain d'origine n'est pas susceptible d'entrainer des effets environnementaux négatifs importants compte tenu des mesures d'atténuation proposées dans l'AEC.

Pêches et Océans Canada

Simon Trépanier
Gestionnaire int.
Programme de protection du poisson et de son habitat, Examens réglementaires

Transports Canada

Paryse Turgeon
Gestionnaire régionale
Affaires environnementales et autochtones,
Transports Canada

Ponts Jacques Cartier et Champlain inc.

Philippe Larouche
Chargé de l'environnement

Dominic Blouin
Directeur de projet

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