GNL QUÉBEC

Énergie Saguenay Project: Natural Gas Liquefaction Complex in Saguenay

Project Description – Summary

ÉNERGIE SAGUENAY

November 2015

TABLE OF CONTENTS

TABLES

FIGURES

MAPS

PHOTOS

KEY COLLABORATORS

GNL Québec Inc.

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WSP Canada Inc.

Martin Larose	Project Director
Hélène Desnoyers	Project Manager
Martin Anctil	Project Description
Louise Grimard	Human Environment
Julie Malouin	Biological Environment
Paul-André Biron	Mapping
Jean-Frédérick Duquette	3D Simulations
Nancy Laurent	Editing

ABREVIATIONS AND ACRONYMS

ABCA	Aquatic Bird Concentration Area
AONQ	Atlas des oiseaux nicheurs du Québec (Atlas of Quebec Breeding Birds)
APCI	Air Product and Chemicals Inc.
AQI	Air Quality Index
bcf	Billion cubic feet
C2-C4	Ethane, Propane, Butane
C5+	Pentane and heavier hydrocarbons
^{o}C	Degree Celsius
CCFRS	Compagnie de chemin de fer Roberval-Saguenay (Roberval-Saguenay Railroad Company)
CEAA	Canadian Environmental Assessment Agency
CIBRO	Centre d'interprétation des battures et de réhabilitation des oiseaux (Shoreline and Bird Rehabilitation Interpretation Centre)
CLD	Centre local de développement (Local Development Center)
CPQMCI	Conseil provincial du Québec des métiers de la construction-International (Quebec Provincial Council of Construction Trades – International)
CSD	Centrale des syndicats démocratiques (Association of Democratic Unions)
CSN	Confédération des syndicats nationaux (Confederation of National Unions)
CO	Carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CO_2	Sulfur dioxide
d	Day
dBA	A-weighted decibel
DFO	Department of Fisheries and Oceans Canada
DPI	Développement Piekuakami Ilnuatsh (Piekuakami Ilnuatsh Development)
EIA	Environmental Impact Assessment
EPOG	Entente de principe d'ordre général (Agreement-in-principle of general nature)
FTQ	Fédération des travailleurs du Québec (Quebec Labor Federation)
GHG	Greenhouse Gas
GREB	Groupe de recherche des battures (Shoreline Research Group)
GTG	Gas turbogenerator
ha	Hectare
H_2S	Hydrogen sulfide
IBA	Impact and Benefit Agreement
kl	Kilolitre
LEMV	*Loi sur les espèces menacées ou vulnérables* (Quebec Act Respecting Vulnerable or Threatened Species)
LNG	Liquefied natural Gas

LPTAA	*Loi sur la protection du territoire et des activités agricoles* (Quebec Act respecting the Preservation of Agricultural Land and Agricultural Activities)
LQE	*Loi sur la qualité de l'environnement* (Quebec Environment Quality Act)
MDDEFP	Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (Quebec Department of Sustainable Development, Environment, Wildlife and Parks)
MDDELCC	Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (Quebec Department of Sustainable Development, Environment, and Fight Against Climate Change)
MERN	Ministère de l'Énergie et des Ressources naturelles du Québec (Quebec Department of Energy and Natural Resources)
MFFP	Ministère de la Forêt, de la Faune et des Parcs du Québec (Quebec Department of Forests, Wildlife, and Parks)
Mm^3	Million cubic meters
MOF	Materials offloading facility
NPRI	National Pollutant Release Inventory
Mtpa	Million of tonnes per year
MW	Megawatt
NO_x	Nitrous oxide
NEB	National Energy Board
NRCan	Natural Resources Canada
RCM	Regional County Municipalities
RTA	Rio Tinto Alcan
SDÉI	Société de développement économique ilnu (Ilnu Economic Development Corporation)
SÉPAQ	Société des établissements de plein air du Québec (Corporation of Quebec Outdoor Establishments)
SPA	Saguenay Port Authority
SQC	Syndicat québécois de la construction (Quebec Construction Union)
t	Ton
TNO	Territoire non organisé (Unorganized Territory)
SO_x	Sulfur oxides
UPA	Union des producteurs agricoles (Union of Agricultural Producers)
VSC	Valued Social Component
VEC	Valued Environmental Component
VOC	Volatile organic compounds

1 GENERAL AND CONTACT INFORMATION

1.1 DESIGNATED PROJECT AND PROPOSED SITE

GNL Québec Inc. (GNL Québec) is developing the Énergie Saguenay Project (hereinafter "the Project"), which involves the construction and the operation of a natural gas liquefaction complex mainly for export purposes (hereinafter "the Complex") in the vicinity of the Grande-Anse marine terminal facilities (Port Saguenay) managed by the Saguenay Port Authority (SPA) in the District of La Baie, Saguenay City, Quebec, Canada (Figure 1-1).

Figure 1-1: Project Site

The Complex will have a liquefied natural gas (LNG) production capacity of 11 million tons per annum (Mtpa). A new gas pipeline, approximately 650 km long, will be built by a third party to supply the project site from Eastern Ontario. The LNG will be mainly exported to global markets showing significant demand growth, including Europe, Asia, the Middle East and South America.

The Complex will comprise natural gas liquefaction trains and LNG storage tanks. Marine facilities to load LNG onto vessels will also be necessary for the project. The project investment is estimated at 7.5 billion dollars (Canadian).

The Complex will be powered by hydroelectricity, including the liquefaction trains, thus allowing for significantly lower greenhouse gas (GHG) emissions than those of most existing similar-size LNG facilities worldwide.

1.2 PROPONENT INFORMATION

1.2.1 Designated Project Title

Project title: Énergie Saguenay Project: Natural Gas Liquefaction Complex in Saguenay.

1.2.2 Proponent's Name and Contact Information

The project proponent, GNL Québec Inc. (hereinafter GNL Québec), is an incorporated company in Quebec owned by Ruby River Capital LLC incorporated in the United States, whose main partners are Freestone International LLC and Breyer Capital LLC. The shareholders have substantial international experience in the field of LNG plant design, development, construction, and operations, as well as significant knowledge of the global natural gas market, along with solid financing expertise of such infrastructure projects.

1.2.3 Proponent's Address

GNL Québec is headquartered at:

345, rue des Saguenéens, bureau 210
Chicoutimi (Québec)
G7H 6K9

1.2.4 Head Officer

Mr. Michel G. Gagnon, President, GNL Québec Inc.
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Phone: 418 973-5868 ext. 203

1.2.5 Primary Contact

Mrs. Lise Castonguay, Director, Environment and Community
Email: lcastonguay@gnlquebec.com
Phone: 418 973-5868 ext. 201

1.3 ORGANIZATIONS AND OTHER STAKEHOLDERS

1.3.1 Consultations to Date

GNL Québec presented its project on June 19-20, 2014 in the City of Saguenay. Since September 2014, more than 25 meetings have been held with regional stakeholders included within the local and extended project study areas (see Section 4). The meetings reached out to over 150 people.

Stakeholder representatives who have been met or contacted to date include:

- Federal and Provincial Governments;
- City of Saguenay, which also has the status of a RCM;
- Fjord-du-Saguenay RCM and its municipalities;
- Residents and vacationers in the vicinity of the project site;
- First Nations (Mashteuiatsh, Essipit and Pessamit);
- Environmental groups;
- Socio-economic groups;
- Tourism groups, including Parc national du Fjord-du-Saguenay;

- SPA Board of Directors, employees and subcontractors;
- Training organizations and educational institutions;
- Youth groups;
- Fire department;
- Saguenay–Lac-Saint-Jean Health and Social Services agency;
- Union des producteurs agricoles (UPA);
- Corporation des pilotes du Bas-Saint-Laurent.

Representatives from the Canadian Environmental Assessment Agency (CEAA) and the ministère québécois du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) (Quebec Department of Sustainable Development, Environment and Fight against Climate Change), Direction des évaluations environnementales des projets industriels et hydriques (Directorate responsible for environmental assessment of industrial and water-related projects) were also met. Several meetings have also been held with business partners and organizations at the national level.

1.3.2 Future Consultations

Throughout the project authorization process, GNL Québec will hold various public consultations with local communities and other stakeholders, as well as regional decision-making bodies. The company will also hold further consultations with First Nations. These meetings will help GNL Québec gather baseline data for the project's environmental assessment, develop a better understanding of community interests and concerns to consider, develop mitigation strategies, and identify opportunities to maximize local and regional economic benefits associated with the project.

1.4 REGULATORY REQUIREMENTS FOR ENVIRONMENTAL ASSESSMENTS

1.4.1 Federal Requirements

In accordance with the Schedule of the *Regulations Designating Physical Activities* of the *Canadian Environmental Assessment Act (2012)* (CEAA 2012), the Project is subject to federal environmental assessment. The environmental assessment triggers are summarized in Table 1-1 below.

1.4.2 Provincial Requirements

Division IV.1 of the Environment Quality Act (*Loi sur la qualité de l'environnement* (LQE) (L.R.Q., c. Q-2)) requires that all individuals and groups follow the Environmental Impact Assessment and Review Procedure (*Procédure d'évaluation et d'examen des impacts sur l'environnement*) prior to undertaking a project covered by the Regulation respecting Environmental Impact Assessment and Review (*Règlement sur l'évaluation et l'examen des impacts sur l'environnement* (R.R.Q., c. Q-2, r.9)).

As summarized in Table 1-1, the Project is subject to the regulatory requirements of this procedure, which involves an environmental impact assessment in accordance with Paragraphs 2 d), 2 j) and 2 s) of the Environmental Impact Assessment (EIA).

This procedure is administrated by the Environmental Assessment Directorate (*Direction des évaluations environnementales*) of the MDDELCC. Submission of project notice with this department is the first step of the procedure to obtain the specific guidelines regarding the nature, scope and extent of the EIA.

Table 1-1: Summary of the environmental assessment triggers at both the provincial and federal levels

Énergie Saguenay Triggers	Regulations Designating Physical Activities (CEAA 2012)	Environment Quality Act (*Loi sur la qualité de l'environnement* (LQE))
Construction of two or three natural gas liquefaction trains with a total yearly LNG production capacity of 11 million tons (30,137 tons LNG/day). Construction of two or three LNG storage tanks each with a maximum capacity of 200,000 m^3, for a maximum on-site storage capacity of 480,000 m^3.	4 *d)* The construction, operation, decommissioning and abandonment of a new facility for the liquefaction, storage or regasification of liquefied natural gas, with a liquefied natural gas processing capacity of 3,000 t/day or more or a liquefied natural gas storage capacity of 55,000 t or more.	*2 j)* the construction of installations for natural gas gasification or liquefaction and the construction of more than 2 km of oil pipeline in a new right-of-way, except conduits for transporting petroleum products under a municipal street; *2 s)* the establishment of one or more reservoirs with a total storage capacity of over 10,000 kl intended to hold a liquid or gaseous substance other than water, food or liquid waste from a livestock operation not referred to in subparagraph o.
Construction of a port facility for mooring and loading a Q-Flex vessel whose capacity will reach 210,000 m^3 (approximately 90,000 t of LNG).	24 *c)* The construction, operation, decommissioning and abandonment of a new marine terminal designed to handle ships larger than 25,000 DWT unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation.	*2 d*) the construction or enlargement of a port or wharf, or a modification in the use of a port or wharf, except in the case of a port or wharf intended for fewer than 100 pleasure or fishing craft.

***

Following the EIA, and receipt of the Ministers' Cabinet order-in-council and Federal Government authorization under the CEAA, applications relating to licences, authorizations, approvals, attestations and leases required by federal and provincial authorities (including municipalities and RCMs) can be submitted (Section 1.5).

1.5 OTHER LEGAL AND/OR REGULATORY REQUIREMENTS

Specific licences and/or authorizations may be necessary for the construction and operation of the Project, in compliance with other federal laws and regulations. The list below is not exhaustive:

Federal Legislation

- Fisheries and Oceans Canada (DFO) must issue authorization under Section 35(2) of the *Fisheries Act* (RSC 1985, c. F-14) if the project has an impact on fish habitats.
- *Species at Risk Act* (SC 2002, c 29).
- *Migratory Birds Convention Act, 1994* (SC 1994, c 22): To comply with this law, any work that could potentially disrupt migrating birds must be done outside nesting periods.
- Transport Canada (TC) should issue authorization under section 5 (1) of the *Navigation Protection Act* (RSC 1985, c. N-22) pertaining to the construction of a wharf along the Saguenay River.
- Natural Resources Canada (NRCan) should issue a licence under section 7 (1) of the Explosives Act (RSC 1985, c. E-17), as explosives will likely be used during Project construction and, therefore, stored on site.
- *Canadian Environmental Protection Act (1999)* (SC 1999, c 33): Mandatory yearly report to the National Pollutant Release Inventory (NPRI) following project completion:
  - *Environmental Emergency Regulations:* authorization is required for storage and handling of chemical products used in operations.
- *Hazardous Products Act* (RSC 1985, c H-3).

- *Canada Transportation Act* (SC 1996, c 10);
- *Transportation of Dangerous Goods Act, 1992* (SC 1992, c 34): A new or residual dangerous goods (explosives, chemical products, etc.) transportation licence may be required.
- *Saguenay-St. Lawrence Marine Park Act* (SC 1997, c 37):
  - *Marine Activities in the Saguenay-St. Lawrence Marine Park Regulations*.

Other licences and authorizations may be required, in addition to CEAA authorization, such as National Energy Board (NEB) authorization for natural gas exports from Canada (*Natural Gas Export Licence under Part VI of the National Energy Board Act, 1985 CN-7 (the "NEB Act") and Regulations made under section 119.01 of that Act*). GNL Québec submitted its application for a natural gas export licence to the NEB on October 27, 2014. The NEB has approved the export licence on August 27, 2015.

As per the CEAA, there is no regional environmental study as defined in Section 73.1 of the CEAA (2012).

Provincial Legislation

At the provincial level, compliance with at least the following laws, regulations and policies could be required:

- *Environment Quality Act* (CQLR, c. Q-2)):
  - Section 22 (project authorization);
  - Section 32 (water management);
  - Section 48 (atmospheric emissions control).
  - *Regulation respecting the Application of the Environment Quality Act* (CQLR c Q-2, r 3);
  - *Regulation respecting Solid Waste* (CQLR, c Q-2, r 13);
  - *Regulation respecting Hazardous Materials* (CQLR, c Q-2, r 32);
  - *Regulation respecting Industrial Depollution Attestations* (CQLR, c Q-2, r 5);
  - *Regulation respecting a Cap-and Trade System for Greenhouse Gas Emission Allowances* (CQLR, c Q-2, r 46.1);
  - *Regulation respecting the Quality of the Atmosphere* (CQLR, c Q-2, r 38);
  - *Groundwater Catchment Regulation* (CQLR, c Q-2, r 6);
  - *Regulation respecting the Quality of Drinking Water* (CQLR, c Q-2, r 40).
- *Act respecting Threatened or Vulnerable Species* (CQLR, c E-12.01).
- *Act respecting Occupational Health and Safety* (CQLR, c S-2.1):
  - *Regulation respecting Occupational Health and Safety* (CQLR, c S-2.1, r 13).
- *Act respecting Conservation and Development of Wildlife* (CQLR, c C-61.1):
  - Regulation respecting Wildlife Habitats (CQLR, c C-61.1, r 18).
- *Act respecting Conservation and Development of Wildlife Act* (CQLR, c E-12.01):
  - *Regulation respecting Threatened or Vulnerable Wildlife Species and Their Habitats* (CQLR, c E-12.01, r 2).
- *Act respecting Compensation Measures for the Carrying-out of Projects Affecting Wetlands or Bodies of Water* (CQLR, c M-11.4).
- *Act respecting Explosives* (CQLR, c E-22).
- *Petroleum Products Act* (CQLR, c P-30.01):
  - *Regulation on Petroleum Products* (CQLR, c P-30.01, r 1).
- *Watercourses Act* (CQLR, c R-13).

- *Cultural Heritage Act* (CQLR, c P-9.002).
- *Act respecting Land Use Planning and Development* (CQLR, c A-19.1).
- *Building Act* (CQLR, c B-1.1).
- Policy for the Protection of Lakeshores, Riverbanks, Littoral Zones, and Floodplains (CQLR, c Q-2, r 35).
- Policy for Soil Protection and Contaminated Sites Rehabilitation.

Regional and Municipal Regulations

Regional and municipal licences are also required:

- Notification of compliance with the Planning and Development Scheme and the Urban Plan of the City of Saguenay.

Other

Project implementation will require SPA authorization, as defined in Section 67 of the CEAA (2012).

1.6 ENVIRONMENTAL STUDIES, CONDUCTED OR ONGOING FOR OTHER REGIONAL PROJECTS

A number of environmental studies have already been conducted, initiated then stopped, or are underway in the immediate area of the project. These studies will be used for assessing the cumulative effects of the project. Some of these are listed below:

Authorized Projects

- Authorization Certificate 7610-02-01-0700802 400464894 for the construction of the 60,000 t/year AP60 pilot plant at the Jonquière Complex within the City of Saguenay territory.
- Decree 473-2006 regarding the issuance of an authorization certificate to Alcan Primary Metal Group, Alcan Inc. Division, for the construction of a Spent Potlining Treatment Plant within the City of Saguenay territory.
- Decree 915-2008 regarding the issuance of an authorization certificate to Rio Tinto Alcan Inc. for the Shipshaw Powerhouse optimization project within the City of Saguenay territory.
- Decree 976-2009 amending Decree 1930-89 of December 13, 1989, regarding the issuance of an authorization certificate for the construction of a railroad to the Laterrière aluminum smelter, Chicoutimi District.
- Decree 946-2011 regarding the issuance of an authorization certificate to Rio Tinto Alcan Inc. for the construction of the Jonquière Complex AP60 Smelter within the City of Saguenay territory.

Projects submitted for review to the *Bureau d'audiences publiques sur l'environnement* (BAPE) (Office of public hearings relative to the environment)

- Lac à Paul apatite mine project, by Arianne Phosphate.
- Route 172 improvement project, km 38 to km 40, within the Fjord-du-Saguenay RCM.
- Biodiversity reserves in nine areas and one aquatic reserve for one area within the Saguenay–Lac-Saint-Jean Administrative Region.
- Railroad service for the Grande-Anse Terminal in Saguenay.
- Rivière-du-Moulin Windfarm in the Charlevoix—Fjord-du-Saguenay RCM.
- Additional turbine added to the Shipshaw Powerhouse.
- Construction of the RTA Spent Potlining Treatment Plant.
- Construction of the Jonquière Complex AP60 Smelter within the City of Saguenay territory.

Projects submitted to the CEAA: Canadian Environmental Assessment Registry

- SPA marine terminal project on the north shore of the Saguenay River: Registry reference no. 80103 (status: in progress).
- Niobec mine expansion project in Saint-Honoré: Registry Reference No. 80011 (status: in progress).
- Installation of a LNG import terminal in Saguenay: “Projet Grande-Anse”: Registry Reference No. 05-03-16553 (status: environmental assessment stopped in May 2012).
- Côte-Nord/Saguenay–Sept-Îles gas pipeline extension: Registry Reference No. 80016 (**status:** environmental assessment stopped).

1.7 BASIC REGIONAL INFORMATION

Many documents of regional scope will be consulted within the EIA for the description of the project’s environment and to better determine the project’s impacts, including documents pertaining to the Saguenay–Lac-Saint-Jean Territory and Natural Resource Commission (*Commission sur les ressources naturelles et le territoire du Saguenay–Lac-Saint-Jean* (CRRNT)) and the Planning and Development Schemes of the City of Saguenay and the Fjord-du-Saguenay RCM.

2 PROJECT INFORMATION

2.1 BACKGROUND INFORMATION

The North American natural gas market has experienced a dramatic shift in recent years. North American gas supply now exceeds forecasts for both near and long-term demand. Notably, long standing historical exports of Canadian natural gas to the Northeastern United States have fallen sharply and are expected to continue to decline due to much increased production capacity south of the border together with a plan to export natural gas to Mexico and even to Canada. Gas pipelines that have historically flowed large volumes of gas sourced in Western Canada into the United States are now considering reversing flows to provide means to deliver additional gas volumes from the United States into the northern markets. Natural gas from Western Canada, that once flowed into the United States is saturating the Canadian market and creating natural gas surpluses. At the same time, Canadian natural gas production capacity is increasing, thus lowering North American natural gas prices and raising interest in exporting natural gas to global markets.

In parallel with the sharp increase in gas supply in North America, global demand for natural gas is expected to continue to increase due to the replacement of more polluting fossil fuels such as coal an doil, economic growth in emerging countries, reduction in the use of nuclear power in some countries, and the search for energy supply diversification and stability in other countries. Based on current estimates, global LNG demand could double over the next 20 years, thus favorably placing Canada as a stable source of natural gas, in liquefied form, for global markets in Europe, Asia, the Middle East and South America. In that respect, the existing natural gas pipeline network from Western Canada to Eastern Ontario can become an asset for exporting excess Canadian natural gas from Easter Canada to global markets.

2.2 OBJECTIVES

The main objective of the project is the liquefaction of natural gas to allow its economical and safe transportation to global markets. Indeed, when natural gas is cooled to about -162°C, it liquefies and can be stored at atmospheric pressure. LNG then takes up only 1/600th of the initial volume of natural gas which enables the economical transportation of the gas over long distances in vessels designed to meet and/or exceed recognized and stringent international safety standards. Once delivered, LNG can be re-heated and returned to its original gaseous form for distribution to residential, commercial and industrial customers. The Project will have a natural gas liquefaction capacity of about 1.56 Bcf/d, or 44 million cubic meters per day (Mm^3/d), for a yearly production capacity of 11 Mtpa.

2.3 GENERAL DESCRIPTION OF THE PROJECT

The base material, i.e. natural gas, will likely come from Western Canada and be transported to Eastern Ontario via the existing pipeline network. Throughout the entire project life, other sources of Canadian natural gas that have not yet been developed may also be used for project purposes. A new gas pipeline about 650 km in length and 91.4 cm or 106.7 cm in diameter (36 or 42 in.) will be built and operated by a third party in order to connect the existing pipeline network to the project site.

Figure 2-1 illustrates the natural gas liquefaction complex project in the natural gas supply chain to LNG export markets. Gas field exploitation, natural gas transportation to the Énergie Saguenay Project site, and marine transportation will be under the responsibility of third parties in these respective areas.

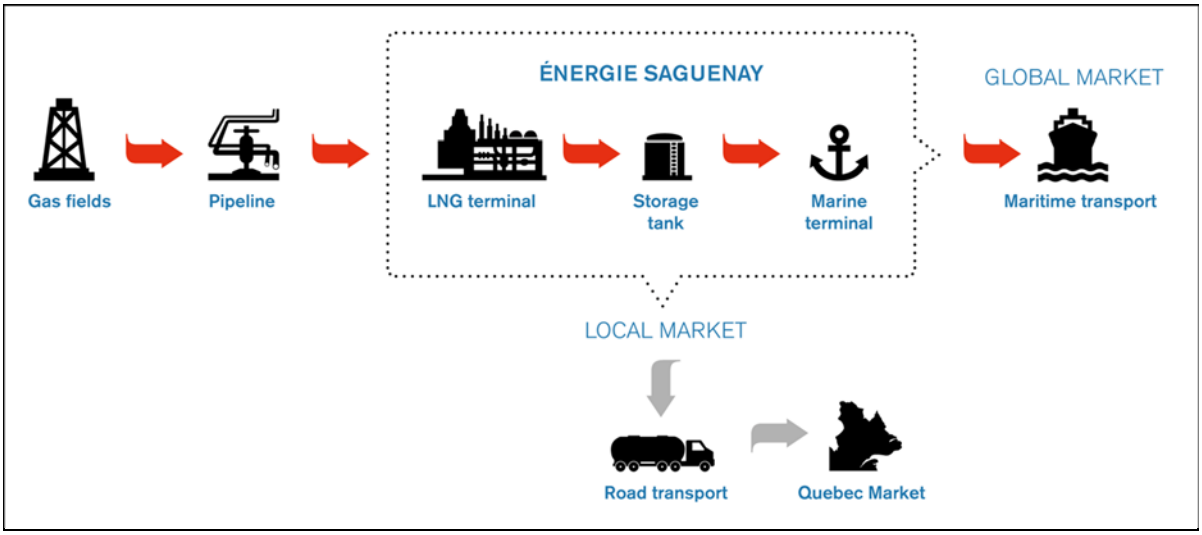


Figure 2-1: Énergie Saguenay Project in the Natural Gas Supply Chain to LNG Export Markets

However, the project impact assessment will take into account marine transportation on Saguenay and St. Lawrence waterways, including the piloting change point at Les Escoumins as well as the route used by the vessels on the Saguenay and St. Lawrence waterways for the sole purpose of picking up LNG from GNL Québec's port facilities (see Project's extended study area in Section 4). The marine transportation will also be subject to a TERMPOL review process with Transports Canada. Three to four vessels per week are expected, depending on their holding capacity, which represents about 320 trips per year (160 round trips).

The Project involves the construction and operation of a natural gas liquefaction complex on a land owned by the SPA.

Based on preliminary studies, the Project will be built on part of 4 012 404 and 4 012 405 lots of the Quebec Cadaster, in the district of La Baie of the City of Saguenay. The approximate project coordinates are: 70° 48' 5.98" W longitude and 48° 23' 40.26" N latitude.

GNL Québec has entered into an option agreement for land, part of which is owned by the SPA (lot 4 012 404, Letters Patent of SPA, Schedule C) and part of which is located on federal lands whose management was assigned to SPA, on lots 4 012 414 and 4 012 415 (Letters Patent of SPA, Schedule B). SPA has acquired lot 4 012 405 in 2015. Once the surveys have determined the exact location of the liquefaction complex, the current option agreement between the SPA and GNL Québec will be revised in order to reflect the location under study for the Project (Map 2-1).

The Project, as shown in Figure 2-2, will include the following major components, illustrated in Figure 2-3:

- Processing facilities (**natural gas liquefaction facilities**) including natural gas inlet station and treatment equipment, two or three liquefaction trains, two or three LNG storage tanks, and refrigerant tanks, boil-off and end-flash gas management systems, including flares, as well as utility systems, such as demineralized water, nitrogen and compressed air supply systems, and an oil heater for process heating needs.
- Port infrastructures ("**wharf**") on the south shore of the Saguenay River, including a jetty, a platform, and a berthing dock for LNG vessels. The wharf will be built to ensure a water depth of 15 meters, at low tide, to accommodate LNG vessels. The platform will support the LNG cryogenic pipes and loading arms, and vapour return pipes to the land-based facilities.
- **Support infrastructures and facilities**, such as service and control buildings, an electric substation, an emergency generator, a water supply system, an effluent collection and treatment system, a waste collection system, and access roads to the site.

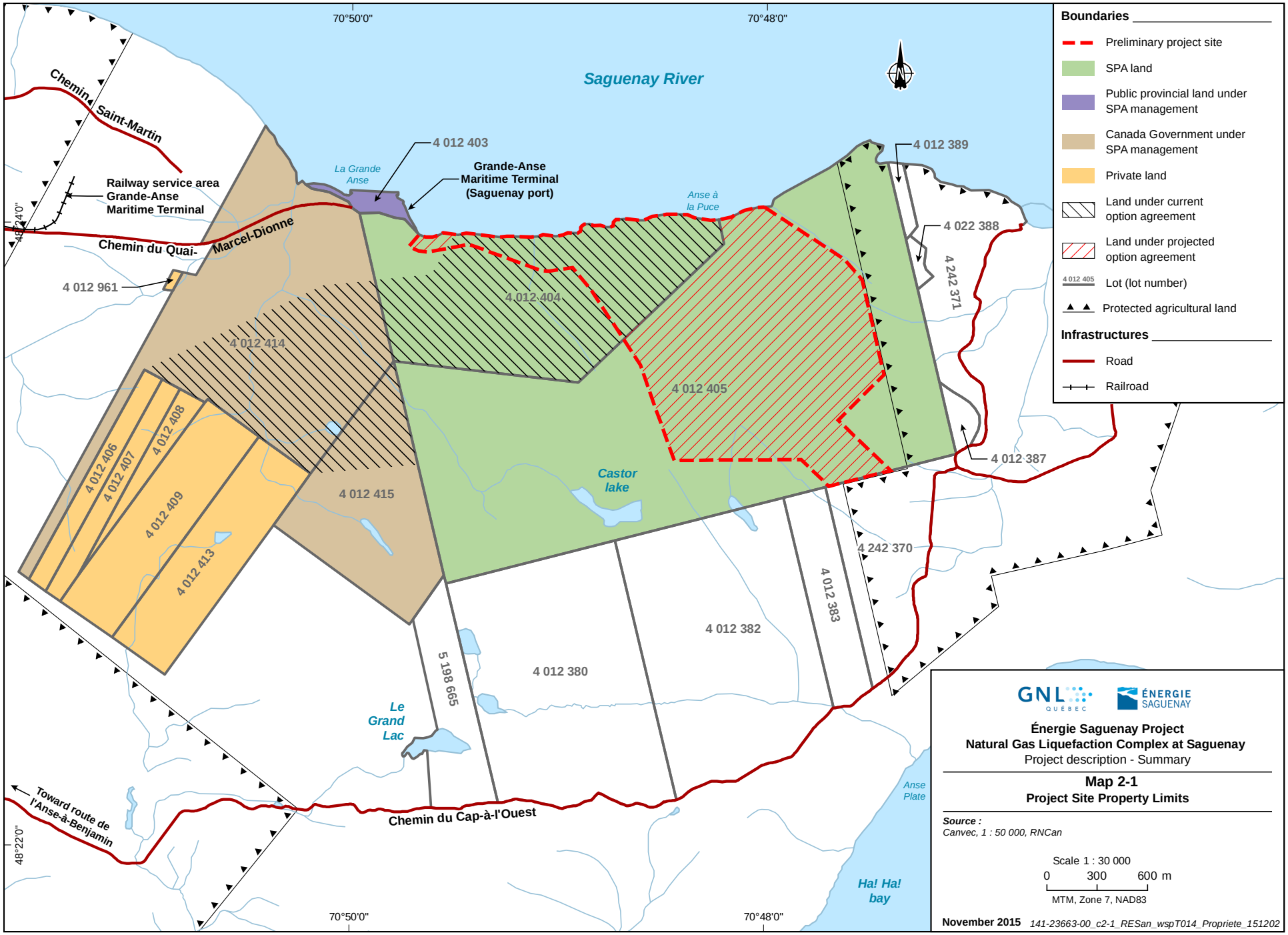

70°50'0"
70°48'0"
48°24'0"
48°22'0"
Saguenay River
Chemin Saint-Martin
Railway service area
Grande-Anse
Maritime Terminal
Chemin du Quai-Marcel-Dionne
La Grande Anse
Grande-Anse
Maritime Terminal
(Saguenay port)
Anse à la Puce
4 012 403
4 012 389
4 022 388
4 242 371
4 012 961
4 012 404
4 012 414
4 012 405
4 012 387
4 012 406
4 012 407
4 012 408
4 012 409
4 012 413
4 012 415
Castor lake
4 242 370
4 012 383
4 012 382
4 012 380
5 198 665
Le Grand Lac
Anse Plate
Ha! Ha! bay
Toward route de l'Anse-à-Benjamin
Chemin du Cap-à-l'Ouest
Boundaries
Preliminary project site
SPA land
Public provincial land under SPA management
Canada Government under SPA management
Private land
Land under current option agreement
Land under projected option agreement
4 012 405
Lot (lot number)
Protected agricultural land
Infrastructures
Road
Railroad
GNL QUÉBEC
ÉNERGIE SAGUENAY
Énergie Saguenay Project
Natural Gas Liquefaction Complex at Saguenay
Project description - Summary
Map 2-1
Project Site Property Limits
Source :
Canvec, 1 : 50 000, RNCan
Scale 1 : 30 000
0 300 600 m
MTM, Zone 7, NAD83
November 2015
141-23663-00_c2-1_RESan_wspT014_Propriete_151202

Figure 2-2: Computer Generated Image of the Project (Preliminary Layout)

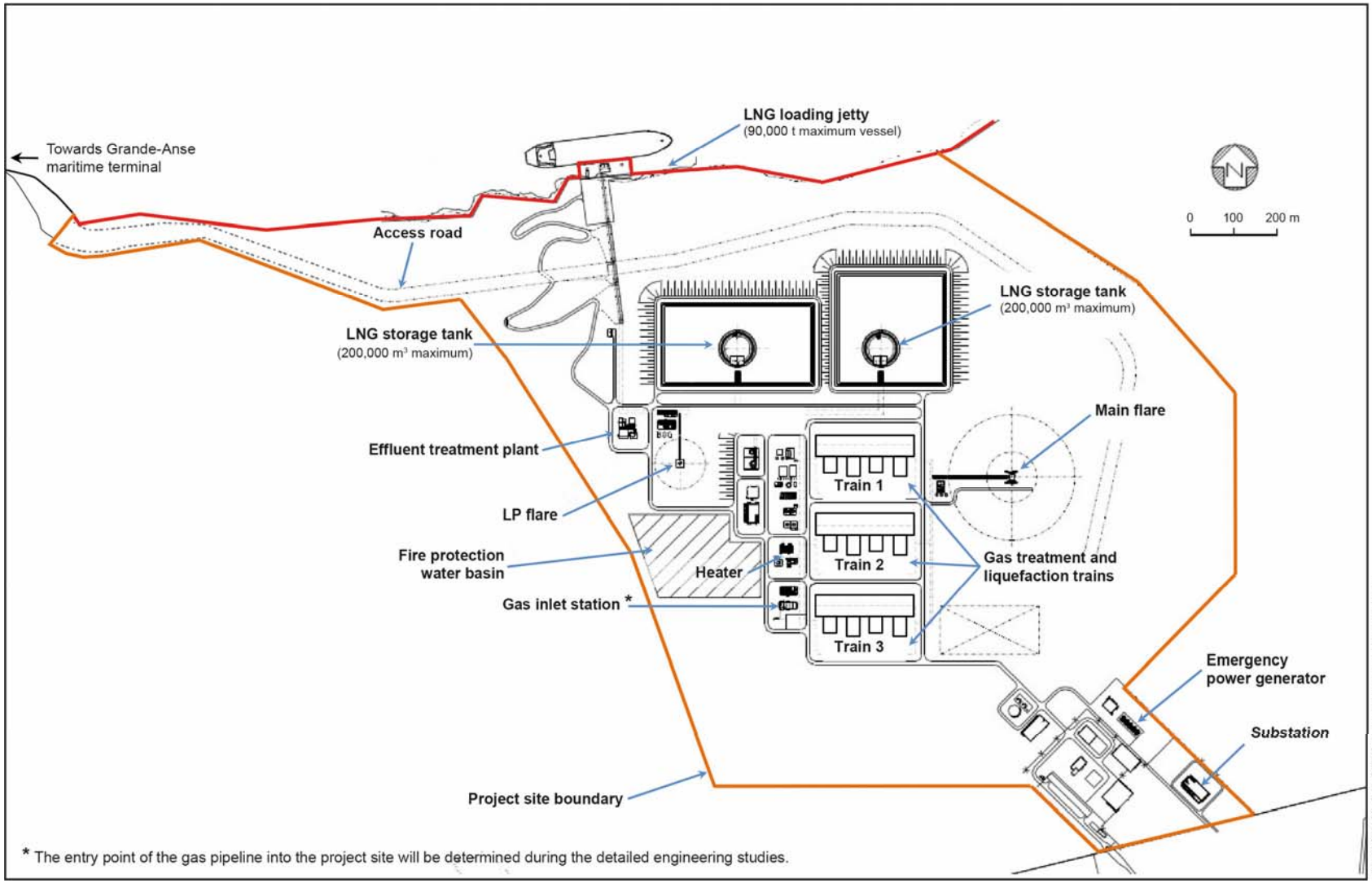


Figure 2-3: Example of the Main Project Components (Option with Three Liquefaction Trains and Two Tanks; Preliminary Layout)

2.4 RELATED PROJECTS AND ACTIVITIES

The GNL Québec Project will include several other related projects and activities, which will be taken into account in the Project's cumulative effects assessment. They are described below.

Gas Pipeline

The Project's gas supply will come from Western Canada, delivered to Eastern Ontario through the existing gas pipeline system. A new, 650 km gas pipeline will have to be built to bring required natural gas volumes from Ontario to the Project site. The pipeline diameter and final route will be confirmed after detailed engineering studies. GNL Québec will enter into commercial agreements with experienced gas pipeline developers/operators who will be the owners responsible for the design, permitting, construction and operation of the new 650 km natural gas pipeline between the existing network and the project site. Prior to the commissioning of the complex, the customers or the owners will have to contract firm, long-term agreements for the provision of sufficient quantities of natural gas.

Power Supply

The proposed liquefaction trains will be powered by hydroelectricity. The estimated 550 MW required to power the proposed terminal will be supplied from the Hydro-Québec hydroelectric grid. Construction of a distribution line from an existing Hydro-Québec sub-station in Saguenay to the Project site will be required. According to preliminary studies, the length of the new transmission line will be about 40 km. Detailed engineering and environmental studies will provide more accurate information on the route this line will take. Hydro-Québec will be responsible for building the transmission line.

Marine Offloading Facility

During construction, various pre-assembled modules and most construction materials will be delivered by ship. It is expected that these will be received at the existing SPA facilities. However, detailed engineering studies are needed to validate the capacity of the existing facilities to receive and temporarily store these materials during construction. Otherwise, modifications to the existing Grande-Anse Terminal or a new marine offloading facility may be needed. The materials offloading facility (MOF) is considered a related project, as this will be under the responsibility of the SPA.

Tugboat Wharf

The berthing of LNG vessels requires powerful tugboats. The tugboats used for commercial ships at the various port facilities in Saguenay are currently berthed at the Rio Tinto Alcan wharf in Baie des Ha! Ha! Detailed navigation studies are required to confirm the type and number of tugboats required for the Project, and their optimal docking location. If these studies determine that tugboats should be docked in the vicinity of the proposed complex, a new dedicated wharf will have to be built and operated by a third party. The type of work required will be defined at a later stage and subject to an agreement between the parties concerned.

2.5 PROJECT COMPONENTS AND ACTIVITIES

2.5.1 Designated Project Components

Table 2-1 lists the permanent components of the Project.

2.5.2 Detailed Process Description

The process comprises two successive steps: natural gas treatment followed by liquefaction. Natural gas treatment consists in eliminating impurities and undesirable trace elements, or reducing them to acceptable levels, as these are undesirable or incompatible with the liquefaction process, either because the can freeze and create blockage in pipes, or because they do not meet equipment operation specifications. The liquefaction process consists in refrigerating the natural gas to about -162°C through a series of refrigeration cycles. The resulting LNG takes up approximately 1/600th of the initial gas volume.

Table 2-1: Permanent Project Components

Components	Permanent Infrastructures
Natural gas supply and liquefaction	Natural gas inlet and compression station. Natural gas treatment equipment/units to remove or reduce to an acceptable level impurities and undesirable trace elements, including acid gas removal, dehydration and mercury removal units. Two or three liquefaction trains with a total production capacity of 11 Mt of LNG per annum (30,137 t/day), including air-cooled heat exchangers and refrigerant compressors with electric driven motors, LNG pipes from the liquefaction trains to the storage tanks. Two or three LNG storage tanks with a maximum individual capacities of 200,000 m^3 and a maximum storage capacity on site of 480,000 m^3. Cryogenic loading lines, boil-off gas return pipes and related pipe racks between LNG storage tanks and the vessel loading dock Infrastructure for the delivery, storage, and handling of refrigerants, including two or three storage tanks with individual capacities of less than 2,000 m^3. Boil-off and end-flash gas management system, including compressors and flares Oil heater for process heating needs Nitrogen and compressed air supply systems Demineralized water supply system for acid gas removal unit Depending on the composition of the natural gas supply and technology choices, the following infrastructures may be integrated to the liquefaction facilities: • Helium recovery system; • Condensates, natural gas liquids (NGL) and heavy hydrocarbon removal and storage systems; • Gas turbogenerator (GTG) • Nitrogen production or recovery unit
Port facilities	Jetty from the Saguenay River shore Platform supporting the necessary equipment for loading LNG onto vessels, including cryogenic loading lines, vapour return lines, LNG loading arms). Mooring, and berthing dolphins for Q-Flex-type LNG vessels with holding capacities up to 217,000 m^3 (about 100,000 t) Interconnected walkways between the platform, jetty and dolphins.
Infrastructures and utilities	Service and control buildings. Maintenance and stockpile areas. Equipment shelters and buildings Electric power supply and distribution systems, including transformers and a sub-station. Industrial wastewater (effluent) and sewer collection, treatment and disposal systems. Runoff water collection and treatment system. Fire extinguishing water system which may include a freshwater pond. Solid waste collection and disposal system. Site access road from the existing road. Roads within the liquefaction complex site, including parking areas. Raw water supply, storage and treatment systems, (industrial, potable and firefighting water). Potential railway interconnection from the existing railroad for the delivery of refrigerants and shipping of certain by-products from the natural gas treatment process. Emergency generator. Site lighting system

Gas Treatment

The natural gas will be supplied at the liquefaction facility at near-ambient temperature and will meet standard pipeline specifications with a typical methane content of about 95%, and low levels of elements that are incompatible with the liquefaction process, such as carbon dioxide (CO_2), water, traces amounts of mercury and, depending on supply sources, hydrogen sulfide (H_2S). To meet LNG production specifications, the natural gas must be treated prior to liquefaction to eliminate these undesirable elements, or reduce their levels within acceptable limits.

The natural gas supplied to the inlet station by pipeline will initially be measured, compressed, and then heated, if necessary, prior to being sent to treatment units.

The natural gas is processed through three steps of treatment before it can be liquefied:

- **Removal of acid gases**: If required depending on natural gas composition, an absorber is used to remove CO_2 and H_2S (acid gases) by putting the natural gas into contact with an amine solution. This is the standard method used in many natural gas treatment and LNG production plants worldwide. The solution containing the absorbed acid gases is subsequently heated to extract the acid gases, which are incinerated prior to being released into the air. The regenerated amine solution can then be recycled and reused in the natural gas treatment circuit.
- **Dehydration**: Natural gas contains certain amounts of water, which must be removed to prevent freezing and formation of hydrates in the heat exchangers of the refrigeration/liquefaction units. The dehydration unit uses molecular sieves to absorb the water. The sieves are periodically heated for regeneration purposes, and the condensed wastewater is treated and reused in the process, or discarded in compliance with regulatory requirements in force.
- **Removal of mercury**: A metal-oxide or sulfur-impregnated carbon catalyst is used to remove any traces of mercury that may be found in the natural gas. Mercury must be controlled and removed to protect the mechanical integrity of aluminum-based equipment in the liquefaction process. Mercury is a hazardous substance and must be handled, transported, treated and discarded in compliance with regulatory requirements in force.

Natural Gas Liquefaction

Once treated, the natural gas is sent to the liquefaction process where it is cooled through heat exchangers, compressors, pressure regulators and valves. Two or three liquefaction trains will be used, each with a refrigerant and air-cooling system.

The natural gas cooling process requires large compressors to compress the refrigerants. This results in increase of refrigerant temperature. The heat from the refrigerants is evacuated through heat exchangers. The refrigerants are then expanded (depressurized), which lowers their temperature. The cooled refrigerants are routed through a series of heat exchangers to absorb heat from the natural gas, thus lowering its temperature. The refrigerants are then recompressed and the cycle repeated.

Depending on the gas composition and the selected technology, a fractionating unit will be used to recover the natural gas liquids (C2-C4: ethane, propane, butane) and condensates (C5+: pentane and heavier hydrocarbons) during the liquefaction process. A helium recovery unit could also be incorporated into the liquefaction circuit. These products will either be reused or stored for future sale.

At the end of the liquefaction process, when the natural gas temperature has dropped to -162°C, it is depressurized. Most of the gas is in liquid form (LNG), but a small portion is still in a vapour state (end-flash gas) and must be separated from the liquid gas. The LNG is stored in insulated tanks at atmospheric pressure, before loading onto vessels.

The end-flash and boil-off gases recovered from tanks and vessel-loading operations are used as fuel for the oil heater and burner pilots, or reused in the liquefaction process. Depending on the selected technology, the end-flash gas could also be used to fuel a turbogenerator which would provide energy for the process. The boil-off and end-flash gas management system includes flares to be used solely in emergency situations or operations in unusual conditions (maintenance, failure, or start-ups).

Two patented liquefaction processes are currently being assessed for the Project: “Propane Pre-Cooled Mixed Refrigerant (C3MR)” process of Air Product and Chemicals Inc. (APCI), and “Optimized Cascade®” process of ConocoPhillips. In both processes, the gas is pre-cooled to about -35°C using propane as refrigerant. In the APCI C3MR process, a mixture of other refrigerants (nitrogen, ethylene, propane and methane) is then used to bring the gas down to liquefaction temperature, of about -162°C, as shown in Figure 2-4. In the ConocoPhillips Optimized Cascade® process, ethylene and methane are used in two stages to reach the liquefaction temperature (Figure 2-5).

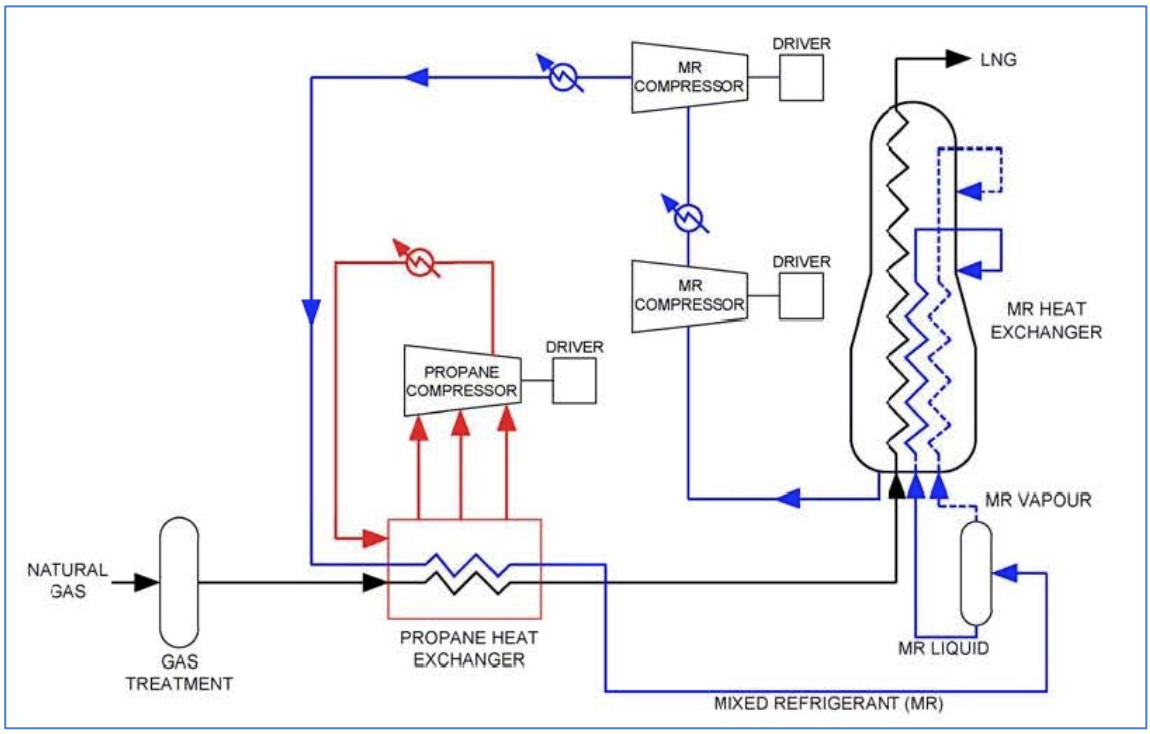


Figure 2-4: APCI C3MR Process Diagram

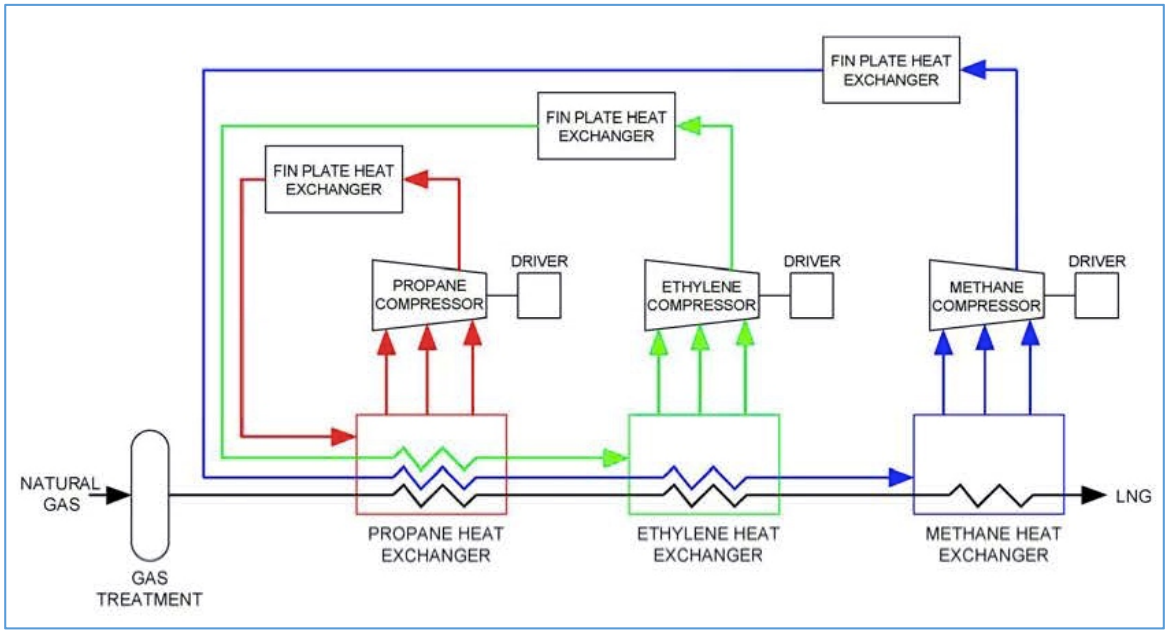


Figure 2-5: ConocoPhillips Optimized Cascade® Process Diagram

2.5.3 Water Usage

The source of water supply for the liquefaction complex and the volumes required for the different needs will be determined in the engineering studies.

The supply system will provide water for the entire site, including the wharf. The main water uses are as follows:

- Potable water for human consumption, emergency showers, and eyewash stations;
- Service water for sanitary needs, fire protection system , and auxiliary equipment cooling;
- Process water for acid gas removal during gas treatment operations. This water will be demineralized and recirculated in the process. During normal operations, water usage will compensate for losses.

2.5.4 Marine Transportation of LNG

Marine transportation of LNG will be under the responsibility of specialized transporters. The vessels will use the Saguenay and St. Lawrence waterways to carry LNG to global markets. About 160 round trips (320 one-way trips) per year are planned (3 to 4 vessels will be loaded each week).

2.6 DESCRIPTION OF PROJECT PHASES

2.6.1 Construction Phase

Construction of the terminal involves clearing, earthwork, mass excavations, blasting, cut and fill work, preparation of foundations, formwork, concreting, erection of structures and buildings, and the installation of various process modules and equipment. Final ground leveling and partial paving could also be required to achieve the desired elevations.

Detailed geotechnical studies must be carried out before the type of port infrastructures required for LNG loading can be properly determined. The wharf must be able to accommodate Q-Flex-type vessels with capacities of up to 217,000 m^3, as well as all the necessary LNG loading equipment. Various designs are being considered, all involving underwater structures, such as piles, sheet-pile caissons, gravity or cantilever structures. Final decision as to the wharf type and location will depend on site characteristics, as well as engineering, process and cost considerations.

2.6.2 Operational Phase

Prevention and Emergency Response Plan

An emergency response plan will be developed for liquefaction complex operations and submitted to the appropriate authorities, including municipal emergency response services.

Compliance with the applicable requirements of the *Environmental Emergency Regulations* (SOR/2003-307) included in the Canadian Environmental Protection Act, 1999, will be assured, where appropriate.

Any accidental spill that may endanger human life, health, safety, well-being, and/or comfort of humans, cause damage or harm to the quality of soil, vegetation, fauna and/or property will be immediately reported to the proper authorities, as prescribed in section 21 of the Quebec Environment Quality Act (LQE). Appropriate containment, control, and/or recovery measures will be implemented.

Vehicle Traffic

Trucks and other vehicles entering the site will use the road network and appropriate access routes, and heavy traffic will avoid using secondary roads in the vicinity of the project site. Appropriate signs will be installed, and speed and load limits will be respected at all times.

By-Product Delivery and Shipping

By-products may be delivered by ship, rail or road transport, depending on markets. Refrigerants will be delivered by tank trucks or tank wagons.

Maintenance Program

A preventive maintenance program will be developed to ensure the integrity and proper operation of all systems and equipment used in the liquefaction complex.

Environmental Monitoring and Follow-Up Program

An environmental monitoring and follow-up program will be implemented during the operational phase. Typically, the program will include the following:

- Process, rainwater, and wastewater effluent monitoring;
- Air emissions and air quality monitoring;
- Hazardous waste management (solid and liquid);
- Accidental spill management;
- Environmental monitoring.

2.6.3 Decommissioning and Abandonment Phase

The following typical decommissioning activities will be performed at the end of the Project's service life:

- Decontamination: Where necessary contaminated soils will be rehabilitated and contaminated materials will be cleaned and sent to appropriate facilities for disposal.
- Dismantling: Obsolete facilities and equipment will be dismantled. Wherever possible, dismantled materials will be recycled or reused. Where necessary, waste materials will be disposed of in authorized sites.
- Site leveling: The site will be leveled where required so that it integrates with the surrounding environment.
- Reconditioning: Depending on the dismantling plan selected, some site areas may be seeded and revegetated.

2.7 VARIANTS AND TECHNOLOGICAL CHOICES

The search for a site to build a natural gas liquefaction complex was conducted along the waterways of the St. Lawrence and the Saguenay rivers for the purpose of exporting LNG to foreign markets in Europe, Asia, South America and the Middle East.

The following criteria were taken into consideration for site selection:

- Project site location remote from densely populated areas.
- Access to existing port infrastructures, as well as to utilities and transportation infrastructures (railroads, roads, airport, etc.).
- Access to hydroelectricity for project needs.
- Year-round access to a deep water port for vessels, with enough space that can be shared with existing maritime activities.
- Available land with sufficient surface area for the project.
- Distance from the existing natural gas distribution network.
- Lower construction cost due to the following conditions:
  - Existing roads, railroads, marine and airport infrastructures;

- Access to skilled workforce in the area;
- Electricity distribution infrastructures nearby.

→ Overall operating costs of the Complex, mainly tied to natural gas supply and LNG shipping to global markets:

- Low ambient temperatures that enhance process efficiency;
- Competitively priced hydroelectricity.

Various technological choices are possible for a number of project components and are still being studied. These are listed in Table 2-2 for information purposes.

Table 2-2: Options under Study for Various Project phases

Project Phase	Component	Options under study
Construction	Material offloading facility	Current Marcel-Dionne wharf at Port Saguenay, modification of existing wharf, or building of a new wharf
	Blasted rock management (cut and fill)	Based on geological and geochemical characteristics
	Temporary concrete plant	To be assessed based on quantities of concrete required and transportation-related nuisances
	Generators	For temporary power-supply needs on the work site and based on potential connection to the existing grid
Operations	Tugboat wharf	Construction type and location based on regional needs (to be determined by the proponent in charge)
	Location of new wharf	Will depend on the results of technical studies
	Wharf design	Piles, sheet-pile caissons, gravity or cantilever structures
	Number of liquefaction trains	2 or 3
	Number of LNG storage tanks	2 or 3
	Process technology	APCI or ConocoPhillips
	Type of LNG storage tanks	Single containment with retention basin or double wall, full containment, or a combination of tanks with floating storage in a vessel
	Type of flare	Ground level or elevated
	Helium recovery	Depending on supply gas composition and selected technology, a helium recovery unit could be incorporated into the liquefaction trains
	Turbogenerator	Depending on selected technology, a turbogenerator may be necessary if excess end-flash gas is expected
	Loading station for LNG tank trucks	Based on local market needs
	Nitrogen recovery or production unit	To meet process requirements and based on selected technology

2.8 AIR EMISSIONS, EFFLUENTS AND WASTE

2.8.1 Air Emissions

2.8.1.1 Construction Phase

Site preparation, excavation, blasting, backfilling, leveling work, as well as vehicle traffic and machine operation will generate point-source and/or fugitive air emissions during construction (exhaust gases, GHGs, particulate matter, etc.). The possible construction of a temporary concrete plant on the site, as well as the probable use of generators for temporary power supply during construction, must also be considered as sources of emissions during this phase.

2.8.1.2 *Operation Phase*

During the commissioning, startup, and operation phases of the project, most point-source and/or fugitive air emissions (exhaust gases, GHGs, particulate matter, sulfur compounds, volatile organic compounds (VOC), etc.) will result from material delivery, natural gas treatment (acid gas removal), liquefaction process (heater, flares, emergency generator), refrigerant storage and handling, LNG storage and loading, vessels and tugboats, as well as worker and material transportation. Table 2-3 summarizes the main contaminants associated with the various emission sources during the operation phase.

Precise assessment of GHG emissions will only be available once more progress is made in technology selection and engineering. However, the use of hydroelectricity as the energy supply for the liquefaction process will allow reducing GHG emissions by more than 85% compared with similar-size plants using natural gas to produce power for their systems.

Table 2-3: Summary of Air Emissions during the Project's Operation Phase

Sector/ Activity	Source	Contaminants[a]					
		Carbon dioxide (CO_2)/monoxide (CO)	Sulfur oxides (SO_x)	Nitrogen oxides (NO_X)	Methane (CH_4)	Hydrocarbon and volatile organic compounds (VOC)	Particulate matter
Natural gas treatment	Acid gas removal and thermal oxidation	X	X	X	X	X	-
Liquefaction process	Heater	X	-	X	X	X	-
	Flares	X	-	X	X	X	-
	Emergency generator	X	X	X	X	X	X
	Refrigerant storage and handling	-	-	-	-	X	-
	Turbogenerator (GTG) (option)	X	-	X	X	X	-
LNG storage	Tanks	-	-	-	X	-	-
LNG shipping	Vessels	X	-	X	X	X	-
	Tugboats	X	X	X	X	X	X

a Contaminants based on typical natural gas composition.

2.8.2 Sources of Liquid Effluents

2.8.2.1 *Construction Phase*

During project construction, the main sources of effluents will be associated with modifications to the natural drainage network (rain and runoff water), machinery maintenance, domestic wastewater, and the delivery of large-size equipment by ship. Water for the temporary facilities may be supplied using temporary connections to the municipal water distribution system. It should be noted that sanitary sewage will be recovered and treated in accordance with applicable standards, either through the municipal system or by means of a temporary septic facility that will be pumped out by a qualified contractor.

The construction of a temporary concrete plant on site, if needed, must also be considered a source of effluents. If necessary, the wastewater from this facility will be recovered and treated. Rainwater will be sent to sedimentation basins before being discharged into ditches along the sloped areas built on the site.

2.8.2.2 Operation Phase

During the commissioning, startup, and operation phases of the project, process effluent will consist of the water extracted during the dehydration process of the natural gas treatment. The main effluents will be sanitary sewage, as well as snow melt and runoff water.

Effluents that may contain hydrocarbons will be treated, then recirculated or disposed of. Sanitary sewage from permanent facilities will be recovered and treated in accordance with applicable standards, either through the municipal system or stand-alone septic facilities.

2.8.3 Residual Materials

During the construction, operation, decommissioning and abandonment phases of the project, every effort will be made to limit waste , maximize recycling and reuse of residual materials and thus minimize landfill of residual materials.

2.8.3.1 Construction Phase

During project construction, the main sources of non-hazardous (mineral or vegetal matter, pier pile filler material, crushed stone, concrete, asphalt, metal, wood, packaging, domestic waste, etc.) and/or hazardous (used oil, grease and oil filters, contaminated empty containers, batteries, absorbents, contaminated rags, etc.) residual materials will be excess materials and waste from construction site, stockpiling areas, and site preparation and development activities.

Appropriate work practices will be implemented to prevent accidental spills. In the event of accidental spills, the contaminated soil will be managed in accordance with existing regulations.

Non-hazardous residual materials (ferrous metals, aluminum, copper and wood) will be collected on site in containers for recovery and/or recycling purposes, as a priority. The designated contractor will pick up these containers and all other waste resulting from construction activities and transport them on a regular basis to authorized recycling, recovery and/or landfill sites.

Domestic waste will be kept in designated containers, which will be regularly picked up by a specialized firm. The burning of residual materials on the project site will be strictly prohibited.

2.8.3.2 Operation Phase

During the commissioning, startup, and operation phases of the project, most of the non-hazardous (metal, wood, packaging material, domestic waste, foreign waste from ships, etc.) and/or hazardous (waste oil and grease,waste oil filters, contaminated empty containers, batteries, absorbents, contaminated rags, solvents, acids, industrial wastes, contaminated mud, etc.) residual materials will result from material delivery, natural gas treatment, liquefaction process, LNG storage and loading, refrigerant handling and storage, and maritime and rail transportation. Accidental spills may also cause to soil contamination, which will be managed in compliance with regulations.

Residual materials will be segregated and sent to appropriate authorized sites for non-hazardous and hazardous waste, depending on their characteristics.

A management plan based on source-reduction will be implemented to reduce the production of waste as much as possible. Disposal, recovery, and recycling methods for solid waste will be assessed during detailed studies. Options will include municipal waste collection services, recycling and recovery by specialized firms (metal, paper, cardboard, electronic components, etc.), local landfill sites in the Saguenay Region (truck transport contracts), and industrial landfill sites outside the region.

2.8.3.3 Decommissioning and Abandonment Phases

At the end of the project's service life, decommissioning and abandonment of the facilities will generate demolition debris (concrete, metal, wood, etc.) and obsolete equipment and structures which will have to be disposed of in

accordance with applicable acts and regulations. Only authorized recycling and disposal sites will be considered to this end. Concrete resulting from demolition activities and deemed to be non-hazardous, may be recycled after cleaning, if needed, or sent to a landfill site. Potentially hazardous waste materials resulting from demolition and decommissioning activities will be characterized in order to determine how they will be managed and disposed of.

Table 2-4 summarizes the various non-hazardous and hazardous materials that may be generated from the construction, operation, decommissioning and abandonment of the natural gas liquefaction facilities.

Table 2-4: Non-Hazardous and Hazardous Residual Materials

Phase	Residual materials	
	Non-hazardous	Hazardous
Construction	• Earth, sand, wood residues • Pile filler material • Crushed stone, concrete, asphalt • Metals • Wood and packaging materials • Domestic waste	• Paint, solvents, reducers and other hazardous liquid wastes • Waste oil and grease • Waste oil filters • Pressurized containers and contaminated empty containers • Absorbents and contaminated rags
Operation	• Metals • Wood and packaging materials • Molecular sieves • Domestic waste • International waste carried by ships	• Paint, solvents, reducers and other hazardous liquid substances • Waste oil and grease • Waste oil filters • Waste mercury filters • Pressurized containers and contaminated empty containers • Absorbents and contaminated rags • Batteries, electronic components, fluorescents, ballasts (PCB) • Industrial waste • Mud/slurry
Decommissioning and Abandonment	• Demolition debris (concrete, metal, wood, etc.) • Obsolete equipment and structures	• Paint, solvents, reducers and other hazardous liquid wastes • Potentially hazardous solid waste (pressurized containers and contaminated empty containers, industrial waste) • Waste oil and grease

2.9 PROJECT SCHEDULE

A summary of the proposed project schedule is shown in Table 2-5.

Table 2-5: Project Shedule

Project Phase	Schedule
Planning and permit applications	2013-2018
Construction	2018 to 2021
Operation and maintenance	End of 2021 for at least 25 years (2046)
Decommissioning and abandonment	2046 or later

The construction phase may take place in two stages, and commissioning will be carried out sequentially in two or three stages, depending on the number of liquefaction trains to be built. Commissioning of the first train is scheduled for late 2021.

The project's service life is expected to extend beyond 25 years. At the end of their service life, the facilities will be decommissioned and abandoned in compliance with applicable regulations.

3 FEDERAL GOVERNMENT PARTICIPATION

3.1 PROPOSED OR EXPECTED FINANCIAL SUPPORT

At this stage, no financial support from the Federal Government has been proposed or planned.

3.2 POTENTIAL USE OF FEDERAL LANDS

Based on preliminary studies, the natural gas liquefaction complex will be located on SPA land (Lots 4 012 404 and 4 012 405). However, if detailed engineering studies result in a modification to the site of the liquefaction complex, the latter may be located on a portion of the federal lands under SPA management (Lots 4 012 414 and 4 012 415).

4 DESCRIPTION OF THE ENVIRONMENT AND POTENTIAL ENVIRONMENTAL IMPACTS

4.1 ENVIRONMENT DESCRIPTION

Two study areas have been defined for preliminary description of the site environment and analysis of the project's environmental impacts. The proposed boundaries of the extended study area already take into consideration concerns raised by stakeholders. The boundaries could be modified to take into account the government guidelines regarding the EIA.

Each of the main biophysical and human components has been described both on a local scale (Map 4-1), in the immediate vicinity of the project, and on a larger scale (Map 4-2), comprising the Baie des Ha! Ha!, along with the Saguenay River and Fjord downstream of the project, all the way to the St. Lawrence River. This second study area will be used to document the cumulative effects of vessel traffic on the Saguenay and St. Lawrence Rivers. The area concerned is where constraints with regard to navigation are most stringent and require the presence of a St. Lawrence pilot on board. It is also the area where the marine habitat is the most sensitive. The increase in vessel traffic associated with the project will also be proportionally higher in the Saguenay than in the St. Lawrence.

The extended study area will also be used for describing and assessing the project's impacts on traditional territorial land and resource use by the Innu First Nations concerned by the project. To address their concerns, an area west of the mouth of the Saguenay River was included to the extended study area to assess the impacts of marine transportation on sea-urchin fishing by Innu businesses. Analysis of the cumulative effects of the project will also consider specific study zones for Valued Environmental Component (VEC) and Valued Social Component (VSC).

Description of the socioeconomic profile will take into consideration the City of Saguenay as well as the entirety of the Fjord-du-Saguenay RCM territory. Analysis of the economic benefits will be conducted for those same entities, for the Saguenay–Lac-Saint-Jean Region, and for the province.

Preliminary description of the environment is based on studies performed for similar or nearby projects, as well as on various regional profiles. In addition, further relevant information was found in the usual databases.

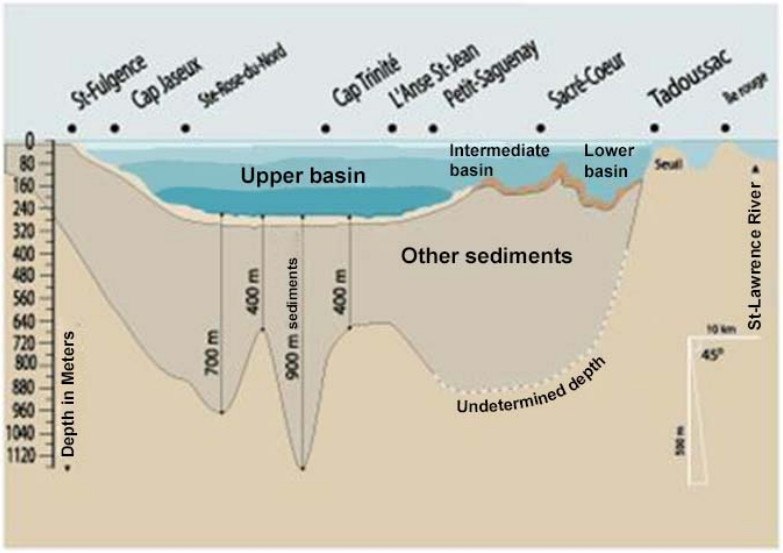
4.1.1 Components of the Physical Environment

4.1.1.1 Geology and Geomorphology

The Saguenay Fjord is encased within the Canadian Shield formation, between the Monts-Valin Massif to the north, and the Laurentian Mountains to the south, and it occupies an ancient tectonic depression that includes Lake Saint-Jean. Besides the Paleozoic rock on the south and southwest shores of Lake Saint-Jean and north of Saguenay City, the Saguenay watershed is part of the Grenville orogenic area, consisting primarily of crystalline rock. The landform is rugged and includes several 300 m-plus peaks. Project site topography has a vertical drop ranging from 40 to 160 meters, with slope grades varying between 5 and 35%, and up to 100% at the eastern end.

Locally, there are rock outcrops in many places and most of the superficial layer is formed of till and marine deposits. Peat bogs are encountered in poorly drained depressions.

The longitudinal profile of the Fjord features several large basins with an average depth of 373 m in the deepest area between the Sainte-Marguerite River and Saint-Fulgence (Figure 4-1). Some basins can reach depths of 700 m, and up to 1,400 m.



Source: Musée du Fjord 2002a; modified from Drainville, 1968, and Praeg & Syvitski, 1991.

Figure 4-1: Longitudinal Section of the Saguenay Fjord

4.1.1.2 Hydrography and Bathymetry

The Saguenay River watershed covers an area of 85,500 km^2 and includes 46 sub-watersheds. Several rivers flow directly into the Saguenay (annual average flow rate of 1,460 m^3/s) or its estuaries, including the Sainte-Marguerite (133 m^3/s), Chicoutimi (79 m^3/s) and Shipshaw (57 m^3/s) Rivers.

The Saguenay River has the typical estuarine circulation of fjords with large water flows (Figure 4-2). A thin surface layer (5-10 m) of brackish water flows towards the estuary, while the saltwater flows into the Fjord as the tide rises. Temperature and salinity levels between the two layers vary sharply and are clearly defined. The Fjord has semi-diurnal tides with average amplitudes of 3.8 m in the area of the Chicoutimi District, Saguenay City. The tide range during the high tide periods reaches an average 6.3 m.

At the Grande-Anse Terminal, currents are moderate and vary according to tides. The average depth is 13.8 m at low tide. The underwater slope is 46% to the east of the terminal, with depths ranging from 10 m to 70 m, at which point de slope flattens out to less than 10%, with depths ranging from 70 m to 120 m at the center of the Fjord channel. Current speeds vary from 0.16 to 0.48 m/s during a complete tide cycle.

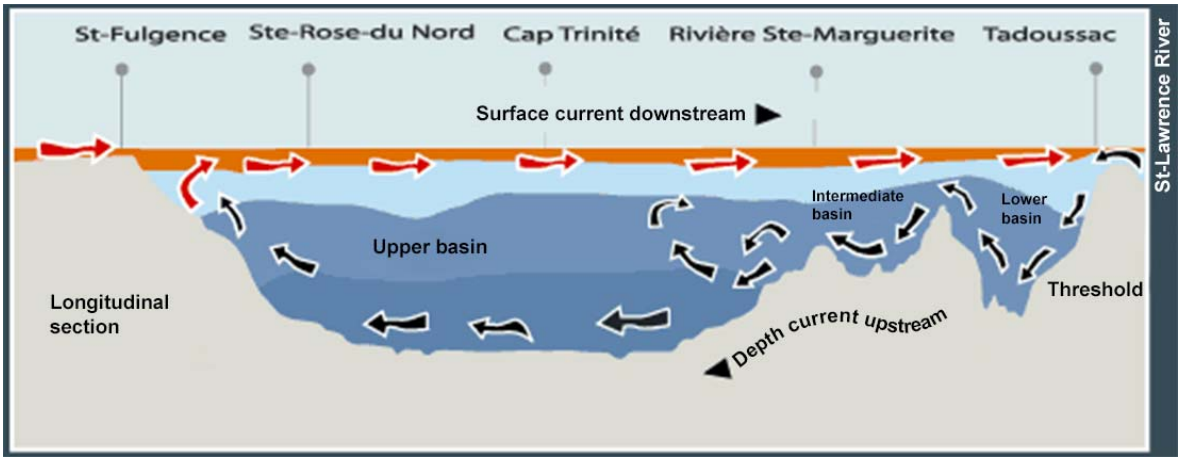


Figure 4-2: Saguenay River Water Circulation Pattern (from the Musée du Fjord 2002b)

GNL QUÉBEC — ÉNERGIE SAGUENAY

Énergie Saguenay Project
Natural Gas Liquefaction Complex in Saguenay
Project description - Summary

Map 4-1

Local Study Area of the Project

Sources :
Canvec, 1 : 50 000, RNCan
SDA, 1 : 20 000, MRNF Québec
Territoire récréatifs du Québec (TRQ), MRNF Québec, 2007
Gestim, MRN Québec, janvier 2014
Commission de protection du territoire agricole du Québec CPTAQ

Scale: 1 : 75 000
0 750 1 500 m
MTM, Zone 7, NAD83

November 2015 *141-23663-00_c4-1_RESan_wspT015_Zetude_locale_151202*

71°0'0" 70°55'0" 70°50'0" 70°45'0" 70°40'0"
48°30'0" 48°25'0" 48°20'0"

Saint Fulgence
Battures-de-Saint-Fulgence faunistic refuge
Mashteuiatsh Nitassinan
Essipit Nitassinan
Le Fjord-du-Saguenay (RCM)
Saguenay (ET)
Anse aux Foins
Cap Saint-François
Saguenay
Chicoutimi district
Baie de la Pointe aux Pins
Pointe aux Roches
Pointe aux Pins
Cap Jaseux
Parc Aventure Cap Jaseux
Anse à Pelletier
Saguenay River
Rivière Pelletier
Saint-Fulgence (M)
Sainte-Rose-du-Nord (M)
Chemin Saint-Martin
Grande-Anse Maritime Terminal (Saguenay port)
La Grande Anse
Anse à la Puce
Anse au Sable
Chemin de la Grande-Anse
Chemin Quai-Marcel-Dionne
Railway service area Grande-Anse Maritime Terminal
Route de l'Anse-à-Benjamin
Chemin Saint-Joseph
Castor lake
Le Grand Lake
Chemin du Cap-à-l'Ouest
Anse à Bouchard
Cap à l'Ouest
Anse Plate
Cap à l'Est
Phare du Cap-à-l'Est
Pourvoirie du Cap au Leste
Parc national du Fjord-du-Saguenay
Parc marin du Saguenay–Saint-Laurent
South-West Part Nitassinan
Anse à Poulette
Anse à Pierrot
Anse à Philippe
Anse à Benjamin
Saguenay
La Baie district
Quai de Bagotville
Baie des Ha! Ha!
Installations portuaires de Port-Alfred
La Grande Baie
Rivière à Mars
Saguenay (M)
Saguenay (ET)
Le Fjord-du-Saguenay (RCM)
Saint-Félix-d'Otis (M)

Project Components
- Project site
- Local study area

Built area
- Nearest houses and auxiliary buildings

Boundaries
- Regional county municipality (RCM) or equivalent territory (ET)
- Municipality (M)
- District
- First Nation Nitassinan
- Protected agricultural land
- Urbanisation limit

Protected Natural Territories
- National park or faunistic reserve area
- Parc marin du Saguenay–Saint-Laurent

Infrastructures
- Grande-Anse Maritime Terminal
- Road
- Railroad

Project Components

- Project site
- Extended study area
- Study zone for the impact assessment on sea urchin fishing

Boundaries

- Administrative region
- Regional county municipality (RCM) or equivalent territory (ET)
- Municipality (M)
- District
- First Nation Nitassinan

Fishing

- Winter fishing area
- Sea Urchin fishing area

Protected Natural Territories

- National park or faunistic reserve area
- Parc marin du Saguenay–Saint-Laurent

Infrastructures

- Road
- Railroad
- Transportation line
- Pipeline
- Airport

GNL QUÉBEC — ÉNERGIE SAGUENAY

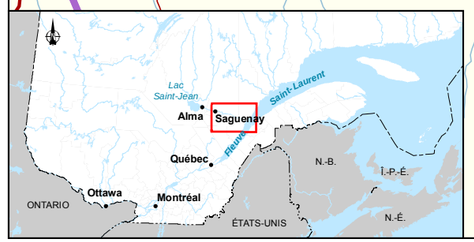
Énergie Saguenay Project
Natural Gas Liquefaction Complex in Saguenay
Project description - Summary

Map 4-2
Extented Study Area of the Project

Sources :
BDGA, 1 : 1 000 000, MRNF Québec
SDA, 1 : 20 000, MRNF Québec
Territoire récréatifs du Québec (TRQ), MRNF Québec, 2007
Composantes d'utilisation géographique régionale (BGR), MRN Québec, janvier 2014

Scale: 1 : 375 000
0 3,75 7,5 km
MTM, Zone 7, NAD83

November 2015 *141-23663-00_c4-2_RESan_wspT016_Zetude_elargie_151202*



4.1.1.3 Icing Pattern

Ice thickness on the Saguenay varies between locations. Near the La Baie District, the average ice thickness is about 75 cm thick at the end of winter, and can vary between 60 and 102 cm. The upstream part of the river starts to freeze in late November or early December. The ice will extend as fas as the St. Lawrence River, generally during the third week of December. However, a navigable corridor is maintained from the St. Lawrence to Baie des Ha! Ha!, and up to the Grande-Anse port facilities. Ice concentrations in the lower part of the Saguenay River decrease due to the mechanical action of tides and currents.

4.1.1.4 Climate

The Saguenay Region is characterised by a cool subpolar temperature; a subhumid climate with a long growing season. Saguenay–Lac-Saint-Jean's climate is generally warmer than the rest of the Canadian Shield, probably because of the low elevation of the Saguenay Fjord and the presence of the Saguenay River and Lake Saint-Jean.

Average annual rainfall in the region is 663.8 mm, and average snowfall is 321.7 cm (total yearly precipitations of 930.6 mm). Prevailing winds at the Saguenay-Bagotville airport are westerly at an average hourly velocity of 11.3 to 16.8 km/h, calculated over one month. Wind gusts of 52 km/h or more occur 17.5 days/year. At the Grande-Anse Terminal, the particular topography provides good protection from prevailing winds. The climatic normal average temperatures in January and July are respectively, 15.7°C, 18.4°C, with a yearly average of 2.8°C.

4.1.1.5 Air Quality

In 2012, the Saguenay meteorological region was rated 10th of a total 28 regions for air quality. Based on yearly regional statistics, the 2012 Air Quality Index (AQI), air quality in Saguenay City (Chicoutimi District) was considered good 55% of the time, and acceptable 43% of the time.

4.1.1.6 Noise

Ambient noise in the area of the Grande-Anse Terminal is the result of human activity and natural causes. Besides the noise generated by the terminal, air and road traffic noise can be heard. Noise associated with the natural environment comes mostly from birds, wind, rain, and waves.

In 2011, ambient noise was monitored over a 24-hour period at three locations within a 10 km radius around the terminal, and levels of 36.2, 47.2 and 59.7 dBA were measured. Local road and air traffic were determined to be the main sources of noise.

4.1.1.7 Ambient Light

At the project site, the main sources of light are the Grande-Anse Terminal and nearby homes and cottages (over 1 km).

4.1.2 Biological Environment

4.1.2.1 Vegetation

Land Vegetation

Most of the local study area lies within a mixed-wood forest environment (balsam fir, black spruce, white birch), with similar proportions of conifers. It is mostly made up of mature stands rather than regeneration stands. It contains several wetlands, one of which is located near an unnamed body of water in the westernmost part of the local study area. Wetlands in the local study area are mostly riparian habitats (marshes and swamps) and shallow stretches of water (receded streams and stagnant water).

Riparian and Intertidal Vegetation

Currently, 253 plant species have been counted on the Mid and Lower Saguenay littoral zones. The local study area and extended study area undergo the effects of tides. The project site shoreline is particularly steep and mostly unsuitable for wetland development. In some areas, the presence of small muddy foreshores fosters the development of freshwater wetlands and brackish water wetlands with tides. Due to the exposure of the site, the prevailing rocky shores, sand and blocks in the foreshore area, intertidal vegetation is generally sparse and mostly clusters of bulrushes and cordgrass beds. Four superficial seagrass beds varying between 50 and 1,430 m^2 in area are found near the Grande-Anse Terminal wharf. In addition, the river banks near the wharf are made up of backfill where no shoreline vegetation grows. Based on 2011 inventories compiled near the Grande-Anse Terminal, vegetation above the tidal range comprises black spruce, white birch, and white cedar, and certain areas are moss-covered.

The distribution of marine algae in the Saguenay is dependent on water temperature, salinity, depth, substrate, dry spells, exposure to waves, currents and ice, light, mineral salts, grazing, as well as intra- and interspecific competition. It varies along the vertical axis, but also according to position relative to the mouth of the Saguenay River and, consequently, freshwater supply. The data gathered during the inventory conducted at the Grande-Anse Terminal suggest that rockweeds may be present on the project site.

4.1.2.2 Invertebrate Fauna

Owing to the special conditions created by brackish water, steep slopes, and rocky substrate in the local study area, the diversity of benthic invertebrates is likely be low. The benthic fauna identified in 2011 reveals a habitat that is favorable to suspension and detritus feeders, including various hydroid species, shrimp, polychaete, gastropods, anemones, ascidians, and sponges. Also, barnacles, waved whelks, tubeworms, Henricia starfish, coralline algae, medusa fish, and red soft coral were included in the inventory compiled at the Grande-Anse Terminal in 2011.

The specific composition of Saguenay zooplankton differs from that of the St. Lawrence. Several plankton species were identified when the inventory was compiled on the project site in May 2014.

4.1.2.3 Fish and Fish Habitats

Over 60 fish species live in the Saguenay River, of which 16% are freshwater fish and 62% are saltwater fish. Migratory species, anadromous (forage in the sea but return to their freshwater birthplace to spawn) and catadromous (forage in freshwater but return to the sea to spawn), make up the rest (22%).

Three Saguenay tributaries flow into the local study area. One, which flows out of Castor Lake, enters the Saguenay upstream from the Grande-Anse Terminal. This stream is the most likely to be a fish habitat. Table 4-1 lists the species most likely found within the local study area.

Table 4-1: Most Probable Fish Species in the Project's Local Study Area

Species	Latin Name	Species	Latin Name
Atlantic poacher	*Agonus decagonus*	Yellowtail flounder	*Pleuronectes ferrugineus*
Haddock	*Melanogrammus aeglefinus*	Snake blenny	*Lumpenus lumpretaeformis*
American shad	*Alosa sapidissima*	Ocean pout	*Macrozoarces americanus*
American eel	*Anguilla rostrata*	Laval eelpout	*Lycodes lavalaei*
Striped bass	*Morone saxatilis*	Checker eelpout	*Lycodes vahlii*
American angler	*Lophius americanus*	Pale eelpout	*Lycodes pallidus*
Capelin	*Mallotus vilosus*	Polar eelpout	*Lycodes polaris*
Shorthorn sculpin	*Myoxocephalus scorpius*	Red hake	*Urophycis chuss*
Lake herring	*Coregonus artedii*	White sucker	*Catostomus commersoni*
Atlantic hookear	*Artediellus atlanticus*	Northern sucker	*Catostomus catostomus*
Walleye	*Sander vitreus*	Greenland cod	*Gadus ogac*
Rainbow smelt	*Osmerus mordax*	Atlantic cod	*Gadus morhua*
Ninespine stickleback	*Pungitius pungitius*	Arctic cod	*Boreogadus saida*
Threespine stickleback	*Gasterosteus aculeatus*	Fourbeard rockling	*Enchelyopus cimbrius*
Blackspottee stickleback	*Gasterosteus wheatlandi*	Brook trout	*Salvelinus fontinalis*
Atlantic sturgeon	*Acipenser oxyrinchus*	Yellow perch	*Perca flavescens*
Moustache sculpin	*Triglops murrayi*	Sea tadpole	*Careproctus reinhardti*
Atlantic halibut	*Hippoglossus hippoglossus*	Atlantic spiny lumpsucker	*Eumicrotremus spinosus*
Greenland halibut	*Reinhardtius hippoglossoides*	American plaice	*Hippoglossoides platessoides*
Banded killfish	*Fundulus diaphanus*	Witch flounder	*Glyptocephalus cynoglossus*
Alewife	*Alosa pseudoharengus*	Winter flounder	*Pseudopleuronectes americanus*
Pollock	*Pollachius virens*	Atlantic aligatorfish	*Aspidophoroides monopterygius*
Northern pike	*Esox lucius*	Atlantic tomcod	*Microgadus tomcod*
Lake whitefish	*Coregonus clupeaformis*	Thorny skate	*Raja radiata*
Lumpfish	*Cyclopterus lumpus*	Greenland shark	*Somniosus microcephalus*
Atlantic herring	*Clupea harengus harengus*	Atlantic salmon	*Salmo salar*
Sea raven	*Hemitripterus americanus*	Atlantic redfish	*Sebastes fasciatus*
American sand launce	*Ammodytes* sp.	Rock gunnel	*Pholis gunnelus*
Longfin snailfish	*Careproctus longipinnis*	Atlantic staghorn sculpin	*Gymnocanthus tricuspis*
Dusky snailfish	*Liparis gibbus*	Fish doctor	*Gymnelus viridis*

Sources: DFO 2013; Mousseau and Armellin 1995; Lambert et Bérubé 2002; GDG Conseil inc. 2000 mentioned in Ville de Saguenay 2005; Lesueur and Archer 1996; Sirois et coll. 2008; Musée du Fjord 2002; Tourisme Saguenay 2012; Gauthier et coll. 2013[1].

[1] See Chapter 7 *References* in the GNL Québec inc. August 2015 report. *Projet Énergie Saguenay : Complexe de liquéfaction de gaz naturel à Saguenay. Description de projet*.

Sportfishing Species

Of the 60 fish species potentially found in the Saguenay River, some are popular sportfishing species and should be further described here.

Searun Brook Trout

The searun brook trout (also called sea trout) completes its life cycle in the Saguenay River and its tributaries. Like salmon, brook trout migrate from the sea to freshwater rivers to spawn. Young brook trout leave their native rivers for the Saguenay River when they are anywhere between 1.2 and 3 years of age. Before they reach sexual maturity, young brook trout spend the winter either in the upstream part of the Saguenay River or in their native rivers, but they are not yet ready to spawn. In the fall, young brook trout swim up the Saguenay River and also up their native rivers. The adults make their way to their native rivers to spawn (Sainte-Marguerite, à Mars, Saint-Jean, and Éternité Rivers).

Over the past several years, searun brook trout has become a popular sportfishing species, due to a decline in Atlantic salmon stocks. The ministère des Forêts, de la Faune et des Parcs (MFFP) (Quebec Department of Forests, Fauna and Parks) carries out regular sampling runs (spawner counts, anglers' logs, sentinel fisheries) in an effort to assess the health of the species, which is not listed in the Species at Risk Act.

Striped Bass

As a result of overfishing and various habitat-debilitating factors, such as dredging and water pollution, the striped bass disappeared from the province around the mid 1960s. In 2002, a restocking program using existing populations in the Miramichi River was initiated in the St. Lawrence River. Unexpectedly, the restocking program was a success, with positive results into the Saguenay River. Over the past few years, Saguenay anglers have been reporting an increasing number of catches, peaking in 2013, especially in the La Baie, Chicoutimi and Saint-Fulgence areas. Fishing for striped bass is however banned under the Species at Risk Act. The striped bass is known to use the Saguenay River for migration and feeding.

Greenland Shark

While rare, the Greenland shark is not protected in law. During the period from 1888 to 2008, these sharks were occasionally observed in the Saguenay River, particularly in Baie des Ha! Ha!, Saint-Fulgence, Sainte-Rose-du-Nord, Baie-Éternité and L'Anse-Saint-Jean. The reasons for the presence of this species in the Saguenay remains unknown and could be due to an abundance of food, ideal spawning and rearing conditions, or other reasons.

Atlantic Sturgeon

Likely to be considered an at risk or vulnerable species in Quebec, the Atlantic sturgeon is a migrating fish that mostly lives in the sea. Habitat destruction and/or degradation, associated with human activity along the waterways, has been identified as the cause for the decline of the species, but rehabilitation efforts are yielding signs of improved conditions in some areas of the St. Lawrence River. Unintentional catches in the Saguenay River have been reported. Historically, most sturgeon catches have occurred in the Saint-Fulgence area, considered a propitious habitat for the species.

American Eel

The American eel is likely to be considered at risk or vulnerable species under the Quebec's Act respecting Threatened or Vulnerable Species, due to a decrease in young eel harvests in recent years, probably caused by limited habitat access due to dams, mortality in hydropower turbines, habitat degradation, and changes in ocean environments. American eels were found in the Saguenay River and its tributaries in the 1980s. They are considered relatively abundant in the Éternité and Petit-Saguenay Rivers.

Rainbow Smelt

Rainbow smelt, an anadromous species, normally spawns in tributaries of the St. Lawrence River. Five populations have been identified in Quebec coastal waters. Saguenay River smelts are part of the St. Lawrence north shore population, extending from the Montmorency River to the Saguenay River. The rainbow smelt has distinctive morphological characteristics (number of vertebrae, lower age-size ratio, lower fertility). The rainbow smelt is a prey of

choice for many fish species, especially groundfish, and is a popular ice-fishing catch. During the spring spawning period, smelt gather in large numbers upstream from the Dubuc bridge, in the Chicoutimi District of Saguenay City.

The rainbow smelt is the most harvested species by volume during the ice-fishing period on the Saguenay River. Ice fishing is practiced throughout the upper basin of the Saguenay River, between Saint-Fulgence and Petit-Saguenay. In 1997, 2000 and 2001, up to 1.8 million fish were caught, and more than 2 million in 2002.

Atlantic Salmon

The Saguenay River is home to two types of Atlantic salmon, searun and freshwater (called “ouananiche”). The latter are abundant in Lake Saint-Jean and are also found in Kenogami Lake, while a number of individuals migrate down the Saguenay River during the spring and fall floods. The anadromous type is found in a few tributaries of the Saguenay River, such as the à Mars, Petit Saguenay, Saint-Jean and Sainte-Marguerite Rivers, hence using the Saguenay River as its migration route. Upstream from the project site, the Atlantic salmon may also swim up the Pelletier River in Saint-Fulgence, but the river is not known as a “salmon or sea-trout river”.

Atlantic Redfish

The Atlantic redfish is a cold-water bottom-dwelling species found on both sides of the Atlantic Ocean. There are two populations in Canadian waters, one in the North, and the other in the St. Lawrence Gulf and Laurentian Channel, also found in the Saguenay River.

In the Saguenay River, redfish catches decline steadily from 1996 to 2010, but have increased slightly since 2010. This finding is in line with the overall population trend, which has shown a sharp decline since 1984. The consultation process to include the St. Lawrence Gulf and the Laurentian Channel populations in the list of the schedule of Canada’s Species at Risk Act is underway. It is considered endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but has no special protection status in Quebec, although the province is in the process of including it in its list of endangered species.

4.1.2.4 Marine Mammals

Three marine mammal species are commonly found in the Saguenay River: the beluga whale, minke whale, and common seal. While belugas and seals are resident species, minke whales are rarely seen with pups. Besides these three species, a few others are occasionally seen at the mouth of the Saguenay River: grey seals, as well as fin, humpback and blue whales, but are highly unlikely to enter in the local study area.

Beluga Whales

The beluga whale is an arctic marine mammal. The resident population of the St. Lawrence Estuary, at the southernmost limit of global populations, is geographically isolated from other beluga populations and, since 2014, considered endangered under the Canadian Species at Risk Act, Appendix I, and threatened under the Quebec Act respecting Threatened or Vulnerable Species. Despite the possible improvement, or at least stabilization of the overall situation perceived in recent years, numerous carcasses found on the shores of the St. Lawrence River in 2012-13 and recent studies show a new decline in St. Lawrence numbers, likely due to pollution, climate change, and human activity.

The summertime distribution of belugas in the St. Lawrence Estuary stretches from Île aux Coudres to Bic on the south shore of the St. Lawrence, up to Forestville on the north shore, and up to Saint-Fulgence upstream on the Saguenay River, with recent observations made in Baie des Ha! Ha! Belugas are concentrated (St. Lawrence Estuary population), on the north shore, within the limits of the Saguenay–St. Lawrence Marine Park, which extends upstream to Cap à l’Est on the Saguenay. One of the most popular sites for the species is undoubtedly Sainte-Marguerite Bay, in Sacré-Cœur; in summer, beluga pods of 6 to 30 individuals are seen almost daily, and sometimes up to 60 individuals are spotted in the area (adults and pups). Only 5% of the St. Lawrence Estuary beluga population, estimated at 1,200 individuals in 2005, frequent the Saguenay River regularly.

Belugas are mostly seen in two areas along the Saguenay River: the mouth of the river and Sainte-Marguerite Bay. Therefore, Beluga whales are unlikely to be seen in the local study area.

Common Seal

The common seal is regularly observed in the upper and lower St. Lawrence Estuaries, and in the Saguenay River. Very little is known of the habits of this marine mammal in the Saguenay. However, it is often seen in the Chicoutimi District area of the river, in Saguenay City. The number of individuals in the Saguenay River may be less than 100, and it is impossible to determine if there has been a factual reduction in numbers since 1970.

The occasional and/or habitual haulout sites are discontinuously dispersed along both shores of the Saguenay River. Two sites have been identified, one just downstream from Cape Éternité, on the south shore, and near Cape Fraternité, on the north shore. These sites are more than 39 km downstream from the project site.

4.1.2.5 Migratory Birds and Other Bird Species

The Saguenay River and surrounding riparian and land environments are home to diverse bird species – 289 species, in the following branches: waterfowl, shorebirds, colonial birds, forest birds, and birds of prey. The widest range of winged species is found in the Baie des Ha! Ha! sector and Saint-Fulgence tidelands, where two Aquatic Bird Concentration Areas (ABCA) are located, at Grande-Baie and Anse-aux-Foins.

Saint-Fulgence also has an Important Area for Bird (IAB), Marais-de-Saint-Fulgence (located 6 km upstream from the project). During spring migration, the site is a stopover for more than 1% of the snow goose and Canada goose continental populations. Moreover, large numbers of migrating Herring gulls and purple sandpipers feed at this site, often over 1% of their respective North American populations. During the nesting period, the yellow rail (a vulnerable species), Le Conte's sparrow and Nelson's sharp-tailed sparrow are found in the marsh. Finally, the peregrine falcon (endangered species), short-eared owl (species at risk) and horned grebe also benefit from the IAB on occasion, during migrations for example.

Based on the data found in the Quebec Breeding Bird Atlas (*Atlas des oiseaux nicheurs du Québec* (AONQ)), 96 species are likely to build nests in the local study area or nearby (Table 4-2). A 2014 inventory shows that only one listed species nests there, the Canada warbler. A peregrine falcon nesting site was reported about 4 km south of the project site.

The project site features a moderately sloped rocky tideland with scattered blocks; not a welcoming site for seagrass, meaning that waterfowl and shorebirds are unlikely to feed there. Great blue herons and bitterns, two colonial species with nesting sites nearby, may also feed in the willow waters within the local study area. A spring 2014 inventory identifies 51 species, shown in bold print in Table 4-2.

Table 4-2: Potential Nesting Species and Nesting Indicators Based on the Quebec Breeding Bird Atlas

Species	Latin name	Index[1]	Species	Latin name	Index[1]
American woodcock	*Scolopax minor*	POSS	**Boreal chickadee**	***Poecile hudsonicus***	**POSS**
White-winged crossbill	***Loxia leucoptera***	**POSS**	**Black-capped chickadee**	***Poecile atricapillus***	**POSS**
Red crossbill	*Loxia curvirostra*	POSS	House sparrow	*Passer domesticus*	POSS
Black-crowned night-heron	*Nycticorax nycticorax*	POSS	**Yellow-bellied flycatcher**	***Empidonax flaviventris***	**POSS**
White-throated sparrow	***Zonotrichia albicollis***	**PROB**	Alder flycatcher	*Empidonax alnorum*	POSS
Song sparrow	*Melospiza melodia*	CONF	**Least flycatcher**	***Empidonax minimus***	**POSS**
Lincoln's sparrow	*Melospiza lincolnii*	POSS	Wlison's warbler	*Cardellina pusilla*	POSS
Swamp sparrow	***Melospiza georgiana***	**POSS**	**Northern parula**	***Setophaga americana***	**POSS**
Savannah sparrow	*Passerculus sandwichensis*	POSS	**Yellow-rumped warbler**	***Setophaga coronata***	**POSS**
Chipping sparrow	*Spizella passerina*	CONF	Chestnut-sided warbler	*Setophaga pensylvanica*	POSS
Fox sparrow	*Passerella iliaca*	POSS	**Black-throated green warbler**	***Setophaga virens***	**POSS**
Northern harrier	*Circus cyaneus*	POSS	Blackburnian warbler	*Setophaga fusca*	POSS
Gadwall	*Anas strepera*	POSS	**Nashville warbler**	***Oreothlypis ruficapilla***	**POSS**
Mallard	***Anas platyrhynchos***	**CONF**	**Bay-brested warbler**	***Setophaga castanea***	**CONF**
American black duck	*Anas rubripes*	CONF	**Magnolia warbler**	***Setophaga magnolia***	**CONF**
Northern shoveler	*Anas clypeata*	CONF	**Black-throated blue warbler**	***Setophaga caerulescens***	**POSS**
Rose-breasted grosbeak	***Pheucticus ludovicianus***	**POSS**	**Ovenbird**	***Seiurus aurocapilla***	**POSS**
Red-winged blackbird	*Agelaius phoeniceus*	PROB	**Pine warbler**[2]	***Setophaga pinus***	
American goldfinch	*Spinus tristis*	PROB	**Northern waterthrush**	***Parkesia noveboracensis***	**PROB**
Spotted sandpiper	***Actitis macularius***	**CONF**	**Canada warbler**	***Cardellina canadensis***	**POSS**
Barred owl	*Strix varia*	CONF	American redstart	*Setophaga ruticilla*	POSS
Ruby-throated hummingbird	*Archilochus colubris*	POSS	Mangrove warbler	*Setophaga petechia*	POSS
American crow	***Corvus brachyrhynchos***	**POSS**	**Common yellowthroat**	***Geothlypis trichas***	**POSS**
American kestrel	*Falco sparverius*	POSS	**Black-and-white warbler**	***Mniotilta varia***	**POSS**

Table 4-2: Potential Nesting Species and Nesting Indicators Based on the Quebec Breeding Bird Atlas (cont'd)

Species	Latin name	Index[1]	Species	Latin name	Index[1]
Black-billed cuckoo[2]	***Coccyzus erythrophtalmus***		**Tennessee warbler**	***Oreothlypis peregrina***	**POSS**
European starling	*Sturnus vulgaris*	CONF	**Cape May warbler**	***Setophaga tigrina***	**POSS**
Merlin	*Falco columbarius*	POSS	**Mourning warbler**	***Geothlypis philadelphia***	**POSS**
Peregrine falcon	*Falco peregrinus*	CONF	Indigo bunting	*Passerina cyanea*	PROB
Ring-necked duck	*Aythya collaris*	POSS	**Broad-winged hawk**	***Buteo platypterus***	**PROB**
Common goldeneye[3]	***Bucephala clangula***	**CONF**	**Hairy woodpecker**	***Picoides villosus***	**CONF**
Blue jay	***Cyanocitta cristata***	**POSS**	Northern flicker	*Colaptes auratus*	CONF
Canada jay	***Perisoreus canadensis***		Yellow-bellied sapsucker	*Sphyrapicus varius*	POSS
Ruffed grouse	*Bonasa umbellus*	CONF	**Downy woodpecker**	***Picoides pubescens***	**CONF**
Ring-billed gull	*Larus delawarensis*	POSS	Eastern wood pewee	*Contopus virens*	PROB
Common raven	***Corvus corax***	**POSS**	Scarlet tanager	*Piranga olivacea*	POSS
Common merganser	*Mergus merganser*	CONF	Common loon	*Gavia immer*	PROB
Pileated woodpecker	***Dryocopus pileatus***	**CONF**	Killdeer	*Charadrius vociferus*	CONF
Great horned owl	*Bubo virginianus*	POSS	**Common grackle**	***Quiscalus quiscula***	**CONF**
Brown creeper	*Certhia americana*	POSS	**Golden-crowned kinglet**	***Regulus satrapa***	**POSS**
Swainson's thrush	***Catharus ustulatus***	**PROB**	**Ruby-crowned kinglet**	***Regulus calendula***	**POSS**
Veery	***Catharus fuscescens***	**POSS**	**Purple finch**	***Haemorhous purpureus***	**POSS**
Hermit thrush	***Catharus guttatus***	**CONF**	**Red-breasted nuthatch**	***Sitta canadensis***	**POSS**
Evening grosbeak	*Coccothraustes vespertinus*	CONF	**Pine siskin**	***Spinus pinus***	**POSS**
Tree swallow	*Tachycineta bicolor*	POSS	Mourning dove	*Zenaida macroura*	POSS
Barn swallow	*Hirundo rustica*	POSS	**Winter wren**[2]	***Troglodytes hiernalis***	
Cedar waxwing	***Bombycilla cedrorum***	**CONF**	Eurasian wren	*Troglodytes hiemalis*	POSS
Dark-eyed junko	***Junco hyemalis***	**POSS**	Turkey vulture	*Cathartes aura*	POSS
Belted kingfisher	*Megaceryle alcyon*	POSS	**Solitary vireo**	***Vireo solitarius***	**POSS**
American robin	***Turdus migratorius***	**CONF**	**Red-eyed vireo**	***Vireo olivaceus***	**PROB**
Eastern bluebird	*Sialia sialis*	CONF	Philadelphia vireo	*Vireo philadelphicus*	CONF

1: POSS: Potential nesting; PROB: Probable nesting; CONF: Confirmed nesting

2: Mentioned in the 2014 inventory (GNL Québec 2014) but omitted from the AONQ 2014 list.

3: Entry named common goldeneye in GNL Québec 2014 but more likely to be golden-eye duck.

Source: AONQ 2014, parcels 19CP65, 19CP66, 19CP75 et 19CP76[2].

4.1.2.6 Herpetofauna

The Saguenay Fjord is the habitat of two amphibian groups, urodeles (salamanders and tritons), and anurous (frogs and toads), which are likely found on the shores of the Saguenay River, along with five garter snake species and one turtle species. In 2014, the American toad, wood frog, green frog, spring peeper, and common garter snake were inventoried in the local study area.

2 See Chapter 7 *References* in the GNL Québec inc. August 2015 report. *Projet Énergie Saguenay : Complexe de liquéfaction de gaz naturel à Saguenay. Description de projet*.

4.1.2.7 Land and Winged Mammals

Land and winged mammals likely to inhabit the local study area are also found around the entire Saguenay–Lac-Saint-Jean Region, six species of large fauna (white-tailed deer, coyote, grey wolf, Canada lynx, moose and black bear), fifteen species of small fauna, nineteen species of micromammals, and seven species of bats (Table 4-4).

An inventory made less than 10 km from the project site in 2010 revealed the presence of six species: short-tailed shrew, cinereous shrew, southern red-backed vole, meadow vole, deer mouse, and meadow jumping mouse. Also, white-tailed deer, porcupine and moose carcasses were found.

4.1.2.8 Endangered and Special-Status Species

Four plant species found in land and riparian areas along the Saguenay River could possibly be listed endangered or vulnerable under the Quebec Act respecting Threatened or Vulnerable Species: striped coral-root, royal lady's slipper, sand-heather, and Tuckerman's quillwort. Table 4-3 lists the special status fauna likely found in the local study area.

4.1.2.9 Habitats of Special Interest

The Saguenay River has diverse special fauna and flora habitats, which are included in the extended study area. These are:

- Saguenay–St. Lawrence Marine Park;
- Parc national du Fjord-du-Saguenay;
- Marais-de-Saint-Fulgence IBA;
- Five Aquatic Bird Concentration Areas (ABCA);
- Heron protection area in Baie des Ha! Ha!

The Marais-de-Saint-Fulgence IAB (7 km northwest of the Project) is of continental and global importance in terms of bird protection, especially gregarious species. Over 210 species have been inventoried, including great gatherings of Canada geese, show geese, Herring gulls, and purple sandpipers.

The extended study area includes five Aquatic Bird Concentration Areas (ABCA): Cap à la Loutre and Anse aux Foins in Saint-Fulgence, and Rang Saint-Martin and Grande-Baie in the La Baie District, Cap Saint-François, on the north shore of the Saguenay River, in the Chicoutimi District.

A heron protection area is also located in Baie des Ha! Ha!, about 9 km from the Project, in Grande Baie where three species live: great blue herons, bitterns, and great egrets.

Table 4-3: Special Status Wildlife Species Likely to Be Found in the Local Study Area

Species	Latin name	Provincial LEMV	Federal	
			COSEWIC	SRA
Fish				
American shad	*Alosa sapidissima*	V	-	-
American eel	*Anguilla rostrata*	SDMV	M	-
Striped bass	*Morone saxatilis*	-	EVD	D
Atlantic sturgeon	*Acipenser oxyrinchus*	SDMV	M	-
Atlantic cod	*Gadus morhua*	SDMV	EVD	-
Thorny skate	*Amblyraja radiata*	-	P	-
Atlantic salmon	*Salmo salar*	-	P	-
Atlantic redfish	*Sebastes mentella*	-	EVD	-
Birds				
Harlequin duck	*Histrionicus histrionicus*	V	P	P
Red knot	*Calidris canutus*	-	EVD	-
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*	SDMV	-	-
Red-shouldered hawk	*Buteo lineatus*	-	-	P
Eastern whip-poor-will	*Caprimulgus vociferus*	SDMV	M	M
Common nighthawk	*Chordeiles minor*	-	M	-
Peregrine falcon	*Falco peregrinus anatum*	V	P	P
Horned grebe	*Podiceps auritus*	M	EVD	EVD
Short-eared owl	*Asio flammeus*	SDMV	P	P
Barn swallow	*Hirundo rustica*	-	M	-
Chimney swift	*Chaetura pelagica*	-	M	-
Olive-sided flycatcher	*Contopus borealis*	-	M	-
Canada warbler	*Wilsonia canadensis*	SDMV	M	M
Red-headed woodpecker	*Melanerpes erythrocephalus*	M	M	-
Loggerhead shrike	*Lanius ludovicianus*	M	EVD	-
Bald eagle	*Haliaeetus leucocephalus*	V	-	-
Rusty blackbird	*Euphagus carolinus*	-	P	-
Yellow rail	*Coturnicops noveboracensis*	M	P	P
Eastern meadowlark	*Sturnella magna*	-	M	-
Herpetofauna				
Brown snake	*Storeria dekayi*	SDMV	-	-
Smooth green snake	*Liochlorophis vernalis*	SDMV	-	-
Mammals				
Least weasel	*Mustela nivalis*	SDMV		
Rock vole	*Microtus chrotorrhinus*	SDMV		
Southern bog hemming	*Synaptomis cooperi*	SDMV		
Silver-haired bat	*Lasionycteris noctivagans*	SDMV		
Hoary bat	*Lasiurus cinereus*	SDMV		
Northern long-eared myotis	*Myotis septentrionalis*		EVD	
Eastern red bat	*Lasiurus borealis*	SDMV		
Eastern pipistrelle	*Perimyotis subflavus*	SDMV	EVD	
Little brown myotis	*Myotis lucifugus*		EVD	
Beluga whale	*Delphinapterus leucas*	M	M	M

Legend: Extinct (D); Critically endangered (EVD), Endangered (M); At risk (P); Likely to be listed threatened or vulnerable (SDMV); Vulnerable (V).

Sources: MDDEFP 2009b; Government of Canada 2015; Mousseau and Armellin 1995[3].

[3] See Chapter 7 *References* in the GNL Québec inc. August 2015 report. *Projet Énergie Saguenay : Complexe de liquéfaction de gaz naturel à Saguenay. Description de projet*.

4.1.3 Components of the Human Environment

4.1.3.1 Administrative Framework and Land Tenure

The local study area (Map 4-1) is under the Saguenay–Lac-Saint-Jean Administrative Region. It is partly in the La Baie District, Saguenay City, south shore of the Saguenay River, and the Saint-Fulgence Municipality, on the north shore. Saguenay City has the jurisdiction of an RCM and Saint-Fulgence in part of the Fjord-du-Saguenay RCM.

In addition to the municipalities mentioned above, the extended study area (Map 4-2) includes six other Fjord-du-Saguenay RCM territories: the town of Sainte-Rose-du-Nord and the Mont-Valin Non-Organized Territory (territoire non-organisé, hereinafter TNO) on the north shore of the Saguenay River, and the towns of Saint-Félix-d'Otis, Rivière-Éternité, L'Anse-Saint-Jean and Petit-Saguenay, on the south shore. In the downstream part of the Saguenay River, the Saguenay and St. Lawrence shores are part of the Sacré-Cœur, Tadoussac, Bergeronnes and Escoumins municipalities, in the Haute-Côte-Nord RCM, as well as the Essipit First-Nation Reserve (Côte-Nord Region – 09) on the north shore.

The local study area includes private and public lands (Map 2-1). Public lands near the project site are under the management of the SPA. SPA is also the owner of two lots to the south of Grande-Anse Maritime Terminal.

In the extended study area, the part of the Saguenay River downstream from Baie des Ha! Ha! to the St. Lawrence River is included within the Saguenay–St. Lawrence Marine Park, which was created in 1997 following a 1990 agreement between the federal and provincial governments. The Marine Park manages the waterway and seabed.

In addition to the Saguenay–St. Lawrence Marine Park, the extended study area is within the boundaries of Parc national du Fjord-du-Saguenay, which stretches along both shores of the Saguenay River, from Sainte-Rose-du-Nord to Tadoussac. It is part of the Quebec national parks network and managed by the Quebec Outdoor Establishments Corporation (*Société des établissements de plein air du Québec* (SÉPAQ)).

4.1.3.2 Allocation of Land

Responsibility for land development and resource management in the local study area is shared by three entities: Fjord-du-Saguenay RCM, Saguenay City, which also has the jurisdiction of an RCM, and Saint-Fulgence Municipality.

The project is located within a designated port area and designated "industrial expansion zone" according to the Planning and Development Scheme of the City of Saguenay as revised in 2015. Still in Saguenay City, the local study area includes agricultural lands (viable and dynamic), logging lands, recreational lands, along with an industrial expansion zone and reserved land areas.

The project site is located on a SPA land, zoned for industrial usage.

The part of the project on Lot 4 012 404 is located within Zone 87790 of the Saguenay City urban zoning plan. The land-use categories specifically covered in this zone are: Railroad (except for tourist trains, switches, and switchyards); Railroad switches and switchyards; Railroad maintenance and equipment; General port facilities and other marine transportation infrastructures; and Parks, playgrounds, and natural areas. A special provision for general port facilities permits industrial usage in line with port activities (Saguenay City, 2012).

The part of the project on Lot 4 012 405 is located within Zone 71779 of the urban zoning plan. The land-use categories specifically covered in this zone are: Light industry; Heavy industry; Public utilities and associated activites; Agricultural – farming and forestry; Breeding; and Parks, playgrounds, and natural areas. A special provision for large-scale industrial use requiring close proximity to port facilities is associated with the light and heavy industry categories. These types of industries must use at least 50 ha of land area. Note here that until large-scale industries are implemented, the City will only authorize forestry operations, in compliance with the orientations and designations concerning intramunicipal public lots (Saguenay City, 2012, amended in 2015).

Shoreline protection measures apply in Zone 87790, along with standards relative to landslide stress zones. These are located along the shore the Saguenay River on either side of the Grande-Anse Terminal and near Chemin du Quai-Marcel-Dionne

4.1.3.3 Socioeconomic Profile

Population

The Fjord-du-Saguenay RCM numbered 21,646 residents in 2014, spread over some 43,000 km^2. Saguenay City occupied 1,137 km^2 and had 147,100 residents in 2014. Saint-Fulgence had a population of 2 013, distributed over a surface area of 350 km^2. The 14 municipalities and other territories (First Nation reserves and TNO) within the extended study area, including the Saguenay and Saint-Fulgence Municipalities, had a total of 158,956 residents.

Economy

The most highly developed activity sectors in the Saguenay–Lac-Saint-Jean Region are logging, aluminum, agrifood and tourism. Logging, wood processing, and aluminum production provide 40% of regional primary and secondary sector jobs. Development of regional resources in the mining industry should also stimulate the economy in coming years.

Nearly 83% of Saguenay City's some 4,200 businesses provide over 57,000 jobs (78.9%) in the service industry, while 19.2% of the jobs come from the secondary sector, and 1.9%, from the primary sector.

Saguenay City's strategic plan aims to improve regional transportation. Maritime, rail, and air transportation are being optimized to support economic development. The *Route verte*, *Véloroute des Bleuets* and *Cols du Fjord* bike paths are also slated for future improvements.

The Fjord-du-Saguenay RCM numbers some 1,000 tourism, sales and service, and natural resource development companies (CLD du Fjord 2014). The commercial and service sectors provide nearly 60% of the jobs available in regional towns and villages. The area also benefits from the Saguenay City's economy. Since 2002, the Fjord-du-Saguenay RCM has been marked by changes in its economy, as the employment rate of people 25 and older rose from 53.2% in 2001, to 65.7% in 2006, and 70.5% in 2011. The median income of these workers was $34,702 in 2011.

4.1.3.4 First Nations

Nitassinan

In Quebec, the Innu territory is called "Nitassinan", meaning "our land". Since 2004, Nitassinan has been the object of an APGN (Agreement-in-Principle of General Nature) involving the Mamuitun and Nutashkuan First Nations, the Government of Quebec and the Government of Canada. By definition, Nitassinan is an ancestral-traditional territory under the jurisdiction of Quebec and governed by Quebec and Canadian laws. Consequently, the Innu Aitun[4] practice to meet the needs of the Innu people is recognized insofar as the sharing of wildlife resources with other Nitassinan users complies with the terms and conditions set out in the APGN. The Innus rights on the Nitassinan are limited. Royalties are planned within the Treaty associated with the APGN on the exploitation of Nitassinan natural resources.

The APGN establishes the foundations for the development of a land-claim treaty. The parties involved have agreed on many legal points regarding, at least, self-government, environmental assessment processes, financing, land development planning, logging, and traditional activities. Territorial protection rights and actions, within the agreement, include the protection of heritage sites, Innu cultural heritage and way of life, as well as access to measures leading to socioeconomic parity.

The project site is located in the Southwest part of the 21,106 km^2 territory covered by the APGN, defined as being of common interest among the Pekuakamiulnuatsh (Mashteuiatsh), Essipit and Pessamit First Nations, as confirmed by the Quebec Department of Energy and Natural Resources (MERN) in May 2014. The nature and level of interest in this territory remain unclear in the APGN.

[4] Innu Aitun refers to all activities, in traditional or contemporary use, associated with Innu national culture, fundamental values, and traditional way of life tied to the occupation and utilization of the Nitassinan and to the special relations they entertain with the Earth. This includes, notably, all hunting, fishing, trapping, and gathering activities, be they for subsistence, ritual and/or social ends.

Besides the Southwest area, the local study area covers the north shore of the Saguenay River, the Mashteuiatsh Nitassinan, an area of 79,062 km^2 around Lake Saint-Jean and on either side of the Saguenay River (Map 4-1).

Pekuakamiulnuatsh First Nation

Historically, Pekuakamiulnuatsh First Nation residents consider themselves either Pekuakamiulnu, Pekuakami Ilnuatsh (Lake Saint-Jean Innu), Mashteuiatsh Innu or Mashteuiatsh Montagnais, all of which are valid designations. In 1856, the Lake Saint-Jean Montagnais Council acquired a territory then known under the name Ouiatchouan, located on the shores of Lake Saint-Jean, which has become the current site of the Mashteuiatsh community. It is the only First Nation reserve in the Saguenay–Lac-Saint-Jean Region.

In 2014, the Mashteuiatsh First Nation had 6,338 members (2,028 residents and 4,310 non-residents). It is located about 100 km west of the project site, on the west shore of Lake Saint-Jean, and 6 km from the town of Roberval. The reserve covers an area of 1,522 ha.

In 2009, the Mashteuiatsh First Nation numbered 106 businesses generating 878 jobs, a significant increase over the 1991 numbers of 53 businesses and 354 jobs. The largest employer is the Band Council with 350 jobs in various sectors. The community has also implemented two economic development companies: *Société de développement économique ilnu* (SDÉI) and *Développement Piekuakami Ilnuatsh* (DPI). In 2010, the community initiated the construction of an industrial park.

Pessamit First Nation

The Pessamit Reserve, formerly known as Betsiamites, then Bersimis, meaning “where leaches and lampreys, or sea eels, are found”. This reserve numbers 2,861 residents and 1,009 non-residents, for a total population of 3,870. It is located on the north shore of the St. Lawrence River, about 54 km southwest of the town of Baie-Comeau. Its vast 25,242 ha territory stretches all the way to the St. Lawrence shoreline.

The Pessamit Innu Council is involved in the political, economic and social aspects of the community. In 2008, the Band Council was the community’s main employer, providing 491 jobs. In addition to community services, the Band Council is active in commercial fishing (two fishing vessels) and recreational tourism. The community also offers logging expertise and has contracted a partnership agreement with Hydro-Québec for the hydropower development of the Toulnustouc River.

Essipit First Nation

The Essipit First Nation, formerly known as Les Escoumins, numbered 203 residents and 472 non-residents in 2014, for a total 675. The reserve was renamed Essipit in 1996, meaning “shell river”, and covers an area of 87,6 ha. The community is located on the north shore of the St. Lawrence River, near Baie des Escoumins, about 100 km east of the Project.

Metis

To this day, there are no known Metis communities within the study areas of the Project. However, a number of Domaine du Roy and Seigneurie de Mingan individuals and groups were claiming ancestral Metis rights over a substantial territory, including the project’s local and extended study areas, were disallowed by the Superior Court of Quebec in February 2015.

Traditional Land Use

The Innu First Nations take part in hunting, fishing, and gathering as subsistence activities and part of their cultural identity. Before the advent of reserves, the Innu conducted these activities as part of seasonal migrations. In the spring, families and groups travelled from their inland hunting locations to the shores of the St. Lawrence River where they hunt marine mammals, such as seals, and take advantage of salmon and geese migration. These coastline activities are still in practice today.

Based on the preliminary information obtained from provincial authorities, the potential of the project site for First Nation traditional activities appears low. Section 5.3 provides further details on the engagement process to be undertaken with the First Nations concerned.

4.1.3.5 Land Use

Man-Made Environment

The local study area includes a few private homes, some of which are farmsteads. Other residences are located west of the project, along and at the end of Chemin Saint-Martin. A few cottages are located on the south shore of the Saguenay River, more than one km east of the project, and 4 km to the south, at Grand Lac. Also, an SPA terminal warehouse is located on Chemin du Quai-Marcel-Dionne.

The strip of land along the north shore of the Saguenay River is mostly designated for recreational use, including many private resort-type lots, some with cottages.

Recreation and Tourism

In addition to cottages, Parc Aventures Cap Jaseux is located across the river from the project site, and offers diverse activities such as kayaking, observation, playground, beach, lodging, and campground. The park is a significant regional tourist attraction that caters to some 45,000 visitors each year.

In Sainte-Rose-du-Nord, located in the extended study area, the Domaine du Cap au Leste outfitter offers canoeing, swimming, and black bear observation. In winter, snowmobiling and ice fishing are among the main attractions.

Moreover, to the northwest, outside the local study area, sits the *Centre d'interprétation des battures et de réhabilitation des oiseaux* (CIBRO) bird sanctuary of Saint-Fulgence, along with a few bed and breakfasts and inns tied to the tourism industry.

A large part of the tourist customer base comes for the outdoor activities. Activities such as kayaking, sailing, sightseeing cruises, whale watching, summer and winter fishing, and snowmobiling are popular on the Saguenay River. The section on commercial navigation describes the sightseeing and whale-watching cruises on the Saguenay River.

Note that the *Route verte* bike path runs along Chemin de Grande-Anse and Chemin de l'Anse-à-Benjamin in the local study area.

Note also that the Saguenay–St. Lawrence Marine Park, a national ecosystem protection and conservation area for part of Saguenay River and St. Lawrence Estuary, sits within the project's extended study area. The marine park also collaborates with several scientific research projects on whales, contamination, birds, and pelagic fish. It is governed by the Saguenay–St. Lawrence Marine Park Act and regulaitons on Marine Activities on the Saguenay–St. Lawrence Marine Park.

Parc national du Fjord-du-Saguenay stretches along the Saguenay River from Sainte-Rose-du-Nord to Tadoussac, all within the extended study area. Under provincial jurisdiction, the conservation, nature, recreation, and service areas provide a variety of protection statuses in various park areas. The park's three key sectors are Baie Sainte-Marguerite, Baie de Tadoussac and Baie Éternité. Besides the conservation and protection mission, the park has a special challenge tied to the fragmentation of the territory into several discontinuous land perimeters. Since 2004, the SEPAQ organization has implemented an Ecological Integrity Monitoring Program for the park. The national parks governed by SÉPAQ fall under the Park Regulations of the Quebec Parks Act (*Règlement sur les parcs* of the *Loi sur les parcs*).

Ice Fishing

The popularity of ice fishing on the Saguenay River has significantly increased since the early 1990s. According to Promotion Saguenay, the number of fishing huts on the river went from 1,000 to more than 1,700 from 1998 to 2012. Within the local study area, the SPA authorizes ice fishing inside a defined area, across from the town of Saint-Fulgence, based on a limited-time agreement between the municipality and the SPA.

In 2015, the main ice fishing hubs within the extended study area are L'Anse-Saint-Jean, Saint-Félix-d'Otis, Sainte-Rose-du-Nord, Saint-Fulgence and the Saguenay City District of La Baie. Ice fishing is a major attraction not only popular among local enthusiasts, but also with North American and European tourists.

Commercial Navigation

There are three commercial wharfs within the local and extended study areas: Grande-Anse Maritime Terminal, Bagotville Maritime Terminal and Port-Alfred Port Facilities, property of RTA.

Several industrial companies established on the shores of the river import and export goods by sea. Commercial navigation on the Saguenay River has increased from an annual average of about 300 ships in the early 90s to an average of about 200 ships since the early 2000s. Based on Fisheries and Oceans Canada projections and data disseminated by Port Saguenay, approximately 200 commercial ships, 30 ocean liners, and 1,000 commercial vessels travelled the Saguenay River in 2010, and this does not include *Société des Traversiers du Québec* year-round ferryboat trips at the mouth of the Saguenay River. While commercial excursions are mostly concentrated in the downstream part of the river, most commercial ships and international ocean liners dock at Baie des Ha! Ha!

The number of ocean liners transiting the Saguenay is expected to increase over the next few years; their number has increased from 10 ships in 2006, to 26 in 2012 and reached 32 ships in 2014. Bookings recorded for 2015 and 2016 suggest that Saguenay will remain a successful destination for a foreseeable future. Cruise shops dock at the Bagotville wharf located in the Baie des Ha! Ha!

The tonnage handled at the Grande-Anse Terminal is mostly made up of pulp, paper, deicing salt, coal, sodium hydroxide, liquid pitch, and general goods. The SPA handled 327,000 t of various goods in 2011, and 270,000 t in 2012. In 2011, 55 ships docked at the Grande-Anse Terminal, and 40 docked in 2012.

Large quantities of raw materials go through the private Port-Alfred Port Facilities in the Baie des Ha! Ha! Given the planned Rio Tinto Alcan expansion projects in the region, certain products could be handled by the Grande-Anse Terminal in the near future, for distribution to various plants via the railroad system. The Grande-Anse Terminal could also become a shipping port for finished products (e.g. aluminum ingots, etc.) heading to foreign markets or toward the Great Lakes.

Finally, several mining companies have shown interest in shipping and receiving their products via the Grande-Anse Terminal. For example, Arianne Phosphate is planning to build a transhipment wharf on the north shore of the Saguenay River, at the municipal border between Saint-Fulgence and Sainte-Rose-du-Nord.

Recreational Navigation

Within the extended study area, Saguenay City (Chicoutimi and La Baie Districts), and the Sainte-Rose-du-Nord, L'Anse-Saint-Jean and Sacré-Cœur Municipalities have wharf facilities for recreational boaters. Between 7,675 and 11,400 recreational boat trips were made on the Saguenay River between May 1st and October 31st, 2007 (excluding the lower and upper estuaries).

The Club de voile Saguenay and Voile Mercator offer excursions, sailing lessons, and sailboat rentals on the Saguenay River. One of their marinas is located in Baie des Ha! Ha! Additionally, sea kayaking is a very popular activity in many areas of the river.

Agriculture, Mining and Forestry

A large part of the local study area belongs to a protected agricultural area under the Quebec's Act respecting *the Preservation of Agricultural Land and Agricultural Activities*. These protected areas are mostly located in Saguenay City, notably east of the project site. The local study area includes agricultural lands to the west and east of the project site, along Chemin Saint-Martin and Chemin du Cap-à-l'Ouest. Farms are also active along the north shore of the Saguenay River, in the Saint Fulgence area.

The local study area has no active mineral tenures (claims or leases).

4.1.3.6 Infrastructures and Services

Road Infrastructure

Four-lane Highway 175 links Saguenay City to Quebec City (211 km) and the rest of North America. Other roads provide access to the region, such as provincial Route 172 from the Côte-Nord Region and Route 381 from the Charlevoix Region, as well as regional Route 170. From Route 170, the Grande-Anse Terminal is accessed by Chemin de Grande-Anse and Chemin du Quai-Marcel-Dionne. This 3.5 km road has a 100 m-wide corridor and is part of the national road network.

Port Infrastructure

The Grande-Anse Maritime Terminal is adjacent to the project site and accessible to ships registered with the International Ship and Port Facility Security Code (ISPS). Its jurisdiction area includes all Saguenay River tidewaters between Cap à l'Ouest and the Chicoutimi District Port Zone.

The Rio Tinto Alcan Port Facilities, located in Baie des Ha! Ha!, are used for incoming bulk raw materials and are tied to the Rio Tinto Alcan railroad service.

The Canadian Coast Guard oversees emergency response efforts on the Saguenay River.

Railway Infrastructure

The *Compagnie de chemin de fer Roberval-Saguenay* (CCFRS) railway operates a rail network between the Port-Alfred Port Facilities in Baie des Ha! Ha! and Rio Tinto Alcan's Saguenay–Lac-Saint-Jean aluminum smelters (Jonquière, Grande-Baie, Laterrière and Alma), and the major regional pulp & paper mills. The CCRRS mainly delivers bauxite from the La Baie District Port Facilities, as well as alumina, petroleum coke, chemical products, paper, forest products, and aluminum. The CCFRS network is connected to the Quebec and Transamerica rail networks.

A new 12.5 km railway section was built within the local study zone in the summer of 2014 and connects the CCFRS network to the Grande-Anse Maritime Terminal.

Air Transportation Infrastructure

Air carriers operate from the Saguenay-Bagotville Airport, located in the La Baie District of Saguenay City, near the Chicoutimi District line, with regular flights to Montreal and Côte-Nord. It is located about 15 km southwest of the project site.

Public Utilities Infrastructure

Saguenay City potable water is mainly drawn from surface water (74.9%), and the remainder from groundwater. The City operates thirteen wells and four water treatment facilities, producing 85,000 m^3 of water per day. Residences and establishments along Chemin de Grande-Anse, Chemin Saint-Martin, Chemin du Quai-Marcel-Dionne, Chemin Saint-Joseph, and Chemin de l'Anse-à-Benjamin get their water from the city waterworks.

In all, 96% of Saguenay City residents are connected to the municipal sewer system. The network does not however cover the area near the project site, notably the Grande-Anse port facilities. The City uses the activated sludge method to treat its sewage in three water pollution control plants. They treat 40,319,509 and 35,920,964 m^3 of residential and industrial wastewater, respectively.

Saguenay City gets its natural gas from the Gaz Métro network.

4.1.3.7 Geography

Geography of the Extended Study Area

The Saguenay Fjord is the main geographical feature of the extended study area. The Saguenay River flows within the confines of the Fjord, between rocky capes averaging some 500 m in height. The river's tributaries flow along adjacent valleys into bays and coves where villages were establihed. This geographical feature has a rugged landform and is covered by dense woodlands mostly made up of coniferous trees. The Saguenay Fjord is subdivided into two landscape units: the south and north shores.

The south shore stretches between the villages of Petit-Saguenay and Saint-Félix-d'Otis, with the Saguenay Fjord and River as the main visual attractions. The only regional road to this natural setting is Route 170, which meanders along the Saguenay River and gradually moves away from it. The view over the rolling landscapes and rivers is spectacular. Photo 4-1 shows part of the Saguenay Fjord within the confines of Parc national du Fjord-du-Saguenay.

The north shore landscapes feature a very high mountainous landform with scenic viewpoints of majestic tree-covered capes. Route 172 is the main road through this scenery. It runs on either side of the second most popular attraction in the area, Sainte-Marguerite River, in the Mont-Valin TNO. This outlandish territory has kept its pristine character through the centuries, as very few human constructions dot the landscapes.

Source : Martin Thibeault © SÉPAQ

Photo 4-1: Landscape in the Saguenay Fjord Geographical Area (Parc national du Fjord-du-Saguenay)

Geography of the Local Study Area

The local study area is dominated by maritime and mixed agriculture/forest landscapes, along with a much smaller industrial landscape.

The Saguenay Fjord and its singularly featured littoral zones are part of the maritime landscape.

The mixed agriculture/forest landscape covers most of the land within the local study area. This rugged landform and plateaus along the shores are mainly covered by coniferous trees (Photo 4-2), and feature small lakes and streams, along with wetlands. There are only a few homes, cottages and agricultural buildings in this area.

The Grande-Anse Maritime Terminal industrial landscape unit is located on a flat land parcel along the Saguenay River, some of it backfilled. It is bordered by a mixed agriculture/forest landscape to the south and a maritime landscape to the north (Photo 4-2).

Source: lapresse.ca

Photo 4-2: Industrial Landscape Unit (Grande-Anse Maritime Terminal) and Mixed Agriculture/Forest Landscape in the Background

4.1.3.8 Cultural and Archaeological Heritage

According to the Quebec Department of Culture and Communications (MCC) Cultural Heritage Register, three 19th Century houses within the local study, on Chemin Saint-Martin, are considered municipal heritage homes. Two crosses, one at the Chemin Saint-Martin and Chemin de la Grande-Anse intersection, and the second at the Chemin de l'Anse-à-Benjamin and Chemin du Cap-à-l'Ouest intersection, have that same status. These heritage structures, located west and southwest of the project site, are protected under the Quebec Cultural Heritage Act.

In the same register, the Cap-à-l'Est lighthouse and Cap à l'Est as such, located in Sainte-Rose-du-Nord and less than 5 km east of the local study area, are listed as structures of interest by the Fjord-du-Saguenay RCM.

4.2 COMPLEMENTARY STUDIES

Complementary studies are underway or planned to develop a better understanding of the receiving environment and the project's environmental impacts, including inventories of the physical, biological, and human environments, and other studies, such as technological risks, risks associated with marine transportation and liquefaction complex, economic benefits, archaeological survey, and landscape survey, including visual simulations.

4.3 POTENTIAL ENVIRONMENTAL IMPACTS

GNL Québec will implement the stringent LNG industry practices and international standards through the different phases of the project. The company is committed to health & safety, and environmental protection, as well as social acceptability.

Few incidents have occurred in LNG facilities worldwide over the past 60 years, and none of these involved damages to individuals or property outside the boundaries of the facilities concerned, as the industry pays extremely close attention to the safety aspects in the design of LNG terminals.

GNL Québec will adopt recognized international practices to protect the health and safety of workers, prevent pollution, and respect the needs of neighboring communities. Moreover, the company's LNG facilities will be equipped with appropriate leak detection systems to prevent environmental and human health risks. Risk assessments for the proposed liquefaction complex and maritime shipping will be performed. Also, precautionary measures and a

prevention and emergency response plan will be implemented within the construction and operational framework of the liquefaction complex.

The main potential impacts of the project on the physical, biological and human environments are listed in Tables 4-4 to 4-6. This preliminary evaluation, as well as the EIA, will analyze all VECs and VSCs likely to be affected by the project's impact sources (direct, indirect, cumulative, etc.), based on a variety of criteria (value, intensity, scope, duration, reversibility, etc.). Mitigation, compensation, and enhancement measures will be proposed in the EIA.

The cumulative effects of the project with other planned projects, actions or activities nearby, notably the gas-supply pipeline project and the Hydro-Québec hydroelectric power line for the liquefaction complex, marine transportation on the Saguenay and St. Lawrence rivers, near the mouth of the Saguenay River, will be assessed. Other regional projects will also be considered in the cumulative effects analysis.

The project's main expected sources of impacts are:

Construction Phase

- Land preparation (tree cutting, stump removal, leveling, excavation, blasting, road building, etc.).
- Installation and presence of the construction site (noise, light, air emissions (including GHGs) non-hazardous and hazardous residue management (storage and recovery)).
- Accidental spill or loss of hydrocarbons and other products.
- Material, equipment and worker transportation.
- General liquefaction complex and wharf construction activities (concrete, structural, piping, mechanical, and electrical, and architectural work, operations in the river).
- Non-hazardous and hazardous residual material management (storage and recovery).
- Dismantling/decommissioning of the construction site.
- Labour and purchasing.

Operation Phase

- Liquefaction complex and wharf presence and operation (noise, light, air emissions – including GHGs – liquid effluents, non-hazardous and hazardous residue management (storage and recovery)).
- Accidental spill or loss of hydrocarbons and other products.
- Technological incidents (fires, etc.).
- Natural events (earthquakes, tornadoes, etc.).
- Structural repairs, etc. (mid- to long-term work).
- Material, equipment and worker transportation.
- Vessel traffic on the Saguenay and St. Lawrence rivers.
- Labour and purchasing.

Decommissioning and Abandonment Phase

- Worksite installation and presence.
- Accidental spill or loss of hydrocarbons and other products.
- Material, equipment and worker transportation.
- General dismantling and recycling of infrastructures.
- Production of non-hazardous and hazardous residues (storage and recovery).
- Worksite decommissioning and land/site rehabilitation.
- Labour and purchasing.

Table 4-4: Main Potential Impacts of the Project on the Physical Environment Components per Project Phase

Phase	Source of Impact	Component	Potential Impact on the Component
Construction	• Land/site preparation • Accidental spill or loss of hydrocarbons and other products	Soil quality and profile	• Modification to soil profile and risk of landslides. • Soil contamination in case of accidental spills.
	• Land/site preparation	Hydrology	• Modification of surface runoff (runoff and infiltration rates) at land facilities.
	• Land/site preparation	Hydrogeology	• Modification to local runoff rate.
	• Accidental spill or loss of hydrocarbons and other products	Groundwater quality	• Groundwater contamination in case of accidental spills.
	• Land/site preparation • Liquefaction complex and wharf general construction activities • Accidental spill or loss of hydrocarbons and other products	Quality of surface water and sediments	• Fine particulate emissions and ligneous waste altering local surface water quality. • Contamination of the aquatic environment in case of accidental spills.
	• Land/site preparation • Worksite installation and presence • Material, equipment and worker transportation • Worksite decommissioning	Ambient air quality	• Temporary increase in dust contents in air and contaminant emission rates, including GHGs, associated with exhaust fumes from vehicles and temporary generators.
	• Land/site preparation • Worksite installation and presence • General liquefaction complex and wharf construction	Ambient noise and light	• Temporary increase in noise and light levels possibly disrupting neighboring residences, cottages, and holidaymakers, and fauna.
Operation	• Accidental spill or loss of hydrocarbons and other products • Technological incidents • Natural events	Soil, groundwater, surface water, and sediments quality	• Soil, groundwater, surface water, and sediment contamination.
	• Liquefaction complex and wharf presence and activities • Structural repairs • Material and equipment transportation • Vessel traffic on the Saguenay and St. Lawrence rivers • Technological incidents	Ambient air quality	• Increase in dust contents in air and contaminant emission rates, including GHGs.

Table 4-4: Main Potential Impacts of the Project on the Physical Environment Components per Project Phase (Cont'd)

Phase	Source of Impact	Component	Potential Impact on the Component
Operation (cont'd)	• Liquefaction complex and wharf presence and activities • Structural repairs • Material and equipment transportation	Noise	• Increase in noise levels possibly disrupting neighboring residences, cottages, and holidaymakers, and fauna.
	• Liquefaction complex and wharf presence and activities • Vessel traffic on the Saguenay and St. Lawrence Rivers	Light	• Increase in ambient light levels possibly disrupting neighboring residences, cottages, and holidaymakers, and fauna.
Decommissioning and abandonment	• Accidental spill or loss of hydrocarbons and other products	Soil and groundwater quality	• Soil and groundwater contamination.
	• Worksite installation and presence • Accidental spill or loss of hydrocarbons and other products • Worksite decommissioning and land/site rehabilitation	Surface water and sediments quality	• Fine particulate emissions and ligneous waste in the aquatic environment. • Contamination of the aquatic environment.
	• Worksite installation and presence • Material, equipment and worker transportation • General infrastructure dismantling and recycling activities • Worksite decommissioning and land/site rehabilitation	Ambient air quality, noise, and light	• Temporary increase in dust contents in air and contaminant emission rates, including GHGs, associated with exhaust fumes from vehicles and occasional flare operation. • Temporary increase in ambient noise and light levels possibly disrupting neighboring residences, cottages, and holidaymakers, and fauna.

Table 4-5: Main Potential Impacts of the Project on the Biological Environment Components per Project Phase

Phase	Source of Impact	Component	Potential Impact on the Component
Construction	• Land/site preparation • Accidental spill or loss of hydrocarbons and other products	Vegetation	• Loss of forestland, wetlands, shoreline habitats, and disruption of vegetation due to deforestation. • Potential introduction of invading exotic species. • Contamination of vegetation.
	• General liquefaction complex and wharf construction • Accidental spill or loss of hydrocarbons and other products	Fish, benthic fauna and habitats	• Disruption or loss of fish and benthic fauna habitats tied to wharf operations (encroachments, noise, vibration, etc.). • Changes to habitat quality in cases of accidental spills.
	• Material and equipment transportation • General liquefaction complex and wharf construction • Accidental spill or loss of hydrocarbons and other products	Marine mammals	• Temporary disruption of marine mammal habitats and behaviors (noise, vibration, physical presence, etc.). • Risk of collisions between marine mammals and ships. • Changes to habitat quality in cases of accidental spills.
	• Land/site preparation • Worksite installation and presence • Material and equipment transportation • General liquefaction complex and wharf construction • Accidental spill or loss of hydrocarbons and other products	Migrating and other birds	• Disruptions to nesting birds due to deforestation and infrastructure development, and changes in noise levels. • Habitat fragmentation leading to changes in nesting and feeding habits. • Changes to habitat quality in cases of accidental spills.
		Land and winged mammals	• Temporary or permanent habitat loss and/or fragmentation, mortality among less mobile individuals, and disruption of mammals due to temporary changes in noise and light levels and vibrations. • Changes to habitat quality in cases of accidental spills.
		Herpetofauna and habitat	• Noise disruption, temporary or permanent habitat loss and/or mortality among less mobile individuals. • Changes to habitat quality in cases of accidental spills.
	• Land/site preparation • Worksite installation and presence • General liquefaction complex and wharf construction • Accidental spill or loss of hydrocarbons and other products	Endangered and special status species	• For flora, loss or changes in abundance and biodiversity due to deforestation. • For fauna, disruptions due to noise and temporary and/or permanent habitat loss. • Changes to habitat quality in cases of accidental spills.

Table 4-5: Main Potential Impacts of the Project on the Biological Environment Components per Project Phase (Cont'd)

Phase	Source of Impact	Component	Potential Impact on the Component
Operation	• Accidental spill or loss of hydrocarbons and other products • Technological incidents • Natural events	Vegetation	• Changes to the quality of vegetation.
	• Wharf presence and operation • Accidental spill or loss of hydrocarbons and other products • Technological incidents • Natural events	Fish, benthic fauna and habitats	• Disruption of habitats and species at wharf site and along the Saguenay and St. Lawrence waterways. • Changes to habitat quality in cases of accidental spills, incidents or natural events.
	• Wharf presence and operation • Accidental spill or loss of hydrocarbons and other products • Technological incidents • Natural events	Marine mammals Migrating and other birds	• Disruption of habitat and behaviors in marine mammals due to wharf operations (noise and physical presence) and along the Saguenay and St. Lawrence waterways.. • Disruption of birds and habitat quality near the wharf and liquefaction complex. • Changes to habitat quality in cases of accidental spills, incidents or natural events.
	• Liquefaction complex presence and operation • Accidental spill or loss of hydrocarbons and other products • Technological incidents • Natural events	Land and winged mammals Herpetofauna and habitat Endangered and special status species	• Disruption of marine mammals and mortality due to site operations and light levels. • Disruption of habitat quality, herpetofauna fauna and endangered and special status species. • Changes to habitat quality in cases of accidental spills, incidents or natural events.
Decommissioning and abandonment	• General infrastructure dismantling activities • Accidental spill or loss of hydrocarbons and other products • Land/site rehabilitation	Vegetation Fish and habitats Benthic fauna and habitats Marine mammals Migrating and other birds Land and winged mammals Herpetofauna and habitat Endangered and special status species	• Changes to habitat quality and disruption of species. • Changes to habitat quality in cases of accidental spills. • Rehabilitation of the aquatic, semi-aquatic and land environments to initial conditions (positive impact).

Table 4-6: Main Potential Impacts of the Project on the Human Environment Components per Project Phase

Phase	Source of Impact	Component	Potential Impact on the Component
Construction	• Worksite installation and presence • Material, equipment and worker transportation • General liquefaction complex and wharf construction • Worksite decommissioning	Territorial and resource uses	• Temporary changes to recreational and tourism activities on the Saguenay River in project area due to construction disruptions and noise.
	• Material, equipment and worker transportation	Roads	• Increased heavy vehicle and worker traffic on local and regional roads and increased risk of traffic incidents. • Early road wear.
	• Land/site preparation • Worksite installation and presence • Material, equipment and worker transportation • General liquefaction complex and wharf construction • Hazardous and non-hazardous residual material management • Worksite decommissioning • Labour and purchasing	Quality of life and health	• Temporary changes in ambient air, noise and light levels, and vibrations affecting the physical well-being of nearby (more than one km) residents and holidaymakers, and Saguenay River users. • Improved economic security and commercial services for the regional population (positive impact).
	• Accidental spill or loss of hydrocarbons and other products	Health	• Changes in land and river user health due to contaminants.
	• Land/site preparation • Worksite installation and presence	Landscape	• Changes to forestlands and marine lands during construction.
		Archaeology and heritage	• Changes to archaeological potential of project site, the case being.
	• Labour and purchasing	Local and regional economy	• Job creation and retention, and economic benefits for local and regional suppliers, and local spending by external construction workers for lodgings, food, gas, entertainment, etc. (positive impact).
Operation	• Liquefaction complex and wharf presence and operation • Vessel traffic on the Saguenay and St. Lawrence rivers • Accidental spill or loss of hydrocarbons and other products • Technological incidents • Natural events	Territorial and resource uses	• Temporary changes to recreational and tourism activities on the Saguenay River in project area due to increased seagoing activity at the wharf and on the Saguenay and St. Lawrence rivers. • Changes to sportfishing, commercial and other nautical activities in cases of accidental spills, incidents and/or natural events.

Table 4-6: Main Potential Impacts of the Project on the Human Environment Components per Project Phase (Cont'd)

Phase	Source of Impact	Component	Potential Impact on the Component
Operation (cont'd)	• Material, equipment and worker transportation	Roads	• Increased heavy vehicle and worker traffic on local and regional roads and increased risk of traffic incidents. • Early road wear.
	• Liquefaction complex and wharf presence and operation • Vessel traffic on the Saguenay and St. Lawrence rivers • Accidental spill or loss of hydrocarbons and other products • Technological incidents • Natural events • Labour and purchasing	Quality of life and health	• Changes to the physical well-being of nearby residents due to truck traffic and other nuisances (road and marine traffic, noise, vibration, dust). • Changes to the psychological well-being of nearby residents due health risk perceptions due to air and water quality impacts, and the potential lowering of property values in the project area. • Improved economic security, building values and commercial and community services for the regional population (positive impact). • Changes to local and regional population health due to contaminant emissions during operations and in cases of accidental spills, incidents, or natural events.
	• Liquefaction complex and wharf presence and operation	Landscape	• Changes to forestlands and marine lands due to the presence of the liquefaction complex, port facilities, and road infrastructure.
	• Labour and purchasing	Local and regional economy	• Job creation and retention, and economic benefits for local and regional suppliers, and local spending by external construction workers for lodgings, food, gas, entertainment, etc. (positive impact).
Decommissioning and abandonment	• Land/site rehabilitation	Territorial use	• Rehabilitation of the land/site leading to revegetation (positive impact).
	• Labour and purchasing	Quality of life	• Changes to the physical well-being of the population due to disruption caused by these operations. • Improved quality of life due to the end of vehicle transportation (positive impact). • Job and purchasing power loss, potential deterioration of economic security for residents and loss of community services leading to potential psychological and social impacts.
	• Accidental spill or loss of hydrocarbons and other products	Health	• Impact of environmental contamination on population health.
	• Land/site rehabilitation	Landscape	• Land/site rehabilitation to natural condition (positive impact).
	• Labour and purchasing	Local and regional economy	• Temporary economic benefits tied to dismantling/decommissioning operations (positive impact). • Regional job and purchasing power loss.

4.4 POTENTIAL IMPACTS ON FIRST NATIONS

The proposed terminal is located in the southwest part of the territory designated in the APGN. Since the status of the southwest part is defined as being of common interest between Pekuakamiulnuatsh (Mashteuiatsh), Essipit and Pessamit First Nations, consultations with these Innu communities prove important within the project framework. For transparency, and in respect of ancestral rights, these communities were contacted very early in the project development and authorization process. The study on First Nation knowledge, and territorial and resource use, was started to allow for the assessment of the project's impacts on the First Nation communities.

As stated at the beginning of this section, the extended study area has been expanded upon request from the First Nations in order to consider the project's potential impacts specifically on sea urchin fishing operations of the businesses of the Essipit community. Potential impacts on First Nations are listed in Table 4-7.

Table 4-7: Main Potential Impacts of the Project on First Nations by Project Phases

Project Phase	Source of Impact	Potential Imipact
Construction	Land preparation	• Loss of traditional lands and resources
	Labour and purchasing	• Foster job creation in Mashteuiatsh, Essipit and Pessamit communities (positive impact) • Economic and training benefits for the three communities (positive impact)
Operations	Vessel traffic on the Saguenay and St. Lawrence rivers	• Changes to sea urchin commercial fishing quality for the businesses of the Essipit community
	Liquefaction complex and wharf presence and operation	• Encroachment of the liquefaction complex on lands potentially used and claimed by the three communities
	Labour and purchasing	• Foster job creation in Mashteuiatsh, Essipit and Pessamit communities (positive impact) • Economic and training benefits for the three communities (positive impact)
Decommissioning and abandonment	Labour and purchasing	• Temporary economic benefits for the three communities (positive impact) • Job losses

4.5 PROJECT ISSUES

Current knowledge of the project and its potential impacts raise the following issues:

- → Protection of the aquatic environment for the conservation of fauna, flora and human activities.
- → Protection of air quality.
- → Protection of endangered and special status species, migrating birds, and their habitats.
- → Protection of maritime traffic safety and quality.
- → Protection of nearby residents' quality of life associated with noise and light disturbances.
- → In case of incidents, protection of biotas and human health and risk perception for shoreline residents and Saguenay River users.
- → Visual integration into the Saguenay Fjord landscapes.
- → Local and regional training and economic benefits for First Nations and other citizens.

The environmental assessment process was started in June 2014 with the first information and public consultation meetings and preliminary baseline studies on the site. GNL Québec wants to develop the Énergie Saguenay Project in partnership with regional and First Nation communities. Various communication tools have been developed.

A proactive consultation process was implemented as soon as the project was announced, and the proposed consultation mechanisms were validated thereafter with stakeholders. The overall population (Native and non-Native) is invited to contribute to the social acceptability of the project (see Sections 5 and 6 for further details).

It should be noted that environmental impacts during construction, operation, and decommissioning/abandonment would be mitigated through careful planning and project optimization, taking into account stakeholder and public concerns and opinions.

4.6 ENVIRONMENTAL CHANGES ON FEDERAL LANDS, IN OTHER PROVINCES OR OUTSIDE CANADA

The natural gas liquefaction complex, including the jetty, will be built on industrial lands owned by the SPA. The project is not expected to have an impact on federal lands, outside the province or outside Canada.

5 PARTICIPATION AND CONSULTATION ACTIVITIES WITH FIRST NATIONS

5.1 CONSULTATION MECHANISM

In the early stages of project development, GNL Québec proactively engaged with the First Nations concerned. The project site being within the southwest part of the Nitassinan of three Innu First Nations, defined as being of common interest for three Innu communities: the Pekuakamiulnuatsh, Pessamit and Essipit communities.

Throughout the Project's life, GNL Québec will collaborate with these First Nation communities, who have claims on the southwest part of the territory where the project site is located, in an effort to develop significant dialog and participation through appropriate mechanisms. GNL Québec intends to collaborate with the First Nations in the following manner:

- By fostering good faith during and after project development;
- By being transparent and providing clear and relevant information in terms of impacts, key issues, and concerns;
- By establishing sustainable relations based on mutual respect and trust;
- By discussing with communities about their needs and expectations;
- By being open to opinions and viewpoints expressed throughout the process;
- By being attentive to and respectful of positions and suggestions;
- By recognizing the value of local and traditional knowledge, and traditional territorial use;
- By providing feedback and follow-ups on discussions and integrating suggestions through acceptable, adapted methods.

5.2 CONSULTATIONS CONDUCTED TO DATE

When the project was announced, several representatives from each of the First Nations were met (Table 5-1). These initial meetings focused on describing the project and gathering preliminary comments and concerns from these representatives.

Table 5-1: Preliminary meetings with First Nation representatives

First Nation	Date
Pekuakamiulnuatsh	June 2014
Essipit	September 2014
Pessamit	October 2014

Following these meetings, a joint Follow-Up Committee was created with two representatives from each of the three First Nations. The committee met for the first time on November 12, 2014. Five other meetings were held thereafter (December 2014, and January, March, April and October 2015).

The meetings led to the signature of a collaboration agreement for the project's planning phase, on May 26, 2015. The agreement includes a process by which GNL Québec will discuss with First Nations during the planning phase to take into account their interests, concerns, ancestral and treaty rights, in an effort to accommodate them wherever possible. The agreement will allow the First Nations fair and equal participation in the economic benefits of the planning phase, based on their qualifications and project needs, particularly in terms of jobs and contracts.

The parties have agreed to develop and propose solutions to coexistence issues that could arise during the project's planning and implementation phases. To this end, the Follow-Up Committee will ensure communications between GNL Québec, Mashteuiatsh, Pessamit and Essipit representatives. The Committee's mandate is to support GNL Québec through the development stages of the Énergie Saguenay Project. First Nation representatives will be in a position to quickly point out any concerns regarding their traditional use of the territory and resources, potential environmental impacts, sites with cultural, ecological and archaeological significance, as well as their traditional and socioeconomic activities. It will also make sure all information regarding regulatory, economic and social aspects of the project is coordinated and distributed to all members.

As part of the collaboration agreement, the parties will continue discussions towards the preparation of an Impact and Benefit Agreement (IBA) to be confirmed before the end of the planning phase, and put into effect following GNL Québec's final investment decision.

The First Nations were also invited to appoint a representative for the advisory committees that will be formed to consult with regional communities (see Section 6-3). At the request of the First Nations, their representative will participate to the committees as an observer.

5.2.1 Information Regarding Current Traditional Use of Land and Resources

Based on available information, the project site land and resources are not being used for traditional purposes. These lands were undoubtedly used in the past. The information regarding past land use will be completed within the environmental assessment and archaeological survey processes with the First Nations concerned.

5.2.2 Main Comments and Concerns

The main preliminary comments and concerns expressed by the First Nations concerned are associated with:

- The project's justification and options/alternatives;
- Potential risks associated with natural gas transportation (pipeline) or LNG shipping (vessels);
- The frequency of vessel trips and associated increase in marine traffic on the Saguenay River;
- The potential impact of vessel navigation on the Innu's commercial activities;
- Collaboration opportunities and socioeconomic benefits (jobs, training, etc.);
- A shortage of Innu personnel to analyze the project and the associated gas pipeline project managed by a separate sponsor.

5.3 UPCOMING CONSULTATIONS

Upcoming activities will be adjusted in line with the evolution of various issues, concerns, needs, and positions expressed by the First Nations. Throughout the environmental assessment process GNL Québec is looking to develop various communication activities and tools that will be specifically designed to address the contribution of First Nations concerned with the project. For example:

- Continued Follow-Up Committee activities with the concerned First Nation groups;
- Continued information and literature searches on First Nation traditional knowledge, territorial and resource use;
- Documentation of the project's impacts on First Nations;
- Discussions regarding potential mitigating and optimizing actions, including actions promoting the participation of First Nation communities in the project;
- Continued discussions for the development of an IBA;
- Participation of First Nation representatives in the Advisory Committees to be implemented in the regional community.
- Other community relations activities, planned jointly with concerned communities, will be set up as the need arises.

6 CONSULTATIONS WITH OTHER STAKEHOLDERS

6.1 CONSULTATION MECHANISM

GNL Québec strongly believes that stakeholders should be involved right from the early stages of the project, in an effort to achieve and maintain social acceptability. At present, consultations are an opportunity to hear public expectations and concerns, and to integrate them into the project design and EIA processes. GNL Québec's voluntary approach will be conducted in parallel with the formal CEAA consultations and upstream from the BAPE public hearing process.

Generally, consultations pursue the following objectives:

- Introduce the project to communities;
- Identify the various opinions and concerns expressed by participants;
- Validate and complete the evaluation of environmental impacts (physical, biological and human environments);
- Improve various project components in an effort to, notably, limit negative impacts and maximize economic benefits.

The consultation mechanism provides concerned individuals and groups with concrete means to find information regarding project development and to have their say. More precisely, the process will give them:

- Access to relevant information and discussions regarding the project, and related subjects;
- A venue for expressing their opinions, observations and concerns;
- A way to participate in the selection of acceptable and adapted mitigating and optimizing actions;
- A way to keep track of concerns and ideas, as expressed and considered.

GNL Québec has proposed a consultation approach that includes two Advisory Committees:

- An Advisory Committee for the natural gas liquefaction complex;
- An Advisory Committee on marine transportation.

The proposed approach is shown in Figure 6-1. Each committee will be made up of various stakeholder and concerned group representatives. Issues regarding the liquefaction complex and marine transportation being specific in terms of impacted environments and stakeholders, the use of separate committees will help to focus discussions on specific issues. When necessary, each committee may create small work groups with access to specialized resources to dig deeper into specific topics of concern and make recommendations to their respective committees.

Pamphlets have also been produced in an effort to better inform stakeholders and communities about the consultation process, as follows:

- Project information sheet.
- Q&A.
- Proposed consultation approach.

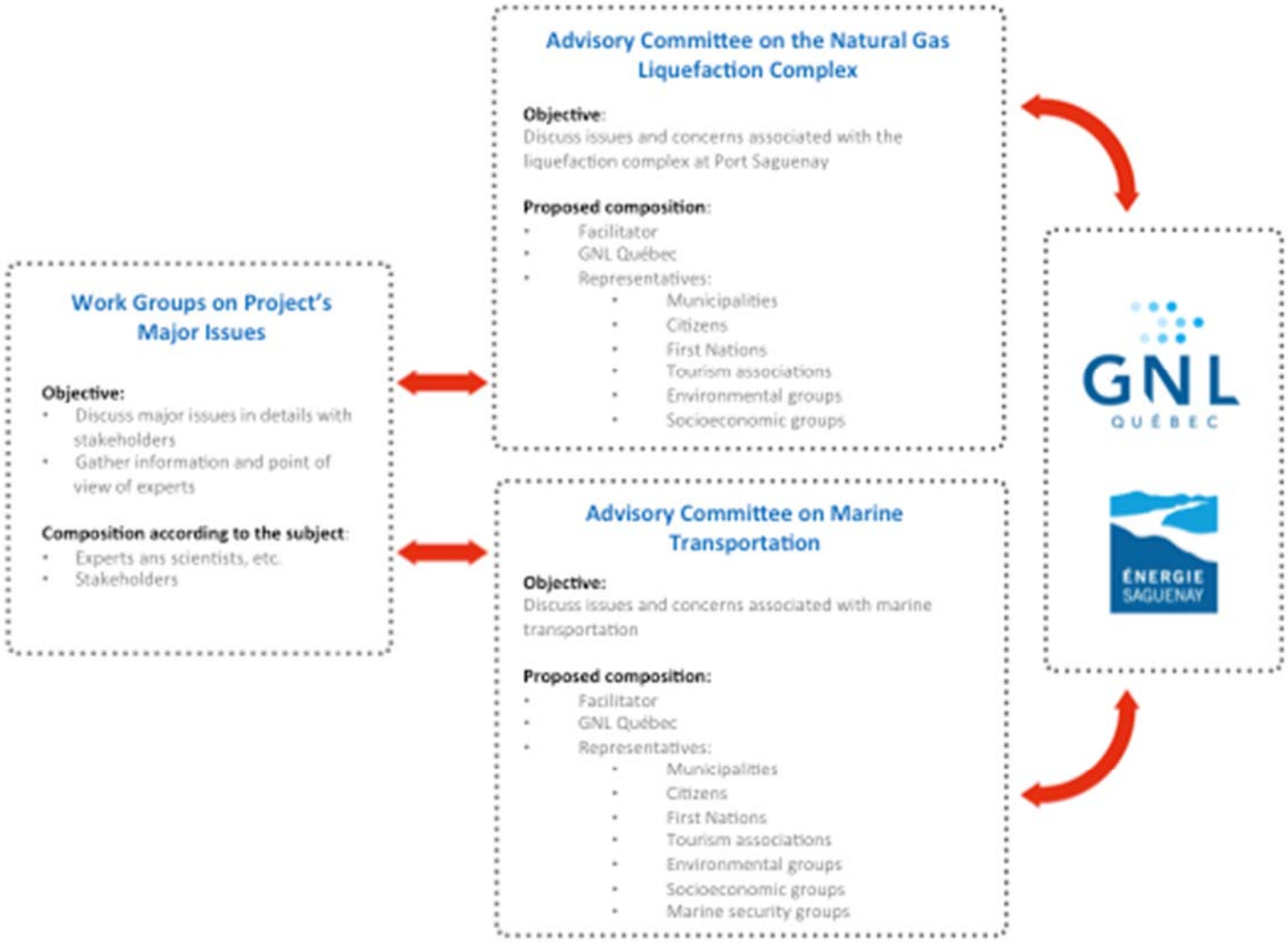


Figure 6-1: Consultation framework

A Project Website (http://www.energiesaguenay.com/) has been designed with the necessary Email (contact@energiesaguenay.com) and telephone (418-412-4993) contact information. Social media platforms have also been created to open communications with communities. This information was handed out to consultation participants. Pamphlets were also handed out and are also available on the Website.

A community relations office, which is also GNL Québec's headquarters, is located in the Chicoutimi District of Saguenay City.

6.2 CONSULTATIONS CONDUCTED TO DATE

6.2.1 Consulted Parties

In the summer of 2014, various stakeholder activities were held to introduce the project and initiate dialogue (Table 6-1).

From September 2014 to May 2015, more than 25 meetings were held with regional stakeholders and organizations (Table 6-1), with the participation of over 150 individuals. These had the following objectives:

- Introduce the project;
- Introduce the proposed consultation approach;
- Gather comments and concerns about the project and proposed consultation approach.

All comments and concerns expressed during the meetings were recorded to ensure proper follow-up.

In parallel, several information meetings were held with key provincial socioeconomic players and partners (Table 6-2). Meetings were also held with elected officials and administrative personnel from various provincial and federal government departments to inform them about the project. Federal and provincial government and opposition party officials were also met.

The project was presented to MDDELCC industrial and hydro project environmental assessment officials, in June 2014, as well as representatives of the Canadian Environmental Assessment Agency in Quebec City, in August 2014.

Also, a provincial interdepartmental committee was formed to steer and coordinate the actions of the various departments concerned with the project.

Table 6-1: Community Stakeholders Consulted to Date

Stakeholders	Meeting Dates
Municipalities	
Saguenay City and RCM	Several dates
Fjord-du-Saguenay RCM (including mayors)	June and September 2014
La Baie District (Saguenay City)	November 2014
Saint-Fulgence	Several dates*
Socio-economic organizations and businesses	
Formation 02	December 2014
Regroupement Action-Jeunesse 02	December 2014
UPA	January 2015
Zone Talbot	March 2015
Saguenay Port Authority	Several dates
Promotion Saguenay	Several dates
Arianne Phosphate	June 2014
Saguenay City CLD	Several dates
Saguenay Chamber of Commerce	June and November 2014
Regional Economic Benefit Maximization Committee (CMAX)	Several dates
Investissement Québec	Several dates
Québec Port Terminals	June 2014
Corporation des pilotes du Bas-Saint-Laurent	July 2014
Rio Tinto Alcan – Regional Economic Development Office	June 2014
BlackRock Metals	June 2014
Environmental Groups	
Conseil régional de l'environnement et du développement durable du Saguenay–Lac-Saint-Jean	June 2014
Eurêko	June 2014
Les Verts Boisés du Fjord	June 2014
Organisme de bassin versant de la rivière Saguenay	June 2014
Zone d'intervention prioritaire Saguenay*	June 2014 and January 2015*
Groupe de recherche des battures (GREB)	February 2015
Tourist Groups	
Marina de Ville de La Baie	June and December 2014
Parc Aventure Cap Jaseux	June and December 2014
Saguenay St-Lawrence Marine Park (provincial and federal representatives)	June 2014 and February 2015
Association touristique régionale	June and December 2014
Others	
Site neighbors	January and February 2015
Saguenay City Fire Department	November 2014
La Baie good neighbourhood committee	February 2015
Chaire en éco-conseil de l'Université du Québec à Chicoutimi	October 2014

* Includes representatives of local residents and tourist organizations in December 2014/January 2015

Table 6-2: Meetings with Provincial Stakeholders to Date

Stakeholders	Meeting Dates
Gaz Métro	Several dates
Hydro-Québec	Several dates
Investissement Québec	Several dates
Quebec construction unions (CSD, CPQMCI, CSN, FTQ, SQC)	December 2014
Conseil du patronat du Québec	November and December 2014
Chaire Énergie – École des Hautes Études Commerciales	November 2014
Quebec manufacturers and exporters	December 2014
Metropolitan Montreal Chamber of Commerce	February 2015
Quebec Federation of Chambers of Commerce	June 2015

6.2.2 Principal Comments and Concerns

The main concerns raised by stakeholders during the meetings held to date are summarized in Table 6-3.

Table 6-3: Main Stakeholder Issues and Concerns

Issues	Main Concerns
Economic benefits	Involvement of local companies, recognition of regional labour force, project investors
Marine transportation	Increased ship traffic, coexistence with other users, Parc marin du Fjord-du-Saguenay, marine wildlife
Visual integration	Integration with the landscape, coexistence with tourist activities, noise, odors, light
Environmental impact	GHG emissions, agricultural land, land ecosystems, shale gas, and site rehabilitation
Health and Safety	Public and worker health risks (inhalation, fire, spills)
Construction	Construction-related nuisances

Comments and suggestions regarding community relations and proposed consultation approach were also gathered and summarized below. They will be taken into consideration as the consultation process moves forward.

Community Relations

- Respect for the community and follow up on concerns;
- Involve organizations and stakeholders early on in project development;
- Assess impacts based on a life cycle and sustainable development approach;
- Solicit concerned and interested persons and organizations.

Advisory Committees

- Incorporate intergenerational aspects into the consultation approach;
- Actively involve communities to foster the development of regional LNG expertise;
- Collaborate with community stakeholders;
- Consider an impact area extended to the Escoumins area for the marine transport committee.

Community members who were met during preliminary consultations were invited to take part in a project status and preliminary consultation wrap-up meeting on June 3rd, 2015. A total of 34 persons attended the meeting that led to the creation of the Advisory Committee on the liquefaction complex. The Committee met in September and October 2015. Minutes of the meetings and documents shared with the Committee members are available on the Project Website.

6.3 UPCOMING CONSULTATIONS

GNL Québec will continue to work with local community representatives and stakeholders throughout the regulatory process to better understand the interests and concerns of communities, gather more basic data, complete environmental impact assessments, develop mitigating actions, and identify opportunities to maximize economic benefits.

A series of stakeholder activities and meetings regarding the project description herein and the EIA process are planned, as follows:

- Formation and implementation of the Advisory Committee on marine transportation and workgroups.
- Open-door days on the topics discussed by the Advisory Committees.
- Distribution of documentation leaflets to Saguenay City residents and other stakeholders regarding the specific topics addressed by the Advisory Committees.
- Community liaison office allowing citizens and other stakeholders to meet with GNL Québec representatives, find information, and express their expectations and concerns.
- Online publishing of any relevant documentation regarding the project.

Following the final investment decision, the Advisory Committees could be converted into Follow-Up Committees with the following mandates:

- Issue recommendations on the development and implementation of mitigating and optimizing actions.
- Provide local communities with a constant information stream and ways to participate and monitor the evolution of the project.
- Assure conformance of the activities with GNL Québec commitments and the laws and regulations in force, in line with best practice principles.

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