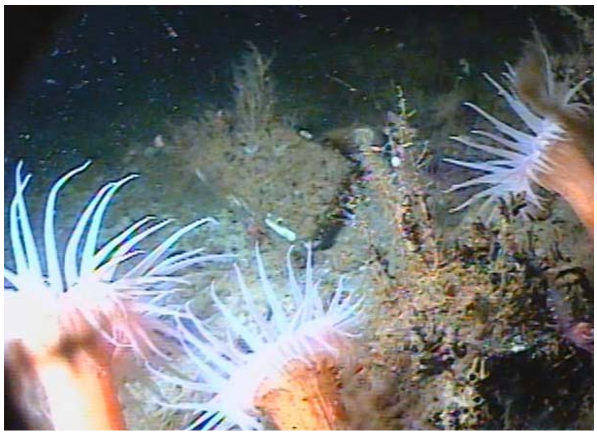
PORT DE SAGUENAY



SAGUENAY PORT AUTHORITY MARITIME TERMINAL PROJECT ON THE NORTH SHORE OF THE SAGUENAY

ENVIRONMENTAL IMPACT STATEMENT SUMMARY

WSP

GROUPE CONSEIL Nutshimit-Nippour

August 2016
151-05819-00

MARITIME TERMINAL PROJECT ON THE NORTH SHORE OF THE SAGUENAY

ENVIRONMENTAL IMPACT STATEMENT

SUMMARY

Saguenay Port Authority

Final version

Project no.: 151-05819-00
Date: August 2016

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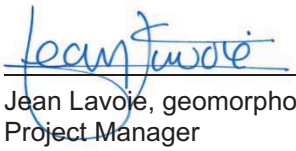

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Reference to be cited:

WSP. 2016 *Maritime Terminal on the Saguenay North Shore - Environmental Impact Statement - Summary*. Report prepared for pour Saguenay Port Authority. 94 pages.

FOREWORD

This summary presents in a simple and vulgarised manner the Environmental Impact Statement's (EIS) of the Maritime Terminal on the Saguenay North Shore valued components (WSP 2016) submitted to the Canadian Environmental Assessment Agency (CEAA). The public information and consultation methods and activities conducted during the EIS preparation are also provided.

Beside this introduction, the summary provides an overview of the project and a technical description of the proposed components in upland and in marine environment in Chapter 2 as well as an overview of the alternatives considered in Chapter 3. Chapters 4 and 5 summarize the consultations carried out in regards to First Nations and local and regional communities, including the concern raised. The environmental assessment methodology is briefly presented in Chapter 6. In Chapter 7, the environmental and social valued components are described as well as the effects on these components, after the implementation of the mitigation and compensation measures. Cumulative effects are also described, as well as the maritime navigation on the Saguenay, the effects of potential accidents or malfunctions and the effects of the environment on the project. Chapter 8 presents a summary of the environmental effects assessment tabulated in tables. Finally, Chapter 9 is related to the project environmental and social management.

Readers are invited to refer to the EIS and to the additional studies appended to the main study to obtain detailed information.

The of the Environmental Impact Report and Summary French version are both official. In case of conflict between the English and French versions, the French version prevails.

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1 INTRODUCTION AND CONTEXT OF THE ENVIRONMENTAL ASSESSMENT

The present document is a plain-language summary of the environmental impact statement (EIS) report for the Marine Terminal Project on the North Shore of the Saguenay proposed by the Saguenay Port Authority (hereinafter referred to as Port of Saguenay), carried out in accordance with the final Guidelines issued by the Canadian Environmental Assessment Agency. The CEAA shall analyse the EIS under the Canadian Environmental Assessment Act, 2012 (CEAA 2012).

According to Article 5 of the CEAA 2012, an assessment of the project's potential negative effects in areas of federal jurisdiction must be conducted. The CEAA shall use this EIS to prepare an environmental assessment report on the project's potential for generating negative effects on areas of federal jurisdiction. The present document includes a summary description of environmental changes caused by the project, for the project's different phases, including changes directly or necessarily linked to any federal decision enabling the project to proceed.

Port of Saguenay plans on building and operating a new multi-user marine terminal to service the north shore of the Saguenay River at the municipality of Sainte-Rose-du-Nord, located approximately 27 km downstream from the district of Chicoutimi, in the city of Saguenay. The plans are to install a wharf and the infrastructure required to handle industrial products. Facilities are also planned for supplying water, collecting runoff water and treating sanitary water for the administrative and service buildings. Currently, the marine terminal's main purpose is to receive, store and ship apatite concentrate from Arianne Phosphate. The terminal will also be available for use by other users.

1.1 REGULATORY FRAMEWORK

In accordance with Article 24, paragraph c) of the appendix of the Regulations Designating Physical Activities under CEAA 2012, the project is subject to a federal environmental assessment due to:

24 The construction, operation, decommissioning and abandonment of a new

(c) 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.

Under the CEAA 2012, an environmental assessment focuses on the potential negative environmental effects which fall under federal jurisdiction, most notably fish and their habitat, other aquatic species and migratory birds. Following an environmental assessment, the Environment Minister shall determine whether the project is likely to generate significant negative environmental effects, after applying measures to mitigate the effects established during the environmental assessment. The DFO will need to issue an authorisation under Paragraph 35(2) of the Fisheries Act (R.S.C. (1985), c. F-14) given the possible effect the project could have on fish habitat.

Transport Canada will need to issue an authorisation under Paragraph 5 (1) of the Navigation Protection Act (R.S.C. (1985), c. N-22) regarding the construction of a wharf on the shores of the Saguenay. Natural Resources Canada (NRCan) will need to issue a permit under Paragraph 7 (1) of the Explosives Act (R.S.C. (1985), c. E-17), given that explosives will most likely be used during construction and thus will be stored.

1.2 GUIDELINES

The Guidelines established by the CEAA indicate the factors to be taken into account for the environmental assessment, which notably include those specified in Paragraph 19(1) of the CEAA 2012, namely:

- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the significance of the effects;
- comments from the public;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the requirements of the follow-up program in respect of the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- any change to the designated project that may be caused by the environment;
- the results of any relevant study conducted by a committee established under section 73 or 74.

In accordance with paragraph 19(1) j) of the CEAA 2012, the CEAA identified marine navigation as an additional element to be taken into account and examined as part of the environmental assessment. This element is not however considered as part of the project by the CEAA for the purposes of the environmental assessment, and thus it will not be established whether the marine navigation associated with the project is likely to generate significant environmental effects. This marine navigation will also not be subject to the conditions imposed on the proponent regarding the implementation of its project. Rather, the information will be used to describe, for the federal government, the effects of the increased marine navigation associated with the project.

1.2.1 CONSTRAINTS AND ISSUES IDENTIFIED

The constraints and issues identified based on the comments received from the public regarding the project description and the Guidelines issued by the CEAA are as follows:

- air quality;
- land-based noise;
- underwater noise;

- ambient light;
- freshwater quality;
- water quality in the marine environment;
- fish;
- species at risk (fauna and flora);
- marine flora and benthos;
- marine mammals;
- land use by First Nations;
- traditional activities of First Nations;
- natural and cultural or archaeological heritage;
- the built environment;
- land use for leisure and tourism;
- risks to human health;
- landscapes;
- increased navigation in the Saguenay;
- bank erosion;
- ice fishing;
- the risk of oil spills in the Parc marin du Saguenay – Saint-Laurent (SSLMP).

2 PROJECT OVERVIEW

Port of Saguenay wishes to extend its activities through its project for a new marine terminal, to serve the north shore of the Saguenay. The Port of Saguenay's objective is to have a multi-user terminal with potential for future expansion.

As the mining company Arianne Phosphate has already stated its intention of using this wharf for shipping apatite concentrate produced at its Lac à Paul site to outside markets, Port of Saguenay viewed this project as an interesting opportunity to increase its offering to meet its primary vocation which is to provide services and conditions that promote increased Canadian foreign trade.

Thus, Port of Saguenay shall handle all apatite concentrate produced by Arianne Phosphate, from the unloading of the trucks to storage silos to the loading of the ships. As of now, Port of Saguenay does not have any other potential clients, but other potential clients could use this new marine terminal, as long as the shipping of Arianne Phosphate's apatite concentrate is not affected.

2.1 PROJECT LOCATION

The marine terminal project is located within the limits of the municipality of Sainte-Rose-du-Nord, in the Fjord-du-Saguenay RCM (Map 1), on the Saguenay River's north shore (left). The site will be accessed to the south of Route 172, from a non-standard road owned by Arianne Phosphate who will grant access rights to the Port of Saguenay and its users (controlled access).

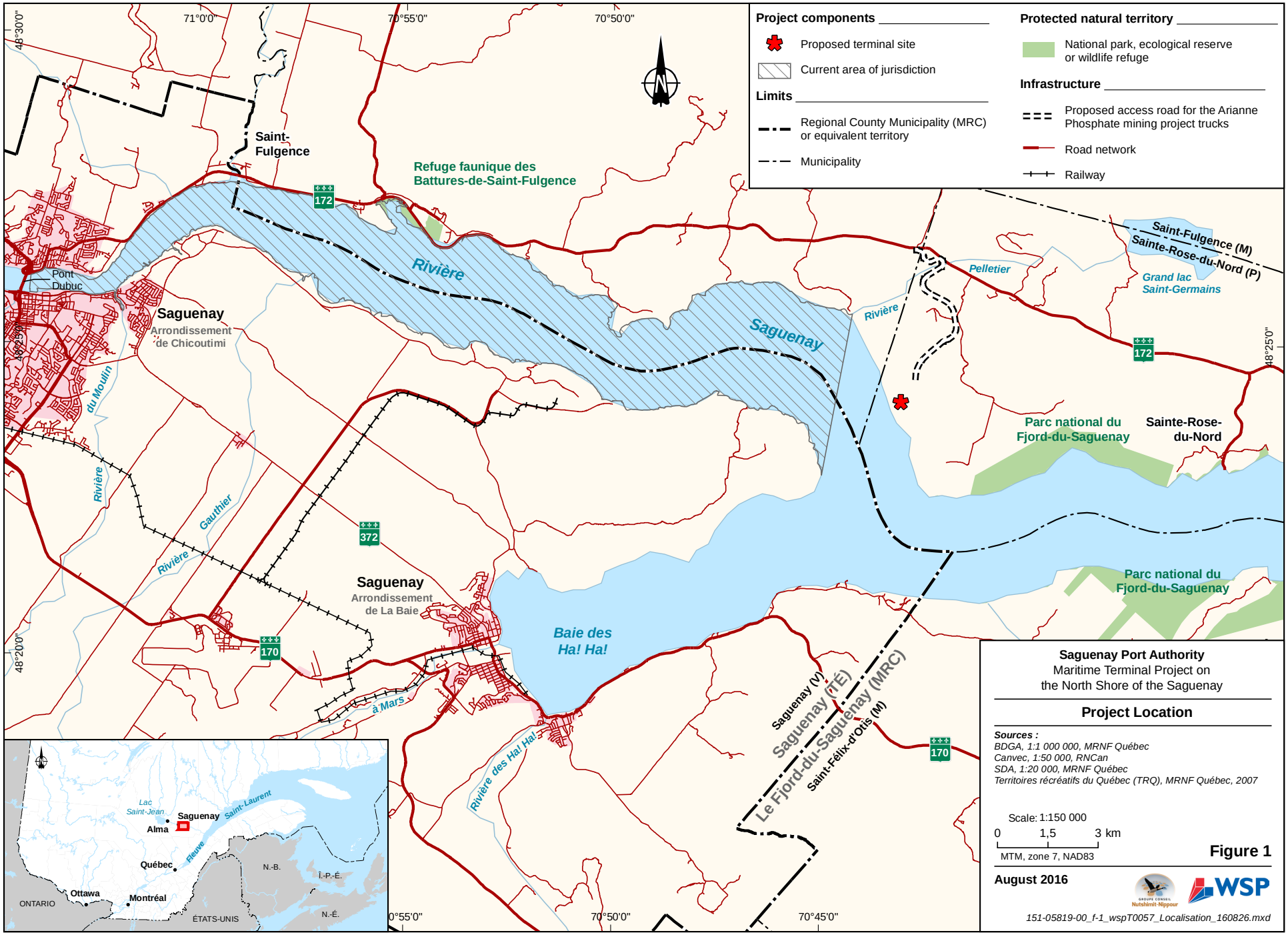
2.2 LAND-BASED COMPONENTS

2.2.1 DESCRIPTION OF INFRASTRUCTURE

The trucks transporting apatite concentrate in closed haulers shall dump their loads in an approximately 8,000-m^2 unloading area. This area shall be equipped with an unloading station formed by two spans with hydraulic hoists, a transfer conveyer and a buffer ditch, with a capacity of 180 t. The tilting unloading platform will allow the apatite concentrate to fall onto a forced air conveyor at a rate of 1,200 tph. The conveyor used for transferring the material to a storage area shall be inserted into a 1.8-m diameter tubular gallery (closed) along its entire length (82 m). A dust collector with filter shall control fugitive dust emissions from unloading trucks unloading and will send them back to the pit where they will be mixed with the main flow of apatite.

The apatite concentrate will then be stored either inside a 70,000 t-capacity silo or within a 130,000 t-capacity dome. These structures shall be built side-by-side, on an area measuring around 57,000 m² (Map 2). The silo and the dome shall be entirely automated for an efficient management of the storage.

Various conveyors systems (total length of around 600 m) will then transport the apatite concentrate to the wharf, for loading onto ships. The material will be transported from the silo and dome retrieval system to two successive forced air conveyors, at a rate of 2,700 tph. The latter will transport the concentrate to a 700 t-capacity transfer silo. The conveyors will be connected by two conveyors chutes and a drop tower.



Saguenay Port Authority
Maritime Terminal Project on the North Shore of the Saguenay

Project Location

Sources :
BDGA, 1:1 000 000, MRNF Québec
Canvec, 1:50 000, RNCan
SDA, 1:20 000, MRNF Québec
Territoires récréatifs du Québec (TRQ), MRNF Québec, 2007

Scale: 1:150 000
0 1,5 3 km
MTM, zone 7, NAD83

Figure 1

August 2016

151-05819-00_f-1_wspT0057_Localisation_160826.mxd

Saguenay Port Authority
Marine Terminal Project
on the North Shore of the Saguenay

Projected Marine Terminal Infrastructure during operation and maintenance

Sources:
Hydrography, BDTQ, 1/20 000, MRNF Québec
Aerial photograph, ville de Saguenay, 2015
Road network, Groupe conseil Nutshimit-Nippour
Project components, WSP, 2016
Isolign: 10 meters

File: 15-0076_F2_InfraProj_en_160829.mxd

WSP
GROUPE CONSEIL Nutshimit-Nippour

0 80 160 m
MTM, zone 7, NAD83

Figure 2
August 2016

Main project components

- Reception building and checkpoint
- Employee building
- Truck loading facilities
- Storage dome (130 000 t)
- Storage silo (70 000 t)
- Permanent access road
- Temporary access road
- Conveyor
- Wharf
- Work area
- Area of deforestation
- Area of revegetation
- Property limit

Physical settings

- Intermittent watercourse
- Permanent watercourse

Existing infrastructure

- Forest road
- Non drivable road / trail

Saguenay River

As for the transfer silo, it will have its own support structures and a complete dust collector. The dust collected in the buffer silo and the conveyors shall thus be returned to the silo unloading stage to be mixed with the main flow of material. An approximately 115-m-long conveyor will then send the concentrate to the wharf's conveyor at a rate of 2,700 tph. Once transported from the buffer silo to the wharf, the apatite concentrate shall be transferred to the wharf's belt conveyor. This conveyor will bring the concentrate to the rail mounted ship loader installed on the wharf.

The rate of use of the equipment conveying the apatite concentrate from the silo and the dome will be around 1,800 h per year, or the time required to fill the 60 ships (30 h per ship) that will transport Arianne Phosphate's annual production of 3 Mt.

An approximately 1.7 km-long access road shall be constructed between the storage area (silo and dome) and a stoking area located behind the wharf. Used mainly to transport materials during construction, the access road shall subsequently be used by light trucks for maintenance, snow removal or, in case of emergency, to aid the bulk carrier's crew. Eventually, the access road will be used for transport for other clients, be it for importing/exporting bulk or unbundled merchandise. The road on the site of the wharf will be accessible to the Port of Saguenay's employees or any other persons having been granted permission to enter the controlled area.

The stoking area adjacent to the wharf, measuring approximately 27,000 m², shall allow the transshipment of materials other than apatite, the maneuvering of vehicles and the development of sedimentation basins for runoff from the access road, the wharf and the area itself. A building housing 12 employees will be constructed in the immediate vicinity of this area.

2.2.2 CONSTRUCTION ACTIVITIES

An area measuring some 387,000 m² will need to be cleared of trees to make room for the truck unloading areas, storage areas (silo and dome), the wharf access road and the adjacent area. After the infrastructure and buildings have been installed, some 10,000 m² will be replanted with appropriate species.

The excavation and backfilling will be conducted so as to have a cut/fill factor of zero. Depending on its technical qualities, the excavated soil will be used as backfill material on site. It is expected that about 1.6 Mm^3 of rock shall be excavated for the development of the unloading area, storage area, access road and the south stocking area. A large part of this will be reused on site, for installations requiring rock backfill. There will be a crusher on site (during construction), near the truck unloading area.

There is no blasting planned in a watercourse or the Saguenay River as part of the project. As for blasting near water for the development of the area adjacent the wharf, the blasting loads will comply with the *Guidelines for the use of explosives in or near Canadian fisheries waters*.

The equipment (conveyors, silos, transfer towers) as well as the buildings will sit on concrete foundations. The access road leading to the wharf and the adjacent storage area, as well as the access roads leading to areas shall be paved.

2.3 MARINE COMPONENTS

2.3.1 DESCRIPTION OF THE WHARF

The Port Saguenay terminal wharf was designed to allow carrier vessels of up to 100,000 dwt to dock. The 60 ships required to ship the apatite concentrate to Arianne Phosphate's clients will have a nominal capacity of 50 000 dwt (Handymax type).

The proposed wharf is a combined wall design, made up of piles (110) and sheet piling connected together. The wharf shall have a 245 m long facade and will be approximatively 26 m wide (Figure 1). It will have the rail-mounted loader, the conveyor and the electric building used to operate the equipment.

The sheet piling wall shall be secured in place at the top by a series of steel tie rods and concrete anchor blocks, anchored into the bedrock. The anchor blocks shall be securely attached to the bedrock with arrows drilled into the rock. The wharf's caissons will be backfilled using a combination of random fill and 15-100 mm crushed stone (produced by on-site crushing). The tops of the caissons will then be covered with a layer of sand.

On the front of the wharf, a concrete cope wall shall be built in order to strengthen the wharf approach and allow the installation of mooring fenders. The wharf's new surface will be covered by a concrete slab in order to support the product loading and unloading operations which will require the use of heavy equipment (cranes, loaders, etc.).

Riprap consolidated using gabions will be installed at certain spots at the foot of the wharf to stabilize the structure. The gabions will be filled out of the water and placed on the bottom using cranes. A team of divers will guide their placement. The total footprint on the seabed of all infrastructures (wharf, riprap and gabions) is estimated at 18,000 m².

2.3.2 TRANSSHIPMENT AND DOCKING ACTIVITIES

Once a ship has docked at the wharf, the loading operations begin. The concentrate shall be conveyed from the transfer silo at a speed of 2,700 tph via a forced air conveyor will be transferred to the wharf's belt conveyor. It will then be sent onto the mobile cart where it is transferred onto the ship loader's belt feeder. The hold is loaded bottom to top, in order to construct a continuous pile and thus reduce dust emissions. The ship loader can stretch and switch direction to be able to reach all sections of the hold. The holds are filled according to the sequence chosen by each ship's captain. It takes 30 hours to load a ship, meaning the loader will be in operation for 1,800 hours per year.

As per its regulations, Port of Saguenay can require tugs at all times or in the event of certain weather conditions (high winds, waves, ice). At other times, the decision will be at the discretion of the ship's pilot, who let it be reminded is a pilot qualified to pilot along the St. Lawrence and the Saguenay from les Escoumins. No refuelling of ships is planned at the port terminal.

287800.0000 287900.0000 288000.0000 288100.0000 288200.0000 288300.0000 288400.0000

5362800.0000 5362700.0000 5362600.0000 5362500.0000

SYSTÈME DE COORDONNÉES PLANES DU QUÉBEC (MTM Québec)
N.A.D. 83 (CSRS) ZONE 7
ÉLÉVATION HYDROGRAPHIQUE BASÉE SUR LE ZÉRO DES CARTES

LÉGENDE:

COURBES BATHYMÉTRIQUE MARÉGRAPHIQUE
COURBES DE NIVEAU TOPOGRAPHIQUE GÉODÉSIQUE

NOTES:

1. LES COURBES TOPOGRAPHIQUES ET BATHYMÉTRIQUES PROVIENNENT DU DESSIN PAR WSP; "2016-02-08 Courbes_Niveaux.dwg".

2. SELON "PECHES ET OCEANS CANADA", LA BAIE (PORT-ALFRED) PLEINE MER SUPERIEUR , GRANDE MARÉE +6.3m, & BASSE MARÉE -0.5m

BATHYMÉTRIE MARÉGRAPHIQUE
CHARGEUR SUR RAILS
CONVOYEUR SUR LE QUAI
QUAI PROPOSÉ
QUAI FUTUR
REGARDE DE TRAITEMENT
PUISARD
LIMITE DE DÉBOISEMENT
AIRE DU QUAI
TOPOGRAPHIE GÉODÉSIQUE
0.000
(15.000)
(10.000)
-15.000
-25.000
-35.000
288147.98
5362779.81
STA. 0+282.0 m±
COUPE X-X
STA. 0+183.0 m±
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RIVIERE SAGUENAY
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2%
COUPE Y-Y
STA. 0+66.0 m±
5362512.82
288238.91
STA. 0+0.000 m
INSTALLATIONS SEPTIQUES
COURBES GÉODÉSIQUES
COURBES MARÉGRAPHIQUE
TOUR DE TRANSFERT
(5.000)
(10.000)
(15.000)
0.000
-5.000
-15.000
-25.000
-35.000

PLAN

ÉCHELLE: 1:2000

0m 50m 100m 150m 200m

PORT DE SAGUENAY

CONCEPTUEL

2016–08–15

consultants

PORTHA INC.

révision		date
révision		date

A no. de détail
B sur dessin no.
C dessin no.

projet

QUAI MUR COMBINÉ

NOUVEAU QUAI SAGUENAY, RIVE NORD

dessin

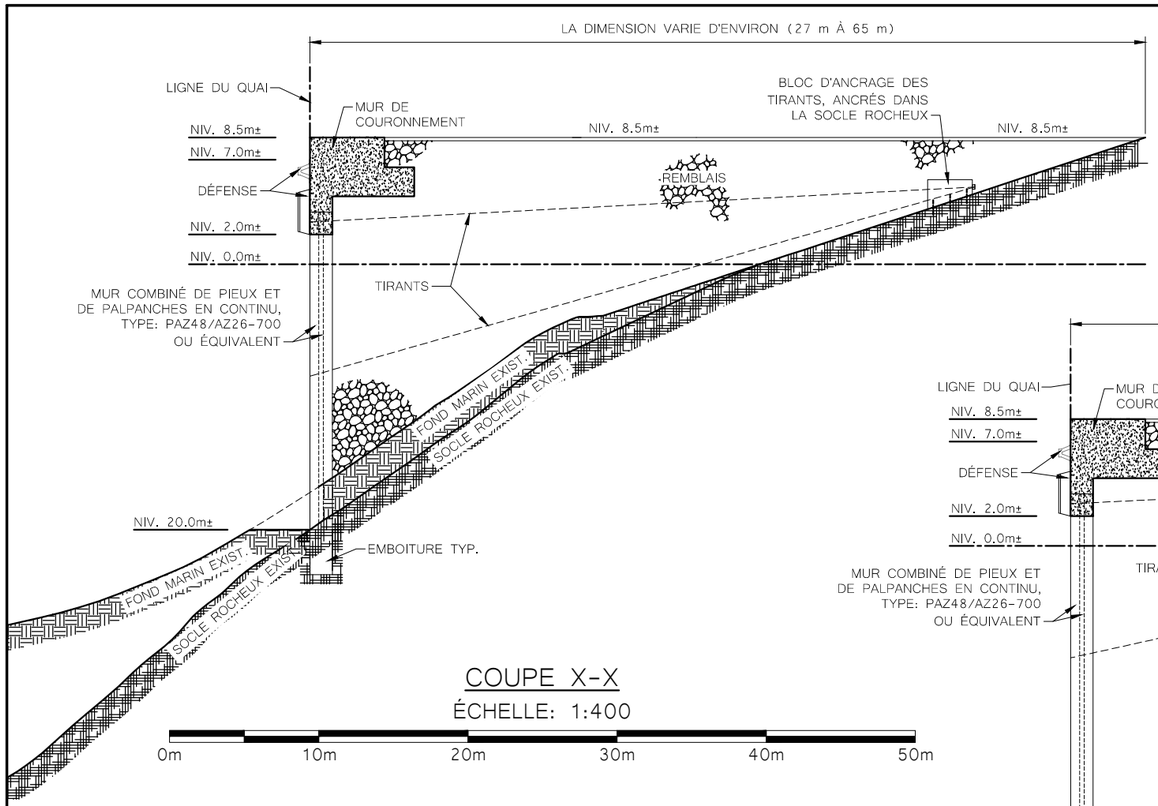
PLAN

designé par	Raymond Gaudreault P. Eng.
date	2016-08-15
dessiné par	Niklaus Wendzich
date	2016-08-15
projet no.	----
paquet no.	LAP2016-00-03
feuille no.	1 de 3

Portha Reference No: LAP2016-00-03-PL0 - ANSI B

Format: ANSI Expand B (11.00 X 17.00 Inches)

Plot Date: 8/8/2014



COUPE X-X

ÉCHELLE: 1:400

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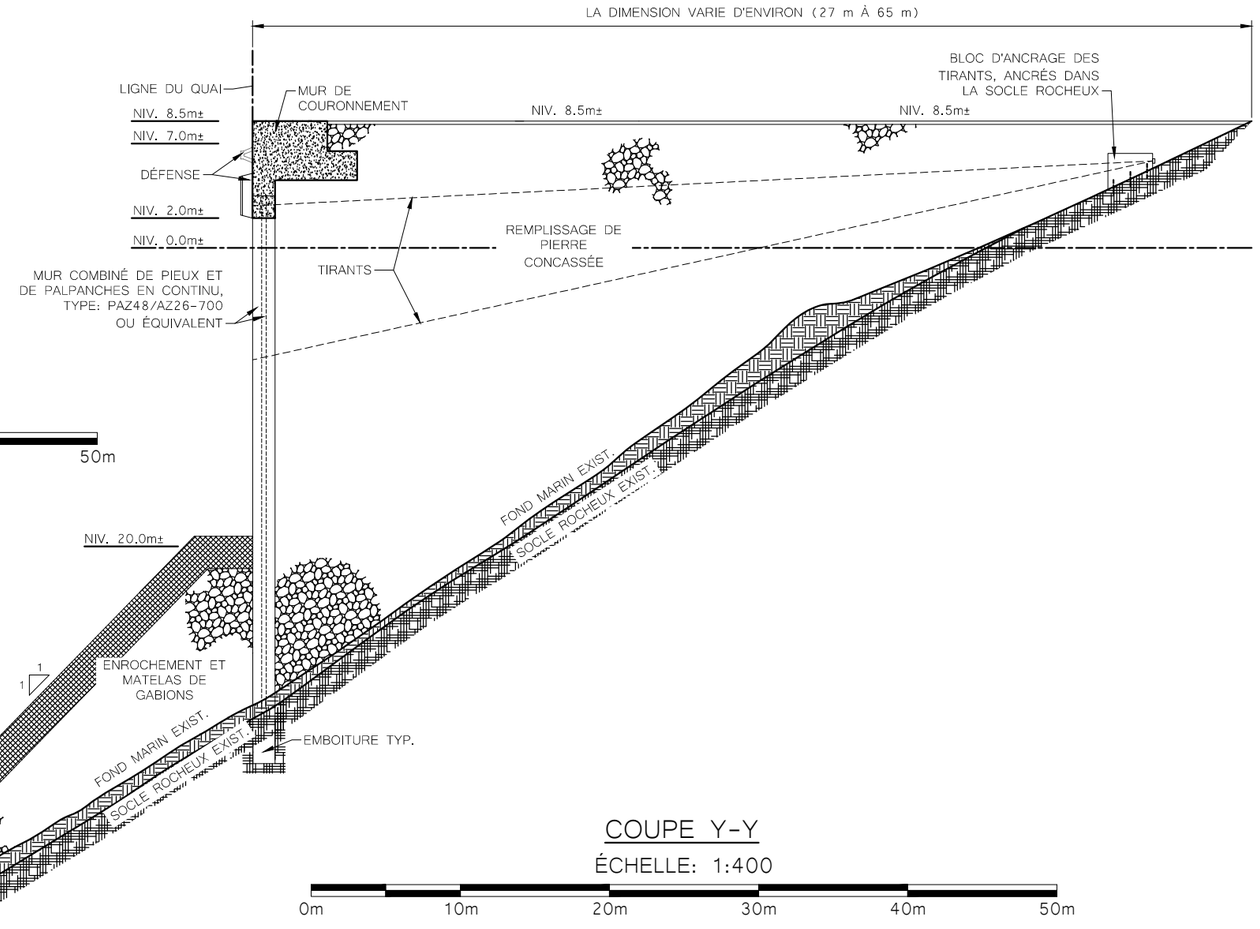

COUPE Y-Y

ÉCHELLE: 1:400

0m 10m 20m 30m 40m 50m

NOTES:

1. LES ÉLÉVATIONS HYDROGRAPHIQUE SONT BASÉE SUR LE ZÉRO DES CARTES
2. LES ÉLÉVATIONS PRÉSENTÉS ICI SONT LIÉS À LE ZÉRO DES CARTES.

PORT DE SAGUENAY

CONCEPTUEL

2016–08–15

consultants

PORTHA INC.

révision		date
révision		date

A no. de détail
B sur dessin no.
C dessin no.

projet

QUAI MUR COMBINÉ

NOUVEAU QUAI SAGUENAY, RIVE NORD

dessin

SECTIONS

dessiné par	Raymond Gaudreault P. Eng.
date	2016-08-15
dessiné par	Niklaus Wendzich
date	2016-08-15
projet no.	----
paquet no.	LAP2016-00-03
feuille no.	2 de 3

Portha Reference No: LAP2016-00-03-ST0 - ANSI B

Format: ANSI Expand B (11.00 X 17.00 Inches)

Plot Date: 8/8/2014

2.4 WATER MANAGEMENT

The apatite concentrate unloading area and storage areas shall be surrounded by a network of ditches and culverts which will collect the contact water. The surface water collected either side of the wharf access road as well as along the conveyors around the edge of storage areas will flow into separate sedimentation basins, distributed throughout the site. The basins will gather any possible suspended matter, before discharge of the water into the Saguenay River.

The buildings' supply of drinking water will come from wells drilled on site. A total of three wells will be needed.

Staffed buildings will be equipped with an Ecoflo-type treatment system; there will thus be three septic systems. When geotechnical characteristics allow, treated wastewater will be infiltrated into the ground.

2.5 TERMINAL DISMANTLING AND CLOSURE

All equipment used for unloading trucks, transport, and storage of apatite concentrate from Arianne Phosphate will be dismantled when the mine ceases operation. The equipment used for loading ships as well as the wharf is multi-user equipment, that is more than one client can use the equipment. In this context, there are no closure plans in place for these marine facilities. Any decision to dismantle the facilities will be made by Port of Saguenay.

2.6 OVERALL COST OF THE PROJECT

The project's overall cost is estimated at around $260 M including direct and indirect costs as well as contingencies.

As for the wharf maintenance costs, there will be an annual cost of around $75,000 to renew the cathodic protection as well as normal maintenance costs which will be similar to those for the Grande-Anse wharf (under Port of Saguenay jurisdiction).

3 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

Port of Saguenay's main objectives are to promote increased Canadian foreign trade and to more specifically develop the Saguenay–Lac-Saint-Jean–Chibougamau–Chapais region's hinterland. The terminal project's specific objectives are to provide Arianne Phosphate with access to a deep-water port, provide any other company with access to large-ship transport from the north shore and to provide local companies access to a north shore port for importing and exporting materials, equipment and products.

In accordance with these objectives and to fulfill its vocation, Port of Saguenay is seizing the opportunity to provide the north shore with a multi-user terminal while increasing its service offer. This opportunity came about with Arianne Phosphate's mining project, with the company wanting to focus on its mining activities. After analysing options for transporting apatite to international markets, in accordance with the project's feasibility and cost-effectiveness, the mining company concluded that the best solution was a terminal on the Saguenay's north shore. The terminal's location was selected following a comparative analysis based on social, environmental, technical and economic criteria. Arianne Phosphate thus called upon Port of Saguenay to take charge of the development of the north shore marine terminal needed for shipping its apatite concentrate.

3.1 LOCATION ALTERNATIVES

After having established the project's justification, location alternatives for the site of the terminal could be compared based on environmental, social and technico-economic criteria. The selected alternative needed to meet among other criteria: the shortest and least-expensive route possible, avoiding environmental and technico-economic constraints, reducing the number of watercourse crossings, the possibility of establishing port infrastructure for loading ships and minimizing disturbance of the landscape. Thus three site alternates were compared: the upstream alternative locate near Jalbert Islands, west of the Pelletier River; the centre alternative, to the east of the Pelletier River and the downstream alternative, the chosen option, located even further east.

Taking into account the cited criteria, the analysis was based on a road alignment study and additional elements of information (stakeholder concerns, sectoral studies, field inventories). Each alternative's terrestrial and marine environments were compared.

A search for the best balance between the poles of sustainable development, that is the lowest environmental effect, the best technical and economic solution and the broadest social acceptance, would identify which alternative to choose. The selection was made based on professional judgement of the importance of the compared constraints and advantages.

The main elements justifying the choice of the selected location alternative are as follows:

- Lowest ecological footprint of the stocking area in terms of surface area occupied
- Isolation of the work area by its surrounding relief
- Furthest work area from dwellings
- Absence of aquatic plants at the projected site of the wharf
- At least 2 km from the closest riverside residence
- Steeply sloped coastline at the wharf;
- Agreements made with owners of 12 of the 13 lots crossed by the access road.

The chosen alternative is the downstream alternative, as it has the widest social acceptability and this aspect makes it preferable to the other options.

3.2 WHARF TYPE ALTERNATIVES

Numerous wharf designs were analysed using technico-economic and environmental criteria. The ten (10) types of wharf compared are as follows: wharf on expanded piles, wharf on piles with back wall, wharf on piles with prefabricated slabs, floating wharf anchored to the shoreline, floating wharf with guides (Flexiport), gravity wharf with concrete caissons, cell gravity wharf, anchored cell gravity wharf, combined wall gravity wharf, barge-mounted loader.

The site characteristics and the environmental footprint were the basis for comparing the choices. The detailed criteria totalled 17 divided into six (6) criteria categories: minimizing the environmental effects, multi-user use and integration, constructability, construction costs, operability, maintenance costs.

The analysis showed that the combined wall gravity wharf was the best choice. While the anticipated environmental effects are slightly greater than for other alternatives, it provides clear advantages for the five (5) other criteria. Mitigation or compensation measures shall be implemented to minimize take into account the environmental potential effects.

It should however be specified that the analysis did not include the characteristics of the underwater substrate at the wharf's planned location. More advanced geotechnical studies are necessary and are only planned at the final plans and specifications phase. Due to the costs and seasonal constraints in conducting such studies, Port of Saguenay proposed to the CEAA that a second alternative be selected, which is little influenced by the underwater substrate's characteristics. The wharf on expanded piles alternative is the one which groups together enough advantages to be considered as an option. The slightly more negative aspects of this alternative involve the construction and maintenance costs. Without knowing the selected alternative geotechnical feasibility, the environmental effects will be assessed using this alternative. If the geotechnical study planned at the final plans and specifications phase show this alternative is feasible, Port of Saguenay will advise the CEAA that this type of wharf will be selected and built. In the opposite case, the wharf on expanded piles alternative shall be chosen for construction.

4 FIRST NATIONS PARTICIPATION AND CONCERNS

As stipulated in the CEAA's guidelines, communication and collaboration with the Aboriginal communities affected by the project is a key objective of CEAA 2012. The communities affected by the project are Mashteuiatsh, Essipit and Pessamit. This part of the study was taken into consideration and initiated in June 2015 through the following initiatives:

- A meeting prior to the impact assessment between proponent, representatives of the First Nations involved and the CEAA. This meeting's objectives included the presentation of the assessment process and an outline of the guidelines for comment.
- The consultation process planned as part of the study and aiming to gather the available information as well as any eventual concerns from the First Nations.
- The conducting of a sectoral study aimed at acquiring the most accurate information possible regarding past and present use of the study area by First Nations.
- The sending of a letter from the Proponent asking for comments from the identified communities regarding the preliminary design and development plans for the north shore marine terminal.
- Finally, the public consultation process, still ongoing, gathering all concerns, including those voiced by Aboriginals.

Official correspondence between Port of Saguenay and the First Nations regarding the project is all directed to a single representative for the three communities involved.

General concerns were expressed by First Nations representatives during the meeting regarding the impact assessment guidelines. Specific concerns regarding certain issues were expressed by representatives from Essipit through the sectoral study. Of specific concern was the use of an historical portage or route leading inland in the Pelletier River sector (just over 2.5 km upstream from the study area). At the request of the communities of Essipit and Mashteuiatsh, the proponent shall conduct archaeological surveys prior to the work to validate the archaeological potential of a section of the local study area. The archaeological work shall be conducted by Aboriginal workers.

The other concerns raised by the community of Essipit are related to marine navigation in the Saguenay and its mouth. They involve among other things commercial activities, most notably companies offering marine mammal-viewing excursions and commercial fishing of green sea urchins. Concern was also raised regarding winter fishing for food in the Saguenay, at Sainte-Rose-du-Nord. Concerns are raised regarding incidents (collisions, oil spills) which could occur with the increase in the number of ships travelling through the mouth of the Saguenay River, and especially the potential effects this increased traffic on the Essipitunnuat's activities, as well as on the area's resources.

Consideration was given to the issues identified by the First Nations with regard to mitigation measures but did not require any changes to the project.

5 PARTICIPATION OF LOCAL AND REGIONAL COMMUNITIES

The CEAA's directives recall the objective of the CEAA 2012 to provide the public with the opportunity of participating in a significant manner in the EIS. In fulfillment of this objective, the concerns of the public at the local and regional levels were gathered through a consultation process set up before the launch of the Marine Terminal on the North Shore of the Saguenay project's EIS. The process continued throughout the EIS. The main stages of the process included preconsultation meetings set up by the proponents of the apatite mine project and the marine terminal project, meetings organized as part of the effects assessment process, and consultations overseen by the CEAA.

During a preconsultation hosted by the apatite mine proponent, municipal organisations, resident groups and the community of Essipit, among others, were met with for a consultation regarding an eventual Marine Terminal on the North Shore of the Saguenay. Once the project had been developed, it was presented by Port of Saguenay acting as the proponent. Numerous local and regional organisations were then met with, starting in March 2015, to present the project and gather concerns. At this stage, the three Aboriginal communities were also approached.

At the same time as the proponent-led consultations, the CEAA launched its four-stage consultation process, at set forth in the CEAA 2012. The first two stages were conducted before and during the EIS. The next stage is a consultation on the published EIS after which, depending on the comments received, the proponent can be called upon to improve upon the mitigation measures in order to reduce the effects. There will be a final public consultation on the draft version of the CEAA's environmental statement report.

The summary draws together the concerns expressed throughout the process. Part of the comments received dealt with the link between Arianne Phosphate's phosphate mine project and the construction of a Marine Terminal on the North Shore of the Saguenay, notably with regard to the project's justification. Concerns were raised regarding the project and others with regard to the consultation process itself. Otherwise, most of the concerns could be classified according to sectoral issues or in consideration of specific elements of the natural environment.

Table 1 presents the summary of the comments and concerns raised throughout the consultations conducted up until the drafting of the impact statement. The concerns and comments are thus from the meetings conducted by Arianne Phosphate and by Port of Saguenay as well as communications received by the CEAA.

The consultations helped gather the support with or without reservations expressed by the majority of stakeholders and to take note of the opposition expressed by others.

As part of its sustainable development process, Port of Saguenay has designed the project in line with the concerns voiced during the consultation process. Thus, all the concerns are considered in the EIS and are the subject of a mitigation measure or action on the part of proponent regarding a specific issue.

Table 1 Summary of the Public's Concerns

Issue	Project Phase	Concern / Comments
Project justification	Overall mine - transport - terminal project	- Security of vacationers on Chemin des Monts-Valin - Lack of train access to the terminal - Limited area for storage facilities - Wharf's exposure to dominant winds - Ice - Proximity of a marine protected area - Demonstrate the profitability of the mine project
	Overall terminal project	- Demonstrate the multi-user vocation and profitability of the terminal
	Navigation	- Request to consult the results of the study conducted by the St. Lawrence pilots - Request for the assessment of cumulative effects of marine transport (taking into account future projects as part of the Plan Nord)
Sustainable development	Overall mine - transport - terminal project	- Wish for a joint provincial (Environment Quality Act) / federal (CEAA) environmental review for the overall mine -transport - terminal project
	Overall terminal project	- Wish to see the principles of precaution and prevention applied - Fears regarding the marine park's long-term conservation, education and recreation mission
	Dismantling	- Deemed contrary to a sustainable development approach
Ethics	Overall mine - transport - terminal project	- Breaking-up the project (mine - transport - terminal) is deemed unethical
Social acceptability	Overall terminal project	- Request to take into account all sector residents and to map all buildings - Consultation of First Nations
Quality of ecosystems	Overall terminal project	- Fears for the environment - Fears for the Saguenay River's ecosystem
	Construction (access road and terminal) Transport and transshipment (operation)	- Request to study the effect of maintenance of the access road - Effects on neighbouring ecosystems - Effects on Atlantic salmon, anadromous brook trout, smelt, belugas and other marine mammals - Fears for capelin and its breeding habitat - Characterisation of the Pelletier River - Fears for species at risk - Dustfall - Pollution of water with de-icing salts and runoff water - Noise pollution - Light pollution - Resuspension of buried contaminated sediment

Table 1 (cont'd) Summary of the Public's Concerns

Issue	Project Phase	Concern / Comments
Quality of ecosystems (cont.)	Navigation	- Request that ice dynamics be characterized - Increase in marine activity in the fjord (cumulative effect) - Bank erosion - Fears of oil spills - Disturbance of belugas and other marine mammals by the ship's noise and speed - Fears of water contamination from ballast waters
Landscape quality	Overall terminal project	- Fears for the preservation of the landscape (UNESCO world heritage site candidate, identity-related feature) - Wish to protect the fjord's terrestrial and marine landscape - Fears for the visual perspective from the New France site
Health and quality of life	Overall terminal project	- Fears for health and quality of life (noise, stress)
	Transport and transshipment (operation)	- Nuisances related to noise, vibrations, dust, odours o Fears for the health and safety of nearby residents o Fears for loss of tranquillity for nearby residents o Fears for the respiratory health of children, seniors and people with et des respiratory illnesses (dustfall)
Security	Navigation	- Site deemed poorly chosen in terms of safety during ship maneuvers - Safe design of the wharf
Recreational tourism	Overall terminal project	- Fears of repercussions for the recreational tourism industry (kayak, whale-watching cruises, clients of the Parc Aventures Cap Jaseux, clients of the Cap au Leste outfitter) o Nuisances caused by noise o Fears of nighttime travel o Alteration of the natural landscape o Light pollution o Loss of clients
Economy	Overall terminal project	- Fears of a drop in property values - Offering workers accommodation in neighbouring establishments - Interesting opportunity for an industrial eco-park on the site of Resolute Forest Products' former sawmill

The following are the issues for which actions have thus been undertaken:

- Sustainable development
  - Improvement of the social acceptability through exchanges with stakeholders
- Health and quality of life
  - Equipment and facilities to prevent dust emissions
  - Measures for mitigating noise
- Quality of ecosystems
  - Optimisation of methods through to completion
  - Adjustment of completion schedule
  - Adoption of an alternative to blasting in a marine environment
  - Ecological lighting
  - Site self-sufficiency in terms of granular material
  - Participation in the work of a noise and marine mammals study group
- Landscape
  - Minimal clearing and re-planting of the site
  - Establishment according to the topography
  - Public consultation for the selection of the colour of the storage silos
- Safety
  - Specific prevention measures and emergency response plan
  - Adherence to the ISPS security code;
  - Project to extend the port's area of jurisdiction
- Economy
  - Favouring regional companies

6 METHODOLOGY AND SCOPE OF THE ENVIRONMENTAL ASSESSMENT

6.1 METHODOLOGY

The general approach selected to assess the environmental effects of the project comply with the environmental assessment federal requirements. The method used is based on the federal reference document on how to determine significant environmental effects from a project and on the Guidelines prepared for the Project EIS.

The Project environmental impact statement presents the environmental setting and the project, then the assessment of the effect on the environment. Relevant information related to physical, biological and human were collected from existing data and specific field surveys. Communications and engagements with the population has defined concerns, interests and environmental issues specific to the Project. The understanding of the Project technical settings has allowed determining the effects on the environmental components and to propose appropriate mitigation measures. The significance of the effects (negative or positive) take into account the current mitigation measures that are generally technically and economically applicable and feasible. It also considers specific mitigation measures and enhancement measures. Residual effects are those

Residual effects are those that remain after the implementation of all these measures. If necessary, compensation programs, surveillance and monitoring will be presented.

The procedure presented in Table 2 summarizes the methodology used for the assessment of effects on the environmental components.

6.2 SCOPE OF THE ASSESSMENT

The CEAA has determined, following the deposit of the project's description by the proponent, that an environmental assessment was required under CEAA 2012. The assessment of environmental impacts should include for the construction, operating and maintenance, and decommissioning phases of the following activities and facilities:

- the wharf;
- maneuvering areas, the navigation channel and anchorage areas;
- dredging necessary for the construction of the dock, the docking of ships and maintenance (if required);
- the sediment or deposit sites in aquatic or terrestrial environment (if required);
- the access road to the dock for the operation and maintenance requirements;
- transhipment, storage and handling areas for apatite concentrate;
- temporary works required for the construction of infrastructure;

- maritime transport within the limits of the terminal or the area of jurisdiction of Saguenay Port, if it is enlarged to include the project site;
- the transhipment operations related to the storage and handling of concentrated apatite;
- waste, cargo residues and hazardous materials management;
- managing stormwater, waste and consumption, including the drilling of wells (if required);
- stripping banks, management of cut and fill and ballast water;
- the waste snow management; the main area comprising the administrative and technical buildings and the electrical substation.

The access road between Highway 172 and the truck unloading site terminal (6.8 km) as well as the power line are excluded from the scope of the assessment.

Table 2. Summary of the project environmental effects assessment methodology

1 DETERMINATION OF THE SCOPE OF THE ENVIRONMENTAL ASSESSMENT
Valued components to be examined
Component chosen or not as valued components, justification base on the regulatory framework and concerns voiced by Aboriginals and the public.
Spatial and temporal boundaries
Identification of the spatial and temporal boundaries of each valued components (VC).
2 DESCRIPTION OF THE BASELINE CONDITIONS
Baseline conditions highlights and identification of the existing information used to describe each component.
3 ENVIRONMENTAL EFFECTS ASSESSMENT
Predicted environmental effects
Description of the predicted environmental effects on each natural and human component (Aboriginals and local and regional public).
Mitigation of effects
Presentation of the mitigation measures proposed to reduce the effect on each component. Compensation programme to limit the loss or enhancement measure to maximize spin off, if required.

Determine if residual effects are significant
Residual effect assessment after the mitigation measures are implemented and determine significant effects.
Cumulative effects
Cumulative effects assessment on valued components (separate chapter, as stated in Guidelines).
4 MONITORING AND FOLLOW-UP PROGRAMS
Monitoring program during the construction stage and follow-up program during the operation and maintenance stage, if required. If needed, preparation of a decommissioning program for the port facilities, and the apatite storage and handling infrastructure.

6.2.1 VALUED COMPONENTS

The impact assessment takes into account the valued components (VC) related to article 5 of the CEAA, including the ones indicated in section 6.2 of the Guidelines issued for the project of the marine terminal on the north shore, as well as endangered species and their critical habitats, as stipulated by article 79 of the Act, Species at Risk Act (SARA). The acquisition of land needed for construction of the terminal and related infrastructures is regarded as the exercise of a federal power, the CEA Agency asked the proponent to also examine the effects on certain additional VC under section 5 (2) of the CEAA 2012. Table 3 summarizes the VC retained for the assessment of environmental effects.

6.2.2 SPATIAL AND TEMPORAL BOUNDARIES

The spatial and temporal boundaries used in the environmental assessment vary according to each component of the natural and human environments.

The spatial boundaries (areas of study) are defined according to the different geographical ranges adapted to each component of the environment, in order to adequately describe the components of the receiving environment of the project and the potential effects on the environment. The limited study area sees the imprint of planned infrastructure and the immediate vicinity. It allows the description of the components of the biophysical and human environments likely to be affected by the implementation of the project infrastructure. The local study area allows for an extended portrait of natural and developed areas surrounding the project site and the extended study area, including the banks of the Saguenay from its mouth to the bridge Dubuc in city of Saguenay, situating the project in relation to the Saguenay River.

As recommended by the CEA Agency, the temporal boundaries used for the environmental assessment covering the three phases of the project, the construction phase (approximately 24 months), the operating and maintenance phase (minimum of 25 years) up to over 40 years and phase of dismantling of transhipment facilities, storage and handling of apatite concentrate (approximately 12 months).

6.2.3 SOURCES OF EFFECTS ON THE COMPONENTS

Sources of potential impacts on environmental components are the work and activities required to construct, operate, maintain and dismantle the planned infrastructure (terminal and wharf). They also take into account the presence and operation of the latter. These sources of potential effects are presented in Table 4.

Table 3 Valued Components to be Examined

	Valued Components	Guidelines*	Stated preoccupation
Physical environment	Weather conditions		
	Terrestrial coastal environment		
	Marine coastal environment		
	Coastal geomorphology		
	Air quality		√
	Terrestrial noise		√
	Underwater noise		√
	Lighting ambiance		√
	Freshwater quality		√
	Water quality in the marine environment		√
	Soil quality		
	Sediment Quality		
Biological environment	Terrestrial flora	√	
	Wetlands	√	
	Forest stands of phytosociological interest	√	
	Species at risk	√	√
	Invasive species	√	
	Marine flora and benthos	√	√
	Endangered Species	√	√
	Fish and fish habitat	√	√
	Freshwater fish	√	
	Species at risk	√	√
	Marinefish	√	
	Species at risk	√	√
	Cold water corals	√	
	Marine mammals		√
	Birds and their habitat	√	
	Wildlife and wildlife habitat	√	
	Large fauna	√	
	Small fauna	√	
	Herpetofauna	√	
	Endangered species	√	
First Nations	Administrative framework and land tenure	√	
	Planning and Land Management	√	
	Demographic profile		
	Built environment	√	
	Infrastructure and Services		
	Socioeconomic profile	√	
	Population		
	Economic structure and the labor market		
	Land use by First Nations	√	√
	Traditional activities	√	√
	Forestry activities	√	
	Commercial fishing	√	
	Use of navigable waters	√	
	Recreational and commercial activities	√	
	Risk to human health	√	
	Natural and cultural heritage	√	√
Local and regional communities	Administrative framework and land tenure	√	
	Planning and Zoning - Federal lands	√	
	Demographic profile		
	Built environment		√
	Infrastructure and Services		
	Socioeconomic profile		
	Population		
	Economic structure and the labor market		
	Land use	√	
	Leisure and tourism	√	√
	Vacationing		
	Agricultural activities		
	Forestry activities		
	Mining activities		
	Commercial fishing	√	
	Navigation (commercial, recreational, traditional)	√	
	Risk to human health	√	√
	Landscape	√	√
	Natural and cultural heritage	√	√

** Supported by the articles 5(1) and 5(2) of the CEAA.*

Table 4 Project Likely Sources of Effects during Construction, Operation, Maintenance and Decommissioning

Sources of Effects –Construction	
Land acquisition	- Purchases or long-term rentals of private land.
Organisation and site decommissioning	- Delivery of several components of large or significant weight. - Setting up temporary site infrastructure (parking lots, trailers for workers, warehouse, storage areas, etc.). - Fencing, protection and signaling terminals, when required, to ensure the safety of the work site. - Cleaning and restoration of the construction site and areas of the site at the end of the work.
Deforestation and elimination of woody debris	- Reforestation and site preparation (grubbing, stripping, blasting, drilling, drainage, etc.) prior to the construction of new facilities.
Site preparation	- Excavation, backfilling and leveling. - Preparation of the foundations of the path leading to the wharf.
Bedrock crushing	- Crushing of blasted bedrock near the area No. 1.
Terminal construction	- Development and construction activities of the unloading area for trucks, the storage area of the apatite concentrate (silo and dome), conveyors, transfer towers, ship loader and path access to the platform including all service buildings (administrative, electricity, etc.).
Wharf construction	- Piles installation activities and wharf construction: o partial backfilling to allow the advance of machinery; o vibratory driving of piles using a template; o sinking of piles; o installation of the tie rods and the anchor wall; o backfilling; o construction of the crown wall; o paving; o installation of riprap and gabions.
Sources of Effects –Construction	
Crossing rivers	- Development of culverts on the terminal site and on the way to the dock.
Development of water services infrastructure	- Installation of a drinking water supply system (well drilling). - Construction of a reservoir of water for fire protection.
Development of wastewater management infrastructure	- Development of wastewater treatment systems: o sanitary water; o runoff (service road to the wharf and infrastructure).
Grid connection	- Power supply by installing a distribution line and transformer stations and control equipment.
Circulation of machinery and transport of materials and workers	- Circulation of machinery for the supply of materials, equipment, goods and services. - Transport of granular materials (if required). - Snow removal and use roadsalts. - Transportation of workers.
Refueling and maintenance of machinery	- Activities related to the supply and maintenance of machinery. - Spill risks (contingency plan).
Non-hazardous waste	- Storage, handling and management of non-hazardous waste.
Hazardous waste	- Storage, handling and management of hazardous waste.
Procurement of goods and services	- Purchase of goods and services necessary for carrying out the work.
Workforce	- Hiring the labor necessary to carry out the work.
Sources of Effect – Operation and Maintenance	
Presence, use and maintenance of buildings and permanent installations	- Physical presence of the facilities and their maintenance. - Lighting for night operations on the site. - Transshipment, warehousing and handling of apatite concentrate. - Ship loading activities. - Presence of vessels. - Repair and maintenance of infrastructure.
Traffic	- Movement of workers.
Activities that generate air emissions	- Air emissions from trucks to the terminal's transshipment site, workers' and maintenance vehicles (nitrogen oxide, sulfur dioxide, carbon monoxide). - Particulate matter emissions during operations and handling of apatite concentrate (site traffic, conveyor transfer points, etc.).
Wastewater management	- Wastewater management (collection, control, and containment bypass) o sanitary water; o runoff (service road to the wharf and infrastructure).
Non-hazardous waste management	- Use, storage and management of non-hazardous waste (recovery, recycling, etc.). - Waste snow management.
Hazardous waste management	- Use, storage and management of hazardous materials (elimination). - Management of contaminated soils.
Goods and services procurement	- Purchase of goods and services necessary for the operation of the terminal and related facilities.
Workforce	- Labor hired to operate the terminal.
Sources of Effect – Decommissioning of port facilities, and apatite storage and handling infrastructure	
Organization and decommissioning of the site	- Withdrawal of several components of large or of significant weight. - Establishment of temporary facilities (trailers for workers, warehouse, storage areas, etc.). - Fencing, protection and signaling terminals, when required, to ensure the safety of the dismantling work site. - Cleaning and restoration of dismantling sites and areas of the site at the end of the work.
Grading and leveling of the land	- If necessary, excavation, backfilling, grading and stabilization of land from the materials in place or, if necessary, with materials from a borrow pit outside the site.
Dismantling of transhipment facilities, storage and handling of apatite concentrate	- Activities to dismantle the truck unloading area, apatite concentrate silos and associated conveyors.
Machinery traffic, transportation of dismantled equipment and transportation workers	- Circulation of machinery for the supply of materials, equipment, goods and services. - Transport of granular materials (if required). - Snow removal and use roadsalts. - Transportation of workers.
Refueling and maintenance of machinery	- Activities related to the supply and maintenance of machinery. - Spill risks (contingency plan).
Non-hazardous waste management	- Storage, handling and management of non-hazardous waste.
Hazardous waste management	- Storage, handling and management of hazardous waste.
Goods and services procurement	- Purchase of goods and services necessary for carrying out the work.
Workforce	- Hiring the labor necessary to carry out the work.

7 DESCRIPTION OF THE EFFECTS ON THE COMPONENTS

7.1 PHYSICAL ENVIRONMENT COMPONENTS

7.1.1 SURFACE DEPOSITS – STABILITY

The Guidelines of the CEAA as well as public Concerns have not revealed the stability of unconsolidated deposits as a CV, but an imbalance of these could lead to potential impacts on other valued components.

In the terrestrial environment, the unconsolidated deposits in the study area are relatively stable and associated with a thin veneer of till on steep slopes. During extreme weather or seismic activity, only small skin flows are likely. In coastal areas, the banks are mainly composed of fractured rock with a high dip, therefore very stable. In the underwater environment, slope stability at the study site increased by the exposure of the rock surface as a result of the 1988 underwater slide.

In construction phase, the potential effects on the stability of surface deposits are associated with deforestation work that could make the steep slopes unstable as well as the destabilization of steep slopes caused by various vibrations or overloads (traffic, battery installation, blasting, etc.). Traffic associated with land clearing and grubbing of stumps will disturb the soil. Deposits will be more susceptible to erosion following removal of vegetation, stripping organic horizons and their reworking by the excavation, backfilling and leveling work. Steep slopes on a part of the study area increase the potential for erosion and the risk of skin flows. Certain construction activities could generate vibrations that can affect the stability of sediments along the steep slope in the underwater environment. The backfilling of the seabed by the introduction of the wharf and stabilization works will cause an encroachment, an excess weight and a change of slope in the marine environment. This encroachment is unlikely to affect the stability of the underwater environment sediments, these being thin and relatively stable. During the operational and maintenance phase, the anticipated effects on the stability of surface deposits are mainly related to traffic which can lead to destabilization of surface deposits due to the vibration and weight loads. In the dismantling phase, the dismantling of the infrastructure associated with the transshipment of apatite and associated work could affect the stability of surface deposits and create vibrations that might affect the stability of the sediments.

Following the implementation of various mitigation measures standards in all phases of the project, the significance of the likely residual effects on the stability of unconsolidated deposits during the building phase is defined not significant. In the operational and maintenance phase, no activity is susceptible of disturbing the sediment stability and creating residual effects. In the dismantling phase, no activity associated with the withdrawal of apatite transshipment infrastructure is likely to disturb the sediment stability as to create residual effects.

During the construction work, environmental monitoring will ensure compliance with the described methods and commitments, the use of working methods that do not cause sediment transport to the Saguenay River, as well as setting the implementation of mitigation measures.

7.1.2 SURFACE DEPOSITS – HYDROSEDIMENTARY DYNAMIC

Sediment dynamics of unconsolidated deposits is not considered by the CEAA or the public as a CV, but changes to it could cause potential impact on other valued components of natural and wildlife areas.

The sedimentary system Saguenay is powered by three sources in different sediments, including regular contributions in sediments from the Saguenay tributaries and bank erosion, episodic intake of sediment from the Saguenay watershed during extreme floods and catastrophic contribution sediment from landslides both on land and underwater. The sediment transport processes and accumulation zones heavily dependent of the bathymetric configuration of the study site.

The contribution of coastal sediments at the study site is negligible because of the rocky and steep banks. Only a few small streams provide near sandy sediments, which feed locally, by the littoral drift, the adjacent coves presenting limited sediment dynamics. The fjord area has experienced several episodes of catastrophic floods in the last century, the latest of which dates back to July 1996. This generated a major input of sediment in the Saguenay via the Ha! Ha! and the North Arm. Historically in the catchment area of the Saguenay River, eleven Seismic shifts have caused significant sediment supply to meet the study site. During extreme events (landslides, floods), the majority of the sediment transfer occurs through suspension, traction or at the bottom of the Saguenay. The study site is located on top of a fairly steep underwater slope and coastline being only weakly supplied with sediment, sedimentation rate is lower than in the deeper parts of the Saguenay.

The likely potential effects on sediment dynamics of unconsolidated deposits primarily related to deforestation and construction and dismantling activities likely to sediment transport to the Saguenay via streams, and the amendment of the drainage conditions during the installation of crossings of rivers and water service management (well). Thus, under construction Phase disturbed surface deposits could be exposed to surface runoff, which could generate a sediment transport in rivers and consequently in the Saguenay. The activities required to build the wharf could reshuffle the seabed sediments and vibrations from this work could trigger landslides in the underwater environment. In operational and maintenance phase, the presence of the wharf and adjacent protective structures may alter sediment dynamics, especially at the small beach (enclaved) located immediately upstream of port facilities. The currents generated by the propellers of ships during docking maneuvers could cause some effects on sediment dynamics in marine sediments locally redesigning and creating locally erosion. The dismantling work of the infrastructure associated with the apatite transshipment could disturb the soil and similarly surface deposits during the construction phase.

Standard mitigation measures are provided for all project phases to mitigate the effects on sediment dynamics of unconsolidated deposits. In construction and operational and maintenance phases, the importance of the likely residual effect is considered not significant. For the dismantling phase, no activity is susceptible to disturb the sediment stability as to create residual effects.

During the construction work, environmental monitoring will ensure that all mitigation measures will be applied. A monitoring of the spatial extent and ecological conditions of sediment and of the sea grass upstream of the projected port facilities is proposed.

7.1.3 SOIL QUALITY

The CEAA Guidelines' as well as the public's concerns did not reveal that the "soil quality" component was valued, but changes to it could cause potential impact on other valued components of natural environments and wildlife.

The thin and undeveloped soils characterizing the limited study area consist of regosols and podzols. The thin soils and unconsolidated deposits shall ensure that the groundwater flow is very limited. No industrial activity is exercised in the immediate catchment area of the study area and the existing data suggest that there is no particular problem in regard to soil quality.

The likely potential effects on soil quality are dust emissions and contamination by toxic products during the production activities for all phases of the project, as well as contamination from road salt during the operational and maintenance phase. The inputs of sediment by the deposit of dust and spillage of contaminants would have the potential effect of modifying the physicochemical parameters of the soil. These effects may directly or indirectly affect organisms and vegetation and ultimately reach streams. The thin soil gives them a low water retention capacity in terms of hydrogeological properties.

The application of specific mitigation measures in all phases of the project will mitigate the effects on soil quality. During the construction phase the residual effect corresponds to at low risk of disruption and contamination and is therefore considered not significant. In operational and maintenance phase as well as the dismantling phase, the magnitude of the residual effect is considered not significant. The application of mitigation measures will prevent the very low impact on the quality of the land concerned will affect the Saguenay.

During the construction work, an environmental monitoring will ensure that all mitigation measures will be applied.

7.1.4 SEDIMENT QUALITY

7.1.4.1 FRESHWATER SEDIMENT

The quality of freshwater sediment is considered as a database of the existing environment, but is not retained as a VC.

Sediments exposed in the project are those of two rivers crossing the limited study area on land. Sediment analyses were performed for station located on one of the rivers crossing the limited study area. Current conditions indicate, for all analysed parameters, concentrations below the concentration values of the threshold effects level (TEL) and of the probable effects level (PEL). Sediment can be considered to reflect uncontaminated river conditions.

Sediment quality in freshwater depends largely on the water quality of rivers. Any effect resulting in a change in the water quality may affect sediment quality. In construction phase, activities that may induce effects are deforestation, land preparation, machinery movement and trucks, watercourse crossings and wastewater management. During the operational phase, the various maintenance works, the use of roadsalts in winter, snow management, residual and hazardous materials and circulation of materials and transport are susceptible to cause effects. The land restoration work, the circulation and refueling of machinery, material transport and handling of hazardous materials pose risks during the dismantling phase. The main anticipated effects during the construction, operational and maintenance and dismantling phases are the deposition of particles and clogging that may affect the growth of plant biomass as well as the benthos diversity and abundance, and water contamination by toxic products that can be transferred to sediments and affect water quality downstream as well as benthic organisms and plants.

The intermittent nature of affected waterways limit the duration of potential effects. Mitigation measures implemented during construction and the dismantling phases will avoid effects on the quality of freshwater sediments. At the operational and maintenance phase, the conservation of protective riparian strip of plant with a minimum width of 30 m along the river is expected to intercept any sediment or contaminant runoff of surface water. The importance of the residual effect on the quality of freshwater sediment is considered not significant.

During the construction work, an environmental monitoring will ensure that all mitigation measures preventing change in water and sediment quality will be applied.

7.1.4.2 MARINE SEDIMENT

Sediment quality in the marine environment is considered by the CEAA as a database. This is not a component reported as a concern for First Nations and local and regional Communities. The marine sediment quality has still been considered as VC because of its influence on the overall quality of fish habitat, which is targeted by the Fisheries Act.

Spatial boundaries considered for the description and analysis of the project effects' correspond to a limited study area established for this component, to approximately 250 m upstream and 750 m downstream of the location of the terminal, to an approximate depth of 60 m. Within this zone, marine sediments were collected at three stations and used to establish existing conditions.

Overall, the marine sediments of the study area are of good quality, although some metals (chromium, cobalt, mercury and arsenic) exceed the concentrations of effects seldom observed and threshold effects level concentrations (arsenic). All other metals detected values were below those two criteria. There are some exceedances for PAHs in the study site. PAH observed in the sediments of Saguenay come from the aluminum industry. For a long time, a slow, yet constant landfill highly contaminated sediments brought in Saguenay in 1960 and 1970 by less contaminated sediments has been observed. The results of samples suggest that sediment contamination by PAH is not constant in the study area. As for PCBs, no value has been detected in the samples.

In construction phase, the activities that may cause effects to the quality of marine sediments are related to the construction of the access road to the wharf and the construction of the wharf. The only anticipated effects on sediment quality are related to sediment transport and oil or hazardous materials spills into the environment. In operational and maintenance phase, the activities that may induce effects on sediment quality are mainly related to activities surrounding the presence and maintenance of buildings and permanent installations, including ship loading activities and docking and undocking maneuvers. The release of apatite into the aquatic environment is considered unlikely; it would result mainly in the sedimentation concentrate to the bottom. A poor dissolution may also occur. Other likely effects are related to oil or hazardous materials spills into the environment. In construction and operational and maintenance phases, the importance of the residual effect is considered not significant. This assessment takes into account the reduction in the degree of disturbance of the component by all the optimisation and project mitigation measures and the implementation and enforcement of standards and regulations in regard to the management of petroleum hydrocarbons and hazardous waste. In the dismantling phase, no effects are expected on marine sediments, port facilities near the Saguenay River remaining in place.

A surveillance program will help ensure compliance with the described methods and commitments taken as part of the present study. More specifically, it will ensure that the working methods do not cause sediment transport to the Saguenay River and compliance with mitigation measures to implement.

7.1.5 CURRENT CIRCULATION

The current circulation is not considered by the CEAA or the public as a VC, but changes in the conditions associated with the movement of currents (changes induced by the new wharf) could cause potential impacts on the natural environment and human.

The portion of the Saguenay targeted by the project is at the bottom part of Saguenay fjord. This section presents a typical estuarine circulation of great discharge rates' fjords. The water masses are stratified. At the surface flows a freshwater layer of a thickness of approximately 5 to 15 m and deeper is the layer of salt water from the St. Lawrence Estuary. The fjord is subject to a regime of semi-diurnal tides with an average amplitude of 4.2 m and up to over 6.6 m during spring tides. The waves are mainly generated by wind, which can come from three different directions. Current Saguenay are classified as rather weak and are influenced mainly by the tides and, to a lesser extent, the streamflow pf the Saguenay. At the study site, in times of low water, both surface river water and subsurface of sea water currents flow downstream. At flood tide, the flow of sea water moves upstream. This phenomenon does however influence very little the downstream direction of the stream flow on the surface.

Given the morphology of the Saguenay Valley and bathymetry of the study site, modeled data indicate that the currents tend to be slower at the center of the Saguenay and their velocity increases along the left bank, from the study site or directly downstream of the latter. All the scenarios studied indicate that along the bank, both in surface and deeper, the currents speed is higher. The model estimated that in times of flood, surface water velocities are estimated in front of the study site are between 0.2 and 0.4 m / s, with a 50% probability that the currents exceed a speed of 0.31 m / s. In conditions of low water, the speed of surface currents varies between 0.12 and 0.29 m / s, with a 50% probability that the currents exceed a speed of 0.20 m / s. In front of the study site, the overall direction of the currents is mainly south-southeast.

In construction phase, the likely potential effects on the circulation of currents are related to the risk of very localized and temporary deviation current and of the formation of counter-currents, particularly upstream, in front and downstream of infrastructure. In operational and maintenance phase, the physical presence of facilities can cause a permanent effect on the current flow by altering the shoreline, not only morphologically, but also in terms of hardening the coast. At upstream of the current, the flow of water will hit the wharf, resulting in the amplification of the counter-currents that could promote locally the erosion of the adjacent shoreline. The potential effects are likely to occur only sporadically along the shore, especially at the level of sedimentary dynamics, of ice, of fish habitat and of navigation. In the dismantling phase, no activity is susceptible to disturb the movement of currents, port facilities near the Saguenay River remaining in place.

No mitigation measures are planned for the effects on the circulation of currents for the construction, operational and maintenance and dismantling phases. The importance of the residual effect on the current flow is considered not significant for construction and operational and maintenance phases.

Once the construction of the wharf is complete, environmental monitoring will ensure that sedimentary and ecological conditions remain stable and will validate the spatial extent of the sea grass upstream of the projected port facilities.

7.1.6 ICE

The ice is not considered by the CEAA or the public as a VC. The conditions associated with ice (changes induced by the new wharf and associated transport ships) could nonetheless cause potential impacts on the natural environment and wildlife, as well as on the human environment.

During winter, the Saguenay is covered with an ice thickness that varies from place to place along its course. The ice season observed around the study site begins with an accumulation of ice patches brought along the shore, especially during high tides. These ice sheets rest on the banks at low tide and freeze on the intertidal zone, so the ice-covered remains full throughout the winter and sinks daily at high tide. By mid-February the ice are still influenced by the upward and downward movement of the tides, but the thickness of the ice cover is strong enough to prevent the migration of free water surface.

Throughout the winter, a waterway is maintained up to the La Baie and Grande-Anse port facilities. Several ships operate, always escorted by an ice-breaker of the Canadian Coast Guard. In mid-March, the Canadian Coast Guard conducts icebreaking operations on the Saguenay River to prevent ice jams and flooding that can result during the spring thaw.

In construction phase, activities related to the construction of the wharf would have localized effects on consolidating the ice cover at the study site. The gradual change in the shoreline would cause a temporary deviation of the currents and the formation of counter-currents located upstream and downstream of the infrastructures, which would make the environment more dynamic and have the effect of hindering the setting of ice locally and fragmenting ice plates. The mobility of the ice rafts could increase sediment transport on the shore and intertidal areas adjacent to the wharf. In operational and maintenance phase, the physical presence of facilities would have a permanent effect on the local dynamics of ice by altering the shoreline morphologically and in terms of the coast of hardening. The mobility of the ice rafts could increase sediment transport on the shore and in intertidal zone in areas adjacent to the wharf.

Potential effects could therefore be felt from time to time along the shore, especially at the sediment dynamics, so the ice processes and, to a lesser extent on marine vegetation and intertidal seagrass. The docking activities and navigation could fragment and weaken the ice cover regularly in front of the wharf and especially along the paths of ships. In the dismantling phase, no activity is susceptible to disturb the ice, port facilities near the Saguenay River remaining in place.

No specific mitigation measures are planned regarding the ice. The importance of the residual effect on ice is not considered significant in construction and operational and maintenance phases. In the dismantling phase, no activity is likely to disturb the ice cover, port facilities near the Saguenay River remaining in place.

No environmental monitoring is recommended on the ice cover.

7.1.7 FRESHWATER QUALITY

Freshwater quality on land is considered a database of the existing environment. It has been a concern stated by the public and is therefore considered a VC.

Freshwater on the site project is found in both intermittent watercourses that will be crossed by a path. The water quality was analysed for one of these streams at a sampling station. The existing water quality conditions indicate a concentration slightly exceeding the protection criteria of aquatic life, chronic effect for petroleum hydrocarbons C_{10}-C_{50} and aluminum. The exceedances are not important and the analysis was not conducted to determine the source of these compounds. All other parameters analysed indicate that the water is of good quality.

Project activities that can induce effects on freshwater would be, the construction stage, deforestation, crossing of streams, all the site preparation and circulation of machinery. In operational and maintenance phase, the truck traffic, maintenance of facilities, use of road salts and water and waste snow and residual and hazardous materials management would be the activities at risk of causing impacts of on freshwater. In the dismantling phase, activities that are potential sources of impacts are the land restoration work, the circulation of machinery and trucks and oil and hazardous materials handling.

For all phases of the project, potential effects on water quality on land would be sediment input and the risk of contamination by hydrocarbons and hazardous materials. In operational and maintenance phase, the potential effects would be associated with the modification of the physicochemical parameters of the water surface. The sediment input and water contamination have the potential effect of increasing turbidity, warming the water and changing physicochemical parameters. These effects can therefore directly or indirectly affect benthic organisms and aquatic and riparian vegetation.

The intermittent nature of affected waterways limits the duration of potential effects. The standard mitigation measures implemented in construction and dismantling phases will prevent impacts on freshwater quality. At the operational and maintenance phase, the conservation of protective riparian strip of plant with a minimum width of 30 m along the river is expected to intercept any sediment or contaminant runoff of surface water. The importance of the residual effect on the water quality on land is considered not significant.

During the construction phase, environmental monitoring will ensure that all mitigation measures will be implemented. As follow up measures, regular maintenance of retention basins installed to trap sediments of drainage ditches will be ensured.

7.1.8 MARINE WATER QUALITY

Water quality in the marine environment is considered by the CEAA as a database of the existing environment and current environmental conditions. This component has been a concern for the public making it a VC.

From Saint-Fulgence, the fresh waters of the Saguenay River mix with the salt water of the fjord as a result of the strong turbulence created by the tides in the shallow part of the Saguenay. At the level of the study area, the mixing of waters is less intense, so brackish water formed at the head of the fjord flow over salt water in a thin surface layer with a very gradual increase in salinity downstream. In free water period, a thin (5-7 m) brackish water (salinity of 10 PSU[1]), relatively warm and turbid occupies the surface. A huge mass of salt water (29 PSU), cold and clear occupies most of the volume of the fjord. The border between the two bodies of water (thermos-halocline) is very clear and varies from 1 to 5 m thick. The water temperature falls rapidly to less than 5°C and salinity passes from 10 to 25 PSU.

Some variables analysed exceed chronic aquatic life criteria (CALC), namely total phosphorus, sulfates and boron. These exceedances are not significant and do not seem representative of particular issues. However, no exceedances of the acute aquatic life criteria (AALC) were observed.

The likely potential effects on water quality in the marine environment would be mainly the input of suspended sediment in the construction phase and the potential for oil or hazardous materials spills into the environment during the construction and the operational and maintenance phases. The inputs of sediment and water contamination have potential effects of increasing turbidity, warming the water and changing physicochemical parameters. These effects could, therefore, directly or indirectly affect benthic organisms and aquatic and riparian vegetation. The dismantling phase, no activity is susceptible of disturbing the marine water quality, port facilities near the Saguenay River remained in place.

The execution of construction work and the loading of apatite in the operational and maintenance phase would involve the use of machinery as well as oil and hazardous materials. The supply and maintenance of machinery and handling of such products could cause the oil or hazardous materials spills likely to reach the aquatic environment. Also, apatite constituted of a group of phosphate minerals, is likely to enhance the aquatic environment in case of spills and thus promoting algae growth in the aquatic environment. The importance of the likely residual effect on water quality in the marine environment is considered not significant.

During the construction work, environmental monitoring will ensure that all mitigation measures will be implemented. A follow-up program of total suspended solids (TSS) will be implemented during the construction work of the wharf to ensure that the work does not affect the quality of the environment.

[1] PSU : *Practical salinity unit*

7.1.9 AIR QUALITY

Because the air quality was raised as a concern by the public during consultations of the CEAA on the project description and the Guidelines, the air quality is considered a VC.

The study area is located in a forest area where there are few industrial activities. According to the National Pollutant Release Inventory, the nearest industrial activities are located 8 km upstream from the proposed terminal. These activities correspond to the port facilities of Grande-Anse on the south shore. Other Rio Tinto port facilities are located in the Ha! Ha!, 13 km from the study site. The Grande-Anse and the Rio Tinto terminals are the only sources of air contaminants identified in the area, since the Resolute Forest Products sawmill in Saint-Fulgence has been closed since 2014. Due to the location of the project, the air quality in the area is considered very good.

For the three phases of the project, the construction, operational and maintenance and dismantling phases the anticipated change on the environment would be the same, the degradation of the air quality related to the emissions of contaminants into the atmosphere. These contaminants include primarily particulate matter (dust) and the gaseous combustion compounds (the exhaust gas). In construction and dismantling phase, special measures will be taken to limit these sources of dust and limit emissions and the spread of contaminants associated with various activities outside the site. The air quality degradation would be limited to the site and its immediate surroundings. In operational and maintenance phase, the proposed development of a marine terminal on the north shore of the Saguenay has been optimised to minimise fugitive emission resulting from the apatite concentrate handling.

For construction, operational and maintenance and dismantling phases, the modeling confirmed that the significance of the likely residual effects would be not significant.

During the work, environmental monitoring will ensure compliance with the methods described, commitments have this portion of the study and application of mitigation measures rigorously. Applied mitigation measures should also be evaluated to ensure their effectiveness and corrections will be implemented as required.

7.1.10 UPLAND NOISE AND VIBRATIONS

The comments from the public during consultations of the CEAA on the project description as well as the Guidelines suggested concerns about land-based noise caused by the project. It is thus a VC.

The environment surrounding the site chosen for the marine terminal is heavily wooded and terrain is hilly. The territory is little used, to the exception of residents of vacation cottages, casual hunters and those attending the Cap au Leste Outfitter located more than 3 km east of the proposed site of the terminal. Considering the closure of the Resolute Forest Products sawmill in 2014, the only sources of change in the ambient noise level for vacationers of Neil and Bouchard lakes are all-terrain vehicles, in winter snowmobiles, local traffic on forest roads and proximity to Route 172. However, the Resolute Forest Products sawmill was a major source of noise in the area until its closure in 2014. In wooded environments with low human activity, the sound climate varies with weather conditions and periods of the season. The main sources of noise are changing and sometimes specific. For the purpose of this study, it is considered that the level of existing sound climate will have moments when it will be low, approximately 30 dBA.

During the construction phase, two scenarios were evaluated considering the busiest periods in terms of equipment and noisy work simultaneously. The methods and construction details (number, type of equipment, etc.) are not precisely known, it was considered in the model that the work would be carried out only during the day (between 7 am and 7 pm) or a usage time of 12 hours. During the operational and maintenance phase, the activities will be day and night, when filling boat activities will be in progress. All equipment of the operational and maintenance phase have a usage time of 100% and the activities were seen as operating all simultaneously. In the dismantling phase, noise emissions will be well below the noise emissions for construction and operational and maintenance phases.

During the construction, operational and maintenance activities, increased noise will be noticeable to nearby homes, but will remain below the allowable limits of the criterion of NI 98-01 MDDELCC and the change in the percentage of highly annoyed people of Health Canada. Thus, following optimisation of the project and recommended mitigation measures, the significance of the likely residual effects on the terrestrial noise and vibrations component is not significant for the construction, operational and maintenance and dismantling phases. No acoustic monitoring as part of the project is necessary.

7.1.11 SUBAQUATIC NOISE

Public is more and more concerned of the effect of underwater noise on the behavior and health of marine wildlife, including consecutive to increased noise generated by human activities (navigation, port activities, etc.). Indeed, concerns in this regard have been raised during the analysis of the project description and the Guidelines of the CEAA, justifying that underwater noise is a VC.

The sound spreading more easily in water than in air, underwater environment is relatively noisy in general, even in the absence of human activities. The background noise is fed by several natural sound sources of varying intensity, such as terrestrial vibrations, wind, rain, the cracking of the ice, waves and currents. Several species composing the aquatic or marine wildlife also emit sounds to communicate between them for feeding and moving purposes. Maritime traffic is usually the dominant noisy activity and product of anthropogenic underwater noise on a wide range of frequencies. Added to this are other manmade noises, including those generated by coastal work, air traffic, exploration activities (e.g. seismic, drilling) and offshore operations, and the use of sonar and other experimental acoustic sources.

Measurements of underwater noise at the terminal site were carried out continuously between July 7 and 11, 2015. A reference state of the underwater noise of the study area was established. During the period, commercial navigation proved to be the main source of anthropogenic noise in the study area, while the background noise from natural sources (wind and currents) was relatively high at the site of future port facilities.

In the construction phase, the noisy activities that may affect the underwater soundscape and induce effects on aquatic wildlife are primarily related to temporary piles sinking operations for the installation of jigs, pre-drilling pile sinking in the rock and vibro-sinking permanent piles and sheet piling. During the operational and maintenance phase, activities that may affect the underwater soundscape and induce effects on aquatic wildlife are traffic and the arrival and departure maneuvers of ships and ship loading. During the dismantling phase, the equipment for loading ships and the wharf will be multi-user equipment; no infrastructure closure plan is planned.

A very precise modeling was performed taking into account the most recent and relevant scientific articles on the subject, and by considering the work description to be done and activities for the marine terminal during all project phases. For construction and, operational and maintenance phases, the performed modeling confirmed that the significance of the likely potential effects on the component is not significant. This assessment takes into account the reduction in the degree of disturbance of underwater noise by all optimisation and mitigation measures of the project. During the dismantling phase, as it is not intended to dismantle the wharf, no activity is likely to cause high levels of underwater noise.

During the work, an environmental monitoring will ensure compliance with the described methods and commitments as part of the present study, to ensure that the working methods in the construction and the operation and maintenance phases will cause no excessive noise in the study area and that they will not cause injury or death to the fish population.

The establishment of a follow-up program in real time of the noise emitted from construction activities, at least for the first two weeks of noisy work is proposed in order to validate the simulation results to check for dead or wounded fish and establish any corrective action if necessary. This monitoring will also collect data of underwater noise on ship loading operations. Where applicable, noise reduction measures could be suggested.

7.1.12 AMBIENT LIGHT

The "Ambient light" component is considered a VC. The public has expressed specifically concerns about the effects of artificial light at night as the ambient light pollution source that can provide effects on human health. In addition, the CEAA has asked the proponent, under paragraph 5(2) of the CEAA, 2012, to examine the effects of the project on human health associated with, among others, the exposure to light. The Environment Canada’s Directive on related to the project states that "current levels of nocturnal light intensity at the project site, including the propagated light, the nocturnal reflection from point light sources and the light of the sky, and any other place where project activities could have an effect on the light intensity; the impact assessment will describe the nocturnal light levels during different seasons and weather conditions".

Although the analysis of this component is relatively new, the proponent has been actively working to make sure to understand the current conditions in the study area with land and marine surveys. The moon influences significantly the measurements, inventories were made in new moon period. Thus, the surveys were conducted during two nights, on September 15 and 16 2015. All measurements were taken after astronomical twilight, specifically between 9 pm and 3 am.

The clarity of the sky and intrusive light are the two main parameters that can be affected by the increase in artificial light at night. The city of Saguenay, mainly the districts of Chicoutimi and Jonquière are the main sources of artificial light at night in the area. The borough of La Baie is another important transmitter of artificial light at night. Other issuers are present around the city of Saguenay as the municipality of Saint-Fulgence and Port Saguenay facilities. However, the city of Saguenay is a strong emitter, therefore we do not see significant influence of these other emitting sources. The further we move away from the city of Saguenay the clearer the sky. According to the classification of the International Commission on Illumination (CIE), the site is part of a sector with low brightness.

The measurement results demonstrate that there is very little intrusive light emitted towards the receiving stations. There are very little artificial light sources on the north shore. Sources of light were observed in both sectors the rest of the north shore had a very black nocturnal landscape, without emission of visible light. Different sources of artificial light were observed on the south shore, the presence of high-intensity light related to the city of Saguenay (Chicoutimi borough and La Baie) and a few light sources emitted by residential sites.

Planning the lighting concept was made by considering best practices at both the lighting needs and the choice of equipment. The presence of environmental effects has been validated using specialised modeling tools.

The activities planned in construction and dismantling phases will cause the temporary emission of artificial light at night well below the development that will be present at the operational and maintenance phase. In operational and maintenance phase very little impact is expected on the clarity of the sky, the modeling results show that new development will emit a very low quantity of artificial light at night. Residents of this sector of Saguenay will only be slightly affected by the halo of light resulting from the project which will be low and maximal, especially during the loading of ships period. The lighting at the property line will be null on land, but temporarily present on the Saguenay, without affecting residents who are located more than 1 km from the property line. No transformation of nocturnal landscapes is anticipated for residents of the north shore while for some areas of the south shore with a direct view of the project site, the landscapes will be affected in a more sharply, particularly during ship loading period.

Mitigation measures are proposed to reduce or eliminate environmental effects induced by the project of the terminal, or improve the project on the artificial light at night. Thus, the balance of likely residual effects of the ambient light on all components is not considered important, in construction phase as well as in operational and maintenance and dismantling phases. The ambient light changes are not likely to have cross effects on other components of the biological environment.

An environmental monitoring will help ensuring compliance of the described methods and commitments as part of the present study and allow verification that the working methods do not cause emission of light directly to the Saguenay. A verification of the angle of lighting installations and application of operating instructions is offered occasionally to ensure that the light sources are switched off in areas where lighting is not required at all times . No specific monitoring is proposed.

7.2 BIOLOGICAL ENVIRONMENT COMPONENTS

7.2.1 UPLAND AND RIPARIAN PLANTS

Terrestrial and riparian flora of the site covered by the proposed Marine Terminal on the North Shore of the Saguenay was chosen as VC under paragraph 5 (2) of the CEAA 2012 and the Guidelines issued by the CEAA.

Wooded areas occupy 93.1% (81.7 ha) in the limited study area and the water environment of the Saguenay River, 6.9% (6.1 ha). These woodlands are comprised 67.8% (55.4 ha) of mature forest and 32.2% (26.3 ha) of regenerating stands. Resinous stands account for 40.9% (35.9 ha) of the total land area and 52.2% for mixed groups (45.8 ha). Terrestrial vegetation is dominated by the following tree species: black spruce, trembling aspen, balsam fir, white spruce, eastern white cedar, white pine and red pine.

One of the listed woodlands, an old red pine forest, is considered as a "forest stand Phytosociological interest." Riparian vegetation focuses on the rocky cliffs of the Saguenay River, and along the two intermittent streams of the territory. On shore of the Saguenay, it is dominated by the red pine, the eastern white cedar, the black spruce, sweet gale, sea plantain and lichens, while in the bank of the intermittent streams, it is composed mostly of rough alder, honeysuckle bush, lady fern and rattle-snake-grass.

In the construction phase, the clearing work will result in the loss of 38.1 hectares of land vegetation and 1.3 ha of riparian vegetation, respectively 43.4% and 1.5% of the total area of the total area of the limited study area. The mature forest represents 60.4% (23.8 ha) of the area to be cleared and regenerating forest, 39.6% (15.6 ha). This corresponds to 58.9% (23.2 ha) of mixed stands and 41.1% (16.2 ha) of resinous stands. Furthermore, deforestation will affect 0.9 ha of forest stand of phytosociological interest which corresponds to 39.1% of its total area. Following the implementation of mitigation measures, the importance of the residual effect of clearing the land and riparian vegetation is considered not significant but it is considered significant in the case of settlement phytosociological forest of interest. In the operational and maintenance phase, during the movement of machinery and transport activities, there is a low risk of contamination of the land and riparian vegetation adjacent to operating areas by oil or hazardous material in case of breakage or accidental spill. After applying mitigation measures, the importance of this residual effect is considered not significant. During the dismantling phase, the restoration of abandoned sites by revegetation work will have a positive effect in ensuring the reconstitution of a vegetation cover at these locations. The importance of this positive residual effect is considered not significant.

Wetlands cover 2.8 ha, or 3.2% of the total area of the limited study area. It essentially corresponds to forest bogs (peat cedar stands) and very small areas of shrub swamps (alder) located in the bank of two intermittent streams. The design and mitigation measures will prevent encroachment on wetlands in the territory at the different phases of the project. Consequently, no residual effects are expected on this component of the environment.

No occurrence of plant species at risk were reported in the study area limited by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the data center on the natural heritage of Quebec (Centre de données sur le patrimoine naturel du Québec-CDPNQ) or during the realisation of rare plant inventories in 2015. Consequently, no residual effects are anticipated for this component.

No invasive exotic plant species (IEPS) was detected in the limited study area during the 2015 floristic inventories. Despite this, in the construction phase, the arrival of machinery and transport of granular materials in the work area will be accompanied by a risk of introduction and spread of IEPS. Following the implementation of mitigation measures to reduce this risk, the importance of the residual effect is associated there is deemed not significant**.**

An environmental monitoring program will ensure that the work follows the laws, policies and regulations, specific commitments and obligations of the proponent and the various mitigation measures proposed to minimize the effects on the terrestrial and riparian flora. A follow-up program for terrestrial and riparian vegetation could include monitoring the IEPS installation in areas that will be restored and replanted at the end of the construction period. It is also recommended to track the survival rate of plants planted and replanted in the revegetated areas to ensure a suitable vegetable recovery on these surfaces.

7.2.2 MARINE PLANTS AND INTERTIDAL MARSHES

The site's marine vegetation and intertidal seagrass covered by the Marine Terminal project on the North Shore of the Saguenay were determined as VC under the Fisheries Act, section 5 of the CEAA 2012 and the Final Guidelines for the preparation of the project's EIS. This component has also been the subject of public concerns during CEAA consultations.

An exhaustive inventory of the intertidal zone between Tadoussac and Shipshaw, from 1976 to 1994 revealed the presence of some 258 vascular plants species in the estuary of the Saguenay River, of which approximately thirty species considered of particular interest because of their scarcity or their distribution limits in Quebec. In Saguenay, the number of plants of interest decreases from upstream to downstream. This distribution reflects a riverine environment more favorable to the establishment of upstream flora while the steep, rocky banks of the downstream portion are less suitable for the establishment of plant communities. Five species of interest are likely to be present on the north shore of the section extending from Saint-Fulgence in Cape à L'Est, which dwarf club-rush, the sun spurge, the salt-marsh sand spurry and sea grass. In addition to these species of interest, intertidal vegetation is dominated by the presence of groups, rush, cordgrass, baltic rush and sedge.

In the project area, because of the predominance of roc in the bank and sand and blocks at the foreshore, in places, the observed intertidal vegetation density is generally low, and focuses on the mid-littoral zone. Only two aquatic plant beds, totaling 900 m^2 have been identified in this area. It corresponds to the monospecific sea grass beds is American bulrush. The H1 sea grass, located north of the north-west boundary of the limited study area, covers an area of 834 m^2 and has a density ranging from medium to high. The sea grass H2, located along the western boundary of the limited study area extends over 54 square meters and is characterized by a low stem density.

Few studies describe the distribution of benthic algae in the Saguenay River. The most extended studies report the presence of 42 species of macrophytes algae. Of these, only a few fucus species would be present in the section corresponding to the local study area. During the 2015 inventories, only one algae settlement was located at the height of the H1 sea grass. It consists of green algae having characteristics resembling those of hollow green weeds or sea lettuce.

No species of plant or algae in danger was detected in the marine environment and the intertidal zone of the study site. Consequently, no effects are expected on this component.

The project has been optimized to avoid direct encroachment on seagrass in the intertidal zone and settlement of green algae in the study area. Thus, few effects are anticipated on these components. In the construction phase, work in water and on the bank related to the wharf construction could cause the emission of suspended matter in the marine environment. This work should not induce effects on intertidal vegetation and stands of green algae in the study area, particularly due to the installation of turbidity curtains, using rocks and crushed stone (15-100 mm) for the material to fill the wharf's boxes but also because of the great dispersion of power of the Saguenay. There is nevertheless a very low risk of contamination by oil or hazardous material in case of breakage or accidental spill. After applying mitigation measures, the residual effect associated with the risk of contamination is considered not significant.

During the operational and maintenance phase, the potential impacts will come mainly from the ships apatite loading activities and the presence and movement of ships in the waters of the Saguenay. These activities could pose a risk of accidental apatite, oil or hazardous substances spill in the marine environment. Following the implementation of various mitigation measures, the likely residual effect is qualified not important. During the dismantling phase, as the wharf and facilities used for ship loading will be maintained in place, no effects on marine vegetation and intertidal seagrass is anticipated.

During the construction and operational and maintenance phases, an environmental monitoring will ensure that the work meets the laws, policies and regulations in effect, the proponent's specific commitments and obligations and the proposed mitigation measures to limit the effects of the project on marine vegetation and intertidal seagrass. A follow-up program could be used to document the evolution of the area and the composition of the intertidal seagrass H1, following the local modification of the sediment dynamics induced by the presence and operation of the wharf.

7.2.3 PLANKTON

The guidelines issued by the CEAA stipulate that the plankton must be regarded as a VC. Indeed, the latter being at the base of the ecosystem's food web of the Saguenay Fjord, it is an important component contributing to the aquatic environment's equilibrium. This component refers to all microorganisms (e.g. Phytoplankton, small planktonic crustaceans, larvae and fish eggs, etc.) in suspension in the water column.

The analysis and description of this component comes from scientific studies conducted in the Saguenay River. Saguenay's phytoplankton is mainly composed of freshwater species and weakly represented by the euryhaline and marine species. Primary productivity in the fjord is very low compared to comparable coastal waters and fjords. This is mainly explained by the absence of major spring bloom in the Saguenay by a late start of the productive period and low phytoplankton biomass values. The species present in the upstream portion of the Saguenay River do not have the same requirements or limiting factors that the ones colonizing downstream, therefore periods of optimal primary production do not necessarily correspond to the scale of the Saguenay.

In the Saguenay, the total abundance of zooplankton does not vary very significantly. Indeed, the tidal cycle and seasonal variations have minimal effect. Nevertheless, the composition of the zooplankton community can vary with the spatial and temporal scale. The zooplankton community also includes the presence of fish larvae in the ecosystem. Studies on the diversity and the spatial and temporal distribution of Saguenay's ichtyoplankton highlight the dominant presence of capelin larvae and smelt.

No endangered species were identified with respect to the component of the plankton in the Saguenay.

The main effects that could affect this component are related to accidental events primarily during the operational and maintenance phase. The implementation of measures to prevent incidents and respond in such circumstances greatly reduces the risk of significant effects on the environment and plankton. Even if an oil spill could affect plankton temporarily, there would be no significant environmental effects on plankton.

No surveillance or monitoring program is proposed for this component.

7.2.4 BENTHIC AND NECTONIC INVERTEBRATES

Benthic invertebrates and nektonic refer to all macroscopic invertebrate perceptible to the naked eye. As part of the proposed Marine Terminal on the North Shore of the Saguenay, benthic invertebrates and nektonic are determined as a VC under the Fisheries Act.

The intertidal zone bordering the Saguenay is characterized by very restrictive conditions for the survival of epibenthic organisms (effects of ice, large variations in water levels, temperature, salinity, etc.). Thus, the abundance and diversity of organisms are significantly reduced compared to other intertidal environments.

The marine environment characterisation campaigns carried out in 2015 did not identify any use of the foreshore or sign of epibenthic invertebrate organisms within the limited study area. Habitats available in this sector are unattractive because the environment is very rocky and the intertidal zone is relatively narrow due to the escarpment of the tidal flat. Moreover, this area is influenced by currents, tides, waves and ice.

The inventory of benthic invertebrates and nektonic subtidal, made from videographic footage recorded in the local study area, helped to distinctly identify 35 species of invertebrates on soft river bed and rocky bottoms of the study area, as well as in the water column. In the first 15 meters of the water column, the diversity and abundance of organisms are very low as a few barnacles and sea urchins were only observed in some places. It is around 20 meters deep that the diversity and density of organisms become more important. Anemones in the Cerianthidae family are the organisms that succeed in order of appearance in the vertical stratification. Generally, cnidarians, annelids and porifera are the best represented division in abundance of organisms in the inventoried environment.

Survey results did not permit the identification benthic invertebrates and nektonic of precarious status.

It is during the building phase that the effects on benthic and nektonic invertebrates component will be felt the most, the overall encroachment of the wharf will be constructed in fish habitat is estimated at 18,000 m², while the real encroachment in area colonized by invertebrates has an area of approximately 3,400 m². Port of Saguenay is committed to compensate the direct encroachment of infrastructure in the habitat, as required by the Fisheries Act.

The establishment of optimisation, compensation and mitigation measures should reduce and limit the effect on this component. In construction and operation and maintenance phases, the significance of the expected effects is not significant. During the dismantling phase, facilities near the Saguenay River remaining in place, no effect is expected.

An environmental monitoring program during the work should help ensure that the working methods do not cause movement of machinery in the intertidal zone, other than in the areas designated for that purpose, that the machinery is well maintained and that it does not cause environmental contamination. A follow-up program could help document the colonisation of the new rock fill by benthic fauna and verify the autocompensatory character.

7.2.5 FISH AND FISH HABITAT

As part of the proposed Marine Terminal on the North Shore of the Saguenay, fish and fish habitat are determined VC under the Fisheries Act and the guidelines issued by the CEAA. Moreover, the consultations conducted by the CEAA have determined that fish and fish habitat were concerns for the public.

7.2.6 FRESHWATER FISH AND HABITAT

The characterisation of fish habitat in the two watercourses crossing the limited study area shows a very low or even non-existent potential. Inventories conducted in the summer of 2015 did not reveal the presence of any species of fish.

The absence of hydrological connection to another watercourse or body of water, the presence of many insurmountable obstacles, diffuse and groundwater flow and steep slopes are factors that limit the colonisation of these two courses of water freshwater fish.

There is no expected impact on this component but watercourse protection measures will still be applied as prescribed in certain regulations.

7.2.7 MARINE FISH AND HABITAT

Saguenay would shelter some 80 fish species, some of which are freshwater, while others are marines. The freshwater fish in the Saguenay represent about 16% of fish communities compared to 62% for marine fish, which therefore constitute the majority. Migratory species, either anadromous or catadromous, count for 22% of all species of fish fauna. The typical freshwater species are found generally in the first 20 meters of the water column from the surface, while marine fish use deeper fjord water.

Eleven (11) species likely to frequent the study area or the Saguenay Fjord display a special status, either provincially or federally.

The development project of a Marine Terminal on the North Shore of the Saguenay and more specifically the construction of a wharf should induce no significant geomorphological or hydrological change susceptible of affecting fish habitat. With respect to fish communities, considering no preferred habitat for the fish is found in the wharf's future implantation site and that physical changes to fish habitat (geomorphology, hydrology, etc.) are generally of low importance, it is not likely that the effects are felt on a particular species.

Regarding the "fish and their habitats" component, the overall habitat encroachment is estimated at 18,000 m². In its current state, this habitat is of no particular interest to fish besides for displacement (migration) or foraging purposes, since the availability of shelters is relatively rare and that the conditions are not suitable for spawning or rearing particular species.

To the exception of total suspended solids (TSS) that could end up in the Saguenay River during construction, other potential effects that may occur in all project phases (operation and maintenance, dismantling) are related to hypothetical events of accidental nature (e.g. oil spills).

Preventive and mitigation measures that will be implemented will reduce the effects that could occur on this component. Consequently, the significance of the residual effects is not significant.

In order to mitigate the effect of loss of habitat, Port of Saguenay is committed to compensate the direct encroachment of infrastructure in fish habitat, as required by the Fisheries Act.

In relation to fish and their habitats, more specifically, an environmental monitoring during the execution of work should verify that the working methods do not cause movement of machinery in the intertidal zone, the machinery is well maintained and it does not cause environmental contamination. A follow-up program will verify the achievement of objectives of fish habitat compensation project(s) that is(are) put forward.

7.2.8 MARINE MAMMALS

The assessment for the marine mammals under the definition of fish as set out in Article 2 of the Fisheries Act which includes, in addition to fish, molluscs, crustaceans and other marine animals including marine mammals. Under the Species At Risk Act (SARA), the description of habitats for the concerned species at risk is part of the evaluation. The protection of the beluga's critical habitat under this law was also implemented in May 2016.

The consideration of marine mammals and their habitat is a directive from the Guidelines of the CEAA. Because of their high ecosystem and socio-economic value, the marine mammals have also been concerns expressed by the community and, in this sense, they are considered a VC. The raised concerns specifically concerned the beluga and the effects of increased shipping on the Saguenay on this species.

The local study area is considered for the assessment of effects on the marine mammals. Effects of navigation on marine mammals at the regional level are discussed in Section 7.6. The local study area is overlapped with the natural distribution in the Saguenay of two species: the harbor seal and beluga. Rare harbor seal sightings have been reported upstream from the site of terminal. Besides these infrequent incursions into the high Saguenay, harbor seals use mainly to haul-out sites where they usually sit in groups. The main popular haul-out sites along the Saguenay are located east and northeast of Éternité Cap. Others have been identified and are located downstream from the Anse-Saint-Jean. The beluga activities in the Saguenay are still little known. The summer range of distribution of the beluga extends upstream in the Saguenay, beyond the limit of the local study area. The most upstream listed observation of a beluga in the literature corresponds to a site located about 5 km downstream of the site project. High Beluga residential areas in Saguenay match with protected critical habitat for this species. These are areas are frequented by groups composed mostly of females and young. This protected habitat extends from the mouth of the Saguenay River to the upstream limit of the Sainte-Marguerite Bay.

In the construction phase, the likely potential effects on marine mammals are associated with wharf construction work, movement of machinery and the use of hazardous materials. The noise produced during blasting works, sinking and drilling exceed the natural sound environment and induce effects on marine mammals potentially present in the local area. Planned mitigation measures, including stopping work when a marine mammal is observed 600 m away from the site, and the presence at all times an observer will reduce anticipated effects.

The probability of the presence of harbor seals and beluga in the local study area is considered low, therefore the effects of noise have a low probability of occurring. The importance of the likely residual effect regarding noise on marine mammals is considered not significant.

The effects of an accidental spill of petroleum hydrocarbons can be direct through toxic fumes affecting the sensitive tissues of marine mammals that are exposed. Indirect effects can be felt through the accumulation in prey eventually ingested by marine mammals. Such an event would likely occur near the shore and involve relatively small quantities of products. Analysis of the effects of a hazardous material spill is similar to that for petroleum hydrocarbons. The nature and amounts of hazardous material involved modulate the effects. The likelihood of finding a marine mammal near the site where such spills would occur is low. Prevention and mitigation measures are planned in case of an accidental spill as well as the application of an emergency response plan. The importance of the residual effect of a spill or of an oil spill is considered not significant.

In the operational and maintenance phase, the risk to marine mammals associated with the movement of ships and particularly to noise, accidental spills of petroleum hydrocarbons, hazardous material or concentrate apatite and collision risk. The noise caused by ships can alter the natural sound environment and induce effects on marine mammals, especially in belugas that use a wide range of sounds to communicate and echolocation. The additional noises of continuous source beyond 120 dB constitute the disturbing threshold for belugas. The intensity of the noise varies depending on the source and distance. This intensity influences the area of influence of noise on marine mammals. Practices and procedures that will be implemented at the terminal will oversee the maneuvers of ships and mitigate the potential effects of noise on marine mammals. The importance of the likely residual effect considered on the low probability of the presence of belugas in the terminal area is considered not significant.

The dismantling phase do not involve facilities located on the shore, activity is not likely to disturb the marine mammals.

Overall, for the local area, regarding the beluga and the harbor seal, the importance of the residual effect of the project is considered not significant.

Moreover, the proponent was interested in the more specific question of the effects of noise on marine mammals and a representative of Port of Saguenay participated to a workshop on the effects of noise on marine navigation beluga, organized by DFO and *Groupe de travail sur le transport maritime et la protection des mammifères marins* (G2T3M). The recommendations from this exercise will be considered by Port of Saguenay as share of its maritime traffic management.

7.2.9 BIRDS AND THEIR HABITATS

Consideration of birds and their habitat as a VC is a requirement from the CEAA Guidelines. The migratory birds are protected by the Migratory Birds Convention Act. The species of migratory birds at risk are also considered VC.

To ensure we have a representative picture of the use of the study area by birds, many hours of observation and listening were conducted at different times (spring and fall migration, nesting period and brood rearing) but also in different environments (aquatic, terrestrial, riparian, etc.) during the year 2015. The compiled results of the various surveys have enumerated for the limited study area a total pf 91 bird species belonging to 28 families. Over the seasons, 55 species (19 families) were observed in breeding season, 31 species (12 families) during spring migration and 37 species (18 families) during fall migration.

The main groups observed are land birds, birds of prey and corvids, waterfowl and other aquatic birds. The representatives of the last two groups are mostly individuals who were observed moving and it seems that the study area is uncrowded during spring and fall migration. As for breeding species (mostly terrestrial species), they attend three main types of habitats: coniferous forests, conifer-dominated mixed forests and deciduous and mixed deciduous-dominated forests.

Of all the species observed during various inventories, only three bird species with special status were identified in the field in 2015 and two of them were crossing species during the migration period. Canada Warbler is the only representative of this group that was observed in the habitats of the study area.

Habitat loss resulting from the clearing work would be the main effect caused by the project. Two types of habitat will primarily be affected: resinous and deciduous, and mixed with deciduous dominance. A total of 45 species of forest birds would potentially be affected by this loss of habitat, which represents 23 ha (94 breeding pairs) in deciduous and mixed with deciduous dominance and 16 ha (69 breeding pairs) in resinous forests.

Other likely effects on birds are associated with the presence of infrastructures (noise, light and crash risk) as well as risks of accidental spills.

The implementation of common measures to contain and limit work in the identified areas will limit the habitat loss of breeding birds. In addition, the realisation of the work of deforestation outside the migration and nesting periods will reduce the intensity of effects on birds who will find alternative habitats nearby. The importance of the residual effect on birds and their habitat is not significant.

In terms of special status species, only the Canada warbler would be affected by the loss of nesting habitat. A total of four breeding pairs would be potentially impacted due to work (3 breeding pairs in deciduous and mixed with deciduous dominance and one breeding pair in resinous). A little over 23 hectares of habitat will be affected by land clearing which represents about 3% of the area of potential nesting habitat available to the species throughout the local study area. Although the importance of the residual effect on this species and its habitat was considered important, so there are many replacement habitat for the Canada warbler and thereby lost habitat areas will not be a factor limiting to the sector under study.

No follow-up or monitoring program is proposed for this component.

7.2.10 OTHER WILDLIFE AND THEIR HABITAT

The species of wildlife were considered a VC under paragraph 5 (2) of the CEAA as a number of them are considered species of special status while others are sought by certain interest groups for food purposes (big game), craft, cultural and even economic purposes (fur animals).

Surveys conducted in 2015 combined with large wildlife recording results confirm the presence of moose, the black bear and the deer of Virginia within the boundaries of the study area. Habitats that are found outside of the hilly areas (steep slopes) offer good shelter and feeding areas mainly for moose. Across the local study area, there is a diversity of habitats that could be used by approximately twenty small and medium-sized mammals. Among them, there are a number of species of mammals of the group for which two species are likely to be designated vulnerable or endangered. However, for one of them, there is no suitable habitat for the species in the territory of the study area.

The limited study area is potentially frequented by seven of the eight species of chiroptera present in Quebec. Of these, six species are listed either on the list of species at risk (Canada) or the list of species likely to be designated vulnerable or endangered.

The amphibians and reptiles Atlas of Quebec reported the presence of 17 species of amphibians and reptiles indigenous to the region. In the limited study area, there are few environments that can offer favorable aquatic habitats to the herpetofauna species.

It is especially some anurans species associated with the terrestrial environment that may use the woodlands of the study area. Most of the other species in this group are associated with wetlands, lakes and rivers.

The major potential environmental effects on different species of wildlife, herpetofauna and chiroptera likely to end up in the territory of the limited study area and in the surrounding environment will be felt particularly during the project construction phase during the deforestation work. They will be largely due to habitat loss. However, alternative habitats are numerous around the intervention sites.

Other likely potential effects are related to the risk of collision with vehicles in circulation and disturbance (noise and light) that would be caused during the realisation of the construction work during the site operation. This would be mainly the same effects that are predictable in the dismantling phase.

For terrestrial wildlife, herpetofauna and chiroptera, the significance of the expected effects for the various phases of the project is considered not significant. Low cleared areas at the local level, the implementation of common measures including measures to control the work and the realisation period of the winter clearing work when bats (species at risk) are absent will result in reducing effects on different species of these groups. The dismantling and re-generation (tree planting) of the site will have positive effects on the majority of species that can colonize the environment.

The only species for which the significance of the expected effects is important is the rock vole (threatened species). However, this species looks for environments near water sources and these areas are protected by the application of common measures.

7.3 COMPONENTS AFFECTING FIRST NATIONS

The local study area touches upon the ancestral territory (Nitassinan) of the Innu communities[2] of Essipit, Mashteuiatsh and Pessamit. More specifically, it is at the junction of the limits of the Nitassinan of the First Nations of Essipit and Mashteuiatsh and the Nitassinan South-West Part, a common territory for these two communities as well as the First Nation of Pessamit. For its part, the limited study area is entirely within the Nitassinan of Essipit (on municipalized territory). Note that the Indian reserve territory of these three First Nations is located respectively around 100 km east (Essipit), 110 km west (Mashteuiatsh) and 160 km north-east (Pessamit) of the project site.

In March 2004, the Pekuakamiulnuatsh[3] and Innu of Essipit and Pessamit[4] signed the Agreement-in-Principle of a General Nature (APGN) with the governments of Québec and Canada. The APGN provides for the recognition, confirmation and continuation on Nitassinan of the Aboriginal rights, including Aboriginal title, of the Pekuakamiulnuatsh and Innu of Essipit. On Nitassinan, the APGN's land regime provides for, among other things, the establishment of Innu-owned lands (Innu Assi), heritage sites, Innu parks and other Innu planning and development areas. None of these territories touch upon the local study area. The Agreement also provides the right to practice Innu Aitun[5] on Nitassinan, notably hunting, fishing, trapping and gathering for subsistence, ritual or social purposes. It also stipulates that the Innu will also agree upon specific modalities and complementary agreements with the governments of Québec and Canada regarding true participation in the management of land, natural resources and the environment.

7.3.1 LAND AND RESOURCE USE BY FIRST NATIONS

The land and resource use by Aboriginal populations and the resulting economic activity were chosen as VCs per paragraph 5 of the CEAA 2012 and the final Guidelines for the preparation of the project's EIS. This component was also among the concerns expressed by First Nations during the CEAA-led consultations.

7.3.1.1 HISTORICAL LAND AND RESOURCE USE

Historical use refers to land use and cultural heritage, including archaeologically, paleontologically, historically or architecturally significant constructions, developments, locations or objects.

Before the period of first contact with Europeans, the Saguenay River was already part of an important Innu communication route connecting Tadoussac with Hudson's Bay. The Saguenay was used to reach inland parts by travelling up certain watercourses via portages and waterways. The Innu sought shelter inland during winter and used the resources at their disposal mainly for food and clothing.

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2 Innu: Montagnais
3 Pekuakamiulnuatsh: Montagnais of Lac-Saint-Jean
4 The First Nation of Pessamit withdrew from the negotiation process in 2005, one year after ratification of the APGN.
5 "Innu Aitun" designates all activities, in their traditional or modern manifestation, relating to the national culture, fundamental values and traditional lifestyle of the Innus associated with the occupation and use of Nitassinan and to the special bond they have with the land. These include in particular all practices, customs and traditions, including hunting, fishing, trapping and gathering activities for subsistence, ritual or social purposes. All spiritual, cultural, social and community aspects are an integral part thereof. The commercial aspects are, however, governed by the prevailing legislation of Canada and Quebec (art. 1.2 of the APGN).

A few sites such as coves or mouths of certain rivers could have been brief stops for Aboriginal groups on the Saguenay, most notably Anse à Pelletier and Anse à la Croix are sites to be considered. Moreover, Anse à la Croix has been reported by the community of Mashteuiatsh as being an historic Innu gathering site.

According to the archaeological potential study, Innu ancestors seemed to occupy the Saguenay's sources rather than its shores, except occasionally for shelter from bad weather. As water levels in the Saguenay River have fluctuated considerably over the millennia, some low terraces and terraces located further inland, at a sea level 20 to 40 m higher than it is today for the earliest periods, could have been visited right at the beginning of human existence in the fjord, that is nearly 7,000 years ago. The current occupation of the shoreline is limited to the last three millennia. On the local study area's north shore, no known occupation site were reported following consultation of the various information sources available. Within the limited study area, the territory's physical characteristics (uneven relief, intermittent watercourses) considerably reduce the area's archaeological potential.

When the Europeans arrived (around 1600), a fur trade was organized in North America with the establishment of a trading post by the French at Tadoussac and a second trading post at Chicoutimi in 1671. From this period on, colonisation, reduced fur trading, illness, the creation of reserves all had an influence on the Innu's social organisation. For the section of the Saguenay River downstream from Chicoutimi, nine family hunting territories have been identified, associated with the Tadoussac and Escoumins bands. Only those located on the south shore touch the local study area. A hunting territory extending to the watersheds of rivers flowing into the Saguenay, from Anse Saint-Jean to La Baie, was occupied by one Flavien Moreau and three generations of his descendants, up until the beginning of the 20th century. Afterwards, this territory was frequented only occasionally. Flavien Moreau occupied a hunting camp on the Saint-Jean River where he also worked as a fishing guide. According to archival maps from the 18th century, a portage trail connected to the Sainte-Marguerite River from the Saguenay. This portage crosses the local study area from the mouth of the Pelletier River towards Lake Saint-Germain, without entering the limited study area.

7.3.1.2 CONTEMPORARY LAND AND RESOURCE USE

Contemporary uses encompass traditional activities as practiced today and for decades (hunting, fishing, trapping and gathering for subsistence, ritual or social purposes), as well as recreational and commercial activities such as recreational tourism (outfitters, tourist accommodation, whale-watching cruises), crab fishing, gathering molluscs and forestry. Water, soil, plant, animal resources are used as part of the practice of contemporary activities on the territory.

According to the studies and the information gathered from the communities of Essipit and Mashteuiatsh during the consultations, the Innu are not currently occupying the local study area's territory in any form. However, some members do practice winter food fishing on the Saguenay, at La Baie and Sainte-Rose-du-Nord, outside of the limited study area. The Innu do not practice any other traditional, cultural, recreational or commercial activities in the local study area.

No contemporary occupation or use by the Innu of the territory within the limited study area has been reported. Therefore, there are no expected environmental effects on this component during the project's construction, operational and maintenance phases nor during dismantling. However, the ongoing exchanges and discussions between Port of Saguenay and the Innu communities during subsequent stages of the project could lead to the two parties discussing an economic agreement which would allow Aboriginal companies or individuals to work on the worksite during the various stages of the project. In the event such an agreement was to come to fruition, there could be a significant positive effect for the First Nations economy.

7.3.2 RISKS TO HUMAN HEALTH

Human health among Aboriginal populations is considered to be a VC under paragraph 5 of the CEAA 2012 and the Final Guidelines issued by the CEAA. Concerns were also expressed regarding this component by First Nations during the consultations.

Given the distance separating the Innu communities from the project site and their confirmation that the limited study area is not occupied nor used by their members for cultural, food or other reasons, no effects are anticipated on the health of Aboriginal populations during the various phases of the project.

7.3.3 NATURAL AND CULTURAL HERITAGE

The present section essentially deals with First Nations-related cultural heritage. The natural heritage as well as cultural heritage related to Euro-Canadians is discussed in Section 7.4.

Cultural heritage is considered a VC under paragraph 5 of the CEAA 2012, in relation to Aboriginal peoples. Heritage resources include, without being limited to, physical objects (mounds, culturally modified trees, historical buildings), sites or places (burial sites, sacred sites, cultural landscapes) and characteristics (language, beliefs).

The description of the historical land and resource use by Innu (Section 7.3.1) confirms that the Saguenay River was frequented. However the consultation of various sources of information (people and literature) have not turned up any known occupation sites. According to data from the Ministère de la Culture et des Communications' (MCC) Inventaire des sites archéologiques du Québec (ISAQ), archaeological work has been conducted within the territory being studied and there are no listed archaeological sites. The archaeological potential study identifies two sectors with low archaeological potential likely to have evidence of ancient prehistoric or historic occupation which cut across the limited study area. The wharf access road crosses one of these identified sectors with archaeological potential.

The only potential likely effects will possibly occur during the construction phase, with disturbance of the soil during the associated work, which could accidentally break objects, displace artefacts or unearth archaeological remains. Considering that an archaeological inventory will be conducted on site, prior to the construction work, and that there will be archaeological monitoring, during the work in the area of low archaeological potential affected by the work, the residual effect on cultural heritage is deemed to be not significant.

7.4 COMPONENTS AFFECTING LOCAL AND REGIONAL COMMUNITIES

7.4.1 LAND USE BY LOCAL AND REGIONAL COMMUNITIES

Land and resource use by local and regional populations, and the resulting economic activity, were chosen as VCs under paragraph 5(2) of the CEAA 2012 and the Final Guidelines for the preparation of the project's EIS.

7.4.1.1 ADMINISTRATIVE FRAMEWORK AND LAND TENURE

The Marine Terminal on the North Shore of the Saguenay project is situated in the Saguenay–Lac-Saint-Jean administrative region within the territory of the Fjord-du-Saguenay RCM and the municipality of Sainte-Rose-du-Nord. It is located nearly 8 km east of the Grande-Anse marine terminal. It straddles private forest lots 1-A, 1-B and 2 in ranges E (northern part) and F of township Saint-Germain as identified in Québec Cadastre. There is currently an option to purchase these lots, which are part of evaluation unit no.8862-69-7023 from the municipal lot division, and they will become the property of Port of Saguenay. Their purchase was negotiated by mutual agreement with the private owner in question.

The project site is located outside the municipality's urbanization perimeter. The land is essentially designated as "recreational". The municipality and the RCM shall modify their respective planning documents to include the new usage related to the marine terminal infrastructure. These modifications will make the project compliant with the RCM's revised land use and development plan as well as the municipality's land use and zoning plans.

7.4.1.2 BUILT ENVIRONMENT

There is virtually no built environment at the project site, besides a few forest roads. There are however some 38 residences, including 31 chalets and 7 permanent residences, less than 2.5 km from this territory. The closest owners are located at Lake Brock (2 chalets), Lake Neil (4 permanent residences and 13 chalets), on Chemin du Cap-à-l'Est (1 permanent residence and 1 chalet) and on Chemin de l'Anse-à-Pelletier (1 chalet). The Parc Aventures Cap Jaseux (PACJ) and the Pourvoirie du Cap au Leste (PCL), two private recreational tourism properties providing their clients with outdoor and ecotourism activities as well as alternative lodging, are respectively located 6.5 km west and 2.5 km south-east of the project site.

At the different stages of the project, the work carried out on site could generate certain nuisances (noise, vibrations, dust, artificial light at night) for residents, vacationers as well as the PACJ's and the PCL's clients. However, modelling shows that the noise levels shall be below the noise criteria established by the MDDELCC and by Health Canada, throughout the project, that vibrations generated by blasting shall not affect the human environment, that dust emissions in the air shall be limited to the site and its immediate surroundings (less than 500 m) and finally, that the amount of artificial light at night emanating from the site will not be intrusive for the area's users.

Implementing the proposed mitigation measures to protect against noise exposure, minimize air quality degradation and control the emission of artificial light at night will significantly reduce the nuisances. The residual effect associated with the risk of disturbing the surrounding population's quality of life at the various phases of the project are deemed not significant.

Resolute Forest Products' (PFR) former Saint-Fulgence sawmill, closed permanently in April 2014, is located on the territory of Saint-Fulgence, to the south of Route 172 and in front of the entrance to Chemin de la Zec-Martin-Valin. the municipality of Saint-Fulgence and the Fjord-du-Saguenay RCM are considering developing a regional industrial park here. During the operational and maintenance phase, the presence of the marine terminal will most certainly have a positive effect on this industrial park's activities. It will help companies interested in establishing themselves here to position themselves for international trade. This positive residual effect is deemed significant.

7.4.1.3 TRAFFIC AND MISCELLANEOUS ACTIVITIES

Access to some of the marine terminal facilities during the operational phase, especially the truck unloading area, the apatite concentrate storage area, the conveyors, the wharf and the platform adjacent to the wharf, could pose an accident risk for area users and workers near these sites, if they are not secured. Several measures are planned to reduce this risk, including: installing a guard house at the entrance to the site to control comings and goings, installing chain-link fencing around dangerous areas and installing safety barriers along access roads. After implementing these measures, the residual effect related to the risk of accidents on the project site during the operational and maintenance phase is considered to be not significant.

The project site is accessible via national road 172, local roads and forest roads. As well as being used by cars and trucks, Route 172 is also used by cyclists along the Véloroute du Fjord-du-Saguenay. Local and forest roads are used or crossed on occasion by ATVs and snowmobiles. There is marginal ATVing and snowmobiling in the area, with no marked paths. Throughout the project, Route 172 and Arianne Phosphate's future access road will be used for transport purposes. The transport of materials, equipment and workers at the various phases of the project could impede travel by users of Route 172, represent an accident risk and contribute to the deterioration of this road. The traffic flow on Route 172 at the study area is low and it already serves as the main axis for transporting goods between Saguenay−Lac-Saint-Jean and the Côte-Nord. The potential repercussions are deemed of little significance. Transport activities could also impede ATVers and snowmobilers, as well as adversely affecting their safety at the intersection of Arianne Phosphate's future access road with Chemin du lac Neil and Chemin du lac Brock. As there is little formal ATV and snowmobile usage on the territory, few effects are expected throughout the project. Following the implementation of various mitigation measures, the residual effect related to the possible disruption of road traffic, cycling, snowmobiling and ATVing, as well as the risk of deterioration of the road infrastructure during transport activities, is deemed not significant during the construction, operational and maintenance, and dismantling phases.

The Saguenay Fjord National Park (SFNP) and the Saguenay–St. Lawrence Marine Park (SSLMP), two protected areas which host numerous outdoor and ecotourism activities, are located respectively 3 km and 2 km south-east of the project site. These two parks, together with the PACJ and the PCL, constitute the area's main tourist attractions. During the construction and operational and maintenance phases, no other repercussions are expected on the activities practiced within these two parks, besides the potential expected effects on kayak-camping activities. During the dismantling phase, no effects are anticipated on these activities.

7.4.1.4 BOATING (RECREATIONAL, CRUISES AND OTHER)

There is recreational boating and sea kayaking on the Saguenay River from May to November with the busiest time being during the summer, from June to September. The fjord is a marked seaway secured by navigation lights and numerous marinas, public wharves and launching ramps ensuring access for recreational boaters and kayakers from Chicoutimi to Tadoussac. Les Croisières du Fjord, Voile Mercator and Damacha provide boat excursions on the Saguenay passing near the project site. Cruise boats and Les Croisières du Fjord's shuttle do not normally travel in front of the projected wharf infrastructure. Rather the path taken runs south of Cap à l'Est to reach the Bagotville wharf in Baie des Ha! Ha! From May to September, Voile Mercator's sail boats travel to the section between Cap à l'Est and Cap Jaseux three to five times a week. Damacha's excursions occasionally go as far as Cap Jaseux and Baie des Ha! Ha! As for sea kayaking, various kayak-camping circuits are proposed by the SÉPAQ in the SFNP and the SSLMP from mid-June to the beginning of September. Some circuits start or end in PACJ and thus pass in front of the project site. Kayakers from PACJ occasionally frequent this sector on their way to Cap à l'Est.

Work in water and blasting during the construction phase, as well as the presence and operation of the wharf infrastructure during the operational and maintenance period could inconvenience recreational boaters and kayakers travelling near the project site, requiring them to travel further out or to areas more suitable for their activity, as well as constituting a safety hazard for them. Considering that there is less recreational tourism in this part of the fjord, that the sectors most popular with recreational boaters and kayakers is further downstream in the SSLMP and that there are already commercial shipping activities due to the presence of the Grande-Anse marine terminal, the project will have little effect on recreational boating and sea kayaking during the construction and operational and maintenance phases. Following the application of mitigation measures, the residual effect relative to the risk of nuisances safety hazards for recreational boaters and kayakers on the Saguenay River are considered to be not significant during the construction and operational and maintenance phases. No effects are expected during the dismantling phase as the wharf and its related ship loading facilities will not be demolished.

The PACJ is planning to develop a marine access point for the park by adding a floating wharf, enabling it to have a stop for the Les Croisières du Fjord's shuttle. Were this project come to fruition, the marine terminal's activities, mainly ship comings and goings, could impede the shuttle's travel to the park. As there is commercial shipping traffic in this portion of the Saguenay River and that the proponent will establish communication links with Les Croisières du Fjord so as to establish harmonisation measures, the residual effect associated with the risk of disrupting the new sea link to the park during the operational and maintenance phase is deemed to be not significant.

The international cruise ships that sail up the Saguenay River during the cruise season, generally from May to October, travel to the Bagotville wharf in Baie des Ha! Ha! passing to the south of Cap à l'Est. The construction work, the presence and operation of the marine terminal, as well as the dismantling activities will thus not have any effect on this component.

7.4.1.5 RECREATIONAL FISHING

There is both summer and winter recreational fishing in the Saguenay River near the project site. According to the information gathered from companies offering fishing packages on the Saguenay, fishing in open waters is rather marginal. The construction activities (work in water and blasting) and the operational activities could disrupt the occasional fishers who frequent this part of the watercourse, as well as being a safety hazard.

There are no wading fishing sites along the shores of the sector under study due to its inaccessibility and the presence of rocky cliffs. There is therefore no effect anticipated for this activity.

The fjord's recognized ice fishing villages, most notably La Baie (Grande-Baie and Anse à Benjamin), Saint-Fulgence (Anse aux Foins) and Sainte-Rose-du-Nord (Anse Théophile), are located a good distance from the project site. There are no ice huts listed as being in front of the site, but there are usually a few present each year, at Anse à Pelletier as well as east of the Jalbert Islands, in the zone under the jurisdiction of the Port of Saguenay. Port of Saguenay has indicated that such facilities are banned within the navigable waters under its jurisdiction. No effects are expected on winter fishing during the project's different phases.

Therefore, following the implementation of mitigation measures, the residual effect associated with the risk of nuisances and safety hazards for sport fishers in the Saguenay River is deemed to be not significant during the construction and operational and maintenance phases. No effects are anticipated during the dismantling phase as the wharf and the related ship loading facilities will not be dismantled.

7.4.1.6 HUNTING AND TRAPPING

Sport moose hunting as well as trapping (mink and American marten) have been confirmed as taking place within and near the project site. The loss of forest habitat due to the clearing of work areas and the noise generated by the construction, operational and maintenance, and dismantling work could slightly change the conditions under which these activities are practiced on private land bordering the project site. Disruption of the area's tranquility could bother game and fun animals frequenting the surrounding woods, requiring hunters and trappers to move to areas that are more productive for practicing their activity. Considering that the territory is hard to access (private tenures, very limited road network, steep slopes), thus limiting the number of hunters and trappers, and that the harvest should not be affected as the work will only have a small effect on wildlife populations, the project's effects on these activities are deemed to be negligible. Therefore, after applying mitigation measures, the residual effect related to the potential disruption of hunting and trapping near the project site is deemed not significant throughout all project phases.

7.4.1.7 AGRICULTURE

There is no agriculture within the project site and this sector is entirely outside the agricultural protected area. There are two vegetable farms, Les Jardins de Sophie and Les Mômes du Fjord, located more than 3 km north-west of the project site in Saint-Fulgence. These two farms' vegetable production could be affected by airborne dust emissions generated by construction, operational and maintenance, and dismantling activities.

As air quality degradation shall be limited to the work areas during the construction and dismantling periods and that it is not expected that total particle and fine particle standards will be exceeded at a distance greater than 500 m from the marine terminal site during the operational and maintenance phase, the project shall not have any effect on these vegetable crops.

7.4.1.8 FORESTRY ACTIVITIES

Recent forestry activities (forest cutting) have been confirmed in the project site's private woodlots. The clearing work will result in a loss of harvestable forest area and a certain volume of merchantable timber. The losses attributable to this work will total 39.4 ha including 23.8 ha (60.4 %) mature forest and 15.6 ha (39.6 %) of regenerating forest. The volumes of wood to be recovered are mainly black spruce, balsam fir and trembling aspen, and to a lesser extent eastern white cedar, red pine and white pine. Merchantable timber volumes shall be recovered in accordance with the SFDA[6] and the RSFM[7]. The recovered volumes' destination shall be agreed upon with the MFFP who will specify the plants able to receive the harvested timber. Following the application of various mitigation measures, the residual effect of clearing on forestry activities is deemed to be **not significant** during the construction phase. No effects are expected on this component subsequent operational and maintenance and dismantling phases.

7.4.1.9 COMMERCIAL FISHING

There hasn't been any commercial fishing on the Saguenay River for a few years now. Due to issues related to contamination by various toxic substances identified in the past in the watercourse, there has been a ban on the commercial fishing of marine species since at least 1985 and of freshwater species since April 1st, 2011. The project will not generate any effects on this activity.

7.4.1.10 ECONOMIC BENEFITS

There is a potential for economic benefits to the population as well as local and regional companies at the different phases of the project, through the purchase of goods and services as well as the hiring of labour. This positive residual effect is deemed to be significant during the construction and operational and maintenance phases, and not significant during the dismantling phase.

7.4.1.11 ENVIRONMENTAL SURVEILLANCE AND MONITORING

At the different phases of the project, environmental surveillance ensures that the work complies with existing laws, policies and regulations, the proponent's specific commitments and obligations, as well as the mitigation measures chosen to minimize the project's effects on land use by Local and Regional Communities. A follow-up program, besides those proposed for the noise, air quality and ambient light components, could include following up on the effects of the presence and operation of the marine terminal on the Pourvoirie du Cap au Leste and the Parc Aventures Cap Jaseux, as well as following up on the economic benefits at the different phases of the project.

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6 Sustainable Forest Development Act
7 Regulation respecting standards of forest management for forests in the domain of the State

7.4.2 RISKS TO HUMAN HEALTH

Human health is designated as a VC, as it is identified as such in the Guidelines issued by the CEAA and that the population expressed concerns in this regard during the project-related consultations.

In terms of environmental health, the main health problems health that the *Centre Intégré Universitaire de Santé et de Services Sociaux du Saguenay–Lac-Saint-Jean* (CIUSSSLSJ) is focused on are cardiorespiratory disease caused by poor air quality, infections or toxicity due to water quality, cancer prevention and environmental toxicity. The project's local study area is within the territory of the *Réseau local de santé* (RLS) de Chicoutimi which also encompasses the municipalities of Saint-Fulgence and Sainte-Rose-du-Nord. It is thus the focus of these same priorities.

Among RLS territory residents, respiratory disease is the 3rd cause of death and the 2nd cause of hospitalisation. Data from the *Enquête de santé du Saguenay– Lac-Saint-Jean 2012* (2012 Saguenay–Lac-Saint-Jean health survey) indicate that 12 % of adults 18 years and over living within the RLS are affected by asthma, for around 7,600 individuals. Chronic obstructive pulmonary disease (COPD) affects 4.1 % of adults 18 years and over in the territory, for around 2,000 individuals. Cardiovascular disease is the 2nd most common cause of death within the RLS' territory. The prevalence of cardiac disease is estimated at 6.4 % of adults 18 years and over in the territory, for around 4,000 individuals. Little data are available regarding infectious and toxicological problems related to water quality. Most of this territory's population (± 80 %) lives in urban areas and the majority (76 %) are provided with drinking water from a municipal network. A low proportion of the territory's residents (4.7 %) use groundwater from a family well.

The urban boundaries of the municipalities of Saint-Fulgence and Sainte-Rose-du-Nord are outside the local study area. Except for forest roads, there is no built environment within the limited study area. Therefore, no data are available with regard to the present sanitary conditions within this area.

In the limited study area, air quality (Section 7.1.9) is currently considered to be very good. The sound climate (Section 7.1.10) is estimated to be low, approximately 30 dBA. In terms of ambient light (Section 7.12), the Saguenay's north shore has a very dark nighttime landscape, without any visible light emissions. For sanitary aspects associated with water quality, the watercourses that cross the limited study area are intermittent and do not feed any sources of fresh water for residences or other anthropogenic constructions. The risk of environmentally-related toxicity is mainly in connection with potential contamination of fish.

Considering the insignificant environmental effects related to air quality, sound climate and ambient light, there are no expected significant effects on human health.

Each of the main aspects likely to influence health (air quality, noise, water quality) are the subject of monitoring a monitoring and follow-up programs, described in the corresponding sections. Regarding the public's concerns and the management of complaints which could be made throughout all project phases, Port of Saguenay will establish an effective communication platform as part of its environmental management program. There is therefore no follow-up program specific to this component proposed.

7.4.3 VISUAL ENVIRONMENT

The visual environment neighbouring the project site has been selected as a VC under paragraph 5(2) of the CEAA 2012, in relation with the (non-Aboriginal) human environment. The project's potential environmental effects on the esthetics of the Saguenay Fjord's landscapes is also a public-interest issue. Concerns have been expressed by some local stakeholders, local tourist and recreational companies, and certain citizen groups and individuals during the consultations conducted by the CEAA and the proponent.

The study area chosen for this component corresponds to an area defined according to the possible visibility limit of the marine terminal's projected facilities. This visibility limit is set at 25 km. The entrenched nature of the Saguenay River, the slopes size and irregularity, and the varied relief of the Laurentian foothills means that certain portions of the territory can be eliminated due to them having no view of the site chosen for the marine terminal. The landscape study area has 16 distinct landscape units, grouped together as five types: river landscape, urban landscape, agricultural landscape, hilly landscape and lakeside landscape.

The Saguenay River and its fjord form four river landscape units, the Saguenay estuary upstream from Saint-Fulgence (R1) and the fjord which splits into three units corresponding to the North Arm (R2), the Baie des Ha! Ha! (R3) and the confluence of the fjord and its downstream portion of Cap à l'Est (R4). The urban perimeters of the borough of Chicoutimi-Nord (Canton-Tremblay) and the municipality of Saint-Fulgence on the north shore, as well as those of the boroughs of Chicoutimi and La Baie form five urban landscapes units (U1 to U5). The agricultural plateau of Canton-Tremblay and Saint-Fulgence on the north shore and the agricultural plain on the south shore of the Saguenay form the two agricultural landscape units (PA1 and PA2). The wooded hills of the North crown (Saint-Fulgence and Sainte-Rose-du-Nord), the Cap à l'Ouest peninsula and the South crown (Saint-Félix-d'Otis) make up the three hilly landscapes (C1, C2 and C3). The grouping of lakes Neil and Bouchard and a few smaller waterbodies, as well as Lake de Sable and the surrounding wooded slopes form the two lakeside units (L1 and L2).

During the construction phase, the likely potential effects on the visual environment and the landscape's esthetics will be related to land clearing and preparation, as well as the addition of new terminal facilities and the wharf, due, among other things, to the removal of forest cover, the exposure of rock faces and the reforming of the relief, the addition of new land- and river-based industrial structures in the landscape of a portion du fjord still relatively undisturbed. During the operational and maintenance phase, the physical presence of the marine terminal various land- and Saguenay River-based facilities, as well as the presence of ships at the wharf will modify the visual environment and the esthetics of the landscape. During the dismantling phase the removal of apatite concentrate transshipment, storage and handling facilities and the restoration of the site will have a positive effect on the visual environment and the esthetics of the fjord by reducing the visual footprint of the marine terminal. As the wharf access road, the manoeuvring area and the wharf are essential components of the multi-user marine terminal, these facilities will remain in place.

A visibility analysis was conducted on a digital elevation model (DEM), considering the site's general development plan and the marine terminal's design parameters (position and height of facilities and most significant planned transformations). This analysis provides an overview of the projected marine terminal's visibility by indicating from where, within the landscape study area, the structures and most significant changes will be visible.

This analysis however overestimates the extent of the components visibility as it does not consider plant cover, the built environment and any other obstacle which could restrict the openness and depth of the views; only land relief is used. To illustrate the integration of the marine terminal and its various components into the surrounding landscape, visual simulations were also produced from various sensitive receptors.

The entrenched nature and the prominent slopes of the fjord, as well as the irregular relief and density of the forest cover characterizing the surrounding environment, means that many sectors of the landscape study area have no view of the chosen site. Thus, six landscape units (U2, U3, U4, PA1, C3, L2) have no view of the projected marine terminal's location. Therefore, the project will not have any effect on the visual environment and the esthetics of these landscapes. For half of the landscape units (R1, R4, U1, U5, PA2, C1, C2, L1), the degree of visibility is considered to be low to nil due notably to the distance between the potential observers and the site of the projected terminal which limits the visibility of the changes which will only be visible in the background of the available views. The likely residual effect is considered to be not significant for these eight landscape units.

During the construction phase, the likely residual effect is considered to be significant for some sensitive sectors and receptors of the North Arm of the Saguenay landscape unit (unit R2) and for the Confluence and downstream part of the fjord unit (unit R3). For both landscapes, the nature of the fjord's slopes and shores means that some locations, considered as sensitive receptors, have no direct view on the location of the projected marine terminal. Thus, for unit R2, residents located at the mouth of the Pelletier River and on the eastern shore of the fjord up to the site of the terminal, as well as upstream from Pointe-aux-Pins and for most of those in Anse aux Sable will not see their visual environment changed by the construction work and the addition of new industrial facilities. The project will have no effect on the visual environment and the esthetics of the landscapes in these sectors. However, during the construction phase, the likely residuals effects are considered to be significant for residents of Anse à Pelletier, who have open and deep views of the fjord landscape and who are among the closest observers to the terminal site, as well as for owners of vacation properties at the western end of Anse au Sable, seasonal tourists visiting the PACJ and recreational boaters, cruise ship passengers and all others users of this portion of the fjord**.**

For unit R3, the nature of the fjord and the size of its slopes mean that the entire downstream portion of the fjord, from Cap à l'Est, has no view of the projected marine terminal site. Thus, the visual environment of the various sensitive receptors identified along the shoreline and on the water in this sector, most notably the Pourvoirie de Cap au Leste, the site of the Cap à l'Est lighthouse, the New France site, the SSLMP and the SFNP, will not be altered by the construction work and the addition of new industrial facilities. No residual effects are expected for these sectors. For riverside residents on the south shore of the Saguenay, along Chemin de la Batture to Anse aux Cailles, as well as recreational boaters, cruise ship passengers and other users of this sector of the fjord the expected residual effect is considered to be significant. The work planned during the construction phase will leave a visual footprint on the currently-wooded slope which makes up the intermediary plan of the views on offer.

During the operational and maintenance phase, given the implementation of appropriate mitigation measures (reforestation, colour and finish of the facilities, etc.) the residual effect shall be not significant for the various landscape units.

However, the likely residual effect remains significant for residents of Anse à Pelletier and one property in Anse au Sable as vegetation growth will do little to reduce the visibility of the facilities from these sensitive receptors.

For the dismantling phase, the removal of large-scale facilities and vegetation growth will help reduce the degree of visibility from certain sensitive receptors, but the presence of the wharf and its access road, as well as the cliff created behind the wharf will leave an effect considered to be not significant.

Changes to the esthetics of the landscape will not generate any significant effects (not significant) on companies who depend on the region's esthetic and recreational appeal.

7.4.4 NATURAL AND CULTURAL HERITAGE

Natural and cultural heritage is listed as a VC under paragraph 5 of the CEAA 2012, in relation with local and regional communities. The project's potential environmental effects on the natural heritage that is the Saguenay Fjord is also a public interest issue. Certain stakeholders, citizens' groups and individuals expressed concerns regarding the efforts to have the Saguenay Fjord designated a UNESCO World Heritage Site during the consultations conducted by the CEAA.

7.4.4.1 NATURAL HERITAGE

The Saguenay Fjord is a natural monument consisting of physical and biological formations. It is considered to be an exceptional element that is representative of the natural region of Saguenay. Its marine portion, downstream from Cap à l'Est, is part of the Saguenay-St. Lawrence Marine Park (SSLMP), managed jointly by the governments of Canada and Québec with the participation of coastal communities. The marine park's adjacent terrestrial portions are included within the limits of the Saguenay Fjord National Park (SFNP), under provincial jurisdiction and administered by the SÉPAQ. The Project to develop a Marine Terminal on the North Shore of the Saguenay involve a portion of the Saguenay Fjord shoreline outside the territory under the jurisdiction of the SSLMP and the SFNP. It will therefore not induce any changes to these two territories and their status.

There are no areas or natural sites exclusively delineated and valued from a scientific, conservation or natural beauty point of view within the limited study area. The likely environmental effects for habitats of threatened species of animals and plants of outstanding universal value are explained in Section 7.2, in each of these components' respective sections.

The presence of the marine terminal on the north shore should not induce any likely environmental effects on the efforts to have the Saguenay Fjord designated a UNESCO World Heritage Site. The section of the fjord chosen as the location of the marine terminal (terrestrial and marine) is not under protective provincial or federal jurisdiction, nor the target of specific legal, scientific, technical, administrative and financial measures. The municipality of Sainte-Rose-du-Nord, as well as the Fjord-du-Saguenay RCM have signified their intention of modifying their respective planning documents so as to integrate the new industrial usage related to the marine terminal infrastructure. The project will therefore eventually comply with the RCM's SADR as well as the municipality's land use and zoning plans municipality.

7.4.4.2 CULTURAL HERITAGE

The Euro-Canadian presence in the local study area dates back to before the Saguenay region opened up to logging (1838), The Anse du Bonhomme Pelletier (Anse à Pelletier) sector seems to have been a preferred hunting territory, being frequented several times a year and for several days, at the time of the Chicoutimi trading post (1676). The territory's colonisation, only allowed for the forestry industry, began when the Vingt-et-Un society were given permission to open the territory to logging in 1838. In 1839, there was a small hamlet in the area encompassing, in addition to the sawmill, a store, a few domestic buildings and other outbuildings. Historical data also speak of land use east of Anse à Pelletier, including logging areas around Lake Neil and the occupation of a place called *Le Petit Glaude*, including, most likely, a family residence and a maple groove. Some cadastral plans of the townships of Harvey and Saint-Germain indicate a public road travelling east of the Pelletier River, crossing the Neil Stream to then join the shores of the Saguenay north of Cap à l'Est. This public road, which used to be used to travel to the various ecumene areas of habitation on the Saguenay River's north shore, crosses the northern end of the limited study area.

The only potential likely effects could possibly occur during the construction phase, through disturbance of the soil during the related work, and which could accidentally cause the breakage of objects, the moving of artefacts or the uncovering of archaeological remains. Considering the recommended mitigation measures, the residual effect on cultural heritage is defined as being not significant**.**

The cumulative effects assessment is interested in VC. These refer to components of the natural and human environments subject to change or significantly be affected by the project, and valued by experts or by the populations as elements of concern. In the context of the proposed Marine Terminal on the North Shore of the Saguenay, this valorisation was expressed most often through collected concerns and that were integrated as part of this EIS. The assessment of cumulative effects requires a real potential for cumulative impacts with other projects or actions and these VC.

A priori, it was determined that the cumulative effects that the new marine terminal project would be the most likely to cause, in addition to those of other regional projects could include:

- additional degradation of water quality due to the Saguenay port operations at the new terminal and the increase of the amount of polluted water from the additional ships that will reach the Upper Saguenay;
- fish habitat disturbance associated with new infrastructure and maritime activities and in addition to disturbance, habitat destruction and changes induced by other projects (encroachment and underwater noise);
- human disturbance of aquatic activities in the area of Haut-Saguenay due to increased marine traffic (hunting, fishing, boating, recreation, swimming, etc.);
- induction of additional nuisances affecting the overall quality of life of local residents and users of the Saguenay area because of the terminal operation activities (noise, dust, lighting, public safety related to road traffic, etc.).

Also, the prior identification of these effects helped identify the VC to use in assessing their importance. These have included: the Saguenay water quality, fish habitat, aquatic fauna, land use (water human activities) and quality of life (residents and users).

On the other hand, many VC have not been the subject of a cumulative impact assessment, as they were not in interaction with other activities or projects, in either space or in time. Among them were included: air quality, surface water quality, shoreline stability, vegetation, wetlands, special status species, risks to human health and the landscape.

The analysis of the cumulative effects of the construction project and operation of new maritime terminal was realised by combining the actual or anticipated effects of 14 other existing industrial and maritime activities and regional projects with good potential to materialize in the coming years, and that may affect the aquatic environment of the Saguenay and its banks.

However, detailed analysis of these effects has determined that the new terminal project, including the operation of 60 new ships per year in the sector, would have no significant cumulative impact with other activities and projects and, as the water quality of the Saguenay, its fish habitat, on its aquatic life, aquatic human activities practiced regionally on the quality of life of the general residents and users of the Saguenay. Also, no mitigation or particular monitoring activity, additional to those already provided in the EIS has been proposed.

7.5 CUMULATIVE EFFECTS

The assessment of cumulative effects is related to VC. These components refer to the natural and human components likely to be modified or affected in a significant manner by the project and are valued by specialists or by concerned populations. In the context of the maritime terminal project on the north shore of the Saguenay, the value of these components was mostly expressed through concerns collected and integrated into the EIS. The assessment of the cumulative effects requires that there is a real potential to cumulate effects on these VC with other projects or actions.

It was determined that various VC will not be subject to cumulative effects since these do not interact with other activities or projects, both in space and time:

- sediment quality;
- freshwater quality;
- air quality;
- upland noise and vibrations;
- subaquatic noise;
- ambient light;
- upland and riparian flora;
- marine flora and intertidal marshes;
- plankton;

- benthic and nectonic invertebrates;
- freshwater fish;
- birds;
- wildlife;
- land and resources use (First Nations);
- natural and cultural heritage (First Nations);
- risks to human health;
- visual;
- natural and cultural heritage (local and regional communities).

The cumulative effects that the new terminal project is most likely to produce on the VC, in addition to those from other regional projects, from the construction of the wharf and ancillary facilities to the shipping and handling operations of incoming and outgoing products, are as follows:

- marine water quality;
- marine fish;
- marine mammals;
- land use (local and regional communities).

The cumulative effects assessment of the construction and operation of a new maritime terminal was conducted by combining these effects to the real or potential effects from other existing industrial and maritime activities and from regional projects showing a good potential to be carried out during the next few years and that will likely have an effect on the selected VC. For marine mammals (beluga), the assessment was conducted within a study area that correspond to its essential habitat in the Saguenay and the St. Lawrence.

The selected VC detailed projected effect assessment has determined that the new terminal project, including the operation of 60 new ships per year in the area and on the St. Lawrence, would not have any significant cumulative effect, in regards to the Saguenay water quality, on the fish and fish habitat, on belugas, and on land use such as tourism and leisure.

7.6 MARINE NAVIGATION ON THE SAGUENAY

In the coming years, the realisation of various projects involving marine transport on the Saguenay will result in a significant increase in navigation. These anticipated changes facing the marine navigation will result in environmental effects that go beyond the responsibility and control of the various proponents. As required by the CEAA Guidelines, this section aims to inform the public and stakeholders of the current status of marine navigation on the Saguenay and sound effects by considering the future increase upcoming projects.

7.6.1 GEOGRAPHICAL LOCATION

The study area considered for the presentation of the current navigation portrait and for evaluating the effects and risks related to its increase covers some 120 km, from the boroughs of Chicoutimi and La Baie to Saguenay up to the St. Lawrence River, a few kilometers in front of Tadoussac.

Saguenay has a particular configuration due to its glacial origins. Indeed, the formation is a fjord type, meaning, a valley between high rocky cliffs formed by the passage of glaciers and the bottom of which is a relatively large and deep arms of the sea where one or more rivers pours itself. Thus, the Saguenay forms a corridor of a general width between 1 to 3 km, depending of the location, and consists of three deep basins (about 150 to 300 m) separated by ridges, which the shallowest has a 20 m-deep-mouth.

This elongated formation corridor, bordered by high cliffs extending into the depths of the Saguenay, conditions the other features of the natural environment. So essentially we find there the rocky banks without rocky strand, with the exception of some mouths of rivers (Sainte-Marguerite, Petit Saguenay, Saint-Jean and Éternité) and the bottom of the Ha! Ha! and head of the Saguenay River. It was in Saint-Fulgence, and upstream, a marsh, aquatic bird gathering areas (ACOA) and a visited area and reproduction of rainbow smelt. Further downstream, in addition to the mouths of river, interest habitats are characterized by the regular presence of harbor seals and beluga, including critical habitat occupies the first few 25 km downstream of the river. These features and the presence of more than a thousand plant and animal species are among the factors behind the establishment of the Saguenay-St. Lawrence Marine Park (SSLMP), one of the landmarks of the conservation of marine species in Canada.

Saguenay crosses the territory of the city of Saguenay and the three RCM with a total of 9 riverside municipalities. From upstream to downstream, these are Saint-Fulgence, Sainte-Rose-du-Nord, Saint-Félix-d'Otis, Rivière-Éternité, L'Anse Saint-Jean, Petit-Saguenay, Sacré-Coeur, Tadoussac and Baie-Sainte-Catherine. The regional population is essentially concentrated in the city of Saguenay, other municipalities with a population between 200 and 2000 people each.

Various human activities are carried out all along the Saguenay, the principal relating to navigation. The latter occupies several niches, namely commercial shipping and cruises, boating, marine tour and passenger transport (ferries). Moreover, the following activities are conducted: boating, kayaking, the recreational fishing, Aboriginal food fishing, hunting for migratory birds, scuba diving, nature watching and recreational aquatic activities such as swimming, windsurfing, kite surfing, etc. Among the most important, there were in 2014, the sea excursions with about 20,000 annual trips, recreational boating with more than 24 000 annual days-tours, kayaking with over 40,000 visit-days and diving more 2500 days-divers. Between them, the sea excursions were allowed to leave at sea of some 275,000 people in 2009, these outlets being essentially concentrated near the mouth of the Saguenay. These activities are conducted in the months of May to October, with a peak attendance in July and August.

In winter, from January to March each year, the ice fishing is the most important activity. It takes place at the following locations: L'Anse-Saint-Jean, Rivière-Éternité, Saint-Félix-d'Otis, Sainte-Rose-du-Nord, Saint Fulgence and Saguenay. More than 80% of annual fishing effort is exerted in the borough of La Baie of Saguenay where one can count more than 1200 of the 1600 ice huts installed on the Saguenay.

Between 1995 and 2008, this fishing effort showed an annual average of 50 000 fishing-days for the entire Saguenay all species, and could reach 62 000 fishing-days some years.

With respect to Aboriginals, although the Saguenay was abandoned as a waterway by the Innu, today they practice winter food fishing, mainly in the Sainte-Rose-du-Nord area. In addition, they use the mouth of the Saguenay to their main economic activities, namely marine mammal watching tours as well as commercial sea urchin fishing in the Alouettes' battures.

7.6.2 MARINE NAVIGATION ACTIVITIES

On the Saguenay, commercial shipping is currently directed to four commercial wharves, namely the Marcel Dionne wharf of the Grande-Anse marine terminal, the Agésilas-Lepage wharf of Bagotville and wharves Powell and Duncan of the Port-Alfred port facilities which belong to Rio Tinto.

Due to the closure of some regional industrial activities, commercial navigation on the Saguenay River rose from an annual average of about 300 ships in the early 1990s to an average of almost 190 ships in the 2000s. The tonnage of cargo handled at the Grande-Anse terminal between 2006 and 2015 ranges between 270,000 and 340,000 tonnes, with an average of 310,000 tonnes. Between June 22, 2004 and March 8 2016, there were a total of 5,241 passages of ships and other (including tugs, barges and large yachts) that were registered on the Saguenay, which represents an average of about 1.2 per ship day of operation of this waterway. During this period, there were only about 5% of days where 4 to 5 ship movements were observed on the Saguenay.

Based on the observed growth data for existing marine activities and information available on anticipated regional projects, the Port of Saguenay considers, in its realistic scenario, that in the coming years we should generally see to the most at a doubling of the number of ships passing on the Saguenay River to reach its facilities. Thus, it would be some 460 ships are expected annually, including the 160 ships that should serve the future LNG-Québec facilities (Énergie Saguenay).

7.6.3 POTENTIAL ACCIDENTS AND FAILURES

Risk analysis related to navigation on the Saguenay has identified the following risk components:

- The presence of shoals reducing the width of the navigation channel and strong cross currents and tides directly at the mouth of the Saguenay;
- The presence of the ferries that cross the Saguenay waterway every 13 minutes between Baie-Sainte-Catherine and Tadoussac;
- The presence of a large number of ships of all types sailing each day the mouth of the Saguenay area;
- The occurrence of dense mist events in the summer and snow fog in winter that can greatly affect visibility for several hours at the mouth of the Saguenay;
- The occurrence of strong winds in the mouth and in the corridor of the Saguenay which requires greater vigilance by pilots to maintain their trajectory;

- The presence of three curves, one of 55 degrees in the first stretch about 25 km from the Saguenay, which is also the narrowest of the course (less than a kilometer in places) and where the distance visibility is the shortest;
- The management of ship movements (anchoring, berthing and getting under way) in the sector of port facilities of Upper Saguenay.

The analysis of maritime incidents and accidents occurring between January 1, 2004 and March 31, 2016 identified a total of 110 events involving ships. The vast majority of them are minor incidents that have jeopardized neither the ship nor its cargo or occupants. Among these, the most frequent were blackouts of any machinery or the technical system of a ship, followed by damage, often mechanical, which render it unfit for navigation. These situations deemed at risk when they arise when the ships are moving. However, the types of accidents that may be the most serious consequences, namely shipwrecks, groundings and collisions between two moving ships, have the lowest probability of occurrence.

With respect to spills, the analysis of 2008-2016 data showed that the amount of oil spilled was relatively low, i.e. at the few dozens of liters, and that they have no significant consequences on the aquatic environment.

7.6.4 EFFECTS AND ENVIRONMENTAL HAZARDS OF NAVIGATION

In order to determine if the anticipated increase in maritime traffic in the Saguenay could have environmental consequences, an analysis of its potential effects was performed. This was based around the main sources of known effects related to marine transportation and related activities, i.e. the movement of ships, releases from their operation, their anchor on the seabed, the risk grounding or sinking and accidental spills. The environmental and social components considered in this analysis were bank stability, the water quality, the Saguenay-St. Lawrence Marine Park (SSLMP), the special status species (including beluga), recreotouristic and commercial aquatic activities and finally the residents.

However, this analysis has determined that the effects of the expected increase in maritime traffic would be altogether relatively low on the Saguenay regarding the erosion caused by waves, injuries caused by collisions between ships and marine mammals , the nocturnal wildlife behavioral changes related to light ships, the disturbance of the peace of local residents by passing ships, degradation of water quality due to discharges from ships, the introduction of invasive alien species when managing ballast water as well as the potential obstacle of the anchors of ships regarding wildlife circulation in the anchorage areas. Although the frequency of moments of underwater noise emissions will also grow parallel to maritime traffic and the characteristics of the Saguenay may, in some places, the spread of these sounds, it is considered that this should not lead to significant changes in aquatic wildlife communities.

In fact, according to this analysis, the most important effect is present at the time of an accidental oil spill. Although the odds of that happening are very low, the increase in marine transportation would lead to some increase in these probabilities. However, if such an event were to occur, it could have environmental consequences and major socio-economic regardless of the location of the event. Although, the analysis has identified four sectors more sensitive than others, namely:

- the mouth of the Saguenay because of its special ecological and economic characteristics,
- the coves, bays and river estuaries along the Saguenay;

- the SSLMP, the Saguenay area identified as a critical habitat for beluga;
- the area where port activities are concentrated in the city of Saguenay.

7.7 EFFECTS OF POSSIBLE ACCIDENTS OR FAILURES

Accidents and possible failures can have effects on components of the environment as defined in Section 5 of the CEAA (2012). The risk of accidents and malfunctions that may occur during each phase of the project were first identified by considering the human and natural causes. The potential effects were described in terms of possible interactions between the components of the environment and the damage caused by an unexpected event.

Potentially hazardous events that can cause effects on components of the environment can occur during all phases of the project. Accidents and failures refer to unexpected events that occur independently of an activity or the normal operation of a project. These unexpected events may occur despite all the preventive measures implemented, hence the importance of the implementation of strict prevention measures. Despite prevention, if such events occur, then it is important to minimise the environmental effects by planning and designing effective mitigation measures and implementing an emergency measures plan (EMP).

The first line of defense against accidents and failures is the application of best practices in environmental protection and health and safety. Thus, potential accidents and malfunctions associated with risks are still possible after the implementation of the following:

- application of best management practices;
- use of the most efficient techniques;
- strict control of emissions permits in the environment and residual environmental effects;
- training;
- development of a EMP.

7.7.1 TERRESTRIAL ENVIRONMENT

Accidents and malfunctions that may occur on land are associated with all the activities planned under construction and operational maintenance and dismantling phases (transport materials, use of machinery, oil and hazardous materials handling). In the operational and maintenance phase, apatite concentrate handling is added to other risks. Accidents and malfunctions can occur during the execution of one or more activities. They can also result from a natural event or a series of events occurring in cascade. The potential risks and their terrestrial consequences combined for all phases of the project are:

7.7.1.1 ACCIDENTAL RELEASE OF HYDROCARBONS

An oil spill can be caused by an accident resulting from a failure or a human error. A spill can cause soil and water contamination, destroy flora and fauna, disrupt terrestrial and aquatic habitats and human activities. In case of spill, the emergency plan will be quickly applied, risks should be limited to the site and the likelihood that the surrounding environment is disturbed is little likely.

7.7.1.2 ACCIDENTAL RELEASE OF HAZARDOUS MATERIAL (OTHER THAN HYDROCARBONS)

Human error, poor weather or mechanical failure during transportation, handling or storage of hazardous materials may be the cause of a spill.

The consequences depend on several factors including the nature of the substance, its physical and chemical properties, the amount spilled, duration, location and nature of the receiving environment. The emission of a toxic cloud can also result from a spill. The environmental consequences are soil and water contamination, destruction of flora and fauna and of terrestrial and aquatic habitats and damage to infrastructure. A spill of a solid substance on the floor would cause little impact to the extent that the spread and infiltration into the soil would be limited. A spill of liquid or greasy products has similar effects to those of an oil spill. Preventive measures as to confine the storage spaces and use of dangerous material should be able to limit the possible consequences of an accident involving such substances.

7.7.1.3 FIRE (FOREST, IN A BUILDING, EXPLOSIVES OR DANGEROUS PRODUCTS HANDLING)

On the site terminal, a fire can be caused by an intense heat source or spark or an electric arc. A wildfire of external origin at site terminal is also a risk to consider. A fire, in addition to the thermal radiation, produces gaseous and particulate emissions which may be toxic.

The consequences of a fire mainly concern the safety of workers and damage to facilities. The consequences of a major fire are also related to the potential presence of smoke or toxic gases outside the site. A toxic cloud may affect the surrounding population and the natural environment according to its area of effect.

7.7.1.4 EXPLOSION

The explosives used in the excavation will be used by specialized contractors and handled according to regulations. The use of explosives is the most likely accident, but there are other sources of explosions (road accident, human error in handling of explosives, hardware failure, lightning striking an electrical transformer, etc.). The consequences of an explosion are related to the pressure and flying debris. These consequences can cause human injury or death, destroy infrastructure and components of the natural environment. The remoteness of housing and the lack of nearby sensitive elements limit the consequences of an explosion on the site. The consequences of a toxic cloud in the environment vary the threshold effects associated with their composition.

7.7.1.5 GAS OR DUST EMISSION

The emission of gas and dust is related to the movement of the machinery, transportation of materials, blasting and excavation. These emissions are as normal as part of a construction site and are subject to standards. In the event of accidental releases of gas or dust exceeding the standards, the possible consequences would amount to the consequences of explosions or fires.

7.7.1.6 APATITE CONCENTRATE SPILL

The product transported and transhipped is an apatite concentrate of about 39% in P_2O_5. It is a granular material with an average diameter of 175 microns and having a measured moisture content between 0 and 2%. Several preventive measures will be introduced (material safety data sheet, specifically trained personnel, closed equipment). If a spill occurred during handling and transport despite the preventive and protective measures, the impact on the environment are considered minor insofar as the spread and infiltration into the soil would be limited and that the product is easily recoverable. Apatite has not undergone any chemical processing. Being a compound containing inert calcium phosphate, it can be considered as a product available by plants and photosynthetic organisms.

7.7.1.7 ACCIDENTS CAUSING INJURIES TO WORKERS

Human errors and failures or equipment breakdown are the most frequent causes of accidents. In all circumstances, the preventive measures will limit the significance of events and in case of accident, emergency measures will be implemented to avoid complications and deaths.

7.7.2 MARINE ENVIRONMENT

In the marine environment, the causes and consequences of potential accidents and malfunctions will be involved in the construction phase and especially in the operation and maintenance phase of the terminal, particularly in connection with ship maneuvers. Apatite concentrate loading operations will be held 60 times per year (60 vessels of 50,000 dwt) at a period of about 30 hours of berthing for each loading. The number of additional users and frequency of the terminal is unknown at this time. Dismantling operations will not cause any risk to the marine environment since the wharf and related facilities will remain in place. The consequences of accidents on the marine during the construction phase are considered equivalent to the likely effects of accidents in the operational and maintenance phase.

During ship operations, risks are associated with the grounding, shipwreck and collisions. The consequences for the environment would be caused by an oil, hazardous materials, ballast water or apatite concentrate spill, or by an explosion or fire. Given the history of accidents in the Saguenay since 2004, the effects of any type of spill is considered limited. Preventive measures and emergency procedures currently in force will limit the scope quickly and effectively. Measures to prevent risks such as explosion and in particular fire will be developed and applied in the operational and maintenance phase.

7.7.3 PRACTICES AND PROCEDURES

All maritime operations surrounding the activities of a port are governed by a variety of laws and regulations for safety and environmental protection. The ship maneuvers are established by regulations to which are subject Port of Saguenay, for example, piloting assistance. For the security component, Port of Saguenay holds a certificate of compliance with the ISPS code (International Ship and Port Security) issued by Transport Canada establishing an international framework to prevent and detect threats and take appropriate measures against security incidents.

7.7.4 EMERGENCY PLAN

In the event of an unforeseen accident, malfunction or unplanned event, despite preventive practices, the measures contained in an EMP will be implemented to ensure that the environmental effects are avoided and kept to a minimum.

Port of Saguenay already applies an EMP at its Grande-Anse facilities. The plan for the north shore terminal will be designed in a similar structure while being customized to the particular site. Training on the procedures for responding to environmental emergencies will be provided to all staff. The EMP will be developed in consultation with customers and partners, will have as main objective to provide the necessary tools to react quickly and effectively during possible emergency situations and will consider the risks identified in this environmental impact study.

The EMP structure is as follows:

- identifying key risks;
- EMP preparation with key stakeholders;
- decision criteria to trigger the EMP (any incident involving risks to health, the environment, property or facilities);
- alert methods;
- management intervention based on thorough knowledge of the roles and responsibilities of each;
- procedures and emergency response during an event (including the steps of triggering the plan up to the production of reports);
- back to normal and monitoring (environmental restoration following an environmental emergency).

Just as the development of the EMP, the steps back to normal and monitoring to be undertaken to confirm its effectiveness will be established with partners and stakeholders, including the public.

7.8 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Extreme and unusual weather conditions, changes in normal local conditions, forest fires, soil movements, including seismic activities are situations posing risks to the project. Among natural disasters, earthquakes are distinguished events related to weather conditions in that they are less predictable. Forest fires may be of natural origin and climatic conditions can influence their occurrence period and extent. However, the human factor plays an important role in their occurrence. The risk to be considered for the project remains the same, regardless of the cause of the fire.

The project has been technically designed to take into account all the risks identified. The designers made sure to include safety factors, including the types of equipment, materials selection and best practices. The risk assessment covers the operational and maintenance phase of the project, a period that exceeds 26 years of life of the apatite mine Arianne Phosphate.

The location of the terminal and the geological and hydro-morphological characteristics make it a relatively secure site regarding soil movements, floods and earthquakes.

Compared to normal weather conditions since the 1960s, predictions based on the work of the Ouranos consortium predict changes in extreme events and conditions based on scenarios developed by the IPCC. Extreme conditions include the maximum and minimum temperatures, precipitation (storms), droughts, heat and cold waves, as well as strong winds. Changes at the regional and local level will be observed in the wake of global changes.

The marine terminal project's site is located in the Centre-du-Québec region (climatically defined by Ouranos). For this region, it is predicted:

- An increase in the annual average temperature between 1.1 and 8.0 °C between 2020 and 2100. For the months of December, January and February as the largest temperature increase is expected;
- The increase in the average temperature is accompanied by a sharp increase in the maximum temperature of the hottest day of the year, between 4 and 7 °C;
- The duration of heat waves will increase sharply;
- A sharp reduction in the annual number of frost-free days is projected;
- Freeze / thaw episodes will occur more frequently in winter and less often in spring and fall;
- It is planned for the Centre-du-Québec region, compared with the 1981-2000 average, a 40 to 70% increase in the amount of precipitation from the most rainy days;
- The expected increase of the average annual total precipitation is between 3 and 26% between 2020 and 2100;
- Increased precipitation will be concentrated in the summer and fall.

7.8.1 EXPECTED CHANGE

7.8.1.1 SNOW OR SHOWER STORMS

For the region, the number of days of heavy rain in 2100 compared with the number in 2000 is expected to increase between 4 and 10 days. The upward trend would increase over time in 2100. For the project in a short time horizon and medium terms, these forecasts can be considered part of natural climate variability to which the infrastructure will be designed.

7.8.1.2 EXTRATROPICAL HURRICANES

Forecasts for 2100 indicate a decrease in hurricane activity in winter for the 2081-2100 period relative to 1980-1999. The intensity of historically lived storms in Quebec should not be changed in the future as to require specially adapted building standards.

7.8.1.3 EXTREME WIND AND WAVES

The forecast on this subject are fragmentary and surrounded by great uncertainty. There might be a decrease in average wind speed in summer 2100 compared to 1979-1999 and a small increase in wind in winter. Wave power is connected to the wind speed; it is conceivable to think that the same conclusions apply to this element of the environment.

7.8.1.4 FOG

The fog conditions are associated with contrasts in temperature between the air masses and water as well as cloud conditions. These phenomena are linked to often very localized and short-lived conditions in the project area, it is difficult to predict trends. It is for navigation in operational and maintenance phase as the fog conditions are the most critical.

7.8.1.5 RISE OF SEA LEVEL

The most relevant forecast available for the project area is the expected increase for the Gulf of St. Lawrence. The expected increase in the models used by the IPCC based on the worst case scenario is 0.3 to 0.75 m in 2100 compared to the average sea level observed for the 1985-2006 period. This increase reflects the isostatic rising still observed in this region. It is therefore possible that part of the planned rising is felt in the Saguenay Fjord. The risk due to rising sea level is higher along erosion sensitive areas (formed banks of unconsolidated deposits and cliffs of sandstone, shale or clay). The geological formation on which the terminal's infrastructures will be built makes any damage to facilities unlikely.

7.8.1.6 ICE COVER AND FLOATING ICE

The thickness of the ice near La Baie is on average 75 cm at the end of winter and can vary between 60 and 102 cm. The ice forms on the Saguenay in the westernmost areas late November or early December. It extends to the St. Lawrence River usually during the third week of December and lasts all winter. The thickness of the ice and the duration of the iced period depend on of occurrence of the temperature below 0° C. With a marked increase in temperature in winter and a decrease in the duration of the freezing temperatures, it is conceivable that by 2100, the ice covered may be less extensive, less thick and could not last as long. This trend is also observed in the waters adjacent to Quebec for 50 years.

7.8.1.7 FOREST FIRES

Forest cover surrounding the site project covers an area of several square kilometers. The sector is therefore at risk of a possible forest fire that could threaten installations and cause environmental damage. It is the Department of Forestry, Wildlife and Park (ministère des Forêts, de la Faune et des Parc-MFFP), supported by the Société de protection des forêts contre le feu (SOPFEU) which manages the Quebec forest fires in terms prevention, detection and the fight against fires. Historically, the majority of fires are intentionally or accidentally caused by humans (incendiary, railway, forest or industrial operations, residents, recreation) in a proportion of about 80% on average each year.

It is expected that by 2100, climate change will exacerbate the conditions favorable to wildfires, increasing the number of fires as well as their severity. These favorable conditions will be important in particular for the Centre-du-Québec region. Spring conditions are particularly favorable and could help increase the size of the fires.

7.8.1.8 SEISMIC ACTIVITY

Eastern Canada is in a stable continental region of the plate of North America, which results in a relatively low seismic activity. The study area is still part of the most active seismic zone of eastern Canada. The area is located in zone 3, an area of a greater seismic probability.

In a 50 km radius around the project site, 64 earthquakes were recorded between 1985 and 2015, with magnitudes between 0.5 and 5.9 (nine earthquakes felt). The most powerful is the 5.9 earthquake occurred on November 25 1988. Very few major earthquakes (magnitude> 3) occurred and the 1988 earthquake being an exception. The recurrence of earthquakes of very high amplitude for the region is 350 to 1000 years.

7.8.1.9 MONITORING AND FOLLOW-UP

Monitoring the effects of the environment on the project is not required. However, the risks will be considered by the environmental management and in the warning procedures in case of extreme events. A follow-up would be implemented until the return to normal conditions in the event that an environmental effect caused infrastructure damage.

Mitigation measures and the effects of the environment on the project associated with each of the identified risks are presented in Table 5.

Table 5 Summary of the potential effects of the environment on the project

Event or situation	Long term risk (> 26 years)	Mitigation measure	Effect
Rain storm or snow storm extratropical	Low, predictable event	Respect the building construction code	Insignificant
Extreme winds and waves	Low, higher in winter, but surrounded by uncertainty, predictable event	Application of the port's navigation rules	Insignificant
Fog	Low, within natural variability, unpredictable event	Application of the port's navigation rules	Insignificant
Sea level rise	Low, long-term predictable conditions	The location of the port along a rock wall protects the installations against the raising effects	Nul
Ice cover and floating ice	Low within the natural variability in the short term, predictable conditions	Application of the port's navigation rules	Insignificant or positive long-term navigational ease
Forest fires	Low, increasing long-term, predictable event	Environmental management program, monitoring fire danger conditions and communications with SOPFEU	Insignificant
Seismic activity	Low, unpredictable event	Construction of facilities according to the seismic standards of the area	Insignificant

8 ENVIRONMENTAL EFFECTS ASSESSMENT SUMMARY

The proposed Marine Terminal on the North Shore of the Saguenay is the subject of an EIS in order to determine the possible effects on the physical and biological environments, for the First Nations and local and regional Communities, and during the different phases of the project, the construction, the operation and maintenance and dismantling phases.

Tables 6 to 9 summarise for each of the evaluated components, project activities, likely potential effects and the significance of the residual effects, and this according to each phase of the project.

Table 6 Summary of environmental effects on the physical environment

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Physical setting	Surficial geology stability		Construction	Forest clearing, excavation, backfilling and land grading and foundation work for the road leading to the wharf	Risk of sediment destabilization	Not significant
				Rock dynamiting, circulation of machinery and wharf construction activities related to driving piles and anchors into the rock	Risk of destabilizing the underwater embankment surficial geology	
			Exploitation and maintenance	No activity is likely to disrupt sediment stability creating residual effects		
			Dismantling	No activity associated with the dismantling of the phosphate transhipment infrastructures is likely to disrupt sediment stability to the point of creating residual effects		
	Sediment dynamics		Construction	Forest clearing, excavation, backfilling and land grading and foundation work for the road leading to the wharf and circulation of machinery Wharf construction	Risk of mobilization of sediment toward waterways	Not significant
			Exploitation and maintenance	Presence of wharf Vessel berthing manoeuvres	Resuspension of marine bottom sediments	Not significant
			Dismantling	No activity associated with the dismantling of the phosphate transhipment infrastructures is likely to disrupt sediment stability to the point of creating residual effects		
	Soil quality		Construction	Forest clearing Land preparation, circulation of machinery and material transportation Watercourse crossing	Risk of accidental spillage of hazardous materials, particularly hydrocarbons	Not significant
			Exploitation and maintenance	Maintenance of permanent buildings and installations, use of winter ice-melters, waste water management, non-hazardous residual material management –snow removal, hazardous material management Circulation and material transportation	Risk of accidental spillage of hazardous materials, particularly hydrocarbons	Not significant
			Dismantling	Land levelling and grading, circulation of machinery – granular material transportation, snow clearing and use of ice-melters, machinery refueling and maintenance – Risk of accidental spillage, non-hazardous and hazardous residual material management – storage, handling and disposal	Risk of accidental spillage of hazardous materials, particularly hydrocarbons	Not significant
	Sediment quality (land-based)	√	Construction	Forest clearing Land preparation, circulation of machinery and material transportation Watercourse crossing Snow removal management	Risk of accidental spillage of hazardous materials, particularly hydrocarbons	Not significant

Table 6 Summary of environmental effects on the physical environment (cont'd)

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Physical setting (continued)	Sediment quality (land-based) (continued)		Exploitation and maintenance	Building and permanent installation maintenance, use of winter ice-melters, Snow removal management, non-hazardous residual material management –Snow removal, hazardous material management Circulation and material transportation	Risk of accidental spillage of hazardous materials, particularly hydrocarbons	Not significant
			Dismantling	Land levelling and grading, circulation of machinery – Granular material transportation, snow clearing and use of ice-melters, Machinery refueling and maintenance – Risk of accidental spillage, non-hazardous and hazardous residual material management– Storage, handling and disposal	Risk of accidental spillage of hazardous materials, particularly hydrocarbons	Not significant
	Sediment quality (marine)	√	Construction	Wharf access road foundation preparation Wharf construction Machinery circulation, refueling and maintenance Use, storage and handling of hazardous materials	Risk of sediment transport in the Saguenay River Risk of accidental spillage of hazardous materials, particularly hydrocarbons, into the environment Modification of the nature and sediments of the river bottom by fill in the water and the installation of riprap and gabion baskets	Not significant
			Exploitation and maintenance	Phosphate loading operation Presence of vessels	Risk of phosphate spillage into the marine environment during vessel loading	Not significant
			Dismantling	No activity is likely to disrupt sediment quality, port facilities near the Saguenay River to remain in place		
	Current circulation		Construction	Wharf construction	Risk of current deviation and counter-current formation particularly upstream, in front and downstream to the infrastructures	Not significant
			Exploitation and maintenance	Presence of wharf	Risk of current deviation and counter-current formation particularly upstream, in front and downstream to the infrastructures	Not significant
			Dismantling	No activity is likely to disrupt sediment quality, port facilities near the Saguenay River to remain in place		
	Ice		Construction	Wharf construction	Inhibition of ice cover formation directly in the area of wharf construction	Not significant
			Exploitation and maintenance	Presence, use and maintenance of the permanent installations	Risk of creating more activity in the environment, which will interfere with local water freezing and fracture ice sheets	Not significant

Table 6 Summary of environmental effects on the physical environment (cont'd)

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual
Physical setting (continued)	Ice (continued)		Dismantling	No activity is likely to disrupt the ice cover, port facilities near the Saguenay River are to remain in place		
	Water quality (land-based)	√	Construction	Forest clearing Land preparation, circulation of machinery and material transportation Watercourse crossing	Inputs of sediment into the water Risk of contamination by hazardous materials and hydrocarbons	Not significant
			Exploitation and maintenance	Circulation and material transportation Building and permanent installation maintenance, use of winter ice-melters, Snow removal management, non-hazardous residual material management – Snow removal, hazardous material management	Physicochemical modifications in the surface water due to contamination (snow removal, hydrocarbons, hazardous materials)	Not significant
			Dismantling	Land levelling and grading, circulation of machinery – Granular material transportation, Machinery refueling and maintenance – Risk of accidental spillage, non-hazardous and hazardous residual material management – Storage, handling and disposal	Inputs of sediment into the water Risk of contamination by hazardous materials and hydrocarbons	Not significant
	Water quality (marine)	√	Construction	Wharf access road foundation preparation Wharf construction Machinery circulation, refueling and maintenance Use, storage and handling of hazardous materials	Risk of MES emissions into the Saguenay River MES emissions during riprap and gabion cage installation Risk of accidental spillage of hazardous materials, particularly hydrocarbons	Not significant
			Exploitation and maintenance	Presence, use, maintenance of building and permanent installations Activities generating atmospheric emissions Use of installations (presence of vessels) Waste water and water runoff management	Risk of accidental phosphate and hydrocarbon spillages Risks altering water quality	Not significant
			Dismantling	No activity is likely to disrupt the quality of water in a marine environment, port facilities near the Saguenay River are to remain in place		
	Air quality	√	Construction	Forest clearing and disposal of wood debris Land preparation, Rock crushing Circulation of machinery and workforce and material transportation	Atmosphere quality degradation	Not significant

Table 6. Summary of environmental effects on the physical environment (cont'd)

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Physical setting (continued)	Air quality (continued)		Exploitation and maintenance	Transhipping, storage and handling of the phosphate concentrate activities Vessel loading activities Presence of vessels Traffic and atmospheric emissions coming from transhipment site trucks	Atmosphere quality degradation	Not significant
			Dismantling	Land levelling and grading Circulation of machinery, transportation of dismantled equipment and workforce	Atmosphere quality degradation	Not significant
	Land noise	√	Construction	Forest clearing and grubbing, landscaping, paving, drilling and blasting, stone crushing, wharf and related equipment, conveyor, septic system, potable water well, equipment concrete foundations	Increase to natural ambient noises	Not significant
			Exploitation and maintenance	Truck off-loading station, silo/dome, transfer silo conveyor to wharf, vessel loader	Increase to natural ambient noises	Not significant
			Dismantling	Truck elevators, silo/dome, transfer silo, conveyor to wharf	Increase to natural ambient noises	Not significant
	Underwater noise	√	Construction	Drilling and vibro-sinking of piles and sheet piling Circulation and vessel berthing	Risk of causing permanent or temporary physical damage to fish or aquatic mammals Temporary behavioural changes in fish	Not significant
			Exploitation and maintenance	Loading operation Circulation and vessel berthing	Temporary behavioural changes in fish	Not significant
			Dismantling	As the dismantling of the wharf is not envisaged, no activity is likely to lead to high underwater noise levels		
	Lighting atmosphere	√	Construction	The likely residual environmental effects during the construction phase are considered as being not significant		
			Exploitation and maintenance	Presence, use, and maintenance of buildings and permanent installations Road traffic	Night emissions of artificial light directed toward the sky and property limits Transformation of night-time landscapes	Not significant
			Dismantling	The likely residual environmental effects during the dismantling phase are considered as being not significant		

Table 7 Summary of environmental effects on the physical environment

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Biological setting	Land and shore plant life	√	Construction	Forest clearing and land preparation Circulation of machinery and granular material transportation Use, storage and handling of hazardous materials	Loss of land and shore vegetation	Not significant
					No residual effect is feared for Unit V1 wet environment, moving the proposed permanent route further east will permit completely avoiding this component	
					No residual effect is expected on the endangered plant species since there is no instance of rare plants in the limited study area.	
					Clearing of 0.9 ha in a forest stand of phytosociological interest	Significant
					Risk of introducing and propagating invasive exotic plant species	Not significant
					Risk of contamination of land or shore vegetation by hydrocarbons or hazardous materials	Not significant
			Exploitation and maintenance	Machinery circulation, refueling and maintenance Use, storage and handling of hazardous materials	Risk of contamination of land or shore vegetation by hydrocarbons or hazardous materials	Not significant
			Dismantling	Rehabilitation of abandoned sites	Reconstruction of the vegetation cover in the sites which had been cleared	Not significant
	Intertidal marine flora and seagrasses	√	Construction	Machinery circulation, refueling and maintenance Use, storage and handling of hazardous materials	Risk of accidental spillage of hazardous materials, particularly hydrocarbons into the environment	Not significant
			Exploitation and maintenance	Phosphate loading operation Presence or maritime terminal Presence of vessels	Risk of accidental phosphate and hydrocarbon spillage Potential modification of the sediment dynamics likely to influence the expansion of certain intertidal seagrasses	Not significant
			Dismantling	No activity is likely to disrupt marine vegetation or intertidal seagrasses, port facilities near the Saguenay River are to remain in place		
	Plankton	√	Construction	No environmental effect on the plankton is expected		
			Exploitation and maintenance			
			Dismantling			

Table 7 Summary of environmental effects on the physical environment (cont'd)

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Biological setting (continued)	Benthic and nektonic invertebrates	√	Construction	Infilling in water Machinery circulation, refueling and maintenance Use, storage and handling of hazardous materials	Risk of accidental spillage of hazardous materials and of hydrocarbons Encroachment into the fish habitat.	Not significant
			Exploitation and maintenance	Phosphate loading operation Presence of vessels	Risk of accidental spillages of phosphate and hydrocarbons	Not significant
			Dismantling	No activity is likely to disrupt the communities of benthic and nektonic invertebrates, port facilities near the Saguenay River are to remain in place		
	Fish and their habitat in a land environment (fresh water)	√	Construction	No affect is expected on fresh water fish and their habitat		
			Exploitation and maintenance			
			Dismantling			
	Fish and their habitat in a marine environment	√	Construction	Infilling in water Machinery circulation, refueling and maintenance Use, storage and handling of hazardous materials Drilling the sockets and vibro-sinking the piles and sheet piles	Risk of accidental spillage of hazardous materials and hydrocarbons. Underwater noise emission Encroachment into the fish habitat	Not significant
			Exploitation and maintenance	Phosphate loading operation Presence of vessels	Risk of accidental phosphate and hydrocarbon spillage Underwater noise emission	Not significant
			Dismantling	No activity is likely to disrupt the fish communities and their habitats, port facilities near the Saguenay River are to remain in place		
	Aquatic mammals	√	Construction	Pile sinking, drilling pile sockets, installation of sheet piles Circulation of machinery Hazardous material use	Risk of accidental spillage of hazardous materials and hydrocarbons Underwater noise emission	Not significant
			Exploitation and maintenance	Presence of vessels	Risk of accidental spillage of hazardous materials and hydrocarbons Underwater noise emission Risk of collision	Not significant
	Aquatic mammals (continued)		Dismantling	No activity is likely to disrupt aquatic mammals, port facilities near the Saguenay River are to remain in place.		

Table 7 Summary of environmental effects on the physical environment (cont'd)

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Biological setting (continued)	Birds and their habitat	√	Construction	Forest clearing and grubbing, stripping and excavation	Loss of habitat	Not significant
					Endangered species : Canada Warbler (loss of habitat)	Significant
				Infrastructure construction Machinery circulation, refueling and maintenance	Annoyance and risk of collision	Not significant
				Residual material storage, handling and management	Risk of hazardous material and hydrocarbon spillage	Not significant
			Exploitation and maintenance	Residual hazardous material management	Risk of hazardous material and hydrocarbon spillage	Not significant
				Lighting of night site operations Presence of installations and machinery circulation Berthing of vessels at the wharf, loading of vessel holds, vessel departure manoeuvering	Annoyance and risk of collision	Not significant
			Dismantling	Circulation of machinery for materials, removed equipment, goods and services Storage, handling and management of residual materials	Annoyance, risk of collision and risk of accidental hazardous material and hydrocarbon spillage (land setting)	Not significant
	Terrestrial fauna, herpetofauna and their habitat	√	Construction	Forest clearing and wood debris disposal Work site organization, land preparation, rock crushing, terminal and wharf construction, watercourse crossing, circulation of machinery and material and workforce transportation Use, storage and handling of hazardous materials Machinery refueling and maintenance	Potential habitat loss Annoyance (noise and lighting) Risk of collision Risk of accidental spillages	Not significant
			Exploitation and maintenance	Presence, use and maintenance of buildings and permanent installation, road traffic and hazardous material management	Annoyance (noise and lighting) Risk of collision Risk of accidental spillages	Not significant
			Dismantling	Organisation and work site decommissioning Land levelling and grading Circulation of machinery, transportation of disassembled equipment and workers	Annoyance (noise and lighting) Risk of collision Risk of accidental spillages	Not significant

Table 7 Summary of environmental effects on the physical environment (cont'd)

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual
Biological setting (continued)	Terrestrial fauna and their habitat (chiropterans)	√	Construction	Forest clearing and wood debris disposal Work site organization, land preparation, rock crushing, terminal and wharf construction, watercourse crossing, circulation of machinery and material and workforce transportation Use, storage and handling of hazardous materials Machinery refueling and maintenance	Potential loss of habitat Annoyance (noise and lighting)	Not significant
			Exploitation and maintenance	Presence, use and maintenance of buildings and permanent installation, traffic and hazardous material management	Annoyance (noise and lighting)	Not significant
			Dismantling	Depending on the period covered by the project realization, the chiropterans may not be present on the site		
	Terrestrial fauna and their habitat (endangered species : rock vole)	√	Construction	Forest clearing and wood debris disposal Work site organization, land preparation, rock crushing, terminal and wharf construction, watercourse crossing, circulation of machinery and material and workforce transportation Use, storage and handling of hazardous materials Machinery refueling and maintenance	Loss of habitats Annoyance (noise and lighting) Risk of collision	Significant
			Exploitation and maintenance	The exploitation, maintenance and dismantling phases have not been taken into consideration in the analysis since the rock vole will not find on the terminal site the necessary conditions for it to continue its life cycle. Even after reconstruction of the setting, this species will prefer habitats close to water sources which are few and far between in this area. The sites which will be refurbished do not meet the requirements of this species.		
			Dismantling			

Table 8 Summary of environmental effects on the physical environment

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
First Nations	Socio-economic profile		Construction	There are no expected environmental effects on the socio-economic profile for the First Nations for the limited study area during the different phases of the project realization		
			Exploitation and maintenance			
			Dismantling			
	Land use	√	Construction	There are no expected environmental effects on the contemporary use of the land by the First Nations for the limited study area during the different phases of the project realization		
			Exploitation and maintenance			
			Dismantling			
	Risks to human health	√	Construction	The remote location of the aboriginal communities with respect to the limited study area and the confirmation that this land is not used by their members for cultural, food or other purposes ensures that there are no expected effects on the health of First Nation populations		
			Exploitation and maintenance			
			Dismantling			
	Cultural heritage	√	Construction	Land preparation, culvert installation, wharf access road and peripheral embankment construction	Loss or destruction of cultural heritage	Not significant
			Exploitation and maintenance	No activity is likely to disrupt cultural heritage, the wharf access road is to remain in place		
			Dismantling	No activity is likely to disrupt cultural heritage, the wharf access road is to remain in place		

Table 9 Summary of environmental effects on the physical environment

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Local and regional communities	Land use	√	Construction	All construction activities	Increase in disturbances (noise, vibrations, dust, artificial night lighting) Disruption of water-based activities (recreational boating, sport fishermen, kayakers) Annoyance (noise) while hunting and trapping	Not significant
				Equipment, material and workforce transportation	Disruption in travel for users of road 172, and local and forest roads Deterioration of traffic routes	Not significant
				Forest clearing and land preparation	Loss of useable areas of forest and in merchantable lumber volume	Not significant
				Procurement of goods and services, workforce hiring	Economic benefits	Significant (+)
			Exploitation and maintenance	Presence and exploitation of the maritime terminal facilities	Increase in disturbances (noise, vibrations, dust, artificial night lighting) Annoyance (noise) while hunting and trapping Risk of accidents for users of the natural environment and for workers	Not significant
					Effect on the future regional industrial park planned by the Municipality of Saint-Fulgence and the MRC of Fjord-du-Saguenay	Significant (+)
				Equipment, material and workforce transportation	Risk of accidents to the users of the natural environment and to workers Potential disruption to road traffic, to cycling, to snowmobiling and ATV activities Deterioration of traffic routes	Not significant
				Maritime terminal navigation and activities	Risk of inconvenience and personal security violations to pleasure craft users on the Saguenay Disruption to the Saguenay shuttle boat trips if the PACJ eventually takes control of this shuttle's circuit	Not significant
				Procurement of goods and services, workforce hiring	Economic benefits	Significant (+)

Table 9 Summary of environmental effects on the physical environment (cont'd)

	Affected component	Valued component (√)	Project phase	Project-related activity	Potential effect	Significance of the residual effect
Local and regional communities (continued)	Land use (continued)		Dismantling	Dismantling of phosphate concentrate handling infrastructures	Increase in disturbances (noise, vibration, dust, artificial night lighting) Risk of accident to users of the area	Not significant
				Procurement of goods and services, workforce hiring	Economic benefits	Not significant
	Risks to human health	√	Construction Exploitation and maintenance Dismantling	Considering the analysis of effects regarding air quality, terrestrial noise and the luminous environment, the project will have no significant effect on human health		Not significant
	Visual setting	√	Construction	Forest clearing et land preparation Terminal and wharf construction	Disruption of the Saguenay north arm landscape unit (Unit R2)	Significant
					Disruption of the confluence and downstream landscape unit of the Fjord (Unit R3)	Significant
					Disruption of the Saguenay estuary landscape (Unit R1) and the Baie des Ha! Ha! (Unit R4)	Not significant
					Disruption of the other landscape units	Not significant
					Effect on local and regional businesses	Not significant
			Exploitation and maintenance	Presence of permanent facilities and vessels	Modification of the visual environment of the fjord Effect on local and regional businesses	Significant (for residents of l'Anse à Pelletier and l'Anse au Sable) Not significant
			Dismantling	Organisation work site decommissioning Dismantling of transhipment, storage and phosphate concentrate handling facilities	Modification of the visual environment of the fjord Effect on local and regional businesses	Not significant
	Natural and cultural heritage	√	Construction	Forest clearing and land preparation	Loss or destruction of cultural heritage	Not significant
			Exploitation and maintenance	No activity is likely to disrupt the cultural heritage associated with the Euro-Canadian presence, the access road to the multi-user maritime terminal is to remain in place		
			Dismantling	No activity is likely to disrupt the cultural heritage associated with the Euro-Canadian presence, the access road to the multi-user maritime terminal is to remain in place		

9 ENVIRONMENTAL MANAGEMENT PROGRAM

Port of Saguenay is required as a port authority, to comply with environmental federal laws and laws, regulations, rules or guidelines applicable provincial, territorial and municipal relevant. According to the Environmental Policy Statement of Port of Saguenay, the latter is aware of its responsibility for environmental protection, pollution prevention and sustainable development. It intends to operate and exploit its facilities with the objective of reducing to a minimum the negative impacts and environmental risks that may be associated with their activities.

The environmental management program (EMP), adapted to the project and all its phases (construction, operation and maintenance, dismantling), aims to ensure compliance with all the measures taken by Port of Saguenay to minimize the significant residual effects project, regulatory compliance, monitor its environmental management activities and achieve its environmental objectives and targets. These actions are part of a perspective of continuous improvement Port of Saguenay's performance on the environment and social environment.

The EMP identifies all the measures that will be implemented during the design, construction, operation and the maintenance of the marine terminal and its closing and identifies responsibilities, schedule and monitoring and audits to undertake to ensure that all mitigation commitments are met. Port of Saguenay will be responsible for ensuring that all the commitments and environmental and social norms set out in the EIS will be implemented by all parties participating in the work, including service providers and subcontractors. An environmental manager will be appointed and will be fully responsible for the implementation of the EMP. He will also ensure that appropriate arrangements are developed and implemented to ensure adequate levels of training, competence and awareness for all project personnel.

The EMP will be revised regularly to remain relevant to the effects and risks associated with the site. All changes will be documented, communicated and approved before implementation of the change. A mechanism for receiving and handling complaints from the public will be also implemented by Port of Saguenay.

9.1 ENVIRONMENTAL SURVEILLANCE PROGRAM

An environmental work monitoring will be conducted so as to ensure compliance with the commitments and obligations of Port of Saguenay on the environment. This general environmental monitoring will be operated by the environmental manager. It will document and monitor construction activities to take necessary decisions on the resolutions of the non-compliance situations, to implement corrective actions and preventive measures to ensure that these nonconformities do not occur again. Contractors should respect the instructions of Port of Saguenay with respect to construction activities based on schedules, but also in order to protect the environment.

The implementation modalities of the impact of reduction measures in operational and maintenance phase are provided for various specific environmental management programs. The dismantling of the site must also be subject to environmental management. Similar measures to those provided in construction phase should be implemented to reduce the risks and disadvantages, including monitoring of dismantling work that will ensure a good progress and intervention in a particular situation.

9.2 SPECIFIC ENVIRONMENTAL MANAGEMENT PROGRAMS

In addition to the general aspects of environmental management, specific EMPs are available for each of the major environmental issues of the project, including the complaint management, the air quality and dust control, lighting management, control of underwater noise, marine mammals, and residual and hazardous materials spills. They describe the specific management measures for each component of the project to avoid, minimize or mitigate potential adverse effects.

9.2.1 CONSTRUCTION PHASE

In construction phase, specific environmental management plans are designed to monitor the air quality and control of dust, vibration, surface water quality, lighting management, control of underwater noise, monitoring of marine mammals, management of the wellbore and waste and hazardous materials management.

9.2.2 OPERATIONAL AND MAINTENANCE PHASE

In operational and maintenance phase, specific environmental management programs focus on social monitoring, waste snow management, lighting management, control of underwater noise, various biological monitoring, waste and dangerous materials management, runoff and water consumption management, cargo residues management, air quality and spills management.

9.2.3 DISMANTLING PHASE (CLOSURE)

The environmental monitoring procedures during the dismantling phase and closure of equipment dedicated to handling and shipping of apatite concentrate from the mining company Arianne Phosphate (forklift trucks, conveyors and elevators), will be developed when the details dismantling of the timing and nature of the work involved will be known. These procedures adhere to good management practices and regulations.