



Parc éolien de Grosse Île S.E.C.
Grosse Île Wind Power L.P.
Volume 7 : Summary



Study submitted to the Ministry of the Environment, the Fight
Against Climate Change, Wildlife and Parks

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Pesca

**PARC ÉOLIEN DE GROSSE ÎLE S.E.C.
Grosse Île Wind Power L.P.**

**Environmental Impact Study
Volume 7: Summary**

**Pesca Environnement
November 2025**

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1. Context

The limited partnership Parc éolien de Grosse Île S.E.C., whose partners are Alliance de l'énergie de l'Est s.e.c. and NGE Renouvelable, is developing Grosse Île Wind Power L.P. An environmental impact study, conducted by Pesca Environnement, was used to describe the project and its potential impacts on the environment, as required by section 31.1 of the *Environment Quality Act* (CQLR, c. Q-2) and the environmental impact assessment and review procedure (CQLR, c. Q-2, r. 23.1). The study was carried out in accordance with the *Directive for Conducting an Environmental Impact Study – Grosse Île Wind Power L.P. on the territory of the Municipality of Grosse-Île in the Marine Community of the Magdalen Islands – File 3211-12-257*, issued by the *ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des parcs* (MELCCFP, 2023e).

This volume corresponds to the summary of the environmental impact study and includes the information contained in Volumes 1 through 6. It was finalized following the MELCCFP's review for admissibility.

1.1. The proponent

Grosse Île Wind Power L.P. is being developed by the limited partnership Parc éolien de Grosse Île S.E.C. (hereinafter referred to as “the Proponent”), composed of Alliance de l'énergie de l'Est s.e.c. and NGE Renouvelable.

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Alliance de l'énergie de l'Est s.e.c.'s mission is to increase the economic benefits of wind resource development by investing, on behalf of the Régie intermunicipale de l'énergie du Bas-Saint-Laurent, the Régie intermunicipale de l'énergie Gaspésie–Îles-de-la-Madeleine, and the MRCs of Montmagny and L'Islet, in wind farms and redistributing the generated profits to its partners. Alliance owns 50% of the wind farm project.

NGE Renouvelable is a partner with Alliance de l'énergie de l'Est s.e.c. and owns 50% of the wind farm project. NGE Renouvelable specializes in the field of renewable energy, primarily in wind and solar power generation. It is a 50% co-owner of the Dune du Nord Wind Farm, currently in operation in the Magdalen Islands, and is developing several other projects.

1.2. Project context and rationale

In the context of the fight against climate change, an energy transition has begun, particularly in Québec, to reduce greenhouse gas (GHG) emissions by prioritizing the use of renewable energy sources. Through its *2030 Energy Policy* and *2030 Plan for a Green Economy*, the Government of Québec has committed to achieving GHG emission reduction targets by 2030 and carbon neutrality by 2050 (Gouvernement du Québec, 2016, 2020). Hydro-Québec anticipates that electricity demand in Québec will increase by 25 terrawatt-hour (TWh) between 2022 and 2032 (Hydro-Québec Distribution, 2022) and that more than 100 additional TWh of electricity from renewable sources will be required for Québec to achieve carbon neutrality by 2050 (Hydro-Québec, 2022a).

Isolated from Hydro-Québec's main grid, the Magdalen Islands are supplied by the diesel-powered thermal generating station in Cap-aux-Meules. In 2021, this thermal plant accounted for 36.5% of Hydro-Québec's corporate emissions. In September 2021, the Régie intermunicipale de l'énergie Gaspésie-Îles-de-la-Madeleine, Plan A Infrastructure inc., and Valeco inaugurated the Dune du Nord Wind Farm, which includes two wind turbines with a total installed capacity of 8 megawatts (MW) (RÉGÎM, 2022).

In response to the objectives for converting off-grid systems set out in Hydro-Québec's 2023–2032 supply plan, the Proponent is developing Grosse Île Wind Power L.P. in order to provide 16.8 MW of contractual wind energy under a privately negotiated agreement signed with Hydro-Québec in March 2023 (Hydro-Québec, 2022b). Grosse Île Wind Power L.P. will reduce annual GHG emissions from the diesel plant by 30,000 tonnes.

2. Project description

The Communauté maritime des Îles-de-la-Madeleine (CMIM) is composed of two municipalities: Grosse-Île and Les Îles-de-la-Madeleine. Grosse Île Wind Power L.P. is located on the private lands of Sel Windsor Ltée and within the territory of Grosse-Île, in the natural province of the Estuary and Gulf of the St. Lawrence. The wind turbines will be mainly located in dune environments. The Project is situated approximately 4 kilometres (km) northeast of the Dune du Nord Wind Farm (RÉGIM, 2024). The components of the environment are illustrated on the maps presented in Appendix A.

The Project consists of the construction and operation of the wind farm, with a contractual capacity of 16.8 MW and a maximum production capacity of 29.4 MW (Table 1). The configuration presented includes four to seven wind turbines, their access roads, and an underground collector system connecting the wind farm to a substation.

Table 1. Technical description of the Grosse Île Wind Power L.P.

Characteristics	Value
Contractual capacity of the wind farm	16,8 MW
Maximum production capacity	29,4 MW
Number of wind turbines	4 to 7
Wind turbine model and manufacturer	Enercon E82 or Vestas 117 or Vestas 136
Wind turbine color	White
Wind turbine shape	Slender and tubular
Planned access road	Directly from Route 199
Land tenure	Public and/or private (Municipality of Grosse-Île)
RCM	Communauté maritime des Îles-de-la-Madeleine
Main land uses	Industrial, recreational

2.1.1. Site selection and configuration variants

The two configuration variants of the Project represent the maximum versions in terms of the number and size of the wind turbines, for a maximum capacity of 29.4 MW. These variants consider environmental and technical parameters as well as the interests of stakeholders and the community.

The Proponent is in discussions with the *ministère des Transports et de la Mobilité durable* (MTMD) regarding the use of the road built in 2023 for the MTMD's sand storage project, as an access road to the wind turbines within Grosse Île Wind Power L.P. According to the agreement

reached with the MTMD, the configuration of Grosse Île Wind Power L.P. will be optimized to promote the use of the existing access and, consequently, reduce the areas required during the construction phase.

The Proponent is in discussions with wind turbine manufacturers and will select a model capable of withstanding the environmental conditions of the Magdalen Islands.

For the purposes of this environmental impact study, the project characteristics were determined conservatively by considering the infrastructure associated with the maximum variant of seven wind turbines as well as the maximum characteristics of a wind turbine. For example:

- The impact of preparing the turbine installation areas were analyzed using a work area (installation and lifting of the tower and blades) characteristic of large models, (i.e., 1 hectare (ha)).
- The visibility of the wind turbines in the landscape were analyzed based on a nacelle height of 99 metres (m) and a total height of 168 m.
- The impact of wind turbine noise on the ambient soundscape was assessed using a sound level emitted by a wind turbine among the highest, namely 110 dBA.

The planned wind turbine installation locations meet a set of parameters aimed at optimizing the productivity of the wind farm while reducing or eliminating anticipated impacts on the environment and on community members (Table 2; Map QC-46 in Appendix A).

Table 2. Configuration parameters for the Grosse Île Wind Power L.P.

Element	Source	Applicable distance to a wind turbine (m)
<i>Physical</i>		
Permanent watercourse and lake	RADF	60
Intermittent watercourse	RADF	30
Wetland (open bog with pool, marsh, riparian swamp)	RADF	60
Lake, pond, bay, lagoon, Gulf of St. Lawrence	SADR	50
<i>Human</i>		
Dwelling	Municipalité des Îles-de-la-Madeleine	500
Local road	Municipalité des Îles-de-la-Madeleine	50
Regional road	Municipalité des Îles-de-la-Madeleine	150
Airport	Municipalité des Îles-de-la-Madeleine	3 000
Snowmobile or ARV trails	Municipalité des Îles-de-la-Madeleine	50
Property boundary	Municipalité des Îles-de-la-Madeleine	2,5

Source : (Municipalité des Îles-de-la-Madeleine, [n.d.]-b)

The total height of the wind turbine will vary depending on the model selected. It is estimated at 168 m in this study.

Setback distances taken from the Specific Provisions Related to Wind Energy Production in Zoning By-law No. 2010-08 of the Municipality of Les Îles-de-la-Madeleine (Municipalité des Îles-de-la-Madeleine, 2022).

RADF: Regulation respecting the sustainable development of forests in the domain of the State (CQLR c. A-18.1, r. 0.01)

SADR: revised land use and development plan

2.1.2. Construction phase

In addition to development activities, implementation of Grosse Île Wind Power L.P. is divided into three phases: construction, operation, and decommissioning.

The construction phase includes the following activities:

- Preparation of the required areas: A work area of up to 1 ha is planned for the installation of each wind turbine (Table 3). The running surface of the access roads will be approximately 13 m wide, and the right-of-way will be cleared over this width. This right-of-way may be wider depending on technical constraints related to the terrain.
- Construction and improvement of access roads and work areas: Construction work includes spreading, soil excavation, installation of culverts as needed, shaping of the access road, compaction of the running surface, ditch profiling, and slope stabilization. Improvement work on the existing road will range from simple grading to work similar to new construction, except for the required areas.

- Transportation and traffic: Wind turbine components, heavy machinery, materials, and equipment required for the activities will be transported by truck. Workers will circulate daily.
- Installation of equipment: The collector system will be underground and buried along the roads where possible. The wind farm will be connected to a substation occupying approximately 0.1 ha, and wind farm maintenance will be carried out from the operations buildings (Appendix A, Map QC-46).
- Restoration of temporary work areas: The method will be chosen based on the characteristics of the affected dune system and the work carried out nearby by the MTMD.

Table 3. Areas required for the construction of the Grosse Île Wind Power L.P.

Project component	Area (ha)	
	4-turbine variant	7-turbine variant
Permanent area		
Wind turbine	4,0	6,9
Construction of new access roads	1,5	1,9
Improvement of existing access roads	0,2	0,8
Collector system	0,0	1,6
Substation	0,1	0,1
Subtotal (permanent areas)	5,8	11,3
Temporary areas		
Service areas and construction offices	0,0	0,0
Storage areas	0,0	0,0
Subtotal (temporary areas)	0,0	0,0
Total	5,8	11,3

The length and area of new access roads and existing access roads are estimated using a right-of-way width of 13 m.

The location and area of temporary workspaces will be determined during the final project configuration. The area of temporary workspaces will be approximately 0.1 ha.

2.1.3. Operation phase

The operation phase will last 30 years according to the terms of the supply contract. It includes:

- The presence and operation of the equipment. Maintenance of the equipment (inspection and preventive maintenance) will be carried out regularly according to the turbine manufacturer’s maintenance program.
- Maintenance of the access roads.

2.1.4. Decommissioning phase

The Proponent commits to decommissioning the wind farm at the end of the supply contract, unless it is renewed. The decommissioning phase includes:

- Transportation and circulation of workers, heavy machinery, and equipment to be removed from the site.
- Preparation of the required areas.
- Dismantling of the equipment.
- Restoration of the work areas and, where necessary, of the roads used, as well as stabilization of the dunes.

2.1.5. Project cost and schedule

The cost of implementing Grosse Île Wind Power L.P. is estimated at approximately 80 million dollars.

Up to 15 people could work on the construction site during the construction phase.

At the time the initial volumes of the environmental impact study were submitted, the Proponent anticipated the start of construction activities as early as August 2024 and commercial commissioning at the end of 2025. This schedule has been revised, following various communications, to target commissioning by the end of 2027.

3. Public consultation process

The Proponent ensures the integration of its project into the host environment. Social acceptability of Grosse Île Wind Power L.P. is a priority. The objectives of the public consultation process are to present the wind project to the host community and to gather comments, observations, interests, and concerns from the stakeholders and parties consulted. This approach allows for better integration of local issues during project development.

A liaison committee is active and includes members of the community who represent the Municipalities of Les Îles-de-la-Madeleine and Grosse-Île, the CMIM, environmental organizations, local businesses, and social organizations. The committee minutes are shared on the Parc éolien de Grosse Île S.E.C. website.

The Proponent has met with local stakeholders, where their interests and concerns were heard from the earliest stages of project development. Several public consultations were conducted with the general population to identify any issues related to the Project and to understand community concerns regarding this development. Comments were also submitted during the government consultation carried out through the Environmental Assessment Registry on its website, following the filing of a project notice by the Proponent. The Proponent plans an additional meeting with stakeholders after the decree, before construction.

The main issues and concerns raised during these meetings are considered in the development of the Project. They were primarily related to the following:

- Positive economic benefits for the Magdalen Islands.
- Creation of local jobs.
- Reduction of GHG emissions and the fight against climate change.
- Protected plant habitat of the Dune-du-Nord and protection of Conrad's crowberry.
- Protection of the dune environment and coastal erosion.
- Preservation of the groundwater table.
- Protection of wetlands and waterbodies.
- Noise disturbance.
- Visual impacts.

The CMIM held two public consultations to amend its land use plan in order to allow the installation of wind turbines in the dune environment of the Dune du Nord in Grosse-Île. The configuration of Grosse Île Wind Power L.P. was adjusted to avoid the Dune-du-Nord plant habitat.

4. Considerations associated with the project

The Proponent plans to develop Grosse Île Wind Power L.P. by integrating the considerations discussed during the project-related information and consultation activities with stakeholders and the public. In addition, the experience gained during the development of the Dune du Nord Wind Farm, located near the study area, strengthens its understanding of the considerations specific to the island environment and to the Grosse Île Wind Power L.P. The Proponent is committed to integrating its project within a sustainable development approach, respecting the three objectives defined by the MELCCFP: environmental protection, economic efficiency, and social equity (MELCCFP, 2023a).

The main considerations raised by the Proponent, citizens, and consulted stakeholders are as follows:

- Ecological considerations:
 - Protection of the biodiversity of the dune ecosystem,
 - Protection of the dune and coastline,
 - Protection of wetlands and waterbodies,
 - Fight against climate change.
- Economic considerations:
 - Economic benefits and energy resource,
 - Maintenance of land uses.
- Social considerations:
 - Maintenance of quality of life and landscapes,
 - Protection of built and archaeological heritage.

These considerations were taken into account in the impact assessment described in Section 5 of this summary, which also accounts for the questions and comments from the ministries and agencies concerned (Volumes 4, 5, and 6). During this process, the Proponent enhanced efforts to avoid various impacts, deepened the study of the receiving environment, and made specific commitments.

5. Impact analysis, mitigation and compensation measures

The assessment of the environmental impacts of Grosse Île Wind Power L.P. begins with determining the potential interrelations between the Project activities and the components of the environment. Table 4 summarizes these interrelations, whether significant or not. In some cases, an activity may not be interrelated with a given component. The impacts resulting from significant interrelations are described in this section.

5.1. Standard mitigation measures

From the design stage of the Project, the Proponent integrated standard mitigation measures to reduce the potential impact of the wind farm on the environment and to address the identified considerations. Some measures are based on common practices in Québec's wind industry. For example, the rules set out in the RADF will be applied during the construction of roads to protect the aquatic environment.

Several standard mitigation measures aimed at reducing impacts on the environment have been implemented or will be applied during the authorization application process, in accordance with the *Règlement sur l'encadrement d'activités en fonction de leur impact sur l'environnement* (REAFIE), or during the construction of the wind farm.

Table 4. Matrix of interrelations between activities and environmental components of Grosse Île Wind Power L.P.

Phases and sources of impacts considerations	Ecological considerations												Economic considerations			Social considerations						
	Protection of the biodiversity of the dune ecosystem							Protection of the dune and coastline	Protection of wetlands and waterbodies				Fight against climate change	Economic benefits and energy resources			Maintenance of land uses			Maintenance of quality of life and landscapes		
	Vegetation of dune environments	Plant species with special status	Birds	Bats	Terrestrial mammals	Fish ¹	Amphibians and reptiles		Wildlife species with special status	Aquatic environment and fish habitat	Wetlands	Groundwater and drinking water		Soils (excluding erosion and dune system)	Economic benefits and energy resources	Land use	Public utility infrastructure	Telecommunication systems	Air (sand and dust)	Soundscape	Landscape	Protection of built and archaeological heritage
Construction																						
Preparation of required areas																						
Construction and improvement of access roads and work areas																						
Transportation and traffic																						
Installation of equipment																						
Restoration of work areas																						
Operation																						
Presence and operation of equipment																						
Maintenance of equipment and access roads																						
Decommissioning																						
Transportation and traffic																						
Preparation of required areas																						
Dismantling of equipment																						
Restoration of work areas																						

1. The impacts on fish are assessed in section 5.4.1 (*Aquatic environments and fish habitat*).

When an activity and a component have several types of interrelations, the most significant interrelation is indicated in the table. Only the components that have an interrelation with at least one of the project activities appear in this table.



Significant interrelation



Non-significant interrelation



No interrelation

5.1.1. Biological Environment

Avoidance of sensitive ecological environments and periods:

- Plan the alignment of access roads to avoid wetlands as much as possible. The ecological characterization of this area made it possible to locate the infrastructure while limiting encroachment into wetlands.
- Plan the work to limit disturbances to the hydrological regime of wetlands. Carry out the work while considering surface runoff and the water supply to wetlands.
- As much as possible, prepare the required areas and widen the road on the side opposite the wetlands, while protecting existing vegetation between the infrastructure and these environments.

Reduction of the areas used:

- Use existing roads as much as possible to reduce the areas required.
- Characterize wetlands and water environments during a field visit before the start of construction work.
- Avoid digging drainage ditches near wetlands to limit the lowering of the water table.
- Restore the temporary areas used during construction (storage areas, service area and construction offices, concrete manufacturing site).

Prevention of the introduction of invasive alien plant species (IAS) in the wind farm installation area. The Proponent plans to:

- Require contractors to clean excavating machinery coming from another region before entering the CMIM territory.
- Include photos of IAS in the construction monitoring guide to facilitate detection of these species by personnel during construction and operation work.
- Require personnel responsible for maintenance and monitoring during operation to consult the list of IAS that could establish themselves on the site and to inform the Proponent of any discovery.
- Notify the MELCCFP in the event of a discovery of IAS during regular construction or operation work and avoid moving soils containing IAS to another site.

5.1.2. Physical environment

Reduction of the areas used:

- Plan the alignment of access roads to avoid wetlands.
- Conduct a field validation before the work to minimize the areas to be used.
- Avoid operating machinery and vehicles outside the planned roads and work areas for the Project.

Avoidance of sensitive ecological environments and periods:

- When the road crosses a wetland, promote the free flow of surface water within the wetland on both sides of the infrastructure by installing drainage culverts. For example, a geogrid/geomembrane could be placed under the road embankment to create a rigid platform that distributes the load over a larger area. This measure would reduce the vertical pressure on the soil and maintain porosity, allowing water to percolate through.
- When the existing road to be improved borders a wetland, waterproof the embankment section located at the wetland boundary to prevent water from flowing through the road base. This measure reduces impacts on the wetland's hydrological regime by ensuring the maintenance of the water table level.
- Stabilize slopes, dunes, and sources of sediment input to wetlands and waterbodies within the band used for work areas. If necessary, slopes will be covered with soil and seeded to encourage vegetation regrowth. Indigenous species will be favored for soil revegetation. Dune stabilization and rapid revegetation of slopes will help prevent the spread of invasive alien species (IAS).

Construction site safety measures:

- Handle, transport, and store hazardous materials in compliance with regulations.
- Regularly inspect heavy machinery and ensure its proper functioning.

Waste reduction:

- Reuse material from stripping activities as backfill, fill, or finishing material during other work or during site restoration, to reduce the amount of material required at construction and decommissioning sites.

Reduction of contamination risks:

- Use, when necessary, devices to limit the dispersion of sediments outside the work area (sediment barriers, use of straw covering, and dust suppressants).
- Equip heavy machinery with spill response kits.
- Avoid refueling with petroleum products and washing vehicles and machinery within 60 m of waterbodies and the shoreline.
- Manage used oils and greases in accordance with applicable regulations.

Restoration of the work area

- Grading of work areas and road rights-of-way at the end of the work, when necessary.

5.1.3. Human environment

Construction site safety measures:

- Oversized convoys and trucks transporting the blades and tower sections of the wind turbines will be accompanied by escort vehicles.
- Establish a transportation plan for the wind turbine components and comply with MTMD standards.
- Design turbine marking in accordance with Transport Canada standards.
- Install signage on the site along the road network and around the work areas.

Reduction of nuisances during construction:

- Respect vehicle speed limits.
- Use dust suppressants (water or other products recognized by the MELCCFP) to limit dust emissions, particularly during dry conditions.
- Conduct noise monitoring during construction and comply with the noise levels recommended by the MELCCFP for construction sites.
- Comply with applicable health and safety standards on a wind farm construction site.

Restoration of work areas:

- Remove unused materials and debris from the site so that they may be recycled, recovered, or, as a last resort, disposed of in authorized facilities.
- Favor underground installation of the electrical cables of the collector system.

Reduction of archaeological and landscape risks:

- If a cultural property or archaeological site is discovered during the work, immediately stop work at that location, notify the Ministry of Culture and Communications (MCC) without delay, and await instructions from the Ministry before resuming work there.

Communication:

- Provide regular updates to the public on the progress of the work (completed and planned activities) through a website or construction updates.

5.2. Protection of the biodiversity of the dune ecosystem

5.2.1. Vegetation of dune environments and plant species with special status

Description of the environment

The study area is located in the bioclimatic domain of the balsam fir–white birch stand, Eastern subdomain (MFFP, 2003; Morneau, 2021). The forested environment covers 14.5% of the study area and is primarily composed of balsam fir stands (12.1%), mainly located on Rock Mountain. The study area is predominantly composed of shrub vegetation of dune environments (40.7%) (Appendix A, Maps 3 and 10). The dune stabilized by shrub or wooded vegetation constitutes the preferred habitat of Conrad’s crowberry, a species unique to the Magdalen Islands.

The *Centre de données sur le patrimoine naturel du Québec* (CDPNQ) reports three plant species with special status in the study area (Gouvernement du Québec, 2023a) : Gulf of St. Lawrence aster, Ontario beggar-ticks, and Conrad’s crowberry.

Pursuant section 17 of the *Act respecting threatened or vulnerable species* and the *Act respecting the conservation and development of wildlife* (CQLR, c. C-61.1), the population of Conrad’s crowberry on the Dune du Nord is protected by the Dune-du-Nord plant habitat (CDPNQ, 2021). This plant habitat has a total area of 259.47 ha, of which 10 ha were removed following the installation of the Dune du Nord Wind Farm, authorized under Decree 611-2019 (Gouvernement du Québec, 2023b). The study area includes 180.4 ha of the Dune-du-Nord plant habitat. Surveys of Conrad’s crowberry plants were conducted in 2022 and 2023 in the northern portion of the plant habitat and in a northwestern portion outside the habitat. Conrad’s crowberry occupies a total area of 2,638.5 m² within the 69.0 ha surveyed in 2022 and 2023, including 607 colonies in the surveyed portion of the plant habitat.

Twenty-five occurrences of invasive alien species (IAS) were reported in the study area, all located south and west of Grosse Île Bay (MELCC, 2020a), including reed canarygrass (*Phalaris arundinacea*), Sakhalin knotweed (*Reynoutria sachalinensis*), Japanese knotweed (*Reynoutria japonica*), and purple loosestrife (*Lythrum salicaria*). White bedstraw (*Galium mollugo* L.) and common reed (*Phragmites australis*) have also been recorded near the study area (MELCC, 2020a).

Impact analysis and mitigation measures

During the construction phase, the Project plans to use an area of 11.3 ha, divided into work areas and road sections. This area will be smaller once the wind turbine model and number have been determined, and the road alignment has been confirmed with the MTMD. Additional area will be required for the location of temporary work areas, this area is estimated to be approximately 0.1 ha. These locations will be situated near the planned work areas and will avoid plant species with special status.

The configuration was optimized to avoid the Dune-du-Nord plant habitat and the Conrad's crowberry plants (Appendix A, Map 10). No Conrad's crowberry plants are present within the planned project rights-of-way. Markers will be installed to delineate permitted circulation zones and thus protect the plants located near the project rights-of-way.

The impact during construction will result in the clearing of shrub vegetation and the exposure of soils within the planned rights-of-way and temporary areas. The areas required for the construction of the wind farm are mainly planned in the most abundant environments of the study area, namely dry bare and semi-bare areas (Appendix A, Map 3).

During the decommissioning phase, a work area around each wind turbine will again need to be cleared to allow for the dismantling of the turbines. Road rights-of-way may need to be widened to facilitate the circulation of heavy trucks transporting large turbine components out of the site.

The magnitude of the anticipated impact on dune vegetation and plant species with special status will be low given the mitigation measures, the maximal use of bare areas, the effort to reduce the required areas, and the optimization of the project configuration.

5.2.2. Birds

Description of the environment

In addition to the various surveys conducted in 2017 in the Dune-du-Nord, the Proponent carried out bird surveys in 2022, 2023, and 2024 in the study area. About one hundred bird species are present or potentially present in the study area, including 7 raptor species observed during migration periods, 97 terrestrial and coastal bird species, and 10 waterfowl species. No migration corridor was identified during the surveys.

Within the study area, 23.78 ha are identified as Horned grebe habitat, as defined by the *Règlement sur les habitats fauniques* (chapter C-61.1, r. 18) of the *Act respecting the conservation and development of wildlife*, and 0.63 ha is designated as critical habitat for the melodus subspecies of the piping plover (Gouvernement du Canada, 2022) (Appendix A, Map QC2-09).

Impact analysis and mitigation measures

Construction and decommissioning

The construction and decommissioning activities of the wind farm may disturb birds, primarily nesting birds, due to noise generated by the presence of workers and machinery (Allison *et al.*, 2019; Pearce-Higgins *et al.*, 2012; Strickland *et al.*, 2011). Since this disturbance will be intermittent and temporary, the magnitude of the anticipated impact is considered low. As a specific mitigation measure, the Proponent plans, as much as possible, to schedule the work outside the migratory bird nesting period, which extends from April 15 to August 31.

The preparation and exposure of the areas required for construction and decommissioning will contribute to modifying the nesting habitat of certain bird species, particularly ground-nesting species. The project configuration is optimized to reduce the areas used, notably by minimizing the size of work areas to what is strictly necessary and by favoring the use of existing roads. Given the planned areas and the availability of replacement habitats, the magnitude of the impact on bird habitat is considered low. The impact on species with special status is assessed in Section 5.2.6.

If work is required during the nesting period, the Proponent will inform the MELCCFP, collaborate with the Ministry, present the survey methodology, and demonstrate that the conditions outlined in the Guidelines to Avoid Disturbing Migratory Birds are met. If these conditions are not met, the Proponent will contact Environment and Climate Change Canada (ECCC) to determine an adapted monitoring method. Several measures presented in Section 6.4.2 of Volume 4 will be implemented and included in the environmental monitoring program, the preliminary version of which will be submitted no later than at the environmental acceptability review stage.

Operation

During the operation phase, based on information provided by the proponent of the Dune du Nord Wind Farm, bird mortality was estimated at 25.5 individuals/turbine/year. The carcass persistence test indicated a significant presence of predators at that wind farm, which may lead to an overestimation of mortality rates. In Québec, monitoring conducted at operating wind farms shows low bird mortality rates, with an average estimated at 1.6 birds/turbine/year (Féret, 2016). During the surveys conducted in the study area of Grosse Île Wind Power L.P. raptor passage rates during migration were low, and no important migration corridor or stopover site was detected. Consequently, the magnitude of the anticipated impact on birds during operation is considered low.

The Proponent commits to installing lighting markers only on turbines subject to Transport Canada regulations. These installations will follow Standard 621 of the Canadian Aviation Regulations (CAR–SOR/96-433) for wind turbines with a total height greater than 150 m. If required, brief regular flashlights with the minimum number of flashes per minute and the shortest allowable flash duration will be used. This measure will help minimize collision risks for avian wildlife (all species combined).

Bird mortality monitoring will be carried out during the operation of the wind farm, as required for every wind farm in Québec. The monitoring program will comply with the standards established by government authorities (MDDEFP, 2013). This detailed program will be submitted as part of the authorization application for the operation of the wind farm. In addition, the use of the wind farm by birds will be monitored during the operation phase.

5.2.3. Bats

Description of the environment

In addition to the various surveys conducted in 2017 in the Dune-du-Nord, the Proponent carried out bat surveys in 2022, 2023, and 2024, identifying three species in the study area: the hoary bat, the little brown bat, and the silver-haired bat.

Impact analysis and mitigation measures

Construction and decommissioning

The surveys indicate that the wind turbine installation area contains no structures suitable for bat roosting. The Proponent plans, as much as possible, to carry out all construction and decommissioning activities in the work areas and along the roads during daylight hours. Consequently, the magnitude of the anticipated disturbance impact is considered low during the construction and decommissioning phases.

The surveys conducted in 2017, 2022, 2023, and 2024 reveal very low bat activity within or near the study area. The study area borders the Gulf of St. Lawrence and is primarily composed of bare and semi-bare environments. It is therefore highly exposed to wind and poorly suited to bat activity. No forest stands are present in the wind turbine installation area (Appendix A, Map 10). Due to the absence of suitable bat habitat in the wind turbine installation area and the low level of activity recorded on-site during the surveys, the magnitude of the anticipated impact on bat habitat during the construction and decommissioning phases is considered low.

Operation

According to information provided by the proponent of the Dune du Nord Wind Farm, no bat carcasses were found during the first year of mortality monitoring. In 2017, 2022, 2023, and 2024, surveys confirmed the low abundance of bats in and near the wind turbine installation area. Considering this information, the magnitude of the anticipated impact on bat mortality during the operation phase is considered low.

Bat mortality monitoring will be carried out during the operation of Grosse Île Wind Power L.P. The monitoring program will comply with the standards established by government authorities (MDDEFP, 2013) and will be submitted as part of the authorization application for the wind farm's operation.

5.2.4. Terrestrial mammals

Description of the environment

Based on data from the scientific literature as well as from the ministries and stakeholders consulted, 15 terrestrial mammal species—5 small and medium-sized species and 10 micromammal species—are potentially present in the study area.

Impact analysis and mitigation measures

Construction and decommissioning

During construction and decommissioning, the presence of workers and machinery, as well as associated noise, may disturb terrestrial mammals (Kaseloo & Tyson, 2004; Radle, 1998; Shannon *et al.*, 2016). Coyotes, foxes, and micromammals adapt well to human presence and use disturbed habitats (Elliot *et al.*, 2016). The scheduled work period will extend from August 1, 2024, to December 1, 2025, covering 14 months. Given the planned duration of the work and its location in habitat already disturbed by human activities, the magnitude of the anticipated disturbance impact on terrestrial mammals during construction is assessed as low.

Each wind turbine work area will create an opening of up to 1 ha in the dune environment. Such openings may affect micromammal habitat. In the Magdalen Islands, mammal populations are primarily represented by foxes, coyotes, and micromammals. Generalist mammals, which are not dependent on a specific habitat type or prey type—such as coyotes—are minimally affected by slight habitat modification, as they use a variety of environments, including disturbed or regenerating areas. Given the area required in a territory already subject to industrial activity, and the limited impacts on mammals, the magnitude of the anticipated impact on terrestrial mammal habitat during construction and decommissioning is considered low.

Operation

During the operation phase, the noise and blade movement of the wind turbines may disturb certain terrestrial mammals. Responses to noise vary among species depending on environmental conditions and the nature of the noise (Kaseloo & Tyson, 2004). Animals may become accustomed to various noise sources, particularly when they emit at slow and regular levels (ISRE, 2000; Radle, 1998; Shannon *et al.*, 2016). Furthermore, daily field experience shows that different species continue to frequent areas near human activities that generate noise. According to information provided by the proponent of the Dune du Nord Wind Farm, mammals continue to frequent the territory during operation. Considering the above, the magnitude of the anticipated impact on terrestrial mammals during the operation phase is considered low.

5.2.5. Amphibians and reptiles

Description of the environment

The study area contains terrestrial and aquatic habitats suitable for amphibians and reptiles. Seven amphibian species and one reptile species are potentially present.

Impact analysis and mitigation measures

The project involves 0.2 ha of right-of-way within wetlands, representing 1.6% of the wetlands in the wind turbine installation area (Appendix A, Map 10). Grosse Île Wind Power L.P. is configured to reduce the required areas to limit habitat fragmentation for amphibians and reptiles. The magnitude of the anticipated impact on the habitat of these species during construction and decommissioning is considered low.

5.2.6. Wildlife species with special status

Description of the environment

In addition to the various surveys conducted in 2017 in the Dune-du-Nord, the Proponent conducted bird and bat surveys in 2022, 2023, and 2024. The description of species potentially present in the study area of Grosse Île Wind Power L.P. is based on the results of these surveys and on data from, among other sources, the scientific literature and the ministries and stakeholders consulted. A total of 21 wildlife species with special status are potentially present in the study area (Table 5).

Impact analysis and mitigation measures

Construction and mitigation measures

During construction, the preparation of required areas and noise associated with the presence of workers and machinery may affect wildlife species with special status. Grosse Île Wind Power L.P. is configured to avoid wildlife habitats of species with special status.

Several specific mitigation measures, related to each vulnerable bird species (including the horned grebe and the piping plover), will be implemented. These measures are described in greater detail in Sections 6.4.6 of Volumes 1 and 4. Considering the implementation of mitigation measures and the scheduling of work outside the nesting period, the magnitude of the anticipated disturbance impact on wildlife species with special status during construction and decommissioning is considered low.

Exploitation

During the operation phase, the anticipated impacts on wildlife species with special status are related to collision risks. According to information provided by the proponent of the Dune du Nord Wind Farm, no special-status species were found during the first year of mortality monitoring at that wind farm. The potential collision risk for wildlife species of special status with the turbines of Grosse Île Wind Power L.P. is therefore low. Consequently, the magnitude of the anticipated impact on species with special status during the operation of Grosse Île Wind Power L.P. is considered low.

Bird and bat mortality monitoring will be carried out during the operation of the wind farm. The monitoring program will comply with the standards established by government authorities (MDDEFP, 2013) and will be submitted as part of the authorization application for the operation of the wind farm.

The Proponent commits to presenting, no later than at the beginning of the environmental acceptability stage of the project, the measures that will be implemented from the start of wind farm operation to reduce collision risks for avian wildlife. These measures may include, for example, temporary adjustments to turbine operations during periods considered more sensitive (migration, breeding, poor visibility conditions).

Table 5. Impacts of preparing the required areas on special-status species potentially present in the study area.

Species	Status	Presence in the study area	Potential habitat in the study area (ha)	Project footprint within potential habitat (ha)	Estimated number of breeding pairs within the project footprint	Expected residual impact	Explanation
	Provincial SARA COSEWIC						
Bird							
Harlequin duck (<i>Eastern population</i>)	Vulnerable Special concern Special concern	Confirmed	0,0	0,0	n/a	Not significant	The species was observed at the Grosse-Île-Nord observation site in November 2022. The species nests along watercourses and coastal estuarine sites, then moves to coastal regions for molting and wintering. No potential nesting habitat for the species is present in the study area. The project footprint is planned outside of the aquatic environment, and the wind turbine installation sites are located more than 90 m from the shoreline.
Hudsonian godwit	– – Threatened	Confirmed	11,2	0,2	0,1	Low	The species was observed during the nesting period in the study area (Volume 3, Study 5). The species nests on the ground and uses coastal wetlands, mudflats, freshwater marshes, saline lakes, flooded fields, and shallow ponds. It is estimated that the wind turbine installation area contains 11.2 ha of potential habitat for nesting and migration of the species. The Project involves encroachment into 0.2 ha of this potential habitat, representing a loss of 2.0% of the potential habitat available in the wind turbine installation area. Since the primary breeding range of the Hudsonian Godwit is located in the boreal region of Canada, the likelihood of this species nesting in the study area is low. It is estimated that 0.1 breeding pair could be affected by habitat modification. The Proponent has committed to applying the “avoid–minimize–compensate” sequence with the objective of achieving no net loss of wetland or waterbody area. Efforts to avoid wetlands are detailed in Section 6.6 of Volume 1. The preparation work for the required areas will be carried out, as much as possible, outside the nesting period, which extends from April 15 to August 31. A search for nests within the planned project right-of-way, located in habitats suitable for the species, will be conducted prior to the start of the work. If nests are found, they will be marked and protected.

Species	Status	Presence in the study area	Potential habitat in the study area (ha)	Project footprint within potential habitat (ha)	Estimated number of breeding pairs within the project footprint	Expected residual impact	Explanation
	Provincial SARA COSEWIC						
Red knot (rufa subspecies)	SDMV Endangered Endangered	Confirmed	3,6	< 0,01	n/a	Not significant	The species was not observed during the surveys conducted in 2017, 2022, and 2023 (Volume 3, Study 5). Its presence was reported at the Grosse-Île-Nord observation site in September 2022. The species uses the Magdalen Islands during its migratory stopovers and frequents coastal habitats, primarily sandy beaches. The wind turbine installation sites are located more than 90 m from the shoreline. It is estimated that the wind turbine installation area contains 3.6 ha of potential habitat for the species during migration. The project involves encroachment into less than 0.01 ha of this potential habitat, representing a loss of 0.07% of the potential habitat available in the wind turbine installation area.
Nelson's sparrow	SDMV – Not at risk	Probable	2,1	0,0	0,0	Low	One individual was observed during the nesting period in the 2017, 2022, and 2023 surveys (Study 5 of Volume 3 and Appendix B of Volume 4). The species nests in salt or brackish marshes along coasts or islands. It is estimated that the wind turbine installation area contains 2.1 ha of potential nesting habitat for this species. The project footprint is planned outside of this potential habitat; therefore, no breeding pair is expected to be affected by habitat modification. The Proponent has committed to applying the “avoid–minimize–compensate” sequence with the objective of achieving no net loss of wetland or waterbody area. The preparation work for the required areas will be carried out, as much as possible, outside the nesting period, which extends from April 15 to August 31. A search for nests within the planned project right-of-way, located in habitats suitable for the species, will be conducted prior to the start of the work. If nests are found, they will be marked and protected.

Species	Status	Presence in the study area	Potential habitat in the study area (ha)	Project footprint within potential habitat (ha)	Estimated number of breeding pairs within the project footprint	Expected residual impact	Explanation
	Provincial SARA COSEWIC						
Peregrine falcon	Vulnerable Special concern Not at risk	Confirmed	0,0	0,0	0,0	Low	The species was observed eight times, during nesting and fall migration periods, in the 2017, 2022, and 2023 surveys. No nesting habitat (cliffs, ledges, suitable structures) is present in the wind turbine installation area; therefore, no breeding pair is expected to be affected by habitat modification. The wind turbine installation area includes 10.3 ha of marshes, which may provide suitable foraging habitat for the species. The project involves encroachment into less than 0.1 ha of these marshes.
Horned grebe (Magdalen Islands population)	Threatened Endangered Endangered	Confirmed	n/a	n/a	n/a	Low	The species was not observed during the targeted surveys conducted in 2017, 2022, and 2023. The study area includes 23.78 ha of habitat for the horned grebe, as defined by the Regulation respecting wildlife habitats. This habitat includes a network of ponds with nesting potential, sites where the species has been observed feeding, and sites where it is likely to have nested. All project infrastructure is planned outside of the species' habitat and aquatic environments. The mitigation measures implemented to limit impacts on this species and its habitat are detailed in R 44 of Volume 4 and reiterated in Volume 6 and in this volume.
Bicknell's thrush	Vulnerable Threatened Threatened	Unlikely	0,0	0,0	n/a	None	The species was not observed in the study area during the 2017, 2022, and 2023 surveys. The species has not been observed in the Magdalen Islands for 10 years. No suitable habitat for the species is present in the wind turbine installation area.
Evening grosbeak	– Special concern Special concern	Confirmed	0,0	0,0	n/a	Not significant	The species was observed in the study area in 2022, outside the targeted surveys (Volume 3, Study 5); however, was not observed during the 2017 or 2023 surveys. The species nests in mature, open mixed forests dominated by balsam fir or white spruce. No potential nesting habitat is present in the wind turbine installation area.

Species	Status Provincial SARA COSEWIC	Presence in the study area	Potential habitat in the study area (ha)	Project footprint within potential habitat (ha)	Estimated number of breeding pairs within the project footprint	Expected residual impact	Explanation
Short-eared owl	SDMV Special concern Threatened	Unlikely	10,3	< 0,1	n/a	None	The species was not observed during the targeted surveys conducted in 2017, 2022, 2023, and 2024. The last record of the species in the Dune-du-Nord dates from 1990, according to the QuébecOiseaux Species at Risk Monitoring database. The species uses marshes, wet meadows, and agricultural lands. The wind turbine installation area includes 10.3 ha of marshes. The Project involves encroachment into less than 0.1 ha of marsh habitat. The Proponent has committed to applying the “avoid–minimize–compensate” sequence with the objective of achieving no net loss of wetland or waterbody area.
Bank swallow	– Threatened Threatened	Probable	–	–	–	Low	The species was observed 265 times in 2023, during the nesting period and spring migration, in the study area (Volume 4, Appendix B). All bank swallows were observed around Grosse Île Bay. The species was observed twice during the nesting period in the 2017 surveys. No bank swallows were observed during the 2022 surveys (Volume 3, Study 5). The species nests in vertical banks composed of substrates made of a mixture of sand and silt. The available mapping data do not allow identification of steep slopes potentially present within the dune system of the study area. Moreover, dune excavation during the construction of the wind farm and the operation of borrow pits could create suitable nesting habitat for the bank swallow. Consequently, if dune excavation or borrow pit operation occurs during the nesting period, the Proponent will consider the recommendations issued by ECCC — <i>Bank Swallow (Riparia riparia): In Sand and Gravel Pits</i> — and will implement the measures detailed in R-45e of Volume 4.
Barn swallow	– Threatened Special concern	Confirmed	0,0	0,0	n/a	Not significant	The species was observed once, during spring migration, in the 2023 survey. No barn swallows were recorded in the 2017 and 2022 surveys. Potential nesting habitat for the barn swallow includes urban areas and inhabited zones. No potential habitat for this species is present in the wind turbine installation area.

Species	Status	Presence in the study area	Potential habitat in the study area (ha)	Project footprint within potential habitat (ha)	Estimated number of breeding pairs within the project footprint	Expected residual impact	Explanation
	Provincial SARA COSEWIC						
Leach's storm petrel (Atlantic population)	SDMV – Threatened	Possible	0,0	0,0	n/a	Not significant	The species was not observed during the surveys conducted in 2017, 2022, and 2023. The species nests on the ground, in cavities. In the Magdalen Islands, the CDPNQ reports two breeding sites: on Brion Island and in the vicinity of Cap-aux-Meules and L'Étang-du-Nord. These breeding sites are located more than 27 km from the planned project infrastructure. If a nest of a species listed in Schedule 1 of the Migratory Birds Regulations (SOR/2022-105), such as the leach's storm-petrel, is discovered, the Proponent will contact ECCC to determine the measures to be implemented.
Lesser yellowlegs	– – Threatened	Confirmed	11,2	0,2	0,9	Not significant	The species was observed 19 times in 2023 and 26 times in 2022 during the nesting period (Study 5 of Volume 3 and Appendix B of Volume 4). The species nests on the ground and uses coastal wetland and aquatic habitats, marshes, and swamps. During migration, it uses a wide variety of coastal environments, including beaches. It is estimated that the wind turbine installation area contains 11.2 ha of potential habitat for the nesting and migration of the lesser yellowlegs. The Project involves encroachment into 0.2 ha of this potential habitat, representing a loss of 2.0% of the potential habitat available in the installation area. Since the primary breeding range of the lesser yellowlegs is in the boreal region of Canada, the likelihood of this species nesting in the study area is low. It is estimated that 0.9 breeding pair could be affected by habitat modification. The Proponent has committed to applying the “avoid–minimize–compensate” sequence with the objective of achieving no net loss of wetland or waterbody area. Efforts to avoid wetlands are detailed in Section 6.6 of Volume 1.
Piping plover (melodus subspecies)	Threatened Endangered Endangered	Probable	3,64	< 0,01	n/a	Not significant	The species was not observed during the surveys conducted in 2017, 2022, and 2023. The last record of the species near the Dune-du-Nord dates from 2014, according to the QuébecOiseaux Species at Risk Monitoring database. In Québec, the species nests exclusively on sandy, gravel, or pebble beaches of the Magdalen Islands.

Species	Status Provincial SARA COSEWIC	Presence in the study area	Potential habitat in the study area (ha)	Project footprint within potential habitat (ha)	Estimated number of breeding pairs within the project footprint	Expected residual impact	Explanation
							The project footprint is planned outside of all CDPNQ occurrences for this species. The Project involves encroachment into less than 0.01 ha of mapped potential habitats, representing a loss of 0.07% of the potential habitat available in the wind turbine installation area. Replacement habitats are available nearby. Mitigation measures related to the piping plover and its habitats are detailed in R-44 of Volume 4.
Bald eagle	Vulnerable – Not at risk	Probable	0,0	0,0	n/a	None	The species was not observed during the 2017, 2022, and 2023 surveys. No suitable nesting habitat for the Bald Eagle is present in the wind turbine installation area.
Rusty blackbird	SDMV Special concern Special concern	Confirmed	14,3	0,2	n/a	Low	The species was observed twice in 2022 and four times in 2023 during migration (spring and fall). Potential habitats for this species include wetlands. The wind turbine installation area contains 14.3 ha of wetlands. The project involves encroachment into 0.2 ha of wetlands, representing 1.6% of the potential habitats for the species present in the wind turbine installation area. The Proponent has committed to applying the “avoid–minimize–compensate” sequence with the objective of achieving no net loss of wetland or waterbody area. Efforts to avoid wetlands are detailed in Section 6.6 of Volume 1.
Yellow rail	Threatened Special concern Special concern	Possible	4,6	0,01	n/a	Not significant	The species was not observed during the 2017, 2022, and 2023 surveys. The species uses freshwater and brackish marshes. It is estimated that the wind turbine installation area contains 4.6 ha of potential nesting habitat for the yellow rail. The Project involves encroachment into 0.01 ha of this potential habitat, representing a loss of 0.2% of the potential habitat available in the wind turbine installation area. The Proponent has committed to applying the “avoid–minimize–compensate” sequence with the objective of achieving no net loss of wetland or waterbody area. Efforts to avoid wetlands are detailed in Section 6.6 of Volume 1.

Species	Status	Presence in the study area	Potential habitat in the study area (ha)	Project footprint within potential habitat (ha)	Estimated number of breeding pairs within the project footprint	Expected residual impact	Explanation
	Provincial SARA COSEWIC						
Roseate tern	Threatened Endangered Endangered	Probable	0,0	0,0	n/a	None	The species was not observed during surveys in 2017, 2022, and 2023. The species nests in colonies on small coastal islands. One breeding site is located approximately 7 km east of the study area. The wind turbine sites are located more than 90 m from the shoreline.
Mammal							
Hoary bat	SDMV – –	Confirmed	n/a	n/a	n/a	Low	See Section 6.4.3 of Volume 1.
Little brown myotis	– Endangered Endangered	Probable	n/a	n/a	n/a	Not significant	See Section 6.4.3 of Volume 1.
Fish							
American eel	SDMV – Threatened	Possible	n/a	n/a	n/a	None	The project footprint is planned outside of the aquatic environment.

SDMV: Susceptible d'être designee comme menaces ou vulnérables → Likely to be designated as Threatened or Vulnerable

5.3. Protection of the dune and the coastline

Description of the environment

Surficial deposits influence the distribution and growth of vegetation as well as the types of human activities that are possible. The surficial deposits present in the study area consist mainly of dunes and weathering deposits. According to ecoforestry data, the study area includes soils with imperfect, poor, or very poor drainage (Appendix A, Map 9).

The dune system of the Magdalen Islands exhibits a great diversity of dune forms, explained by numerous local factors such as the availability of sand particles, the morphological diversity of beaches, the diversity of vegetative cover, exposure to prevailing winds, proximity to areas of strong currents, and anthropogenic pressure (Houde-Poirier *et al.*, 2018 (mise à jour : 2022)). The Magdalen archipelago contains three types of aeolian forms: the foredune, the caoudeyre, and the parabolic dune. These forms, joined or superimposed, contribute to the formation of dune massifs. Six types of dune massifs have been characterized on the archipelago (Morin, 2000). This morphological diversity contributes to the variety of habitats present on the Dune-du-Nord.

The Magdalen Islands are subject to coastal erosion, resulting in a progressive shoreline retreat. The evolution of this phenomenon is monitored by the CMIM, which adopted its first intervention master plan in 2010 to delineate high-risk zones (ASSNAT et CMIM, 2020). In June 2023, the CMIM adopted the *Règlement constituant la Commission permanente sur l'érosion et la submersion côtières et en déterminant les règles de régie interne* (CMIM, 2023). The study area includes zones of constraints related to coastal erosion and land movements, as defined in the zoning bylaw (Municipalité des Îles-de-la-Madeleine, 2016). Grosse Île Wind Power L.P. has been designated as a priority intervention area in the CMIM's *Cadre d'intervention en érosion et submersion côtière*.

Impact analysis and mitigation measures

Dune system

The morphological diversity of the Dune-du-Nord dune system contributes to the diversity of habitats present in the study area. Exposing the soil over the areas required for the Project could lead to changes in the morphology of the dune system. During construction of the wind farm, the machinery used will, as much as possible, be equipped with rubber tracks to reduce soil compaction. Restoration of the work areas will include, if necessary, stabilizing the dunes located near the work areas and access roads.

During decommissioning, the work areas at each wind turbine location will be graded to promote the natural return of dune vegetation and to re-establish natural site drainage. As planned during the construction phase, the dunes may be stabilized if needed. In such cases, the stabilization method will be adapted to the characteristics of the dune system concerned.

Coastal erosion

The risks of coastal erosion and submersion over the lifespan of Grosse Île Wind Power L.P. were modeled by LasalleNHC (Volume 4, Appendix G).

The assessment of risk levels for coastal erosion and submersion hazards is presented in Table 6 for the moderate scenario and in Table 7 for the high scenario, for the 2050 and 2060 horizons.

This approach follows the steps described in the guides *Les changements climatiques et l'évaluation environnementale* (MELCC, 2021b) and *Élaborer un plan d'adaptation aux changements climatiques* (Ouranos et MELCCFP, 2024). The scope of this approach is limited to the infrastructure installation area and its surroundings, for the duration of the project (30 years). The methodology used to assess risk levels is based on the matrix suggested in Section 2 of the guide *Élaborer un plan d'adaptation aux changements climatiques*.

Adaptation measures were defined, considering the scope of the approach and these climate-related risks. Residual risk is defined as the level of risk after applying these adaptation measures. This residual risk was determined by applying the same matrix-based analysis after implementation of the adaptation measures.

Finally, based on the analyses and results of the study conducted by LasalleNHC, the risk levels established for erosion and submersion hazards and all adaptation measures described in Tables 6 and 7 remain appropriate and relevant for both the gulf side and the lagoon side. Consequently, the residual risk established through the application of these adaptation measures remains valid for both the gulf and the lagoon.

The Proponent commits to submitting, according to reasonable parameters to be defined with the MELCCFP at the beginning of the environmental acceptability stage, a modeling of erosion and submersion hazards that considers the impact of a potential breach of Route 199 in the event of a storm. The evaluation of residual risk for the Project, after applying the mitigation measures listed in Tables 6 and 7 of this volume, will be updated based on the results of this modeling.

As a preventive measure, the Proponent commits to conducting annual monitoring of the morphological evolution of the shoreline in the wind turbine installation area throughout the lifespan of the Project. This annual monitoring may be performed using drones or other surveying methods and will allow documentation of shoreline morphological changes and detection of any emerging vulnerable zones. In addition, the Proponent is currently analyzing different potential solutions to reduce the Project's exposure and risk regarding these hazards. These measures will be integrated into the design and detailed engineering phases of the project infrastructure. The Proponent commits to identifying these measures no later than the beginning of the environmental acceptability stage of the Project, as well as planning their implementation and associated costs, while ensuring the economic viability and resilience of the Project throughout its useful life.

Table 6. Assessment of risks associated with sea-level rise effects related to climate change for Grosse Île Wind Power L.P. and adaptation measures – Moderate scenario

Climate risk	Description of impact	Likelihood	Consequences in 2050	Consequences in 2060	Calculated risk 2050	Calculated risk 2060	Proposed adaptation measure	Estimated residual risk level
Lagoon side and gulf side								
Erosion risk	Coastal erosion and scour causing increased pressure on the wind turbine foundations and project infrastructure. Damage to infrastructure by wave action (wind turbine foundations, access roads, substation, etc.) that could lead to a shutdown of operations.	5	3	4	15	20	<p>1. Priority intervention zone:</p> <ul style="list-style-type: none"> The PEDGI project is identified as a priority intervention zone by the Communauté maritime des Îles-de-la-Madeleine (CMIM). <p>2. Assessment and implementation of technical resilience solutions:</p> <p>The Proponent is assessing various solutions aimed at increasing the resistance of the infrastructure to climate-related risks and extreme events, including:</p> <ul style="list-style-type: none"> Shoreline protection and stabilization. Oversizing of foundations to enhance structural integrity. Adaptation of anchoring systems to limit the effects of erosion and scour. Elevation of sensitive electrical infrastructure. Use of materials optimized for coastal conditions. <p>These measures are being evaluated based on their technical and economic feasibility and are intended to ensure the structural and functional longevity of the Project, even in the event of temporary submersion or failure of Route 199.</p> <p>3. Annual monitoring of shoreline evolution:</p> <p>Implementation of an annual shoreline monitoring protocol, including:</p> <ul style="list-style-type: none"> Drone surveys (topographic and photogrammetry). Detection and documentation of morphological changes along the shoreline. Systematic transmission of results to the competent authorities. <p>These results will be integrated into the CMIM's Coastal Erosion and Submersion Intervention Framework.</p> <p>4. Emergency and operational continuity plan:</p> <p>An emergency measures plan will be developed in collaboration with the relevant authorities and will include:</p> <ul style="list-style-type: none"> A specific intervention plan for extreme climate events. The establishment of a secure operational base on the archipelago. Planning of alternative logistical solutions, including the use of maritime transport if necessary. <p>These measures aim to ensure the operational safety and long-term resilience of the PEDGI project throughout its lifespan.</p>	4

Climate risk	Description of impact	Likelihood	Consequences in 2050	Consequences in 2060	Calculated risk 2050	Calculated risk 2060	Proposed adaptation measure	Estimated residual risk level
Submersion risk	<p>Partial, temporary flooding of access roads during storm events.</p> <p>Exceeding the drainage capacity of access roads and potential erosion of ditches.</p> <p>Partial and temporary submersion of work areas and infrastructure.</p> <p>Partial and temporary damage to infrastructure from small waves (scour).</p>	5	1	2	5	10	<p>1. Management of access roads:</p> <ul style="list-style-type: none"> Localized elevation of the most vulnerable sections of access roads to limit temporary flooding. Improved drainage: installation or enlargement of culverts and ditches to increase water evacuation capacity. Use of permeable or reinforced surfacing in low-lying areas to promote infiltration and reduce erosion. Periodic maintenance of the drainage network to prevent blockages. <p>2. Protection against erosion and scour:</p> <ul style="list-style-type: none"> Stabilization of ditches and embankments through vegetation adapted to coastal conditions. Use of materials resistant to corrosion and salt spray for exposed structures. <p>3. Prevention of impacts on work areas and infrastructure:</p> <ul style="list-style-type: none"> Elevation of wind turbine platforms and sensitive electrical infrastructure. Installation of emergency drainage systems (pumps). Scheduling of sensitive work outside periods with a heightened risk of storms. <p>4. Post-event monitoring and maintenance:</p> <ul style="list-style-type: none"> Systematic inspection of access roads, ditches, and infrastructure after each extreme event. Rapid repair of scoured or eroded areas. Updating of the coastal risk management plan based on field observations. <p>These measures aim to ensure the safety of operations and the resilience of the PEDGI project throughout its lifespan.</p>	3

Table 7. Assessment of risks associated with sea-level rise effects related to climate change for Grosse Île Wind Power L.P. and adaptation measures – High scenario

Climate risk	Description of impact	Likelihood	Consequences in 2050	Consequences in 2060	Calculated risk 2050	Calculated risk 2060	Proposed adaptation measure	Estimated residual risk level
Lagoon side and gulf side								
Erosion risk	Coastal erosion and scour causing increased pressure on the wind turbine foundations and project infrastructure. Damage to infrastructure by wave action (wind turbine foundations, access roads, substation, etc.) that could result in turbine shutdown.	4	4	5	16	20	<p>1. Priority intervention zone:</p> <ul style="list-style-type: none"> The PEDGI project is identified as a priority intervention zone by the Communauté maritime des Îles-de-la-Madeleine (CMIM). <p>2. Assessment and implementation of technical resilience solutions:</p> <p>The Proponent is assessing various solutions aimed at increasing the resistance of the infrastructure to climate-related risks and extreme events, including:</p> <ul style="list-style-type: none"> Shoreline protection and stabilization. Oversizing of foundations to strengthen structural integrity. Adaptation of anchoring systems to limit the effects of erosion and scour. Elevation of sensitive electrical infrastructure. Use of materials optimized for coastal conditions. <p>These measures are being evaluated based on their technical and economic feasibility and are intended to ensure the structural and functional durability of the Project, even in the event of temporary submersion or failure of Route 199.</p> <p>3. Annual monitoring of shoreline evolution:</p> <p>Implementation of an annual shoreline monitoring protocol, including:</p> <ul style="list-style-type: none"> Drone surveys (topographic and photogrammetry). Detection and documentation of shoreline morphological changes. Systematic transmission of results to the competent authorities. <p>These results will be integrated into the CMIM's Coastal Erosion and Submersion Intervention Framework.</p> <p>4. Emergency and operational continuity plan:</p> <p>An emergency measures plan will be developed in collaboration with the relevant authorities and will include:</p> <ul style="list-style-type: none"> A specific intervention plan for extreme climate events. Establishment of a secure operational base on the archipelago. Planning of alternative logistical solutions, including the use of maritime transport if necessary. <p>These measures aim to ensure operational safety and the resilience of the PEDGI project throughout its lifespan.</p>	4

Climate risk	Description of impact	Likelihood	Consequences in 2050	Consequences in 2060	Calculated risk 2050	Calculated risk 2060	Proposed adaptation measure	Estimated residual risk level
Submersion risk	<p>Partial, temporary flooding of access roads during storm events.</p> <p>Exceeding the drainage capacity of the road network and erosion of ditches.</p> <p>Partial and temporary submersion of work areas and infrastructure.</p> <p>Partial and temporary damage to infrastructure from small waves.</p>	4	2	3	8	12	<p>1. Management of access roads:</p> <ul style="list-style-type: none"> Localized elevation of the most vulnerable sections of access roads to limit temporary flooding. Improved drainage: installation or enlargement of culverts and ditches to increase water evacuation capacity. Use of permeable or reinforced surfacing in low-lying areas to promote infiltration and reduce erosion. Periodic maintenance of the drainage network to prevent blockages. <p>2. Protection against erosion and scour:</p> <ul style="list-style-type: none"> Stabilization of ditches and embankments using vegetation adapted to coastal conditions. Use of materials resistant to corrosion and salt spray for exposed structures. <p>3. Prevention of impacts on work areas and infrastructure:</p> <ul style="list-style-type: none"> Elevation of wind turbine platforms and sensitive electrical infrastructure. Installation of emergency drainage systems (pumps). Scheduling of sensitive work outside periods with a heightened risk of storms. <p>4. Post-event monitoring and maintenance:</p> <ul style="list-style-type: none"> Systematic inspection of access roads, ditches, and infrastructure after each extreme event. Rapid repair of scoured or eroded areas. Updating of the coastal risk management plan based on field observations. <p>These measures aim to ensure operational safety and the resilience of the PEDGI project throughout its lifespan.</p>	4

5.4. Protection of wetlands and water bodies

5.4.1. Water bodies and fish habitat

Description of the environment

The study area is located in the Gulf of St. Lawrence. According to the Québec multi-scale hydrographic basin database, the study area contains no watershed (MELCCFP, 2023c). The Project's footprint also does not contain any lakes (Appendix A, Map 9).

The ponds and lagoons of the Îles-de-la-Madeleine may potentially be used by six fish species, including the American eel, considered threatened in Canada (COSEPAC, 2021). The Grande Entrée lagoon and Grosse Île Bay are designated as fish habitat (Appendix A, Map QC2-09).

Impact analysis and mitigation measures

The wind turbine installation area is further than 60 m of any given waterbody. Construction of Grosse Île Wind Power L.P. does not require the installation of any culvert or watercourse crossing (Appendix A, Map 9).

The Proponent commits to applying the “avoid–minimize–offset” sequence with the objective of no net loss of waterbodies. The measures cited in the RADF will be applied during the construction of access roads to protect the aquatic environment. Cleaning of machinery more than 60 m from waterbodies and from the shoreline will help protect the aquatic environment and fish habitat.

The impact intensity will be low, considering efforts to avoid waterbodies. The anticipated impact on waterbodies and fish habitat during construction is assessed as low.

5.4.2. Wetlands

Description of the environment

Based on Québec's potential wetland mapping (CIC, 2022; MELCC, 2022), potential wetlands represent 20.1% of the study area, corresponding to 185.8 ha, of which 9.1% are open peatlands. Two complete characterization studies, as per section 46.0.3 of the *Environment Quality Act* (EQA), were conducted to characterize and delineate the wetlands located within the Project footprint (Volume 3, Studies 3a and 3b). This approach made it possible to avoid encroachment of the Project into waterbodies.

Impact analysis and mitigation measures

The Proponent considered environmental parameters when optimizing the configuration of Grosse Île Wind Power L.P. The refinement of the configuration, which aimed to avoid protected floristic habitat, also reduced the Project's footprint on wetlands within the Dune-du-Nord. The project area located across from the Salt Mine site is primarily composed of terrestrial environments.

The proposed configuration includes a total of 0.2 ha of wetlands within the areas required for the Project (Appendix A, Map 9). This encroachment, mainly affecting swamps, represents 1.6% of the wetlands present in the Project's project area.

The Proponent commits to applying the “avoid–minimize–offset” sequence with the objective of no net loss and to compensate for unavoidable losses to wetlands in accordance with applicable legislation, including the *Règlement sur la compensation pour l'atteinte aux milieux humides et hydriques* (RCAMHH). In addition, a minimum distance of 30 m from wetlands will be maintained during vehicle refueling involving oil and petroleum products.

Considering the avoidance efforts implemented in the Project configuration, the anticipated magnitude of the Project's impact on wetlands is assessed as moderate. Given the specific mitigation measures planned with the objective of achieving no net loss, the residual impact will be low.

5.4.3. Groundwater and drinking water

No wells or boreholes are located within the planned project footprint. None of the activities included in the Project will alter the nature or flow of groundwater. The installation work for the wind turbines will take place more than 600 m southwest of the wells used to supply freshwater to the Sel Windsor facilities. Considering the distance between the wind farm and these wells, no compensatory measure for Sel Windsor's freshwater supply is being considered. In the Grosse-Île sector, residences are located more than 2 km east of the wind farm, on the opposite side of Grosse Île Bay, which limits any connection with that sector.

The following measures will be implemented to avoid any risk of contamination of the groundwater table:

- Use, when necessary, devices to limit the dispersion of sediments outside the work area: sediment barrier, straw cover, dust suppressants.
- Equip heavy machinery with spill-response kits.
- Avoid refueling with petroleum products and washing vehicles and machinery within 60 m of waterbodies and the shoreline.
- Manage used oils and greases in accordance with applicable regulations.

The Proponent commits to carrying out a field inventory of drinking water intake sites within a minimum radius of 500 m (over land) around the planned work locations and to submitting the results of this study when filing the first application for a ministerial authorization under section 22 of the EQA.

5.4.4. Soils (excluding erosion and excluding the dune system)

Description of the environment

The study area includes land contaminated by light hydrocarbons north of the Sel Windsor Ltée (MELCCFP, 2023b), two active federal contaminated sites, and one closed federal site (Secrétariat du Conseil du Trésor du Canada, [s. d.]) (annexe A, carte 9). Domestic heating oil tanks represent a source of contamination for soils and groundwater when accidental spills occur. These autonomous heating systems, intended to reduce residents' dependence on the thermal power plant, are reportedly used by 50% of households in the Îles-de-la-Madeleine (Lemieux *et al.*, 2022).

A phase I soil characterization study was conducted in accordance with the documents *Terrains contaminés – Guide de caractérisation des terrains* (MENV, 2003) and *Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés* (Beaulieu, 2021). According to the conclusions of this study, an industrial explosives storage area is likely, in its current condition, to have been contaminated; it is identified as a potential contamination area located outside the Project area (Volume 3, Study 2). The Proponent maintains ongoing discussions with the owner of this site, who is aware of the Project and has ensured that the distances between the wind turbines and the explosives site building meet the Canadian Standard 2910-510/2015.

Impact analysis and mitigation measures

Construction activities may alter the nature and characteristics of the soil within the areas required for the Project. As mentioned in Section 5.3 of this volume, to limit soil compaction, the machinery used will be equipped, whenever possible, with rubber tracks. Slope stabilization along the roads will be ensured using the measures recommended in the RADF. Field verifications will be carried out prior to construction to plan the access roads accordingly.

During site restoration at the end of construction, the upper soil layer may be spread over the footprint of the roads and over portions of the work areas to be restored. The extracted sand may also be used to fill any caoudeyres present within the Project footprint.

Considering the measures aimed at reducing soil compaction and restoring the sites, the anticipated magnitude of the Project's impact on soils during construction and decommissioning is assessed as low.

5.5. Climate change mitigation

According to the energy assessment carried out by the CMIM in 2017, GHG emissions from residents of the Îles-de-la-Madeleine are higher than the Québec average due to the territory's dependence on imported fuel. The supply of heating oil to the Cap-aux-Meules power plant accounted for 45% of the archipelago's energy consumption in 2011, or 6.5 tonnes of oil equivalent per inhabitant per year (CMIM, [s. d.]). This power plant accounts for more than 37% of Hydro-Québec's GHG emissions. The 2017–2025 energy strategy of the Îles-de-la-Madeleine sets objectives for a 15% reduction in the territory's GHG emissions, notably by improving the energy autonomy of the archipelago and integrating renewable energy production (Municipalité des Îles-de-la-Madeleine, [s. d.]-a). The contribution of Grosse Île Wind Power L.P. is part of this broader context of electrification and GHG emission reduction.

GHG emissions during construction

The estimated total GHG emissions associated with the four-turbine variant amount to 1,182.5 metric tonnes of CO₂ equivalent (hereafter "t CO₂ eq.") over its entire lifespan: 882.5 t CO₂ eq. during the construction phase and 300 t CO₂ eq. over 30 years of operation (an average of 10 t CO₂ eq. per year). Added to this is the annual loss of CO₂ sequestration capacity linked to the preparation of the 5.8 ha of land required for the Project, estimated at 50 t CO₂ eq. per year.

For comparison, in 2017, residents of the Îles-de-la-Madeleine emitted 242,000 t CO₂ eq. of GHGs into the atmosphere through energy production and consumption, or 17 t CO₂ eq. per inhabitant (Beaudoin-Gagnon & Leblanc, 2020). Total GHG emissions in Québec in 2018 amounted to 80.6 million t CO₂ eq. (MELCC, 2020b).

Considering the various standard mitigation measures planned to reduce GHG emissions during the construction of the wind farm (Volume 1, Section 6.7), the magnitude of the anticipated impact of these emissions is assessed as low.

GHG emission reduction during operation

During operation, the impact on GHG emissions is considered positive and of high magnitude. The residual impact is assessed as significant and positive, given the emissions avoided through the use of renewable energy.

5.6. Economic benefits and energy resource

Socioeconomic context of the Communauté maritime des Îles-de-la-Madeleine

The economy of the CMIM is mainly oriented toward the service, commerce, and public administration sectors. In 2021, the proportions of jobs related to health care and social assistance (16.7%), agriculture, forestry, fishing, and hunting (13.5%), and retail trade (11.6%) were the most significant within the CMIM.

In 2020, the Dune-du-Nord Wind Farm, consisting of two wind turbines for a total capacity of 8 MW, was commissioned in the Municipality of the Îles-de-la-Madeleine. This wind farm stemmed from the willingness of the population of the Îles-de-la-Madeleine to contribute to the effort to reduce GHG emissions, especially since they are on the front line of the effects of climate change on the island environment. The construction of this wind farm generated \$2,650,000 in economic benefits for businesses on the archipelago, and during operation, several local contracts are awarded to local personnel to ensure maintenance and carry out various tasks related to ongoing activities (Magazine Les Îles, 2022; Régie intermunicipale Gaspésie–Îles-de-la-Madeleine, 2022).

Impact analysis and mitigation measures

Construction

During construction, up to 15 people from various trades, including several workers from the region, could be employed on the worksite. The Proponent intends to collaborate, as much as possible, with local workers and contractors to maximize local economic benefits. Direct benefits are expected, as well as indirect benefits related to the purchase of materials and worker accommodations.

A liaison committee has been created and includes representatives from the CMIM, the Municipality of Grosse-Île, environmental organizations, local businesses, and social organizations. It will address local economic benefits with the aim of maximizing them and promoting the employment of residents of the Îles-de-la-Madeleine. The impact on job creation and economic benefits for the Municipality of Grosse-Île and the CMIM will be positive in nature, and the intensity is assessed as moderate. The magnitude of the anticipated impact on the socioeconomic context is assessed as high and positive.

Operation

During operation, as in the construction phase, the liaison committee will ensure that local economic benefits are prioritized. The impact of the wind farm in terms of economic benefits is positive. The magnitude of the socioeconomic impact during operation is assessed as high and positive.

Depending on the selected variant, two to four wind turbines will be located on public land. Annual territorial royalties of \$6,227 per megawatt installed will be paid to the Municipality of Grosse-Île. The CMIM, as the manager of public lands, will receive surface rights payments of \$6,764 per megawatt installed per year. Added to this are dividends from the Régie intermunicipale de l'énergie Gaspésie-Îles-de-la-Madeleine, for both the CMIM and the Municipality of Grosse-Île, which will receive income proportional to their property wealth. From wind farm revenues, more than \$760,000 was paid to the CMIM in 2022 by the Régie intermunicipale de l'énergie Gaspésie-Îles-de-la-Madeleine. In addition, profits generated by Grosse Île Wind Power L.P. will be shared with the community partner, the Alliance de l'énergie de l'Est s.e.c.

Decommissioning

During decommissioning, which will be of shorter duration than construction, workers will hold temporary jobs on the worksite. The decommissioning of the wind farm will generate a loss of revenue related to territorial royalties for the Municipality of Grosse-Île and the CMIM. The magnitude of the anticipated impact on the environment and the regional economy is assessed as moderate.

Securing the island energy resource

According to the energy assessment carried out by the CMIM in 2017, the archipelago imports 81,000 tonnes of oil equivalent, nearly half of which is used to produce electricity at the Cap-aux-Meules thermal power plant. The first objective of the 2017–2025 energy strategy of the Îles-de-la-Madeleine is to ensure greater energy production autonomy for the archipelago, notably by reducing oil supply by 15% and integrating more than 9 MW of renewable energy into local electricity production (Municipalité des Îles-de-la-Madeleine, [s. d.]-a). The contribution of Grosse Île Wind Power L.P. fits within this context of a desire for autonomy and diversification of energy production.

The impact of the wind farm on securing the energy resource is positive in nature. The magnitude of the anticipated impact during operation is assessed as high and positive.

5.7. Maintenance of land use

Description of the environment

The tourism industry plays an important role in the CMIM economy, generating numerous jobs in the tertiary sector. A total of 1,400 jobs are generated, directly or indirectly, by the tourism industry, distributed across more than 200 businesses on the territory. Economic benefits amount to 50 M\$ per year (Tourisme Îles-de-la-Madeleine, [s. d.]). Tourism on the Îles-de-la-Madeleine tends to stabilize at 50,000 visitors per year. Visitor traffic is concentrated over a period of seven to eight weeks during the summer season (Îles-de-la-Madeleine.com, 2022).

The exploitation of fisheries resources provides a livelihood for 1,100 fishers and assistant fishers. Eight hundred people also work in seafood processing plants. In total, 80 M\$ are generated annually by this industry, with snow crab and lobster being the main crustaceans harvested (Îles-de-la-Madeleine.com, 2022).

Agriculture and the agri-food industry have expanded considerably over the past decade. This economic sector now creates more than 100 jobs in the CMIM, of which 52% are in market gardening and other productions, and 48% in charcuterie, meat, eggs, cheese, and beverages (Îles-de-la-Madeleine.com, 2022).

In Grosse-Île, since 1982, salt extraction has been an important economic activity, generating economic benefits of nearly 15 M\$ per year (MinesQC.com, 2013-2017). The Salt Mines, operated by Sel Windsor Ltd., employ 130 residents of the archipelago (communication personnelle, Daniel Deschênes, directeur général, Sel Windsor Ltée, août 2023).

In 2007, the CMIM adopted a wind development plan for the territory (Agglomération des Îles-de-la-Madeleine, 2010). In December 2020, the first wind farm of the Îles-de-la-Madeleine was commissioned: the Dune du Nord wind farm. This wind farm, developed by Parc éolien de la Dune du Nord S.E.C., includes two wind turbines for a total installed capacity of 8 MW, but a contractual capacity of 6.4 MW.

Route 199, also referred to as the Main Road, runs along the Gulf of St. Lawrence and crosses the study area. This road is used as the main route between the municipality of Grosse-Île and the municipality of Îles-de-la-Madeleine and provides access to the main localities of the archipelago (Annex A, Map 11). A paved on-road cycling route, the Route Verte, runs along Route 199 and crosses the study area (La Route verte, 2018). The Trans-Québec (nos. 8900 to 8901), a local snowmobile trail of the Club des motoneigistes de l'île du Havre-Aubert, crosses the study area following Route 199 (FCMQ, [s. d.]).

Power transmission lines cross the study area, running along Route 199 (Annex A, Map 11). A connection line links the two turbines of the Dune du Nord wind farm, and the collector system transports electricity from the turbines to the step-up substation.

Impact analysis and mitigation measures

The construction of the wind farm may temporarily disturb activities carried out on public land. Hunting, fishing, and motorized recreational activities may be limited at certain times due to disturbance caused by the circulation of heavy machinery and workers. No permanent residences are present within the Project footprint.

The Proponent will implement harmonization measures to mitigate construction-related impacts on users, including:

- Communicating with the Club des motoneigistes de l'île du Havre-Aubert to determine a bypass trail around the wind farm.
- In the event of winter work near snowmobile trails, communicating with the club to establish safety and land-use harmonization measures.
- Maintaining communication with residents through the liaison committee and the Project website: <https://www.parceoliengrosseile.ca/>
- For work located on private land, ensuring communication with Sel Windsor Ltd. to define appropriate measures to minimize disruption of industrial activities.
- Installing signage for the construction site and work areas to ensure the safety of land users and employees.
- Developing a traffic and transportation management plan and ensuring compliance with MTMD standards.
- Coordinating maritime transport of wind turbine components with port authorities and with the Coopérative de transport maritime et aérien (CTMA), ensuring that all port norms and restrictions are respected.
- Communicating with port authorities and the CTMA to plan the delivery schedule for components in accordance with port availability, maritime traffic at the Cap-aux-Meules wharf, and port authority directives.
- Ensuring the free circulation of the Madeleine II and Voyageur II ferries and communicating with the CTMA.

Thanks to these specific mitigation measures, the residual impact on land use and public utility infrastructure is assessed as minor for users during construction. Decommissioning activities may result in similar impacts, but of lesser intensity. Decommissioning will be of shorter duration than construction and will involve fewer activities, as no road construction is planned. The standard and specific mitigation measures applied during construction will also be implemented during decommissioning, as applicable. The magnitude of the anticipated impact on land use and public utility infrastructure during construction and decommissioning is assessed as moderate.

5.8. Maintenance of quality of life and landscape

5.8.1. Air (sand and dust)

Description of the environment

The air quality index is generally good within the CMIM (AccuWeather, 2023). The main source of atmospheric contaminant emissions (GHG, NOx) in the Îles-de-la-Madeleine is the diesel-engine thermal power plant in Cap-aux-Meules, located approximately 34 km southwest of the study area.

Impact analysis and mitigation measures

During construction and decommissioning, transportation and circulation will cause a localized increase of sand and dust near the work area. Standard mitigation measures will be applied to limit dust generation, such as reducing vehicle speed and using dust suppressants, particularly during dry weather.

Considering the standard mitigation measures that will be applied, the magnitude of the impact of sand and dust generation on air quality is assessed as low. During decommissioning, the intensity will be lower than during construction, given the reduced number of trucks (no road construction).

5.8.2. Soundscape

Description of the environment

Ambient noise levels within and near the study area were measured during a soundscape characterization campaign conducted in 2022 and in accordance with the noise instruction note (MELCCFP, 2023d).

The two assessment points were selected to determine the baseline sound levels representative of potential receptors present within the study area. They were located within the Dune-du-Nord floristic habitat and at Pointe de la Grande Entrée. The minimum one-hour sound level ranged from 34.5 to 48.3 dBA during the day and from 36.6 to 53.9 dBA at night. The maximum one-hour sound level ranged from 43.7 to 58.3 dBA during the day and from 48.8 to 54.5 dBA at night. The main sources of noise were wind in the trees and bird songs.

Impact analysis and mitigation measures

Construction and decommissioning

Construction and decommissioning activities, due to transportation and the use of heavy machinery, will contribute to increasing ambient noise levels locally. According to the *Lignes directrices relativement aux niveaux sonores provenant d'un chantier de construction industriel* (MDDELCC, 2015), the limits to be respected for the soundscape of this type of site are 55 dBA during the day (7:00 a.m. to 7:00 p.m.; LAr,12h) and 45 dBA at night (7:00 p.m. to 7:00 a.m.; LAr,1h). No permanent residence, healthcare facility, or social services establishment is located within 1 km of the Project footprint. However, access to the Project area will be directly from Route 199, which passes through residential zones. Circulation on the territory and the execution of the work will be planned in such a way as to limit noise impacts and comply with ministerial requirements.

Overall, the magnitude of the anticipated impact on the soundscape during construction and decommissioning is assessed as low.

Operation

During operation, the perception of sound levels emitted by the wind turbines will vary depending on weather conditions and the location of the user within the territory.

The evaluation of the impact of wind turbine operation on the soundscape is based on the noise instruction note (MELCCFP, 2023d). This note provides maximum acceptable noise levels from fixed sources, depending on the time of day and the zoning category of the receiving environment. The sound level will vary according to the distance between receptors and the wind turbines. The closest turbine is located 1.7 km from a permanent residence (annex A, map 12).

The intensity of the impact is assessed as low due to the anticipated noise level based on modelling (annex A, map 12). The magnitude of the anticipated impact on the soundscape during operation is assessed as low.

5.8.3. Landscape

Description of the environment

The landscapes of the Îles-de-la-Madeleine archipelago contribute to its national and international reputation. They are therefore protected by a charter that recognizes that landscapes are part of the identity and quality of life of the inhabitants of the Îles-de-la-Madeleine.

The landscape study area is located within the insular landscape of the Gulf of St. Lawrence (Robitaille & Saucier, 1998) and entirely encompasses the municipality of Grosse-Île. To the southwest, it extends into the territory of the municipality of the Îles-de-la-Madeleine (annex A, map 7). The landscape study area is crossed from northeast to southwest by Route 199, whose views are generally open. In addition, the wind turbines of the Dune du Nord wind farm are located within the study area.

The landscape study area is divided into seven landscape units grouped into three types (annex A, map 7):

- The insular landscape unit of East Island (I) is located at the northeastern end of the landscape study area and is characterized by the presence of the Pointe-de-l'Est National Wildlife Area. Due to the flat topography, views are generally closed on the landward side and open when oriented toward the Gulf of St. Lawrence. Route 199 borders the western limit of this landscape unit.
- The dune landscape units (D1, D2, D3) are characterized by flat terrain and generally panoramic views. Several recreational attractions (swimming, windsurfing, kitesurfing, kayaking, camping) draw many tourists and vacationers each year (Tourisme Îles de la Madeleine, 1534-2023).
- The village landscape units (V1, V2, V3) offer very wide views from within the units. Topography and visual framing vary from one unit to another. The Pointe-aux-Loups unit notably includes about fifty houses with two frequented beaches. The Grande-Entrée unit is known for lobster fishing and attracts temporary observers thanks to Bassin aux Huîtres and Boudreau Island.

Impact analysis and mitigation measures

The landscape study focuses on the visual impact of the wind farm during the operation phase. The wind turbine towers will become progressively visible as early as the construction phase. The level of resistance offered by the landscape units varies from one unit to another depending on their aesthetic quality, the concentration of potential observers, and their visual accessibility, which limits the possibilities for concealing the projected equipment and infrastructure. Landscapes with irregular topography favour the partial or complete concealment of the projected equipment and infrastructure and offer lower resistance. For each landscape unit, the degree of perception was assessed based on the visual exposure of potential observers, their sensitivity, and the visual influence of the presence of the wind turbines and other equipment.

A legal constraint is assigned to unit I due to its uniqueness and high intrinsic quality. The local population, land managers, and tourists show great interest in it, as evidenced by the presence of the Pointe-de-l'Est National Wildlife Area within this unit. This low-relief landscape offers panoramic views of the Gulf of St. Lawrence and open views toward Grande Entrée Lagoon and Old Harry Bay.

Table 8 summarizes the level of resistance, the degree of perception, and the anticipated magnitude of the visual impact for each landscape unit. The visibility analysis is illustrated on map 13 in annex A. The visual simulations are provided in annex B.

Table 8. Summary of the visual impacts of Grosse Île Wind Power L.P. by landscape unit

Landscape unit	Resistance	Degree of perception	Impact significance
I Île de l'Est	Constraint	Very low to none	Minor to none
D1 Plage de Pointe-aux-Loups	Very high	High to none	Minor to none
D2 Dune-du-Nord	Very high	None	None
D3 Dune-du-Sud	Very high	Low to none	Minor to none
V1 Grosse-Île	High	High to none	Minor to none
V2 Pointe-aux-Loups	High	Low to none	Minor to none
V3 Grande-Entrée	High	Low to none	Minor to none

5.9. Protection of built and archaeological heritage

Description of the environment

The description of the archaeological heritage is based on an archaeological potential study carried out in fall 2022 and updated in February 2023 by Jean-Yves Pinal, consulting archaeologist (volume 3, study 8). Three archaeological sites are known within the study area: two prehistoric sites and one Euro-Canadian site located along the inner shoreline of Grosse-Île. The study also identified 20 zones of archaeological potential in the study area: the two cemeteries and the church of Grosse-Île, as well as 17 zones along the shoreline.

According to data from the *Répertoire du patrimoine culturel du Québec* and from the *Historic Sites and Monuments Board of Canada*, no classified cultural property is located within the study area (MCC, 2013-2022; Parcs Canada, [s. d.]).

Impact analysis and mitigation measures

No known archaeological site, archaeological potential zone, or classified cultural property is located within the Project footprint (Appendix A, Map 11). The construction activities do not involve any demolition or modification of buildings located within or near the Project footprint.

Considering the above, the magnitude of the anticipated impact is considered low. The overall importance of the anticipated impact during construction is also considered low.

5.10. Significance of residual impacts

Any impact that persists after the implementation of mitigation measures will be considered a residual impact. The residual impacts expected during construction, operation, and decommissioning of Grosse Île Wind Power L.P. are presented in Table 9.

A low-magnitude impact (considering standard mitigation measures) will not require specific mitigation measures. In such cases, the residual impact is considered minor.

A moderate- or high-magnitude impact, despite the application of standard mitigation measures, will require the implementation of specific mitigation measures. This will result in a residual impact that is either significant or minor, depending on the effectiveness of the measures implemented.

Residual impacts will be minor for environmental components following the application of standard and specific mitigation measures, except for the socioeconomic context and GHG emissions, for which major positive residual impacts are expected (Table 9).

In the case of birds, bats, the dune system, and landscape, monitoring will be conducted to document the impact during the operation of Grosse Île Wind Power L.P.

Table 9. Residual impact of Grosse Île Wind Power L.P. on environmental components

Phases and sources of impacts considerations	Ecological consideration											Economic considerations			Social considerations					
	Protection of dune-ecosystem biodiversity							Protection of dunes and coast	Protection of wetlands and waterbodies				Climate-change mitigation	Economic benefits and energy resource	Maintenance of land use			Maintenance of quality of life and landscapes		
	Vegetation of dune environments	Plant species with special status	Birds	Bats	Terrestrial mammals	Fish	Amphibians and reptiles		Wildlife species with special status	Waterbodies and fish habitat	Wetlands	Groundwater and drinking water			Soils (excluding erosion and excluding the dune system)	Land use	Public utility infrastructure	Telecommunication systems	Air (sand and dust)	Soundscape
Construction																				
Preparation of required areas														+	+					
Construction and improvement of access roads and work areas														+	+					
Transport and circulation														+	+					
Installation of equipment														+	+					
Restoration of work areas														+	+					
Operation																				
Presence and operation of equipment														+	+					
Maintenance of equipment and access roads														+	+					
Decommissioning																				
Transport and circulation																				
Preparation of required areas																				
Dismantling of equipment																				
Restoration of work areas																				

Minor residual impact
 + Positive impact
 Significant residual impact
 No significant interaction or no interaction

5.11. Cumulative impacts

Cumulative impacts are assessed by combining the anticipated residual impacts of Grosse Île Wind Power L.P. with the residual impacts of the Dune du Nord wind farm and other current or planned developments or activities in the region. At the local scale, construction of Grosse Île Wind Power L.P. is likely to contribute to a cumulative impact with the following main activities: mining operations on the lands of Sel Windsor Ltd., sand stockpiling work by the MTMD, and operation of the Dune du Nord wind farm. At the regional scale, the construction of the Project is likely to contribute to a cumulative impact with the works planned under the coastal hazards intervention program, whose objective is to protect road infrastructure located on sites vulnerable to erosion or submersion (MTMD, 2023).

Soils, dune-ecosystem vegetation, erosion and dune system

Throughout the development of the Project, the Proponent plans to minimize the required footprint and avoid wetlands as well as protected wildlife and plant habitats. In addition, the Proponent is in discussions with the MTMD to use, as an access road to the wind turbines, the road built in 2023 for the MTMD's sand-stockpiling project. Depending on the agreement reached with the MTMD, the area required for the Project could therefore be reduced. This shared use of the road by the MTMD and Parc éolien de Grosse Île S.E.C. would help reduce the cumulative impacts associated with both projects.

The proximity of the wind project to Hydro-Québec's transmission line, running along Route 199, will make it possible to avoid building a new connection line. The Proponent commits to communicating with the MTMD to coordinate the underground installation of the collector system along Route 199 with the work planned along this road as part of the coastal-hazards intervention program.

Thus, considering the optimization efforts already implemented and the additional optimization potential still available, the cumulative impact on soils, dune-ecosystem vegetation and the dune system will be limited.

Birds and bats

A low contribution to a cumulative impact on birds is expected due to the low passage rates observed during the surveys conducted in the study area. The bat surveys conducted confirmed their very low abundance in the study area. According to the information provided by the proponent of the Dune du Nord Wind Farm, no carcass of a species with special status was found during the first year of mortality monitoring carried out at the Dune du Nord Wind Farm.

Socioeconomic context

The construction of Grosse Île Wind Power L.P. could generate up to 15 direct jobs on the worksite, which will last 14 months. The Proponent will maximize local economic benefits and prioritize local employment. With equal qualifications and pricing, workers and businesses from the CMIM will be prioritized during the construction of the wind farm. The construction of the Project could coincide with works related to the coastal-hazard intervention program on the road network (MTQ, 2021).

The Alliance de l'énergie de l'Est s.e.c. will also benefit from the Project, given its direct 50% equity participation, which it will subsequently redistribute to partner RCMs through the intermunicipal energy boards of Bas-Saint-Laurent and Gaspésie–Îles-de-la-Madeleine.

Soundscape

The construction activities associated with Grosse Île Wind Power L.P., as well as those related to the sand stockpiling project and the MTMD coastal-hazard intervention program, may combine and result, within the same sector, in an increase in ambient noise levels when carried out simultaneously, or lead to a longer duration of noise when they occur non-simultaneously. The soundscape monitoring that will be conducted during construction of the wind farm will make it possible to document this impact.

During operation of Grosse Île Wind Power L.P., the noise generated by the wind turbines will comply with the sound level limits established by the *note d'instruction sur le bruit* (MELCCFP, 2023d) at permanent residences. Given the distance between the Dune du Nord wind farm and these residences, the contribution of the Project's turbines to the increase in ambient noise levels will be of little significance in terms of a cumulative impact with this wind farm.

Landscape

The cumulative impact of wind farms on the landscape is assessed based on two phenomena:

- Simultaneous visibility of two wind farms from a single viewpoint.
- Successive visibility of different wind farms along a given route.

The two wind farms will contribute to the phenomenon of successive visibility, since they will be visible along the route between Pointe-aux-Loups and Grosse-Île, from Route 199. As mentioned in the landscape impact analysis, the insertion and absorption capacities are medium or low, which limits visual integration and, consequently, increases impacts. The generally flat relief, mostly devoid of tall vegetation, limits the visual absorption of the wind turbines. However, the wind turbines will be located in an already industrialized landscape due to the presence of the Sel Windsor Ltd. infrastructure and the Dune du Nord wind farm. Visibility of Grosse Île Wind Power L.P. will be possible given the panoramic open views that characterize much of the territory.

6. Environmental oversight

The Proponent commits to implementing an environmental oversight program to ensure compliance with its commitments and with applicable regulations, and to ensure the application of the necessary environmental protection measures during the construction, operation, and decommissioning of the wind farm. The Proponent also commits to developing and applying an emergency response plan to protect personnel, land users, the public, and the environment.

6.1. Environmental oversight program

Environmental oversight will ensure compliance with:

- The measures described in the impact study, including mitigation and compensation measures, which will be detailed in the monitoring program.
- The conditions set out in the government decree.
- The commitments provided for in the ministerial authorizations.
- The requirements relating to applicable laws and regulations, including the revised land use and development plan (Agglomération des Îles-de-la-Madeleine, 2010).

The Proponent will designate an environmental monitor during project implementation (construction and decommissioning). The monitor will be responsible for ensuring the implementation of the environmental monitoring program, communicating the obligations to the stakeholders concerned, and determining the compliance of the work with the regulations, standards, and commitments of the Proponent. In addition, the monitor must; notify the Proponent and the construction manager of any environmental non-compliance or any activity requiring modifications, participate in the search for solutions, if necessary, by communicating and collaborating as needed with the relevant ministerial authorities, and prepare the reports required by the Proponent and government authorities.

A residual materials management plan promoting material recovery will be submitted prior to obtaining ministerial authorizations under section 22 of the EQA. It will be developed in accordance with applicable regulations and guidelines and will include all the information presented in section 3.7 of Volume 4. Communication with the CMIM will be maintained to define the management measures for residual materials during the construction and decommissioning phases, in accordance with the residual materials management plan in effect for the Îles-de-la-Madeleine territory. During decommissioning, the Proponent commits to promoting deconstruction to enable the reuse of wind farm components, as much as possible. Residual materials management measures will promote the recycling and reuse of unused materials and debris.

6.2. Emergency measures in the event of an accident or failure

The Proponent will ensure that all personnel and subcontractors are familiar with the emergency measures plan and able to apply it during the three phases of the Project. This plan will fall under the responsibility of the Proponent or the general contractor. It will describe:

- The types of possible or probable accidents and failures (risk analysis).
- Preventive measures.
- The emergency procedures to be implemented (responsible persons, available equipment, actions to be taken, routes to prioritize).
- Communication and alert processes according to the internal and external resources available.
- Training of stakeholders.
- Procedures for updating or assessing the plan.

The Proponent also commits to including, in its emergency measures plan, an intervention plan in the event of extreme weather events. This intervention plan will ensure the safety of operations in case of emergency and will include:

- The permanent installation in the Îles-de-la-Madeleine of a secured operational base, including tools, spare parts, and a dedicated marine vessel. The latter will provide an alternative access to the wind turbines by sea in the event of a temporary interruption of the road connection.
- The implementation of a decision-making framework defining the procedures to follow depending on the type of event, the responsibilities of the stakeholders, and the criteria for maintaining or stopping operations, in accordance with the priorities of protecting people, property, and the environment.

7. Environmental monitoring

In accordance with the directive issued (MELCCFP, 2023e), environmental monitoring will be carried out during the operation of Grosse Île Wind Power L.P. The monitoring will focus on the following components; dune system, birds, bats, and landscape. The monitoring programs will be submitted to MELCCFP representatives at the time of the application for ministerial authorization for the operation of the wind farm.

7.1. Dune system

After the construction of Grosse Île Wind Power L.P., the work areas may be subject to monitoring in order to verify the effectiveness of the restoration and stabilization measures implemented for the dune systems.

A baseline assessment, before and after the installation of the wind farm, may be carried out on the dune systems affected by the Project's footprints. The areas that underwent stabilization (using coconut fiber mats, seeding of short-leaved beachgrass, filling of caoudeyres, or installation of brushwood bundles or sand fences) may be subject to monitoring. If applicable, a report will be produced and submitted to the MELCCFP.

In addition, as a preventive approach, the Proponent commits to carrying out annual monitoring of the morphological evolution of the shoreline within the Project area throughout its lifespan. This annual monitoring may be conducted using drones or other surveying methods and will document the morphological evolution of the shoreline and detect the potential emergence of vulnerable zones.

7.2. Birds and bats

The objective of bird and bat monitoring is to measure the actual impact of the operating wind farm on these species, specifically regarding mortality rates associated with the presence of the turbines. Monitoring will be carried out by searching for bird and bat carcasses at the base of the turbines, as well as through a study of raptor behavior when approaching the wind farm, using methods consistent with the reference protocols of the relevant ministries (Environnement Canada, 2007; MDDEFP, 2013; MRNF, 2008). This monitoring will be conducted during the first three years of wind farm operation and, subsequently, every ten years. A report will be produced and submitted to the MELCCFP after each monitoring year.

The Proponent commits to submitting to the MELCCFP a preliminary version of the bird and bat mortality monitoring program no later than at the stage of the Project's environmental acceptability analysis. The Proponent also commits to collaborating with the relevant authorities based on the results obtained during this monitoring. Additional mitigation measures may be discussed and implemented if the monitoring program reveals unexpected impacts, such as a high number of direct mortalities or more intense disturbance than anticipated. These measures must be appropriate and tailored to various factors, including the species concerned, weather conditions, and time of year, while considering scientific advancements in this regard.

7.3. Landscape

The objectives of landscape monitoring are to assess the perceived impact on residents and tourists, and to validate the assessment of the landscape impact. The perceived impact on the population will be measured through a survey conducted following the commissioning of the wind farm. The landscape impact will be validated using photographs taken after construction at the same locations used for the visual simulations. This monitoring will be carried out within the year following the commissioning of the wind farm, and a report will be produced and submitted to the MELCCFP.

The survey (French version) will be made available to citizens at the CMIM office. Radio and local newspaper announcements will be issued to invite the population to obtain the survey. It will also be made available to the liaison committee, which will disseminate the information, and it will be distributed in certain businesses to reach as many citizens as possible. In addition, the survey (English version) will be mailed to the residents of Grosse-Île and posted on the municipality's Facebook group. Surveys may be completed in French or English, on paper or online. The online version will be available on the Parc éolien de Grosse Île S.E.C. website.

8. Effects of the environment and climate change

Certain meteorological or environmental phenomena may influence the operation of the wind farm. Trends observed for some atmospheric and hydrological phenomena will evolve over the coming years due to climate change (MDDELCC, 2018). The frequency and intensity of certain extreme climate events could have significant consequences on transportation and electricity-generation infrastructure exposed to climate risks (Ouranos, 2015). The Proponent has taken into consideration the potential repercussions of these climate risks during the development of the Project in order to reduce risks related to climate change by following the steps described by the MELCCFP (2021a).

The design of the wind farm, as well as the selection and manufacturing of the turbines, will help counter the effects of these phenomena on the wind farm's production:

- Ice-detection systems on the blades which, above a certain threshold, trigger turbine shutdown. Several models are also equipped with de-icing systems.
- Selection of a turbine model designed to withstand and operate in very cold or very hot conditions.
- Grounding system to divert current into the ground in the event of lightning.
- Restoration and stabilization of the dune system to promote sand retention.
- Design of turbine foundations that accounts for the seismic zone and the recommendations of the National Building Code.
- Clearing of areas around the turbines to reduce the risk of material damage in the event of fire. Since the turbine nacelle is located approximately 100 m above ground, it is unlikely that a fire could reach it. The tower is made of concrete and steel, materials resistant to high temperatures.
- Selection of a turbine model equipped with a shutdown device in the event of extreme winds. The components of the model selected by the Proponent (blade, nacelle, tower and foundation) will be designed to withstand stronger winds.

The Proponent has confirmed its commitment to identify, develop and implement an adaptation solution in collaboration with various local and governmental stakeholders. In 2020, the CMIM received financial support to develop a Coastal Erosion and Flooding Intervention Framework, a tool enabling the identification of sectors most vulnerable to erosion and flooding, the prioritization of upcoming interventions, and coordinated action with the community and relevant ministries to implement sustainable solutions for the population of the Islands. Thus, the Grosse-Île Wind Farm Project was included as a priority intervention zone in this CMIM framework. This initiative aims to combine the Proponent's development efforts with those already underway to address coastal

erosion and flooding issues on the territory. These issues affect several sites considered vulnerable in the Îles-de-la-Madeleine, and the required adaptation measures extend well beyond the Proponent's interests in developing the Grosse-Île Wind Farm Project.

In addition, the Proponent is currently analyzing various complementary solution avenues to reduce the Project's exposure and risk to coastal hazards, in collaboration with a specialized engineering firm (R3-7, volume 6). These provisions will be included in the analysis and design of the Project's infrastructure to ensure increased resilience to coastal hazards and extreme events.

Furthermore, as a preventive approach, the Proponent commits to conducting annual monitoring of shoreline morphological evolution within the Project area for its entire operational life. This annual monitoring may be performed using drones or other surveying methods and will document shoreline morphological changes and detect the possible emergence of vulnerable zones.

Finally, the Proponent will submit, according to reasonable parameters to be defined with the MELCCFP, no later than the beginning of the environmental acceptability analysis stage of the Project, an updated modelling of erosion and flooding hazards, whose parameters will be discussed and validated with the MELCCFP.

9. Project summary

Table 10 summarizes the impacts of Grosse Île Wind Power L.P. based on the ecological, economic, and social issues, as well as the standard, specific, and compensatory mitigation measures planned.

Table 10. Summary of impacts based on ecological, economic, and social issues and planned measures – Grosse Île Wind Power L.P.

Nature of the impact	Magnitude of the impact	Standard mitigation measure	Specific and compensatory measure	Residual impact
Ecological considerations				
Protection of the biodiversity of the dune ecosystem				
Habitat modification. Disturbance of wildlife species by activities and noise. Mortality related to the equipment and operation of the wind turbines.	Low for all components and phases of the Project.	Reduction of the areas used. Restoration of the construction zone and work areas. Avoidance of sensitive ecological environments and periods. Reduction of contamination risks. Control of risks associated with the introduction of IAS (invasive alien species).	Withdrawal of the Project from the floristic habitat of the Dune-du-Nord. Avoidance of wildlife habitats of species with special status. Avoidance of <i>Corema conradii</i> (Conrad’s crowberry). Circulation restricted solely to road right-of-way. Marking and securing of <i>Corema conradii</i> plants in the immediate vicinity of roads and work areas. No use of biocides or phytosanitary products on the site. Carrying site-preparation work outside, as much as possible, the nesting period, which extends from April 15 to August 31. Marking and securing of nests within the Project right-of-way, located in habitats suitable for species with special status. Seeding of short-awned beach grass (<i>Ammophila breviligulata</i>) using seed heads from the work areas to facilitate vegetation recovery after construction and decommissioning. Monitoring of bird and bat mortality. Monitoring of wind farm use by birds.	Low
Protection of the dune and the coastline				
Modification to the physical characteristics of the dune system. Risks related to coastal erosion.	Strong for the dune system during construction and decommissioning and for coastal erosion during operation. Low for the other phases of the Project.	Reduction of the areas used. Restoration of the construction zone and work areas.	Reduction of soil compaction by using, where possible, machinery equipped with rubber tracks. Adaptation of the method for restoring work areas and stabilizing dunes to the morphological characteristics of the dune system concerned. Design of the Project’s infrastructure to ensure increased resilience to coastal climate risks. Annual monitoring of the morphological evolution of the shoreline within the Project footprint.	Low

Nature of the impact	Magnitude of the impact	Standard mitigation measure	Specific and compensatory measure	Residual impact
Protection of wetlands and waterbodies				
Modification of flow and sediment input. Modification of the nature or area of the wetland. Modification of the drinking water resource. Modification to soil characteristics.	Moderate on wetlands during construction and decommissioning. Low for the other components and/or other phases of the Project.	Reduction of the areas used. Avoidance of sensitive environments and ecological periods. Reduction of contamination risks. Avoid wetland and water environments. Apply the “avoid–minimize–offset” sequence with the objective of no net loss of wetland or aquatic environment.	Avoid refueling with petroleum products and washing vehicles and machinery less than 60 m from waterbodies and the shoreline. Clean machinery more than 60 m from waterbodies and the shoreline. Apply RADF measures. Use, when necessary, devices to limit sediment dispersion outside the work area. Equip heavy machinery with spill response kits Manage used oils and greases in accordance with applicable regulations. Use machinery equipped, as much as possible, with rubber tracks.	Low
Climate change mitigation				
GHG emissions.	High (positive) during operation. Moderate during construction. Low during decommissioning.	Restoration of work areas and the construction site area. Reduction of contamination risks. Reduction of waste.	Reduce GHG emissions. Rapidly restore temporary areas to accelerate vegetation regrowth and reestablish carbon sequestration by vegetation. Whenever possible, avoid wetlands. Whenever possible, turn off vehicle engines during prolonged stops.	Important (positive) during operation. Low during construction and decommissioning.
Economic considerations				
Economic benefits and energy resource				
Economic benefits. Securing the energy resource.	High (positive) during construction and operation. Moderate during decommissioning.	Not applicable	Creation of a liaison committee, including local stakeholders, which will address local economic benefits and their maximization.	Important (positive) at each phase of the Project.

Nature of the impact	Magnitude of the impact	Standard mitigation measure	Specific and compensatory measure	Residual impact
Maintenance of land use				
Disturbance of activities and circulation.	Moderate for the disturbance of activities and circulation during construction and decommissioning. Low for the other components and/or other phases of the Project.	Safety measures related to the construction site. Reduction of nuisances during construction. Communication.	Communicate with the Havre-Aubert Island Snowmobile Club to determine a trail bypassing the wind farm. In the event of winter work near snowmobile trails, communicate with said club and establish safety and usage-harmonization measures. Adapt specific measures to the activities of Sel Windsor Ltd. Maintain communication with citizens (creation of a liaison committee and project-dedicated website). Provide regular reports on the progress and planning of the work to MTMD, Sel Windsor Ltd., CMIM, and the Municipality of Grosse-Île. Install construction-site signage to maintain, as much as possible, circulation on Route 199 and ensure the safety of land users and employees.	Low
Social considerations				
Maintenance of quality of life and landscapes				
Sand and dust uplift. Disturbance from noise. Modification of landscapes.	Moderate to none on landscape modification during the operation phase. Low for the other components and/or other phases of the Project.	Reduction of nuisances during construction. Safety measures related to the construction site.	Use of dust suppressants. Compliance with the <i>Lignes directrices relativement aux niveaux sonores provenant d'un chantier de construction industriel</i> . Mitigation measures on the landscape.	Low
Protection of built and archaeological heritage				
Disturbance of archaeological and cultural heritage.	Low for all components, at each phase of the Project.	Reduction of archaeological and landscape risks.	Declaration to the Ministry of any accidental discovery of an artifact or archaeological site during construction work.	Low

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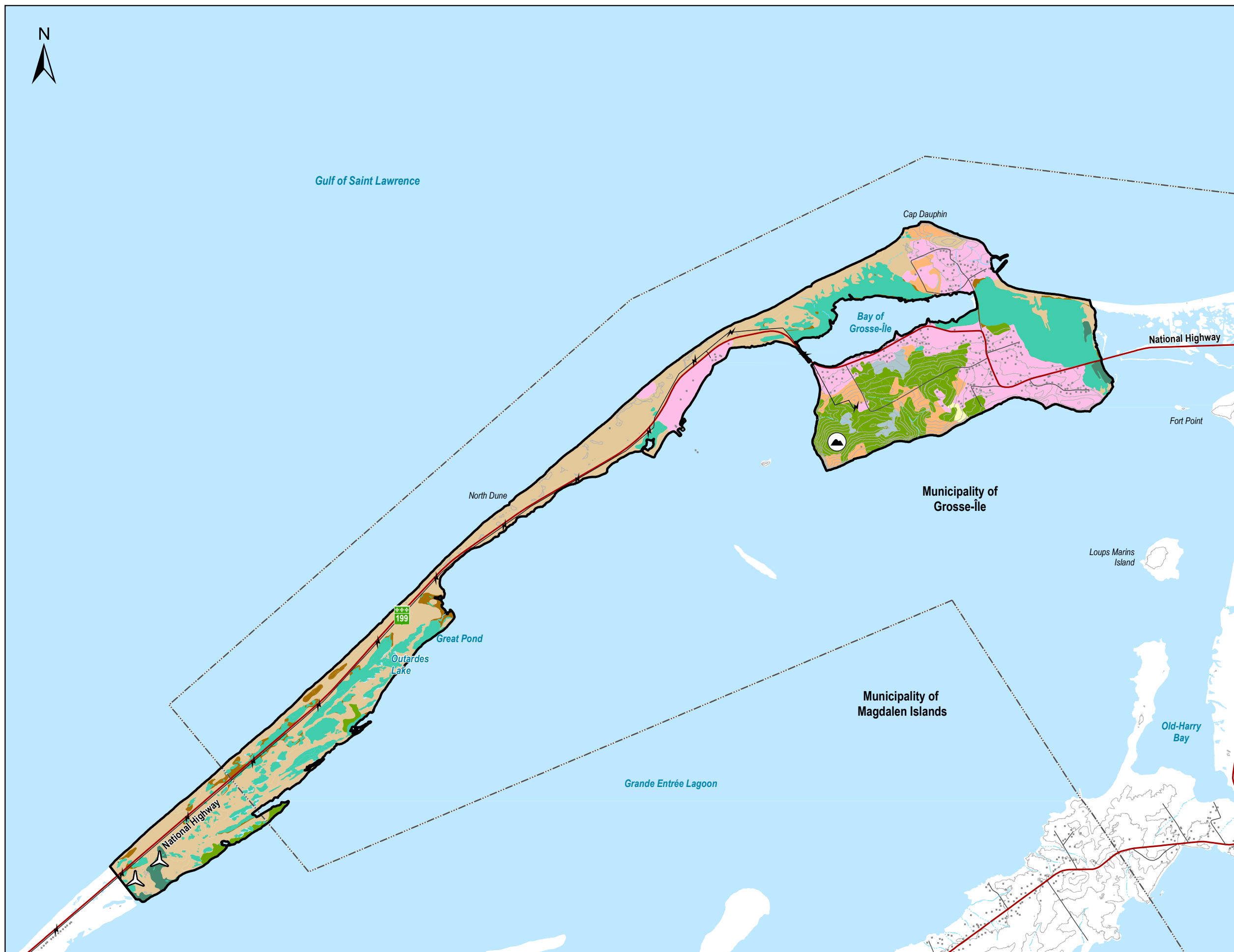
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Appendix A. Maps



Grosse Île Wind Power



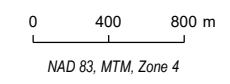
- Study Area
- Vegetation**
- Wet bare and semi-bare land
- Dry bare and semi-bare land
- Fallow land
- Spruce forest
- Regeneration
- Fir forest
- Agricultural land
- Hydrography**
- Permanent watercourse
- Intermittent watercourse
- Waterbody
- Wetland
- Existing infrastructure**
- Dune-du-Nord Wind Power L.P.
- Other features**
- National highway
- Road
- Power line
- Building
- Anthropogenic environment
- Municipal boundaries
- Contour line (10 meters)
- Rock Mountain

FOR AUTHORIZATION
 This document does not constitute an act constituting the practice of engineering within the meaning of the Engineers Act, and must not be interpreted as such. The works and structures are illustrated and described for the purpose of obtaining authorizations.

This document does not constitute an act constituting the practice of the surveying profession within the meaning of the Surveyors Act, and must not be interpreted as such. The property boundaries and subdivision shown and described in this document are illustrated for informational purposes only and must not be used for the delimitation or positioning of public or private properties, rivers, streams and other waters of Quebec, within the meaning of that Act.

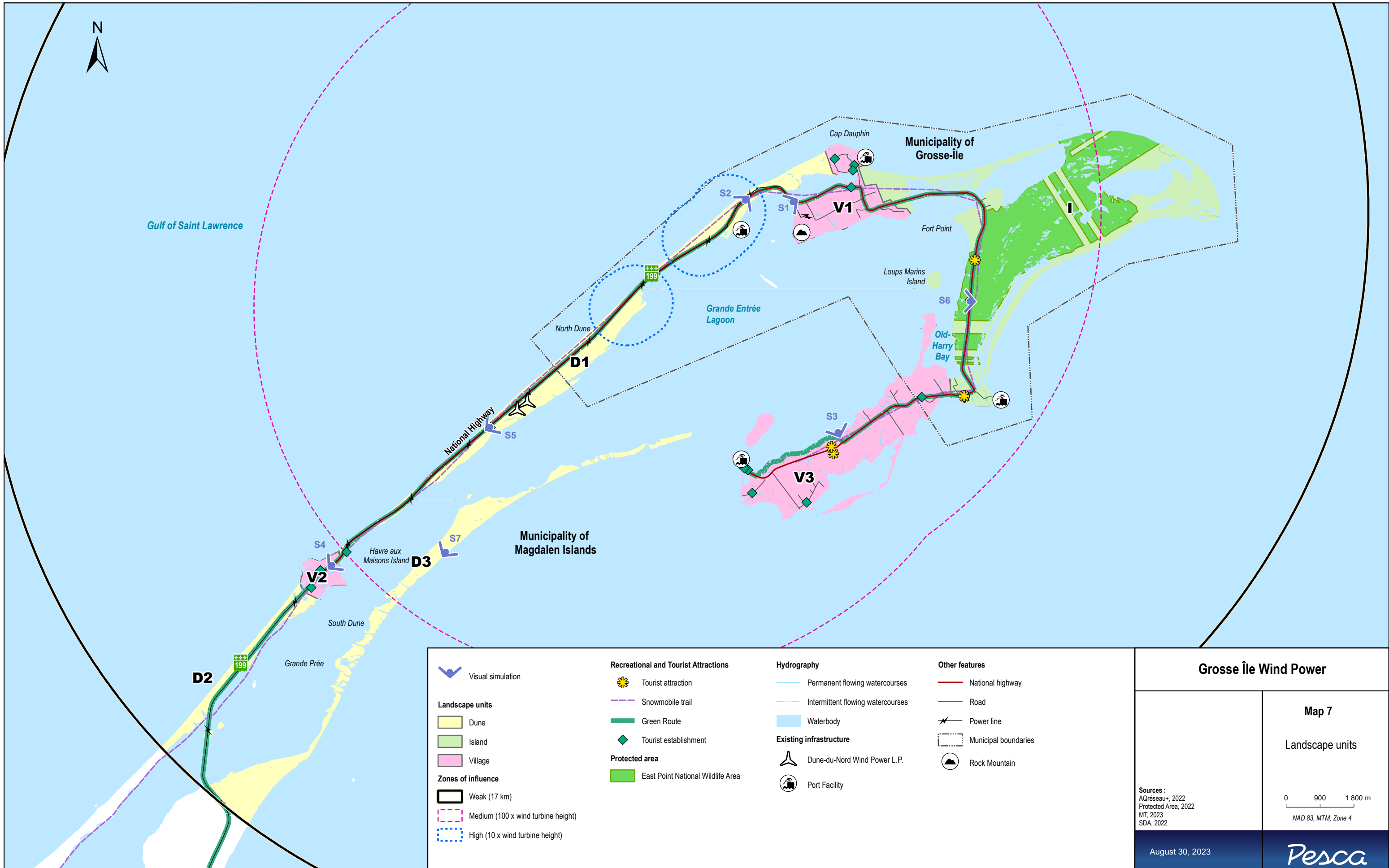
Vegetation Map 3

Sources :
 AQRéseau+, 2022
 CMHPQ, 2019
 GRHQ, 2021
 Ecoforestry Inventory, 2022
 LiDAR Derivative Product, MFFP, 2019
 SDA, 2022



March 13, 2023

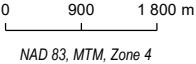




Grosse Île Wind Power

Map 7

Landscape units



Sources :
 ACréseau+, 2022
 Protected Area, 2022
 MT, 2023
 SDA, 2022

August 30, 2023





Project area

Hydrography

- Permanent watercourse
- Waterbody
- Wetland (PESCA, 2023)
- Wells and boreholes

Protection zone

- Setback from shoreline (90 m)
- Hydrography (50 m)

Project infrastructure (7 wind turbines)

- Wind turbine
- Existing road to be improved
- Road to be constructed
- Collector network
- Substation
- Project footprint

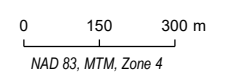
Other features

- Port facility
- Salt mine
- National highway
- Power line

Grosse Île Wind Power

Map 9
Impact on the
physical environment

Sources :
AQRéseau+, 2022
CMHPQ, 2019
RDE, 2023
SDA, 2022
SIH, 2023
UQAR, 2023



August 31, 2023



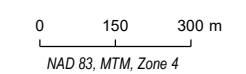


- Project Area
- Project infrastructure (7 wind turbines)**
- Wind turbine
- Existing road to be improved
- Road to be constructed
- Collector network
- Substation
- Project footprint
- Coverage of Conrad's Corema (Attention Fragiles 2022, PESCA 2023)**
- Less than 1 m²
- Between 1 and 10 m²
- Between 10 and 20 m²
- > 20 m²
- Potential habitats of plants with special status**
- Dune-du-Nord Flora Habitat
- Potential habitats of fauna with special status**
- Horned grebe habitat
- Horned grebe (CDPNQ)
- Piping plover (CDPNQ)
- Invasive alien species**
- Smooth bedstraw observed
- Hydrography**
- Permanent watercourse
- Waterbody
- Wetlands (PESCA, 2023)**
- Shallow water / pond
- Marsh
- Tidal marsh
- Swamp
- Wetland
- Wooded bog
- Open bog
- Other features**
- Port facility
- Salt mine
- National highway
- Power line

Grosse Île Wind Power

Sources :
 AGréseau+, 2022
 Attention Fragile, 2022
 CDPNQ, 2023
 CMHPQ, 2019
 Floristic Habitat, 2022
 HAFA, 2021
 RDE, 2023
 SDA, 2022

Map 10
 Impact on the
 biological environment



August 31, 2023



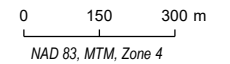


- Project area
- Project infrastructure (7 wind turbines)**
- Wind turbine
- Existing road to be improved
- Road to be constructed
- Collector network
- Substation
- Project footprint
- Borrowing Bank
- Leases**
- Industrial purposes
- Protection zone**
- Route 199 (50 m)
- Snowmobile trail (50 m)
- Hydrography**
- Permanent watercourse
- Waterbody
- Wetland (PESCA, 2023)
- Tenure**
- Private
- Public
- Undetermined
- Not illustrated
- Other features**
- Port facility
- Salt mine
- National highway
- Power line

Grosse Île Wind Power

Map 11
Impact on the human environment

Sources :
AQRéseau+, 2022
CMHPQ, 2019
MERN, 2023
RDE, 2023
SDA, 2022

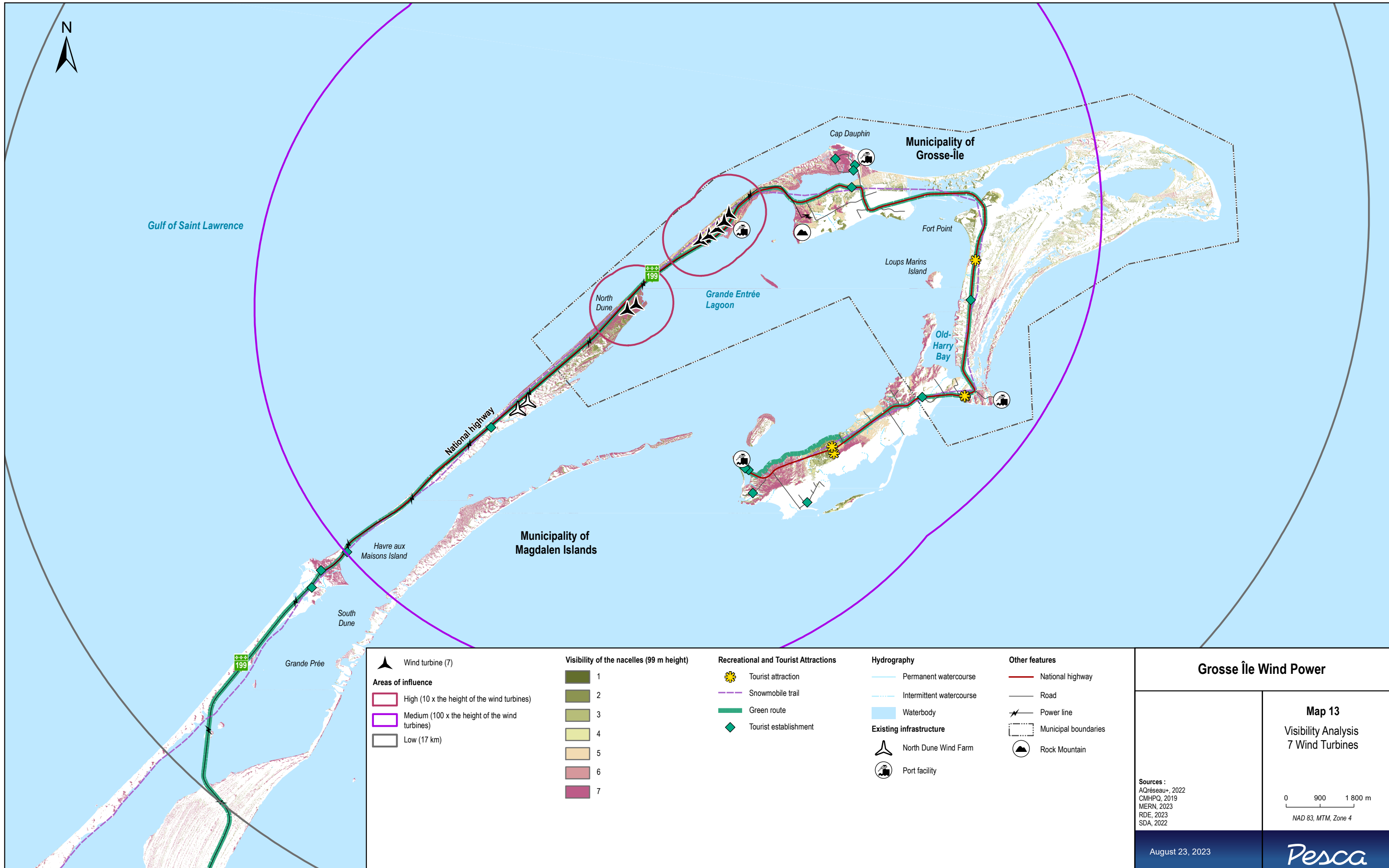


August 31, 2023



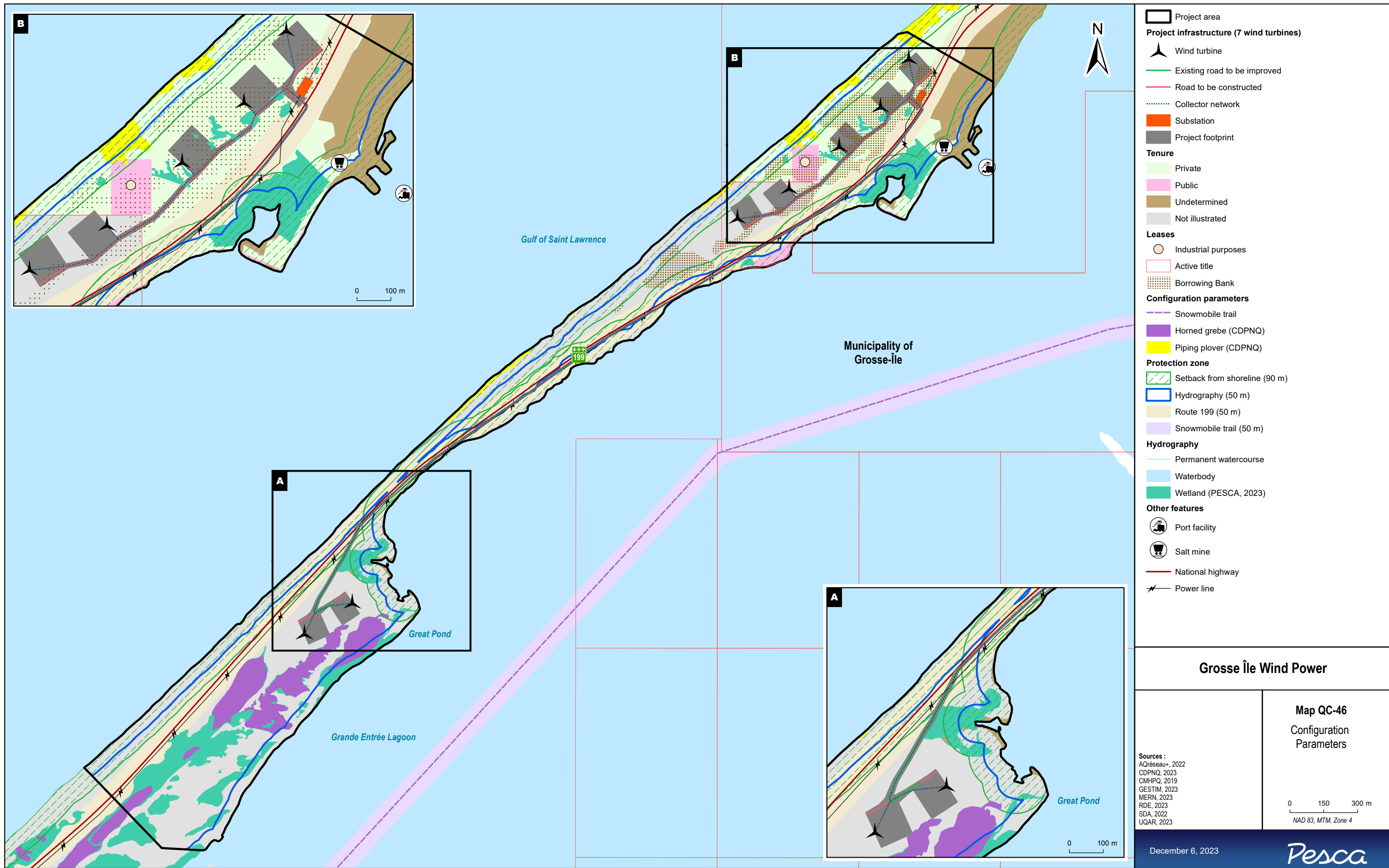


<ul style="list-style-type: none"> Wind turbine (7) Study Area Modeling of wind turbine noise 30 to 34 dBA 35 to 39 dBA 40 to 44 dBA 45 to 49 dBA 50 dBA and more Isophone at 50 dBA 	<p>Recreational and Tourist Attractions</p> <ul style="list-style-type: none"> Tourist attraction Snowmobile trail Green Route Tourist establishment 	<p>Hydrography</p> <ul style="list-style-type: none"> Permanent watercourse Intermittent watercourse Waterbody <p>Existing infrastructure</p> <ul style="list-style-type: none"> North Dune Wind Farm Port facility 	<p>Other features</p> <ul style="list-style-type: none"> National highway Road Collector network Municipal boundaries Rock Mountain
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<ul style="list-style-type: none"> Wind turbine (7) 	Visibility of the nacelles (99 m height) <ul style="list-style-type: none"> 1 2 3 4 5 6 7 	Recreational and Tourist Attractions <ul style="list-style-type: none"> Tourist attraction Snowmobile trail Green route Tourist establishment 	Hydrography <ul style="list-style-type: none"> Permanent watercourse Intermittent watercourse Waterbody Existing infrastructure <ul style="list-style-type: none"> North Dune Wind Farm Port facility 	Other features <ul style="list-style-type: none"> National highway Road Power line Municipal boundaries Rock Mountain
--	---	--	--	---

Grosse Île Wind Power	
Map 13 Visibility Analysis 7 Wind Turbines	
Sources : AGréseau+, 2022 CMHPQ, 2019 MERN, 2023 RDE, 2023 SDA, 2022	0 900 1 800 m NAD 83, MTM, Zone 4
August 23, 2023	

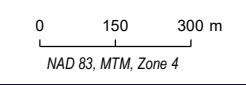


- Project area
- Project infrastructure (7 wind turbines)**
- Wind turbine
- Existing road to be improved
- Road to be constructed
- Collector network
- Substation
- Project footprint
- Tenure**
- Private
- Public
- Undetermined
- Not illustrated
- Leases**
- Industrial purposes
- Active title
- Borrowing Bank
- Configuration parameters**
- Snowmobile trail
- Horned grebe (CDPNQ)
- Piping plover (CDPNQ)
- Protection zone**
- Setback from shoreline (90 m)
- Hydrography (50 m)
- Route 199 (50 m)
- Snowmobile trail (50 m)
- Hydrography**
- Permanent watercourse
- Waterbody
- Wetland (PESCA, 2023)
- Other features**
- ⚓ Port facility
- ⚙️ Salt mine
- National highway
- Power line

Grosse Île Wind Power

Map QC-46
Configuration Parameters

Sources :
AQRéseau+, 2022
CDPNQ, 2023
CMHPQ, 2019
GESTIM, 2023
MERN, 2023
RDE, 2023
SDA, 2022
UQAR, 2023



December 6, 2023





Project area

Potential habitats of species with special status

- Hudsonian Godwit and Lesser Yellowlegs
- Red Knot (*rufa*) and Suitable Habitat for Piping Plover
- Yellow rail
- Nelson's sparrow
- Rusty blackbird

CDPNQ Occurrences

- Piping plover
- Horned grebe

Recognized wildlife habitat

- Horned grebe

2023 Bird survey

- 2023 terrestrial bird listening point
- 2023 terrestrial bird transect
- 2023 short-eared owl survey site
- 2023 waterfowl and horned grebe survey site
- 2023 raptor survey site

2022 Bird survey

- 2022 terrestrial bird listening point
- 2022 waterfowl survey site
- 2022 short-eared owl survey site

Project infrastructure (7 wind turbines)

- Wind turbine
- Existing road to be improved
- Road to be constructed
- Collector network
- Substation
- Project footprint

Hydrography

- Permanent watercourse
- Intermittent watercourse
- Waterbody

Other features

- Port facility
- Salt mine
- Powerline
- National highway

Grosse Île Wind Power

QC2-09

Potential habitats of species with special status

Sources :
 ACRéseau+, 2022
 Attention Fragile, 2022
 CDPNQ, 2023
 CMHPQ, 2019
 Floristic Habitat, 2022
 HAFA, 2021
 RDE, 2023
 SDA, 2022
 Government Imagery

0 350 700 m
 NAD 83, MTM, Zone 4

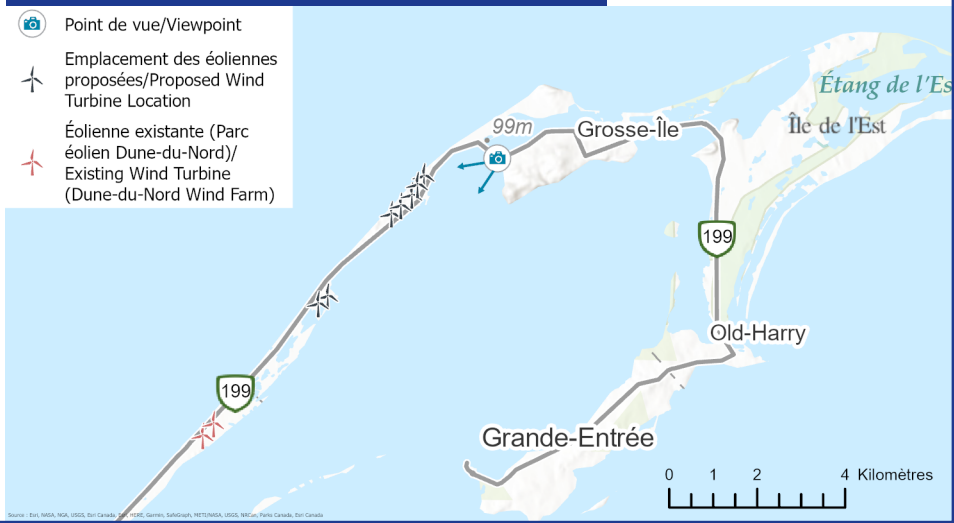
Appendix B. Visual simulations



PHOTO ORIGINALE / ORIGINAL PHOTO



CARTE DE LOCALISATION / LOCATION MAP



Simulation 1

Route 199 - Pont de la Grosse-Île

Paramètres techniques / Technical Parameters

Photographie / Photography

Coordonnées / Coordinates

Latitude : 47,617478°

Longitude : -61,540953°

Élévation / Elevation : 1,0 m

Direction : 238°

Date : 13 septembre 2022 / September 13th, 2022

Description du parc éolien simulé / Description of the Simulated Wind Farm

Hauteur des éoliennes / Height of the Wind Turbines:

Tour / Tower : 99 m

Pale / Blade : 67,795 m

Nombre total d'éoliennes / Total Wind Turbine Count: 7

Distance de l'éolienne la plus rapprochée : 1 712 m

Distance de l'éolienne la plus éloignée / Distance to Furthest Wind Turbine : 5 228 m

Nombre d'éoliennes visibles / Number of Visible Turbines : 7 (PEDGI) + 2 (PEDDN)





PHOTO ORIGINALE / ORIGINAL PHOTO



CARTE DE LOCALISATION / LOCATION MAP



Simulation 2

Mines Seleine (Chemin Principal)

Paramètres techniques / Technical Parameters

Photographie / Photography

Coordonnées / Coordinates

Latitude: 47,617839°

Longitude: -61,557650°

Élévation / Elevation: 5,1 m

Direction : 220°

Date : 13 septembre 2022 / September 13th, 2022

Description du parc éolien simulé / Description of the Simulated Wind Farm (PEDGI)

Hauteur des éoliennes / Height of the Wind Turbines

Tour / Tower : 99 m

Pale / Blade : 67,795 m

Nombre total d'éoliennes / Total Wind Turbine Count: 7

Distance de l'éolienne la plus rapprochée : 519 m

Distance de l'éolienne la plus éloignée / Distance to Furthest Wind Turbine : 4 254 m

Nombre d'éoliennes visibles / Number of Visible Turbines :

7 (PEDGI) + 2 (PEDDN)








PHOTO ORIGINALE / ORIGINAL PHOTO



CARTE DE LOCALISATION / LOCATION MAP



-  Point de vue/Viewpoint
-  Emplacement des éoliennes proposées/Proposed Wind Turbine Location
-  Éolienne existante (Parc éolien Dune-du-Nord)/ Existing Wind Turbine (Dune-du-Nord Wind Farm)



Simulation 3

Chemin de l'Église

Paramètres techniques / Technical Parameters

Photographie / Photography

Coordonnées / Coordinates

Latitude: 47,562353°

Longitude: -61,524767°

Élévation / Elevation: 1,3 m

Direction : 338°

Date : 13 septembre 2022 / September 13th, 2022

Description du parc éolien simulé / Description of the Simulated Wind Farm (PEDGI)

Hauteur des éoliennes / Height of the Wind Turbines

Tour / Tower : 99 m

Pale / Blade : 67,795 m

Nombre total d'éoliennes / Total Wind Turbine Count: 7

Distance de l'éolienne la plus rapprochée : 6 358 m

Distance de l'éolienne la plus éloignée / Distance to Furthest Wind Turbine : 6 587 m

Nombre d'éoliennes visibles / Number of Visible Turbines : 5 (PEDGI)





Simulation 4

Île-aux-Loups (Route 199)

Paramètres techniques / Technical Parameters

Photographie / Photography

Coordonnées / Coordinates

Latitude: 47.530456°

Longitude: -61.703361°

Élévation / Elevation: 10 m

Direction : 47°

Date : 9 septembre 2022 / September 9th, 2022

Description du parc éolien simulé / Description of the Simulated Wind Farm (PEDGI)

Hauteur des éoliennes / Height of the Wind Turbines

Tour / Tower : 99 m

Pale / Blade : 67,795 m

Nombre total d'éoliennes / Total Wind Turbine Count: 7

Distance de l'éolienne la plus rapprochée : 10 388 m

Distance de l'éolienne la plus éloignée / Distance to Furthest Wind Turbine : 14 131 m

Nombre d'éoliennes visibles / Number of Visible Turbines : 7 (PEDGI) + 2 (PEDDN)



PHOTO ORIGINALE / ORIGINAL PHOTO



CARTE DE LOCALISATION / LOCATION MAP



Source : SH, MDA, MGA, USGS, BC/CANAL 201, HERE, Garmin, SANGA, METROMSA, USGS, NRCAN, Parks Canada



PHOTO ORIGINALE / ORIGINAL PHOTO



CARTE DE LOCALISATION / LOCATION MAP



Simulation 5

Le P'tit-Brick

Paramètres techniques / Technical Parameters

Photographie / Photography

Coordonnées / Coordinates

Latitude: 47.563810°

Longitude: -61.648006°

Élévation / Elevation: 4,3 m

Direction : 53°

Date : 9 septembre 2022 / September 9th, 2022

Description du parc éolien simulé / Description of the Simulated Wind Farm (PEDGI)

Hauteur des éoliennes / Height of the Wind Turbines:

Tour / Tower : 99 m

Pale / Blade : 67,795 m

Nombre total d'éoliennes / Total Wind Turbine Count: 7

Distance de l'éolienne la plus rapprochée : 4 857 m

Distance de l'éolienne la plus éloignée / Distance to Furthest Wind Turbine : 8 600 m

Nombre d'éoliennes visibles / Number of Visible Turbines : 7 (PEDGI) + 2 (PEDDN)





PHOTO ORIGINALE / ORIGINAL PHOTO



CARTE DE LOCALISATION / LOCATION MAP



Simulation 6

Réserve nationale de la faune de la Pointe-de-l'Est

Paramètres techniques / Technical Parameters

Photographie / Photography

Coordonnées / Coordinates

Latitude: 47,593797°

Longitude: -61,478439°

Élévation / Elevation: 1,0 m

Direction : 272°

Date : 21 octobre 2022 / Octoberber 21th, 2022

Description du parc éolien simulé / Description of the Simulated Wind Farm (PEDGI)

Hauteur des éoliennes / Height of the Wind Turbines

Tour / Tower : 99 m

Pale / Blade : 67,795 m

Nombre total d'éoliennes / Total Wind Turbine Count: 7

Distance de l'éolienne la plus rapprochée : 6 828 m

Distance de l'éolienne la plus éloignée / Distance to Furthest Wind Turbine : 12 360 m

Nombre d'éoliennes visibles / Number of Visible Turbines : 5 (PEDGI)





PHOTO ORIGINALE / ORIGINAL PHOTO



CARTE DE LOCALISATION / LOCATION MAP



Simulation 7

Sentier de Quad

Paramètres techniques / Technical Parameters

Photographie / Photography

Coordonnées / Coordinates

Latitude: 47,533728°

Longitude: -61,663569°

Élévation / Elevation: 10 m

Direction : 35°

Date : 21 octobre 2022 / October 21th, 2022

Description du parc éolien simulé / Description of the Simulated Wind Farm (PEDGI)

Hauteur des éoliennes / Height of the Wind Turbines:

Tour / Tower : 99 m

Pale / Blade : 67,795 m

Nombre total d'éoliennes / Total Wind Turbine Count: 7

Distance de l'éolienne la plus rapprochée : 4 272 m

Distance de l'éolienne la plus éloignée / Distance to Furthest Wind Turbine : 11 794 m

Nombre d'éoliennes visibles / Number of Visible Turbines : 7 (PEDGI) + 2 (PEDDN)





Pesca