ENVIRONMENTAL ASSESSMENT REGISTRATION

THE ARCHES AND FLAT HILLS WIND FARM

SUBMITTED BY: Kruger

SUBMITTED TO: DEPARTMENT OF ENVIRONMENT

JULY 2004

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1 NAME OF UNDERTAKING

The name of the undertaking is: The Arches and Flat Hills Wind Farm

2 PROPONENT

2.1 Name of Corporate Body

The name of the corporate body undertaking the project is Kruger Inc.

Kruger is one of the few privately-owned companies in the Canadian pulp and paper industry. Kruger Inc. and the Kruger Family interests employ some 10,500 people in Canada and abroad. The Kruger Head Office is located in Montréal, Canada.

Major investments since 1905 have enabled the company to be a leader in technology and active in world markets. Kruger anticipates and meets the needs of its local and international customers and offers an array of products made from virgin and recycled fibers: newsprint, coated and supercalendered paper, linerboard, recovered paper, packaging, lumber, wood panels and tissue.

Kruger acquired Scott Paper Limited in 1997. As a leading tissue manufacturer, Scott Paper serves the Canadian consumer market with well-known brands including Cottonelle, Purex, White Swan, Capri, Viva, ScotTowels and Scotties, as well as away-from-home products for industrial and commercial use across Canada.

Synonymous with quality, productivity and innovation, the Kruger logo is recognized in Canada, the United States and in international markets.

2.2 Address

The head office is located at:

3285 chemin Bedford
Montréal (Québec) Canada
H3S 1G5

2.3 Chief Executive Officer

Name:	Mr. Joseph Kruger II
Official Title:	Chairman of the Board and Chief Executive Officer

2.4 Principal Contact Person for Purposes of Environmental Assessment

Name:	Mr. Allan Vatcher
Official Title:	Vice President
Address:	3285 chemin Bedford, Montréal (Québec) Canada, H3S 1G5
Telephone Number:	514-343-3209

3 THE UNDERTAKING

This section describes the nature and rational for Kruger's project.

3.1 Nature of the Undertaking

Kruger proposes to develop, construct, own and operate a wind project on Newfoundland's Northern Peninsula. The two targeted zones for the wind park are The Arches and the Flat Hills. More information about the location of the project is provided in section 4 of this document. The project is expected to have an installed capacity of 40 MW and be built between the spring and fall of 2005.

Kruger has taken a methodological approach to developing the project. The first three phases (market study and sensitivity analysis, wind mapping and site visit) have been completed while the fourth phase (wind monitoring) is well underway.

3.1.1 Market Study and Sensitivity Analysis

The first stage of project development involved a market study and sensitivity analysis. The market study compared the wind energy potential in the provinces of British Columbia, Ontario, Quebec and Newfoundland. The sensitivity analysis examined the price paid per kWh for three different internal rates of return and three different capacity factors. Based on the results of these studies, it was decided that the province of Newfoundland presented the most opportune market for a wind power project.

3.1.2 Wind Mapping

Following the decision to analyse the feasibility of a project in Newfoundland, it was decided to produce a wind speed map in order to select the site with the most potential. Kruger had a mesoscale wind speed map produced of the central and western regions of the province at a resolution of 110 meters. The wind speed map confirmed that there are excellent long term average wind speeds in the province. Using the map, 12 areas were targeted as being potential sites for the project. The next stage, the site visit, was required to choose the most suitable site.

3.1.3 Site Visit

During the site visit, eight sites were examined for their development potential. The main criteria considered for site selection were:

- Easy road accessibility;
- Electrical grid accessibility;
- Availability of space for a 20 – 40 MW wind farm development;
- Suitable orientation of the area relatively to the prevailing winds on site;
- Few potential environmental impacts;
- Distance from cities and towns.

Based on these criteria, two sites were selected for detailed wind monitoring: *The Arches* and the *Flat Hills*.

3.1.4 Wind Monitoring

It was decided to install two 50 meter wind monitoring towers, one in each targeted zone. The first wind monitoring tower was installed in The Arches in the middle of February 2004 while the second was installed in July 2004. Figure 3.1 is a picture of the installed wind monitoring tower at The Arches.

Figure 3.1 : Wind Monitoring Tower at The Arches

3.2 Rationale for the Undertaking

3.2.1 Project Goals

Kruger is renowned for its strong corporate sustainability based on a long term reputation of human and environment safety protocols. In order to further its commitment to an environmentally sound future, Kruger strives to use power produced by renewable sources. It is this motivation that leads Kruger to convert wind energy to usable power.

By getting involved in wind energy generation in Newfoundland, Kruger has the following goals:

- Demonstrate full commitment to long term sustainable development;
- Provide Newfoundland and Labrador Hydro (NLH) with a reliable energy source to satisfy future demand;
- Provide NLH with energy from a new source to diversify energy input to the grid;
- Reduce the province's dependence on fossil fuels;
- Provide reliable and stable power to the electrical grid;
- Mitigate any environmental impacts from the project development, construction and operation;
- Obtain local support for the project;
- Demonstrate the potential for wind energy projects to the province's population.
-

3.2.2 Introduction to Wind Energy and Global Trends

Wind energy is the fastest growing source of power production around the world with a compounded annual growth rate of approximately 30%. Current installed capacity in Canada is just over 300 MW while forecasts for 2012 predict between 6,000 and 10,000 MW of installed capacity. Some of the reasons why such a large increase is expected during next ten years are the following:

- Wind energy has become a proven technology in Canada;
- Cost of wind energy is expected to be equal to that of conventional energy generating sources in 2008 (costs continue to decrease with gained experience, larger markets for manufacturers, larger turbines, increased efficiency, and better methods of integrating wind energy into the grid);
- Federal and provincial governments are starting to support wind energy;
- Public is creating additional opposition to new power generation based on any type of fossil fuels;
- Wind energy has an excellent public perception;
- Wind energy does not rely on volatile fuel prices;
- Distributed generation decreases transmission costs;
- Quick installation time.

Furthermore, wind energy is a safe, reliable, economical and environmentally sustainable energy source. It is in fact the cleanest form of electricity on the market today. Unlike conventional sources of power, wind energy does not create emissions or hazardous waste of any kind.

3.2.3 Newfoundland Wind Energy Opportunities

As the province's power load continues to increase, new sources of power generation are necessary. In order to meet Kyoto protocols and the public's expectations of low impact power generation, the province will have to examine methods of power generation with minimal environmental impact. As there are a diminishing amount of potential hydro sites, wind energy is the next most viable alternative.

Newfoundland has an excellent wind potential and some of the highest wind speeds in Canada. The other Maritime Provinces are already involved in developing projects and implementing Renewable Portfolio Standards. For example, Prince Edward Island is currently generating 5% of its total power from the wind. While Newfoundland does not yet have an installed utility-sized wind farm, two wind farms are under development in the province. The first project is the St. Lawrence Wind Demonstration Project being developed by the NEWind Group. The second project is the Burnt Ridge, Elliston, Bonavista Peninsula Wind Farm. Both of these projects are expected online within the next couple of years.

Wind power will be easily integrated into the provincial electrical grid because the windy season coincides with the season of peak electrical demand. Additionally, wind power is complimentary to both hydroelectric and thermal generation and as such, wind plants will alleviate operating limitations and constraints on thermal and hydro by providing clean electricity.

4 DESCRIPTION OF THE UNDERTAKING

This section describes the geographical and physical location of the project and the activities involved in project construction and operation.

4.1 Geographical Location

Kruger proposes to implement a wind farm with an installed capacity of 40 MW on the west coast of Newfoundland's Northern Peninsula. The general location of the project is shown in Figure 4.1.

More precisely, the project will be located between the towns of Parson's Pond and Portland Creek to the east of The Arches Provincial Park and to the east of all pasture lands. The targeted area is about 105 km north-west of Deer Lake, 20 km north of the Gros Morne National Park, and 10 km south of Daniel's Harbour. The site takes advantage of the strong winds coming off the Gulf of St. Lawrence. The proposed area for the project and its topography is shown in Figure 4.2. It is expected that the project will be divided between two sites and that there will be 15 MW developed at The Arches and 25 MW developed at the Flat Hills.

A road, the 430, and a 138 kV power line pass closer through the site.

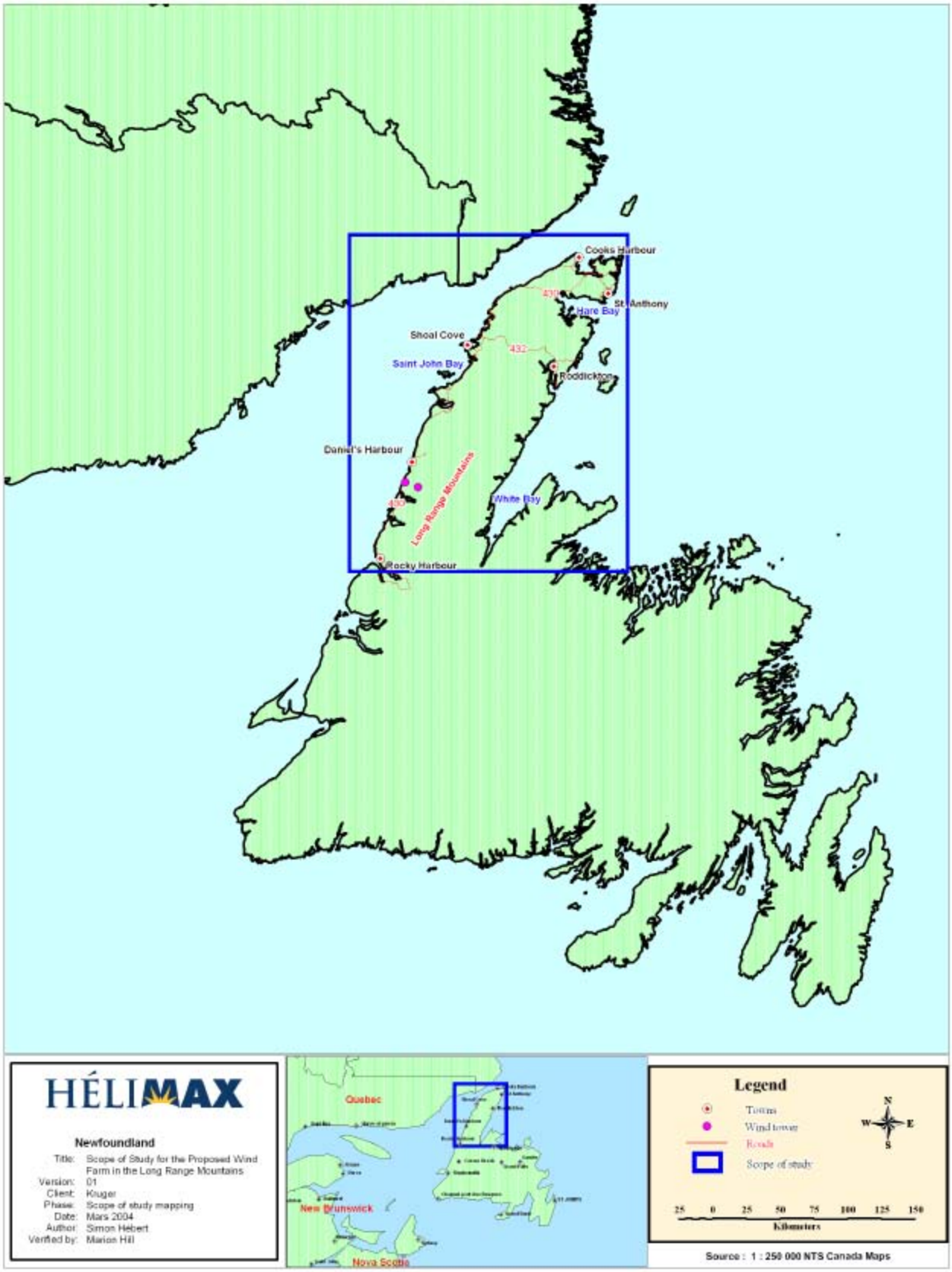


Figure 4.1 : Northern Peninsula, Newfoundland

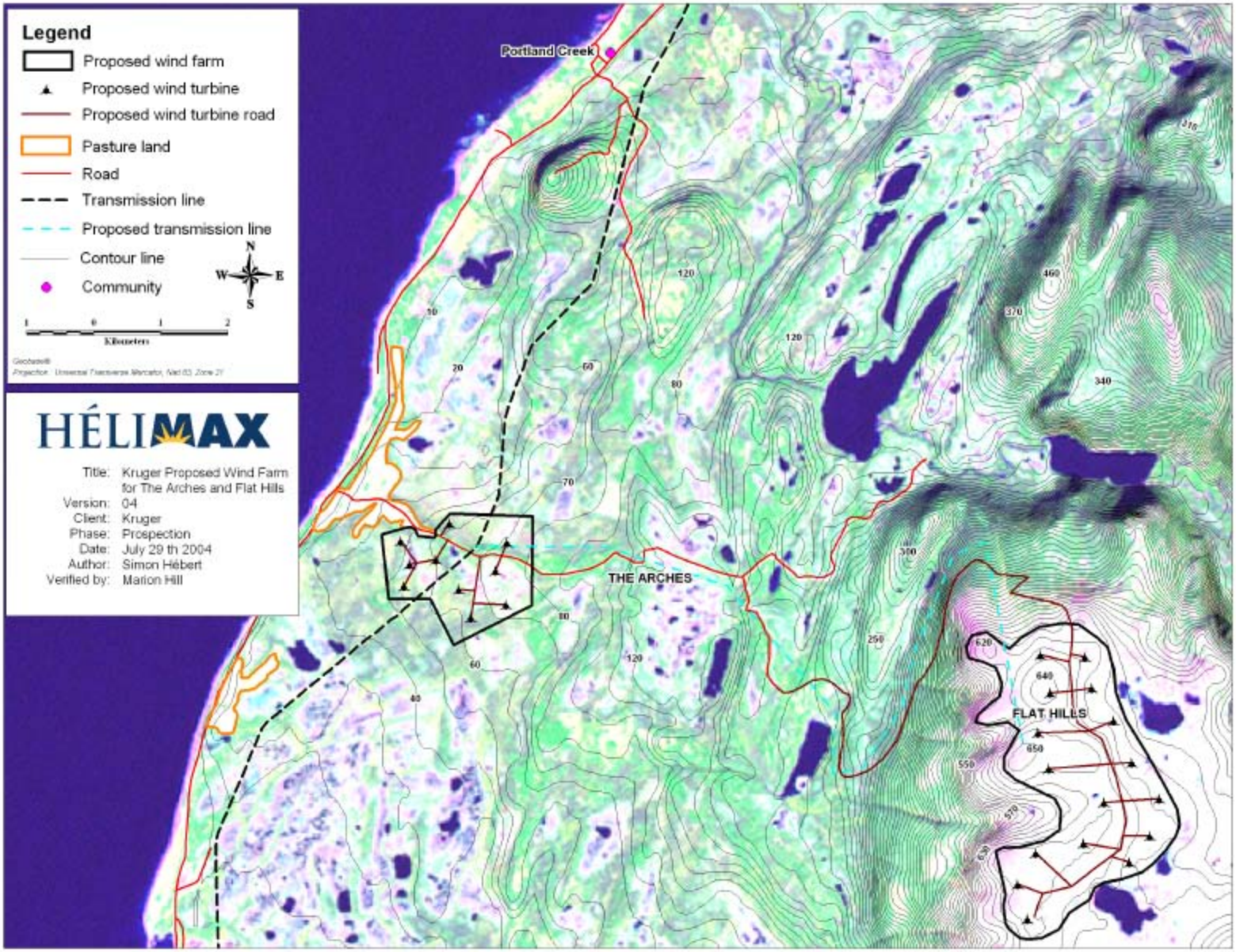


Figure 4.2: Wind Farm Design at The Arches and Flat Hills

4.2 Physical Features

The coasts of the Northern Peninsula are dominated by low lying planes while the interior is formed by the Long Range Mountains, a chain of flat-topped mountains.

The Arches and the Flat Hills are located in two different ecological regions of the province. Newfoundland's ecological regions are shown in Table 4.1. The Arches is situated in the Northern Peninsula, Subregion A which represents the Coastal Plain. The Flat Hills is located in, Northern Peninsula, Subregion C which represents the Northern Long Range (Government of Newfoundland Forest Resources). As the two sites are part of two different subregions, the physical features (vegetation and topography, geology, climate, and resource and land use) of the two sites will each be treated individually in the following sections.

Table 4.1: Geophysical Regions of Newfoundland (Government of Newfoundland Forest Resources)

4.2.1 Vegetation and Topography

The topography of The Arches is distinguished by a slope rising from an elevation of 40 meters at the west end of the site near the shore, to an elevation of about 120 meter above sea level approximately 5 km inland at the east end of the site. The site is dominated by bogs and scrub forest where balsam fir and spruce are the dominant type of vegetation. Kalmia heath covers poorly-drained sites while dwarf black spruce and evergreen shrubs are common on exposed rock (Newfoundland and Labrador Heritage Patrimoine 2002). Figure 4.3 shows pictures of The Arches and Figure 4.4 shows pictures of the Flat Hills.

Figure 4.3: Pictures of The Arches Site

Figure 4.4: Pictures of the Flat Hills

The Flat Hills, a subsection of the Long Range Mountains, offers a wide plateau suitable for wind farm development. The elevation of the site ranges between 620 and 650 meters. This region is sparsely covered with black spruce, balsam fir, dwarf kalmia and mosses (Government of Newfoundland Forest Resources).

4.2.2 Geology

The Arches site is dominated by limestone and igneous rocks. The Flat Hills, part of the Long Range Mountains, consist of one billion year old gneiss, schist and granite belonging to the Grenville Province of the Laurentian Shield (Newfoundland Department of Tourism 2001).

4.2.3 Climate

The climate of the Northern Peninsula is harsh with the first frosts starting in September and long winters that stay into May or June. Sea-ice may be present from January until May. Summer maximums are seldom above 18 °C. Table 4.2 shows the yearly average temperature, precipitation and wind speed observed at Daniel's Harbour which is 10 km north of the site.

Table 4.2: Average Monthly Temperatures and Precipitations (Environment Canada 2002)

	Yearly Average
Daily Mean Temperature (°C)	3.1
Precipitation (mm)	1137.5
Wind Speed (km/h)	24
Prevailing Wind Direction	Southwest

The wind rose from the observations taken from The Arches wind monitoring tower is shown in Figure 4.5. As can be seen the predominant winds are from the south-west.

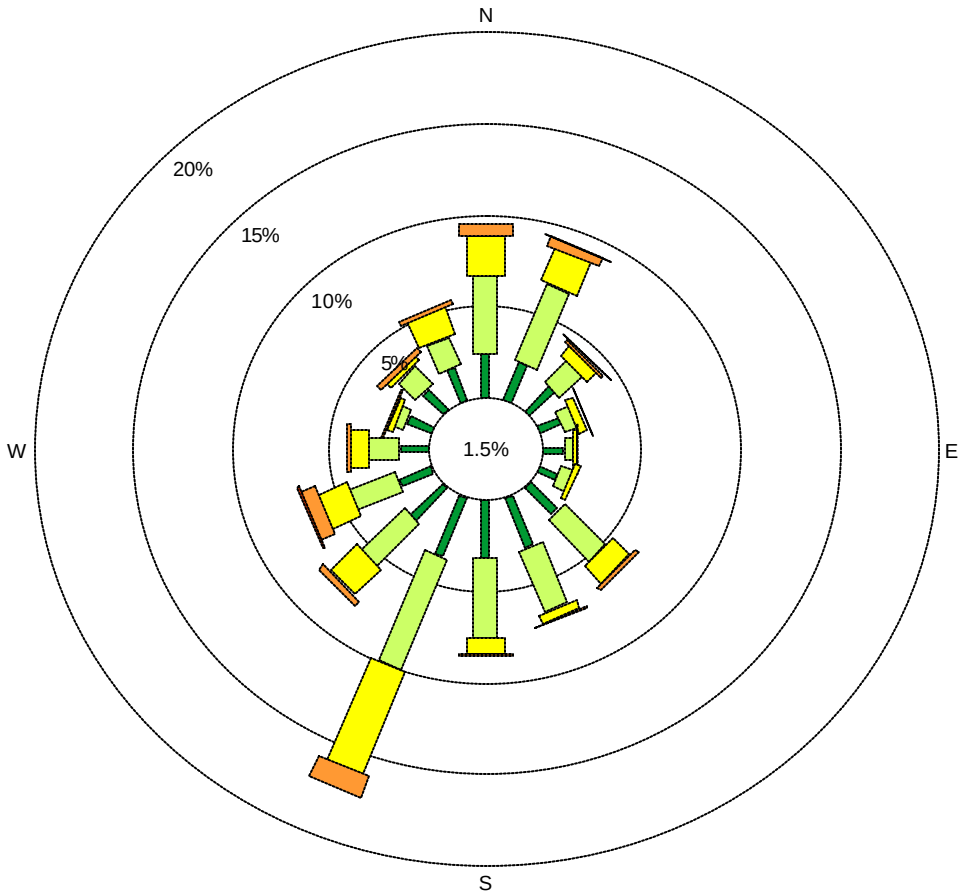


Figure 4.5: Wind Rose (m/s) The Arches

4.2.4 Resource and Land Use

The proposed project is situated on land that is not heavily used on a regular basis. There are a few cottages in the area. The most common leisurely activity in the area is hunting and fishing.

4.3 Wildlife and Birds

As with any new construction, building a wind farm can affect fish, mammals and birds that live in the area around the project. It is therefore important to catalog the wildlife living in the region in order to understand and then minimize the impact that the wind farm will have. This section will review what types of fish, mammals and birds live in The Arches and Flat Hills.

4.3.1 Fish

As the wind farm would be built inland, the only fish that may be affected are those that live in the ponds and streams around the project. The fish may be affected if their natural environment is changed due to the construction process. Extreme precaution will be taken to minimize any of these effects; roads and wind turbines will be sited in such a manner as to avoid disruption of the fish environment. Therefore, an impact on fish can be considered as marginal or inexistent.

4.3.2 Mammals

While wind farms have not been found to affect mammals living in the environment, it is still important to take precautions. Table 4.3 lists the mammals that are common and or abundant in Gros Morne National Park and Insular Newfoundland. As Gros Morne National Park is close to The Arches and the Flat Hills, the mammals found in the park could also be found at the targeted wind park site. However as the park is a protected environment, it will house a larger variety of species than would be seen at The Arches and the Flat Hills.

Table 4.3: Land Mammals of Gros Morne National Park and Insular Newfoundland (Parks Canada 2003)

Family	Species	Status on the Island	Status in Gros Morne Park
Shrews	Common shrew (Sorex cinereus)	Abundant	Abundant
Bats	Little brown bat (Myotis lucifugus)	Common	Common
	Northern long-eared bat (Myotis septentrionalis)	Common	Common
Hares	Snowshoe Hare (Lepus americanus)	Abundant	Abundant
Squirrels	Red squirrel (Tamiasciurus hudsonicus)	Abundant	Abundant
Beavers	American beaver (Castor canadensis caecator)	Common	Common
Rats and Mice	Deer Mouse (Peromyscus maniculatus)	Common	Common
	Meadow Vole (Microtus pennsylvanicus terraenovae)	Common	Common
Canids	Red fox (Vulpes vulpes deletrix)	Common	Common
Bears	Black bear (Ursus americanus hamiltoni)	Common	Common
Weasels	Ermine (Mustela erminea)	Common	Common
	Mink (Mustela vison)	Common	Common
Cats	Lynx (Lynx canadensis subsolanus)	Common	Uncommon
Deer	Caribou (Rangifer tarandus caribou)	Abundant	Abundant
	Moose (Alces alces)	Abundant	Abundant

None of these mammals are considered endangered, threatened and concerned species as defined by Environment Canada.

4.3.3 Birds

One of the main environmental concerns while evaluating the implementation of a wind energy project is the possible impact on bird populations. These impacts vary from loss or disruption of habitat to actual mortality due to collisions with the towers and blades. Although studies have shown that avian collisions with wind turbines are not as significant as with other structures, such as transmission lines and windowed buildings (National Wind Coordinating Committee 2001), it is important to evaluate the possible disrupted populations in the projected areas. An overview of predominant species and protected populations in the area would give a good idea of the impact if any. Appendix A presents a list of birds that have been observed in Gros Morne National Park.

As Gros Morne National Park is close to The Arches and the Flat Hills, the birds found in the park could also be found at the targeted wind farm site. However as the national park is a protected environment, it will house a larger variety of species than would be seen at The Arches and the Flat Hills.

4.4 Wind Farm Components

Three major components to a wind farm:

- Wind turbines
- Roads
- Substation and electrical wiring.
-

4.4.1 Wind Turbines

Wind turbines convert the energy contained in the wind into electricity. Utility grade horizontal axis wind turbines, such as the ones that will be used, produce electricity to be delivered to the electrical grid. The major components of a utility scale wind turbines are: the rotor, the hub, the nacelle with the control system, the generator and drive train, the tower and the foundation. These components are shown in Figure 4.6.

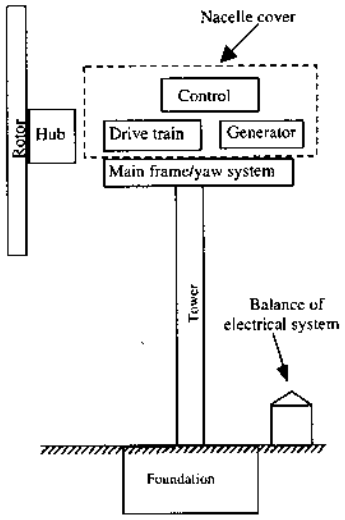


Figure 4.6: Wind Turbine Components (Manwell et al. 2002)

Installing the wind turbines involves excavating an area of approximately 225 square meters and about 4 to 6 meters deep in which a concrete foundation is then poured. The tower, nacelle and rotor will be attached and installed with large cranes on site. Beside each tower base, there is a small transformer occupying a footprint of approximately nine square meters.

4.4.2 Roads

Service roads will be built from the provincial road, road 430, to each wind turbine. The total length and width of these gravel roads will be kept to a minimum so as to reduce the environmental impact. The roads will be built to support the weight of the equipment and machinery required to build the wind farm. Once construction is finished, only access roads for lightweight vehicles will be necessary during the lifetime of the project. These roads will be used for operation and maintenance of the wind turbines. The roads that will be built are shown in Figure 4.7.

Whenever possible, existing roads will be used instead of building new ones. To reduce the environmental impact from construction and deforestation on the ecosystem, the layout of the service roads will be optimized with respect to surface area and environmental protection.

4.4.3 Substation and Electrical Wiring

The electricity produced from each wind turbine will be collected at the substation. The substation transforms the medium voltage produced from the wind turbines to high voltage so that the wind farm can be interconnected to the transmission grid. The electrical wiring between the wind turbines and the substation will be installed overhead or underground as appropriate. In either case, these wires will generally follow the service roads as to further minimize impact on the targeted site.

4.5 Construction

The construction of a wind park involves installing the three components described in the previous section: wind turbines, roads, and substation and electrical wiring. The whole construction process should take between 6 and 9 months. The construction would be done from spring to fall in order to avoid the harsh winter construction period.

4.5.1 Site Preparation

This particular site has been chosen because it is expected there will be a minimal amount of work during site preparation and therefore a minimal impact on vegetation and ground at the site. Specifically, any changes to pasture land will be avoided during site preparation and construction to preserve these areas.

Before construction begins, the site will be prepared for the installation of the turbines. Deforestation and excavation will occur only when absolutely necessary for construction and will be kept to as small an area as possible. The site will be prepared for construction as well as being able to hold 10 turbines at The Arches and 16 turbines at the Flat Hills, a total of 26 transformers, a storage area for maintenance equipment and spare parts, and roads to each of the turbines. Throughout the time of site preparation, particular attention will be paid to the environment to limit any significant and long term changes to the site, with respect to both soil and vegetation.

4.5.2 Construction Process

Particular attention during the construction process will be paid to the environment to limit any changes to the site, both with respect to soil and vegetation. Efforts will be made to reduce the effects that construction may have on cottages in the area. All of the work performed, along with the materials and methodology, will conform to the province of Newfoundland's regulations.

Once the construction is completed, the site will be cleaned up, and seeds will be planted to prevent erosion and to stabilize the soil when necessary.

4.5.3 Grid Integration Equipment

A substation will connect the wind farm to the transmission system. The voltage will likely be increased from 12.47 KV, the voltage produced by the turbines and transformers, to 138 kV, the voltage of the utility line.

The substation will be built according to Newfoundland and Labrador Hydro's specifications and will be in proximity of the park.

4.5.4 Turbine Specifications

The particular manufacturer of the wind turbines for the project has not yet been chosen. However, the turbines will likely be about 1.5 MW with a rotor diameter of 80 meters. The turbines will be installed on 80 meters tall towers. It is proposed that 26 wind turbines will be installed with 10 at The Arches and 16 at the Flat Hills.

4.6 Operation

4.6.1 Security of People and the Environment

As soon as the park is commissioned, it will be secured in order to avoid any danger. All necessary precautions will be taken to ensure the safety of people and wildlife that may visit the site. The electrical connections will be made following industry standards. No transmission line or electrical equipment will be accessible other than to authorized personnel responsible for the operation and maintenance of the park. Strict procedures will be implemented to ensure that the people responsible are properly trained and that the procedures are followed.

The procedures advised by the manufacturer will be implemented to secure the park and its operation. The wind turbines will have redundant emergency brakes in case there is a problem during operation. A procedure will be implemented in order to stop the turbines even when there is no available electricity from the electrical grid. Furthermore, anytime personnel are required to perform work in the nacelle, they will follow strict procedures defined by the manufacturer.

The installations will be built in a secure manner in order to ensure that no living being can be hurt or killed by the ground installations. The transmission lines will be buried when necessary in order to limit visual impact and possible bird kills. The wind park will be off limits to unscheduled visitors and signs will be posted clearly indicating high voltage machinery.

4.6.2 Aerial Security

The site will be lit by appropriate lighting as defined by the latest regulations set by Transport Canada.

4.6.3 Visual Impact

There will be a visual impact from the project because wind turbines are large, majestic structures. The effect of the impact is subjective and as such varies from one person to another. The wind park will be configured in such a manner as to create a comfortable image well integrated into the environment by taking advantage of topography and other site features. The goal is to build a project with minimal visual impact.

A visual simulation has been produced to reproduce the effect that the turbines will have on the environment. The site would appear partly as shown in Figure 4.7.

Figure 4.7 : Visual Impact of the Project

4.6.4 Noise Impact

All wind turbines produce a certain level of noise, usually about 104 dB(A). Conventional wind turbines produce noise because of:

- The aerodynamic effect of the wind moving over the blades
- The speed of the moving blades
- The electrical generator when it spins at high speeds.

At a distance of 300 meters from the turbines, the noise created from their operation will not be heard. As there are no permanent residents in the immediate vicinity of the project area, no one should be affected by the noise produced from the wind farm. However, the project design will ensure that any noise created will be minimal in areas used by residents.

4.6.5 Impact on Radio and Television Transmission

Wind turbines do not have any impact on mobile phone transmission and should not have an impact on radio or television transmission signals. As wind turbine blades are currently built from fiberglass with minimum amounts of metal, the disturbance that the wind park is expected to have is minimal.

If any disturbance is created, the problem is easily corrected by re-orientating antennas or by adding simple auxiliary transmitters.

4.7 Review of Sensitivity

Table 4.4 presents an overview of the sensitivity of each aspect of the environment during each stage of the project development. The impact is ranked on a scale from 1 to 5 where 1 is extremely low impact, and 5 is high impact. As can be seen, the impact of the wind farm is low.

Table 4.4 : Review of Sensitivity of the Environment to Wind Park Project

		Sensitivity of the Element to the Environment									
		Birds	Mammals	Habitat	Soil	Water	Vegetation	Noise	Visual	Health	Electromagnetic Interference
Site Preparation	Deforestation	1	2	2	1		2	1	1		
	Excavation			1	2			1	1		
	Soil sampling				1						
	Garbage removal				2		2				
Construction	Access Roads			1	2	1	1	1	1		
	Transmission lines and towers			1	1		2		1	1	
	Foundations				1				2		
	Tower Erections									2	
	Garbage Removal				2	2	2				
Operation	Service Roads		1			1	1	1	1	1	
	Transmission lines and towers	1							2		
	Wind Turbines	2						1	1	1	2
	Transformers and site equipment							1	1		
	Garbage Removal					1					
	Site clean up				1		2	1		2	

5 APPROVAL OF THE UNDERTAKING

Table 5.1 lists the permits required before wind park construction may commence and the authorities responsible for issuing them.

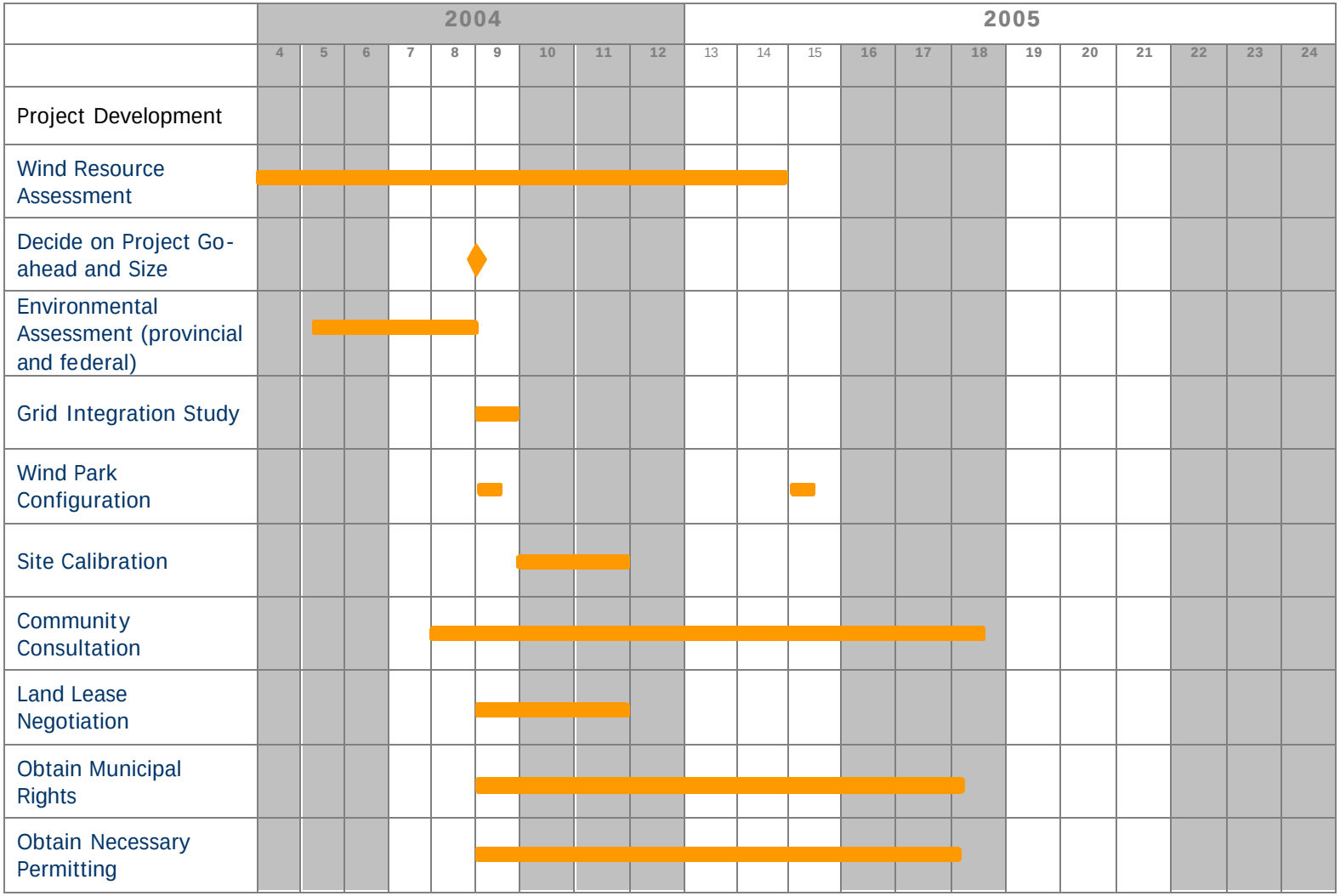
Table 5.1: Permits Required for the Project

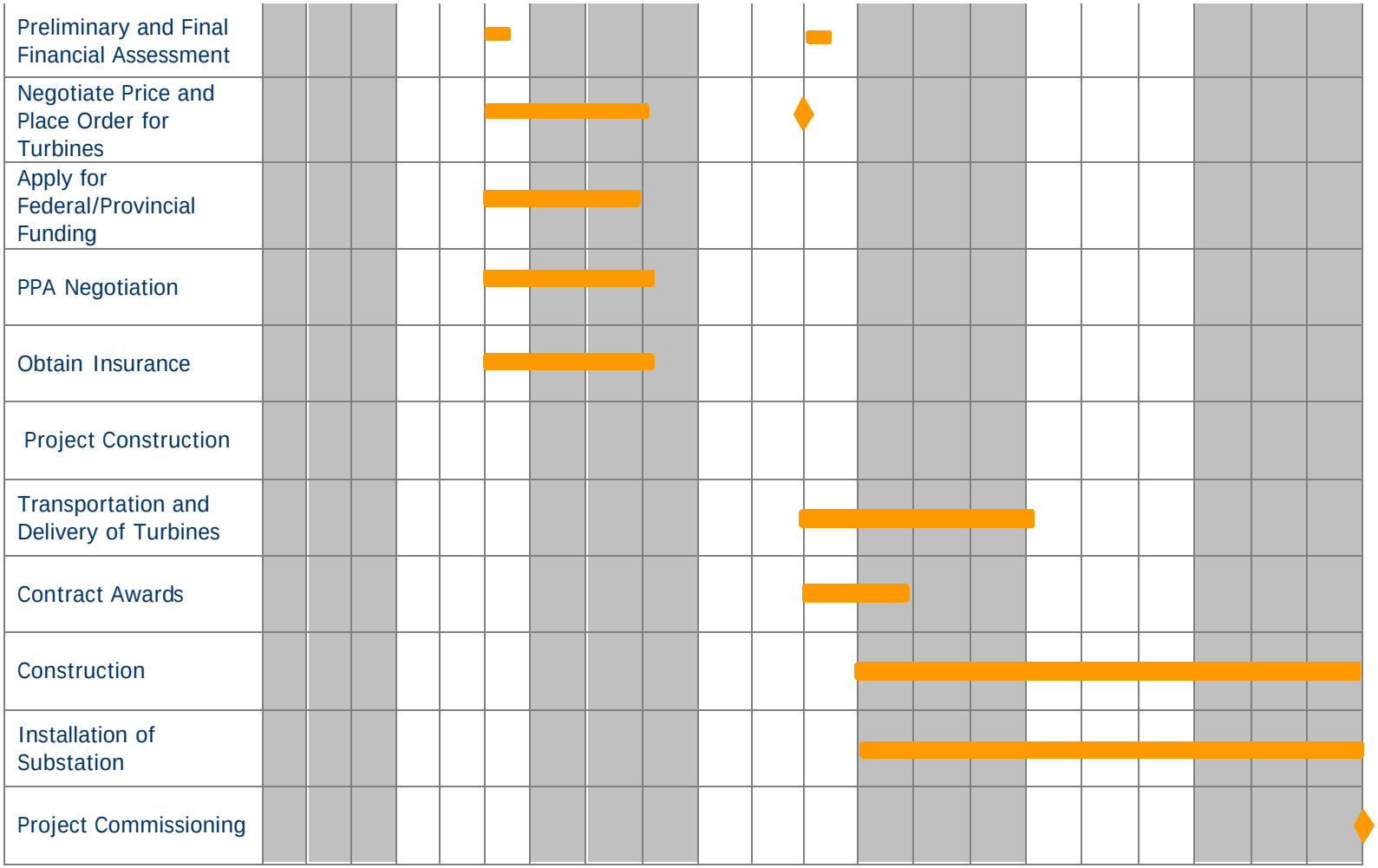
Permit	Authority
Building Accessibility Exemption Registration.	Municipal Council
Environmental Permit.	Department of Environment
Permits for Crown Lands	Department of Government Services and Land Office, Customer Services
Application for road construction on Crown Land.	Department of Government Services and Lands Office
Construction on site	Environment, Water Resource Division
Highway Access Permit.	Department of Works, Services and Transportation
Tall Structures Obstruction Clearance.	Transport Canada
Electrical Permit	Customer Services / Operations
Fish Habitat	DFO Canada

6 SCHEDULE

Table 6.1 is projected schedule for the project. As there are many factors influencing the project development and project construction, it should be noted that this is only a preliminary schedule.

Table 6.1: Proposed Project Schedule




Preliminary and Final Financial Assessment
Negotiate Price and Place Order for Turbines
Apply for Federal/Provincial Funding
PPA Negotiation
Obtain Insurance
Project Construction
Transportation and Delivery of Turbines
Contract Awards
Construction
Installation of Substation
Project Commissioning

7 FUNDING

The project will be funded internally by Kruger Inc. and/or Corner Brook Pulp and Paper. Additional funding will be obtained from programs such as the Federal Government Wind Power Production Incentive.

8 REFERENCES

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APPENDIX A

The following is a list of the birds seen at Gros Morne and the interior.

GEESE, SWANS & DUCKS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Snow Goose				x					x		x	x	x	x
Canada Goose	x					x					x	x	x	x
Brant				x					x		x	x	x	
Gadwall				x							x	x	x	x
American Wigeon		x				x					x	x	x	x
American Black Duck	x					x					x	x	x	x
Mallard			x			x					x	x	x	x
Blue-winged Teal			x			x					x	x	x	x
Northern Shoveler			x			x					x	x	x	
Northern Pintail		x				x					x	x	x	x
Green-winged Teal	x					x					x	x	x	x
Redhead					x				x		x	x		
Ring-necked Duck	x					x					x	x	x	x
Greater Scaup		x				x	x							
Lesser Scaup			x								x	x	x	x
King Eider		x									x	x	x	x
Common Eider	x					x	x							
Harlequin Duck			x			x					x	x	x	x
Surf Scoter		x									x	x	x	x
White-winged Scoter		x									x	x	x	x
Black Scoter		x				x					x	x	x	x
Long-tailed Duck	x										x	x	x	x
Bufflehead			x								x	x	x	x
Common Goldeneye	x					x	x							
Barrow's Goldeneye			x								x		x	x
Hooded Merganser				x		x					x	x	x	x
Common Merganser		x				x	x							
Red-breasted Merganser	x					x	x							

GROUSE & PTARMIGAN	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Ruffed Grouse	x					x	x			x				
Spruce Grouse		x				x	x			x				
Willow Ptarmigan	x					x	x							
Rock Ptarmigan		x				x	x							

LOONS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Red-throated Loon		x												
Common Loon	x					x	x							

GREBES														
Pied-billed Grebe			x			x					x	x	x	x
Horned Grebe				x							x	x	x	x
Red-necked Grebe		x									x		x	x

FULMARS & SHEARWATERS														
Northern Fulmar	x					x	x							
Cory's Shearwater			x									x		
Greater Shearwater	x										x	x	x	
Sooty Shearwater	x										x	x	x	
Manx Shearwater		x				x					x	x	x	

STORM-PETRELS														
Wilson's Storm-Petrel		x									x	x	x	
Leach's Storm-Petrel	x					x					x	x	x	

GANNETS														
Northern Gannet	x					x					x	x	x	x

CORMORANTS														
Double-crested Cormorant		x				x					x	x	x	x
Great Cormorant		x				x	x							

HERONS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
American Bittern		x				x					x	x	x	
Great Blue Heron			x								x	x	x	x
Tricolored Heron					x				x		x	x		

IBISES														
Glossy Ibis				x					x		x	x	x	

OSPREYS, EAGLES & HAWKS														
Osprey	x					x					x	x	x	
Bald Eagle		x				x	x							
Northern Harrier		x				x					x	x	x	x
Sharp-shinned Hawk		x				x					x	x	x	x
Cooper's Hawk					x				x				x	x
Northern Goshawk		x				x					x	x	x	x
Rough-legged Hawk		x				x					x	x	x	x

FALCONS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
American Kestrel			x			x					x	x	x	x
Merlin		x				x					x	x	x	x
Gyrfalcon			x								x	x	x	x
Peregrine Falcon			x								x	x	x	x

RAILS, GALLINULES & COOTS														
American Coot			x								x	x	x	x

CRANES														
Sandhill Crane				x					x		x	x	x	x

PLOVERS														
Black-bellied Plover	x										x	x	x	x
Semipalmated Plover	x					x					x	x	x	
Piping Plover			x			x					x	x		
Killdeer			x			x					x	x	x	x

SANDPIPERS & PHALAROPES	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Greater Yellowlegs	X					X					X	X	X	X
Lesser Yellowlegs		X									X	X	X	
Solitary Sandpiper				X							X	X	X	
Willet			X			X					X	X	X	
Spotted Sandpiper	X					X					X	X	X	
Whimbrel		X										X	X	
Hudsonian Godwit			X									X	X	
Ruddy Turnstone	X										X	X	X	X
Red Knot		X									X	X	X	X
Sanderling	X										X	X	X	X
Semipalmated Sandpiper	X										X	X	X	
Western Sandpiper					X				X			X		
Least Sandpiper	X					X					X	X	X	
White-rumped Sandpiper	X										X	X	X	X
Baird's Sandpiper				X								X	X	
Pectoral Sandpiper		X									X	X	X	
Purple Sandpiper		X									X	X	X	X
Dunlin		X									X	X	X	
Stilt Sandpiper				X								X	X	
Buff-breasted Sandpiper				X								X	X	
Ruff				X					X		X	X	X	X
Short-billed Dowitcher		X									X	X	X	
American Woodcock				X		X					X	X	X	X
Wilson's Phalarope				X							X	X	X	
Red-necked Phalarope		X									X	X	X	
Red Phalarope		X									X	X	X	

SKUAS, GULLS, TERNS & SKIMMERS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Pomarine Jaeger	x										x	x	x	
Parasitic Jaeger	x										x	x	x	
Long-tailed Jaeger		x									x	x	x	
Laughing Gull				x					x		x	x	x	
Franklin's Gull				x					x		x	x	x	x
Bonaparte's Gull				x							x	x	x	x
Mew Gull				x							x	x	x	x
Ring-billed Gull	x					x					x	x	x	x
Herring Gull	x					x	x							
Thayer's Gull				x					x		x	x	x	x
Iceland Gull	x										x	x	x	x
Lesser Black-backed Gull				x							x	x	x	x
Glaucous Gull	x										x	x	x	x
Great Black-backed Gull	x					x	x							
Black-legged Kittiwake	x					x	x							
Ivory Gull		x									x		x	x
Caspian Tern		x				x					x	x	x	
Common Tern	x					x					x	x	x	
Arctic Tern	x					x					x	x	x	
Black Tern				x					x		x	x	x	

AUKS														
Dovekie	x										x	x	x	x
Common Murre	x					x	x							
Thick-billed Murre	x					x	x							
Razorbill		x				x					x	x	x	x
Black Guillemot	x					x	x							
Atlantic Puffin	x					x					x	x	x	x

DOVES														
Rock Pigeon		x				x	x							
Mourning Dove		x				x					x	x	x	x

CUCKOOS														
Black-billed Cuckoo				x					x		x	x	x	

OWLS												
Great Horned Owl		x				x		x				
Snowy Owl		x						x			x	x	x	x
Northern Hawk Owl			x			x		x				
Long-eared Owl				x					x			x		
Short-eared Owl		x				x					x	x	x	x
Boreal Owl		x				x		x				

NIGHTJARS												
Common Nighthawk				x							x	x	x	

HUMMINGBIRDS												
Ruby-throated Hummingbird			x			x					x	x	x	

KINGFISHERS												
Belted Kingfisher	x					x					x	x	x	x

WOODPECKERS												
Yellow-bellied Sapsucker			x			x					x	x	x	x
Downy Woodpecker	x					x	x							
Hairy Woodpecker	x					x	x							
American Three-toed														
Black-backed Woodpecker		x				x	x							
Northern Flicker	x					x					x	x	x	x

TYRANT FLYCATCHERS												
Olive-sided Flycatcher		x				x					x	x		
Eastern Wood-Pewee				x							x	x	x	
Western Kingbird				x				x			x	x	x	
Eastern Kingbird		x				x					x	x	x	

SHRIKES												
Northern Shrike			x					x			x	x	x	x

VIREOS												
Philadelphia Vireo			x			x					x	x	x	
Red-eyed Vireo			x			x					x	x	x	

JAYS, MAGPIES & CROWS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Gray Jay	x					x	x							
Blue Jay		x				x	x							
American Crow	x					x	x							
Common Raven	x					x	x							

LARKS														
Horned Lark	x					x					x	x	x	x

SWALLOWS														
Tree Swallow	x					x					x	x	x	x
Bank Swallow		x				x					x	x	x	
Cliff Swallow				x							x	x	x	
Barn Swallow		x				x					x	x	x	

CHICKADEES														
Black-capped Chickadee	x					x	x							
Boreal Chickadee	x					x	x							

NUTHATCHES														
Red-breasted Nuthatch		x				x	x							

CREEPERS														
Brown Creeper			x			x	x							

WRENS														
Winter Wren		x				x					x	x	x	x

KINGLETS														
Golden-crowned Kinglet	x					x	x							
Ruby-crowned Kinglet	x					x					x	x	x	x

THRUSHES	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Northern Wheatear				x		x					x	x	x	
Veery		x				x					x	x		
Gray-cheeked Thrush	x					x					x	x	x	
Swainson's Thrush	x					x					x	x	x	
Hermit Thrush	x					x					x	x	x	x
American Robin	x					x					x	x	x	x

MOCKINGBIRDS & THRASHERS																
Gray Catbird				x		x						x	x	x		
Northern Mockingbird			x			x						x	x	x	x	

STARLINGS																
European Starling	x					x	x									

PIPITS																
American Pipit	x					x						x	x	x	x	

WAXWINGS																
Bohemian Waxwing		x						x				x	x	x	x	
Cedar Waxwing		x				x						x	x	x	x	

WOOD WARBLERS																
Tennessee Warbler	x					x						x	x	x		
Orange-crowned Warbler			x									x	x	x	x	
Nashville Warbler				x		x						x	x	x		
Northern Parula			x									x	x	x		
Yellow Warbler	x					x						x	x	x		
Magnolia Warbler	x					x						x	x	x		
Cape May Warbler			x			x						x	x	x	x	
Black-throated Blue Warbler				x								x	x	x		
Yellow-rumped Warbler	x					x						x	x	x	x	
Blackburnian Warbler			x			x						x	x	x		
Pine Warbler				x					x			x		x	x	
Palm Warbler		x				x						x	x	x	x	
Bay-breasted Warbler			x			x						x	x	x		
Blackpoll Warbler	x					x						x	x	x	x	
American Redstart	x					x						x	x	x		
Prothonotary Warbler				x					x				x	x		
Ovenbird	x					x						x	x	x	x	
Northern Waterthrush	x					x						x	x	x		
Mourning Warbler	x					x						x	x	x		
Common Yellowthroat		x				x						x	x	x	x	
Wilson's Warbler	x					x						x	x	x		
Canada Warbler				x								x	x	x		

TANAGERS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Scarlet Tanager				x					x		x	x	x	

SPARROWS																
American Tree Sparrow		x				x					x	x	x	x		
Chipping Sparrow			x			x					x	x	x	x		
Field Sparrow					x				x		x		x	x		
Lark Sparrow				x					x		x	x	x	x		
Fox Sparrow	x					x					x	x	x	x		
Song Sparrow		x				x					x	x	x	x		
Lincoln's Sparrow	x					x					x	x	x	x		
Swamp Sparrow	x					x					x	x	x	x		
White-throated Sparrow	x					x					x	x	x	x		
White-crowned Sparrow		x				x					x	x	x	x		
Dark-eyed Junco	x					x	x									
Lapland Longspur		x									x	x	x	x		
Snow Bunting	x										x	x	x	x		

CARDINALS																
Northern Cardinal				x					x			x	x			
Rose-breasted Grosbeak			x			x					x	x	x	x		
Dickcissel				x							x	x	x	x		

BLACKBIRDS	Common	Uncommon	Very Uncommon	Rare	Very Rare	Breeder	Resident	Irruptive	Vagrant	Introduced	Spring	Summer	Fall	W
Bobolink			x			x					x	x	x	
Red-winged Blackbird			x			x					x	x	x	x
Rusty Blackbird		x				x					x	x	x	x
Common Grackle			x			x					x	x	x	x
Brown-headed Cowbird			x			x					x	x	x	x

FINCHES																
Pine Grosbeak	x					x	x									
Purple Finch	x					x	x									
Red Crossbill			x			x	x									
White-winged Crossbill	x					x	x	x								
Common Redpoll	x					x	x	x								
Hoary Redpoll				x							x		x	x		
Pine Siskin	x					x	x	x								
American Goldfinch		x				x					x	x	x	x		
Evening Grosbeak		x				x		x			x	x	x	x		

OLD WORLD SPARROWS																
House Sparrow		x				x	x									