NEEGAN BURNSIDE

Whitesand First Nation
Cogeneration and Pellet Mill Project

Design and Operations Report

Sagatay Cogeneration LP

October 2014

Whitesand First Nation
Cogeneration and Pellet Mill Project

Design and Operations Report

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Prepared for:

Sagatay Cogeneration LP, with its General Partner, Sagatay Cogeneration Ltd., and Whitesand First Nation as agent

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0	December 18, 2013	Draft Report Submission for Consultation
1	October 17, 2014	Application to the Ministry of the Environment and Climate Change for Renewable Energy Approval

Executive Summary

Sagatay Cogeneration LP, with its General Partner, Sagatay Cogeneration Ltd., and Whitesand First Nation as agent is proposing to develop, construct and operate a biomass fueled electric power and heat cogeneration plant, and wood pellet facility. The Project is located on Crown Land in an unorganized territory of the Thunder Bay District near Whitesand First Nation and Armstrong, Ontario. The unorganized territory is administered by the Armstrong Local Service Board and the Project will be located solely on the traditional territory of Whitesand First Nation.

The only biomass used to fuel the cogeneration plant will be woodwaste, making it a Class Thermal Facility under Ontario Regulation 359/09 (O.Reg. 359/09) of the *Environmental Protection Act*.

The Design and Operations Report provides a detailed assessment of the equipment and processes at the facility, and includes:

- a Site Plan for the Project;
- facility design features, particularly as they relate to the protection of the environment and public;
- activities and processes to be performed during the operational phase;
- an Environmental Effects Monitoring Plan; and,
- details regarding communications and emergency response plans.

Some components of the Project are not considered part of the renewable energy generation facility (such as the pellet plant), and as such are not subject to O.Reg. 359/09. However, they have been described and evaluated in this report to properly assess the cumulative effect of engaging in the Project. The Project components that are not considered to be part of the renewable energy generation facility are subject to Environmental Compliance Approval administered by the Ministry of the Environment and Climate Change (MOECC) and the Ministry of Natural Resources (MNR) Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects.

An Environmental Effects Monitoring Plan has been prepared in accordance with the requirements of O.Reg. 359/09. Each potential negative environmental effect as a result of engaging in the Project is identified and assessed for performance objectives, mitigation strategies, monitoring, and contingency measures.

A Communications Plan will be developed and implemented during construction, operation, and decommissioning of the Project. These plans will ensure stakeholders and government agencies are informed regarding pertinent Project activities. An

Emergency Response Plan will also be developed and implemented throughout all phases of the Project to mitigate potential impacts from any emergency that may occur.

Safe and reliable operation of the Whitesand First Nation Cogeneration and Pellet Mill Project can be implemented without causing significant adverse environmental effects. This will be achieved through proper implementation of the mitigation, monitoring, and contingency measures outlined in this report.

This Design and Operations Report has been prepared in accordance with O.Reg. 359/09 in support of an Application for Renewable Energy Approval of the Project.

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1.0 Introduction

1.1 Project Overview

Sagatay Cogeneration LP, with its General Partner, Sagatay Cogeneration Ltd., and Whitesand First Nation ("Whitesand") as agent, is proposing to develop, construct and operate a biomass fueled electric power and heat cogeneration plant, and wood pellet facility (the "Project"). The Project is located on Crown Land in an unorganized territory of the Thunder Bay District near Whitesand First Nation and Armstrong, Ontario. The unorganized territory is administered by the Armstrong Local Service Board and the Project will be located solely on the traditional territory of Whitesand First Nation.

The general Project components include a biomass fueled electric power and heat cogeneration plant, wood pellet plant, maintenance garage, material storage and handling areas, wastewater management system, water storage pond, wells, pump building, and transformer substation. The only biomass used to fuel the cogeneration plant will be woodwaste, making it a Class 1 Thermal Facility under Ontario Regulation 359/09 (O.Reg. 359/09) of the *Environmental Protection Act*. The proposed Class 1 Thermal Facility would have a nameplate capacity of up to 3.6 MW, and would displace the energy supply from existing diesel generators servicing the community via a local grid, operated by Hydro One Remote Communities Inc., as well as supply electricity for the Project. The local grid is not connected to the Provincial grid, and there are no such future plans for a transmission connection.

As the cogeneration facility and ancillary equipment is classified as a Class 1 Thermal Facility under O.Reg. 359/09, an Application for Renewable Energy Approval ("REA") is being prepared under O.Reg. 359/09.

The remaining Project components that are not considered to be part of the renewable energy generation facility are subject to Environmental Compliance Approval administered by the Ministry of the Environment and Climate Change ("MOECC") and the Class Environmental Assessment for Ministry of Natural Resources ("MNR") Resource Stewardship and Facility Development Projects ("MNR Class EA").

1.2 Report Requirements

The Design and Operation Report is the principle document where the details of a renewable energy project are presented. Aspects of the Project outside of the operation phase such as construction and decommissioning are addressed within separate reports as part of the REA application.

This Design and Operations Report has been prepared in accordance with Table 1 of O.Reg. 359/09, which sets out specific content requirements as provided in **Table 1.1**.

Table 1.1 Design and Operation Report Requirements

Requirements	Completed	Reference This Report Section #
1. Set out a Site Plan of the project location at which the renewable energy project will be engaged in including, i. One or more maps or diagrams of,		
A. All buildings, structures, roads, utility corridors, rights of way and easements required in respect of the renewable energy generation facility and situated within 300 m of the facility.	Yes	Appendix A
B. Any ground water and surface water supplies used at the facility.	Yes	Appendix A
C. Any things from which contaminants are discharged into the air	Yes	Appendix A
D. Any works for the collection, transmission, treatment and disposal of sewage.	Yes	Appendix A
E. Any areas where waste, biomass, source separate organics and farm material are stored, handled, processed or disposed of,	Yes	Appendix A
F. The project location in relation to any of the following within 125 m: the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Conservation Plan, the area of the Niagara Escarpment Plan, the Protected Countryside, the Lake Simcoe watershed.	N/A	2.8
G. Any noise receptors or odour receptors that may be negatively affected by the use or operation of the facility.	Yes	Appendix A
ii. A description of each item diagrammed under subparagraph i.	Yes	2.0 & 3.0

Requirements	Completed	Reference This Report Section #
iii. One or more maps or diagrams of land contours, surface water drainage and any of the following, if they have been identified in complying with this Regulation: properties described in Column 1 of Table 19 to Section 19, heritage resources, archaeological resources, water bodies, significant or provincially significant natural features and any other natural features identified in the Protected Countryside or the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Plan.	Yes	Appendix A
iv. A description, map or diagram of the distance between the base of any wind turbines and any public road rights of way or railway rights of way that are within a distance equivalent to the length of any blades of the wind turbine, plus 10 m.	N/A	N/A
v. A description, map or diagram of the distance between the base of any wind turbines and all boundaries of the parcel of land on which the wind turbine is constructed, installed or expanded within a distance equivalent to the height of the wind turbine, excluding the length of any blades.	N/A	N/A
vi. A description, map or diagram of the distance between the base of each wind turbine and the nearest noise receptor.	N/A	N/A
2. Set out conceptual plans, specifications and descriptions related to the design of the renewable energy generation facility, including a description of,		
i. Any works for the collection, transmission, treatment and disposal of sewage, including details of any sediment control features and storm water management facilities.	Yes	3.1.6 & 3.1.7
ii. Any things from which contaminants are discharged into the air.	Yes	3.1.8

Requirements	Completed	Reference This Report Section #
iii. Any systems, facilities and equipment for receiving, handling, storing and processing any waste, biomass, source separated organics, farm material and biogas.	Yes	3.1.1 & 3.1.9
iv. If the facility includes a transformer substation, the works, facilities and equipment for secondary spill containment.	Yes	3.1.4
3. Set out conceptual plans, specifications and descriptions related to the operation of the renewable energy generation facility, including,		
i. in respect of any water takings,		
A. A description of the time period and duration of water takings expected to be associated with the operation of the facility.	Yes	4.2.1
B. A description of the expected water takings, including rates, amounts and an assessment of the availability of water to meet the expected demand.	Yes	4.2.1 & Appendix D
C. An assessment of and documentation showing the potential for the facility to interfere with existing uses of the water expected to be taken.	Yes	Appendix D
ii. A description of the expected quantity of sewage produced and the expected quality of that sewage at the project location and the manner in which it will be disposed of, including details of any sediment control features and storm water management facilities.	Yes	4.2.2 & 4.2.3
iii. A description of any expected concentration of air contaminants discharged from the facility.	Yes	4.2.4
iv. In respect of any biomass, source separated organics and farm material at the facility.		
A. The maximum daily quantity that will be accepted.	Yes	4.2.5
B. The estimated annual average quantity that will be accepted.	Yes	4.2.5

Requirements	Completed	Reference This Report Section #
C. The estimated average time that it will remain at the facility.	Yes	4.2.5
D. The estimated average rate at which it will be used.	Yes	4.2.5
v. In respect of any waste generated as a result of processes at the project location, the management and disposal of such waste, including:		
A. The expected types of waste to be generated.	Yes	4.2.6
B. The estimated annual average quantity that will be accepted.	Yes	4.2.6
C. The estimated average time that it will remain at the facility.	Yes	4.2.6
D. The estimated average rate at which it will be used.	Yes	4.2.6
vi. If the facility includes a transformer substation:		
A. A description of the processes in place to prevent spills.	Yes	3.1.4 & 4.2.3
B. A description of the processes to prevent, eliminate or ameliorate any adverse effects in the event of a spill.	Yes	3.1.4, 4.2.3, & 6.1.3
C. A description of the processes to restore the natural environment in the event of a spill.	Yes	3.1.4, 4.2.3, & 6.1.3
4. Include an environmental effects monitoring plan in respect of any negative environmental effects that may result from engaging in the renewable energy project, setting out,		
i. Performance objectives in respect of the negative environmental effects.	Yes	Section 5.0
ii. Mitigation measures to assist in achieving the performance objectives mentioned in subparagraph i.	Yes	Section 5.0
iii. A program for monitoring negative environmental effects for the duration of the time that the project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.	Yes	Section 5.0

Requirements	Completed	Reference This Report Section #
5. Include a response plan setting out a description of the actions to be taken while engaging in the renewable energy project to inform the public, aboriginal communities and municipalities, local roads boards and Local Services Boards with respect to the project, including,		
i. Measures to provide information regarding the activities occurring at the project location, including emergencies.	Yes	6.1 & 6.2
ii. Means by which persons responsible for engaging in the project may be contacted.	Yes	6.3
iii. Means by which correspondence directed to the persons responsible for engaging in the project will be recorded and addressed.	Yes	6.3
6. If the project location is in the Lake Simcoe watershed, a description of whether the project requires alteration of the shore of Lake Simcoe, the shore of a fresh water estuary of a stream connected to Lake Simcoe or other lakes or any permanent or intermittent stream and,		
iv. How the project may impact any shoreline, including ecological functions of the shoreline.	N/A	N/A
v. How the project will be engaged in to:		
A. Maintain the natural contour of the shoreline through the implementation of natural shoreline treatments, such as planting of natural vegetation and bioengineering.	N/A	N/A
B. Use of vegetative riparian areas, unless the project location is used for agricultural purposes and will continue to be used for such purposes.	N/A	N/A
7. If it is determined that the project location is not on a property described in Column 1 of the Table to Section 19, provide a summary of the matters addressed in making the determination.	Yes	Appendix C
8. If Section 20 applies in respect of the project and it is determined that the project location does not meet one of the descriptions set out in subsection 20 (2) or that the project location is not in an area described in subsection 20 (3), provide a summary of the matters addressed in making the determination.	N/A	N/A

Requirements	Completed	Reference This Report Section #
9. If subsection 21 (3) or 23 (2) applies, provide a summary of the matters addressed in making the determination:		
i. under subsection 21 (3) or clause 23 (2) (a) as the case may be, including a copy of the document completed under the applicable provision.	Yes	Appendix C
ii. under clause 23 (3) (b), if applicable.	N/A	N/A

2.0 Site Plan

2.1 Project Location

The Project is located on Crown land in an unorganized territory of the Thunder Bay District near Whitesand First Nation and Armstrong, Ontario; approximately 210 km north of Thunder Bay, and 2 km south of Armstrong. The Project will be located on the traditional territory of Whitesand First Nation. This Project context is shown in the key map of **Figure A1** of **Appendix A**.

The "Project Location" is defined in O.Reg. 359/09 as:

> *"a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the project".*

The Project Location also includes any temporary work areas required to construct the Project. The cogeneration plant, pellet plant, maintenance garage, wastewater management system, water storage pond, and associated equipment and temporary work areas will be contained within a boundary of approximately 35 ha as shown in **Figure A1** of **Appendix A**.

There is an existing electricity distribution connection owned and operated by Hydro One Remote Communities Inc. that will be used to connect the Project to the local grid. It is within an existing right-of-way extending from the site to the nearby existing diesel generating station. Any upgrades required to the existing electricity distribution connection will be the responsibility of Hydro One Remote Communities Inc.

Solid waste generated at the facility will be disposed of off-site at an approved disposal facility.

2.2 Site Plan Requirements

Site Plan information is provided in **Appendix A**. The Site Plan was prepared in accordance with O.Reg. 359/09 and the guidance provided in Chapter 6 of the Technical Guide to Renewable Energy Approvals (MOE, 2013). Site Plans are generally required to include one or more maps or diagrams that depict the following at and within 300 m of the Project Location:

- buildings or structures;
- roads, utility corridors, rights-of-way, or easements;
- ground water and surface water supplies used at the facility (i.e., wells);
- any things from which contaminants are discharged into the air;
- any works for the collection, transmission, treatment, and disposal of sewage;
- any areas where waste, biomass, source separated organics and farm material are stored, handled, processed or disposed of;
- any noise receptors or odour receptors that may be negatively affected by the use or operation of the facility; and,
- land contours indicating surface drainage.

All of the above features are depicted in **Figures A1**, **A2**, and **A5** of **Appendix A**. It should be noted there are no Project transformers which will operate at a nominal voltage of 50 kV or more.

2.3 Natural Heritage Features

The Evaluation of Significance in the Natural Heritage Assessment (Neegan, 2014) for the Project assessed significant habitat (Category 3 woodland caribou) within the Project Location, and candidate habitat for avian Species of Conservation Concern (Olive-sided Flycatcher and Eastern Wood-Pewee) within the Project Location. The habitats noted above are shown in **Figure A3** of **Appendix A**. The candidate habitat for avian Species of Conservation Concern was subsequently confirmed as not significant in 2014. However, mitigation measures for migratory bird species are still proposed in the Environmental Impact Study of the Natural Heritage Assessment (Neegan, 2014). Further details regarding evaluated natural heritage features are provided in the Natural Heritage Assessment under a separate cover.

2.4 Water Bodies

The Water Assessment Report (Neegan, 2014) for the Project did not identify any lake trout lakes that are at or above capacity within 300 m of the Project Location. Furthermore, no other permanent or intermittent surface water features, including

seepage areas, were found within 120 m of the Project Location. Since the Project Location boundaries are outside the setback requirements established in O.Reg. 359/09, a Water Body Report was not required.

The Water Assessment Report analyzed five water bodies in the vicinity of the Project Location. These water bodies are shown in **Figure A4** of **Appendix A**.

Mitigation measures were developed in the Surface Water Assessment Report (Neegan, 2014) under a separate cover to minimize potential impacts on the water bodies identified above.

2.5 Noise and Odour Receptors

As noted in the Acoustical Assessment Report (Akoustik, 2014) under a separate cover, there are no points of reception (POR) within 500 m of the facility, and the closest noise receptors to the Project are the following:

- POR 1 (the Armstrong Public School, approximately 1233 m north of the facility);
- POR 2 (the McKenzie Inn/Cottages, approximately 1795 m south of the facility); and,
- POR 3 (a residential dwelling, approximately 1564 m north of the facility).

The locations of the noise receptors noted above are shown in **Figure A5** of **Appendix A**, and are further analyzed in the Acoustical Assessment Report (Akoustik, 2014) under a separate cover. The Acoustical Assessment Report concludes that predicted worst-case noise emissions from the Project comply with MOECC standards for continuous 24-hour operation.

Since the Project is a Class 1 Thermal Treatment facility, where only woodwaste will be used to create electricity (and wood pellets by the pellet plant), no impacts associated with odour are anticipated. As such, no odour receptors are identified in the Site Plan, and no Odour Study Report is required in accordance with O.Reg. 359/09.

2.6 Archaeological Resources

The Stage 1 Archaeological Assessment (Scott Hamilton Archaeological Consultation, 2013) for the Project concluded that extensive modification of the ground surface has severely degraded any cultural heritage potential, leading to the recommendation that the study area does not require further archaeological assessment. The Ministry of Tourism, Culture and Sport has reviewed the above referenced report and is satisfied that the fieldwork and reporting are consistent with the Ministry's 2011 Standards and Guidelines for Consultant Archaeologists and the terms and conditions for

archaeological licences. As such, no archaeological resources were discovered and are therefore not shown on the Site Plan.

2.7 Cultural Heritage Resources and Protected Properties

Upon completion of the Stage 1 Archaeological Assessment, a Cultural Heritage Self-Assessment was undertaken to evaluate cultural heritage resources. The Cultural Heritage Self-Assessment is provided in **Appendix C**. The Cultural Heritage Self-Assessment indicates no known cultural heritage resources at the Project Location, and therefore there are none shown on the Site Plan.

The Cultural Heritage Self-Assessment in **Appendix C** also contains a written summary and information that was gathered to conclude that the Project Location is not on a property described in Column 1 of the Table to section 19 of O.Reg. 59/09.

2.8 Provincially Protected Areas

The Project Location is in northern Ontario and is not on or within 125 m of any of the following:

- the portion of the Oak Ridges Moraine Conservation Plan Area that is subject to the Oak Ridges Moraine Conservation Plan;
- the area of the Niagara Escarpment Plan;
- the Protected Countryside; or
- the Lake Simcoe watershed.

3.0 Facility Design Plan

The design information provided in this report is provided for the purpose of identifying and mitigating potential negative environmental effects.

3.1 Facility Components

The Project includes a variety of components with the overall objective to generate electricity and create premium grade wood pellets. Conceptual diagrams of the various processes at the facility, including the required equipment for each process, are provided in **Appendix B**.

3.1.1 Woodyard

The Project components relating to the woodyard can generally be characterized as the ancillary features that will be used to facilitate material transport, processing, conditioning, storage, and equipment operation and maintenance. The wood pellet shipping area, truck scale approach and exit ramps, and biomass storage pads will be hard surfaced (i.e., asphalt or concrete) to facilitate material handling and storage. The remaining portions of the yard will consist of gravel access roads, or will remain as existing gravel or vegetation. The site will be equipped with the appropriate fire, safety, security, communications equipment and underground utilities. Detailed diagrams of the processes and equipment in the yard are provided in **Appendix B**, and the Site Plan is shown in **Figure A1** of **Appendix A.**

Near the entrance of the site, there will be a truck scale to weigh transported materials, which will be delivered to the site in the form of hogged fuel, or chipped material meeting Pulp Mill Spec Wood Chip requirements. The hogged material will be used as fuel for the cogeneration plant and the chipped material will be used as feedstock for the pellet plant. The hogged and chipped materials will be stored outside in separate piles on uncovered paved storage pads. The hogged material storage pad is approximately 7,170 m^2 (77,177 ft^2) and the chipped material storage pad is approximately 9,430 m^2 (101,504 ft^2). Both paved storage pads will be higher than the surrounding grades such that site drainage is directed around them, and they will be sloped to prevent ponding and reduce saturation of biomass and leachate production. There will also be a paved area approximately 2,600 m^2 (27,986 ft^2), northwest of the pellet plant, to facilitate shipment of wood pellets. Covered and secured propane bottle storage racking will also be located on this paved area adjacent the pellet plant.

There will be a mechanical conveyor system with diversion screens, metal detectors, and magnets to facilitate material storage and transport throughout the facility. The conveyor system will service each material storage pile, which will be used in the

cogeneration and pellet plant processes. The conveyor system will be supplemented by truck dumpers, biomass storage pile stackers, a mobile bucket loader, storage bins, a wood hog and screen in an approximately 40 m^2 (430 ft^2) enclosure, a hogged fuel storage bin and stoker in an approximately 215 m^2 (2,315 ft^2) enclosure, and a chip sizer in an approximately 37 m^2 (400 ft^2) enclosure. There will also be medium voltage Motor Control Centers (MCCs) as required by equipment at critical points along the mechanical conveyor system. The MCCs are anticipated to be installed in ocean shipping containers or similar enclosures ranging from approximately 15 m^2 to 30 m^2 (161 ft^2 to 323 ft^2).

The yard will host a biomass belt dryer, having a footprint of approximately 385 m^2 (4,144 ft^2). The biomass belt dryer will be used to dry biomass from approximately 45 to 50% moisture content to approximately 10% moisture content for use as feedstock in the wood pellet manufacturing process. The biomass belt dryer will be equipped with a drain to convey wash-up water to the wastewater management system. A conceptual detail of the biomass belt dryer is provided in **Appendix B**.

The yard will also host a maintenance garage, diesel fuel storage and filling station, and waste oil building, having footprints of approximately 225 m^2 (2,422 ft^2), 160 m^2 (1,720 ft^2), and 16 m^2 (172 ft^2) respectively. The garage will have proper storage facilities for any oils, lubricants, or hazardous chemicals to be used and stored in the building. The diesel fuel storage and filling station will include above ground tanks on a hard surface, and will comply with the requirements of O.Reg. 217/01 and the Ontario Liquid Fuels Handling Code. Waste oil from site operations will be stored in metal barrels in the small metal waste storage building, complete with a containment sump, and stored until there is adequate material to warrant a pick-up and disposal at an approved facility.

Other equipment in the yard will include the appropriate fire, safety, security, and communications equipment detailed in Section 4.0, as well as underground utilities, including:

- electrical grounding grid;
- power, control, and communications electrical cables;
- site water distribution system from wells to buildings and hydrants;
- site wastewater distribution system from buildings to wastewater management system;
- steam, condensate and instrument air lines to and from the biomass belt dryer;
- process and instrument air lines from the cogeneration plant to the pellet plant; and,
- glycol heating system lines from the cogeneration plant to the site buildings.

For all Project buildings, any hazardous material will be securely stored in appropriate, labeled containers, with Material Safety Data Sheets in each building where the hazardous material will be used or stored. The site buildings will be pre-engineered steel buildings on reinforced concrete foundations, conforming to the requirements of CAN/CSA-S16-01, CAN/CSA-A23.3-04, National Building Code of Canada and/or Ontario Building Code as appropriate. Furthermore, foundations will be designed based on the results of a geotechnical investigation of the site. Conceptual elevation and section details of the site buildings are provided in **Appendix B**.

3.1.2 Biomass Cogeneration Plant

The biomass cogeneration plant is considered a Class 1 Thermal Facility under O.Reg. 359/09. It will have a nominal capacity of up to 3.6 MW, which will be used to power the pellet plant, as well as provide electricity for the entire demand of the local community. Biomass quantities required for the cogeneration plant are estimated to be 82,315 Green Metric Tonnes (GMT) per year, or 235 GMT per day, assuming a biomass moisture content of 45%.

There are a number of technologies available to generate electricity from biomass. The Project is proceeding on the basis of using the steam Rankine cycle. This process is a closed thermal cycle, where the biomass fuel combustion process and the power generation cycle are physically separated. This process isolates and protects the power generator from potential contamination in the biomass fuel combustion process.

The steam Rankine cycle can generally be described in the following three steps:

1. biomass is combusted in a boiler to produce steam;
2. steam is used to drive a steam turbine, connected to an electrical generator, creating electricity;
3. steam is condensed and pumped for re-use in the boiler to repeat the cycle.

The cogeneration component of the plant comes from the steam turbine exhaust, where the steam at a lower pressure and temperature is used in the pellet plant biomass dryer system, and for heat in the on-site buildings.

Electricity generated at the cogeneration plant will be distributed via underground cables to service all buildings and electrical equipment on site. Electricity will also be distributed via underground cables from the cogeneration plant to the Project transformer substation, where it will be stepped-up from 5 kV to 25 kV and connected to the local grid operated by Hydro One Remote Communities Inc.

The total footprint of the cogeneration plant, including the heat source building, turbine building, cooling tower, ash collection / storage system, and ancillary equipment is expected to be approximately 1,330 m^2 (14,315 ft^2).

Preliminary detailed diagrams of the proposed processes and equipment at the cogeneration facility are provided in **Appendix B**. Generally, the equipment required for the congregation plant includes:

- a biomass dryer;
- water treatment systems and storage tanks for process and domestic water supply;
- a biomass dryer, furnace and boiler to generate steam;
- a steam turbine;
- an oil tank and lubrication system;
- an electrical generator;
- a condenser and cooling tower;
- water, wastewater, and steam distribution piping;
- a steam/glycol heating system (to heat site buildings);
- a fire suppression system;
- a heating and ventilation system, including exhaust stacks;
- pumps and fans;
- a baghouse and exhaust stack;
- an emission monitoring system;
- an ash collection and storage system;
- wastewater management infrastructure (refer to Section 3.1.6);
- a mechanical material handling system;
- partitioned rooms (i.e., offices, lunch room, mechanical/electrical room); and,
- fuel tanks and a backup/emergency generator.

3.1.3 Pellet Plant

While the Pellet Plant is not considered part of the renewable energy generation facility, it has been included in the reports for O.Reg. 359/09 for completeness, to evaluate the cumulative effect of the Project.

The pellet plant will utilize heat and electricity from the cogeneration plant to create approximately 8 metric tons per hour or 60,000 metric tons per year of residential and/or industrial grade fuel pellets. Biomass quantities required for the pellet plant are estimated to be 139,000 m^3/yr., or 380 m^3/d.

Dried biomass from the belt dryer in the woodyard will be used as feedstock for the pellet plant. The dried biomass will first be transferred to a covered dry biomass storage

bin/silo adjacent the pellet plant. It will then be transferred to the hammer mill via the mechanical conveyor system and feed bucket elevator. In the hammer mill, the biomass will be ground into a fine material, and then transferred to a ripening bin with moisture metering equipment. The pellet mill will then use process steam from the cogeneration plant to compress the ground material under high temperature and pressure conditions into wood pellets. The wood pellets are then cooled, screened, and stored in a pellet storage bin/silo adjacent the pellet plant prior to packaging on site for shipping.

The total footprint of the pellet plant, including its ancillary equipment and storage bins/silos is expected to be approximately 1,310 m^2 (14,100 ft^2).

Preliminary detailed diagrams of the processes and equipment at the pellet plant are provided in **Appendix B.** Generally, the equipment required for the pellet plant includes:

- a mechanical material handling system, including feed bucket elevators;
- dry biomass and pellet storage bins/silos;
- hammer mills;
- a pellet ripening bin;
- moisture metering equipment;
- pellet mills;
- a pellet cooler;
- dust control bag houses;
- wastewater management infrastructure (refer to Section 3.1.5);
- partitioned rooms (i.e., control room, offices, lunch room, mechanical/electrical room);
- a pellet packaging and bag stacking system; and,
- covered and secured propane bottle storage racking on the paved pellet shipping area adjacent the pellet plant.

3.1.4 Transformer Substation

A main transformer substation will be constructed near the entrance of the site to step up the voltage of the electricity produced by the cogeneration plant from 5 kV to 25 kV. This is required to match the voltage of the electricity distribution line operated by Hydro One Remote Communities. The substation will include protection, control, monitoring, and communications equipment (including line reactor and load bank) to protect on-site equipment and ensure that the electricity being distributed to Hydro One Remote Communities is compliant with the specified operating conditions. It will also include security and safety equipment, including proper electrical grounding and a fence. The footprint of the transformer substation is expected to be approximately 465 m^2 (5,005 ft^2). A conceptual plan of the substation is provided in **Appendix B**.

A secondary spill containment system will be provided around the main transformer to contain a volume equal to the transformer oil and lubricants plus the equivalent stormwater volume of a minimum 24-hour duration, 50-year return storm for the stormwater drainage area around the transformer. It will be constructed of an impervious floor and walls to contain a potential spill from the transformer. The site will be equipped with spill kits such that oil can be removed from the secondary containment system and either transferred to metal barrels for storage in the waste oil building or removed for disposal off-site by a qualified service provider. It should be noted that the main transformer at the transformer substation will be rated for 25 kV on its primary voltage side, and will not be capable of operating at or above 50 kV. Additional mitigation measures for the transformer substation are discussed in the facility operational plan (Section 4.0) of this report.

In addition to the main transformer substation, there will also be three outdoor pad-mounted transformers servicing the cogeneration and pellet plants. These transformers would step down the voltage used by the buildings from 5 kV to 600 V for distribution to the plant loads. These pad-mounted transformers will be installed according to CAN/CSA-C227.4-06 and/or the requirements of the authorities having jurisdiction. Additional transformers will be installed in Project buildings as required to service equipment operating at 120 V, 208 V and 240 V. Further to the secondary spill containment system for the main substation transformer described above, all oil-filled transformers will be installed above a containment catch basin.

There is an existing electricity distribution connection owned and operated by Hydro One Remote Communities Inc. that will be used to connect the Project to the local grid. It is within an existing right-of-way extending from the site to the nearby existing diesel generating station. The Project connection point is anticipated to be at a hydro pole near the Project's main transformer substation or at the entrance of the site. The hydro pole will be equipped with a gang operated fused disconnect switch in accordance with the Canadian Electrical Code and Hydro One. Furthermore, Hydro One will monitor the quality of electricity generated by the cogeneration plant, and will remote trip the cogeneration plant in the event that it is operating outside of its specified parameters. The existing diesel generators would then be used as an emergency backup source of power for the community until the problem is resolved at the cogeneration plant. Any upgrades required to the existing electricity distribution connection will be the responsibility of Hydro One Remote Communities Inc.

3.1.5 Water Supply and Storage

Facility process water and potable domestic water is expected to be supplied via existing on-site wells. Water supply for firefighting is expected to be supplied via an on-site

storage pond with a liner. It is anticipated that the pond would be required to hold a volume of approximately 1,136,000 L under the volume of inaccessible water during the winter, and would have a footprint of approximately 3,650 m^2 (39288 ft^2). A pump building would be required adjacent the pond and would have a footprint of approximately 150 m^2 (1,615 ft^2).

If feasible, water supply for firefighting may alternatively be supplied via storage tanks within the heated portions of on-site buildings.

Existing wells at the Project Location are anticipated to be used for primary and backup sources of water for use by the Project. The primary well pump will be required to operate continuously with a capacity of 5.7 L/s, and will need to be installed at a depth of approximately 34 m below the top of casing. Further details regarding the existing wells, required pumps, and groundwater characteristics are provided in **Appendix D**. As noted in **Appendix D**, it is recommended that TW2-13 be used as the primary well, with TW3-90 to be used as a backup or monitoring well. The locations of these wells are shown in **Figure A1** of **Appendix A**.

Preliminary detailed diagrams of the processes and equipment relating to water supply and storage are provided in **Appendix B.** Generally, the equipment required for the water supply and storage system includes:

- wells (primary and back-up);
- pumps;
- an underground water distribution system;
- a potable water treatment and storage system;
- monitoring equipment;
- automatic sprinkler systems for the cogeneration plant, pellet plant, and maintenance garage buildings;
- fire hydrants and post-indicating valves in the woodyard;
- storage tanks for firefighting water supply (if feasible); and,
- a pond with a liner and pump building for firefighting storage supply (if required).

3.1.6 Wastewater Management

An on-site wastewater management system has been designed to manage wastewater generated by the Project. There will be separate wastewater treatment tanks for various Project wastewater streams (i.e., process wastewater, wash-up wastewater, domestic sewage) with a common subsurface effluent disposal bed. There will also be a portable toilet in the woodyard, which will be serviced and maintained by a qualified service provider.

The general components of the wastewater management system will include:

- gravity pipes and forcemains connecting the on-site buildings to the effluent disposal bed;
- pump chambers to service the forcemains;
- an oil/grit separator for wash-up wastewater from the maintenance garage;
- subsurface wastewater tanks under the cogeneration plant and pellet plant buildings;
- a septic tank in the woodyard;
- a bed dosing tank;
- a subsurface effluent disposal bed; and,
- monitoring equipment and alarms.

Further details regarding the facility wastewater management design is provided in the Effluent Management Plan Report (Burnside, 2014) under a separate cover.

3.1.7 Stormwater Management

All proposed construction and decommissioning activities will be in accordance with the *"Measures to Avoid Causing Harm to Fish and Fish Habitat"* published by Fisheries and Oceans Canada. These measures, combined with an erosion and sediment control plan to be designed and implemented by the Contractor prior to all other works, will ensure protection of surface water quality, fish, and fish habitat during construction and decommissioning.

Stormwater management and erosion and sediment control during Project operation is proposed to be addressed by a vegetated filter strip and/or a bio-swale at the downstream boundary of the site to the south/southeast. In addition, the high porosity of the soils and deep water table at the Project Location is conducive to infiltration. Since a significant portion of the Project Location (over 90%) is proposed to remain as gravel or vegetation, rather than paved or hard-surfaced, impacts from stormwater will be mitigated at the source by increased infiltration and decreased runoff. Furthermore, the Project Location was sited over 120 m away from any surface water feature, providing additional protection of existing surface water features.

Further details regarding stormwater management and erosion and sediment control measures are provided in the Surface Water Assessment Report (Burnside, 2014) under a separate cover.

3.1.8 Air Emissions

The Project will include a variety of equipment that will discharge contaminants into the air. All significant sources of air emissions are shown on **Figure A2** of **Appendix A**.

The heights of emission points are further detailed in the building elevations and section details in **Appendix B**.

A Best Management Plan for the site will be in place to control dust/particulate emissions from unpaved roads and biomass storage piles.

The cogeneration plant will be equipped with emissions control equipment as required to comply with MOECC regulations. Primary emissions control equipment will include a multiple cyclone fly ash arrestor, and secondary emissions control equipment will include an exhaust flue gas baghouse treatment system. There will also be a continuous emission monitoring system installed to ensure the cogeneration plant is operating in compliance with emission limits established through REA and ECA approvals.

The pellet plant will also be equipped with emissions control equipment as required to comply with MOECC regulations. The pellet cooler exhaust air will be routed through a dust control vacuum system equipped with a cyclone and baghouse treatment system. The hammermill will also have its own baghouse treatment system.

Further details regarding facility air emissions and controls are provided in the Emission Summary and Dispersion Modelling Report (Burnside, 2014) under a separate cover.

3.1.9 Solid Waste

Solid waste in the form of non-hazardous wood ash will be generated at the cogeneration facility. Preliminary detailed diagrams of the ash collection system are provided in **Appendix B**.

Wet bottom ash and dry fly ash will be collected and conveyed in a heavy-duty ash removal drag chain conveyor to an ash collection and truck loading bay. A truck will be parked in the heated ash collection area inside the boiler building of the cogeneration plant to collect the ash. When full, the truck will dispose of the ash off-site at an approved disposal facility.

Other non-hazardous solid waste generated at the site will be stored in appropriate bins of each building prior to disposal off-site at a landfill.

4.0 Facility Operational Plan

The Project will operate throughout the year for seven days per week and 24 hours per day. The facility will be staffed full time with appropriate automation controls, redundancies and procedures to ensure an efficient, safe, reliable facility.

Operations and maintenance procedures will be performed by approximately 10 to 12 staff at all times based in the woodyard, cogeneration plant and pellet plant. Truck drivers will also be required for delivery of biomass and shipment of wood pellets.

Operations and maintenance procedures for the various processes at the Project are described below. Environmental impacts relating to water, wastewater, air emissions, biomass, and solid waste are also described.

4.1 Operations and Maintenance Procedures

4.1.1 Facility Control and Monitoring

The Project will be monitored and controlled with a Programmable Logic Control (PLC) system for field control and a Supervisory Control and Data Acquisition (SCADA) system for overall process control.

The PLC will perform self-diagnostics, accessible from the operator control console and the engineering workstation, to facilitate system troubleshooting from a central control room in the cogeneration plant. The SCADA system will monitor, control, display, and record process data from field sensors and this information will be used for general process supervision, execution of plant and equipment performance calculations, historical record keeping, and diagnostics for management and maintenance of the plant.

4.1.2 Woodyard Operation

4.1.2.1 Daily Operations

The operating staff for the woodyard will work 12-hour shifts, seven days a week, throughout the year. It is anticipated that there will be approximately two operators in the woodyard. These two staff will operate equipment in the woodyard and mobile bucket loaders to facilitate biomass delivery, storage, and conveyor transport in support of full-time operation of the cogeneration plant and pellet plant. The biomass belt dryer in the woodyard will be operated and maintained by pellet plant personnel.

The woodyard operating staff will ensure that chipped and hogged biomass storage piles are maintained within the limits of the hard-surfaced storage pad, in order to facilitate

material handling, and provide mitigation for biomass leachate. They will also collect refuse biomass from the pellet plant process chip re-sizing, rejects, fines, and losses to be used as hogged fuel for the cogeneration plant.

The maintenance garage, diesel fuel storage and filling station, and waste oil building will be used as required by site staff. All staff on site will be required to be appropriately trained in the health and safety, spill prevention, and emergency response protocols described in this report.

Biomass delivery truck drivers will also frequent the site (approximately 20 trucks per day on average). Biomass delivery truck drivers (delivering chipped and hogged material) are expected to operate the truck scale upon entry and exit, as well as the truck dumper, as required. They will also have access to the portable toilet in the woodyard for use as required.

There will also be approximately nine wood pellet delivery truck drivers required on a daily basis throughout the year. These truck drivers will have access to the pellet plant and associated washroom facilities.

4.1.3 Biomass Cogeneration Plant Operation

4.1.3.1 Daily Operations

The Biomass Cogeneration Plant will operate throughout the year for 24 hours per day and seven days per week. There will be a total of approximately three operators working 12-hour shifts. Two operators will be dedicated to the boiler/turbine operations, while the third operator will move between fuel system operations and assisting in the power plant. A First Class Operating Engineer will be responsible for the power plant operation. There will also be an administrative supervisor responsible for both the cogeneration plant and pellet plant operations.

The operators will be located in a sound reduction control room equipped with remote camera views of key operation points to identify potential process issues and prevent or minimize unplanned production stoppages. The cogeneration plant will also have an office for the supervisor for administrative functions.

The cogeneration plant operators will be responsible to ensure all equipment, including but not limited to, the furnace, boiler, turbine, generator, mechanical conveyor system, and ash collection system are functioning as designed. The operators will also monitor the continuous emission monitoring system to ensure the plant is operating within its regulated limits.

4.1.3.2 Scheduled Maintenance

Maintenance staff will consist of a flexible two person crew, capable of servicing both the cogeneration plant and pellet plant at all times throughout the year. This crew will have the appropriate metal working, electrical, and instrumentation control skills as required. As a team, they will assist each other in the daily maintenance issues to sustain the operation of the plant and perform their individual preventive maintenance tasks. They will also perform regular inspections of the woodyard, transformer substation, wastewater management system, and water supply system to ensure all equipment at the Project are functioning properly.

In addition to the preventive maintenance tasks and inspections, every five to seven years, an approximate two week maintenance outage will be performed for a major inspection and overhaul of the boiler, turbine, and auxiliaries, as required.

An annual preventative maintenance shutdown will also be required for the biomass furnace/steam boiler. The steam boiler makeup water supply requires closer monitoring and physical conditioning to prevent internal damage, so the feedwater system will include a water sampling system to monitor water quality and prompt required maintenance.

4.1.3.3 Unscheduled Maintenance

Unanticipated maintenance or repairs that cannot be readily addressed by the on-site maintenance crew will be performed by qualified contractors brought in for specific work orders.

4.1.4 Pellet Plant Operation

4.1.4.1 Daily Operations

The Pellet Plant will operate throughout the year for 24 hours per day and seven days per week. Operating staff will work 12-hour shifts, with approximately four operators during the day and two operators at night.

Occasionally pellet shipping truck drivers will also be on site. Pellet shipping truck drivers are expected to operate the truck scale upon entry and exit, and to load the one US ton (0.91 metric ton) pallet loads of pellets with a forklift onto the truck trailer.

The pellet plant operators will be responsible to ensure all equipment, including but not limited to, the biomass belt dryer, mechanical conveyor system, pelleting system (hammer mills and pellet mills), and pellet packaging system, are functioning as designed.

4.1.4.2 Scheduled Maintenance

As noted above, a flexible two person maintenance crew will assist each other in the daily maintenance issues to sustain the operation of both the cogeneration plant and pellet plant and perform their individual preventive maintenance tasks.

4.1.4.3 Unscheduled Maintenance

Unanticipated maintenance or repairs that cannot be readily addressed by the on-site maintenance crew will be performed by qualified contractors brought in for specific work orders.

4.1.5 Non-Standard Operation

4.1.5.1 Electrical Source

The plant essential service loads, necessary for the functions needed when the power plant is not in operation, will be supplied by the stand-by diesel generator system. The plant essential service loads will include at minimum lighting, security, fire alarms, pumps, HVAC, communications, building controls, and freeze protection.

The stand-by generator will also supply critical loads within the facility in the event of loss of the off-site Hydro One diesel generator connection. The stand-by generator will provide all power required for safe shutdown and start-up without having to draw power from the existing Hydro One diesel generating facility. If the Biomass Cogeneration Plant is offline, the existing Hydro One diesel generating plant will supply power to the community.

4.1.5.2 Upset Conditions

Upset conditions are those which for equipment stress or safety purposes, are outside specified design conditions. Upset conditions may include operating circumstances other than normal continuous operation, such as unplanned start-up and shutdown, equipment malfunction, and emergency events. Upset conditions will be established during detailed design to protect the environment and ensure safety of site personnel, the local community, and equipment at the facility.

Hydro One Remote Communities will also specify conditions under which the facility will need to operate to protect the equipment associated with the local electricity distribution system. If the facility is operating outside its specified parameters, it will be automatically disconnected from the electricity distribution system until the problem at the facility is resolved.

4.1.5.3 Cold Weather Operation

Warm-up procedures will be incorporated into the operating procedures or heat trace will be installed on piping where the temperature may drop below 0°C during shutdown periods in the winter.

During the heating season, the building heating and process make up air will be heated with waste heat from the steam condenser system. The design will provide for freeze protection of equipment during normal operations, shut-down, start-up, and during extreme weather conditions.

4.1.6 Safety

4.1.6.1 General

All Project work during construction, operation, maintenance, and decommissioning will comply with the Ontario Occupational Health and Safety Act.

4.1.6.2 Pre-Start Safety Review

There will be a pre-start safety review of the Project prior to operation in accordance with regulatory requirements. This review will ensure that all equipment has been installed as designed, commissioned appropriately, and that safety procedures and a training program are in place as outlined in Section 5.2.

4.1.6.3 Security

The site will be equipped with a slide gate at the access road entrances to deter unauthorized entry. Fencing and signage will also be placed around the fire water storage pond and around the transformer substation for safety.

Closed Circuit Televisions will monitor key areas such as the fuel handling area, biomass boiler, and turbine generator area. All cameras will be equipped for night vision and a dedicated computer and screen will be installed in the control room to allow operations personnel to control and access all cameras.

4.1.6.4 Fire and Explosion Protection

All site buildings and the woodyard will be designed and equipped in accordance with the National Fire Code of Canada, including suitable fire protection equipment such as sprinkler systems for the cogeneration plant, pellet plant, and maintenance garage, siamese connections, hydrants, hose stations, and fire extinguishers. All fire protection

equipment requiring water will be connected to the pump building, which will draw water from the water storage pond noted in Section 3.1.5. Water from the pond will be supplied to the fire protection equipment at the required design pressure and rate through the use of a diesel pump system. The diesel pump system will include a 24 hour full load capacity double wall sub-base fuel tank with level and leak monitoring. This diesel pump system will operate even in the event of a power outage. As required, the water storage pond will be replenished by the site well(s) at the allowable water taking rate.

Dried biomass and wood pellet storage silos adjacent the pellet plant will be equipped with a combustion gas/fire alarm system, internal biomass temperature monitoring system, pressurized CO_2 gas fire/combustion suppression system, fire sprinklers, and explosion vent panels.

The site will also be equipped with fire and gas detection equipment, and manual alarm pull stations to protect site personnel and trigger the emergency response plan as outlined in Section 6.0.

4.1.6.5 Emergency Shutdown

Control systems will be in place to trigger an “Emergency Shutdown” for shutdown of the entire facility, or a “Unit Shutdown” for shutdown and isolation of individual processes or equipment. The facility will be equipped with local and remotely mounted push buttons to initiate the shutdowns. Unit Shutdowns will require manual reset locally by operators. Emergency Shutdowns will follow the detailed start-up procedures to bring the plant back on-line.

Warning beacons for fire will be indicated with a red lens. Emergency and egress lighting will be provided by battery backed units or the emergency stand-by generator. A two tone horn will be used on site to indicate a hazardous condition and/or plant shutdown. Horn protocols will be developed for evacuation, all clear, and testing.

4.1.6.6 Roof Access

Exterior ladders will be provided for access to the all site building roofs. All roofs will have provisions for fall arrest anchor points to provide safe access and movement of maintenance personnel on to and around the entire roof area.

4.2 Environmental Impacts

4.2.1 Water Takings

As outlined in Section 3.1.5, existing wells at the Project Location are anticipated to be used for primary and backup sources of water for use by the Project. Project water demand is expected to include the following:

- 4.10 L/s for the cogeneration plant cooling tower;
- 1.52 L/s for the reverse osmosis system and boiler feedwater; and,
- 0.08 L/s for domestic water supply.

Since the above processes will require operation 24 hours per day throughout the year, the primary well will be required to continuously supply 5.7 L/s of groundwater to support Project operations throughout the year, which is more than 50,000 L/day.

A detailed hydrogeological assessment of the groundwater characteristics at the Project Location, including results from pump testing, is provided in **Appendix D**. The hydrogeological assessment in **Appendix D** concludes that the groundwater can supply 5.7 L/s from the well identified as TW2-13, and the water taking would not adversely impact the existing wells in the surrounding area, including those in Armstrong, Ontario.

4.2.2 Wastewater Management

The Project will produce process wastewater from the cogeneration plant, sanitary wastewater generated by employees, and wash-up wastewater from site buildings.

Sanitary sewage flow estimates were generated based on projected employee numbers and flow values contained in Ontario's Building Code (OBC). The expected quantity of sanitary wastewater is 3,900 L/day. It is expected to be similar in quality to domestic strength sewage, as the wastewater will consist of flows from the washrooms and lunchrooms for the cogeneration plant and pellet mill. The expected wastewater quality will be: 180 mg/L BOD, 180 mg/L TSS, 40 mg/L NH_3. Sanitary wastewater will be treated via a conventional septic system and disposed in a leaching bed shared with the process and wash-up wastewater.

Sanitary sewage from the portable toilet in the woodyard yard will be removed and disposed of at an off-site facility as required by a qualified service provider.

Process wastewater is expected to be produced by the cogeneration plant and its cooling tower. Descriptions of process wastewater flows are provided in **Table 4.1**.

Table 4.1 Process Wastewater Flows

Building	Source	Description
Cogeneration Plant	Boiler Blow Down	Water is wasted from the boiler to avoid increasing the concentration of impurities inside the boiler.
	Reverse Osmosis System Blow Down	Flush-out and reject water from the reverse osmosis machines and water softeners.
Cooling Tower	Cooling Tower Bleed Off	Water is wasted from the cooling tower to avoid increasing the concentration of impurities inside the tower.

The average flow rate for process wastewater is expected to be approximately 1.0 L/s with a peak flow rate of 2.15 L/s for 30 min/d. Based on all inputs, the expected daily flow for process wastewater is 92,000 L/d or 33,580 m^3 per year. The process wastewater is expected to have a low concentration of solids and other contaminants, and will be similar in quality to the raw water supply from groundwater wells. A treatment tank and filter screen are proposed to prevent any solids or floating material from entering the leaching bed. The process wastewater will be disposed of in the leaching bed.

Wastewater will also be produced from wash-up activities, including wash-up from the cogeneration plant, biomass belt dryer and maintenance garage. These effluent sources are described in **Table 4.2**.

Table 4.2 Wash-up Wastewater Flows

Building	Source	Description
Cogeneration Plant	Wash-up and Floor Drains	Cleaning plant operations. The resulting wastewater will have dirt dust as well as some trace oils and chemicals.
	Ash Transfer Shed Wash-up	High-pressure wash system for cleaning and to remove ash build-up from trucks. Flow will be 23 kg (50 lbs) of ash mixed with 1,900 L (500 USgal) water per week.
Biomass Belt Dryer	Chip Dryer	Cleaning and washing down equipment. The resulting wastewater will contain dirt and biomass as well as some trace oil and chemicals.
Maintenance Garage	Garage wash-up and floor drains	Cleaning and washing down equipment and vehicles. The resulting wastewater will contain dirt and oil. A grit removal sump and oil separator will be included in the maintenance garage and will be designed and sized accordingly by WSP.

The expected quantity of wash-up wastewater is 10,300 L/day. Wash-up wastewater is expected to have wood dust, ash and other solids that will settle out or float out of the wastewater stream, and will be treated via a conventional septic system and disposed of in the leaching bed.

The Site conditions are conducive to subsurface infiltration; therefore, sanitary, process and wash-up effluent are proposed to be disposed of in a common in-ground leaching bed rated for 106,200 L/day. The wastewater management system has been designed to achieve reasonable use requirements as regulated by MOECC.

4.2.3 Stormwater Management

As outlined in Section 3.1.7, the high porosity of the soils and deep water table at the Project Location is conducive to infiltration, and the majority of the Project Location (over 90%) is proposed to remain as gravel or vegetation, rather than paved or hard-surfaced. Calculations provided in the Surface Water Assessment Report (Neegan, 2014) confirm a negligible increase in runoff will result from the Project. This will mitigate potential impacts associated with stormwater at the source by increased infiltration and decreased runoff. The use of a vegetated filter strip and/or bio-swale is proposed at the downstream side of the site to further promote infiltration and mitigate erosion and sedimentation. The details of the vegetated filter strip and bio-swale are provided in the Surface Water Assessment Report (Neegan, 2014) under a separate cover.

As outlined in Section 3.1.4, the transformer substation will include a secondary containment system around the main transformer. In addition, the site will be staffed 24 hours per day throughout the year, and regular inspections of the transformer substation will take place as noted in Section 4.1.3.2. As such, a transformer failure is not likely to occur unnoticed, and quick response will be initiated to follow the cleanup procedure outlined in Section 3.1.4. If stormwater is found standing in the secondary containment system of the transformer substation and it does not appear to be contaminated with oil, it will be collected and disposed of in a building wash-up drain connected to an oil/grit separator and the wastewater management system. While the stormwater will likely be uncontaminated, it will be handled as though it were a hazardous material to ensure potential trace oils or chemicals are treated through the oil/grit separator and wastewater management system rather than “spilled” on-site.

In the event of a spill beyond the confines of the secondary containment system, the emergency response protocol for spills will be followed, as detailed in Section 6.1.3. Restoration of the affected environment will take place, such as removal of contaminated soil off-site at an approved disposal facility, and replacement with suitable fill matching surrounding conditions.

4.2.4 Air Emissions

The main contaminants expected from the operation of the facility are particulate matter, benzo(a)pyrene, and acrolein. An air emissions model of the facility was developed based on all significant sources of air emissions at the Project. The details of the assessment are provided in the Emission Summary and Dispersion Modelling (ESDM) Report (Neegan, 2014) under a separate cover.

As noted in the ESDM report, all predicted concentrations are below the applicable MOECC standards. The highest concentration is predicted for the particulate matter at 50.1% of the criteria. Considering the conservative assumptions included in the model, the actual concentration is expected to be much lower. Benzo(a)pyerene and acrolein are predicted at 5.8% and 2.6% of their criteria, respectively.

For further details regarding air emission sources and concentrations, refer to the Emission Summary and Dispersion Modelling Report (Neegan, 2014) under a separate cover.

4.2.5 Biomass Storage

As described in Section 3.1.1, biomass will be delivered to the site in the form of chipped and hogged material. These biomass materials will be stored on paved storage areas with drainage directed away from the piles, consistent with environmental best practices listed in the “Biomass Storage Environmental Practices Guide” (OFIA, 2008). Furthermore, the paved storage areas are located over 290 m from the nearest water body, and over 70 m from the proposed facility production well. These setback distances are well over the recommended minimum setback of 30 m (OFIA, 2008). In addition, as outlined in Section 4.1.2.1, the woodyard operators will ensure the biomass piles are maintained within the limits of the paved storage pad to provide mitigation for biomass leachate.

One storage pad will be dedicated for cogeneration plant fuel, and will store up to approximately 13,450 m^3. The other storage pad will be dedicated for pellet plant feedstock, and will store up to approximately 28,320 m^3. Anticipated biomass storage and use for the Project is provided in **Table 4.3**.

Table 4.3 Biomass Storage and Use

	Cogeneration Plant	**Pellet Plant**
Maximum daily quantity that will be accepted	2,855 m3 (based on unloading three trucks/hr.)	2,855 m3 (based on unloading three trucks/hr.)

	Cogeneration Plant	**Pellet Plant**
Estimated annual average quantity that will be accepted	82,315 Green Metric Tonnes (GMT*)	139,000 m3
Estimated average time that it will remain at the facility	Hogged Material: 22 days	Chipped Material: 21 days
Estimated average rate at which it will be used	235 GMT*/day	380 m3/d

*Assuming a biomass moisture content of 45%

4.2.6 Solid Waste

As described in Section 3.1.9, solid waste in the form of non-hazardous wood ash will be generated at the cogeneration facility. The facility design and operators will ensure that the ash collection system is functioning properly, and that the collection truck disposes of the ash off-site at an approved disposal facility prior to overloading. In addition, the ash collection storage room will include a floor drain to ensure ash is maintained within the collection system and wash-up water runoff is treated by the wastewater management system.

Anticipated wood ash waste generation is provided in **Table 4.4**.

Table 4.4 Wood Ash Waste Generation

Expected type of waste to be generated	Non-hazardous wood ash
Estimated annual average quantity that will be generated	2,000 m^3/yr.
Estimated average time that it will remain at the facility	2 days
Estimated average rate at which it will be generated	5.5 m^3/d

Other non-hazardous waste generated at the facility (i.e., paper, food scraps, etc.) are not expected to be significant in quantity, but will be stored in appropriate bins and disposed of at the local landfill as required.

5.0 Environmental Effects Monitoring Plan

An environmental effects monitoring plan has been prepared in accordance with the requirements of O.Reg. 359/09. The guiding principles that were used to establish the plan are summarized below. The details of the environmental effects monitoring plan are provided in **Tables 5.1** and **5.2**.

5.1 Potential Negative Environmental Effects

Any potential negative environmental effect that may result from engaging in the Project has been identified in **Tables 5.1** and **5.2**. These effects were identified from the operations and maintenance activities described in this report in conjunction with other investigations undertaken.

5.2 Performance Objectives and Mitigation Strategies

The ultimate performance objective for each potential negative environmental effect was to avoid occurrence of the effect. In cases where avoidance was not possible, an appropriate mitigation strategy was developed to minimize the magnitude, likelihood, duration and permanence of the potential effect. Mitigation strategies were typically developed according to the following approach:

- design Project siting to avoid occurrence of the effect;
- develop operational procedures to mitigate the effect; and,
- develop rehabilitation measures to restore affected features.

Mitigation will be implemented through a variety of mechanisms, including:

- Contract Documents: Whitesand is committed to operating the Project in an environmentally responsible manner and in compliance with all applicable environmental laws, regulations, and guidelines. All of Whitesand's contractors and subcontractors will be accountable for actions that have an adverse effect on the environment. As such, any contract documents executed by Whitesand will incorporate appropriate provisions from the REA documents. Additionally, all contractors, subcontractors, and other associates of the Project will follow the guiding principles of the monitoring program. These organizations will also comply with all relevant local, provincial, and federal legislation.

- Management Structures: Whitesand, the construction Contractor, and the Operation and Maintenance Contractor or staff, will take steps to ensure that they have appropriately skilled personnel to carry out the environmental responsibilities as defined in this Report. All organizations associated with Project development

activities will develop responsive reporting systems that clearly assign responsibility and accountability for development actions. As appropriate, Whitesand will review these reporting documents.

- Change Management: During implementation of the Project, change may be required to address unforeseen or unexpected conditions or situations. Whitesand, the construction Contractor and the Operation and Maintenance Contractor or staff will be responsible for ensuring environmental and safety issues are addressed. Whitesand will incorporate any significant changes to Project programs, procedures, and plans throughout the life of the Project.

- Environmental Procedures: Whitesand, the construction Contractor and the Operation and Maintenance Contractor or staff will be responsible for implementing all approved environmental procedures during all phases of the Project. Individual personnel responsibilities will be assigned as necessary to support the full and effective implementation of the environmental procedures. Environmental procedures will address the following issues to prevent environmental contamination:

- Spills and releases: to identify the specific procedures for the prevention, response, and notification of spills. In addition it should establish the general procedures for spill clean-up, personnel training, and material handling and storage to prevent spills.

- Hazardous waste management: to outline the procedures for the proper identification of hazardous waste and its proper storage, handling, transport, and disposal. In addition, the procedures should outline specific requirements for personnel training, emergency response, product testing, review and approval, and record keeping.

- Solid waste management: to establish alternative procedures for the management and disposal of used lubricants, used drums, and general office waste.

The procedures above will ensure internal and external risks are fully evaluated and the information communicated to personnel in advance of any accident or malfunction.

- Operation and Maintenance Training Program: As appropriate Whitesand and/or the Operation and Maintenance Contractor and/or staff should develop an operations training program to ensure personnel receive appropriate training in relation to operation and maintenance programs, environmental procedures, safety, and the emergency preparedness and response plan. With respect to the environment and natural features, training may cover the following issues:

Environmental Protection, including:

- any inspection, monitoring, maintenance and reporting required by Project permits and/or applicable environmental legislation;
- important/sensitive environmental features and areas;
- incidence reporting (spills, wildlife incidents); and,
- materials disposal.

Facility Safety, including:

- security and safety protocols and responsibilities;
- accident reporting; and,
- chemical and hazardous materials handling.

Emergency Preparedness, including:

- fire preparedness and response;
- natural disasters (i.e., extreme weather events); and,
- hazardous materials and spill response.

Training should begin as the initial staff complement is hired during the pre-operational mobilization period. There should also be on-going training for personnel as well as specific training sessions for new hires.

5.3 Project Monitoring and Contingency Measures

Project monitoring was designed to ensure performance objectives will be achieved through proper implementation of mitigation strategies. Where Project monitoring reveals that a mitigation strategy is not achieving its performance objective, contingency measures will be employed. Contingency measures have been developed to achieve the following:

- rehabilitate or correct a negative environmental effect;
- notify the applicable agencies and public, if required; and,
- develop alternative mitigation strategies that could prevent the same negative environmental effect from occurring again.

5.4 Environmental Effects Monitoring Plan

The environmental effects monitoring plan is detailed in **Tables 5.1** and **5.2**. The details provided in the tables are a result of the comprehensive investigations undertaken for

the Project, including **Appendix C** and **D** of this report, and the following reports submitted under separate covers:

- Stage 1 Archaeological Assessment
- Natural Heritage Assessment
  - Records Review
  - Site Investigation
  - Evaluation of Significance
  - Environmental Impact Study (results shown in **Table 5.2**)
- Water Assessment Report
  - Records Review
  - Site Investigation
- Surface Water Assessment Report
- Effluent Management Plan Report
- Construction Plan Report
- Emission Summary and Dispersion Modelling Report
- Noise Study Report
- Decommissioning Plan Report

Table 5.1 Environmental Effects Monitoring Plan – Effects Summary

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
Archaeological and Cultural Heritage	• Disturbance to archaeological and cultural heritage resources during construction and operation	• Minimize disturbance to archaeological and cultural heritage features.	• A Stage 1 Archaeological Assessment Report has been completed, and concluded that extensive modification of the ground surface has severely degraded any cultural heritage potential, leading to the recommendation that the Study Area does not require further archaeological assessment. • The Ministry of Tourism, Culture and Sport has reviewed the above referenced report and is satisfied that the fieldwork and reporting are consistent with the Ministry's 2011 Standards and Guidelines for Consultant Archaeologists and the terms and conditions for archaeological licenses. • A Cultural Heritage Self-Assessment was undertaken to evaluate the potential for cultural heritage resources at or abutting the Project Location. The assessment concluded there is low potential for cultural heritage resources.	• Should any unknown/unexpected artifacts or human remains be encountered during construction, the construction contractor will stop work and the Ministry of Tourism, Culture and Sport will be notified for direction prior to proceeding.
Woodlands and Natural Vegetation	• Fragmentation; • Introduction of invasive species; • Vegetation loss/change during construction; and, • Removal of biomass from surrounding forests for use in the various facility processes	• Minimize disturbance to forest communities to the extent possible.	• Field studies took place in the summer of 2013 to confirm the presence, significance, sensitivity and abundance of woodlands and natural vegetation, including: – Vegetation Inventories; – Ecological Land Classification; and, – Species at Risk surveys as required. • No Significant Woodlands, rare vegetation communities or at risk flora were identified. • Forests regenerating from previous harvesting activities are present. The following mitigation will be used to minimize disturbance to surrounding forests: – The Project Location site boundaries will be surveyed and marked to limit vegetation clearing and encroachment beyond the Project Location; – No clearing, grading, stockpiling of materials, temporary work areas, etc., will be permitted beyond the Project Location; – Silt fencing will be installed to limit soil movement beyond the boundaries of the Project Location; – Erosion and sediment control measures will be regularly inspected to ensure they are functioning and are maintained as required; – If erosion and sediment control measures are not functioning properly, alternative measures will be implemented and prioritized above other construction activities; and, – Only approved and permitted biomass will be stored on site and used in the cogeneration plant and pellet plant.	• During construction, an Environmental Inspector will regularly monitor operations to ensure that activities do not extend beyond the Project Location; • If accidental encroachment occurs, the offending material or equipment will be immediately removed and restoration of the area conducted as needed; and, • Deliveries of biomass will be regularly inspected and will not be accepted without the proper documentation to ensure it is approved biomass from a permitted source. Non-permitted biomass will not be accepted for storage or use at the facility.

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
Wetlands	• Fragmentation; • Introduction of invasive species; • Vegetation loss/change; • Possible loss of, or disturbance to, Provincially Significant Wetlands, non-Provincially Significant Wetlands and unevaluated wetlands; and, • Impacts to the hydrological regime due to changes in surface water runoff and groundwater drawdown.	• None Required.	• Field studies took place in the summer of 2013. No wetlands were identified within 120 m of the Project Location.	• None Required.
Life Science and Earth Science Areas of Natural and Scientific Interest (“ANSIs”)	• These features are not present within 120 m of the Project Location. No effects are anticipated.	• None Required.	• The Project has been sited in an area with no ANSIs at or within 120 m of the Project Location.	• None Required.
Terrestrial Wildlife and Wildlife Habitat	• Disruption to terrestrial species and their breeding, feeding and migration habitats, including: – birds; – bats; – mammals; – amphibians; – reptiles; – insects; and, – species at risk.	• Minimize habitat loss to the extent possible and limit direct loss to the confines of the Project Location.	• Field studies took place in 2013 and 2014 to confirm the presence, significance, sensitivity and abundance of wildlife and wildlife habitat, in accordance with the Natural Heritage Assessment Guide for Renewable Energy Projects (MNR, 2012). The only significant feature identified at or within 120 m of the Project Location was Category 3 woodland caribou habitat. • Limit disturbance to Category 3 woodland caribou habitat as follows: – Minimize the footprint of the facility and land clearing requirements to the extent possible; – Minimize construction impacts as noted above under “Woodlands and Natural Vegetation” and below under “Surface Water”, “Air, Odour, Dust”, and “Noise”; and, – Review potential impacts with the MNR to confirm permitting requirements and additional mitigation, if required under the ESA, 2007.	• None, unless required by MNR for Category 3 woodland caribou habitat under the ESA, 2007.

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
			• Mitigate impacts to migratory bird species by implementing the following: – Tree and vegetation clearing will not occur during the breeding season (May 16 to August 8); – Noise levels will be maintained at or below the approved limits set out by MOECC in the REA and ECA approvals; and, – Measures to limit accidental encroachment into habitats beyond the Project Location and to minimize sedimentation and erosion effects on habitats are described under "Woodlands and Natural Vegetation", above.	
Provincial Parks, Conservation Reserves or Valleylands	• These features are not present within 120 m of the Project Location. No effects are anticipated.	• None Required.	• The Project has been sited in an area with no provincial parks, conservation reserves, or valleylands at or within 120 m of the Project Location.	• None Required.
Surface Water	• Erosion and sedimentation during all Project phases could affect water quality at the water bodies in the vicinity of the Project Location; • Water quality impacts due to potential fuel and oil spills; • Water quality impacts due to leachate or movement of biomass into nearby water bodies; and, • Water quality impacts associated with the subsurface disposal wastewater management system.	• Prevent erosion and sedimentation impacts on water bodies; • Prevent occurrence of spills; • Minimize biomass leachate production and prevent migration into water bodies; and, • Minimize potential impacts on water bodies associated with wastewater management system subsurface disposal.	• Field studies took place in the summer of 2013 to evaluate water bodies in the vicinity of the Project. The Project Location was sited such that there are no water bodies at or within 120 m of the Project Location, and no Lake Trout Lakes within 300 m of the Project Location. • Mitigation measures will be implemented to minimize potential impacts associated with erosion and sedimentation as follows: – An erosion and sediment control plan will be designed and implemented prior to any other construction activities; – Erosion and sediment control measures would be inspected regularly and repaired/maintained as required; – Materials removed or stockpiled would be contained in a manner to ensure sediment does not enter any water body; – The porous soils and deep water table at the Project Location are conducive to infiltration. The Project has been designed with more than 90% of the site area having gravel or vegetated surfaces, promoting infiltration at source, thereby reducing runoff and associated erosion and sediment impacts; and, – A vegetated filter strip and/or bio-swale will be constructed at the downstream side of the Project for additional infiltration, reduced runoff, and reduced erosion and sediment transport. • Mitigation measures will be implemented to prevent the occurrence of spills as follows: – A secondary containment system will be constructed in the transformer substation around the main site transformer and will be inspected regularly; – All other oil filled transformers will be installed above a containment catch basin; – The diesel fuel storage and filling station will include above ground tanks on a	• A three year post-construction monitoring program is proposed at ponds 1, 4, and 5, as shown on Figure A4 of the Site Plan in Appendix A of the Design and Operations Report. The monitoring program would include: – Taking water samples at ponds 1, 4, and 5, for chemical analysis to determine pollutant levels in each pond; – The first round of testing would occur prior to construction to establish background conditions. These background conditions will be evaluated to set performance objectives in consultation with MOECC; – Subsequent samples will be taken twice a year (during Spring after snow melt, and Summer), for three years; and – If testing remains within the performance objectives for three years of Project operation, testing will discontinue. Otherwise, MOECC will be consulted to implement further mitigation, contingency, and testing procedures. • Wastewater flow monitoring and reporting in accordance with MOECC requirements. • Minor site re-grading and dense vegetation planting as required to disperse channelized flows.

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
			hard surface, and will comply with the requirements of O.Reg. 217/01 and the Ontario Liquid Fuels Handling Code; – A waste oil building will be constructed with a containment sump for storage of waste oil in metal barrels; – Site personnel will be trained in the proper handling, use, and storage of hazardous materials; • Biomass will be stored on paved storage areas with drainage directed away from the piles, consistent with environmental best practices listed in the "Biomass Storage Environmental Practices Guide" (OFIA, 2008); • The paved biomass storage areas are located over 290 m from the nearest water body; and, • The wastewater management system has been designed in accordance with the effluent limits established in consultation with MOECC.	• Covered storage of biomass if monitoring discovers non-conformance due to biomass leachate impacts. • The Ontario Ministry of the Environment document "Spills Reporting – A Guide to Reporting Spills and Discharges", dated May 2007 and as amended from time to time, will be followed for spill reporting protocols, including calling the MOECC Spills Action Centre.
Groundwater	• Groundwater taking for use by the Project (expected to require more than 50,000 L/d); • Potential to encounter non-documented shallow dug wells; • Water quality impacts due to leachate from biomass to groundwater; • Impacts to groundwater quality from on-site subsurface wastewater treatment; • Water quality impacts due to potential fuel and oil spills; and, • Water quality impacts from damaged underground utilities (i.e., glycol heat	• No adverse impact on existing wells in the vicinity of the Project; • Minimize biomass leachate production and potential impact on groundwater; • Minimize potential impacts on groundwater associated with wastewater management system subsurface disposal; • Prevent occurrence of spills; and • Minimize potential for underground utility damage and associated	• A hydrogeological assessment has been completed, and concluded that the groundwater can supply 5.7 L/s from the well identified as TW2-13, and the water taking would not adversely impact the existing wells in the surrounding area, including those in Armstrong, Ontario. The hydrogeological assessment is included in Appendix D of the Design and Operations Report. • Due to the porous nature of the surficial soils and deep water table at the Project Location, no shallow dug wells are anticipated. Furthermore, none were encountered during natural heritage field studies or during the on-site hydrogeological assessment. • Biomass will be stored on paved storage areas with drainage directed away from the piles, consistent with environmental best practices listed in the "Biomass Storage Environmental Practices Guide" (OFIA, 2008). • The paved biomass storage areas are located over 290 m from the nearest water body. • The wastewater management system has been designed in accordance with the effluent limits established in consultation with MOECC. • Mitigation measures will be implemented to prevent spills as noted above under "Surface Water". • All underground electrical cables, backfill, and grounding will be installed according to the Electrical Safety Code and the authorities having jurisdiction. • Gravity pipes or forcemains for the wastewater conveyance system will be installed in accordance with all relevant Ontario Provincial Standard Specifications (OPSS), including OPSS 410 and OPSS 412 as appropriate. • If technically feasible, propylene glycol (a low toxicity, organic compound) will be used for the glycol heating system.	• As part of the three year post-construction monitoring program outlined above under "Surface Water", water samples will also be taken from the Project's production well and analyzed for compliance with performance objectives set in consultation with MOECC. • Ponds 1, 4, and 5 are believed to be groundwater fed. As such, the post-construction surface water monitoring program outlined above is expected to provide insight on groundwater quality conditions. Furthermore, the cogeneration plant will be equipped with a water treatment system that will be able to detect water quality coming from the production well on site. Any abnormal incoming water quality characteristics will prompt notice to potentially affected groundwater users, and further investigations, such that the cause of the unexpected results is determined and corrective actions are taken. • Wastewater flow monitoring and reporting in accordance with MOECC requirements. • Covered storage of biomass if monitoring discovers non-conformance due to biomass leachate impacts. • Monitoring of glycol heating system fluid levels to confirm no leaks have occurred.

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
	transfer system or wastewater conveyance system).	impacts on the environment.		• The Ontario Ministry of the Environment document "Spills Reporting – A Guide to Reporting Spills and Discharges", dated May 2007 and as amended from time to time, will be followed for spill reporting protocols, including calling the MOECC Spills Action Centre.
Aquatic Species and Aquatic Habitat	• Potential impacts to aquatic habitat due to erosion and sedimentation, spills, and leachate migration to water bodies; and, • Water bodies may also be affected by groundwater taking.	• Minimize impacts on potential aquatic species at water bodies in the vicinity of the Project.	• Field studies took place in the summer of 2013 to evaluate water bodies in the vicinity of the Project. The Project Location was sited such that there are no water bodies at or within 120 m of the Project Location, and no Lake Trout Lakes within 300 m of the Project Location; • No fish were observed from shoreline observations at the five closest water bodies to the Project Location; and, • Refer to mitigation measures above under "Surface Water" and "Groundwater" for measures to protect potential aquatic species and aquatic habitat in the vicinity of the Project.	• Refer to the monitoring and contingency measures above under "Surface Water" and "Groundwater", which will be implemented in part to protect potential aquatic species and aquatic habitat in the vicinity of the Project.
Air, Odour, Dust	• Dust and air emissions from Project equipment; • Increases in air-borne dust and particulate matter; • Increased emissions from equipment during construction and decommissioning; • Positive effects of reducing air emissions by replacing the need for the existing diesel generating station; and, • Odour impacts from biomass storage piles.	• Comply with the applicable air emissions regulations during Project operation; • Minimize dust and air emissions during construction and decommissioning; and, • Minimize odour from biomass storage piles.	• An Emission Summary and Dispersion Modelling (ESDM) report has been prepared under a separate cover in accordance with O.Reg. 419/05. The report indicates air emissions compliance with the applicable regulatory requirements during Project operation. • The construction and decommissioning contractors would implement good site practices with regard to air/odour/dust, which may include: – Multi-passenger vehicles would be utilized to the extent practical; – Company and contractor personnel would avoid idling of vehicles when not necessary for construction activities; – Equipment and vehicles would be maintained in good working order with functioning mufflers and emission control systems as appropriate; and, – Dust suppression (e.g., water) of source areas. • A Best Management Plan will be in place during operation to control dust/particulate emissions from unpaved roads and biomass storage piles. • Low emissions and low temperature wood drying technology will be used for drying of biomass during Project operation. • Ash waste will be collected and stored inside the cogeneration plant building. • Biomass and waste ash delivery trucks carrying friable material will be loaded and/or covered such that emissions are minimized during transport. • Biomass will be stored on paved storage areas with drainage directed away from the piles, consistent with environmental best practices listed in the "Biomass Storage Environmental Practices Guide" (OFIA, 2008). Proper drainage at the biomass storage piles will promote drying of material and reduced odour effects.	• The cogeneration plant will be equipped with a Continuous Emission Monitoring system to ensure the cogeneration plant is operating within existing Ministry established air emissions limits for biomass combustion facilities; and, • A Communications Plan will be developed and implemented during all phases of the Project, including a complaint response protocol as outlined in Section 6.3 of the Design and Operations Report. Corrective actions will be taken to address the complaint as appropriate.

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
Noise	• Noise emissions from the operation of construction machinery and transport of materials to and from the facility; • Noise emissions from the operation of equipment at the facility; and, • Noise effects associated with decommissioning and dismantling activities.	• Minimize noise emissions during construction and decommissioning • Comply with REA and ECA noise emission requirements during Project operation.	• Industry best practices will be implemented to minimize noise impacts during construction and decommissioning. For example, construction equipment will be repaired and maintained in good working order, and all engines associated with construction equipment would be equipped with mufflers. To the greatest extent possible, activities that could create excessive noise would be restricted to daytime construction hours, and construction/decommissioning activities would adhere to local noise regulations that may be in effect. • The facility has been designed to mitigate noise impacts by locating equipment with significant noise emissions in buildings as required. Building doors will be kept closed during operation as required to achieve predicted noise levels. • A Noise Study Report has been prepared to assess noise impacts during Project operation, and indicates compliance with regulatory requirements at the nearest points of reception. • Regular facility maintenance will take place throughout the operational phase of the Project to ensure that all equipment is functioning properly, reducing noise associated with malfunctioning equipment.	• A Communications Plan will be developed and implemented during all phases of the Project, including a complaint response protocol as outlined in Section 6.3 of the Design and Operations Report. Corrective actions will be taken to address the complaint as appropriate.
Petroleum, Oil and Gas Resources	• Possible impacts on existing or historic petroleum, oil and gas wells.	• None required.	• A review of the MNR's oil, gas and petroleum library indicated there are no current or historical petroleum wells or facilities within 75 m of the Project Location.	• None required.
Provincial and Local Infrastructure	• Temporary pressure on local services and inconvenience to local residents during construction and decommissioning; • Traffic delays on local and provincial roads as a result of construction-related traffic (i.e., movement of heavy equipment and facility components); • Damage to roads as a result of the movement of heavy equipment and facility components;	• Minimize traffic; and, • Restore any damage to roads/ infrastructure.	• The construction and decommissioning contractors will comply with Book 7 (Temporary Conditions) of the Ontario Traffic Manual to ensure all equipment deliveries and construction-related traffic is controlled in a safe manner that minimizes traffic disruptions. • The Project Location is situated over 300 m from Highway 527, minimizing traffic impacts associated with construction activities or work areas on or near public roads. • During Project operation, transport trucks will frequent the site on a daily basis for the delivery of biomass and shipment of wood pellets. The woodyard will have adequate space for multiple trucks on site at the same time, ensuring no backups will occur onto Highway 527. Based on existing traffic volume and the population of Armstrong, Ontario, no significant traffic delays are expected during the operational phase of the Project. • Oversize/overweight trip permits will be obtained from MTO as required. • A Road Condition Survey will be conducted if required by MTO or the local services and roads boards. Any damage to local or provincial infrastructure as a result of construction or decommissioning activities will be repaired promptly as required. • Consultation will take place with the MTO and local service board if there is a need	• Any upgrades and/or subsequent rehabilitation and maintenance/repair will be negotiated with the appropriate authorities. • A Communications Plan will be developed and implemented during all phases of the Project, including a complaint response protocol as outlined in Section 6.3 of the Design and Operations Report. Corrective actions will be taken to address the complaint as appropriate.

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
	and, • Potential traffic delays during Project operation as a result of deliveries of biomass.		to upgrade or widen any roads in order to allow for the delivery of equipment or biomass.	
Waste	• Construction and decommissioning waste will be generated and will require disposal; and, • The cogeneration plant will generate wood ash waste, which will require disposal.	• Meet MOECC and operator requirements for disposal of waste at an approved landfill/disposal facility.	• During construction and decommissioning, the Contractor would implement a site-specific waste collection and disposal management plan. • Non-hazardous wood ash waste generated by the cogeneration plant will be regularly disposed of off-site at an approved landfill/disposal facility. No landfilling will occur on-site.	• Testing of waste material as required to confirm acceptability for disposal.
Public Health and Safety	• Safety concerns related to the operation of heavy equipment during construction; • Accidents, spills or malfunctions associated with Project components, including heavy equipment, furnace, boiler system, pressurizing equipment, and electrical systems; • Fire and/or explosion at the facility or within material stockpiles, with the potential to spread to surrounding forests; and, • Water quality impacts	• Protect site personnel and the public; • Prevent occurrence of spills; • Prevent occurrence of fires and explosions; and, • No adverse impacts to wells in the vicinity of the Project.	• All Project work during construction, operation, maintenance, and decommissioning will comply with the Ontario Occupational Health and Safety Act. • A Health and Safety Plan will be developed and implemented during each phase of the Project, including the minimum emergency response elements described in Section 6.1 of the Design and Operations Report, and a staff training program including the minimum elements described in Section 5.2 of the Design and Operations Report. • The site will be equipped with security equipment, signage, and entrance slide gates. Fencing and signage will be installed around the transformer substation and fire water supply pond. • There will be a pre-start safety review of the Project prior to operation in accordance with regulatory requirements. This review will ensure that all equipment has been installed as designed, commissioned appropriately, and that safety procedures and a training program are in place as noted above. • Mitigation measures will be implemented to prevent spills as noted above under “Surface Water”. • The entire facility, including biomass storage areas, will be fully equipped for fire detection and protection as described in Section 4.1.6.4 of the Design and Operations Report. • Biomass will be stored on paved storage areas with drainage directed away from the piles, consistent with environmental best practices listed in the “Biomass Storage Environmental Practices Guide” (OFIA, 2008). • The wastewater management system has been designed in accordance with the	• The facility will be monitored by staff on site 24 hours / day, throughout the year. Any event encountered that could impact public health and safety will trigger the emergency response protocols outlined in the Health and Safety Plan. • Refer to the monitoring and contingency measures above under “Surface Water” and “Groundwater”, which will be implemented in part to protect public health.

Environmental Component	Potential Effects	Performance Objective	Mitigation Strategy	Proposed Monitoring and Contingency Measures
	on wells in the vicinity of the Project.		effluent limits established in consultation with MOECC. •	
Provincial Land Use Plans	• The Project is not protected under the Greenbelt Plan, Lake Simcoe Protection Plan, Niagara Escarpment Plan or Oak Ridges Moraine Conservation Plan. No impacts under provincial land use plans or policies are anticipated.	• None Required.	• No mitigation measures are required.	• None Required.

Table 5.2 Environmental Effects Monitoring Plan – Natural Heritage Assessment Environmental Impact Study

Potential Impacts and Mitigation					**Environmental Effects Monitoring Plan**					
Project Activity	**Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.**	**Mitigation Strategy**	**Residual Effect (magnitude/frequency/ duration)**	**Performance Objective**	**Methodology**	**Monitoring Locations**	**Frequency and Duration of Sample Collection**	**Technical and Statistical Value of Date**	**Reporting Requirements**	**Monitoring Plan and Contingency Measures**
Habitat of Threatened and Endangered Species: Category 3 Woodland Caribou Habitat										
All Construction, Operation and Decommissioning Activities	• Loss of approximately 35 ha of Category 3 habitat (D)	• Minimize the footprint of the facility and land clearing requirements to the extent possible. • Minimize construction effects (noise, dust, erosion/sedimentation). • Review potential impacts with the MNR to confirm permitting requirements and additional mitigation, if required under the ESA, 2007.	• Limited geographic extent based on entire range of Category 3 habitat. • Low magnitude based on relatively low importance of Category 3 habitat. • Duration of effect will last for the entire life of the facility. • No residual effect to the species anticipated.	• Minimize loss of Category 3 habitat to the extent possible.	• No Environmental Effect Monitoring needed unless specified as part of ESA, 2007 requirements.					
Habitat for Migratory Breeding Birds										
Tree and vegetation clearing for construction	• Loss of approximately 35 ha of breeding habitat (D). • Potential for greater loss if clearing,	• Tree and vegetation clearing will not occur during the breeding bird season (May 16 to August 8). • The site boundaries will be surveyed and marked to limit	• Loss will be experienced for the life of the project; however, magnitude considered to be low based on	• Minimize habitat loss to the extent possible and limit direct loss to the confines of the Project Location.	• N/A	• N/A	• N/A	• N/A	• N/A	• N/A

Potential Impacts and Mitigation					Environmental Effects Monitoring Plan					
Project Activity	**Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.**	**Mitigation Strategy**	**Residual Effect (magnitude/frequency/ duration)**	**Performance Objective**	**Methodology**	**Monitoring Locations**	**Frequency and Duration of Sample Collection**	**Technical and Statistical Value of Date**	**Reporting Requirements**	**Monitoring Plan and Contingency Measures**
	encroachment of equipment or stockpiles inadvertently extends beyond the Project Location boundary (D).	encroachment within Project Location. • No clearing, grading, stockpiling of materials, temporary work areas, etc. will be permitted beyond the Project Location. • During construction, an Environmental Inspector will regularly monitor operations to ensure that activities do not extend beyond the Project Location. • If accidental encroachment occurs the offending material or equipment will be immediately removed and restoration of the area conducted as needed.	large extent of suitable habitat present in the surrounding area.							
Land clearing, construction and decommissioning activities	• Movement of exposed sediment into the features (I). • Sedimentation could have a minor effect on the size of	• Silt fencing will be installed to limit soil movement beyond the boundaries of the Project Location. • Erosion and sediment control measures will be	• Limited duration, frequency, geographic extent. • No residual effect anticipated.	• No vegetation loss or disturbance associated with sediment and erosion beyond the Project Location.	• N/A	• N/A	• N/A	• N/A	• N/A	• N/A

Potential Impacts and Mitigation					Environmental Effects Monitoring Plan					
Project Activity	**Potential Effects (D=Direct) (I=Indirect) Potential effect on the size, diversity, health, connectivity, functionality and resilience of the natural feature.**	**Mitigation Strategy**	**Residual Effect (magnitude/frequency/ duration)**	**Performance Objective**	**Methodology**	**Monitoring Locations**	**Frequency and Duration of Sample Collection**	**Technical and Statistical Value of Date**	**Reporting Requirements**	**Monitoring Plan and Contingency Measures**
	woodland and on its function (I).	regularly inspected to ensure they are functioning and are maintained as required. • If erosion and sediment control measures are not functioning properly, alternative measures will be implemented and prioritized above other construction activities.								
Construction activities and Facility Operations	• Noise disturbance during construction and operations could cause bird species to avoid suitable nesting areas adjacent to the project (I). • No effect anticipated at the species level.	• Noise levels will be maintained at or below the approved limits set out by MOECC in the REA and ECA approvals.	• Loss will be experienced for the life of the project; however, magnitude considered to be low based on large extent of suitable habitat present in the surrounding area.	• Minimize disturbance effects to maintain breeding habitat in the area.	• N/A	• N/A	• N/A	• N/A	• N/A	• N/A

6.0 Emergency Response and Communications Plans

The Emergency Response and Communications Plans define the avenue for ongoing communication throughout Project construction, operation and decommissioning phases. This will ensure members of the community, Aboriginal communities, the local service board, and government ministries are informed of pertinent Project activities, in addition to any emergencies that may occur.

The Emergency Response and Communications Plans will be reviewed and updated as appropriate by the parties responsible for Project activity according to each phase. Any updates to the plans will be communicated to all stakeholders as they are made.

6.1 Communications Plan for Emergencies

Whitesand and/or the relevant Contractor will finalize a detailed Emergency Response Plan (ERP) in collaboration with the appropriate emergency service departments. A current version of the ERP will be kept at the cogeneration plant. The ERP will contain current contact information for emergency responders, including police and fire contacts, and will outline the chain of communication between on-site personnel, Whitesand, emergency contacts, the local community and other pertinent stakeholders in the event that an emergency situation should occur. The ERP will typically include the following information:

- designation of facility emergency coordinators;
- emergency action communication protocol;
- process description for responding to emergencies;
- objectives for emergency response and communication;
- local emergency response contact phone numbers;
- facility information, including exact location;
- site evacuation procedures and routes;
- fire response plan;
- personal injury response plan;
- procedures for responding to and documenting chemical/oil spills and release, including Ministry of the Environment and Climate Change Spills Action Centre contact information;
- material Safety Data Sheets (MSDS) for all chemicals used during construction, operation, and decommissioning;
- weather-related emergency procedures;
- process for documenting personnel injuries/serous health conditions;

- regulatory references; and,
- required health and safety training for employees.

Potential emergency situations which could occur generally include fire, personal injury, and spills. All incidents will be properly documented and kept on file. Documentation will include date of incident, date of reporting, name of reporter, description of the incident, cause of the incident, actions taken, communications with internal and external personnel, and follow-up required. The following sections detail the emergency response procedures for the above noted emergency events.

6.1.1 Fire

In the event that the facility's automatic fire detection and prevention measures cannot prevent a fire event, the fire response plan will be implemented. As outlined in Section 4.1.6.4, all site buildings and the woodyard will be equipped with suitable fire protection equipment (i.e., sprinkler systems for the cogeneration plant, pellet mill, and maintenance garage, siamese connections, hydrants, hose stations, and fire extinguishers). Should a fire occur, Project personnel will attempt to extinguish it, only if it is safe to do so. If there is a risk of personal injury, extinguishing the fire will not be attempted; the Project area will be evacuated and Project personnel will immediately call 911 and the local fire contact to summon emergency response crews. If applicable, Project personnel will notify all adjacent residents if the fire appears able to move off of the Project site. All staff on site during the life of the Project will be trained in the procedure to deal with a fire and the use of firefighting equipment, including extinguishers.

6.1.2 Personal Injury

Whitesand will retain contractors to conduct all works related to each Project phase, and it will be the responsibility of the contractors to establish their own Health and Safety program in accordance with the Ontario Occupational Health and Safety Act.

Personal Protective Equipment will be worn by all personnel within the Project area as required. Any Project equipment requiring access by personnel will have appropriate handrails, toe-boards, non-slip surfaces, and anchor points for harnesses as applicable. Any electrical equipment will be insulated and grounded in accordance with the Ontario Electrical Safety Code. All personnel will receive the appropriate training for Project activities, health and safety, emergency response, and communications plans.

Should a personal injury occur on site that requires an ambulance, Project personnel will immediately call 911 and assist the injured worker, until emergency services arrive.

Should a non-critical personal injury occur on site not requiring an ambulance, the injured worker will be treated on scene by the on-site first aid supplies, safety showers, or eye-wash stations; or they will be taken to the local hospital. Maps to the closest hospitals will be kept in the cogeneration plant. A listing of all Project personnel trained in first aid/CPR will also be posted on site.

In all cases of personal injury, the Project Manager responsible for the phase of the Project will be notified immediately. All incidents will be documented and kept on file. Documentation will include date of incident, date of reporting, name of reporter, name of injured, description of the incident, cause of the incident, actions taken, communications with internal and external personnel, and follow-up required, as required by the Ontario Occupational Health and Safety Act.

6.1.3 Spills

Site personnel will be trained in the proper handling, use, and storage of hazardous materials to prevent the occurrence of a spill.

The Ontario Ministry of the Environment and Climate Change clearly outlines spill procedures in the “Spills Reporting – A Guide to Reporting Spills and Discharges”, dated May 2007. Definitions for the types of spills that require reporting are defined in O.Reg. 675/98 (Classification and Exemption of Spills and Reporting of Discharges). Due to the extended timeline of the Project, personnel will be responsible for utilising the latest update of the provincial procedures.

Spills that are most probable during the Project phases include discharge into the natural environment from a structure, vehicle or other container, such as sewage and hazardous materials (i.e., lubricating grease and oil).

Should a spill occur, the following will be implemented:

- evaluation of the scene for potential risks to human health and safety;
- stop the spill, if it is safe to do so;
- if there is immediate danger to human health, contact 911 for assistance, and notify the public who may be directly impacted or in harm’s way;
- notify the Project Manager of any incident;
- contain and clean-up the spill, using the on-site spill kit;
- if required, contact outside certified spill response contractors for assistance;
- gather relevant information for documentation and reporting; and,
- report the spill to government agencies as required (i.e., Ministry of the Environment and Climate Change Spills Action Centre, local service board, etc.).

A spill kit will be available on-site during all Project phases and will contain equipment necessary for emergency spills response. This will include absorbent pads, absorbent boom, disposal bags, neoprene gloves, protective goggles, multi-purpose granular sorbents, and a plastic bin or metal drum to store items.

The Ministry of the Environment and Climate Change Spills Action Centre phone number (1-800-268-6060) will be posted at the cogeneration plant, as well as on the spill kit.

Documentation for all spills will be kept on file and sent to the Ministry of the Environment and Climate Change as required. The documentation will include all information outlined by the Ministry of the Environment in the aforementioned guide.

6.2 Communications Plan for Project Updates and Activities (Non-Emergency)

All non-emergency communications will be disseminated through a variety of media avenues to keep stakeholders apprised of Project updates and activity. Where applicable, these avenues will include:

- Project website;
- newspaper notices;
- posting of notices in the local community;
- construction signage; and,
- email and/or letters.

Project updates will include any legally required notices as well as any information that Whitesand and/or the Contractor considers relevant to inform the public of and ensure their safety.

6.3 Stakeholder Communication, Complaints, and Response

Whitesand will create a Communications Plan that clearly outlines a process for two-way communication with all stakeholders. At all times, the Communications Plan will be available on the Project website and at the cogeneration plant. The local service board will also be supplied with contact information to direct stakeholder communications and complaints to the appropriate personnel who can implement the proper procedures.

The Communications Plan will outline the procedure for stakeholder communications to ensure proper documentation and to facilitate an efficient response. Whitesand and/or the Contractor will promptly respond to stakeholder communications, within 48 hours whenever possible.

Complaints received by Whitesand and/or the Contractor will be documented and responded to according to the procedure outlined in the Communications Plan. All complaints will be properly documented for record keeping including name, mailing address and telephone number of the complainant, time and date of the complaint, details of the complaint, actions taken to rectify the complaint, and actions that will be taken to prevent a reoccurrence of the complaint. All of this correspondence will be provided to the complainant to keep them informed on the response approach. The Communications Plan will also outline the required communications with government agencies that will take place as appropriate.

7.0 Conclusion

Safe and reliable operation of the Whitesand First Nation Cogeneration and Pellet Mill Project can be implemented without causing significant adverse environmental effects. This will be achieved through proper design, operation and maintenance of the facility, and the implementation of mitigation, monitoring, and contingency measures outlined in this report.

Burnside has prepared this Design and Operations Report for Whitesand in accordance with O.Reg. 359/09. This report has been prepared by Burnside for the sole benefit of Whitesand, and may not be re-produced by any third party without the express written consent of Whitesand.

Respectfully submitted,

Neegan Burnside Ltd.

Signature  October, 2014

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Project Manager
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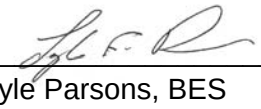
Reviewed by:

Signature  October, 2014

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Signature  October, 2014

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Whitesand First Nation

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