White Pines Wind Project
Additional Avoidance and Mitigation Measures to Minimize Potential Impacts to Blanding's Turtle (*Emydoidea blandingii*)

Prepared for:
wpd Canada
2233 Argentia Road, Suite 102
Mississauga, ON L5N 2X7

Project No. 1494 l July 2016

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

WHITE PINES WIND PROJECT
Additional Avoidance and Mitigation Measures to Minimize Potential Impacts to Blanding's Turtle (*Emydoidea blandingii*)

Project Team:

Staff	Role
Andrew G. Ryckman	Project Manager/Biologist
Pamela Hammer	Terrestrial and Wetland Biologist
Tara Livingstone	Terrestrial and Wetland Biologist

Report submitted on July 21, 2016

Andrew G. Ryckman
Senior Terrestrial and Wetland Biologist

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1.0 Project Description

The White Pines Wind Project (the Project) is a wind energy generating facility proposed by wpd Canada Corporation (wpd Canada), located south of the Town of Milford, in Prince Edward County, Ontario. The Project is generally bordered by Brummell Road/Bond Road to the north, Lighthall Road to the west, Gravelly Bay Road to the East, and Lake Ontario to the south. The Renewable Energy Approval (REA) for the Project was granted on July 16, 2015 by the Ministry of the Environment and Climate Change (MOECC) which approved the construction and operation of 27, 2.05 megawatt (MW), Senvion (previously known as REPower) wind turbines for a total installed capacity of up to 55.35MW (MOECC 2015).

Two notice of appeals of the REA were filed with the Environmental Review Tribunal (ERT) (the Tribunal) on July 29, 2015 and July 31, 2015, pursuant to section 142.1 of the *Environmental Protection Act* (*EPA*), seeking revocation of the REA on the grounds that the Project will cause serious and irreversible harm to plant life, animal life, and the natural environment.

The ERT proceeding order, commenced under section 142.1(2) of the *EPA*, R.S.O. 1990, c.E.19, as amended, was issued on February 26, 2016. Based on the evidence and submissions before the Tribunal on the Project's impacts, the Tribunal found that engaging in the Project in accordance with the REA will cause serious and irreversible harm to animal life, plant life, or the natural environment under section 145.1(2) of the *EPA,* relating to Blanding's turtle (*Emydoidea blandingii*). It was determined that this proceeding would be further adjourned under section 59(2)1,ii of Ontario Regulation (O. Reg.) 359/09 (herein referred to as the REA Regulation), until the hearing of submissions with respect to an appropriate remedy occurs, pursuant to section 145.2.1(4) of the *EPA*.

Natural Resource Solutions Inc. (NRSI) was retained by wpd Canada to assist with the preparation of additional avoidance and mitigation measures in consultation with other biological experts to remedy potential impacts to Blanding's turtle that may occur during the operation of the Project. In particular, the ERT ruling asserts that serious and

irreversible harm to the local population of Blanding's turtle will be caused by the Project, due to:

- increased nest predation associated with upgrades to municipal roads and the construction of crane pads, turbine bases, and access roads for the Project, and
- increased adult mortality associated with upgrades to municipal roads required for the Project (ERT 2016).

This document has been prepared to identify, present, and discuss the robust avoidance and mitigation measures that are currently proposed within the approved REA documents for the Project to mitigate impacts to Blanding's turtle during the operational phase of the Project. The document also identifies additional avoidance and mitigation measures that are proposed to protect the species during the operational phase of the Project. The results of the proposed monitoring commitments are intended to provide a framework for adjusting the mitigation measures as a result of post-construction monitoring feedback, with the ultimate goal of managing the risks to the local Blanding's turtle population.

As identified the REA Regulation, the proposed layout of Project infrastructure and the associated construction/disturbance areas is collectively referred to as the 'Project Location'. For the purposes of this report, NRSI will refer to the areas within 120m of the Project Location as the 'Project Area'.

2.0 Staff Roles

The following is a brief description of the key Project team members, including additional disciplinary experts. Corporate CVs for each of these key staff have been provided in Appendix I.

NRSI Key Staff Members

Andrew Ryckman, B.Sc.
Senior Terrestrial and Wetland Biologist
Andrew is a Senior Terrestrial and Wetland Biologist and head of the Renewable Energy Branch at NRSI with more than 10 years of experience working on renewable energy projects, including the management of more than 120 proposed and operational wind energy facilities across Canada. He has considerable experience managing Environmental Assessments, Environmental Screening Reports, Natural Heritage Assessments, Species at Risk Reports, and Post-construction Mortality and Behaviour Reports, with specific experience with project management, agency consultation, report generation, data analysis, ERT testimony, and conducting a wide variety of wildlife and vegetation studies for the purpose of assessing risk and establishing appropriate mitigation techniques. Andrew also has direct experience developing and implementing monitoring programs, assessing impacts, and developing site-specific mitigation measures for a variety of provincial and federal Species at Risk (SAR) including, but not limited to, bobolink (*Dolichonyx oryzivorus*), eastern foxsnake (*Pantherophis gloydi*), massasauga rattlesnake (*Sistrurus catenatus catenatus*), Blanding's turtle, milksnake (*Lampropeltis t. triangulum*), little brown myotis (*Myotis lucifugus)*, and northern myotis (*Myotis septentrionalis*).

Andrew has accepted invitations to present at training workshops led by government agencies, including acting as the only presenting consultant at a post-construction monitoring workshop for other consultants that was held in April 2014. He has also accepted invitations to present on the topic of wind energy and wildlife in numerous other settings, including at a Committee on the Status of Species at Risk in Ontario (COSSARO) meeting in May 2014. He is a well-respected leader in the industry and is often consulted by developers, agency staff, and other consultants with specific questions about project methods and approaches. Andrew has been asked to provide formal and informal recommendations on proposed agency guidelines (or revisions) prior to implementation within several jurisdictions across Canada. Andrew has also provided expert testimony at several ERTs, successfully defending the assessed impact of proposed wind energy facilities on wildlife, with specific testimony on bats, birds, reptiles, and various SAR.

Andrew's role in this Project was as Project Manager, coordinating and overseeing all aspects of this report, and providing expertise with respect to

avoidance and mitigation measures and monitoring commitments for Blanding's turtle.

Pamela Hammer, B.Sc.
Terrestrial and Wetland Biologist
Pamela is a Terrestrial and Wetland Biologist with more than 5 years of environmental consulting experience, working on a variety of projects tasks. Pamela has experience mapping vegetation communities, conducting vegetation inventories and wildlife habitat assessments for birds, bats, herpetofauna, and mammals. She has experience developing and implementing monitoring programs for a variety of provincial and federal SAR including, but not limited to, bobolink, eastern meadowlark (*Sturnella magna*), eastern foxsnake, little brown myotis, and northern myotis. Her experience also includes the identification and assessment of potential Blanding's turtle habitats on various project sites. She also has experience conducting tree inventories, risk assessments, implementing integrated pest management practices, and environmental monitoring. Pamela is a Certified Arborist (2011), is qualified as a Tree Risk Assessor (2013), and is certified in the Ecological Land Classification (ELC) System for Southern (2014) and Northeastern Ontario (2011).

Pamela is experienced in project management, including agency consultation, coordination of field surveys, and reporting. She has managed numerous renewable energy projects in Ontario, including pre-construction and post-construction wildlife surveys and bird and bat mortality monitoring, and has knowledge of the provincial requirements and expectations for pre-construction and post-construction monitoring.

Pamela assisted with the preparation of this report, including providing technical input with respect to avoidance and mitigation measures and monitoring commitments for Blanding's turtle.

Tara A. Livingstone, B.Sc.
Terrestrial and Wetland Biologist
Tara is a Terrestrial and Wetland Biologist with more than 6 years of experience working in the environmental field. During her consulting experience, Tara has managed numerous Natural Heritage Assessments and post-construction monitoring programs for wind project developments across Ontario. She has coordinated a range of field surveys, including ELC mapping, bat habitat assessments, breeding bird surveys, and reptile surveys. She is also certified in the ELC system for Southern Ontario (2013).

Tara has managed projects throughout Ontario and New Brunswick, including overseeing and conducting bird and bat monitoring. She is experienced in project management, developing monitoring programs, leading field crews, analyzing data, and assessing potential impacts to wildlife. She also has extensive experience with client and agency liaison through her project management involvement and is well-versed in developing, coordinating, and conducting, pre-construction, construction and post-construction monitoring programs.

As part of her previous work experience with the Ministry of Natural Resources and Forestry (MNRF), Tara worked closely with reptile SAR. She conducted extensive fieldwork for a long-term mark and recapture population study on an endangered turtle population, and she prepared technical manuals and animal handling protocols for the species. Tara also performed SAR reviews for development projects, created and implemented SAR exemption agreements, and issued SAR permits. She reviewed existing provincial recovery plans and status reports, contacted recovery teams and species experts and developed funding proposals for external project funding.

Tara assisted with the preparation of this report, including providing technical input with respect to avoidance and mitigation measures and monitoring commitments for Blanding's turtle.

Disciplinary Experts

Shawn R. Taylor, B.Sc., M.Sc., R.P. Bio
President / Senior Ecologist (Ecosystem Works Inc.)
Shawn is the President, a Senior Ecologist, and Registered Professional Biologist at Ecosystem Works Inc. Shawn has over 27 years of experience, specializing in roadway mitigation, ecosystem restoration, natural channel design, constructed wetlands, sediment and erosion control, and soil bioengineering. He has previously conducted a 4 year Blanding's turtle population, range and distribution study as well as a conservation needs assessment for the City of Ottawa, and has published scientific papers based on this work. Shawn is also a part of the Ontario Road Ecology Group (2010) and has worked in road ecology for over 25 years. Shawn was qualified by the ERT as having expertise in the areas of ecological restoration and construction mitigation. Shawn has also testified before the Tribunal in the Ostrander and Amherst Island wind projects, with regard to road ecology, and the construction and operational mitigation of impacts on Blanding's turtle.

Shawn's role in this Project was to provide technical input with respect to avoidance and mitigation measures and monitoring commitments for Blanding's turtle. He was also responsible for developing specifications for implementing the avoidance and mitigation measures, including construction details and restoration techniques. Shawn consulted on the road design alterations, prepared the detailed specifications and arranged for the proposed custom seed mix, as provided within Appendices II to VI in this report.

3.0 Assessment of Blanding's Turtle Habitat

The Blanding's turtle is listed as Threatened, both nationally and provincially (Government of Canada 2016, MNRF 2015a). This species prefers shallow marshes, bogs, ponds, or swamps with soft bottoms and aquatic vegetation (OMNR 2000). It basks on logs, stumps, and banks in sunny locations in the spring, and overwinters in soft bottoms of waterbodies (Ontario Nature 2015). The Blanding's turtle can travel long distances between summer habitat and nesting sites or overwintering habitat, making the largest overland movement of any Ontario turtle species (Ontario Nature 2015). Blanding's turtles are known to dig nests in a variety of loose substrates, including sand, organic soil, gravel, and cobblestone (Government of Canada 2016). The Ontario range of Blanding's turtle extends south throughout Southern Ontario, particularly south and east of Manitoulin Island (Ontario Nature 2015).

The White Pines Wind Project Area consists of a variety of naturalized habitats, including treed alvar, coniferous forest, cultural woodland, deciduous forest and deciduous swamp, as well as some active agricultural land (hay, soybeans, wheat) (Stantec 2012a). Through the NHA process, a number of significant wetlands, significant woodlands, a significant valleyland, and significant wildlife habitats were identified within the Project Area (Stantec 2012a).

According to the *Species at Risk Report*, some suitable habitat for Blanding's turtle occurs within the Project Area (Stantec 2012b). This includes approximately 1,451ha of potentially suitable nesting and spring foraging habitat; however, suitable nesting habitat for Blanding's turtle is also abundant throughout the local landscape (Stantec 2012b). Of the 1,451ha of potential nesting and foraging habitat available, approximately 15.9ha (1.1%) will be removed temporarily during the construction phase of the Project, and 12.9ha (0.9%) will be permanently removed (Stantec 2012b).

4.0 Existing Avoidance and Mitigation Measures

A number of avoidance and mitigation measures to minimize potential impacts to Blanding's turtle and its habitat during the operational phase of the White Pines Wind Project have already been outlined in documents for the Project, including:

- REA Approval Letter (MOECC 2015),
- NHA and Environmental Impact Study (EIS) Report (Stantec 2012a),
- Species at Risk Report (Stantec 2012b),
- Construction Plan Report (Stantec 2012c), and
- Design and Operations Report, including the Environmental Effects Monitoring Plan (EEMP) (Stantec 2012d).

These existing operational avoidance and mitigation measures have been summarized, as per the documents above, in Table 1 below.

Table 1. Existing Operational Avoidance and Mitigation Measures for Blanding's Turtle at the White Pines Wind Project

Type of Avoidance/ Mitigation Measure	Summary of Existing Operational Avoidance and Mitigation Measures
Timing Restrictions	Avoid all Blanding's turtle overwintering habitat during the overwintering period of October 15 to April 15.[1,3]
	No in-water works will be performed from October 15 to April 15 of any year as turtles could be hibernating.[1,3]
	Where possible, maintenance activities within Blanding's Turtle habitat shall only occur between October 15 and April 30.[1,3]
	If maintenance activities between May 1 and October 14 are unavoidable, every attempt must be made to avoid harassment or injury to Blanding's turtles, including, but not limited to the following further restrictions:[1,3] (i) Immediately prior to maintenance activities, a Qualified Professional shall search all work areas to identify the presence of Blanding's turtles. (ii) Should a Blanding's turtle(s) be observed within the Project Location, all maintenance activity (within 30m of the observation) shall cease immediately until the Blanding's Turtle vacates at least 30m from the maintenance activity of its own accord.
	Maintenance vehicle traffic on access roads shall be restricted to daylight hours from April 15 to October 15.[1,3]
Signage	Vehicle speeds shall be restricted to 15km/h or less; speed limit signage will be installed to communicate the 15km/h limit on all access roads.[1]
	Turtle crossing signs will be installed along access roads that occur in or adjacent to Blanding's turtle habitat (i.e., to turbines T12-T24 and T26-T29).[1,3]
On-site Policies	All refueling activities will occur well away from significant natural features and wildlife habitats. In the event of an accidental spill, the MOECC Spills Action Centre will be contacted and emergency spill procedures will be implemented immediately.[2,4,5]

Type of Avoidance/ Mitigation Measure	Summary of Existing Operational Avoidance and Mitigation Measures
	Any fuel storage and activities with the potential for contamination will occur in properly protected and sealed areas.[2,4,5]
Training and Education	A Qualified Professional will prepare a staff training manual at least 15 business days prior to when a person begins maintenance activities. The manual shall describe, at a minimum, how to identify Blanding's turtles and steps to be taken upon encountering a Blanding's turtle.[1,3]
	All persons entering the site shall be provided training with the manual about Blanding's turtles and the proper steps to take upon encountering a Blanding's turtle. The training shall occur at least 15 business days prior to when a person begins maintenance activities within the Project Location.[1,3]
	If a nesting turtle or the nest site of a Blanding's turtle is encountered within the Project Location, the Qualified Professional shall determine if a maintenance activity may adversely affect the nesting turtle or nest site, and shall provide any direction and/or measures to avoid impact. Wpd Canada will follow any direction and/or measures as recommended by the Qualified Professional.[1]
	All observations of Blanding's turtles on the site shall be recorded and submitted to the District Manager and the Director within 2 business days of the observation, with any observed fatalities reported to the District Manager and the Director immediately.[1,3]
Site Security	The Company shall ensure that gates prohibiting access are installed at the entrance to all access roads that occur in or adjacent to Blanding's turtle habitat.[1]

Source:
1: REA Approval Letter (MOECC 2015)
2: NHA and EIS Report (Stantec 2012a)
3: Species at Risk Report (Stantec 2012b)
4: Construction Plan Report (Stantec 2012c)
5: Design and Operations Report, including the EEMP (Stantec 2012d)

5.0 Additional Avoidance and Mitigation Measures

5.1 Nest Predation

The ERT ruling stated that serious and irreversible harm to the local population of Blanding's turtle will be caused by the White Pines Wind Project due to increased nest predation associated with upgrades to municipal roads and the construction of crane pads, turbine bases, and access roads for the Project (ERT 2016). Specifically, the Tribunal has expressed a concern that the large areas of aggregate may create sub-optimal areas where Blanding's turtle may nest, and furthermore that predation may increase over the 20 year operational period by their known egg-predators (i.e., fox, raccoon, skunk, coyote). Some evidence exists that the egg-predators are enticed to the nesting sites by olfactory odours released as the eggs are deposited. The ERT concern arises as these mammals may alter their behaviours to regularly hunt for newly-laid eggs along the gravel access roads (Riley and Litzgus 2014). Although predation of nests account for up to 80% losses in natural, undisturbed habitats, and the protection of adult females from mortality is a more critical issue (Environment Canada 2016), the Tribunal is concerned that the presence of the access roads may result in additional losses of eggs to the detriment of the already endangered population of Blanding's turtle. The Tribunal was satisfied that the mitigation measures proposed to be implemented during construction are adequate to protect individuals of the local Blanding's turtle population and that no further remedies are necessary during the construction period.

There are a total of 15 access roads proposed, as well as one short laneway into a substation on County Road 10. The perimeter of the substation will be fenced and surrounded with 1m of 4-6" gabion-style, angular stone, in accordance with electrical safety requirements. The 15 access roads will be finished in Granular A aggregate, a material that may be attractive to Blanding's turtle for nesting, and a number of additional avoidance and mitigation measures are proposed herein to inhibit turtle nesting along these access roads, removing or significantly reducing the opportunities and the risk of egg predation by mammals. Furthermore, monitoring to assess the effectiveness of the adopted remedy of managing the risk over the life of the operational phase of the Project will also be implemented. A description of redundant mitigation measures, execution

details of mitigation measures, responsible parties, and compliance strategies are outlined in Tables 2-1 to 2-5 below. Associated preliminary design drawings of the access road construction and restoration phases are shown on Figures 1.1 to 1.5.

General Description of Proposed Project

New access roads, totaling 16.7 linear kilometers, by an average width of 5m are proposed to be constructed to provide permanent access to the base of the 27 approved wind turbines. In addition, crane pads measuring 30m x 45m and 18m diameter turbine bases, adjacent to the access roads will be part of the permanent infrastructure. During construction, temporary road improvements (widening at the intersection between the access road and municipal roads) will be necessary to increase the turning radius for the long trucks carrying the turbine components. Laydown and staging areas will further increase the amount of surface area where aggregates are to be placed. The laydown areas, staging areas, intersection and road improvements will all be temporary, and will not be features remaining during the operational period.

Construction work is governed by REA commitments between May 1 to October 15 to protect Blanding's turtle activity period, except where otherwise noted. For post-construction monitoring purposes (i.e. during the operation of the Project), a broader Blanding's turtle survey period from what is mandated by the REA will be adopted beginning April 1 and will continue until October 15.

Please note that to the extent that more effective methods are found, they will be discussed with MNRF and implemented if acceptable.

Table 2-1. Additional Measures to Avoid and Mitigate Blanding's Turtle Nest Predation along Access Roads at the White Pines Wind Project

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
PRIMARY MITIGATIONS: **2.1 Construction Modifications to Access Roads and Other Surfaces to Prevent Blanding's Turtles from Nesting in these Areas, including Compaction, Buried Shoulders, Large Stone, Geogrid Core, and Vegetation.** **Design of Roads using Compaction to Deter Nesting** Blanding's turtles prefer to nest in loose substrate, including sand, soil, and small, loose gravel free from vegetation or with minimal vegetation cover to provide shade (Government of Canada 2016, ODFW 2015, Toronto Zoo 2016). Given this, the access roads, crane pad, turnaround areas and lay down areas have been redesigned to address these issues by minimizing or eliminating features that encourage turtle nesting from each item's respective design. Given the preference of the turtles to nest in sandy or gravelly soils, the access roads, crane pads, crane laydown areas, and vehicle turnaround areas will be constructed to a 95% Standard Proctor Density (SPD) rate of compaction, rather than a loose substrate. This high level of compaction provides a surficial density between that of asphalt and concrete, yet will act as a solid, physical deterrent to turtles digging and nesting in these areas. **Design of Road Edges using a Buried Shoulder Technique with Re-vegetation to Deter Nesting** While the private access roads will continue to be constructed flush with the ground, the shoulder, or outer edges of these roads, will be replaced with a buried shoulder (see Figure 1.2. for detailed design). The ground above the shoulders will be replaced with vegetation which will become deeply rooted to ensure compactness and discourage further nesting. A geogrid core through the shoulder will trap gabion stone below it, and resist excavation of nest cavities deeper than 100 mm. Solar radiation is a key factor in turtle nesting areas as turtle embryo development is dependent on the amount of sunlight received. As a result, Blanding's turtles avoid shaded areas for nesting, as they will not be exposed	**2.1.1. 95% Compaction** Aggregates will include both Granular A and Granular B. The Granular A surface aggregate will be graded and windrowed down to the Granular B base. The Granular A material will be spread in layers, and when compacted, will not exceed 100mm in depth. Following delivery of the turbine components and once the heavy equipment is no longer required, the compaction of the access roads, crane pads, turbine bases and vehicle turnaround areas will be tested and will be re-compacted throughout. A core of tough geogrid will be placed 100mm below the finished surface to resist excavations by turtles. The aggregate on temporary building areas (i.e. turbine staging areas, laydown areas, disturbed areas outside of the 18m turbine perimeter and temporary road intersection upgrades) will be removed, replaced with topsoil and restored to original conditions immediately following the turbine installations. Access road and perimeter area restoration drawing details are provided in Appendix II. Geotechnical testing will be completed to confirm the compaction rates of the Granular B base and the finished Granular A surface meet 95%SPD. Testing will be completed every 50m along the roadway by a Consulting Geotechnical Engineer, who will be retained by the Approval Holder for this purpose. Detailed specifications on the implementation of this measure are provided in Appendix III.	A Roads Contractor, engaged by the Approval Holder, will be responsible for performing compaction works and construction of the works in accordance with this report and the specifications in Appendix III A Consulting Geotechnical Engineer, engaged by the Approval Holder, will be responsible for ensuring the compaction of the access roads, crane pads, crane laydown areas and vehicle turnarounds areas are performed in accordance with this report and the specifications in Appendix III. The Approval Holder's Site Attendant (see Section 4.1 of Table 4-1 for additional details on Site Attendant) will be responsible for monitoring the ongoing conditions of the compacted areas during the life of the Project, and reporting any signs of degradation.	Following the completion of construction on site, a Consulting Geotechnical Engineer will be contracted to perform compaction testing a minimum of once per year for the first 3 years of operation, during the Spring prior to the Blanding's turtle nesting season. The Approval Holder will continue to test these areas annually until receiving 3 consecutive annual tests confirming the mandated compaction rate, after which, the Approval Holder will test every 3 years in the Spring for the remainder of the life of the Project. Testing will occur on every compacted area, 200m apart, as well as in areas that show signs of wear, degradation, or run-off, if any. In the event that the Approval Holder's Site Attendant reports any visible signs of wear, degradation, or runoff, a Consulting Geotechnical Engineer will be retained to perform compaction testing as soon as reasonably possible. In the event that testing discloses lower than 95% compaction at any point during the life of the Project, the Approval Holder's Road Contractor will perform additional compaction to the Consulting Geotechnical Engineer's satisfaction. Following any compaction works, inspections will return to annual spring testing until receiving 3 consecutive positive tests, before returning to a 3 year schedule. A report will be provided by the Consulting Geotechnical Engineer after every compaction test and will be retained for the operating life of the Project. These reports will be available for review by the MOECC's Project Inspector (Provincial Officer) or MNRF upon request.

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
to enough sunlight to achieve the ground temperature threshold necessary for egg incubation. As such, the vegetation has been selected to encourage thicket formation and shading of the areas adjacent to the road to further diminish the attraction of the roads for use by turtles for nesting. **Design of Electrical Safety Zones with Large Stone** Areas subject to additional restrictions related to the Electrical Safety Authority (ESA) considerations will be referred to as Electrical Safety Zones. Areas within the Electrical Safety Zones include the turbine base, stairs, pad mount transformer, and fenced substation. The 1m electrical insulating layer ring around these features that typically consist of smaller stone aggregate will be replaced with a significantly larger 4-6" stone. Blanding's turtles prefer to nest in loose substrate, including sand, soil, and small, loose gravel free from vegetation with minimal vegetation cover (Government of Canada 2016, ODFW 2015, Toronto Zoo 2016). In addition, guidance for creating suitable turtle nesting habitats specifically indicates that large gravel should not be used (Long Point Basin Land Trust 2011). The use of larger 4-6" stone, instead of small, loose, gravel that is typically used for nesting, is expected to considerably decrease the suitability of these areas for nesting female Blanding's turtle compared to surrounding habitats, if not eliminate nesting within the access roads and shoulders altogether.	**2.1.2 Shoulder-less Access Roads (Buried Shoulders)** As side slopes and shoulders of access roads are more difficult to achieve a 95% compression rate, the access roads will instead be built without these shoulders or slopes. A typical shoulder-less access road cross section concept is shown on Figure 1.2. Detailed specifications for the implementation of this measure are provided in Appendix III. Restoration details are provided in Appendix II, and a proposed custom seed mix for restoration areas is provided in Appendix IV.	A Roads Contractor, engaged by the Approval Holder, will be responsible for construction of the access roads as designed in Figure 1.2 and in accordance with this report and the specifications in Appendix III.	The construction of the shoulder-less roads will be documented with photographs and a topographical survey of the finished works. These records will be retained for the duration of the operation of the Project, and will be available for review by the MOECC's Project Inspector (Provincial Officer) or MNRF upon request.
	2.1.2.1 Vegetation Restoration of Buried Shoulders Tall, well rooted vegetation will be installed along the edges of all access roads to create a thicket to shade the shoulders and prevent digging/nesting by Blanding's turtles. The edges of each access road will be shoulder-less (see Section 2.1.2 of Table 2-1) and composed of buried coarse gabion stone held in place with geogrids, covered with topsoil, and over time, by deeply rooted native vegetation. The root zone is intended to be deep and interwoven with the rock and geogrid, and diversified across several native species. The thick root mass, dense stem count and entwined geogrid will make excavation for a nest very difficult. The selected tenacious seed mix is also intended to provide a shading thicket along the access roads to reduce incubation soil temperatures. Seeded at the start of the construction phase, expected during the fall season, the vegetation will begin the grow-in period throughout the remainder of the construction period. The vegetation should be established by the time of commissioning, deeply rooted within 2-3 years and becoming a dense thicket within 5 years. Although the vegetation will not be deeply rooted by the time of commissioning, the dense band of vegetation will provide some shade over the shoulders, increasing the density over time, providing unfavourable nesting conditions. Under shade, the shoulders will not be exposed to enough sunlight to achieve the necessary ground temperature threshold needed for egg incubation. The plantings will also provide a long-term deterrent to nesting activity as the root zones become more established over time and the amount of shade continues to increase. The access road and perimeter area restoration details are provided in Appendix II, and a proposed custom seed mix for restoration areas are provided in Appendix IV.	The Constructor, as a representative of the Approval Holder, will be responsible for supervision of the Roads Contractor in the construction of the access roads and to ensure compliance with designs in Figure 1.2 and in accordance with this report and the specifications in Appendix III. A Qualified Ecologist will oversee the vegetation monitoring and the re-vegetation activities in accordance with the specifications in this report. Details of vegetation restoration monitoring is provided in Section 2.3 of Table 2-3.	Records of vegetation monitoring will be retained for the operating life of the Project and will be available for review by the MNRF upon request as identified in Section 2.3 of Table 2-3.
	2.1.3. Electrical Safety Zone - 4-6" Stone For areas within an Electrical Safety Zone, including around turbine bases, stairs, substations and pad-mount transformers, a 1m ring of 4-6" gabion-style, angular stone will be placed around these features. The material cannot be mechanically compacted to the same 95% SPD due to the underlying grounding grid and as per the electrical code, but will be tamped as best practical. As Blanding's turtles prefer to nest in loose substrates, including sand, soil, and small, loose gravel, the larger 4-6" stone utilized in the smaller areas of the Electrical Safety Zone will act as an effective nesting deterrent The locations of where this material will be placed are shown on Figure 1.1.	An Electrical Contractor, engaged by the Approval Holder, will be responsible for the installation of the 4-6" stone as shown on Figure 1.1 and in accordance with this report and the specifications in Appendix III	The installation of 4-6" stone as an electrical insulating layer will be documented with photographs and a topographical survey of the finished works. These records will be retained for the duration of the operation of the Project, and will be available for review by the MOECC's Project Inspector (Provincial Officer) or MNRF upon request

Table 2-2. Additional Measures to Avoid and Mitigate Blanding's Turtle Nest Predation along Access Roads at the White Pines Wind Project

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
REDUNDANT MITIGATION: **2.2 Vegetation Restoration Monitoring** Vegetation monitoring of the edges of the access roads in Years 1-3 will indicate early on if changes are necessary to reseed, directly plant trees and shrubs, or change the seed mix to further reduce the probability of nesting. Any changes will be monitored for 2 years following a change and every 5 years thereafter.	As outlined in Section 2.1.2 of Table 2-1, the vegetation will be seeded at the start of the construction phase, and should be established prior to the onset of operations, deeply rooted within 2-3 years and becoming a dense thicket within 5 years, providing unfavourable nesting conditions. However, within first 3 years of principle construction, the vegetation will be monitored to ensure that it remains well established and growing vigorously. Monitoring of the growth and density of vegetation along the edges of the shoulder-less access roads, as measured by the number of stems per square meter, will be conducted once in August or September in Years 1, 2, 3, and 5 after construction at a minimum of 30 locations covering the general geography of the site by a Qualified Ecologist. Two permanently-monumented sites on each access road will be established for this purpose. During the monitoring years, $1m^2$ quadrants of stem density and species diversity will be collected for assessment. Bare patches requiring repairs that are documented through this plot-monitoring, as well as any bare patches noted on the site outside of the monitoring plots, will be immediately noted for correction with additional restoration activities. Within 5 years, the vegetation will be so well established, if not from the seeded species, then from grasses spreading from the existing seed bank, that it is anticipated that chances in the probability of nesting will remain constant throughout the remainder of the operational period. Ultimately, vegetation is likely to completely overgrow the access roads unless purposely maintained, even if made from crushed aggregates, such that the probability of nesting due to vegetation will gradually diminish to zero, which would be of greatest benefit to Blanding's turtle as they will avoid these surfaces for nesting, and therefore minimize the probability of egg-predation risk as a result of the Project.	A Qualified Ecologist will oversee the vegetation monitoring and the re-vegetation activities in accordance with the specifications in this report. The Site Attendant will also be responsible for reviewing vegetation along the full extent of the access roads, not just the bare patches observed within the restrictive monitoring plots. The Site Attendant will conduct this review a minimum of twice weekly by traversing the site on foot, from March to October, or until snow covers the ground, whichever comes first. The Site Attendant will report to the Qualified Ecologist if any bare patches are observed at any time outside of the designated monitoring window.	Records of vegetation monitoring will be retained for the operating life of the Project and will be available for review by the MNRF upon request. If any major changes are to be made to the re-vegetation strategy, the MNRF will be notified. Additionally, the vegetation monitoring data, growth progress and effectiveness will be discussed as a component of the meeting with MNRF where one is requested under Section 2.3.2 of Table 2-3 (Column D) and the Approval Holder will work with MNRF to implement any appropriate additional measures to ensure restoration success.

Table 2-3. Additional Measures to Avoid and Mitigate Blanding's Turtle Nest Predation along Access Roads at the White Pines Wind Project

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
REDUNDANT MITIGATION: **2.3 Turtle Nesting Monitoring** The construction methods have been revised to prevent Blanding's turtles from nesting within the gravel access roads and crane pads by eliminating the use of loose aggregate that is exposed at the surface of these features by compacting access roads and crane pads to a 95% SPD, creating shoulder-less access roads with tall, well rooted vegetation, and using 4-6" gabion-style angular stone in Electrical Safety Zones (refer to Section 2.1 of Table 2-1). The Approval Holder will also engage in specific monitoring of the all compacted areas, along the shoulder-less access roads, and within all the Electrical Safety Zones to ensure that the measures are achieving the desired impact. Although the start of the nesting season is typically late May (MNRF 2015b), nightly monitoring will begin in early spring (i.e. May 1st) as a proactive measure and to better ensure that any nests or nesting activity is observed as early as possible. The nightly monitoring will occur from May 1st to the later of July 15 or 4 weeks from the initial observation of a nest or nesting activity in or on the Project's monitored areas. Monitoring will primarily be accomplished by in-person survey teams as described in Section 2.3.1 of Table 2-3. The surveys will be backed up by the use of strategically placed wildlife cameras. The wildlife cameras will therefore act as a second redundant monitoring measure. If nests or nesting activity occurs within the monitored area, the nest and egg protection procedures will be implemented as described in Section 2.4 of Table 2-4. The records of any Blanding's turtle observations made during the course of the monitoring measures will also be submitted to the Natural Heritage Information Centre (NHIC). Contributing to the scientific knowledge base for this species contributes to the overall benefit of the species.	**2.3.1. Nesting Surveillance by Personnel in the Extended Nesting Season** The Blanding's turtle nesting period is annually and regionally variable, but generally occurs in late May to early July, and lasts about 3 weeks each year, with most activity occurring in one week (MNRF 2015b). Following the recommended monitoring protocol (MNRF 2015b), surveys will consist of nightly (i.e. between 7pm and 10pm) nesting searches commencing on May 1st and will continue for a minimum period of 10 weeks until either July 15th or 4 weeks from the onset of nesting (initial observation on the Project's monitored areas), whichever is greater These surveys will be conducted using a slow moving vehicle, bicycle, golf-cart or on foot. The small Electrical Safety Zones, as well as any areas with low visibility will be searched on foot. All access roads, crane laydown areas, vehicle turn-arounds, turbine bases, pad mount transformers and substations will be surveyed and special attention will be given to areas of expected high turtle activity or in proximity to high quality hibernation, basking, or foraging habitat. A maximum speed limit of 15km/hr will be implemented along access roads. The low speed and perspective gained from a slow moving vehicle or bicycle is expected to readily aid in observations of turtle nest excavations, test excavations, and/or the presence of predated egg shells. The small Electrical Safety Zones as well as any areas with low visibility will be searched on foot. Monitoring records will be maintained and in accordance with the REA. All Blanding's turtle observations will be recorded and submitted to the District Manager (i.e. MNRF) and the Director (i.e. MOECC) within 2 business days of the observation(s), with any observed fatalities reported to the District Manager and Director immediately. These surveys will occur for the first 3 years of the operational phase to monitor the effectiveness of the proposed avoidance and mitigation measures, and then every 5 years until the turbines have been decommissioned.	**2.3.1. Nesting Surveillance by Personnel in the Extended Nesting Season** The Approval Holder will record and report to the MOECC all sightings of Blanding's turtles, per the REA condition L12. Any turtle and/or nesting activity observed by the monitors will also be reported to the Approval Holder, per Section 2.3.3 of Table 2-3. The surveys will be conducted by qualified and SAR-trained personnel under the supervision of the team lead of a Qualified Environmental Vendor. The group will be comprised of a minimum of five (5) individuals (i.e. two (2) teams of two (2) monitors per team and one (1) Senior team lead). The lead will travel the site using a slow vehicle (< 15km/hr). The team members will bike or use golf carts to traverse the site at least twice per evening. The monitors will traverse the areas of the Electrical Safety Zones on foot. Each team member will be equipped with a means to call or radio the team lead when siting a turtle or nesting activity.	As required by the REA condition L12, all Blanding's turtle observations must be reported within 2 business days to the Director (i.e. MOECC) and the District Manager (i.e. MNRF). Any observed fatalities must be reported to the District Manager and Director (MOECC) immediately. All records of Blanding's turtle monitoring, as well as the camera footage, will be retained for the operating life of the Project and will be available for review by the MNRF upon request
	2.3.2. Wildlife Camera Surveillance during the extended Nesting Season Beginning May 1st, a minimum of 15 cameras will be used to support the nightly in-person searches conducted by 3rd party personnel. The specific locations and placement of the cameras will be determined based on site-specific conditions and proximity to nearby habitat. Due to the length of some access roads, cameras will be placed in strategic locations near watercourse crossings or adjacent to wetlands and woodlands, and not adjacent to open fields. The cameras will be tested in each of the monitoring years, a minimum of 1 week prior to the onset of the nightly monitoring. The wildlife cameras will remain in operation for the duration of the in-person surveillance, as specified above, providing a redundant method of observation or as a fail-safe methodology. Camera data will be collected and reviewed daily and inspected bi-weekly to ensure battery capacity during the surveillance period.	**2.3.2. Redundant Wildlife Camera Surveillance during Nesting Season** The camera data will be reviewed daily by a member of the monitoring team (from a Qualified Environmental Vendor). This team will also be responsible for ensuring the ongoing maintenance, battery life and upkeep of the cameras.	As required by REA condition L12, all Blanding's turtle observations must be reported within 2 business days to the Director (i.e. MOECC) and the District Manager (i.e. MNRF). Any observed fatalities must be reported to the District Manager and Director (MOECC) immediately. The results of the monitoring will be provided, in a report prepared by the Qualified Environmental Vendor, to the MNRF that will be submitted by the end of the each monitoring year. A meeting will be requested with the MNRF at the end of each monitoring year if any nesting activity occurred on the Project site, to determine if measures taken to reduce predation and measures taken to protect Blanding's turtles and their eggs are adequate for ensuing years. All records of turtle monitoring as well as the camera footage will be retained for the operating life of the Project and will be available for review by the MNRF upon request.

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
	2.3.2 Reporting Records of all observations of turtles and/or nesting activity will be maintained, mapped, and be available for statistical probability and spatial analysis. The observations will provide feedback on the effectiveness of the compaction of the aggregate surfaces, and the avoidance and mitigation efforts in place to reduce the probability of turtles nesting on the access roads. These records will be provided in a report to MNRF that will be submitted by the end of each monitoring year. ***Overall Benefit: Contribution to Science*** Feedback into the scientific community will be an objective of the monitoring and reporting of the success of the avoidance and mitigation strategies. Per Section 2.3.2 of Table 2-3 (Column D) the records will be submitted to the MNRF for the recorded years. The records of Blanding's turtle observations will also be submitted, for the recorded years, to the Natural Heritage Information Centre (NHIC) to contribute to the scientific knowledge base for this species.	Reports will be completed as set out in Section 2.3.2 of Table 2-3, by a Qualified Environmental Vendor who will also be responsible for submitting the completed reports to the MNRF. A Qualified Environmental Vendor will be responsible for providing the data in a format acceptable to the NHIC.	The results of the monitoring will be provided, in a report prepared by a Qualified Environmental Vendor to MNRF that will be submitted by the end of each monitoring year. A meeting will be requested with the MNRF at the end of each monitoring year if any nesting activity occurred on the Project site, to determine if measures taken to reduce predation and measures taken to protect turtles and their eggs are adequate for ensuing years. All records of Blading's turtle monitoring will be retained for the operating life of the Project and will be available for review by the MNRF upon request.

Table 2-4. Additional Measures to Avoid and Mitigate Blanding's Turtle Nest Predation along Access Roads at the White Pines Wind Project

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
REDUNDANT MITIGATION: **2.4 Nest Protection and Egg Incubation** It is expected that eggs laid directly within the Project access roads and graveled surfaces will be a very rare and infrequent event with the addition of the proposed mitigation measures identified. However, in the unlikely event that nesting activity does occur within these surfaces, the nest location will be recorded. The nest will then be protected by a cage until the Qualified Professional (or a representative from the receiving facility) can excavate the eggs for artificial hatching at a designated wildlife protection and rehabilitation facility. Nests that are protected with cages or incubated have a documented higher hatching success rate than typical in the wild. Many nests in nature face imminent loss due to a number of natural and human-related factors, and mammalian predators take up to 100% of turtle nests in some areas (UTRCA 2008), with nest predation by raccoons, skunks, foxes and coyotes as the most significant cause of nest failure (COSEWIC 2005). Although artificial egg incubation has started relatively recently, it is proving to be highly effective (UTRCA 2008). For example, artificial incubation methods for the spiny softshell turtle (*Apalone spinifera*) have resulted in greater success rates than in-situ nest protection (i.e. nest cages) (UTRCA 2008). In addition, current literature shows that an ideal incubation environment can enhance survivorship and growth rates of turtles (Lawton et al. 2008). By identifying and protecting all of the nests that do occur, the Project will be increasing the overall nest success for the population rather than simply mitigating any potential negative effects.	**Temporary Egg Protection** If nests or nesting activity is observed, a cage will be placed over the nest(s) to protect it from predation until the eggs can be removed for incubation. The cages will be designated using UTM coordinates but will not be marked using flagging tape or other similar material as this may increase the risk of nest predation. **Incubation** The nests will be carefully excavated in consultation with the MNRF and the eggs will be removed and transferred to a designated wildlife protection and rehabilitation facility where they will be hatched under artificial conditions. The hatchlings will then be reared before release back to the site in the spring 2 calendar years from the date the eggs were collected. The young turtles will be released in the nearest suitable wetland that is within 1km of the original nest site. In selecting an incubation facility, the Approval Holder will give preference to any facility capable of also monitoring the young turtles for 2 years after their release in an effort to advance research on population and life cycle of the Blanding's turtle, and provide further contribution to the overall benefit for the species. The UTM co-ordinates of the nest(s) will be documented and the locations of all sites will be posted in the staff office to ensure that Project staff are aware of the location and as a focus point for future monitoring. If only shell fragments are found, the fragments will be counted at each nest and the clutch size recorded to determine the probability of predation and hatchling survival. The UTM co-ordinates of the nest(s) will be documented as "active areas" and the locations of all sites will be posted in the staff office to ensure that Project staff are aware of the location and to watch for additional wildlife activity in this location.	The Qualified Professional (or a representative from the receiving facility) will be responsible for removing the eggs from the site for their incubation and the return to an appropriate location once matured. The Approval Holder will contract with an appropriate receiving facility, which will operate in accordance with MNRF guidelines and will seek MNRF authorization to obtain any necessary Endangered Species Act permits.	The removal and incubation will be conducted in accordance with the terms of any necessary Endangered Species Act permits for the removal, incubation and maturation of the eggs. The results of the monitoring and any egg incubation will be provided in the aforementioned report to MNRF that will be submitted by the end of each monitoring year.

Table 2-5. Additional Measures to Avoid and Mitigate Blanding's Turtle Nest Predation along Access Roads at the White Pines Wind Project

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
ALTERNATIVE MITIGATION: **2.5 Nest and Egg Protection –Cage Protection** Although it is highly unlikely that nesting will occur on the Project site with the mitigation methods committed to in this report, if observed, every effort will be made to incubate the eggs. However, in the event of exceptional circumstances in which there is a period of time in which the eggs cannot be incubated (e.g. loss of vendor, the rehabilitation site is at capacity for that year, etc.) every effort will be made to establish a new incubation facility. In the event that loss of the facility requires immediate remediation (i.e. this occurs during the nesting season), cage protection will be implemented as an alternative mitigation measure. When confirmed Blanding's turtle nests are identified within the Project crane pads, turbine bases, and/or access roads, cages will be placed around the nests and will be monitored to ensure adequate protection.	**2.5.1 Protective Cages**. If observed, the nest location and clutch size will be recorded and protected with a wire cage to protect it from predation and increase the probability of a high hatching rate. The cage design selected will allow for hatchlings to escape on their own accord. Shell fragments will be counted at each predated nest and the clutch size recorded to determine the probability of predation and hatchling survival. Nests will not be marked using flagging tape or other similar material as this may increase the risk of nest predation. However, the UTM co-ordinates of the nest(s) will be documented and the locations of all sites will be posted in the staff office to ensure that Project staff are aware of the location for additional carefulness and to focus monitoring for the specific area. *Following consultation with the MNRF based on the accumulated experience as the monitoring years proceed, more efficient variations in the method of protection may result. The use of protective nest cages may also consider an approach to fully bury the cages to further minimize the potential risk of poaching or predation. **2.5.2 Nest Monitoring** Nest monitoring will be conducted twice per week to monitor the success of the nest and ensure its protection from operational impacts. Surveys will be completed during the turtle nesting/hatching season between June 1 and September 30 or from the placement date of the cage(s) to September 30, whichever is sooner. **2.5.3 Cage Removal for Hatchlings** The cage design selected will allow for hatchlings to escape on their own accord. Any turtle nests protected with a buried cage will be removed prior to the hatching period to allow turtle hatchlings to naturally disperse. The installed nesting cage will be removed in advance of the anticipated hatching of the nest, prior to August 1st.	A Qualified Environmental Vendor will be responsible for placing the cages, recording the data, and monitoring the nests.	The results of the monitoring will be provided in a report to MNRF that will be submitted by the end of each monitoring year.

5.2 Adult Road Mortality

The ERT ruling states that serious and irreversible harm to the local population of Blanding's turtle will be caused by the White Pines Wind Project due to increased adult mortality associated with upgrades to municipal roads required for the Project (ERT 2016). This is primarily a risk of mortality to adult female turtles, as they may cross roads in search of suitable nesting locations. Adult male turtles are much less likely to leave their residence wetlands, tending to follow watercourses and wetlands where they can remain wet. Juveniles of both genders seem equally prone to road mortalities; however, they are seldom seen as road mortalities before becoming sexually mature (i.e. 14 years old). Hatchlings, once they are away from the nests find seclusion under piles of brush where they may live for over a decade, are seldom seen and rarely killed by vehicles. The loss of sexually mature, older adult females is recognized widely as the most serious threat to population stability.

Risk is expressed as a probability of mortality as a result of changing variables. During the Project operational phase, it is anticipated that there will be 2 trips per week between April and October for the first 3 years by biologists conducting the environmental monitoring, and 2 trips per year for regular (i.e. non-critical) turbine maintenance. This is a very small change to the normal traffic frequency, and therefore a small change in the probability of risk due to Project staff traffic, of which most are by trained biologists sensitive to the impacts to SAR. The concern, therefore, lies primarily with the risk due to changes in public traffic patterns, in addition to the minor additional Project staff traffic.

Specifically, the Tribunal has expressed a concern that vehicle volumes and speeds will increase on smoother, wider municipal roads during the operational phase of the Project, resulting in an increased level of road mortality risk to Blanding's turtle due to vehicle collisions (ERT 2016). It is expected that permanently upgraded roads will allow motorists to drive more quickly, and because they are smoother and wider, that the roads will be used more frequently (ERT 2016), resulting in a net increase in the chronic rate of mortality to Blanding's turtle. In particular, "the rough, seasonally closed tertiary roads within the core of turtle territory may experience an increased level of traffic volume and speed" (ERT 2016). Maintaining the existing rates of speed and traffic volume currently experienced on the

secondary and tertiary roads, and thereby the existing probability of mortality risk to adult female Blanding's turtle, is of importance to the Tribunal, scientific community, members of the local public and the wider community as a whole.

A number of additional measures are proposed herein to mitigate the probability of mortality risk for adult Blanding's turtle along the municipal roads within the Project Area during the construction and operational periods. The Project will avoid most construction activities during the nesting period, which will minimize the risk to adult females during construction. Chief among the strategy for the operational period is the complete removal of all temporary municipal road improvements immediately following principle tower erection, when the heavy-haul roads are no longer needed. Where possible, the number of road upgrades will be limited to 6 segments by using the existing paved roads, avoiding some roads (i.e. Mapyl Layn Road, parts of Hilltop Road, and Helmer Road) where there are wetlands nearby, and minimizing the number of roads to be upgraded.

Six road segments in total will be temporarily upgraded, including 3 secondary roads and 3 tertiary roads. There will be 13 intersections upgraded to a 50m turning radius. All municipal road alterations, including intersection improvements, will have the temporary upgrades removed following the turbine erection phase of the Project, or as soon as they are no longer required. The road condition classifications currently present within the Project Area are shown on Figure 2.1. The routing of heavy-haul Project trucks, planned to avoid routes along existing roads through wetlands where Blanding's turtles are more likely to occur, and the 6 segments of municipal roads that will be temporarily improved are shown on Figure 2.2. The segments, length, and type of municipal road upgrades are listed as follows:

- Lighthall Road south of Royal Road: Secondary Gravel –1.90km
- Hill Top Road west of Brewers Road: Secondary Gravel –0.66km
- Whattams Road north of Babylon Road: Secondary Gravel – 0.80km
- Army Reserve Road east of Lighthall Road: Tertiary Gravel–1.46km
- Hill Top Road east of Brewers Road: Tertiary Gravel –1.52km
- Helmer Road west of Babylon Road: Tertiary Gravel – 2.06km

By omission therefore, and as an avoidance measure, Figure 2.2 also indicates which municipal roads will be prohibited for use by Project traffic, and therefore will not be improved, as they intercept waterbodies, wetlands, and woodlands where Blanding's turtle may occur.

Furthermore, monitoring to assess the effectiveness of the adopted remedy of managing the risk of adult mortality over the life of the operational phase of the Project will be implemented. A description of redundant mitigation measures, execution details of mitigation measures, responsible parties, and compliance strategies are outlined in Tables 3-1 to 3-3 below.

General Description of Proposed Project

A total of 6 segments of municipal roads within the Project Area will be upgraded and/or widened as part of the construction phase in order to transport materials and wind turbine components for the Project. Currently, the secondary all-weather gravel roads and tertiary seasonal gravel roads are graded by the Municipality in early spring (late April). Generally, this is completed once per year on the tertiary roads, and may be completed several times per year on the secondary roads, as they receive more traffic. As needed, the tertiary roads are topped with angular, 2" coarse granular aggregate and the secondary roads are topped with finer Granular A aggregate. The 3 road condition classifications present within the Project Area are shown on Figure 2.1. The routing of heavy-haul Project trucks and the 6 segments of municipal roads that will be temporarily improved are shown on Figure 2.2.

Construction work is governed by REA commitments between May 1 to October 15 to protect Blanding's turtle activity period, except where otherwise noted. For post-construction monitoring purposes (i.e. during the operation of the Project), a broader Blanding's turtle survey period from what is mandated by the REA will be adopted beginning April 1 and will continue until October 15.

Please note that to the extent that more effective methods are found, they will be discussed with MNRF and implemented if acceptable.

Table 3-1. Additional Measures to Avoid and Mitigate Adult Blanding's Turtle Mortality due to Municipal Road Improvements at the White Pines Wind Project

Mitigation measures to address Impact 2 (Increased adult mortality associated with upgrades to municipal roads required for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
PRIMARY MITIGATION: **3.1 Restoration of Municipal Road Segments to Pre-construction Conditions, and Re-seeding of Shoulder** The construction method has been revised to prevent increased adult Blanding's turtle mortality by restoring the updated segments of municipal roads to their original standard that the Municipality achieves during current annual grading activities within 15 days, immediately following turbine erection, manufacturer's inspection, and signoff. The temporary widening of segments of roads will also be restored to the same standard that the Municipality achieves during annual grading activities through the removal of temporarily added gravel and by re-establishing the vegetation community along the roadside. This will be verified by a pre- and post-construction geodetic survey and GPS-linked video recording of the topography and vegetation abundance. After the segments of road are returned to their original state, they will be allowed to degrade throughout the year, as is the case currently, such that over the course of one calendar year, they will return to their pre-construction conditions as to avoid enabling increased traffic and speed along such roads as a result of the operations phase of the Project. By implementing these avoidance and mitigation measures, it is expected that existing rates of speed and traffic volume currently experienced on the secondary and tertiary roads, prior to the Project, will be maintained throughout the operational phase of the Project. As a result, there will be no impact on the mortality rate attributable to the Project due to the restoration of previous conditions.	**3.1.1. Pre-construction Video and Topographical Survey** A chainage-annotated video survey will be conducted in order to capture baseline data prior to the start of construction along municipal roads. This video survey will be combined with the detailed topographical surveys of pre-existing conditions that are currently being completed.	The video survey of municipal roads to be improved will be conducted by staff of the Approval Holder. The Approval Holder will contract a licensed survey company to carry out the topographical surveys.	The Road Use Agreement with the Municipality requires the results of the surveys be made available to the Municipality to confirm completion of the works as agreed upon. These results will be available for review by the MOECC's Project Inspector (Provincial Officer) or MNRF staff upon request.
	3.1.2. Temporary Road Segment Upgrades Along secondary and tertiary road segments, growing vegetation will be cut flush to the ground without disturbing any root zones outward from the road edge by 2m. The existing road base will be scarified to a depth of 200mm, and compacted to 90% SPD. For tertiary roads, non-woven geotextile fabric will be placed over the prepared area of subgrade and shoulders to at least 1500mm outward from the edge of the existing roadway, and draped directly over trimmed vegetation and undisturbed topsoil. On the secondary roads, a 600mm wide shoulder will be excavated and backfilled with Granular B to create a wider base. For both secondary and tertiary road segments, the granular material will be placed, proof rolled, and compacted to 95% SPD in lifts of not more than 100mm between compaction runs to meet finished grades and cross fall. Geotechnical testing will be conducted to verify compaction rates are satisfactory before moving on. During final compaction of the road top surfaces, the side slopes and shoulder edge will be compacted to achieve consolidation of the granular material. These layers will be brought to design levels and profiles by not less than 3 passes of a suitable plate compactor. Detailed specifications for how the proposed avoidance and mitigation measures on the road upgrades will be implemented are provided in Appendices V and VI. The 3 road condition classifications present within the Project Area are shown on Figure 2.1. The routing of heavy-haul Project trucks and the 6 segments of municipal roads that will be temporarily improved are shown on Figure 2.2. By omission therefore, Figure 2.2 also indicates which municipal roads will be avoided by Project traffic, and therefore will not be improved. A typical municipal secondary road temporary upgrade cross section concept is	A Roads Contractor, engaged by the Approval Holder, will be responsible for performing construction of the works in accordance with this report and the specifications in Appendix V and VI	Design specifications for Temporary Road Segment upgrades are described in the Roads Use Agreement (RUA) passed on April 26, 2016 by Prince Edward County and must be constructed in accordance with that design.

Mitigation measures to address Impact 2 (Increased adult mortality associated with upgrades to municipal roads required for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
	shown on Figure 2.3. A typical municipal tertiary road widening cross section concept is shown on Figure 2.4 The 13 intersection improvements used during component deliveries will require different solutions depending on whether the intersecting roads are paved or gravel, and the turning radius required at each. Most will be improved to a maximum turning radius of 50m. These have been previously described in the Roads Use Agreement (RUA) passed on April 26, 2016 by Prince Edward County and will be constructed in accordance with that design.		

Mitigation measures to address Impact 2 (Increased adult mortality associated with upgrades to municipal roads required for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
	3.1.3. Road Restoration The temporary road segment improvements discussed above will be removed within 15 business days of the turbine erection, inspection and manufacturer's sign-off. Intersection improvements will be restored in a progressive manner, within 15 business days from when they are no longer required. This will be completed by scarification to the original grade, removing the aggregate, and transporting the Granular A and Granular B material for disposal / re-use. For tertiary roads, the geotextile fabric and geogrids will be removed, and undisturbed soils will be exposed, allowing the uncovered root zone and seed bank to re-establish the native vegetation. For all road sections, the restored roadway will be regraded level and verified that it complies with pre-existing video and topographical survey and video record (refer to Section 3.1.1 in Table 3-1). Where topsoil has been significantly disturbed, topsoil will be replaced, areas will be seeded with native species, and will be packed to consolidate the seed into the soil. Restoration details are provided in Appendices V and VI, and a proposed custom seed mix is provided in Appendix IV. The custom seed mix has been developed based on the botanical inventory from the Project Area by Stantec, selecting for suitable native species that will create shade along the adjacent road edge. **Timing** Municipal road segments will be returned to their original state during the Blanding's turtle overwintering period of October 15 to April 30. If restoration activities cannot be completed by April 30, condition L1 (3) of the REA will be enforced. This condition indicates that every attempt must be made to avoid harassment or injury to Blanding's turtles, including, but not limited to the following further restrictions: (i) Immediately prior to construction and maintenance activities, a Qualified Professional shall search all work areas to identify the presence of Blanding's turtles. (ii) Should a Blanding's turtle(s) be observed within the Project Location, all construction or maintenance activity (within 30m of the observation) shall cease immediately until the Blanding's turtle vacates at least 30m from the construction area or maintenance activity of its own accord. After the segments of road are returned to their original state, they will be allowed to degrade throughout the year, as is the case currently, such that over the course of one calendar year, they will return to their pre-construction conditions	A Roads Contractor, engaged by the Approval Holder, will be responsible for performing restoration of the works in accordance with this report and the specifications in Appendix V and VI .	The Road Use Agreement with the Municipality requires the results of the post-construction video surveys (as detailed in Section 3.3 of Table 3-3) be made available to the Municipality to confirm restoration of the works as agreed. These results of the video and topographical surveys (see Section 3.3 of Table 3-3) will be available for review by the MOECC's Project Inspector (Provincial Officer) or MNRF staff upon request. Confirmation that the road segments have been restored to the pre-construction municipal standard, and maintained as such, will be included in the report to MNRF that will be submitted by the end of each monitoring year.

Table 3-2. Additional Measures to Avoid and Mitigate Adult Blanding's Turtle Mortality due to Municipal Road Improvements at the White Pines Wind Project

Mitigation measures to address Impact 2 (Increased adult mortality associated with upgrades to municipal roads required for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
REDUNDANT MITIGATION: **3.2 Vegetation Inspection of Temporary (Municipal) Road Segment Upgrades** As the original root zone is being protected by the construction methodology, (described in Section 3.1.2 of Table 3-1), the improvements are being removed progressively and the natural seed bank is expected to generate additional plant species in disturbed soils, it is expected that the municipal roadsides will recover quickly and require minimal long term maintenance. Normally, encroaching vegetation is cleared back to the edge of the road right-of-way during regular maintenance by the Municipality, to return the roadsides to the Municipal Standard, the same as Approval Holder is implementing.	Prior to demobilization by the contractor, a post-restoration survey of the vegetation along the improved municipal roads will be completed by the Environmental Monitor, in concert with the video recording of the road topography. Areas that remain bare, or have recovered poorly will be targeted for hand work and reseeding as part of the Contractor's responsibility. The Approval Holder will retain the responsibility for ensuring the roads have been properly restored for a period of one year following the completion of construction under the terms of the Road Use Agreement with the Municipality. Prior to the completion of that one year period, in the spring of the following year, a further survey of the vegetation along the improved municipal roads will be completed by the Environmental Monitor. Areas that remain bare, or have recovered poorly will be targeted for hand work and reseeding as part of the Contractor's responsibility. Follow-up revegetation work, if any, will be coordinated with the Municipality for implementation as necessary.	**Vegetation inspection:** The Environmental Monitor will work closely with the Contract Administrator to ensure that the vegetation is restored within the designated timeframe following the manufacturer's inspection and signoff, and within the allowable timing restrictions.	The video recordings, survey records and documentation of re-seeding will all be made available to the MNRF for review upon request.

Table 3-3. Additional Measures to Avoid and Mitigate Adult Blanding's Turtle Mortality due to Municipal Road Improvements at the White Pines Wind Project

Mitigation measures to address Impact 2 (Increased adult mortality associated with upgrades to municipal roads required for the Project)			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
REDUNDANT MITIGATION: **3.3 Post-construction Video and Topographical Surveys** As mentioned above, video and topographical surveys will be conducted prior to construction to document the existing conditions of the municipal road segments within the Project Area. Once construction is complete and the road segments have been restored back to their original condition, the video and topographical surveys will be repeated. These will be compared to the pre-construction surveys, to ensure that the municipal road segments have been restored to the condition the Municipality achieves during their annual grading activities.	A chainage-annotated video survey will be conducted after completion of road restoration. This video survey will be combined with a detailed topographical survey to be completed post-restoration as well. Pre- and post-restoration videos will be compared by chainage length to ensure the municipal roads have been restored to a similar condition as what the Municipality achieves during annual grading activities. An Independent Engineer will review the restoration and pre-construction surveys and prepare a report to confirm that the conditions have been restored to pre-construction annual maintenance levels. In the event that the Independent Engineer's report discloses any discrepancies between present condition and the annual maintenance conditions, repairs will be made to surfaces altered through Project activities to return the roads to the same condition that the Municipality achieves during annual grading activities. The Independent Engineer will be directed to complete a new report following the completion of any repair works.	The video survey of municipal roads to be improved will be conducted by staff of the Approval Holder. The Approval Holder will contract a licensed survey company to carry out the topographical surveys. An Independent Engineer, engaged by the Approval Holder, will be responsible for ensuring the restoration of the access roads to municipal maintenance standards as documented in Section 3.1 in Table 3-1.	The Road Use Agreement with the Municipality requires the results of the post-construction surveys be made available to the Municipality to confirm restoration of the works as agreed upon. These results will be available for review by the MOECC's Project Inspector (Provincial Officer) or MNRF staff upon request. A report will be provided by the Independent Engineer after the completion of all works on municipal roads and any repairs, if applicable. This will be retained for the operating life of the Project and will be available for review by the MOECC's Project Inspector (Provincial Officer) or MNRF upon request.

Table 4-1. Additional Measures to Avoid and Mitigate Blanding's Turtle Nest Predation along Access Roads and to Avoid and Mitigate Adult Blanding's Turtle Mortality due to Municipal Road Improvements at the White Pines Wind Project

Mitigation measures to address Impact 1 (Increased nest predation associated with the construction of crane pads, turbine bases, and access roads for the Project) *Mitigation measures to address Impact 2 (Increased adult mortality associated with upgrades to municipal roads required for the Project)*			
A. Description of Mitigation Method	**B. Execution Details of Mitigation Measure**	**C. Responsible Parties**	**D. Compliance**
REDUNDANT MITIGATION: **4.1 Site Attendant** As an additional layer of redundancy and to ensure all mitigation and monitoring (in Tables 2-1 to 2-5 and Tables 3-1 to 3-3) is being completed and logged properly, at least one full time Site Attendant position will be created by the Approval Holder. This person will traverse all parts of the Project site at least twice weekly and will inspect all access roads, crane laydown areas, vehicle turn-arounds, and electrical safety zones to ensure the integrity of the proposed mitigations including, but not limited to monitoring the integrity of the gates, signage, vegetation, and compaction. The Site Attendant will retain daily logs. The Site Attendant will be specifically trained on the mitigation measures, their need and rationale and will be encouraged to take an active role in the mitigation program/strategies. This person will have the authority to request the services of the respective professional for rectification, restoration, adjustments or improvements as needed to maintain the integrity of the mitigation solutions.	From April to October, when conducting the inspections of access roads, crane laydown areas, vehicle turn-arounds, and Electrical Safety Zones, the Site Attendant will be on foot at least twice weekly to more closely inspect the mitigation measures, including, but not limited to any breaches of vegetation, any degradation of compaction, any damage to gates or signage, and any visible signs of trespassing. Daily logs will be retained and reviewed by the Approval Holder on a quarterly basis.	The Approval Holder will be responsible for hiring of the full time individuals, and ensuring that any vacations/holidays, leaves or absences are covered so as to always maintain a minimum one full time position solely dedicated to this Project. The Approval Holder will also be responsible for the training or education of the staff members on the measures required to be monitored, and the quarterly review of the daily logs. A job description has been provided in Appendix VII.	The daily logs will be retained for the operating life of the Project and will be available to the MOECC's Project Inspector (Provincial Officer) or MNRF upon request.

6.0 Summary

NRSI was retained by wpd Canada to assist with the preparation of additional avoidance and mitigation measures to prevent or significantly reduce the risk of egg predation and road mortalities accruing to Blanding's turtle that may occur during the operation of the Project. In particular, the ERT ruling asserts that serious and irreversible harm to the local population of Blanding's turtle will be caused by the Project, due to:

- increased nest predation associated with upgrades to municipal roads and the construction of crane pads, turbine bases, and access roads for the Project, and
- increased adult mortality associated with upgrades to municipal roads required for the Project (ERT 2016).

This document first identifies the avoidance and mitigation measures already required within the approved REA and then addresses additional mitigation measures set out to further protect Blanding's turtles from predation and road mortality during the operational phase of the Project

The additional measures, as outlined in Tables 2 and 3, are intended to provide a redundant series of measures (i.e. a fail-safe methodology). The plan recognizes that data collected as part of these measures has the potential to increase critical knowledge in relation to Blanding's turtles and wind development. As the science develops in relation to this species and more is known about the local Blanding's turtle population distribution, there is the potential for improved methods and/or strategies for species protection. At the very least, the monitoring commitments will ensure that the measures proposed are effective and can be modified if adjustments, such as re-compaction or re-seeding, are necessary.

The ultimate goal of the commitments in Tables 2 and 3, in conjunction with the REA commitments, is to reduce or even remove the probability of negative risks (predation, mortality) and increasing the probability of positive risks (increased egg survival, avoid nesting on roadways) that support an increase in the population. These are long term goals, commensurate with the longevity of the Project that match with the long life span of Blanding's turtle. By embracing long term monitoring commitments and committing to make meaningful changes as result of monitoring, wpd Canada is demonstrating their

commitment to providing long term care and sustainable protection to an imperiled species.

Given the details of the proposed development and the redundant avoidance and mitigation measures, as well as the monitoring commitments, presented above, NRSI expects that the potential for impact, if any, to Blanding's turtle would be very minimal and temporary in nature. It is understood that a letter of credit will be established to adequately fund the avoidance and mitigation measures described above. Given the funding assurance, as well as realistic mitigation measures, redundancy of approach, long term monitoring to ensure effectiveness and additional compliance measures, NRSI is confident that with this approach, it is highly unlikely that the local population of Blanding's turtle will experience serious and irreversible harm during the operational phase of the Project. In contrast, it is our opinion that the Project has a realistic potential to increase the population through the reduction of predation, which would otherwise occur in the area in the absence of the Project and without these redundant measures. Furthermore, if any nests are found, incubation of eggs and re-introduction of juvenile Blanding's turtles back into the Project Area has additional merit for ensuring the survival of the species.

7.0 References

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2005. COSEWIC assessment and update status report on the Blanding's Turtle *Emydoidea Blandingii* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. viii + 40 pp. Available at: www.sararegistry.gc.ca/status/status_e.cfm

Environment Canada. 2016. Recovery Strategy for the Blanding's Turtle (*Emydoidea blandingii*), Great Lakes/St. Lawrence population in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. Vii+ 49 pp

Environmental Review Tribunal (ERT). 2016. White Pines Wind Project ERT Decision Letter. February 2016.

Government of Canada. 2016. Species at Risk Public Registry - Blanding's Turtle Great Lakes/St. Lawrence Population. Updated March 2016. Available at: http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=846

Lawton, M., M. Brobbel, T.B. Herman. 2008. Using Incubation and Headstarting as Conservation Tools for Nova Scotia's Endangered Blanding's Turtle (*Emydoidea blandingii*). Powerpoint Presentation prepared by Michael Lawton.

Long Point Basin Land Trust. 2011. Creating and Improving Turtle Habitat. Available at: http://www.longpointlandtrust.ca/reptile-factsheets-download/

Ministry of Natural Resources and Forestry (MNRF). 2015a. Species at Risk in Ontario (SARO) List. Last updated October 1, 2015. Available at: http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276722.html

Ministry of Natural Resources and Forestry (MNRF). 2015b. Survey Protocol for Blanding's Turtle (*Emydoidea blandingii*) in Ontario. Species Conservation Policy Branch. Peterborough, Ontario. ii + 16 pp.

Ministry of the Environment and Climate Change (MOECC). 2015. White Pines Wind Project RenewableEnergy Approval. July 2015.

Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide: Appendix G. Available at:http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@fw/documents/document/mnr_e001287.pdf

Ontario Nature. 2015. Blanding's Turtle (*Emydoidea blandingii*). Available at: http://www.ontarionature.org/protect/species/reptiles_and_amphibians/blandings_turtle.php

Oregon Department of Fish and Wildlife (ODFW). 2015. Guidance for Conserving Oregon's Native Turtles including Best Management Practices. Oregon Department of Fish and Wildlife. 99pp.

Riley, Julia L., and Jacqueline D. Litzgus. 2014. Cues Used by Predators to Detect Freshwater Turtle Nests may persist late into Incubation. Canadian Field-Naturalist 128(2): 179–188

Stantec Consulting Ltd. 2012a. White Pines Wind Project Natural Heritage Assessment and Environmental Impact Study. May 2012.

Stantec Consulting Ltd. 2012b. White Pines Wind Project Species at Risk Report. August 2012.

Stantec Consulting Ltd. 2012c. White Pines Wind Project Construction Plan Report. September 2012.

Stantec Consulting Ltd. 2012d. White Pines Wind Project Design and Operations Report. September 2012.

Toronto Zoo. 2016. Turtle Nesting Areas: Constructing Artificial Turtle Nests. Available at: http://www.torontozoo.com/adoptapond/turtlenests.asp?opx=2

Upper Thames River Conservation Authority (UTRCA). 2008. Effectiveness of Nest Predation and Artificial Egg Incubation for Turtles in Ontario. Powerpoint Presentation prepared by Scott D. Gillingwater, Species At Risk Biologist.

8.0 Glossary

Approval Holder: wpd White Pines Wind Incorporated.

Constructor: the person or persons who undertake the responsibility for oversight of all of the works in connection with the Project, including those completed by contractors and subcontractors, on behalf of the Approval Holder. The Constructor has the obligation to ensure that all works are completed as set out within contract commitments and design specifications.

Consulting Geotechnical Engineer: A person currently active in the field of geotechnical engineering, who has the formal education, training, and experience necessary to assess soil conditions and compaction for the site facilities.

Contract Administrator: The representative of wpd White Pines Wind Incorporated who will be responsible for administrating the construction and restoration contracts of the works in connection with the REA.

Contractor: The representative of wpd White Pines Wind Incorporated who will be responsible for administrating the construction and restoration contracts of the works in connection with the REA.

Electrical Contractor: A contractor that performs specialized construction work related to the design, installation, and maintenance of electrical systems, who is responsible for Project safety and all work completed by his/her forces as well as subcontractors, suppliers and sub trades.

Environmental Monitoring: Surveys, inventories, studies and observations and reporting made on behalf of the Approval Holder during the operations phase of the Project.

Independent Engineer: An engineer who is not representing the Approval Holder and was not involved in the design stage of the Project.

Personnel: A body of persons contracted or employed by wpd White Pines Wind Incorporated or wpd Wind Manager.

Project Area: All areas within 120m of the Project Location.

Project Location: The area that includes the footprint of the facility components, plus any temporary work and storage locations.

Qualified Ecologist: An individual who has the formal education, training, and experience necessary to perform vegetation remediation and monitoring.

Qualified Environmental Vendor: A reputable environmental company that has knowledge and experience related to Species at Risk (SAR) and/or SAR habitat replacement.

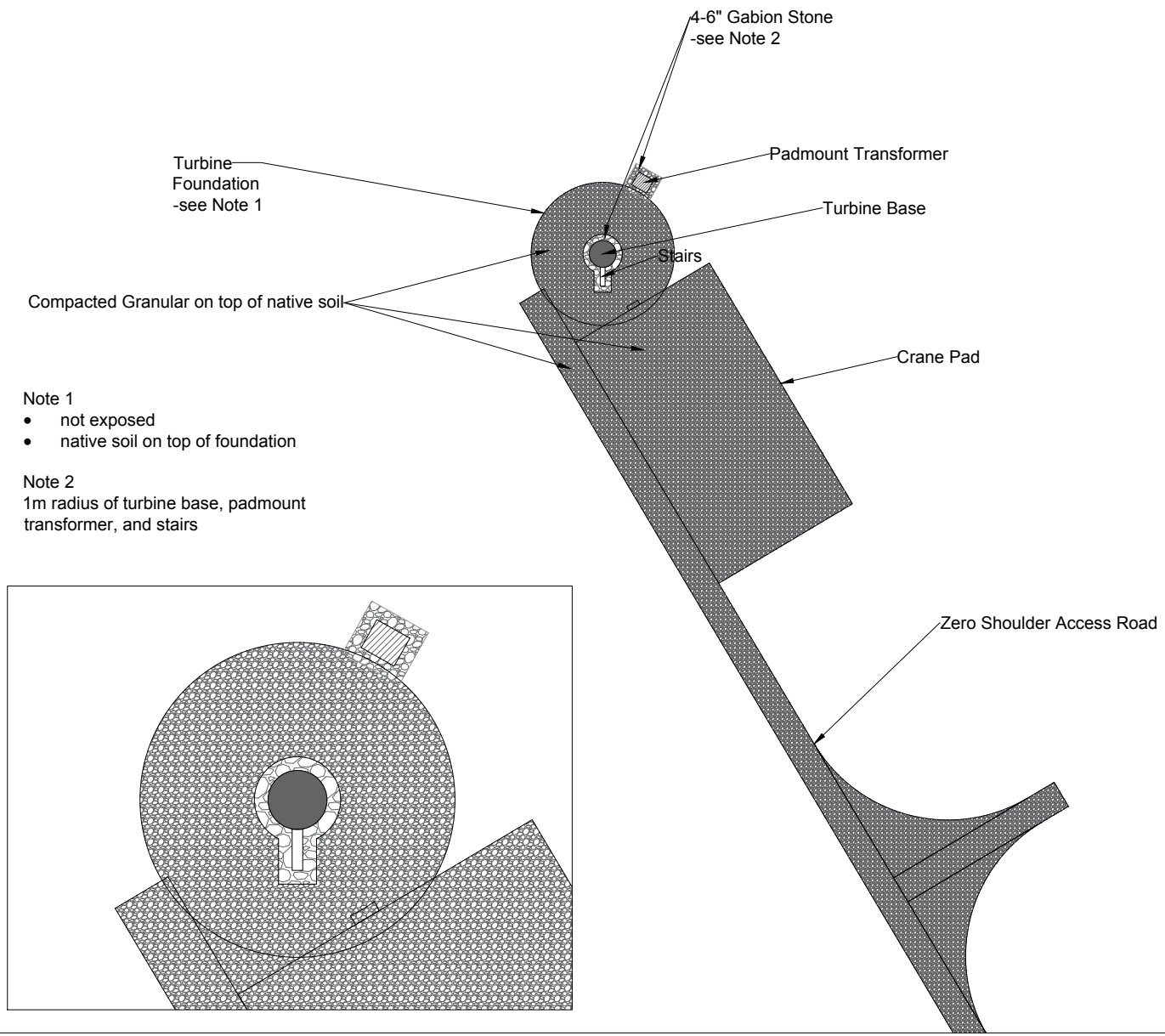
Qualified Professional: With respect to Blanding's turtles, a person with particular expertise who is trained or qualified.

Roads Contractor: A contractor that performs specialized construction work related to building roads, grading roads, and maintaining roads, who is responsible for Project safety and all work completed by his/her forces as well as subcontractors, suppliers and sub trades.

Site: A generic term, in this case, equivalent to the Project Area.

Site Attendant: An individual or individuals responsible for monitoring the Project Area in relation to these mitigation methods to ensure the integrity of the proposed mitigation including, but not limited to monitoring the integrity of the gates, signage, vegetation control, nesting cages and road compaction.

Figures



Note 1
- not exposed
- native soil on top of foundation

Note 2
1m radius of turbine base, padmount transformer, and stairs

Revision	Modifications	Date	Name
9			
8			
7			
6			
5			
4			
3			
2			
1			

WHITE PINES WIND PROJECT

Concept:

Typical Turbine Gravel Distribution

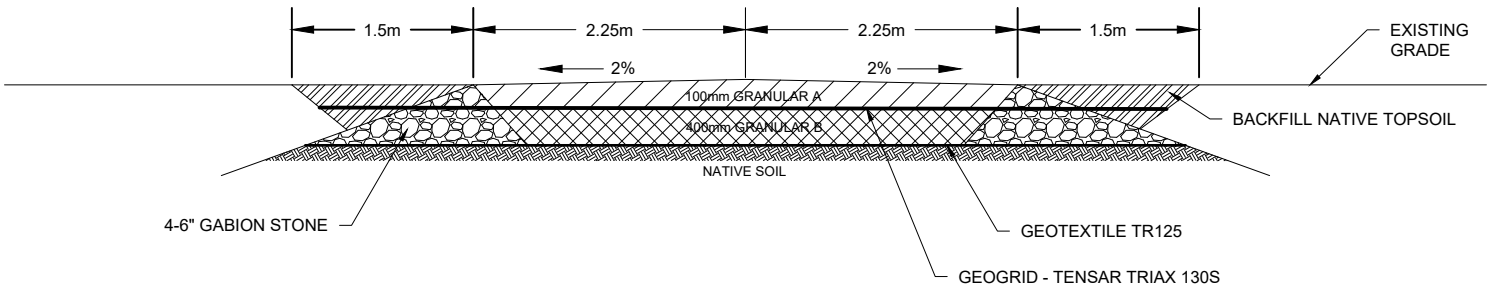
	Date	Name	Drawing Number:
drawn by:	07.13.2016	AlTa	WPWF_TYP
verified by:	07.13.2016	KeTo	Substitute for:
issued by:			

Plan development:
wpd Canada Corp.
2233 Argentia Road, Suite 102
Mississauga, Ontario
L5N 2X7
(p) 905-813-8400
(toll free) **1-888-712-2401**
(f) 905-813-7487
http://www.wpd-canada.ca

Signature:

Fig. 1.1

Scale:	Format:	Content of the table:
N.T.S.	**ANSI A**	



NOTE 1: COMPACTED IN 100mm LIFTS TO 95% SPD

Revision	Modifications	Date	Name
9			
8			
7			
6			
5			
4			
3			
2			
1			

WHITE PINES WIND PROJECT

Concept:

Typical access road cross section (shoulderless)

	Date	Name	Drawing Number:
drawn by:	04.21.2016	AlTa	WPWF_TYP_E001
verified by:	04.21.2016	KeTo	Substitute for:
issued by:			

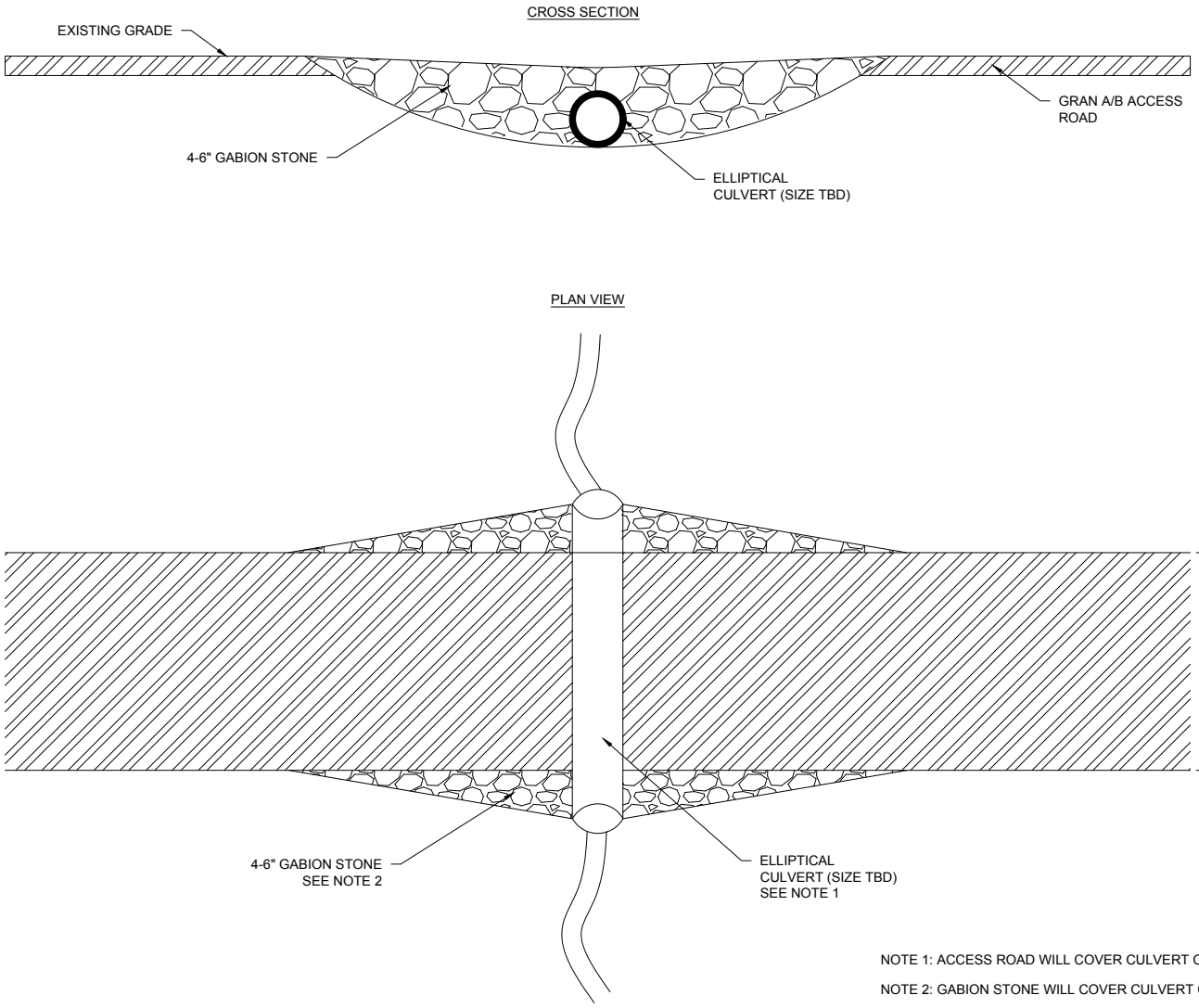
Plan development:

wpd Canada Corp.
2233 Argentia Road, Suite 102
Mississauga, Ontario
L5N 2X7
(p) 905-813-8400
(toll free) **1-888-712-2401**
(f) 905-813-7487
http://www.wpd-canada.ca

Signature:

Fig. 1.2

Scale:	Format:	Content of the table:
N.T.S.	**ANSI A**	**cross section**



Revision	Modifications	Date	Name
9			
8			
7			
6			
5			
4			
3			
2			
1			

WHITE PINES WIND PROJECT

Concept:

Typical access road cross section with culvert

	Date	Name	Drawing Number:
drawn by:	04.21.2016	AlTa	WPWF_TYP_E001
verified by:	04.21.2016	KeTo	Substitute for:
issued by:			

Plan development:

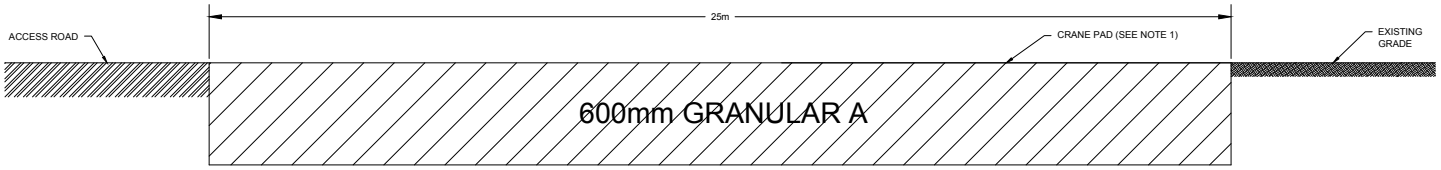
wpd Canada Corp.
2233 Argentia Road, Suite 102
Mississauga, Ontario
L5N 2X7
(p) 905-813-8400
(toll free) **1-888-712-2401**
(f) 905-813-7487
http://www.wpd-canada.ca

Signature:

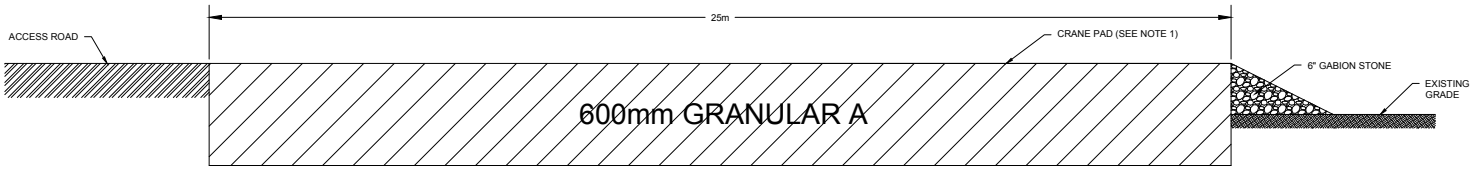
Fig. 1.3

Scale:	Format:	Content of the table:
N.T.S.	**ANSI A**	**cross section**

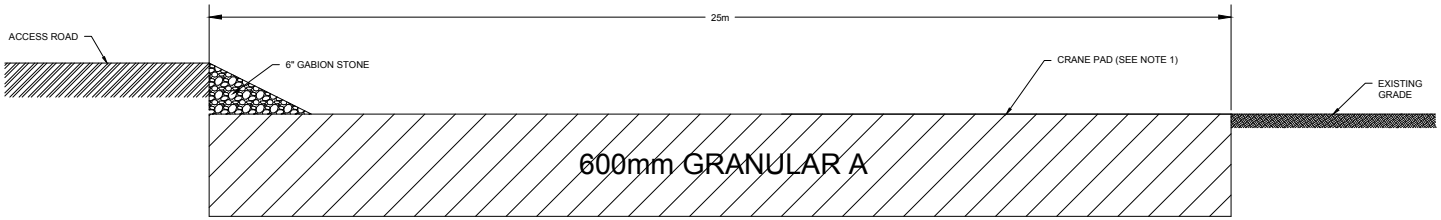
SCENARIO 1



SCENARIO 2A



SCENARIO 2B



NOTE 1: COMPACTED IN 100mm LIFTS TO 95% SPD

Revision	Modifications	Date	Name
9			
8			
7			
6			
5			
4			
3			
2			
1			

WHITE PINES WIND PROJECT

Concept:

Typical crane pad cross section

	Date	Name	Drawing Number:
drawn by:	04.212016	AlTa	WPWF_TYP_E001
verified by:	04.21.2016	KeTo	Substitute for:
issued by:			

Plan development:

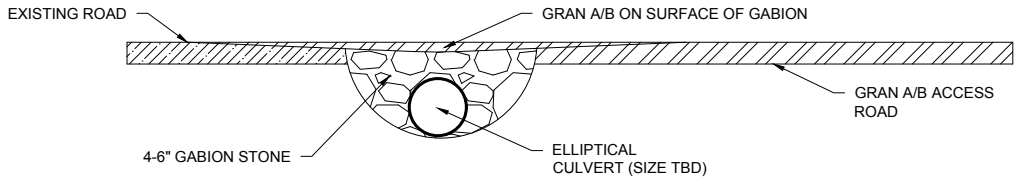
wpd Canada Corp.
2233 Argentia Road, Suite 102
Mississauga, Ontario
L5N 2X7
(p) 905-813-8400
***(toll free)* 1-888-712-2401**
(f) 905-813-7487
http://www.wpd-canada.ca

Signature:

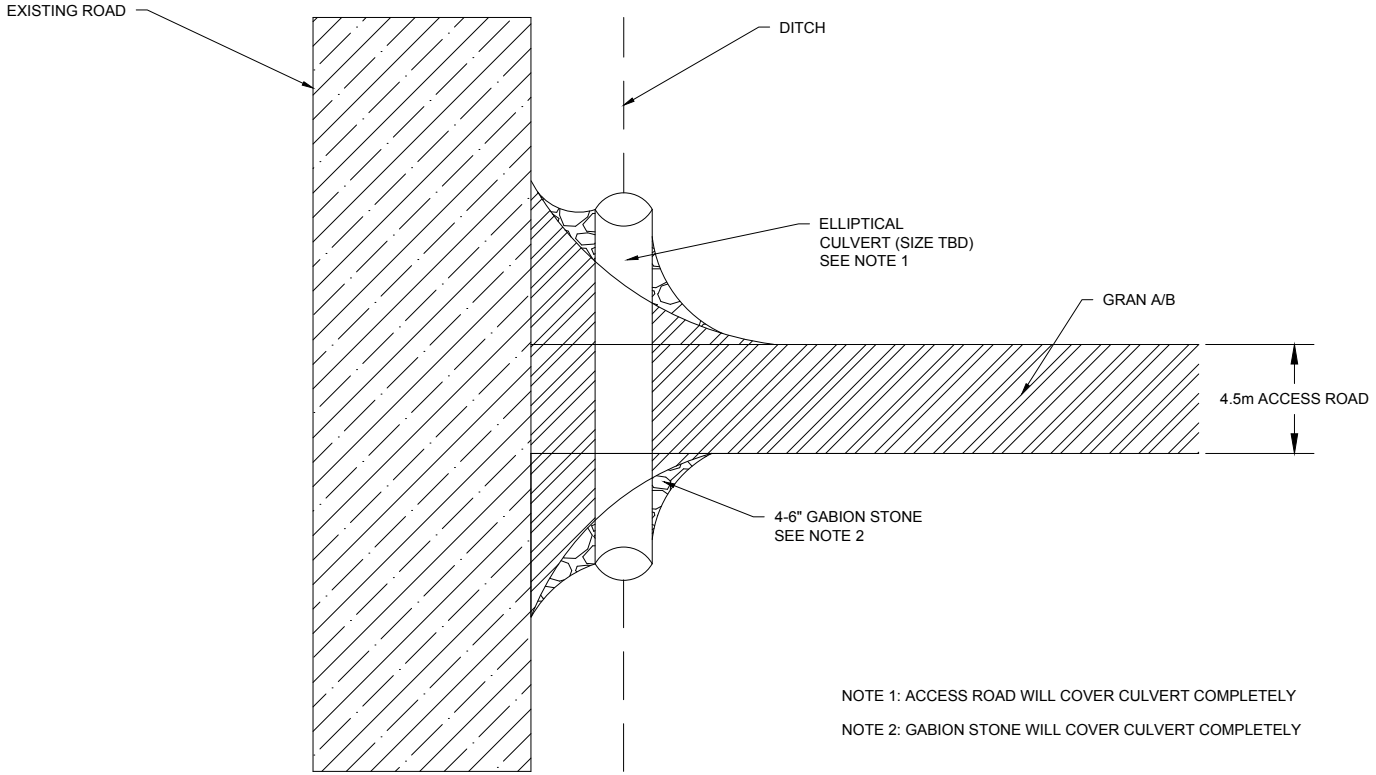
Fig. 1.4

Scale:	Format:	Content of the table:
N.T.S.	**ANSI A**	**cross section**

CROSS SECTION



PLAN VIEW



NOTE 1: ACCESS ROAD WILL COVER CULVERT COMPLETELY

NOTE 2: GABION STONE WILL COVER CULVERT COMPLETELY

Revision	Modifications	Date	Name
9			
8			
7			
6			
5			
4			
3			
2			
1			

WHITE PINES WIND PROJECT

Concept:

Typical entrance cross section with culvert

	Date	Name	Drawing Number:
drawn by:	07.13.2016	AlTa	WPWF_TYP_E001
verified by:	07.13.2016	KeTo	Substitute for:
issued by:			

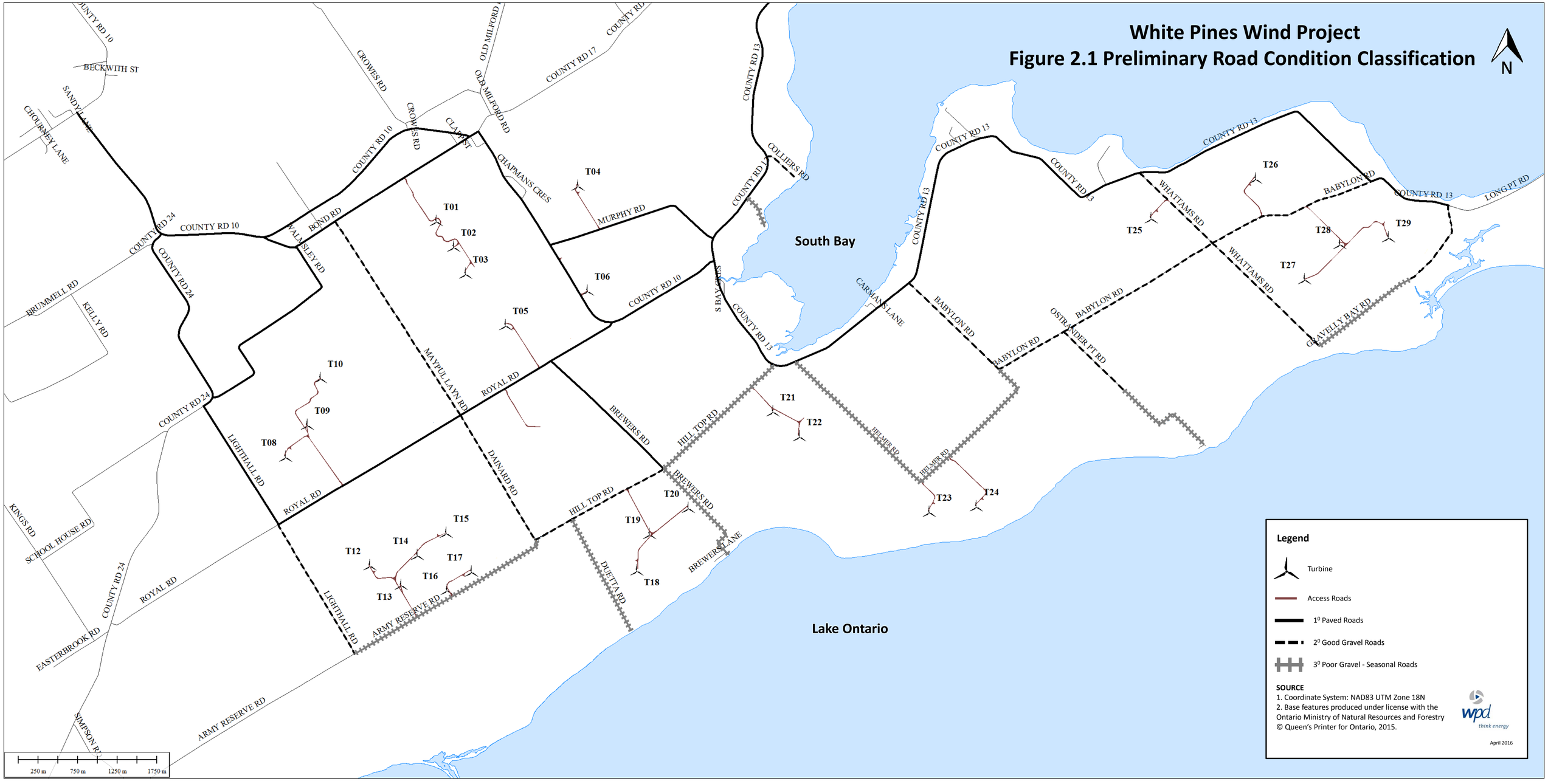
Plan development:

wpd Canada Corp.
2233 Argentia Road, Suite 102
Mississauga, Ontario
L5N 2X7
(p) 905-813-8400
(toll free) **1-888-712-2401**
(f) 905-813-7487
http://www.wpd-canada.ca

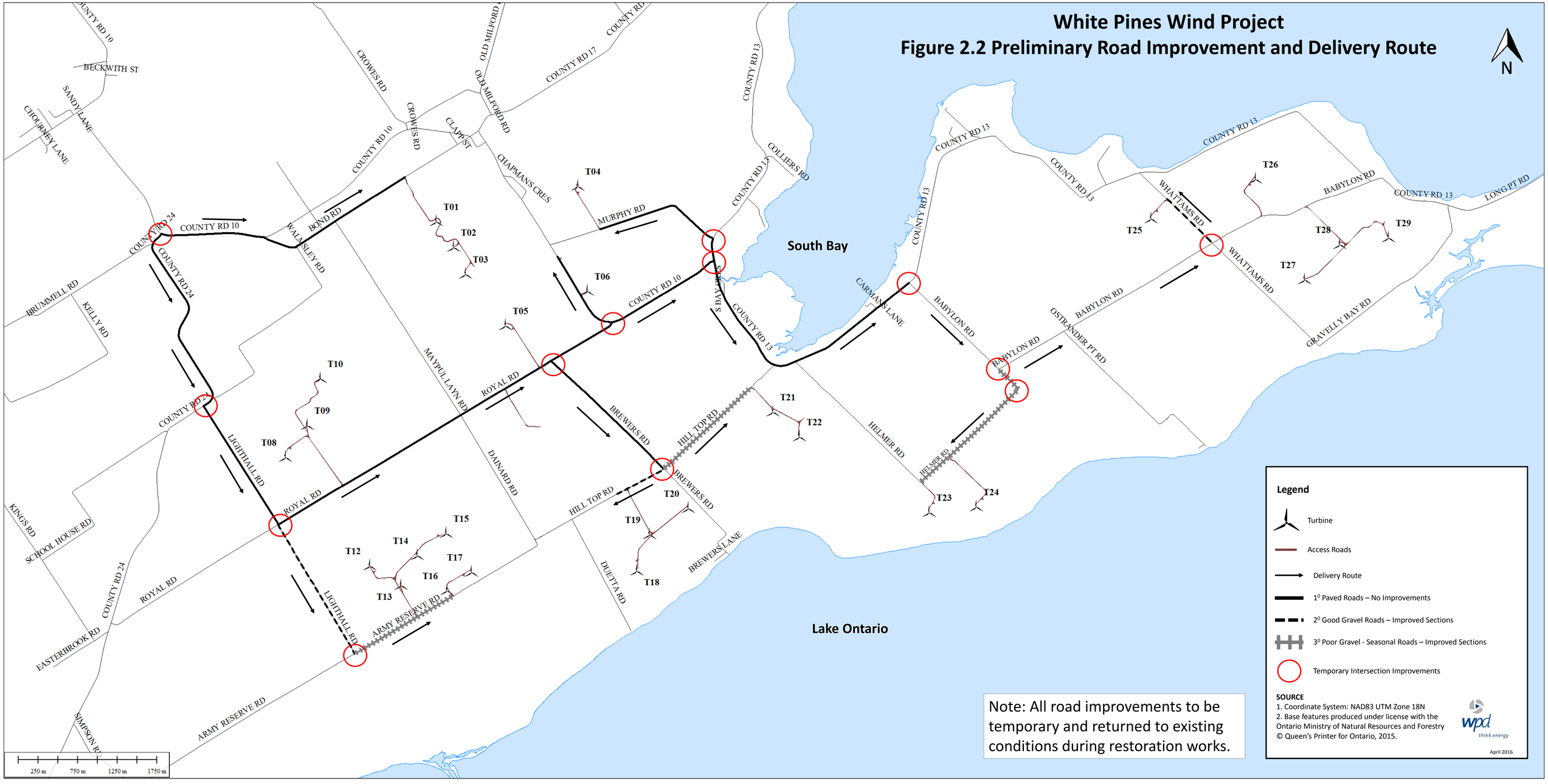
Signature:

Fig. 1.5

Scale:	Format:	Content of the table:
N.T.S.	**ANSI A**	**cross section**


White Pines Wind Project
Figure 2.1 Preliminary Road Condition Classification
N
South Bay
Lake Ontario
T01
T02
T03
T04
T05
T06
T09
T10
T08
T12
T13
T14
T15
T16
T17
T18
T19
T20
T21
T22
T23
T24
T25
T26
T27
T28
T29
COUNTY RD 10
COUNTY RD 24
COUNTY RD 13
COUNTY RD 17
BECKWITH ST
SANDY LANE
CHOURNEY LANE
CROWES RD
OLD MILFORD RD
CLAY ST
CHAPMANS CRES
BOND RD
WALMSLEY RD
MURPHY RD
COLLIERS RD
BRUMMELL RD
KELLY RD
MAYPULLAYN RD
ROYAL RD
LIGHTHALL RD
DAINARD RD
BREWERS RD
HILL TOP RD
BREWERS LANE
DUETTA RD
ARMY RESERVE RD
KINGS RD
SCHOOL HOUSE RD
EASTERBROOK RD
SIMPSON RD
SHANTY BAY
CARMANS LANE
HELMER RD
BABYLON RD
OSTRANDER PT RD
WHITTAMS RD
GRAVELLY BAY RD
LONG PT RD
250 m
750 m
1250 m
1750 m
Legend
Turbine
Access Roads
1⁰ Paved Roads
2⁰ Good Gravel Roads
3⁰ Poor Gravel - Seasonal Roads
SOURCE
1. Coordinate System: NAD83 UTM Zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry
© Queen's Printer for Ontario, 2015.
wpd
think energy
April 2016

White Pines Wind Project
Figure 2.2 Preliminary Road Improvement and Delivery Route



Legend

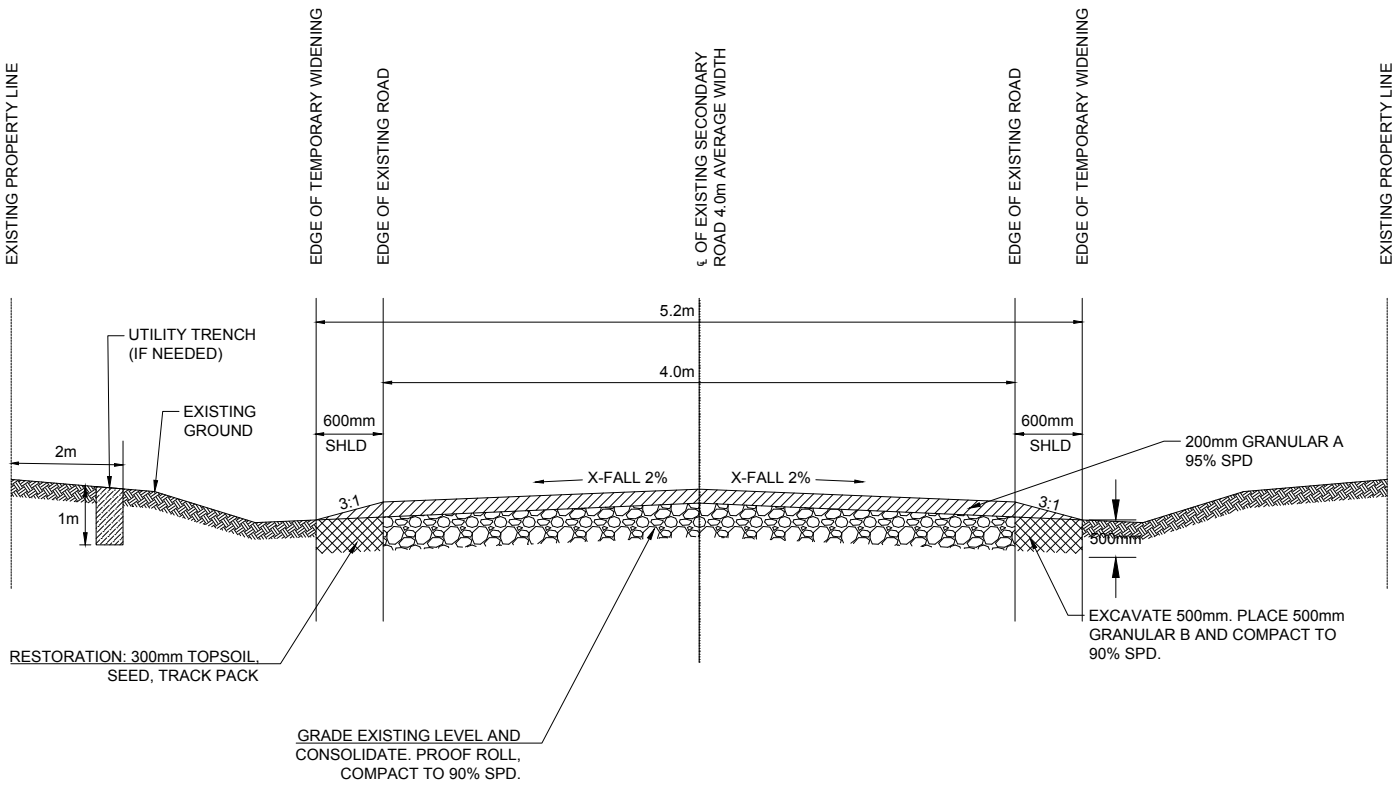
- Turbine
- Access Roads
- Delivery Route
- 1^0 Paved Roads – No Improvements
- 2^0 Good Gravel Roads – Improved Sections
- 3^0 Poor Gravel - Seasonal Roads – Improved Sections
- Temporary Intersection Improvements

SOURCE
1. Coordinate System: NAD83 UTM Zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry

wpd think energy

April 2016

Note: All road improvements to be temporary and returned to existing conditions during restoration works.



NOTE 1:
Existing road shoulders to be excavated to 500mm depth. Place Granular B in 100mm lifts and compact to best practical density or 90% SPD.

NOTE 2:
Grade and compact existing road base. Place Granular A in 100mm lifts; compact to 95% SPD.

NOTE 3:
Roads to be returned to pre-existing widths after the completion of construction of the widn farm.

Revision	Modifications	Date	Name
9			
8			
7			
6			
5			
4			
3			
2			
1			

WHITE PINES WIND PROJECT

Concept:

Typical Municipal Secondary Road Temporary Upgrade Cross Section

	Date	Name	Drawing Number:
drawn by:	04.21.2016	AlTa	WPWF_TYP_D001
verified by:	04.21.2016	KeTo	Substitute for:
issued by:			

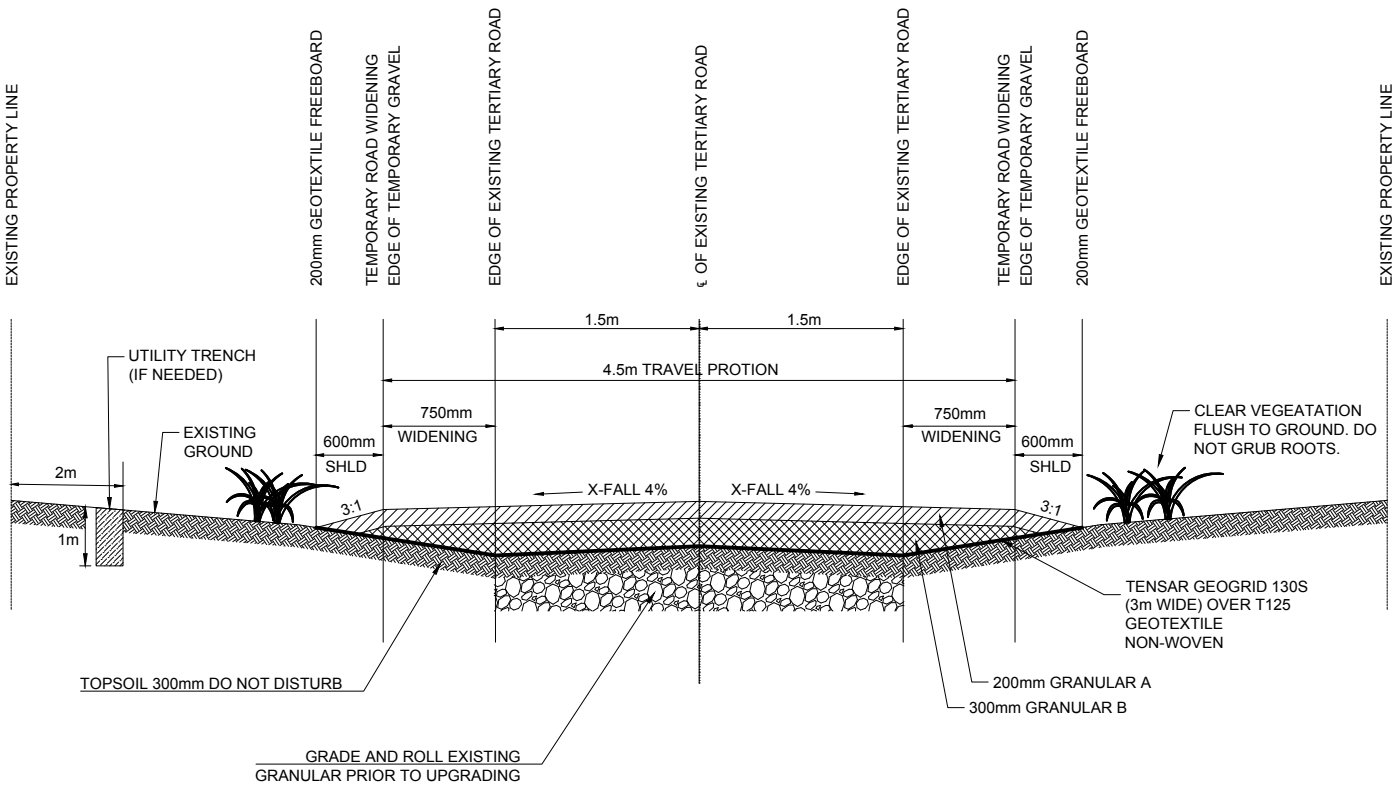
Plan development:

wpd Canada Corp.
2233 Argentia Road, Suite 102
Mississauga, Ontario
L5N 2X7
(p) 905-813-8400
(toll free) 1-888-712-2401
(f) 905-813-7487
http://www.wpd-canada.ca

Signature:

Fig. 2.3

Scale:	Format:	Content of the table:
N.T.S.	**ANSI A**	**cross section**



NOTE 1:
Grade existing road surface to level. Place new materials directly overtop.

NOTE 2:
Compacted In 100mm Lifts to 95% SPD.

NOTE 3:
Roads to be returned to pre-existing widths after the completion of construction of the widn farm.

Revision	Modifications	Date	Name
9			
8			
7			
6			
5			
4			
3			
2			
1			

WHITE PINES WIND PROJECT

Concept:

Typical Municipal Tertiary Road Temporary Upgrade Cross Section

	Date	Name	Drawing Number:
drawn by:	04.21.2016	AlTa	WPWF_TYP_D002
verified by:	04.21.2016	KeTo	Substitute for:
issued by:			

Plan development:

wpd Canada Corp.
2233 Argentia Road, Suite 102
Mississauga, Ontario
L5N 2X7
(p) 905-813-8400
(toll free) 1-888-712-2401
(f) 905-813-7487
http://www.wpd-canada.ca

Signature:

Fig. 2.4

Scale:	Format:	Content of the table:
N.T.S.	**ANSI A**	**cross section**

Appendix I
Corporate CVs

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

ANDREW G. RYCKMAN, B.Sc.
TERRESTRIAL AND WETLAND BIOLOGIST

EDUCATION

- Bachelor of Science, Honours, Zoology (2004), University of Guelph, Guelph, Ontario

CERTIFICATIONS

- Ecological Land Classification for Southern Ontario, MNRF, 2010
- Bat Acoustic Monitoring Workshop, Bat Conservation International, 2008

AREAS OF PROFESSIONAL EXPERIENCE

Andrew is a terrestrial and wetland biologist with extensive experience working on a variety of environmental projects. He has managed numerous projects across Canada, and routinely oversees and completes natural area inventories, vegetation community mapping, and surveys of bats, reptiles, amphibians, plants, breeding and migrating birds, and terrestrial mammals. He has worked in a variety of sensitive and rare habitats and is capable of identifying conservation targets, realizing potential habitat for rare species, and addressing potential threats and providing appropriate mitigation measures.

Andrew provides expertise in the following areas:

- inventories of wetland and terrestrial biological resources
- identification of significant and sensitive natural areas and species
- analysis of interrelations between biological and physical components of ecosystems
- analysis of environmental impacts on wetland and terrestrial resources
- management plans for significant species and habitats
- rehabilitation of disrupted habitats
- impact mitigation in sensitive habitats

Terrestrial and Wetland Ecosystem Studies

The assessment of terrestrial ecosystems and associated wildlife is Andrew's primary area of expertise. He routinely characterizes vegetation communities and sensitive habitats, and conducts inventories of bats, reptiles, birds, amphibians, terrestrial mammals, and vascular plants. He has applied Ecological Land Classification on many projects in southern Ontario, northern Ontario and Manitoba. Andrew has participated in wetland studies, including wetland delineation. He is experienced with aerial photographs and community mapping and is able to use these resources as navigational and field work aids.

Andrew's specific expertise includes:

- inventories and mapping of terrestrial and wetland vegetation communities, fauna, and soils
- design and coordination of vegetation surveys in natural, fragmented, and wilderness habitats
- field and laboratory identification of plants in Ontario and Manitoba
- identification of conservation targets, threat assessments, and sensitive and significant habitats
- development and undertaking of conservation and restoration plans
- design and implementation of management plans
- analysis and determination of wetland buffers and setbacks

Wildlife Studies
Andrew has worked extensively with reptiles and amphibians, birds, mammals, butterflies, and dragonflies. He has worked closely with a variety of reptile species including COSEWIC listed species such as eastern fox snake, black rat snake, and spotted turtle. He has strong amphibian auditory identification skills, and has taken part in numerous amphibian call surveys. Andrew also has considerable experience conducting bird point count surveys, migration monitoring, and breeding bird surveys. Andrew specializes in bat surveys and has experience with a variety of bat monitoring techniques, including extensive experience with major acoustic bat monitoring systems. He is trained in acoustic bat monitoring and sonogram recognition and is comfortable with a variety of bat analysis software packages. Andrew has helped create a comprehensive reference call library using recorded bat sonograms and call sequences. Andrew has worked on site rehabilitation plans that incorporate specific habitat requirements for herptiles and butterflies, and has organized and led butterfly inventories, identifying species distributions, densities, and diversity.

Andrew's specific expertise includes:
- field surveys and acoustic call analysis of bats
- strong visual and auditory identification skills for surveying herpetofauna and birds
- identification of significant or preferred habitat for sensitive or significant species
- comprehensive impact assessment and proposed mitigation measures
- background review, agency consultation, and work program preparation

Wind Power Projects
Andrew has managed and participated in numerous Environmental Screening Reports and Environmental Assessments for proposed wind generating facilities across Canada, including Ontario, Alberta, Saskatchewan, and New Brunswick. He routinely deals with federal, provincial, and regional agency staff during the monitoring process, and works closely with these agencies to develop monitoring programs based on specific site characteristics. Andrew has completed the full range of biological analysis including monitoring of bats, birds, herpetofauna, mammals, butterflies, as well as vegetation community mapping. He uses the environmental characterization reports to address potential impacts of proposed facilities and works closely with the developers to establish any recommended follow-up monitoring. Andrew has also managed post-construction monitoring at operational facilities, producing detailed reports on the estimated impact on bird and bat populations.

Andrew's specific expertise includes:
- development and implementation of full biological work programs
- impact assessment, follow-up recommendations, and mitigation measures
- agency consultation, public meetings, and open houses
- during construction and post-construction monitoring

EMPLOYMENT HISTORY

Terrestrial and Wetland Biologist 2005 to present
Natural Resource Solutions Inc., Waterloo, Ontario.

Field Technician 2005
Nature Conservancy of Canada, Peterborough, Ontario

Naturalist Interpreter 2004
Ontario Parks / MNRF, Awenda Provincial Park, Midland, Ontario

PUBLICATIONS AND SYMPOSIA PRESENTATIONS

Humphrey C.L., T. Lessard, and A.G. Ryckman. 2012. A Comparison of Acoustic Bat Data and Observed Mortality Patterns. Canadian Wind Energy Association (CanWEA) Annual Conference. Toronto, Ontario. October 14-17.

Ryckman, A.G. 2010. Environmental Considerations of Offshore Wind Energy. Canadian Wind Energy Association (CanWEA) Annual Conference. Montreal, Quebec. November 1-3.

Ryckman, A.G. 2009. The Influence of Natural Features on Bat Activity. Canadian Wind Energy Association (CanWEA) Annual Conference. Toronto, Ontario. September 20-23.

Stephenson, D.E. and A.G. Ryckman. 2007. Results of Bat Monitoring at 20 Wind Farm Sites in Ontario and Manitoba. Canadian Wind Energy Association (CanWEA) Annual Conference. Quebec.

Stephenson, D.E. and A.G. Ryckman. 2007. A Comparison of Crossing Designs for Amphibian Movement. Roads & Ecopassages Forum. Toronto, Ontario. March 20-22, 2007.

PAMELA HAMMER, B.Sc.
TERRESTRIAL AND WETLAND BIOLOGIST
CERTIFIED ARBORIST

EDUCATION

- Honours Bachelor of Science, Biology (2009), University of Toronto, Mississauga, Ontario.

CERTIFICATIONS AND MEMBERSHIPS

- Certifications:
  - MNRF Ecological Land Classification for Southern Ontario, 2014
  - MNRF Certified Butternut Health Assessor, 2014
  - Ontario Reptile and Amphibian Field Survey Training Course, Nature Conservancy of Canada, 2013
  - Tree Risk Assessment Qualified, International Society of Arboriculture, 2013
  - Certified Arborist, International Society of Arboriculture, April 2011
  - Environmental Monitoring for Construction, Vancouver Island University, 2011
  - MNRF Northeastern Ecological Land Classification, 2011

- Memberships:
  - International Society of Arboriculture
  - International Society of Arboriculture, Ontario Chapter
  - Toronto Entomologists' Association

AREAS OF PROFESSIONAL EXPERIENCE

Pamela is a terrestrial and wetland biologist with over five years of experience working on a variety of environmental projects. She routinely completes natural area inventories, vegetation community mapping, and surveys of reptiles, amphibians, plants, mammals, birds, and insects. Pamela has worked on projects focusing on the identification of important natural features and the evaluation of the significance and sensitivity of these features.

Pamela provides expertise in the following:

- inventories of terrestrial and wetland biological resources
- identification of significant and sensitive natural resources and wildlife species
- analysis of interrelations between biological and physical components of ecosystems
- evaluation of natural resource policies and guidelines and their application to management
- analysis of environmental impacts on wetland and terrestrial resources

Terrestrial and Wetland Ecosystem Studies
Pamela routinely characterizes vegetation communities and sensitive habitats, and conducts inventories of vascular plants, birds, reptiles, amphibians, and mammals. She is experienced in applying the Ecological Land Classification System in projects in southern and northern Ontario to

delineate, describe and map vegetation communities. Pamela has also participated in wetland studies where the Ontario Wetland Evaluation System has been implemented

Pamela's specific expertise includes:

- inventories of terrestrial and wetland vegetation communities, fauna, and soils
- delineation and characterization of terrestrial and wetland vegetation communities
- identification of significant and sensitive natural areas and species
- analysis of environmental impacts on wetland and terrestrial communities
- impact mitigation in wetland and terrestrial communities

Woodlot and Forestry Studies

Pamela is a Certified Arborist with over seven years of experience evaluating trees in natural, rural and urban environments. She integrates information on tree ecology and biology, soils, herbaceous flora and wildlife when evaluating areas to determine significance and sensitivity to disturbance. Pamela has experience conducting tree inventories and risk assessments, identifying common pests and diseases in natural and urban environments, and implementing integrated pest management practices.

Pamela's specific expertise includes:

- tree species identification
- woodland and tree inventories, mapping, evaluations and management plans
- diagnosing tree disorders caused by insects, disease, and construction
- analysis of woodland significance
- evaluation of impacts

Wildlife Studies

Pamela has experience identifying and evaluating candidate and confirmed significant wildlife habitats. She has conducted a wide range of surveys and inventories to identify the presence of wildlife on study sites, including bird, amphibian, reptile, mammal, and insect monitoring.

Pamela's specific expertise includes:

- wildlife habitat identification, delineation and assessment
- identification of rare and sensitive species
- identification of significant and preferred habitat for sensitive and significant species
- visual and auditory identification of birds and amphibians
- bat habitat assessments, exit surveys and acoustic call analysis.
- impact assessment and mitigation

Renewable Energy Studies

Pamela has experience conducting and coordinating pre-construction monitoring related to the natural environment at proposed wind power and solar generating facilities, as well as post-construction monitoring at operational wind power projects in Ontario. She also develops Natural Heritage Assessments for proposed wind and solar generating facilities across Ontario, and uses these to address potential impacts of proposed facilities. Pamela has also conducted and coordinated post-construction mortality monitoring at operational facilities, producing detailed reports on the estimated impact on bird and bat populations.

Pamela's specific expertise includes:

- development and implementation of full biological work programs
- coordination of and participation in a wide range of studies, including bat monitoring, bird behavior and breeding monitoring, as well as herpetofauna, mammal and vegetation inventories
- post-construction mortality monitoring
- extensive experience in analyzing data, and interpreting and reporting monitoring results
- developing Natural Heritage Assessments

- impact assessment, follow-up recommendations, and mitigation measures
- agency consultation, public meetings, and open houses

EMPLOYMENT HISTORY

Terrestrial and Wetland Biologist
Natural Resource Solutions Inc., Waterloo, Ontario 2010 to present

Integrated Pest Management Forestry Technician
City of Mississauga, Mississauga, Ontario 2008 to 2010

TARA A. LIVINGSTONE (née Lessard), B.Sc.
TERRESTRIAL AND WETLAND BIOLOGIST

EDUCATION

- Bachelor of Science, Honours, Biology (2006), University of Ottawa, Ottawa, Ontario

CERTIFICATIONS

- Ontario Ministry of Natural Resources, Ecological Land Classification System for Southern Ontario, 2013
- NHIC Data Sensitivity Training, 2010
- Introductory Bioengineering Course, 2009
- RX-100 Low Complexity Prescribed Burn Training Course, 2009
- Electrofishing Crew Leader – 2nd Class, 2009

AREAS OF PROFESSIONAL EXPERIENCE

Tara is a Terrestrial and Wetland Biologist and Project Manager with experience working on a variety of environmental projects. She has managed projects across Ontario and New Brunswick, and routinely oversees and completes natural area inventories, vegetation community mapping, and surveys of bats, reptiles, amphibians, plants, breeding and migrating birds, and terrestrial mammals.

Tara provides expertise in the following areas:

- inventories of wetland and terrestrial biological resources
- identification of significant and sensitive natural areas and species
- analysis of interrelations between biological and physical components of ecosystems
- analysis of environmental impacts on wetland and terrestrial resources
- management plans for significant species and habitats
- impact mitigation in sensitive habitats
- construction/environmental monitoring

Construction/Environmental Monitoring
Tara has coordinated environmental construction monitoring for renewable energy projects, including large wind energy facilities, throughout Ontario, and is experienced in assessing conditions from pre- to post-construction. She has led client conference calls and has provided summary reports to the Ministry of Natural Resources and Environment Canada regarding vegetation monitoring and bird nest surveys during the breeding season. Tara has also prepared, and assisted with the implementation of, Sighting Protocols and Wildlife Fact Sheets for various construction sites that provide guidance on protection of wildlife, including Species at Risk.

Tara's specific experience includes:

- environmental monitoring support services for renewable energy projects in Ontario
- preparation of environmental monitoring summary reports documenting existing conditions, and providing recommendations for protection of natural features and wildlife during construction
- developing Sighting Response Protocols and Fact Sheets for significant wildlife species within construction areas

Renewable Energy Projects
Tara has managed and advised on numerous Natural Heritage Assessments for proposed wind and solar generating facilities across Ontario and New Brunswick. She routinely deals with federal and provincial agency staff during the permitting process, and works closely with these agencies to develop monitoring programs based on specific site characteristics. Tara has coordinated studies of a variety of wildlife groups, including data collection and analysis from studies of bats, birds, herpetofauna, mammals, as well as vegetation inventories and community mapping. As part of the Natural Heritage Assessment report, Tara addresses potential impacts of proposed facilities and works closely with the developers to establish recommended follow-up monitoring, mitigation strategies, and contingency plans. Tara has also managed post-construction monitoring of operational facilities, producing reports on the estimated impact on bird and bat populations, and working with agency staff to determine if additional mitigation measures are required.

Tara's specific expertise includes:
- development and implementation of comprehensive biological work programs
- impact assessments, mitigation strategies, and contingency measures
- agency consultation and public information sessions
- post-construction monitoring

Wildlife and Wildlife Habitat Studies
Tara has extensive experience working with reptile, amphibian, and bird species, including several Species at Risk. She has strong amphibian auditory identification skills, and has taken part in numerous amphibian call surveys. Tara also has experience conducting bird point count surveys, migration monitoring, breeding bird surveys, and has experience with a variety of bat monitoring techniques, including acoustic bat monitoring systems.

Tara's specific expertise includes:
- visual and auditory identification skills for surveying herpetofauna and birds
- field surveys and acoustic call analysis of bats
- identification of significant or preferred habitat for sensitive or significant species
- comprehensive impact assessment and proposed mitigation measures
- background review, agency consultation, and work program preparation

EMPLOYMENT HISTORY

Terrestrial and Wetland Biologist
Natural Resource Solutions Inc., Waterloo, Ontario — 2011 to present

Acting Management Biologist
Ontario Ministry of Natural Resources, Clinton, Ontario — 2009 to 2011

Species at Risk Technician
Ontario Ministry of Natural Resources, Clinton, Ontario — 2007 to 2009

Wildlife and Forest Ecology Field Assistant
University of Toronto, Toronto, Ontario — 2007

Boreal Bird Research Assistant
Bird Studies Canada, Port Rowan, Ontario — 2006

SHAWN R. TAYLOR, R.P.BIO

Ecosystem Works Inc., 6 Country Lane Cres., | Limehouse, ON, L0P1H0 | 905 875 8391 |
email: staylor@ecosystemworks.com or/ riverdoctor@cogeco.ca

Road Ecologist, Aquatic Biologist
Lake, Stream and Wetland Design
Environmental Impact Assessor
River Morphology Specialist
Stormwater Management Facility Design

EDUCATION & AFFILIATIONS

M.Sc. (Integrated Agriculture and Aquaculture), Asian Institute of Technology, Bangkok, 1989
B.Sc. (Aquatic Biology), University of Guelph, 1984

Registered Professional Biologist, College of Applied Biology
Association of Professional Biologists of British Columbia
Ontario Road Ecology Group
International Erosion Control Association

SKILLS PROFILE

- Extensive construction mitigation and management experience related to environmental protection
- Thorough knowledge of sediment and erosion control measures used to control runoff
- Detailed design of over 100 stream realignments and wetlands supporting infrastructure and land development since 1992
- Senior project management skills to assembling teams, leading staff and developing unique solutions
- Conducts real-time applicable research related to Road Ecology
- Can relate biology, hydraulics, sediment transport, fluvial morphology and habitat in the context of River dynamics

RELEVANT EXPERIENCE

ENVIRONMENTAL IMPACT ASSESSMENTS AND ECOSYSTEM DESIGN

2015 – Confidential Client
Provided expert witness testimony concerning the impact mitigation and restoration of Blanding's turtle habitat at a proposed renewable energy project on a populated island in Ontario.

2015 – White Pines Wind Energy
Provided expert witness testimony concerning the impact mitigation and restoration of Blanding's turtle habitat at a proposed renewable energy project, Price Edward County, Ontario.

2015- Ostrander Wind Energy LP
Provided expert witness testimony concerning the impact mitigation and restoration of Blanding's turtle habitat at Ostrander Point, Price Edward County, Ontario.

2015 - Penn Energy 4 - Van Dorp Solar Farm, Port Hope Ontario.
Developed an enhancement method of sediment and erosion control using frost seeding at Port Hope Solar intended to manage runoff and avoid runoff problems; strategy worked very well to avoid compliance issues.

2014/ 2015 - Penn Energy 3 - Hamilton Solar Farm, Baltimore, Ontario.
Provided emergency sediment and erosion control mitigation and design, supervised construction monitoring, water quality assessments, interpretation and regulatory agency liaison to meet quality criteria.

2013 / 20014 -CFB Shilo Species at Risk Survey & IEA, Department of National Defence
Principal scientist, project manager: Conducted survey of 24 possible species at Risk in Range Area 9, modelled habitat use by 18 species and completed an Internal Environmental Assessment to plan for digbox training at Canada Forces Base Shilo

2012 / 2013 – Blanding's Turtle Conservation Management Plan – City of Ottawa
Principle Scientist, Project Manager: Peer reviewed scientific conservation needs assessment and Population Viability Analysis (PVA) to manage a threatened Blanding's turtle population in a rapidly urbanizing area of Northern Ottawa.

2012 – Christina Lake SAG-D Plant; Cenovus Energy
Lead Restoration Design: Reclamation of Borrow Pit Zero at the Christina Lake SAG-D oil sands extraction facility. Designed a pothole lake and sphagnum bog replacement cells to offset disturbed areas on a like for like basis.

2010-2013 – Species at Risk Specialist Services, City of Ottawa
Project manager: Conducted population estimate, distribution and range study of Blanding's turtle over 750 ha South March Highlands in Ottawa. Also directed radio telemetry work, road crossing assessments and technical reporting.

2011 – Long-Term Monitoring, St Marys Cement Company
Project manager: Year five of ten, long-term environmental monitoring of 25.6 wetland and 2.8 km creek reconfiguration project, Bowmanville, Ontario.

2009-2011 – Hydro One Networks Inc. Parkway Transformer Station
Ongoing work to complete land and easement transfers, complete landscaping and creek restoration works prior to handover to the municipality. Three year compliance monitoring of water quality, fisheries, benthic invertebrates and vegetation.

2009 – Pearson Airport Runway Extensions, Greater Toronto Airports Authority
Preliminary planning, cost estimating and predicting permitting needs for two realignments of Etobicoke Creek, required for runway emergency safety area extensions to the existing runways.

2009 – CFB Gagetown, Department of National Defence
Revegetation strategy for battalion-strength training area to re-establish forest lands.

2008/2009 – CFB Gagetown, Department of National Defence
Sharpes Brook restoration and implementation of bioengineering training program.

2007-2008 – Yunnan Huaneng Lancang River Hydro Power Co. China
Principal investigator for the biophysical environmental impacts of hydro electric developments in Yunnan Province on the Lower Mekong River. Coordinated all aspects of field work, data collection, issues synthesis, cumulative impacts and environmental management and documentation. Travelled and worked extensively in South East Asia, along the Mekong River.

2004-2007 – Hydro One Networks Inc. Parkway Transformer Station
Project manager and construction manager for the relocation of two tributaries to the Rouge River in Markham, Ontario. Oversaw extensive hydraulic modelling, fish habitat and CEAA approval negotiations, stream and wetland detailed design of two SWM pond designs and 985 m of creek valley, integrated within the power grid around the station. Approximately $5.6 M in contracting over three phases.

2005/2006 – Greater Toronto Airports Authority, Phases I and II Etobicoke Creek Erosion Repairs
As project manager, developed a design, processed Fisheries Act and CEAA approvals and completed contract administration of the small realignment and eroding bank stabilization works using a combination of hard engineered solutions and soil bioengineering.

2005 – Resun Delong Habitat Technologies, Shenzhen, China
Lead consultant for the conceptualization and preliminary cost estimating for design-build of 11 ha lake restoration in GuangDong Province for CITIC Land Developments PPL.

2005 – Resun Delong Habitat Technologies, Shenzhen, China
Provided advice and technical information for the treatment of river and lake water in three major municipalities in China: Guangzhou, Nanjing, Shiang Hai.

2004/2005 – Greater Toronto Airports Authority, Spring Creek Realignment Repairs
Project manager for the manipulation of realignment to improve the plan-form and functioning of Spring Creek as it flows through Toronto International Airport.

2002-2003 – Greater Toronto Airports Authority
As project manager, developed an eight-year master plan for the relocation and rehabilitation of two major tributaries of Etobicoke Creek within the Lester B. Pearson International Airport including capital costing and scheduling.

2002-2006 – St Marys Cement Company
Project manager and construction manager for the reconfiguration and habitat restoration of Westside Marsh, a 25.7 ha wetland, valued at $2.3 M in habitat construction. Extensive federal approvals under Fisheries Act, CEAA and Navigable Waters required. Contracting by Habitat Works!

2001-2003 – Rennie Street Landfill / Red Hill Creek Relocation, City of Hamilton
As supervising biologist, coordinated natural channel design, habitat restoration and landscaping efforts on the relocation of Red Hill Creek. Responded to questions during CEAA panel review.

2000 – ICI Courtright Phosphates Plant Lagoon Decommissioning
Project manager for the technical concepts and preliminary design of wetlands restoration on a 328 acre site as part of the site closure plan.

1998 – Royal Oak Mines, Yellowknife
Principal investigator for the concepts for restoration and reclamation of fish habitats in Baker Creek on the Giant Mine property.

1997-1998 – BHP Diamond Mine, Northwest Territories
Designer and construction supervisor for the Panda Diversion (3.3 km) and Grizzly Creek (90 m). Habitat improvements for Arctic Grayling**.**

1998 – Ecoplans
Technical peer reviewer for the Little East River final design.

1997 – Public Works and Government Services Canada
Designer for the wetland portion of a wastewater treatment facility at the Dorchester federal penitentiary in New Brunswick.

1996-1997 – Metropolitan Toronto Region Conservation Authority
Project manager for the design, approvals and installation of fishways over two low head weirs on the Don River.

1996-1998 – City of Surrey, British Columbia
Designer for the greenway constructed wetland retention basin and natural channel tributary to Serpentine River.

1995-1997 – Greater Toronto Airports Authority
Site inspector (construction phase) and project manager (retrofit phase) for the Moore Creek (550 m) and Spring Creek (1300 m) realignment at Pearson Toronto Airport. Follow-up retrofit contract to improve channel functions.

1994-1999 – St Marys Cement, Bowmanville
Project manager for the design-build setup of a 2.8 km creek and 27.4 ha wetland to replace the loss of Class 2 provincially significant wetland. Federal Fisheries and CEAA approvals required. Specialty contracting in marsh by Habitat Works! (2003-2006).

1994-1996 – Public Works Canada
Project manager for final design and construction supervision of natural channel root wads, live cribs, wetland cells and bioengineered slopes on East Etobicoke Creek at Toronto International Airport.

1994-1995 – County of Essex
Design coordinator for an 8 ha wetland creation project to allow bridging structure over Cedar Creek and Class 2 wetland.

1994-1995 – Region of York
Project manager and site inspector for fish habitat restoration projects on the Don River at Rutherford Road.

1994 – City of Mississauga
Design coordinator for a habitat enhancement of Etobicoke Creek at stormwater outlet, Eastgate Parkway.

1993 – Region of York
Project manager for final design, construction supervision and monitoring of two sections of Tannery Creek natural channel restoration over 130 m of length in the Town of Aurora.

1992-1993 – Region of Peel
Design coordinator and construction supervisor for floodplain and terrace rehabilitation where Derry Road crosses the Credit River, Meadowvale Conservation Area and restoration of natural channels in Levi Creek (75 m) and a tributary to Mullet Creek (80 m). Received Mississauga 1994 Urban Design Award.

1992 – City of Cambridge
Design and construction of five vortex rock weirs as compensation of fish habitat loss.

1991-1992 – Ministry of Transportation, Ontario, Natural Channel Design
Little East River realignment based on fluvial geomorphology and hydrology and optimum habitat suitability indices for brook trout.

LAND DEVELOPMENT

2014 / 2015 - Fort Erie Estates, Fort Erie

Project Manager: Natural feature preliminary inventories, species at risk review, opportunities and constraints mapping of a 40 ha parcel of land, a former golf course, in the Town of Fort Erie.

2012 / 2015 – Niagara Estates of Campbellville, Milton

Project Manager: Natural features inventories update, species at risk, opportunities and constraints mapping of a 68 ha parcel of land in the Town of Milton. Staff defended same before Ontario Municipal Board, June 2015.

2012 / 2014 – Green Valley Estates, London, Ont.

Project Manager: Natural features inventories update, fluvial geomorphology rapid assessment, species at risk, opportunities and constraints mapping of a 125 ha parcel of land in the City of London rural expansion area.

2008 / 2009 – Urbacon Development, Richmond Hill

Project Manager: Natural features inventories update, SWM pond landscape design, bridge construction mitigation, sediment and erosion control, watermain crossing of the Rouge Creek, Species at Risk – Redside Dace.

2008 – Orlando Corporation – South Beaver Creek SWM Facility

Project Manager: Detailed design, approvals and contract administration of stormwater management wetland in Richmond Hill.

2007 – Twiss Road, Niagara Estates of Campbellville

Project Manager: Functional Low Impact Development design, natural features inventories, constraints mapping of a 68 ha parcel of land in the Town of Milton.

2006 – McNair Creek Rehabilitation, Block 12 City of Vaughan

Project Manager: Emergency Rehabilitation of McNair Creek following the collapse of the bottom during underground boring to install a watermain.

2006 – Block 11 Properties Owners Inc.

Project Manager: Habitat assessments of three watercourses, with detailed design of four creek relocations using natural channel design and biotechnical soil design techniques. Completed construction observations, contract administration, warranty inspections and monitoring.

2006 – Woodlands Trails, Amherstburg

Project Manager: Functional design of a stormwater wetland and adjacent recreational facilities in Amherstburg (Windsor).

2005 – North Bathurst Property Edge Management – Madison Homes
Designer and Construction management of a Valley Edge Management Plan to offset the impacts of development on the East Don River valley, part of Block 11 in the City of Vaughan.

2003- Concord Floral Dam Removal - Concord.
Designer and construction management for the destructive removal of a low head weir on the East Don River, Town of Concord.

2001-2002 – Mattamy Development Corp.- Brampton.
Ecosystem designer for Mattamy's subdivision including environmental approvals, CEAA screening, technical concepts, detailed design and costing of Fletchers Creek relocation and pocket wetland creation over 950 m in length.

2002-2003 – North Roseland Developments, Monarch Construction and Coco Paving
Stormwater management wetland designer for three SWM facilities in Windsor as part of three separate subdivisions. Conceived of the theme to name each facility after migratory waterfowl. Conducted follow-up training with City of Windsor engineering staff on operational ecosystem management in the fall of 2002.

2001 – North Fanshore Subdivision
Project manager for the design of two tributary relocations totalling over 900 m in northwest Brampton, Ontario, on Fletchers Creek. Provided technical concepts, detailed design, costing, federal Fisheries, Environment Canada and CEAA approvals and construction supervision (in progress). Specialty contracting of bioengineering, creek channel and valley bottom by Habitat Works!

2001 – Dibattista Gambin Developments Ltd.
Ecosystem designer on the Cookfield Developments subdivision involving environmental approvals, technical concepts, detailed design and costing of creek relocation and pocket wetland creation over 190 m in length.

1998-2000 – TACC Construction, Fieldgate Homes Habitat Design, Block 32 Owners Group
Approvals and contract administration relocation of the West Don River in Vaughan, Ontario. Design, approvals and creation of 1.6 km valley, 1.9 km of low flow channel and associated wetlands and riparian communities. Specialty contracting of bioengineering, creek channel and valley bottom by Habitat Works!

1999 – Orlando Corporation
Fish habitat approvals facilitator for the realignment of 940 m of Tomken Road Creek. Provided habitat and contracting expertise to detailed design and facilitated TRCA, MNR, DFO and CEAA approvals. Specialty contracting of valley by Habitat Works!

1997-1998 – Dulverton Owners Group
Designer and contract administrator for the construction of stormwater wetland and landscaping in Stouffville, Ontario.

1995-1997 – Coco Paving
Design coordinator and inspector for the 3.9 ha stormwater wetland in Riverside Park, Windsor.

1993 – Metrus Land Management, Conceptual and Final Design
Construction supervision and monitoring of Holland River natural channel restoration over a 190 m length. This highly successful project is now a demonstration facility and industry standard.

1991 – Metrus Management
Wetland successional evaluation and impact assessment of a proposal to use marsh for stormwater management facilities.

TRANSPORTATION ASSIGNMENTS & ENVIRONMENTAL MANAGEMENT

2011/2012 – Lake Margaret Limnology Assessment, Town of St Thomas

Interpretation and assessment of multi-year water quality sampling from Lake Margaret, a eutrophic waterbody, in a former gravel extraction pit. Developed a long term strategy to reduce phosphorous loadings and rehabilitate the lake as a recreational asset.

2010/2011 – Terry Fox Drive, Construction Phase, City of Ottawa
Environmental Monitor: Compliance inspections of environmental mitigation, landscaping, wildlife passages, floodplain compensation, 3 constructed wetlands, reforestation plots and 250 m creek realignment along 4.8 new roadway construction.

2009/2010 – Terry Fox Drive Extension, City of Ottawa
Manager of environmental approvals responsible for submission of two CEAA screening EAs, field work logistics, agency consultation, cumulative impact assessment, five Species at Risk, ESA negotiations and the completion of the detailed design.

2004 – Manning's Road SWM Study, Windsor

Assessment of drainage characteristics and preliminary design of storm water management facilities for the Manning's Road Planning area in Windsor.

2001/2002 – Ministry of Transportation, Ontario, Southwest Region

Fisheries and CEAA approvals and design coordination for the Cedar Creek relocation as part of the Highway 401 widening in Cambridge, Ontario.

2000-2002 – Ministry of Transportation, Ontario, Southwest Region
Fisheries coordinator for the Highway 26 realignment (GWP 629-91-00). TPM assignment for the preliminary and detailed design and contract administration of Highway 26 from Collingwood to Wasaga Beach, Ontario.

2001-2002 – Ministry of Transportation, Ontario
Fisheries coordinator for the Highway 40-Running Creek Bridge replacement.

2001-2002 – Ministry of Transportation, Ontario, Eastern Region
Fisheries coordinator for the Highway 35 roadway improvements in Hawkesbury, Ontario.

2000 – Region of Durham
Project biologist for the Bayly Street widening, bridge reconstruction and natural channel design in the Town of Ajax, Ontario.

1996-1998 – Toronto Harbour Commission
Aquatic biology input to a fixed-link span approvals for the Toronto Island Airport including preparation of fish habitat compensation plans and CEAA screening.

1998 – Toogood Pond Restoration, Markham
As project manager and biologist, assessed sediment impacts to a former mill pond in the urban envelope and developed a conceptual plan for bypassing the dam.

1997 – TransMaritime Pipelines, Fisheries Component Input
Analysis of habitat data and component preparation of a National Energy Board application through Nova Scotia and New Brunswick.

1995-1997 – Browning-Ferris Industries
Aquatic ecosystem input to BFI's Ridge Landfill expansion including preliminary design of two drainage ditches to restore habitat for vulnerable fish species.

1995-1996 – Municipality of Metropolitan Toronto
Project coordinator responsible for the impact assessment of aquatic ecology associated with the proposed development of a landfill at the Adams Mine Site in Kirkland Lake, Ontario.

1994, 1996, 1997 – Ministry of Transportation, Ontario
Project manager and design coordinator for construction inspection and detailed design of a 1.1 ha wetland/stream creation to restore fish and wetland habitat; Highway 403/6 new interchange, Ancaster.

1993-1996 – Ministry of Transportation, Eastern Region
Environmental impact assessment, fisheries and wetlands, route planning study for Highway 17 between Haley Station and Meath.

1991-1996 - City of Sault Ste. Marie
Multi-year monitoring of benthic macroinvertebrates as water quality indicators at Cherokee Landfill in Sault Ste. Marie and Northumberland Landfill in Cobourg.

1994-1995 – Township of Southwold
Natural environment coordinator for the Lynhurst area sub-watershed study.

1994 – City of Richmond Hill
Site analysis and management recommendations in master servicing plan for a 1,000 acre land development with several Rouge River tributaries; OPA 121/135.

1993-1994 – Government of the Bahamas
Environmental assessment coordinator for the New Providence Island transportation planning and development project in Nassau.

1992-1993 – Atria Engineering
Littoral ecosystems component of the Niagara shoreline management plan for Lake Ontario.

1992 – Aquatic Ecosystem Component
Ancaster (City of Ancaster), St. Thomas, (Town of St. Thomas), and Bayview Northwest (Town of Richmond Hill) sub-watershed development plan.

1992 – Ministry of Transportation
Coordination of natural sciences input to environmental assessment of widening Highway 24 between Cambridge and Guelph.

1991 – Ministry of Transportation
Environmental evaluation, water quality analysis and rehabilitation design of 12 streams for expansion of QEW highway.

1991 – Ministry of Transportation
Evaluation and impact mitigation of 38 stream crossings, wetlands, forests and wildlife areas during alternative route selection for a major expansion of Highway 11 in northern Ontario.

1991 – City of Hamilton
Fisheries habitat and aquatic ecosystem evaluation in Cootes Paradise, Hamilton, to minimize impacts due to road construction.

1991 – Municipality of Metropolitan Toronto
Provision of aquatic ecosystem input to evaluate route alignment of the Eglinton Avenue rapid transit system.

1990 – City of Wallaceburg
Evaluation and impact assessment of the Libby Street bridge crossing of the Sydenham River.

1987 – Asian Institute of Technology, Bangkok
Socio-economic survey, analysis and evaluation of 35 Thai farming families as database input for on-farm research of alley cropping and rice-fish culture in Thailand.

1986-1987 – University of Songkla, Thailand
Technical assistance to assess impact by Crown of Thorns starfish on a coral reef ecosystem.

1982-1983 – Limnos Ltd. and Ontario Ministry of the Environment
Conducted two studies on the phosphate eutrophication of Lake Ontario through the systematic collection of the algae *Cladophora*.

1982 – Limnos Ltd. and Ontario Hydro
Survey of aquatic weed distribution in the Niagara Falls water diversion channel.

1981 – Ontario Hydro
Capture of fish by speargun, fill nets, trap nets and seine for radionuclide studies at the Bruce and Pickering nuclear generating stations.

FISHERIES HABITAT MANAGEMENT

1994-2000 – Blue Circle Cement Canada, Coordinator of Fisheries and Wetland Issues
Federal Environmental Assessment (CEAA) Screening study, design and construction of a lake trout spawning shoal in Bowmanville.

1992-1994 – Province of Ontario
Aquatic ecosystem component to a multi-year Interim Waste Authority landfill site search environmental assessment.

1992-1993 – Town of Halton Hills
Cumulative impact assessment of impacts to the Hungry Hollow and Silver Creek Valley ecosystem from numerous infrastructure developments.

1992-1993 – Halton Region
Analysis of impacts and cumulative impact assessment from alternative routing of a trunk waste water main in the Town of Halton Hills

1997 – Regional Municipality of Ottawa-Carleton
As aquatic biologist, undertook analysis of historic impacts and development, and restoration strategies for Shirley's Bay wetland in Kanata.

1997 – Ontario Place
Project biologist for the Toronto Aquarium fish habitat evaluation and compensation plan.

1993 – Ministry of Transportation, Northern Region
Habitat Suitability Index assessment of Big Squaw Creek near Highway 11/17 in Thunder Bay.

1992-1993 – City of Toronto
Investigation of options for stormwater treatment and marsh restoration of Grenadier Pond in High Park, Toronto.

1992 – Ministry of Transportation, Eastern Region
Underwater video survey, impact assessment and design of compensation for lost fish habitat during Glenora Ferry dock improvements.

1991 – Frontenac County
Assessment of damage and design of a compensation package for fisheries rehabilitation to address Fisheries Act charges.

1991 – Ministry of Transportation
Water quality assessment of four road crossings, impact assessment on fisheries potential and design of rehabilitative compensation during QEW highway expansion.

1991 – Cosburn, Patterson, Mather
Design of rehabilitation strategy for a gravel pit to be used for stormwater management in a sensitive natural environment.

1991 – Metrus Management Land Development
Analysis of natural habitat degradation, water quality, stormwater management criteria and stream rehabilitation design using Best Management Practices procedures.

1990-1991 – City of Brantford
Analysis of natural fisheries habitat and electrofishing inventory existing at site of proposed industrial park development.

1990 – Metropolitan Toronto Region Conservation Authority
Diagnosis of ecosystem imbalance and prescription of rehabilitation measures for a kettle lake conservation area to ensure that fishing and public swimming is compatible and economically viable.

1990 – Tribute Corporation
Fish habitat assessment and construction mitigation of a proposed boathouse on Lake Simcoe.

1990 – G.L. Sernas Ltd.
Provide access for wild Northern Pike; design a bottom draw fish ladder.

EMPLOYMENT HISTORY

2015 - Present ***Ecosystem Works Inc.***

2015 - Present — President, Senior Ecologist & Project Manager providing professional services in the fields of stream, lake & wetland design, sediment & erosion control, road ecology, species at risk mitigation planning, construction design, post-construction monitoring. Shawn also provides enhanced sediment control on renewable energy facilities prone to runoff & erosion.

Dillon Consulting Limited

2008-2015 — Partner, River and Wetland Restoration Design Specialist providing design expertise and specialized construction services in bioengineering, stream and wetlands restoration. Responsible for construction management of projects in excess of $3 million.

2003-2008	Partner, Office Manager. Management and administrative responsibility for staff, seasonally up to 19 members, construction management and environmental management consulting. Merged three groups and managed relocation of the office.
	Dillon Consulting Limited / Habitat Works! Inc.
1998-2005	President, Habitat Works! Inc., a wholly-owned subsidiary of Dillon. Responsible for administration, management strategy of integrated consulting, greenhouse operations and construction management of ecosystem restoration projects in excess of $1 million.
	Dillon Consulting Limited
1996-1998	Associate and Biologist. Project Manager and Primary Ecosystem Designer of natural stream channels, ecosystem restoration, wetlands and riparian zones. Continued responsibilities in habitat assessment, cumulative impacts, coordination of Fisheries and Oceans Approvals, supervision of environmental site inspectors.
1990-1995	Aquatic Biologist with project management responsibility for design and implementation of fish and wetland habitat restoration projects, transportation planning and input to environmental management and assessment; cumulative impact assessment; environmental effects monitoring; environmental planning; soil bioengineering and stream rehabilitation.
	Ontario Ministry of Natural Resources, Fisheries Branch
1989-1990	Capital Development Biologist, Fish Culture Section. Provided bio-technology for renovation and improved efficiency of provincial fish culture stations. Technical support, policy development and regulatory interpretation for the Ontario aquaculture industry.
	Department of Agriculture, Thailand
1985-1987	Agro-Aquaculture Scientist, Farming Systems Research Institute, Chiang Mai, Thailand. Conducted independent studies on integrated farming and rice/fish culture in areas of slash and burn agriculture, severe erosion, poverty and underdevelopment. Led farmer education programs and published primary research findings.
	Ontario Ministry of Natural Resources, Fisheries Branch
1984-1985	Research Associate, Lake St. Clair Fisheries Assessment Unit. Conducted a literature review on historical fisheries, wetlands classification and fish habitat of Lake St. Clair.
	Limnos Ltd. (Consulting)
1982, 1983 (summers)	Research Associate. Conducted effects monitoring studies related to the aquatic environment. *Cladophora* algae collections, Point Petre, Prince Edward County, Ontario.
	Ontario Hydro (Research)
1981	Student Assistant. Conducted fisheries and environmental effects monitoring near the Bruce and Pickering nuclear generating stations.

TECHNICAL PAPERS

Hasler, C.T., K. Robinson, N. Stow and S. R. Taylor, 2015. Population size and Spatial Ecology of Blandings Turtle (*Emydoidea blandingii*) in South March Highlands, Ottawa, Canada. Can. J. Zoology, 2015, 93(7): 509-514, 10.1139/cjz-2015-0064.

Taylor, S. R. and S. Stoddard, 2014. Terry Fox Drive, March Road to Kanata Avenue, Ottawa; Road Ecology Design Considerations. Proc. Trans. Assoc. Can, Montreal. November 2014

Taylor, S.R., N. Stow, C. Hasler, K. Robinson, 2014. Lessons Learned: Terry Fox Drive Widlife Guide System Intended to Reduce Road Kills and Aid in the Conservation of Blandings Turtle (*Emydoidea blandingii*). Proc. Trans. Assoc . Can, Montreal. November 2014

Taylor, S.R., D. Restivo and J. Wright. 2011. Wildlife Guide System Design at Terry Fox Drive, Ottawa. Ontario Road Ecology Group Conf. May 2011.

Taylor, S.R. and J.W. Little, 2011. Westside Creek and Marsh Reconfiguration Construction; Results – Part III. Canadian Land Reclamation.

Taylor, S.R. and J.W. Little, 2007. Westside Creek and Marsh Reconfiguration Construction; Monitoring – Part II. Canadian Land Reclamation.

Taylor, S.R. and J.W. Little, 2004. Westside Creek and Marsh Reconfiguration Construction Techniques-Part I. Canadian Land Reclamation.

Taylor, S.R. and J.W. Little, 2004. Westside Creek and Marsh Reconfiguration Construction Techniques-Part I. Society for Ecological Restoration Conf., Victoria

Taylor, S.R., 2002. Integrated Natural Channel Design Canadian Land Reclamation, Spring 2002.

Taylor, S.R., 2000. A Technical Primer on Integrated Natural Channel Design and Construction. The Wetland Journal, Spring 2000 issue.

Taylor, S.R. and C.J. Thomas, 1996. A Tale of Two Contractors: Realignment of Spring Creek at Toronto International Airport. Canadian Water Resources Association, Vancouver, October 1996.

Taylor, S.R., 1995. Westside Marsh Fish Habitat Compensation Plan, St. Marys Cement Corporation.

Taylor, S.R., 1992. Implications of the Fisheries Act. Canadian Water Resources Annual Meeting, November 1992, Toronto.

Taylor, S.R. and J.D. Hynes, 1990. Aquaculture Productivity Incentive Program. Summary Report. Ontario Ministry of Natural Resources Technical Bulletin.

Moccia, R.C., J.D. Hynes and S.R. Taylor, 1990. Towards the year 2000, a development plan for the Ontario Aquaculture Industry. Ontario Aquaculture Steering Committee Working Paper.

Taylor, S.R., 1989. The evaluation of septage raised Tilapia (*Oreochromis niloticus*) as a fish meal replacement in the diet of the Black Tiger Shrimp (*Penaeus monodon*) in an intensive recirculation system. Asian Institute of Technology Masters of Science Thesis.

Taylor, S.R., B. Pakdee and D. Klampratum, 1989. Border method and fish-culture synergistic effects on the yield of rice grain. IN R.S.V. Pullin, T. Bhukaswan, K. Tongachai and J.D. MacLean (eds). The 2nd International Symposium on Tilapia in Aquaculture. ICLARM Conf. Proc. 15, Dept. Fish, Bangkok and International Centre for Living Aquatic Resources Management, Manila.

Taylor, S.R., S. Bangliang and D. Klampratum, 1987. Hill areas fish culture: Guidelines for highland pond and rice fish culture. Technical Bulletin, Farming Systems Research Institute, Department of Agriculture, Ministry of Agriculture and Co-operatives, Bangkok.

Taylor, S.R., 1987. Diversified alley cropping, Information Centre for Low External Input Agriculture Newsletter, Vol. 3 (2), p. 12.

PARTICIPATION IN CONFERENCES

Terry Fox Drive, March Road to Kanata Avenue, Ottawa; Road Ecology Design Considerations, Transportation Association of Canada, Montreal. November 2014

Lessons Learned: Terry Fox Drive Widlife Guide System Intended to Reduce Road Kills and Aid in the Conservation of Blandings Turtle (*Emydoidea blandingii*). Transportation Association of Canada, Montreal. November 2014

Terry Fox Drive Wildlife Guide System, Paper and Study Tour Host; Road Ecology Canada, Ontario Road Ecology Group conference, Ottawa, September 2014.

Wildlife Guide System Design at Terry Fox Drive, Ottawa. Ontario Road Ecology Group Conf. May 2011.

The Biophysical Effects of Climate Change on the Mekong River Basin, 2008. Annual Conference, Ontario Professional Society of Engineers.

Getting On Stream with Current Thinking. CWRA 1996 Annual Conference, Vancouver; Presented technical paper.

Wetland Mitigation Course in Wetland Design Criteria, E. Garbisch, Instructor (Maryland, USA), 1995.

Participation in natural channel design conference, Niagara Falls. Poster board given: Holland River natural channel design, February 1994.

Steering Committee and participant: Cumulative Impact Assessment Workshop, American Fisheries Society, Toronto, December 1992.

Participation in a fluvial geomorphology, stream classification workshop and training program. American Society of Fisheries, Ontario Chapter, Rosgen Natural Stream Design Workshop, June 1991.

World Aquaculture '90. Participation in World Aquaculture Society conference, trade show and business meeting. Representative; Ontario Ministry of Natural Resources, World Aquaculture '90, Halifax, Canada, June 10-14, 1990.

Participation in national conference on aquatic technology advances in Canada. Aquatech '90, University of Guelph, Canada, April 1990.

Participation in International conference on the technology, business and biology of shrimp culture in Asia. Shrimp '88, Bangkok, Thailand, February 1988.

The effect of a green manure - rice fish cropping system on the ultimate yield components of rice and fish. Taylor, S.R. and B. Pakdee, 1987. The First Annual Rice/Fish Culture International Symposium, Ubon Rachatani, Thailand, May 1988.

Paper presented (see above), Second International Symposium on Tilapia in Aquaculture (ISTA II). ICLARM, Bangkok, February 1987.

Paper presented: Taylor, S.R., D. Klampratum and P. Natengum, 1986. The synergistic effect of border-effect and fish on a rice-fish strategy for Northern Thailand. Second National Farming Systems Research Conference. Prince of Songkla University, Hat Yai, Thailand, April 1986.

Appendix II
Access Road and Perimeter Areas Restoration Specification
Prepared by Shawn Taylor, Ecosystem Works Inc.

- Note to Reader: The following specification has been prepared specifically as part of the Avoidance and Mitigation Measures as an example of the intent of the proposed works to protect Blanding's Turtle for the White Pines Wind Project. This specification may therefore be altered prior to tendering as more of the detailed design is completed or to provide a greater level of accuracy and precision to bidders. Prepared: July, 2016.

SPEC # - ACCESS ROAD AND PERIMETER AREAS RESTORATION

GENERAL

The work specified herein shall only be completed following delivery of all wind turbine components, including foundation steel, blades, nacelle, structural concrete and when turbine erection, pad mount transformer installation and underground cable installations are complete. There are two tasks to perform under this specification.

Task 1 – Perimeter Restoration: Removal of excess aggregate from the lay-downs, turbine staging areas, temporary road intersections and any disturbed areas outside the 18 m turbine perimeter. Re-application of stockpiled topsoil, fine grading and over seeding are specified herein.

Task 2 - Access Road, Turbine Base and Crane Pad Restoration: Re-grading of the permanent access road surfaces, crane pads, necessary culvert replacements and the re-compaction of the roadway centre core to the dimensions indicated are required under this specification. Turbine bases, outside of the 1 m clear stone step-potential safety ring will require compaction and restoration as part of this task.

General Instructions

1. All construction work, including restorative works, is governed by the wildlife protection guidelines of April 30 – July 15 to protect bird nesting, and May 1 to October 15 to protect the Blanding's Turtle activity period, except where noted otherwise.

2. Comply with requirements of other sections of contract, and co-ordinate activities with other work.

3. Include in the stipulated prices the transport and disposal of all materials required to complete these works according to the details and specifications.

4. The extent of the work is shown schematically on the Contract Drawings. In the case of a discrepancy, the specifications shall take precedence.

5. Both edges of the access roads and crane pads are to be hardened below grade, topsoiled and seeded with heavily rooting plant species to avoid turtle nesting.

6. Maintain and repair as necessary the existing Heavy Duty silt / exclusion fencing as this work is completed. Ensure no gaps between sections or beneath the fencing will allow animals access to the work site.

Related Work

1.	Heavy Duty Silt Fencing	OPSD 219.130
2.	Aggregates: General	Section #
3.	Culvert Installations	Section #

Testing

1. Geotechnical testing is required to confirm the compaction rates of the Granular A surface meet 95% SPD. A Geotechnical Consultant will be retained by the Owner for this purpose.

2. Allow for testing every 50 m or otherwise as instructed by the Consultant.

Restrictions

1. Importation of topsoil is prohibited to minimize the spread of invasive plant species.

PRODUCTS

Materials

1. Tensar Geogrid Triax 130S

2. Native topsoil from stockpiles. Importation of topsoil is not permitted to reduce the spread of invasive species.

3. White Pines Custom Seed Mix: Equal blend by weight of viable seed: 4.7 Kg/ha plus 500 gm/ha each of the following Shrubs and Tree seed:

Wildflowers:
Achillea millefolium White Yarrow
Aquilegia Canadensis Wild Columbine
Asclepias incarnate Red Milkweed
Eupatorium maculate Joe Pye Weed
Monarda fistulosa Bergamot
Oligneuron rigidum Stiff Gonldenrod
Rudbeckia hirta Black-Eyed Susan
Symphyotrichum novae-angliae New England Aster
Verbena hastata Blue Vervain
Native Grass:
Elymus virginicus Virginia Wild Rye

Potential Source: Wildflower Farm, Coldwater, Ont. http://www.wildflowerfarm.com/

Shrubs and Trees:
Juniperis horizontalis Creeping Juniper

Sambucus canadensis	Common Elderberry
Viburnum lentago	Nannyberry
Prunus serotine	Black Cherry
Ostrya viginiana	Hop hornbeam

3. S2 straw aeromat rolled erosion control blanket as needed

EXECUTION

Site Inspection

1. Examine the condition of the access roads and the environmental conditions under which the work will be performed. Some watercourse crossings are required to have culverts replaced, or that may need restoration following use by heavy equipment. Notify the Owner or Consultant of any unsatisfactory conditions and culvert replacements that will be needed. Do not proceed with the work until unsatisfactory conditions have been corrected.

2. Previously installed wildlife exclusionary / silt retention fencing around the perimeter of the work areas is to remain in place temporarily, for a period of not more than six months following demobilization. The contractor is responsible for ongoing maintenance, removals, and disposal until assumption by the Owner or a period of six months following project commissioning, whichever comes first. Wildlife exclusion / silt fencing is governed under a separate specification and payment item.

Perimeter Site Restoration

1. The turbine staging areas around the perimeter of the permanent access roads, crane pads, pad mount transformer, cable trenching and turbine bases are to be restored to original ground conditions. Surfaces to be restored must be stripped of all debris, excess aggregate, geotextile underlay materials, unstable or unconsolidated materials and returned to the original sub-grade. Reuse of the aggregate and relocated to other turbine units or elsewhere is highly encouraged. No stockpiles of aggregate material may remain on the landowners property after construction assumption.

2. All sub-drainage or underground services bridging to within the restoration areas must be completed in conjunction with road base maintenance and during the surface regrading.

3. Replace stockpiled topsoil to a depth of 300 mm or better and rough grade. Do not fine grade.

4. Overseed blended White Pines Custom Seed Mix at 5.2 kg/ha with a rotary spreader or drill seeder. Track pack with a light-weight tracked machine to consolidate seed into soil. Do not fine grade. No mulch or cover is required except as noted elsewhere. Cover restored areas with S2 straw rolled erosion control matting when within 5 m of a watercourse or wetland.

Crane Pad and Turbine Base Restoration

1. Grade off the surface of each crane pad and turbine base to a depth of 200 mm, or as required to ensure there are no depressions or irregularities that may collect water.

2. Fill depressions to a level surface and compact base to 95% SPD. Replace Granular A in lifts of not more than 100 mm, proof roll and compact each lift to 95% SPD. Place a core of Tensar Geogrid 100 mm below the finished surface elevation. Coordinate with geotechnical testing at no less than six locations per pad. Plate-compact remaining surfaces around the edges as best as practical to a minimum of 90% SPD.

3. Replace stockpiled topsoil to a depth of 300 mm or better where adjacent perimeter areas have been removed. Rough grade only, do not fine grade.

4. Overseed topsoil with blended White Pines Custom Seed Mix at 5 kg/ha plus Cover Crop at a rate of 150 kg/ha with a rotary spreader or drill seeder. Track pack with a light-weight tracked machine to consolidate seed into soil. Do not fine grade. No mulch or cover is required except as noted elsewhere. Cover restored areas with S2 straw rolled erosion control matting when within 5 m of a watercourse or wetland.

Restoration of Road Base Granular

1. Working half of each side, grade off and windrow the Granular A surface aggregate to 25 mm above the Granular B base.

2. The Contractor shall verify and ensure that the prepared Granular B road base is restored from damage from inundation by surface water, settlement and damage by other trades to a consistent thickness of 300 mm. Supply, place and compact additional aggregate as deemed necessary to meet the depth specification. No traffic shall be allowed to cross the base while being restored. Repair of damage resulting from prior activities shall be the responsibility of the Contractor and shall be repaired in a satisfactory manner.

3 Proof roll and compact the base aggregate to meet the required cross fall and grades. Compacted base granular shall be 95% of the maximum Standard Proctor Density achieved in accordance with ASTM Specification D.698. Provide access for geotechnical testing and allow for results to be transmitted to the Owner or his Consultant for verification to proceed. Further construction shall not proceed until the base has been approved by the Owner or his Consultant.

Surface Drainage

1. Gradients and cross-falls shall have a minimum value of 2% (1/4" per foot).

Culvert Inspection

1. Any culverts which have been structurally damaged during previous phases of construction, or during restoration compaction, shall be immediately removed and replaced upon the approval of the Constructor.

Restoration of Granular A Surfaces

1. The upper surface of the Granular B base shall be sufficiently well graded and compacted to prevent infiltration of the bedding sand into the base both during construction and throughout its service life.

2. Additional compaction should not be attempted within 200 mm of the topsoiled edge during the restoration works. If repairs to underground services are required, the full width of the disturbance across the access road should be re-compacted to the full width and length of the disturbance allowing for a minimum of 1.0 m horizontal replacement of the Geogrid on either side of the cross trench / disturbed soils.

3. Place a single 100 mm lift of Granular A overtop of the prepared Granular B base and compact to 95% SPD to meet cross fall requirements. Proof roll, moisten with water and compact with vibratory heavy equipment.

4. Place Tensar Geogrid over the width of the compacted Granular A and Gabion Stone shoulders.

5. Place a final 100 mm lift of Granular A overtop of the Tensar Geogrid to meet grades and crossfall. Proof roll and compact the final lift to 95% SPD to meet finished grades and drainage cross fall. Allow for geotechnical testing every 50 m linear to verify compaction rates are satisfactory before moving on.

6. Provide a compacted, finished 200 mm thickness of Granular A as a permanent surface, with a Tensar geogrid core through the centre as indicated in the drawings. The finished, compacted surface shall be 95% of maximum Standard Proctor Density achieved in accordance with ASTM Specification D.698.

7. Replace topsoil over the gabion stone and overseed as required.

Final Acceptance of Access Road Restoration

1. After the core has been compacted, final inspections and signoff may proceed.

2. Inspection by the Owner, the Consulting Biologist and the Consulting Engineer shall determine whether additional work to inhibit turtle nesting is required, which would be at additional cost under a change order.

Clean Up

1. Pick up and remove from the site all surplus materials, equipment and debris resulting from this section of the work.

2. Reposition, maintain and restore the exclusionary (silt) fences with Heavy Duty Silt Fence following OPSS 219.130, with the mesh back facing towards the road surfaces.

Tolerance of Surface Profile

1. All road surfaces, crane pad surfaces, culvert structure and surrounding surfaces shall be true to the lines, levels, grades, thickness and cross sections as shown on the drawings and in this specification.

2. All restored perimeter surfaces shall be finished to meet the road grades with topsoil, seed and track packed into place.

3. All finished surfaces shall be finished to lines and levels to ensure positive drainage at all drainage outlets, culverts and channels. In no case, shall the cross-fall of any portion of the finished granular surface be less than two percent (1/4"/ft).

PAYMENT

Measurement for Payment

Measurement for payment of **Task 1: Perimeter Restoration** shall be by lump sum. Measurement for payment of removal and disposal of silt fencing after six months post-restoration will be by a separate lump sum amount.

Measurement for payment of **Task 2: Restoration of the Access Roads, Wind Turbine Bases and Crane Pads** shall be per square meter.

Basis of Payment

Task 1 – Perimeter Restoration: Payment at the contract lump sum price for this item shall be in full compensation for all labour, equipment and supply and installation of materials, complete as described herein and as shown on the contract drawings. Payment for excavation and backfill required to replace topsoil, supply of seed, placement of seed and track packing to meet grades is deemed to be included in payment for the perimeter restoration item.

The lump sum payment for silt fence removal and disposal, six months after demobilization, will deem to include all labour, equipment, tipping fees and transport to a licensed waste management facility.

Task 2 - Access Road and Crane Pad Restoration: Payment at the unit price for this item shall be full compensation for all labour, equipment, supply and installation of new materials, complete as described herein and as shown on the contract drawings, except as noted herein. Item includes payment for restoring all Access Roads, Crane Pads and Wind Turbine Bases. Payment for the regrading, geogrid and compaction required to meet the 95% SPD requirement shall be deemed to be included in the unit prices. Payment for geotechnical testing shall be borne by the Owner.

The supply price of replacement culverts will be additional on an as-needed basis, pending a request for an approved change order to the Constructor.

Appendix III
Access Road and Perimeter Areas Construction Specification
Prepared by Shawn Taylor, Ecosystem Works Inc.

- Note to Reader: The following specification has been prepared specifically as part of the Avoidance and Mitigation Measures as an example of the intent of the proposed works to protect Blanding's Turtle for the White Pines Wind Project. This specification may therefore be altered prior to tendering as more of the detailed design is completed or to provide a greater level of accuracy and precision to bidders. Prepared: July, 2016.

SPEC # - ACCESS ROAD AND PERIMTER AREAS CONSTRUCTION

GENERAL

The work specified herein shall govern the placement of specific planned aggregate surfaces to construct the permanent access roads, crane pads and additional temporary surfaces meant to facilitate delivery and erection of the wind turbine components, transformer installation and underground cable installations on participating land owner properties. Site preparation, clearing and grubbing, topsoil stripping and management, gate installations, silt fencing and signage are covered under separate specifications. Placement of aggregates over the turbine foundations and grounding grid are covered under separate specifications.

There are two tasks to integrate and perform under this specification.

Task 1 – Perimeter Work Areas Construction: This task covers the placement of aggregate for the lay-down, turbine staging area, temporary road intersection and other work areas outside the 18 m turbine perimeter, as indicated in the contract drawings. These surfaces are to be temporary and shall be removed immediately following the installation of the turbines, transformers and cabling associated with each group of turbines, when the heavy haul roads are no longer needed.

Task 2 - Access Road and Crane Pad Construction: This task covers the supply, placement, grading of the access road surfaces, necessary culvert installations, compaction of the roadway centre core & side slopes, and application of top soil to the dimensions indicated in the contract. Supply, placement and grading of the compacted crane pads is included as they will remain in place permanently. Re-application of stockpiled topsoil, rough grading and over seeding that buttress the roads and crane pads are specified herein.

General Instructions

1. All construction work is governed by the wildlife protection guidelines of April 30 – July 15 to protect bird nesting, and May 1 to October 15 to protect the Blanding's Turtle activity period, except where noted otherwise.

2. Comply with requirements of other sections of the Renewable Energy Approvals, the general construction contract, and co-ordinate activities with other site work.

2. Include in the stipulated prices is the transport of all materials required to complete these works according to the details and specifications.

3. The extent of the work is shown schematically on the Contract Drawings. In the case of a discrepancy, the specifications shall take precedence.

4. All surfaces of the access roads and crane pads are to be compacted to 95% Standard Proctor Density (SPD) to avoid turtle nesting during the construction and operational periods.

5. Coordinate the installation and maintenance of heavy duty silt / wildlife exclusion fencing around the perimeter of the work area following OPSD 219.130. Where soil depth is 10 cm or bears onto rock, place 200 mm native soil or granular B over bottom flap to ensure no gaps appear beneath the fencing materials. Ensure joints between sections allow no gaps where animals may get through.

Related Work

1.	Grubbing and Stripping	Section #
2.	Heavy Duty Silt Fencing	OPSD 219.130
2.	Aggregates: General	Section #
3.	Culvert Installations	Section #
4.	Turbine Foundations	Section #
5.	Step Potential Grounding Grid Installation	Section #
6.	Layout and Surveying	Section #

Testing

1. Geotechnical testing is required to confirm that the compaction rates of the Granular B base and the Granular A bearing surfaces both meet 95% SPD and to record the average side slope rates of compaction. A Geotechnical Consultant will be retained by the Owner for this purpose.

2. Allow for testing every 50 m or otherwise as instructed by the Consultant.

Restrictions

1. Importation of topsoil is prohibited to minimize the spread of invasive plant species.

PRODUCTS

Materials

1. Tensar TriAx 130S Geogrid underlay or equivalent (for installation during the restoration phase, paid under separate specification)

2. Nonwoven geotextile filter fabric TR125 or equivalent

3. Aggregates shall be:

   a) Granular A
   b) Granular B

c) 4 – 6” angular gabion stone

(See drawings to determine quantities.)

4. Native topsoil from stockpiles. Importation of topsoil is not permitted to reduce the spread of invasive species.

5. White Pines Custom Seed Mix: Equal blend by weight of viable seed: 4.7 Kg/ha plus 500 gm/ha each of the following Shrubs and Tree seed:

Wildflowers:

Achillea millefolium	White Yarrow
Aquilegia Canadensis	Wild Columbine
Asclepias incarnate	Red Milkweed
Eupatorium maculate	Joe Pye Weed
Monarda fistulosa	Bergamot
Oligneuron rigidum	Stiff Gonldenrod
Rudbeckia hirta	Black-Eyed Susan
Symphyotrichum novae-angliae	New England Aster
Verbena hastata	Blue Vervain

Native Grass:

Elymus virginicus	Virginia Wild Rye

Potential Source: Wildflower Farm, Coldwater, Ont. http://www.wildflowerfarm.com/

Shrubs and Trees:

Juniperis horizontalis	Creeping Juniper
Sambucus canadensis	Common Elderberry
Viburnum lentago	Nannyberry
Prunus serotine	Black Cherry
Ostrya viginiana	Hop hornbeam

5. S2 straw aeromat rolled erosion control blanket as needed

EXECUTION

Site Inspection & Preparation

1. Examine the condition of the terrain and the environmental conditions under which the work will be performed. Some watercourse crossings are required to have culverts placed, that may need periodic replacement or restoration following use by heavy equipment. Notify the Owner or Consultant of any unsatisfactory conditions and culvert replacements that will be needed. Do not proceed with the work until the unsatisfactory conditions have been corrected.

2. Clear vegetation, grub roots, strip topsoil and prepare subsoil to establish a firm sub-grade as specified.

Access Road Construction

1. Place Geotextile filter fabric aggregate over prepared area of subgrade. Place lifts of not more than 100 mm of Granular B and 4-6" gabion stone on shoulders as detailed in the contract drawings. Proof roll and compact each 100 mm lift to 95% SPD to meet finished grades and cross fall. Allow for geotechnical testing to verify compaction rates are satisfactory before moving on.

2. Blend topsoil into the gabion stone at a rate of 70% stone and 30% dry topsoil. Reserve for use where indicated.

3. Replace stockpiled topsoil to a minimum depth of 300 mm or better and rough grade, only to match the surface road grade and native ground. Do not fine grade.

4. Overseed blended seed mixture at a rate of White Pines Custom Seed Mix 5 kg/ha plus Cover Crop 150 kg/ha with a rotary broadcast spreader or drill seeder. No mulch or cover is required except as noted elsewhere or where slopes are adjacent to watercourses or wetlands. In these cases cover with S2 straw aeromat rolled erosion control blanket to a width of not less than 5.0 m from the creek bank.

5. Track pack with a Dresser Blade or light-weight tracked machine to consolidate seed into soil. Do not fine grade.

Compaction of Access Road Side Slopes

1. During final compaction of the top road surfaces, the side slopes and shoulder edge shall be compacted to achieve consolidation of the Granular A aggregate and 4-6" Gabion Stone – Topsoil underlay. These layers are to be brought to design levels and profiles by not less than three passes of a suitable plate compactor.

2. Compaction of the side slopes shall be accomplished by the use of a plate compactor capable of a minimum of a 5,000 pound compaction force.

3. Side slope compaction should proceed as closely as possible following initial compaction of the road surface, and prior to backfilling with topsoil.

Crane Pad Construction

1. Excavate sub-soil to a minimum depth of 600 mm and establish a firm sub-grade. Level and consolidate. Three grading scenarios are possible, depending on the native land gradient as shown in the contract drawings.

2. Place Granular A in lifts of not more than 100 mm, proof roll and compact to 95% SPD. Allow for geotechnical testing in place.

3. Compact final grade to 95% SPD.

4. Blend topsoil into the gabion stone at a rate of 70% stone and 30% dry topsoil. Reserve for use where indicated

5. Place ramp of 6” gabion stone – topsoil blend as needed for vehicle access to the access road, or to buttress the perimeter of the crane pad to the native ground surface. Plate compact, to the best practical level of compaction.

6. Place topsoil, rough grade, overseed and track pack to consolidate the seed bed as specified.

Temporary-Use Perimeter Work Areas

1. The use of granular materials in the laydown and staging areas will be at the contractors discretion. Some aggregate may be necessary in moist or wet conditions however must be taken up for disposal off site during the restoration works.

2. Clear vegetation, grub roots, strip and stockpile topsoil to expose the subsoils. Excavate as required to provide a firm base for staging of equipment and turbine components.

Surface Drainage

1. Gradients and cross-falls shall have a minimum value of 2% (1/4" per foot).

2. All culverts to be elliptical in shape to allow passage of turtles. Sizing to be determined by hydrologist during detailed design.

3. Protect all watercourse and wetland crossings with silt fence as specified in the stormwater management design report and specifications.

Clean Up

1. Pick up and remove from the site all surplus materials, equipment and debris resulting from this section of the work.

2. Reposition, maintain and restore the wildlife exclusionary (silt) fences with Heavy Duty Silt Fence following OPSS 219.130, with the mesh back facing towards the road surfaces.

Tolerance of Surface Profile

1. All surface, culvert structures and compacted surfaces shall be true to the lines, levels, grades, thickness and cross sections as shown on the drawings and in this specification.

2. All perimeter surfaces shall be finished to meet the native grades with topsoil, seed and track packed into place.

3. All completed surfaces shall be finished to lines and levels to ensure positive drainage at all drainage outlets, culverts and channels. In no case, shall the cross-fall of any portion of the finished granular surface be less than two percent (1/4"/ft).

PAYMENT

Measurement for Payment

Measurement for payment of **Task 1 – Perimeter Work Areas Construction** shall be by lump sum. Measurement for payment of installation of wildlife exclusion / silt fencing will be per linear metre.

Measurement for payment of **Task 2 - Access Road and Crane Pad Construction** shall be per square meter defined separately.

BASIS OF PAYMENT

Task 1 – Perimeter Work Areas Construction: Payment at the contract lump sum price for this item shall be in full compensation for all labour, equipment and supply and installation of materials, complete as described herein and as shown on the contract drawings. Payment for excavation, transport, backfill and rough grading required to install topsoil, supply and place seed and machine track packing to meet grades is deemed to be included in payment for the perimeter work areas construction item.

Task 2 - Access Road and Crane Pad Construction: Payment at the unit price for this item shall be full compensation for all labour, equipment, supply and installation of materials, complete as described herein, except as noted below, and as shown on the contract drawings.

Payment for Tensar Geogrid supply and installation is made under a separate (Access Road Restoration) item and is not to be installed during the initial construction phase.

Item includes payment for construction of all Access Roads and Crane Pads including the supply and placement of culverts. Payment for aggregate surfacing of the Wind Turbine Bases is by separate item. Payment for the grading of each lift and the compaction effort required to meet the 95% SPD requirement shall be deemed to be included in the unit prices. Payment for geotechnical testing shall be borne by the Owner.

The supply price of unforeseen culvert replacements will be additional on an as-needed basis, pending a request for an approved change order to the Constructor.

Appendix IV
Proposed Custom Seed Mix
Prepared by Wildflower Farm Inc. for Ecosystem Works Inc.

Wildflower Farm Inc.

10195 Hwy 12 West, R.R. #2
Coldwater, Ontario, Canada L0K 1E0
Toll Free: 1 866 GRO WILD (1 866 476 9453)
web site: www.wildflowerfarm.com
e-mail: info@wildflowerfarm.com

White Pines Custom Seed Mix - Proposed - 100 ha

Seed #	Latin Name	Common Name	% by seed count	% by wgt.	Grams Required	Seed count	Seed Price	Height	Colour
10005	*Achillea millefolium*	White Yarrow	8.08%	0.60%	2875	17666875	$1,164.38	1' - 2'	white
10930	*Aquilegia canadensis*	Wild Columbine	7.04%	2.41%	11500	15398500	$25,875.00	1' - 3'	red/yellow
11530	*Asclepias incarnata*	Red Milkweed	4.44%	12.05%	57500	9717500	$64,687.50	3' - 5'	pink/red
11570	*Asclepias syriaca*	Common Milkweed	0.74%	2.41%	11500	1621500	$10,350.00	3' - 5'	lavender
13240	*Eupatorium maculatum*	Joe Pye Weed	4.40%	0.60%	2875	9625500	$3,881.25	4' - 6'	pink/red
16040	*Monarda fistulosa*	Bergamot	6.48%	1.20%	5750	14185250	$3,363.75	2' - 5'	lavender
16270	*Oligoneuron rigidum*	Stiff Goldenrod	7.60%	2.41%	11500	16617500	$10,350.00	2' - 5'	yellow
18040	*Rudbeckia hirta*	Black Eyed Susan	17.04%	2.41%	11500	37283000	$5,175.00	1' - 3'	yellow
19040	*Symphyotrichum novae-angliae*	New England Aster	12.23%	2.41%	11500	26749000	$12,937.50	3' - 6'	pink/purple
19540	*Verbena hastata*	Blue Vervain	8.62%	1.20%	5750	18848500	$3,234.38	2' - 5'	blue
	Total Wildflower Seeds		**76.66%**	**27.71%**	**132250**	**167713125**	**$141,018.75**		

Seed #	Native Grasses Latin Name	Common Name	% by seed count	% by wgt.	Grams Required	Seed count	Seed Price	Height	Colour
23550	*Elymus virginicus*	Virginia Wild Rye	23.34%	72.29%	345000	51060000	$31,050.00	2' - 4'	green
	Total Native Grasses		**23.34%**	**72.29%**	**345000**	**51060000**	**$31,050.00**		

Subtotal Wildflowers & Native Grasses	**100.00%**	**100.00%**	**477250**	**218773125**	**$172,068.75**	
Seed Mixing Labour			Grams		**$625.26**	
Shipping Cost					**$500.00**	
HST			477.25		**$22,433.94**	
Total Cost			KG		**$195,627.95**	
				$ per sq. m	$1.96	

Appendix V
Secondary Road Improvements Specification
Prepared by Shawn Taylor, Ecosystem Works Inc.

- Note to Reader: The following specification has been prepared specifically as part of the Avoidance and Mitigation Measures as an example of the intent of the proposed works to protect Blanding's Turtle for the White Pines Wind Project. This specification may therefore be altered prior to tendering as more of the detailed design is completed or to provide a greater level of accuracy and precision to bidders. Prepared: July, 2016.

SPEC # - SECONDARY ROAD IMPROVEMENTS

GENERAL

The work specified herein shall govern the temporary upgrading of three municipal secondary roads within the project area. It also specifies the restoration of the roads back to their original conditions immediately following delivery and erection of the turbines. Wherever possible, the underlying road bed structure is to remain in place, relatively undisturbed, with the temporary road topping up the already-firm base.

There are three sections of road to complete (lengths are approximations):

- Lighthall Road south of Royal Road for access to Army Reserve Road – 1,900 m
- Hill Top Road west of Brewers Road to the access road to turbines T18, T19 & T20 – 660 m
- Whattams Road north of Babylon Road to the access road for Turbine T25 – 800 m

There are two tasks to integrate and perform under this specification.

Task 1 – Secondary Road Improvement Construction: This task covers the sub-grade preparation, potential culvert installations and placement of aggregate for the secondary road improvements, as indicated in the contract drawings. A pre-construction survey and GPS-linked video survey will be completed by the Owner for use by the Contractor to verify that the existing conditions have been replicated. These surfaces are for temporary use, and shall be removed immediately following the installation of the turbines, transformers and cabling associated with each specified group of turbines, when the heavy haul roads are no longer needed.

Task 2 – Secondary Road Restoration: This task covers the removal of previously placed materials in the shoulders, trim grading of the temporary municipal road surfaces, survey verification and re-application of top soil and seed as needed to meet the dimensions indicated in the pre-construction survey.

General Instructions

1. All construction work is governed by the wildlife protection guidelines of April 30 – July 15 to protect migratory bird nesting, and May 1 to October 15 to protect the Blanding's Turtle activity period, except where noted otherwise.

2. Roadside shrubs, trees and grasses within 2.0 m of the existing roadside are to be trimmed flush to ground level. No topsoil stripping or grubbing of roots is allowed.

3. Comply with requirements of other sections of the Renewable Energy Approvals, the general construction contract, and co-ordinate activities with other site work.

4. Included in the stipulated prices is the supply, transport and disposal of all materials required to complete these works according to the details and specifications.

5. The extent of the work is shown schematically on the Contract Drawings. In the case of a discrepancy, the specifications shall take precedence.

6. All surfaces of the temporary roads are to be compacted to 95% Standard Proctor Density (SPD), or best possible density, to avoid turtle nesting during the construction period.

7. Coordinate the installation and maintenance of heavy duty silt fencing at water crossings following OPSD 219.130 at locations specified in the contract drawings.

Related Work

1.	Excavation	Section #
2.	Heavy Duty Silt Fencing	OPSD 219.130
3.	Aggregates: General	Section #
4.	Culvert Installations	Section #
5.	Layout and Surveying	Section #
6.	Road Closures and Traffic Management	Section #

7. Traffic Management Plan; Wildlife Management Plan

Testing

1. Geotechnical testing is required to confirm that the compaction rates of the Granular B base, and the Granular A bearing surfaces, both meet 95% SPD and to record the average side slope rates of compaction. A Geotechnical Consultant will be retained by the Owner for this purpose.

2. Allow for testing every 50 m or otherwise as instructed by the Consultant.

Restrictions

1. Each segment of the secondary temporary road improvements are to be restored immediately, within 15 business days following erection of the final turbine within the group identified above, or where this period falls outside of the specified time restrictions, at the direction of the Constructor in consultation with the Project Biologist or qualified person.

2. Importation of topsoil is prohibited to minimize the spread of invasive plant species.

PRODUCTS

Materials

1. Aggregates shall be:

   a) Granular A
   b) Granular B

   Re-use of aggregates is encouraged where feasible.

   (See drawings to determine quantities.)

2. Topsoil drawn from on-site stockpiles.

3. White Pines Custom Seed Mix: Equal blend by weight of viable seed: 4.7 Kg/ha plus 500 gm/ha each of the following Shrubs and Tree seed:

Wildflowers:

Achillea millefolium	White Yarrow
Aquilegia Canadensis	Wild Columbine
Asclepias incarnate	Red Milkweed
Eupatorium maculate	Joe Pye Weed
Monarda fistulosa	Bergamot
Oligneuron rigidum	Stiff Gonldenrod
Rudbeckia hirta	Black-Eyed Susan
Symphyotrichum novae-angliae	New England Aster
Verbena hastata	Blue Vervain

Native Grass:

Elymus virginicus	Virginia Wild Rye

Potential Source: Wildflower Farm, Coldwater, Ont. http://www.wildflowerfarm.com/

Shrubs and Trees:

Juniperis horizontalis	Creeping Juniper
Sambucus canadensis	Common Elderberry
Viburnum lentago	Nannyberry
Prunus serotine	Black Cherry
Ostrya viginiana	Hop hornbeam

4. S2 straw aeromat rolled erosion control blanket as needed

EXECUTION

Site Inspection & Preparation

1. Examine the condition of the existing road structure and the environmental restrictions under which the work will be performed. Some watercourse crossings are required to have culverts replaced, that may need periodic replacement or restoration following use by heavy equipment. Notify the Owner or Consultant of any unsatisfactory conditions and culvert replacements that will be needed. Do not proceed with the work until the unsatisfactory conditions have been corrected.

2. Prepare and install signage noting road closures, temporary detours, wildlife crossings and project vehicle speeds on the municipal roads.

Secondary Road Construction

1. Cut growing vegetation flush to the ground without disturbing the rootzone. Do not grub or strip topsoil. Remove trimmings to the side, away from the work area.

2. Scarify the existing road base to a depth of 200 mm, grade level and proof roll to establish a firm, consolidated sub-grade as specified. Compact to 90% SPD or best achievable.

3. Excavate shoulder areas nominally 600 mm wide to a depth of 500 mm. Remove and dispose of fill. In case of encountering bedrock, stop there. Backfill Granular B in 100 mm lifts, compact to 90% SPD or best achievable.

4. In lifts of not more than 100 mm between compaction runs, place and compact Granular A as detailed in the contract drawings. Proof roll and compact each 100 mm lift to 95% SPD to meet finished grades and cross fall. Allow for geotechnical testing to verify compaction rates are satisfactory before moving on.

5. Coordinate work with cable trench crossings to ensure adequate roadbed compaction during bridging operations.

Compaction of Secondary Road Side Slopes

1. During final compaction of the top road surfaces, the side slopes and shoulder edge shall be compacted to achieve consolidation of the Granular A aggregate. These layers are to be brought to design levels and profiles by not less than three passes of a suitable plate compactor.

2. Compaction of the side slopes shall be accomplished by the use of a plate compactor capable of a minimum of a 5,000 pound compaction force.

3. Side slope compaction should proceed as closely as possible following initial compaction of the road surface, and prior to use by heavy equipment.

4. Side slopes are likely to require periodic maintenance to maintain the structure of the roadbed. The Contractor is responsible for maintenance as included in this item.

Surface Drainage

1. Gradients and cross-falls shall have a minimum value of 2% (1/4" per foot).

2. All replacement culverts to be elliptical in shape to allow passage of turtles. Sizing to be determined by a hydrologist during detailed design.

3. Protect all watercourse and wetland crossings with silt fence as specified in the stormwater management design report and specifications.

Restoration of Secondary Roads

1. The secondary temporary road improvements are to be removed immediately, within 15 business days following erection of the final turbine within the group identified above, or if this period falls outside of the specified time restrictions, at the direction of the Constructor in consultation with the Project Biologist or qualified person.

2. Grade the Granular A to a winrow in the centre of the road. Excavate the 600 mm wide shoulder regions to remove all Granular B.

3. Backfill 200 mm lifts with topsoil and consolidate to a level to match the new road surface. Consolidate with plate compactor as above. Grade-out the Granular A, eliminating the shoulder edges, and proof roll. Trim topsoil to meet the new granular edge. Rough-grade the topsoil to match the grades of the road surface and the adjacent native ground. Do not fine grade

4. Verify that the restored roadway complies with the pre-existing survey and video record.

5. Overseed blended seed mixture at a rate of White Pines Custom Seed Mix 4.7 kg/ha with a rotary broadcast spreader. No mulch or cover is required except as noted elsewhere or where slopes are adjacent to watercourses or wetlands. In these cases cover with S2 straw aeromat rolled erosion control blanket to a width of not less than 5.0 m from the creek bank.

6. Track pack with a Dresser Blade or light-weight tracked machine to consolidate seed into soil. Do not fine grade.

7. Re-grade surface of secondary roadway to meet Municipal standard of 2% cross fall.

8. The Owner will complete a vegetation survey prior to project acceptance and demobilization. Road edges remaining bare of vegetation or where there is sparse growth, will be identified by the Owner for targeted restoration, which may require hand work and reseeding. The Contractor is therefore responsible for ensuring the vegetation has recovered to a density that meets the Municipal Standards and satisfaction of the Owner prior to project acceptance.

Clean Up

1. Pick up and remove from the site all surplus materials, equipment and debris resulting from this section of the work. Recycling and reuse of materials is encouraged.

2. Reposition, maintain and restore the silt fences with Heavy Duty Silt Fence following OPSS 219.130, with the mesh back facing away from the road surfaces.

Tolerance of Surface Profile

1. All surface, culvert structures and compacted surfaces shall be true to the lines, levels, grades, thickness and cross sections as shown on the drawings, in this specification and the pre-existing survey and video recording.

2. Disturbed native surfaces within 2.0 m horizontal of the original road edge shall be finished to meet the native grades with topsoil, seeded and track packed into place.

3. All completed surfaces shall be finished to lines and levels to ensure positive drainage at all drainage outlets, culverts and channels. In no case, shall the cross-fall of any portion of the finished granular surface be less than two percent (1/4"/ft).

4. Provide as-built and post restoration drawings to the Owner.

PAYMENT

Measurement for Payment

Measurement for payment of **Task 1 – Secondary Road Improvement Construction** shall be by square metre. Measurement for payment of installation of silt fencing will be per linear metre under separate item.

Measurement for payment of **Task 2 - Secondary Road Restoration** shall be per square meter defined separately.

BASIS OF PAYMENT

Task 1 – Secondary Road Improvement Construction: Payment at the contract unit price for this item shall be in full compensation for all labour, equipment, supply and installation of materials, complete as described herein and as shown on the contract drawings. Payment for supply, excavation, transport, backfill and compaction required to install aggregates to meet grades is deemed to be included in payment for this item. Item includes payment for traffic management of the secondary roads including the supply and placement of signage and as-built drawings.

Payment for the grading of each lift and the compaction effort required to meet the 95% SPD requirement shall be deemed to be included in the unit prices. Payment for geotechnical testing and independent surveying shall be borne by the Owner.

The supply price of unforeseen culvert replacements will be additional on an as-needed basis, pending a request for an approved change order to the Constructor.

Task 2 - Secondary Road Restoration: Payment at the unit price for this item shall be full compensation for all labour, equipment, removal of materials and disposal, complete as described herein, and as shown on the contract drawings. Roadside vegetation re-establishment will be required to meet the Municipal standard and the Owners satisfaction.

Appendix VI
Tertiary Road Improvement Construction Specification
Prepared by Shawn Taylor, Ecosystem Works Inc.

- Note to Reader: The following specification has been prepared specifically as part of the Avoidance and Mitigation Measures as an example of the intent of the proposed works to protect Blanding's Turtle for the White Pines Wind Project. This specification may therefore be altered prior to tendering as more of the detailed design is completed or to provide a greater level of accuracy and precision to bidders. Prepared: July, 2016.

SPEC # - TERTIARY ROAD IMPROVEMENT CONSTRUCTION

GENERAL

The work specified herein shall govern the temporary upgrading of three municipal tertiary roads within the project area. It also specifies the restoration of the roads back to their original conditions immediately following delivery and erection of the turbines. Wherever possible, the underlying road bed and surrounding vegetation are to remain in place, relatively undisturbed, with the temporary road 'floating' on top.

There are three sections of road to complete (lengths are approximations):

- Army Reserve Road east of Hilltop Road to the access road for turbines T13 thru T16 – 1,460 m
- Hill Top Road east of Brewers Road to the access road for turbines T21 & T22 – 1,520 m
- Helmer Road west of Babylon Road to the access road for Turbines T23 & T24 – 2,060 m

There are two tasks to integrate and perform under this specification.

Task 1 – Tertiary Road Improvement Construction: This task covers the sub-grade preparation, geogrids, necessary culvert installations and placement of aggregate for the tertiary road improvements, as indicated in the contract drawings. A pre-construction survey and GPS-linked video survey will be completed by the Owner for use by the Contractor to verify that the existing conditions have been replicated. These surfaces are to be for temporary use, and shall be removed immediately following the installation of the turbines, transformers and cabling associated with each group of turbines, when the heavy haul roads are no longer needed.

Task 2 – Tertiary Road Restoration: This task covers the removal of previously placed materials, trim grading of the temporary municipal road surfaces, survey verification and re-application of top soil as needed to meet the dimensions indicated in the pre-construction survey.

General Instructions

1. All construction work is governed by the wildlife protection guidelines of April 30 – July 15 to protect migratory bird nesting, and May 1 to October 15 to protect the Blanding's Turtle activity period, except where noted otherwise.

2. Roadside shrubs, trees and grasses within 2.0 m of the roadside are to be trimmed flush to ground level. No topsoil stripping or grubbing of roots is allowed.

3. Comply with requirements of other sections of the Renewable Energy Approvals, the general construction contract, and co-ordinate activities with other site work.

4. Included in the stipulated prices is the supply, transport and disposal of all materials required to complete these works according to the details and specifications.

5. The extent of the work is shown schematically on the Contract Drawings. In the case of a discrepancy, the specifications shall take precedence.

6. All surfaces of the temporary roads are to be compacted to 95% Standard Proctor Density (SPD), or best possible density, to avoid turtle nesting during the construction period.

7. Coordinate the installation and maintenance of heavy duty silt fencing around the watercourse crossings following OPSD 219.130 at locations specified in the contract drawings.

Related Work

1. There shall be no Grubbing and Stripping related to this item.

2. Heavy Duty Silt Fencing OPSD 219.130

3. Aggregates: General Section #

4. Culvert Installations Section #

5. Layout and Surveying Section #

6. Road Closures and Traffic Management Section #

7. Traffic Management Plan; Wildlife Management Plan

Testing

1. Geotechnical testing is required to confirm that the compaction rates of the Granular B base and the Granular A bearing surfaces both meet 95% SPD and to record the average side slope rates of compaction. A Geotechnical Consultant will be retained by the Owner for this purpose.

2. Allow for testing every 50 m or otherwise as instructed by the Consultant.

Restrictions

1. Each segment of the tertiary temporary road improvements are to be removed immediately, within 15 business days following erection of the final turbine within the group identified above, or where this period falls outside of the specified time restrictions, at the direction of the Constructor in consultation with the Project Biologist or qualified person.

2. Importation of topsoil is prohibited to minimize the spread of invasive plant species.

PRODUCTS

Materials

1. Tensar TriAx 130S Geogrid underlay or equivalent
   Nonwoven geotextile filter fabric TR125 or equivalent

2. Aggregates shall be:

   a) Granular A
   b) Granular B

   Re-use of aggregates and geotextile is encouraged where feasible.

   (See drawings to determine quantities.)

3. White Pines Custom Seed mix and S2 straw aeromat rolled erosion control blanket as needed

EXECUTION

Site Inspection & Preparation

1. Examine the condition of the existing road structure and the environmental restrictions under which the work will be performed. Some watercourse crossings are required to have culverts replaced, that may need periodic replacement or restoration following use by heavy equipment. Notify the Owner or Consultant of any unsatisfactory conditions and culvert replacements that will be needed. Do not proceed with the work until the unsatisfactory conditions have been corrected.

2. Prepare and install signage noting road closure(s), temporary detours, wildlife crossings and project vehicle speeds on the municipal roads.

Tertiary Road Construction

1. Cut growing vegetation flush to the ground without disturbing the rootzone. Do not grub or strip topsoil. Remove trimmings to the side, away from the work area.

2. Scarify the existing road base to a depth of 200 mm, grade level and proof roll to establish a firm, consolidated sub-grade as specified. Compact to 90% SPD or best achievable.

3. Place non-woven Geotextile filter fabric over prepared area of subgrade and shoulders to at least 1500 mm outward from the edge of the existing roadway. Drape directly over trimmed vegetation and undisturbed topsoil.

4. Place one 3.0 m wide panel of Geogrid overtop of Geotextile along either shoulder (i.e., two panels per linear section), to 1500 mm from the edge of the existing roadway. Roughly 1500 mm will therefore be pinched beneath new aggregate above the existing road, and 1350 mm will lay above the topsoil layer. Allow for 150-200 mm freeboard due to the varying terrains.

5. In lifts of not more than 100 mm between compaction runs, place Granular B and then Granular A, as detailed in the contract drawings. Proof roll and compact each 100 mm lift to 95% SPD to meet finished grades and cross fall. Allow for geotechnical testing to verify compaction rates are satisfactory before moving on.

Compaction of Tertiary Road Side Slopes

1. During final compaction of the top road surfaces, the side slopes and shoulder edge shall be compacted to achieve consolidation of the Granular A/B aggregate. These layers are to be brought to design levels and profiles by not less than three passes of a suitable plate compactor.

2. Compaction of the side slopes shall be accomplished by the use of a plate compactor capable of a minimum of a 5,000 pound compaction force.

3. Side slope compaction should proceed as closely as possible following initial compaction of the road surface, and prior to use by heavy equipment.

4. Side slopes are likely to require periodic maintenance to maintain the structure of the roadbed. The Contractor is responsible for maintenance as included in this item.

Surface Drainage

1. Gradients and cross-falls shall have a minimum value of 2% (1/4" per foot).

2. All replacement culverts to be elliptical in shape to allow passage of turtles. Sizing to be determined by a hydrologist during detailed design.

3. Protect all watercourse and wetland crossings with silt fence as specified in the stormwater management design report and specifications.

Restoration of Tertiary Roads

1. The tertiary temporary road improvements are to be removed immediately, within 15 business days following erection of the final turbine within the group identified above, or if this period falls outside of the specified time restrictions, at the direction of the Constructor in consultation with the Project Biologist or qualified person.

2. Grade the Granular A to a winrow in the centre of the road, remove and transport to stockpiles for reuse. Separately, grade the Granular B to a winrow, remove and transport to stockpiles for reuse.

3. Remove, reuse, recycle or dispose of geotextile fabric and geogrids and expose undisturbed soils.

4. Verify that the restored roadway complies with the pre-existing survey and video record.

5. Only where the topsoil has been significantly disturbed:

a) Replace stockpiled topsoil to a minimum depth of 300 mm or better and rough grade, only to match the surface road grade and native ground. Do not fine grade.

b) Overseed blended seed mixture at a rate of White Pines Custom Seed Mix 5.2 kg/ha with a rotary broadcast spreader. No mulch or cover is required except as noted elsewhere or where slopes are adjacent to watercourses or wetlands. In these cases cover with S2 straw aeromat rolled erosion control blanket to a width of not less than 5.0 m from the creek bank.

c) Track pack with a Dresser Blade or light-weight tracked machine to consolidate seed into soil. Do not fine grade.

6. Re-grade surface of pre-existing road to meet Municipal standard of 2% cross fall.

7. The Owner will complete a vegetation survey prior to project acceptance and demobilization. Road edges remaining bare of vegetation or where there is sparse growth, will be identified by the Owner for targeted restoration, which may require hand work and reseeding. The Contractor is therefore responsible for ensuring the vegetation has recovered to a density that meets the Municipal Standards and satisfaction of the Owner prior to project acceptance.

Clean Up

1. Pick up and remove from the site all surplus materials, equipment and debris resulting from this section of the work. Recycling and reuse of materials is encouraged.

2. Reposition, maintain and restore the silt fences with Heavy Duty Silt Fence following OPSS 219.130, with the mesh back facing away from the road surfaces.

Tolerance of Surface Profile

1. All surface, culvert structures and compacted surfaces shall be true to the lines, levels, grades, thickness and cross sections as shown on the drawings, in this specification and the pre-existing survey and video recording.

2. Significantly disturbed native surfaces shall be finished to meet the native grades with topsoil, seed and track packed into place.

3. All completed surfaces shall be finished to lines and levels to ensure positive drainage at all drainage outlets, culverts and channels. In no case, shall the cross-fall of any portion of the finished granular surface be less than two percent (1/4"/ft).

4. Provide as-built and post restoration drawings to the Owner.

PAYMENT

Measurement for Payment

Measurement for payment of **Task 1 – Tertiary Road Improvement Construction** shall be by square metre. Measurement for payment of installation of silt fencing will be per linear metre under separate item.

Measurement for payment of **Task 2 - Tertiary Road Restoration** shall be per square meter defined separately.

BASIS OF PAYMENT

Task 1 – Tertiary Road Improvement Construction: Payment at the contract unit price for this item shall be in full compensation for all labour, equipment, supply and installation of materials, complete as described herein and as shown on the contract drawings. Payment for supply, excavation, transport, backfill and compaction required to install aggregates to meet grades is deemed to be included in payment for this item. Item includes payment for traffic management of the tertiary roads including the supply and placement of signage and as-built drawings.

Payment for the grading of each lift and the compaction effort required to meet the 95% SPD requirement shall be deemed to be included in the unit prices. Payment for geotechnical testing and independent surveying shall be borne by the Owner.

The supply price of unforeseen culvert replacements will be additional on an as-needed basis, pending a request for an approved change order to the Constructor.

Task 2 - Tertiary Road Restoration: Payment at the unit price for this item shall be full compensation for all labour, equipment, removal of materials and disposal, complete as described herein, and as shown on the contract drawings. Roadside vegetation re-establishment will be required to meet the Municipal standard and the Owners satisfaction.

.

Appendix VII
Site Attendant Job Description

White Pines Wind Project

Appendix VII: Site Attendant Job Description

The Approval Holder is hiring a full-time Site Attendant to oversee the active protection measures of the Blanding's turtle within the White Pines Wind Project Area. The person will be responsible for actively monitoring the mitigation measures committed to by wpd to assist in protecting and enhancing the Blanding's turtle population in the southern areas of Prince Edward County.

Responsibilities:

- Monitoring of Project Area at least twice a week including access roads, crane laydown areas, vehicle turnaround areas, and Electrical Safety Zones to ensure the integrity of the proposed mitigation, including but not limited to, monitoring the integrity of the gates, signage, vegetation control, nesting cages and road compaction.
- Responsible for documenting site visit information, including but not limited to, areas visited, time of day, issues encountered, actions taken to remedy issues and follow up actions.
- Site Attendant will report on areas of turtle activity and will be able to identify signs of turtle nesting, or the presence of eggs or egg fragments and will report immediately to the Qualified Professional for further investigation and/or action.
- Participate and have a central role with other staff in helping in maintaining mitigation measures.
- Responsible for contacting qualified individuals should mitigation measures need to be addressed, including but not limited to, nest/egg recovery, road and gate repair and equipment maintenance.
- Oversee that vehicles and equipment used to assist surveys, including bicycles, golf carts, binoculars, cameras, etc. are maintained and kept in working order.

Qualifications

- Post-secondary education in environmental sciences or related field.
- Experience identifying and working with turtles and/or their habitat is an asset.
- Diligent in logging and reporting detailed information.
- Self-motivated individual, capable of working long hours by themselves
- Comfortable operating a variety of vehicle types, including trailers, and capable of cycling and walking long distances.
- Willing to working off hours and be on-call should problems arise.