

Erosion and Sediment Control Plan (ESC)

ISSUED FOR PERMIT REV 2.0

Nation Rise Wind Project

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Prepared for:

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1. Introduction

The Erosion and Sediment Control Plan (ESC) is prepared to satisfy the requirements of provincial and federal regulatory agencies regarding environmental management considerations during construction of the Nation Rise Wind Project (the “Project”). The ESC Plan complies with the Ministry’s Guideline 6-B *Guidelines for Evaluating Construction Activities on Water Resources* (MOEE 1995); *Stormwater Management Planning and Design Manual* (MOE 2003); and the *Erosion and Sediment Control Guideline for Urban Construction* (The Greater Golden Horseshoe Conservation Authorities 2006).

This plan details ESC measures to be implemented in order to minimize negative effects to natural features throughout the work area potentially caused by erosion and sedimentation. This plan outlines general ESC Best Management Practices (BMP’s) to be applied to all construction works as well as specific measures to be implemented throughout various tasks of the project including: road upgrades and construction of new roads, preparation of turbine sites and the development of temporary construction compounds and laydown areas.

This plan is to be read in conjunction with the detailed design drawings for road and turbine site construction. This ESC plan is intended to act as a living document, to be updated as needed throughout project development and as site conditions change. The process for evaluation and modification of the ESC plan is outlined within the Monitoring and Maintenance section of this report.

2. ESC Plan Development

As part of the Renewable Energy Act (REA) approval for the Project, natural heritage investigations were completed by Natural Resource Solutions Incorporated (NRSI). These investigations produced the *Nation Rise Wind Farm Natural Heritage Environmental Impact Study* (NHEIS) (NRSI 2017), the *Nation Rise Wind Farm Waterbody Assessment* (Waterbody Report) (NRSI 2017b), and the *Nation Rise Wind Farm Natural Heritage Pre-construction Monitoring Report* (NRSI 2018). These documents identify sensitive natural features in the project area, evaluate potential environmental effects and propose mitigation measures to lessen negative effects. This ESC Plan has been developed with the intent of meeting the recommendations outlined in these reports.

The development of this ESC plan has included the following tasks:

- Reviewing sensitive receivers identified in the Natural Heritage and Waterbody Reports.
- Reviewing mitigation measures committed to within the REA document and the Natural Heritage and Waterbody Reports.
- Evaluating precipitation, soils and mapping information to identify susceptibility of the project location to erosion and sedimentation.
- Evaluating the nature and extent of the proposed works.
- Compiling General ESC BMP’s based on commitments made within approved REA documents.
- Assigning Site Specific ESC Measures along the length of the all road works and turbine site development.

- Detailing site-specific ESC treatment methods including application, installation, maintenance and decommissioning.
- Outlining monitoring and maintenance requirements.

In the review of the approved REA documents it was noted that in some locations sediment fence is recommended as an exclusion measure (e.g. to prevent turtles from entering a work area) or to delineate a sensitive area to be avoided. While these mitigation measures utilize ESC materials, it should be recognized that it is not for the purpose of managing erosion and sedimentation and therefore are not included within this plan.

It is recommended that sediment fence used in a non-ESC application is of a different colour material or will have at least 33% of the stakes marked consistently with a unique-coloured flagging tape not used elsewhere on the Project.

3. Background Information

3.1 Proposed Works

The Nation Rise Wind Project (the Project) is being developed by the Nation Rise Wind Farm Limited Partnership (Nation Rise LP, the Owner). The Project is considered a Class 4 wind facility with a total nameplate capacity of 100 MW. The Project is located in Eastern Ontario in the Township of North Stormont and the United Counties of Stormont, Dundas and Glengarry, Ontario.

The Project will involve the construction or development of the following features:

- Up to thirty-three (33) wind turbine generators (**WTGs**) installed with a hub height of 131 m above grade;
- Up to three (3) permanent meteorological towers;
- Temporary and permanent access roads and crane pads;
- Electrical collector lines, substation, and switchyard; and,
- Construction staging and laydown areas.

These projects components were assessed for the potential to impact natural features in the area through erosion and sedimentation. Details of the feature identification and impact assessments can be found in the REA documents. The below sections outline the general and site-specific ESC measures required during construction.

3.2 Sensitive Features

Natural heritage investigations were completed by NRSI as part of the REA approval process. These investigations produced the *Nation Rise Wind Farm Natural Heritage Assessment and Environmental Impact Study*, *Nation Rise Wind Farm Pre-construction Monitoring Report* and the *Nation Rise Wind Farm Waterbody and Water Assessment Report*. These documents identify sensitive natural features in the project area, evaluate potential environmental effects and propose mitigation measures to lessen negative effects. This section provides a summary of the features that could be affected by erosion and

sedimentation and goes on to summarize the mitigation strategies committed to within the REA approval process as it relates to erosion and sediment control measures. It should be noted that these mitigation measures are also covered within Section 5- General ESC BMP's and Section 6- Site Specific ESC Measures.

Various sensitive habitats were identified during the REA approval process, including: seasonal concentrations areas; rare vegetation communities; amphibian breeding habitat; turtle wintering areas; habitats for species of conservation concern; habitat for special concern species or rare wildlife species; waterbodies; and, general significant wildlife habitat. The location of these habitats is identified in the REA documents listed at the beginning of this section and have been identified on the Site plans. The following Sensitive habitats have been confirmed on or adjacent to the property and have been identified as areas with the potential to be impacted by the project:

- Wetlands: WET-001, -002, -003, -004, -008, -009, -011, -013, -016, -017, -018, -019, -020).
- Woodlands: WOD-002, -005, -006, -007, -009, -012, -014, -017, -020, -021, -031, -038, -042, -043, -044, -046, -047, -048, -049, -051, -053, -054, -055
- Rare Vegetation Community (Savanah): SAV-001
- Turtle Wintering Area: TWA-001
- Amphibian Breeding Habitat- Woodlands: AWO-011, -016, -020, -023
- Open Country Bird Breeding Habitat: OCB-001
- Eastern Wood-Pewee Habitat: EAWP-004, -008, -009, -010, -013, -015
- Wood Thrush Habitat: WOTH-004, -005
- Monarch Habitat: MONA-001, -002, -003, -004, -005, -006
- Waterbodies

3.3 Climate and Weather Data

There are two World Meteorological Organization (WMO) climate stations nearby the Project Location. The first is the Kemptville Climate Station (WMO Station ID 71300) located approximately 42 km from the Project site. The second is the Ottawa MacDonald Cartier International Airport (WMO Station ID 71628) located approximately 43 km from the Project site.

The nearest Wind Finder (www.windfinder.com) monitoring station is at Moose Creek, located approximately 16 km from the Project Site. Table 1 provides average monthly wind speeds and average air temperature for this location. Averages were calculated from observations taken between 01/2016 and 09/2018. Figure 2 indicates the annual average wind speed and directions for this location.

Table 1

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Wind Speed (m/s)	3	3	3	3	4	2	3	3	2	3	3	3	3
Air Temp. (°C)	-9	-4	-5	3	14	16	21	20	16	11	-3	-6	6

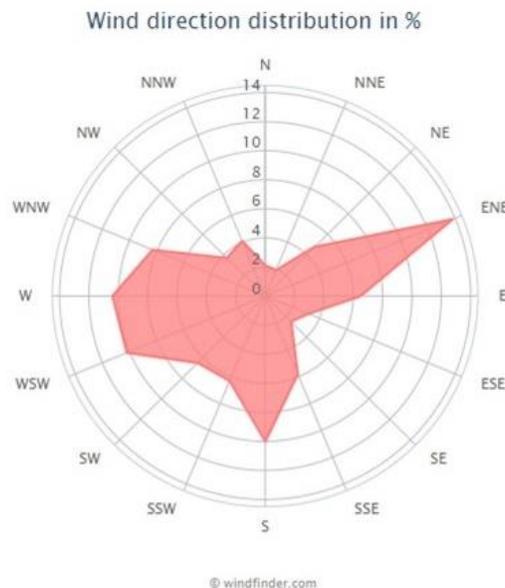


Figure 2

The nearest Water Survey of Canada monitoring station is located on the South Nation River approximately 15 km from the Project site. Figure 3 provides the monthly maximum, minimum and mean daily discharges in m³/s for the period January 1974 – December 2017 (WSC 2018). Typically, the lowest flows occur in February and in the summer months. The highest flows are in the spring, peaking in April. A smaller increase in flow occurs in October and November. Data from only 2017 is also shown on the graph to allow for recent and historical comparisons.

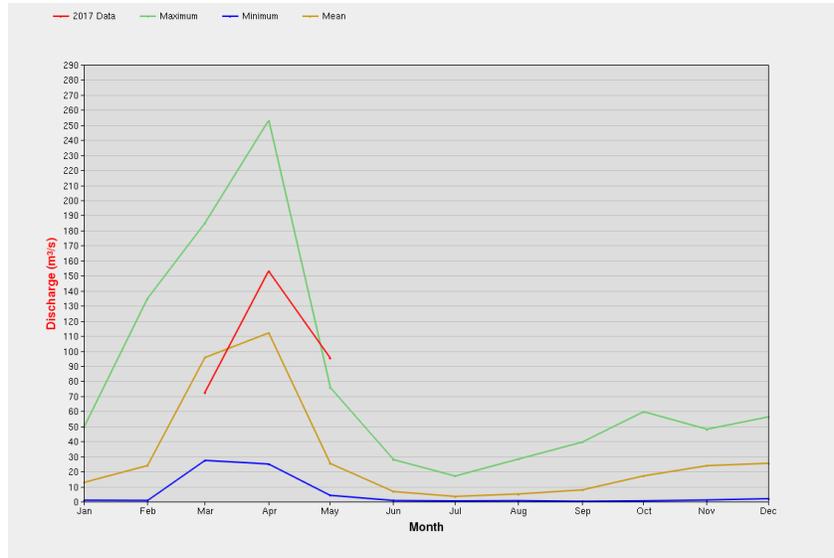


Figure 3

4. General ESC BMPs

The following general mitigation practices will be implemented during the work:

4.1 General

- This ESC Plan must be read in conjunction with the contract design drawings and the REA documents. Any deviation from this ESC plan must be agreed to in advance by the Project Manager, the EM and the author of the ESC Plan.
- Prior to commencing work, the Contractor shall review the detailed work plan, including clearing techniques and timing, sediment and erosion control measures, and storm and emergency response protocols with the EM and the Project Manager to obtain their approval.
- When possible, confine sensitive operations to periods of dry weather, minimize traffic and select equipment that will create the least amount of disturbance.
- In cases of intense storm events (20 mm in 24 hours, as forecasted at Environment Canada's Kemptville, ON weather station) construction will temporarily stop until soils stabilize to minimize erosion, soil compaction and the potential for sediment release into nearby watercourses.
- The work activities will be modified or stopped during severe or prolonged precipitation until ground conditions are conducive (i.e. suitably dry) for the work at hand.
- Do not allow additional trails to be constructed to access the work site.
- Vehicle travel on exposed soils will be limited. The use of heavy equipment on steep slopes will be avoided where possible to minimize potential for erosion and sediment transport.
- Maintain good housekeeping practices on the work site at all times to avoid off site contamination.
- The Contractor shall keep sediment and erosion control materials (e.g. erosion control blankets, sediment fencing, mud mats, rock or straw bales for check dams, wooden stakes, sediment bags, lock-blocks, etc.) on site in sufficient quantities to allow timely installation in the event of oncoming rain events.
- Concrete pours will be conducted in-the-dry and the Project Manager, Contractor and EM shall ensure no concrete or leachate enters any stream, lake or wetland
- Concrete handling will employ watertight forms, spill contingencies, and designated truck clean out pits.
 - Clean-out pits and washing areas will be established well away from a stream, lake or wetland and will be subject to best industry practices and regulatory requirements.

4.2 Refuelling and Maintenance

- All vehicle fueling, greasing, oiling and maintenance will take place in designated locations, a minimum of 30 m from any stream, lake, wetland or other sensitive receiver and where site grading and spill response equipment will be established to contain spillage.
- Maintain a readily available spill response kit on the work site at all times and ensure personnel are trained in its use.

4.3 Dust

The contractor shall include measures to control fugitive dust emissions, specifically when working within 30 m of a significant natural feature, wildlife habitat, wetland, watercourse or waterbody (as identified within the Environmental Mapping). Fugitive dust control may include the following:

- Control of on-site speed limits
- Dust suppressants to unpaved areas
- Re-vegetate cleared areas as soon as reasonably practicable
- Wind fences
- Blasting mats and water suppression in areas of blasting
- Control dust on the construction site to prevent migration off site. If roads are excessively dry, apply water to surface in a controlled manner

4.4 Delineate work area

- Prior to construction, the construction boundaries and the limits of vegetation clearing will be clearly demarcated in the field with flagging. Only those areas specifically designated for clearing on drawings and within approved limits of the Project area will be cleared. The Contractor will ensure no construction disturbance occurs beyond the marked limits. No equipment should be permitted to enter any natural areas beyond the clearing boundaries during construction.
- Vehicles and equipment will be restricted to the work site, right-of-way boundaries, and designated access roads and vegetation in adjoining areas will not be disturbed.
- Where construction activity occurs within 30 m of a sensitive receiver, wetland, watercourse, or waterbody, the construction area will be clearly delineated with highly visible snow fencing and protective fencing. If soil conditions do not permit the proper installation of ESC measures construction will be delayed until such time that suitable ESC measures can be properly installed.
- Where construction activity (including but not limited to all staging and laydown areas, access roads, turbine construction areas, and / or any land disturbances) occurs within 30 m of a wetland, watercourse, or waterbody, silt fence will be installed at the limits of construction prior to initiating construction (including clearing).
- Should monitoring reveal that clearing occurred beyond defined limits, mitigation action will be taken that could include rehabilitation of the disturbed area at the direction of a qualified ecologist.

4.5 Stripping and Grubbing

- Minimize vehicle traffic on exposed soils during site clearing, grubbing, grading and topsoil removal.
- Soil compaction will be minimized within 30 m of any of the following features: WOD-005, 009, 014, 020, 021, 031, 038, 044, 046, 047, 048, 053, 054, ALV- 001, 002, SAV-001, TGP-001, 002, AWO- 001, 012, 014, 015, 016, 018, 022, MUWE- 001, 002, 003, 004, 005, 007, 009*, 010

- Stripping and grubbing operations will be implemented progressively and will take place immediately prior to excavation and earthworks to minimize the length of time that free sediment material is exposed
- Where construction can be completed without grubbing and stripping, none shall occur. Grubbing and stripping of the organic layer and upper soil horizons will be limited to areas requiring grading or excavation.
- In areas of clearing where no grubbing is specified, trees and shrubs shall be cut to within 30 cm of the ground.
- Grubbing and earthworks shall not proceed until all required erosion and sediment control measures, as described in the ESC Plan, are in place. ESC measures shall be maintained until construction works and final remediation is complete.
- The Contractor, working with the Project Manager and EM, will be responsible for the appropriate and timely implementation of these mitigation measures.
- Sediment control materials will be kept on-site in sufficient quantities during all stages of project construction to allow timely installation if and as required.
- Grubbing shall be suspended during and immediately after intense storm events (20 mm in 24 hours, as forecasted at Environment Canada’s Kemptville, ON weather station), and will not commence until erosion potential has returned to normal
- All loose clearing and grubbing materials shall be removed from the riparian zone at the end of each work day.

4.6 Stockpiles

- The organic vegetation mat and topsoil that has been grubbed and stripped shall be stockpiled outside of riparian areas, wetlands, or other sensitive receivers and may be re-used for rehabilitation on-site in accordance with the Natural Heritage Assessment.
- A minimum 5 m buffer will be maintained between the clearing edge and the stockpile base.
- Should an excavation or borrow area extend toward the stockpiles, the stockpiles should be moved to another disturbed area so the salvaged topsoil is not mixed with other materials.
- Stockpile materials will be stored >30 m from all water bodies, wetlands, and other sensitive receivers and in a location where transportation of sediment into one of these areas cannot occur. Where this is not possible stockpiles will be covered when not in use, especially during rain events or high wind events.
- Install sediment fencing down-gradient of any stock piled material.

4.7 Ditches and Fencing and Slope texturing

- Earthworks will be scheduled such that the duration of exposed soil surfaces are kept to a minimum.
- Establish rough roadside ditch lines as soon as possible after vegetation clearing.
- Sediment fencing and/or barriers should be used along construction areas adjacent to sensitive receivers (including wetlands, watercourses, seeps, significant wildlife habitat and woodlands) as outlined by the Site Specific ESC Measures

- Sediment fencing will be regularly monitored by the Contractor and properly maintained during and following construction until soils in the construction area are re-stabilized with vegetation.
- Sediment controls shall be installed between the water course/wetland and the proposed works as per the Site Specific ESC measures.
- Sediment fencing will be erected along wetland edges and in the vicinity of water bodies located within 30 m of construction areas, including all staging areas, access roads, and turbine construction areas, as per the Site Specific ESC measures.
- Unless otherwise noted, where reference is made to sediment fence it shall be of the type known commonly as Light-Duty Silt Fence Barrier (OPSS 805, OPSD 219.110)
- In the event that heavy duty silt fence or rolled erosion control products are considered, these must not have a plastic-mesh backing even if labelled biodegradable. This gillnet-like material is often lethal to wildlife that becomes entangled within it.
- Sediment fencing does not act as filter to remove sediment from water; it shall not be placed across flowing streams
- Additional locations for ESC measures may be implemented on site as needed and as deemed appropriate by the Project Manager and the EM.
- Slope texturing will be performed on all exposed slopes with natural erodible material if left for greater than 24 hours.
- Perpendicular sediment fence will be installed on all exposed slopes with erodible material if left for a period greater than 48 hours when there is a 50% or greater chance of rain as per Environment Canada's Kemptville, ON weather station.
- Straw mulch will be applied on all exposed slopes with erodible material if left for a period greater than 24 hours when there is a 50% or greater chance of rain as per Environment Canada's Kemptville, ON weather station.
- Temporary ESC measures should be removed and disposed of properly only once the area has been stabilized.
- In some locations, sediment fence is recommended as an exclusion measure (e.g. to prevent turtles from entering a work area) or to delineate a sensitive area to be avoided.
 - In these instances the fence often appears neither on contract design drawings nor within the text of the *ESC Plan*
 - Sediment fencing used in a non-ESC application shall be of a different colour material or will have at least 33% of the stakes marked consistently with a unique-coloured flagging tape not used elsewhere on the Project.

4.8 Monitoring

- Monitoring of all stormwater and erosion sand sediment control measures shall be completed by a Qualified Inspector, as defined in the REA Approval Document.
- The Contractor shall monitor weather forecasts and local conditions so that work may be planned appropriately and respond as required.

- Earthworks will be stopped during prior to intense storm events (20 mm in 24 hour period, as forecasted at Environment Canada’s Kemptville, ON weather station) or whenever surface erosion occurs that has potential to transfer sediment into watercourses or wetlands.
- The contractor shall conduct weekly monitoring of the limits of clearing to ensure that disturbance is minimized.
- Monitoring of disturbed areas will continue until vegetation has substantially re-established.
- The contractor shall monitor culvert installations to ensure flow conveyance with no ponding or restrictions.
- All sediment and erosion control measures, culvert installations and stockpiles are to be monitored by a Qualified Inspector to ensure they are functioning as intended:
 - All ESC measures will be monitored weekly (at a minimum) during normal weather conditions and daily during and immediately before and after significant storm events (10 mm in 24 hours, as forecasted at Environment Canada’s Kemptville, ON weather station) and spring freshet
 - Culvert installations will be monitored twice weekly during normal weather conditions, and daily before, during and after significant storm events (10 mm in 24 hours, as forecasted at Environment Canada’s Kemptville, ON weather station) and spring freshet
 - In-water work ESC measures will be monitored daily
 - ESC monitoring will continue until soils in the construction area are re-stabilized and temporary ESC measures are removed
- All ESC measures shall be properly maintained by the Contractor to ensure they are functioning as intended and are maintained and/or upgraded as required.
- If the sediment and erosion control measures are not functioning properly, no further work should occur until the sediment and/or erosion problem is addressed;

4.9 Restoration

- All disturbed areas of the construction site will be restored as soon as conditions allow.
- Depending on surrounding habitat, natural regeneration and/or seeding will be relied on to restore native vegetation cover. Stabilization and restoration will occur as soon as the work is completed and before the end of the construction season. Once stockpile, staging and laydown areas are no longer required, vegetation will be surveyed to assess disturbance and the potential for natural regeneration.
- If seeding or replanting is required, all material will consist of native species indigenous to the Eco District (6E-12), and in consultation with MNRF.
- In riparian areas, and where potential extensive erosion may occur (i.e. on steep, unstable slopes), a re-vegetation program shall be implemented in accordance with the Natural Heritage Assessment as soon as possible following grubbing and stripping to encourage rapid re-vegetation.
- Newly stabilized slopes will be monitored by qualified personnel and unstable slopes will be repaired as soon as instability is discovered.

- All ESC measures are to be decommissioned following the completion of construction once the site has been stabilized. Removal of ESC measures shall be completed as outlined within each specific treatment note.
- On steep slopes, once topsoil with native seedbank and/or seed mix is placed, and where directed by the Environmental Monitor, Rolled Erosion Control Products or Hydraulically Applied Bonded Fiber Matrix will be used to stabilize erodible material until vegetation can establish.

4.10 Culverts

- Where the installation of an equalizing culvert is proposed, appropriate erosion control measures (i.e., rip rap, straw bales, seeding) will be installed at the ends of each culvert to prevent erosion as outlined by the Site Specific ESC Measures.
- Where culverts are proposed within 30 m of an identified natural feature, enhanced sediment and erosion control measures (i.e., straw bales, double rows of sediment fencing, check dams) will be installed as added protection to filter runoff and further minimize potential sedimentation within the down-gradient features as outlined by the Site Specific ESC Measures.
- Flows and water levels upstream and downstream of the work area are to be maintained.
- Flowing water may need to be diverted around the work area in order to properly install a culvert in which case the following mitigation measures will reduce or eliminate impacts:
 - A site specific dewatering and diversion plan for each water crossing is to be developed by the contractor and approved of by the Project Manager and Environmental Manager.
 - Cofferdams will be designed by a Professional Engineer and constructed in accordance with that design.
 - Cofferdams used to isolate the in-water work area from flowing water should be made of clean materials, free of fines.
 - If rip-rap or pea gravel bags are used, clean, washed material should be used to build the cofferdam.
 - Material required to construct cofferdams must not be taken from below the high water mark.
 - Cofferdams should be designed to accommodate any expected high flows of the watercourse during the construction period.
 - Sediment-laden discharge from the dewatered work area should be pumped into a non-sensitive vegetated area or adequately-sized settling basin to remove suspended solids and prevent sediment and other deleterious substances from entering the watercourse. If no suitable areas exist, a filter system should be placed on the pump outlet to remove suspended sediments prior to re-entry into the watercourse.
 - All water pumped during dewatering activities will be directed away from significant natural features and not directly into wetlands, streams or lakes.
 - The area to be used for discharging will be clearly marked with flagging and/or snow fencing prior to work commencing.

- After dewatering work is no longer required, any remaining disturbed areas will be restored as soon as feasible, and depending on surrounding habitat, natural regeneration and/or seeding will be relied on to restore native vegetation cover.
- Accumulated sediment should be removed from behind the cofferdam before its removal, while ensuring that the natural bed of the watercourse is not damaged.
 - If altered, the original channel bottom gradient and substrate should be restored after cofferdam removal.
- Cofferdams should be removed in a downstream to upstream sequence to allow gradual re-introduction of water to the dewatered area and prevent excessive suspension of sediment or other bed material.
- The bypass pumping system should be sized to accommodate any expected high flows of the watercourse during the construction period. Back-up pumps should be kept on site in case of pump failure.
- Discharge from the bypass pumping system must not result in downstream flooding and a diffuser or other energy dissipation device will be used if required to prevent erosion at the point of discharge (e.g. scour).
- Bypass pump intakes and discharges (if necessary) will be equipped with “siltation control measures sufficiently sized for the volumes to be pumped. These devices will be maintained throughout the construction period.
- Fish that become trapped or otherwise isolated by temporary works must be collected, transported to a safe location immediately downstream of the work area and released without harm or delay as required. A licence to collect and relocate fish is required from the MNRF.
- Pump intakes should be sized and adequately screened to prevent harm to fish as per the DFO’s *Freshwater Intake End-of-Pipe Fish Screen Guideline*.
- If constructed channels (aka ditches) are used to divert flow around the worksite:
 - The flow of water diverted must remain within the channel
 - The ditches are protected from any anticipated erosion during the period of construction and use of the ditch
 - Upon completion of the works, diversion ditches are completely backfilled and the area returned as closely as possible to the natural state
 - The work area is isolated from all flowing water without cutting off flow to downstream portions of the stream at any time during construction
 - The point of return for diverted water to the creek is located immediately downstream of the work site to minimize disturbance to downstream fish populations and habitats.
 - The discharge shall be regulated at such a rate that there is no flooding in the downstream area and no soil erosion or stream channel scouring is caused at the point of discharge. A discharge diffuser or other energy dissipation device shall be used, if necessary, to mitigate flows which physically alter the stream channel or banks
 - Siltation control measures shall be installed at both the taking location upstream of the construction site and (if necessary) the discharge site shall be sufficient for volumes

pumped. All measures to properly maintain these control devices shall be undertaken throughout the construction period.

- Culvert work should not be completed during flood stage flows or during times when heavy precipitation is occurring or is expected.
- If applicable, runoff from cast-in-place concrete or grouting is completely isolated from fish-bearing waters for a minimum of 48 hours.

4.11 Dewatering

- Restrict taking of groundwater and surface water during extreme low flow time periods.
- If in-water work is required (e.g. for culvert installation and/or electrical collector line installation), adhere to required timing windows confirmed through consultation with regulatory agencies, including the MNRF.
- Perform in-water work in dry conditions, where possible. Where work in dry conditions is not possible, short-term, isolated surface water dewatering is required.
- The Contractor is to develop site specific dewater plans for all required surface water and ground water dewatering operations. The dewatering plan is to follow the plan template and include the following measures:
 - Prior to dewatering, isolate the work area with the installation of a temporary water containment structure. The structure should form an impermeable enclosure that will prevent debris and sediment from escaping into the surrounding water body.
 - Construct a bypass channel or provide pump around system to maintain flow through the water body and prevent back flooding, which could ultimately overtop the water containment structure.
 - Obtain applicable permits, where required, for surface water dewatering.
 - Prior to surface water dewatering, obtain a Fish Salvage Plan, prepared by a qualified fisheries biologist and relocate fish to a suitable location, preferably downstream and away from the construction area, as detailed in the plan.
 - Install an in-stream sediment filter (e.g. Siltsoxx or Filtersoxx) downstream of water containment structure. Dewatering discharge should be dissipated (i.e. splash pads, sand bags, hay bales, etc.) and may require splitting discharge to more than one location.
- Dewatering discharge rates should be evaluated to ensure they do not result in erosion and sedimentation to the receiving water body.
- Sediment-laden discharge from the dewatered work area should be pumped into a non-sensitive vegetated area or adequately-sized settling basin to remove suspended solids and prevent sediment and other deleterious substances from entering the watercourse. If no suitable areas exist, a filter system should be placed on the pump outlet to remove suspended sediments prior to re-entry into the watercourse.
- All water pumped during dewatering activities will be directed away from significant natural features and not directly into wetlands, streams or lakes, with the exception of bypass pumping of non-contact water for in-water works, if required.

- The area to be used for discharging will be clearly marked with flagging and/or snow fencing prior to work commencing.
- If discharging to a municipal storm sewer system, ensure that water quality meets the objectives of the municipal storm sewer bylaw prior to discharge.
- Re-vegetate disturbed area adjacent to water bodies as soon as practical after construction activities are complete.

5. Site Specific ESC Measures

In addition to the generally applicable ESC Measures outlined in Section 5 the following site-specific measures are also required.

Specific Treatment Areas	
<p>Within 30m of or overlapping any of the following: WOD-002, 005, 006, 007, 009, 012, 014, 017, 020, 021, 031, 038, 042, 043, 044, 046, 047, 048, 049, 051, 053, 054, 055, WET- 001, 002, 003, 004, 008, 009, 011, 013, 016, 017, 018, 019, 020, WSA-001, TWA-001, SNH-006, SAV- 001, AWO-011, 016, 020, 023, OCB-001, EAWP- 004, 008, 009, 010, 013, 015, WOTH-004, 005, MONA-001, 002, 003, 004, 005, 006, Generalized SWHs, Waterbodies</p>	<p>Delineate work areas with sediment fencing.</p> <p>Any construction (including but not limited to all staging and laydown areas, access roads, turbine construction areas, and / or any land disturbances) within 30 m of wetlands, watercourses, or waterbodies will, at a minimum, require the installation of silt fence at the limits of construction prior to initiating construction.</p>
<p>Within 30m of or overlapping the following: WOD-002, 005, 006, 007, 009, 012, 014, 017, 020, 021, 031, 038, 042, 043, 044, 046, 047, 048, 049, 051, 053, 054, 055, WET- 001, 002, 003, 004, 008, 009, 011, 013, 016, 017, 018, 019, 020, SNH-006, SAV-001, AWO- 011, 016, 020, 023, OCB- 001, WOTH-004, 005, MONA- 001, 002, 003, 004, 005, 006, Generalized SWHs</p>	<p>Specific attention to on-site dust control in these areas.</p>
<p>Within 120m of or overlapping the following: WOD-009, WET-004, OCB-001, MONA-001.</p>	<p>Specific attention to on-site dust control during blasting in these areas.</p>

6. ESC Treatment Notes

6.1 Sediment Fence: Parallel

1. Light duty sediment fencing shall be installed as per OPSS 805 and OPSS 219.110.
2. Sections of sediment fence shall be no more than 30 m in length.
3. Sediment fencing will not be placed across a watercourse at any time.
4. When prescribed parallel to travelled road surface:
 - 4.1. Sediment fencing will be installed 2 m from the toe of slope or at the limit of vegetation clearing.
 - 4.2. The last 2 m of the down gradient end of sediment fence will be installed with a J-pattern return on contour to maximize ponding efficiency.
 - 4.3. Where sediment fencing intersects the outlet of a culvert or cross drain, fencing will end in a J-pattern and restart on the other side of the outlet.
5. When sediment fencing is installed at a turbine site in place of an organic berm the layout and dimensions are to match that of the intended berm.
6. Sediment Fencing shall be inspected regularly for fallen, torn, slumping or degraded fabric, broken supporting posts and washouts.
7. Accumulated sediment shall be removed and disposed of when the depth is $\frac{1}{2}$ the fence height.
8. Following construction activities and site stabilization, accumulated sediment shall be removed and disposed of and sediment fencing shall be completely removed.

Detailed Drawings:

- OPSS 219.110 Light-Duty Silt Fence Barrier
- Typical Sediment Fence Installation Parallel to Travelled Road Surface
- Typical Sediment Fence Installation Perpendicular to Travelled Road Surface

6.2 Sediment Fence: Perpendicular

Perpendicular sediment fence has been prescribed on all exposed slopes with erodible material if left for a period greater than 48 hours when there is a 50% or greater chance of rain as per Environment Canada's Kemptville, ON weather station.

1. Light duty sediment fencing shall be installed as per OPSS 805 and OPSS 219.110.
2. Sediment fencing will not be placed across a watercourse at any time.
3. 15 m sections of sediment fence shall be installed perpendicular to the road surface in successive rows extending to the edge of the corridor.
4. A single row of sediment fence shall not extend across the entire road surface.
5. Successive rows of sediment fence will be installed in an offset pattern with 2 m of overlap in the middle and will be placed at a distance of 15 m (slope distance) from the previous.
6. The last 1.5 m of each fence will be installed with J hooks with ends up-gradient to the main run of fencing to maximize ponding efficiency.
7. Fencing shall be placed immediately following vegetation removal. The removal of fencing shall be phased and will progress with the placement of the granular road bed.

8. Sediment Fencing shall be inspected regularly for fallen, torn, slumping or degraded fabric, broken supporting posts and washouts.
9. Accumulated sediment shall be removed and disposed upon decommissioning of fence or when the sediment depth is $\frac{1}{2}$ the fence height.

Detailed Drawings:

- OPSD 219.110 Light-Duty Silt Fence Barrier
- Typical Sediment Fence Installation Parallel to Travelled Road Surface
- Typical Sediment Fence Installation Perpendicular to Travelled Road Surface

6.3 Straw Mulch

Straw mulch application has been prescribed on exposed slopes with erodible material if left for a period greater than 24 hours when there is a 50% or greater chance of rain as per Environment Canada's Kemptville, ON weather station. This is a means of temporary erosion control.

1. Apply straw mulch by hand or with blower equipment evenly over surface in a 25 mm thick layer.
2. Straw should cover 80% of the soil surface and be applied at a coverage rate of 3000 kg/ha.
3. Anchor straw by crimping (ie. Using bulldozer or other tracked equipment with cleats to punch mulch into the soil).
4. Straw mulch coverage is intended for temporary erosion control and will be inspected at a minimum every 24 hours and immediately before and following rainfall events.

6.4 Rock Check Dam

1. Rock check dams to be installed as per OPSS 805 and OPSD 219.210.
2. Ditch line must be defined prior to the installation of rock check dams.
3. Rock check dams will be placed at a distance of 40 m.
4. Minimum D_{50} stone size used for the rock check dams will be 150 mm.
5. At minimum, accumulated sediment within a rock check dam is to be removed once sediment depth is $\frac{1}{2}$ total dam height.
6. After construction works and site stabilization rock check dams will be decommissioned by spreading rock material out over the length of the ditch so as not to impede flow and ditch function.

Detailed Drawings:

- OPSD 219.210 Rock Flow Check Dam (V-Ditch)

6.5 Excavated Sediment Trap in Ditch

1. Excavated sediment trap in ditch is to be installed as per OPSS 805 and OPSD 219.220.
2. A second rock check dam will be placed up gradient of the excavated sediment trap.
3. Excavated sediment trap in ditch shall measure 5 m along the length of the ditch.
4. At minimum, sediment collected within the excavated sediment trap in ditch shall be removed once the excavation is filled to $\frac{1}{2}$ of its total depth.

5. After works are completed, excavated sediment trap in ditch is to be filled to match the invert of the adjacent ditch lines. Associated rock check dams to be decommissions by spreading rock material out over length of the ditch so as not to impede flow and ditch function.

Detailed Drawings:

- OPSD 219.220 Excavated Sediment Trap in Ditch

6.6 Standard Culvert Treatment

1. Where ditches are present parallel to the roadway up and down chainage from the culvert installation:
 - 1.1. Excavated sediment traps shall be installed within both ditch lines 5 m from the culvert inlet and 5 m from the culvert outlet prior to culvert works.
 - 1.2. Rock flow check dams will be installed within the ditch line 1 m up-gradient and 1 m down-gradient from the sediment trap excavation.
2. Where ditches are not present parallel to the roadway up and down chainage from the culvert installation:
 - 2.1. Sediment fencing shall be installed along both sides of the stream, 1 m from the edge of water. The fencing shall meet the fencing placed parallel with the roadway and extend 5 m beyond the toe of slope. The last 2 m of the sediment fence will be installed in a j pattern ending up gradient to maximize ponding efficiency.
3. Sediment fencing shall be placed around the inlet and outlet of the culvert, parallel to the roadway, up-gradient of the ditch line and extend approximately 10 m from each side of the culvert.
4. After culvert works are complete and the areas around the culvert are stabilized, accumulated sediment within the traps will be removed and material will be brought into the sediment trap to match the invert of the ditch line. The rock check dams surrounding the sediment trap will be levelled out to line and stabilize the ditch immediately surrounding the culvert.

Detailed Drawings:

- Standard Culvert Treatment

6.7 Slope Texturing

Slope texturing is prescribed on open surfaces of exposed soil and is intended to roughen the surface, thereby reducing the velocity and energy of surface water runoff.

1. After vegetation clearing leave soil in rough grade condition as long as possible.
2. Where soils have not been left in rough grade condition, prior to leaving the site use tracked construction equipment to move up and down the slope leaving depressions perpendicular to the slope direction.
3. During slope texturing limit passes to prevent over compaction of the surface.
4. During tracking operations care must be taken to minimize disturbance to the soil where the equipment turns or changes direction.

6.8 Double Row of Sediment Fence

Double rows of sediment fence have been prescribed where the works are immediately up gradient of sensitive receivers and are intended to provide an additional row of protection and sediment collection.

1. Double rows of light duty sediment fencing shall be installed as per OPSS 805 and OPSD 219.110.
2. Sections of sediment fence shall be no more than 30 m in length.
3. Sediment fencing will not be placed across a watercourse at any time.
4. The interior row of sediment fencing will be installed 2 m from the toe of slope or 3 m from the limit of vegetation clearing.
5. The second, outer row of fencing will be offset 3 m from the first.
6. The last 2 m of the down gradient end of sediment fence will be installed with a J-pattern return on contour to maximize ponding efficiency.
7. J-pattern returns between each row of fencing will be offset.
8. Sediment Fencing shall be inspected regularly for fallen, torn, slumping or degraded fabric, broken supporting posts and washouts.
9. Accumulated sediment shall be removed and disposed of during decommissioning or when the depth is $\frac{1}{2}$ the fence height.
10. Following construction activities and site stabilization, accumulated sediment shall be removed and disposed of and sediment fencing shall be completely removed.

Detailed Drawings:

- OPSD 219.110 Light-Duty Silt Fence Barrier
- Typical Sediment Double Row of Sediment Fence Detail

6.9 Water Diversion Structure (Fencing)

Water Diversion Structures are prescribed in areas where a significant drainage area reports directly to the area of the works. The intention of the water diversion structures is to hold water back from areas of exposed soil and allow it to infiltrate.

1. The water diversion structure can be constructed from either light duty sediment fence or by organic berms.
2. Water diversion structures shall be placed in areas of stable ground and undisturbed soil at the limit of the work area.
3. Water diversion structures shall be installed parallel to the direction of the works facing up gradient (ie. Fencing stakes installed on side of road works).
4. The last 2 m of the down gradient end of the diversion structure will be installed with a J-pattern return on contour to break the flow path and avoid water velocity buildup.
5. Sections of the diversion structures shall be no more than;
 - 5.1. 30 m long if constructed from sediment fence, or
 - 5.2. 20 m long if constructed from as an organic berm.
6. Diversion structures will not be placed across a watercourse at any time.

7. Diversion structures shall be inspected regularly as outlined in section 7.1 for Sediment Fence structures.
8. Following construction activities and site stabilization, diversion structures shall be removed from the site as described in section 7.1 for Sediment Fence structures.

Detailed Drawings:

- OPSD 219.110 Light-Duty Silt Fence Barrier
- Typical Water Diversion Structure

7. Monitoring and Maintenance

ESC plans are intended to act as living documents to be updated as needed throughout project development as site conditions change. It is highly recommended that the design engineer is consulted for advice regarding modifications or revisions to the plans.

The contractor undertaking the works listed in Section 4 will be responsible for the implementation of this ESC plan.

Monitoring will be undertaken by a construction supervisor or a designated representative of the contractor during all work to ensure that the proposed ESC measures are functioning as intended. Inspections of ESC measures will be completed by a Qualified Inspector as defined in the REA Approval Document, and outlined in Section 4.8. Maintenance will be completed as outlined in Section 6.

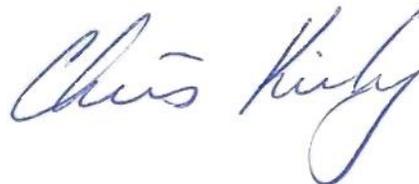
A diary documenting the monitoring and performance of the ESC measures will be maintained and submitted to the Contract Administrator or others upon request. A list of emergency contacts including the designated project team, applicable agency and local contacts will be maintained on site at all times.

Prior to initiating construction, the Contractor will provide the PM copies of the ESC inspection and maintenance forms for review and approval.

8. Signatures



Bill Tibble, M.Sc.
Tulloch Engineering



Chris Kirby, P.Eng
Tulloch Engineering

9. References

Greater Golden Horseshoe Conservation Authorities, 2006. *Erosion and Sediment Control Guideline for Urban Construction*.

Ontario Ministry of Environment and Energy, 1995. Guideline 6-B *Guidelines for Evaluating Construction Activities on Water Resources*.

Ontario Ministry of Environment, 2003. *Stormwater Management Planning and Design Manual*.

Ontario Ministry of Environment and Climate Change, 2018-05-04. *Renewable Energy Approval Number 0871-AV3TFM*.

Ontario Ministry of Natural Resources. 2013. *In-water Work Timing Window Guidelines*.

<https://www.ontario.ca/document/water-work-timing-window-guidelines>

Ontario Provincial Standards for Roads and Public Works, 2010. *ONTARIO PROVINCIAL STANDARD SPECIFICATION, METRIC: OPSS 805, CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES*.

Ontario Provincial Standards for Roads and Public Works, 2006. *ONTARIO PROVINCIAL STANDARD DRAWING, OPSD 219.110, LIGHT-DUTY SILT FENCE BARRIER*.

Ontario Provincial Standards for Roads and Public Works, 2012. *ONTARIO PROVINCIAL STANDARD SPECIFICATION, METRIC: OPSS 450, CONSTRUCTION SPECIFICATIONS FOR PIPELINE AND UTILITY INSTALLATION IN SOIL BY HORIZONTAL DIRECTIONAL DRILLING*.

NRSI 2017a. *Nation Rise Wind Farm Natural Heritage Environmental Impact Study*.

NRSI 2017b. *Nation Rise Wind Farm Water Body Report and Assessment*.

NRSI 2018. *Nation Rise Wind Farm Natural Heritage Pre-construction Monitoring Report*.