North Kent Wind Project
Erosion and Sediment Control Plan Handbook

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CONTENTS

1.0 INTRODUCTION

As part of the Erosion and Sediment Control (ESC) Plan included in the North Kent Wind Project Civil Construction Plan Set, a Handbook has been developed, which is intended to act as an operational field guide for the construction phases of the Renewable Energy Systems (RES) Canada North Kent Wind Project. The purpose of this document is to serve as the ESC Plan Handbook for the project.

2.0 PROJECT DESCRIPTION

The project is located in the municipality of Chatham-Kent, Province of Ontario, Canada. It will consist of 34 Siemens, SWT 3.2-113 WTGs.

Collector voltage will be 34.5 kV. Underground collector cable routing from WTGs will be along the WTG access road and right-of-way of public roads to the substation. The substation will be constructed on the north-east parcel at the intersection of Prince Albert and Eberts line. The Point of Common Coupling (PCC) with HONI's 230 kV L29C transmission line, connected to Lambton TS and Chatham SS. An overhead 230 kV line will be constructed between the substation and the PCC.

3.0 PURPOSE

The Handbook for construction activities provides the framework for the requirements of the overall Environmental Management and Protection (EMP) Plan with respect to erosion and sediment control, by outlining the following:

- Roles and responsibilities of environmental management and construction staff;
- A description of existing site conditions;
- A strategy for adaptive management of ESC measures;
- Details regarding the recommended Best Management Practices (BMPs) that should be implemented to provide adequate erosion and sediment control measures during construction; and
- The required monitoring of ESC measures during construction and reporting duties.

4.0 ROLES AND RESPONSIBILITIES

A team comprised of a Project Manager (PM) and an Environmental Monitor (EM) will be assembled to carry out environmental monitoring activities, including the implementation of proposed ESC measures.

The purpose of an environmental monitoring program is to identify significantly sensitive areas prior to the start of each specific component of every construction activity, and ensure that such areas are avoided and that environmental impacts are mitigated through effective implementation of the ESC Plan. This will be accomplished through working with the committee, as well as the Project Managers from RES Canada to implement the ESC Plan.
A summary of the roles and responsibilities of the PM, EM, and Subcontractor Construction Foreman (CF) are provided below:

4.1 PROJECT MANAGER

The Construction Manager will co-ordinate all environmental aspects of the project, including the ESC Plan and will be responsible for ensuring that an adequate level of environmental supervision and stewardship is maintained. In addition, the PM will liaise with the EM, the CF, and the committee comprised of the RES Canada, AECOM, and the LTVCA.
Other responsibilities of the PM will include:

- Reviewing mitigation plans for environmental impacts;
- Co-ordinating the environmental monitoring of construction activities;
- Providing environmental monitoring and mitigation training to construction personnel; and,
- Providing direction to the EM to ensure regulatory compliance and appropriate mitigation of environmental impacts.

4.2 ENVIRONMENTAL MONITOR

The Environmental Monitor will assist the PM and will be on-site to observe all aspects of the construction phases, and to ensure regulatory compliance and mitigation of environmental impacts. With respect to the
ESC Plan, the EM is responsible for ensuring that the day-to-day implementation and monitoring of all proposed ESC measures is executed. These duties include:

- Supervising the installation and construction of ESC measures;
- Liaising with the CF, his/her team and sub-contractors on a daily basis to identify existing or potential problems regarding the implementation of the ESC Plan;
- Assisting the Construction Management Team and sub-contractors to resolve any ESC issues immediately;
- Ensuring that the ESC drawings and plans are kept up-to-date;
- Coordinating the activities proposed in the Environmental Monitoring Plan (refer to Section 6);
- Tracking changes to the ESC plan, including the status of regulatory approvals, and;
- Monitoring the success of the ESC measures being implemented.

4.3 SUBCONTRACTOR CONSTRUCTION FOREMAN

The Construction Foreman will assume responsibility for ensuring that the ESC features are properly constructed and/or installed, and operated and maintained accordingly. In addition, the Construction Foreman will be responsible for undertaking the following:

- Liaising with the CM and EM regularly to identify any existing or potential problems regarding the implementation of the ESC Plan;
- Resolving any ESC issues in a timely manner;
- Proposing and aiding in the implementation of changes to the ESC Plan with the EM.

5.0 ADAPTIVE MANAGEMENT

In order to address changing site conditions, potential revisions to the construction schedule and uncertainties related to the performance of proposed ESC measures, there may be occasions when the ESC Plan may need to be modified to ensure that regulatory compliance continues to be satisfied throughout the duration of the project.

It is important to provide the flexibility necessary to modify the ESC Plan as site conditions dictate such that on-site erosion resulting in increased sediment transport to local watercourses is controlled to the extent possible. Accordingly, an assessment of the performance of each of the proposed BMPs employed at the site will be undertaken at regular intervals, as specified in the Environmental Monitoring Plan section (refer to Section 7). As part of these assessments, documentation will be prepared for each of the Best Management Practices (BMPs), which will address the following:

- The tasks undertaken as part of the Environmental Monitoring Plan to assess the performance of BMPs;
- The results of monitoring that led to the decision to modify a BMP;
- The modifications proposed to enhance the performance of specific BMPs;
- The individual responsible for proposing modifications to a BMP;
- The modifications that were implemented; and,
- Details (i.e., drawings/sketches/specifications) of the modifications implemented.

Further monitoring will be required following any modifications to determine the associated performance of altered or supplementary BMPs. In addition, modifications or improvements to BMPs are to be reflected in updated ESC Plan that will be available on-site for regulators, RES Canada staff, and consultants.

The following activities are proposed to ensure that changes to the ESC Plan are recommended, approved and implemented in a timely and effective manner.

1. A weekly memo prepared by the EM for review by the PM, which will address the following:
   - Identify and document all monitoring activities performed;
   - Summarize the results of monitoring (i.e., field measurements and laboratory analysis) activities
   - undertaken;
   - Describe the maintenance activities carried out to enhance BMP performance; and,
   - Summarize all proposed changes to the ESC Plan, including a description of proposed BMP modifications, the rationale for the change and remedial actions taken.
2. If changes to the ESC Plan are necessary, the PM will review the proposed changes and delegate and discuss the changes with the appropriate RES staff.
3. The EM will update the ESC Plan, as required.

6.0 BEST MANAGEMENT PRACTICES

The recommended BMPs that are to be employed as part of the ESC Plan for the North Kent Wind Project includes those that will be used to control flow, erosion, and sediment transport. A combination of BMPs, structural or otherwise, will be implemented at each of the sites (i.e., access roads, wind turbine staging/assembly areas, and collector system circuit sites) to provide the necessary level of erosion and sediment control.

Design considerations, guidelines, and procedures for the installation or implementation of BMPs are summarized below, while additional information (i.e., standard specifications and drawings) are available in Relevant Ontario Provincial Standard Specifications and Drawings (Ontario Provincial

Standard Specification OPSS 577). For ease of reference, the recommended BMPs are separated into erosion, sediment and filtration control measures.

6.1 EROSION CONTROL PRACTICES

Erosion prevention is essential and is the most effective method in protecting downstream aquatic habitat during the construction process. Erosion controls involve minimizing the extent of disturbed areas by clearing only what needs to be cleared, preserving and protecting natural cover, and immediately stabilizing disturbed areas.

6.1.1 Vegatative Filter Strips

In an effort to limit the area of disturbance and resulting erosion potential, as well as trap sediment through filtration and improve infiltration capacity, strips of natural vegetation can be identified, marked and protected from the effects of construction activities. Vegetative filter strips are of particular importance along watercourses to reduce bank erosion and sediment loading.

Design Considerations and Specifications:

- Fence or flag clearing limits and keep all equipment and construction materials out of the natural areas;
- Keep all excavations outside of the drip line of trees and shrubs;
- Vegetative filter strips should be maintained along the top of bank of all watercourses and;
- Additional ESC measures, such as silt fencing, may be required to prevent overloading of sediment to the filter strip, which can also act an additional barrier to prevent construction equipment from entering the area.

Inspection and Maintenance Requirements:

- Inspect area frequently to ensure that flagging or fencing remains in place and repair as required.

6.2 SEDIMENT CONTROL MEASURES

Perimeter controls are implemented to protect adjacent areas down-gradient from the construction site and/or divert sediment laden runoff away from unprotected/disturbed slopes and areas. Perimeter controls are also utilized to convey runoff from external drainage away from a construction site. Although some perimeter controls may provide some sedimentation, its main function is to prevent sediment laden runoff from encroaching onto adjacent undisturbed areas, unprotected slopes, and/or water courses.

6.2.1 Silt Fence

The purpose of silt fencing is to intercept and detain suspended sediment travelling in the form of sheet flow off of disturbed areas. Silt fencing should be installed along the perimeter of sensitive or protected areas, along watercourse corridors and at the base of moderate to steep slopes, as per the North Kent Wind Project Environmental, Health and Safety Management Plan (EHSMP).

Silt fence consists of a non-woven synthetic geotextile fabric stretched across and attached to supporting posts, wire mesh may be used in some applications. This measure does NOT filter runoff, but acts as a linear barrier creating upstream ponding which allows soil particles to settle out thereby reducing the amount of soil leaving a disturbed area. The sediment control fence also decreases the velocity of sheet flow and low to moderate level concentrated flows.

As an alternative to silt fencing, straw wattles (e.g., Siltsoxx™), straw bale barriers, and/or sandbag barriers can be considered for perimeter control. In addition, or, granular filter berms at an approximate height of 0.3 m can be installed at locations where the topography is generally flat.

Design Considerations and Specifications:

- Silt fence should be installed as per manufacturer's specifications.
- Posts are to be spaced no more than 1.8 m apart and driven into the ground a minimum of 750 mm, where possible;
- Posts shall be 50 mm x 50 mm wood stakes or equivalent;
- A trench must be excavated approximately 200 mm wide and 300 mm deep along the line of posts, on the upslope side of the barrier, and should follow the slope contour;
- Geotextile material should be woven type 270R or equivalent and, if possible, should be cut from a continuous roll to avoid joints – if joints are necessary, geotextile should be spliced only at support posts, with a minimum overlap of 200 mm and both ends secured to the post;
- When standard strength geotextile is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty staples (i.e., 25 mm long), tie wires or hog rings – the wire must extend into the trench a minimum 50 mm and not more than 900 mm above the original ground surface;
- If extra-strength geotextile is used and post spacing is reduced, the requirement for a wire mesh support fence is eliminated; and,
- When sediment accumulates to half the height of the silt fence, it should be removed and replaced.

Inspection and Maintenance Requirements:

- Inspect after every significant rainfall event and daily during prolonged periods of rain;
- Ensure that base of geotextile remains buried and posts are anchored as shown on **Figure 1**; and,
- If sediment accumulates above one half of the height of the silt fence, remove or replace section of fence, if necessary.

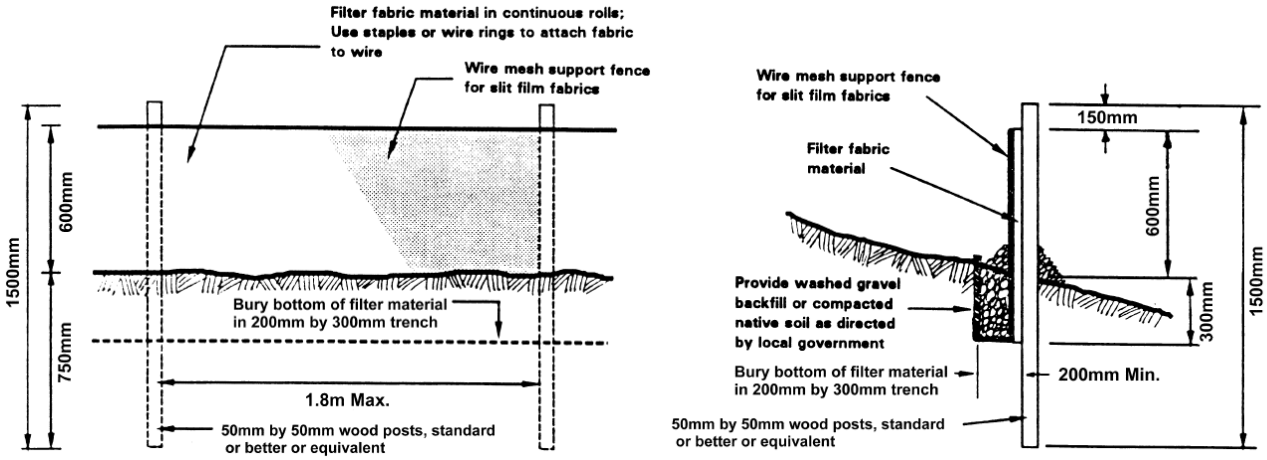


Figure 1. Typical Silt Fence Installation

6.2.2 Interceptor/Diversion Swales and Dykes

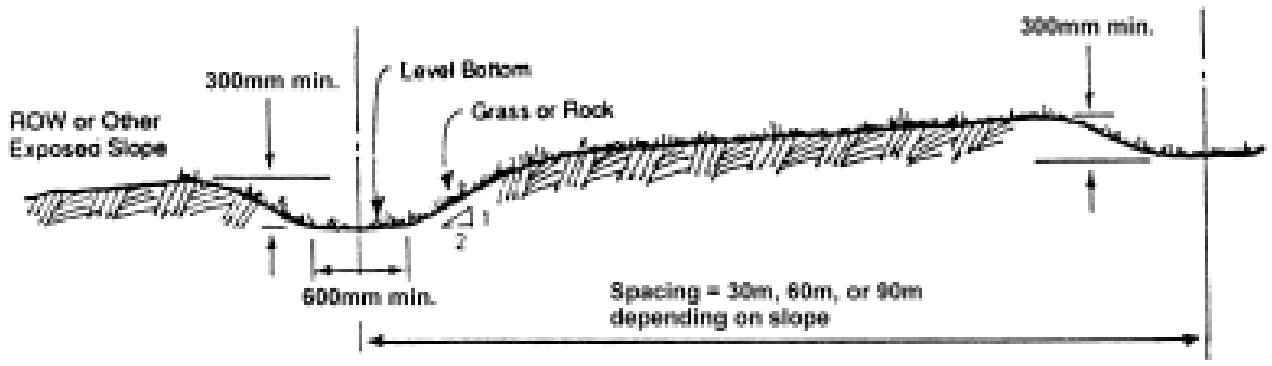
The purpose of interceptor/diversion swales and dykes is to divert runoff around disturbed areas to a stabilized outlet or location through the use of temporary grading or conveyance systems. A typical detail for interceptor/diversion swales is provided on **Figure 2**.

Design Considerations and Specifications:

- Temporary interceptor/diversion swales and dykes should be constructed along the top of long or steep slopes (i.e., >3H:1V) or where the contributing drainage area exceeds 2 ha;
- Additional flow control should be provided through the installation of rock or straw bale check dams at appropriate intervals, if longitudinal slope is greater than 5%; and
- Swales should be stabilized through vegetation or rip-rap, where required to prevent erosion.

Inspection and Maintenance Requirements:

- Inspect periodically until vegetative cover is established, as well as following all significant rainfall events; and repair all damaged areas immediately.



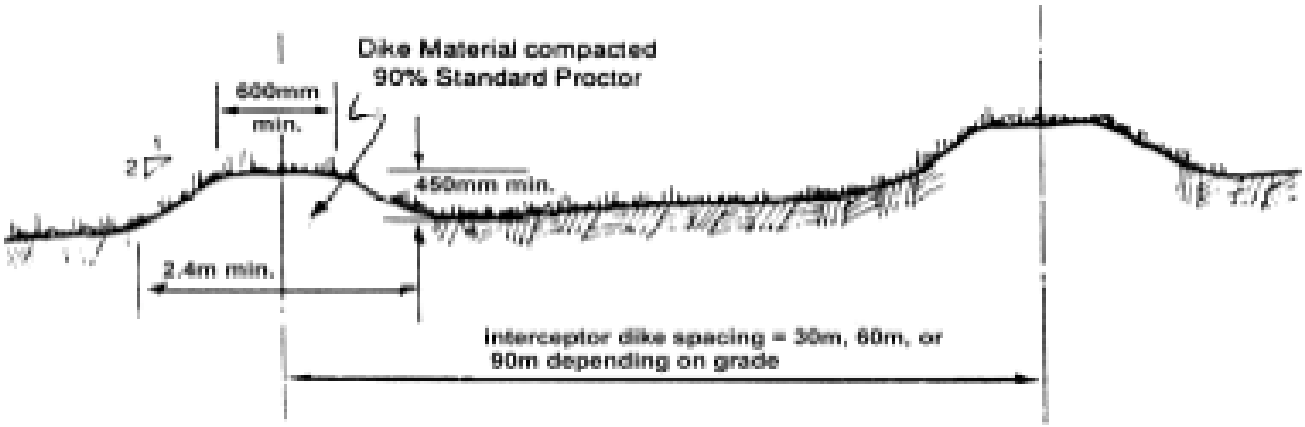


Figure 2. Interceptor/Diversion Swale

6.2.3 ***Rock Check Dams***

A rock check dam consists of granular material placed temporarily across a ditch, minor stream or drainage way. Its purpose is to reduce the velocity of runoff to reduce the erosion of ditch and drainage way inverts. Rock check dams allow for little ponding and are therefore not very effective in settling out sediment, particularly fine soil particles.

Rock check dams are to be installed in ditches where longitudinal slope exceeds 5% or where flow velocities are high enough to result in significant channel erosion. Although minimal, rock check dams also provide an opportunity for settlement of suspended solids through detention.

As an alternative to silt fencing, the following BMPs can be considered:

- Straw bale check dams; or
- Ditch Chexx™.

<u>Design Considerations and Specifications:</u>

- Check dams are to be constructed of appropriate sized rock (150 mm), with bottom layer consisting of smaller stones;
- A layer of non-woven geotextile is to be placed between the top and bottom layers and extended along the upstream end and anchored with additional stone;
- The rock should be placed with a maximum upstream slope of 2:1 and downstream slope of 4:1;

<u>Inspection and Maintenance Requirements:</u>

- Inspect structures weekly and following significant rainfall events;
- Ensure that geotextile is properly anchored at upstream end;

- Place additional rock on dam if settling or movement of stones has occurred; and,
- Remove accumulated sediment when it accounts for half of the sump capacity and stabilize.

6.3 FILTRATION CONTROL MEASURES

Filtration is the process in which sediment laden water passes through a porous media consisting of small voids to trap the suspended sediment.

6.3.1 ***Sediment Bags***

Sediment Bags consist of UV stabilized, geotextile material sewn into a bag structure and are used to filter out suspended sediment from dewatering discharge. For smaller sites, sediment bags are often a more economic and effective method of filtering sediment laden waters than sediment basins or ponds.

6.4 DEWATERING MEASURES

Through the completion of a desktop-level analysis, evaluate the potential for proposed dewatering activities to exceed 50,000 litres over a 24 hour period. As general rule, any consideration for dewatering activities over 30,000 litres should be brought to the attention of the PM, or if the dewatering activities are anticipated to detrimentally impact the hydrogeological form and/or function of nearby groundwater sensitive surface water features (i.e., wetlands and/or watercourses); In the event that interference is anticipated, a field program will be designed by the PM and EM and implemented by the CF to monitor groundwater-surface water interactions of the identified surface water feature, prior to, during and following the construction dewatering activity.

If using sump/trash pumps to dewater heavy sedimentation, the inlet pump head for the dewatering system can be wrapped in filter fabric and surrounded with clear stone, or equivalent.

If excessive suspended solids are apparent, discharged water should be directed through a filter bag or straw bale/filter fabric device or equivalent, or diffused through a drainage swale and exposed to other sediment screening methods to reduce suspended solids being release from the construction site. The number and size of the sediment control bags or equivalent filter will be dependent on the extent and location of the required dewatering.
In any scenario in which the dewatering activities will exceed 50,000 litres over a 24 hour period;

- The PM and EM should be consulted and a field program will be designed by the PM and EM and implemented by the CF; and
- All water taking activities will comply with the North Kent Wind Project Renewable Energy Application (REA) Section I.

Additional information regarding BMPs for dewatering (i.e., standard specifications and drawings) are available in Relevant Ontario Provincial Standard Specifications and Drawings (Ontario Provincial Standard Specification OPSS 518)

7.0 ENVIRONMENTAL MONITORING PLAN

The Environmental Monitoring will be conducted to ensure that pre-construction commitments made to regulatory agencies and other stakeholder groups are fulfilled during construction and that preventive and protective environmental measures are in place and functioning properly throughout construction.

Environmental inspection of the recommended ESC measures and project activities is essential to ensure the effectiveness of measures taken to protect the environment. At a minimum, weekly environmental inspections of the site should be conducted. For more sensitive aspects of the work, inspection will be carried out at critical times in the process (e.g., wet weather conditions, working within watercourses, significant excavations, etc).

The site monitoring and maintenance required to support the ESC Plan is described in the following sections. The Environmental Monitor will document site monitoring activities on the RCEMT 002 Environmental Monitoring Checklist.

During the construction phase, the on-site EM shall:

- Complete pre-assessments of each work locations to establish baseline BMPs and ESC measures.
- Conduct weekly visual inspections of:
    - All structural BMPs for ESC (i.e., silt fencing, straw bale and rock check dams, etc.) weekly and after all significant rainfall events.
- Conduct daily visual inspections of trenching/excavation dewatering activities.
- Remove accumulated sediment for all applicable BMPs when visible and store and stabilize on-site in a controlled area.
- Co-ordinate the maintenance of erosion and sediment control BMPs as indicated in the specifications provided, and as needed.

8.0 REPORTING

Documenting and reporting the environmental conditions, as they relate to the North Kent Wind Project, is essential to ensuring compliance with the requirements prescribed by the relevant regulatory agencies.

Following the implementation of proposed BMPs, the monitoring activities, as described in Section 7 of this Handbook, will be carried out by the EM utilizing the Inspection Report RCEMT 002 Environmental Monitoring Checklist under the supervision of the Project Manager. Results of BMP inspections, monitoring data and the remedial actions taken will be summarized by the EM in a weekly report, which will be submitted to the Project Manager for review.