

Nalcor Energy – Lower Churchill Project



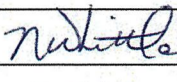
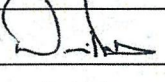


LCP HVdc Overland Transmission and HVdc Specialties

Environmental Protection Plan

Nalcor Doc. No. LCP-PT-MD-0000-EV-PL-0010-01

Comments: This document supersedes the Lower Churchill Project (LCP) Project-Wide Environmental Protection Plan for Component 3 and 4a (SLI Document # 505573-0000-68RA-I-0022, Nalcor Energy (NE)-LCP Document # LCP-SN-CD-0000-EV-PL-0008-01)

Total # of Pages
(Including Cover):
157

B3	03-Jul-2014	Re-Issued for Use	 N. Whittle	 D. Haley	 D. Green	 R. Power
B2	Apr-2014	Issued for Use	Melissa McComiskey	Marion Organ	Dave Green	Ron Power
B1	08-Jul-2013	Issued for Use	Andrea Stephen	Dave Haley	Dave Green	Ron Power
Status / Revision	Date	Reason for Issue	Prepared by	Functional Manager Approval	Quality Assurance Approval	Project Manager (Generation + Island Link) Approval

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1 INTRODUCTION

Environmental Protection Plans are of critical importance to large construction projects. The EPP will ensure a high level of environmental protection in all of the Project's work areas during construction and commissioning. This EPP is a working document for use at Site by Project personnel and contractors. It will help ensure conformance with the Project policy statements. It also will serve as a tool for Project participants, including regulators to monitor regulatory compliance and to improve on environmental performance.

This EPP contains standard environmental protection procedures, or mitigation measures, for activities commonly associated with large projects of this type. The objectives of this EPP are to:

- a) anticipate potential negative environmental effects associated with construction; and
- b) implement appropriate mitigation measures to minimize or avoid negative effects where practical.

Negative effects include impacts to air quality and climate, groundwater and surface water resources, soil, biota and their habitats, human health and communities, and natural and historic resources.

Reference documentation, including Federal and Provincial reference documents, guidelines, fact sheets and operational statements for information detailed in the EPP is located in reference document LCP-PT-MD-0000-EV-SD-0001-01, as well as the reference section of this document.

2 PURPOSE

The purpose of this EPP is to establish work practices and assign roles and responsibilities that all Project participants will follow to mitigate negative environmental effects associated with construction and commissioning of the LCP. Specifically, the purpose of this EPP is to:

- a) Document the conditions and requirements of Environmental Assessment (EA) release;
- b) Outline the LCP's commitments to minimize potential environmental effects, including commitments made in the Labrador-Island Transmission Link Environmental Impact Statement (EIS) and the EIS Addendum (Nalcor, 2012);
- c) Provide concise and clear instructions to LCP participants regarding procedures for protecting the environment and minimizing potential impacts to the environment;

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- d) Provide direction to LCP participants regarding issues and concerns of stakeholder groups, including aboriginal peoples, fisheries groups, landowner groups, and the public;
- e) Provide a reference document for LCP participants to use when planning and/or conducting specific construction and commissioning activities;
- f) Provide direction for environmental orientation programs for LCP participants;
- g) Document changes to the EPP originating through the interactive revision process;
- h) Provide a reference to applicable legislative requirements and guidelines; and
- i) Provide a detailed summary of environmental issues and protection measures to be implemented during construction.

3 SCOPE

The scope of this EPP covers the engineering, procurement, construction, and commissioning phases of the LCP for overland HVdc transmission line and HVdc specialties (formally known as Components 3 and 4a). The focus of the EPP is on construction activities associated with the Labrador-Island Transmission Link from Muskrat Falls to Soldiers Pond, as well as Soldiers Pond Switchyard and other HVdc specialties. The “Protection Description” Section of this document describes the Project in more detail. Please note that there are additional components of the Project that are outside the scope of this EPP. The complete component list is as follows:

- a) **Component 1:** Muskrat Falls Generation Facility including the proposed reservoir, associated site access roads, accommodations complex and laydown areas;
- b) **Component 2:** Gull Island Generation Facility;
- c) **Component 3:** HVdc Specialties
- d) **Component 4a:** Overland HVdc transmission line from Muskrat Falls to Soldiers Pond;
- e) **Component 4b:** The 315kV HVac transmission line from Muskrat Falls to Churchill Falls and associated infrastructure; and
- f) The cable crossing at the **Strait of Belle Isle (SOBI)**.

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In addition, this EPP does not cover the Operations phase of the Project. A separate EPP for this will be developed and submitted at a later date.

This EPP is one component of the LCP's [*Environmental Management Plan \(Document # LCP-PT-MD-0000-EV-PL-0002-01\)*](#). Other documents of the Environmental Management Plan, supplementary to this EPP, includes the following:

- 1) Contract-Specific Environmental Protection Plan (C-SEPP) Template (Document # LCP-PT-MD-0000-EV-FR-0002-01)
- 2) Rehabilitation Plan (RP) (Document # LCP-SN-CD-0000-EV-PL-0004-01);
- 3) LCP Regulatory Compliance Plan (RCP) (Document # LCP-PT-MD-0000-RT-PL-0001-01);
- 4) Reference Material Document for Project Wide Environmental Protection Plan - (Document # LCP-PT-MD-0000-EV-SD-0001-01); and
- 5) LCP's Master Spill Response Plan (Document # MFA-PT-MD-0000-EV-PL-0002-01) will be used by Contractors as a basis for preparing their own spill response plans.

This EPP applies to all Project participants, including Project Personnel, Contractors, Subcontractors, suppliers, service providers, and all Employees of these organizations.

Given the LCP's magnitude, accepted *Contract-Specific Environmental Protection Plans (C-SEPPs)* will be required. C-SEPPs will be prepared by all Contractors for all construction contracts to ensure that effects on the environment are minimized to the extent practical. These C-SEPPs will provide sufficient detail on the Contractor's:

- a) Scope of work;
- b) Methods of construction;
- c) Sequence of activities;
- d) List of resources (i.e., equipment and site workforce);
- e) Temporary and permanent installations;
- f) Environmental protection procedures and alternative procedures, if required; and

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g) Environmental contingency measures.

This EPP will serve as a resource to Contractors as they prepare their own C-SEPPs. Contract packages will include C-SEPP templates with specific instructions on how these templates are to be properly completed. All C-SEPPs will require acceptance by the Project prior to the Contractor's mobilization to Site.

In certain cases, particularly in areas where environmental risks are elevated, specific mitigation measures will be engineered for the Project. These measures, detailed in the form of technical specifications and construction drawings, will form part of the contract packages.

4 DEFINITIONS

Authorized Escort: A Contractor or Subcontractor representative who has completed Site orientation, is fully aware of the Site's emergency response and evacuation procedures, and has the authority to accompany Site Visitors.

Contractor: Any Contractor engaged by Nalcor or any Subcontractor engaged by Nalcor, or engaged on behalf of Nalcor, or any Subcontractor engaged by a Contractor to carry out work at the Sites.

Employee: All Employees employed by Nalcor and consultants engaged by Nalcor to work at any of the Sites, either through third-party agencies or consultants hired or contracted by Nalcor directly. This includes, but is not limited to full time, part time, casual, term, intermittent or occasional Employees, and seconded Employees who are either directly employed by or under assignment to Nalcor.

Personnel: Nalcor Employees, Contractors, Subcontractors and their respective Employees.

Site(s): Muskrat Falls Power Generating Facility, Labrador Island Link, Labrador Transmission Access, Strait of Belle Isle, direct current (dc) Specialties, and other ancillary Sites and staging areas.

Site Access: Obtaining a Site Pass issued as per the Worker Site Access Standard, Nalcor Doc. No. LCP-PT-MD-0000-HS-SD-0003-01 or Nalcor authorization required to access the various Sites.

Visitor: Any person(s) visiting the Sites, including, but not limited to, vendors, couriers, delivery personnel, regulatory personnel, consultants, engineering representatives, stakeholders, and other personnel not assigned to the Site.

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5 ABBREVIATIONS AND ACRONYMS

ACA	Ammoniacal Copper Arsenate
ACZA	Ammonia Copper Zinc Arsenate
ARD	Acid Rock Drainage
ATV	All-Terrain Vehicle
CCA	Chromated Copper Arsenate
CCME	Canadian Council of Ministers of the Environment
CEAA	Canadian Environmental Assessment Act
CEPA	Canadian Environmental Protection Act
C-SEPP	Contract-Specific Environmental Protection Plan
CuN	Copper Naphthenate
DFO	Department of Fisheries and Oceans Canada
DNR	Department of Natural Resources
DOEC	Department of Environment and Conservation
EA	Environmental Assessment
ECWSR	Environmental Control Water and Sewer Regulations
EEM	Environmental Effects Monitoring
EEMP	Environmental Effects Monitoring Plan
EIS	Environmental Impact Statement
EPA	Environmental Protection Act
EPP	Environmental Protection Plan
ERC	Environment and Regulatory Compliance
ERP	Emergency Response Plan
ESA	Endangered Species Act
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
GAP	Storage and Handling of Gasoline and Associated Products Regulations

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H&S	Health and Safety
HVac	High Voltage Alternating Current
HVdc	High Voltage Direct Current
IMO	International Maritime Organization
LCP	Lower Churchill Project
LITL	Labrador-Island Transmission Link
MCTS	Marine Communication and Traffic Services
MSDS	Material Safety Data Sheet
MM	Mealy Mountains (in reference to Caribou herd)
MSRP	Master Spill Response Plan
MW	Megawatt
NLDOEC-WD	NL Department of Environment and Conservation – Wildlife Division
NPAG	Non-Potential Acid Generation
NWPA	Navigable Waters Protection Act
OSEM	On-site Environmental Monitor
PAG	Potential Acid Generation
PAO	Provincial Archeological Office
PAO	Provincial Archeology Office
PCP	Pentachlorophenol
PPWSA	Protected Public Water Supply Area
PDT	Project Delivery Team
RCP	Regulatory Compliance Plan
RECP	Rolled Erosion Control Products
RFP	Request for Proposal
ROW	Right-of-Way
RP	Rehabilitation Plan
RRF	Revision Request form
RRIF	Revision Request Initiation Form

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RWM	Red Wine Mountains (in reference to Caribou herd)
SARA	Species At Risk Act
SOBI	Strait of Bell Island
SOP	Standard Operating Procedure
TC	Transport Canada
TRM	Turf Reinforcement Mats
TSS	Total Suspended Solid
WHMIS	Workplace Hazardous Materials Information System
WMP	Waste Management Plan

6 PROJECT DESCRIPTION

The proposed Project will extend over a distance of approximately 1,100 km, and this EPP includes the following key components:

6.1 HVDC SPECIALTIES

- a) An ac to dc converter station at Muskrat Falls near the lower Churchill River in Central Labrador;
- b) A dc to ac converter station at Soldiers Pond, with some associated Island system upgrades;
- c) Electrodes in the Strait of Belle Isle (L'Anse Au Diable, Labrador) and Conception Bay (Dowden's Point, Newfoundland), connected to their respective converter station by a small overhead electrode line;
- d) Transition compounds at Forteau Point and Shoal Cove to transition overhead lines to underground and submarine cables;
- e) ac switchyard at Soldiers Pond;
- f) Synchronous condensers at Soldiers Pond; and
- g) Permanent access roads to Forteau Point, L'Anse au Diable, Shoal Cove, Dowden's Point and Soldiers Pond.

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6.2 HVDC OVERLAND TRANSMISSION

- a) An overhead HVdc transmission line from Muskrat Falls to Forteau Point (approximately 383 km);
- b) An overhead electrode line from the HVdc transmission line to L'Anse au Diable (approximately 22 km);
- c) An overhead HVdc transmission line from Shoal Cove to Soldiers Pond on the Island's Avalon Peninsula (approximately 695 km);
- d) An overhead electrode line from Soldiers Pond to Dowden's Point (approximately 12 km); and
- e) Permanent telecommunication services, including telecom rooms, internal and external cabling with cooper and fibre optic cables, core switches, servers and other equipment, distribution equipment and accessories and access and terminals equipment. Permanent telecommunication services will be provided at all switchyards, converter stations, transition compounds, electrode Sites, and synchronous condenser Sites.

6.3 CONSTRUCTION RELATED INFRASTRUCTURE

Construction related infrastructure will be established to support construction activity for HVdc Overland Transmission and HVdc Specialties. Some of this infrastructure is temporary and will be decommissioned before the end of the construction phase. It is anticipated that the following infrastructure will be required:

HVdc Specialties

- a) Temporary construction camps at Forteau Point, L'Anse au Diable, and possibly Shoal Cove;
- b) Rock quarries for L'Anse au Diable and Dowden's Point breakwaters;
- c) Borrow pits and crushing facilities for construction fill and surfacing materials at Forteau Point, L'Anse au Diable, Shoal Cove, Dowden's Point, and Soldiers Pond;
- d) Local concrete batch plants at each remote Site (except Soldiers Pond);
- e) Construction power at all Sites;
- f) Communication facilities (telephone, internet) required at all Sites;
- g) Equipment fuel facilities at all Sites;

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- h) Spoil disposal areas at all Sites;
- i) Temporary office and sanitary facilities at all Sites;
- j) Temporary ac transmission line relocations at Soldiers Pond;
- k) Waste disposal at all Sites;
- l) Heavy equipment transport facility to move large transformers to Site (at Soldiers Pond). May require temporary road or bridge reinforcement or repairs and power line raising or outages by Contractor(s);
- m) Insulating oil storage tanks for transformer oil (many thousands of litres) and treatment facilities;
- n) SF6 and welding gas cylinder storage and handling facilities;
- o) Blasting materials storage facilities;
- p) Telecommunication services for the HVac switchyard, converter stations, transition compounds and electrode sites, remote camps at various locations throughout the Project and marshalling yards; and
- q) Telecommunication infrastructure at the Soldiers Pond switchyard, the transition compounds, the electrode Sites, the construction camps and marshalling yards include an office trailer and telecom rooms, core infrastructure and equipment in the telecom rooms and electronic equipment inside the trailer offices.

HVdc Overland Transmission

- a) HVdc Right-Of-Way (ROW) clearing camps and all associated infrastructure;
- b) HVdc transmission line construction camps and all associated infrastructure;
 - i. Temporary access and bypass for both ROW clearing and transmission line construction, as well as use of corduroy roads;
 - ii. Temporary bridges and culverts for both ROW clearing and transmission line construction;
 - iii. Borrow pits and possible quarries;
 - iv. Marshalling yards, material storage and lay-down areas;
 - v. Fuelling and fuel storage facilities; and

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- vi. Possible helipads and associated facilities.

6.4 CONSTRUCTION SCHEDULE

HVdc overland transmission will commence in the spring of 2014 and will span three (3) years. The construction associated with the HVdc specialties will commence in the spring of 2014 and will span over three (3) years.

7 RESPONSIBILITIES

The LCP Environmental and Regulatory Compliance (ERC) Team is comprised of environmental engineering and construction management staff. Figure 7-1 illustrates the team structure. Roles and responsibilities of team members are further defined in the sections that follow.

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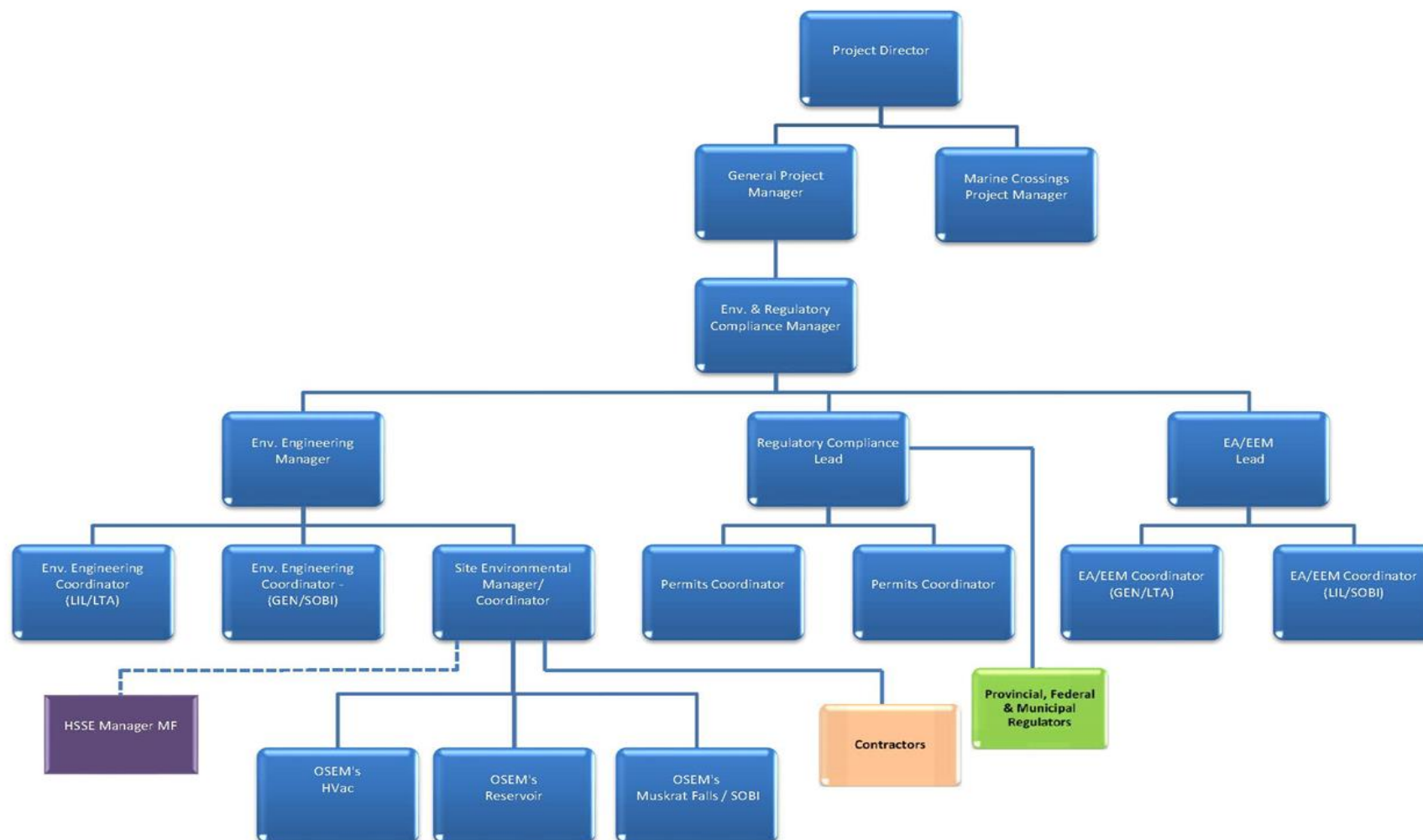


Figure 7-1 - Lower Churchill Project: Environment and Regulatory Compliance Team

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7.1 ENVIRONMENT AND REGULATORY COMPLIANCE TEAM

7.1.1 Auditing Function

The purpose of the auditing function will be to evaluate compliance and effectiveness of the EPP and to identify opportunities for continual improvement. Auditing will consist of daily field reports, risk based and semi-annual environmental compliance audit reports, and annual performance reviews.

The daily field reports will be completed by the On-Site Environmental Monitors (OSEM), who reviews daily activities of the Contractors. The risk based and semi-annual environmental compliance audit reports will be completed by a member of the ERC team. The reports will document all incidents of non-compliance with the EPP and their causes. The ERC team will distribute the environmental compliance audit reports to relevant Project participants.

The annual performance review will be completed by the key members of the Environmental and Construction teams. This audit will include a review of all work activities that relate to environmental concerns, issues and/or mitigations, and will include a review of environmental audits carried out by the ERC team during the year. The review process will give all parties a chance to evaluate overall environmental performance and compliance with government regulations, permits, this EPP, and C-SEPPs.

7.1.2 Individual Responsibilities

General Project Manager

The General Project Manager will be accountable for the acceptance of the EPP. The General Project Manager will be consulted on the various aspects of EPP management. This person will also be consulted on Environmental Compliance Monitoring processes such as daily field reports, environmental audits and annual environmental performance reviews. Environmental Effects Monitoring is the responsibility of the ERC team and the General Project Manager will be accountable. The General Project Manager will be supported in this function by the ERC Manager.

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Environment and Regulatory Compliance (ERC) Manager

The ERC Manager will be accountable for development, acceptance, implementation and management of this EPP. They will be accountable for review and acceptance of the C-SEPP, as well as all environmental compliance monitoring. The ERC Manager is responsible for implementation and management of the C-SEPP, along with the Contractor. The ERC Manager will be informed of all activities that are the responsibility of the ERC team such as acceptance of this EPP, C-SEPP and environmental effects monitoring.

Environmental Engineering Manager

The Environmental Engineering Manager will be responsible for the development, review, implementation and management of this EPP and review, acceptance and implementation of the C-SEPP, as well as all environmental compliance monitoring.

Regulatory Compliance Lead

The Regulatory Compliance Lead is responsible to review and ensure commitments and requirements of EA release are included in this EPP as it relates to their work. This person is responsible to ensure legislative and permit conditions are reflected in this EPP. They are also responsible for communicating results of the EEMP to the ERC group.

Environmental Engineering Coordinator

The Environmental Engineering Coordinator will be responsible for the following:

- i. Implementation of this EPP as it relates to their work fronts;
- ii. Supporting the Environmental Engineering Manager with managing changes to the EPP;
- iii. Reviewing, acceptance and implementation of the C-SEPP;
- iv. Along with Site Environmental Manager/Coordinators, are responsible for Project Environmental Awareness such as orientation of project Employees, Visitors and Contractors.
- v. Responsible for certain aspects of environmental compliance monitoring such as reviewing daily field reports and environmental audits, which they will be informed on environmental affects monitoring details.

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- vi. Manage Opportunity for Improvements, Non-Conformance and Corrective Action registries.

Permits Coordinator

The permits coordinator will be responsibility for the following:

- i. Providing support for the development and implementation of the EPP and will be a consulted on management or revisions of the EPP.
- ii. Providing support for C-SEPP implementation and project environmental awareness through orientation.
- iii. Providing support and consultation for several aspects of environmental compliance monitoring.
- iv. Consulting on the review of the EPP to ensure compliance with condition of permits.
- v. Managing the permit registry (in consultation with the Environmental Engineering Coordinators) and will be informed on environmental effects monitoring details.

Site Environmental Manager/Coordinators

These individuals will be responsible for the following:

- i. Coordinating all activities and monitoring efforts by the On-Site Environmental Monitors to ensure compliance with the EPP, C-SEPP, and permit conditions.
- ii. Reporting directly to the Construction Manager, and interface functionally with the Environmental Engineering Manager and Environmental Engineering Coordinators.
- iii. Communicating directly with the Contractor's on environmental performance and non-conformance issues.
- iv. Participating in the environmental audit reviews.

On-Site Environmental Monitor (OSEM)

The OSEM will be responsible for the following:

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- i. Monitoring on-Site Project activities, evaluate the Contractors' environmental performance with respect to requirements established in the EPP and C-SEPP,
- ii. Evaluating the performance of designed/constructed environmental mitigation systems through sampling and testing programs, and track on-site compliance with regulatory requirements and conditions of all permits and approvals.
- iii. Producing daily field reports as part of environmental compliance monitoring and will provide support for managing the opportunity for improvements, corrective action and non-conformance registries.
- iv. Reporting directly to the Site Environmental Manager and functionally to the Environmental Engineering Coordinators,
- v. Interacting with the Contractors on environmental procedures and requirements, participating in Project team meetings, toolbox meetings, conduct environmental reviews of drawings, and assisting in the revision and update of the EPP and C-SEPP, as necessary.
- vi. Ensuring the Employees, Visitors and Contractors travelling to the Site receive the appropriate orientation and training before going on site.

Component Project Managers

The Component Project Managers will provide support for the development of the EPP and the C-SEPP and will be responsible for implementation of the C-SEPP. They will be informed about all aspects of the EPP, C-SEPP, and compliance tracking.

Area Managers

The Area Managers will be informed on all aspects of the development of the EPP and C-SEPP. They will be informed of environmental compliance monitoring and environmental effects monitoring, and will provide support for managing the compliance tracking.

Construction Managers

The Construction Managers will be responsible for the following:

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- i. Overseeing construction management, including management of on-Site environmental issues through implementation of the EPP.
- ii. Acceptance and implementation of the C-SEPP, and for revisions to this document.
- iii. Reporting directly to the Project Manager and for certain aspects of environmental compliance monitoring and compliance tracking.
- iv. Ensuring Visitors, Contractors and Employees travelling to the Site receive the appropriate orientation and training required, as well as ensuring that this responsibility has been delegated to the HSSEER Manager for the Muskrat Falls Site.

Package Lead

The Package Leads will be responsible for the following:

- i. Ensuring the EPP is included in procurement packages.
- ii. Supporting acceptance and implementation of the C-SEPP, and will be informed about all aspects of the EPP, C-SEPP and compliance tracking.

Contractors

Contractors will build, supply and/or install various components of the Project, or be involved in provision of services to support construction and/or procurement, as defined in the work scopes of their respective contract packages. The Contractors will be accountable and responsible for the following:

- i. Implementing environmental protection procedures as outlined in the EPP and developing, implementing, and maintaining their own C-SEPP, as applicable.
- ii. Holding toolbox meetings at the start of each shift to discuss health, safety and environmental issues,
- iii. Developing their own orientation and training package to deliver to individuals entering the Sites on their behalf in addition to the Project training noted above.
- iv. Ensuring EPP conditions are reflected in their proposals and bids, and will comply with all relevant regulations, guidelines, permits, approvals and authorizations.

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The Contractor may be consulted, as required; on aspects of environmental compliance monitoring and environmental effects monitoring.

7.2 PROJECT ENVIRONMENTAL AWARENESS

7.2.1 Employee Orientation

A Project environmental orientation has been developed and will be presented to all Site Visitors that arrive at the Project Site. The orientation is considered a prerequisite to entering any of the LCP Sites.

Project environmental orientation will include elements of this EPP such as: environmental protection procedures; proper storage and handling of materials; encounters with wildlife, rare/endangered species, historic resources, waste management, and emergency response. Project environmental orientation will be delivered by experienced individuals with an in depth knowledge of the EPP and a knowledge of construction and execution activities.

The project environmental orientation will include a review of the following:

- a) Environmental management;
- b) Environmental considerations;
- c) Non-compliance and corrective actions;
- d) Environmental contingency measures;
- e) Incident reporting requirements;
- f) All permit-required work; and
- g) Construction site rules and regulations.

All Personnel who attend the Project Environmental Orientation session will be required to sign an attendance sheet, and will be provided with access to copies of the EPP, or C-SEPP as appropriate. All documentation must indicate the completed training and expiration dates.

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7.2.2 Visitor Orientation

A temporary orientation will be provided to those Site Visitors who have arrived at the Project, but will not be completing any field construction work (meetings, office work, deliveries, etc.). The Visitor orientation will cover relevant environmental protection measures, Project emergency procedures, environmental incident reporting requirements, and other general project environmental requirements.

Any person, who has not taken the full orientation program, will be supervised by a designated, oriented Project Personnel at all times, and will abide by the EPP.

7.2.3 Contractor Orientation

Contractors may develop and deliver additional environmental orientations to their workforces, Visitors, consultants and inspectors on the details of their C-SEPP, and/or corporate requirements. The Contractor orientations may be reviewed by the LCP.

7.2.4 Toolbox Meetings

Toolbox meetings (short, informal meetings) will be held by the Contractor with its field crews and supervisors at the beginning of each work shift. The tool box meeting will involve discussion of work task assignments for the day and any associated safety hazards. These meetings will also provide the opportunity to discuss environmental concerns and applicable mitigation measures that apply.

8 REFERENCES

Information and documents referenced in this EPP can be found at the LCP Project Office in St. John's. DFO Operational Statements and Factsheets, as well as DOEC Environmental Guidelines and Federal Government Regulations are included in Nalcor document, "Reference Material Document for Project Wide Environmental Protection Plan" - LCP-PT-MD-0000-EV-SD-0001-01). A listing of the key reference material is provided below:

Provincial Government Guidelines (Water Resources Division, DOEC)

- Environmental Guidelines for Watercourse Crossings;
- Environmental Guidelines for Stream Crossings by All-Terrain Vehicles;
- Environmental Guidelines for Bridges;

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- Environmental Guidelines for Culverts;
- Environmental Guidelines for Fording;
- Environmental Guidelines for Diversions, New Channels, Major Alterations;
- Environmental Guidelines for Pipe Crossings; and
- Environmental Guidelines for General Construction Practices.

DFO Operational Statements

- Aquatic Vegetation Removal in Freshwater Systems Operational Statement;
- Beaver Dam Removal Operational Statement;
- Bridge Maintenance Operational Statement;
- Clear Span Bridges Operational Statement;
- Culvert Maintenance Operational Statement;
- Dock and Boathouse Construction Operational Statement;
- High Pressure Directional Drilling Statement;
- Ice Bridges and Snow fills Operational Statement;
- Isolated Pond Construction Operational Statement;
- Maintenance of Riparian Vegetation in Existing Right-of-ways Operational Statement;
- Overhead Line Construction Operational Statement;
- Punch and Bore Crossings Operational Statement;
- Routine Maintenance Dredging Operational Statement; and
- Underwater Cables Operational Statement.

DFO Fact Sheets

- Fact Sheet on Effects of Silt on Fish and Fish Habitat;
- Fact Sheet on Blasting – Fish and Fish Habitat Protection;

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- Fact Sheet on Ditching;
- Fact Sheet on Temporary Fording Sites;
- Fact Sheet on Forwarder Trails;
- Fact Sheet on Filter Fabric;
- Fact Sheet on Rock Check Dam;
- Fact Sheet on Temporary Bridges;
- Fact Sheet on Resource Road Construction;
- Fact Sheet on Instream Work in the Dry – Cofferdams;
- Fact Sheet on Streambank Stabilization;
- Fact Sheet on Instream Work in the Dry – Temporary Diversion;
- Fact Sheet on Instream Work in the Dry – Elevated Pipes;
- Fact Sheet on Culvert Stabilization;
- Fact Sheet on Storm Drain Outlets;
- Fact Sheet on Temporary Settling Basins;
- Fact Sheet on Bridge Construction/Demolition;
- Fact Sheet on Freshwater Salmonid Habitat Requirements;
- Fact Sheet on Highway Construction/Upgrading – Infilling, Stabilization and No-Grub Zones;
- Fact Sheet on Freshwater Intake End-of-Pipe Fish Screen;
- Fact Sheet on Stream Clean-up;
- Fact Sheet on Timber Crib;
- Fact Sheet on Water and Sewer Installation – Stream Crossings;
- Fact Sheet on Culvert Installation; and
- Fact Sheet on AVTs, Fish Habitat and You

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Other Pertinent Federal Documents

- Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters, Wright and Hopky, 1998;
- Freshwater Intake End-of-Pipe Fish Screen Guidelines, Fisheries and Oceans Canada, 1995;
- Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador. Fisheries and Oceans Canada, St. John's, NF, Gosse, M.M., et. al. 1998;
- Standard Methods Guide for the Classification/Quantification of Lacustrine Habitat in Newfoundland and Labrador, Bradbury C., et. Al. 2001;
- Forestry Guidelines for the Protection of Fish Habitat in Newfoundland and Labrador, Scruton, D.A., et. al. 1997; and
- Standard Methods Guide for Freshwater Fish and Fish Habitat Surveys in Newfoundland and Labrador Rivers & Streams, Sooley, Darrin R. 1998.

Other Pertinent Provincial Documents

- NL Water Resources Act;
- Accredited Laboratory Policy (PD:PP 2001-01.02)
- Environmental Policy for Infilling Bodies of Water W.R. 91-1(*Water Resources Act*, DOEC);
- Environmental Policy for Land and Water Developments W.R. 95-01 (*Water Resources Act*, DOEC);
- Environmental Policy for Development in Shore Water Zones W.R. 97-1 (*Water Resources Act*, DOEC);
- Environmental Policy for Development in Wetlands W.R. 97-2 (*Water Resources Act*, DOEC);
- Environmental Code of Practice for Concrete Batch Plant & Rock Washing Operations (Department of Environment and Lands);
- Newfoundland and Labrador Species at Risk Data Sheets; and
- Motorized Snow Vehicles and All-Terrain Vehicles Regulations (NL Department of Natural Resources).

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9 RELEVANT LEGISLATION

There are regulatory requirements at the provincial, federal and municipal levels that apply to the design and construction of the Project. Compliance will be evaluated through a program of environmental compliance monitoring, primarily implemented by On-Site Environmental Monitors.

The LCP has adopted Nalcor Energy's Corporate Environmental Policy and Guiding Principles and its Environmental Management System, which meet the requirements of ISO 14001:2009 (Environment). As a result, environmental protection measures and mitigation associated with this Project will meet the same high corporate Standard.

All work undertaken during the design, construction and commissioning phases of this Project will be in accordance with the most recent guidelines. For a detailed discussion of the regulatory requirements for the Project see the Regulatory Compliance Plan (Nalcor Document #. LCP-SN-CD-0000-RT-PL-0001-01).

9.1 FEDERAL

The following federal environmental acts apply to one or more aspects of Project:

- a) Canadian Environmental Assessment Act (CEAA);
- b) Canadian Environmental Protection Act (CEPA);
- c) Species at Risk Act (SARA);
- d) Navigable Waters Protection Act (NWPA);
- e) Transportation of Dangerous Goods Act, 1992;
- f) Oceans Act;
- g) Canada Shipping Act;
- h) Migratory Birds Convention Act; and
- i) Fisheries Act.

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9.2 PROVINCIAL

The following provincial acts and regulations apply to one or more aspects of the Project:

- a) Dangerous Goods Transportation Act;
- b) Endangered Species Act;
- c) Forestry Act;
- d) Historic Resources Act;
- e) Newfoundland and Labrador Lands Act;
- f) Environmental Protection Act (EPA);
- g) Air Pollution Control Regulations, 2004;
- h) Gasoline Volatility Control Regulations, 2003;
- i) Pesticides Control Regulations, 2003;
- j) Storage and Handling of Gasoline and Associated Products Regulations, 2003;
- k) Used Oil Control Regulations, 2002;
- l) Waste Diversion Regulations, 2005;
- m) Waste Management Regulations, 2003;
- n) Waste Material Disposal Areas, 1996;
- o) Wild Life Act;
- p) Water Resources Act;
- q) Well Drilling Regulations, 2003;
- r) Water Power Rental Regulations, 2003;
- s) Environmental Control Water and Sewage Regulations, 2003; and
- t) Lower Churchill Labrador Island Transmission Link Project Act.

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9.3 MUNICIPAL

In some areas, construction activity will take place within municipal boundaries. In these areas, local bylaws will be complied with and permits obtained.

10 PREFACE-MAINTENANCE OF THE ENVIRONMENTAL PROTECTION PLAN (EPP)

This Environmental Protection Plan (EPP) will at times require updating in response to changes in the Project, Contractor work methods, group structure, or technological advancements that provide higher level of environmental protection. The subsections below indicate the process with respect to maintenance and implementation of the EPP.

10.1 INITIATING REVISIONS

This EPP is a controlled document and revisions may only be processed by the Environment and Regulatory Compliance (ERC) Manager. It is anticipated that most of the revisions to this EPP will be initiated by the Environment and Regulatory Compliance Team at the work fronts or at the Lower Churchill Project office in St. John's.

Project Delivery Team (PDT) staff will request revisions through document control. EPP holders and readers/reviewers (within the PDT, government agencies, contracting firms, other stakeholders, etc.) may request revisions by forwarding a completed Revision Request Form (RRF), to the Environment and Regulatory Compliance Manager. These revision requests will be screened and reviewed by the ERC Manager and forwarded to the General Project Manager for approval.

10.2 COMPLIANCE INSTRUCTIONS

Revision requests that have been accepted by the Project Manager will be sent to the Environment and Regulatory Compliance Manager for distribution to key Project participants as "Compliance Instructions". These instructions will be signed off by key holders of the EPP and returned within two (2) days of receipt. A log of compliance instructions will be maintained by the Environmental Engineering Coordinators, and these will be incorporated periodically into a revised edition of the EPP.

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10.3 REVISION PROCEDURES

Revisions to the EPP will be made annually, or as required, in accordance with Project document control procedures. The Environment and Regulatory Compliance Manager will issue the accepted revisions of the EPP to key holders, Contractors, and readers/reviewers. Each revision will be accompanied by a Revision Control Record that:

- Identifies all compliance instructions that have been issued since the last revision; and
- Lists the sections being superseded.

Within two (2) working days of receiving a revised Plan, EPP holders shall:

- Familiarize themselves with revised sections of the EPP;
- Incorporate all revisions into their areas of responsibility, as appropriate;
- Ensure that all personnel are familiar with the revisions; and
- Acknowledge receipt of the revised EPP by forwarding via fax, email, or mail a signed and dated Acknowledgement Form to the Environment and Regulatory Compliance Manager.

11 GENERAL ENVIRONMENTAL PROTECTION PLAN

In general, environmental mitigation will be planned and designed prior to issuing proposal calls for construction contracts. Environmental mitigation plans and specifications will be incorporated into documents provided to prospective contractors for proposal purposes.

Environmental mitigation will be consistent with applicable standards, codes, acts and regulations, and the conditions of Environmental Assessment (EA) release. This section contains a comprehensive suite of environmental protection procedures to be used.

The procedures in this section may need to be modified in the future to address new activities, unforeseen Site conditions, changes in engineering design and/or construction work methods, or new environmental performance standards. These changes will be part of the maintenance of the EPP as outlined in the front of this report.

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11.1 SCHEDULING AND TIMING OF CONSTRUCTION ACTIVITIES

Construction planning is one of the most fundamental activities in the management and execution of construction projects. One of the most important factors in a large scale project is the scheduling and timing of various activities. However, sensitive time periods, outlined in the section below, will be considered in Project planning, where practical. Where activities are to be carried out during sensitive time periods, additional mitigations will be applied, as required.

Environmental Concerns

Construction activities will be organized so that various tasks that must be accomplished have the necessary precedence and resources required to complete the task.

Environmental Protection Procedures

- a) A complete schedule of activities, provided by the Contractor and accepted by OSEMs, will be completed prior to commencement of any construction task and any restrictions on timing will be noted on the schedule;
- b) While the ideal time of year for construction located near a body of water is typically in early June through to late October, which is due to the low flow and low rainfall period, construction will be occurring at other times and specific attention will be paid to ensure environmental mitigations are applied during this period;
- c) Stripping, grading, excavating and/or rehabilitation activities will be scheduled to minimize the amount of time the soil is exposed to elements;
- d) Activities will be conducted in such a way as to reduce the amount of time spent in or around a stream or waterbody;
- e) Construction activities will be scheduled, where possible, to avoid any sensitive areas of fish and wildlife habitat and critical periods in fish and wildlife cycles. The sensitive life stages of wildlife in the Project area are illustrated below. These sensitive life stages as indicated in blue, are used to identify the timing of migration, spawning and calving in the vicinity of the Project area; and
- f) If timing is not ideal, alternative mitigations will be implemented.

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Table 11-1 - Sensitive Life History Stages of Aquatic and Terrestrial Fauna

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Aquatic												
Newfoundland Island												
American Eel												
Arctic Char												
Arctic Char (sea-run)												
Atlantic Salmon												
Brook Trout												
Brown Trout												
Rainbow Smelt												
Rainbow Trout												
Labrador												
Arctic Char (sea-run)												
Atlantic Salmon												
Brook Trout												
Burbot												
Lake Trout												

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Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Aquatic												
Lake Whitefish												
Northern Pike												
Ouananiche												
Rainbow Smelt												
Round Whitefish												
Suckers												
Terrestrial												
Early Nesting Waterfowl												
Late Nesting Waterfowl												
Forest Avifauna												
Raptors												
Caribou												
Moose												
Semi-aquatic Furbearers												
Terrestrial Furbearers												
Black Bear												

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11.2 CONSTRUCTION ENTRANCE

Environmental Concerns

Construction entrances typically consist of a gated Right-Of-Way (ROW) and a security building, but would also include access to transmission line ROW from public roads/highways. Environmental concerns include the vegetation clearing that may be required for the construction of these features, and tracking of dirt and mud from the Site onto public roads and streets.

Environmental Protection Procedures

Measures to remove mud and dirt from vehicles, heavy equipment and pedestrians will be required. Measures include rumble racks, tire washes and sediment traps.

- All cleaning activities should occur on a gravel pad with runoff running through a sediment trapping device prior to discharge;
- The gravel pad should be designed for the heaviest vehicle anticipated on Site;
- Ensure proper cleaning of machinery/vehicles to prevent potential spread of invasive species;
- Ensure all Site traffic use the facility and ensure the sediment trapping device is cleaned and maintained regularly; and
- Temporary erosion control measures will be applied as required in the area of vegetation clearing for any gate areas or entrance buildings. See Section “Erosion Prevention and Sediment Control” for applicable control measures.

11.3 LINEAR DEVELOPMENTS

Environmental Concerns

Linear developments encompass a diverse range of standard construction related activities such as ditching, right-of-way clearing, roads and transmission line construction. Environmental concerns associated with linear developments include potential sedimentation/erosion, and the loss of vegetation and fish/wildlife habitat. Linear features can also have a negative impact on caribou beyond habitat loss.

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Environmental Protection Procedures

Road Construction & Ditching

- a) Aggregate (fill) materials for construction purposes will not be removed from any stream;
- b) Sedimentation control measures, as outlined in Section, “Erosion Prevention and Sediment Control”, will be followed. Solids that accumulate in a settling pond or behind a sediment trap will be removed on a regular basis to ensure such systems remain effective;
- c) Work will not be undertaken on easily erodible materials during or immediately following heavy rainfalls without accepted protection measures in place;
- d) Buffer zones will be flagged prior to any disturbance activities, as required;
- e) Natural vegetation will be left in place where possible. Rights-of-way, particularly in areas of dense vegetation, will be as narrow as practicable; loss of ground vegetation will be kept to a minimum;
- f) Roads will be adequately ditched so as to allow for good drainage. Where possible, ditches will be kept at the same gradient as the road;
- g) Drainage from areas of exposed fill will be controlled by grade or ditching and directed to vegetated areas away from all watercourses and at least 30 m from stream crossings. These drainage areas will be determined in consultation with the OSEMs;
- h) Surface water will be directed away from work areas by ditching. Runoff from these areas will have sediment removed by filtration or other suitable methods as outlined in Section, “Erosion Prevention and Sediment Control” and will be directed away from wetlands and watercourses;
- i) The sediment control measures will be determined on Site by Contractor Personnel and accepted by the On-Site Environmental Monitor;
- j) Check dams will be used, as required, to reduce runoff from work areas with exposed soil;
- k) In areas where natural vegetation must be removed, the topsoil layer will be separately stored from grubbed material for rehabilitation;
- l) Cut areas through silt and clay materials will have erosion prevention measures in place (Section “Erosion Prevention and Sediment Control”);

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- m) Temporary erosion control will be applied on exposed slopes in sensitive areas immediately following exposure of a slope. A permanent control measure will be installed shortly thereafter. Refer to Section “Erosion Prevention and Sediment Control” for applicable erosion control measures;
- n) The cutting and filling phase of road construction, and the development of other work areas, will be conducted as outlined in the following procedures:
 - i. Cutting and filling will be done only upon completion of grubbing. Where engineering requirements do not require grubbing (e.g., within the buffer zone of a stream crossing), filling will occur without any disturbance of the vegetation mat or the upper soil horizons;
 - ii. Filling in the vicinity of stream crossings will be done in a manner which ensures that erosion and sedimentation of watercourses, waterbodies and other ecologically sensitive areas, such as wetlands, is minimized and done in strict compliance with the required watercourse alteration permits from the DOEC. The hydrologic function of wetlands will be maintained;
 - iii. The infilling of watercourses and waterbodies will not be permitted, except as authorized by regulatory agencies and with the approval of the OSEM. The OSEM will inspect the work to ensure it is completed in compliance with the required watercourse alteration permits from the DOEC, and any guidance provided by DFO;
 - iv. Buffer zones will be maintained between the roads and the bank of any watercourse they parallel (refer to Section “Erosion Prevention and Sediment Control”); and
 - v. Road fill will be dry and ice free. On areas of sensitive terrain, excess fill will be end-dumped from the established roadbed.
- o) Culverts will be properly installed to maintain natural cross-drainage and to prevent ponding;
- p) The number of stream crossings will be minimized. Where access must cross a stream, the environmental protection procedures detailed in Section “Erosion Prevention and Sediment Control” will be followed;
- q) Where possible, construction activities will avoid areas of wildlife concentrations to prevent undue disturbance of wildlife during critical periods (refer to Sections: “Scheduling and Timing of Construction Activities”, “Resource Specific Mitigations” & “Site Rehabilitation”). If encounters with wildlife are

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unavoidable, then contingency plans detailed in the Contingency Plan Section of this document will be followed;

- r) Where possible, rights-of-way will avoid known archaeological, historic and/or spiritual sites and required buffers will be respected (See Section “Buffer Zones”). Where they cannot be avoided, the site will be mitigated to the satisfaction of Provincial Archaeology Office (PAO) prior to work proceeding. If any archaeological or historic sites are encountered (known or otherwise), all work will cease in that area until approval to proceed has been granted by the PAO;
- s) Reference will be made to the Guidelines for Protection of Fish Habitat in Newfoundland and Labrador, 1998; and
- t) Boundaries of right-of-way and road easements and all boundaries of the facility, infrastructure and borrow sites that will be developed will be staked.

Right-of-Way Clearing

- a) All salvaged timber will be piled at right angles to rights-of-way so as not to obstruct the access or work of others, damage vegetation or be placed within buffer zones of critical habitat;
- b) Disposal of cleared non-merchantable timber, slashing and cuttings from cleared areas will take place through mulching and/or piling to minimize the amount of slash. No burning of materials is permitted for this Project;
- c) If slash piles are to be used, they will be piled so as not to cause unnecessary damage to vegetation outside the right-of-way. A 6.5 m break in slash piles will be made every 200 m to allow for drainage and animal access. The maximum height of the piles will not exceed 3 m; and
- d) All conditions outlined under Road Construction and Ditching (above), as well as Transmission Line Development (below) that also apply to right-of-way clearing will be adhered to.

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Transmission Line Development

- a) Where feasible and applicable, untreated wood should be used. Where untreated wood is not practical, it will be treated with Pentachlorophenol (PCP), Chromated Copper Arsenate (CCA) Ammonical Copper Arsenate (ACA), Ammoniacal Copper Zinc Arsenate (ACZA), or Copper Naphthenate (CuN) only (refer to Section “Wood Treatment” of this document for information regarding the use of treated wood in and around waterbodies and protected water supply areas);
- b) Access for the transmission line development will follow the protective measures as listed above for roads and ditching; and
- c) Ground travel on the transmission line will follow existing trails and tote roads, where practical. Stream crossings will follow DFO Standard Operating Procedures (SOP), where feasible (one time ford, clear span bridge, etc.).

11.4 WINTER CONSTRUCTION

Environmental Concerns

The principal concerns associated with winter construction are potential effects on freshwater ecosystems and water quality.

Environmental Protection Procedures

- a) Winter vehicles will be confined to properly prepared, groomed and approved trails and to work sites;
- b) Maintenance and refuelling of vehicles will be restricted to designated areas;
- c) Only streams or waterbodies that are frozen will be traversed, unless permits to ford are in place (see the DFO Operational Statement for Ice Bridges and Snow Fills);
- d) Any debris or materials placed upon the ice surface of any waterbody will be removed immediately after job completion; and/or prior to spring melt;
- e) The ground must be frozen or a minimum 0.5 m snow cover for unfrozen ground is required for winter trails to avoid ground disturbance;
- f) All known archaeological sites will be avoided;

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- g) Snow removed for snow clearing operations will be disposed of in areas directed by the OSEM; and
- h) Gaps of at least 2 m are to be left in windrowed snow to allow for animal movements.

11.5 EQUIPMENT OPERATION AND MOVEMENT

A variety of equipment will be used on Site during construction. This is a potential source of noise, air emissions, and potential leaks or spills.

Environmental Concerns

Noises associated with equipment operation and movement may negatively affect humans and wildlife. Air emissions may have air quality implications. Accidental leaks or spills of fuel or other hazardous materials may affect soils, water, fish, vegetation and wildlife. Tracked equipment has the potential to disturb the ground around/at work fronts.

Environmental Protection Procedures

- a) All approvals, authorizations and permits for Project activities will be followed;
- b) Prior to the commencement of construction, equipment will be inspected for the presence of soil that could contain seeds and/or propagules of invasive and non-native species. If equipment is found to have soil attached, it will be cleaned (i.e., pressure washed) to remove the potential seed source. In addition, equipment coming from other regions or provinces will be clean and free of potential seed sources of invasive plants.
- c) Noise control procedures will be followed during all work activities (Section “Noise Control”);
- d) All equipment will have exhaust systems regularly inspected and mufflers will be operating in accordance with manufacturer’s recommendations;
- e) All equipment (e.g., diesel generators) will meet the requirements of the *NL Air Pollution Control Regulations* under the *Environmental Protection Act*, as required. Diesel generators will be registered with DOEC, as required. Refer to the guidance document for Approval of Diesel Generators (GD-PPD-061) for the registration form and guidance on completion;

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- f) All equipment used during construction will follow the environmental protection procedures outlined in this EPP. In the case of an accidental event resulting from the use of equipment (e.g., a fuel spill), refer to Section, "Contingency Plans";
- g) All equipment on the Project site will use only oils/lubricants that classify as "biodegradable", where feasible (refer to Section, "Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials" of this document for additional information on the use of biodegradable oils/lubricants);
- h) ATVs and tracked vehicles will only be used where necessary. ATV use will comply with the Motorized Snow Vehicles and All-Terrain Vehicle Regulations, 1996, the Environmental Guidelines for Stream Crossings by ATV, 1994 and the DFO Fact Sheet ATVs, Fish Habitat and You;
- i) The use of heavy equipment in or near watercourses will be minimized and restricted;
- j) All equipment will be regularly maintained and inspected. If problems are identified the equipment will be taken out-of-service and repaired to prevent release of hydrocarbons into the environment; and
- k) Best Management Practices outlined in "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (May 2005, ChemInfo Services Inc. for Environment Canada) will be implemented to mitigate air quality effects during the site preparation, clearing, and construction phases, where practical.
- l) Equipment coming from other regions or provinces will be clean and free of potential seed sources of invasive plants.

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11.6 VESSEL OPERATIONS (BARGE/BOATS)

Vessel traffic during construction may be required, including barges, tugs and ocean-going barges, and marine vessels to transport equipment and supplies to the construction Sites. Heavier vessels will be used for some of the larger modules particularly if they are being transported on the high seas. All vessels will meet Transport Canada Regulations and Standards, under the *Canada Shipping Act*, as well as international regulations established by the International Maritime Organization (IMO).

Environmental Concerns

Project vessel traffic may, at times, increase vessel traffic in Goose Bay and/or Cartwright. There is a risk due to increase in vessel traffic for vessels to collide, run aground and/or sink. Such events may lead to the accidental release of fuel and other hazardous materials to the marine environment. The release of non-compliant ballast water could also introduce non-indigenous species or deleterious substances into Canadian waters.

Environmental Protection Procedures

- a) All vessel activity will comply with the Pollutant Discharge Reporting Regulations, Regulations for Prevention of Pollution from Ships and Dangerous Chemicals and Vessel Traffic Service Zones Regulations as required under the *Canada Shipping Act*;
- b) All commercial vessels 20 m or more in length entering Goose Bay will report to the Marine Communications and Traffic Service Center (MCTS);
- c) The OSEMs and the local public will be advised of all particulars with regard to incoming/outgoing vessel traffic on a timely basis including updates regarding the estimated time of Arrival/Estimated Time Of Departure (ETA/ETD) as advised by vessel masters;
- d) Project vessel masters will observe the following basic rules:
 - i) Demonstrate that they have a set of safety and emergency procedures on board;
 - ii) Advise the Site office of their time of departure from their port of origin and their estimated time of arrival at Happy Valley-Goose Bay or Cartwright;
 - iii) Notify the site office of their progress at sea or, if stopping at other ports enroute, update their ETA;

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- iv) Relevant Canadian Hydrographic Charts or electronic charting systems will be on board prior to leaving their port of origin; these charts will be kept on board at all times;
- v) Implement Best Management Practices designed to achieve zero discharge of oily waste while at the Site and along the shipping route;
- vi) All Project-related vessels will have onboard adequate oil spill response equipment to handle an accidental release of product into the environment; and
- vii) Refer to the Master Spill Response Plan in the event of a spill or leak.
- e) No Project-related vessels will discharge wastes into surrounding waters. The discharge of garbage from ships into Canadian waters and the waters of the Fishing Zones of Canada is prohibited;
- f) All crewmembers will be familiar with emergency procedures for both life threatening and potentially polluting situations;
- g) Vessel traffic will not encroach on the marine or land portion of the Gannet Islands Ecological Reserve;
- h) All stationary hazards, such as moored platforms, vessels and electrode site breakwaters will be clearly marked according to the *Navigable Waters Protection Act* and/or *Collision Regulations* under the *Canada Shipping Act*; and
- i) All vessels will comply with the Ballast Water Control and Management Regulations SOR/2006-129, under the *Canada Shipping Act*.

11.7 HELICOPTER TRAFFIC

Helicopter use at the Project site during construction will be required.

Environmental Concerns

Noise from the aircraft may disturb wildlife. Collisions with wildlife could result in mortality for both wildlife and humans. Fuelling of helicopters may result in spills.

Environmental Protection Procedures

- a) All aircraft will maintain an altitude of no less than 500 m from concentrations of birds or other wildlife;

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- b) Flights for wildlife viewing or photography are not permitted, except when conducting wildlife surveys. Permits from the Wildlife Division are required for wildlife surveys;
- c) The OSEM will inform all charter pilots of the EPP requirements;
- d) All aircrafts will inform the Contractor of their expected arrival and departure times;
- e) Aviation fuel caches will have approval from Service NL;
- f) The Contractor will ensure that helicopter landing areas are kept clear of equipment, materials/supplies at all times throughout the construction phase to avoid accidents or damage to the helicopter;
- g) All aircraft operators will review marine and aviation weather forecasts prior to departure;
- h) Raptors (e.g., Bald Eagle, Osprey, and Red Tailed Hawk) are known to nest within in the Project area. Under no circumstances will nesting raptors be approached. The disturbance effects that helicopters have on nesting raptors can be detrimental for both the birds and the safety of the aircraft. All aircrafts will maintain a 300 m vertical and horizontal buffer from known active raptor nests (refer to Table 11-13);
- i) Locations along the Churchill River are known as spring and fall staging areas for waterfowl. Helicopters moving through these areas during this time (typically May or September) will maintain a minimum altitude of 500 m from concentrations of waterfowl; and
- j) The number of helicopter trips should be minimized to the extent feasible by combining trips or using other appropriate means of travel.

11.8 CLEARING OF VEGETATION

Environmental Concerns

Vegetation clearing (e.g., trees, shrubs) will be required during site preparation for work areas, laydown areas, roads, and ROWs. Environmental concerns include loss of habitat, sedimentation of watercourses, and disturbance or destruction of historic resources.

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Environmental Protection Procedures

The following measures will be implemented to reduce the potential effects of vegetation clearing:

General

- a) Cutting activities will be limited to those areas that are required for construction of infrastructure and ROW clearing;
- b) Mulching of non-merchantable wood within the HVdc ROW is allowed as an option for disposal, except where piling is required for habitat enhancement, primarily in the Pine Marten critical habitat areas, or otherwise directed by the Company. Clearing within waterbody buffer zones along the HVdc ROW will be reduced to a 3 m wide travel route, or as required for equipment.
- c) All clearing will comply with the requirements of all applicable permits, including a Commercial Cutting Permit and an Operating Permit;
- d) A cutting permit will be obtained prior to the start of any site clearing. Clearing and tree removal will be restricted to the minimum areas needed for the site and stockpiles;
- e) Clearing will consist of cutting to within 15 cm or less of the ground and stockpiling of all merchantable timber; as well as the removal, piling and mulching of shrubs, debris and other non-merchantable timber in the area, as appropriate;
- f) Disposal of cleared non-merchantable timber, slash and cuttings from cleared areas will take place through mulching and/or piling to minimize the amount of slash. No burning of materials is permitted for this Project;
- g) If slash piles are to be used, they will be piled so as not to cause unnecessary damage to vegetation outside the right-of-way. A 6.5 m break in slash piles will be made every 200 m to allow for drainage and animal access. The maximum height of the piles will not exceed 3 m;
- h) Limits of clearing will be shown on all drawings issued for construction. Only those areas designated on drawings will be cleared. Trees will be blazed/flagged at intervals in advance of clearing to demarcate the limits of the work. Blazed trees will not be felled. Clearing activities will not remove any trees outside the authorized clearing limits;

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- i) Slash, mulched debris and any timber will not be permitted to enter any watercourse. All timber and slash/debris will be piled/disposed of above spring flood levels;
- j) Mechanical clearing by mechanical harvesters will likely take place within the main construction areas and ROWs. For other clearing required, chain saws or other hand-held equipment may be used except where alternative methods or equipment are accepted by the OSEM;
- k) Mechanical clearing by means other than mechanical harvesting equipment (i.e., bull dozer or excavators) will not occur;
- l) Firefighting tools and water delivery systems must be available, as required, by the Operating Permit for the activity;
- m) A buffer zone of undisturbed vegetation will be maintained between construction areas and all waterbodies, watercourses, and ecologically sensitive areas (refer to Section, "Buffer Zones" within this document), unless otherwise authorized. Buffer zone features will be key elements of the environmental review of drawings prior to construction;
- n) Where possible, timber will be felled inward toward the work area to avoid damaging any standing trees within the immediate work area;
- o) Workers will not destroy or disturb any features that are indicative of a historic or archaeological site. Any such findings will be reported immediately to the OSEM (refer to Section "Historic or Archaeological Resources");
- p) Clearing activities will be in compliance with the Avifauna Management Plan;
- q) No clearing will take place within 800 m of an active raptor nest (refer to Table 11-13). If a nest is encountered during clearing activities, all work will stop until the site is cleared by the OSEM, in consultation with the appropriate regulatory agencies;
- r) If a tree containing an inactive eagle or osprey nest is encountered during clearing of construction sites (other than transmission lines), the nest will be assessed for viability and if the nest is deemed viable a platform will be established as approved by the provincial Wildlife Division. For other raptors such as hawks and owls, active nests will be identified as per the Avifauna Management Plan and appropriate buffers applied;

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- s) If a tree containing an inactive raptor nest is encountered during transmission line clearing, a platform will not be required as the tower will provide an alternative nesting site;
- t) Merchantable timber is defined as being 2.5 m or more in length with a top diameter not less than 9.1 cm and being of generally sound condition. Non-merchantable timber consists of all other vegetation with no merchantable value, such as small trees, shrubs, limbs and/or branches;
- u) All merchantable timber will be salvaged. It will be cut into standard harvesting lengths (i.e., 2.5 - 3.5 m lengths), trimmed, and stored in identified stockpile areas. See Figure 11-3 for poorly cut and piled wood and Figure 11-4 shows properly cut and piled wood; and
- v) All merchantable timber within the specific clearing limits will be stockpiled so as not to obstruct the access of work of others.

Transmission Line/Road Rights-of Way

- 1) All salvaged timber will be piled at right angles to rights-of-way so as not to obstruct the access or work of others, damage vegetation or be placed within buffer zones of critical habitat; and
- 2) Slash and debris is to be disposed of as per items g) and i) of the general conditions outlined above.



Figure 11-2 - Poorly Cut and Piled Wood

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Figure 11-3 - Properly Cut and Piled Wood

11.9 PUMPS AND GENERATORS

Environmental Concerns

A variety of water pumps, hoses and generators will be in frequent use in many construction sites and at remote work camps. Environmental concerns are associated with any accidental spills or chronic leaks contaminating waterbodies and soil. There may also be concerns with noise, as well as air emissions from generators at the Sites.

Environmental Protection Procedures

The following measures will be implemented to reduce the potential effects of the storage, handling, use and disposal of the fuel and other hazardous materials.

- a) Refer to Section, “Buffer Zones” for required buffer zones for fuel and other hazardous materials storage and handling;
- b) Noise control procedures will be followed during use (refer to Section “Noise Control”);
- c) Drip pans will be placed underneath pumps and generators. The drip pans will be lined with absorbent material. Absorbent material will be kept at all sites where pumps and generators are in use;
- d) Spill kits will accompany all pumps and generators at the site (refer to Section “Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials” with this document);
- e) Pumps and generators will be located as far as practical from all waterbodies;

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- f) Pumps and generators will be located on a level, stable surface. All pumps used for freshwater supply will have a fine mesh screen on the intake hose (Please refer to DFO's "Freshwater Intake End of Pipe Fish Screen" guidelines);
- g) Hoses and connections on equipment will be inspected routinely for leaks and drips;
- h) A Water Use License from the Water Resources Management Division will be required for withdrawal of water from a waterbody;
- i) All diesel generators at the Sites will meet the requirements of the *Air Pollution Control Regulations, 2004* under the *Environmental Protection Act* as required, Generators built to Tier 4 Final emission standard may be exempt from NLDOEC Certificate of Approval; and
- j) All leaks will be reported immediately to the OSEMs. Upon detection of a leak, the equipment (i.e. pump, generator, etc.) will be shut down immediately and corrective action taken to repair the leak and clean-up any contaminated soil and/or water (Refer to the Master Spill Response Plan).

11.10 SURVEYING

Surveying activities may include: vegetation removal, traversing, establishing targets, permanent benchmarks and transponder stations.

Environmental Concerns

Surveying activities may disturb vegetation, wildlife, and historic resources.

Environmental Protection Procedures

Vegetation Removal

- a) Vegetation removal will be scheduled to minimize disturbance to animals in sensitive areas or during sensitive time periods, where possible;
- b) Width of survey lines will be limited to that which is absolutely necessary for line of sight and unobstructed passage;
- c) Whenever possible, cutting lines to the edge of open areas will be avoided;
- d) Trees and shrubs will be cut flush with the ground wherever possible with stumps not to exceed 15 cm;

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- e) Cutting of survey lines will be kept to a minimum;
- f) All trees not exactly on transit lines will be left standing and trees partly on line should be notched (notch not to exceed 1/3 tree's diameter) instead of removed, to allow sighting;
- g) Discretion will be used when large trees are encountered. For example, trees 30 cm at Diameter Breast Height (DBH) or larger should, whenever possible, not be cut. On grid lines, trees of 30 cm diameter or larger will be left intact and will be traversed to continue the line;
- h) Wildlife will not be harassed or disturbed;
- i) Vehicles will yield the right-of-way to wildlife;
- j) There will be no cutting in areas designated as sensitive without notification to the OSEMs;
- k) Archaeological sites and features will not be disturbed during survey work. Any historic resource discoveries will be reported as per Section, "Historic or Archaeological Resources";
- l) Survey crews will have a briefing on the recognition of historic resources prior to commencing work.

Traversing

- a) ATVs will not be allowed off the right-of-way, except where acceptable to the OSEM. ATV use will comply with the *Motorized Snow Vehicles and All-Terrain Vehicle Regulations, 1996*, the *Environmental Guidelines for Stream Crossings by ATV, 1994* and the DFO Fact Sheet *ATVs, Fish Habitat and You*;
- b) No motorized vehicles will enter the areas designated as sensitive without notification of the OSEMs;
- c) Activity within sensitive areas will be minimized; and
- d) Walking in sensitive areas will be restricted to established walking paths, where available.

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Establishing Targets, Permanent Benchmarks and Transponder Locations

- a) A driven T-bar, embedded to readily identify each benchmark location, will be used;
- b) Access to sensitive areas will be accepted by the OSEMs;
- c) Standard iron bars and sledgehammers will be used to establish benchmarks; and
- d) Heavy equipment will not be used to access sensitive areas.

11.11 DRILLING

11.11.1 Geotechnical

Drilling will be required as part of geotechnical investigations to recover soil samples, characterize the subsurface of proposed foundations, excavate areas and probe the bedrock surface. Seismic geophysical methods may also require drilling of shot holes in which small sources of energy (explosives, weight drop, air gun, etc.) are to be placed.

Environmental Concerns

The environmental concerns associated with drilling are surface disturbances, disposal of drilling fluids and cuttings, generation of dust, noise, and the potential effects on terrestrial habitats, historic resources, air quality and aquatic ecosystems.

Environmental Protection Procedures

The following mitigation measures must be followed when drilling at the Site:

- a) A Water Use License from the Water Resources Management Division is required;
- b) Shot holes for seismic activities will not be within 100 m of any water well, structure or buried service line;
- c) Drilling mud, together with drilling cuttings and return water, will be treated using a polydrill filter box or suitable alternative (See Figure 11-5). Solids collected will be disposed of at an approved waste disposal site. All treated water will be discharged on land to the environment in a manner that will promote permeation into overburden soils and will not enter or impair waterbodies. If drilling mud is

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required, biodegradable products such as clear-bore or an approved equivalent will be used. The type will be documented and the up-to-date MSDS provided and kept on file;



Figure 11-4 - Polydrill Filter Box used for Solids Removal in Drilling Applications

- d) All discharges will meet the Environmental Control Water and Sewer Regulations (ECWSR).
- e) Drilling of boreholes will be conducted in compliance with all conditions of the Exploration Approval for the work required under the *Mineral Regulations* issued under the *Mineral Act*;
- f) All drilling equipment on the Project Site will use only oils/lubricants that classify as “biodegradable” (refer to Section, “Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials” within this document for additional information on the use of biodegradable oils/lubricants);
- g) Due to the nature of drilling activities (quicksnaps, couplings) oil drops and leaks may occur. The area will be cleaned up at every opportunity and all rigs will be equipped with spill kits (as outlined in Section “Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials” within this document);
- h) In the event of a hose rupture or loss of hydraulic fluid, the Master Spill Response Plan will be followed;
- i) Abandoned drill holes will be sealed with a cement grout bentonite mixture;
- j) If explosives are used in seismic shot holes, a blasting plan will be reviewed with the OSEM to ensure any unexploded charges are removed from the holes prior to sealing;

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- k) If blasting occurs near water, DFO's "Guidelines for the use of Explosions in or near Canadian Fisheries Waters" will be consulted;
- l) Drilling sites will be cleared of vegetation following the procedures detailed in Section, "Clearing of Vegetation" of this document;
- m) Disposal of all drilling materials and associated solid wastes will be undertaken in accordance with the procedures in Section, "Solid Waste Disposal" of this document;
- n) Fuel will be stored, handled and transported according to Sections "Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials" and "Buffer Zones within this document;
- o) Water applications will be used to control dust. Water-based drilling dust suppression systems may require anti-freeze in winter months, which will be approved by the DOEC. The use of water for dust control or coring/wash boring will be undertaken in a manner that ensures return water does not enter watercourses;
- p) Drilling equipment will have muffled exhaust to minimize noise;
- q) No person will deposit or permit deposition of oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds; and
- r) If possible, drilling will be scheduled to minimize disturbance to animals in sensitive areas during sensitive time periods.

11.11.2 Water Well

Water well drilling may be required on land during hydrogeological investigations to evaluate groundwater quality and quantity of bedrock aquifers.

Environmental Concerns

The environmental concerns associated with drilling water wells are surface disturbances, disposal of drilling fluids and cuttings, generation of dust, noise, and the potential effects on terrestrial habitats, historic resources, air quality and aquatic ecosystems.

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Environmental Protection Procedures

- r) Drilling sites will be cleared of vegetation following the procedures detailed in Section, “Clearing of Vegetation” of this document;
- s) Disposal of all drilling materials and associated solid wastes will be undertaken in accordance with the procedures in Section, “Solid Waste Disposal” within this document;
- t) Fuel will be stored, handled and transported according to Section, “Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials” within this document;
- u) Drilling equipment will have muffled exhaust to minimize generated noise;
- v) Drilling of water wells will be conducted in compliance with the *Water Resources Act* and the *Well Drilling Regulations*; and
- w) Potential drilling sites in sensitive areas will be confirmed by the OSEMs.

11.11.3 Marine and Riverine Environment

Marine drilling may be required during geotechnical investigations to determine foundation conditions - assess stability, and underlying seabed or riverbed for Project infrastructure. Drilling will be conducted from a barge of suitable size.

Environmental Concerns

The environmental concerns associated with this type of geotechnical drilling in a marine environment include pollution from the release of drill cuttings and other drilling related debris, fuel or other hazardous material, noise generated by drill operations, and disturbance of aquatic ecosystems (marine communities and/or individual species) caused by increased turbidity in the area proximal to the drill collar location.

Environmental Protection Procedures

- a) All drilling equipment on the Project site will use only oils/lubricants that classify as “biodegradable” (refer to Section “Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials” within this document for additional information on the use of biodegradable oils/lubricants);
- b) Potential drilling sites will be inspected and cleared by the OSEM prior to drilling proceeding;

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- c) The drill rig will be inspected for mechanical soundness prior to mobilization to the drill site. Barges used to support drilling will be inspected and approved prior to drill mounting onto barge. The drill crew will also keep a daily log of inspections and mechanical soundness of barge and drill. Daily logs will note the general stability of the drill rig and overall assessment of the surrounding sea/river state;
- d) Following the initial inspection and prior to each drill mobilization, the drill rig and barge will be inspected by the OSEM for potential environmental risks;
- e) All fuel, lubricants and other hydrocarbons will be stored, handled and transported according to Section “Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials” within this document. Only necessary quantities will be stored at the drill rig at any time;
- f) A spill containment boom will be deployed around the barge until it is removed from the drill site;
- g) Disposal of drilling materials and all solid wastes will be undertaken according to Section, “Solid Waste Disposal” within this document;
- h) Drilling equipment will have muffled exhaust to minimize noise;
- i) Turbidity from the release of drill water will be localized to the area of the drill site and will cease after drilling is complete. Release of suspended solids will be frequently monitored by the OSEM;
- j) All discharges will meet the Environmental Control Water and Sewer Regulations (ECWSR).
- k) Operations will be suspended when weather and flow conditions exceed the capabilities of the drill and moorings to operate in a safe and effective manner. Guidelines relating to drill and moorings performance capabilities will be established by H&S Coordinators and/or OSEMs in consultation with the drilling foreman;
- l) All drill workers will be familiar with oil spill response procedures (Traffic Services Centre, Oil Spill Report – at sea or on land: 1-800-563-9089). Spill response equipment will be on the barge at all times. All fuel spills will be handled in accordance with the Master Spill Response Plan; and
- m) In the event of a spill, all drilling activity will cease until clean-up is performed. Priority in the event of a spill will be the safety of all crewmembers.

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11.12 SURFACE WATER AND GROUNDWATER USE

Groundwater and/or surface water may be extracted from wells or intake structures at different Project areas and various construction camps.

Environmental Concerns

Environmental concerns associated with water wells include potential for saltwater intrusion, proximity to sources of contamination, and excessive drawdown at the aquifer. Environmental concerns associated with surface water use at the site include excessive removal of water and the potential effect on fish habitat.

Environmental Protection Procedures

- a) Wells will be developed in consultation with the DOEC Water Resources Management Division to avoid areas of groundwater constraint such as potential sources of contamination (septic fields, landfills, etc.), proximity of other wells, and seawater;
- b) Water extraction rates will be established, under approval of the Water Resources Management Division, to address concerns for drawdown or potential effects on the water table, and to ensure withdrawal from surface waterbodies does not affect the natural flow regime and fish/fish habitat;
- c) Water withdrawal will be documented in the Water Withdrawal Form as per applicable Water Use License;
- d) Applicable reference documents include Freshwater Intake End-of-Pipe Fish Screen Guidelines, 1995, Freshwater Intake End-of-Pipe Fish Screen Fact Sheet, Guidelines for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador, 1998 and the Policy for Allocation of Water Use W.R. 88-1 (rev1995); and
- e) A Water Use License is required from the Water Resources Management Division.

11.13 STORAGE, HANDLING, USE AND DISPOSAL OF FUEL & OTHER HAZARDOUS MATERIALS

A variety of fuels and potentially hazardous materials will be used during Project construction activities. Gasoline, diesel fuel, grease, motor oil and hydraulic fluids are all needed for equipment. Other potentially hazardous materials, which may be routinely used, include but are not limited to:

- Propane;

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- Explosives;
- Acetylene (i.e., welding);
- Oxygen;
- Paints;
- Epoxies;
- Concrete additives;
- Wood Treatments;
- Antifreeze; and
- Cleaners and solvents.

Environmental Concerns

The primary concern regarding the use of fuel and hazardous materials is their uncontrolled release to the environment through spillage, and the subsequent adverse effects on human health and safety, terrestrial, aquatic and marine habitat and species, soil, and groundwater quality.

Environmental Protection Procedures

General Practices

- All fuel, hazardous and controlled product storage areas, including temporary and permanent fuelling and fuel storage facilities will be designed in accordance with applicable codes and regulations.
- The *Storage and Handling of Gasoline and Associated Products Regulations, 2003* (referred to as the “GAP Regulations”) under the *Environmental Protection Act* controls the construction, operation, and registration of “storage tank systems”¹ in the province of Newfoundland and Labrador.
- Information on storage tanks, storage tank systems, and equipment storage tanks proposed for use on the Project will be provided for review. Tanks that are not already registered under GAP will be evaluated on a case-by-case basis to determine if GAP Regulations apply. Tank registration will be accompanied by any necessary regulatory variances.

¹ The GAP Regulations defines “storage tank system” as an “... atmospheric or low pressure closed tank container and all vents, fill and withdrawal piping associated with it installed in a fixed location and includes temporary arrangement on cradles and skids”.

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- d) In general, the GAP Regulations apply to all stationary storage tanks and storage tank systems except in the following cases:
- Tanks with capacities of 2,500 litres or less that are connected to a heating appliance;
 - Tanks that are designed, constructed, and utilized in the inherent operation of a piece of equipment. In this case, the tanks must be physically secured and dedicated to the equipment requiring the fuel for its operation; and
 - "Mobile" tanks (e.g., tank trucks and tank truck trailers) used for temporary, stationary storage. In this case storage period must not exceed fourteen (14) days and no additional fuel can be added to the tank. There must also be a minimum of fourteen (14) days of downtime between separate storage periods and there can be no more than two, fourteen (14) day storage periods within a twelve (12) month timeframe.

Note: that all provisions of the GAP Regulations, including registration, apply for all tanks associated with mobile generators.

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Consideration for the design and construction of storage facilities will include:

- a) Contracted fuel suppliers will comply with this EPP. A C-SEPP will be developed by the Contractor, including contingency plans which will require acceptance by the Project. Before transporting or positioning fuel at the site the contractor will read and accept the Master Spill Response Plan;
- b) All fuel storage and handling will be in compliance with *GAP Regulations*. Necessary registrations and variances will be obtained from Service NL for storage facilities, as required;
- c) The Master Spill Response Plan that contains information regarding spills of fuel and hazardous materials will be kept on Site near all fuel storage facilities (In addition, refer to Section, “Contingency Plans” regarding fuel suppliers contingency plans);
- d) Any soil contaminated by small leaks of fuel, oil or grease from equipment (including hydraulic hose ruptures and loss of fluid) will be disposed as per policies and guidelines. For larger leaks and spills a disposal plan will be developed and submitted to regulators for approval;
- e) The *Used Oil Control Regulations* will be used to determine requirements for the storage and disposal of used oil;
- f) All equipment on the Project Site will use only oils/lubricants² that classify as “biodegradable”³; unless demonstrated by the Contractor and accepted that it is not feasible because of:
 - i) Technical or performance constraints;
 - ii) Negative impacts on equipment warranties;
 - iii) Cost constraints; and/or
 - iv) Unavailability of biodegradable oils and lubricants.
- g) Empty drums will be stored and backhauled to nearest receiving community, as per the Waste Management Plan (WMP). Bungs will be inspected and tightened prior to shipping;

² For example: hydraulic oil; multipurpose lubricant; chain oil; form oil; gear oil; transmission fluid; differential fluid; rust proofing; heat transfer fluids; compressor fluid; saw guide oil; electrical insulating fluid; and grease.

³ i.e. the product must be either “readily biodegradable”; or have inherent, primary biodegradability; or inherent, ultimate biodegradability, as defined by the *OECD 301 B: Ready Biodegradability Test* procedure.

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- h) Contractors will at all times maintain in good condition at least one spill kit dedicated to each piece of fuel-powered equipment. Each spill kit will be located on the equipment and stored in a weather-proof container. Each spill kit will have an absorption capacity of no less than 23 litres. Examples of acceptable spill kits with various absorption capacities are as follows:

23 Litre Absorption Capacity

- One (1) 10-liter bag Oclansorb®, or equivalent;
- Two (2) 4-mil heavy duty disposal plastic bag 30" * 48";
- One (1) steel hand spade;
- Two (2) 100mm * 1200mm Sorb Sox®, or equivalent;
- Five (5) sorbent pads 3/8" * 17" * 19".

64 Litre Absorption Capacity

- One (1) 13-liter bag Oclansorb®, or equivalent;
- Ten (10) sorbent pads 3/8" * 17" * 19", or equivalent;
- Two (2) 4-mil yellow heavy duty disposal bag 30" * 48";
- One (1) steel hand spade;
- Two (2) 4" * 4' Sorb Sox®, or equivalent;
- Two (2) 4" * 8' Sorb Sox®, or equivalent;

121 Litre Absorption Capacity

- Twenty five (25) sorbent pads 3/8" * 17" * 19";
- Ten (10) 4-mil yellow heavy duty disposal bag, 30" * 48";
- One (1) 44-liter bag Oclansorb®, or equivalent;
- Eight (8) Sorb Sox® 4" * 4', or equivalent;
- Five (5) Sorb Sox® 4" * 8', or equivalent;
- Two (2) Spillows® 2" * 17" * 19", or equivalent;
- One (1) spark resistant poly-shovel;
- One (1) Sorb Sox® Boom 7" * 10', or equivalent; and
- One (1) Pair of chemical resistant gloves.

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- i) To mitigate environmental effects of fuel and hazardous material spills and leaks, Contractors will at all times maintain in good condition at least one spill kit dedicated to each piece of fuel-powered equipment. Each spill kit will be located on the equipment and stored in a weather-proof container. Each spill kit will have an absorption capacity of no less than 23 litres;
- j) The Contractor will ensure adequate and appropriate spill response materials and equipment are available for use relative to the scope of work and environmental sensitivities - i.e., spill kit containing aquatic booms for working near water and spill kits capable of capturing 110% of reasonable potential spill volumes should be present at the camp site(s) and with mobile field crews;
- k) Only trained, qualified persons will handle fuels and other hazardous materials. The Workplace Hazardous Materials Information System (WHMIS) will be implemented to ensure proper handling and storage is achieved. Operators will be in attendance for the duration of all fuelling operations;
- l) The Canadian Transport Emergency Centre (CANUTEC – 613-996-6666) operated by Transport Canada can assist emergency response personnel in handling dangerous goods emergencies;
- m) Waste oils, lubricants, and other used oil will be reused, recycled or disposed of at an approved, licensed waste management facility in accordance with the WMP (as per the *Used Oil Control Regulations, 2002* and the *Air Pollution Control Regulations, 2004*);
- n) Fuel storage areas will be equipped with firefighting equipment, in accordance with approvals;
- o) Smoking will be prohibited within 50 m of a fuel storage area; and
- p) Refer to Section, “Buffer Zones” within this document for specific information related to buffer zones required for fuel storage, equipment fuelling and fuel transfer activities.

Fuel Storage Requirements

- a) Fuel storage tanks will comply with *GAP Regulations* and will be equipped with vacuum gauges and vent pipes, as applicable;
- b) Waste oil storage tanks will comply with the *Used Oil Control Regulations, 2002* (see Figure 11-6 for a typical waste oil tank equipped with vacuum gauges, vent pipe, etc.);
- c) All bulk fuel and waste oil storage (> 2000 L) will be in tanks with suitable secondary containment (i.e., double walled, self dyked, lined, earthen dyke);

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Figure 11-5 – Typical Waste Oil Tank

- d) A letter of consent will be obtained from designated officials of the Service NL for fuel caches of ten (10) or more 205 L drums (including helicopter fuel caches). A letter of consent is not required for fuel caches under 10 drums;
- e) A marker stake or flag will be required for a petroleum products storage site of less than 10 x 205 L drums;
- f) Boundary poles or posts with colourful flags or a painted marker will be required for temporary petroleum product sites of 10 to 100 x 205 L drums;
- g) Fuels stored inside dykes or self-dyked units will be clearly marked to ensure they are not damaged by moving vehicles and are visible under all weather conditions. Dykes and barriers will be designed and constructed in accordance with the *GAP Regulations* (see Figures 11-7 and 11-8 below for typical dyked and concrete pad methods for tank installation);
- h) Used oil will be stored in an appropriate storage tank meeting the requirement of Section 18 and 21 of the *Used Oil Control Regulations*;
- i) Used oil can be stored in a 205 L drum as long as the drum is:
 - i) clearly marked "used oil";
 - ii) made of 18 gauge steel;
 - iii) stored in an area providing secondary containment;
 - iv) equipped with sufficient size openings to prevent spillage during filling or emptying;

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- v) equipped with venting if they are intended to be vacuumed out; and
- vi) in compliance with CAN/GSSB-43.150-95 if they are to be transported by road.

All used oil tanks will be inspected on a regular basis as per Section 24 of the *Used Oil Control Regulation*. All fuel storage tank systems will be inspected on a regular basis as per Sections 20 and 21 of the *GAP Regulations*. This involves, but is not limited to, gauging or dipping and the keeping of reconciliation records for the duration of the program.



Figure 11-6 - Acceptable Fuel Storage with Dykes



Figure 11-7 - Fuel Storage on Concrete Pad

11.13.1 Fuel Transfer

The following procedures will apply to the transfer of fuel or hazardous material:

- a) In all cases, a qualified person will attend the transfer to storage tanks for the duration of the operation. This person will be trained in proper fuel handling procedures to minimize the risk of a spill. The attendant will be trained in the requirements of the fuel suppliers approved Spill Contingency Plan, Master Spill Response Plan (MSRP) and WHMIS;
- b) Hoses or pipes used for fuel transfer will be equipped with properly functioning and approved check valves, spaced to prevent backflow of fuel in the case of failures;
- c) All tanks will be dipped before and after filling;

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- d) Fuel transfers between ship and shore or between ships will be conducted in accordance with the *Canada Shipping Act, Oil Pollution Prevention Regulations*;
- e) Exposed pipelines will be protected from vehicular collision damage by the installation of guardrails; and
- f) Exposed “ship to shore” fuel transfer lines will be clearly flagged from the shoreline to the receiving fuel tank to prevent traffic collision during transfer operations.

11.13.2 Equipment Fuelling and Lubrication

The following procedures will apply to the fuelling of heavy construction equipment:

- a) Fuelling and lubrication of equipment will occur in such a manner as to minimize the possibility of contamination to soil or water;
- b) When refuelling equipment, operators will:
 - i. Use leak-free containers and reinforced rip and puncture-proof hoses and nozzles;
 - ii. Be in attendance for the duration of the operation; and
 - iii. Seal all storage container outlets except the outlet currently in use.
- c) Regular inspections will be performed on the hydraulic and fuel systems of machinery. Leaks will be repaired immediately;
- d) Fuelling or servicing of mobile equipment on land will not be allowed within 30 m of watercourses or waterbodies, except in designated areas with dewatering pumps; and
- e) Fuelling attendants will be trained in the requirements under the contractors Spill Contingency Plan in the C-SEPP and the MSRP.

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11.13.3 Hazardous Materials

The following procedures will apply to the use of hazardous materials:

- a) Hazardous materials will be used only by personnel who are trained and qualified in the handling of these materials and only in accordance with manufacturers' instructions and government regulations. WHMIS and the provisions of the *Transportation of Dangerous Goods Act* will be implemented throughout the job site. All Employees involved with hazardous materials will be appropriately trained;
- b) All hazardous wastes will be stored, removed and disposed of in accordance with the WMP (as per government regulations and applicable permits);
- c) Up-to-date Material Safety Data Sheets (MSDS) must be available on-Site prior to receipt of any hazardous materials;
- d) A hazardous waste storage area will be constructed and properly marked. A permit may be required for construction of this area; and
- e) Hazardous waste will not be permitted to be poured down drains, oil/water separators, septic systems or discharged into the environment in any form.

11.13.3.1 Wood Treatment

The following standards will apply to the use of wood preservatives on the Site:

- a) Creosote will not be used on the site.
- b) In Protected Water Supply Areas:
 - i. Treated wood products will not be used in Protected Water Supply Areas;
 - ii. Where written justification for treated wood is presented, for the use in protected water supply areas, for acceptance, the treatment options will be restricted to Chromated Copper Arsenate (CCA), Ammonical Copper Arsenate (ACA), Ammoniacal Copper Zinc Arsenate (ACZA), pentachlorophenol (PCP), or Copper Naphthenate (CuN);
 - iii. The below Table, Buffer Zones for Replacement of Treated Wood within a Water Supply Area" specifies the required buffer zones separating waterbodies (within protected water supply areas) from locations where treated wood products, including poles, are to

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be used. If structures are required within these specified buffer zones, then only untreated wood, steel or concrete will be used; and

- iv. If wood poles are required within the buffer zones outlined in the below Table, but untreated wood poles are not practical or feasible, alternative protective measures may be used. However, regulatory approval for such alternative measures will be required. Specific techniques used to eliminate or minimize environmental disturbance will be applied as appropriate.

Table 11-2 - Buffer Zones for Placement of Treated Wood within a Water Supply Area

Body of Water	Width of Buffer Zone
Pond/Lake	150 m (for pond/lake intake structures)
River	150 m for a distance of 1 km upstream and 100 m downstream of river intake structures
Main River Channel	75 m
Major Tributaries/Lakes/Ponds	50 m
Other bodies of water	30 m

- b) Saltwater and Freshwater Areas (other than Protected Water Supply Areas):
 - i. In areas of low water hardness (i.e., 15-25 mg/L-1 CaCO₃), pH 5.5 or less, and elevated background metals levels, or areas where metals-sensitive biota exist, ACA, ACZA and CCA will not be used;
 - ii. Pentachlorophenol will not be used in salt water environments;
 - iii. For temporary installation of wood structures (i.e., bridge abutments or wood poles) within 15 metres of a waterbody, only untreated timber will be used;

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- iv. For permanent installations, non-invasive materials such as concrete or steel will be used;
- v. If use of untreated wood or alternative materials is not feasible or practical, approval by regulators is required prior to use of CCA, ACA, PCP and CuN; and
- vi. Protective measures outlined above under Protected Water Supply Areas will be considered; however, using these alternatives requires preapproval by regulatory agencies.

Spills and Leaks of Fuel and Hazardous Materials

The following procedures will apply to the Spills of Fuel and Hazardous Materials:

- a) All necessary precautions will be implemented to prevent the spillage and leakage of fuels and other hazardous materials used during the construction phase;
- b) All spills of fuel and hazardous materials will be reported immediately to the OSEM. In the event of a spill refer to the Master Spill Response Plan; and
- c) A copy of the Master Spill Response Plan will be present on site. In the event of a spill the outlined procedures will be followed.

11.14 SEWAGE DISPOSAL

All sewage disposal activities will comply with Newfoundland and Labrador's Health and Community Services Act, 1997 and the Environmental Control Water and Sewage Regulations, 2003 under the *Water Resources Act*, 2003.

Environmental Concerns

The accidental release of untreated sewage is a concern to human health, drinking water quality, and freshwater and marine ecosystems. This applies to effluent from a sewage treatment system that does not meet the limit set in Schedule A of the *Environmental Control Water and Sewage Regulations, 2003*.

Environmental Protection Procedures

- a) Development of sewage treatment facilities will be undertaken in consultation with the relevant regulatory agencies for a temporary or permanent sewage collection system, and a Certificate of Approval will be obtained from the Service NL and/or the DOEC;

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- b) The health inspector with the Service NL is the approval authority for sewage flows under 1000 gallons. The general sanitization of the site is under the jurisdiction of the health inspector who will perform periodic inspections;
- c) All sewage disposal activities will comply with Section 36(3) of the Fisheries Act;
- d) Wastewater, septage, sludge, bio-solids, or other types of hazardous or deleterious liquids from the Project Site will not be allowed to be discharged to public wastewater collection systems or treatment facilities;
- e) For septic systems, the location of a tile field will be clearly marked and vehicular traffic will not be permitted to operate within this defined boundary; and
- f) Portable washrooms and toilets used at any LCP Site will be routinely inspected and properly maintained by their owners. Sewage sludge removed from the facilities will be transported off Site for approved treatment and disposal. Companies engaged to perform this work must have approval from the Service NL and/or DOEC. Copies of government approvals must be provided to the OSEM before work can proceed. All human sanitary waste must be contained and disposed in a manner that meets all environmental and health requirements. Any concerns must be brought to the immediate attention of the OSEMs and H&S Coordinator.

11.15 SOLID WASTE DISPOSAL

Environmental Concerns

Solid waste (e.g. construction waste, domestic waste, paper, cardboard, and wood), if not properly controlled and disposed of, can be unsightly, may cause human safety and health concerns, and could negatively affect wildlife.

Environmental Protection Procedures

- a) A Waste Management Plan (WMP) is in place to address waste generation, handling, storage and disposal during construction. The WMP includes methods for waste stream separation, collection, storage, transport, disposal, and associated schedules. Any procedures or strategies for management of solid waste will also be in accordance with the Provincial Waste Management Strategy;

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- b) Waste management at all sites will comply with all provisions of the WMP;
- c) Waste material will not be deposited in a body of water; and
- d) Waste material will not be deposited anywhere except at a facility or site approved to accept that specific type of waste.

11.16 WORKING WITHIN 15 METRES OF A BODY OF WATER

Environmental Concerns

Working close to waterbodies poses a risk of introducing contaminants into the aquatic ecosystem, affecting fish, fish habitat, and other receptors, and affecting the natural flow regime of the waterbody. Contaminants such as sediment, petroleum hydrocarbons, and other deleterious substances may impact fish, wildlife, plants, and human receptors. Proper protection plans are required to minimize or eliminate sedimentation and water pollution and maintain riparian habitat near waterbodies.

Environmental Protection Procedures

Mitigation measures provided in various sections (refer to Sections, "Erosion Prevention and Sediment Control", "Storage, Handling and Disposal of Fuel and Other Hazardous Material", and "Buffer Zones") will be consulted to ensure that appropriate measures are understood and implemented during the course of construction.

In addition, the following steps will be taken to ensure protection of waterbodies:

- a) A joint engineering and environmental reconnaissance of the Site will be completed in the early planning stages to identify all nearby bodies of water and mitigation and protective measures will be identified;
- b) The majority of construction works will take place during low flow and low rainfall period, where possible;
- c) Any vehicles or equipment working near a body of water will be clean and in good condition;
- d) Heavy equipment will be kept outside the high water mark of all bodies of water, where possible; and
- e) All equipment on the Project Site will use only oils/lubricants¹ that classify as "biodegradable"² where feasible (refer to Section "Storage, Handling and Disposal of Fuel and Other Hazardous Material" within the document for additional information on the use of biodegradable oils/lubricants).

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11.17 WATERCOURSE CROSSINGS – FORDING, CULVERTS AND BRIDGES

Environmental Concerns

The environmental concerns associated with fording, culvert installations, bridge construction and maintenance include direct disturbance to, or mortality of, fish, disturbance to waterfowl, and loss of fish habitat caused by sedimentation and removal of substrate, and disturbances to stream bank vegetation.

Environmental Protection Procedures

Erosion stabilization methods and effective sedimentation control practices will be implemented when required (refer to Section, “Erosion Prevention and Sediment Control” within this document), and these will conform to requirements, guidelines, and principles contained in DFO Factsheets, Operational Statements, DOEC Environmental Guidelines, and specific requirements of regulatory permits and approvals.

All watercourse crossings (fording, culvert installation and bridge crossings) will comply with permits issued by DOEC. Additionally, Notifications and Requests for Project Reviews to DFO must be approved in order for work to occur. If a guidance letter is issued for Works and Undertakings Affecting Fish and Fish Habitat from DFO, all conditions will be followed.

The following measures will be implemented to minimize negative effects of watercourse crossings:

- Attention will be given to scheduling in order to minimize the time the watercourse is disturbed and therefore minimize the sediment entering the watercourse. The ideal time for construction is during low flow and low rainfall period;
- Any alterations to a body of water, which may impact navigation, will require a Navigable Waters Permit Application under *Navigable Waters Protection Act (NWP)* request for project review under NWP from Transport Canada (TC). If a NWP authorization is issued, the conditions will be adhered to;
- Any alterations to a body of water which may impact water quality will require a DOEC permit(s) under the *Water Resources Act*;
- Watercourse crossing construction activities, in areas of fish habitat, will be undertaken in accordance with DFO requirements and under the direct guidance of the OSEM;

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- e) To the extent practical, construction activities in waterbodies or watercourses will be scheduled to occur during low flow or frozen conditions, to avoid sensitive periods / habitat for fish, and will be shut down during heavy precipitation events;
- f) Where possible, all in-water works will be completed inside the appropriate fisheries timing windows (June 1 – September 30 on the Island; June 15 – September 15 in Labrador). Work outside the fisheries timing windows will be done in consultation with DFO;
- g) All watercourses and bodies of water will be examined by the OSEM or Contractor/Subcontractor environmental Personnel on a site-specific basis in order to evaluate each watercourse crossing (including upstream and downstream);
- h) Work will be performed in such a way as to ensure that materials such as sediment, fuel and oil do not enter watercourses and waterbodies;
- i) The banks and flood plains of watercourses must be adequately protected from erosion using an applicable erosion prevention method as outlined in Section, “Erosion Prevention and Sediment Control”;
- j) A suitable buffer (refer to Section, “Buffer Zones” within this document) of undisturbed natural vegetation will be left between the access road and the bank of any adjacent watercourse, unless otherwise specified. The typical buffer width will be determined in consultation with the OSEM according to the following formula:

Buffer width (m) = 20 m + 1.5 x slope (%) (where slope >30%);

Refer to Section, “Buffer Zones” within this document for buffer widths related to temporary fuelling services or washing of equipment near watercourses or waterbodies.

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11.17.1 Fording

When fording any watercourse, the DOEC Environmental Guidelines for Fording and the DFO fact sheet for Temporary Fording Sites will be followed in conjunction with the following:

- a) Areas of known or suspected spawning habitat will be avoided;
- b) Where feasible, crossings will be restricted to a single location and made at right angles to the watercourse;
- c) Equipment activity within the watercourse will be minimized by limiting the number of crossings. Equipment will only be in the watercourse during fording;
- d) All equipment will be clean and mechanically sound to avoid the introduction of oil, gasoline, and hydraulic fluids to waterbodies;
- e) No servicing or washing of heavy equipment will occur adjacent to a watercourse, waterbody, or ecologically sensitive area. These areas will be identified on constraint mapping and will be identified in the field by the OSEM;
- f) In the case that the ford area is not natural bedrock or is easily disturbed by fording, the entire fording area will be stabilized using vegetation mats, corduroy or coarse material (125 mm diameter or greater) when such material is available from a reasonably close location within the right-of-way, when the substrate of the ford area is not subject to easy disturbance by fording, or coarse material is not easily available within the right-of-way. Fording under existing substrate conditions may occur under the guidance of the OSEM;
- g) Fording activities will not decrease the depth of the watercourses to less than 20 cm. Where the existing depth is less than 20 cm, that depth will be maintained;
- h) Photographs of all ford sites will be taken prior to and after the fording has been completed (as per applicable DOEC temporary water crossing permit conditions). The OSEM will be responsible for collecting these photographs. However, the Contractor can collect these photographs in order to proceed with schedule if the OSEM is not available. The Contractor would then be responsible to provide these crossing site photographs to the OSEM within twenty-four (24) hours;
- i) Waterbodies will not be forded during high flow periods;

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- j) All bank sections, which contain erodible materials, will be stabilized or avoided if possible. If banks must be sloped for stabilization, no material will be deposited within the watercourse; sloping will be accomplished by back-blading and the material will be deposited above the high water mark of the watercourse; and
- k) Proposed fording activities on waterbodies or watercourses visible on 1:50,000 scale maps will require a permit from DOEC.

11.17.2 Culverts

In those locations where installations or upgrading of existing culverts are required, permits are required from DOEC.

The culverts used will be sized to handle the 1-in-100 year return period flood (however design criteria may vary depending on Site-specific conditions and the length of time a culvert will be used (i.e. temporary vs. permanent) and will be constructed in accordance with the DOEC Environmental Guidelines for Watercourse Crossings and Culverts and the DFO operational statement for Culvert Maintenance, DFO fact sheets for Culvert Installations, as well as any applicable permits in place and their conditions. The following measures will also be implemented:

Installation of Culverts

- a) Install culvert(s) shall be in accordance with good engineering and environmental practices. Photographs of culvert installation are shown as Figures 11-9 and 11-10;
- b) Proposed culvert installations on watercourses visible on a 1:50,000 scale map will require a permit from DOEC;
- c) Unless otherwise indicated, all work will take place in dry conditions, either by the use of cofferdams or by diverting the stream with pumps and hoses. All work involving major alterations to stream channels will be carried out at a time of low flow and in a manner that prevents downstream sedimentation;
- d) Cylindrical culverts will be counter sunk when installed in fish habitat (as recommended by DFO) as such that the culvert bottom is one-third the diameter below the stream bed, in the case that culverts less than 750 mm outside diameter. For culverts greater than 750 mm outside diameter, the culvert bottom will be installed a minimum of 300 mm below the streambed;

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- e) If two (2) culverts are to be installed at one (1) location, one culvert will be installed at an elevation lower than the other one. A maximum of two (2) culverts are allowed at one (1) location;
- f) The natural low flow regime of the watercourse will not be altered; culverts will not disrupt flow of water or cause ponding at the upstream side of the installation;
- g) A culvert will not be installed before site-specific information such as localized stream gradient, fish habitat type and species present have been evaluated, as required;
- h) Photographs of all culvert installations will be taken prior to and after the installation has been completed (as per applicable DOEC temporary water crossing permit conditions). The OSEM will be responsible for collecting these photographs. However, the Contractor can collect these photographs in order to proceed with schedule if the OSEM is not available. The Contractor would then be responsible to provide these crossing site photographs to the OSEM within twenty-four (24) hours;
- i) Inlet and outlet areas will be adequately protected from erosion by installing erosion prevention structures as outlined in Section, "Erosion Prevention and Sediment Control";
- j) When rock energy dissipaters are utilized at culvert outlets, proper fish passage must be ensured. Both upstream and downstream fish passage will be provided and maintained post-construction;
- k) Culverts will be of sufficient length to extend a short distance beyond the toe of the fill material;
- l) Backfill material will be of texture that will support the culvert and limit seepage and subsequent washing out;
- m) Culverts will be aligned such that the original direction of streamflow is not significantly altered and the gradient at the culvert follows the stream channel gradient to the extent possible. Infilling or reduction of the natural cross-sectional area of the watercourse will not be permitted;
- n) Fill, construction debris, and mulched debris will be removed from the culvert area to a location above the peak flow level to prevent its entry into the watercourse;
- o) Construction activity will be confined to the immediate area of the culvert;
- p) Fill material will not be removed from streambeds or banks, except when removal of material is necessary to ensure a flat foundation for installing a culvert;
- q) The use of heavy equipment in watercourses or bodies of water will not be permitted;

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- r) Culverts will be marked to indicate their position under the snow;
- s) As required, cofferdams of non-erodible material will be installed above and below work areas to separate them from the watercourse when excavating for culverts and footings. All sandbags used in construction must be accounted for and removed after work is completed. Where pumping is used to bypass flow, pumps will have sufficient capacity to prevent washout of the cofferdams. Refer to DFOs fact sheet for Instream Work in the Dry – Cofferdams;
- t) Cofferdams will be removed upon completion of construction and the streambed returned as closely as possible to its original condition;
- u) Water pumped from work areas or other runoff must have sediment and turbidity removed by settling ponds, filtration, or other suitable means before discharging to a waterbody;
- v) The release of sediment laden water into a waterbody, watercourse or ecologically sensitive area, due to construction activities, will comply with applicable discharge guidelines as presented in the *Newfoundland and Labrador Environmental Control Water and Sewage Regulations, 2003* under the *Water Resources Act*;
- w) With respect to maintenance of water quality within receiving waterbodies on and around the Site, the *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life* will be used; and
- x) Culvert installations will not require a DFO review when the following conditions are met (unless the culvert installations are within fish habitat):
 - i) The work does not include realigning the watercourse, installing a culvert liner or support struts, replacing damaged or destroyed bevels ends, or extending/replacing the existing culvert;
 - ii) Explosives are not used to remove debris; and
 - iii) The work does not include any dredging, infilling (e.g., filling scour pools) or excavation of the channel upstream or downstream of the culvert.

Culvert Upgrading/Maintenance

Culvert maintenance includes the removal of accumulated debris (e.g., logs, boulders, garbage, and ice build-up) that prevents the efficient passage of water and fish through the structure, as well as reinforcement of eroding inlets and outlets. The following measures will be implemented when upgrading/maintaining culverts:

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- a) In locations where upgrading and/or alterations are required for an existing culvert at the Site, the mitigation measures listed above for installation of a culvert will be reviewed and followed, as applicable;
- b) Culverts will be inspected regularly so that immediate action can be taken to clear blockages caused by ice or debris and to identify any apparent problems, such as erosion, which may require remedial action;
- c) An inspection of culverts will be made during and after major floods to observe the culvert operation and record high water marks. Conditions which require corrective maintenance will be noted, including debris accumulations, sedimentation, erosion, piping, scour, and structural damage and reported if applicable;
- d) Culverts which have been damaged by ice or debris by improper installation or construction procedures, or are in a condition, which could impair their proper functioning, will be replaced immediately to prevent overtopping, erosion, or flooding; and
- e) Access for maintenance will be provided, especially where debris control structures are installed. Such access will not disrupt the Site rehabilitation efforts.



Figure 11-8 - Example of Well Installed Culvert



Figure 11-9 - Example of Culvert Installation

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11.17.3 Bridges

- a) Environmental protection measures outlined above, which are applicable to bridge construction and maintenance, will be adhered to;
- b) Any proposed bridge installations require a permit from DOEC;
- c) Photographs of all bridge installations will be taken prior to and after the installation has been completed (as per applicable DOEC temporary water crossing permit conditions). The OSEM will be responsible for collecting these photographs. However, the Contractor can collect these photographs in order to proceed with schedule if the OSEM is not available. The Contractor would then be responsible to provide these crossing site photographs to the OSEM within twenty-four (24) hours;
- d) During bridge construction all applicable guidelines will be adhered to, including, but not limited to: DOEC Environmental Guidelines for Bridges and Watercourse Crossings, DFO Clear Span Bridges Operational Statement, DFO Fact Sheet for Temporary Bridges, and DFO Fact Sheet for Bridge Construction/Demolition;
- e) To safely convey peak flows, permanent bridges will be designed for a hundred (100) year return period streamflow;
- f) Temporary bridges will consider the following basic design criteria:
 - i) Hydraulic design will be based on the 1:2 year storm event, or as applicable in DOEC permit conditions;
 - ii) Abutment logs will be placed a minimum of 1 meter from the top of the bank;
 - iii) Deck height will be a minimum of 250 cm above the bank height; and
 - iv) Deck height will be a minimum of 450 cm above the water surface at the time of installation.
- f) Each installation will take into consideration site-specific conditions and appropriate criteria will be accepted by the OSEM;
- g) The upstream and downstream sides of abutments must be protected with erosion prevention structures as outlined in Section, "Erosion Prevention and Sediment Control" within this document, to prevent erosion and scouring;

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- h) Roadside embankments near the watercourse will be adequately protected from erosion by installing applicable erosion prevention structures as outlined in Section, “Erosion Prevention and Sediment Control”;
 - i) Adequate erosion protection as per Section, “Erosion Prevention and Sediment Control”, will be provided where roadside ditches discharge into the watercourse near the bridge;
 - j) Abutments and piers will be constructed in the dry and where possible during times of low flow;
 - k) During construction of concrete components, formwork will be constructed to prevent any fresh concrete from entering bodies of water. Dumping of concrete or washing of tools and equipment in any body of water is prohibited;
 - l) Periodic maintenance such as painting, resurfacing, clearing of debris, or minor repairs, will be carried out without causing any physical disruption of the watercourse. Care will be taken to prevent spillage of pollutants into the water;
 - m) All waste materials will be disposed of in accordance with the WMP;
 - n) All areas affected will be returned to a state that resembles local natural conditions; and
 - o) During rehabilitation activities following the end of construction, all temporary bridges will be removed.
- All crossing sites will be inspected by the OSEM for satisfactory site rehabilitation with respect to bank slopes and in-stream conditions.

11.18 BUFFER ZONES

Environmental Concerns

The potential for erosion/sedimentation, spills, and resulting effects on water quality, fish and fish habitat are key environmental concerns associated with construction activities. In addition, sensitive and rare environmental receptors (e.g., Osprey nesting sites, archaeological/historic resources) require protection from activities associated with construction.

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Buffer zones of natural vegetation or undisturbed areas that separate these environmental receptors from construction activities are needed to mitigate adverse environmental effects. These undisturbed areas may also provide wildlife habitat and/or travel corridors near work areas and Project features.

Due to the many buffer zones referenced in various government documents and others that may be stated in regulatory permits yet to be obtained, the appropriate buffer zone to use in a specific area may vary over time. Therefore, the OSEM will be the only Site Personnel to determine which buffer is applicable, and Contractors will be required to consult with these individuals prior to establishing buffers. The policy for Land and Water Related Developments in Protected Public Water Supply Areas will be adhered to.

For general guidance, the following procedures will define the minimum requirements during construction.

Environmental Protection Procedures

- a) DFO recommends buffer zones to separate areas of land disturbance/roadways from waterbodies will be calculated by the following formula:

Buffer Width (m) = 20 m + 1.5 x slope (%) (where slope >30%);

- b) In the vicinity of a Public Protected Water Supply Area (PPWSA), the following activities will not be conducted by the LCP, unless otherwise approved by the Engineer and NLDOEC Water Resources Management Division:
 - i) Placing, depositing or discharging or permitting the placing, depositing or discharging into a body of water, any sewage, refuse, chemicals , and industrial wastes or any other material which impairs or has potential to impair water quality;
 - ii) Using an intake pond, lake or specified buffer zones for any activity detrimental to water quality;
 - iii) Using ice covered waterbody for transporting logs, riding skidoos/motor vehicles/all-terrain vehicles, or any other activity, which impairs or has potential to impair water quality;
 - iv) Using or operating existing facilities in such a manner which impairs or has potential to impair water quality;
 - v) vehicle maintenance facilities, warehouses, and chemicals storage areas;
 - vi) Storage and disposal of pesticides, and application of chemicals in specified buffer zones;

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- vii) Mechanical clearing of forest in sensitive areas (manual clearing will be conducted in the PPWSA), establishment of camps and camp facilities, and storage of chemicals;
 - viii) Activities, operations or facilities associated with aggregate extraction, maintenance facilities, washing of aggregates, asphalt plants, discharge or deposit of waste material into a body of water;
 - ix) Application of herbicides in the right-of-way, and use of chemically treated utility poles and other related structures; and
 - x) Creation and operation of waste disposal facilities.
- c) A minimum buffer zone of natural vegetation 20 m from the high water mark of waterbodies, watercourses and ecologically sensitive areas will be maintained around work areas, where available space poses a constraint, except where specified otherwise. If space available, then wider buffer zones of 100 m will be maintained between construction areas and watercourses, waterbodies and ecologically sensitive areas (Figure 11-11 shows a typical buffer zone being protected by tarp fencing);



Figure 11-10 - Tarp Fence Outlining a Vegetation Buffer Zone

- d) Sediment control devices will be constructed outside buffer zones, as required. These devices are required to control runoff from areas of exposed soils and prevent transport of sediments towards waterbodies. Section, “Erosion Prevention and Sediment Control” outlines all acceptable sediment control measures;

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- e) All aircraft must maintain a 300 m vertical and horizontal buffer from known active raptor nests (refer to Table 11-13);
- f) No clearing will take place within 800 m of an active raptor nest (refer to Table 11-13);
- g) For all work activities other than clearing, a 200 m buffer will be respected for active raptor nests (refer to Table 11-13). Within this 200 m buffer zone the following applies, after consultation with the Provincial government:
 - i) Only essential vehicular activity will be permitted;
 - ii) Work will only be permitted in the presence of the OSEM; and
 - iii) Crews will cease work if there is a disturbance at a nest until activity at the nest has returned to normal; work will not commence again until approval from the OSEM.
- h) Crews will not establish a permanent or temporary camp within 800 m of a known raptor nest;
- i) Locations along the Churchill River are known as spring and fall staging areas for waterfowl and harlequin ducks. Helicopters moving through these areas during this time (typically May through September) will maintain a minimum altitude of 500 m from concentrations of waterfowl and harlequin ducks;
- j) For known harlequin duck nesting areas, a 100 m buffer of natural vegetation will be maintained along the river's edge during their breeding, nesting and staging times (May through September). A 30 m buffer will be maintained outside the sensitive nesting season. Clearing and construction within these buffers during the specified times will not occur unless otherwise authorized;
- a) Buffer zones for other bird species not indicated in this document are outlined in the Avifauna Management Plan (refer to Nalcor document LCP-SC-CD-0000-EV-RP-0002-01) and will be respected;
- b) A minimum buffer zone of 100 m will be maintained from the high water mark of waterbodies, watercourses and ecologically sensitive areas around any bulk fuel storage activities;
- c) The typical buffer zone for quarries and borrow pits in relation to a waterbody is 100 m. In some instances, the development of quarries and borrow pits will be allowed within this 100 m buffer zone, however applicable permits from regulators will be required, as well as consultation with the Site Environmental Manager;

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- d) A minimum buffer zone of 50 m will be maintained around any archaeological site. The size of buffer zones may increase or decrease depending on the type of site and the buffer zone will be determined by the Provincial Archaeology Office (PAO). Where the site has been designated for recovery and/or recording, the buffer zone will be maintained until it has been cleared with the OSEM. Where available space poses constraints, this width may be reduced and supplemented by other protective measures. Site-specific mitigative measures for known historic resources in the Project area are addressed within Section, "Historic or Archaeological Resources";
- e) Buffers for working around caribou are outlined in Section, "Wildlife Protection"; and
- f) Table 11-3 provides a summary of recommended buffer zones.

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Table 11-3 - Recommended Buffer Strips for Various Activities

Activity	Environmental Receptor	Recommended Width (m) of Buffer Strip
Handling, use and storage of bulk fuels (> 2000L)	Waterbody	100 m
Storage and handling of small quantities (<2000L) of fuel in appropriately contained areas and with adequate spill response	Waterbody	30 m
Handling and use of fuels (including transfer and fuelling of equipment). Storage of fuel in containers ≤25L	Waterbody	15 m
Clearing of Vegetation	Waterbody	20 m (+1.5 x slope (%) where >30%)
	Active Raptor Nests	800 m (Labrador: between May 15 to August 15, and Island: between May 1 to August 15)
Other Work Activities	Active Raptor Nests	200 m (Labrador: between May 15 to August 15, and Island: between May 1 to August 15)
Aircrafts	Active Raptor Nests	300 m (vertical and horizontal)
	Waterfowl and Harlequin Duck Concentrations	500 m vertical distance
Quarrying and Aggregate Removal from Borrow Areas	Waterbody	100 m

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Activity	Environmental Receptor	Recommended Width (m) of Buffer Strip
All Activities	Archaeological sites	50 m
Cutting	Scheduled Salmon Rivers	30 m
Cutting	Black Bear Denning Sites (Late October – Late April)	50 m
Cutting/Construction	Harlequin Duck	100 m during nesting, breeding and molting seasons (Early May through September) 30 m outside the sensitive time
Cutting/Construction	Active waterfowl/waterbird nests (species not of management concern)	100 m
Cutting/Construction	Active passerine nests (species not of management concern)	30 m
Cutting	Waterbody occupied by a beaver	30 m

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11.19 ALTERATIONS TO A BODY OF WATER/INSTRAM WORKS

Environmental Concerns

The environmental concerns associated with alterations to a body of water include direct disturbance to, or mortality of, fish, disturbance to waterfowl, and loss of fish habitat caused by sedimentation and removal of substrate, and disturbance to stream bank vegetation. Typical alterations to a body of water include fording, bridges and culverts. However other less common alterations include cofferdams, pumping and stream diversions. Fording, bridges and culverts have been discussed in Section, watercourse Crossing – Fording, Culverts and Bridges”, therefore this section will concentrate on cofferdams, pumping and stream diversions.

Environmental Protection Procedures

- a) Any work within 15 m of a waterbody visible on a 1:50,000 scale map will require a permit from DOEC;
- b) Erosion stabilization methods and effective sedimentation control practices will be implemented when required, and these will conform to requirements, guidelines, and principles contained in DFO Factsheets, Operational Statements, DOEC Environmental Guidelines and specific requirements of regulatory permits and approvals;
- c) Two (2) cofferdams or a square type structure will be used for best results. The first cofferdam will be upstream of the construction area and will keep the construction area dry and provide a basin for water to be pumped. The second cofferdam will be downstream of the construction area and will prevent any sediment laden water that may have accumulated in the construction area from discharging directly into the watercourse;
- d) Pumping the water will commence prior to starting intrusive work to prevent the river from being silted as water passes the work area. When a watercourse is too large to divert by other measures, part of the river may be blocked off to allow work to take place in dry conditions. One third the width of the watercourse or less will be blocked at any time in order to ensure efficient remaining capacity in the channel to safely accommodate flow without causing excessive high velocity, erosion or overtopping of banks. A dewatering plan will be developed prior to dewatering activities;
- e) An alternative means of isolating the work area will be to construct a temporary diversion channel lined with plastic sheeting or an impermeable material. The channel will be designed to handle the predicted

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flows of the watercourse. Figure 11-12 shows the typical use of a cofferdam in a river and Figure 11-13 shows an illustration of a stream diversion coupled with the upstream and downstream cofferdams;



Figure 11-11 - Cofferdams Surrounding Work Area

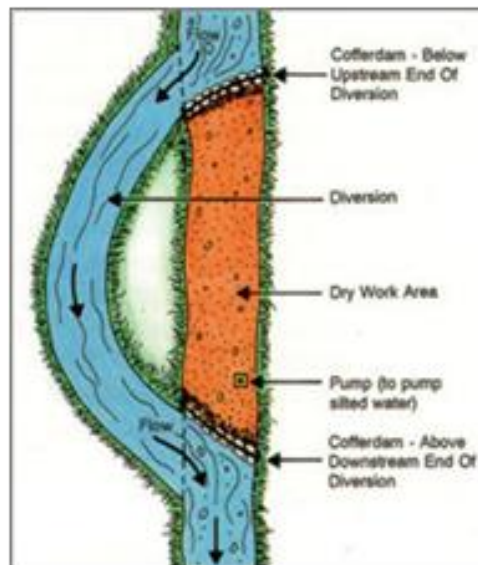


Figure 11-12 - Illustration of Stream Diversion and Cofferdams

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- f) Floating silt curtains or suitable alternative will be used to contain and control the dispersion of turbidity and sediment when working in or near a waterbody;
- g) The curtain will be located beyond the lateral limits of the construction site; the alignment will be as close as possible to the activities but not so close as to be disturbed by the construction equipment;
- h) The curtain will be firmly anchored in place by posts; and
- i) The Contractor will remove built up sediment and debris as required; if the fabric becomes clogged it will be replaced.
- j) The following applies for fish habitat and relocation:
 - i. A license to conduct fish sampling/collection permits will be obtained from DFO prior to any sampling, collection or relocation activities;
 - ii. The waterbody will be de-watered using a screened pump, which will be deployed on a floating structure near the deepest portion of the pond/river. The pump will be monitored during all de-watering. Water will be directed to a vegetated area so that any sediment carried by the pump will be further filtered through vegetation before reaching another waterbody. The pumped water and the screen will be monitored for fish during all pumping. Optimally, the pond will be reduced to a small containment area capable of being electrofished/ seined by boat;
 - iii. If soft sediment moves toward the deeper part of the area during draw-down, this will effectively reduce the size of the area and will require careful monitoring of water levels so that too much water is not removed hence trapping all fish in a thick layer of sediment;
 - iv. Electrofishing inside the small containment area left after de-watering will be conducted by a small boat so as to reduce the amount of sediment disturbance. Other techniques will be available should electrofishing become inefficient due to increased sediment disturbance (e.g. seining and/or casting net). The boat will be of a non-conducting material so that the electrofisher will not short out (e.g. zodiac, fibreglass/plastic canoe). A second small boat will be used to transport any captured fish to shore so that disturbance of bottom sediment is minimized. This boat will be moved between the shore and collection boat by ropes. This may be modified in the field as necessary;

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- v. Water temperature will be another critical factor in successful relocation of all fish, as the reduced pond will warm relatively quickly. Optimally, it would be desirable to begin collection of fish in the early morning hours. Coordination of the draw-down will be conducted to ensure this can occur. Water temperature will be monitored continually and any exceedance of the Experimental License requirement will mean a stop in collection, is required. However, this may be a field-call as pausing once the pond is reduced may cause more harm than completing the relocation. This situation will be avoided;
- vi. Monitoring will include recording water temperatures, dissolved oxygen levels, pH, and visual observations of stress and/or overcrowding. If signs of stress and/or overcrowding are observed, additional measures may be required;
- vii. Once the pond has been de-watered, the small containment area will be electrofished, seined, and/or netted to remove any remaining fish;
- viii. All fish will be contained in 20 litre buckets for transport to the release point. Each bucket will be relocated once five fish are exceeded or thirty minutes have passed so that stress is avoided;
- ix. All fish will be acclimatized prior to release. Each bucket will be laid into the receiving water so that water temperatures between both are equal (measured using thermometers). Once acclimated, fish will be released;
- x. An estimate of the length of each fish will be obtained in order to calculate the total weight of the fish;
- xi. Experienced personnel will be responsible for capture and release of the fish. The person responsible for capture will be familiar with all equipment and will be able to adjust the voltage on the electrofisher as water levels and conductivities change. They will also be able to detect signs of fish stress. The person responsible for fish release will be experienced in acclimating fish and monitoring their health. They will also be able to estimate fish species and lengths;
- xii. If dewatering is required as part of the execution of work, a dewatering plan will be developed as part of the C-SEPP; and
- xiii. Stream diversion (pumps/diversion channels) will be provided for fish passage for projects of longer duration – DFO regulations for instream works will be adhered to.

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11.20 WORK IN/AROUND MARINE ENVIRONMENT

Environmental Concern

The principal environmental concerns from marine construction include the release of fines, hazardous liquids, and toxic substances to the water and substrate, and disturbance to fish and fish habitat. Marine construction activities can also disturb near shore terrestrial habitat and cause seabirds, waterfowl and marine mammals to avoid the area.

Environmental Protection Procedures

- a) Work in and around the marine environment will require a permit for the Alteration of a Waterbody under the *Newfoundland and Labrador Water Resources Act*, and the *Federal Navigable Waters Protection Act*;
- b) The LCP will complete a survey of the electrode sites to determine whether fish are trapped in the electrode ponds, and, based on the results of the survey, implement an appropriate fish capture and relocation plan. The LCP will consult with DFO regarding the development and implementation of the plan;
- c) Clean blasted rock will be used for infilling. Armour stone protection will be placed progressively to minimize erosion and to prevent the loss of infill material. All blasted material will be taken from an approved quarry site;
- d) The operation of heavy equipment will be confined to dry, stable areas or approved barges;
- e) Infilling will be done in compliance with the *Navigable Waters Protection Act* authorization;
- f) Any timber cribbing used for construction of temporary or permanent structures will consist of untreated wood (or preservatives safe for the marine environment);
- g) Sedimentation prevention methods as outlined in Section, "Erosion Prevention and Sediment Control" will be used where appropriate to control sedimentation into the marine environment during infilling;
- h) Refer to Section, "Alteration to a Body of Water/Instream Works" for silt control procedures in water works;
- i) All equipment will have muffled exhausts to minimize noise;

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- j) Fuelling of equipment will follow the buffers outlined in the “Buffer Zone” section;
- k) All vehicles will be clean and in good repair. Regular mechanical inspections for leaks on all equipment will be made and repairs undertaken immediately; and
- l) The Master Spill Response Plan (refer to document LCP-SN-CD-0000-EV-PL-0007-01) and appropriate spill kits will be on all fuel-powered vehicles/equipment and as needed elsewhere on-site (refer to Section “Storage, Handling, Use and Disposal of Fuel & Other Hazardous Materials”).

11.21 GRUBBING AND DISPOSAL OF RELATED DEBRIS

Environmental Concerns

The principal concerns associated with grubbing and disposal of related debris are the potential effects of erosion and sedimentation on marine and freshwater ecosystems and water quality.

Environmental Protection Procedures

All grubbing and disposal of related debris near watercourses will adhere to relevant regulatory requirements, including the permits from DOEC and the formal “Letters of Advice”, “Operational Statements”, and/or Authorizations for Works or Undertakings Affecting Fish Habitat from the Fisheries and Oceans Canada.

Other specific measures to be undertaken to minimize potential effects on aquatic habitat and resources are as follows:

- a) Grubbing of the organic vegetation mat and/or the upper soil horizons will be minimized (will not occur within 2 m of standing timber). These will be left in place where possible. Limits of stripping and/or grubbing will be shown on all drawings issued for construction;
- b) The organic vegetation mat and upper soil horizon material, which has been grubbed, will be spread in a manner that attempts to cover exposed areas. Any surplus material will be stored or stockpiled for site rehabilitation and re-vegetation purposes elsewhere in the Project area. Topsoil and peat will be stockpiled separately from the overburden and separated by a buffer zone (refer to Section, “Buffer Zone”) from any waterbodies, watercourse or ecologically sensitive areas. The location of the stockpiles will be shown on drawings issued for construction and accessible for future rehabilitation purposes;
- c) A minimum of 5 metres should separate stockpiles of grubbed material from standing timber;

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- d) Grubbed material and/or topsoil will be stored in low piles to decrease the effect of compaction on structure. Stockpiles of topsoil should be seeded or otherwise protected using erosion control methods as outlined in Section, "Erosion Prevention and Sediment Control" to prevent erosion and loss of nutrients. This is especially important if stockpiles are to remain in place for periods of a year or more;
- e) Erosion prevention and sediment control measures will be installed to minimize and control runoff soil erosion and transport of sediment laden water during grubbing and the re-spreading and stockpiling of grubbed materials. Section, "Erosion Prevention and Sediment Control" outlines all acceptable prevention and control methods (i.e. use of sediment ponds);
- f) Where grubbed materials are re-spread or stockpiled, as many stumps and roots as possible will be left in place to maintain soil cohesion to dissipate the energy of runoff and promote natural re-vegetation;
- g) The length of time that grubbed areas are left exposed to the natural elements will be minimized to prevent unnecessary erosion. These areas will be monitored for erosion and such findings will be reported to the OSEM;
- h) During grubbing, care will be taken to ensure that grubbed material will not be pushed into areas that are to be left undisturbed (Figures 11-14 and 11-15 show examples of grubbing activities and a grubbed right-of-way);
- i) Grubbing will be avoided on steep slopes near watercourses. A buffer zone will be maintained between grubbed areas and watercourses, waterbodies and ecologically sensitive areas (refer to Section, "Buffer Zones"). Grubbing limits adjacent to watercourses will be flagged in the field prior to undertaking grubbing/stripping activities;
- j) Grubbing and other debris will not be permitted to enter any watercourse;
- k) Bog and other wet material that is excavated from the site will be piled and graded on well drained ground in low piles. The piles will be seeded or otherwise protected using erosion control methods as outlined in Section, "Erosion Prevention and Sediment Control"; and
- l) Where the piles are in the transmission line right-of-way they will not impede access to the line for future maintenance or access.

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Figure 11-13 - Example of Grubbing Activities



Figure 11-14 - Example of Grubbed and Cleared Path

11.22 QUARRYING AND AGGREGATE REMOVAL FROM BORROW AREAS

Environmental Concerns

The principle concerns for quarry development and associated aggregate removal include the potential for impacts on aquatic systems, noise, dust, loss of terrestrial habitat and historic resources, potential quarry development/rehabilitation plans.

Environmental Protection Procedures

The following measures will be implemented to minimize these effects:

- Permits to quarry will be obtained from the NL Department of Natural Resources before quarries are established. Quarry activity will be undertaken in compliance with these quarry permits and will comply with all other relevant regulations;
- Noise control procedures will be followed (refer to Section, “Noise Control”);
- Quarries will not be located 100 m from a waterbody unless otherwise approved by the Department of Natural Resources. If approved, additional mitigative measures may be required;
- The development of quarry sites and rock excavations will require monitoring to determine the absence or presence of sulphide bearing rock. For environmental protection against Acid Rock Drainage (ARD), the OSEM will visually inspect bedrock before, during, and after excavation work on a periodic basis.

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Visible evidence of ARD is typically a yellowish colour of water or sediment called yellow boy or evidence of sulphides in rock. In the event that visible evidence of ARD is noted, the OSEM will be notified immediately. Photographs of yellow boy and sulphides (Figures 11-16 – 11-19) are shown below;



Figure 11-15 - Photograph of Yellow Boy Water Runoff



Figure 11-16 - Photograph of Yellow Boy Water Runoff



Figure 11-17 - Typical Sulphides in Rock



Figure 11-18 - Typical Sulphides in Rock

- e) Quarry areas will be developed in a controlled manner so as to minimize potential environmental effects and locations will consider sensitive wildlife areas. The following protection procedures will be implemented to minimize disturbance and facilitate rehabilitation:
 - i) A buffer zone of undisturbed vegetation will be maintained between borrow areas/quarries and watercourses, waterbodies and ecologically sensitive areas (refer to Section, "Buffer Zones");

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- ii) The quarry area, stockpile area and limits of clearing will be staked and/or flagged to prevent over-extension of the development, (corner posts at least 1 metre high above ground will be installed to mark the quarry area);
 - iii) The area to be excavated will be clear cut of all vegetation prior to grubbing, excavation or removal of any material. Only the area necessary for one (1) year production will be cleared;
 - iv) All stumps, organic matter and topsoil will be stripped from the area to be excavated and stockpiled at least 5 m from uncleared areas; stockpiles will be kept at least 10 m from the area of excavation; separate overburden piles will be developed where this material is present; topsoil and the underlying overburden will not be mixed (refer to Section “Grubbing and Disposal of Related Debris”);
 - v) Stockpile areas are to be confirmed by the OSEM, prior to stripping;
 - vi) Upon completion of excavation of a quarry, no cliff faces or benches will be left at a height of greater than 5 m. Available material left over from quarrying and stockpiled overburden will be used to minimize slopes and face heights and to rehabilitate the area;
 - vii) Each quarry will be evaluated by the OSEM on a site-specific basis to determine whether the cliff faces will be converted to rubble slopes; and
 - viii) Following sloping, the topsoil and any organic materials will be re-spread over the disturbed area to promote natural re-vegetation by adjacent seed sources.
- f) In order to prevent sedimentation of waterbodies, watercourses and ecologically sensitive areas, sediment control measures (basins and traps) will be established, if required, and cleaned on a regular basis, as required, to ensure that the designed retention capacity is maintained at all times. Section, “Erosion Prevention and Sediment Control” outlines all acceptable sediment control measures;

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- g) The Total Suspended Solid (TSS) content of construction-altered water that is released into a natural waterbody will not exceed 30 milligrams per litre⁴ and be in compliance with *Environmental Control Water and Sewage Regulations, 2003*;
- h) With respect to maintenance of water quality within receiving waterbodies on and around the site, the *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life* will be used;
- i) The pH level of construction-altered water that is released into a natural waterbody will be between 5.5 and 9 pH units and be in compliance with *Environmental Control Water and Sewage Regulations, 2003*;
- j) Dust from aggregate processing, storage and handling will be controlled with water as required during times when temperatures are above freezing. A Water Use License must be obtained from the Water Resources Management Division;
- k) If crushing activities in the quarry require a water source, a license from the DOEC, Water Resources Management Division, will be obtained prior to any water use; and
- l) Quarry operations will consider sensitive wildlife periods as outlined in Section, "Scheduling and Timing of Construction Activities".

11.23 TRENCHING

Environmental Concerns

Where linear excavations for the construction of water lines or any other infrastructure is undertaken, potential runoff of sediment-laden water could result in effects on marine or freshwater fish and fish habitat, water quality and historic resources.

⁴ If water is being abstracted from a watercourse, used, treated and subsequently returned to the same watercourse, these solids data mean that the effluent should not contain more than 30 milligrams per litre more than was in the water originally abstracted.

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Environmental Protection Procedures

The following measures will be implemented to minimize the potential effects of trenching:

- a) Topsoil and excavated overburden and bedrock will be stored in separate stockpiles for later use during rehabilitation;
- b) Any unsuitable material will be disposed of in a disposal area to be confirmed by the OSEM;
- c) Dewatering of trenches, as outlined in Section, "Dewatering Work Areas" will make use of measures to minimize and control the release of sediment laden water through the use of acceptable sediment control measures as outlined in Section, "Erosion Prevention and Sediment Control"; and
- d) Backfilling of linear trenches will allow for settlement to ensure that the finished grade of the trench is level with the surrounding surface.

11.24 EXCAVATION, BACKFILLING AND GRADING

Excavation, backfilling and grading of common rock and other materials may be required at various locations within the Project Site.

Environmental Concerns

The principal environmental concerns associated with excavation, backfilling and grading are potential effects on water quality and fish and fish habitat due to runoff of sediment laden water. Potential disturbance to rare species and habitat and archaeological resources must also be taken into account.

Environmental Protection Procedures

All work will be conducted in a manner that ensures the minimum amount of disturbance necessary and controls potential sedimentation of watercourses and waterbodies in or adjacent to the work areas as outlined in the following procedures:

- a) Excavation, backfilling and grading will be done only after grubbing and stripping is completed. Where engineering requirements do not require grubbing and stripping (e.g., within the buffer zone of a stream crossing), filling will occur without any disturbance of the vegetation mat or the upper soil horizons;

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- b) Excavation, backfilling and grading in the vicinity of stream crossings will be done in a manner that minimizes erosion and sedimentation of watercourses and waterbodies; and
- c) A buffer zone of undisturbed vegetation will be maintained between construction areas and all watercourses, waterbodies and ecologically sensitive areas (refer to Section, “Buffer Zones”).

11.25 EROSION PREVENTION AND SEDIMENT CONTROL

Environmental Concerns

The potential for erosion and resulting effects to water quality and fish and fish habitat is a key environmental concern associated with construction activities. The following (Figures 11-20 and 11-21) show sediment runoff situations that can be avoided by following the environmental protective measures herein.



Figure 11-19 - Sediment Plume in Water



Figure 11-20 - Sedimentation on Land

Environmental Protection Procedures

Erosion prevention and sedimentation control will be a main objective in all work areas where soil may be transported by water, wind, or ice. An Erosion and Sedimentation Control Plan will be prepared and submitted by the Contractor as part of the C-SEPP, prior to the start of Site activities. Storm water discharge into any waterbody showing on 1:50,000 mapping will require a DOEC permit under the Water Resources Act.

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11.25.1 Site-Specific Erosion and Sedimentation Control Plan

The following outlines the requirements of the Erosion and Sedimentation Control Plan:

- a) A brief description of the proposed land disturbing activities, existing site conditions and adjacent areas;
- b) A description of the critical areas on the site (i.e. areas that have a potential for serious erosion problems);
- c) Construction schedule that includes the date stripping and grading will begin and the expected date of stabilization;
- d) A brief description of the measures that will be used to minimize erosion and control sedimentation on the site, including types, options, when they will be installed and where they will be located;
- e) An inspection and maintenance program, including frequency of inspection and repair, clean out and disposal of trapped sediment, duration and final rehabilitation when site work is complete;
- f) Shut down plans where construction plans are delayed for an extended period of time;
- g) An emergency response plan that identified available short term resources in terms of personnel, equipment and erosion and sedimentation control measures and reporting steps;
- h) Name of person preparing plan and professional stamp/designation;
- i) Site plan including the following features:
 - i) Existing and final site contours at an interval and scale sufficient to identify runoff patterns before and after disturbance;
 - ii) Existing vegetation and buffers;
 - iii) Limits of clearing and grading;
 - iv) Critical areas; and
 - v) Location and type of erosion and sedimentation control measures with dimensions.
- j) Detailed drawings of all erosion and sedimentation control structures and measures showing dimensions, material and other important details;
- k) The following calculations are to be provided:

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- i) Design calculations for erosion and sedimentation control measures (culverts, channels, sediment traps, etc.) such as particle size, flow rates and peak discharge;
 - ii) Calculations to demonstrate the design of sediment removal efficiency; and
 - iii) Any other calculations, as required.
- l) Contingency measures will be implemented to deal with storm events and high runoff in order to minimize adverse environmental effects from these events. Erosion prevention and sediment containment measures and required equipment will be available to address contingency/emergency situations.

11.25.2 Erosion Prevention

The primary way to control erosion is to prevent activities that can contribute to it. However, specific erosion control measures may be required to be designed for the site to minimize the effects of construction activities on the environment. Options for erosion prevention are discussed in the following sections.

11.25.2.1 Discussion of Erosion Control Options

Slope Treatments

Several slope treatments can be used to reduce erosion. Slope treatments are used prior to seeding for vegetation growth. Roughening a slope with horizontal depressions helps control erosion by creating safe seeding sites, therefore increasing vegetation, reducing runoff velocity, and increasing infiltration. The depressions also trap sediment on the face of the slope. The amount of roughening required depends on the steepness of the slope and the type of soil. Stable, sloping rocky faces may not require roughening or stabilization, while erodible slopes require special surface roughening. Roughening methods include stair-step grading, grooving, and tracking. All three (3) methods are shown in Figures 11-22 to 11-24.

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Figure 11-21 - Photograph of Grooving Slope Treatment Method

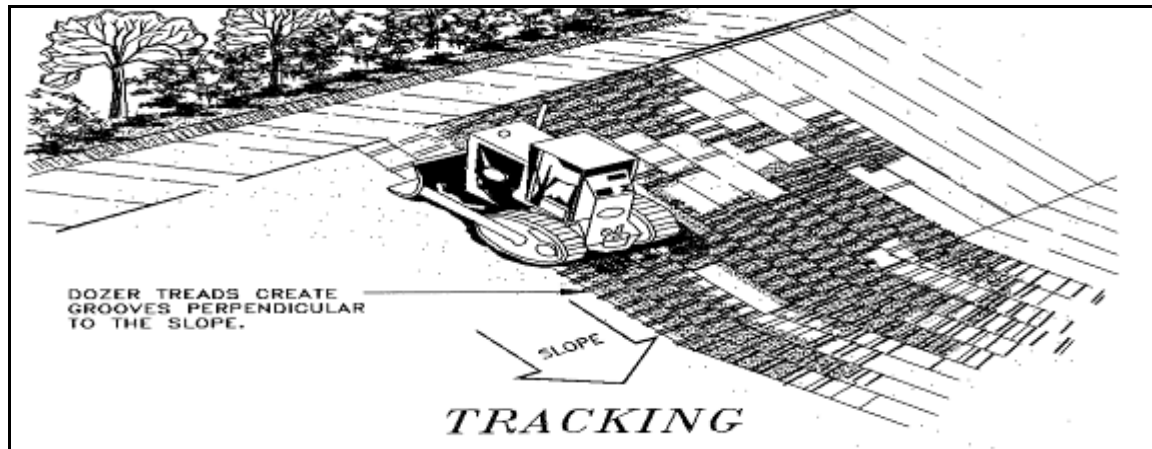


Figure 11-22 - Illustration of Tracking Slope Treatment Method

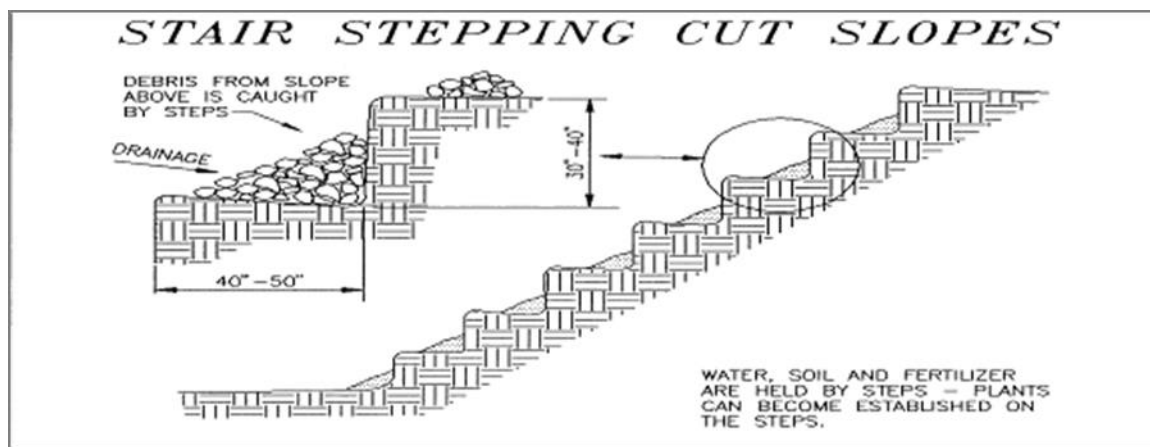


Figure 11-23 - Illustration of Stair Stepping Slope Treatment Method

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Erosion Control Nets/Mats/Blankets/Fibrous Rolls

Erosion control blankets are temporary protective barriers laid on top of bare soil vulnerable to erosion, commonly made of mulch, wood fibre, straw or synthetics. They are typically used on short steep slopes where there is a high erosion potential and slow vegetation establishment. Rolled erosion control products (recps) are manufactured mulch blankets (see Figure 11-25) that protect soil from erosion and turf reinforcement mats (trms) are used to help establish vegetation in channels.



Figure 11-24 - Photograph of Erosion Control Blanket used on a Slope

Erosion control nets are typically synthetic textiles or nets that degrade over time. The nets are woven to permit plants to take root through the holes in them. They also act as a medium to retain water for longer period of time. Different grade of nets are used based on the topography of the ground. The more closely knit nets can be used to curtail erosion in steep areas, while the more loosely knit nets can be used in flatter terrain. Installation of erosion control mats and blankets will take into consideration the criteria listed in Section, “Design criteria and installation procedures for Erosion Control Measures”.

Fibre rolls serve as barriers between up-gradient construction and down-gradient waterbodies. Fibre rolls are installed on slopes in line with one another with one at the base of the slope. The space between each row of

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fibre roll is dependent on the steepness of the slope. The steeper the slope, the more rows of evenly spaced horizontal rolls is required. Fibre rolls are fastened to the ground with wooden stakes. Figures 11-26 and 11-27 show some of the methods of erosion control.



Figure 11-25 - Photograph of Fibre Rolls used to Stabilize



Figure 11-26 - Photograph Shows Erosion Control Blanket on Slope And Erosion Control Mat in Channel

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Rip Rap

Rip rap can be used as an erosion-resistant ground cover and when installed properly it reduces runoff velocity and increases infiltration. Rip rap typically works well on river banks and/or bottoms, roadside ditches and tops of slopes. A non-woven geo-textile liner should be used at the top of the channel to prevent migration of fines. Rip rap placement will follow criteria listed in Section, “Design criteria and installation procedures for Erosion Control Measures” and applicable construction specifications and drawings. Figure 11-28 shows properly placed rip rap while Figure 11-29 shows poorly placed rip rap with geotextile exposed.



Figure 11-27 - Photograph of Rip Rap Placed Along a Slope



Figure 11-28 - Photograph of failed Rip Rap Protection a Slope

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Check Dams and Dikes

Check dams and dikes are temporary barriers that are typically constructed of rocks, gravel bags, sandbags or fibre rolls that are installed across a constructed swale or drainage ditch to reduce water velocity. They are placed in areas where runoff erosion has occurred or where runoff needs to be diverted or channelled. They are not designed to stop the water, but to slow it down. Check dam and dyke installation will follow the criteria listed in Section, “Design criteria and installation procedures for Erosion Control Measures” and applicable construction specifications and drawings.

Check dams will be maintained and inspected periodically, as well as unscheduled inspections prior to, and after, a significant rainfall event, anticipated heavy precipitation or runoff event (e.g. snowmelt). Removal of sediment from check dams will be conducted as required, in order to ensure that the dam continues to perform its design function of reducing the amount of sediment present in the runoff. Photographs of rock constructed check dams are shown below in Figures 11-30 and 11-31.



Figure 11-29 - Photograph of Rock Constructed Check Dam



Figure 11-30 - Photograph of a Rock Constructed Dike

Energy Dissipaters

Energy dissipaters (or outlet protection devices) are devices that are installed on the downstream end of a culvert or outlet and are used to reduce the velocity of the water flow. Energy dissipaters are typically made of rocks (rip rap apron); however they can be man-made devices such as concrete blocks or metal prongs. Energy dissipaters required for fish bearing waters will be of natural means (not man-made). Energy dissipaters require engineering design to accommodate the velocity and volume of flow and will follow the criteria listed in Section,

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“Design criteria and installation procedures for Erosion Control Measures” and applicable construction specifications and drawings. Figure 11-32 shows properly constructed or placed energy dissipaters while Figure 11-33 shows improperly placed rocks as energy dissipaters.



Figure 11-31 - Correct Construction of Rock Energy Dissipaters



Figure 11-32 - Incorrect Construction of Rock Energy Dissipaters

11.25.2.2 Design Criteria and Installation Procedures for Erosion Control Measures

Design criteria and installation procedures for applicable options discussed above are listed below. Reference will be made to these criteria if either of these options is deemed suitable for site-specific conditions.

Straw Mats

Design criteria and installation procedures for applicable options discussed above are listed below. Reference will be made to these criteria if either of these options is deemed suitable for site-specific conditions.

Straw Mats

- Straw mats will be applied at a rate of 3000 to 8000 lb/acre;
- Soil will be visible through the straw mat (not too heavily applied);
- Straw will be applied by blower or by hand; and
- Straw will be anchored to prevent it from blowing away.

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Wood Fibre Mulch

- e) Preferable on steep cut slopes of 2H:1V or steeper; and
- f) Wood fibre mulch will be applied at a rate of at least 1000 lb/acre (increasing the rate of application will increase effectiveness).

Rolled Erosion Control Products (RECPs)

- a) May be used for gradients of 2.5H:1V or steeper;
- b) Will be installed on unfrozen ground;
- c) Slopes will be top soiled and seeded prior to placing RECP;
- d) Blankets will be in full contact with the soil by properly grading soil, removing rocks or deleterious materials, prior to placing blanket;
- e) In channels, blankets will extend above the anticipated flow height, with a minimum 0.5 m of freeboard;
- f) For Turf Reinforcement Mat (TRM), blanket will be placed immediately after top soiling;
- g) Blanket will be anchored by using wire staples, metal geotextile stake pins, or triangular wooden stakes; and
- h) Blankets will be placed parallel to direction of flow, with fabric not stretched but maintaining contact with underlying soil.

Rolled Erosion Control Products (RECPs) on Slopes

General installation methods for RECPs on slopes are listed below however all installation will be designed on a site-specific basis and products will be installed according to manufacturer's procedures.

- a) Prepare surface and place topsoil and seed (surface should be smooth and free of rocks, debris, or other deleterious materials);
- b) Blanket will be anchored at top of slope in a minimum 0.15 m by 0.15 m trench for the entire width of the blanket;
- c) The blanket will be rolled out downslope;

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- d) Where the blanket roll is not long enough to cover the entire length of the slope, a minimum 0.15 m by 0.15 m check slot will be excavated at the location of the lap, and the downslope segment of blanket anchored in the check slot, similar to the method used for the top of the slope, or when blankets, must be spliced down the slope, place blanket end over end (shingle style) with approximately 0.10 m overlap. Staple through overlapped area at 0.3 m intervals;
- e) The upslope portion of blanket will overlap the downslope portion of blanket, shingle style, at least 0.15 m with staple anchors placed a maximum 0.3 m apart;
- f) Adjacent rolls of blanket will overlap a minimum 0.1 m;
- g) Anchors will be placed along central portion of blanket spaced at $4/\text{m}^2$ minimum (0.5 m spacing) for slopes steeper than 2H:1V and $1/\text{m}^2$ (1 m spacing) for slopes flatter than 2H:1V; and
- h) Anchors along splices between adjacent rolls will be placed 0.9 m apart.

Rolled Erosion Control Products (RECPs) in Channels

General Installation Methods for RECPs in channels are listed below however all installation will be designed on a site-specific basis and products will be installed according to manufacturer's procedures.

- a) Prepare surface and place topsoil and seed (surface should be smooth and free of large rocks, debris, or other deleterious materials);
- b) Excavate a minimum 0.15 m deep and 0.15 m wide trench at the upstream end of channel and place end of RECP into trench;
- c) Use a double row of staggered anchors approximately 0.1 m apart (i.e. 0.2 m linear spacing) to secure RECP to soil in base of trench;
- d) Backfill and compact soil over RECP in trench;
- e) Roll centre RECP in direction of water flow on base of channel;
- f) Place RECP end over end (shingle style) with a minimum 0.15 m overlap downgrade;
- g) Use a double row of staggered anchors approximately 0.1 m apart to secure RECP to soil;
- h) Full length edge of RECP at top of side slopes will be anchored in a minimum 0.15 m deep and 0.15 m wide trench;

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- i) Use a double row of staggered staple anchors a maximum of 0.1 m apart (i.e. 0.2 m linear spacing) to secure RECP to soil in base of trench;
- j) Backfill and compact soil over RECP in trench;
- k) Overlap RECP on side slopes (shingle style down channel) a minimum of 0.1 m over the centre RECP and secure RECP to soil with anchors spaced a maximum of 0.2 m apart;
- l) In high flow channels, a check slot across the width of the channel is recommended at a maximum spacing of 10 m to anchor the ends of the RECP to the underlying soil;
- m) Use a double row of staggered staple anchors a maximum of 0.1 m apart (0.2 m linear spacing) to secure RECP to soil in base of check slot; and
- n) Backfill and compact soil over RECP in check slot.

Rip Rap

The following criteria will be considered when installing rip rap:

- a) Used for grades 5-15%;
- b) It will be constructed of durable, large, loose stone;
- c) A non-woven geo-textile liner will be used at the top of the channel to prevent migration of fines;
- d) Side slopes of rip rap must be a slope of 3H:IV or less;
- e) Rip rap will be of angular stone;
- f) Rip rap depth will be at least 300 mm and 1.5x the maximum stone diameter; and
- g) Rip rap should be clean and free of substances deleterious to fish and fish habitat.

Check Dams and Dikes

The following criteria are to be considered when installing a check dam:

- a) Check dams will not be used in live streams or in channels with extended base flows, as this may have a detrimental effect on fish or fish habitats;

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- b) The check dam sediment trap will consist of rockfill with filter fabric on the upstream face held in place with small shot rock;
- c) Accumulated sediment will be cleaned out of the filter fabric at regular intervals as required and the material will be disposed of so that it cannot subsequently run into any waterbodies containing fish;
- d) Any damaged section(s) of filter fabric as well as any undercut or end flow areas where water flows freely around the filter fabrics will be repaired or replaced, as soon as practical;
- e) Drainage area will be less than 4 ha;
- f) The filter fabric will be of a weight of at least 200 g/m²;
- g) The rockfill will be clean rock, with rock fragments sized between 100 and 150 mm;
- h) The small shot rock will be clean rock, with fragments no larger than 120 mm;
- i) When used in series, the top of the downstream check dam will be level with the bottom of the next dam upstream;
- j) The check dam will extend beyond the top of the ditch banks and the centerline elevation will be low enough that flow does not go around the structure; and
- k) Check dams will be maintained and inspected periodically as well as unscheduled inspections prior to, and after, a significant rainfall event, anticipated heavy precipitation or runoff event (e.g. snowmelt). The following maintenance will be completed, as required:
 - Remove any accumulations of sediment; and
 - Add or remove rock as necessary to maintain design height, cross-section and flow through characteristics.

Energy Dissipaters

The following criteria are to be considered when installing energy dissipaters:

- a) Energy dissipaters are preferably constructed on level grade for a distance which is related to the outlet flow rate and the tailwater level;

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- b) The sill or transition to the natural channel will be level with and at the same slope as the receiving channel;
- c) Energy dissipaters are applicable for small and medium size culverts of any cross-section where the depth of flow at the outlet is less than the culvert height;
- d) For rip rap aprons, the apron width at the pipe end will be 3x the pipe diameter;
- e) Energy dissipaters will drain by gravity when not in operation; and
- f) Energy dissipaters will be self cleaning and require minimum maintenance.

11.25.2.3 Silt Fences/Sediment Barriers

Sedimentation Prevention

Sediment barriers are temporary sediment control devices that are used to protect water quality of down gradient rivers, streams and other waterbodies from sediment in water runoff. The most common barriers are silt fences; however other options include straw or hay bales or a berm of erosion control mix. Silt fences are typically used in combination with other site water control measures, including sediment traps and basins. Engineering requirements may vary depending on the locations of the silt fence and will take such factors into consideration as drainage/surface area of exposed soils and time of year the silt fence is employed.

Silt fences typically consist of a piece of synthetic filter fabric stretched between a series of wooden stakes. The stakes are installed on the downhill side of the fence, and the bottom edge of the fabric is trenched into the soil and backfilled on the uphill side. The storm water passes through the fence and sediment is deposited on the uphill side of the fence.

Silt fences are suitable for sheet runoff from exposed areas of soil with grades less than 5% as a result of construction activities. Figures 11-34 to 11-36 show proper construction of silt fences and Figures 11-37 and 11-38 show poorly constructed silt fences that have failed and allowed silt or silty water to pass through. The following criteria will be taken into consideration when installing silt fences:

- a) The silt fence will consist of a filter fabric fence held in place by posts;
- b) The woven filter fabric will be of a weight of at least 200 g/m²;
- c) No single run of silt fence will exceed 100 m in length;

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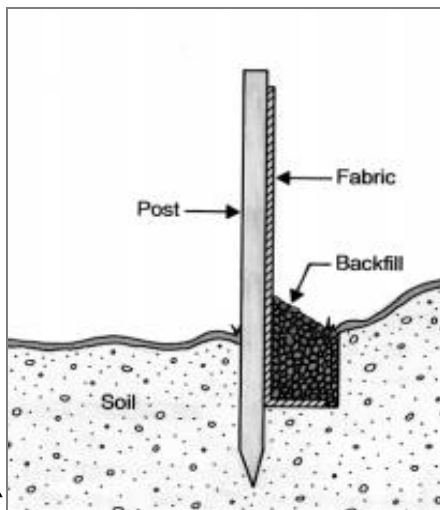
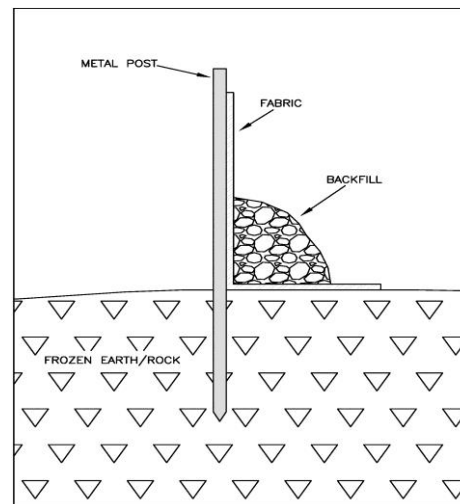
- d) The drainage area behind the silt fence will not exceed 0.1 ha per 30 meters of fence;
- e) Silt fences will not be installed on a slope, and be located no nearer than 1 m from the toe of slope;
- f) Silt fences will not be used when the overland flow exceeds $0.03 \text{ m}^3/\text{sec}$;
- g) The fabric will be at least 900 mm wide/high;
- h) The fence posts will be of sufficient length to support the fabric, be sturdy and be of dimensions of at least 50 mm square;
- i) The staples will be sufficiently sturdy to support the fabric for the required life of the fence;
- j) The posts will be secured at 3 m intervals on the immediate down slope side of the trench;
- k) The filter fabric will be taken from a continuous roll, and cut to the required length. The maximum length of the filter fabric will be stapled to the upstream side of the stakes, with 200 mm of fabric extending into the trench and spread over the trench bottom;
- l) When installing a silt fence in frozen earth or rock, metals posts will be used and wire ties will be used to attach the filter fabric (Figure 11-36);
- m) When a fence is installed in frozen earth it will be checked and potentially replaced during spring melt as the posts may have shifted with the melting earth;
- n) Silt fences will be removed when the site has been stabilized, or re-vegetated;
- o) Silt fences will be inspected and maintained on a regular basis as well as before any anticipated heavy precipitation or runoff event (e.g. snowmelt). Accumulation of sediment will be periodically removed and disposed of in an area where it will not re-enter any waterbody; and
- p) Also, repairs and replacement of damaged silt fences will be addressed immediately.

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Figure 11-33 - A Well Constructed Silt Fence

Figure 11-34 - Properly Constructed Silt Fence
(Downhill Side on Left, Uphill Side on Right)Figure 11-35 - Properly Constructed Silt Fence for
Frozen Earth or Rock

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Figure 11-36 - Examples of Poorly Installed Silt Fences



Figure 11-37 - Examples of Poorly Installed Silt Fences

11.26 SITE WATER MANAGEMENT

Environmental Concerns

For a large-scale, earth-moving construction projects such as the LCP, a major consideration in the protection of water quality and aquatic resources is the management of site water run-off and associated suspended solids. The protection of water quality and aquatic resources will focus on prevention, containment and treatment of water and wastewater associated with the site. Wastewater, septage, sludge, biosolids, or other types of hazardous or deleterious liquids from the project site will not be allowed to be discharged to public wastewater collection systems or treatment facilities. Any work camps connecting to public drinking water or wastewater systems will be required to obtain a Permit to Construct from the Water Resources Management Division. Site water management can be divided into three (3) main categories: Surface Water Interception, Containment and Treatment.

Environmental Protection Procedures

The main focus of measures to protect water quality and aquatic resources is prevention. Preventative measures will include measures to reduce the volume of water entering the Sites (thereby reducing the volume of water that requires subsequent containment and treatment). Site water management systems will be installed as per

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technical specifications and/or the C-SEPPs. See references such as DFO's Fact Sheets on Ditching, Filter Fabric, Rock Check Dams and Temporary Settling Basins for more information related to erosion prevention and sedimentation control.

Storm water discharge into any waterbody showing on 1:50,000 mapping will require a DOEC permit under the *Section 48 of the Water Resources Act*. Effluent monitoring locations, frequency, sampling and reporting will comply with the conditions of the permit.

11.26.1 Description of Site Water Management Methods

Surface Water Interception

Reducing the amount of water entering the work sites through surface water runoff, infiltration through the cofferdams and groundwater seepage may be required. At the main work sites ditches will be incorporated into the site layout to intercept surface water and divert it around the work areas. Infiltration through the cofferdams and groundwater seepage will be reduced by the installation of a properly designed sump and pump well systems that will draw down the water table.

Containment

Once in the work areas, water will be contained until the water can be treated and released. A system of ditches and drains, incorporated with sump and pump systems, may be required to handle water that enters all excavations. Where required, ditches, drains and sumps will be located along the lower boundaries of the construction sites to intercept and contain silty or sediment laden water. Measures to contain water from excavations and other construction works will include but not be limited to:

- a) The containment of water from concrete production and placement, including the cutting of concrete, washing of forms or water otherwise contaminated by concrete components or admixtures;
- b) The containment of wash water from the cleaning of mixers and mixer trucks;
- c) The control of sediment and runoff from aggregate washing areas. This may include, but will not be limited to, use of a closed system washing operation or a multiple tiered settling basin system; and
- d) Testing and treatment for elevated levels of Total Suspended Solids (TSS) or other contaminants related to blasting (such as Ammonium Nitrate and fuel oil).

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Treatment (Sediment Ponds/Traps)

Once contained, water will undergo testing and if necessary treatment prior to release. The goal of Site water management is to release water within regulatory limits for all parameters. Water will be tested for oil and grease, TSS, ammonium nitrates and/or any other parameters outlined by the monitoring plan in the C-SEPP based on usage of equipment and Site chemicals, as required, to meet the *Environmental Control Water and Sewage Regulations, 2003*.

For open excavations, a system of properly designed and constructed settling basins is the preferred method of sediment removal. A sediment basin (also called a sediment pond – See Figure 11-39) is a temporary pond built on a construction site to capture eroded or disturbed soil that is transported due to water runoff. The sediment basin protects the water quality of down gradient waterbodies. The sediment suspended in the water settles in the pond before the runoff is discharged. Sediment basins are typically used on larger construction sites (>5 acres). Use of sediment basins is usually in conjunction with other sediment and erosion controls. Reference the DFO Fact Sheet for Temporary Settling (Detention) Basins for more information.



Figure 11-38 - Sediment Basin

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A sediment trap is similar to a sediment basin and is basically an embankment built along a waterway or low-lying area on the Site. Sediment traps should be installed prior to construction and earth moving activities and are commonly used on smaller construction sites, where a sediment basin is not practical. Use of sediment traps is usually in conjunction with other sediment and erosion controls. The size of sediment traps and basins will depend on the size of the site, location and rainfall runoff for the area. See Figure 11-40 for a photograph of a sediment trap.

Both sediment ponds and sediment traps require periodic inspection and maintenance. Inspections will occur following each significant rainfall to ensure proper drainage and to determine if structure repairs are required. Maintenance will include removal and disposal of accumulated sediment from the settling basins in order to maintain their operating capacity. Sediment will be disposed of in area that would preclude the sediment from entering waterbodies downstream.



Figure 11-39 - Sediment Trap

Water leaving sediment traps and basins will be tested for applicable parameters (Schedule A of the *Environmental Control Water and Sewage Regulations, 2003* under the *Water Resources Act*). Following testing, the addition of chemicals or the use of mechanical processes may be required to treat the water in conjunction with settling and filtration.

Contaminated or silted water pumped from excavations or work areas, or any runoff or effluent directed out of the Project site will have sediment removed by applicable sediment control measures, as outlined in Section,

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“Erosion Prevention and Sediment Control”, before discharging to a watercourse, waterbody or other ecological sensitive area. In addition, any effluent will be tested for TSS and hydrocarbons (if there are any indications of hydrocarbon contamination, such as a sheen or odour) before being discharged to any watercourse, waterbody or other ecological sensitive area. Effluent discharge will comply with the provincial *Environmental Control Water and Sewage Regulations, 2003* under the provincial *Water Resources Act*.

With respect to maintenance of water quality within receiving waterbodies on and around the site, the *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life* will be used.

11.26.2 Design Criteria and Construction Considerations

The design of the structures will consider the following:

- The loading of suspended solids in the water;
- Particle size and gradation;
- The volume of water to be treated;
- The rate of inflow;
- Rate of outflow; and
- The contributing surface area.

Specific design criteria are provided below:

- Design storm will be the precipitation of the twenty-four (24) hour rainfall intensity from a 1:20 year storm;
- Drainage area for each sediment retention structure will not exceed 2 ha;
- Ponds will be located in low lying areas where they will not contribute to high groundwater conditions and where the system can return the water to a body of water or recharge the water table;
- Pond designs will include an overflow discharge in case of flooding. The overflow section will have a minimum width of 1.5 m for every 250 m² of pond area;
- Provide 1 to 2 % elevation drop between inlet and outlet grades; and

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- f) Maintain a minimum pond depth of 1 m. A minimum length to bottom width ratio of 4:1. The size will be determined to ensure discharge water meets the *Environmental Control Water and Sewage Regulations, 2003*.

11.27 DEWATERING WORK AREAS

Environmental Concerns

The major concerns associated with dewatering are sedimentation, direct fish mortality, and/or habitat destruction for freshwater and marine fish species.

Environmental Protection Procedures

- Filtration or other suitable measures, such as settling ponds, silt fences and dikes, will be implemented for sediment removal and turbidity reduction in water pumped from work areas before discharging;
- Where possible, clean water meeting the *Environmental Control Water and Sewage Regulations, 2003* will be discharged to vegetated areas to further reduce any potential effects on watercourses. Additionally, mechanisms to prevent scouring and erosion of the discharge location will be installed as outlined in Section, "Erosion Protection and Sediment Control";
- The size of sedimentation ponds will be designed to accommodate the anticipated volume of collected water and meet discharge criteria for water quality as outlined in Section, "Site Water Management";
- Discharged water will be encouraged to follow natural surface drainage patterns;
- Serious harm to fish and fish habitat will not be permitted unless an authorization under the Fisheries Act has been issued; see Fish Habitat and Relocation in Section, "Alterations to a Body of Water/Instream Works".

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11.28 BLASTING AND WASTE ROCK DISPOSAL

Environmental Concerns

The general environmental concerns associated with on-land blasting include:

- a) Destruction of vegetation outside excavation limits;
- b) Noise disturbances to humans and wildlife;
- c) Disturbance of archaeological resources;
- d) Release of chemicals (i.e. ammonia) to the environment (explosive mixtures and products); and
- e) Dust generation.

Blasting in or near waterbodies can affect organisms with swim bladders (fish) but may also affect a variety of aquatic animals including shellfish, marine mammals, otters, seabirds and waterfowl. The introduction of sediment into the water column is also a concern for marine/freshwater water quality and related effects on aquatic life.

Environmental Protection Procedures

The handling, transportation, storage and use of explosives and all other hazardous materials will be conducted in compliance with all applicable laws, regulations, orders of the DOEC and the Service NL, the *Explosives Act*, and the *Transportation of Dangerous Goods Act*. The following measures will be implemented to minimize the effect of the use of explosives and blasting:

- a) Explosives will be used in a manner that will minimize damage or defacement of landscape features, trees, ecologically sensitive areas such as wetlands, and other surrounding objects by controlling through standard best practice (including precisely calculated explosive loads and adequate stemming), the scatter of blasted material beyond the limits of activity. Outside of cleared areas, inadvertently damaged trees will be cut, removed, and salvaged if merchantable (refer to Section, "Clearing of Vegetation"). Fly rock, which inadvertently enters a waterbody, watercourse, or any ecologically sensitive area and that can be recovered without further damage to the environment, will be removed. Instances where larger fly rocks (boulders) enter these areas or deep waterbodies, recovery of this will be discussed with the OSEM;

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- b) Blasting patterns and procedures will be used, which minimize shock or instantaneous peak noise levels. Incident of fish kills should also be reported to DFO. Refer to “Response Procedures for Natural and Pollution-Related Fish Kill Incidents in the Atlantic Region”;
- c) Time delay blasting cycles or blasting mats will be used, if necessary, to control the scatter of blasted material;
- d) Blasting will not occur in the vicinity of fuel storage facilities;
- e) All blasters will have a Blasters’ Safety Certificate from the NL Department of Labour. This certificate and a Temporary Magazine License will be obtained prior to drilling and blasting;
- f) Use of explosives will be restricted to authorized Personnel who have been trained in their use;
- g) There will be separate magazines on Site for explosives and for dynamite blasting caps. All temporary magazines for explosive storage will have appropriate approvals;
- h) The immediate area of the blast site will be surveyed within one (1) hour prior to a blast, and operations will be curtailed if wildlife (e.g. black bears, water fowl, raptors, etc.) is observed within 500 m. Environmental Personnel and OSEMs will conduct pre-blast monitoring to see and identify species of concern. Additionally, any individual animal sightings by other Personnel will be reported to the OSEM. Blasting may be delayed in such circumstances until wildlife have been allowed to leave the area of their own accord;
- i) All blasting associated debris, such as explosive boxes and used blasting wire, must be collected for proper disposal as soon as possible following blasting activity;
- j) If blasting is necessary within the vicinity of an archaeological site, precautions will be taken to ensure that blasted material and shock waves do not disturb any part of the site. If necessary, protective covering will be applied to the site under the supervision of an approved archaeologist. Blasting will not be undertaken in these areas without first notifying the OSEM;
- k) Waste rock that is suitable for usage at the site will be set aside for subsequent use. Waste rock not suitable for site use will be deposited in the designated stockpile area;

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- l) Previous testing on selected samples of bedrock has shown the samples to be Non-Potentially Acid Generating (NPAG). As a precautionary measure the OSEM will inspect all areas of blasted rock and rock stockpiles to ensure no evidence of PAG material exists; and
- m) If possible, blasting will be done outside of sensitive time periods for important wildlife areas (See Table 11-1).

11.28.1 Blasting in Close Proximity to or In a Body of Water

Seismic geophysical methods may require in-water blasting. This may include the use of small sources of energy (explosives, air gun, weight drop, etc.) in the water column.

The following measures will be implemented to minimize the effect of the use of explosives and blasting in or near water:

- a) When blasting operations are within 200 m of a waterbody occupied by fish, the operations will be carried out in accordance with DFO guidelines;
- b) Downstream areas will be monitored after each blast for evidence of fish kills and if any are evident, blasting operations will cease and the incident will be reported to the OSEM;
- c) Three (3) hours prior to any blasting activities near waterbodies, a visual reconnaissance of the area will be undertaken to establish the presence of water fowl or aquatic mammals;
- d) If blasting is necessary within 15 m of a waterbody, it will be undertaken in compliance with the required Water Resources permits from the DOEC, and DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters, 1998. A copy of this reference will be kept at the Project site and made available to all Contractors;
- e) Underwater blasting activities will require review and authorization from DFO, the OSEM will confirm that the DFO Area Habitat Biologist has been notified twenty-four (24) hours before the start of blasting operations;
- f) Drilling and blasting activities will be undertaken in a manner that ensures the magnitude of explosions is limited to that which is absolutely necessary. A blasting plan will be reviewed with the OSEM in advance of work in close proximity to waterbodies;

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- g) For multiple charges, time delay detonators will be used to reduce the overall detonation to a series of single explosions separated by minimum delay;
- h) Large charges will be subdivided into a series of smaller charges with minimum delay detonation;
- i) The on land set-back distance from the blast site to the waterbody or the set-back distance around the blast site in the waterbody will be based on the maximum weight of charge to be detonated at one instant in time, the substrate, and the type of fish or fish habitat in the area of the blast. These set-back distances are outlined in the Guidelines for Use of Explosives In or Near Canadian Fisheries Waters, 1998 and the DFO Fact Sheet for Blasting – Fish and Fish Habitat Protection; and
- j) Blast holes will be stemmed with sand or gravel to grade or to streambed/water interface to confine the blast.

11.28.2 Waste Rock Disposal

For environmental protection against ARD and other leaching of heavy metals the OSEM will visually inspect rock before, during, and after blasting work and on a periodic basis. Visible evidence of ARD is typically a yellowish colour of water or sediment called yellow boy or evidence of sulphides in rock. In the event that visible evidence of ARD is noted, the OSEM will be notified immediately. Photographs of yellow boy and sulphides are shown in Section, “Quarrying and Aggregate Removal from Borrow Areas” (also refer to Figures 9-16 to 9-19).

Stockpiling will be completed in a manner that will reduce the potential for acid rock drainage and metal leaching. All stockpiles will be placed in an area where drainage can be collected, tested and treated, if required. Consideration will be given to installing a settling pond for runoff to deal with suspended solids. Stockpile areas and limits of clearing will be staked and/or flagged to prevent overextension of the development, thereby minimizing the extent of the operation.

Treatment will be site-specific based on analytical results. However, typical treatment will include settling ponds, and the addition of chemicals or the use of mechanical processes to aid in settling or filtration. Treatment options will be confirmed by the OSEM and approved by DOEC.

The release of water from blasting activities and waste rock drainage will meet Schedule A of the *Environmental Control Water and Sewage Regulations, 2003* before it will be permitted to be discharged directly or indirectly into a storm sewer, body of water or onto the ground.

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11.29 CONCRETE PRODUCTION

Environmental Concerns

The major concern relating to concrete production is the effects of effluent released to the environment. Liquid wastes may contain hazardous materials such as cement, concrete additives, and form oil.

Cement is very alkaline and washwater from spoiled concrete or from the cleaning of the batch plant mixers and mixer trucks, conveyors and pipe delivery systems can have pH levels outside the acceptable range. Similarly, spoiled concrete or washwater would contain concrete additives and agents, some of which are toxic to aquatic species. Aggregates, particularly the finer sand fractions may be washed from spoiled concrete or discharged in washwater. Uncontrolled release of such washwater, chemicals and sediments could adversely affect aquatic life and aquatic habitat.

Environmental Protection Procedures

- Approval from DOEC will be obtained to establish the required concrete batch plants at each Site. Plant operations will comply with the conditions outlined in the approvals and requirements under air pollution control regulations;
- Prior to the release of effluent to the environment it will be tested for appropriate parameters (as outlined in Schedule A of the *Environmental Control Water and Sewage Regulations, 2003*) to ensure effluent quality standards are met. The specific criteria for concrete production are a pH level between 5.5 and 9 and TSS less than 30 mg/L. Release will be in accordance with runoff control procedures;
- With respect to maintenance of water quality in receiving waterbodies in and around the site the *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life* will be used;
- If water to be released does not meet discharge criteria, it will be further treated until these discharge criteria have been met;
- Treatment will be site-specific as it depends on analytical results, however typical treatment may include the addition of chemicals or the use of mechanical processes to aid in filtration or settling. Treatment options will be confirmed by the OSEM and approved by DOEC;
- The Environmental Code of Practice for Concrete Batch Plant and Rock Washing Operations, 1992 will be adhered to during concrete production activities;

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- g) When concrete is to be placed within 15 m of a waterbody, provisions of all required permits will be followed. Under no circumstances will fresh concrete come into contact with a waterbody, before the concrete has cured;
- h) Washwater from the cleaning of mixers, mixer trucks and concrete delivery systems will be handled using the procedures outlined in Section 3.0 of the *Environmental Code of Practice for Concrete Batch Plant and Rock Washing Operations*. The following outlines important steps to take; however the code of practice will be reviewed thoroughly:
- i) All rinsing activities will be carried out at the site of the concrete batch plant, except rinsing of the chute;
- j) The rinsing of the chute may be carried out at the delivery site, unless concrete is being rinsed from the chute; in this case, rinsing must occur prior to site delivery. It is permissible to rinse onto the ground or soil, but under no circumstances into a pond or stream or onto a surface that leads directly to a waterbody, such as a storm sewer;
- k) All rinsing activities at the site of the batch plant will be done over a containment pond (approximately 12.2 m x 4.57 m and less than 0.91 m deep). The material used to form the bottom and sides of the pond can be compacted clay or a synthetic liner, however the DOEC will approve any installation of a synthetic liner. The pond will be self-contained with no water inlets or outlets and no possibility of surface drainage into or out of the pond;
- l) Any trucks returning with unused concrete will dispose of this concrete into an approved area able to contain it while still in liquid form before the trucks can be washed. Once the concrete has hardened it may be used as fill material. Liquid concrete will not be permitted to run freely over the ground;
- m) Once all concrete has been removed from the truck, the truck may be brought over to the containment pond where washing can take place. Any water that is used to wash the truck will be directed into the pond;
- n) When the water level in the pond reaches a height that necessitates discharge, water can be discharged following the procedure outlined in b) and c) above otherwise it will be removed by pumper truck or undergo additional treatment; and
- o) Water will not be discharged in an area where it would cause erosion or be able to pick up solids from the surface.

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11.30 DUST CONTROL

Environmental Concerns

The environmental concerns associated with dust include effects on human health and aquatic ecosystems, waterfowl and vegetation.

Environmental Protection Procedures

The following measures will be taken to mitigate potential effects of dust:

- a) Dust from construction activities will be controlled where possible by using frequent applications of water. Waste oil will not be used for dust control, but other agents, such as wood chips, calcium chloride, matting and re-vegetation, will be considered on a site-specific or as needed basis and will require the approval of appropriate regulators;
- b) Environment Canada's Best Practices for the Use and Storage of Chloride-Based Dust Suppressants, (February, 2007) will be followed for the application of chloride-based dust suppressants. This includes, but is not limited to, the following:
 - i. Chloride based dust suppressants will not be applied prior to a heavy rainfall or if rain is threatening for at least thirty-six (36) hours;
 - ii. Dust suppressants will be applied after a rainfall event to aid in mixing.
 - iii. Suppressants will be applied during early morning or evening times to reduce evaporation; and
 - iv. Chloride suppressants will not be applied to a bridge deck or paved surface.
- c) Dust control agents (e.g., wood chips, calcium chloride, matting) will be stored at suitable distances from all watercourse, waterbody, or ecologically sensitive areas using proper buffer zones (refer to Section, "Buffer Zones").

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11.31 NOISE CONTROL

Environmental Concerns

A variety of noises associated with construction and operation activity can negatively affect wildlife and fish and can affect human safety and health. Noises associated with blasting are temporary in nature and noises associated with drilling are considered long-term, but localized.

Environmental Protection Procedures

Measures will be implemented wherever possible to minimize potential effects arising from a variety of noise sources, including:

- Wildlife surveillance will be conducted prior to and post noisy activities. Activities may be delayed until wildlife have been allowed to leave the area as directed by the OSEM;
- Adherence to all applicable regulations;
- Mitigation such as enclosing noisy equipment and constructing temporary noise-reducing berms;
- All equipment will have exhaust systems regularly inspected and mufflers will be operating properly in accordance with the manufacturers recommendations; and
- Low level flying of aircraft will be avoided in areas where sensitive wildlife is present (i.e. caribou, osprey, harlequin duck and other waterfowl).

11.32 RESOURCE SPECIFIC MITIGATIONS

Environmental Concerns

Construction activities have the potential to impact a number of specific resources in the work areas of the LCP. The resources include historic and archaeological resources, species at risk, forestry resources, and land use.

11.32.1 Historic and Archaeological Resources

Sites of historic or archaeological significance have been identified at the dc specialties and the HVdc overland transmission line project areas. When working in areas of high potential for historic or archaeological sites, Site-specific work measures will be developed.

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To date, 124 archaeological sites have been identified as Historic Resources Impact Assessments for the proposed transmission corridor from Muskrat Falls to Soldiers Pond and the DC Specialties Sites. Of the 124 sites that have been identified, 87 of these sites are considered to be outside the proposed boundaries and footprints of the DC transmission line and DC Specialties sites. However, awareness of the locations of these sites will be maintained during construction activities.

Historic Resources activities/reviews are ongoing at Forteau Point and Churchill Falls and the results will be incorporated when available. See Table 11-3 for information about the known sites within the project boundaries. Detailed maps showing the segments of the HVdc transmission line and the Labrador shoreline will be provided to the contractor to aid in the development of their *C-SEPP*.

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Table 11-4 - Historical and Archaeological Resources in the Lower Churchill Region

Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EiBf-20	HVdc Transmission line	Disturbance/ Loss	Transition Compound
EiBf-45**	HVdc Transmission line	Disturbance	Converter Station/ electrode/Transmission Line
EiBf-46**	HVdc Transmission line	Disturbance	Converter Station/ electrode/Transmission Line
EiBf-47**	HVdc Transmission line	Disturbance	Converter Station/ electrode/Transmission Line
EhBe-07**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EhBe-08**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EdBg-01	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EbBi-01**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
DhBf-01	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
DhBe-04	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
DfBa-13	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-04**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-08**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-25**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-35**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-36**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL

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Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EiBf-37**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-38**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-39**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-40**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-43**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EiBf-44**	HVdc Transmission line	Disturbance	Clearing of vegetation for TL
EjBe-15	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-16	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-18**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-19	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-20	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBe-01**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBe-02**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBe-03**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBe-04**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBe-05**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBe-06**	Labrador Shoreline	Disturbance/ Loss	Converter Station/ electrode/Transmission Line

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Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EiBf-01**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-02	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-03**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-05**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-06**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-09**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-10**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-11**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-12**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-13**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-14**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-15**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-16**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-17**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-18**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-22**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-23**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line

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Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EiBf-24**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-26**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-27**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-01**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-02**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-03	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-06**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-27**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-28**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-30**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-31**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-33	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-34	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-35	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-36	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-41**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-42**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line

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Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EjBe-55**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-56**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-57**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-58**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-59**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-60**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-61**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-63	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-64**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-65**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-01**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-02**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-03**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-04**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-05**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-06	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-08**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line

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Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EjBf-09**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-10**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-11**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-12**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-13**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBf-14**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-66**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-67	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-68	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-69	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-70	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-71	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-28**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-31**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-33**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-32**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-72	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line

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Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EiBf-34**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-41**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-75	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-29**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-42**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-83	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-84	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EjBe-85	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EiBf-30**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EhBe-02**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
EhBe-04**	Labrador Shoreline	Disturbance/ Loss	Converter Station/electrode/Transmission Line
DfBa-02	Central/Eastern NL	Disturbance/ Loss	Converter Station/electrode/Transmission Line
DfBa-04	Central/Eastern NL	Disturbance/ Loss	Converter Station/electrode/Transmission Line
CIAI-04**	Avalon Peninsula	Disturbance/ Loss	Converter Station/electrode/Transmission Line
CiAf-02	HVdc Transmission line Avalon Peninsula	Disturbance/ Loss	Converter Station/electrode/Transmission Line
FfCa-01	HVdc Transmission line Southern Labrador	Disturbance/ Loss	Transmission Line

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Archaeological Borden Number/Name	Location	Environmental Effect	Contributing Project Activity
EiBf-49**	Forteau Point	Disturbance/ Loss	Transition Compound
EiBf-50	Forteau Point	Disturbance/ Loss	Transition Compound
EiBf-51	Forteau Point	Disturbance/ Loss	Transition Compound
EiBf-52	Forteau Point	Disturbance/ Loss	Transition Compound
EiBf-87	L'Anse Au Diable	Disturbance/ Loss	Electrode Site
EiBf-87	L'Anse Au Diable	Disturbance/ Loss	Electrode Site
EiBd-03	Shoal Cove	Disturbance/ Loss	Transition Compound

** These sites are outside the proposed boundaries of the dc overland transmission line and dc specialties Sites. However, awareness of the locations of these sites will be maintained during construction activities.

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As per the requirements of the PAO, a historic and archaeological resources impact assessment will be conducted at Sites where there is potential for historic and archaeological resources to be located. For low potential sites a desktop review may be adequate. For higher potential sites, field assessment may be required.

Existing information will be provided where available, and where activity will take place in an area that has not been previously reviewed a historic resources overview assessment may be required.

The following mitigations will be implemented with respect to historic and archaeological resources:

- a) All persons on Site will be informed of the historic resources potential of the area, of their responsibility to report any unusual findings, and to leave such findings undisturbed;
- b) An environmental awareness session to be attended by all staff and contractors to identify areas of high historic resources potential;
- c) The OSEM will report to the PAO if any potential archaeological resources are uncovered during excavation (Martha Drake, Provincial Archaeologist, 709-729-2462);
- d) Where possible, known sites will be avoided by modifying design (i.e. road and transmission line alignment adjustment) to ensure a 50 m minimum buffer (actual size to be determined by the PAO). Where the site cannot be avoided, the site will be recorded/recovered to the satisfaction of the PAO before work can proceed as per Historic Resources Management Plan developed by the ERC Team;
- e) The On-Site Environmental Monitor will be contacted immediately if any historic resources are discovered during the course of the work. All work within 50 m of the discovery location will stop and contingency plan procedures implemented; and
- f) Regular monitoring will be conducted by the OSEM to ensure that site protection measures are adequate and that the terms and intent of the EPP requirements are being met. Sites registered with the PAO outside the immediate Project area will be visited annually by the OSEM during periods when the sites are not snow covered to ensure they have been left undisturbed.

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11.32.2 Species at Risk

Many wildlife species (including plants, animals and birds) and their habitat are protected under provincial and federal regulations such as the national *Species at Risk Act*, *Migratory Birds Convention Act* and the *NL Endangered Species Act*. Of primary concern are disturbances, destruction or degradation of critical habitat, recovery habitat and disturbance during critical life periods (i.e. nesting and spawning). Displacement of species due to construction activities (i.e. blasting) or encounters with construction equipment and Personnel are also concerns.

Several species have been identified through the Environmental Assessment process as being of concern in the HVdc transmission line right-of-way and the dc specialties Sites. They include vegetation, furbearers, mammals, avifauna and waterfowl and are as follows:

- a) Fernald's Braya (SARA threatened; NL ESA threatened);
- b) Long's Braya (SARA endangered; NL ESA endangered);
- c) Fernald's milk-vetch (SARA special concern; NL ESA vulnerable);
- d) Boreal Felt Lichen (SARA special concern; NL ESA vulnerable);
- e) American Marten, Newfoundland Population (SARA threatened; NL ESA endangered);
- f) Woodland Caribou - Red Wine Mountains (RWM) Herd and Mealy Mountains (MM) Herd (SARA threatened; NL ESA threatened)
- g) Harlequin Duck (SARA special concern; NL ESA threatened);
- h) Olive Sided Flycatcher (SARA threatened; NL ESA threatened);
- i) Grey-cheeked Thrush (SARA none; NLESA vulnerable);
- j) Rusty Blackbird (SARA special concern; NL ESA vulnerable);
- k) Red Crossbill (SARA endangered; NL ESA endangered);
- l) Short-eared Owl (SARA special concern; NL ESA vulnerable);
- m) Common Nighthawk (SARA threatened; NL ESA threatened);
- n) Barrows Goldeneye (SARA special concern; NL ESA vulnerable);
- o) Piping Plover (SARA endangered; NL ESA endangered);

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- p) Ivory Gull (SARA endangered; NL ESA endangered);
- q) Blue Whale (SARA endangered; NL ESA none);
- r) Fin Whale (SARA special concern; NL ESA none);
- s) Leatherback Sea Turtle (SARA endangered; NL ESA none);
- t) Atlantic Wolffish (SARA special concern; NL ESA none);
- u) Northern Wolffish (SARA threatened; NL ESA none);
- v) Spotted Wolffish (SARA threatened; NL ESA none);
- w) White Shark (SARA endangered; NL ESA none).

Reference should be made to the fact sheets for species listed on the SARA list and the Endangered Species Act to find further information about these species.

A "Section 19" permit is required from the Wildlife Division, Department of Environment and Conservation, Governmental of Newfoundland and Labrador. The following mitigations will be implemented with respect to endangered, threatened or vulnerable wildlife at the Site:

- 1) RWM and MM herd caribou:
 - Known occupation of areas by season for these herds has been prepared using geo-referenced telemetry data from 2007-2012;
 - LCP is committed to the collaring of up to 10 satellite collard for the RWM and MM herds; and
 - An aerial survey will be conducted each winter during the construction period to provide a general understanding of the location of caribou relative to Project components and planned Project construction areas.
- 2) If RWM and/or MM herd caribou are present during late winter and late pregnancy periods, Project activities may be restricted, delayed or minimized, specifically:
 - A cautionary period (late winter) – February 3 to April 15 If Project activities are to occur within 1 km of the known 90% kernels for the wintering period and caribou are known to be present in these areas based on satellite telemetry or other reports, LCP and NLDEC-WD will develop appropriate mitigation which may include restricting, delaying or minimizing an activity.

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- A critical period (calving/immediately post-calving) – May 30 to June 30. If Project activities are to occur within 1 km of the known 90% kernels for the calving/immediately post calving period and caribou are known to be present in these areas based on satellite telemetry or other reports, LCP and NLDOEC-WD will develop appropriate mitigation such as restricting, delaying or minimizing an activity.
- 3) Critical habitats will be identified on site plans or plan profiles for roads and transmission lines for C-SEPP;
 - 4) Clearing within identified critical habitat for Newfoundland Marten will be restricted during the marten denning period (more details are available in the Species at Risk Impacts Mitigation and Monitoring Plan);
 - 5) Risk of harm to martens will be mitigated through avoidance during the denning period within the range of their critical habitat. Should any tree clearing be planned for the marten denning period from April 1 to June 30, LCP will consult with NLDOEC Wildlife Division to identify a specific plan for identifying and avoiding denning locations. Given the relatively small area to be cleared along an existing ROW, and the low likelihood of interaction with the species, mitigative measures are expected to reduce or avoid effects to the point where there are no measurable effects on the marten population.
 - 6) All Site Personnel will receive training to recognize any endangered, threatened or vulnerable species of plant or animal and its habitat prior to the start of clearing and any other site activities;
 - 7) Through site surveys, existing potential rare plants habitat will be identified and mapped prior to the commencement of any Site work. Based on this mapping, travel routes and “no-go” zones will be established to avoid sensitive areas. Animals and animal habitats such as active nesting sites and beaver dams, will also be identified and mapped;
 - 8) Work plans will be submitted in advance and will be reviewed for potential conflicts, including rare plants, endangered species, critical habitat and other areas of concern (i.e. beaver dams and nesting sites);
 - 9) Where required (i.e., as per the Avifauna Management Plan or associated EEM Plans), prior to commencement of work, an on-site wildlife biologist will be on-site to survey for areas of concern (e.g., critical breeding habitat, rare plants, nest sites) and to provide input on work methods, lay out approved travel routes and work areas and associated buffer zones;

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- 10) In areas where concerns have been identified, the OSEM will ensure work crews are aware of concerns identified and work methods to be used;
- 11) There will be no intrusion into “no-go” zones without prior permission of the OSEM;
- 12) Crews will not travel outside of marked work areas and trails. If markers are not clear or are missing, the OSEM will be consulted prior to commencing or continuing with the work;
- 13) The OSEM will monitor work activity in sensitive sites at all times and provide advice on access and travel requirements;
- 14) The Environmental Engineering Coordinator will be informed of activities near sensitive areas so that they may notify any regulators;
- 15) Notice of potential impacts to rare or protected species and their habitat at the job site will be given to the OSEM for evaluation;
- 16) Prior to construction during nesting season (refer to Table 11-13) the area will be surveyed for active nests, including raptor and other NL ESA or SARA listed species listed in Section, “Species at Risk” within this document;
- 17) No clearing will take place within 800 m of an active raptor (refer to Table 11-13). If a nest is encountered during clearing activities, all work will stop until the Site is cleared by the OSEM, in consultation with the appropriate regulatory agencies;
- 18) For all work activities, other than clearing, a 200 m buffer will be respected for active raptor nests (refer to Table 11-13). Within this 200 m buffer zone the following applies, after consultation with the provincial government:
 - i. Only essential vehicular activity will be permitted;
 - ii. Work will only be permitted in the presence of the OSEM; and
 - iii. Crews will cease work if there is a disturbance at a nest until activity at the nest has returned to normal; work will not commence again until approval from the OSEM.
- 19) Crews will not establish a permanent or temporary camp within 800 m of a known raptor nest;
- 20) If a tree containing an inactive nest is encountered during site clearing, the nest will be assessed for viability and if the nest is deemed viable a platform will be established as approved by the provincial government; and

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- 21) If a tree containing an inactive nest is encountered during the transmission line right-of-way clearing a platform may not be required as the transmission line tower will provide an alternative nesting site.

11.32.3 Wildlife Protection

The following mitigative measure will be implemented for the protection of wildlife at the Site:

- a) Construction activities will be scheduled considering any sensitive areas of fish and wildlife habitat and critical periods in fish and wildlife cycles, and considering additional mitigation measures that may be required (Table 11-1). Annual timing of migration, spawning and calving in the vicinity of the Site will be considered at all times;
- b) Personal pets will not be brought to the construction site;
- c) Buffer zones will be implemented to protect wildlife at the site. Refer to Section, "Helicopter Traffic" for the buffer zones for helicopter traffic at the site;
- d) Fishing and hunting are prohibited at or near the Project area. All project participants will be prohibited from fishing and hunting at or near the construction site while working on the Project;
- e) Mitigation measures provided in various sections (refer to Sections "Erosion Prevention and Sediment Control", "Storage, Handling and Disposal of Fuel and Other Hazardous Material", "Buffer Zones", etc.) will be consulted while working close to water to ensure that appropriate measures are understood and implemented to protect freshwater fish and fish habitat;
- f) Under no circumstances are wildlife to be fed and all measures will be taken to avoid inadvertent feeding;
- g) Wildlife will not be chased, caught, diverted, followed or otherwise harassed by project participants;
- h) All wildlife sightings and nuisance wildlife will be reported to the OSEM;
- i) The forestry branch will be contacted and updated with regards to nuisance wildlife and wildlife encounters;
- j) Equipment and vehicles will yield the right-of-way to wildlife and adhere to construction site speed limits;
- k) Environmental awareness training, with regular briefings, will be implemented for all Personnel by the Contractor;

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- l) All persons on Site will be made aware of the potential for encounters with black bears and instructed to report all sightings to the OSEM;
- m) Persons on Site will take part in the Bear Awareness program (refer to Black Bear EEMP);
- n) Black bear deterrent measures such as bear bangers and bear spray may be used, and translocation of bears will be undertaken before any lethal means are considered. A research permit for relocation of bears may be required from the Wildlife Division, Department of Environment and Conservation, Government of Newfoundland and Labrador;
- o) Fire arms will not be permitted on site, with exception of approved bear monitors;
- p) Black bear protection permits will be obtained for each black bear monitor. Permits will be signed by the individual that the permit is issued to;
- q) An Avifauna Management Plan has been developed by the ERC Team. The Plan includes:
 - i) Surveying for migratory bird nests prior to cutting during the nesting season;
 - ii) Surveying for sensitive habitat that typically supports nest;
 - iii) Information regarding avoiding identified nests until fledged;
 - iv) Information regarding cutting in sensitive habitats during nesting season; and
 - v) Employing on-site support of qualified biologists during construction, as required.
- r) As part of the environmental assessment process, the Project has committed to not interfering with traplines. Prior to construction, a public notification will be made about activity in the area and will include a request that traps in the area be removed. Prior to clearing, the area will be surveyed for traps in conjunction with the avifauna survey. These traps will be moved outside of the construction right-of-way and flagged. Once construction begins, should a trap be encountered in the work area, it will be moved outside of the active right-of-way and flagged.
- s) Clearing activities between (refer to Table 11-13) will be in compliance with the Avifauna Management Plan; and
- t) No one will disturb, move or destroy migratory bird nests. If a nest or young birds are encountered, work will cease in the immediate area of the nest. Work will not continue in the area until the nest is no

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longer occupied, otherwise the work plan will be modified to avoid nest sites by a minimum of 30 m (100 m for Rusty Blackbird).

Caribou

Several sensitive caribou areas are crossed by the HVdc line. These areas are identified on constraint mapping and in these areas the following mitigation measures apply:

- a) Caribou will be permitted to cross work areas, and access roads with traffic yielding to the animals when crossing a road;
- b) If human-mediated caribou mortality occurs, LCP will contact NLDOEC-WD immediately;
- c) Garbage control measures will be used to prevent bears, wolves, and other animals from accessing garbage and prevent attraction of animals to garbage storage areas; and
- d) The Project footprint will be minimized to the extent possible, including access and other disturbances on the landscape being kept within existing areas of disturbance where possible. Where it was possible the Project was designed to minimize the creation of new access (for example, the ac and dc transmission lines for the Project follow existing linear features such as the Trans-Labrador Highway and Trans-Canada Highway).

The following describes specific potential interaction scenarios and the associated mitigation:

Scenario 1 – Caribou within 20 km of Project activities (based on satellite telemetry or other reports)

- OSEM will conduct weekly visual surveys of 10 km radius around each activity from road-accessible vantage points for caribou or signs of caribou (i.e., winter craters, tracks or scat).

If present, wildlife observations will be included in the weekly environmental report to be sent to NLDEC-WD in Corner Brook (whenever Project activities are ongoing), and such information will be presented during environmental awareness training and regular briefings for all Personnel.

Scenario 2 – Caribou **within 5 km** of Project activities (based on satellite telemetry or other reports)

- OSEM to issue advisory to all Project Personnel that all sightings of caribou to be reported immediately to the OSEM. The OSEM will then immediately notify all vehicle operators.

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- OSEM will conduct daily visual surveys of 10 km radius around each activity from road-accessible vantage points for caribou or signs of caribou (i.e., winter craters, tracks or scat).
- If present, wildlife observations will be included in the weekly environmental report to be sent to NLDEC-WD in Corner Brook.

Scenario 3 – Caribou present during sensitive time periods:

- During the calving (May 28 – July 1) and post calving seasons (July 2 – September 20) if caribou approach the worksite, it is proposed there be a progressive level of heightened awareness by Project Personnel. For all Project-caribou interactions, an LCP representative will contact the NLDOEC-WD to confirm an appropriate response given the proximity and sensitivity of the caribou.

Scenario 4 – Other Project activities (e.g., grubbing, grading and leveling, laydown and storage of equipment and material in existing areas, generators to support the activity, vehicle and heavy equipment use, handling and transfer of fuel and other hazardous material, waste disposal, sewage disposal and hazardous waste disposal, localized and low intensity blasting, tower erection and conductor stringing).

- As these activities would not be audible beyond a short distance, if caribou are observed within 500 m of such an activity, the OSEM will determine if the activity will be delayed or curtailed.
- Wildlife interactions will be included in the weekly environmental report to be sent to NLDOEC-WD in Corner Brook.

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11.33 COMMISSIONING

Environmental Concerns

Commissioning occurs after installation and prior to release for commercial operation; it is a means of verifying and documenting that each component, system and assembly of a facility is built, installed and tested as planned and designed to meet Project requirements.

Commissioning the proposed HVdc overland transmission line is related to mechanical acceptance so that all hardware is in place and properly installed.

After mechanical completion of the HVdc and synchronous condenser facilities final commissioning is completed in two (2) stages. The first stage is static commissioning which consists of systematically testing individual components or sections of a completed system using test equipment voltages and currents. This process will take about six (6) months at each converter station and at the synchronous condenser facility, about three (3) months at each transition compound and about one (1) month at each shoreline pond electrode site. The second stage is dynamic commissioning, which consists of operational performance testing while connected to the existing network and operating near full operating conditions. This process will take about two (2) months and will include all sites noted above.

Temporary telecommunication construction related infrastructure requires commissioning that will also include static and dynamic commissioning and will take approximately three (3) weeks at each facility (switchyards, converter stations, transition compounds, electrode sites, construction camps and marshalling yards). Permanent telecommunication construction related infrastructure requires similar commissioning, however the timeline will be approximately three (3) months at each facility (switchyards, converter stations, transition compounds, electrode sites, construction camps and marshalling yards).

Environmental concerns related to commissioning relate to unintended release of hydrocarbons into the environment.

Environmental Protection Procedures

- a) All equipment containing fluids will be checked for leaks by the supplier and/or manufacturer and will be tested according to the manufacturer's directions prior to commissioning activities;
- b) There will be monitoring during commissioning for spills and/or leaks;
- c) Appropriate spill kits will be on hand to respond to a spill or leak (see Section 9.13);

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- d) In the event that a spill or leak is detected, the Master Spill Response Plan will be referred to for response to any incidents; and
- e) All other requirements of this EPP will be adhered to during commissioning.

11.34 SITE REHABILITATION

Environmental Concerns

The primary concern with environmental rehabilitation is site stabilization and erosion prevention. This is particularly pertinent to temporary structures such as roads, quarries, and cofferdams.

Environmental Protection Procedures

Environmental rehabilitation will be consistent with all applicable standards, codes, acts and regulations and the conditions of EA release.

General rehabilitation approaches are provided in this section. However specific rehabilitation approaches will also be developed in compliance with regulatory requirements and industry best practice and will be completed on a site-by-site basis and included in the C-SEPP. An outline of the requirements of the site-specific rehabilitation plan is provided below.

11.34.1 Site-Specific Rehabilitation Plan

The following outlines the requirements of the Site-Specific Rehabilitation Plan:

- a) Removing and stockpiling overburden and organic material for re-use;
- b) Re-grading areas to control erosion and establish suitable drainage;
- c) Replacing the overburden and organic material to produce conditions for re-growth; and
- d) Encouraging natural re-vegetation.

On some Sites there may be limited overburden and organic matter. Nutrient poor soils and a shorter growing season may also slow down and reduce the rate of vegetation re-establishment. In these cases, it may be necessary to import seed, mulch or geotextiles to artificially improve re-vegetation for key areas. Measures to prevent the invasion of disturbed sites by non-native plant species will be considered. Acceptable approaches include, but are not limited to, the following:

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- 1) Use of native plant and soil material for rehabilitation and re-vegetation;
- 2) Use of only species that are non-aggressive and non-persistent (where local plants are not available or will not meet the rehabilitation objectives).
- 3) Implementation of measures to ensure that additional materials (required to limit erosion, reduce sedimentation or enhance establishment) are weed and disease free; and

All areas of the construction sites will require careful consideration of the landscape within which the work is taking place to ensure that the correct approach is taken. Areas will be prioritized in terms of need and importance and the level of rehabilitation will be modified accordingly. Factors that will be considered in determining the rehabilitation approach include, but are not limited to, the following:

- a) Site and public safety (including future access requirements);
- b) Sedimentation concerns and proximity to waterbodies;
- c) The natural habitat of the area (i.e., vegetation, soil, and hydrology
- d) Wildlife habitat considerations;
- e) Riparian habitat considerations;
- f) The productivity of the site (i.e. moisture, content and nutrient regime) and its effect on re-vegetation;
- g) The availability of materials and implications of importing unnatural material;
- h) Land use and their effect on success of rehabilitation techniques; and
- i) Overall cost of rehabilitation measures.

Once the schedule of work at each construction area has been developed, a detailed schedule for carrying out rehabilitation work will be developed in accordance with regulatory requirements and will also consider industry best practice for implementation of site rehabilitation. The site-specific rehabilitation plan will indicate timing of the rehabilitation works for each area to be rehabilitated. Consideration will be given to progressive rehabilitation throughout the construction period, as opposed to waiting for the end of construction before starting with rehabilitation.

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11.34.2 General Measures

- a) Rehabilitation will be required for all temporary works, including roads, stream crossings, camps and quarry and borrow areas;
- b) No temporary buildings or structures associated with the work will be left on Site upon completion of the work;
- c) All solid waste, including petroleum, oil and lubricant containers will be removed from Site;
- d) Pre/Post occupation inspection will be completed by the OSEM; and
- e) The OSEM will prepare a report for all sites documenting Site conditions prior to disturbance and upon Site abandonment and rehabilitation. Each report will include a description of the condition of vegetation and other aspects of natural environment.

Quarry/Borrow Areas

The following measures are specific to quarry and borrow areas and will be considered in rehabilitation plans for those areas:

- a) Any organic material or overburden removed during development of the borrow pits and quarries will be stockpiled near the pit or quarry area for future use during rehabilitation of the borrow pit or quarry. Overburden (and non-PAG rock) that is not suitable for rehabilitation purposes will be stockpiled for temporary use or permanent disposal. Stockpiling will be in stable configurations and contoured to match the surrounding landscape. For temporary stockpiling it will be and returned to the borrow pit or quarry opening once extraction from the pit or quarry is complete;
- b) As site conditions dictate, vegetation or other cover materials may be established on slopes to control erosion and dust (as outlined in Section, "Erosion Prevention and Sediment Control"). Quarries and pits reclaimed during operations may be used as test plots to evaluate suitable re-vegetation techniques to be used for the rehabilitation of other work areas in the future;
- c) Arrangements will be made with the representatives of the Department of Natural Resources for an inspection to be conducted prior to abandonment of the site;
- d) All equipment and material will be removed from the site;
- e) All pit and quarry slopes will be graded to slopes less than 20%, or to a slope conforming to that existing prior to quarrying;

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- f) Excess overburden may be used for sloping but topsoil or organic material may not be used for sloping. Following sloping, topsoil or organic material may be spread over the entire quarry area to promote vegetation; and
- g) Quarry conditions, including slope on rock walls, will be determined through the Rehabilitation Plan. Each quarry will be evaluated on a site-specific basis to determine if cliff faces should be converted to rubble slopes.

Roads/Stream Crossings

- a) The following measures are specific to road and culvert/bridge rehabilitation and will be considered in rehabilitation plans for those areas:
- b) The Contractor will submit a plan for controlling erosion during rehabilitation activities. This plan would address construction activities that have the potential for stream sedimentation;
- c) When working in a stream or waterbody, remove all fill around pipes before water bypass installation and pipe removal;
- d) The stream will be dewatered at the site using a non-eroding, water tight diversion during excavation. Settling basins will be used to ensure that muddy water does not enter the waterbody;
- e) Fill material that requires temporary placement will be placed in stable areas outside of stream channels and flood plains;
- f) Channel banks will be armoured with large rock, woody debris and vegetation when needed;
- g) Channel and vegetation rehabilitation will be required if there are disturbances upstream and downstream of the stream crossing site;
- h) Stream channels will be restored to natural grade and dimensions and re-vegetation may be required;
- i) All culverts will be removed;
- j) Temporary bridges in all areas of the site will be removed; and
- k) Removed culverts and other structural materials will be disposed of as per the WMP.

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12 ENVIRONMENTAL MONITORING AND FOLLOW UP

12.1 ENVIRONMENTAL COMPLIANCE MONITORING

To ensure that appropriate and effective environmental mitigation measures are employed during construction, the Project will have full-time OSEMs at various work fronts. These individuals will continuously inspect worksites and activities for conformance with the EPP, C-SEPPs, engineered mitigation measures required by design; and compliance with government regulations and permits.

This EPP establishes the basis for environmental compliance monitoring at the work fronts, i.e., monitoring for regulatory compliance to verify that conditions of all permits and approvals are satisfied, and that all environmental regulatory requirements are met. Refer to the Regulatory Compliance Plan (RCP) for further information on regulatory compliance for the LCP.

Non-conformance with this EPP, C-SEPP, and/or non-compliance with permits, approvals, and regulatory requirements will be documented, as indicated in the following paragraphs, as well as in the RCP, and as addressed under the Contractor responsibilities for mitigation measures. Corrective action will be identified, target dates will be agreed upon, and responsibilities will be assigned to appropriate Personnel. This documentation will be distributed to other members of the Project's environmental management team and written notice of agreed corrective action will be forwarded to the Contractor so that issues are resolved to the satisfaction of the Project's environmental management team.

If non-conformance items are noted that require immediate attention, or if agreed corrective action is not implemented in a timely and effective manner, then appropriate resources will be contracted by the Project to immediately undertake the required action.

Daily Field Reports will be prepared by the OSEM and approved by the Environmental Engineering Coordinators. They are distributed to appropriate Project team members including the Construction Manager and the Environmental Engineering Manager. These reports will include a description of work being undertaken by the Contractor and document incidents of non-conformance with environmental requirements. The Environmental Engineering Coordinators, in consultation with Project Personnel and the Contractor, will prepare Environmental Compliance Audit Reports, and the frequency of these reports will be risk-based with a baseline of semi-annual auditing, and will ultimately document all incidents of non-compliance and their causes. The Environmental Coordinators will distribute the Environmental Compliance Audit Reports to relevant Project team members. The Environmental Engineering Coordinators will be responsible for managing the Non-Conformance Registry,

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including updating it regularly, and incorporating all conditions into the Registry to ensure that these are complied with in a timely manner.

The Contractor will be responsible for developing a site-specific Compliance Monitoring Plan to be included in the C-SEPP. This will include such things as frequency of monitoring, parameters, locations and media to be monitored, etc. All analysis conducted to support compliance monitoring are subject to the Accredited Laboratory Policy.

12.2 ENVIRONMENTAL EFFECTS MONITORING

The intent of Environmental Effects Monitoring (EEM) is to confirm predictions made as part of the Environmental Assessment. EEM monitoring will be carried out by the ERC Team. The EEM program results will be communicated to the ECR Manager by the Environmental and Regulatory Compliance Leads.

Should effects deviate from predicted, the ERC Team will determine the cause and appropriate action. Should this information be linked to work practices, the EPP will be revised and updates will be provided to contractors and staff. It is noted that there may be additional requirements for approvals and communication with the regulators related to the EEM Plans and regulatory guidelines.

12.3 ANNUAL ENVIRONMENTAL PERFORMANCE REVIEW

At the end of each construction year the project will convene an environmental performance workshop to review all work activities that relate to environmental concerns, issues and/or mitigations. This workshop will include a review of environmental audits carried out by project staff during the year. The review process will give all parties a chance to evaluate overall environmental performance and compliance with government regulations, permits, the EPPs, and C-SEPPs.

13 CONTINGENCY PLANS

Contingency plans to address unplanned occurrences and emergency situations are provided in the following sections. The following unplanned occurrences and emergencies have been addressed under contingency plans:

- i) Fuel and Hazardous Material Spills (Master Spill Response Plan);
- ii) Wildlife Encounters (including nesting and denning sites);
- iii) Historic and Archaeological Resources; and

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iv) Forest Fires (ERP).

13.1 FUEL AND HAZARDOUS MATERIALS SPILLS

Spills of fuel and/or hazardous materials can potentially be harmful to human health and safety, vegetation, soil, surface water, ground water, wildlife, aquatic organisms, historic resources and human health and safety.

In case of a fuel or hazardous material spill project staff will refer to the Master Spill Response Plan (refer to document LCP-SN-CD-0000-EV-PL-0007-01) for detailed contingency measures. A site-specific fuel and hazardous materials response plan will form part of the C-SEPP.

To mitigate environmental effects of fuel and hazardous material spills and leaks, Contractors will at all times maintain in good condition at least one spill kit dedicated to each piece of fuel-powered equipment. Each spill kit will be located on the equipment and stored in a weather-proof container. Each spill kit will have an absorption capacity of no less than 23 litres.

The Contractor will ensure adequate and appropriate spill response materials and equipment are available for use relative to the scope of work and environmental sensitivities - i.e., spill kit containing aquatic booms for working near water and spill kits capable of capturing 110% of reasonable potential spill volumes should be present at the camp site(s) and with mobile field crews.

13.2 WILDLIFE ENCOUNTERS

Wildlife encounters pose a potential risk for stress or injury to both the wildlife and Site Personnel. To reduce the risk and stress, control measures and environmental protection procedures have been put in place and are shown below. As a protection measure, hunting, trapping or fishing by Project Personnel is not permitted on Site.

The following procedures will be implemented on site to prevent the attraction of wildlife to work fronts and camps:

- a) work fronts and camps will be kept clean of food scraps and garbage;
- b) Animal proof disposal containers will be used and will be regularly emptied and transferred to an approved waste disposal site (as per WMP); and
- c) No personal pets, domestic or wild, will be allowed on the Site.

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In the case of wildlife encounters the following will be implemented:

- i. No attempt will be made by any worker at the project site to chase, catch, divert, follow or otherwise harass wildlife by vehicle or on foot;
- ii. Equipment and vehicles will yield the right-of-way to wildlife;
- iii. Any wildlife sightings or encounters will be reported to the OSEM;
- iv. The OSEM will be responsible for all actions in response to nuisance animals, including the use of firearms by bear monitors in the project area. A research permit for relocation of nuisance animals may be required from the Wildlife Division, Department of Environment and Conservation, Government of Newfoundland and Labrador.
- v. If the nest of any bird is encountered during construction and operation activities, work around the nest will be stalled until the Wildlife Division has assessed the situation and appropriate mitigation is applied;
- vi. Any incidents that result in the displacement or killing of wildlife will be reported to the OSEM complete with details on the incident and the names (and contact information) of the persons involved; and
- vii. In the event of a bear encounter project personnel will follow the procedures as outlined in the Bear Awareness Training.

13.3 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Historic resources that are disturbed, destroyed or improperly removed from a site represents a potential cultural loss of information and history that could otherwise be handled and interpreted in an efficient and appropriate manner.

Under the *NL Historic Resources Act* RSNL 1990, c.H-4, all archaeological sites and artifacts are the property of the Crown, and will not be disturbed. The Project will take all reasonable precautions to prevent Employees or other persons from removing or damaging any such objects or sites. Persons in contravention may be held liable for prosecution under Section 35.1 and 35.2 of the *Historic Resources Act* RSNL1990, c. H-4. Personnel working in the vicinity will be advised of the find, including the OSEM.

In case of a suspected discovery of an archaeological site or artifact the following procedures will apply:

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- a) Archaeological materials encountered will be reported initially to the OSEM. The OSEM will then immediately report this to the Site Environmental Manager, the Environmental Engineering Coordinator, and Construction Manager. The Provincial Archaeologist at PAO (Martha Drake, Provincial Archaeologist, 709-729-2462) will be informed of the discovery by Environmental Engineering Coordinator with the following information:
- i. Nature of activity;
 - ii. Nature of the material discovered; and
 - iii. Precise location of the find.
- b) The site area will be flagged for protection and avoidance;
- c) All work will cease within 50 m of the discovery until the ERC team advises the PAO of the discovery. The PAO, in consultation with the ERC team, will provide direction regarding the discovery and may authorize a resumption of the work. If required, a full archaeological assessment will be conducted of the site and immediate area; and
- d) The PAO will assess the significance of the discovery and determine if mitigation is required. The ERC team in consultation with the PAO will develop mitigation measures which are approved by the PAO.

13.4 FOREST FIRES

Construction for the development of the Lower Churchill may have activities that increase the risk of fire in the natural environment. Fires on Site could spread to the surrounding area and forest. The main concerns include human health, damage to vegetation, wildlife and air and water quality. In case of a forest fire Project Personnel will refer to the Emergency Response Plan for detailed contingency measures.

The operator will take all precautions necessary to prevent fire hazards when working at the site. These include but are not limited to:

- a) An Operating Permit will be required during the forest fire season;
- b) All flammable materials will be stored and handled properly; and
- c) All flammable waste will be appropriately disposed of on a regular basis;

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In the case of a fire being encountered the following will be implemented:

- a) The Construction Manager will appoint a supervisory staff member as “On Scene Commander” for fighting any forest fires for each work front;
- b) Immediate steps will be taken by the operator and Contractors on site to contain or extinguish the fire. Applicable personnel will be trained in firefighting and the use of such equipment. Equipment will be provided in proper operating condition to suit the labour force and will comply with manufacturer’s standards;
- c) Fires will be immediately reported to the Construction Manager who will in turn report it to the applicable authorities (1-866-709-3473). The following information is required when reporting a fire:
 - i) name and telephone number;
 - ii) time of detection of fire;
 - iii) size of fire, location of fire; and
 - iv) weather conditions (rain, sun, wind direction and speed, temperature).
- d) Sufficient firefighting equipment to suit the labour force and fire hazards will be provided by the Contractor. Equipment will be provided as specified in the forest fire regulations and Operating Permit and will include shovels, back tanks and axes. Such equipment will comply with and be maintained to manufacturer standards. Project personnel will be trained in the use of such equipment;
- e) During the fire season, ATV’s will be equipped with a fire extinguisher or suitable equivalent containing a minimum of 227 grams of ABC dry chemical. Other machinery and equipment will be equipped with a fire extinguisher containing a minimum of 4.5 kilograms of ABC dry chemical;
- f) The forest fire suppression equipment referred to in the Operating Permit will be provided at the operating site in the following table:

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Table 13-5 - Forest Fire Suppression Equipment Requirements

Employees	Back Tank Pumps	Axes or Pulaski Tools	Grubbers or Shovels
5 or less	1	1	1
6-10	2	2	2
11-15	3	3	3
16-20	4	4	4
>20	Add 1 back tank pump, 1 axe or Pulaski tool and 2 grubbers or shovels to the above figure for each group of 5 additional employees or fraction of that number of employees. The back tank pump must have a capacity of 20 litres and be of a type approved by the forest service.		

- g) The Contractor is required to ensure all fire pumps are approved by Forest Services, and all approvals will be documented;
- h) When the number of Employees reaches 20 or over, one fully functional forest fire pump, such as the Wajax Mk3, will be available at the work front. Pump accessories will include: a gated “Y” valve, hose strangler and two nozzles for each unit, additionally, 610 meters of forest fire hose will be available for each unit. If there are greater than forty (40) Employees, two (2) of these systems are required;
- i) The forestry official issuing the Operating Permit may specify deviations from the equipment requirements (should local operating conditions warrant deviations);
- j) The actual location of the forest fire suppression equipment in relation to the operating site may be designated by the forestry official issuing the permit;
- k) A copy of the Operating Permit will be on the operating site and will be shown when requested by a forestry official or during an LCP Environmental Audit;
- l) The Operating Permit may be temporarily suspended by a forestry official if the fire weather index for that locality rises to high or extreme;

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- m) Where a forest fire occurs on forest land in an area where logging or industrial operations are being carried out the person/s carrying out the operations will immediately notify the nearest forest management district office or ranger station and commence fighting the fire with all labour, materials, equipment and facilities at his or her disposal until relieved of this responsibility by a forestry official or the fire is extinguished; and
- n) For additional information regarding forest fire contingency planning, refer to the ERP.

14 CONTACT LIST

LCP General Information:

1-(888)-576-5454

lowerchurchill@nalcorenergy.com

DOEC Water Resources – St. John's:

(709) 729-5713

DOEC Crown Lands - Happy Valley-Goose Bay:

(709) 896-2488

DOEC Wildlife Division:

(709) 637-2029

DFO: Habitat Management – Labrador:

(709) 896-6193

DNR Forestry Division:

(709) 497-8479

DNR Mines Division:

(709) 729-6447

Service NL, GSC - Happy Valley-Goose Bay:

(709) 896-5471

Provincial Archaeology Office:

(709) 729-2462

Environment Canada Environmental Emergency Report Line:

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(709)772-2083 or 1-(800)-563-9089

Town of Happy Valley-Goose Bay:

(709) 896 3321