Environmental Management Manual

New Brunswick

Department of Transportation

Fourth Edition

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ENVIRONMENTAL MANAGEMENT MANUAL
FOR
NEW BRUNSWICK DEPARTMENT OF TRANSPORTATION

APPROVAL OF ENVIRONMENTAL MANAGEMENT MANUAL:

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Abstract

The Environmental Management Manual (EMM) is a comprehensive document outlining the Department of Transportation's general approach to a wide range of activities that are an integral part of the goals and objectives of the Strategic Plan. The Department's approach to environmental protection places a high priority on impact avoidance and covers procedures and methods in Planning, Design, Construction, Operations, Maintenance and Rehabilitation (OMR).

Each area covered within a section contains a brief discussion, followed by General Protection Measures used by the Department.

For major projects, the Planning and Land Management Branch (PALM) works with the key provincial and federal departments and agencies early in the planning process to develop physical and environmental constraint mapping for corridor selection, and obtains further input and information from public information sessions and meetings. PALM also registers major projects with the Department of Environment for environmental review. Additional studies are often required at this stage and the approval of the project usually includes a number of terms and conditions to be complied with during design, construction and operation.

The Design Branch responsibilities include further environmental considerations in establishing the formal horizontal and vertical alignment and environmental protection, and minimizing environmental impacts during field surveying and subsurface investigations.

The Construction and OMR section describes and illustrates the environmental protection measures employed for many activities not limited to clearing, grubbing, excavation, culvert installation, summer and winter OMR, disposal areas, hazardous material handling, bridge maintenance and ferry operations.

The EMM contains specific approaches and protection measures used when dealing with environmentally sensitive areas such as agricultural lands, domestic water supplies, designated watersheds, classified waterbodies, environmentally significant areas, habitat of species at risk, wetlands, estuaries, fish habitat, forest resources, historic resources, and wildlife habitat.

This document is generic in nature and is intended to be updated periodically to reflect changes in procedure and policy, knowledge gained through monitoring efforts, and changes in technology that are beneficial in environmental protection.

Users of this Document

In addition to NBDOT users, NBDOT also hires consultants, surveyors, equipment rental firms, and other types of firms, depending on the specific task to be completed. It is expected that such firms doing work for the Department shall conform to this EMM where applicable.

NBDOT's highways are constructed under contracts awarded through a public tendering process. The contract documents contain a description of the work, the standards under which it is to be carried out, and the results expected to be obtained. The Specifications contain environmental protection measures as outlined in this EMM. Any new or site-specific protection measures, as determined by regulatory agencies or through the EIA screening or CEAA process, are detailed in the Plans and Particular Specifications of the contract.

Anyone who is employed by NBDOT is required to have their own copy(ies) of this EMM and must be familiar with the content s found therein.

This Environmental Management Manual (EMM) replaces the Environmental Protection Plan (EPP) dated May 1998 and the Environmental Field Guide (EFG) dated August 1998.

Responsibilities

NBDOT, Contractors, Consultants, Developers and Operators are responsible for ensuring the protection measures outlined in this document are adhered to.

Permits and Exemptions

Prior to commencing any work, NBDOT staff, Contractors and/or Consultants need to be cognizant of their surroundings. There are a number of ESA's (Environmental Sensitive Areas) that need to be investigated and identified. Section 5.23 of this EMM discusses many of the ESA’s that may be encountered in the field during construction and/or OMR activities.

Work must be carried out so as to be in compliance with the various Acts and Regulations of the Province of New Brunswick and/or Government of Canada which concern the protection of the environment, and any approvals or permits issued to NBDOT. Although most permits that may be required for activities are outlined under Section 4.0 and Section 5.0 of this EMM, working in or near any ESA may require additional permits or exemptions.

Glossary

Abbreviations

cm	centimetre
dBA	decibels on the A-weighted scale (measure of noise)
ha	hectare
km	kilometre
kmh	kilometres per hour
L	litre
Leq	equivalent sound pressure level
m	metre
mg	milligram
mm	millimetre

Acronyms

AC CDC	Atlantic Canada Conservation Data Centre
AHF	Appalachian Hardwood Forest
ARD	Acid Rock Drainage
ASU	Archaeological Services Unit
CANUTEC	Canadian Transport Emergency Centre
CCME	Canadian Council of Ministers of the Environment
CEA Agency	Canadian Environmental Assessment Agency
CEAA	Canadian Environmental Assessment Act
CEPA	Canadian Environmental Protection Act
CSA	Canadian Standards Association

Acronyms

CWS	Canadian Wildlife Service
DWA	Deer Wintering Area
EA	Environmental Assessment
EC	Environment Canada
ECS	Erosion Control Structure
EIA	Environmental Impact Assessment
EMM	Environmental Management Manual
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
ESA	Environmentally Sensitive Area
DFO	Fisheries and Oceans Canada
HADD	Harmful Alteration, Disruption, or Destruction of fish habitat
IP	Induced Polarization
M&T	Maintenance & Traffic
MBCA	Migratory Bird Convention Act
MSDS	Material Safety Data Sheets
NBCAPP	New Brunswick Coastal Areas Protection Policy
NBDAA	New Brunswick Department of Agriculture and Aquaculture
NBDNR	New Brunswick Department of Natural Resources
NBDOT	New Brunswick Department of Transportation
NBENV	New Brunswick Department of Environment
NBDWCS	New Brunswick Department of Wellness, Culture and Sport
NSA	Noise Sensitive Area

Acronyms

NWPA	Navigable Waters Protection Act
OMR	Operation, Maintenance and Rehabilitation
PALM	Planning and Land Management
pH	Potential Hydrogen
RA	Regulatory Agencies
ROW	Right of Way
SARA	Species at Risk Act
SBR	Sulphide Bearing Rock
SSEPP	Site Specific Environmental Protection Plan
TAC	Transportation Association of Canada
TDG	Transportation of Dangerous Goods
TRC	Technical Review Committee
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency
WAWA	Watercourse and Wetland Alteration (Regulation)
WAWAP	Watercourse and Wetland Alteration Permit
WHMIS	Workplace Hazardous Materials Information System
WfPADO	Wellfield Protected Area Designation Order
WsPADO	Watershed Protected Area Designation Order

Definitions

abutment:	A wall supporting the end of a bridge.
access road:	A road that provides a route for landowners to get to land where the previous route to the land has been eliminated as a result of the highway.
acid-generating material:	Rock materials containing sulphide minerals which, when exposed to air and water, may generate acidic drainage.
alignment:	Refers to the centerline of the highway.
anthropogenic:	Of, relating to, or resulting from the influence of human beings on nature.
apron:	A floor material or lining that protects a surface from erosion.
baffles:	Vanes, weirs, guides, grids, grating, or similar devices places in a conduit to deflect, concentrate, or regulate flow.
bedrock:	The more or less solid rock in place either at or beneath the surface of the earth.
bilge water:	Water in the bilge of a ship (*e.g.* ferry) that can become contaminated with fuel and oil.
borrow:	A source of soil, granular or rock to be used in construction, usually imported from offsite.
bridge:	Any structure in excess of 3 metres in span length carrying vehicular and/or pedestrian traffic.

Definitions

bunker:	A bin or compartment for storage; especially one on shipboard (*e.g.,* ferry) for the ship's fuel.
bunkering:	Filling a ship’s bunker with fuel oils.
channel:	A natural stream, perennial or intermittent, that conveys water; a ditch or other waterway, regardless of shape or size, excavated or constructed for the purpose of conveying water.
cofferdam:	An enclosure built in a body of water so that the foundations of a bridge, or other structures, may be built or repaired out of the influence of the surrounding water.
concentration:	The relative amount of a substance combined or mixed with other substances.
corridor:	Refers to the highway route in general, but does not specifically mean the actual area to be affected by construction.
culvert:	A culvert is a conduit used to enclose a body of water. It is generally used to allow water to pass underneath a road, railway, driveway or embankment.
deposition:	Material which settles or is dropped due to slower movement of a transporting agent such as water or air.
disposal site:	A location approved by NBDOT for disposal of non-hazardous construction and OMR waste.
diversion ditch:	A channel constructed to divert stream flow, either temporary or permanent.
downstream:	In the direction of the normal flow of a watercourse.

Definitions

drainage:	The removal of excess surface water or groundwater from land by means of subsurface drains or open ditches.
drainage area (watershed):	All land and water area from which runoff may run to a common (design) point.
dyke:	An impervious bank of earth or sandbags constructed to confine water or another liquid from entering or leaving an area of land, either temporary or permanent.
embankment:	Fill constructed with soil or rock materials, upon which a roadbed is constructed.
erodible:	Susceptible to erosion.
erosion:	The process of soil and rock weathering caused by natural means (*e.g. g*ravity, water, wind, ice).
erosion control:	The use of natural or manufactured materials to prevent/minimize erosion. Some examples of erosion control are; Topsoil, Mulching, Hydroseeding, Jute Mats, Riprap, Sod and Trees and Shrubs.
fauna:	Animals.
filter screen:	A geotextile which hangs or is supported vertically to enclose a portion of a body of water to minimize sediment transport.
fines:	Generally refers to the silt- and clay-size particles in soil.
fish habitat:	Spawning grounds and nursery rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

Definitions

flora:	Plants
flume:	A channel or ditch utilized to drain water from the top of a slope to the bottom.
ford:	A crossing located in a watercourse where the water is shallow enough to be traversed by motorized vehicles, and where the banks and bed of the crossing will not be adversely disturbed.
footprint:	The area to be affected by the activities associated with construction.
gabions:	Galvanized or PVC-coated steel wire-mesh cages filled with rocks, typically joined in rows and tiers for slope retention and streambank protection.
geotextiles:	Man-made fabrics or grids used in applications such as drainage, filtration, separation and soil reinforcement.
grade:	The elevation or slope of the road, channel, or natural ground.
grading:	The act of altering the ground surface to a desired grade or contour by cutting, filling, leveling, and/or smoothing.
groundwater:	Is water located beneath the ground surface in the spaces between particles of rock and soil, or in crevices and cracks in rock.
grubbing:	The removal of roots and stumps after clearing, leaving topsoil to be salvaged.
habitat:	The environment in which the life needs of a plant or animal are supplied.

Definitions

hazardous material:	Any prohibited, restricted, or controlled product.
hydraulic mulch:	Shredded newsprint, wood fibres or straw used in a hydroseeding mix as a groundcover.
hydrophytic (vegetation):	A plant growing in water or in soil too waterlogged for most plants to survive.
hydroseed:	A mixture of various grass seeds, fertilizer, hydraulic mulch and water with a binding agent typically used as an erosion control methodology.
intertidal zone:	Includes the area of marine coastline between the extreme high and low water marks.
jute mat:	A mesh mat made of woven twisted jute yarn used as a ditch liner or on slopes as a temporary means of controlling erosion until the ditch/slope can be stabilized.
marine environment:	Areas under salt water influence include estuaries, coastal marine and nearshore zones, and open ocean regions.
migratory birds:	Birds protected in Canada under the Migratory Birds Convention Act, as listed in the Canadian Wildlife Service Occasional Paper No. 1, 1991 edition.
mitigation:	Actions to avoid or compensate for the environmental effects resulting from the proposed project activity.
mulching:	The application of hay, straw or hydraulic mulch on slopes and other exposed ground as a temporary measure to prevent erosion of the exposed ground and siltation of watercourses and wetlands.
pH:	A numerical measure of acidity and of alkalinity. The neutral point is pH 7.0. All pH values below 7.0 are acid and all above 7.0 are alkaline.

Definitions

plunge pool:	An open structure or excavation at an outfall, conduit, chute, drop, or spillway to reduce the energy of the descending stream of water.
quarry:	A source of rock materials.
right-of-way (ROW):	The land secured and reserved to the public for Highway purposes.
riparian:	The area adjacent to flowing water that contains elements of both aquatic and terrestrial ecosystems.
riprap	A graded mixture of rock placed on earth surfaces for protection of the soil against erosion or sloughing.
rill/rilling (rill erosion)::	A small channel, usually not more than 0.30 m deep, cut into the surface of the soil by runoff.
runoff:	Portion of the precipitation on a drainage area that is discharged from the area in the stream channels. Includes surface runoff, groundwater runoff, or seepage.
sediment:	Fine soil material that is generated by erosion.
sedimentation:	Transportation and deposition of soil particles that become detached through erosion.
sediment control:	The use of natural or manufactured materials to catch the particles of soil before releasing the water into the surrounding environment. Some examples of sediment control are sediment control fence, erosion control structures and sediment ponds.
sediment pit:	An enlargement in a drainage ditch to permit the settling of debris carried in suspension.

Definitions

sediment pond:	An area constructed by excavation or building embankments to trap sediment-laden runoff prior to discharge to a watercourse or wetland.
seepage:	Water escaping through, or emerging from, the ground; usually considered to occur along an extensive line or surface, as contrasted with a spring, where the water emerges from a localized spot.
sheet erosion:	Soil erosion caused by sheet flow (overland flow), which is water flowing in a thin layer over the soil surface, as opposed to concentrated flow.
siltation:	See also sedimentation. Denotes sediment pollution of a watercourse, wetland, or the marine environment.
slope drain:	A conduit extending from the top to the bottom of a cut or fill slope.
solvent:	An organic liquid in which other organic materials (such as grease or oil) will dissolve.
Species at Risk:	All species listed in Schedule 1 of the *Species at Risk Act* as “Extirpated”, “Endangered”, or “Threatened”, or listed by the New Brunswick *Endangered Species Act* as “Endangered” or “Regionally Endangered.”
Species of Conservation Concern:	Species not under the protection of the *Species at Risk Act* and the New Brunswick *Endangered Species Act* (*i.e.,* listed in the *Species at Risk Act* but not as “Extirpated”, “Endangered”, or “Threatened” in Schedule 1; listed as “Species of Special Concern” within Schedule 1 of the *Species at Risk Act*; or ranked as “S1”, “S2”, or “S3” by the Atlantic Canada Conservation Data Centre and also ranked as “At Risk”, “May be at Risk”, or “Sensitive” by NBDNR).
stabilization:	The use of natural or manufactured materials to control erosion. Examples of stabilization are mulching and hydroseeding.
streambank:	The usual boundaries, not the flood boundaries, of a stream channel.

Definitions

streambed:	Bottom of channel carrying streamflow.
stakeholder:	A member of a group or an individual who has a vested interest in the Project.
stripping:	The excavation of organic soils (topsoil) after grubbing; also, the excavation of undesirable or unneeded soil overlying bedrock, aggregates or soils suitable for roadbed construction.
substrate:	Mineral and organic material that forms the bed of a stream.
sulphide-bearing rock:	Rock containing sulphide minerals which when exposed to air and water may generate acid drainage.
surface water:	All water, the surface of which is exposed to the atmosphere.
suspended sediments:	Sediment particles floating or suspended in water.
temporary water barrier:	See dyke. Generally used to separate a watercourse/wetland from the work area.
temporary water control works:	The management of water on a project site including the design, supply, placement and removal of water barriers and diversions.
topography:	The configuration of the earth's surface, including the shape, elevation and position of its natural and man-made features.
toxicity:	The characteristic of being poisonous or harmful to plant or animal life; the relative degree of severity of this characteristic.

Definitions

toxins:	Substances which are poisonous or harmful to plant or animal life.
users	Drivers using the road/highway system.
watercourse:	The full width and length, including the bed, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.
Watercourse and Wetland Alteration Permit:	A permit signed by the Minister of the Environment and issued as per the *Watercourse and Wetland Alteration Regulation* under the *Clean Water Act*.
weir:	Is a small overflow-type dam commonly used to raise the level of a river or stream
wetland:	Land that, either periodically or permanently, has a water table at, near or above the land's surface or that is saturated with water. Wetlands are characterized by poorly drained soil and predominately hydrophytic or water tolerant vegetation.

1.0 Introduction

1.1 Purpose and Objectives

The EMM outlines the methods which NBDOT uses to plan, design, construct, operate, maintain and rehabilitate highway facilities (roadways and structures) to avoid and minimize environmental impacts, in a manner consistent with federal and provincial environmental regulations applicable to New Brunswick.

The NBDOT strategy for environmentally sustainable development involves a pro-active approach to environmental protection as follows;

- Priority is placed on avoiding areas of potential environmental concern and, thereby, avoiding potential for impacts;
- If areas of potential environmental concerns cannot be avoided, appropriate mitigative measures are identified to ensure that there are no significant adverse impacts; and
- Compensation is provided in certain circumstances, if residual impacts are identified for the environment.

The EMM provides:

- Documentation of environmental concerns and appropriate protection measures relevant to an activity;
- Guidelines to personnel regarding the procedures necessary to protect the environment and minimize adverse environmental impacts; and
- A reference document for the implementation of environmental protection measures.

Specifically, the objectives of this EMM are as follows;

- To provide guidelines for environmental protection;
- To facilitate the acquisition of approvals and permits required under various acts and regulations, and to ensure that permit conditions are included as standard construction and operation procedures;
- To explain environmental requirements to NBDOT personnel and other users of the document, and to show how these requirements are to be met;
- To provide regulatory agencies, Contractors, and the public with a description of NBDOT's approach to highway planning, design, construction, and OMR; and
- To ensure that environmental requirements are practical and realistic in light of necessary planning, design, construction and OMR procedures.

It should be noted that the EMM cannot cover, in detail, the complete range of situations which may arise. Site-specific environmental protection plans or measures are also developed as required in consultation with the appropriate provincial and federal departments and/or agencies.

Good judgment and decisions by NBDOT personnel and other users throughout the planning, design, construction, OMR phases are also essential for effective environmental protection. The EMM provides information and guidelines on which to base decisions.

This EMM replaces both the May 1998 Environmental Protection Plan and the August 1998 Environmental Field Guide.

1.2 Organization

The EMM is organized as follows;

Section 1 – Introduction
Section 2 – Environmental Approval Process
Section 3 – Planning
Section 4 – Design
Section 5 – Construction & OMR
Section 6 – References
Appendices

1.3 Relationship to Other Environmental Commitments and Documents

This EMM provides general environmental protection measures that are to be used on all NBDOT projects. Additional protection measures are:

- Environmental Protection Standards of the transportation industry;
- Federal and Provincial acts, regulations, guidelines, policies and permits;
- Professional experience of NBDOT staff;
- NBDOT Bridge Maintenance Manual;
- NBDOT Highway Maintenance Management Manual;
- NBDOT Salt Management Plan - Draft;
- Project-specific Environmental Management Plans (if applicable);
- Site Specific Environmental Protection Plans (if applicable), and
- Other internal NBDOT Documents.

2.0 Environmental Legislations, Policies, Procedures and Guidelines

The environmental approvals process begins at the earliest stage of a project, and continues throughout the planning, design, construction, operation, maintenance and rehabilitation (OMR) of the project. To successfully navigate the environmental approvals process in an efficient manner while ensuring a high level of environmental protection, it is necessary to have a sound understanding of the environmental legislation and policies that guide the process.

At NBDOT, both the Planning and Land Management Branch (PALM) and the Design Branch are integrally involved with the environmental assessment portion of the environmental approval process, and they often develop environmental protection measures in consultation with the Construction and Maintenance & Traffic (M&T) Branches. The PALM, Design, Construction and M&T Branches are all involved in the approval process.

The following section outlines the component of federal and provincial environmental legislation, policies, procedures and guidelines which apply to the construction, design and OMR of roadways and structures. The section provides an indication of which activities affecting the environment may be regulated.

Environmental requirements such as mitigation measures, monitoring, etc are identified during the environmental impact assessment process, which is conducted as per the *NB Clean Environmental Act* and/or the *Canadian Environmental Assessment Act* during the planning and the design phase of the projects. The environmental requirements are then implemented during the construction and OMR phase.

2.1 Environmental Legislation and Policies

2.1.1 *Federal Acts and Regulations*

Environmental management and protection in New Brunswick is primarily the responsibility of the provincial government, however federal legislation applies when a federal authority has a specified decision-making responsibility in relation to a project. The “triggers” for an environmental assessment are when a federal authority:

- Proposes a project;
- Provides financial assistance to enable a project to be carried out;
- Sells, leases, or otherwise transfers control or administration of federal land to enable a project to be carried out;
- Provides a license, permit or an approval that is listed in the *Law List Regulations* that enables a project to be carried out.

Federal funding and permits are the most common triggers for highway construction projects in New Brunswick.

The applicable federal acts and regulations are summarized in Table 2.1.

Table 2.1 – Federal Acts, Regulations, Policies and Guidelines

Federal Acts, Regulations, Policies and Guidelines		Administered By
Canadian Environmental Assessment Act		Canadian Environmental Assessment Agency
Website	http://laws.justice.gc.ca/en/C-15.2/	
Canadian Environmental Protection Act		Environment Canada
Website	http://www.ec.gc.ca/CEPARegistry/the_act/	
Canadian Wildlife Act		Environment Canada
Website	http://laws.justice.gc.ca/en/W-9/	
Code of Practice for the Environmental Management of Road Salts		Environment Canada
Website	http://www.ec.gc.ca/nopp/roadsalt/cop/en/rs_main.htm	
Federal Policy on Wetlands Conservation		Environment Canada
Website	http://www.qc.ec.gc.ca/faune/atlasterreshumides/html/programmes_politique_e.html	
Fisheries Act		DFO/Environment Canada
Website	http://laws.justice.gc.ca/en/F-14/	
Indian Act		Indian Affairs and Northern Development
Website	http://laws.justice.gc.ca/en/I-5/	
Migratory Birds Convention Act		Environment Canada
Website	http://laws.justice.gc.ca/en/M-7.01/	
Navigable Waters Protection Act		Transport Canada
Website	http://laws.justice.gc.ca/en/N-22/	
Species At Risk Act		DFO/Env Canada/Parks Canada
Website	http://www.sararegistry.gc.ca/the_act/default_e.cfm	

Canadian Environmental Assessment Act

CEAA is administered by the Canadian Environmental Assessment Agency (CEA Agency). *CEAA* was developed to balance environmental considerations with economic and social considerations in project decision-making. The key objectives of *CEAA* are:

- To minimize or avoid environmental effects before they occur;
- To incorporate environmental factors into decision making;
- To provide an opportunity for public participation; and
- To promote sustainable development.

Canadian Environmental Protection Act

The *Canadian Environmental Protection Act* (*CEPA*) is administered by Environment Canada and Health Canada, and is an important part of Canada's federal environmental legislation. *CEPA* is aimed at preventing pollution and protecting the environment and human health and at promoting sustainable development. *CEPA* includes regulations that control the release of toxic emissions and effluents into the environment (including petroleum products and road salt); and the transportation, storage, use and disposal of toxic substances.

CEPA also includes the *Disposal at Sea Regulation* which is administered by Environment Canada.

Canadian Wildlife Act

The *Canada Wildlife Act* provides the federal Minister of the Environment with the authority to acquire lands for wildlife research, conservation and interpretation and to take any action deemed necessary to protect any species of wildlife in danger of extinction. The act applies to all federal lands, any waters on or flowing through the lands, the natural resources on the land, and the internal waters of Canada, and includes provisions for the protection of endangered species. Lands protected by the *Canada Wildlife Act* have *Wildlife Area Regulations* (special protective prohibitions) that may limit or preclude road development. These lands should be avoided where possible.

Code of Practice for the Environmental Management of Road Salts

In 2004, Environment Canada released the Code of Practice for the Environmental Management of Road Salts (EC 2004, the "Code of Practice"). The environmental effects of increased chloride concentrations to the natural environment were a large part of the reason for the development of the Code of Practice. Recognizing that a total ban on road salt would compromise human safety, the focus of road salt risk management is on implementation measures that optimize winter road OMR practices, while minimizing the use of road salt, particularly near "Vulnerable Areas" (areas of a receiving environment that may be particularly sensitive to road salts). Environment Canada determined that the development and refinement of salt management plans is the best mitigation against potential environmental effects from road salt use.

NBDOT has prepared a Draft Salt Management Plan that includes a commitment to optimizing road salt use in New Brunswick through improved operational efficiency, newer technology, and the implementation of best management practices.

Federal Policy on Wetlands Conservation

The Federal Policy on Wetland Conservation (Environment Canada 1991) does not constitute specific legislation, but sets forth goals, principles, and strategies which are integrated into the existing federal mandates. This policy is administered by the Canadian Wildlife Service, which is part of Environment Canada. The objective of this policy is to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future". This objective is achieved through more specific goals such as the use of wetlands in a

manner that enhances prospects for their productive and sustainable use by future generations, and no net loss of wetland functions on all federal lands, on all waters, or on any other lands where an environmental assessment under *CEAA* is required. In practice, all projects requiring a provincial EIA registration or a provincial WAWA permit for work in or near wetlands should also be in compliance with the Federal Policy on Wetland Conservation.

"Wetland function" is defined per the Federal Policy on Wetland Conservation (Environment Canada 1991) as:

> "…the natural processes and derivation of benefits and values associated with wetland ecosystems, including economic production (*e.g.,* peat, agricultural crops, wild rice, peatland forest production), fish and wildlife habitat, organic carbon storage, water supply and purification (groundwater recharge, flood control, maintenance of flow regimes, shoreline erosion buffering), and soil and water conservation, as well as tourism, heritage, recreational, educational, scientific, and aesthetic opportunities".

Fisheries Act

Although the *Fisheries Act* is administered primarily by DFO, Environment Canada administers Section 36 of the *Fisheries Act,* which deals with deleterious substances.

The *Fisheries Act* prohibits the deposit (*e.g.*, direct discharging, dumping, leaking, spilling) of deleterious substances into waters that contain fish or other marine animals. This includes lakes, rivers, oceans, and storm drains that empty into watercourses. The deleterious substances most common to road development projects are petroleum products (*e.g.*, gasoline, diesel, and hydraulic oil) and suspended sediments. The *Fisheries Act* also prohibits the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, the destruction of fish by any means other than fishing (including incidental mortality from blasting), and the impediment of fish migration.

There are six sections of the *Fisheries Act* where the need for authorization is a *CEAA* Law List trigger, of which, only *Section 35(2)* commonly applies to road developments. Under *Section 35(2)* of the *Fisheries Act*, no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat without authorization from the Minister of DFO. In practice in New Brunswick, authorization under *Section 35(2)* (also referred to as a *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat or "HADD Authorization"), is typically required for all culvert and structure installations on fish bearing watercourses. Fish Habitat compensation is a standard condition of a *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat. The amount and type of required compensation is generally decided on a per watercourse basis.

Indian Act

The *Indian Act* is administered by Indian and Northern Affairs Canada. This Act is in place to protect the land base set aside for Aboriginal peoples, and prohibits trespassing, and the removal of resources including plant-life and geological materials, by a non-Aboriginal person, from any reserve lands without permission.

There are three sections of the *Indian Act* where the need for a permit/authorization triggers an environmental assessment under *CEAA*, of which, only *Section 28(2)* commonly applies to road developments. *Section 28(2*) allows for the authorization of a non-Aboriginal person to occupy or otherwise use reserve land. Therefore, a *CEAA* environmental assessment is required for any work within reserve lands.

Migratory Birds Convention Act

The *Migratory Birds Convention Act* (*MBCA*) is an international legislation that provides migratory birds in Canada and the United States with protection from indiscriminate harvesting and destruction. The *MBCA* is administered by Environment Canada (in Canada) and prohibits the disturbance, destruction, taking or possession of a migratory bird, migratory bird nest, egg, or nest shelter. In addition, the Act stipulates that no person shall deposit or permit to be deposited, oil, oil wastes or any other substance harmful to migratory birds in any water or other areas (such as wetlands) frequented by such birds. There are currently no obtainable authorizations or permits for the *MBCA* that apply to road development projects. The *MBCA* is also linked to *SARA* through the protection of critical habitat as defined in *SARA*.

The *Migratory Bird Sanctuary Regulations* identifies sanctuaries established under the MBCA.

Migratory Bird Sanctuary Regulations

The Migratory Bird Sanctuary Regulation under the Migratory Birds Convention Act is administered by Environment Canada and identifies established sanctuaries throughout New Brunswick and Canada.

The Migratory Bird Sanctuary Regulation prohibits the following within a migratory bird sanctuary:

- Hunting of migratory birds;
- Disturbing, destroying or taking the nests of migratory birds;
- Having in possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird;
- Possession of any firearm or any hunting appliance; or
- Allowing a dog or cat to run at large.

In addition, there are specific activities that are prohibited during certain times of the year at various bird sanctuaries.

The Minister may issue a permit authorizing any person to have firearms in their possession and to shoot and have in their possession migratory birds in such portion of a migratory bird sanctuary.

Navigable Waters Protection Act

The *Navigable Waters Protection Act* (*NWPA*) is administered by Transport Canada. Physical works on, in, over, under, through, or across navigable waters in Canada are forbidden without the approval of Transport Canada under the *NWPA*. Works include bridge, culvert, and tunnel

construction, the dumping of fill materials, the placement of overhead wires, or the construction of any other structures which have the potential to interfere with navigation. Likewise, no substance may be deposited in a navigation channel such that navigability is interfered with.

There are four sections of the *NWPA* where the need for a permit/authorization may trigger an environmental assessment under *CEAA*, of which, only *Section 5(1)(a)* commonly applies to road developments. Under *Section 5(1)(a)*, no work shall be built or placed in, over, under, through or across any navigable water unless the work and the site and plans thereof have been approved by Transport Canada. To initiate this process, a *NWPA* application must be submitted to Transport Canada. The application must include design drawings and clearly labeled water elevations. For new construction, a "formal approval" process may be required. The formal approval process is followed when the work has the potential to substantially interfere with navigation (as determined by Navigable Waters Protection Branch officials).

Species At Risk Act

The *Species at Risk Act* (*SARA*) provides a framework for the protection and the recovery of species in Canada, where protected species include: mammals, birds, amphibians, reptiles, fish, mollusks, lepdiopterans (moths and butterflies), and plants. *SARA* provides legal protection to species, subspecies and distinct populations of Canadian species which are listed in Schedule 1 of *SARA* on federal lands, on all waters, or on any other lands where an environmental assessment under *CEAA* is required. *SARA* includes many prohibitions, and the following three are encountered with road development projects:

- No person shall kill, harm, harass, capture or take an individual of a species listed as extirpated, endangered, or threatened;
- No person shall damage or destroy the residence of one or more individuals of a species listed as extirpated, endangered, or threatened; and
- No person shall destroy any part of the critical habitat of any listed endangered or threatened species, or an extirpated species where there is a recovery plan in place to reintroduce the species.

Under *SARA*, the preferred mitigation for protected species, their residences, and their critical habitat is avoidance. If a project is likely to affect an individual, residence, or critical habitat of any *SARA* listed species, then the Responsible Authority (below) must send a notification to the following agencies, as applicable:

- Fisheries and Oceans Canada (responsible for aquatic species);
- Environment Canada (responsible for migratory birds protected by the *Migratory Birds Convention Act* and for all other species); and
- Parks Canada (responsible for any species on lands administered by Parks Canada).

In some cases, mitigation or compensation may be acceptable when avoidance is not possible. *SARA* does include a provision for obtaining a permit to engage in an activity affecting a protected species, its residence, or its critical habitat.

2.1.2 Provincial Acts and Regulations

The majority of provincial environmental legislation in New Brunswick is administered by the New Brunswick Department of Environment (NBENV). Other regulating bodies include the New Brunswick Department of Natural Resources (NBDNR), New Brunswick Department of Energy (DE), Department of Health (DH) and the New Brunswick Department of Wellness, Culture and Sport (NBDWCS). In addition, some approval processes may involve more than one regulating body. An example of this is the *Watercourse and Wetland Alteration Regulation* process where permit applications are often reviewed by NBENV, NBDNR and Fisheries and Oceans Canada (DFO).

Within each of the provincial acts are regulations, some of which require permits or authorizations prior to conducting the physical works associated with road development. The applicable provincial acts, regulations, policies and guidelines are summarized in Table 2.2.

Table 2.2 – New Brunswick Provincial Acts, Regulations, Policies and Guidelines

Provincial Acts, Regulations, Policies and Guidelines		**Administered By**
Draft Proposed Wetland Mitigation Guidelines		DNR
Website		
Cemetery Companies Act		Health
Website	http://www.gnb.ca/0062/acts/acts/c-01.htm	
Clean Air Act		Environment
Website	http://www.gnb.ca/0062/acts/acts/c-05-2.htm	
Clean Environment Act		Environment
Website	http://www.gnb.ca/0062/acts/acts/c-06.htm	
Air Quality Regulation		Environment
Website	http://www.gnb.ca/0062/regs/97-133.htm	
Water Quality Regulation		Environment
Website	http://www.gnb.ca/0062/regs/82-126.htm	
Petroleum Product Storage & Handling Regulation		Environment
Website	http://www.gnb.ca/0062/regs/87-97.htm	

Provincial Acts, Regulations, Policies and Guidelines		Administered By
Clean Water Act		Environment
Website	http://www.gnb.ca/0062/acts/acts/c-06-1.htm	
Wellfield Protected Area Designation Order		Environment
Website	http://www.gnb.ca/0062/PDF-regs/2000-47.pdf	
Water Well Regulation		Environment
Website	http://www.gnb.ca/0062/PDF-regs/90-79.pdf	
Guidelines for decommissioning (abandonment) of Water Wells		Environment
Website	http://www.gnb.ca/0009/0002-e.pdf	
Water Classification Regulation		Environment
Website	http://www.gnb.ca/0062/PDF-regs/2002-13.pdf	
Watercourse and Wetland Alteration Regulation		ENV/DFO/DNR
Website	http://www.gnb.ca/0062/regs/90-80.htm	
Watershed Protected Area Designation Order		Environment
Website	http://www.gnb.ca/0062/regs/2001-83.htm	
Costal Areas Protection Policy		Environment
Website	http://www.gnb.ca/0009/0371/0002/Coastal-E.pdf	
Environmental Impact Assessment Regulation		Environment
Website	http://www.gnb.ca/0062/regs/87-83.htm	
Fish and Wildlife Act		DNR
Website	http://www.gnb.ca/0062/acts/acts/f-14-1.htm	
Fur Harvester Regulation		DNR
Website	http://www.gnb.ca/0062/PDF-regs/84-124.pdf	
Nuisance Wildlife Control Regulation		DNR
Website	http://www.gnb.ca/0062/PDF-regs/97-141.pdf	
Endangered Species Act		DNR
Website	http://www.gnb.ca/0062/acts/acts/e-09-101.htm	
New Brunswick Forest Fires Act		DNR
Website	http://www.gnb.ca/0062/acts/acts/f-20.htm	
Historic Sites Protection Act		Wellness, Culture & Sport
Website	http://www.gnb.ca/0062/acts/acts/h-06.htm	
Parks Act		Tourism & Parks/DNR
Website	http://www.gnb.ca/0062/PDF-acts/p-02-1.pdf	

Provincial Acts, Regulations, Policies and Guidelines		Administered By
Pipeline Act		Energy
Website	http://www.gnb.ca/0062/acts/acts/p-08-5.htm	
Protected Natural Areas Act		DNR
Website	http://www.gnb.ca/0062/acts/acts/p-19-01.htm	
Quarriable Substance Act		DNR
Website	http://www.gnb.ca/0062/PDF-acts/q-01-1.pdf	
Topsoil Preservation Act		Environment
Website	http://www.gnb.ca/0062/PDF-acts/t-07-1.pdf	
Wetlands Conservation Policy		DNR/ Environment
Website	http://www.gnb.ca/0078/publications/wetlands.pdf	

Draft Proposed Wetland Mitigation Guidelines

The draft Proposed Wetland Mitigation Guidelines for New Brunswick (NBDNR 2003), are intended "to generate discussion concerning wetland mitigation principles in New Brunswick to support the no net loss of wetland function objective identified in the New Brunswick Wetlands Conservation Policy." These guidelines have not been approved by the Province, but are currently being used in part by regulators for developing compensation plans. The guidelines recommend that the general mitigation strategy for protecting wetlands is avoidance, followed by minimization of environmental impacts, and lastly by physical compensation. The guidelines provide general ratios for different types of compensation. The preferred compensation is like-for-like habitat, with a premium placed on restoration of existing wetland. Currently, financial compensation is not being accepted.

Cemetery Companies Act

The *Cemetery Companies Act* is administered by the New Brunswick Department of Health. Under this act, a cemetery (public or private) cannot be altered without approval of the Minister of Health. No person is permitted to disturb a grave or remove a monument or other improvement to a burial plot. The Act includes many prohibitions, including the following:

- Harming trees, shrubs or plants;
- Committing a nuisance;
- Harming a tomb, monument, gravestone or other cemetery structure; or
- Harming a fence or railing erected for the protection of the cemetery.

Clean Air Act

The Clean Air Act along with its regulations is the primary statute protecting the air quality in New Brunswick. The Act oversees emissions potentially affecting air quality and states that without the required authority or permission, no person shall cause or permit an air emission that causes damage to property, substantially interferes with the normal conduct of business, or causes substantial loss of enjoyment of the normal use of any property.

Types of activities potentially regulated by this Act include activities causing smoke or dust.

Clean Environment Act

The Clean Environment Act is the principal statute protecting the environment quality in New Brunswick. The Act states that no person may directly or indirectly discharge, emit, leave, deposit, or throw any contaminant or waste into or upon the environment where such action may:

- Affect the natural quality or constitution of the environment (physical, chemical, or biological);
- Endanger the health, safety, or comfort of a person;
- Endanger the health of animal life;
- Cause damage to property;
- Cause damage to plant life; or
- Interfere with the visibility, the normal conduct of business, or the normal enjoyment of life or property.

Several Regulations made under this Act may be applicable to highway construction and OMR activities, including the following;

- Petroleum Product Storage and Handling Regulation
- Water Quality Regulation

Air Quality Regulation

The *Air Quality Regulation* under the New Brunswick *Clean Air Act* is administered by NBENV and states that:

> "no person shall, without permission, cause or permit an air emission that causes substantial loss of enjoyment of the normal use of any property, substantially interferes with the normal conduct of business, or causes damage to property."

Activities that are potentially controlled under the *Air Quality Regulation* are the burning of woody debris or slash, and highway construction activities causing air emissions (*e.g.*, exhaust or dust). While NBDOT must be in compliance with the *Air Quality Regulation* throughout construction, an authorization is not typically required for these activities, with the exception of burning. Burning however is currently not recommended by NBDOT.

Water Quality Regulation

The New Brunswick *Water Quality Regulation* under the *Clean Environment Act* is administered by NBENV and protects New Brunswick's water, where water includes: coastal waters; groundwater; surface waters; flowing or standing waters; and ice. Under the *Water Quality Regulation*, it is prohibited to emit, discharge, deposit, leave or throw any contaminant or construct, modify or operate a source of contamination into or near the water without a permit. Potential contaminants associated with road development projects include solids, liquids, heat, sound, vibration, or any combination of these. While NBDOT must be in compliance with the

Water Quality Regulation throughout construction and OMR, an authorization is not typically required for these activities under this Regulation.

Petroleum Product Storage & Handling Regulation

The *Petroleum Product Storage and Handling Regulation* under the New Brunswick *Clean Environment Act* is administered by NBENV. Regulated activities include the transportation and handling of petroleum products, use of dispensing facilities, spill prevention and remediation, and the design and construction of petroleum storage tanks. Storage tanks over 2,000 L, total capacity, must be registered and licensed under this Regulation.

Clean Water Act

The Clean Water Act applies to any activity affecting surface waters and groundwaters, including any activity within 30 m of a watercourse or wetland. Under this Act, water includes flowing or standing water, above and below the earth surface, and ice on any body of water.

The Act states that a WAWA permit must be obtained prior to undertaking or proceeding with any project that alters or diverts all or part of a watercourse or wetland. Types of activities potentially regulated by this statute include any structures constructed in, over, or around watercourses and wetlands, and any activity which may result in the deposition of a substance either directly or indirectly into surface water or groundwater.

Wellfield Protected Area Designation Order

More than 150,000 people in New Brunswick get their drinking water from municipal wellfields that are protected by the New Brunswick *Wellfield Protected Area Designation Order* which is a Regulation under the *Clean Water Act*. The *Wellfield Protected Area Designation Order* is administered by the Sustainable Development, Planning & Impact Evaluation Branch of NBENV. Wellfields can be contaminated by chemicals or bacteria seeping into the groundwater. Potential contaminants associated with road construction and operation includes petroleum products, paint, road salt, and fertilizer. Contamination can occur as a result of improper storage, use or disposal, or in the event of an accident. Blasting activities also have the potential to impact wellfield areas.

The *Wellfield Protected Area Designation Order* divides protected wellfields into three zones based on the likelihood and consequence of contamination depending on the distance of the project activity from the wellhead and the nature of the groundwater flow. In this regard, the size and shape of the zones are unique to each wellfield. A map of the zones for each protected wellfield is included within the *Wellfield Protected Area Designation Order* which can be obtained from NBENV.

There are different prohibitions within each zone. Road development is generally allowed within Zone B and Zone C, although certain conditions may apply. Road development in Zone A requires an exemption under the Clean Water Act. The storage (temporary or permanent) of petroleum products and salt are not permitted within these zones. The Wellfield Protection Area Designation Order is enforced through substantial fines, though exemptions to the prohibitions may be obtained under certain conditions.

Water Well Regulation

The Water Well Regulation under the New Brunswick Clean Water Act is administered by NBENV.

Thousands of New Brunswick families, living in smaller towns and rural areas, rely on individual wells for drinking water. The quality of the water aquifers produce can be influenced by naturally occurring and/or man-made substances. It is important to plan the location of the well to reduce the risk of influence from other site features such as roads and septic systems. The New Brunswick "Water Well Regulation" specifies well location set back distances from structures, and potential contaminant sources.

The New Brunswick "Clean Water Act" requires that all new well construction, deepening of existing wells and well abandonment must be carried out by a licensed New Brunswick Water Well Contractor and licensed well driller.

Guidelines for Decommissioning (Abandonment) of Water Wells.

The *Guidelines for Decommissioning (Abandonment) of Water Wells* provides advice on the decommissioning of drilled, dug and/or monitoring wells. Section 27 of the Water Well Regulation states that: “Where a well is not in use and its continued existence might constitute a safety hazard or allow a contaminant to enter the aquifer, the owner of the well shall fill and seal the well using a method approved by the Minister sufficient to prevent the vertical movement of water in the well.”

If an individual or company is being contracted to carry out all operations incidental to the abandonment of water wells, they must be a licensed water well contractor who holds a valid New Brunswick Water Well Contractors Permit.

Water Classification Regulation

The Water Classification Regulation under the New Brunswick *Clean Water Act* is administered by NBENV. The purpose of water classification is to set goals for surface water quality and promote management of water on a watershed basis. The Water Classification Regulation establishes water quality classes, and associated water quality standards, and outlines administrative processes and requirements related to the classification of water. Water classification places the water of lakes and rivers or segments of rivers into categories or classes based on water quality goals. Each class is then managed according to the goal. The goals associated with a specific class are set according to the intended uses of the water, and the water quality and quantity required to protect the intended uses.

The classifications are as follows;

- Outstanding Natural Waters Class – natural water quality and have had little disturbance from human activities.
- AP Class – watersheds which are designated as municipal drinking water supplies under the Watershed Protected Area Designation Order.

- AL Class – all lakes not classified in the Outstanding or AP Classes will automatically be placed into the AL Class. Lakes are known to be very sensitive systems that must be managed differently from rivers and streams.
- A, B and C Classes – Rivers and other watercourses not included in the above classes will be classified into one of three Classes, A, B or C.

Watercourse and Wetland Alteration Regulation

The *New Brunswick Watercourse and Wetland Alteration Regulation* (*WAWA Regulation*) under the *Clean Water Act* is administered by NBENV. The *WAWA Regulation* is designed to protect streams, rivers, wetlands and lakes from alteration resulting from work or ground disturbance near the area. The *Clean Water Act* applies to all freshwater watercourses. Under the *Clean Water Act*, an "alteration" is defined as a temporary or permanent change at, near or to a watercourse or wetland, or to water flow of the watercourse or wetland which includes:

- Repairs, modifications or removal of existing structures in the watercourse or wetland;
- Operation of machinery on the bed of a watercourse/wetland other than an approved fording location;
- Operation of machinery in or on a watercourse/wetland;
- Any deposit or removal of material into or from a watercourse/wetland or within 30 metres of a watercourse/wetland;
- Any disturbance of the ground within 30 metres of a watercourse/wetland except by agricultural activities that occur more than 5 metres from the bank of the watercourse/wetland;
- Any removal or breaching of beaver dams, lodges, etc.;
- Any removal of vegetation from the bed or bank or within 30 metres of a watercourse or wetland; and
- Any removal of vegetation from a watercourse/wetland or within 30 metres of the watercourse/wetland except agricultural activities that occur more than five metres from a watercourse/wetland.

A *WAWA Regulation* permit (often just referred to as a WAWA permit) is required from NBENV before any one of the above activities is conducted. A provisional permit may be issued where the input of DFO and/or NBDNR is not required, as in the case of geotechnical work that adheres to the conditions outlined in the provisional permit. In all other cases, a standard permit is required and will likely contain conditions of approval that limit the means and time in which the project work can be carried out. WAWA permit requires detailed design drawings and specifications.

Where a watercourse meets the technical definition of a watercourse as outlined in the *Clean Water Act*, but is not depicted on the digital map layer of the NBDNR Watercourse Database or represented on the black and white 1:10,000 scale orthophoto maps, such watercourses are exempt from the requirement to obtain a permit under the *WAWA Regulation*. However, NBENV must be notified of all planned work within 30 m of a watercourse, regardless of the size or nature of the watercourse, in order for the exemption to be valid.

The Watercourse and Wetland Alteration Technical Guidelines (NBENV, Latest Approved Version) provide guidance on standard mitigation that must be followed where applicable.

Watershed Protected Area Designation Order

More than 300,000 people in New Brunswick get their drinking water from watersheds protected under the *Watershed Protected Area Designation Order* which is a Regulation under the *Clean Water Act*. The *Watershed Protected Area Designation Order* is administered by the Sustainable Development, Planning & Impact Evaluation Branch of NBENV. Watersheds can be contaminated as a result of improper storage, use or disposal of petroleum products, paint, road salt, and fertilizer, or in the event of an accident. Contaminants can enter a watercourse directly from a point source such as a leaking hydraulic line from construction equipment, or indirectly from road surface runoff. Under this Order, sediment is also considered as a contaminant.

The *Watershed Protected Area Designation Order* divides protected watersheds into the following three zones:

- Zone A – Water Body;
- Zone B – 75 m buffer; and
- Zone C – Remainder of the watershed.

Maps of the zones for all protected watersheds are included within the *Watershed Protected Area Designation Order*. There are different prohibitions within each zone. Road construction is generally allowed within all three zones provided that approval is obtained under the *WAWA Regulation* and that the specifications given in the *Watershed Protected Area Designation Order* are followed. These specifications include off-take ditches, sediment basins, riprap stabilizers, shoulder widths, roadbeds, water bars, borrow pits, ditches and culverts and are designed to minimize erosion and ground disturbance. The *Watershed Protected Area Designation Order* can be obtained from NBENV.

The storage (temporary or permanent) of petroleum products and salt are not permitted within Zones A and B. New petroleum storage tanks may be installed and operated within Zone C provided that the activities are undertaken in compliance with the *Petroleum Product Storage and Handling Regulation* of the *Clean Environment Act*. The *Watershed Protection Area Designation Order* is enforced through substantial fines, though exemptions to the prohibitions may be obtained under certain conditions.

Coastal Areas Protection Policy

The New Brunswick Coastal Areas Protection Policy (NBCAPP) is overseen by the Sustainable Development, Planning & Impact Evaluation Branch of NBENV. NBCAPP was designed with the following key objectives:

- To minimize the threats to humans from storm surge and flooding;
- To minimize the contamination of coastal waters and wetlands;
- To protect inland areas from storm surge;
- To maintain coastal plants and animals; and
- To minimize public expenditures required to repair damage to public properties such as roads and bridges.

NBCAPP divides the coastal areas into the following three zones:

- Zone A – the area of coastal features;
- Zone B – a 30 m buffer immediately landward of Zone A; and
- Zone C – the coastal transition zone.

Specific zones are not provided for the New Brunswick coast. A coastal areas professional that is approved by the Province must be used to determine the zones for a given project or area. A list of coastal area professionals in New Brunswick is maintained by NBENV.

It is noted in the NBCAPP that activities (such as transportation) that require operation in these zones may be exempted under the policy provided that appropriate analysis is undertaken. Appendix A of the NBCAPP provides a list of project types that will require formal environmental review under the NB *EIA Regulation*. Also included in Appendix A of the NBCAPP is a general list of recommended mitigation for projects that must undergo environmental review.

Environmental Impact Assessment Regulation

The New Brunswick *Environmental Impact Assessment Regulation* (NB *EIA Regulation*) is part of the New Brunswick *Clean Environment Act*, and is administered by NBENV. As stated in the document Environmental Impact Assessment in New Brunswick (NBENV 2006a), environmental impact assessment is:

> "A process through which the environmental impacts potentially resulting from a proposed project are identified and assessed early in the planning process. EIA identifies steps that can be taken to avoid negative environmental impacts or reduce them to acceptable levels before they occur. EIA therefore, represents a proactive, preventative approach to environmental management and protection."

Fish And Wildlife Act

The New Brunswick Fish and Wildlife Act is administered by NBDNR. Under Section 34(4) of the Fish and Wildlife Act "…the owner or occupant of private land, or a person who would be entitled to hold a license issued under this Act or the regulations and is designated by an owner or occupant of private land may, in accordance with the regulations, hunt, on any day and at any time, except during the night, or trap, snare, remove or relocate on any day and at any time any wildlife listed in subsection (5) that is found under, on or above that private land, where necessary for the prevention of;

- Damage to private property, or
- Injury to owners of private property or owners or occupants of private land.

Section 34(5) of the Fish and Wildlife Act indentifies a number of wildlife that can be hunted, trapped, snared, removed or relocated and it includes beavers.

Fur Harvester Regulation

Under the *Fur Harvester Regulation* (84-124) of the *Fish and Wildlife Act*, a license is required to trap and remove beaver. The *Wildlife Refuges and Wildlife Management Areas Regulation*

identifies the established wildlife refuges and wildlife management areas in New Brunswick, and the prohibited activities in the areas.

Nuisance Wildlife Control Regulation (97-141)

The Nuisance Wildlife Control Regulation under the New Brunswick Fish and Wildlife Act is administered by DNR. The Regulation states that " no person shall operate a nuisance wildlife control enterprise, or hunt, trap, snare, remove or relocate nuisance wildlife as the employee of a nuisance wildlife control enterprise, unless the person is the holder of an operator's license." It also notes that "the holder of an operator's license shall ensure that every trap and snare set or placed by the holder is checked at least once every twenty-four hours after it is set or placed and shall ensure that any wildlife taken by it is removed from it immediately."

Endangered Species Act

The New Brunswick *Endangered Species Act* is administered by NBDNR for the protection of species, both plant and animal, that are on the endangered species list along with their habitat. The NB *Endangered Species Act* prohibits the following:

- To willfully or knowingly kill, injure, disturb or interfere with a member or any part of a member of an endangered species or regionally endangered species;
- To willfully or knowingly attempt to kill, injure, disturb or interfere with a member or any part of a member of an endangered species or regionally endangered species;
- To willfully or knowingly destroy, disturb or interfere with the nest, nest shelter or den of a member of an endangered species of fauna or regionally endangered species of fauna; and
- To willfully or knowingly attempt to destroy, disturb or interfere with the nest, nest shelter or den of a member of an endangered species of fauna or regionally endangered species of fauna.

There are no permits or authorizations for violation of these prohibitions, and therefore, any protected species and its critical habitat must be considered as a constraint to road development.

New Brunswick Forest Fires Act

The New Brunswick *Forest Fires Act* is administered by NBDNR and applies to all fires that are threatening or burning forested lands located outside city/town municipal boundaries (but not including agricultural lands), with the purpose of protecting these lands from fire.

During forest fire season (summer) a burning permit is required for planned open fires, with the exception of campfires and most small brushfires outside of cities, towns and some villages, in which case the burning permit information line (1-866-458-8080) is called to determine if burning is permitted in a particular county.

While a person is within forest land the following actions are prohibited:

- Smoking while moving locations; and

- Discarding or dropping a burning match, ashes from a cigar/cigarette/pipe or any burning substance.

Under the NB *Forest Fires Act*, a person in charge of a fire, or who accidentally causes a fire, must prevent the fire from spreading, and not leave it unattended.

Historic Sites Protection Act

The *New Brunswick Historic Sites Protection Act* is administered by NBDWCS, with the purpose of protecting heritage and archaeological resources. Under the *Historic Sites Protection Act*, no person shall excavate or alter in any way a protected site or remove or cause to be removed there from, any historical or anthropological object without a permit. Non-protected sites are not covered by the *Historic Sites Protection Act*, and therefore do not require a permit. However, an archaeological and heritage survey is commonly required for road development projects that require authorization under the NB *EIA Regulation*, or *CEAA*. A separate Terms of Reference for the archaeological and heritage evaluation is commonly issued by NBDWCS for medium or large-scale road development projects.

Parks Act

The Parks Act is administered by Tourism & Parks and DNR. The Act regulates the use and protection of provincial parks in New Brunswick. Specifically, it notes that without the permission of the minister, no person in a provincial park shall;

- Cut, damage or remove any plant, shrub, flower or tree,
- Remove any artifact or natural object, make an excavation,
- Alter, damage or destroy any lake, watercourse or water spring, or
- Remove, damage or deface any real or personal property of the Crown.

In addition, no person shall throw or deposit any litter or waste material in a provincial park except into a waste container or a place designated for that purpose.

Pipeline Act

Under the New Brunswick *Pipeline Act*, any person proposing to undertake a ground disturbance must take all precautions reasonably necessary to ascertain whether a pipeline exists within the area where a ground disturbance is planned. It is the responsibility of that person to determine who the owner/operator of the pipeline is and to notify the owner/operator. This Act also contains contingency and emergency response plans.

Protected Natural Areas Act

The New Brunswick *Protected Natural Areas Act* is administered by NBDNR. The purpose of this Act is:

> "To protect the biological diversity of fauna and flora within the Province and the relationship between such fauna and flora and the environment by protecting,

> conserving and managing land … while providing opportunities for public access to those lands or portions of those lands for outdoor recreational activities, educational activities and scientific research that have minimal environmental impact."

The Act identifies prohibited activities in established protected natural areas. Existing protected natural areas would represent a constraint in the planning of a new highway.

Quarriable Substance Act

The Quarriable Substance Act is administered by DNR. A "quarriable substance" includes ordinary stone, building or construction stone, sand, gravel, peat, clay and soil. The Act applies to all Crown Lands and any shore area designated by the Lieutenant-Governor in Council.

Under this Act, no person shall remove or take a quarriable substance unless the person has been issued a quarry permit.

Topsoil Preservation Act

The Topsoil Preservation Act is administered by NBENV. Under the Act, no person shall remove topsoil from a site unless the person is the holder of a permit.

The Minister may issue an order requiring the person;

- To cease removing topsoil from a site or moving topsoil from a parcel or to cease permitting the removal of topsoil from a site or the moving of topsoil from a parcel
  - Permanently,
  - For a specified period, or
  - In the circumstances set out in the order;
- To alter the manner of removal of topsoil from a site; or
- To carry out rehabilitation of the site or the parcel or other remedial action in relation to the site or the parcel from which topsoil is, or has been, removed or moved.

Wetlands Conservation Policy

Wetlands are protected provincially by the New Brunswick Wetlands Conservation Policy. The primary objective of this policy is to prevent any loss of provincially significant wetlands and to achieve no net loss of wetland functions for all other wetlands (*e.g.*, wetlands greater than 1 ha in size but not considered as provincially significant and smaller than 1 ha but contiguous to another water body). Implementation of this policy is the responsibility of NBENV through existing regulations of New Brunswick's *Clean Water Act* and the *Clean Environment Act*.

3.0 Highway Planning

Major highway projects typically go through an extensive planning phase in the Planning and Land Management Branch prior to receiving departmental approval to proceed with detailed design. PALM undertakes the environmental assessment work for these large highway projects.

During the planning phase, environmental constraints and concerns are identified through available data, data collection, consultation with provincial and federal departments and agencies, and public information sessions. These constraints and concerns are then addressed during both planning and design by the following mechanisms in order of priority:

- Avoid any impact;
- Minimize/mitigate the impact;
- Compensate for the impact.

The planning of a new or expanded highway corridor generally occurs in the following order:

- Project identification;
- Constraint identification;
- Project Alternatives, Route selection and pre-design;
- Departmental approval;
- Public consultation;
- Environmental assessment.

3.1 Project Identification

A project is typically identified by NBDOT as a result of needs studies, economic development, government initiatives, public input, etc. Once a project area has been identified, the base property mapping, topographical mapping, available environmental mapping and aerial photography is assembled for the planning corridor.

3.2 Constraint Identification

Once the mapping is assembled, contact may be made with relevant provincial and federal departments and agencies to solicit information and identify environmental constraints. Typical provincial departments and agencies may include Agriculture and Aquaculture, Environment, Fisheries, Local Government, Natural Resources, Tourism and Parks, Wellness, Culture and Sport, and NB Power. Typical federal departments may include Environment Canada, Fisheries and Oceans Canada and Transport Canada.

Additional physical and environmental constraints can then be added to the base mapping to assist in selecting narrower highway corridors and alignments for further analysis.

3.3 Project Alternatives, Route Selection and Pre-design

Various alignments are developed within the project corridor. These alignments are compared based on various constraints prior to selecting a preferred option.

Typically, the route selected minimizes the impact on identified environmental features while balancing the engineering constraints and socio-economic considerations. The goal is to arrive at a recommended highway project to present to the public for further input and feedback.

Some of the features or constraints considered at this stage include:

- Agricultural lands;
- Areas of steep terrain;
- Cemeteries;
- Design speed and highway classification;
- Designated groundwater protection areas (wellfields);
- Designated watersheds;
- Construction costs;
- Environmentally sensitive areas;
- Flood plains including designated flood risk areas;
- Historic/heritage sites;
- Location of other highways, railways or other transportation facilities;
- Recreational trails;
- Residential, institutional, commercial, and industrial development;
- National and provincial parks;
- Sulphide-bearing rock;
- Utilities, power lines, fibre-optic lines, etc.;
- Watercourses
- Classified Waterbodies; and
- Wetlands.

Additional constraints may also be identified during field reconnaissance.

3.4 Departmental Approval

The preferred alignment(s) is reviewed by the Arterial Highway Committee, which is comprised of technical staff from the applicable District and the Planning and Land Management, Design, Construction, and Maintenance and Traffic Branches. The project is presented to the committee for their input and approval. Committee members may recommend revisions to the plans based on their expertise. Any applicable changes are incorporated and a recommendation is developed for consideration by Senior Management.

Presentation is made to Senior Management for their approval. Senior Management may recommend revisions to the plans prior to presentation to the Minister for approval.

3.5 Public Consultation

Once the recommended highway corridor has been thoroughly reviewed within the Department, and has received preliminary approval from the minister, it is prepared for presentation to the general public. As noted in the NB EIA Regulation, NBDOT must demonstrate that the public has had an opportunity for open and transparent involvement. Notification of the session(s) is forwarded to provincial and federal departments and agencies to provide an opportunity for further review and comments. Depending on the location of the project, meetings are sometimes held with municipalities or local service districts to identify local issues and any major concerns prior to public consultation.

The public information session(s) typically follows an "open house" format. Planning and Land Management provide plans for the public to review. Those in attendance are able to discuss any issues and concerns regarding the alignment with NBDOT staff. The public is advised that they have the opportunity to provide written input either during and/or after the session. Secondary meetings may be held with the property owners to present plans for access to severed properties. However, these issues are frequently dealt with during ROW acquisition.

The public often identifies unknown local features or concerns that require modifications or a complete change to the original corridor. If significant changes are made, the plans go back to Senior Management for review, ministerial approval, and through the public consultation process again if required.

3.6 Environmental Assessment

Registration and Environmental Assessment

Both provincial and federal legislation may require a proposed highway project to undergo an environmental assessment. The EA is conducted to identify potential environmental impacts at the earliest stage of planning so that they can be mitigated in an effort to protect and sustain the existing environment. When a project requires both a provincial and federal assessment, both governments do their best to harmonize their respective EA reviews in order to avoid any unnecessary duplication.

New Brunswick Environmental Impact Assessment Regulation

The NB EIA Regulation has two different levels of assessment. The first level requires a Registration of all proposed projects listed in Schedule A of this regulation. As described in A Guide to Environmental Impact Assessment in New Brunswick (Registration Guide; NBENV 2007), a Registration must contain "full and accurate descriptions of the project location, proposed activities, the existing environment, potential impacts, and proposed mitigation…"

NBDOT typically provides a Terms of Reference to qualified consultants to complete an EA and Registration document, which would satisfy the *New Brunswick Clean Environment Act*. Generally field studies are required to determine and/or confirm any areas of environmental concern. To gain access to the project area NBDOT requests permission from NBENV to establish a narrow or wide centerline survey. Once the field studies are completed the consultant prepares the Registration document and submits it to NBENV on NBDOT's behalf.

NBENV reviews the Registration document. During the review process several iterations of the document may be required to address Regulator and public concerns. Once the document has been finalized NBENV prepares a recommendation for the Minister.

The Minister then takes one of the following possible actions:

- Approve the Registration as is;
- Approve the Registration with conditions;
- Determine that a Comprehensive Review is required; or
- Project not approved.

If a Comprehensive Review is required, then NBENV will issue project-specific guidelines for the conduct of the Comprehensive Review. Highway projects have not historically required Comprehensive Review under the NB *EIA Regulation*.

Typically, the overall time required to complete the Registration process from the time the consultant is hired to project approval is from 12 to 30 months.

Canadian Environmental Assessment Act

CEAA places a legal obligation upon federal government departments and specified agencies to ensure that an environmental assessment of qualifying projects is completed before irrevocable decisions to proceed are taken. NBDOT projects "trigger" an environmental assessment under *CEAA* if they satisfy one or more of the following general criteria:

- A federal authority provides funding for a project;
- A federal authority sells, leases, or otherwise transfers control or administration of federal land;
- A federal authority provides a license, permit, or an approval that is listed in the *Law List Regulations* (e.g. *Fisheries Act* Authorization for Works or Undertakings Affecting Fish Habitat, NWPA permit, permit for disposal at sea, etc.);

More specific details on these triggers are included in the *CEAA* Inclusion List (CEA Agency 1999). Triggers that involve an authorization or permit under an Act are referred to as *CEAA* Law List triggers. One or more Responsible Authorities will be appointed to the project pending the trigger for the environmental assessment. A Responsible Authority represents the Minister that administers the triggered *CEAA* Law List act, and is ultimately responsible for ensuring that an environmental assessment of the project is carried out. Responsible Authorities that are common to highway projects include:

- Transport Canada (federal funding or *Navigable Waters Protection Act* authorization);
- Infrastructure Canada (federal funding); and/or
- Fisheries and Oceans Canada (*Fisheries Act* authorization).

Responsible Authorities should be consulted for guidance prior to conducting the environmental assessment. When there is both a provincial and federal EA required, the CEA Agency tends to act as the Federal Environmental Assessment Coordinator (FEAC).

There are four possible levels of environmental assessment under *CEAA*. These are: Screening; Comprehensive Study; Mediation; and Panel Review. In general, all highway projects less than 50 km in length require Screening-level environmental assessments, and all highway projects more than 50 km in length require Comprehensive Study environmental assessments. Mediation and Panel Review environmental assessments are not common for highway projects. A project may be referred to a Mediator or a Panel as a result of heightened public concerns. A Panel Review could also be required (even for a Screening) if it is determined that the project is likely to result in a significant adverse environmental effect that cannot be mitigated. Panel Reviews of this nature are avoided by adjusting the project description, or by developing mitigation, so that a significant adverse environmental effect is not likely to occur. Panel Reviews are very rigorous environmental assessments, involving a considerably greater level of effort and time to conduct than a Screening or a Comprehensive Study. For these reasons, Panel Reviews should be avoided to the extent possible.
A Responsible Authority may issue Conditions of Approval when approving a project to proceed.

If changes to the alignment or project design are required following initial environmental approvals (provincial and/or federal), the modified project must be re-evaluated. If the changes are determined to be outside the considerations contained within the initial assessment, the changes must be assessed, and may require additional information/study requirements.

General Protection Measures

Environmental protection is considered throughout the highway planning phase from the initial data collection and project development to final EA approvals.

a) Constraint mapping is used to identify a wide range of physical features and areas of environmental concern. The selection of a recommended project area is then developed on the premise of avoiding impacts where possible and minimizing the impact when avoidance is not feasible. Protection measures for areas of special environmental consideration are further outlined in Section 5.23 – Working Near Environmental Sensitive Areas.

b) Public information sessions and meetings are carried out to provide a forum for further input and the identification of constraints and issues of a local nature that may otherwise not be identified. The sessions also provide another opportunity for review by interested provincial and federal departments and agencies.

c) Contact is made with provincial and federal departments and agencies early in the planning stage to solicit information and identify environmental constraints and concerns.

d) The federal and provincial EA processes identify project-specific environmental protection measures to be addressed in each phase of the project. Mitigation commitments and monitoring requirements are documented in the Provincial Registration and the CEAA Screening Report. Additional mitigation/monitoring requirements are typically issued as conditions of approval in the Provincial Certificate of Determination and the Federal approvals or authorizations.

e) EA Reports and approval documents are forwarded to the Design, Construction and Maintenance and Traffic branches. Conditions of approval are assigned to the

appropriate branch to ensure they are carried out at the proper stage of development. Protection measures contained in the EA Reports must also be carried out during the appropriate phase of the project. Each branch is responsible for reviewing the Reports and assigning the appropriate responsibilities within their branch to ensure requirements are met.

Responsibilities

NBDOT and/or its agents are responsible for ensuring that the EA processes are carried out according to the applicable federal and provincial requirements.

4.0 Highway Design

Highway design is the process of combining many different components into a final product that is ready for construction. The objective of this process is to create a finished product that is aesthetically pleasing, and provides the intended level of service and safety. In order for this objective to be achieved, the design will incorporate a balance between design standards, guidelines, engineering judgment, environmental concerns and financial restraints.

The basis for design of environmental protection and mitigation measures originates from many different sources, including but not limited to:

- General and site specific commitments made in the Environmental Assessments associated with a project (i.e. Provincial Environmental Registrations; Federal CEAA Screening Reports, Comprehensive Studies, Mediation and Panel Reviews.
- Regulatory Agency requirements and guidelines. (i.e. NBENV *Watercourse and Wetland Alteration Technical Guidelines,* DFO *Guidelines for the Protection of Fish and Fish Habitat – the Placement and Design of Large Culverts, Design Criteria for Fish Passage in Culverts,* etc.)
- Conditions of Approval associated with required permits. (i.e. WAWAP, *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat, NWPA Approval, CEAA Sign Off, Provincial Certificate of Determination etc.)
- Environmental protection measures outlined in the NBDOT Environmental Management Manual.
- Requirements as a result of consultation with the Public, First Nations and other Provincial, Federal and Municipal governments. (i.e. NBENV, NBDNR, DFO, Cities, Towns, Villages, Local Service Districts etc.)

The design process incorporates the consideration of environmental constraints; concerns and considerations identified from the sources outlined above and addresses them using the following mechanisms in the following order of priority:

- Avoid any impact to the environment;
- If the impact cannot be avoided, then minimize and mitigate the impact;
- Compensate for the impact.

Highway design is divided into four functions: Route Selection, Surveying, Geotechnical Investigations, and Design. The Design function includes the design of the roadway, bridges, structures, culverts, interchanges, grade separations climbing lanes, secondary roads, drainage features and ancillary facilities and features. Each of the four functions is described in the following sub-sections.

4.1 Route Selection

Description

A new or improved highway alignment must be located such that the impacts to the surrounding environment are minimal and in balance with a cost effective design.

The route selection process often occurs simultaneously with the environmental assessment process.

Route selection is affected by numerous factors and controlling features such as the environmental constraints identified in the planning and/or pre-design phase, and the design constraints listed in Section 3.3 and below.

Concerns

The concerns associated with the route selection process include potential impacts to:

- Watercourses, wetlands, estuaries, tidal zones and marine shore areas;
- Historic sites;
- Agricultural land;
- Fish and fish habitat;
- Wildlife and wildlife habitat;
- Species at risk and their habitat;
- Adjacent land use and development;
- Groundwater and domestic water supplies;
- Environmentally Sensitive Areas; and
- Parks, trails and recreational areas.

Required Permits

None required.

General Protection Measures

a) Routes shall be located such that, wherever possible, they blend in with the topography.

b) Routes shall be located and alignments shall be selected to avoid and/ or minimize the environmental effects on the areas of concerns outlined above while taking into consideration the overall costs of the highway project.

Checklist/Reminders

See Appendix A: Section 4.1 - NBDOT Route Selection Checklist

Responsibilities

NBDOT and/or its agents are responsible for ensuring that the route is selected according to the protection measures outlined above.

4.2 Surveying

Description

Surveying involves the pickup of detailed field data necessary for the identification of the right-of-way requirements and the design of all highway and structure construction and reconstruction projects.

Where required, this may include cutting the centreline and cross section offsets of sufficient width to provide a clear line of sight for survey equipment and access to the site for geotechnical investigation equipment

Concerns

The concerns and potential impacts associated with surveying include:

- Protection of watercourses and wetlands;
- Disturbance of environmentally sensitive areas; and
- Safe use of equipment and storage of fuels.

Required Permits

- Environmental permits are not typically required for standard survey methods, with the exception of where the surveying involves the removal of trees located within 30 m of a watercourse or wetland.
- If surveying involves the removal of trees located within 30 metres of a watercourse or wetland, a Provincial Watercourse and Wetland Alteration (WAWA) Permit is required. In many cases a Provisional Permit for Centreline Clearing may be adequate. See Appendix “B” for a copy of the Provisional Permit Notification Form for Centreline Clearing as well as a copy of the Provincial Watercourse and Wetland Alteration (WAWA) Permit.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Clearing is to be carried out manually, using hand held equipment only.

c) Equipment used for the surveying process shall be in good working order, free of leaks.

d) No trees or bushes shall be felled across or into a watercourse.

e) Access to both sides of each watercourse/wetland is achieved either by means of an existing nearby crossing or wading across the watercourse/wetland on foot.

f) All bucked-up woody vegetation and slash is to be moved to areas where it cannot be washed into a watercourse/wetland by floodwaters.

g) Fuels required during the surveying process will be handled with care.

h) Fuels required during the surveying process will be stored at least 30 metres away from watercourses and wetlands.

i) Re-fueling of equipment will be carried out at least 30m away from any watercourse or wetland.

j) Survey crews will remove all of their garbage from the survey site.

k) Survey crews will carry out their work in a manner that minimizes ground disturbance and exposure of soils.

l) Survey crews will take the necessary steps to ensure that their activities do not result in noticeable suspended sediment in a watercourse.

m) If the ground within 30 metres of a watercourse or wetland becomes disturbed during the surveying operation the area will be stabilized with evergreen boughs, rock, hay mulch or other suitable material such that erosion is prevented.

n) Vegetation shall be maintained along the banks of a watercourse/wetland in sufficient quantity to provide bank stability and adequate shade to prevent a rise of water temperature, which could adversely affect the fish, their food and habitat.

o) Survey crews will take precautions to prevent of disturbance of migratory birds or destruction of nest trees during active nesting season, particularly with regards to endangered or threatened species, raptors or colony nesters.

Checklist/Reminders

See Appendix A: Section 4.2 - NBDOT Surveying Checklist

Responsibilities

NBDOT is responsible for ensuring the proper permits are in place prior to the removal of trees located within 30 metres of a watercourse/wetland.

NBDOT and/or their agents are responsible for ensuring that all of the protection measured outlined above are adhered to during all surveying operations.

4.3 Geotechnical Investigations

Description

Route location and highway design is largely dependent upon geotechnical factors, such as the soil and bedrock conditions. Therefore, a review of geological information and soils testing is required to determine the suitability of the in situ material for highway construction.

Soil testing for a new highway route is done with tracked excavators and drill rigs. Soils testing adjacent to an existing highway is usually done by an auger drill mounted on a boom truck that does not leave the existing highway surface.

Concerns

The concerns and potential impacts associated with geotechnical investigations include:

- Erosion due to the exposure of soils;
- Sedimentation of watercourses from cuttings and drilling slurries;
- Impacts to fish and aquatic habitats as a result of crossing watercourses with equipment;
- Impacts to sensitive ecosystems; and
- Accidental fuel spills from refueling and maintenance of equipment.

Required Permits

- A WAWA permit is required for the excavation of test pits and drilling of boreholes within 30 m of a watercourse/wetland, or a wetland greater than 1 ha or contiguous to a watercourse.
- In most instances, a Provisional Permit is applicable; however if instream work is required above the head of tide, a standard permit with project specific conditions of approval must be obtained. See Appendix “B” for a copy of the Provisional Permit Notification Form for Geotechnical Investigations as well as a copy of the Provincial Watercourse and Wetland Alteration (WAWA) Permit.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Drilling crews shall carry out what they carry in (i.e. all garbage).

c) All access roads shall remain unobstructed.

d) All test pits shall be backfilled and smooth graded immediately following collection of the required data.

e) All exposed soil resulting from drill holes, test pits and vehicle and drill rig tracks must be stabilized by covering the exposed area with evergreen boughs or hay mulch.

f) Watercourse/wetland crossings are to be avoided whenever possible (i.e. access to both sides of the watercourse/wetland shall be achieved using alternate routes).

g) Where a watercourse/wetland crossing cannot be avoided, the equipment being used (i.e. drill rig, excavator etc.) shall cross the watercourse/wetland at an existing crossing or temporary bridge completely spanning the watercourse/wetland.

h) Temporary crossings shall be installed to ensure that the natural watercourse/wetland flow is not constricted.

i) Swamp mats must be deployed for equipment to proceed at the first evidence of rutting within a wetland or within 30 metres of a watercourse/wetland.

j) Once the operation is complete swamp mats must be removed and the ruts shall be smoothed, overlain with slash and tramped.

k) All ruts cut into the vegetative mat and disturbed stream banks are to be stabilized against erosion with rock, evergreen boughs, hay mulch or other suitable material such that erosion is prevented.

l) No in-channel test pits shall be excavated at any time.

m) All equipment used shall be in good working order.

n) All equipment surfaces must be free of deleterious substances (such as oil, grease etc.) prior to working in the wetted portion of the watercourse/wetland.

o) Any equipment leaking fluids and/or fuels shall be immediately repaired.

p) All equipment shall have a spill kit on board.

q) All equipment shall be re-fuelled in an area at least 30 metres away from a watercourse, wetland or private water well.

r) All equipment shall be serviced in and area at least 30 metres away from a watercourse, wetland or private water well.

Checklist /Reminders

See Appendix A: Section 4.3 – NBDOT Geotechnical Investigation Checklist

Responsibilities

It is the responsibility of NBDOT or their Consultant to obtain the required permits for the geotechnical investigations.

NBDOT and/or its agents are responsible to ensure that all of the protection measures outlined above are adhered to.

4.4 Design

Description

Highway design includes the design of the roadway geometry, bridges, structures, culverts, interchanges, grade separations, climbing lanes, secondary roads, drainage features and ancillary facilities and features.

The environmental impacts, ROW requirements, and the overall costs of a highway development project are variable depending on the type or class of road that is constructed. In New Brunswick, there are three highway classifications: arterial, collector or local. Each of these classifications is subdivided into rural or urban, referring not only to municipal boundaries but also to adjacent land use. The Transportation Association of Canada (TAC) states that classification refers to the category of the road in terms of the road's:

- Environment (rural or urban);
- Function (arterial, collector or local road);
- Cross-section (undivided, divided); and
- Design speed.

Highway design, including the horizontal and vertical geometry and the cross-sectional elements, takes into account the following:

- The number and type of vehicles using the highway;
- Existing and potential adjacent land use and development ;
- Existing roadways, structures, culverts, intersections etc.;
- The desired design standard/classification of the highway;
- Environmental constraints;
- The local topography; and
- The soil and bedrock conditions.

The design standards (design speed and classification) determine the typical cross-section to be used and the vertical and horizontal curve requirements. Together with the topography (rugged, rolling or flat) and soil conditions, the design standards directly affect the ROW required and the amount of impact on the natural environment and on adjacent land use and development.

The design phase is divided into four different stages including:

- Pre-design;
- Preliminary Design;
- Pre-Tender Design;
- Issued for Construction Design.

The pre-design stage typically involves carrying out geotechnical investigations, surveying, and conducting environmental background studies where required. The information gathered as a result of the pre-design activities allows for the preliminary design work to be carried out. The

combination of the information obtained from the pre-design and preliminary design phases is used to commence any regulatory processes such as permit applications, authorizations, approvals, environmental registrations, screenings, etc. that may be required. Once the regulatory process has commenced and the preliminary design is complete, a more detailed design is prepared for pre-tender. The pre-tender design is reviewed internally with Departmental staff for any final changes that may be required prior to preparing the final design. Once the revisions are made to the design, and the necessary regulatory approvals are obtained, the final documents are prepared and the design is issued for tender.

There is considerable opportunity during the design process to minimize the potential environmental effects of a project by means of altering the design, or incorporating environmental protection measures into the design. Any considered alterations to a design must be undertaken without compromising safety. This document does not attempt to address all possible means by which the design process can minimize environmental effects as these are highly variable pending the nature of the work and the nature of the project area. However, some of the key environmental protection measures that must be considered in the design of most projects are presented in the following sub-sections.

Concerns

The concerns associated with the design phase include potential impacts:

- To watercourses, wetlands, estuaries, tidal zones and marine shore areas;
    - As a result of erosion and sedimentation;
    - As a result of Sulphide Bearing Rock drainage;
- To fish and fish habitat;
- To aquaculture facility water quality and quantity;
- To wildlife and wildlife habitat;
- To species at risk and their habitat;
- To historic sites;
- To agricultural land;
- To adjacent land use and development;
- To groundwater and domestic water supplies;
- To Environmentally Significant Areas; and
- To parks, trails and recreational areas.

Required Permits

- An EIA Determination is required for projects that require registration under the New Brunswick Environmental Impact Assessment Regulation (87-83) – Clean Environment Act.
- An EA Approval is required for projects that are required to undergo a Screening, Comprehensive Study or a Panel Review under the Federal Canadian Environmental Assessment Act.
- A WAWA Permit is required for work to be carried out within 30 metres of a watercourse or wetland.

- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat is required for work that is determined (by DFO) to cause a HADD. (Harmful Alteration, Disruption or Destruction of fish habitat).
- A Navigable Waters Protection Act (NWPA) Authorization will be obtained where a watercourse is deemed to be navigable by Transport Canada.
- Other permits may be required for special projects. (such as disposal at sea)

General Protection Measures

Design Considerations for the Protection of Fish and Fish Habitat

The following must be considered during the design process to minimize the potential for adverse environmental impacts on fish and fish habitat:

a) DFO, NBENV (and NBDNR - where applicable) will be consulted regarding the design.

b) High quality fish habitat will be avoided where possible in the design.

c) The alignment of the roadway will be selected to cross streams at right angles to minimize the length of a culvert, and the number of bridge piers, thereby minimizing the amount of lost habitat.

d) Crossings will be located on straight stream segments where possible, thereby minimizing the amount of lost habitat.

e) Crossings will be located in stream stretches with level approaches and stable banks.

f) Crossings will be avoided at sites where culvert installation will involve large fills or approaches with deep or lengthy cuts.

g) The design of roadway interchanges near watercourses will be carried out to avoid/minimize the number of culvert installations and the placement of large amounts of fill adjacent to the watercourses.

h) Bridge piers will be located as close as possible to the banks of the watercourse or at shallow locations in the watercourse.

i) Bridge abutments will be located so that slope protection encroachment into the watercourse is minimized.

j) Permanent watercourse diversions will be avoided where possible.

k) Natural watercourse features for stream diversions, in accordance with Watercourse and Wetland Alteration Technical Guidelines (NBENV, latest approved version) will be incorporated in the design.

l) Natural drainage patterns will be maintained where possible.

m) DFO design criteria and guidelines will be considered in the design.

n) The appropriate type of erosion and sediment prevention materials/methods will be determined and included in the design.

o) The appropriate placement of erosion and sediment prevention materials/methods will be determined and included in the design.

p) The existing vegetation surrounding watercourses and wetlands will be maintained wherever possible.

q) A Watercourse and Wetland Alteration Permit will be obtained for work to be carried out within 30 metres of a watercourse of wetland.

r) A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat will be obtained for work that has been determined (by DFO) to cause harmful alteration, disruption or destruction of fish habitat.

s) The conditions of approval, commitments and requirements regarding fish and fish habitat associated with the Environmental Assessments will be incorporated in the design.

t) The conditions of approval, commitments and requirements regarding fish and fish habitat associated with the WAWAP will be incorporated in the design.

u) The conditions of approval, commitments and requirements associated with the *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat will be incorporated in the design.

v) Fish Habitat Compensation will be carried out for projects resulting in harmful alteration, disruption or destruction of fish habitat.

Design Considerations for Navigability

The following must be considered during the design process to minimize the potential for adverse environmental impacts on navigable waters:

a) Transport Canada will be consulted to determine requirements for navigability;

b) Allowances for navigability will be incorporated in the design where required;

c) A Navigable Waters Protection Act (NWPA) Authorization will be obtained where required;

d) The conditions of approval, commitments and requirements associated with the NWPA Authorization will be incorporated in the design.

Design Considerations for Protection Against Erosion and Sedimentation

The following must be considered during the design process to minimize the potential for adverse environmental impacts as a result of erosion and sedimentation:

a) The size and scope of the work area will be limited to that which can be completed and stabilized within 30 days;

b) A minimum 30 metre buffer zone will be maintained for development adjacent to a watercourse or wetland;

c) Clearing limits will be limited to that which is necessary for construction purposes, where possible;

d) The appropriate type of erosion and sediment prevention materials/methods will be determined and included in the design;

e) The appropriate placement of erosion and sediment prevention materials/methods will be determined and included in the design;

f) Energy dissipators will be used at culverts (*e.g.,* baffles, plunge pools, large rocks, riprap);

g) A Watercourse and Wetland Alteration Permit will be obtained for work to be carried out within 30 metres of a watercourse or wetland;

h) The conditions of approval, commitments and requirements regarding erosion and sedimentation associated with the Environmental Assessments will be incorporated in the design;

i) The conditions of approval, commitments and requirements regarding erosion and sedimentation associated with the WAWAP will be incorporated in the design.

Design Considerations to Prevent Acid Rock Drainage

The following must be considered during the design process to prevent adverse environmental impacts as a result of acid rock drainage:

If sulphide bearing rock (SBR) is determined to be present, as discussed in Section 5.25 – Sulphide Bearing Rock & Acid Rock Drainage Management, then the following methods will be used for avoidance:

a) Horizontal movement of the alignment to avoid the area; or

b) Vertical (upward) movement of the alignment to minimize the amount of excavation.

If SBR is determined to be present and the vertical and horizontal alignments cannot be adjusted to reasonably avoid the SBR area, then the NBDOT Guidelines for Using Sulphide Bearing Bedrock (NBDOT 2002) shall be followed in consultation with NBENV and Environment

Canada. See Section 5.25 – Sulphide Bearing Rock & Acid Rock Drainage Management for additional information regarding design protection measures for SBR.

Design Considerations for the Protection of Wetlands

The following must be considered during the design process to minimize the potential for adverse environmental impacts on wetlands without compromising safety:

a) Wetlands will be avoided where possible;

b) Where wetlands cannot be reasonably avoided or where avoidance would result in unacceptable environmental impacts on other constraints, NBENV and NBDNR will be consulted regarding the design;

c) Culvert systems must provide water level equalization across fills similar to natural conditions;

d) Peak flows must be able to dissipate at normal rates and prevent damming;

e) Established circulation patterns must be maintained;

f) Channelization must be minimal;

g) Diffuse and underground drainage patterns must be maintained;

h) Draining of surface water must be avoided;

i) The appropriate type of erosion and sediment prevention materials/methods will be determined and included in design;

j) The appropriate placement of the erosion and sediment control measures shall be ensured;

k) Creation of standing water must be avoided;

l) Peak tidal flows must be maintained in both directions;

m) Interference with tidal and freshwater exchange must be avoided;

n) Median widths must be minimized;

o) Backslope and foreslope steepness must be maximized, where feasible;

p) The existing vegetation surrounding watercourses and wetlands will be maintained wherever possible;

q) Where required by NBENV, Wetland Compensation will be carried out for work within wetlands that cannot be avoided.

Design Considerations for the Protection of Wildlife and Wildlife Habitat

The following must be considered during the design process to minimize the potential for adverse environmental impacts on wildlife and wildlife habitat:

a) In areas that are known to have high concentrations of animals such as deer and moose, or at identified wildlife paths, or wintering areas, the following environmental protection measures must be considered:

- Installation of warning signage;
- Improved driver line-of-sight;
- Installation of wildlife fencing;
- Installation of wildlife crossings.

b) Fencing and crossing locations must be determined in consultation with NBDNR.

c) Fencing and crossing locations must be designed in consultation with NBDNR.

Design Considerations for the Protection Against Items Related to Climate

Climate can interact with highway developments in a way that adversely impacts the environment and the infrastructure. Some examples of this are observed in the form of ice jams, cold air pooling, land subsidence, sea level rise and flooding. Climate change can potentially affect road infrastructure, and reduce the ability of watercourse crossing structures to minimize floods. All of these issues are considered further in this section.

Climate Change

It is generally accepted that global warming and predicted climate change in this country will lead to wetter winters, hotter summers and more extreme climatic conditions e.g. more severe precipitation events. This could lead to an increased likelihood of damage and disruption from flood flows exceeding the capacity of existing infrastructure.

The following items are vulnerable to potential climate change impacts:

- Bridges;
- Culverts;
- Causeways and coastal roads;
- Surface drainage;
- Hillside slopes and batters; and
- Development within floodplain areas.

Specifications for the design of the items listed above are being amended to require designers to design for future increased flood flows, storm surges, sea level rise and land subsidence.

The design of projects near areas that may be vulnerable to effects caused by climate change (including coastal areas, river valleys, and watercourse crossings etc.) will be done in consultation with NBENV.

a) The design of all watercourse crossings will be done using a 100-year return flood design flow;

b) The design of all culverts will be done using a capacity of 90% full at the 100-year return flood design flow;

c) The design of all development within, and along coastal areas will allow for the following :

- Higher – High Water Large Tide;
- Storm Surge;
- Sea Level Rise;
- Land Subsidence.

Ice Jams

Ice jams are events where ice fragments flowing down a river become backed up ("jammed"), effectively creating a temporary blockage to flow. Ice jams occur during the mid winter or spring thaw of rivers. They typically occur in areas where flow is restricted, such as river bends or narrows, or in areas of relatively stronger ice, such as occurs at the top of headponds. Where ice jams occur, severe and abrupt increases in upstream water elevations often result and can cause flooding of roads, residential properties, and wildlife habitat. Watercourse crossing structures, including culverts and bridges, have the potential to cause ice jams, where the structures (or the support piers and footings) act to restrict the passage of broken ice.

- The potential for ice jam formation and the possible effects (should ice jams occur) must be considered when designing watercourse structures.

Cold Air Pooling

Cold air pooling is a less known phenomenon that may impact frost-sensitive agricultural crops. Cold air pooling is most likely to occur in areas where cooler air masses, associated with higher elevations, move downward along valleys. Where these air masses meet obstructions, such as highways, they may back-up and become concentrated. If these areas also contain frost-sensitive agricultural crops, then crop damage may result. Although typically associated with mountain topography, or areas of glacier contact, cold-air drainage flows can occur with elevation differences of only a few metres. Elevation alone is not enough to cause cold-air drainage flows. In order for cold air pooling to occur, there must also be a measurable difference in temperature between two locations - where the colder temperature is located at the higher elevation.

a) In areas where cold air pooling may be an issue, (i.e. may impact frost-sensitive agricultural crops such as grapes, blueberries etc.) the potential for cold air pooling must be considered in the design;

b) Where cold air pooling is anticipated, and where there is cultivation of frost sensitive crops, alternative highway design or compensation may be warranted. This will be determined in consultation with NBENV.

Checklist/Reminders

See Appendix A: Section 4.4 – NBDOT Environmental Design Checklist

Responsibilities

NBDOT and their Consultants are responsible to ensure that the protection measures outlined above are incorporated in to the design.

NBDOT is responsible for obtaining the required permits, approvals and authorizations associated with their work (unless otherwise noted in the Contract documents).

NBDOT and their Consultants are responsible to ensure that the conditions of approval outlined in the permits, authorizations and approvals have been incorporated into the design and tender documents.

Contractors, Developers and Operators interested in bidding on NBDOT contracts are responsible to obtain a copy of any available environmental documentation (permits, approvals, authorizations, EMP's, site specific EPP's etc.).

Contractors, Developers and Operators interested in bidding on NBDOT contracts are responsible to familiarize themselves with the environmental documentation associated with a contract in order to determine if the environmental requirements will have an impact on their work and on how bidders prepare their tenders to incorporate the requirements.

NBDOT and their Contractors, Developers and Operators are responsible for ensuring the environmental measures in the Designs are implemented.

4.5 Project-specific Environmental Protection Measure Documents

This section describes the project-specific environmental protection measure documents that are developed for projects that undergo the provincial or federal environmental assessment process. These documents are the result of the environmental assessment process (including field investigations), and project design, and are intended to communicate the project-specific environmental protection measure commitments to the highway developer or contractor.

4.5.1 Project-specific Environmental Management Plans

Description

In addition to this EMM, which must be followed for all NBDOT projects, a project-specific Environmental Management Plan (EMP) may be required. The requirement for a project specific EMP will be determined in consultation with provincial and federal regulators.

The project-specific EMP contains additional environmental protection measures that are specific to the project (*i.e.*, beyond what is included in this EMM), such as those resulting from the environmental approvals process.

Typically the EMP will contain the following information:

- The geographic location(s) of environmentally sensitive areas and features including, but not limited to, the location(s) of:
  - Watercourses;
  - Wetlands;
  - Designated wellfields and watersheds;
  - Drinking water wells;
  - Sulphide-bearing rock;
  - Rare plants;
  - Deer wintering areas;
  - Archaeological or heritage resources; and
  - Noise sensitive areas.
- The environmental protection measures specific to the environmentally sensitive areas and features;
- The mitigation and monitoring requirements specific to the project construction and operation;
- Contingency and emergency response plans for accidents, malfunctions, and unplanned events that are likely to occur, or for those that if they occurred would have severe environmental consequence, regardless of likelihood of occurrence.

A general Table of Contents for an EMP to be followed is presented in Table 4.1.

Table 4.1 – Environmental Management Plan Table of Contents

Chapter Number	Chapter Title	Description of Chapter Contents
1	Introduction	• Background; • EMP Organization; • EMP Objectives, • EMP Scope; • Reference to other applicable sources of environmental commitments; • The Environmental Management Team; • Commitment to training for key staff; and • Commitment to compliance monitoring and environmental inspection.
2	Environmental Mitigation and Monitoring - Construction Phase	Mitigation and monitoring commitments for the Construction phase that are specific to the project
3	Environmental Mitigation and Monitoring – OMR Phase	Mitigation and monitoring commitments for the OMR phase that are specific to the project
4	Contingency and Emergency Response Planning	Contingency and emergency response plans that are specific to the project.
Appendix A	Maps and Figures	Maps and figures of the project, including locations of environmental sensitive areas and features.

Chapter Number	Chapter Title	Description of Chapter Contents
Appendix B	Document Cross-Reference Index	A cross-reference index that links the EMP with other environmental approval documents (*e.g.*, environmental assessment report) and with other environmental protection procedure documents (*e.g.,* NBDOT EMM and Standard Specifications).
Appendix C	Site-specific EPP's	Site-specific EPP's for environmentally sensitive areas that require site-specific mitigation.

Required Permits

- Each project-specific EMP must be provided to NBENV for review and approval prior to construction.

Responsibilities

NBDOT is responsible for the development of the EMP where required.

Contractors are responsible to obtain a copy of the EMP associated with the Contract.

NBDOT and their Contractors, Developers and Operators are responsible for ensuring that the EMP is implemented.

4.5.2 Site-specific Environmental Protection Plans

Description

In addition to this EMM, which must be followed for all NBDOT projects, and the EMP (if required), a site-specific Environmental Protection Plan (SSEPP) may also be required. The requirement for a SSEPP will be determined in consultation with provincial and federal regulators.

Site-specific EPP's are developed for areas (or sites) where a special set of environmental protection measures must be followed.

The SSEPP's contain environmental protection measures that are specific to a certain site (*i.e.*, beyond what is included in this EMM and the EMP). The protection measures outlined in the SSEPP's are those resulting from the commitments made in the environmental approvals process.

Site-specific EPP's are commonly developed for work near watercourses, wetlands, locations of rare plants, and locations of high archaeological potential.

The SSEPP is an important part of the environmental protection process. It is the mechanism by which the site specific commitments made during the environmental approvals process are communicated to the individual machine operator, site foreman and other onsite personnel. In this regard, they should be developed so that they are easily communicated to Developers, Operators and Contractors.

Typically the site specific EPP will contain site-specific information such as the exact location of:

- Erosion and sediment control measures;
- Buffer zones;
- Rare plants;
- Areas with high archaeological potential;
- Protected watershed and wellfields;
- Required archaeological monitoring; and
- Locations of other environmentally significant areas.

Required Permits

- SSEPP's will be provided to NBENV for review and approval must be obtained prior to the commencement of construction.
- In the event that SSEPP's are not developed at the time of the EMP review, they will be submitted for review and approval separately as they become available.

Responsibilities

NBDOT is responsible for the development and distribution of the site specific EPP's where required.

NBDOT and their Contractors, Developers and Operators are responsible for ensuring that the site specific EPP's are implemented.

4.5.3 Fish Habitat Compensation

Throughout the planning, design and construction and OMR phases NBDOT's approach for the consideration of environmental constraints, concerns and considerations is to address them using the following mechanisms in order of priority:

- Avoidance – preventing impacts by choosing alternate alignments, designs, project locations etc.;
- Minimization – reducing the adverse effects of a project through mitigation once it has been determined that there are no reasonable alternatives to avoid impacts;
- Compensation – "making up for" the unavoidable loss.

NBDOT is commonly faced with no other option but to compensate as a result of the HADD of fish habitat associated with the watercourse crossings for the highway infrastructure.

The HADD of fish habitat is regulated under the Subsection 35(2) of the *Fisheries Act* which allows a HADD of fish habitat to be authorized by the Minister or by regulations made under the Act. Habitat compensation (Fish Habitat Compensation) is required when a *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat is issued in order to achieve No Net Loss (NNL) of productive capacity as per DFO's *Policy for the Management of Fish Habitat* (Habitat Policy) (1986).

In order to achieve No Net Loss (NNL) of productive capacity as per DFO's *Policy for the Management of Fish Habitat* (Habitat Policy) (1986) when a *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat is issued, NBDOT is required to carry out compensation. Compensation is defined in the DFO Habitat Policy as:

> "*The replacement of natural habitat, increase in the productivity of existing habitat, or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources.*"

Once a project is identified as triggering a HADD, NBDOT will identify potential fish habitat compensation projects in consultation with other NBDOT staff, Non-government/not for profit organizations and DFO, to compensate for the impacts associated with the HADD of fish habitat.

For each compensation project that is deemed to be feasible, a compensation plan is developed and submitted to DFO for review and approval. Once the project is approved by DFO, it is then implemented.

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5.0 Construction & OMR

The following section contains information on specific environmental protection measures applicable to NBDOT construction and OMR activities.

Construction

The construction phase of a highway project involves physical implementation of the outputs from the planning and design phases. Construction activities generally involve the movement of excavated material (soil and rock) as well as the placement of aggregates and surface treatments (chipseal and asphalt). Construction activities can expose large areas. Construction activities that expose large areas are as follows;

- Clearing;
- Grubbing;
- Excavation;
- Embankment construction;
- Waste disposal;
- Pit and Quarry Use.

Exposed soils, especially highly erodible soils, can result in environmental problems if left unprotected. Erosion of soils can lead to sedimentation of nearby watercourses and wetlands. Sedimentation can have significant and long-term consequences for both fish and people.

Construction activities can pose other environmental risks in addition to erosion and sedimentation. The construction of roadways and structures could introduce other hazards that could be detrimental to the environment.

Operation, Maintenance & Rehabilitation (OMR)

The OMR phase involves the operation and preservation of the existing infrastructure including the maintenance and rehabilitation of highways and structures.

Not unlike the construction phase, the OMR phase has similar environmental concerns such as erosion and sedimentation; however there are other environmental concerns particular to OMR activities such as snow and ice removal or ferry operations.

5.1 Asphalt Concrete

Description

Asphalt Concrete is a mixture of bituminous material, coarse aggregate and fine aggregate used to provide a riding surface for vehicular and pedestrian traffic. This section addresses the loading, hauling, placing and disposal of conventional hot mix and recycled asphalt concrete.

This section only discusses asphalt concrete. Portable asphalt plants are discussed under Section 5.17 – Temporary Ancillary Facilities Management.

Concerns

The potential environmental effects associated with the loading, hauling, placing and disposal of asphalt concrete include:

- The improper handling of petroleum products and/or chemicals; and
- The improper disposal of waste and excess asphalt generated.

Required Permits

None identified.

General Protection Measures

a) Environmentally friendly asphalt release agents must be used on truck boxes and other equipment such as rollers in place of diesel fuel.

b) Release agents used to lubricate truck boxes must only be used at the asphalt plant in a location where sprayed and spilled material can be contained to prevent accidental release to the environment.

c) Spill management of solvents used to clean tools used during the placing of asphalt concrete must follow the guidelines outlined in Section 5.12 – Spill Management.

d) Disposal of hazardous materials shall be in accordance with Section 5-13 – Storage and Handling of Petroleum Products and 5.14 - Storage and Handling of Other Hazardous Materials.

e) Waste and excess asphalt must be disposed of properly in accordance with Section 5.20 – Waste Management. Cured asphalt is considered “Clean Fill” by NBENV if it is not exposed to a heat source.

f) Equipment used for loading, hauling, placing and disposing of asphalt concrete shall be in good working order and free of leaks.

Checklist/Reminders

See Appendix A: Section 5.1 – Asphalt Concrete Checklist

Responsibilities

NBDOT and their Contractors, Developers and Operators are responsible for ensuring the protection measures outlined above are adhered to.

5.2 Beaver and Beaver Dam Removal

Description

Removal of beaver and their dams may be required because of their impact on the highway infrastructure due to the flooding and backwater.

Concerns

The concerns and potential impacts associated with Beaver dam removal include:

- Sedimentation of the watercourse/wetland and erosion of roadways and adjacent properties;
- Endangering wildlife that may be utilizing the area;
- Destruction of wildlife habitat; and
- Allowing a beaver dam to remain in place may lead to flooding and damage to the road.

Required Permits

- A Watercourse and Wetland Alteration (WAWA) Permit is required before a beaver dam can be removed. A Provisional WAWA Permit is usually adequate for beaver dam removal during the ice free period (approximately May to November), where all conditions of the provisional permit can be met. Removal of dams outside this period would require a standard WAWA Permit.
- Determining whether a beaver pond is a wetland or not must be completed prior to the issuance of a permit. The determination that the beaver pond is or is not a wetland can be made by checking the New Brunswick Department of Natural Resources wetlands inventory, the Canadian Wildlife Service Wetlands Atlas, aerial photography, and consulting with wetland biologists.
- The application for a WAWA permit for removal of a dam associated with a beaver pond, which is considered a wetland, will undergo additional scrutiny by NBENV, and may require compensation (See Section 5.23.10 – Wetlands). Allow sufficient time (*e.g.,* at least two months) to obtain standard WAWA permits when a wetland is involved.
- If a wetland associated with a beaver dam is more than 2 ha, an EIA Registration is required, unless the removal is part of a larger project that has already been registered under the *EIA Regulation*s.

General Protection Measures

a) A copy of the WAWA must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Removal of beaver dams will be performed as per the Highway Maintenance Management System Manual.

c) Beaver dam management devices such as pond levelers, culvert screening devices, and other methods to limit water level without harming beavers must be considered as an

alternative to dam removal, where possible. These devices must consider both water flow and fish passage. NBDNR should be consulted when selecting these alternatives.

d) Where possible, drawdown and removal of beaver dams on ponds or wetlands where waterfowl are observed to be actively nesting or raising young must be conducted after the broods have left.

e) The beaver(s) must be removed by a licensed Nuisance Wildlife Control Officer or a licensed trapper prior to dam removal. This may include a NBDOT employee who has graduated from the NBDNR Trapper Education Course, and who holds a current Fur Harvester's License, or a licensed private contractor.

f) Once the pond has been drained, all exposed areas must be stabilized.

g) Disposal of debris and/or excavated material associated with the dam removal shall be performed in accordance with Section 5.20 – Waste Management.

Checklist/Reminders

See Appendix A: Section 5.2 – Beaver Dam Removal Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.3 Clearing

Description

Clearing consists of cutting and salvaging all merchantable timber and disposing of all other trees, logs and brush. Merchantable timber is defined, as timber for which there is an established market in the general vicinity of the Contract.

Concerns

The concerns and potential impacts associated with clearing operations include:

- The use of heavy equipment and removal of mature trees and slash during clearing operations;
- Erosion and sedimentation as a result of the ground exposure due to the use of heavy equipment and the removal of mature trees and slash during clearing operation;
- Clearing practices can also create a variety of problems like, drainage problems, disturb the movement of fish in a watercourse, disturb birds in a critical nesting stage, affect deer wintering areas, etc.;

- Disruption or destruction of ESA's;
- Impact to watercourse/wetlands; and
- Improper equipment maintenance and handling of fuels.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- If burning is allowed, a burning permit must be obtained from NBENV and NBDNR.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) NBDOT Technicians or other survey personnel shall flag the clearing limits and any ESA's prior to clearing activity.

c) Most ROW clearing activities must avoid the generally accepted migratory bird-nesting period of between May 1st to August 31st.

d) Winter clearing, on frozen ground, shall be conducted whenever possible.

e) Avoid clearing during deep snow conditions which hinder deer movement, or when deer may be yarded up in deer wintering areas within or near the ROW.

f) Buffer zones will extend a minimum of 30 m each side of a watercourse/wetland and will be clearly identified. Where there are steep grades or highly sensitive watercourses/wetlands, buffer zones shall be extended as required.

g) Ground disturbance must be minimized to reduce the potential for erosion and sedimentation of watercourses/wetlands.

h) If rutting or ground disturbance occurs during clearing operations, the ground shall be immediately stabilized. (See Section 5.7 – Erosion and Sediment Management)

i) Equipment is not permitted to enter a watercourse/wetland.

j) The use of heavy equipment within 10 m of the watercourse/wetland bank is to be avoided.

k) Directional hand felling and harvesting must be used where ground conditions are not suitable for access by heavy equipment.

l) When cable skidders are used, the full length of cable shall be used to avoid rutting soft ground areas.

m) Trees must be felled away from and not into or over a watercourse or wetland.

n) Avoid long skids of timber on steep slopes adjacent to watercourses/wetlands.

o) Slash shall not be placed or left in watercourses/wetlands. Brush, slash and other debris must be piled away from watercourses/wetlands so that they are not washed into the watercourses/wetlands by floodwaters.

p) Watercourse/wetland crossings must be avoided where possible.

q) Skidding trees across a watercourse/wetland shall not be permitted.

r) Temporary bridges can be used to facilitate crossings a watercourse/wetland (See Section 5.17.6. – Temporary Watercourse/Wetland Crossings).

s) Temporary bridge crossing and fording location shall be approved by NBENV.

t) During the installation of water crossings, any trees requiring cutting within 10 m of a watercourse/wetland must be cut by hand or by machinery able to “reach in” to cut and yard the timber out.

u) Burning is generally not accepted on NBDOT ROW, however if burning is required, NBENV and NBDNR shall be consulted prior to commencement of the burning and approval must be obtained.

v) Merchantable timber shall be delimbed and removed from the site, while non-merchantable timber, logs, and brush must be chipped or shredded and left on site or buried within the ROW (See Section 5.20 – Waste Management).

w) All necessary precautions must be taken to prevent the discharge or loss of any fuels and oil into the environment.

x) Machinery and pollutants shall be located or stored in areas not in danger of floodwater, and at least 30 m away from a watercourse, wetland or private water well.

y) All roads used to access and transport during the clearing operations will follow the measures outlined in Section 5.17.5.

z) All equipment used during clearing shall be in good working condition and free of leaks.

Properly cleared area. Note that there are no standing trees

Close up of shredded material.

Checklist/Reminders

See Appendix A: Section 5.3 – Clearing Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

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5.4 Culverts

Description

A culvert is a conduit used to enclose a flowing body of water. It is generally used to allow water to pass underneath a road, railway, or embankment. This section outlines the concerns and protection measures associated with the installation, maintenance and removal of culverts.

The installation can be subdivided into minor and major culvert. It should be noted that an integral part of the culvert work might include a temporary or permanent diversion

5.4.1 Minor Culvert Installation

Description

Minor culverts include those installed for driveways or property access in drainage ditches, and under the roadway surface for cross drainage. To be included in this category, the drainage being serviced by these culverts should not be considered watercourses as defined by NBENV.

Concerns

The concerns and potential impacts associated with minor culvert installation include:

- Erosion and sedimentation during the construction;
- Disposal of waste material;
- Improper equipment maintenance and improper handling of fuels;
- Impacts to fish and fish habitat; and
- Impacts to watercourses/wetlands.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Culvert will be sized with sufficient capacity based on the size of the drainage area being serviced.

c) The size of the disturbed area and the duration it is exposed will be minimized.

d) Existing vegetation will be maintained outside work area limits.

e) Exposed soils must be stabilized daily as the work progresses.

f) Construction/OMR activities are to coincide with low flow (June 1st – September 30th). The timing of works near watercourses is typically limited to the dryer months of the year, reducing potential for erosion and sedimentation.

g) Surface run-off will be controlled to permit working in the dry and to avoid sediment from directly entering watercourses/wetlands by:

- Using the dam and pump method,
- Using dykes and/or ditches to divert runoff,
- Limiting slope/gradient of disturbed areas,
- Stabilizing erodible soils with mulch, vegetation, riprap, and/or
- Containing the sediment with the use of check dams in ditches.

h) Erosion and sediment control measures will be employed to prevent sedimentation of nearby watercourses/wetlands before, during and immediately following culvert installation until the area is permanently stabilized. (See Section 5.7 – Erosion and Sediment Management)

i) In culverts with steep grades, energy dissipators may be required.

j) The inlet and outlet of the culvert may have protection against scour. (e.g., Energy Dissipation Pool)

k) Stockpiled material or waste material is to be located away from the watercourse/wetland and monitored to ensure that sediment is not entering a watercourse/wetland.

l) Waste disposal shall be in accordance with Section 5.20 – Waste Management.

m) Permanent stabilization shall be performed immediately after the work is complete.

Checklist/Reminders

See Appendix A: Section 5.4 – Culverts Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.4.2 Major Culvert Installation

Description

Major culverts are generally those installed for crossing watercourses and wetlands and require fish passage.

Concerns

The concerns and potential impacts associated with major culvert installation include:

- Erosion due to exposed soils;
- Sedimentation of watercourses/wetlands;
- Impacts to fish and fish habitat; and
- Accidental fuel spills.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- An NWPA permit may be required if work is being carried out in a navigable waterbody.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- Consultation and/or a *Fisheries Act* Authorization to Destroy Fish by Means other than Fishing from DFO may be required if blasting takes place in or near a watercourse.

General Protection Measures

a) A copy of the WAWA, NWPA and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Culvert will be sized with sufficient capacity based on the size of the drainage area being serviced.

c) The size of the disturbed area and the duration it is exposed will be minimized.

d) Existing vegetation will be maintained wherever feasible.

e) Exposed soils must be stabilized daily as the work progresses.

f) Construction/OMR activities are to coincide with low flow (June 1st – September 30th). The timing of works near watercourses is typically limited to the dryer months of the year, reducing potential for erosion and sedimentation and avoiding the spawning and juvenile life stages of fish.

g) Major Culverts will be installed in isolation of stream flow. And surface run-off will be controlled to permit working in the dry and to avoid sediment from directly entering watercourses/wetlands by:

- Using the dam and pump method,
- Using dykes and/or ditches to divert runoff,
- Using temporary or permanent diversions,
- Limiting slope/gradient of disturbed areas,
- Stabilizing erodible soils with mulch, vegetation, riprap, and/or
- Containing the sediment with the use of check dams in ditches.

h) When pumping the watercourse, hoses must be fitted with screens according to DFO's "*Freshwater Intake End-of-Pipe Fish Screen Guideline*."

i) Erosion and sediment control measures will be employed to prevent sedimentation of nearby watercourses/wetlands before, during and immediately following culvert installation until the area is permanently stabilized. (See Section 5.7 – Erosion and Sediment Management)

j) In culverts with steep grades, energy dissipators may be required.

k) The inlet and outlet of the culvert may have protection against scour (e.g., Energy Dissipation Pool)

l) Stockpiled material or waste material is to be located away from the watercourse/wetland and monitored to ensure that sediment is not entering a watercourse/wetland.

m) Waste disposal shall be in accordance with Section 5.20 – Waste Management.

n) Permanent stabilization shall be performed immediately after the work is complete.

Installation, Inspection and Repair

Major culvert installations typically involve:

1. Surveying and design of the culvert;

2. Permits and approvals;

3. Erosion and sediment control measures to be installed prior to work commencing including sediment control fencing along banks of watercourses and wetlands;

4. Temporary or permanent diversion, if required;

5. Fish rescue(s) as required.

6. Trench excavation which may include blasting;

   - Blasting in or near watercourses is to be done in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Program as early as possible to identify resources at risk and to develop an effective mitigation plan. A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat must be obtained, which would require a minimum *CEAA* screening if instream work is expected to cause a HADD, as determined by DFO. See Section 5.8.2 - Blasting and Section 2.1.1 (*Fisheries Act*).

   - Blasting in or near a watercourse/wetland may be necessary for culvert installation. Blasting can alter/disturb fish habitat, or cause injury or death to fish, and as well as groundwater impacts and public disturbance. Detonation near water causes shockwaves that impact on fish as well as fish eggs. The degree of damage depends on factors such as the type of explosion, size, water depth and species.

7. Base Preparation (if required);

   - The culvert must be installed on a firm substrate. A soft foundation must be replaced with clean, granular material (as per drawings and specifications) to prevent sagging.

8. Culvert placement;

   - Careful placement of the culvert as per design specifications is crucial to the future success of the culvert and the passage of fish.

     The invert of the culvert shall be set 0.2 times the diameter of the culvert to a maximum of 450 mm below the upstream and downstream riffle. This permits the water depth in the culvert to be equal to that in the watercourse depth during low flow conditions.

     The culvert shall extend 0.3 m beyond the upstream and downstream toes of fill placed around the structure.

   - Riprap and/or concrete headwalls shall be placed at both ends of a culvert to an elevation of at least one half of the pipe diameter above the top of pipe and a minimum of one pipe diameter on each side of the culvert immediately upon completion of the culvert installation. The remainder of foreslopes must be no steeper than 2 horizontal to 1 vertical, and shall be permanently stabilized against runoff.

9. Fish rescue(s) as required.

Temporary Diversion

Permanent Diversion

10. Trench excavation which may include blasting;

- Blasting in or near watercourses is to be done in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Program as early as possible to identify resources at risk and to develop an effective mitigation plan. A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat must be obtained, which would require a minimum *CEAA* screening if instream work is expected to cause a HADD, as determined by DFO. See Section 5.8.2 - Blasting and Section 2.1.1 (*Fisheries Act*).

- Blasting in or near a watercourse/wetland may be necessary for culvert installation. Blasting can alter/disturb fish habitat, or cause injury or death to fish, and as well as groundwater impacts and public disturbance. Detonation near water causes shockwaves that impact on fish as well as fish eggs. The degree of damage depends on factors such as the type of explosion, size, water depth and species.

11. Base Preparation (if required);

- The culvert must be installed on a firm substrate. A soft foundation must be replaced with clean, granular material (as per drawings and specifications) to prevent sagging.

12. Culvert placement;

- Careful placement of the culvert as per design specifications is crucial to the future success of the culvert and the passage of fish.

  The invert of the culvert shall be set 0.2 times the diameter of the culvert to a maximum of 450 mm below the upstream and downstream riffle. This permits the water depth in the culvert to be equal to that in the watercourse depth during low flow conditions.

  The culvert shall extend 0.3 m beyond the upstream and downstream toes of fill placed around the structure.

- Riprap and/or concrete headwalls shall be placed at both ends of a culvert to an elevation of at least one half of the pipe diameter above the top of pipe and a minimum of one pipe diameter on each side of the culvert immediately upon completion of the culvert installation. The remainder of foreslopes must be no steeper than 2 horizontal to 1 vertical, and shall be permanently stabilized against runoff.

13. Backfilling the trench;

14. EDP – Energy Dissipator Pool (if required);

- EDP construction for fish passage and energy dissipation, are constructed at the outlet of culverts on fish bearing streams. EDP's assist with fish passage, create a resting area for fish, reduce scour and dissipate energy. The pool's width should be

at least 2 times the culvert diameter and the pool length should be at least 3 times the culvert diameter with a minimum depth of 1 metre.

Energy Dissipator Pool

15. Permanent stabilization.

- Riprap, gabions, geotechnical fabric (not in channel), seeding, mulching or a combination of these methods shall be used to stabilize the area. New streambeds may be lined with materials such as riprap and gravel. If the banks have been cleared, planting of trees and/or shrubs is recommended.

- Earth fill slopes on each side of a culvert in a fish-bearing watercourse shall be faced with clean rock (also known as fill foreslope erosion protection), 50 to 250 mm in size, to an elevation of 4 m above the invert of the culvert or to the subgrade shoulder, whichever is less, for a distance of 25 to 75 m on either side of the culvert depending on the topography and culvert size. Above this 4 m height the slopes shall be mulched by the end of each day's fill construction for the same distance each side of the culvert as for the rock protection (25 to 75 m). When the area is to be final-shaped, jute matting shall be installed, then the area hydroseeded.

Permanent Stabilization of Worksite, including fill foreslope erosion protection

Checklist/Reminders

See Appendix A: Section 5.4 – Culverts Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For a Construction Project, NBDOT will be responsible to schedule all meetings required with NBENV and DFO. In addition, NBDOT will monitor or make arrangements to have the TSS levels monitored when required.

For an OMR Project, NBDOT will be responsible for all of the above.

5.4.3 Watercourse Diversions

Description

Watercourse diversions allow culvert work to be performed in the “dry” while water and fish are diverted away from the construction area. Diversions are designed to allow fish passage during construction. Diversions can either be temporary or permanent.

A temporary diversion is used to temporarily divert the watercourse away from the culvert construction by way of channels or pumping.

A temporary plastic-lined diversion channel.

A temporary diversion must be capable of handling the anticipated stream flow. Pumps & hoses (fitted with screens) are required, one for pumping the water and another pump for back up.

A permanent diversion is created when the culvert is installed adjacent to the natural streambed in the “dry”. After installation of the culvert the watercourse is diverted through the permanent diversions.

Concerns

The concerns and potential impacts associated with diversions include:

- Erosion due to soil exposure;
- Sedimentation of the watercourse and/or wetland;
- Impacts to fish and fish habitat; and
- Accidental fuel spills.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- An NWPA permit may be required if work is being carried out in a navigable waterbody.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.

- Consultation and/or a *Fisheries Act* Authorization to Destroy Fish by Means other than Fishing from DFO may be required if blasting takes place in or near a watercourse.

General Protection Measures

a) A copy of the WAWA, NWPA and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Permanent diversions will be designed in consultation with DFO.

c) Diversions are to be constructed as per the design.

d) Temporary barriers will be used to isolate the diversion from the watercourse during construction.

e) Before the diversion is opened, the channel should be free of sediment and the surrounding area stabilized.

f) If the water does not flow out of the original channel under natural conditions after the streamflow has been diverted, the remaining water must be pumped.

g) If the water has a high concentration of sediments, the water must be pumped into a sediment pond, a filter fabric bag, or a vegetated area at least 30 m away from any watercourse or wetland.

h) All exposed areas will be stabilized daily as work progresses. (See Section 5.7 – Erosion and Sediment Management)

i) When pumping the watercourse, hoses must be fitted with screens according to DFO's "*Freshwater Intake End-of-Pipe Fish Screen Guideline*."

j) Pumps, when in use, should be monitored to ensure that they are functioning properly.

k) The ground disturbance shall be kept to a minimum.

l) The site should be inspected prior to, during and after a rainfall event. Any deficiencies will be immediately repaired.

Checklist/Reminders

See Appendix A: Section 5.4 – Culverts Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For Construction or OMR Projects, NBDOT will be responsible to schedule all meetings required with NBENV and DFO. In addition, NBDOT will monitor or make arrangements to have the TSS level monitored when required.

5.4.4 Culvert Maintenance

Description

Culverts are cleaned and repaired as required to ensure their proper operation.

Concerns

The concerns and potential impacts associated with culvert maintenance include:

- Sedimentation of the watercourse/wetlands;
- Erosion due to exposure of soils;
- Accidental fuels spills; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Proper erosion control measures shall be installed prior to and as required during the maintenance to prevent any sediment from entering a watercourse/wetland.

c) When pumping the watercourse, hoses must be fitted with screens according to DFO's "*Freshwater Intake End-of-Pipe Fish Screen Guideline*."

d) Undesirable materials (*e.g.,* branches and debris) must be removed from the culvert and/or watercourse and must be properly disposed of. (See Section 5.20 – Waste Management)

Checklist/Reminders

See Appendix A: Section 5.4 – Culverts Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For a Construction Project, NBDOT will be responsible to schedule all meetings required with NBENV and DFO. In addition, NBDOT will monitor or make arrangements to have the TSS level monitored when required.

For an OMR Project, NBDOT will be responsible for all of the above.

5.4.5 Culvert Removal

Description

Culverts may need to be replaced at some point due to age, condition, failure, inadequate flow capacity, and/or obstructing fish passage.

Concerns

The concerns and potential impacts associated with culvert removal include:

- Sedimentation of the watercourse/wetlands;
- Erosion due to exposure of soils;
- Accidental fuels spills; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.

General Protection Measures

a) A copy of the WAWA and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) The removal of an existing culvert shall be done in isolation of stream flow.

c) A dam-and-pump or temporary plastic-lined diversion shall be used to ensure natural flow is uninterrupted and water quality is maintained during culvert removal. (See Section 5.4.3 – Watercourse Diversions)

d) When pumping the watercourse, hoses must be fitted with screens according to DFO's "*Freshwater Intake End-of-Pipe Fish Screen Guideline*."

e) All exposed erodible soil shall be stabilized by placement of rip rap, hydroseeding, or seeding by conventional means and blanketing with hay/straw mulch. (See Section 5.7 – Erosion and Sedimentation Management)

Checklist/Reminders

See Appendix A: Section 5.4: Culverts Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For a Construction Project, NBDOT will be responsible to schedule all meetings required with NBENV and DFO. In addition, NBDOT will monitor or make arrangements to have the TSS level monitored when required.

For an OMR Project, NBDOT will be responsible for all of the above.

5.5 Detouring

Description

The construction or OMR of roadways and structures often requires the diversion of traffic around the site using existing roadways or constructing a temporary detour adjacent to the work site.

Concerns

The environmental concerns associated with detouring traffic include:

- Noise pollution;
- Dust pollution; and
- Erosion or sedimentation

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) A temporary structure required for a detour shall be assessed by NBDOT in consultation with appropriate regulatory agencies with respect to watercourse hydrology, construction timing, fish passage, navigation, stream channel material, bank material, type and size of temporary structure, and overall costs.

c) Erosion control measures shall be in place prior to construction.

d) Approach fills of temporary detour structures shall be stabilized against erosion.

e) No temporary infilling of any portion of a watercourse/wetland is to be carried out during construction of a detour, unless authorized in the WAWA Permit.

f) Abandoned detour sites shall be shaped and permanently stabilized. See Section 5.7 – Erosion and Sediment Management.

g) Dust control shall be carried out in accordance with Section 5.6 – Dust Control.

h) Noise control shall be carried out in accordance with Section 5.23 – Working Near Environmental Sensitive Areas.

Installation, Inspection and Repair

The following are the general suggested steps that should be followed when establishing a construction detour:

1. Drive the detour both in the daytime and at nighttime. Verify that the signs are properly installed and are reflective. If the signing is not, reinstall and/or replace signs.

2. Drive the detour and verify that the increase in traffic will not create erosion and sedimentation problems. If there is a potential, install all erosion and sedimentation control measures.

3. Verify that the detour will not create a dust control problem. And if there is potential for such problem, ensure that dust suppressant is available.

4. Verify that the increase in traffic will not increase noise pollution. If so, ensure that protection measures are considered as per Section 5.23 – Working Near Environmental Sensitive Areas.

Checklist/Reminders

See Appendix A: Section 5.5 – Detouring Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.6 Dust Control

Description

Airborne dust during dry and/or windy conditions can create hazardous conditions, including effects on human health. Application of dust suppressants such as water or chemical suppressants is carried out to minimize the amount of airborne dust.

Worksite that requires dust suppressants.

5.6.1 Water

Description

Water is the most commonly used dust suppressant method and can be applied on projects for dust control as needed to minimize fugitive dust.

Concerns

The concerns and potential impacts associated with the use of water as a dust suppressant include:

- Water is not a long lasting solution for dust control and several applications may be required on dry and windy days;
- Erosion and sedimentation of watercourses and wetlands due to uncontrolled surface run-off;
- Accidental fuel leaks where pumping from a watercourse/wetland is required; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required for the withdrawal of water from a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Activities that generate fugitive dust shall be minimized during high winds.

c) Water withdrawal from streams shall be limited as to maintain sufficient flow and depth to ensure that fish habitat is protected, and fish passage is maintained (*e.g.,* so as not to noticeably reduce the flow of the stream). Water withdrawal should not exceed 37.5% of the July, August and September mean flow. A none fish habitat or a large pond or lake is a preferred water source during the summer months as stream flows are reduced.

d) Water trucks shall not be driven into a watercourse/wetland.

e) Water trucks shall not be driven down to the edge of the watercourse/wetland unless the area is firm enough so that this action does not cause rutting.

f) If the ground within 30 m of a watercourse/wetland is disturbed the area is to be stabilized by an approved erosion control method. (See Section 5.7- Erosion and Sediment Management).

g) Rock and gravel may be moved by hand to obtain a pool for a suction pipe, but a pool cannot be created by using any powered equipment.

h) When pumping the watercourse, hoses must be fitted with screens according to DFO's "*Freshwater Intake End-of-Pipe Fish Screen Guideline*."

i) Refueling or repairs of water trucks, pumps or any other machinery shall not be conducted within 30 m of a watercourse, wetland or private water well.

j) Storage of fuel shall be conducted in accordance with Section 5.13 – Storage and Handling of Petroleum Products.

k) Spill kits will be available in the equipment.

l) Alternatives to water as a dust suppressant must be approved by NBDOT.

m) The water used for dust control must not directly runoff and enter into the watercourse/wetland.

n) The water trucks shall have a method of controlling the application rate, so that no excess water flows into a watercourse/wetland.

o) Erosion and sediment control measures will be installed as per design to control runoff.

Checklist/Reminders

See Appendix A: Section 5.6 – Dust Control Checklist

Responsibilities

For a Construction Project, the Contractor is responsible for obtaining the required permits.

For an OMR Project, NBDOT is responsible for obtaining the required permits.

NBDOT and its Contractor, Developers and Operators are responsible for ensuring the protection measures outlines above are adhered to.

5.6.2 Chemical Dust Suppressants

Description

Chemical dust suppressants can be applied to dirt roads for dust control. Liquid chemical dust suppressants must be applied by tanker truck under controlled conditions. Flake chemical suppressants are applied for spot treatment under controlled conditions.

Concerns

The concerns and potential impacts associated with the use of chemical dust suppressants include:

- Accidental spill of hazardous materials;
- Storage and handling of hazardous material; and
- Improper application rates.

Required Permits

None identified.

General Protection Measures

a) The "Best Practices for the Use and Storage of Chloride-Based Dust Suppressants (Environment Canada, 2004b)" will be followed.

b) All Chemical Dust suppressants shall be stored in accordance with Section 5.14 – Storage and Handling of Other Hazardous Material.

c) Application criteria must be followed as prescribed in the NBDOT *Highway Maintenance Management System Manual*.

d) Application shall be restricted to the driving surface only.

e) Tankers used in the application of liquid calcium chloride shall not be washed out within 30 m of a watercourse, wetland or other environmentally sensitive area.

f) Chemical dust suppressant shall not be applied within 30 m of a watercourse, wetland or private water well.

g) Lignosulphonate or water shall be used in recognized ESA's.

h) All chemical dust suppressants shall be stored in accordance with Section 5.14 – Storage and Handling of other Hazardous Materials.

Checklist/Reminders

See Appendix A: Section 5.6 – Dust Control Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

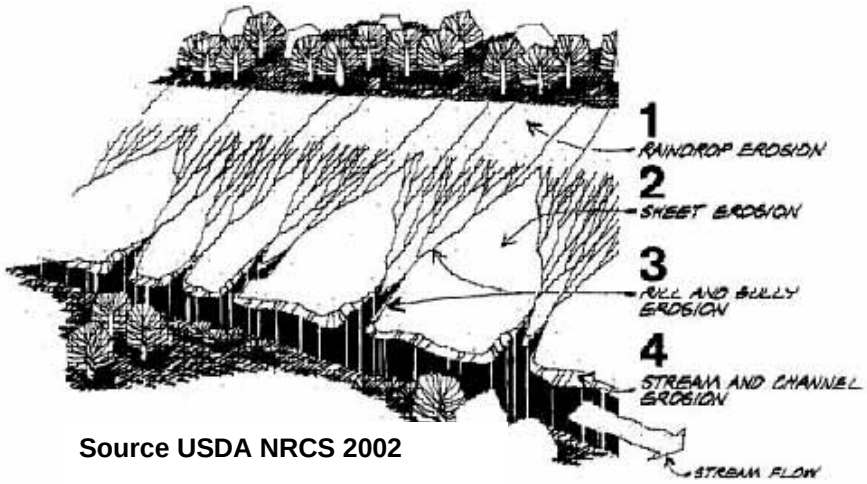
5.7 Erosion and Sediment Management

5.7.1 Erosion Control

Description

Erosion is the loss or removal of soil/material via wind, water, ice or gravity. Forms of water erosion may include:

- Raindrop (splash) erosion;
- Sheet erosion;
- Rill erosion;
- Gully erosion; and
- Stream/channel erosion.



Source USDA NRCS 2002

Factors that influence erosion include:

- Soil characteristics;
- Vegetative cover;
- Topography; and
- Climate.

Erosion control prevents/minimizes erosion through the use of natural or manufactured materials. If properly installed and maintained, erosion control measures can reduce the amount of soil/material loss.

Concerns

The concerns and potential impacts associated with activities with the potential for erosion include:

- Sedimentation of watercourses and/or wetlands;
- Dust control pertaining to erosion caused by wind; and
- Impacts to fish and fish habitat.

General Protection Measures

The following general protection measures shall be considered when planning construction and/or OMR activities with the potential for erosion.

a) The size of the disturbed area and the duration it is exposed will be limited.

b) Stabilization of the exposed areas will be carried out in accordance with the applicable permits and Section 5.22 – Work Progression.

c) Construction/OMR activities within 30 m of a watercourse or wetland will be carried out between June 1st and Sept 30th.

d) All erosion and sediment control measures will be installed prior to the commencement of the work and as required or as directed by the Engineer, throughout the work.

e) Existing vegetation will be maintained wherever feasible.

f) Off takes, ditches and dykes will be used to divert runoff flow into vegetated areas away from watercourses and wetlands.

The following erosion control measures will be used to minimize and/or prevent erosion.

- Topsoil;
- Mulching;
- Hydroseeding;
- Jute Mats;
- Riprap;
- Sod;
- Trees and Shrubs.

These erosion control measures are described in detail below.

5.7.1.1 Topsoil

Description

Topsoil is generally a mixture of soil, sand and organics used in conjunction with hydroseed to provide cover for erodible material. Topsoil sustains and promotes the growth of vegetation and therefore aids in the reduction of erosion.

Topsoil must be used in conjunction with other forms of erosion control in order to effective.

Concerns

The concerns and potential impacts associated with topsoil application include:

- Erosion of un-established areas;
- Sedimentation of watercourse/wetlands;
- Impacts to fish and fish habitats; and
- Accidental spills and fuels leaks.

Required Permits

None identified.

General Protection Measures

a) Areas to be topsoiled will be shaped and completed to the final grade.

b) Areas to be topsoiled will be scarified or otherwise loosened to a depth of 50 mm within 1 day preceding the placement of topsoil.

c) Topsoil should be applied evenly and uniformly on the prepared areas to a depth of 100 mm (+/- 25mm).

d) Large clods, roots, stones and rocks larger than 75 mm shall be removed from the slopes.

e) Once topsoil has been applied and is free of roots, stones, etc, it shall be brought to an even surface meeting the required grade.

Topsoil on backslope. Roots being removed by hand.

Back-dragging topsoil.

f) Topsoil stockpiles shall be located a minimum of 30 m away from a watercourse/wetland, where they will not block the natural drainage or be a potential source of siltation of watercourses/wetlands.

g) Topsoil stockpiles will be mulched in accordance with Section 5.22 – Work Progression.

h) Sediment control fence shall be installed around the stockpile to contain sediment in runoff.

i) Upon completion of the topsoil placement, the area must be stabilized with either hydroseed or mulch, according to the contract documents and Section 5.7.1.2 and 5.7.1.3.

j) Erosion control and sediment structures must be installed as outlined in the contract document and in accordance with Section 5.7.2.

k) Topsoiled areas shall be monitored and maintained from the time of application until the vegetation is established as an effective form of erosion and sediment control.

l) Topsoil shall be inspected prior to, during and after any rainfall events for signs of erosion.

m) All deficiencies noted during an inspection of the topsoiled area, will be repaired immediately.

n) Topsoiling is not permitted after the week of Sept 30th unless approved by NBDOT.

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.1.2 Mulching

Description

Mulching provides a temporary cover for exposed soils to reduce erosion. Mulch is applied to slopes and other exposed ground to prevent erosion and siltation of watercourses. Mulching is also used in conjunction with hydroseeding to increase the soils temperature, retain moisture and reduce compaction which promotes vegetation growth.

Mulch can be one of the following;

- Unprocessed hay or straw in rolls or bales;
- Processed (i.e. pre-packaged bags) shredded straw, newsprint and/or cotton fibres; or
- Shredded trees and (bark or woody material).

Concerns

The concerns and potential impacts associated with mulching include:

- Erosion and sedimentation as result of
  - Poor work progression;
  - Improper application (i.e. length of exposure and timing of mulching); and
  - Lack of maintenance of mulched areas.

Required Permits

- A WAWA permit is required for the withdrawal of water from a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Exposed areas will be mulched in accordance with Section 5.22 – Work Progression.

c) Mulch will be reasonably free of noxious weeds and other undesirable material.

d) Mulch will be kept dry at all times until applied.

e) Areas to be mulched will be shaped and completed to the final grade prior to the application of mulch.

f) Mulching shall be carried out according to the Contract documents or as directed by the Engineer.

g) A binder (tackifier) will be applied to the mulched area according to the manufacturer recommended application rate, to ensure that the mulch remains in place and is not washed or blown away.

h) In cases where a small area requires temporary stabilization mulch can be applied by hand and must be applied evenly, uniformly and at a thickness that will ensure effective protection against erosion and sedimentation.

i) Mulch shall be monitored and maintained from the time of application until the vegetation is established as an effective form of erosion and sediment control.

j) Mulch shall be inspected prior to, during and after any rainfall event.

k) Damaged mulched areas and/or bare spots (due to wind, water or other causes) will be repaired immediately.

l) Mulching will be carried out in accordance with Section 5.22 – Work Progression.

m) Mulch is temporary; therefore areas will be permanently stabilized as soon as possible.

n) If water is required, water trucks shall not be driven into the watercourse/wetland. And they shall not be driven down to the edge of the watercourse/wetland unless the area is firm enough so that action does not cause rutting.

p) Water withdrawal from streams shall be limited as to maintain sufficient flow and depth to ensure that fish habitat is protected, and fish passage is maintained (*e.g.,* so as not to noticeably reduce the flow of the stream). Water withdrawal should not exceed 37.5% of the July, August and September mean flow. A non fish habitat or a large pond or lake is a preferred water source during the summer months as stream flows are reduced.

q) When pumping the watercourse, hoses must be fitted with screens according to DFO's "*Freshwater Intake End-of-Pipe Fish Screen Guideline*."

r) Mulch shall be maintained in a functional condition from the time of application until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions.

s) Prior to winter shutdown, an onsite meeting shall be held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control. Any deficiencies are to be addressed prior to spring runoff.

Mulching – Application by mechanical means.

Proper coverage.

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

For a Construction Project, the Contractor is responsible for obtaining the required permits.

For an OMR Project, NBDOT is responsible for obtaining the required permits.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.1.3 Hydroseeding

Description

Hydroseeding is carried out to establish permanent vegetation growth in areas where the ground is exposed, in order to prevent erosion. Hydroseeding is a mixture of seed, fertilizer, hydraulic mulch, binder, green dye and water.

There are five types of hydroseeding;

- Hydroseeding A – Roadside mix with no mulch;
- Hydroseeding AM – Municipal mix with no mulch;
- Hydroseeding B – Roadside mix with mulch;
- Hydroseeding BM – Municipal mix with mulch; and
- Hydroseeding C – Roadside mix with bonded fibre matrix.

In general, Hydroseeding A & B (roadside mixes) are used on all construction and OMR activities. Hydroseeding AM & BM (municipal mixes) are used inside municipalities and for residential lawns. Hydroseeding C is used on steep slopes.

Concerns

The concerns and potential impacts associated with the hydroseeding include:

- Erosion & sedimentation due to
    - Poor work progression (i.e. length of exposure and timing of seeding);
    - Improper application rates;
    - Lack of maintenance of hydroseeded areas;
- Areas to be hydroseeded shall be back dragged or otherwise left in a loosened condition, free of ruts, ridges and materials such as weeds, sticks, roots, large rocks which would impede growth of seed mix and mowing; and
- Hydroseeding will be carried out as per the design or as directed by the Engineer.

Required Permits

- A WAWA permit is required for the withdrawal of water from a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Hydroseeding will not be carried out on harden, crusted or eroded soil.

c) Areas to be hydroseeded will be shaped or completed to the final grade prior to hydroseeding.

d) Hydroseeding must be completed within 48 hours of surface preparation.

e) Seed material will be kept dry at all times until applied.

f) Large areas requiring seeding will be done by mechanical means.

Hydroseeding – Application by mechanical means

g) Small areas, requiring hydroseeding may be hand sowed using an available commercial seed mix following manufactures directions.

h) Hydroseed will be applied evenly and uniformly. The use of green dye in the mix allows for visual inspection of the coverage.

Proper coverage.

i) Application rates for hydroseeding are noted in the Standard Specifications under Item 614 – Hydroseeding.

j) After Labour Day, only Hydroseeding B shall be used.

k) Hydroseeding must not be done after the week of September 30th. Stabilization is required beyond this date and shall be carried out in accordance with Section 5.7.1.2 - Mulching.

l) Hydroseeding will not be carried out during windy conditions or during heavy rainfall.

m) Hydroseed shall be monitored and maintained from the time of application until vegetation is established as an effective erosion and sedimentation control.

n) Hydroseeding shall be inspected prior to, during and after any rainfall event.

o) Damaged hydroseeded areas, areas that do not receive proper coverage and areas with bare spots will be repaired immediately.

p) Hydroseeding will be carried out in accordance with Section 5.22 – Work Progression.

q) Water withdrawal from streams shall be limited as to maintain sufficient flow and depth to ensure that fish habitat is protected, and fish passage is maintained (e.g., so as not to noticeably reduce the flow of the stream). Water withdrawal should not exceed 37.5% of the July, August and September mean flow. A none fish habitat or a large pond or lake is a preferred water source during the summer months as stream flows are reduced.

r) When pumping the watercourse, hoses must be fitted with screens according to DFO's "*Freshwater Intake End-of-Pipe Fish Screen Guideline*."

s) Hydroseeding shall be maintained in a functional condition from the time of application until the work is completed.

t) Prior to winter shutdown, an onsite meeting shall be held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control. Any deficiencies are to be addressed prior to spring runoff.

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

For a Construction Project, the Contractor is responsible for obtaining the required permits.

For an OMR Project, NBDOT is responsible for obtaining the required permits.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.1.4 Jute Mats

Description

Jute mats are manufactured from jute yarn. This yarn is woven into a mesh blanket and contains small openings to allow grass growth. Jute mats can be used in ditches or on slopes to minimize erosion until the areas have been re-vegetated. Jute mats are usually used in conjunction with hydroseeding.

Concerns

The concerns and potential impacts associated with jute mats include:

- Poor work progression (i.e. length of exposure and timing of jute mate placement);
- Improper installation of jute mats; and
- Lack of maintenance of jute mats.

Required Permits

None identified.

General Protection Measures

a) Jute mats will be installed as per the design documents or as directed by the Engineer.

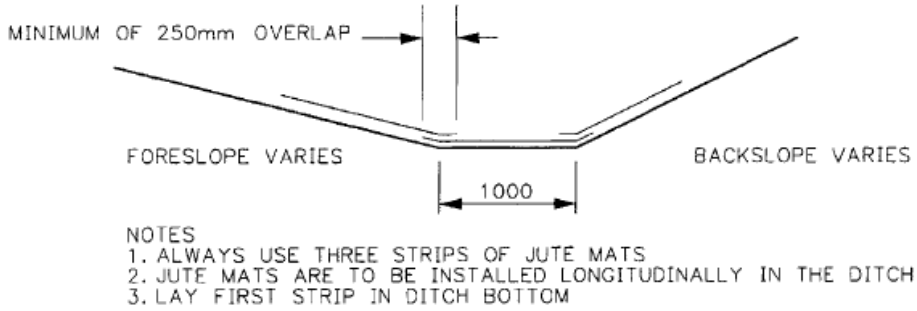
b) Only install jute mats if there is enough growing season left for vegetation to establish. If it is late in the season, keep erosion control structures in and mulch the entire area.

c) Areas to receive jute mats will be shaped and completed to the final grade.

d) Any erosion control structures in the ditch must be removed prior to installing the jute mats.

e) Jute mats will be installed along the full length of the prepared ditch and/or slope and secured in place with staples.

f) For ditch applications, the following applies:
- Three (3) strips of jute mats must be used.
- The first strip must be installed in the bottom of the ditch.
- The next two strips are installed on the foreslope and backslope of the ditch and will overlap the bottom strip by 250 mm.

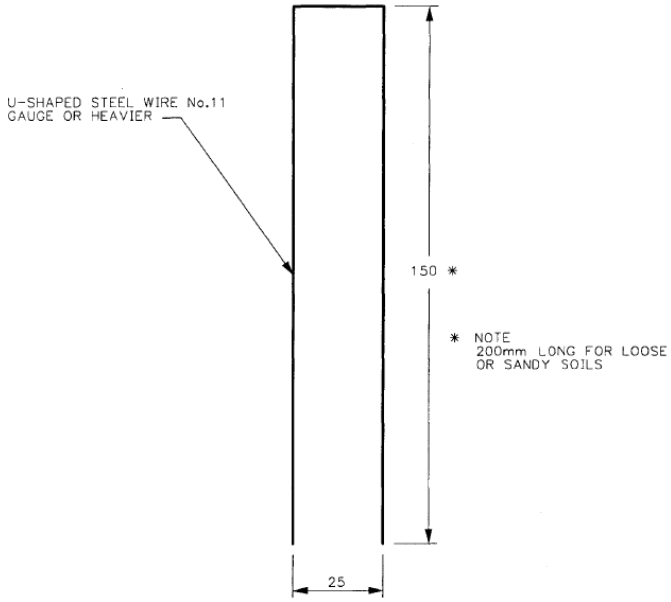


Ditch Application

g) For slope applications, the following applies:
- Enough strips of jute mat will be use to cover the required area.
- Strips will be overlapped by 250 mm.

h) Once the jute mats are installed, they will be pinned to the ground with staples to prevent movement.

i) Areas with jute mats must be hydroseeded immediately in accordance with Section 5.7.1.3 – Hydroseeding.



Staple Detail

j) Areas with jute mats shall be inspected prior to, during and after any rainfall event.

k) Any damaged areas will be repaired immediately by covering the damaged area with a strip of jute mat and stapling it into the ground.

l) Jute mats shall be maintained in a functional condition from the time of installation until the work is completed and the vegetation has established.

Jute mat installation in ditch.

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.1.5 Riprap

Description

Riprap is often used to control erosion on long steep slope/ditches where water volume and velocity are expected to be high and vegetation is difficult to establish. It can also be used where seepages are exposed on slopes as well as to stabilize slope failures. Riprap is also used as protection around culverts and in watercourse channels. Riprap is considered a permanent erosion control measure.

Concerns

The concerns and potential impacts associated with the use of riprap include:

- Erosion and sedimentation as a result of:
  - Improper sizing of riprap leading to displacement of material and exposed areas, which are susceptible to erosion; and
  - Improper placement of riprap leading to displacement and slope failures.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Riprap will be properly sized based on the requirements for the intended use and the application.

c) The required size of riprap will be placed according to the designs or as directed by the Engineer.

d) Riprap will not be obtained from a source that has the potential to be acid generating.

e) Slopes, ditches and channels to be riprapped will be constructed as per the design or as directed by the Engineer.

f) Where required according to the contract documents or as directed by the Engineer, geotextile will be placed and pinned to the ground to prevent slippage prior to placement of riprap. Note: Geotextile is not to be used in or on the banks of flowing fish bearing watercourses.

g) Where multiple strips of geotextile are required, ensure that the strips are laid in an overlapping fashion.

Placement of riprap on backslope.

h) Riprap protection will be placed to the toe of the slope to prevent the material from sliding down the foreslope.

i) Riprap protection will be placed to the bottom of the backslope to prevent the material from sliding down the backslope.

j) Excavated material must be disposed of at least 30 m away from the watercourse/wetland.

k) Waste material will be stabilized.

l) Riprapped areas will be maintained from the time of installation until the completion of the project.

m) Riprap shall be inspected prior to, during and after any rainfall event.

n) Any damaged areas are to be repaired immediately.

o) If riprap is to be placed within 30 m of a watercourse or wetland, a WAWA permit will be obtained.

p) All of the conditions in the WAWA permit will be followed.

Riprap used as culvert protection and channel protection.

Checklist/Reminders

See Appendix A: Section 5.7- Erosion and Sediment Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.1.6 Sod

Description

Sod is mature lawn that has been cultivated; cut into thick squares or rolls with the underlying soil and roots. Sod may be used in late season for small areas where there is not sufficient time for hydroseeding but “instant” stabilization is required. Sod is considered a permanent erosion control measure.

Concerns

The concerns and potential impacts associated with the placement of sod include:

- Erosion and sedimentation as a results of:
  - Poor work progression (i.e. timing for placement of sod);
  - Improper installation of sod; and
  - Lack of maintenance of sodded areas.

Required Permits

None identified.

General Protection Measures

a) Sod will only be installed if there is enough growing season left for vegetation to establish.

b) Areas to receive sod will be shaped and completed to the final grade.

c) The area to receive sod will be topsoiled in accordance with Section 5.7.1.1 – Topsoil.

d) Fertilizer will be placed prior to the placement of sod.

e) The entire area will be pre-wet prior to placing sod.

f) Strips of sod will be laid over the area such that adjoining rows of sod are staggered to ensure that the joints don't line up (brick pattern).

g) When placing sod on a slope, the sod must be stapled or staked to ensure that it remains in place.

h) Once sod is placed, it must be watered thoroughly.

i) Sodded areas must be watered daily until the area is established.

j) Sod shall be monitored and maintained from the time of installation until the area has become established as an effective erosion and sediment control.

k) Sod shall be inspected prior to, during and after any rainfall event.

l) Damaged and/or dead areas will be repaired and/or replaced immediately.

Sod prior to installation

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.1.7 Trees and Shrubs

Description

Trees and Shrubs are another method used to stabilize slopes. The root system of trees and shrubs penetrates deep into the subsurface soil, providing increased soil stability. Trees and shrubs are also used to provide shade to watercourses, which lowers the temperature of the water to improve fish habitat.

Concerns

The concerns and potential impacts associated with the use of trees and shrubs include:

- Erosion and sedimentation as a result of:
  - Poor work progression (i.e. timing for planting trees and shrubs);
  - Improper planting of trees and shrubs; and
  - Improper maintenance of planted trees and shrubs.

Required Permits

None identified.

General Protection Measures

a) Trees and shrubs will only be planted if there is enough growing season left for vegetation to establish.

b) Areas to be planted will be shaped and completed to the final grade.

c) Trees and Shrubs will be planted according to suppliers recommendations.

d) Trees and shrubs shall be watered as per the supplier's recommendation.

e) Trees and shrubs shall be monitor and maintained from the time of planting until they become established.

f) Dead trees and shrubs shall be replaced.

Trees and shrubs planted along watercourse channel.

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.1.8 Other Types of Erosion Control

Description

Other materials that may be used for erosion control are;

- Plastic Film (polyethylene)
  - Plastic film (polyethylene) may be placed on areas where immediate protection is required. Generally plastic is used for temporary stream diversions although it can also be used to cover small stockpiles.

- Gravel
  - Gravel may be used to cover erodible material. Gravel must be clean to ensure it does not cause sedimentation.

- Gabions
  - Gabions may be specified on steep slopes where stability is a concern.

Concerns

Each material noted has benefits and challenges and must be reviewed prior to installation.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) The type of material used will depend on a number of factors such as;

   - Length and grade of slope;
   - Soil conditions;
   - Water source (rainwater, sheet flow, seepages); and
   - Volume of water expected.

b) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

Checklist/Reminders

None Identified.

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.2 Sediment Control

Description

Sediment is the fine soil material that is generated by erosion. Sedimentation is the transportation and deposition of sediment as a result of erosion. Sediment control measures are used to contain, control and filter sediment-laden water prior to discharge. If properly installed and maintained, sediment control measures can reduce the effects of sedimentation.

Once soil has become exposed, there is potential for the sediment to enter a watercourse and/or wetland. The following are some protection measures utilized by the Department to prevent sedimentation.

- Sediment Control Fence;
- Sediment Ponds;
- Erosion Control Structures;
- Flume (Slope Drain).

These sediment control measures are described in detail below.

Concerns

The concerns and potential impacts associated with activities potentially causing sedimentation include:

- Sedimentation of watercourses can negatively affect fish habitat;
- Suspended solids can abrade or clog fish gills causing fish to die;
- Particles can settle in the spawning beds smothering/killing incubating eggs;
- Turbidity (lack of water clarity) decreases the amount of sunlight that can reach the algae and aquatic plants which reduces the food supply for aquatic life;
- Sediment clogged gravel substrate will leave the area unacceptable for fish spawning;
- Sediment deposited in the watercourse channel can decrease the water depth which increases the water temperature and may result in unacceptable water temperature for fish habitat; and
- Fish feeding may be affected by smothering of food sources, or by reduced visibility in some species due to the turbidity level.

5.7.2.1 Sediment Control Fence

Description

Sediment Control Fence is a geotextile supported on posts in order to handle the stress from sediment loading. It is a temporary barrier for containing sediment in sheet runoff. It is used to protect watercourses and wetlands from sediment contamination. Sediment control fence filters suspended sediment from sheet runoff. The sediment accumulates behind the fence for future removal and/or stabilization.

Concerns

The concerns and potential impacts associated with the use of sediment control fence are sedimentation of watercourses and wetlands include:

- Poor work progression (i.e. improper timing of installations);
- Improper installation, inspection, maintenance and repair of the fence.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Sediment control fence will be installed prior to ground disturbance.

c) Sediment control fence will be installed downslope of disturbed areas.

d) Sediment control fence will be installed along the upland edge of the undisturbed vegetation of a watercourse/wetland in order to intercept and filter sheet runoff before it enters a watercourse/wetland.

e) Sediment control fence will not be installed on top of a hill or in a ditch as a sediment check dam.

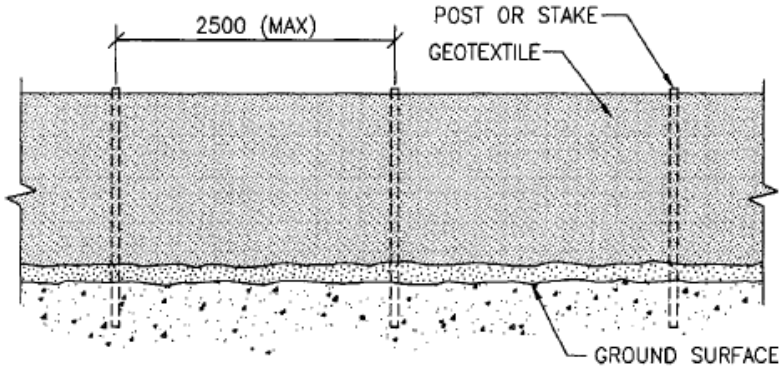
f) Sediment control fence will not be installed across areas with a concentrated channel flow.

g) Sediment control fence will be located in a continuous fashion, perpendicular to the direction of flow.

h) Sediment control fence will be used in the following situations/locations:

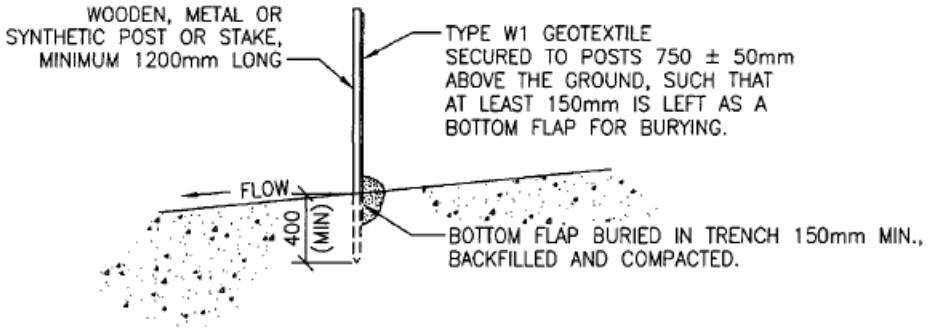
- To delineate buffer zones;
- Along the contour of exposed slopes;
- At the toe of embankments;
- The downhill side of large cut area; and
- Adjacent to watercourses/wetlands.

i) Stakes/posts will be wooden, metal or synthetic, a minimum of 1200 mm long and shall be anchored as least 400 mm below the ground surface and located no more than 2500 mm apart.

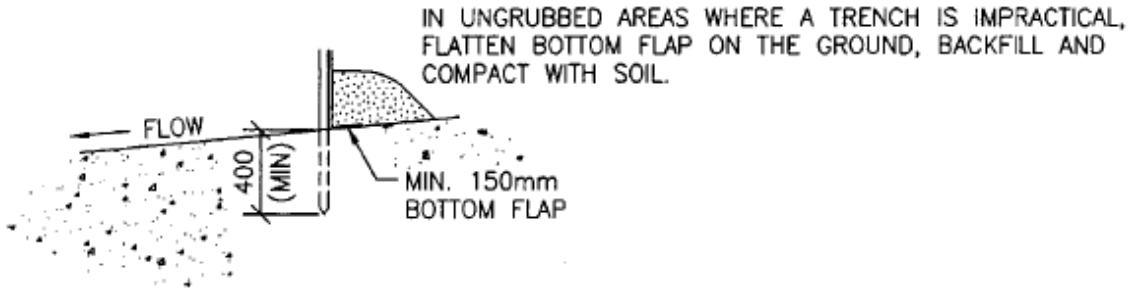


Stake/post details.

j) Sediment control fence will be installed such that it extends 700 to 800 mm above the ground surface and a minimum of 150 mm below the surface in a trench. In cases where the trench is impractical, such as in ungrubbed area, the bottom flap shall be flattened along the ground. In either case, earth shall be compacted over the bottom flap so that no flow can pass under the fence.



Sediment control fence installation in grubbed areas.



Sediment control fence installation in ungrubbed areas.

k) If more than one roll of fencing is required, the end shall be rolled together to form one continuous line of fencing.

Ends rolled together.

Sediment passing around end of fence.

l) Posts will be positioned on the downstream side of the installation. This minimizes tearing from sediment loading.

m) The geotextile shall be securely fastened to the posts.

n) Sediment must be removed after it has accumulated to a level not exceeding ½ the height of the fence.

o) Sediment that has been removed must be disposed of at least 30 m away from the watercourse/wetland.

p) Sediment control fence shall be inspected prior to, during and after any rainfall event.

q) Sediment control fence shall be inspected daily during embankment construction to ensure embankment materials do not damage fence.

r) Any deficiencies shall be repaired immediately.

Large rocks have buried the fence allowing sediment to pass over.

s) Repairs to the geotextile shall be done at the posts only.

t) If a section of the fence is torn, it will be replaced with a new section.

u) If repairs to existing fence are impractical, another line of fencing will be installed.

Proper installation of sediment control fence at toe of fill.

Sediment control fence not properly installed

v) Sediment control fence shall be removed once permanent stabilization has been carried out and it is no longer required.

w) Prior to removal of the sediment control fence, any remaining sediment shall be removed and disposed of in accordance with Section 5.20 – Waste Management.

x) Once the sediment fence is removed, all exposed areas resulting from of the removal will be stabilized.

y) Sediment control fences shall be maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and as per the WAWA permit conditions.

z) Prior to winter shutdown, an onsite meeting shall be held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control. Any deficiencies are to be addressed prior to spring runoff.

aa) Permission must be obtained in order to dispose of sediment onto a private property.

bb) Disposal areas must be stabilized.

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.2.2 Sediment Ponds

Description

Sediment ponds are constructed to control and contain sediment-laden runoff water prior to discharge into watercourse or wetland. Sediment settles to the bottom of the pond rather than flowing in to the watercourse or wetland. Clean water flows out of the pond through an outlet or the turbid water can be pumped and discharged to a stable area capable of filtering the effluent before reaching a watercourse/wetland.

Concerns

The concerns and potential impacts associated with the use of sediment ponds include:

- Sedimentation of watercourses and wetlands as a result of:
  - Improper work progression; and
  - Improper sizing, construction, inspection, maintenance and repair of sediment ponds.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

- Permission from the land owner to pump water onto private property must be obtained prior to pumping.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Sediment ponds will be designed by an Engineer, and will be sized with sufficient capacity based on the size of the drainage area being serviced.

c) As a rule of thumb, for every hectare of exposed construction area, sediment basins or traps having a total storage volume of at least 190 cubic metres shall be constructed to intercept overland flow.

d) Sediment ponds will be constructed as per the design.

e) Where practical, contributing drainage areas shall be subdivided into smaller areas and multiple sediment ponds shall be installed.

f) Sediment ponds will be located to ensure that there is a minimum of 30 m between the pond and the nearest watercourse or wetland.

g) Sediment ponds will be constructed to the required dimensions.

h) A safety fence must be installed around the perimeter of the pond.

i) The safety fence will be highly visible to pedestrian and vehicular traffic.

j) Exposed slopes or berms will be stabilized with plastic, geotextile, mulch or rock.

k) Existing vegetation will be maintained between the pond and the watercourse or wetland to allow the water that is discharged from the pond to filter through the vegetation prior to entering the watercourse or wetland.

l) Sediment ponds shall be inspected prior to, during and after any rainfall event.

m) Any deficiencies shall be repaired immediately.

n) If heavy rain is forecasted, sediment ponds will be dewatered and cleaned out to ensure it can handle the potential rainfall and runoff.

o) Ponds requiring dewatering shall be pumped in such a manner that sediment-laden water is not introduced into a watercourse or wetland. Dewatering shall not increase the suspended solids level of a receiving watercourse or wetland more than 25 mg/L above background levels. The effluent and receiving waters shall be monitored to verify the effectiveness of the suspended solids treatment.

p) If there is little or no vegetation available to filter the discharged water, the water will be pumped into a sediment filter bag.

q) Sediment from ponds shall be removed when the sediment level reaches half the height of the spillway.

r) Sediment removed from the pond must be disposed of at least 30 m away from the watercourse or wetland.

s) When the sediment pond is no longer required, the pond should be backfilled, shaped and stabilized.

t) A WAWA permit will be obtained for work within 30 m of a watercourse or wetland.

u) Sediment ponds shall be maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions.

v) Prior to winter shutdown, an onsite meeting shall be held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control. Any deficiencies are to be addressed prior to spring runoff.

w) Disposal area must be stabilized.

Large Sediment Pond with Safety Fence

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For a Construction Project, NBDOT will be responsible to schedule all meetings required with NBENV and DFO. In addition, NBDOT will monitor or make arrangements to have the TSS level monitored when required.

For an OMR Project, NBDOT will be responsible for all of the above.

5.7.2.3 Erosion Control Structures

Description

Erosion control structures (ECS) are temporary structures installed in ditches in order to slow concentrated water flow and to allow for any sediment to settle out of the runoff before discharging into a watercourse or wetland.

There are four types of erosion control structures.

- Type A – Spillway Structure
  - Type A structures are used as spillways for sediment ponds as well as used at the cut/fill transition where runoff leaves the ditch to enter a watercourse.
- Type B – Riprap Structure
  - Type B structures are used in ditches having a grade over 8 % with medium to high flows as well as in rock ditches.
- Type C – Straw/Hay bale Structure
  - Type C structures are used in ditches having a grade up to 8 % and/or low flows (except in rock ditches).
- Type D – Straw/Hay bale Structure (alternate design)
  - Type D structures can also be used in ditches having a grade up to 8 % and/or low flows (except in rock ditches).

Erosion control structures are to be installed at intervals of 200 m ÷ the ditch grade %. For example, if the ditch grade is 2%, then the recommended spacing is 200 m ÷ 2 or 100 m. The spacing should decrease if the soil has a high silt content (over 50% passing the 75 µm sieve)

Concerns

The concerns and potential impacts associated with the use of ECS's include:

- Sedimentation of watercourses and wetlands as a result of:
  - Improper work progression; and
  - Improper installation, inspection, maintenance and repair of ECS's.

Required Permits

None Identified

General Protection Measures

a) Erosion control structures will be installed as the work progresses, not after the work is complete.

b) Erosion control structures will be installed at the locations shown in the design or as directed by NBDOT.

Type A Structure

a) Type A Structures are usually installed in completed ditches and/or sediment ponds.

b) Structures should be installed in the dry.

c) For Sediment ponds;
- Construct berm (dyke) and/or excavate a sediment pond large enough to contain a large volume of water. Excavated material can be used to build the berm around the pond.

d) For Ditch purposes;
- Construct berm (dyke) large enough to contain runoff in the ditch.

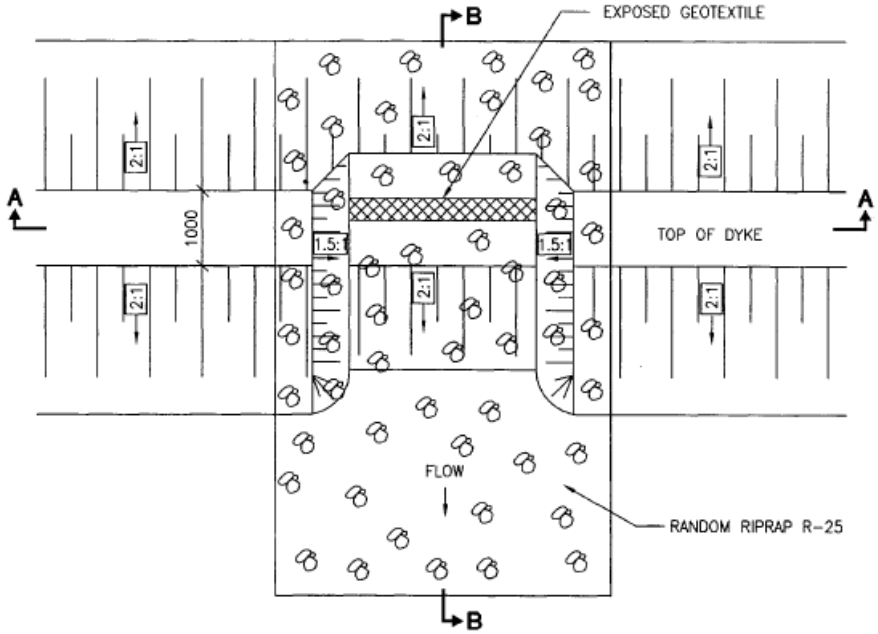
e) For the spillway, excavate a 3 m apron on the downstream end of the structure. (approximately 300 mm deep)

f) Build the spillway out of riprap to a height that is approximately 300 mm below the top of the berm.

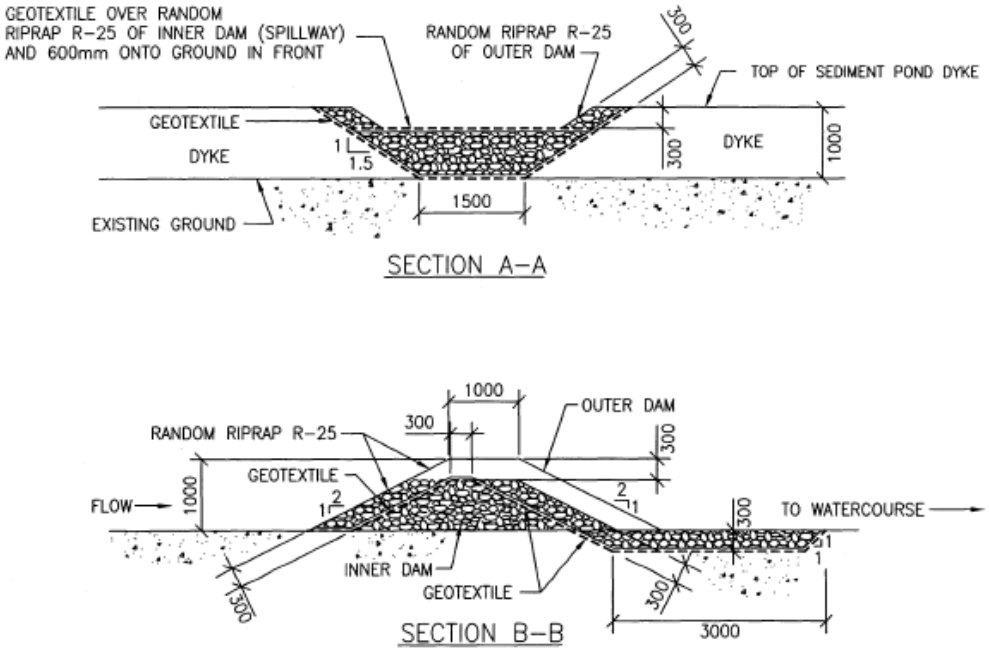
g) Lay geotechnical fabric on the apron and up over the riprap spillway and down the other side. The fabric should extend approximately 300-400 mm beyond the spillway.

h) Cover the fabric with riprap but do not cover the top of the spillway.

i) The centre of ECS is low to allow for water to spill over.



Type A Erosion Control Structure – Plan View



Type A Erosion Control Structure – Sections

Completed Type A Erosion Control Structure

Type B Structure

a) Type B Structures are usually installed in completed ditches.

b) Structures should be installed in the dry

c) Construct sediment pit.

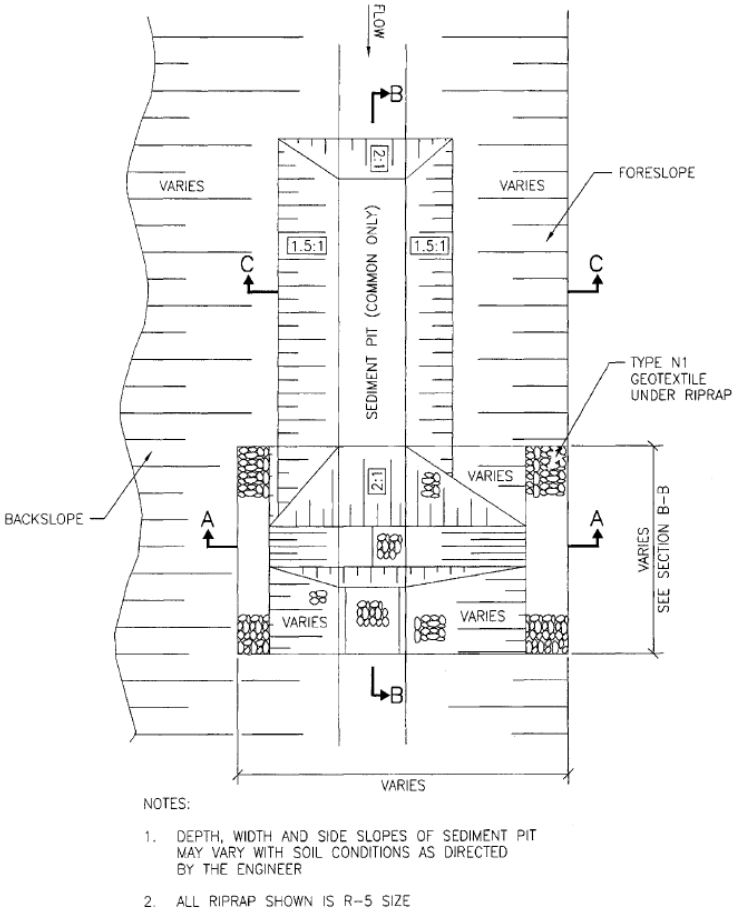
d) Lay geotechnical fabric on ground right to the edge of the sediment pit. Make sure the fabric extends far enough to cover the apron.

e) Cover the exposed fabric with riprap and build the berm (dyke) and apron.

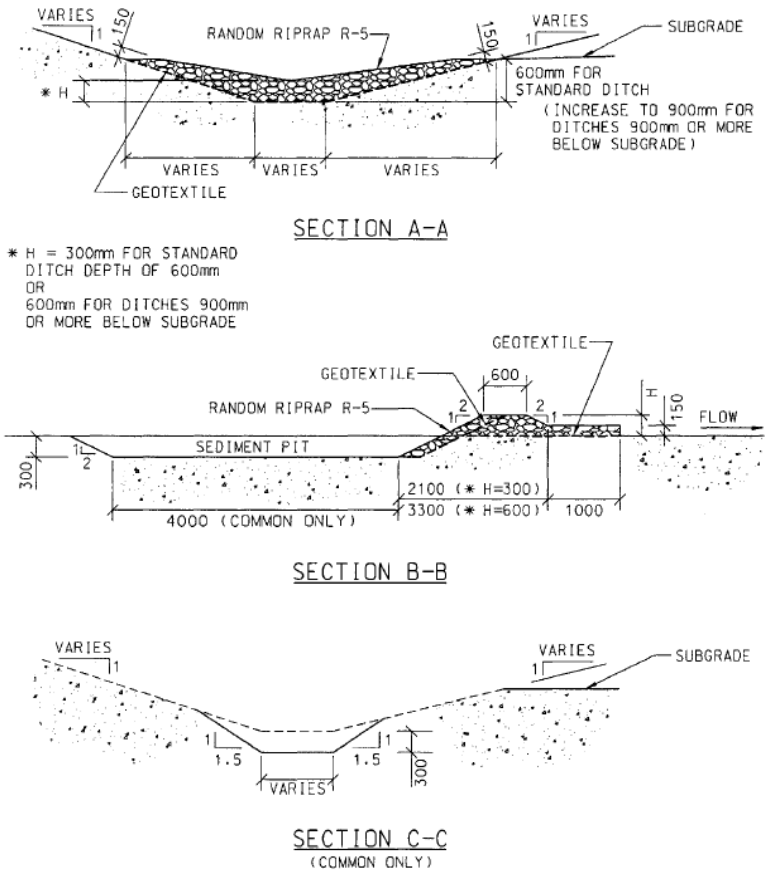
f) Place geotechnical fabric on the upstream side of the berm (dyke) and drape the fabric down into sediment pit.

g) To complete the structure, cover the exposed fabric with riprap.

h) The centre of ECS is low to allow for water to spill over.



Type B Erosion Control Structure – Plan View



Type B Erosion Control Structure – Sections

Completed Type B Erosion Control Structure

Type C Structure

a) Type C Structures are generally installed as road construction or ditching activities progress. Ditches do not have to be completed in order to place these types of erosion control.

b) Structures should be installed in the dry.

c) Bales must be “keyed” into foreslope, backslope, and the bottom of the ditch, and built to ensure that the water flows over the center of the dam and not around either end.

d) If the trench excavation is larger than the bales, the remaining area must be backfilled and compacted.

e) Care should be taken to keep the bale twine from contacting ground. Twine will rot faster when in contact with the ground.

f) Bales should be set such that they are 450 mm high.

g) Gaps between the bales should be packed with loose straw/hay to prevent seepage.

h) The centre of ECS is low to allow for water to spill over. This can be done by either embedding the centre bale deeper into the ground or by rotating the bale to its least dimension.

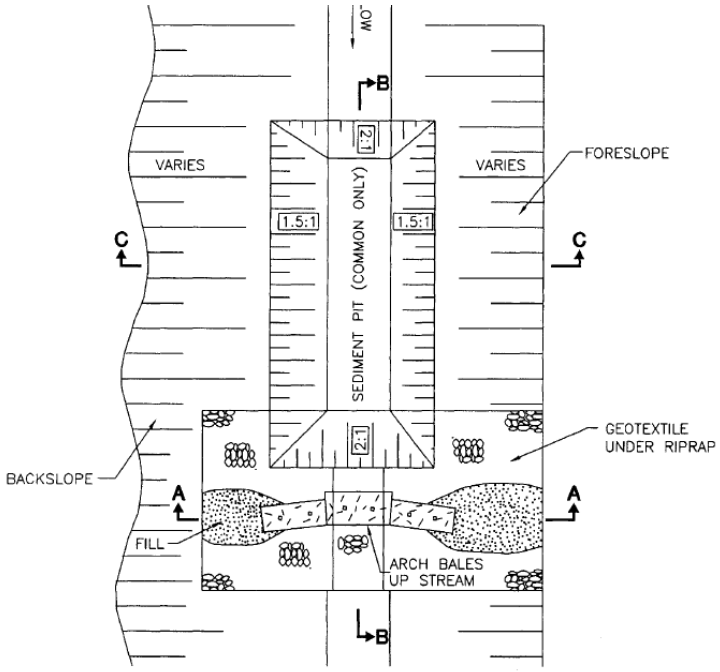
i) Stakes must be a minimum of 300 mm into the ground. The stakes should be flush with the top of the bale.

j) Construct sediment pit.

k) Build Common Excavation berm (dyke) on both sides of bales to contain water.

l) Place geotechnical fabric over the bales and CE berms (dykes).

m) Place riprap over fabric on both sides of structure to help hold fabric down and hold bales in place.

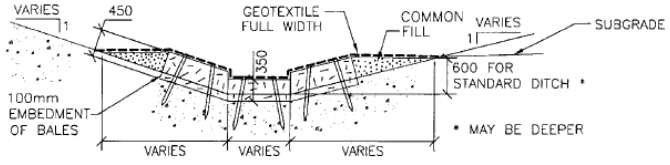


NOTES: 1. NUMBER OF HAY/STRAW BALES REQUIRED VARIES DEPENDING ON BACKSLOPE AND FORESLOPE, AND DITCH WIDTH AND DEPTH.

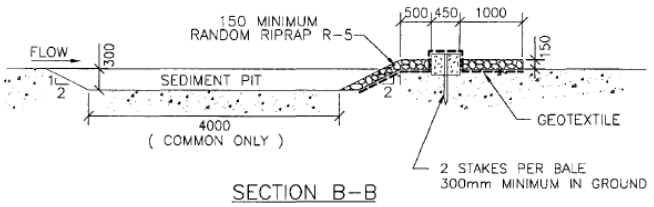
2. DEPTH, WIDTH AND SIDE SLOPES OF SEDIMENT PIT MAY VARY WITH SOIL CONDITIONS AS DIRECTED BY THE ENGINEER.

3. THE GEOTEXTILE MUST BE PLACED OVER THE BALES AND DYKES AND EXTEND ALONG THE GROUND IN FRONT AND BACK OF THIS DAM, AND BE HELD IN PLACE BY THE RIPRAP R-5.

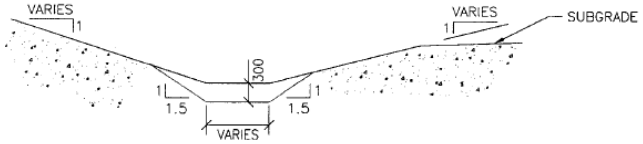
Type C Erosion Control Structure – Plan View



SECTION A–A



SECTION B–B



SECTION C–C
(COMMON ONLY)

Type C Erosion Control Structure – Sections

Completed Erosion Control Structure C

Type D Structure

a) Type D Structures are generally installed as road construction or ditching activities progress. Ditches do not have to be completed in order to place these types of erosion control.

b) Structures should be installed in the dry.

c) Bales must be “keyed” into foreslope, backslope, and the bottom of the ditch, and built to ensure that the water flows over the center of the dam and not around either end.

d) If the trench excavation is larger than the bales, the remaining area must be backfilled and compacted.

e) Bales should be set such that they are 450 mm high.

f) Gaps between the bales should be packed with loose straw/hay to prevent seepage.

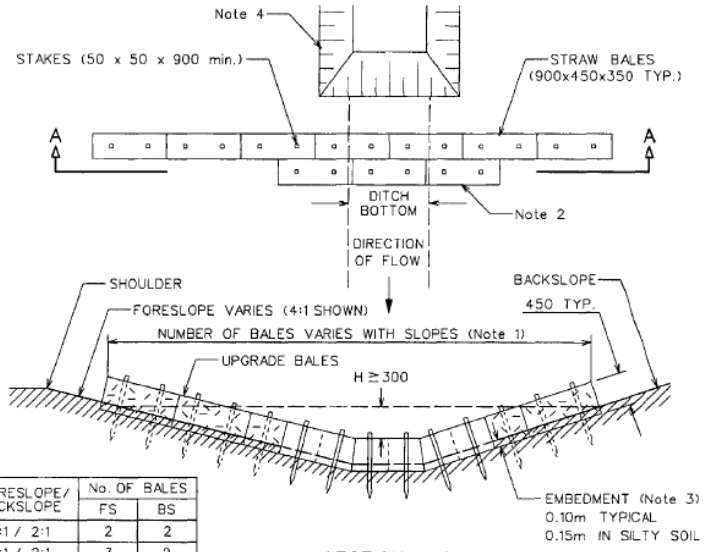
g) Bale twine should not come in contact with ground.

h) Centre of ECS is low to allow for water to spill over.

i) Stakes must be a minimum of 300 mm into the ground. The number of bales required is dependent on the grades of the foreslope and backslope. The flatter the grade, the more bales are required.

j) Stagger joints of downstream bales.

k) Construct sediment pit.



FORESLOPE/ BACKSLOPE	No. OF BALES	
	FS	BS
2:1 / 2:1	2	2
3:1 / 2:1	3	2
3:1 / 3:1	3	3
4:1 / 3:1	4	3
6:1 / 3:1	5	3
WIDE SWALES	AS REQ'D	

NOTES:

1) SEE TABLE FOR TYPICAL NUMBER OF UPSTREAM BALES WHICH ARE REQUIRED TO ENSURE MIN. 300mm FOR HEIGHT 'H' (FROM TOP OF BALES AT DITCH CENTRE TO POINT WHERE HIGHEST BALES INTERCEPT SLOPES.)
2) INSTALL MINIMUM OF 3 BALES DOWNGRADE AS REINFORCEMENT. JOINTS OF DOWNGRADE BALES SHOULD BE STAGGERED FROM UPSTREAM BALES.
3) IF TRENCH FOR BALE EMBEDMENT IS EXCAVATED WIDER THAN BALES, BACKFILL WITH EXCAVATED MATERIAL.
4) THE SEDIMENT PIT OF STANDARD DWGS 605-5 AND 605-6 IS REQUIRED FOR TYPE 'D' STRUCTURE.

Type D Erosion Control Structure – Plan and Section

Completed Type D Erosion Control Structure

For all Erosion Control Structures

a) ECS shall be maintained from the time of installation until the area has become re-vegetated and/or until jute mats are installed.

b) Retained sediment will be removed when it reaches a level 300 mm below the low point of the Type A structure and 100 mm below the low point of Type B, C and D structures.

c) Removed sediment must be disposed of at least 30 m away from a watercourse/wetland.

d) Erosion control structures shall be inspected prior to, during and after any rainfall event.

e) Any deficiencies shall be repaired immediately.

f) The erosion structures shall be removed when no longer required.

g) Once an ECS removed, any remaining sediment shall be removed and disposed of at least 30 m away from a watercourse or wetland.

h) The area where the ECS was removed will be stabilized.

i) Erosion control structures shall be maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions.

j) Prior to winter shutdown, an onsite meeting shall be held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control. Any deficiencies are to be addressed prior to spring runoff.

k) Permission of the landowner must be obtained in order to dispose of sediment onto a private property.

l) Disposal area must be stabilized.

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.2.4 Flume (Slope Drain)

Description

Flumes (slope drains) are channels or ditches utilized to drain water from the top of a slope to the bottom. These types of structures minimize erosion on a slope by concentrating the water to specific area. Flumes can be used in conjunction with cutoff ditches.

Flumes can be constructed from various types of material including metal and concrete but in general they are typically constructed with geotextile and riprap.

Flumes are permanent structures.

Concerns

The concerns and potential impacts associated with the use of flumes include:

- Sedimentation of watercourse or wetlands as a result of;
  - Improper sizing and construction of the flume.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Flumes will be sized with sufficient capacity based on the size of the drainage area being serviced.

c) Flumes will be constructed as per the specified dimensions.

d) Where practical, contributing drainage areas shall be subdivided into smaller areas and multiple flumes shall be installed.

e) Flume will be located in natural drainage areas where possible.

f) Geotextile will be placed in the channel.

g) If using multiple strips of geotextile, strips will be laid according to the manufacturer's specifications and item 601 of the Standard Specifications.

h) Adequately sized riprap will be placed on top of geotextile.

i) Riprap protection will be provided at the bottom of the flume.

j) Excavated material must be disposed of at least 30 m away from the Watercourse/wetland.

k) Permission of the landowner must be obtained in order to dispose of excavated material onto a private property.

l) Disposal area must be stabilized.

This slope requires a flume (slope drain) to carry flow from the top of the slope to the ditch.

Completed Flume (Slope Drain)

Checklist/Reminders

See Appendix A: Section 5.7 – Erosion and Sediment Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.7.2.5 Other Protection Measures

Wet Weather Shutdown Guideline

Notwithstanding the requirement to maintain erosion and sediment control measures throughout the construction and OMR activities, there are times when adverse weather conditions may warrant the shut down of work. Continued activity during extreme wet conditions may cause unacceptable disturbance and subsequent discharges of sediment into a watercourse or wetland. Shut down of work is at the discretion of the Engineer (for construction projects) or the Supervisor (for OMR projects). The Wet Weather Shutdown Guidelines (Appendix D) shall be used in the decision-making process.

5.7.3 Ditching

Description

Ditches are primarily constructed to direct water away from roadways. Cutoff ditches are utilized to capture water draining onto the project site at the top of cuts or at the toe of fills.
Ditching is undertaken to correct deficiencies such as erosion, non-conformity in grade, line or cross section of the ditch, water ponding on the roadway and restrictive vegetation that impedes the drainage of the roadbed.

There are three types of ditch configurations.

- V-shaped;
- Elliptical;
- Trapezoidal.

Ditch Types

Concerns

The concerns and potential impacts associated with ditching include:

- The erosion and sedimentation of watercourses and wetlands; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Where possible, a 30 m buffer zone of vegetation will be maintained between the end of the ditching and the watercourse/wetland.

c) Ditching will be constructed to the shape shown on the construction plans or as directed by the NBDOT.

d) Ditching will commence at the lowest point and work towards the highest point, allowing the work to be carried out in the dry.

e) Vegetation and soil removed by ditching must be disposed of at least 30 m away from the watercourse/wetland.

f) Install erosion control structures as the work progresses. Follow Section 5.7.2.3 – Erosion Control Structures for the installation, maintenance and removal.

g) Ditches will not break the bank of a watercourse or enter directly into a wetland.

h) The end of the ditch will be directed into a vegetated area.

i) Natural drainage will be maintained where possible.

j) Trapezoidal ditches will be used where possible. V-shaped or elliptical ditches are more prone to erosion and therefore will only be used where a trapezoidal ditch cannot be constructed.

k) Ditches must be stabilized by either hydroseeding or lining the ditch with riprap.

l) The type of stabilization will be determined based on the slope and volume of water expected in the ditch.

m) Erosion and sediment control measures shall be maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions.

n) Prior to winter shutdown, an onsite meeting shall be held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion and sediment control. Any deficiencies are to be addressed prior to spring runoff.

o) Permission of the landowner must be obtained in order to dispose of sediment onto a private property.

p) Disposal area must be stabilized.

Ditching operation.

Checklist/Reminders

See Appendix A: Section 5. 7- Erosion and Sediment Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.8 Excavation, Blasting and Aggregate Production

Description

This section addresses environmental protection measures associated with excavation and aggregate production, including blasting, crushing and screening issues.

5.8.1 Excavation

Description

For this item, excavation is the removal, placement and/or disposal of any type of material from a work area.

Concerns

The concerns and potential impacts associated with the excavation include:

- Erosion and sedimentation of watercourses, wetlands and other ESA's;
- Creation of unstable banks or slopes;
- Noise pollution;
- Dust pollution and;
- Damage to groundwater resources (quality and quantity) and infrastructure such as dug wells, drilled wells, waterlines and septic systems.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Erosion control measures shall be installed prior to commencement of the work in accordance with Section 5.7 – Erosion and Sediment Management.

c) Disposal areas shall be developed in accordance with Section 5.20 – Waste Management.

d) The size of the excavation area will be minimized in order to minimize exposed areas.

e) Exposed material resulting from earth cut and fill operations shall be stabilized in accordance with Section 5.22 – Work Progression.

f) Attention shall be given to upcoming weather forecast, so that work in excessive wet conditions shall be avoided when possible.

g) The Wet Weather Shutdown Guidelines (Appendix D) shall be followed in wet weather conditions.

h) Erosion control measures shall be inspected prior to, during and after any rainfall event.

i) Any deficiencies will be repaired immediately.

j) Excavation of acid generating materials will be carried out in accordance with Section 5.25 – Sulphide Bearing Rock & Acid Rock Drainage Management.

Checklist/Reminders

See Appendix A: Section 5.8 – Excavation, Blasting & Aggregate Production Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractor, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.8.2 Blasting

Description

Blasting of rock is required where ripping is not feasible. Blasting can occur in rock cut areas within the ROW as well as in quarries for the purpose of highway construction and production of aggregate sources.

Concerns

The concerns and potential impacts associated with blasting include:

- Disturbance to wildlife and wildlife habitat;
- Impacts to fish and fish habitat;
- Noise pollution;
- Impacts to the landscape;
- Improper storage and handling of blasting agents;
- Impacts to groundwater wells and septic systems; and
- Sedimentation of watercourses and wetlands.

Required Permits

- A blasting permit and blaster certificate will be required prior to the commencement of any blasting operation.
- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.

General Protection Measures

a) A copy of the WAWA and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Explosives must be used in a manner that will minimize damage or defacement of landscape features, trees and other surrounding objects by controlling the scatter of blasted material beyond the limits of activity.

c) Blasting patterns and procedures must be used which minimize shock or instantaneous peak noise levels, where possible.

d) Blasting must not occur in the vicinity of fuel storage facilities.

e) Use of explosives will be restricted to authorized personnel who have been trained in their use, and have a valid blasters certificate.

f) If working near residential areas, wells and septic systems will be located and monitored during construction activities (if applicable).

g) Blasting near any groundwater well or other environmentally sensitive area shall be done in accordance with Section 5.23 – Working Near Environmental Sensitive Areas.

h) Residents within 500 m of blast areas must be informed of the blasting schedule and consideration shall be given to minimize disruption to local residents.

i) Blasting will be permitted only between 30 minutes after sunrise and 30 minutes before sunset. Blasting within 500 m of any residence or business will not be permitted to take place between 7:00 p.m. and 7:00 a.m. Monday to Friday, or on any weekend or public holiday, without prior notification to and approval by the Engineer.

j) All blasts will be monitored in accordance with an approved schedule for air blast concussion and ground vibration.

k) Explosives shall be stored, handled, and used in accordance with both federal and provincial regulations and permits, and in such manner as to reduce potential environmental risks. (See Section 5.14 – Storage and Handling of Other Hazardous Materials)

General Protection Measures for Blasting in or near Waterbodies

Prior to commencement of any blasting, refer to the "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters." (http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/water-eau/explosives-explosifs/pdf/explos_e.pdf)

a) Blasting activity within or near watercourses/wetlands must be conducted in consultation with DFO to ensure that adequate measures are implemented to ensure protection of fish and fish habitat.

b) Blasting in the wet conditions must only occur in situations where such operations are deemed necessary and will comply with the above, as well as the following:

- Blasting activities must be done in a manner, which ensures that the magnitude of explosions is limited to that which is absolutely necessary.
- A blasting plan must be reviewed by DFO, Habitat Management Program staff, in advance of work in or near watercourses/wetlands.
- Prior to any blasting in or near a watercourse/wetland, a visual reconnaissance of the area must be undertaken to ensure that there are no mammals, or concentrations of

birds, waterfowl or fish. Blasting must be delayed in such circumstances until they have been allowed to leave the area of their own accord.
- Under no circumstances shall noise or other devices be used to harass or otherwise disturb these animals to encourage them to leave the area of the proposed blast.
- If significant concentrations of fish are detected in the area, described blasting must proceed only when concentrations of fish have left the area. Fish rescue may be required to remove fish from the calculated impact zone.

General Protection Measures for Undetonated Blasting Agents

a) If an undetonated hole or charge is found, the following general protection measures shall be carried out:

- Explosives shall be washed out with a combination of water and air, then any water contaminated with ANFO blasting materials must be contained and disposed of as a per Section 5.14 – Storage and Handling of Other Hazardous Materials.
- Undetonated blasting agents shall not be disposed of with blasted rock.

b) Proof of a valid blaster certification is required prior to blasting.

c) An onsite meeting will be held with DFO prior to blasting within 30 m of a watercourse/wetland.

Checklist/Reminders

See Appendix A: Section 5.8 – Excavation, Blasting & Aggregate Production Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

The Contractor is responsible for obtaining the blasting permit and blaster certificate.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.8.3 Crushing, Screening and Washing

Description

Crushing, screening and washing is carried out on blasted and/or excavated material to further process the material into highway materials such as subbase, base or asphalt concrete. Crushing, screening and washing of aggregates can occur within the ROW or off site at a pit or quarry.

Concerns

The concerns and potential impacts associated with crushing, screening and washing include:

- Noise pollution;
- Dust pollution; and
- Erosion and sedimentation.

Required Permits

- An approval to operate an aggregate production facility shall be obtained from NBENV. This may already be addressed if the aggregate operation is associated with a quarry developed for the purposes of a highway construction project, for which an approval has been already obtained.

General Protection Measures

a) The location of the aggregate processing plant shall allow for strategies to limit noise, dust, and control sediment-laden water resulting from washing aggregates.

b) The facility operator must ensure that odour, dust, noise, and site runoff being released or discharged from the facility does not cause adverse environmental impacts to any off-site receptor. Best Management Practices (BMP) must be employed to reduce the potential and mitigate adverse environmental impacts. BMP's include but are not limited to:

    - Rubber dust skirts;
    - Use of water sprays and mist; and
    - Sediment ponds for control of washwater.

c) Crushers should be placed in low areas of the site, to reduce uninterrupted line of sight and noise propagation to receptors (noise sensitive areas).

d) Erosion control measures shall be installed prior to commencement of the work in accordance with Section 5.7 – Erosion and Sediment Management.

e) Storm water must be controlled to divert offsite water and keep it from entering the facility and picking up sediment, and to minimize the volume of water requiring treatment.

f) The use of petroleum products for a dust control agent shall not be permitted.

Checklist/Reminders

See Appendix A: Section 5.8 – Excavation, Blasting & Aggregate Production Checklist

Responsibilities

The Contractor is responsible for obtaining the Approval to Operate permit for lands not owned by NBDOT.

NBDOT is responsible for obtaining the Approval to Operate for lands owned by NBDOT.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9 Ferry Operations

Ferry service is provided for passenger-vehicle traffic at locations where fixed crossings do not exist. The ferry system consists of self-propelled ferries and cable ferries.

Several items in the ferry operation, such as bilge water, minor maintenance, bunkering and oil transfer, ferry cable, sewage and litter barrels, cleaning landings, ramp construction, application and removal of protective coatings and salt storage have the potential to create negative impacts to the environment.

5.9.1 Bilge Water

Description

Cable ferries operate by winching along a fixed cable. Water enters the ferries along with the cable. In the bilge, the water can become contaminated with oil and grease from the engine and hydraulic equipment. Bilge water must be routinely removed from the ferries.

Concerns
The concerns and potential impacts associated with the bilge water include:

- Improper handling and disposal of contaminated bilge water; and
- Accidental spills of hazardous materials.

Required Permits

None identified.

General Protection Measures

a) Water contaminated with liquid hydrocarbons must be removed by vacuum truck for treatment and properly disposed of.

b) Non-oily water originating from clean compartments can be pumped overboard.

c) Uncontaminated Bilge water shall only be pumped overboard under calm conditions.

d) The entire bilge shall be steam cleaned annually.

e) The residue from steam cleaning is to be collected for disposal.

f) All engines and equipment shall be kept in good repair to minimize leakage.

g) Any leaks, should they occur, shall be repaired immediately.

h) Bilge water shall be checked for contamination with oil prior to disposal.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9.2 Minor Ferry Maintenance

Description

Service and minor repairs to the ferries are performed on board by operators.

Concerns

The concerns and potential impacts associated with minor ferry maintenance include:

- Accidental spills of hazardous materials.

Required Permits

None identified.

General Protection Measures

a) Spill kit shall be kept on board to address any minor leaks.

b) Waste oil shall be collected in a closed container and placed immediately in a secure location.

c) The waste oil shall be moved as soon as practical to a site serviced by an approved waste oil carrier for recycling or disposal.

d) Servicing of diesel engines shall be undertaken as prescribed by NBDOT Vehicle Management Agency.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9.3 Bunkering and Oil Transfer

Description

Fuel and lubricants are kept on board the ferries as required to meet safety and operational requirements.

Concerns

The concerns and potential impacts associated with bunkering and oil transfer include:

- Accidental spills of hazardous materials; and
- Improper storage and handling.

Required Permits

None identified.

General Protection Measures

a) Bunkering and oil transfers shall be performed in accordance with the procedures outlined in the NBDOT Ferry Operations Manual(s).

b) Bunkering shall be carried out under the supervision of the ferry operator, marine engineer or designate.

c) Bunkering shall not occur while the ferry is operating or while private vehicles are on board.

d) In the event of a spill, the following shall be notified immediately (See Section 5.12 - Spill Management):

    - Coast Guard 1-800-565-1633.
    - NBDOT Supervisor.
    - Local Fire Prevention Authority
    - Transport Canada Ship Safety Branch 506-636-4748.
    - NBENV Regional Office.

e) A spill kit shall be kept on board to address minor leaks.

f) A separate fully stocked oil spill response station shall be maintained on the ferry or in the on shore storage shed.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators responsible to ensure that the protection measures outlined above are adhered to.

5.9.4 Ferry Cables

Description

Ferry cables must be replaced when they become worn.

Concerns

The concerns and potential impacts associated with replacing ferry cables include:

- Improper disposal.

Required Permits

None identified.

General Protection Measures

a) All worn cables shall be removed from the waterway and rewound onto spools.

b) Spools of worn cables will be disposed of through a scrap metal dealer for recycling.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9.5 Sewage and Litter Barrels

Description

Public toilets are provided on the self-propelled ferries. Portable toilets are provided at the ferry landings for the cable ferries.

Concerns

The concerns and potential impacts associated with sewage and litter barrels include:

- Improper handling and disposal; and
- Accidental spills of hazardous materials.

Required Permits

None identified.

General Protection Measures

a) On-shore toilet facilities shall be pumped out by a licensed septic hauler as needed to maintain sanitary conditions.

b) Holding tanks, where fitted, on self-propelled ferries shall be pumped out by a licensed septic hauler as needed to maintain sanitary conditions.

c) Litter barrels located at ferry landing areas shall be serviced at regular intervals to minimize the nuisance potential of the sites.

d) The litter collected shall be disposed of at the closest Regional Solid Waste Commission landfill.

e) All toilet facilities, holding tanks and litter barrels will be inspected regularly to ensure leaks do not occur.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9.6 Cleaning of Ferry Landings

Description

Cleaning is undertaken at paved ferry landings to prevent the accumulation of dirt and debris.

Concerns

The concerns and potential impacts associated with the cleaning of ferry landings include:

- Sedimentation of watercourses and/or waterways

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Where accumulations of dirt and debris are excessive, the landing shall be scraped or swept prior to flushing.

c) All Material scraped loose shall be disposed of at least 30 m away from the watercourse and where it cannot be returned to the watercourse.

d) Waste shall be disposed of in accordance with Section 5.20 – Waste Management.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9.7 Ramp Construction

Description

During spring, added height is often required at ferry landings to address high water conditions. Ramps additions are constructed to allow ferry operations to continue.

Concerns

The concerns and potential impacts associated with ramp construction include:

- Sedimentation of watercourse/wetland;
- Erosion of banks;
- Accidental spills of hazardous material; and
- Waste Management.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- An NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWAP, NWPA permit and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Erosion control measures shall be installed prior to commencement of the work in accordance with Section 5.7 – Erosion and Sediment Management.

c) Additions to existing ramps should be constructed of sand bags lined with geotextile fabric and clean pit run gravel. Other ramp construction techniques may be employed provided that a similar level of protection from erosion is achieved.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9.8 Application and Removal of Protective Coatings

Description

Protective coatings are applied to ferries to protect steel components from corrosion. Over time, the protective coatings begin to deteriorate and require removal and/or re-application.

Concerns

The concerns and potential impacts associated with the application and removal of protective coatings include:

- Improper handling of coating materials;
- Improper waste disposal; and
- Accidental spills of hazardous materials.

Required Permits

None identified.

General Protection Measures

a) Protection measures as contained in the Guidelines for the Application and Removal of Protective Coatings prepared by NBENV (1993) shall be followed.

b) Partial enclosures shall be utilized for manual application and removal of protective coatings including chipping, scraping and brush/roller painting.

c) Full enclosures shall be utilized for abrasive blasting for removal and spray application of protective coatings.

d) Spent blasting (e.g., sand blasting) media shall be disposed of at an approved waste disposal site.

e) Where the spent blasting material is known to contain lead or other materials that may be considered hazardous, laboratory testing shall be undertaken to determine the appropriate waste disposal option.

f) Solvents used in the cleaning of painting equipment shall be collected in a closed container and recycled by an approved solvent recycler.

g) Empty cans of coatings and solvents shall be disposed of in an environmentally acceptable manner (i.e., crushed, bagged and disposed at a regional landfill).

h) All waste will be properly disposed of in accordance with Section 5.20 – Waste Management.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.9.9 Salt and Sand Storage

Description

Salt and sand are used in ferry operation for winter OMR activities. The salt and sand used for the winter OMR is stored at the ferry approaches.

Concerns

The concerns and potential impacts associated with salt and sand storage include:

- Improper storage and handling of salt and sand; and
- Accidental spills.

Required Permits

None identified.

General Protection Measures

a) All salt and sand/salt mix shall be stored in weatherproof containers.

b) Excess salt and sands spilled during use shall be returned to the storage container.

Checklist/Reminders

See Appendix A: Section 5.9 – Ferry Operations Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that all the protection measures outlined above are adhered to.

5.10 Fire Prevention and Contingency

Description

The purpose of fire prevention and contingency plan in relation to fires in and around a work site is to minimize the potential for the start of fires, and to ensure that fires, which do occur, can be controlled immediately.

Concerns

The concerns and potential impacts associated with fires include:

- Loss or destruction of property and wildlife habitat; and
- Impacts to air quality

Required Permits

- If burning is allowed, burning permits must be obtained from NBENV and from NBDNR.

General Protection Measures

a) All necessary precautions must be taken to reduce the potential for fires by controlling/limiting fire hazards at the worksite.

b) The worksite shall be kept free of all flammable waste.

c) No burning shall occur on site without the applicable permits and without prior approval from NBDOT, NBENV and DNR.

d) All equipment shall be kept in good working order.

e) On site personnel shall be prepared to control and fight any fires on the worksite.

f) Contractors are required to have sufficient fire fighting equipment available and in good working order when working in forested areas as required by NBDNR under the General Regulation of the *Forest Fires Act*. The fire protection requirements shall be consistent with those required on all forest operations in New Brunswick, as specified in the Act.

g) In the event of a fire as a result of NBDOT work, the contractor is required to fight any fires in and about the work area.

h) All fires within or threatening forest habitat will be reported to NBDNR.

i) The nearest Natural Resources office or 911 will be called and the following information will be provided:

- Your name.
- Your telephone number.
- The exact location of the fire.
- A description of what is burning.
- The size of the fire.
- Is anyone fighting the fire?
- Access to the fire.

Checklist/Reminders

See Appendix A: Section 5.10 – Fire Prevention & Contingency Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible for ensuring that the protection measures outlined above are adhered to.

5.11 Grubbing

Description

Grubbing is the removal and disposal of stumps and roots. A root rake, or similar equipment, removes the roots and stumps and the topsoil is left for salvage.

Concerns

The concerns and potential impacts associated with grubbing include:

- Improper waste disposal;
- Improper work progression;
- Erosion and sedimentation of watercourses/wetlands; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- If burning is allowed, burning permits must be obtained from NBENV and from NBDNR.

General Protection Measures

a) A copy of the WAWAP must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Erosion control measures shall be installed prior to commencement of the work in accordance with Section 5.7 – Erosion and Sediment Management.

c) A 30 m buffer zone shall be maintained on both sides of each watercourse and/or around wetlands where no grubbing or filling is to take place until erosion control devices, and drainage structures are installed.

d) Grubbing shall be carried out by means of a root rake or similar equipment in order to preserve as much topsoil as possible.

e) Grubbings shall be disposed of by the following methods:
   - Tub-grinding of the roots and stumps, along with any slash, brush and non-merchantable timber from the clearing operation, which can be used as mulch;
   - Burying in fills (planned to be over 5 m in finished height), tramped and compacted to within 0.6 m of original ground; or
   - In an approved Disposal area in accordance with Section 5.20 – Waste Management.

Root rake attached to excavator used to remove roots and stumps only.

f) Burning is generally not accepted on NBDOT ROW, but if burning is permitted, NBENV and DNR shall be consulted prior to commencement of the burning.

g) Grubbing materials shall not be placed within 30 m of a culvert, bridge or any other structure.

h) The appropriate erosion control devices must be installed prior to commencing the grubbing operation to prevent sediment from leaving the work area and entering watercourses/wetlands or private property.

i) The buffer zones will be clearly identified.

Checklist/Reminders

See Appendix A: Section 5.11 – Grubbing Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.12 Spill Management

Description

Accidental releases of petroleum, oil and lubricants (POL) as well as other hazardous materials into the environment can occur.

This section deals with spills that may occur during construction and OMR operations. See Section 5.13 – Storage and Handling of Petroleum Products and Section 5.14 – Storage and Handling of Other Hazardous Materials and for the protection measures associated with the storage and handling of petroleum products and hazardous materials.

Concerns

The concerns and potential impacts associated with the accidental releases of pollutants into the environment, such as by spills, refueling losses and leakage from equipment include:

- Contamination of soil, groundwater, and watercourses/wetlands;
- Transportation of contaminants off site to down gradient aquifers or watercourses and/or wetlands; and
- Impacts to waterfowl, fish, shellfish and vegetation.

Required Permits

None identified.

General Protection Measures

a) Plans and procedures must be in place to respond to such emergency situations.

b) For hazardous substances, WHMIS information fact sheets will be reviewed to be fully aware of the nature of the product and the precautions to be taken in handling and other important information.

c) Onsite fuelling must not occur within 30 m of a watercourse, wetland or private water well.

d) Designated fuelling and storage areas on a construction site must be at least 100 m away from any watercourse, wetland or private water well.

e) Materials to facilitate rapid containment and clean up of spills must be available during any construction/OMR activity in or near any watercourse, wetland, private water well or environmentally sensitive area.

f) Equipment should be inspected daily for leaks.

g) All leaks will be repaired immediately.

Small Spills

For spills of petroleum, oils, or lubricants (POL's) that occur during refueling of machinery or through breaks in hydraulic lines and are highly localized and easily cleaned up by onsite crews using standard equipment, sorbent materials, and the following protection measures will be followed:

a) Identify the material involved and refer to MSDS or call CANUTEC (1-613-996-6666) for precautionary measures, if necessary.

b) Stop the flow of the product being spilled, if safe to do so, taking precautions to avoid personal injury.

c) Control and contain the spilled product, if it can be done safely, using onsite materials found in a spill cleanup kit. Contaminated materials and soils shall be disposed of at an approved facility.

d) Record the details of the spill, including:
- Name and contact info of the person reporting the spill;
- Date and time of spill;
- Type and approximate amount of product spilled;
- Location of spill or leak;
- Source of spill or leak;
- Type of accident;
- Weather conditions;
- Proximity to watercourse, wetland or other sensitive feature; and
- Status of the spill (ongoing or contained, cleanup efforts).

e) Contact the local NBENV office or the Coast Guard Environmental Emergency number (1-800-565-1633).

f) Report the spill to the Resident Engineer and Construction Foreman/Supervisor.

g) Small spills at NBDOT maintenance depots (*i.e.,* less than 20 L) that occur on level ground and are easily controlled and cleaned up must be cleaned up and reported following the protection measures detailed above.

h) For spills at fuelling facilities, notification must also include:

- The NBDOT Supervisor;
- Vehicle Management Agency;
- Maintenance and Traffic Branch; and
- The local Fire Prevention Authority.

i) All maintenance depots must be equipped with at least one spill kit, containing absorbent pads and booms for petroleum spills.

j) The clean up kit must be maintained.

k) Bags of peat moss or sawdust will also be available to control and clean up small spills.

l) The contaminated soil will be removed for disposal at a proper disposal facility.

Checklist/Reminders for Small Spills

See Appendix A: Section 5.12 – Spill Management Checklist

Large Spills

For a large spill that is not highly localized and easily cleaned up by on-site crews using standard equipment and sorbent materials or where soil, groundwater, and surface water contamination may occur, the following protection measures will be followed:

a) Stop the flow of the product being spilled, if safe to do so, taking precautions to avoid personal injury.

b) Identify the material involved and refer to MSDS or call CANUTEC (1-613-996-6666) for precautionary measures, if necessary.

c) Perform a quick assessment of the spill:

- Is there a concern for human health? If so, should the area be cordoned off?
- How extensive is the spill?
- Are there any watercourses, wetlands, or other sensitive environmental features nearby and down gradient of the spill?
- Are there drainage systems that lead to these features?

d) Control and contain the spilled product, if it can be done safely, using onsite materials.

e) Contact the Coast Guard Environmental Emergency number (1-800-565-1633).

f) Notify the NBDOT District Engineer or other designated representative.

g) For large spills at a maintenance depot, notify

- The Maintenance Supervisor;
- Vehicle Management Agency;
- Maintenance and Traffic Branch; and
- The local Fire Prevention Authority.

h) Record the details of the spill, including:

- Name and contact info of the person reporting the spill;
- Date and time of spill;
- Type and approximate amount of product spilled;
- Location of spill or leak;

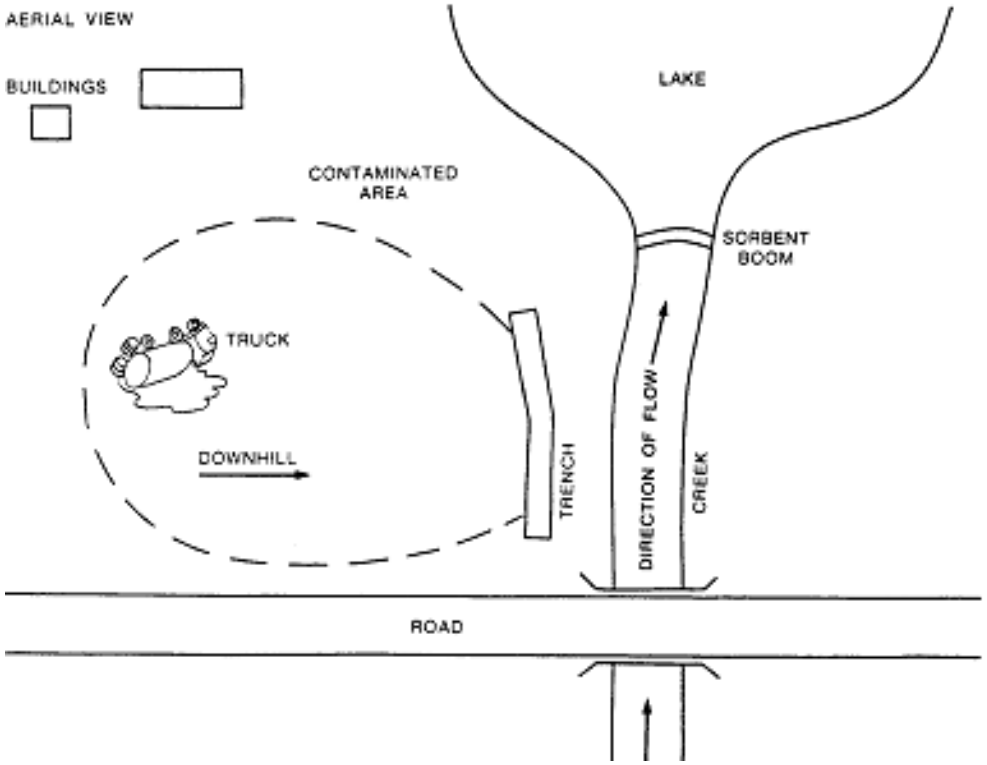
- Source of spill or leak;
- Type of accident;
- Weather conditions;
- Proximity to watercourse, wetland or other sensitive feature; and
- Status of the spill (ongoing or contained, cleanup efforts).

Containment Options for Large Spills

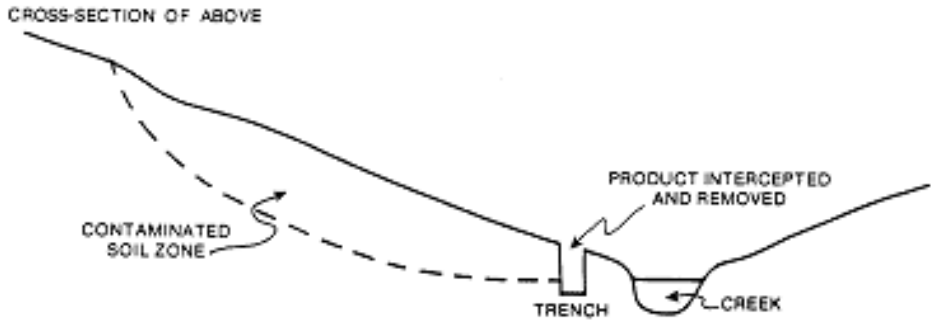
The following containment options will be used for Large spills.

a) On level land, excavate a sump hole (line with plastic if soils are porous) and pump the spilled product into a temporary container or other non-porous storage option.

b) On sloped land, dig a trench (lines with plastic if soils are porous) downslope from the spill to intercept the spilled material.



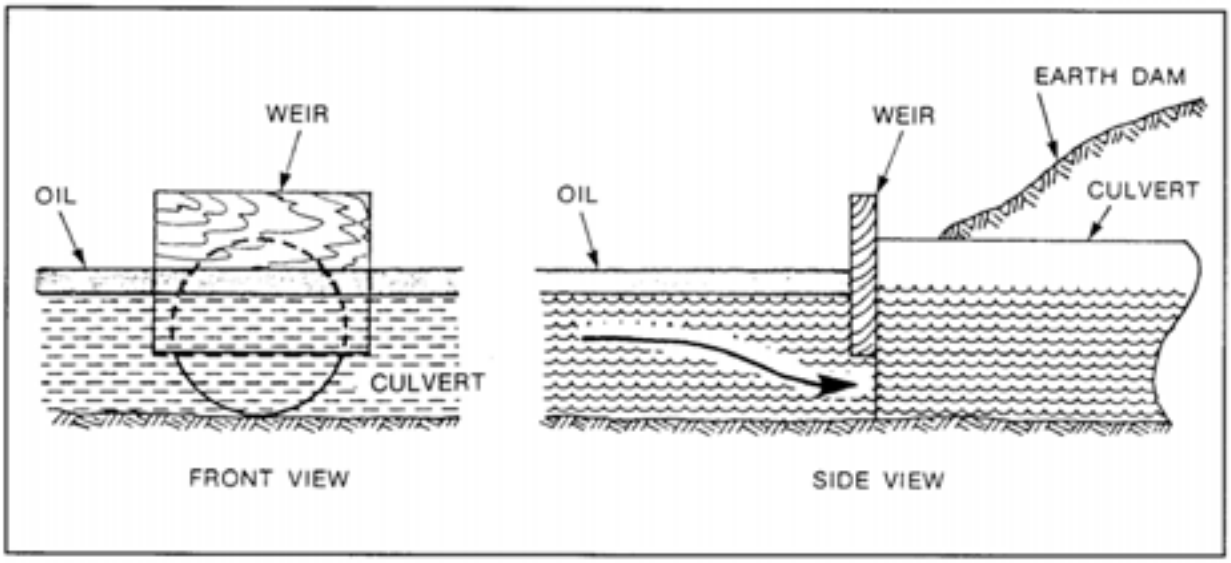
Plan view of trench excavation on down gradient.



Profile of trench excavation

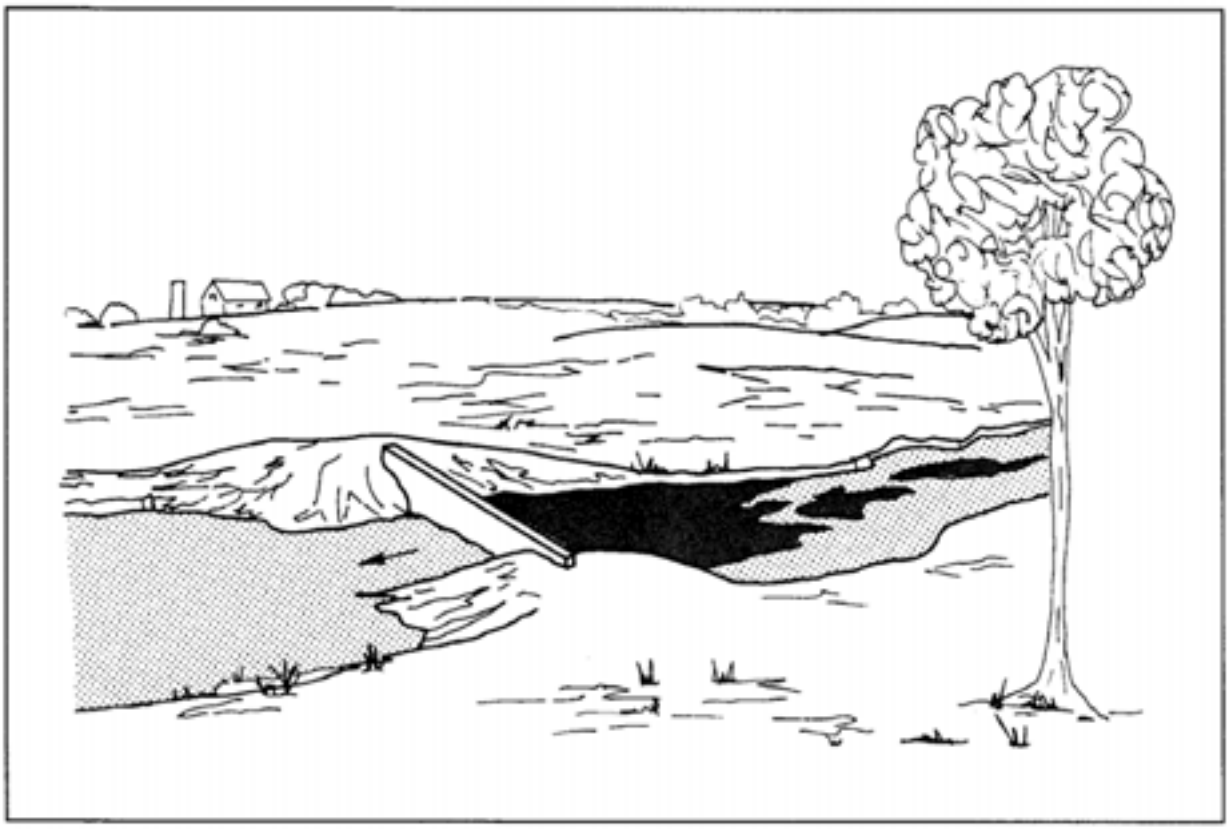
c) Within a drainage ditch, watercourse or wetland, a number of options are possible:

i) A culvert weir can be used to stop oil from entering a culvert. The top half of the culvert is blocked off, blocking oil on the surface of the water, and allowing water to drain underneath. If water levels are too low, the culvert shall be temporarily blocked off completely.



Culvert weir.

ii) A weir on a small watercourse can be constructed using plywood, planks, logs, or other available material anchored in the bank of the watercourse, allowing water to flow underneath, trapping the oil above.



Use of culvert weir on a small watercourse.

iii) For larger watercourses, sorbent booms may be used to intercept spilled material downstream of a spill, or contain in the marine environment.

Checklist/Reminders for Large Spills

See Appendix A: Section 5.12 – Spill Management Checklist

Spills During Highway Operation

For spills that occur during highway operation, the following protection measures will be carried out:

a) The NBDOT "*Standard Operating Procedure #7 - Emergency Procedures for Transportation Incidents Involving Dangerous Goods*" (Revised January 1995) will be followed at the scene of a spill.

b) Where the first on the scene is highway maintenance personnel who happen upon the scene of the accident they shall (assuming police, fire and ambulance have been notified);

- Assume the worst case, and prevent anyone from entering the area of danger;

- Safely attempt to get the required emergency telephone numbers from the driver (or the shipper's papers) in order to identify the materials involved and to make a quick assessment of their hazards, (Annex A of SOP#7 gives a guide to assessing the hazards if it is not possible to get the shipper's emergency number);
- Report all information at hand to headquarters or the dispatcher (*i.e.,* respective of the first group on the scene) as applicable; and
- Determine if the Coast Guard (1-800-565-1633) has been informed, and if not, ensure that a call is made giving the Coast Guard all information at hand. The Coast Guard will then activate the response from NBENV and the Emergency Measures Organization.

a. NBDOT shall assist with the clean up as required and provide signage and barriers for the public. NBDOT shall keep specified routes open for emergency vehicles.

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.13 Storage and Handling of Petroleum Products

Description

The proper storage, handling and use of petroleum products can greatly reduce the risk of accidental spills or discharges into the environment.

The *Petroleum Product Storage and Handling Regulation* (*Regulation 87-97*) regulates the storage, transport, and handling of petroleum products, which includes asphalt, engine oil, gasoline, and lubricants. Regulated activities include the storage of petroleum products, the transportation and delivery of these products to dispensing facilities, use of dispensing facilities, prevention of spillage and remediation in the event of a spill of a petroleum product into the environment.

There are two general classes of storage, those being Temporary Storage and Permanent Storage.

5.13.1 Temporary Storage of Petroleum Products

Description

Temporary storage of petroleum products is often required for construction projects, and typically involves the use of aboveground storage tanks for ancillary facilities such as a mobile asphalt plant, and the use of portable tanks and containers for refueling and other uses.

Concerns

The concerns and potential impacts associated with temporary storage of petroleum products include:

- Impacts to surface and ground water quality;
- Accidental spills; and
- Potential fire hazards.

Required Permits

- All temporary storage tank systems on a site with a capacity of 2,000 L or more must be registered and approved under *Regulation 87-97*. Tank systems must be installed by a licensed installer, as outlined in the regulation. Regulation 87-97 Schedule A, Part I and Part II, contains a site approval form and an environmental approval form for new installations or modifications to an existing system, and must be forwarded to NBENV at least one month prior to the anticipated start of construction.
- Properties that have 2,000 liters or more, of petroleum product storage capacity, are required to register the tanks on site with NBENV and receive an annual Petroleum Storage Site License for the systems on sites.

General Protection Measures

a) All containers used for temporary storage of petroleum products shall be in good condition, and checked for leaks regularly.

b) Containers must be clearly marked and stored in clearly marked areas, on a flat surface, at least 100 m from a watercourse, wetland or private water well.

c) Any above ground fuel container with a capacity of greater than 30 L shall be stored on an impervious mat and shall be surrounded by an impervious dyke of sufficient size to contain not less than 110% of the capacity of the tank, plus 150 mm of freeboard.

d) Any above ground fuel container with a capacity of greater than 30 L shall also be measured for liquid level weekly and for water level weekly (See Section 65 of the *Petroleum Product Storage and Handling Regulation – Clean Environment Act* (New Brunswick *Regulation 87-97*)).

e) Fuel storage areas and non-portable transfer lines shall be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The markers should be visible under adverse weather conditions.

f) The storage area should be sloped or drained such that any spilled material flows to a safe collection area.

g) Smoking shall be prohibited within 10 m of a fuel storage area.

h) Project sites shall be equipped with at least one clean-up kit, containing absorbent pads and booms for petroleum spills. The kit shall be maintained. Bags of peat moss or sawdust will also be available, to help absorb larger spills.

i) Waste oils and lubricants or other petroleum products shall be retained in a clearly labeled tank or closed container, and recycled or disposed of at an approved facility.

Temporary storage of such wastes prior to disposal shall also have an impervious mat and be surrounded by an impervious dyke of sufficient size to contain not less than 110% of the capacity of the storage containers, plus 150 mm of freeboard.

j) All empty containers are returned to a designated location for proper disposal. Empty containers are not to be disposed of on site.

Checklist/Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

5.13.2 Permanent Storage of Petroleum Products

Description

Permanent Storage of petroleum products is generally restricted to NBDOT Maintenance Depots and refers to both aboveground and underground tank systems.

Concerns

The concerns and potential impacts associated with the permanent storage of petroleum products include:

- Accidental spills;
- Impacts to surface water and groundwater quality; and
- Potential fire hazards.

Required Permits

- Petroleum storage tank systems must be registered under and in compliance with the *Petroleum Product Storage and Handling Regulation – Clean Environment Act* (New Brunswick *Regulation 87-97*) before commencing operation. Registration does not apply to sites with a total capacity less than 2,000 L. *Regulation 87-97* Schedule A, Part I and Part II, contain a site approval form and an environmental approval form for new installations or modifications to an existing system, and must be forwarded to NBENV at least one month prior to the anticipated start of construction. Registration must be renewed on an annual basis.

- All aboveground storage tanks must conform to the National Fire Code and NB Regulation 87-97, and for furnace oil tanks, CSA B139.

General Protection Measures

a) Waste oils and lubricants or other petroleum products shall be contained in a clearly labeled tank or closed container, and recycled or disposed of at an approved facility. Temporary storage of such wastes prior to disposal shall also have an impervious mat and be surrounded by an impervious dyke of sufficient size to contain not less than 110% of the capacity of the storage containers, plus 150 mm of freeboard.

b) Smoking shall be prohibited within 10 m of a fuel storage area.

c) All maintenance depots shall be equipped with at least one clean-up kit, containing absorbent pads and booms for petroleum spills. The kit shall be maintained. Bags of peat moss or sawdust will also be available, to help absorb larger spills.

d) All aboveground storage tanks shall be checked visually for damage or leaks on a regular basis (weekly recommended).

e) Gasoline and diesel tanks shall be dipped for products and water, and reconciled daily. Waste oils and tanks shall be dipped for products and water at the end of the last business day in each week and at the beginning of the first business day of each week. (See Section 5.13.5 for Waste Oil Tanks). All information is to be provided on the "Petroleum Product Inventory Control Record". When a loss of liquid or a gain of water of 5 mm or more, or when the water at the tank bottom exceeds 50 mm, or when a sensor panel goes into alarm, the Supervisor, NBENV and Maintenance and Traffic Branch shall be notified immediately. When a sensor panel goes into alarm, a licensed tank installer is to be called in to inspect and the M&T Branch is to be notified.

f) Other underground storage tank systems shall be inspected on a regular basis (at least once each week) as per Section 65 of New Brunswick Regulation 87-97. This involves, but is not limited to, gauging or dipping for fuel and water level, and reconciliation of records to be properly maintained for two years.

g) Underground (and aboveground) furnace oil tanks should be dipped regularly (quarterly) with water-finding paste for levels of water, product and sludge.

h) The NBENV must be contacted when a leak is suspected or when liquid is suspected to be entering the tank.

i) Cathodic protection testing shall be performed for all underground steel petroleum storage systems, and testing results shall be submitted to NBENV every year, indicating the protection system is working properly. Any tank or piping not passing the test shall be repaired or removed by a licensed installer.

j) Precision leak testing shall be performed on all single wall underground storage systems that have been installed for 20 years (or more), and testing results shall be submitted to NBENV every two years (on the even year), indicating that the tanks and piping are not

leaking. Testing shall be performed by a licensed company independent of the owner of the tank system, using a device approved by NBENV.

Checklist /Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

5.13.3 Fueling and Fuel Transport

5.13.3.1 Fuel Handling and Transfer at Worksites

Description

Gasoline and Diesel are required on site to refuel equipment. These products may be dispensed from a temporary storage tank or from portable equipment that comes to the jobsite (fuel trucks).

Concerns

The concerns and potential impacts associated with temporary storage of petroleum products include:

- Impacts to surface water and groundwater quality;
- Accidental spills; and
- Potential fire hazards.

Required Permits

- All temporary storage tank systems on a site with a capacity of 2,000 L or more must be registered and approved under *Regulation 87-97*. Tank systems must be installed by a licensed installer, as outlined in the regulation. Regulation 87-97 Schedule A, Part I and Part II, contains a site approval form and an environmental approval form for new installations or modifications to an existing system, and must be forwarded to NBENV at least one month prior to the anticipated start of construction.
- Properties that have 2,000 liters or more, of petroleum product storage capacity, are required to register the tanks on site with NBENV and receive an annual Petroleum Storage Site License for the systems on sites.

General Protection Measures

a) Only approved, portable containers shall be used for collecting, transporting and fuelling with gasoline or fuel oil. The container must be metal or plastic, bearing the ULC or CSA label of approval. If refilling a plastic gas can, the can should be removed from the vehicle and placed on the ground. This should minimize the risk of static electricity sparking any gasoline fumes.

b) Care shall be taken at all times when products are being handled or transferred, to prevent any product from being spilled, misplaced, or lost and prevent the possibility of the product to contaminate the soil, watercourses, wetlands and/or groundwater.

c) Onsite fuelling must not occur within 30 m of a watercourse, wetland or private water well.

d) Designated fuelling and storage areas must be at least 100 m away from any watercourse, wetland or private water well.

Petroleum products stored too close to a watercourse.

e) Equipment should be inspected daily for leaks.

f) All leaks shall be repaired immediately.

g) Materials to facilitate rapid containment and clean up of spills must be available during any activity in or near any watercourse/wetland or environmentally significant area.

h) In the event of a spill, Section 5.12 – Spill Management will be followed.

i) In the event of a spill, all used sorbent materials will be returned to the appropriate storage yards for reuse or safe disposal.

j) If fuelling is done from a bulk tanker, the hose/nozzle assembly shall not be left unattended during fueling, and shall be placed in its proper position upon completion.

k) Fueling sites and fuel trucks shall have clean-up kits, containing absorbent pads and booms for minor spills that may occur during fueling.

l) All containers used for temporary storage of petroleum products shall be in good condition, and checked for leaks daily.

m) The pour spout will be properly installed and secured on fuel containers and verified prior to fueling.

n) Re-fueling will be carried out to avoid spilling fuel on the machine.

o) After re-fueling the cover on the fuel container and the cap on the machine will be put into place.

p) The fuel container will be move away from the machine before starting it.

q) All empty containers will be returned to a designated location for re-use or proper disposal. Empty containers are not to be disposed of on site.

r) Petroleum product suppliers that do not see a valid license for the fuel storage systems are prohibited from refueling the tanks.

Checklist/Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

5.13.3.2 Fueling at Maintenance Depots

Description

Gasoline and Diesel are available at most NBDOT sites. Many sites are equipped with computrol fuel system units allowing 24-hour access to fuel by outside users.

Concerns

The concerns and potential impacts associated with the permanent storage of petroleum products include:

- Accidental spills;
- Impacts to surface water and groundwater quality; and
- Potential fire hazards.

Required Permits

- Petroleum storage tank systems must be registered under and in compliance with the *Petroleum Product Storage and Handling Regulation – Clean Environment Act* (New Brunswick *Regulation 87-97*) before commencing operation. Registration does not apply to sites with a total capacity less than 2,000 L. *Regulation 87-97* Schedule A, Part I and Part II, contain a site approval form and an environmental approval form for new installations or modifications to an existing system, and must be forwarded to NBENV at least one month prior to the anticipated start of construction. Registration must be renewed on an annual basis.
- All aboveground storage tanks must conform to the National Fire Code and NB Regulation 87-97, and for furnace oil tanks, CSA B139.

General Protection Measures

a) Only approved, portable containers may be used for collecting, transporting and fueling with gasoline or fuel oil.

b) The container must be metal or plastic, bearing the ULC or CSA label of approval. If refilling a plastic gas can, the can should be removed from the vehicle and placed on the ground. This should minimize the risk of static electricity sparking any gasoline fumes.

c) Pumps, hoses, and nozzles shall be checked for any signs of leakage and serviced regularly. Do not use if leaking.

d) Fuel clips or other mechanical devices shall not be used to prop open the nozzle.

e) The nozzle shall not be left unattended.

f) The following signs shall be maintained at all fuelling facilities:

    - No Smoking;
    - Turn Off-Ignition;

- No cell phone;
- Do Not Leave Nozzle Unattended.
- Operating instructions

g) In the event of a leak or spill, the procedures outlined in Section 5.12 – Spill Management will be followed.

h) Engines will be shut off when refueling.

Checklist/Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

5.13.4 Waste Oil Tanks and Waste Oil Disposal

Description

Waste oil tanks or drums are located at most depots for the temporary storage of oil and waste oil products from vehicle servicing.

Concerns

The concerns and potential impacts associated with temporary storage of petroleum products include:

- Impacts to surface water and groundwater quality;
- Accidental spills; and
- Potential fire hazards.

Required Permits

None identified.

General Protection Measures

a) At any given time, not more than 500 litres of waste oil will be stored onsite in barrels, pails, drums, etc.

b) Drums will be placed on a drip pan to contain spills.

c) Oil filters will be drained of waste overnight before being recycled or disposed of at an approved disposal facility.

d) Waste oil tanks must be dipped for products and water levels every first and last business day of the week.

e) The pick up and disposal of waste oil will be carried out at specific pickup and disposal locations.

f) The pickup and disposal of waste oil is by contract through Vehicle Management Agency at specified pickup locations (contact #506-453-2601).

g) Between pickups, waste oil should be collected in a tank or closed container.

Checklist/Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

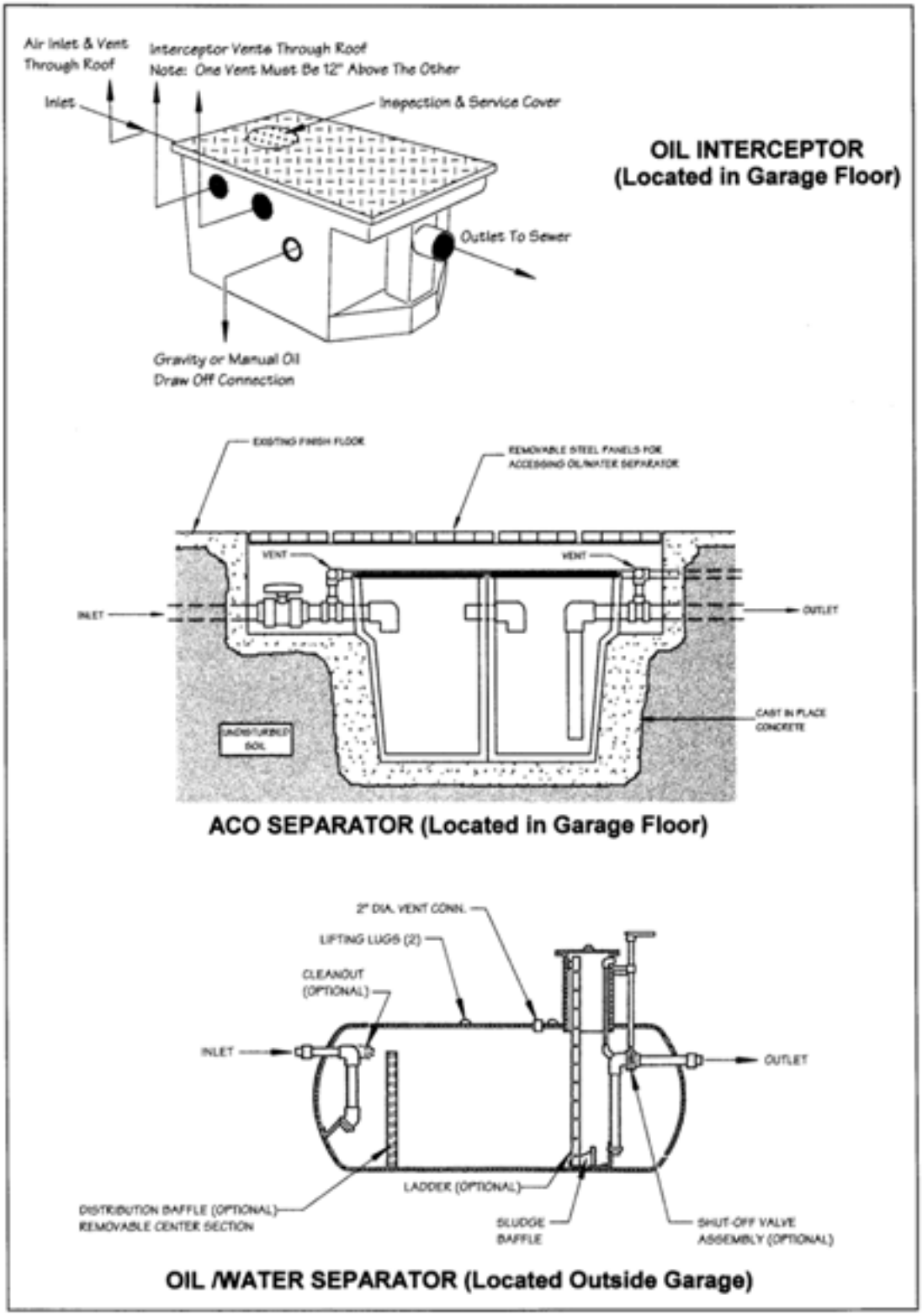
5.13.5 Oil/Water Interceptors and Separators

Description

There are three types of oil/water separators at NBDOT garages, including:

a) Oil Interceptor (located in garage floor);
b) ACO Separator (located in garage floor); and
c) Oil/Water Separator (located outside garage).

All work on the principle of gravity separation to float the lighter oil to the surface.



Typical Oil/Water Separator

Concerns

The concerns and potential impacts associated with oil/water interceptors and separators include:

- Contamination of soil, surface water and groundwater.

Required Permits

- A building permit may be required at the time of installation.
- Oil/water separators and oil/water interceptors with a capacity of 900 L or more are considered as petroleum storage tanks and require licensing from NBENV. (See Section 5.13.2 – Permanent Storage of Petroleum Products)

General Protection Measures

a) Leaks and spills shall be cleaned up before reaching floor drains.

b) Waste oils must not be deliberately added to separators or drains.

c) Manufacturer's maintenance requirements shall be followed for each separator type.

d) Oil/water interceptors and separators shall be dipped for product thickness weekly, or any time a spill is suspected.

Checklist/Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

5.13.6 Floor Drains

Description

Floor drains allow for liquids to be collected at a central location and removed from the depot.

Concerns

The concerns and potential impacts associated with floor drains include:

- Contamination of soil, surface water and groundwater.

Required Permits

- A building permit may be required at the time of installation.

General Protection Measures

a) Leaks and spills shall be contained and cleaned up before reaching floor drains.

b) Waste oils must not be deliberately added to drains.

c) A regular schedule for cleaning the floor drains will be established. It is recommended that they be cleaned 2-3 times per year.

d) Floor drains will be regularly inspected to determine if maintenance is required.

Checklist/Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

5.13.7 Tank Removal and Replacement

Description

When a tank is no longer required or has failed, the tank must be removed and disposed of in order to minimize the potential of impacting the environment. The environmental section of the Maintenance and Traffic Branch generally handles tank removals and replacements.

Concerns

The concerns and potential impact associated with tank removal and replacement include:

- Contamination of soil, surface water and groundwater.

Required Permits

- Petroleum storage tank systems must be registered under and in compliance with the *Petroleum Product Storage and Handling Regulation – Clean Environment Act* (New Brunswick *Regulation 87-97*) before commencing operation. Registration does not apply to sites with a total capacity less than 2,000 L. *Regulation 87-97* Schedule A, Part I and Part II, contain a site approval form and an environmental approval form for new installations or modifications to an existing system, and must be forwarded to NBENV at least one month prior to the anticipated start of construction. Registration must be renewed on an annual basis.
- All aboveground storage tanks must conform to the National Fire Code and NB Regulation 87-97, and for furnace oil tanks, CSA B139.

General Protection Measures

a) NBENV Regulation 87-97 Schedule D form will be completed and submitted to the NBENV immediately after the removal of any petroleum storage system (including furnace oil tanks) on a site in the province of New Brunswick having a total capacity greater than or equal to 2,000 L of petroleum product storage capacity.

b) Any contaminated soil shall be assessed by a New Brunswick site professional and/or removed for disposal at an approved facility.

c) NBENV will be notified of the removal date five days prior to removal.

d) The system will be emptied of all products prior to removal.

e) Waste products will be disposed of at an approved facility.

f) If contaminated soil is suspected or identified, NBENV will be notified.

g) Remove contaminated soil for disposal at an approved facility and/or have it assessed by a New Brunswick site Professional.

h) The premises will be restored to a neat and clean condition.

i) The disturbed area will be stabilized in accordance with Section 5.7 – Erosion and Sediment Management.

Checklist/Reminders

See Appendix A: Section 5.13 – Storage & Handling of Petroleum Products Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT and Contractor personnel shall be responsible for the safe storage and handling of petroleum products used during construction and OMR.

NBDOT, petroleum system users and Contractor's personnel shall be responsible for reporting any spills that may occur.

5.14 Storage and Handling of Other Hazardous Materials

Description

This section addresses hazardous materials other than petroleum products and explosives that may be stored, handled and used during construction and OMR.

For the purpose of this manual, hazardous material is defined as a material which, by reason of its properties, is a hazard to health or to the environment and which is explosive, gaseous, flammable, poisonous, radioactive, corrosive, oxidizing or leachable or is designated as a hazardous material, and any object classed by regulation as a hazardous material.

Some of the frequently used hazardous materials would include paint, solvents, antifreeze, road salt and winter sand.

Concerns

The concerns and potential impacts associated with the storage and handling of hazardous material include:

- Accidental spills;
- Contamination of soil, surface water and groundwater; and
- Potential fire hazards.

Required Permits

- Hazardous materials shall be stored in appropriate storage areas in accordance with federal and provincial legislation and permits.

General Protection Measures

a) All products shall be stored in approved product storage areas (*e.g.,* with spill containment capability) in a well ventilated area.

b) Hazardous materials shall be stored at least 30 m from any watercourse, wetland or private water well and at a location where lost or spilled product cannot enter a watercourse, wetland or private water well.

c) Hazardous waste shall be dealt with in compliance with federal and provincial regulations. A professional hazardous waste management company shall be contacted for disposal of most hazardous wastes.

d) All products shall be handled by trained, qualified personnel.

e) All products and fuel storage areas shall be properly labeled, with labels visible at all times.

f) All necessary precautions shall be taken to minimize spills, misplacement or loss of hazardous materials.

g) In the event of a spill, Section 5.12 - Spill Management will be followed.

h) Smoking shall be prohibited within 10 m of a hazardous materials storage area.

i) Storage sites shall be inspected regularly (at least weekly) to ensure compliance.

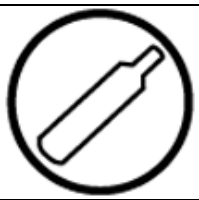
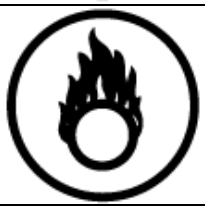
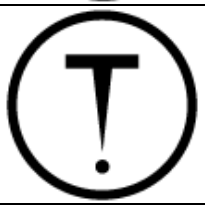
j) Hazardous waste will be collected and disposed of at an approved disposal facility.

The four key programs for protection measures used by the Department of Transportation for identification, handling, transportation and storage of hazardous products are the Workplace Hazardous Materials Information System, Material Safety Data Sheets, CANUTEC and Transportation of Dangerous Goods.

Workplace Hazardous Materials Information System (WHMIS)

WHMIS is a system put in place to provide a safe workplace. The WHMIS program delivers information on products using labels, Material Safety Data Sheets (MSDS) and education programs. Storage of hazardous (controlled) materials must comply with WHMIS requirements.

Controlled products are those that fall under the following categories:

• Class A – Compressed Gas	
• Class B – Flammable and Combustible Material	
• Class C – Oxidizing Materials	
• Class D1 – Materials Causing Immediate and Serious Toxic Effects	
• Class D2 – Materials Causing Other Toxic Effects	
• Class D3 – Biohazardous Infectious Materials	
• Class E – Corrosive Material	
• Class F – Dangerously Reactive Materials	

Material Safety Data Sheets (MSDS)

MSDS provide information on the controlled product that includes the hazardous ingredients of the product, health hazards, protective measures and emergency procedures. MSDS of a controlled product should be reviewed prior to working with the product.

Canadian Transport Emergency Centre (CANUTEC)

CANUTEC is operated by Transport Canada. CANUTEC's mandate is to provide assistance via the telephone to emergency response personnel when dealing with a dangerous goods emergency. CANUTEC has a scientific data bank of products/chemicals where technical information can be accessed in the event of an emergency providing:

- Properties of the dangerous good;
- Health hazards and first aid;
- Fire, explosion, spill or leak hazards;
- Remedial actions;
- Evacuation distances; and
- Personal protective clothing and decontamination.

CANUTEC may be contacted in the event of a spill or emergency phone to receive prompt advice: 1-613-996-6666

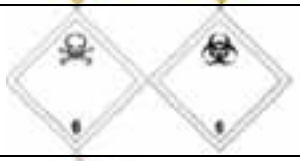
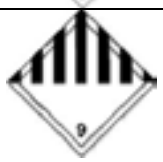
CANUTEC staff also provides an information service on all aspects of the regulatory requirements for the handling, offering for transport and transporting of dangerous goods by all modes of transport. CANUTEC is the primary contact point for the Transport of Dangerous Goods Directorate on questions regarding the transportation of dangerous goods regulations and chemical products.

For general information CANUTEC should be reached by calling the information number (613) 992-4624, to keep the emergency telephone lines free.

Transportation of Dangerous Goods (TDG)

The *Transportation of Dangerous Goods Act* is a federal legislation to promote public safety during the transportation of dangerous goods. The transportation of goods can be by means of road, rail, water or air.

Federal and provincial legislation provide for the regulation of an extensive list of products, substances or organisms classified as dangerous. The products fall into one of nine classes. A system of diamond-shaped placards and labels is used to identify dangerous goods.

Class 1 explosives	
Class 2 gases	
Class 3 flammable liquids	
Class 4 flammable solids, spontaneously combustibles and substances that, on contact with water, emit flammable gases	
Class 5 oxidizing substances and organic peroxides	
Class 6 poisonous (toxic) and infectious substances	
Class 7 radioactive materials	
Class 8 corrosives	
Class 9 miscellaneous products or substances • **miscellaneous identified dangerous goods** • **certain specified goods considered dangerous to the environment** • **dangerous wastes**	

Checklist/Reminders

See Appendix A: Section 5.14 – Storage & Handling of Other Hazardous Materials Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.14.1 Traffic Paint

Description

Traffic painting involves painting lines for traffic control on the roads/highways. NBDOT mainly purchases traffic paint in returnable, re-usable containers. These bulk containers are 1,100 L totes and are re-filled frequently.

Concerns

The concerns and potential impacts associated with traffic line painting include:

- Contamination of soil, surface & ground water.

Required Permits

None identified.

General Protection Measures

a) The use of water-borne paint will be utilized where possible versus oil based traffic paint.

b) All solvents used to wash spray painting or other equipment, shall be returned to the appropriate storage yards for safe storage or disposal.

c) Small quantities of paint designated for disposal shall first be allowed to harden, and then disposed of at a regional landfill.

Checklist/Reminders

See Appendix A: Section 5.14 – Storage & Handling of Other Hazardous Materials Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15 Structures

Description

A structure is used to allow vehicular, or pedestrian or wildlife to cross a watercourse/wetland, railway facility or highway.

The construction, maintenance and removal of structures each have their own potential environmental impacts. The protection measures associated with the construction, maintenance and removal of structures will be discussed in the following sections.

5.15.1 Structures Construction

Description

The construction of structures includes grade separations, watercourse crossings, seawalls, wildlife crossings, wharves and large (≥ 3m diameter or equivalent area) culvert installations.

Concerns

The concerns and potential impacts associated with structures construction include:

- Erosion and sedimentation of watercourse and wetlands;
- Impacts to fish and fish habitat; and
- Accidental spills.

The following activities are typically involved in the construction of a structure within a watercourse, wetland or marine environment:

a) Installation of filter screen and/or floating boom;
b) Installation of cofferdams;
c) Installation of temporary access structure;
d) Excavation for abutments and foundations;
e) Construction of foundations and piers; and
f) Construction of embankments.

These items are described in detail below.

5.15.1.1 Filter Screen

Description

A filter screen is installed in a waterbody to contain and confine sediment-laden water resulting from a disturbed area adjacent to or within a body of water. Filter screens are composed of permeable geotextile fabric which is suspended vertically in a water body and secured to the bottom of the water body using weighted material. A floating boom may be used to secure the top of the screen at the water surface.

Concerns

The concerns and potential impacts associated with filter screens include:

- Sedimentation of watercourses/wetlands; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- A NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Filter screens will be designed to withstand all natural forces and the predictable weather conditions specific to the site where being installed.

c) The portion of the geotextile located along the bottom of the watercourse shall be held in place in such a manner that water cannot pass between the bottom line of the geotextile and the bed of the watercourse.

d) Filter screens will be installed around the work area prior to the commencement of work.

e) The filter screen is to form a continuous sheet and the seams are to be constructed with materials and in a manner that conforms to the manufacturer's instructions.

f) Filter screens will be installed in locations that will allow for the continued passage of fish and boats/vessels.

g) The filter screen shall be maintained in a functional manner.

h) The filter screen shall be inspected daily and prior to, during and after any rainfall.

Filter screen placed in a watercourse to contain silt from earthwork activities and prevent its transport downstream. Note that the filter screen is placed such that if silt laden runoff from the construction area enters the watercourse, it will enter the containment area.

i) Any deficiencies are to be repaired immediately.

j) The filter screen shall be removed from the watercourse after work is completed.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.1.2 Construction of Cofferdams

Description

Cofferdams are used to allow work within a water body to be done in the dry separate from the water body. Cofferdams are constructed to isolate the work area from the water body. Cofferdams may be constructed of sheet piling, earth berms covered to prevent sedimentation, sandbags, or other materials.

Sheet-pile cofferdam and filter screen at bridge pier location to isolate the work area from the watercourse.

Concerns

The concerns and potential impacts associated with the cofferdams include:

- Sedimentation of watercourses and wetlands; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- A NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) An impermeable liner shall be used on the face of sand bag cofferdams, to prevent water from passing through the cofferdam.

c) Erosion and sediment control measures will be installed prior to the commencement of any earthwork.

d) If dewatering is carried out to control and/or lower the water level inside cofferdam, the water will be pumped to a sediment pond (See Section – 5.7.2.2 – Sediment Ponds) or into a filter bag to ensure that the concentration of sediment (i.e. total suspended solids (TSS) is below regularly discharged criteria (i.e. typically 25 mg/L) before it reaches a water body.

e) Sediment-laden water discharged during dewatering shall not be allowed to flow directly into a watercourse, wetland or marine environment.

f) A filter bag may be used in lieu of a sediment pond if there is concern of sediment-laden water entering a watercourse/wetland.

Filter bag installed on temporary access structure before start of dewatering operation

Filter bag after start-up of dewatering operation. The sediment is retained in the bag and the bag is disposed of at an approved disposal site after use.

g) Material removed from within the cofferdam will be disposed of at least 30 m from a watercourse or wetland.

h) Disposal areas must be stabilized upon completion of the work.

i) Discharge during dewatering will be monitored to ensure that sediment-laden water does not re-enter the watercourse/wetland.

j) TSS will be monitored at the point where the discharge re-enters the watercourse/wetland.

k) The cofferdam shall be maintained in a functional manner.

l) The cofferdam shall be inspected daily and prior to, during and after any rainfall event.

m) Any deficiencies are to be repaired immediately.

n) The cofferdam shall be removed from the watercourse after work is completed.

o) Filter bags and the sediment retained in a filter bag will be disposed of at an approved disposal site.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For a Construction Project, NBDOT will be responsible to schedule all meetings required with NBENV and DFO. In addition, NBDOT will monitor or make arrangements to have the TSS level monitored when required.

For an OMR Project, NBDOT will be responsible for all of the above.

5.15.1.3 Excavation and Construction of Abutments and Foundations

Description

The excavation and construction of abutments and foundations involves the removal of material from within the cofferdam or foundation; pile driving (if applicable); the placement of reinforcing steel; concrete and riprap/armour stone (if applicable). Work may involve the use of a temporary access structure or trestle.

Concerns

The concerns and potential impacts associated with excavation and construction of abutments and foundations include:

- Erosion and sedimentation of watercourse and wetland;
- Impacts to fish and fish habitat;
- Noise pollution;
- Impacts to navigability; and
- Accidental spills.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- A NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Excavation shall not occur in stream without the proper protection measures and permits/authorization.

c) If navigable water, ensure that no work activity will obstruct boat/vessel passage.

d) Erosion and sediment control measures will be in place prior to commencing work.

e) Vegetation will be maintained where possible.

f) Exposed areas will be stabilized daily.

g) Where possible, the work shall be performed during low flow and/or dry weather.

h) Foundation excavation in a watercourse shall be done in a manner that minimizes the release of sediment to watercourses/wetlands. Methods such as the use of cofferdams, filter screens, pumping procedures, special excavation equipment, watertight barges, and watertight trucks may be required.

i) Material excavated from within a cofferdam shall be disposed of at least 30 m from a watercourse, wetland or marine area.

j) Where marine sediments are excavated and disposal is required on land, the Guideline for the Siting and Operation of a Dredging Material Disposal Site On Land (NBENV 2001) shall be followed. Contact NBENV for additional guidance.

k) Temporary access structures (i.e. trestles, rock causeways) will be constructed in isolation from the water body using filters screens and/or cofferdams.

l) Temporary access structures will not impede navigation in navigable waters.

m) Temporary access structures will be constructed to withstand ice management and ice jams.

n) Blasting in or near watercourses shall be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters, and approved by DFO.

o) The Habitat Management Program of DFO shall be contacted as early as possible to identify resources at risk and to develop an effective mitigation plan.

p) Construction activity will be carried out in a manner that does not block fish passage.

q) Noise disturbance from pile driving work adjacent to residential developments may require restrictions to work scheduling and time frames.

r) Equipment will be in good working condition, free of leaks.

s) Hazardous material will be stored and handled in accordance with Section 5.14 – Storage and Handling of Other Hazardous Materials.

t) Fresh concrete shall not be discharged into a watercourse.

u) If any material to be used for Riprap, armor stone or rock fill is suspected, it will be tested in accordance with Section 5.25 – Acid Rock Drainage Management, to ensure it is not acid generating.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.1.4 Construction of Embankments

Description

The Construction of embankments may be temporary (for access) or permanent (approach fill to structure) and generally involve material being placed in or near a watercourse/wetland. Work may also include the installation of underground drainage (catch basins and culverts) and/or the placement of riprap or armour stone.

Concerns

The concerns and potential impacts associated with the construction of embankments include:

- Erosion and sedimentation of watercourses and wetlands;
- Impacts to fish and fish habitats; and
- Loss of wetland area.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- A NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed.

b) Work shall not occur in stream without the proper protection measures (i.e. cofferdams and filter screens) and permits/authorization.

c) Erosion and sediment control measures will be installed prior to commencing work.

d) Clean material will be used as embankments fill in or within 30 m of watercourses and/or wetlands.

e) Embankment fills within 30 m of a watercourse will be stabilized at the end of each day.

f) Riprap or armour stone will be used where necessary.

g) If any material to be used for Riprap, armour stone or rock fill is suspected to contain acid generating materials, it will be tested in accordance with Section 5.25 – Acid Rock Drainage Management, to ensure it is not acid generating.

h) Drainage pipes installed to transmit water from catch basins to the toe of the slope must have geotextile fabric and riprap placed at the outlet to prevent erosion.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.2 Structures Maintenance

Description

Repair or rehabilitation of damaged or deteriorated structure components are undertaken as required ensuring the structural integrity of the structure. Also, resurfacing of the structure is performed with the intention of extending the life cycle of bridge components.

The following are typical types of activities during repair or rehabilitation of a structure within a watercourse, wetland or marine environment:

a. Application and Removal of Protective Coatings;
b. Maintenance of Substructure and Superstructure;
c. Chipsealing the deck;
d. Concrete Repair; and
e. Cleaning of Structures.

The environmental protection measures associated with these activities are discussed in the following sections.

5.15.2.1 Application and Removal of Protective Coatings

Description

Protective coatings are applied to structural components and clearance beams to prevent deterioration and corrosion of steel. Deteriorated protective coatings are removed when determined that they are no longer protecting the structural components.

Concerns

The concerns and potential impacts associated with the application and removal of protective coatings include:

- Improper storage and handling of hazardous materials.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- An NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Prior to commencement of work on structures, the bridge shall be checked for signs of nesting by migratory birds.

c) Where possible, activities which could destroy eggs or nestlings shall not take place during the months of May through July on sections of bridges where nests of migratory birds are found to exist.

d) Where the spent blast media is known to contain lead or other materials that may be considered hazardous, laboratory testing shall be undertaken to determine the appropriate waste disposal options.

e) All necessary precautions shall be taken to prevent discharge or loss of any harmful material or substance into the watercourse.

f) Enclosures must be used to prevent the discharge of material into a watercourse/wetland.

g) Solvents used in the cleaning of painting equipment shall be located in a closed container and recycled by an approved solvent recycler.

h) All empty coating, paint solvent and cleaner containers shall be disposed of in an environmentally acceptable manner (*i.e.,* crushed, bagged and disposed at a regional landfill).

i) The Handling and Storage of Hazardous Material shall be carried out in accordance with Section 5.14 – Handling and Storage of Hazardous Material.

j) A specific site plan will be in place where specific environmental concerns exist.

k) A partial enclosure is required where surface preparation and/or coating operations result in chippings, scrapings, and other materials or debris which may escape from the operation.

l) A partial enclosure will be used during manual removal (chipping, scraping) and application (brush/roller) of protective coatings.

m) A full enclosure is required where surface preparation and/or coating operations may cause the escape of dust, paint overspray, and all other materials or debris from the operation, and where this type of release must be prevented.

n) A full enclosure will be used during abrasive blasting and spray application of protective coatings.

o) A full enclosure with a negative pressure system is required where surface preparation and/or coating operations may cause the escape of dust beyond a specified distance (normally 10 m), and where the escape of all other materials or debris from the operations must be prevented. Such an enclosure should be utilized where there is serious concern for potential human health, property or damage to fish and fish habitat, or where a full enclosure alone is deemed to be insufficient protection.

p) For abrasive blasting below the deck, staging will be used to collect spent blasting media. Geotextile fabric is placed over the staging to allow vacuuming of the media for proper disposal or re-use. Tarps are also tucked in along the sides of the bridge deck to minimize fugitive emissions.

Typical set-up for below deck work. Note geotechnical fabric over staging to allow for collection of spent abrasives.

q) Normal abrasive material recovery will be 85% or more. This is to be verified by comparing the weight of abrasive material used to the weight of material recovered.

r) For abrasive blasting above the deck, staging will be mounted on sections of the deck. Impermeable tarps will be installed at the top of the staging to keep the work area dry. Tarps are typically used to enclose the remainder of the work area, and the bridge deck is used to collect the spent blasting media. All bridge deck drains will be blocked. Open steel grating decks will be covered with geotechnical fabric or by some other means to collect the spent blasting media.

Typical set-up for above deck work. Screen tarps fully enclose the work area to prevent blasting media from being released to the underlying watercourse.

s) If air or airless spray tools are used, drapes and curtains similar to those used during abrasive blasting will be erected to prevent paint from entering the environment.

t) Spent blasting media will be handled and disposed of according to NBENV guidelines, depending on its classification as either "non-hazardous solid waste" or "hazardous solid waste."

u) A leachate test will be used to determine its classification.

v) As a non-hazardous waste, the spent blasting media will be transported from the project site to an approved waste disposal site.

w) Written approval from the NBENV must be obtained for disposal of blasting media classified as hazardous waste.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.2.2 Maintenance of Substructure and Superstructure

Description

Repair and replacement of damaged or deteriorated bridge components are undertaken as required to ensure the structural integrity of the structure. Work may include repairs to decks, piers and abutments.

Concerns

The concerns and potential impacts associated with maintenance of Super and Sub structures include:

- Erosion and sedimentation of watercourses and/or wetlands;
- Impacts to navigability; and
- Accidental spills.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- An NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Prior to the commencement of work on structures, the bridge shall be checked for signs of nesting by migratory birds.

c) Where possible, activities which could destroy eggs or nestlings shall not take place during the months of May through July on sections of bridges where nests of migratory birds are found to exist.

d) If navigable water, ensure that no work activity will obstruct boat/vessel passage.

e) All necessary erosion protection measures shall be in place prior to the commencement of work to prevent silt and debris from washing into the watercourse.

f) When repairs to bridge decks are necessary, any breakthrough of the deck should be avoided.

g) The sides of the deck will be covered to prevent pieces of concrete or other materials from being introduced to the underlying watercourse. Plywood boards or tarps may be used for this purpose.

h) Bridge deck drains will be blocked.

i) When concrete replacement work is necessary on structures, timber staging will be placed next to the face to prevent concrete from falling into the water, or a cofferdam will be constructed to enclose the work area. (See Section 5.15.1.2 – Construction of Cofferdams)

j) Unsalvageable treated timbers shall be disposed of in accordance with Section 5.20 – Waste Management.

k) All necessary precautions shall be taken to prevent discharge of any harmful material or substance into the watercourse including, but not limited to, hydrocarbons, concrete (asphaltic and Portland cement), fresh concrete, creosote timbers and preservatives.

l) During underwater concrete abutment and pier repairs, concrete shall be fully cured before forms are removed and the repair exposed to current.

m) All waste generated in the removal of damaged and deteriorated components shall be collected for proper recycling or disposal.

n) All treated wood waste shall be disposed of in accordance with Section 5.20 – Waste Management.

o) All hazardous material used during removal of a structure shall be disposed of in accordance with Section 5.14 – Storage and Handling of Other Hazardous Materials.

p) All necessary precautions shall be taken to prevent discharge or loss of fillers into the watercourse.

q) Grout pumping equipment shall not be cleaned within 30 m of a watercourse/wetland.

r) Excess spent grout shall be allowed to dry and disposed of at least 30 m away from any watercourse or wetland.

s) Exposed areas will be stabilized upon completion of the work

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.2.3 Chipsealing Decks

Description

Chipseal is applied to decks and approaches to improve skid resistance of the deck surface and to extend the life of the deck.

Concerns

The concerns and potential impacts associated with chipsealing include:

- Improper handling of hazardous materials.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Prior to commencement of work, the structure shall be checked for signs of nesting by migratory birds. Where possible, activities which could destroy eggs or nestlings shall not take place during the months of May through July on sections of bridges where nests of migratory birds are found to exist.

c) No bridge located over a watercourse shall be surfaced with liquid asphalt unless the necessary steps have been taken to prevent the asphalt from entering the watercourse.

d) Where the danger exists of asphalt over-spray entering the watercourse, the sides of the structure shall be skirted with sheet polyethylene (or similar protection).

e) Where the danger exists of asphalt seeping through the deck into the watercourse, the bridge deck shall be underdraped with sheet polyethylene (or similar protection).

A properly protected watercourse during chipsealing operations.

f) Where it is considered impractical to protect a watercourse from asphalt contamination, chipsealing shall not be carried out.

g) Deck drains will be covered prior to chipsealing.

h) Upon completion of chipseal operation, skirting and underdraping will be kept in place until the chipseal has set.

i) Skirting and underdrapping and other protection materials will be disposed at an approved facility.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.2.4 Cleaning Structures

Description

Cleaning is done to remove accumulated sand and other materials that may obstruct drainage on a structure.

Concerns

The concerns and potential impacts associated with the cleaning of structures include:

- Sedimentation of watercourse/wetland.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Where accumulations of dirt and debris are excessive, bridge surfaces shall be vacuumed, scraped or swept prior to blowing with compressed air or flushing.

c) All material vacuumed or scraped shall be collected and disposed of at least 30 m from any watercourse/wetland.

d) All waste shall be disposed in accordance with Section 5.20 – Waste Management.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.2.5 Ice Control

Description

Circumstances may arise when ice jams may threaten a structure which may result in failure, or may cause backwater effects at culverts. In these circumstances, measures to control the ice need to be implemented. Ice control options include using heavy equipment, when possible, or the use of blasting materials.

Concerns

The concerns and potential impacts associated with ice control include:

- Impacts to wildlife and wildlife habitat;
- Impacts to fish and fish habitat; and
- Accidental spills of hazardous materials.

Required Permits

None Identified.

General Protection Measures

a) Ice control options are outlined in the New Brunswick River Ice Manual (Environment Canada and NBENV 1989). Mitigation to prevent severe ice jams are preferred to removing ice once a jam has developed that may threaten a structure.

b) Mechanical ice removal is preferred for small watercourses accessible from the banks, using construction equipment such as backhoes and draglines. The equipment operator shall exercise judgment as ice removal operations progress, to ensure the safe removal, and minimizing potential for environmental impacts, such as those that may occur following the loss of equipment into the watercourse.

c) Properly placed explosives may be used for removing ice jams by blasting the ice sheet holding the jam in place. However, blasting ice jams is rarely effective and is inherently dangerous.

d) Blasting shall be conducted in accordance with the DFO's Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Program, as early as possible to identify resources at risk and to develop an effective mitigation plan.

e) Onsite fuelling must not occur within 30 m of a watercourse, wetland or private water well.

f) Designated fuelling and storage areas must be at least 100 m away from any watercourse, wetland or private water well.

g) Materials to facilitate rapid containment and clean up of spills must be available during any construction/OMR activity in or near any watercourse/wetland or environmentally significant area.

h) Equipment should be inspected daily for leaks.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.15.3 Removal of Structures

Description

Removal of a structure may be required when a road is decommissioned, or when replacement is required for old structures.

Concerns

The concerns and potential impacts associated with the removal of structures include:

- Sedimentation and erosion of watercourses and wetlands;
- Impacts to fish and fish habitat;
- Accidental spills;
- Dust;
- Noise; and
- Impacts to navigability.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- An NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Erosion and sediment control measures shall be installed prior to commencement of the work.

c) Where complete removal is required, the watercourse shall be restored to its original cross section.

d) The amount of de-vegetation will be limited to reduce the risk of sedimentation.

e) Banks of the watercourse shall be protected immediately following removal, using riprap or any other approved slope protection method.

f) Waste and debris shall be disposed of in accordance with Section 5.20 – Waste Management.

g) Foundation excavation in a watercourse shall be done in a manner that minimizes the release of sediment to watercourses/wetlands. Methods such as the use of cofferdams, filter screens, pumping procedures, special excavation equipment, watertight barges, and watertight trucks may be required.

h) Navigation requirements and the potential effects of temporary trestles on ice movement and ice jams shall be investigated and taken into consideration in both the design and construction phases of any trestle and/or causeway.

i) Where possible, work will be done during low flow and/or dry weather.

j) Equipment will be in good working condition.

k) Hazardous material will be stored in accordance with Section 5.14 Storage and Handling of Other Hazardous Materials.

l) Blasting in or near watercourses shall be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters, and in consultation and approval with DFO. The Habitat Management Program of DFO shall be contacted as early as possible to identify resources at risk and to develop an effective mitigation plan.

m) Fish passage shall be maintained.

n) Waste material excavated shall be disposed of at least 30 m from a watercourse or wetland.

o) Where dewatering inside cofferdams is required, and the concentration of total suspended solids (TSS) exceeds regulatory discharge criteria (typically 25 mg/L above background), the water shall be treated prior to discharge into the watercourse.

p) Protection measures shall be considered to control/limit noise and fugitive dust.

q) No excavation will take place in the stream until all required permits, approvals and protection measures are in place.

r) Install proper erosion and sediment control measures prior to commencement of the work.

s) Prior to commencement of work on structures, the bridge shall be checked for signs of nesting by migratory birds. Where possible, activities which could destroy eggs or nestlings shall not take place during the months of May through July on sections of bridges where nests of migratory birds are found to exist.

t) All waste generated in the removal of the structure shall be collected for proper recycling or disposal.

u) All treated wood waste shall be disposed of in accordance with Section 5.20 – Waste Management.

v) All hazardous material used during removal of a structure shall be disposed of in accordance with Section 5.14 – Storage and Handling of Other Hazardous Materials.

w) Exposed areas will be stabilized upon completion of the work.

Checklist/Reminders

See Appendix A: Section 5.15 – Structures Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For a Construction Project, NBDOT will be responsible to schedule all meetings required with NBENV and DFO. In addition, NBDOT will monitor or make arrangements to have the TSS level monitored when required.

For an OMR Project, NBDOT will be responsible for all of the above.

5.16 Summer Highway Maintenance

Description
Several Maintenance activities such as, Patching, Grading, Ditch Maintenance, vegetation Control, Painting (Striping) are undertaken as required to ensure the integrity & safety of the highway system.

5.16.1 Patching

Description

Patching is undertaken to repair potholes, depressions, ruts, bumps, and distorted surfaces on surface-treated highways.

This section will focus on the placement of the asphalt concrete for maintenance purposes and the disposal of any surplus asphalt waste. For protection measures associated with asphalt concrete see Section 5.1 – Asphalt Concrete and for protection measures associated the Asphalt plant see Section 5.17 – Temporary Ancillary Facility Management.

Concerns

The concerns and potential impacts associated with patching include:

- Improper handling and storage of hazardous materials;
- Improper handling of petroleum products and/or chemicals;
- Improper disposal of waste and excess asphalt.
- Cleaning of tools and equipment;
- Accidental spills; and
- Contamination of soil, surface water and groundwater.

Required Permits

None Identified.

General Protection Measures

a) Patching shall be performed as outlined in the Highway Maintenance Management System Manual.

b) Asphalt emulsion pumps, shovels, rakes, and other tools shall only be cleaned at maintenance depots.

c) Only environmentally friendly release agents shall be used to clean equipment and tools.

d) All used fuel shall be collected in a container and recycled or disposed of at an approved facility.

e) Empty drums shall be returned to the maintenance depot for proper disposal.

f) Spill Management of solvents used to clean tools used during the application of asphalt concrete must follow the guidelines outlined in Section 5.12 – Spill Management.

g) NBDOT personnel shall minimize the volume of waste materials by only ordering as much as can be put down before the hot mix cools to a point where proper compaction cannot be achieved.

h) Surplus materials shall be used where possible at other locations or returned to the depot for proper disposal. Disposal of hazardous materials shall follow the guidelines outlined in Section 5.14 - Storage and Handling of Other Hazardous Materials.

i) Waste patching material (cured asphalt) is considered “clean fill” by NBENV if it is not exposed to a heat source. Such material shall be disposed of at a location, on NBDOT property, at least 30 m from a watercourse, wetland or any other ESA, where it cannot be washed into an ESA.

Checklist/Reminders

See Appendix A: Section 5.16 – Summer Highway Maintenance Checklist

Responsibilities

The Highway Superintendent must ensure that maintenance personnel are properly trained in the use and disposal of patching materials and materials used for clean up.

5.16.2 Grading

Description

Grading is used to reshape unpaved roads to maintain proper crown and remove ruts, potholes and washboard conditions.

Concerns

The concerns and potential impacts associated with grading include:

- Generation of dust; and
- Prevention of Sheet-flow runoff.

Required Permits

None Identified.

General Protection Measures

a) Grading shall be performed as outlined in the Highway Maintenance Management System Manual.

b) To minimize generation of dust, grading should be undertaken after periods of wet weather.

c) Grading shall be carried in a matter that does not leave windrows along the side of the road that would prevent sheet-flow runoff.

Checklist/Reminders

See Appendix A: Section 5.16 – Summer Highway Maintenance Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.16.3 Ditch Maintenance

Description

Ditch maintenance is undertaken to allow drainage of the roadbed and to correct deficiencies such as erosion, non-conformity in grade, line, or cross-section of ditch, water ponding on roadway, and restrictive vegetative growth that impedes drainage of the roadbed. Additional ditching measures are found in Section 5.7.3 - Ditching

Concerns

The concerns and potential impacts associated with ditch maintenance include:

- Erosion and sedimentation of watercourses and wetlands;
- Impacts to fish and fish habitats; and
- Accidental spills.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Where possible, a buffer zone of 30 m shall be kept between the end of ditching and all watercourses and wetlands.

c) All erosion and sediment control structures will be installed prior to commencement of the work.

d) Erosion control structures shall be installed where the ditch meets the buffer zone.

e) Additional erosion control structures will be installed further up the ditch as required (See Section 5.7 – Erosion and Sediment Management) and maintained until the exposed areas have been re-vegetated and are no longer prone to erosion and sedimentation.

f) Petroleum-contaminated material encountered in the ditch shall be reported to NBENV and appropriate remedial measures initiated in accordance with Section 5.13 – Storage and Handling of Petroleum Products and Section 5.14 – Storage and Handling of Other Hazardous Materials.

g) The location of sanitary outfalls encountered in the ditch shall be reported to the New Brunswick Department of Health.

h) Side slopes shall be as flat as possible within the limits of the ROW and terrain.

i) Natural drainage shall be maintained whenever practical.

j) Ditches shall be directed into surrounding vegetation where possible rather than emptying into a natural watercourse or wetland.

k) Sediment deposited in the ditch shall be removed when it reduces the capacity of the channel.

l) Removed material and sediment shall be disposed of at a location at least 30 m from a watercourse and such that it cannot wash into a watercourse or wetland.

m) Suitable excavated material shall be used when needed to fill in washouts, depressions foreslopes or backslopes.

n) Riprap if required shall be used to line the bottom of ditches that have steep grades and/or excessive erosion.

o) To ensure stabilization, the ditch will be mulched, hand seeded, hydroseeded, or lined with jute matting, depending on the erosion potential of the in-situ material in the ditches.

p) After the completion of ditching operations all exposed areas will be stabilized to erosion and sedimentation.

Checklist/Reminders

See Appendix A: Section 5.16 – Summer Highway Maintenance Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.16.4 Vegetation Control

Description

Vegetation along roadways is controlled by mowing and brush cutting to maintain safe sight distances, facilitate snow control, prevent drainage obstructions, and improve roadside appearances.

5.16.5 Pavement Markings

Description

This section covers the application of paint as roadway markings. For storage and handling of paint see Section 5.14.1 – Traffic Paint.

Concerns

The concerns and potential impacts associated with the pavement marking include:

- Improper storage and handling of hazardous material.

Required Permits

None identified.

General Protection Measures

a) When painting operations are being carried out, care must be taken to avoid spills.

b) Spills shall be contained and disposed of in accordance with Section 5.12 – Spill Management.

c) Spray equipment shall be cleaned at the roadside with a volatile or water base solvent away from any ESA.

d) The solvent shall be collected and then added to the paint tank on the striping truck where it aids in the drying process.

e) Where a risk of contamination of roadside vegetation exists, a sheet of polyethylene (or other suitable material) with absorbent material shall be used to contain the spills.

f) Onsite fuelling must not occur within 30 m of a watercourse, wetland or private water well.

Checklist/Reminders

See Appendix A: Section 5.16 – Summer Highway Maintenance Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

Concerns

The concerns and potential impacts associated with vegetation control include:

- Rutting or disturbance of soft soils near watercourses and/or wetlands; and
- Erosion and sedimentation of watercourses and/or wetlands.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Mowing and brush cutting shall be performed as outlined in the Highway Maintenance Management System Manual.

c) All vegetative growth shall be controlled through manual and/or mechanical means. Herbicides are not permitted.

d) Mowing and other equipment should not proceed if the ground is soft, to prevent rutting, exposure of new ground, root damage, and ponding of water.

e) Slash shall not be allowed to enter a watercourse or wetland, and it shall be disposed of where it cannot be washed into a watercourse/wetland by floodwaters.

f) Brush will be chipped and spread (not piled) on ROW. Burning is not permitted.

g) Areas to be mowed, or brush cut, will be clearly marked and/or clearly communicated to personnel performing the work.

Checklist/Reminders

See Appendix A: Section 5.16 – Summer Highway Maintenance Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17 Temporary Ancillary Facility Management

5.17.1 Portable Asphalt Plants

Description

This section only pertains to portable asphalt plants. Permanent asphalt plants owned and operated by private companies/contractors are not covered in this document; however these types of asphalt plants must have a valid "Approval to Operate" from NBENV. In addition, this section only discusses the portable asphalt plant setup and operation. (See Section 5.1 – Asphalt Concrete for protection measures dealing with the asphalt material or Section 5.16-Summer Highway Maintenance for patching operation).

Portable asphalt plants are often stationed near highway construction projects where it is more economical and feasible to transport raw material to the site rather than transport material from permanent facilities. In general, a portable asphalt plant consists of a portable drum mix asphalt plant, a baghouse, petroleum/bitumen storage tanks and aggregate stockpiles. Where a wet scrubber is used to control air emissions, a sediment pond(s) is employed.

Concerns

The concerns and impacts associated with the operation of a portable asphalt plant include;

- The release of exhaust gas and/or process gas;
- The release of fugitive dust;
- The improper management of petroleum products and/or chemicals;
- The improper management of solid waste generated; and
- The release of nuisance odour and/or sound.

Required Permits

- The mobile asphalt plant must have a current approval under the ***Air Quality Regulations – Clean Air Act*** and the approval must be amended to locate the plant at a new location each time the plant is moved. Notification to NBENV must occur at least two weeks prior to relocating the asphalt plant and written approval is required prior to moving to a new site.
- An Approval to Operate under the New Brunswick Air Quality Regulation must be obtained.
- Petroleum Storage Approval must be obtained under the New Brunswick Petroleum Product Storage and Handling Regulation.
- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland or to extract water from a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) The Contractor, when considering the location of the asphalt plant, shall avoid where possible environmental constraints such as:

- Watercourses;
- Wetlands;
- Waterbodies;
- Residential and other odour and noise sensitive areas; and
- Wellfields

c) The asphalt plant and other facilities shall be operated in such a manner so as to safeguard the air and water resource by controlling or mitigating environmental pollution in accordance with the ***Clean Air Act***, the ***Clean Water Act***, and other relevant legislation.

d) Erosion and sediment control measures shall be installed at the asphalt plant site to control runoff from the site where warranted (See Section 5.7 – Erosion and Sediment Management).

e) Where air pollution control technology includes a wet scrubber, no scrubber water is to be discharged to the environment. Sediment ponds are to be properly sized and are to be used as a source of clean water for the scrubber, where feasible. (See section 5.7 – Erosion and Sediment Management) Excess water shall be pumped and disposed of at an approved disposal facility.

f) Use and storage of petroleum and other chemicals at the asphalt plant shall follow the guidelines outlined in Section 5.13 – Storage and Handling of Petroleum Products and Section 5.14 - Storage and Handling of Other Hazardous Materials.

g) Spill Management of petroleum and other chemicals at the asphalt plant shall follow the guidelines outlined in Section 5.12 – Spill Management.

h) Within two weeks of relocating the mobile asphalt plant from the present site, complete site rehabilitation shall be implemented. The site shall be reinstated to a condition equivalent to the state of the site prior to the operation of the asphalt plant.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.2 Pits

Description

Pits are developed to supply materials, such as aggregates and borrow, for construction and OMR activities. Borrow is material obtained off-site and is used to complete embankments to subgrade and other aspects of work. Borrow may constitute overburden/surficial deposits or ripped/excavated bedrock. Developing a pit usually involves many activities such as clearing (Section 5.3) and grubbing (Section 5.11) of the site, material excavation, blasting and placement (Section 5.9).

Concerns

The concerns and potential impacts associated with pits include:

- Erosion and sedimentation of watercourses/wetlands;
- Impacts to ESA's;
- Generation of dust; and
- Excessive noise.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland or to extract water from a watercourse/wetland.
- Permits are required from NBDNR if source is located on Crown Land.
- Permits may be required from local Government agencies, such as Municipal/City, Local Service District, and Rural Planning Commissions (if plan has been adopted).
- An "Approval to Operate" a borrow source may be required from NBENV if EIA has stipulated its requirement.
- Permits may not be required if material is acquired within the ROW limits.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Pits shall be developed and operated in accordance with all applicable provincial guidelines, policies, acts, regulations and permits requirements.

c) Pits shall not be located within 30 m of a watercourse, wetland or private water well.

d) New pits shall be located to avoid environmentally sensitive areas.

e) Erosion and sedimentation control measures will be installed to control runoff from the site. See Section 5.7 – Erosion and Sediment Management.

f) Vegetated buffer zones shall be left and maintained around pits where possible to reduce the noise and dust from those sites.

g) Pits shall be left in a neat and safe condition free from overhanging banks.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.3 Stockpiling

Description

Materials such as topsoil, borrow, and aggregates may be temporarily stockpiled within the ROW or other temporary ancillary facility during highway construction.

Concerns

The concerns and potential impacts associated with stockpiling include:

- Erosion and sedimentation of watercourses and wetlands.

Required Permits

- None Identified.

General Protection Measures

a) Stockpiled materials shall be located at least 30 m away from a watercourse or wetland.

b) Sediment control fencing shall be installed around the perimeter of stockpiles to contain erodible material to stop any sediment.

c) Stockpiled materials containing erodible material (such as topsoil) shall be stabilized by mulching to prevent erosion.

d) Drainage from other areas of the site will be directed away from stockpiles.

e) In dry, windy conditions, stockpiles may require wetting for dust control to reduce off-site environmental impacts.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.4 Quarries

Description

Quarriable substances provide raw materials to build infrastructure necessary for economic growth. Quarries generally involve blasting and processing of materials (See Section 5.8 – Excavation, Blasting and Aggregate Production)

Concerns

The concerns and potential impacts associated with quarries include:

- Erosion and sedimentation of watercourses and wetlands;
- Generation of dust;
- Impacts to ESA's; and
- Excessive noise.

Quarry development has been recognized as an issue of concern. The need for a balance between access to quarriable material and the protection of the social and natural environment exist.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland or to extract water from a watercourse/wetland.
- An approval to operate a quarry is required from NBENV on all crown land and freehold lands throughout the province (expect NBDNR lands).
- A permit is required from NBDNR to remove material from NBDNR Crown Lands.
- Permits may not be required if material is acquired from the within the ROW limits.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Quarry sources shall be developed and operated in accordance with all applicable provincial guidelines, policies, acts, regulation and permits requirements.

c) Unless authorized as a condition of the permit, the quarry may only operate between the hours of 7am to 7pm. And unless authorized in the permit, there shall be no mining and processing on Sundays and Statutory Holidays.

d) The final perimeter of the quarry shall respect the distance set in the permit or as approved by NBENV.

e) No blasting shall occur on Sunday, Statutory Holidays or outside the hours of 8am to 6pm.

f) An undisturbed buffer strip shall be maintained at least 15 m wide between the final perimeter of a quarry and a public highway, or non-residential property. The undisturbed buffer strip between the quarry and a residential property shall be at least 50 m wide. In both situations, the buffer width can be reduced with written approval of the adjacent land owner.

g) No excavation may take place to a depth that will permanently impact the water table. The quarry operator/owner will be required to demonstrate and get approval from NBENV that no long-term impact will occur prior to commencement of the work.

h) In the event that a historic site is unearthed in a quarry, the operator/owner shall immediately cease operation and notify the Archaeological Services Unit.

i) The proponent shall perform a representative pre-blast survey of all structures and wells within 500 m.

j) The quarry shall be designed to contain all runoff water and sediment within the work area. This may include water treatment and sediment control plan.

k) If there is a risk for fugitive dust to impact adjacent landowners, the owner/operator shall make arrangement so that no dust is visible at the property line.

l) The owner/operator shall ensure that noise pollution created by the quarry operations will not affect the adjacent landowners.

m) The final reclamation of a quarry shall be done to the satisfaction of NBENV.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.5 Temporary Access Roads

Description

Temporary access roads are necessary to provide access during construction.

Concerns

The concerns and potential impacts associated with temporary access roads include:

- Erosion and sedimentation of watercourses/wetlands;
- Impacts to fish and fish habitat;
- Impacts to ESA's;
- Impacting watercourse/wetland banks.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Dust control shall be carried out in accordance with Section 5.6 – Dust Control.

c) Erosion and sedimentation control measures shall be installed and maintained in accordance with Section 5.7 – Erosion and Sediment Management.

d) Erosion and sedimentation control shall be installed prior to the construction of temporary access roads.

e) Proper ditching shall be constructed to prevent runoff from flowing directly into watercourses or wetlands.

f) Additional erosion and sediment control measures shall be installed as required along the temporary access road.

g) The access road will be capped with rock/gravel to ensure sedimentation does not occur.

h) Temporary roads may be placed on geotechnical fabric to reduce mixing of existing ground material with fill material, to facilitate removal of fill material and to facilitate restoration of the site after the road is no longer required.

i) Abandoned detour sites shall be cleaned up, and approaches and streambanks are stabilized by seeding and mulching, placing of riprap, or a combination of these measures.

j) If a temporary watercourse crossing is required, it shall be installed in accordance with Section 5.17.6 – Temporary Watercourse/Wetland Crossings.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.6 Temporary Watercourse/Wetland Crossings

5.17.6.1 Temporary Watercourse/Wetland Crossings with a Structure

Description

A temporary watercourse crossing is a structure that is placed in/over watercourse to provide access across the watercourse for a limited period of time. They may be used to provide access to heavy equipment prior to and/or during construction of a permanent crossing, or to maintain traffic flow while an existing culvert or structure is being repaired or replaced.

Concerns

The concerns and potential impacts associated with temporary watercourse/wetland crossing with a structure include:

- Erosion and sedimentation of watercourses/wetlands; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.
- A NWPA permit may be required if work is being carried out in a navigable waterbody.

General Protection Measures

a) A copy of the WAWA and NWPA permits and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Where feasible, temporary crossing structures will be used instead of culverts to reduce the impact on aquatic habitat.

c) Temporary crossings will be designed/sized for peak flows expected during the life of the crossing.

d) Ice crossings over watercourses may be used.

e) Crossings locations will be chosen where the stream channel is straight and narrow.

Temporary crossing at narrow location. Note sideboards on structure to limit the amount of debris that can enter the watercourse.

f) Temporary crossings will be constructed at right angles to the watercourse, where possible.

g) When no longer needed, the crossing structure and all construction materials shall be removed from the watercourse, the banks and all exposed soil stabilized against erosion, and the channel restored to its original condition.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.6.2 Fords

Description

Fording is crossing a watercourse where the water is shallow enough to be traversed by vehicles.

Concerns

The concerns and potential impacts associated with fords include:

- Erosion and sedimentation of the watercourses/wetlands; and
- Impacts to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.

General Protection Measures

a) A copy of the WAWAP and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) A ford should only be considered as an alternative to constructing a bridge or installing a culvert.

c) Fording locations must be chosen to minimize disturbance to the banks.

d) Fording must take place perpendicular to the watercourse.

e) Equipment utilizing fords are to be clean and free of leaks.

f) The number of crossings shall be kept to a minimum and confined to the low flow period between June 1st and September 30th.

g) Approaches to the crossing shall be stabilized and access roads to crossing shall be covered with clean gravel.

h) Exposed soils must be stabilized at crossing locations.

i) Felled trees, slash and/or debris shall not be hauled through or allowed to enter the watercourse.

j) Crossings shall be removed as soon as they are no longer necessary and approaches shall be mulched or otherwise stabilized so as to minimize any sediment runoff into the watercourse.

k) The crossing area shall be restored to a condition equivalent to the condition prior to construction.

l) Fords are prohibited in watercourses located in designated drinking water supply watersheds.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.7 Marshalling Yards and Laydown Areas

Description

Marshalling yards and lay down areas are areas used on a temporary basis to store equipment and materials.

Concerns

The concerns and potential impacts associated with marshalling yards and lay down areas include:

- Erosion and sedimentation of watercourses/wetlands;
- Noise; and
- Fugitive Dust

Required Permits

- None Identified.

General Protection Measures

a) Locate marshalling yards and lay down areas using the same constraints and environmental considerations used in the siting of roadway alignments.

b) Brownfield sites are preferred to greenfield sites.

c) Open sites are preferred to forested sites that require clearing.

d) Incorporate environmental protection measures for clearing (Section 5.3), dust control (Section 5.6), erosion and sediment control (Section 5.7), grubbing (Section 5.11), and other relevant sections, as required.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.8 Storage of Explosives

Description

The purpose of this section is to cover the storage of explosives that are required during a Construction or OMR Project.

Concerns

The concerns and potential impacts associated with the storage of explosives include:

- Contamination of a watercourse, wetland or private water well.

Required Permits

None Identified.

General Protection Measures

a) Where storage of blasting agents will occur off site at an approved facility, only the amount of blasting materials required for one day will be transported to the site as needed. *Transportation of Dangerous Goods Act* and *Regulations* will be followed. All unused blasting materials shall be returned to the approved storage facility.

b) Where a temporary magazine is required for the storage of explosives on site, a temporary magazine license shall be obtained as outlined in Schedule II of the *Explosives Regulation* of the federal *Explosives Act*.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.9 Work Camps

Description

Temporary work camps may be necessary for employees depending on project accessibility, distance from existing accommodations or the cost of alternative accommodations.

Concerns

The concerns and potential impacts associated with work camps include:

- Erosion and sedimentation of watercourses and wetlands; and
- Improper waste disposal.

Required Permits

Permits will be required for solid and liquid waste disposal, water supply and sewerage treatment if not already in place.

Protection Measures

a) Facility size (area, water and septic) will be determined based on the number of employees to be at the site and the number of housing facilities.

b) Camps shall not be located within 100 m of any watercourse/wetlands.

c) Existing cleared areas for camps will be utilized; however if this is not possible, the area to be cleared will be minimized.

d) Existing vegetation will be maintained where possible.

e) Erosion and sedimentation control measures will be installed, to prevent sediment from leaving area.

f) Garbage will be stored in containers to minimize litter being spread over the area and to minimize the potential for wildlife encounters.

g) Waste disposal shall be carried out in accordance with Section 5.20 – Waste Management.

Checklist

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.17.10 Decommissioning of Temporary Ancillary Facilities

Description

Decommissioning involves the removal of temporary access roads, marshalling yards, laydown areas, temporary watercourse crossings, materials storage sites, work camps, pits, quarries and borrow sites.

Concerns

The concerns and potential impacts associated with decommissioning of temporary Ancillary facility include:

- Erosion and sedimentation of watercourses and wetlands.

Required Permits

None Identified.

General Protection Measures

In addition to facility-specific protection measures as outlined above, the following protection measures must be implemented during the decommissioning of temporary ancillary facilities:

a) Sites containing temporary ancillary facilities shall be cleaned up, and stabilized by seeding and mulching, placing of riprap, or a combination of these measures.

b) Erosion and sediment control measures shall be maintained until which time vegetation has established, and protection measures are no longer warranted.

c) Wastes shall be disposed of in accordance with Section 5.20 – Waste Management.

d) Sediment ponds containing "clean" material (*i.e.,* from aggregate piles or general site runoff) shall be cleaned of sediment. The excavated sediment shall be disposed of at a location approved by the Engineer, at least 30 m from a watercourse and such that it cannot enter a watercourse. Disposal areas shall also be mulched and/or hydroseeded. If required for treatment of site run-off, they may be maintained, and later filled in with clean fill when no longer needed.

e) Where sediment ponds may contain "suspect" material (*e.g.,* used with wet scrubbers at a mobile asphalt plant), sediment removed from the pond should be characterized by laboratory testing to determine if disposal as a contaminated sediment is required. If the sediment is unsuitable as clean fill, then the material should be disposed of as contaminated waste at an approved hazardous waste disposal facility. The sediment pond shall be filled in with clean fill, and mulched/hydroseeded.

f) Where the quality of soils affected by construction and operation of temporary ancillary facilities is unable to support the growth of vegetation (*e.g.,* due to compaction), the soil shall be restored and adequately prepared using mechanical means, or amended with topsoil.

Checklist/Reminders

See Appendix A: Section 5.17 – Temporary Ancillary Facility Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.18 Topsoil

Description

Topsoil is the surface layer of the soil profile and is responsible for supplying water and nutrients to plants. Topsoil can be salvaged from on site, if adequate quality and quantities exist, or it may come from sources off site. Preserving and using undisturbed soil yields a more successful planting medium. Topsoil may be required as per the planning and design of a site or may be requested by the NBDOT.

Concerns

The concerns and potential impacts associated with Topsoil include:

- Erosion and sedimentation of watercourses/wetlands; and
- Impacts to fish and fish habitat.

Required Permits

None identified.

General Protection Measures

a) Topsoil stockpiles shall be located a minimum of 30 m from any watercourse or wetland, where they will not block natural drainage or be a potential source of sedimentation of watercourses and wetlands.

b) Stockpiles shall be mulched in accordance with Section 5.17.3 – Mulching.

c) Sediment control fencing will be installed around the stockpile to contain any sediment.

d) Once the areas have been topsoiled, hydroseed shall be applied in accordance with Section 5.7 – Erosion and Sediment Management.

e) Topsoil shall not be placed after the end of the week, which September 30th occurs without the permission of the NBDOT and is not to be placed on frozen or wet ground. If vegetation cannot be established prior to the onset of winter conditions, then the soil must be adequately stabilized using alternate measures, to ensure runoff is not conveyed to nearby watercourses.

Checklist/Reminders

See Appendix A: Section 5.18 – Topsoil Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.19 Vehicle and Equipment Management

5.19.1 Servicing and Maintenance

Description

Service and minor repairs to vehicles and equipment are routinely performed both in the field on site and at maintenance depots.

Concerns

The concerns and potential impacts associated with vehicle equipment and management include:

- Improper storage and handling of hazardous material; and
- Accidental spills.

Required Permits

None identified.

General Protection Measures

a) Tankers shall not be washed out where wash water could enter a watercourse or wetland.

b) At sites without oil/water separators, the amount of wash water used shall be minimized. Wash areas shall be positioned where the wash water will not directly enter a watercourse, wetland, private water well or marine environment. Washing equipment contaminated with petroleum shall not be permitted unless the wash water can be properly contained, collected, and disposed of.

c) Routine washing with water will take place, where possible, at sites equipped with oil-water separators so that any petroleum product can be removed prior to discharge of the wastewater.

d) Washing of specialized equipment (*e.g.,* chipseal vehicles, engines) should only take place at facilities that are properly equipped to treat the contaminated wastewater.

e) Equipment leakages shall be repaired immediately upon detection. (See Section 5.12 – Spill Management)

f) Care shall be taken to prevent oil, antifreeze, and other hazardous liquids from entering floor drains.

g) A supply of absorbent materials for spills shall be maintained at all maintenance depots and in maintenance vehicles equipped to service equipment in the field.

h) No more than 500 litres of waste oil shall be stored in temporary storage containers.

i) All containers, drums, and pails shall be closed and provided with a drip pan.

j) Oil filters shall be thoroughly drained, tied up in a plastic bag, and recycled or disposed of at a solid waste disposal facility.

k) Vehicles and equipment must be serviced in accordance with the service manual or prescribed by Vehicle Management.

l) Equipment shall be inspected daily to ensure that the equipment is operating properly and there are no leaks.

m) Leaks must be repaired immediately.

Checklist/Reminders

See Appendix A: Section 5.19 – Vehicle & Equipment Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.19.2 Idling

Description

Idling is the process in which a vehicle or equipment engine is running but is not in gear nor is it doing any work. There are several myths or misconceptions about idling: *(Source: Natural Resources Canada.)*

Myth: The engine should be warmed up before driving.
Reality: The best way to warm up your vehicle is to drive it. Even in cold weather you need no more than 30 seconds of idling before driving your vehicle.

Myth: Idling is good for your engine.
Reality: An idling engine will leave soot deposits that can build up and cause oil contamination that can damage engine components, including cylinders, spark plugs and exhaust systems.

Myth: Shutting off and restarting your vehicle is hard on the engine and uses more gas than if you leave it running.
Reality: Frequent restarting has little impact on engine components like the battery and the starter motor.

Concerns

The concerns and potential impacts associated with idling include:

- Impacts to health of people and the environment.

Required Permits

None identified.

General Protection Measures

The NBDOT has implemented an idling policy which includes the following protection measures:

a) Diesel construction equipment will be turned off when not in active use.

b) Dump trucks that are idling for 5 minutes or more will be turned off.

c) All light-duty vehicles such as (¼ or ½ ton trucks) will be turned off while unattended, or while not moving for 5 minutes or more.

d) Morning vehicle warm-ups will be restricted to 3-5 minutes.

e) A staging zone will be established for trucks that are waiting to load/unload to minimize public exposure to emissions.

f) Idling equipment will be located away from sensitive receptors such as fresh air intakes to buildings.

g) The idling restrictions apply for all vehicles under all circumstances except for the following:

- When the engine is required to power auxiliary equipment (*e.g.,* hoist, lift, computers, safety lighting, and internal equipment);
- Extreme weather conditions (-10 degrees Celsius or below / +30 degrees Celsius or above) or any other circumstance where heating or air conditioning is required for worker's health and safety;
- The original equipment manufacturer specifically recommends a longer idling period for normal and efficient operation of the motor vehicle in which case such recommended period shall not be exceeded;
- Vehicle/equipment maintenance and diagnostic purposes;
- Where the unit is not expected to restart due to mechanical problems; and
- Assisting on an emergency scene.

Checklist/Reminders

See Appendix A: Section 5.19 – Vehicle & Equipment Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.20 Waste Management

Description

Waste Management is an important environmental issue for NBDOT construction projects and highway operation. This section outlines the requirements and procedures for:

- Disposal areas;
- Construction and demolition debris;
- Garbage and other wastes;
- Litter barrels and litter pick-up (operation);
- Recycling or reuse of highway construction waste; and
- Vegetation waste.

5.20.1 Disposal Areas

Description

Disposal areas are used for the disposal of waste from clearing, grubbing, asphalt, beaver dam removal, and excavation surplus materials not identified for stockpiling and later use. This material would meet the definition of "Clean Fill" under the Clean Fill Guidelines (NBENV 2002d).

Concerns

The concerns and potential impacts associated with Waste Management include:

- Erosion and sedimentation of watercourses/wetlands;
- Impacts to ESA;
- Interference with natural drainage; and
- Destruction of landscape.

Required Permits

- Approval from the land owner and NBDOT will be required for disposal sites located within or outside the ROW.
- Approval from NBENV will be required for disposal sites located outside NBDOT ROW if the proposed site is near any ESA's.
- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) The disposal of 'clean fill' will be encouraged within the project limits.

c) Disposal area locations need to be identified.

d) Disposal areas shall be located taking into consideration the environmental constraints identified in Section 3.3 and the design constraints in Sections 4.1 and 4.4.

e) Determine best disposal configuration such that it blends in with the surrounding topography.

f) NBDOT as well as the property owner must provide approval of the proposed Disposal Area. This may require the proposed site to be inspected for ESA's and further approval from NBENV.

g) Disposal areas shall be located no closer than 30 metres from a watercourse, wetland or marine environment and where runoff from the disposal area cannot enter a watercourse or wetland or cause sedimentation of a watercourse or wetland. Additional setback requirements may apply in protected watersheds and designated groundwater protection areas, or may be warranted by site-specific conditions.

h) Clear proposed disposal area if required.

i) Disposal areas shall not block natural drainage.

j) Erosion and sediment control measures will be installed to control run off.

k) Disposal areas shall be left with a neat and finished appearance and permanently stabilized in accordance with Section 5.7 – Erosion and Sediment Management.

Checklist/Reminders

See Appendix A: Section 5.20 – Waste Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

For Construction projects, the Contractor is responsible to identify the disposal locations, to get the approval from the landowner and to get approval form NBENV (if required) to utilize the property.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.20.2 Construction and Demolition Debris

Description

Construction and Demolition (C&D) Debris may be generated during highway construction, including materials from the demolition of buildings and structures.

Concerns

The concerns and potential impacts associated with construction and demolition debris include:

- Improper disposal of C&D debris.

Required Permits

For both an existing and a new C&D site, an Approval to Operate from NBENV is required. Both of these options need to meet the following:

- Guidelines for the Siting and Operation of a Class 1 Land Reclamation Site Utilizing Construction and Demolition Debris (NBENV 2002b) for more than 100 tandem truck loads; or the
- Guidelines for the Siting and Operation of a Class 2 Land Reclamation Site Utilizing Construction and Demolition Debris from the Demolition of a Residential or Small Commercial Building (NBENV 2002c) for less than 100 tandem truck loads, without a nearby (within 30 km) existing full time Construction and Demolition Debris Disposal Site facility, transfer station, or sanitary landfill.

General Protection Measures

a) C&D debris will be disposed of at an approved C&D site.

b) Only material that meets the NBENV definition of C&D will be disposed of at an approved C&D site.

Checklist/Reminders

See Appendix A: Section 5.20 – Waste Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.20.3 Garbage and Other Wastes

Description

Garbage and other highway construction and OMR wastes addressed in this section include all wastes excluding:

- Those suitable as “clean fill” (Section 5.20.1);
- Construction and Demolition Debris (Section 5.20.2); or
- Recyclable or reusable materials (Section 5.20.5).

Concerns

The concerns and potential impacts associated with Garbage and other waste disposal include:

- Contamination of groundwater;
- Improper handling of hazardous material; and
- Wildlife encounter.

Required Permits

None identified.

General Protection Measures

a) Rags and other potentially combustible materials used in equipment maintenance shall be kept in a covered container separate from other materials until the combustible material can be removed from site for disposal. Contact a professional hazardous waste management company for disposal of such wastes.

b) Waste diesel fuel, transmission oils, hydraulic oils, and motor oil shall be stored in a labeled tank or drum for off-site recycling at a waste oil recycler, in accordance with Section 5.13.4 – Waste Oil Tank and Waste Oil Disposal.

c) Hazardous waste shall be collected and disposed of off-site at a certified disposal facility approved for receiving liquid industrial wastes. Solvents, acids and caustic liquid waste shall be collected separately and stored for removal and disposal by a certified waste management company specializing in liquid and hazardous wastes.

d) There shall be no burning of waste on the site.

e) Domestic waste from site offices and camps shall be gathered daily and stored in closed steel containers for removal and disposal at an approved Regional Solid Waste Commission Landfill.

f) In order to minimize wildlife encounters, food waste is to be removed from site.

g) Compostable waste should be considered for disposal separate from wastes destined for a landfill.

Checklist/Reminders

See Appendix A: Section 5.20 – Waste Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.20.4 Litter Barrels and Litter Pick-up

Description

Litter barrels are provided for the convenience of the public to dispose of their litter at various roadside locations.

Concerns

The concerns and potential impacts associated with litter barrels and litter pick up include:

- Improper maintenance of the litter barrels;
- Improper disposal of the litter collected; and

- Wildlife encounters.

Required Permits

None identified.

General Protection Measures

a) All litter collected shall be disposed of at the closest Regional Solid Waste Commission landfill.

b) Litter barrels shall be serviced at regular intervals to minimize the nuisance potential of the sites.

c) Pick up of litter along the ROW by highway maintenance personnel is encouraged.

Checklist/Reminders

See Appendix A: Section 5.20 – Waste Management Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.20.5 Recycling or Reuse of Highway Construction Waste

Description

NBDOT and Contractors should always look at opportunities for reduction, reuse and recycling of waste materials. Recycling refers to a process of utilizing existing materials in a newly manufactured product. Reuse involves the removal and use of existing materials in substitution of importing newly manufactured material. In the past, materials that were discarded on highway projects typically included excavated materials such as topsoil, poor or wet subsoils, old asphalt concrete, and Portland cement concrete.

Concerns

The concerns and potential impacts associated with recycling and reusing highway construction waste include:

- The Recycling and Reusing of existing material may mean that those materials will need to be stockpiled for a period of time.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland or if storing material within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Where practical, NBDOT shall recycle old asphalt concrete pavement by mixing it with virgin aggregates and new asphalt cement.

c) Topsoil shall be stripped off cuts and shallow fill areas and reused on finished roadway slopes.

d) Contractors shall use poor subsoils, usually in deep fills, and moisture condition (dry out) wet subsoils instead of disposing of them.

e) NBDOT shall reuse steel guide rails (after straightening), and wooden guide posts, where practical.

f) Old aluminum signs shall be covered with new reflective sheeting and reused. Other aluminum products, such as sign posts, light or signal poles, overhead sign structures, and bridge rails, shall be reused, or, if not reusable, sold as scrap and recycled. Steel from pile cut-offs and from old bridges is to be similarly recycled.

g) Any stockpiled material shall be stabilized in accordance with Section 5.7 – Erosion and Sediment Management.

h) Stockpiled material shall be kept 30 m away from watercourse/wetland and/or private well.

i) Material not deemed to be recyclable shall be disposed of in accordance with Section 5.20.2 – Construction and Demolition Debris.

Checklist/Reminders

See Appendix A: Section 5.20 – Waste Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.20.6 Vegetation Waste

Description

There is a possibility that vegetation waste (wood chips, stumps, etc) may be left behind after the clearing and grubbing operations are completed.

Concerns

The concerns and potential impacts associated with vegetation waste disposal include:

- Increased use of disposal areas; and
- Improper disposal of materials

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland or if storing material within 30 m of a watercourse/wetland.

For both an existing and a new C&D site, an Approval to Operate from NBENV is required. Both of these options need to meet the following:

- Guidelines for the Siting and Operation of a Class 1 Land Reclamation Site Utilizing Construction and Demolition Debris (NBENV 2002b) for more than 100 tandem truck loads; or the
- Guidelines for the Siting and Operation of a Class 2 Land Reclamation Site Utilizing Construction and Demolition Debris from the Demolition of a Residential or Small Commercial Building (NBENV 2002c) for less than 100 tandem truck loads, without a nearby (within 30 km) existing full time Construction and Demolition Debris Disposal Site facility, transfer station, or sanitary landfill.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Chipped vegetation waste will be spread over ground or used in the fill to minimize the size of disposal areas.

c) Chipped vegetation shall not be spread into any watercourse and/or wetland.

d) Chipped vegetation waste can be used for mulch.

e) Grubbings can be placed in one lift (not to exceed 600 mm) in fills to minimize the use and size of disposal areas.

f) If vegetation waste cannot be disposed of in one of the methods outlined above, it will be disposed of by burying or disposal at a regional landfill.

g) Stockpiled or disposed material shall be kept 30 m away from watercourse/wetland and/or private well.

Checklist/Reminders

See Appendix A: Section 5.20 – Waste Management Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.21 Winter Highway Maintenance

Introduction

The New Brunswick Department of Transportation has a Winter Maintenance Service Policy that describes the Departments objectives and timeframes for snow control dependent upon climatic conditions, and an accompanying Storm Response Guide to assist departmental personnel in providing consistent levels of service throughout the province.

The following subsections provide general protection measures for several aspects of winter maintenance.

5.21.1 Snow Removal and Disposal

Description

Highways, intersections, bridges, grade separations, and NBDOT parking lots are plowed to remove accumulated snow. In general, disposal of snow is not done extensively across New Brunswick, but only at select NBDOT-owned facilities.

Concerns

The concerns and potential impacts associated with Snow Removal and Disposal include:

- Contamination of watercourses, wetlands and groundwater;
- Impacts to fish and fish habitat;
- Impacts to ESA's; and
- Interference with natural drainage.

Required Permits

None identified.

General Protection Measures

a) Snow removal and disposal shall be performed as outlined in the Highway Maintenance Management System Manual.

b) Snow storage areas will be located away from environmentally sensitive locations.

c) NBDOT personnel and snow removal contractors shall deposit snow in designated areas away from surface waters (watercourses and wetlands) and sensitive groundwater areas, especially drinking water sources.

Checklist/Reminders

See Appendix A: Section 5.21 – Winter Highway Maintenance Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.21.2 Sanding

Description

Sand is applied to road surfaces to provide traction on snow-packed or ice-packed surfaces. In stockpiles, salt is added to winter sand in small quantities to prevent freezing.

Concerns

The concerns and potential impacts associated with Sanding include:

- Erosion and sedimentation of watercourses/wetlands;
- Impacts to fish and fish habitat;
- Impacts to ESA's;
- Interference with natural drainage; and
- Impacts to infrastructure.

Required Permits

None Identified.

General Protection Measures

a) Sanding shall be performed as outlined in the Highway Maintenance Management System Manual.

b) The amount of salt added to winter sand should be kept to a minimum (2.5% - 4%) to minimize the amount of salt entering the environment.

c) The use of sand with a percentage of salt higher than 4% shall only be used in limited situations such as the requirement to bare up snow-packed local roads where salt is not normally used.

Checklist/Reminders

See Appendix A: Section 5.21 – Winter Highway Maintenance Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.21.3 Salting

Description

Salt is applied to road surfaces to obtain clear driving lanes or bare centre strip within a reasonable time after a storm.

Concerns

The concerns and potential impacts associated with Salting include:

- Contamination of watercourses/wetlands;
- Contamination of groundwater and residential wells;
- Impacts to fish and fish habitat;
- Impacts to ESA's;
- Impacts to soil properties; and
- Impacts to vegetation.

The main concern for salting is the potential of salt affecting the surrounding environment.

The leaching of large quantities of road salt into the ground may contaminate groundwater, residential water supplies, damage soil structure and adversely affect plant life.

Required Permits

None identified.

General Protection Measures

a) All personnel are to be trained in salt management strategies.

b) Salt shall be applied as outlined in the Highway Maintenance Management System Manual.

c) The New Brunswick Department of Transportation has a Salt Management Policy and has developed a Draft Salt Management Plan that sets out a framework for ensuring NBDOT continuously improves the management of road salt used in its winter OMR activities. The document is dynamic, to allow for NBDOT to phase in new approaches and technologies for salt management.

d) To maximize the effectiveness of salting operations while minimizing the salt requirements, salt should be applied at rates that achieve the desired effect but will not subject the surrounding environment to excess salt loadings.

e) To reduce excess salt usage spreaders should be kept in calibration, and spinners shall be adjusted to prevent overthrow (waste).

f) For blocked culverts, steaming should be the first choice unless the situation or location makes it impractical or impossible to use. In rare cases, calcium chloride would be utilized.

Checklist/Reminders

See Appendix A: Section 5.21 – Winter Highway Maintenance Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.21.4 Winter Materials Storage

Description

Materials required for winter OMR operations are stockpiled at the maintenance depots. Salt is stored indoors. Sand is stored indoors or outdoors depending upon the site storage capacity. Salt is added (2.5 - 4%) to sand stockpiles in order to prevent the stockpile from freezing.

Concerns

The concerns and potential impacts associated with Winter Materials Storage include:

- Erosion and sedimentation of watercourses/wetlands;
- Potential for groundwater or surface water contamination;
- Impacts to fish and fish habitat;
- Impacts to ESA's;
- Interference with natural drainage;
- Impacts to infrastructure;
- Impacts to soil properties; and
- Impacts to vegetation.

Required Permits

None Identified.

General Protection Measures

a) Storing of winter materials shall be done as outlined in the Highway Maintenance Management System manual and as specified in the Draft Salt Management Plan.

b) Care shall be taken to ensure that only minimal quantities of winter maintenance materials are stored on site (*i.e.,* only one season's supply of materials).

c) All salt shall be stored in a structure designed for salt storage (salt dome or salt shed).

d) Loading of salt into vehicles shall take place inside the storage structure or as close to the entrance as possible.

e) To minimize spillage, loader buckets shall be partially full during loading.

f) Any salt spilled in the yard will be immediately cleaned up and re-stockpiled.

g) Brooms and shovels shall be kept at the dome entrance for easy access and use in the event of salt spills.

h) Site drainage will be directed away from the storage locations.

i) Blended sand will be stored in domes, where possible.

j) When blended sand is stored outside, care will be taken to ensure that quantities are minimal and that piles are put up as late in the season as possible.

k) Stockpiling procedures as outlined in the Highway Maintenance Management System Manual shall be followed.

l) Drainage will be directed away from the blended sand pile to reduce the amount of salt leaching from the stockpile.

m) Covers will be used to prevent salt from leaching from the stockpile.

n) Sediment control fencing will be installed where there is a risk of runoff from sand stockpiles to leave the property and impact adjacent properties, watercourses and/or wetlands.

o) Where possible, sand shall be stockpiled away from locations where there is potential for contamination of groundwater sources.

Checklist/Reminders

See Appendix A: Section 5.21 – Winter Highway Maintenance Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.22 Work Progression

Description

Work Progression is the orderly and timely progression of excavation, embankment work and stabilization of erosion-prone materials to ensure the protection of the environment.

Work Progression minimizes erosion potential by limiting the extent and timeframe that areas are exposed.

Concerns

The concerns and potential impacts associated with improper Work Progression include:

- Contamination of watercourses/wetlands;
- Impacts to fish and fish habitat; and
- Impacts to ESA's.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) A copy of the WAWA permit must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Existing vegetation will be maintained wherever possible.

c) Work Areas will be identified prior to commencing earthwork activities.

d) Disposal areas shall be included in the identified work areas and must be stabilized in accordance to work progression and Section 5.7.

e) The size of the work area will be based on the area that can be completed and stabilized within 30 days after the area is started.

f) Stabilization shall mean hydroseeding of all erodible materials or, mulching when hydroseeding is deemed to not be practicable.

g) Erosion-prone cuts shall be excavated such that all runoff is directed to one or two exit points.

Area stripped of all vegetation – Poor Work Progression

Areas stabilized as work progresses - Good Work Progression

h) Runoff will be controlled and erosion and sediment control measures will be installed prior to the commencement of the work and as required during the work.

i) Work Areas that cannot be completed within the 30-day period due to overly large cut/fill quantities or prolonged wet weather shall have all erodible soil mulched.

j) Work shall continue diligently on these cuts and/or fills, and shall be stabilized each successive 30-day period until the final shaping and hydroseeding are completed.

k) Work Areas which have uncompleted cuts and fills and completed grubbing and stripping which have not been under continuous and/or diligent construction, or have been abandoned shall be mulched to avoid the potential of fines being deposited into a watercourse/wetland.

l) Work Areas not completed at the time of winter shutdown shall be mulched.

m) Stockpiles that contain erodible materials shall be mulched.

n) Inspection of the work area must be conducted prior to, during and after any rainfall to ensure the effectiveness of work progression. This would include monitoring the effectiveness of any installed erosion and sediment control structures and the monitoring of any stabilized areas.

o) Any deficiencies shall be repaired immediately.

Checklist/Reminders

See Appendix A: Section 5.22 – Work Progression Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23 Working Near Environmentally Sensitive Areas

Description

This section outlines environmental protection measures to minimize the potential impact of highway construction and operation on particular areas of environmental concern that could not be avoided during highway planning and design.

It is recognized that in unique circumstances, environmental management plans, site-specific environmental protection plans or other measures may need to be developed in consultation with appropriate provincial or federal departments.

Identification/Flagging of Environmentally Sensitive Areas
During environmental investigations, usually conducted in support of an environmental assessment, a number of environmental sensitive areas may be identified in close proximity to the final ROW. Environmentally sensitive areas that may require flagging include:

- Rare plants;

- Wetlands;
- Archaeological and/or heritage resources;
- Protected areas; and/or
- Deer wintering areas.

The environmentally sensitive areas shall be flagged by persons capable of identifying the feature.

5.23.1 Agricultural Lands

Description

Productive agricultural land is a valuable resource and should be avoided whenever possible. When avoidance is not possible, care shall be taken during planning, design, construction and OMR activities to minimize damage and to accommodate the requirements of the property owner for continued use of the surrounding land.

Concerns

The concerns and potential impacts associated with Agricultural Lands include:

- Destruction or alteration of productive agriculture land;
- Impacts to land adjacent to productive agriculture land; and
- Inhibiting the development or expansion of existing agriculture land.

Required Permits

None identified.

General Protection Measures

a) When farming operations are divided by highway development, meetings shall be held with affected property owners to establish alternate access to severed properties. Although the standard practice is to establish a network of property access roads to the closest public highway, the possibility of providing livestock or machinery underpasses is also given consideration on a case by case basis.

b) Arrangements shall be made with private property owners as necessary to provide access through the ROW to and from their property during construction.

c) Routes of travel to and from private property, as arranged during consultations with the property owner, shall be identified and clearly marked in the field. Contractor and NBDOT personnel and equipment passage shall be restricted to these routes of travel.

d) Where farm fences have been cut as a result of construction activities, they shall be repaired and/or replaced to original condition immediately, if needed for containment of farm animals.

e) Any adverse effects on property, such as damage to farm or access roads, removal of livestock watering source and/or agricultural stream crossing, damage to buildings, subsurface drainage systems, erosion control structures, drainage ditches, etc, resulting from execution of work, shall be repaired so as to return the property as closely as possible to pre-work conditions, or the owner shall be compensated.

f) Erosion and sediment control measures shall be installed in accordance with Section 5.7 – Erosion and Sediment Management.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.2 Archaeological, Heritage and Paleontological Resources

Description

Historic resources include archaeological and historic sites and objects that are protected under provincial legislation. The main mechanism of protection is avoidance wherever possible. Objects of historical significance, however, may be found during construction and OMR. Provisions must be made for protection of these discovered objects and sites.

Concerns

The concerns and potential impacts associated with Archaeological, Heritage and Paleontological Resources include:

- Loss of archaeological, heritage and paleontological resources.

Required Permits

- A permit from ASU is required in order to excavate or alter in any way a protected site.

General Protection Measures

a) Where archaeological investigations during the planning and design stage of a highway have identified archaeological, or heritage resources that would be affected by the new highway corridor, options for protection or other mitigation are developed in conjunction with the Archaeological Services Unit (Heritage Branch, New Brunswick Department of Wellness, Culture and Sport), and subsequently implemented.

b) The NB Museum will be contacted with regards to the discovery of paleontological resources, to determine applicable mitigation.

c) In the event of the discovery of an archaeological or other heritage resource, all work shall cease in the immediate area of the discovery until such time as NBDOT personnel, having consulted with the Archaeological Services Unit, advise those involved as to the disposition of the discovery, and authorize resumption of the work.

d) All fossils and other remains or items of geological or archaeological interest or value discovered during highway construction or operations are deemed to be the property of the Crown. The Contractor and NBDOT shall take all reasonable precautions to prevent employees or other persons from removing or damaging any such articles or items.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

NBDOT is responsible for contacting and hiring a qualified archaeologist to be present during the work.

5.23.3 Forest Resources

Description

During the implementation of a highway system, forest resources may be affected within the final ROW.

Concerns

The concerns and potential impacts associated with Forest Resources include:

- Impacts to forestlands; and
- Loss of forestlands

Required Permits

None identified.

General Protection Measures

a) NBDOT, during the highway planning and design stage, shall minimize the amount of intensely managed forest land displaced.

b) NBDOT shall negotiate the purchase of property directly from the property owner.

c) Arrangements shall be made with private property owners as necessary to provide access through the ROW to and from their property during construction and operation.

d) Salvage of merchantable timber shall be carried out in accordance with Section 5.3 – Clearing, during ROW clearing activities.

e) Vegetation control shall be carried out in accordance with Section 5.16 – Summer Highway OMR and Related Activities.

f) Fire prevention measures shall be followed in accordance with Section 5.10 – Fire Prevention and Contingency.

Installation, Inspection and Repair

None identified.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.4 Groundwater Wells

Description

Roads can often be located within 500 m of residential wells, which can lead to potential for impacts to groundwater and residential wells as a result of construction activities.

Concerns

The concerns and potential impacts associated with Groundwater Wells include:

- Increased surface runoff;
- Decreased groundwater recharge;
- Decreased groundwater quality and/or quantity; and
- Impact to water wells.

Required Permits

None identified.

General Protection Measures

a) Residential wells within ROW shall be decommissioned as per the NBENV Guidelines for decommissioning (abandonment) of Water Wells (NBENV, undated).

b) For drilled groundwater wells within 500 m of construction activities, a proportion of representative wells may be subject to a pre-blast survey as a baseline against which to compare any changes during or after construction activities, should a complaint be registered. The inventory of residential wells shall include an interview with the well owner, documentation of well construction specifics (yield, depth, and construction, where available), collection of a water sample for chemical and bacterial analysis (alkalinity, pH, major ions and microbiology), and photographic documentation of the well location.

c) Any dug wells within 50 m of a planned major (>5 m) overburden cut or structure shall be inspected, measured for water level and depth, and inventoried for future reference prior to construction.

d) Where rock excavation is required in close proximity to residential wells, ripping shall be used instead of blasting, where possible.

e) If wells are adversely affected by construction, temporary water shall be provided during construction.

f) Wells found to be permanently damaged as a result of construction activities will be repaired or replaced.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

For a Construction Project, the Contractor will be responsible for the pre-blast survey and monitoring of the residential wells.

5.23.5 Mineral Resources

Description

Due to the economical and social value that mineral resources may represent, care needs to be given so that the development of highway facilities avoids or minimizes the negative impacts on the mineral resources.

Concerns

The concerns and potential impacts associated with Mineral Resources include:

- Impacts to existing or future mining operations; and
- Potential for subsidence where areas have been previously mined.

Required Permits

None identified.

General Protection measures

a) The amount of lands required for the highway corridor which contain valuable mineral resources will be minimized.

b) Areas with potential for subsidence will be avoided, when possible.

c) Arrangements shall be made with private property owners as necessary to provide access through the ROW to and from their property during construction and operation.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.6 Noise Sensitive Areas

Description

Noise sensitive areas are defined as residential or commercial areas affected by noise from machinery used during construction and OMR of highway facilities. NSA are identified during the Planning and Design phases.

Concerns

The concerns and potential impacts associated with Noise Sensitive Areas include:

- Interference and/or disturbance of the public within the NSA.

Required Permits

None identified.

General Protection Measures

a) All equipment shall be maintained in good working order for noise suppression standards.

b) Where complaints of excess noise are received during construction, noise monitoring shall be conducted and corrective action taken if warranted, where noise levels exceed 65 dBA over a 24 hour period (Leq). Construction activities may be restricted to daylight hours if complaints and follow-up noise monitoring identify a problem.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.7 Rare Plants

Description

Rare plants are an environmental resource considered during the planning and design of highways. While efforts are taken to avoid rare plants, portions of populations may be found within the ROW, as well as in close proximity to the ROW boundaries.

Concerns

The concerns and potential impacts associated with Rare Plants include:

- Impacts to and/or loss of rare plants population.

Required Permits

None identified.

General Protection Measures

a) Specific mitigation for rare plants must be addressed in a project-specific EMP or site-specific EPP.

b) Where populations of rare plants are located within or adjacent to the ROW, the clearing limits shall be flagged.

c) Site staff will be made aware of any rare plant locations.

d) Ancillary facilities will not be placed in an area outside of the ROW where rare plant populations have been identified.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.8 Watercourses, Fish and Fish Habitat

Description

Under the NB Clean Water Act, a watercourse is defined as the full width and length, including the bed, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not. However for the purpose of this document, watercourse may include marine shore drainage areas, intertidal zones and wetland areas.

Marine shore drainage areas are coastal lands that are effectively close enough to the shoreline to have an impact on the intertidal zone; this typically includes a 30 m area from each watercourse bank, in the portion of the watercourse which is under salt water influence. An intertidal zone is the area of the main coastline between the extreme high and low watermarks.

Water quality relates to the quantity of physical and chemical substances suspended or dissolved in the water. The physical activity or equipment and personnel in and around a watercourse may result in sediment entering the watercourse. As well hazardous material may enter a watercourse from equipment activity or maintenance.

Highway development may also affect fish habitat by either affecting the water quality or by stream alteration.

Sediment in a watercourse may affect fish both directly and indirectly. Direct mortality, by suffocation due to sediment clogging of gill surfaces or from extreme stress due to hyperventilation, is a rare problem and will occur only under severe circumstances. Indirect effects such as loss of habitat and food supply are more common. High turbidity caused by excessive sediment in the water may disrupt spawning activities, impair feeding efficiency of fish, damage the breathing organs and clog the feeding apparatus of aquatic invertebrates, resulting in the loss of this food source to fish species. Settled sediment may fill in rearing pools, reduce the intra-gravel flow of water in spawning areas, and suffocate the eggs of both fish and aquatic invertebrates.

Watercourse crossings during highway construction and OMR can result in the direct removal of small amounts of fish habitat and, if not done properly, could result in barriers to fish migration. Crossings at spawning areas can result in the direct loss of eggs.

Concerns

The concerns and potential impacts associated with Watercourses, Fish and Fish Habitat include:

- Erosion and Sedimentation;
- Accidental spills;
- Disruption or alteration of watercourse flow; and
- Impact to fish and fish habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.

General Protection Measures

a) A copy of the WAWA and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Means of lessening the impacts on watercourses, fish and fish habitat at the Design stage are detailed in Section 4.

c) Other protection measures related to construction and OMR activities around watercourses, fish and fish habitat have been detailed in Section 5.

d) Site-specific erosion and sediment control plans (or site-specific EPP) developed for work within 30 m of a watercourse shall be followed, as required.

e) No blasting shall be carried out in or near a watercourse without consultation and/or the authorization from DFO.

f) Equipment shall be in good working condition and its surfaces shall be free of deleterious substances such as oil and grease, before working in the wetted portion of a watercourse.

g) When equipment is working within 30 m of a watercourse, a spill kit will be kept on board or nearby to permit rapid containment of leaks.

h) Prior to structure or culvert installation or maintenance, NBDOT may be required by DFO to carry out fish rescues on fish populations where there is potential for direct impacts. Fish rescues must be carried out by qualified aquatic biologists.

i) All erosion and sediment control measures will be in place, inspected and maintained.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.9 Watershed and Wellfield Protection Zones

Description

Drinking water originates from one of two sources: groundwater or surface water.
Most groundwater is retrieved through wells. A wellfield is a group of wells that together draw water from the aquifer to supply a public water system. A watershed area is an area of land that drains surface water from a connected system of watercourses and that ultimately drains into one particular river, creek, stream or other flowing body of water.

Wellfields and watersheds are an important resource and because of this, both need to be protected from contamination due to construction or OMR activities. Unfortunately, watershed or wellfield protection zones may not be avoidable during the planning and design stage.

See Section 2.1.2 – Provincial Acts and Regulations for more detail on Watershed and Wellfields.

Concerns

The concerns and potential impacts associated with construction and OMR activities within Watershed and Wellfield Protection Zones include:

- Improper storage of hazardous materials and petroleum products;
- Improper disposal of hazardous materials and petroleum products;
- Accidental spills;
- Sedimentation of watersheds;
- Impacts to watershed or wellfield protected zones through contamination; and
- Impacts to water quality and quantity of a municipal water supply.

Required Permits

- An exemption by NBENV from the Watershed Protected Area Designation Order & Wellfield Protected Area Designation Order, under the Clean Water Act is required in order to work or store materials products within the protected watershed or wellfield area.
- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.

General Protection Measures

a) The NBENV will be contacted to determine if the activity is located in a Watershed Protected Area. NBENV maintains a complete listing of designated watershed protected areas, including mapping. Maps of the zones for all protected watersheds are included within the *Watershed Protected Area Designation Order*.

b) The NBENV will be contacted to determine if the activity is located in a Wellfield Protected Area. NBENV maintains a complete listing of designated wellfield protected areas, including mapping. Maps of the zones for all protected wellfields are included within the *Wellfield Protected Area Designation Order*.

c) NBDOT is required to apply for an exemption for any activities within a watershed or wellfield protected area. This exemption must be obtained prior to commencement of any work.

d) A copy of the WAWAP, WfPADO and WsPADO must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

e) NBDOT shall ensure that the boundary between the ROW and the watershed or wellfield protected area is flagged prior to commencing any activities in the area.

f) There shall be no ground disturbance (rutting, etc.) within the watershed or wellfield protected area during any activities, unless authorized in the exemption.

g) Refueling of equipment shall take place outside of the watershed or wellfield protected area.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.10 Wetlands

Description

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water at some time during the growing season. Wetlands are characterized by poorly drained soils and predominantly hydrophytic or water tolerant vegetation.

Wetlands support a variety of important functions including groundwater recharge and discharge, flood control, water quality control, sediment stabilization, nutrient transport/transformation, fish habitat, wildlife habitat, and biomass production/export.

Concerns

The concerns and potential impacts associated with Wetlands include:

- Erosion and Sedimentation;
- Accidental spills;
- Loss of wetlands; and
- Impacts to wildlife habitat.

Required Permits

- A WAWA permit is required prior to commencement of work within 30 m of a watercourse/wetland.
- A *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat may be required if work will result in Harmful Alteration, Disruption, Destruction of fish habitat.

General Protection Measures

a) A copy of the WAWAP and *Fisheries Act* Authorization for Works or Undertakings affecting Fish Habitat (if applicable) must be kept at the site for the duration of the work, and the conditions of approval shall be followed. Field staff must be familiar with the requirements outlined in the permits.

b) Means of lessening the impacts on watercourses, fish and fish habitat at the Design stage are detailed in Section 4.

c) Other protection measures related to construction and OMR activities around watercourses, fish and fish habitat have been detailed in Section 5.

d) Construction and related activities in wetlands shall be limited to within the ROW.

e) Vehicles and equipment used during construction shall only use designated roadways and access areas.

f) Construction machinery shall be in good working condition and be cleaned of mud and vegetation prior to entering and leaving wetlands within the construction area during

groundbreaking activities (e.g., grubbing and grading), to minimize the spread of invasive plant species (e.g., purple loosestrife).

g) As required, wetlands remaining following partial impacts by highway construction shall be monitored after construction to visually assess the wetland hydrology, the introduction of invasive plant species, the chloride levels in the soil and the use by recreational vehicles.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.23.11 Wildlife and Wildlife Habitat

Description

There is the potential for workers to come into contact with wildlife during work carried out on NBDOT ROW. This could have adverse environmental effects on both worker (e.g., disruption of work activity, or bodily harm) and wildlife (e.g., mortality, loss of habitat, or disturbance of critical life cycles).

Concerns

The concerns and potential impacts associated with Wildlife and Wildlife Habitat include:

- The displacement of wildlife from habitat due to construction activities;
- The potential severing of natural wildlife travel routes, resulting in road kills and an unsafe situation for the traveling public;
- The fragmentation or permanent loss of wildlife habitat; and
- Impacts to both workers and/or wildlife.

Required Permits

None Identified.

General Protection Measures

a) Means of lessening the impacts on wildlife and wildlife habitat at the Planning and Design stages are detailed in Sections 3 and 4.

b) In areas where high wildlife concentrations (e.g. deer or moose) are expected to interact with the highway, the possibility of incorporating wildlife crossings in conjunction with wildlife fencing into the highway design will be investigated. The investigation normally looks at the feasibility of locating a crossing and a cost analysis for the most efficient type of structure. Such crossings are located in consultation with DNR wildlife biologists.

c) In general, construction activities shall be scheduled, wherever possible, to avoid periods when deer may be yarded up in deer wintering areas near the ROW. If these periods cannot be avoided, then all attempts will be made to minimize deer-construction interaction.

d) Clearing activities will be carried out in accordance with Section 5.3 – Clearing in order to minimize impacts to migratory birds.

e) During construction, only designated roadways and access shall be used outside the construction footprint to limit off-road interactions with wildlife and wildlife habitat.

f) Domestic waste from site offices and camps including food waste shall be gathered daily and stored in closed steel containers for removal and disposal at an approved waste disposal site, to avoid the attraction of nuisance animals.

g) In case of persistent wildlife encounters, NBDOT personnel shall notify the local NBDNR district office to arrange for removal of nuisance animals, if necessary.

Checklist/Reminders

See Appendix A: Section 5.23 – Working Near Environmentally Sensitive Areas Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.24 Working Near Pipelines and Other Underground Services

Description

This section addresses work (*e.g.,* excavation) that has potential to disturb or damage underground natural gas and crude oil pipelines or other underground services during construction and OMR activities carried out by NBDOT and its contractors. Other underground services include power lines, cable and phone lines, water and sewer pipelines and railway switches.

Part 3, Section 29(1) of the New Brunswick *Pipeline Act* provides instruction on precautions that must be taken before excavation or digging can take place in the vicinity of underground pipelines. In essence, this section outlines the communication that must occur between contractors and underground service providers before any work takes place and stipulates

actions to take in the event that a pipeline is punctured, cracked, scratched, gouged, flattened or dented. The associated *Pipeline Regulation* under the Act further stipulates safe setback distances from underground pipelines to allow work to proceed.

Concerns

The concerns and potential impacts associated with Working Near Pipelines and Other Underground Services include:

- Accidental release of hazardous materials;
- Accidental spills;
- Impacts to surface and groundwater quality;
- Degradation of air quality; and
- Potential fire hazards.

Required Permits

None identified.

General Protection Measures

a) NBDOT personnel or contractors must contact the underground service providers listed below and receive clearance to dig.

b) No excavation or other ground-breaking activities such as geotechnical drilling shall take place until all services below are cleared or verified, and all necessary all-clear numbers, agreement letters, and approvals are obtained.

c) Excavation locations must be marked on-site prior to a clearance request being submitted.

d) Clearance requests should be submitted a minimum of 48 hours prior to any work taking place. Contact numbers for the various underground service providers are listed below.

    - For sites within Saint John City limits, the following number will provide clearance information for all services except Rogers Cable, 1-866-DIG-LINE.
    - ELECTRICAL - NB Power – All NB: Ph. 1 (800) 663-6272, IN SAINT JOHN contact Saint John Energy Ph. (506) 658-5252 or (506) 631-1469 pager. (Cliff Carson).
    - TELEPHONE - Aliant – All NB: Ph. 1 (800) 332-3333.
    - WATER/SEWER – Contact relevant municipality.
    - NATURAL GAS - Enbridge Gas – All NB: Ph. 1 (800) 994-2762.
    - NATURAL GAS - Maritimes & Northeast Pipeline – All NB: Ph. 1 (888) 444-6677.
    - NATURAL GAS, WHEN IN PENOBSQUIS ON OR ADJACENT TO ROUTE # 114 - Contact Potash Corp. of Saskatchewan (PCS) Ph. (506) 432-8400 (George Bollman or Ken Fenwick).
    - NATURAL GAS – Brunswick Pipeline – All NB. Ph. 1-888-410-2220
    - CRUDE OIL PIPELINE – contact Irving Oil Ph. (506) 202-7072 (Greg McCluskey).

- CABLE – Roger's Cable – All NB: Ph. 1 (800) 738-7893, *On Fridays, 1 (877) 935-7572.
- CN RAIL - Group Telecom/360 Network (only if you are within 50 feet from a CN Right-of-Way Phone Number: 1 (877) 865-6193.
- NB SOUTHERN RAILWAY – contact Ph. (506) 632-5828 (Steve Wills).
- PRIVATE PROPERTIES - Contact the Land Owner.
- Note: For areas beyond public property boundaries it is necessary to contact the appropriate utility companies, in case off-site operations are required. Also, request additional information (*i.e.,* site plans) must be obtained before proceeding with underground operations on private property.

e) In the event that a natural gas or crude oil pipeline or other underground service is punctured, cracked, scratched, gouged, flattened or dented, all work is to immediately cease and the appropriate company and regulatory authorities will be contacted.

f) Under these circumstances, it is essential that rapid and effective reporting of the incident take place. In the case of the natural gas or crude oil pipelines the owner/licensee/permittee for that pipeline must be contacted immediately to provide emergency response as stipulated under the *Pipeline Act*. For other underground services, the associated company must be contacted to provide appropriate emergency response.

Checklist/Reminders

See Appendix A: Section 5.24 – Working Near Pipelines & Other Underground Services Checklist

Responsibilities

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

5.25 Sulphide Bearing Rock & Acid Rock Drainage Management

Description

Bedrock units containing iron-sulphide minerals such as pyrite and pyrrhotite have the potential to generate acidic drainage when these minerals react with oxygen and water to form sulphuric acid. Although these materials are naturally occurring, excavation increases the exposed sulphide-mineral surface area, resulting in a large increase in reaction rates compared to natural conditions. The greatest potential source of acidic drainage in highway construction is therefore the rock mass excavated from rock cuts (rather than the exposed backslopes or ditches.)

The geology of New Brunswick is varied and complex. Minor sulphide mineralization may be found in most lithological bedrock units; however, certain units such as black shales/slates may have higher levels of mineralization. Mineralization may be present in a number of forms, ranging from pronounced veins and glebs to microscopic disseminations throughout the rock

mass. The mechanical competency of the host rock impacts the degree of interaction between the mineralization and the environment. Fine-grained quartzite, for instance, would react slowly. Rusty weathering on the exposed fracture face can be evidence of interaction taking place.

NBDOT investigates for sulphide bearing rock at all stages of planning, design and construction of highways. Geological mapping, published geological data, past experience and induced polarization geophysical surveys are all employed to assess proposed highway alignments. The results of the surveys are used to identify potential sulphide mineralization so that field testing and sampling can be targeted to these areas.

The presence of sulphide minerals suggests that the rock may have acid-generating potential. However, many rock types contain carbonate minerals such as calcite that act to neutralize acidity generated by the sulphide minerals. Whether or not excavation of the rock materials actually causes acid drainage depends on the balance between acid-generating and acid-neutralizing minerals and the rates of reactions.

NBDOT uses a two-step lab testing methodology. Samples are first screened based on the total sulphur content. Those with a total sulphur greater than 0.3 % by weight are then subjected to the “Modified” Sobec acid-base accounting procedure based on the total sulphur content. This approach involves the chemical analyses that determine the acid-neutralization capacity (neutralization potential, NP) of minerals within the sample and the acid-generating capacity (acid potential, AP) from sulphide minerals contained within the sample. The neutralization potential ratio (NPR) is the ratio of NP to AP.

An NPR value of 1 would theoretically indicate no acid-generating potential. However, higher values are required to address the uncertainty in the relative rates of the reactions (i.e. a relatively fast-reacting acid-generating mineral combined with a slow-reacting acid-neutralizing mineral). NBDOT defines sulphide bearing rock as total sulphur greater than 0.3% by weight and NPR less than 3.

Due to the potential environmental impact of acid-generating rock and the high costs of mitigation, sulphide bearing rock meeting the above-noted criteria are avoided where possible in the planning and design stages of highway development. Imported aggregates (other than those used in the production of asphalt concrete) must also have an NPR >3.

NBDOT has a Sulphide Bearing Rock (SBR) Committee consisting of members of Planning, Design, Construction, and TransCanada Highway Project Branches. The Committee meets on an as-needed basis to address issues as they arise. Representatives from NBENV, DNR, DFO and EC may be consulted if SBR avoidance is not possible, or, if SBR is encountered in an area where it was not expected.

Concerns

The concerns and potential impacts associated with Sulphide Bearing Rock & Acid Rock Drainage Management include:

- Low pH in watercourses/wetlands;
- Metal contamination of soils, groundwater and surface water systems;
- Degradation of water quality; and

- Impacts to fish and fish habitat.

Required Permits

- A Disposal at Sea (DAS) permit will be required for disposal in a marine environment.

General Protection Measures

a) NBDOT has a number of documents, procedures and guidelines to follow when encountering SBR in the field (See Appendix "C"). These include:

- Acid Rock Protocol (NBDOT 2000);
- Guidelines for Using Sulphide Bearing Rock (NBDOT 2002);
- Assessment of Field Monitoring Methods for Sites with Rock Materials That May Cause Acidic Drainage (Al 2007); and
- Environmental Impacts from Acid Rock Drainage: Interpretation Criteria for Water Quality Monitoring Data (Al 2005).

b) In areas that have been identified as containing SBR, avoidance must be shown by:

- Raising the grade vertically of the highway to avoid excavation;
- Moving the alignment horizontally to avoid the mineralization.

c) Where complete avoidance is not possible, NBDOT must have monitoring plans and site-specific management and contingency plans.

d) In areas that contain rock materials that may cause ARD, NBDOT monitoring programs will be carried out before, during, and after construction in accordance with *"Assessment of Field Monitoring Methods For Sites With Rock Materials That May Cause Acidic Drainage"* (Al, 2007). Environmental effects are based on variations in several key parameters (pH, SO4, Fe and Al) in accordance with "Environmental Impacts from Acid Rock Drainage: Interpretation Criteria for Water-Quality Monitoring Data" (Al, 2005). Both references are contained in Appendix C. In addition, weekly water quality monitoring, in the form of pH readings, are done by NBDOT staff.

e) Sulphide bearing rock generated during highway construction will be placed in specially designated fills and covered with a low permeable cover. A typical section of an SBR disposal area is shown in Appendix "C".

f) If working on an identified SBR project, the exposed rock cuts will be checked regularly by the NBDOT Geological Engineer to determine if there are any additional areas of mineralization.

g) Blasting patterns will be designed to minimize rock fragmentation.

h) Any SBR identified must be isolated and trucked separately to an identified SBR fill area.

i) Disposal areas are to be located within the project footprint (if feasible) or located on NBDOT owned property. Disposal areas must be identified and approved by NBDOT in consultation with the regulatory agencies.

j) Wetlands are not to be used for disposal of SBR unless the wetland is impacted by the project footprint (i.e. roadway goes through wetland). Wetlands impacted by the project footprint are contingency areas and are only to be used if there are no other locations available for disposal.

k) SBR disposal areas are not to be located within 100 m of a wetland or watercourse. This distance may increase if the topography indicates that drainage is towards the watercourse/wetland.

l) The toe of the fill of the disposal area must be grubbed to eliminate stumps and undulations that may allow for water to percolate into the SBR fill.

m) If the existing topography indicates that the surface water may drain towards the SBR fill, then an interceptor ditch or berm shall be constructed.

n) Any low areas adjacent to the fill, which may allow for water to pond, must be filled in and graded to allow for the water to drain away from the fill.

o) Lift thickness for SBR shall be 1.2 m (versus the standard 1.0 m), so that oversized blasted rock can better be incorporated into the fills.

p) SBR must be covered with low-permeable material. The cover must have a minimum thickness of 600 mm under the roadbed and 800 mm on the slopes to minimize moisture penetration into and runoff out of the SBR.

q) The cover in median areas of SBR fill areas will be increased to a thickness to 1.4 m.

r) As SBR material is being placed, the low permeable cover material will be placed as well.

s) The low permeable material shall not be pushed down over the fill foreslope.

t) The low permeable cover material shall be placed in lifts not exceeding 300 mm in height, except for the first lift, which may be up to 1m in height. Each lift must be compacted.

u) SBR cut/fill/cover work must be specified to be carried out continuously until completed. At the end of each month's work, as specified under Item 946 - WORK PROGRESSION, SBR fill slopes must be shaped and covered with a low-permeability material, topsoiled, and hydroseeded. If the fill foreslope is steep (i.e. 2:1), then jute mats will be placed prior to hydroseeding to minimize erosion.

v) The finished area shall be hydroseeded using the Hydroseed "B" in accordance with Section 5.7.1.3.

w) Hydroseed shall be maintained from the time of application until the area has become re-vegetated.

x) Hydroseeding shall be inspected prior to, during and after any rainfall. Any deficiencies shall be repaired immediately.

y) For non-wetland areas, SBR material placed adjacent to a culvert in a designated SBR fill area will have lateral protection (*i.e.,* gasketed to prevent leaks from the joint seams) See Appendix "C"

z) For wetland areas, SBR material placed adjacent to a culvert in a designated SBR fill area and the culvert itself will have lateral protection as well as be encapsulated with a low permeable material prior to the placement of the SBR material. In addition, SBR will not be placed within 1 m of the groundwater table within the designated wetland. See Appendix "C"

aa) For all culverts placed within SBR fill areas, any fill material required below the culvert will not be sulphide bearing.

bb) As is standard practice, the ditches and median will be designed to minimize standing water, and thus seepage, into the SBR fill area. Cross drainage culverts, as part of highway design, will ensure that no standing water remains in the ditches.

cc) The grades for the highway and adjacent ditches will be designed to direct water away from SBR fill areas. Any run-off that does run toward the fill area will be intercepted by a ditch and transported out of the area.

dd) To minimize the potential for runoff from exposed SBR rock cuts reaching a watercourse, where possible, ditch drainage will be cut off by cross-culvert, with the outlet draining into the woods to low-lying areas that do not drain directly to any watercourse.

ee) Drainage rock ditches and rock face along SBR cut areas will be diverted, where possible, into adjacent wooded areas away from any watercourses or wetlands.

ff) Foreslopes and ditches in SBR rock cuts are to be covered with topsoil and seeded to minimize rock exposure.

gg) If acid-producing bedrock is encountered in an area where it was not expected, work will be stopped at the location that the SBR was encountered and the site will be assessed and a site-specific management plan will be developed.

hh) Runoff from SBR cut and fill areas must be monitored, as indicated in a project-specific EMP, and treated if required prior to discharge.

ii) Monitoring and Repair to SBR disposal areas shall be carried out in accordance with the *"Generic Contingency Plan for Sulphide Bearing Rock"* (See Appendix "C")

Checklist/Reminders

See Appendix A: Section 5.25 – Sulphide Bearing Rock & Acid Rock Drainage Management Checklist

Responsibilities

Planning Branch is responsible for coordinating the project registration and the environmental studies for new highway alignments.

Design Branch is responsible for identifying sulphide bearing rock through field programs. They are also responsible for completing the geometric highway design work.

Construction Branch is responsible for coordinating water quality monitoring programs.

District Staff are responsible for overseeing the day-to-day construction activities and weekly water quality monitoring.

SBR Committee is responsible for providing technical and policy direction on SBR issues.

NBDOT is responsible for identifying SBR in the field.

NBDOT is responsible for identifying, testing and approving the low permeable cover material.

NBDOT is responsible for obtaining the required permits, unless otherwise noted in the contract documents.

NBDOT and its Contractors, Developers and Operators are responsible to ensure that the protection measures outlined above are adhered to.

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6.0 References and Resources

Source	Date	Title
ADI Limited	2003	Identification of a Realistic Provincial Standard Noise Threshold Level report prepared by ADI Limited for the New Brunswick Department of Transportation, Report: (55) 0600-454.1, April, 2003.
Al, T.	2007	Assessment of Field Methods for Sites with Rocks Materials That May Cause Acidic Drainage. Prepared for: New Brunswick Department of Transportation.
Al, T.	2005	Environmental Impacts from Acid Rock Drainage: Interpretation Criteria for Water-Quality Monitoring Data. Prepared for The New Brunswick Department of Transportation. June 13, 2005.
CEA Agency	1999	Consolidated Regulations Under the *Canadian Environmental Assessment Act*. http://dsp-psd.pwgsc.gc.ca/Collection/En105-58-2000E.pdf
DFO	1998	Guidelines for the Protection of Fish and Fish Habitat: The Placement and Design of Large Culverts. Fisheries and Oceans Canada Maritimes Region.
DFO	1995	Freshwater Intake End-of-Pipe Fish Screen Guideline http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/water-eau/pipe/pdf/end-of-pipe_e.pdf
Environment Canada	1991	The Federal Policy on Wetland Conservation. Environment Canada. Ottawa, Ontario. http://www.wetlandscanada.org/Federal%20Policy%20on%20Wetland%20Conservation.pdf
Environment Canada	2004a	Code of Practice for the Environmental Management of Road Salts. http://www.ec.gc.ca/nopp/roadsalt/cop/en/rs_main.htm http://www.ec.gc.ca/nopp/roadsalt/cop/pdf/1774_EngBook_00.pdf
Environment Canada	2007	Best Practices for the Use and Storage of Chloride-Based Dust Suppressants. http://www.ec.gc.ca/nopp/roadsalt/reports/chlorideBP/en/ChlorideBPe.pdf February 2007

Source	Date	Title
Environment Canada and NBENV	1989	New Brunswick River Ice Manual. Prepared by the New Brunswick Subcommittee on River Ice: Environment Canada and the New Brunswick Inland Waters Directorate Department of the Environment. http://www.gnb.ca/0009/0369/0004/index-e.asp
Hooper, W.C., L. McCabe and T. Robertson.	1995	A Standardized Fisheries Stream Survey for Atlantic Canada. Department of Natural Resources and Energy, Fish and Wildlife Branch, Fredericton, NB.
MacDougall. A. and J. Loo.	1998	Natural History of the Saint John River Valley Hardwood Forest of Western New Brunswick and Northeastern Maine. Information Report M-X-204E. Natural Resources Canada, Canadian Forest Service, Atlantic Forestry Centre, Fredericton, N.B. http://cfs.nrcan.gc.ca/subsite/mx-204/home
NBDNR	2003	Draft Proposed Wetland Mitigation Guidelines for New Brunswick.
NBDNR and NBENV	2002	New Brunswick Wetlands Conservation Policy. July 2002. http://www.gnb.ca/0078/publications/wetlands.pdf
NBDOT	1992a	Bridge Maintenance Management System Manual
NBDOT	1992b	Highway Maintenance Management System Manual.
NBDOT	2000	Acid Rock Protocol. October 2000
NBDOT	2002a	Guidelines for Using Sulphide Bearing Rock.

Source	Date	Title
NBENV	1993	Guidelines for the Application and Removal of Protective Coatings. February 1993.
NBENV	2001	Siting and Operation of a Dredging Material Disposal Site On Land. Internet: http://www.gnb.ca/0009/0024-e.pdf
NBENV	2002a	A Coastal Areas Protection Policy for New Brunswick. Sustainable Planning Branch. Internet: http://www.gnb.ca/0009/0371/0002/Coastal-E.pdf
NBENV	2002b	Guidelines for the Siting and Operation of a Class 1 Land Reclamation Site Utilizing Construction and Demolition Debris. February 1, 2002. Internet: http://www.gnb.ca/0009/0373/0001/0003-e.pdf
NBENV	2002c	Guidelines for the Siting and Operation of a Class 2 Land Reclamation Site Utilizing Construction and Demolition Debris from the Demolition of a Residential or Small Commercial Building. February 1, 2002. Internet: http://www.gnb.ca/0009/0373/0001/0004-e.pdf.
NBENV	2002d	Clean Fill Guidelines.
NBENV	2004	New Brunswick's Wellfield Protection Program. Internet: http://www.gnb.ca/0009/0371/0001/Wellfield-E.pdf
NBENV	Undated	New Brunswick's Watershed Protection Program. Internet: http://www.gnb.ca/0009/0371/0004/watershed-e.pdf
NBENV	Undated	New Brunswick's Water Classification Program. Internet http://www.gnb.ca/0009/0371/0003/waterclass-e.pdf
NBENV	2005	A Guide to Environmental Impact Assessment in New Brunswick. April. Internet http://www.gnb.ca/0009/0377/0002/11-04-e.pdf

Source	Date	Title
NBENV	2005	Additional Information Requirements for Linear Facilities. Version 08-02-25. Internet http://www.gnb.ca/0009/0377/0002/0001/0011-e.pdf
NBENV	2006a	Environmental Impact Assessment in New Brunswick. Internet publication. Internet http://www.gnb.ca/0009/0377/0002/0020-e.pdf
NBENV	2006b	Watercourse and Wetland Alteration Technical Guidelines. (Latest Approved Version) http://www.gnb.ca/0009/0371/0005/0001-e.pdf
NBENV	Undated	Guidelines for decommissioning (abandonment) of Water Wells. Internet: http://www.gnb.ca/0009/0002-e.pdf.
Savoie, R. and D. Haché	2002	Design Criteria for Fish Passage in New or Retrofit Culverts in the Maritime Provinces, Canada. Fisheries and Oceans Moncton, NB. iv + 38 pp., 2 appendices.
Transport Canada	2006	Proponents' Guide for Environmental Assessment Pursuant to the *Canadian Environmental Assessment Act*. Prepared for Transport Canada by Laurie Bruce, Planning Solutions and Vic Thom, Thomplan. Paper copy only. Contact Transport Canada at: http://www.tc.gc.ca/eng/programs/environment-environmentalassessment-recent_publications-666.htm
Washburn & Gillis Associates Ltd.	1998	Environmental Field Guide. Prepared for the New Brunswick Department of Transportation. August 1998. http://internal.dot.gnb.ca/const/reference/98-environ-field-guide.pdf
Wright, D.G., and G.E. Hopky	1998	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters. Internet http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/water-eau/explosives-explosifs/pdf/explos_e.pdf

Appendix “A” – Checklists/Reminders

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Project Name:	**Designer Name:**
Contract Number:	**Design Consultant:**
Date:	**Checked By:**

4.1 NBDOT Route Selection Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
Route Location	Has the route been located such that, wherever possible, they blend in with the topography?					
	Has the route been located, and the alignment been selected to avoid and/ or minimize the environmental effects on the following items, taking into consideration the overall costs of the highway project:					
	• watercourses, wetlands, estuaries, tidal zones and marine shore areas					
	• historic sites					
	• agricultural land					
	• fish and fish habitat					
	• wildlife and wildlife habitat					
	• species at risk and their habitat					

4.1 NBDOT Route Selection Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	• adjacent land use and development					
	• groundwater and domestic water supplies					
	• environmentally significant areas					
	• parks, trails and recreational areas					

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

4.2 NBDOT Surveying Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Surveying	Has clearing been carried out manually, using hand held equipment only?				
	Is equipment being used for the surveying process in good working order, free of leaks?				
	Have trees or bushes shall be felled across or into a watercourse?				
	Has access to both sides of each watercourse been achieved either by means of an existing nearby crossing or wading across the watercourse on foot?				
	Has all bucked-up woody vegetation and slash been moved to areas where it cannot be washed into a watercourse by floodwaters?				
	Have fuels required during the surveying process will be handled with care?				
	Have fuels required during the surveying process been stored at least 30 meters away from watercourses and wetlands?				
	Has re-fueling of equipment been carried out at least 30m away from any watercourse or wetland?				

4.2 NBDOT Surveying Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have survey crews removed all of their garbage from the survey site?				
	Have survey crews carried out their work in a manner that minimizes ground disturbance and exposure of soils?				
	If the ground within 30 meters of a watercourse or wetland has been disturbed during the surveying operation, was the area stabilized with evergreen boughs, rock, hay mulch or other suitable material such that erosion is prevented?				
	Has vegetation been maintained along the banks of a watercourse in sufficient quantity to provide bank stability and adequate shade to prevent a rise of water temperature, which could adversely affect the fish, their food and habitat?				
	Has a Provisional Permit for Centerline Clearing been obtained where required (i.e. if surveying involves the removal of trees located within 30 meters of a watercourse or wetland)?				
	Have the conditions of approval outlined in the Provisional Permit for Centerline Clearing been adhered to during surveying operations?				

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 4.3 NBDOT Geotechnical Investigation Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Geotechnical Investigations	Has the drilling crew carried out what they carried in (i.e. all garbage)?				
	Have all access roads remained unobstructed?				
	Have all test pits been backfilled and smooth graded immediately following collection of the required data?				
	Have all exposed soil resulting from drill holes, test pits and vehicle and drill rig tracks been stabilized by covering the exposed area with evergreen boughs or hay mulch?				
	Have watercourse crossings been avoided whenever possible (i.e. access to the both sides of the watercourse shall be achieved using alternate routes)?				
	Where a watercourse crossing cannot be avoided, has a Watercourse and Wetland Alteration Permit must been obtained?				
	Where a watercourse crossing cannot be avoided, has the equipment being used (i.e. drill rig, excavator etc.) crossed the watercourse at an existing crossing or temporary bridge completely spanning the watercourse?				

Section 4.3 NBDOT Geotechnical Investigation Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have temporary crossings been installed to ensure that the natural watercourse flow is not constricted?				
	Have swamp mats been deployed for equipment to proceed at the first evidence of rutting within a wetland or within 30 meters of a watercourse?				
	Once the drilling operation is complete have swamp mats been removed and the ruts smoothed, overlain with slash and tramped?				
Geotechnical Investigations	Have all ruts cut into the vegetative mat and disturbed stream banks been stabilized against erosion with rock, evergreen boughs, hay mulch or other suitable material such that erosion is prevented? If rotary drilling must be carried out in or near a watercourse, has a containment area been established to prevent the drilling fluid from entering the watercourse?				
	If rotary drilling is to be carried out in the channel of a watercourse, has the drill rig been fitted with recovery equipment to prevent the escape of drilling fluid to the watercourse?				
	Is the crew aware that no in-channel test pits shall be excavated at any time? Have all equipment surfaces been cleaned so that they are free of deleterious substances (such as oil, grease etc.) prior to working in the wetted portion of the watercourse?				
	Has equipment been inspected for leaking fuels and/or fluids prior to use?				

Section 4.3 NBDOT Geotechnical Investigation Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has any equipment leaking fluids and/or fuels been repaired immediately?				
	Is equipment being serviced in and area at least 30 meters away from a watercourse or a wetland?				
	Does each piece of equipment have a spill kit on board?				
	Is equipment being re-fuelled in an area at least 30 meters away from a watercourse or wetland?				
	Has a Provisional Permit for Geotechnical Investigations been obtained where required. (i.e. if geotechnical investigations are being carried out within 30 meters of a watercourse or wetland)?				
	Have the conditions of approval outlined in the Provisional Permit for Geotechnical Investigations been adhered to?				

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Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
Protection of Fish and Fish Habitat	**Watercourse Crossings (including bridges, large, and small culverts) and Diversions**					
	Have DFO, NBENV (and NBDNR - where applicable) been consulted regarding the design?					
	Has high quality fish habitat been avoided where possible in the design?					
	Has the alignment of the roadway been selected to cross streams at right angles to minimize the length of a culvert, and the number of bridge piers, thereby minimizing the amount of lost habitat?					
	Have the crossing been located on straight stream segments thereby minimizing the amount of lost habitat?					
	Has the crossing been located in stream stretches with level approaches and stable banks?					
	Have crossings been avoided at sites where culvert installation will involve large fills or approaches with deep or lengthy cuts?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the design of roadway interchanges near watercourses been carried out to avoid/minimize the number of culvert installations and the placement of large amounts of fill adjacent to the watercourses?					
	Have bridge piers been located as close as possible to the banks of the watercourse or at shallow locations?					
	Have bridge abutments been located so that slope protection encroachment into the watercourse is minimized?					
	Have permanent watercourse diversions been avoided where possible?					
	Have natural watercourse features for stream diversions, in accordance with Watercourse and Wetland Alteration Technical Guidelines (NBENV 2006b) been incorporated in the design?					
	Have natural drainage patterns been maintained where possible?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the DFO design criteria and guidelines for the following items been considered in the design? (Note: The following DFO documents contain information related to the design criteria and guidelines for the design of watercourse crossings - however they may not be exhaustive and DFO consultation is required: Guidelines for the Protection Fish and Fish Habitat – the Placement and Design of Large Culverts (DFO 1998). Design Criteria for Fish Passage in New or Retrofit Culverts in the Maritime Provinces, Canada (Savoie and Haché 2002).					
	• Type of Culvert					
	• Culvert Size (1 in 100 Flood)					
	• Culvert Alignment					
	• Fishway Type					
	• Flow Determination					
	• Minimum Flow Depth					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	• Maximum Water Velocity					
	• Baffle Height					
	• Notch Size					
	• Drop Between Baffles					
	• Baffle Locations					
	• Minimum Baffle Spacing					
	• Maximum Baffle Spacing					
	• Culvert Slope					
	• Downstream Invert Elevation					
	• Upstream Invert Elevation					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	• Energy Dissipation Pool Design					
	• Inlet Design					
	• Outlet Design					
	• Temporary Diversion					
	• In Stream Control Structures					
	• Construction Sequence					
	Has the appropriate type of erosion and sediment prevention materials/methods been determined and included in the design?					
	Has the appropriate placement of erosion and sediment prevention materials/methods been determined and included in the design?					
	Has the existing vegetation surrounding watercourses and wetlands been maintained wherever possible?					
	Has a Provincial Environmental Assessment of the project been carried out where required?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Has a Federal Environmental Assessment of the project been carried out where required?					
	Have the conditions of approval, commitments and requirements associated with the Environmental Assessments been incorporated in the design?					
	Has a Watercourse and Wetland Alteration Permit been obtained for work to be carried out within 30 meters of a watercourse of wetland?					
	Have the conditions of approval, commitments and requirements associated with the WAWAP been incorporated in the design?					
	Has a HADD Authorization been obtained for work that has been determined (by DFO) to cause harmful alteration, disruption or destruction of fish habitat?					
	Have the conditions of approval, commitments and requirements associated with the HADD Authorization been incorporated in the design?					
	Has HADD Compensation been carried out for projects resulting in harmful alteration, disruption or destruction of fish habitat?					
Navigability	Has Transport Canada been consulted to determine requirements for navigability?					
	Has a Navigable Waters Protection Act (NWPA) Authorization been obtained where required?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Have the conditions of approval, commitments and requirements associated with the NWPA Approval been incorporated in the design?					
	Have allowances for navigability been incorporated in the design?					
Protection Against Erosion and Sedimentation	Has the size and scope of the work area been limited to that which can be worked on at one time?					
	Have minimum 30 meter buffer zones been maintained for development adjacent to a watercourse or wetland?					
	Have the appropriate type of erosion and sediment prevention materials/methods been determined and included in the design?					
	Has the appropriate placement of erosion and sediment prevention materials/methods been determined and included in the design?					
	Have energy dissipators been used at culverts (e.g., baffles, plunge pools, large rocks, riprap)?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Has a Watercourse and Wetland Alteration Permit been obtained for work to be carried out within 30 meters of a watercourse or wetland?					
	Have the conditions of approval, commitments and requirements regarding erosion and sedimentation associated with the WAWAP been incorporated in the design?					
	Have the conditions of approval, commitments and requirements regarding erosion and sedimentation associated with the Environmental Assessments been incorporated in the design?					
Protection Against Acid Rock Drainage	If SBR is determined to be present has the horizontal alignment been adjusted to avoid the area?					
	If SBR is determined to be present has the vertical alignment been moved (upward) to minimize the amount of excavation?					
	If SBR is determined to be present and the vertical and horizontal alignments cannot be adjusted to reasonably avoid the SBR area, then have the NBDOT Guidelines for Using Sulphide Bearing Bedrock (NBDOT 2002) been carried out in consultation with NBENV and Environment Canada?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
Protection of Wetlands	Have wetlands been avoided where possible?					
	Where wetlands cannot be reasonably avoided, or where avoidance would result in unacceptable environmental impacts on other constraints, have NBENV and NBDNR been consulted regarding the design?					
	Have culvert systems provided water level equalization across fills similar to natural conditions?					
	Will peak flows be able to dissipate at normal rates and will damming be prevented?					
	Have established circulatory patterns been maintained?					
	Has channelization be kept to a minimum?					
	Have diffuse and underground drainage patterns been maintained?					
	Has the draining of surface water been avoided?					
	Has the creation of standing water been avoided?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Have peak tidal flows been maintained in both directions?					
	Has interference with tidal and freshwater exchange been avoided?					
	Have median widths been minimized?					
	Has backslope steepness been maximized?					
	Has the existing vegetation surrounding watercourses and wetlands will be maintained wherever possible?					
	Where required by NBENV, has Wetland Compensation been carried out for work within wetlands that cannot be avoided?					
Protection of Wildlife and Wildlife Habitat	In areas that are known to have high concentrations of animals such as deer and moose, or at identified wildlife paths, or wintering areas, have the following environmental protection measures been considered:					
	• Installation of warning signage					
	• Improved driver line-of-sight					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	• Installation of wildlife fencing					
	• Installation of wildlife crossings					
	Have fencing and crossing locations been determined in consultation with NBDNR?					
	Have fencing and crossing locations been designed in consultation with NBDNR?					
Protection Against Ice Jams	Has the potential for ice jam formation and the possible effects (should ice jams occur) been considered when designing watercourse structures?					
Protection Against Cold Air Pooling	In areas where cold air pooling may be an issue, (i.e. may impact frost-sensitive agricultural crops such as grapes, blueberries etc.), has the potential for cold air pooling been considered in the design?					
	Where cold air pooling is anticipated, and where there is cultivation of frost sensitive crops, has NBENV been consulted to determine if alternative highway design or compensation is warranted?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
Protection Against Climate Change	Has the design of projects near areas that may be vulnerable to effects caused by climate change (including coastal areas, river valleys, and watercourse crossings etc.) will be done in consultation with NBENV?					
	Has the design of all watercourse crossings will be done using a 100 year return flood design flow?					
	Has the design of all culverts will be done using a capacity of 90% full at the 100 year return flood design flow?					
	Has the design of all development within, and along coastal areas allowed at least 2 meters above Higher-High-Water-Large-Tide (HHWLT), where possible?					
Permits, Approvals, Authorizations	Has an EIA Approval been obtained for projects that require registration under the New Brunswick Environmental Impact Assessment Regulation (87-83) – Clean Environment Act?					
	Has an EA Approval been obtained for projects that are required to undergo a Screening, Comprehensive Study or a Panel Review under the Federal Canadian Environmental Assessment Act?					
	Has a WAWA Permit been obtained for work to be carried out within 30 meters of a watercourse or wetland?					
	Has a HADD Authorization been obtained for work that is determined (by DFO) to cause a HADD (Harmful Alteration, Disruption or Destruction of fish habitat)?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Has a Navigable Waters Protection Act (NWPA) Authorization be obtained where a watercourse is deemed to be navigable by Transport Canada?					
	Have other permits been obtained where required for special projects (such as disposal at sea, for the destruction of fish etc.)?					
Project Specific Environmental Protection Documents (EMPs, Site Specific EPPs)	**Environmental Management Plans (EMPs)**					
	Is a project-specific Environmental Management Plan (EMP) required?					
	Does the EMP contain the geographic location(s) of environmentally sensitive areas and features including, but not limited to, the location(s) of:					
	• Watercourses					
	• Wetlands					
	• Drinking wells					
	• Sulphide-bearing rock					
	• Rare plants					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	• Deer wintering areas					
	• Archaeological or heritage resources					
	• Noise sensitive areas					
	Does the EMP have the environmental protection measures specific to the environmentally sensitive areas and features?					
	Does the EMP contain the mitigation and monitoring requirements specific to the project construction and operation?					
	Does the EMP contain contingency and emergency response plans for accidents, malfunctions, and unplanned events that are likely to occur, or for those that if they occurred would have severe environmental consequence, regardless of likelihood of occurrence?					
	Does the EMP follow the general Table of Contents for an EMP presented in Table 4.1 of the NBDOT EMM?					

4.4 NBDOT Environmental Design Checklist

	Protection Measure/ Environmental Consideration	Item Incorporated in Design	Acceptable	Not Acceptable	Not Applicable	Comments
	Site Specific Environmental Protection Plans (Site Specific)					
	Does the site specific EPP contain the following site specific information:					
	• The exact locations for placing erosion and sediment control measures					
	• The exact locations of buffer zones					
	• The exact locations of rare plants					
	• The exact locations of areas with high archaeological potential					
	• The exact locations of required archaeological monitoring					
	• The exact locations of other environmentally significant areas					

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Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 5.1 Asphalt Concrete Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Asphalt Concrete	Are there any petroleum leaks coming from either the trucks or the placing equipment?				
	Has any waste been properly disposed of?				

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Project Name:	**Surveyor's Name:**
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Date:	**Checked By:**

Section 5.2 Beaver Dam Removal Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Beaver Dam Removal	Can water be controlled by means other than dam removal?				
	Has the proper WAWA permit has been obtained?				
	Are the field staff familiar with the WAWA permit?				
	Prior to releasing pond water, have the appropriate erosion control measures been installed downstream from the dam?				
	Are there are signs that waterfowl are using the ponded water as a breeding area? If so the beaver dam removal must wait until the broods have left.				
	After the entire pond has been drained, has the exposed areas been stabilized?				

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Project Name:	**Surveyor's Name:**
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Section 5.3 Clearing Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Clearing	Can the clearing be done to avoid the generally accepted migratory bird nesting period?				
	Have all the clearing limits been clearly identified?				
	Does the ROW need to be identified?				
	Have all the buffer zones been clearly identified?				
	Have all the other ESA's been clearly identified?				
	If there is proposed watercourse/wetland crossing, have you applied for a crossing permit through NBENV?				
	If applicable, is there a copy of the WAWA permit on site?				
	Are the field staff familiar with the WAWA permit?				

Section 5.3 Clearing Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Each buffer shall be looked at individually to determine if the clearing operation shall be conducted over frozen ground condition or after the diversion has been installed.				
	Do you have access to appropriate erosion control measures should clearing activities disturb the ground?				

Project Name:	**Surveyor's Name:**
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Section 5.4 Culverts Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Major & Minor Culvert Installation	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Has the culvert been sized properly based on the size of the drainage area being serviced?				
	If applicable, have you met with NBDENV and DFO prior to commencement of work?				
	Has ground disturbance been kept to a minimum?				

Section 5.4 Culverts Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has existing vegetation been retained wherever feasible?				
	Have exposed soils been stabilized daily as the work progress?				
	Does construction/maintenance activities coincide with low flow (June 1st – September 30th)?				
	Has surface run-off been controlled to allow for working in the dry by using:				
	• the dam and pump method,				
	• the use of dykes/ditches to divert runoff,				
	• by limiting slope/gradient of disturbed areas,				
	• stabilization of erodible soils with mulch, vegetation, riprap, and/or				
	• contain the sediment with the use of check dams in ditches				
	Have sediment control measures been employed to prevent sedimentation of nearby watercourses/wetlands?				

Section 5.4 Culverts Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	If applicable have the inlet and outlet of the pipe been protected against scour?				
	Did you stockpile material away from watercourse/wetland and monitor them to ensure that sediment is not entering a watercourse/wetland?				
	Ensure that waste material is properly disposed of as per section 5.20 – Waste Management.				
	Has permanent stabilization been performed immediately after the work is complete?				
Watercourse Diversions	Diversions will be designed in consultation with DFO.				
	Ensure that a WAWA permit has been obtain and a copy is available on site.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Has the diversions been constructed as designed?				

Section 5.4 Culverts Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Before the diversion is opened, is the water should be free of suspended solids and the surrounding area stabilized?				
	Have temporary barriers been installed to isolate the diversion from the watercourse during construction?				
	After the streamflow has been diverted, has any water that did not flow out of the original channel under natural conditions been pumped out?				
	If the water has a high concentration of sediments, was the water pumped into a temporary sedimentation pond, a filter fabric bag, or vegetated area?				
	Has ground disturbance been kept to a minimum?				
	Have all exposed areas been stabilized daily as work progresses?				
	When pumping the watercourse, have hoses been fitted with screens DFO guidelines?				
	Have you minimized the length of time in-stream necessary to install the culvert?				
	Has the site been inspected prior to, during and after a rainfall event? Have any deficiencies been immediately repaired?				

Section 5.4 Culverts Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have you taken pictures of the site before, during and following construction, documenting the watercourse, erosion control measures, and structures?				
	Have you kept detailed daily records of all personnel on the site (including visiting regulatory officers), weather conditions, timing of work events, and the work completed?				
Culvert Maintenance	Ensure that a WAWA permit has been obtain and a copy is available on site				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Are proper erosion control measures installed prior to and as required during the maintenance to prevent any sediment from entering a watercourse/wetland?				
	Have undesirable materials (e.g., branches and debris) been removed from the culvert and/or watercourse and properly disposed of?				
Culvert Removal	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Ensure that the removal of an existing culvert is done in isolation of stream flow.				

Section 5.4 Culverts Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Utilize either a dam-and-pump or temporary plastic-lined diversion to ensure natural flow is uninterrupted and water quality is maintained during culvert removal.				
	Ensure that the diversion channel has similar depth and width as the existing watercourse in the immediate vicinity of the structure being removed.				
	Is the new channel constructed so as to maintain fish passage during periods of low flow?				
	Are all exposed erodible soil stabilized?				

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Section 5.5 Detouring Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Detouring	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	If applicable, make sure a meeting has been held with NBDENV and DFO prior to commencement of work.				
	Have all erosion control measures have been installed?				
	No temporary infilling of any portion of a watercourse/wetland is to be carried out during construction of a detour, unless authorized in the WAWA Permit.				
	Will this detour create noise pollution? If there is, see section 5.23 - Working Near Environmental Sensitive Areas.				
	Will this detour create dust pollution? If it is, see section 5.6 – Dust Control.				
	Have all exposed areas been stabilized?				

Section 5.5 Detouring Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that waste material is properly disposed of as per section 5.20 – Waste Management.				
	Abandoned detour sites shall be shaped and permanently stabilized. See section 5.7 – Erosion and Sediment Management				

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Section 5.6 Dust Control Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Water	Try to limit activities that generate fugitive dust during high winds.				
	A WAWA permit must be obtained for the withdrawal of water from a watercourse.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Water trucks shall not be driven into a watercourse/wetland.				
	Water trucks shall not be driven down to the edge of the watercourse/wetland unless the area is firm enough so that this action does not cause rutting.				
	If the existing ground becomes disturbed, do you have the appropriate erosion control measures materials available for immediate installation?				
	Rock and gravel may be moved by hand to obtain a pool for a suction pipe, but a pool cannot be created by using any powered equipment.				
	Ensure that the amount of water withdrawn from the water source is not excessive.				

Section 5.6 Dust Control Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that the intake hose is properly screened.				
	If a petroleum leak occurs, do you have a spill kit available?				
	Ensure that the water truck is not leaking petroleum product and is not re-fueling or getting services within 30 m of a watercourse/wetland				
	The water trucks shall have a method of controlling the application rate, so that no excess water flow into a watercourse/wetland.				
	Ensure that water (runoff) does not directly enter any watercourse/wetland.				
Chemical Suppressants	Is there any watercourse/wetland on this project? And are all appropriate measures taken to prevent direct runoff?				
	Ensure that chemical dust suppressant will not directly runoff and enter a watercourse/wetland.				
	Ensure that the proper application rates are followed.				
	Chemical dust suppressant shall not be applied within 30 m of a watercourse/wetland.				
	Ensure that lignosulphonate is used within a recognized ESA .				

Section 5.6 Dust Control Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Tankers used in the application of liquid calcium chloride shall not be washed out within 30 m of a watercourse, wetland or other environmentally sensitive area.				
	Application shall be restricted to the driving surface only.				

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Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
General	**Erosion Control**				
	Has ground disturbance been kept to a minimum?				
	Has stabilization of the exposed areas been carried out?				
	Does construction/maintenance activities coincide with low flow (June 1st – September 30th)?				
	Have sediment control measures been employed to prevent sedimentation of nearby watercourses/wetlands?				
	Has existing vegetation been retained wherever feasible?				
	Have offtakes, ditches and dykes been used to divert runoff flow into vegetated areas away from watercourses and wetlands?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Topsoil	Are you beyond the cutoff date for topsoiling? Topsoiling is not permitted after the week of Sept 30th unless approved by NBDOT.				
	If you are beyond the cutoff date for placing topsoil, did you mulch the area?				
	Have areas to be topsoiled been shaped and completed to the final grade?				
	Have areas to be topsoil been scarified or otherwise loosened prior to the placement of topsoil?				
	Has topsoil been applied evenly and uniformly on the prepared areas to a depth of 100 mm (+/- 25mm)?				
	Have large clods, roots, stones and rocks above 75 mm been removed from the slopes.				
	Are topsoil stockpiles located a minimum of 30 m away from a watercourse/wetland, where they will not block the natural drainage or be a potential source of siltation of watercourses/wetlands?				
	Have topsoil stockpiles been mulched?				
	Has sediment control fence been installed around the stockpile to contain sediment in runoff?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Upon completion of the topsoil placement has the area been stabilized with hydroseed or mulch? A good rule of thumb is that you should not see any exposed ground when the hydroseeding and mulching operations are complete.				
	Have erosion control and sediment structures been installed as required?				
	Have topsoiled areas been monitored and maintained from the time of application until the vegetation is established?				
	Have topsoiled areas and topsoil stockpiles been inspected prior to, during and after any rainfall events.				
	Have all deficiencies been repaired immediately?				
Mulching	Have you prepared the areas for mulching? Areas to be mulched must be shaped.				
	Is mulch reasonably free of noxious weeds and other undesirable material?				
	Has the mulch been kept dry at all times until applied.				
	Is the entire area covered with mulch? A good rule of thumb is that you should not see any exposed ground when the mulching operation is complete.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has a binder (tackifier) been applied to the mulched areas to ensure that the mulch remains in place and is not be washed or blown away?				
	Has the binder application been completed within 48 hours after the mulch has been placed?				
	In cases where a small area requires temporary stabilization, mulch can be applied by hand.				
	Were mulched monitored and maintained from the time of application until the vegetation is established?				
	Have mulched been inspected prior to, during and after any rainfall event?				
	Have damaged areas and/or bare spots (due to wind, water or other causes) been repaired immediately?				
	If water is required for the mulching operation, have you obtained a WAWA permit?				
	Are the field staff familiar with the WAWA permit?				
	Ensure that water trucks are not driven into the watercourse/wetland. Also water trucks shall not be driven down to the edge of the watercourse/wetland unless the area is firm enough so that action does not cause rutting.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	If water is required to apply the binder, has the water withdrawn from the streams been limited so as to maintain sufficient flow and depth to ensure that fish habitat is protected, and fish passage is maintain?				
	Prior to winter shutdown, was an onsite meeting held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control?				
	Have any deficiencies been addressed prior to spring runoff?				
Trees & Shrubs	Is there enough time left in the growing season for trees and shrubs to establish?				
	Were areas to be planted shaped and completed to the final grade?				
	Have trees and shrubs been planted according to suppliers recommendations?				
	Have trees and shrubs been watered as per the supplier's recommendation?				
	Were trees and shrubs monitored and maintained from the time of planting until they become established?				
	Were dead trees and shrubs replaced immediately?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Are you beyond the cutoff date for hydroseeding? Hydroseeding must not be done after the week of September 30th unless approved by NBDOT.				
Hydroseeding	If you are beyond the cutoff date for placing topsoil, did you mulch the area?				
	Have you prepared the areas for hydroseeding? Soil must be loosened prior to seeding.				
	Hydroseed will not be carried out on harden, crusted or eroded soil.				
	Has the hydroseeding been completed within 48 hours of surface preparation?				
	Has seed material been kept dry at all times until applied?				
	Ensure that large areas requiring seeding are done by mechanical means.				
	In cases where a small area requires hydroseeding it may be hand sowed using an available commercial seed mix following manufactures directions.				
	Has hydroseed been applied evenly and uniformly? A good rule of thumb is that you should not see any exposed ground when the hydroseeding operation is complete. The use of green dye in the mix allows for visual inspection of the coverage.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	If it is after Labour Day, only Hydroseeding B shall be used.				
	Ensure that hydroseeding is not carried out during windy conditions or during heavy rainfall.				
	Has hydroseed been monitored and maintained from the time of application until vegetation is established?				
	Has hydroseeding been inspected prior to, during and after any rainfall event?				
	Has damaged hydroseeded areas, areas that do not receive proper coverage and/or areas with bare spots been repaired immediately?				
	If water is required for the hydroseeding operation, have you obtained a WAWA permit?				
	Are the field staff familiar with the WAWA permit?				
	Ensure that water trucks are not driven into the watercourse/wetland. Also water trucks shall not be driven down to the edge of the watercourse/wetland unless the area is firm enough so that action does not cause rutting.				
	If water is required to apply the hydroseed, has the water withdrawn from the streams been limited so as to maintain sufficient flow and depth to ensure that fish habitat is protected, and fish passage is maintain?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Prior to winter shutdown, was an onsite meeting held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control?				
	Have any deficiencies been addressed prior to spring runoff?				
Jute Mats	Are you beyond the cutoff date for hydroseeding? Only install jute mats if there is enough growing season left for vegetation to establish. If it is late in the season, keep erosion control structures in and mulch the entire area.				
	Have areas to receive jute mats been shaped and completed to the final grade?				
	Have any erosion control structures in the ditch been removed prior to installing the jute mats?				
	Have jute mats been installed along the full length of the prepared ditch and/or slope?				
	Once the jute mats are installed, have they been pinned to the ground with staples to prevent movement.				
	For ditch applications, jute mats will be installed according to:				
	Three (3) strips of jute mats must be used.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	The first strip must be installed in the bottom of the ditch.				
	The next two strips are installed on the foreslope and backslope of the ditch and will overlap the bottom strip by 250 mm.				
	For slope applications, jute mats will be installed according to:				
	Enough strips of jute mat will be use to cover the required area.				
	Strips will be overlapped by 250 mm.				
	Have areas with jute mats been hydroseeded immediately?				
	Have areas with jute mats been inspected prior to, during and after any rainfall event?				
	Have any damaged areas been repaired immediately by covering the damaged area with a strip of jute mat and stapling it into the ground?				
	Ensure that jute mats have been maintained in a functional condition from the time of installation until the work is completed and the vegetation has established.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Sod	Is there enough time left in the growing season for sod to establish?				
	Have areas to receive sod been shaped and completed to the final grade?				
	Has the area to receive sod been topsoiled?				
	Has fertilizer been placed prior to the placement of sod?				
	Has the entire area been pre-wet prior to placing sod?				
	Have strips of sod been laid over the area such that adjoining rows of sod are staggered to ensure that the joints don't line up?				
	When placing sod on a slope, was the sod stapled or staked to ensure that it remains in place?				
	Once sod is placed, was it watered thoroughly?				
	Have sodded areas been watered daily until the area is established?				
	Have sod been monitored and maintained from the time of installation until the area has become established?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Were damaged and or dead areas repaired/replaced immediately?				
Riprap	Are you required to work within 30 m of a watercourse and/or wetland? If yes, then you require a WAWA permit. Do not start any work until a permit has been issued.				
	Are the field staff familiar with the WAWA permit?				
	Has riprap been properly sized based on the requirements for the intended use and the application?				
	Have you utilized shot rock for riprap instead of round fieldstone? Rounded stones are more susceptible to movement.				
	Ensure that riprap is not obtained from a source that has the potential to be acid generating.				
	Have slopes, ditches and channels to be riprapped been constructed as per the design or as directed by the Engineer?				
	Where required according to the contract documents or as directed by the Engineer, has geotextile been placed and pinned to the ground to prevent slippage prior to placement of riprap?				
	Ensure that geotextile is not used in fish bearing streams.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has riprap protection been placed at the toe of the slope to prevent the material from sliding down the foreslope or backslope?				
	Have riprapped areas been maintained from the time of installation until the completion of the project?				
	Have any damaged areas been repaired immediately?				
	Has excavated material been disposed of at least 30 m away from the watercourse/wetland?				
	Have disposal areas been stabilized?				
Sediment Control Fence	**Sediment Control**				
	Are you required to work within 30 m of a watercourse and/or wetland? If yes, then you require a WAWA permit. Do not start any work until a permit has been issued.				
	Are the field staff familiar with the WAWA permit?				
	Has sediment control fence been installed prior to ground disturbance?				
	Has sediment control fence been installed downslope of disturbed areas?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has sediment control fence been installed along the banks of a watercourse/wetland in order to intercept runoff before it enters a watercourse/wetland?				
	Ensure that sediment control fence is not installed on top of a hill or in a ditch as a sediment check dam.				
	Ensure that sediment control fence is not installed across areas with a concentrated channel flow.				
	Has sediment control fence been located in a continuous fashion, perpendicular to the flow?				
	Sediment control fence will be used in the following situations/locations:				
	• To delineate buffer zones;				
	• Along the contour of exposed slopes;				
	• At the toe of embankments;				
	• The downhill side of large cut area;				
	• Adjacent to watercourses/wetlands.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Are stakes/posts a minimum of 1200 mm long, anchored as least 400 mm below the ground surface and located no more than 2500 mm apart?				
	Is the sediment control fence installed such that it extends 700 to 800 mm above the ground surface and a minimum of 150 mm below the surface in a trench?				
	In cases where the anchoring below the ground is impractical, such as in ungrubbed area, has earth placed and compacted over the bottom flap so that no flow can pass under the fence?				
	If more than one roll of fencing is required, are the ends rolled together to form one continuous line of fencing?				
	Are posts positioned on the downstream side of the installation?				
	Is the geotextile securely fastened to the posts?				
	Has sediment been removed after it has accumulated to a level not exceeding ½ the height of the fence?				
	Has sediment that has been removed been disposed of at least 30 m away from the watercourse/wetland?				
	Has sediment control fence been inspected prior to, during and after any rainfall event?				
	Has sediment control fence been inspected daily during embankment construction to ensure embankment materials do not damage fence?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have any deficiencies been repaired immediately?				
	Have repairs to the geotextile been done at the posts only?				
	If a section of the fence is torn, has it been replaced with a new section?				
	If repairs to existing fence are impractical, was another line of fencing installed?				
	Has the sediment control fence been removed once it is no longer required?				
	Prior to removal of the sediment control fence, has any remaining sediment been removed for disposal?				
	Once the sediment fence is removed, have all exposed areas been stabilized?				
	Have sediment control fences been maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions?				
	Prior to winter shutdown, has an onsite meeting shall be held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control? Any deficiencies are to be addressed prior to spring runoff.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has permission been obtained in order to dispose of sediment onto a private property?				
	Have disposal areas been stabilized?				
Sediment Ponds	Are you required to work within 30 m of a watercourse and/or wetland? If yes, then you require a WAWA permit. Do not start any work until a permit has been issued.				
	Are the field staff familiar with the WAWA permit?				
	Have sediment ponds been designed by an Engineer, and will be sized with sufficient capacity based on the size of the drainage area being serviced?				
	Where practical, have contributing drainage areas been subdivided into smaller areas and multiple sediment ponds installed?				
	Have sediment ponds been located to ensure that there is a minimum of 30 m between the pond and the nearest watercourse or wetland?				
	Have sediment ponds been constructed to the required dimensions?				
	Has a safety fence been installed around the perimeter of the pond?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is the safety fence highly visible to pedestrian and vehicular traffic?				
	Have exposed slopes or berms been stabilized with plastic, geotextile, mulch or rock?				
	Has existing vegetation been maintain between the pond and the watercourse or wetland to allow the water that is discharged from the pond to filter through the vegetation prior to entering the watercourse or wetland?				
	Have sediment ponds been inspected prior to, during and after any rainfall event?				
	Have any deficiencies been repaired immediately?				
	If heavy rain is forecasted, have sediment ponds been dewatered and cleaned out to ensure it can handle the potential rainfall and runoff?				
	Have ponds requiring dewatering been pumped in such a manner that sediment-laden water is not introduced into a watercourse or wetland?				
	Has the effluent and receiving waters been monitored to verify the effectiveness of the suspended solids treatment?				
	If there is little or no vegetation available to filter the discharged water, is the water being pumped into a sediment filter bag?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has sediment from ponds been removed when the sediment level reaches half the height of the spillway?				
	Has sediment removed from the pond been disposed of at least 30 m away from the watercourse or wetland?				
	When the sediment pond is no longer required, has the pond been backfilled, shaped and stabilized?				
	Has sediment ponds been maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions?				
	Prior to winter shutdown, has an onsite meeting been held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control? Any deficiencies are to be addressed prior to spring runoff.				
	Have disposal areas been stabilized?				
Erosion Control Structure "A"	Ensure that erosion control structures are installed as the work progresses, not after the work is complete.				
	Type “A” is usually installed in completed ditches and/or sediment ponds.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the erosion control structure been install in the dry?				
	For sediment pond applications, did you construct a berm (dyke) or excavate a sediment pond large enough to contain a large volume of water? Excavated material can be used to build the berm around the pond.				
	For ditch applications, did you construct a berm (dyke) large enough to contain runoff in the ditch?				
	For the spillway, has the 3 m apron been excavated on the downstream end of the structure? (approximately 300 mm deep)				
	Has the spillway been built out of riprap to a height that is approximately 300 m below the top of the berm?				
	Has geotechnical fabric been laid on the apron and up over the riprap spillway and down the other side? The fabric should extend approximately 300-400 mm beyond the spillway.				
	Has the fabric been covered with riprap? Do not cover the top of the spillway.				
	Is the centre of ECS low to allow for water to spill over?				
	Has the ECS been maintained from the time of installation until the area has become re-vegetated and/or until jute mats are installed?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has retained sediment been removed when it reaches a level 300 mm below the low point of the Type A structure?				
	Has removed sediment been disposed of at least 30 m away from a watercourse/wetland?				
	Have erosion control structures been inspected prior to, during and after any rainfall event?				
	Have any deficiencies been repaired immediately?				
	Have the erosion structures been removed when no longer required?				
	Once an ECS removed, has any remaining sediment been removed and disposed of at least 30 m away from a watercourse or wetland?				
	Has the area where the ECS was removed been stabilized?				
	Have erosion control structures been maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions?				
	Prior to winter shutdown, has an onsite meeting been held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control? Any deficiencies are to be addressed prior to spring runoff.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has permission of the landowner been obtained in order to dispose of sediment onto a private property?				
	Have disposal areas been stabilized?				
Erosion Control Structure "B"	These types of erosion control structures are usually installed in completed ditches.				
	Has the erosion control structure been install in the dry?				
	Have you constructed the sediment pit?				
	Has geotechnical fabric been laid on ground right to the edge of the sediment pit? Make sure the fabric extends far enough to cover the apron.				
	Has the exposed fabric been covered with riprap and the berm (dyke) and apron been built?				
	Has geotechnical fabric been placed on the upstream side of the berm (dyke) and draped down into sediment pit?				
	To complete the structure, has the exposed fabric been covered with riprap?				
	Is the centre of ECS low to allow for water to spill over?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the ECS been maintained from the time of installation until the area has become re-vegetated and/or until jute mats are installed?				
	Has retained sediment been removed when it reaches a level 100 mm below the low point of the Type B structure?				
	Has removed sediment been disposed of at least 30 m away from a watercourse/wetland?				
	Have erosion control structures been inspected prior to, during and after any rainfall event?				
	Have any deficiencies been repaired immediately?				
	Have the erosion structures been removed when no longer required?				
	Once an ECS removed, has any remaining sediment been removed and disposed of at least 30 m away from a watercourse or wetland?				
	Has the area where the ECS was removed been stabilized?				
	Have erosion control structures been maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Prior to winter shutdown, has an onsite meeting been held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control? Any deficiencies are to be addressed prior to spring runoff.				
	Has permission of the landowner been obtained in order to dispose of sediment onto a private property?				
	Have disposal areas been stabilized?				
Erosion Control Structure "C"	Ensure that erosion control structures are installed as road construction or ditching activities progress.				
	Remember, ditches do not have to be completed in order to place these types of erosion control.				
	Has the erosion control structure been install in the dry?				
	Have bales been “keyed” into foreslope, backslope, and the bottom of the ditch, and built to ensure that the water flows over the center of the dam and not around either end?				
	If the trench excavation is larger than the bales, has the remaining area been backfilled and compacted?				
	Has care been taken to keep the bale twine from contacting ground? Twine will rot faster when in contact with the ground.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Are bales set such that they are 450 mm high?				
	Have gaps between the bales been packed with loose straw/hay to prevent seepage?				
	Is the centre of ECS low to allow for water to spill over? This can be done by either embedding the centre bale deeper into the ground or by rotating the bale to its least dimension.				
	Have stakes been driven a minimum of 300 mm into the ground? The stakes should be flush with the top of the bale.				
	Have you constructed the sediment pit?				
	Have you built the common excavation berm (dyke) on both sides of bales to contain water?				
	Have you placed geotechnical fabric over the bales and CE berms (dykes)?				
	Has riprap been placed over fabric on both sides of structure to help hold fabric down and hold bales in place?				
	Has the ECS been maintained from the time of installation until the area has become re-vegetated and/or until jute mats are installed?				
	Has retained sediment been removed when it reaches a level 100 mm below the low point of the Type C structure?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has removed sediment been disposed of at least 30 m away from a watercourse/wetland?				
	Have erosion control structures been inspected prior to, during and after any rainfall event?				
	Have any deficiencies been repaired immediately?				
	Have the erosion structures been removed when no longer required?				
	Once an ECS removed, has any remaining sediment been removed and disposed of at least 30 m away from a watercourse or wetland?				
	Has the area where the ECS was removed been stabilized?				
	Have erosion control structures been maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions?				
	Prior to winter shutdown, has an onsite meeting been held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control? Any deficiencies are to be addressed prior to spring runoff.				
	Has permission of the landowner been obtained in order to dispose of sediment onto a private property?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have disposal areas been stabilized?				
Erosion Control Structure "D"	Ensure that erosion control structures are installed as road construction or ditching activities progresses.				
	Remember, ditches do not have to be completed in order to place these types of erosion control.				
	Has the erosion control structure been install in the dry?				
	Have bales been “keyed” into foreslope, backslope, and the bottom of the ditch, and built to ensure that the water flows over the center of the dam and not around either end?				
	If the trench excavation is larger than the bales, has the remaining area been backfilled and compacted?				
	Has care been taken to keep the bale twine from contacting ground? Twine will rot faster when in contact with the ground.				
	Are bales set such that they are 450 mm high?				
	Have gaps between the bales been packed with loose straw/hay to prevent seepage?				
	Is the centre of ECS low to allow for water to spill over? This can be done by either embedding the centre bale deeper into the ground or by rotating the bale to its least dimension.				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have stakes been driven a minimum of 300 mm into the ground? The stakes should be flush with the top of the bale.				
	Did you know that the number of bales required is dependent on the grades of the foreslope and backslope? The flatter the grade, the more bales are required.				
	Did you stagger the joints of downstream bales?				
	Have you constructed the sediment pit?				
	Has retained sediment been removed when it reaches a level 100 mm below the low point of the Type C structure?				
	Has removed sediment been disposed of at least 30 m away from a watercourse/wetland?				
	Have erosion control structures been inspected prior to, during and after any rainfall event?				
	Have any deficiencies been repaired immediately?				
	Have the erosion structures been removed when no longer required?				
	Once an ECS removed, has any remaining sediment been removed and disposed of at least 30 m away from a watercourse or wetland?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the area where the ECS was removed been stabilized?				
	Have erosion control structures been maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions?				
	Prior to winter shutdown, has an onsite meeting been held between all parties involved in the project to evaluate the site conditions and to identify specific requirements for erosion control? Any deficiencies are to be addressed prior to spring runoff.				
	Has permission of the landowner been obtained in order to dispose of sediment onto a private property?				
	Have disposal areas been stabilized?				
Flume (Slope Drain)	Are you required to work within 30 m of a watercourse and/or wetland? If yes, then you require a WAWA permit. Do not start any work until a permit has been issued.				
	Are the field staff familiar with the WAWA permit?				
	Have flumes been sized with sufficient capacity based on the size of the drainage area being serviced?				
	Where practical, have contributing drainage areas been subdivided into smaller areas and multiple flumes shall be installed?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have flumes been located in natural drainage areas where possible?				
	Has geotextile been placed in the channel?				
	If using multiple strips of geotextile, have strips been laid according to the manufacturers specifications?				
	Has adequately sized riprap been placed on top of geotextile?				
	Have you utilized shot rock for riprap instead of round fieldstone? Rounded stones are more susceptible to movement.				
	Ensure that riprap is not obtained from a source that has the potential to be acid generating.				
	Has excavated material been disposed of at least 30 m away from the watercourse/wetland?				
	Has permission of the landowner been obtained in order to dispose of excavated material onto a private property?				
	Have disposal areas been stabilized?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Ditching	Are you required to work within 30 m of a watercourse and/or wetland? If yes, then you require a WAWA permit. Do not start any work until a permit has been issued.				
	Are the field staff familiar with the WAWA permit?				
	Where possible, has a buffer zone of vegetation been maintained between the end of the ditching and the watercourse/wetland?				
	Has ditching been constructed to the shape shown on the construction plans or as directed by the NBDOT?				
	Ensure that trapezoidal ditches are used where possible.				
	Did you know that v-shaped or elliptical ditches are more prone to erosion and therefore will only be used where a trapezoidal ditch cannot be constructed?				
	Has ditching commenced at the lowest point and work progressed towards the highest point allowing the work to be carried out in the dry?				
	Has only the area being ditched been exposed?				
	Has vegetation and soil removed by ditching been disposed of at least 30 m away from the watercourse/wetland?				

Section 5.7 Erosion and Sediment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have you installed erosion control structures as the work progresses?				
	Ensure that ditches do not break the bank of a watercourse or enter directly into a wetland.				
	Has natural drainage been maintained where possible?				
	Have erosion control structures been installed in ditches?				
	Have ditches been stabilized by either hydroseeding or lining the ditch with riprap?				
	Have erosion and sediment control measures been maintained in a functional condition from the time of installation until the work is completed, including during shutdown due to weather, during winter months and during spring runoff and/or as per the WAWA permit conditions?				
	Has permission of the landowner been obtained in order to dispose of sediment onto a private property?				
	Have disposal areas been stabilized?				

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 5.8 Excavation, Blasting & Aggregate Production Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Excavation	A WAWA permit must be obtained if excavating within 30m of a watercourse or wetland.				
	Are the field staff familiar with the WAWA permit?				
	Is the WAWA permit posted on site?				
	Are all erosion and sediment control measures in place prior to commencement of excavation?				
	The size of the excavation should be limited to what can be completed within 30 days.				
	Are exposed material resulting from earth cut and fill operations being stabilized according to provisions in the Work Progression? See section 5.22 – Work Progression. Attention shall be given to upcoming forecast, so that work in excessive wet conditions shall be avoided when possible.				

Section 5.8 Excavation, Blasting & Aggregate Production Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have the erosion control measures been inspected prior to, during and after any rainfall event?				
	Have any deficiencies been immediately repaired?				
	If working near residential areas, Have the wells and septic systems near the blasting operation been sampled and monitored?				
	If acid generating materials are encountered, work must be carried out in accordance with Section 5.25 – Sulphide Bearing Rock & Acid Rock Drainage Management.				
	Disposal areas must follow section 5.20 – Waste Management.				
Blasting	A WAWA permit must be obtained if excavating within 30m of a watercourse or wetland.				
	Are the field staff familiar with the WAWA permit?				
	Is the WAWA permit posted on site?				
	Use of explosives will be restricted to authorized personnel who have been trained in their use, and have a valid blasters certificate.				

Section 5.8 Excavation, Blasting & Aggregate Production Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have you met with DFO prior to blasting if blasting within 30 m of a watercourse/wetland?				
	Blasting must not occur in the vicinity of fuel storage facilities.				
	If working near residential areas, Have the wells and septic systems near the blasting operation been sampled and monitored?				
	If blasting near ground water well, please refer to section 5.23 – Working Near Environmental Sensitive Areas.				
	Have residents within 500 m of blast areas been informed of the blasting schedule?				
	Are blasts being monitored in accordance with an approved schedule for air blast concussion and ground vibration?				
	Are explosives being stored, handled, and used in accordance with both federal and provincial regulations and permits, and in such manner as to reduce potential environmental risks? See section 5.14 – Storage and Handling of Other Hazardous Material.				

Section 5.8 Excavation, Blasting & Aggregate Production Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Crushing, Screening and Washing	Is the location of the processing facility at the best location for the site?				
	The location of the aggregate processing plant shall allow for strategies to limit noise, dust, and control sediment-laden water resulting from washing aggregates.				
	Ensure that the erosion and sediment control measures are in place prior to commencement of the processing.				
	Are all the sediment and erosion control measures working properly?				
	Is there a need to control fugitive dust from the processing facility?				
	Is there a need to control the noise from the processing facility?				

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 5.9 Ferry Operations Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Bilge Water	Are there any leaks? Leaks shall be repaired immediately.				
	Have you checked the bilge water for contamination with oil prior to disposal?				
	Is the water contaminated with liquid hydrocarbons? If so, it must be removed by vacuum truck for treatment and properly disposed of.				
	Non-oily water originating from clean compartments can be pumped overboard.				
	Have you done the annual steam cleaning of the entire bilge?				
	The residue from steam cleaning must be collected for disposal.				
	Are all engines and equipment in good repair to minimize leakage?				

Section 5.9 Ferry Operations Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Minor Ferry Maintenance	Have you serviced the diesel engines as prescribed by NBDOT Vehicle Management Agency?				
	Has the waste oil been collected and placed in a closed container and located in a secure location?				
	The waste oil shall be moved as soon as practical to a site serviced by an approved waste oil carrier for recycling or disposal.				
	Do you have a spill kit shall on board to address any minor leaks?				
	Do you have a supply of absorbent materials and containers available to contain and collect the leaks?				
	If absorbent is used, has it been replaced directly after use?				
Bunkering & Oil Transfer	Has bunkering and oil transfers been performed in accordance with the procedures outlined in the NBDOT Ferry Operations Manual(s)?				
	Bunkering shall be carried out under the supervision of the ferry operator, marine engineer or designate.				
	Bunkering shall not occur while the ferry is operating or while private vehicles are on board.				
	In the event of a spill, the following shall be notified immediately (also refer to section 5.12 - Spill Management):				

Section 5.9 Ferry Operations Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Do you have a separate fully stocked oil spill response station on the ferry or in the on shore storage shed?				
	Do you have a spill kit on board to address minor leaks?				
	Do you have a supply of absorbent materials and containers available to contain and collect the leaks?				
	If absorbent is used, has it been replaced directly after use?				
Ferry Cables	Have all worn cables been removed from the waterway and rewound onto spools?				
	Spools of worn cables will be disposed of through a scrap metal dealer for recycling.				
Sewage & Litter Barrels	Have on-shore toilet facilities been pumped out by a licensed septic hauler as needed to maintain sanitary conditions?				
	Have the holding tanks on self-propelled ferries been pumped out by a licensed septic hauler as needed to maintain sanitary conditions?				

Section 5.9 Ferry Operations Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have the litter barrels located at ferry landing areas been serviced at regular intervals to minimize the nuisance potential of the sites?				
	The litter collected shall be disposed of at the closest Regional Solid Waste Commission landfill.				
	Have the toilet facilities, holding tank and litter barrels been inspected regularly to ensure leaks do not occur?				
	Have the sewage and litter barrels been serviced regularly?				
Cleaning of Ferry Landings	Are there accumulations of dirt and debris that are excessive?				
	Has the landing shall been scraped or swept prior to flushing?				
	Has all of the material that was scraped loose been disposed of at least 30 m away from the watercourse and where it cannot be returned to the watercourse?				
	Waste shall be disposed of as per section 5.20 – Waste Management.				
Ramp Construction	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				

Section 5.9 Ferry Operations Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Have all erosion and sediment control measures been installed prior to commencement of work?				
	Additions to existing ramps should be constructed of sand bags lined with filter fabric and enclosing pit run gravel.				
	Other ramp construction techniques may be employed provided that a similar level of protection from erosion is achieved.				
Protective Coatings	Have the protection measures contained in the Guidelines for the Application and Removal of Protective Coatings prepared by NBENV (1993) been followed?				
	Partial enclosures shall be utilized for manual application and removal or protective coatings including chipping, scraping and brush/roller painting.				
	Full enclosures shall be utilized for abrasive blasting for removal and spray application of protective coatings.				
	Has the spent blasting (e.g., sand blasting) media been disposed of at an approved waste disposal site?				

Section 5.9 Ferry Operations Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is the spent blasting material is known to contain lead or other materials that may be considered hazardous?				
	If the spent blasting material contains hazardous materials, has laboratory testing been undertaken to determine the appropriate waste disposal option?				
	Have solvents that were used in the cleaning of painting equipment been collected in a closed container and recycled by an approved solvent recycler?				
	Have the empty cans of coatings and solvents been disposed of in an environmentally acceptable manner (i.e., crushed, bagged and disposed at a regional landfill)?				
	Has all waste been disposed of properly?				
Salt & Sand Storage	Are all salt and sand/salt mixes stored in weatherproof containers?				
	Have excess salt and sands spilled during use been returned to the storage container?				

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Section 5.10 Fire Prevention & Contingency Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Fire Prevention & Contingency	Do you have all permits and approval prior to commencement of burning?				
	Has the potential of a fire in and around a work area been minimized to avoid destruction of property and habitat?				
	Have all necessary precautions been taken to reduce the potential for fires by controlling/limiting fire hazards at the worksite?				
	Has the worksite been kept free of all flammable waste?				
	No burning shall occur on site without the applicable permits and without prior approval from NBDOT, DENV and DNR.				
	Have all equipment been kept in good working order?				
	Are on site personnel prepared to control and fight any fires on the worksite?				
	Does the Contractor have sufficient firefighting equipment available and in good working order when working in forested areas as required by NBDNR under the General Regulation of the *Forest Fires Act?*				

Section 5.10 Fire Prevention & Contingency Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Do you have the nearest fire department phone number?				
	Have all fires within or threatening forest habitat been reported to NBDNR?				

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Section 5.11 Grubbing Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Grubbing	If you are working within 30 m of a watercourse/wetland, do you have your WAWA permit?				
	If applicable, is there a copy of the WAWA permit on site?				
	Are site staff familiar with the WAWA?				
	Have you maintained a 30 m buffer zone on both sides of each watercourse and/or around wetlands where no grubbing or filling is to take place until erosion control devices, and drainage structures are installed?				
	Are the buffer zones been clearly identified?				
	Are the appropriate erosion control devices been installed prior to commencing the grubbing operation to prevent sediment from leaving the work area and entering watercourses/wetlands or private property?				
	Are the erosion control measures properly installed?				

Section 5.11 Grubbing Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Document on a daily basis which area have been grubbed.				
	Ensure that section 5.22 – Work Progression is being followed.				
	Ensure that proposed disposal site/area has been approved and follows section 5.20 – Waste Management.				
	Burning is generally not accepted on NBDOT ROW, but if burning is required, DENV and DNR shall be consulted prior to commencement of the burning.				
	Are you salvaging all topsoil?				

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Section 5.12 Spill Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
General	Do you have WHMIS information fact sheets for hazardous substances?				
	Have you reviewed and fully aware of the nature of the product and the precautions to be taken in handling and other important information?				
	Onsite fuelling must not occur within 30 m of a known groundwater source or private well.				
	Are the designated fuelling and storage at least 100 m away from any groundwater source or private well?				
	Do you have spills kits or materials to facilitate rapid containment and clean up of spills?				
	Have you completed the daily inspection of equipment for leaks?				
	Have all leaks been repaired immediately?				

Section 5.12 Spill Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Small Spills	Have you inspected your equipment/vehicle for leaks?				
	Can you identify the material involved in the spill? Refer to MSDS or call CANUTEC (1-613-996-6666) for precautionary measures, if necessary.				
	If it safe to do, can you stop the flow of the product being spilled?				
	If it can be done safely, can you control and contain the spilled product using onsite materials found in a spill cleanup kit?				
	Did you contact the Coast Guard Environmental Emergency number (1-800-565-1633)?				
	Did you record the details of the spill, including:				
	• Name and contact info of the person reporting the spill;				
	• Date and time of spill;				
	• Type and approximate amount of product spilled;				

Section 5.12 Spill Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	• Location of spill or leak;				
	• Source of spill or leak;				
	• Type of accident;				
	• Weather conditions;				
	• Proximity to watercourse, wetland or other sensitive feature; and				
	• Status of the spill (ongoing or contained, cleanup efforts).				
	Have you reported the spill to the Resident Engineer, Construction Foreman and/or Supervisor?				
	For spills at fuelling facilities, notification must also include:				
	The NBDOT Supervisor;				

Section 5.12 Spill Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Vehicle Management Agency;				
	Maintenance and Traffic Branch; and				
	The local Fire Prevention Authority.				
	All maintenance depots must be equipped with at least one spill kit, containing absorbent pads and booms for petroleum spills.				
	Is the clean up kit maintained?				
	Bags of peat moss or sawdust will also be available to control and clean up small spills.				
	If you have used a spill kit for clean up, have you made arrangements to have another kit made available?				
	If applicable, have you made arrangements to have the contaminated soil removed for disposal?				

Section 5.12 Spill Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Large Spills	Same as Small Spills except for the following;				
	Notify the NBDOT District Engineer or other designated representative.				
Spills During Highway Operation	Are you familiar with the NBDOT "*Standard Operating Procedure #7 - Emergency Procedures for Transportation Incidents Involving Dangerous Goods*" (Revised January 1995) which is to be followed at the scene of a spill?				
	Make sure you prevent anyone from entering the area of danger;				
	Can you safely get the shipper's emergency telephone number from the driver or the shipper's papers in order to identify the materials involved and to make a quick assessment of their hazards?				
	Utilize Annex A of SOP#7 to assess the hazards if it is not possible to get the shipper's emergency number.				
	Did you report all information at hand to headquarters or the dispatcher (*i.e.,* respective of the first group on the scene)?				
	Did you contact the Coast Guard (1-800-565-1633)?				

Section 5.12 Spill Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	The Coast Guard will then activate the response from NBENV and the Emergency Measures Organization.				
	Make sure you assist with the clean up as required and provide signage and barriers for the public.				

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Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Temporary Storage	Are containers clearly marked, properly stored and located at least 100 m away from any watercourse/wetland?				
	Is the above-ground fuel container with a capacity of greater than 30 L stored on an impervious mat and shall be surrounded by an impervious dyke of sufficient size to contain not less than 110% of the capacity of the tank, plus 150 mm of freeboard?				
	Is the above-ground fuel container with a capacity of greater than 30 L been measured for liquid level weekly and for water level weekly (Section 65 of 87-97)?				
	Are the fuel storage areas and non-portable transfer lines clearly marked or barricaded to ensure that they are not damaged by moving vehicles? The markers should be visible under adverse weather conditions.				
	Smoking shall be prohibited within 10 m of a fuel storage area.				
	Are waste oils and lubricants or other petroleum products retained in a clearly labeled tank or closed container and recycled or disposed of at an approved facility?				
	Are temporary storage of wastes (prior to disposal) stored on an impervious mat and shall be surrounded by an impervious dyke of sufficient size to contain not less than 110% of the capacity of the tank, plus 150 mm of freeboard?				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is the storage area sloped or drained such that any spilled material flows to a safe collection area?				
	Do you have a spill kit onsite in the event of a spill?				
	Have you reported any spills?				
	Have you returned the empty containers to the appropriate location?				
Permanent Storage	Are the waste oils and lubricants or other petroleum products retained in a clearly labeled tank or closed container, and recycled or disposed of at an approved facility?				
	Are temporary storage of wastes (prior to disposal) stored on an impervious mat and shall be surrounded by an impervious dyke of sufficient size to contain not less than 110% of the capacity of the tank, plus 150 mm of freeboard?				
	Smoking shall be prohibited within 10 m of a fuel storage area.				
	Is the maintenance depot equipped with at least one clean-up kit, containing absorbent pads and booms for petroleum spills. The kit shall be maintained?				
	Have the aboveground storage tanks been checked visually for damage or leaks on a regular basis (weekly recommended)?				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the gasoline and diesel tanks been dipped for products and water, and reconciled daily? Waste oils and tanks shall be dipped for products and water at the end of the last business day in each week and at the beginning of the first business day of each week. (See section 5.13.5 for Waste Oil Tanks).				
	Did you notify the Supervisor and Maintenance and Traffic Branch, when you notice a loss of liquid or a gain of water of 5 mm or more, or when you notice that the water at the tank bottom exceeds 50 mm, or when the sensor panel goes into alarm?				
	Other underground storage tank systems shall be inspected on a regular basis (at least once each week) as per Section 65 of New Brunswick Regulation 87-97. This involves, but is not limited to, gauging or dipping for fuel and water level, and reconciliation of records to be properly maintained for two years.				
	Has the underground (and aboveground) furnace oil tanks been dipped (quarterly) with water-finding paste for levels of water, product and sludge?				
	If you suspect a leak or liquid is entering the tank, have you contacted NBENV?				
	Has cathodic protection testing been performed for all underground steel petroleum storage systems, and the testing results submitted to NBENV every year?				
	Has precision leak testing been performed on all single wall underground storage systems that have been installed for 20 years (or more), and the testing results been submitted to NBENV every 2 years (on the even year)?				
	Have you checked all aboveground storage tanks? It is recommended that they are visually checked every week.				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have you conducted your daily tank dipping and reconciled your records?				
	Have you reported any spills?				
	Is a spill kit available for use in the event of a spill?				
	Has your petroleum storage license been renewed?				
Fueling and Fuel Transport	Only approved, portable containers shall be used for collecting and transporting gasoline or fuel oil.				
	Has care been taken at all times when products are being handled or transferred, to prevent any product from being spilled, misplaced, or lost and possibly able to enter and contaminate the soil, a watercourse, or wetland?				
	Has onsite fuelling occurred outside of 30 m of a known groundwater source or private well?				
	Are designated fuelling and storage areas at least 100 m away from any groundwater source or private well?				
	Has equipment been inspected daily for leaks?				
	Are all leaks repaired immediately?				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Are materials to facilitate rapid containment and clean up of spills available during any activity in or near any watercourse/wetland or environmentally significant area?				
	In the event of a spill, follow Section 5.12 – Spill Management.				
	Has all used sorbent materials for spill cleanup been returned to the appropriate storage yards for reuse or safe disposal?				
	If fuelling is done from a bulk tanker, the hose/nozzle assembly shall not be left unattended during fueling, and shall be placed in its proper position upon completion.				
	Do all fueling sites and fuel trucks have clean-up kits, containing absorbent pads and booms for minor spills that may occur during fueling?				
	Are all containers used for temporary storage of petroleum products in good condition, and checked for leaks daily?				
	Has The pour spout been properly installed and secured on fuel containers and verified prior to fueling?				
	Has re-fueling been carried out to avoid spilling fuel on the machine?				
	After re-fueling, has the cover on the fuel container and the cap on the machine been put into place?				
	Has the fuel container been moved away from the machine before starting it?				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have all empty containers been returned to a designated location for proper disposal? Empty containers are not to be disposed of on site.				
	See Checklist under Temporary Storage.				
Fueling at Maintenance Depots	Only approved, portable containers may be used for collecting, transporting and fueling with gasoline.				
	Is the container metal or plastic, bearing the ULC or CSA label of approval? If refilling a plastic gas can, the can should be removed from the vehicle and placed on the ground. This should minimize the risk of static electricity sparking any gasoline fumes.				
	Check pumps, hoses, and nozzles for any signs of leakage and serviced regularly. Do not use if leaking.				
	Fuel clips or other mechanical devices shall not be used to prop open the nozzle.				
	Do Not Leave Nozzle Unattended				
	In the event of a leak or spill, follow Section 5.12 – Spill Management.				
	Is the engine shut off before refueling?				
	If refilling a plastic gas can, remove the can from the vehicle and place it on the ground. This should minimize the risk of static electricity sparking any gasoline fumes.				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have you shut the engine off on the vehicle?				
	Is there a spill kit available at the depot in the event of a spill?				
Waste Oil Tank & Waste Oil Disposal	At any given time, not more than 500 litres of waste oil will be stored onsite in barrels, pails, drums, etc.				
	Are drums placed on a drip pan to contain spills?				
	Did you allow for oil filters to drain of waste overnight before being recycled or disposed of at an approved disposal facility?				
	Have waste oil tanks been dipped for products and water levels every first and last business day of the week?				
	Ensure that the pick up and disposal of waste oil are carried out at specific pickup and disposal locations.				
	Between pickups, ensure that waste oil is collected in a tank or closed container.				
	Check the quantity of waste oil in storage. If the quantity is close to or over the 500 litres allowed at the facility, arrange to have waste oil picked up.				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Oil/Water Separators & Interceptors	Ensure that leaks and spills are cleaned up before reaching floor drains.				
	Ensure that waste oils are not deliberately added to separators or drains.				
	Did you follow the manufacturer's maintenance requirements for each separator type?				
	Have oil/water interceptors and separators been dipped for product thickness weekly, or any time a spill is suspected?				
	Have you checked the interceptors and separators to determine if any maintenance is required?				
	Have the interceptors and separators been inspected this year?				
Floor Drains	Have leaks and spills been contained and cleaned up before reaching floor drains?				
	Ensure that waste oils are not deliberately added to drains.				
	Have the floor drains been regularly inspected to determine if maintenance is required?				
	Have you established a regular schedule for cleaning the floor drains? It is recommended that they be cleaned 2-3 times per year.				

Section 5.13 Storage & Handling of Petroleum Products Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Tank Removal & Replacement	If contaminated soil is suspected, has NBENV been notified so that they inspect the removal of contaminated soil?				
	Has an NB site Professional been retained if contamination was identified?				
	If there is any contaminated soil, has it been assessed by New Brunswick site professional and/or removed for disposal at an approved facility?				
	Have you notified NBENV of the removal date? The Owner of a storage system must notify NBENV five working days in advance of the tank removal date				
	Is the system been emptied of all products prior to removal?				
	Have waste products been disposed of at an approved facility?				
	Have the premises been restored to a neat and clean condition?				
	Has the disturbed area been stabilized according to Section 5.7 - Erosion and Sediment Management?				
	Have you completed the NBENV Regulation 87-97 Schedule D form and submitted it to the NBENV immediately after the removal of any petroleum storage system (including furnace oil tanks)? This applies to systems having a total capacity greater than or equal to 2,000 L of petroleum product storage capacity.				

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Section 5.14 Storage & Handling of Other Hazardous Materials Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
General	Are all products stored in approved product storage areas (e.g., with spill containment capability) in accordance with federal and provincial legislation and permits, in a well ventilated area?				
	Are hazardous materials stored at least 30 m from any watercourse/wetland and at a location where lost or spilled product cannot enter a watercourse/wetland?				
	Hazardous waste shall be dealt with in compliance with federal and provincial regulations. A professional hazardous waste management company shall be contacted for disposal of most hazardous wastes.				
	All products shall be handled by trained, qualified personnel.				
	Are all products and fuel storage areas properly labeled, with labels visible at all times?				
	Have all necessary precautions been taken to minimize spills, misplacement or loss of hazardous materials?				
	In the event of a spill, section 5.12 - Spill Management will be followed.				
	Smoking shall be prohibited within 10 m of a hazardous materials storage area.				

Section 5.14 Storage & Handling of Other Hazardous Materials Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have storage sites been inspected regularly (at least weekly) to ensure compliance?				
	Have hazardous waste whether from accidents been collected and disposed of at an approved disposal facility?				
Pavement Markings	Have all solvents used to wash spray painting or other equipment, been returned to the appropriate storage yards for safe storage or disposal?				
	Ensure that small quantities of paint designated for disposal be allowed to harden first, and then disposed of at a regional landfill.				

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Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Filter Screen	**Construction**				
	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Is the filter screen designed to withstand all natural forces and the predictable weather conditions specific to the site where being installed?				
	Does the filter screen allow for the continued passage of fish and boats/vessels?				
	If navigable water, ensure that no work activity will obstruct passage.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is the filter screen installed around the work area prior to the commencement of work?				
	Does the filter screen form a continuous sheet?				
	Is the bottom of the filter screen held in place in such a manner that water cannot pass between the bottom line of the geotextile and the bed of the watercourse?				
	Has the filter screen been maintained in a functional manner?				
	Has the filter screen been inspected daily and prior to, during and after any rainfall?				
	Have any deficiencies been repaired immediately?				
	Has the filter screen been removed from the watercourse after work is completed?				
Construction of Cofferdams	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Ensure that erosion & sediment control measures are in place.				
	Ensure that an impermeable liner is used on the face of earth or sand bag cofferdams, to prevent water from passing through the cofferdam.				
	Ensure that discharge during dewatering is monitored to ensure that sediment-laden water does not re-entering the watercourse/wetland.				
	Is TSS being monitored at the point where the discharge re-enters the watercourse/wetland?				
	Has the cofferdam been maintained in a functional manner?				
	Has the cofferdam been inspected daily and prior to, during and after any rainfall event?				
	Have any deficiencies been repaired immediately?				
	A filter bag may be used in lieu of a sediment pond if there is concern of sediment-laden water entering a watercourse/wetland.				
	If using a filter bag, ensure that the bag and the sediment retained in a filter bag is disposed of at an approved disposal site.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the material removed from within the cofferdam been disposed of at least 30 m from a watercourse or wetland?				
	Ensure that the cofferdam shall be removed from the watercourse after work is completed.				
	Has the disposal areas been stabilized upon completion of the work?				
Excavation & Construction of Abutments & Foundations	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Ensure that erosion & sediment control measures are in place.				
	Have you maintained as much existing vegetation as possible?				
	Where possible, the work shall be performed during low flow and/or dry weather.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the foundation excavation in a watercourse been done in a manner that minimizes the release of sediment to watercourses/wetlands?				
	Has the material excavated from within a cofferdam been disposed of at least 30 m from a watercourse, wetland or marine area?				
	If you are excavating and disposing of marine sediments on land, the Guideline for the Sifting and Operation of a Dredging Material Disposal Site On Land (NBENV 2001) must be followed.				
	Ensure that temporary access structures are constructed in isolation from the water body using filters screens and/or cofferdams.				
	Ensure that temporary access structures do not impede navigation in navigable waters.				
	Has the temporary access structures been constructed to withstand ice management and ice jams (if applicable)?				
	Blasting in or near watercourses shall be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters, and approved by DFO.				
	Ensure that construction activity does not block fish passage.				
	Noise disturbance from pile driving work adjacent to residential developments may require restrictions to work scheduling and time frames.				
	Is the equipment in good working condition and free of leaks?				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Are hazardous material stored and handled as per Section 5.14 – Storage and Handling of Other hazardous Material.				
	Ensure that fresh concrete is not discharged into a watercourse.				
	If your source of Riprap, armour stone or rock fill is suspected to be acid generating, has it been tested in accordance with Section 5.25 – Acid Rock Drainage Management?				
	Have disturbed areas been stabilized immediately?				
Construction of Embankments	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Ensure that erosion and sediment control measures are installed prior to commencing work.				
	Are you using clean material as embankments fill in or within 30 m of watercourses and/or wetlands?				

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	If your source of Riprap, armour stone or rock fill is suspected to be acid generating, has it been tested in accordance with Section 5.25 – Acid Rock Drainage Management?				
	Have the embankment fills within 30 m of a watercourse been stabilized at the end of each day?				
	Have disturbed areas been stabilized immediately?				
	Are the outlet of drainage pipes covered with geotextile fabric and riprap to prevent erosion?				
Application & Removal of Protective Coatings	**Maintenance**				
	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Prior to the commencement, did you check the structure for signs of nesting by migratory birds?				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	If the spent blast media is known to contain lead or other materials that may be considered hazardous, has laboratory testing been undertaken to determine the appropriate waste disposal options?				
	Have all necessary precautions been taken to prevent discharge or loss of any harmful material or substance into the watercourse?				
	Do you have written approval from the DENV for the disposal of blasting media classified as hazardous waste?				
	Do you have an enclosure to prevent the discharge of material into a watercourse/wetland?				
	A partial enclosure is required where surface preparation and/or coating operations result in chippings, scrapings, and other materials or debris which may escape from the operation.				
	A full enclosure is required where surface preparation and/or coating operations may cause the escape of dust, paint overspray, and all other materials or debris from the operation, and where this type of release must be prevented.				
	For abrasive blasting below the deck, ensure that staging is used to collect spent blasting media. Utilize geotextile fabric over the staging to allow vacuuming of the media for proper disposal or re-use.				
	For abrasive blasting above the deck, ensure that staging is mounted on sections of the deck. Utilize impermeable tarps at the top of the staging to keep the work area dry.				
	Are all bridge deck drains blocked? Open steel grating decks must be covered with geotechnical fabric or by some other means to collect the spent blasting media.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	If you are using air or airless spray tools, utilize drapes and curtains similar to those used during abrasive blasting to prevent paint from entering the environment.				
	Ensure that spent blasting media is handled and disposed of according to DENV guidelines, depending on its classification as either "non-hazardous solid waste" or "hazardous solid waste."				
	Ensure that solvents used in the cleaning of painting equipment shall be are kept in a closed container and recycled by an approved solvent recycler.				
	Are all empty coating, paint solvent and cleaner containers disposed of in an environmentally acceptable manner (i.e., crushed, bagged and disposed at a regional landfill)?				
	The Handling and Storage of Hazardous Material shall be carried out in accordance with Section 5.14.				
	Has the spent blasting media been transported from the project site to an approved waste disposal site?				
Maintenance of Substructure and Superstructure	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Are all necessary erosion protection measures in place prior to the commencement of work to prevent silt and debris from washing into the watercourse?				
	Prior to the commencement, did you check the structure for signs of nesting by migratory birds?				
	If navigable water, ensure that no work activity will obstruct boat/vessel passage.				
	Are the sides of the deck covered to prevent pieces of concrete or other materials from being introduced to the underlying watercourse?				
	Have all necessary precautions been taken to prevent discharge of any harmful material or substance into the watercourse?				
	Are the bridge deck drains blocked?				
	Have all necessary precautions been taken to prevent discharge or loss of fillers into the watercourse?				
	Ensure that grout pumping equipment is not cleaned within 30 m of a watercourse/wetland.				
	Ensure that excess spent grout is allowed to dry and is disposed of at least 30 m away from any watercourse or wetland.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has all waste generated in the removal of damaged and deteriorated components been collected for proper recycling or disposal?				
	Has all treated wood waste been disposed as outlined in Section 5.20 – Waste Management?				
	Has all hazardous material used during removal of a structure been disposed of as per Section 5.14 – Storage and Handling of Other Hazardous Materials.				
	Have all disturbed areas been stabilized upon completion of the work?				
Chipsealng Decks	Ensure that valid WAWA and all appropriate permits have been received and a copy is onsite.				
	Are the field staff familiar with the WAWA permit?				
	Prior to commencement of work, did you check the structure shall be for signs of nesting by migratory birds?				
	No bridge located over a watercourse shall be surfaced with liquid asphalt unless the necessary steps have been taken to prevent the asphalt from entering the watercourse.				
	If there is a danger of asphalt over-spray entering the watercourse, did you ensure that the sides of the structure are skirted with sheet polyethylene (or similar protection)?				
	If there is a danger of asphalt seeping through the deck into the watercourse, did you ensure that the bridge deck was underdraped with sheet polyethylene (or similar protection)?				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Where it is considered impractical to protect a watercourse from asphalt contamination, chipsealing shall not be carried out.				
	Did you cover the deck drains prior to chipsealing?				
	Ensure that upon completion of chipseal operation, the skirting and underdraping is kept in place until the chipseal has set.				
	Was skirting and underdrapping and other protection materials disposed at an approved facility?				
Cleaning Structures	Ensure that valid WAWA and all appropriate permits have been received and a copy is onsite.				
	Are the field staff familiar with the WAWA permit?				
	If there are excessive accumulations of dirt and debris, bridge surfaces must be vacuumed, scraped or swept prior to blowing with compressed air or flushing.				
	Do you have a method of collecting accumulated material for proper disposal?				
	Has all material vacuumed or scraped been collected and disposed of at least 30 m from any watercourse/wetland?				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Ice Control	Ice control options are outlined in the New Brunswick River Ice Manual (Environment Canada and NBENV 1989).				
	Mechanical ice removal is preferred for small watercourses accessible from the banks, using construction equipment such as backhoes and draglines.				
	Should blasting be required it shall be conducted in accordance with the DFO Guidelines for the Use of Explosives in Canadian Fisheries Waters.				
	If you are blasting, have you contacted DFO? Have you developed an effective mitigation plan for their review?				
	Ensure that onsite fuelling does not occur within 30 m of a known groundwater source or private well?				
	Are designated fuelling and storage areas at least 100 m away from any groundwater source or private well?				
	Are materials to facilitate rapid containment and clean up of spills available during any construction/maintenance activity in or near any watercourse/wetland or environmentally significant area?				
	Has the equipment been inspected daily for leaks?				
	Are containers clearly marked, properly stored and located away from any watercourse/wetland?				
	Do you have a spill kit onsite in the event of a spill?				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Have you reported any spills?				
	Have you returned the empty containers to the appropriate location?				
Removal of Structure	**Removal**				
	Ensure that if working within 30 m of a watercourse or wetland that a WAWA permit has been obtained prior to commencement of the work.				
	Ensure that if working in a navigable waterbody that a NWPA permit has been obtained prior to commencement of the work.				
	Ensure that if work involves the disruption or destruction of fish habitat that a Fisheries Act Authorization for Works or Undertakings affecting Fish Habitat has been obtained prior to commencement of the work.				
	Is a copy of applicable permits available on the work site and are field staff familiar with the requirements?				
	Prior to commencement of the work, the bridge shall be checked for signs of nesting by migratory birds. Where possible, activities which could destroy eggs or nestlings shall not take place during the months of May through July on sections of bridges where nests of migratory birds are found to exist.				
	No excavation will take place in the stream until all required permits, approvals and protection measures are in place.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Are all erosion & sedimentation control measures properly installed prior to commencing work?				
	Ensure that no rutting occurs within the buffer zone and if so it is properly stabilized.				
	Ensure that the amount of de-vegetation is limited to reduce the risk of sedimentation.				
	Ensure that the banks of the watercourse is protected immediately following removal, using riprap or any other approved slope protection method.				
	Ensure that foundation excavation in a watercourse is done in a manner that minimizes the release of sediment to watercourses/wetlands.				
	Ensure that no activities at any phase will create obstruction to the ice movement.				
	If navigable water, ensure that no work activity will obstruct passage.				
	Where possible, work during low flow and/or dry weather.				
	Is equipment in good working condition?				
	Hazardous material will be stored as per section 5.14 Storage and Handling of Other Hazardous Material.				

Section 5.15 Structures Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Are you blasting in or near a watercourse? If so it shall be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters, and in consultation and approval with DFO.				
	Has fish passage been maintained?				
	Has waste material been disposed of at least 30 m from a watercourse or wetland?				
	If dewatering of a cofferdam is required, and the concentration of total suspended solids (TSS) exceeds regulatory discharge criteria has the water been treated prior to discharge into the watercourse?				
	Have you considered protection measures to control/limit noise and fugitive dust?				
	Where complete removal is required, ensure that the watercourse is restored to its original state.				
	Waste and debris shall be disposed of as per section 5.20 – Waste Management.				
	Have you stabilized the disturbed areas upon completion of the work?				

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Section 5.16 Summer Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Patching	Ensure that asphalt emulsion pumps, shovels, rakes, and other tools are only be cleaned at the maintenance depot.				
	Ensure that only environmentally friendly release agents are used to clean equipment and tools.				
	Has all used fuel been collected in a container and recycled or disposed of at an approved facility?				
	Have empty drums been returned to the maintenance depot for proper disposal?				
	Have all solvents used to clean tools or other equipment, been returned to the appropriate storage yards for safe storage or disposal?				
	In the event of a spill, Section 5.12 - Spill Management will be followed.				
	Have you minimized the volume of waste materials by only ordering only what is needed for one location?				
	Ensure that surplus materials are used where possible at other locations or returned to the depot for proper disposal.				

Section 5.16 Summer Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Grading	In order to minimize the generation of dust, grading should be undertaken after periods of wet weather.				
	Ensure that grading is carried in a matter that does not leave windrows along the side of the road that would prevent sheet-flow runoff.				
Ditch Maintenance	Obtain a WAWA Permit prior to the commencement of the work if the ditching operation is within 30 meters of, or create a possibility for sediment to enter, a wetland or watercourse.				
	Are the field staff familiar with the WAWA permit?				
	Are all erosion and sediment control structures installed prior to commencement of the work?				
	Have all measures been taken to reduce the potential for sediment to enter any wetland or watercourse?				
	Have you maintained a buffer zone of 30 m between the end of ditching and all watercourses and wetlands (if possible)?				
	Ensure that an erosion control structure is installed where the ditch meets the buffer zone.				
	Ensure that additional erosion control structures are installed further up the ditch as required and maintained until the exposed areas have been re-vegetated and are no longer prone to erosion and sedimentation.				
	Report ant petroleum-contaminated material encountered in the ditch to NBENV.				

Section 5.16 Summer Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Report any sanitary outfalls encountered in the ditch to the New Brunswick Department of Health.				
	Ensure that side slopes are as flat as possible.				
	Ensure that natural drainage is maintained whenever practical.				
	Ditches shall be directed into surrounding vegetation where possible rather than emptying into a natural watercourse or wetland.				
	Has removed material and sediment been disposed of at a location at least 30 m from a watercourse and such that it cannot wash into a watercourse or wetland?				
	Have all exposed areas been stabilized to minimize erosion and sedimentation?				
Vegetation Control	If work is to be done within 30 meters of a wetland or watercourse, a WAWA permit must be obtained.				
	Are the field staff familiar with the WAWA permit?				
	Ensure that all vegetative growth is controlled through manual and/or mechanical means. Herbicides are not permitted.				
	Are areas to be mowed and/or brush cut, clearly marked? Have you communicated what needs to be done to personnel performing the work?				

Section 5.16 Summer Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that mowing and other equipment does not proceed if the ground is soft.				
	Ensure that slash does not enter a watercourse or wetland.				
	Has brush been chipped and spread (not piled) on ROW? Burning is not permitted.				
Pavement Markings	Ensure that spray equipment is cleaned at the roadside away from any ESA.				
	Where a risk of contamination of roadside vegetation exists, utilize a sheet of polyethylene (or other suitable material) with absorbent material to contain the spills.				
	Spills shall be contained and disposed of as per section 5.12 – Spill Management.				
	Ensure that the refueling or maintenance of the spray truck is not occurring near any ESA's.				
	Ensure that absorbent material is available if required.				

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Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Portable Asphalt Plants	Considered the location of the plant with respect to:				
	• Watercourses;				
	• Wetlands;				
	• Waterbodies; and				
	• Residential and other odour and noise sensitive areas.				
	Has the proper WAWA permit has been obtained?				
	If on DOT ROW, ensure that NBDOT has granted approval for plant location.				
	Does the plant have an up to date approval to operate?				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is the asphalt plant and other facilities operated in such a manner so as to safeguard the air and water resources?				
	Have erosion and sediment control measures been installed at the asphalt plant site to control runoff from the site where warranted? (See section 5.7 – Erosion and Sedimentation Management)				
	Ensure that no scrubber water is to be discharged to the environment.				
	Are sediment ponds properly sized?				
	Has excess water been pumped and disposed of at an approved disposal facility?				
	Ensure that the use and storage of petroleum and other chemicals at the asphalt plant follow the guidelines outlined in section 5.13 – Storage and Handling of Petroleum Products and section 5.14 - Storage and Handling of Other Hazardous Materials.				
	Ensure that Spill Management of petroleum and other chemicals at the asphalt plant follow the guidelines outlined in section 5.12 – Spill Management.				
	Ensure that within two weeks of relocating the mobile asphalt plant from the present site that the complete site is rehabilitated.				
Pits	Ensure that pits shall be developed and operated in accordance with all applicable provincial guidelines, policies, acts, regulations and permits requirements.				
	Ensure the pit is not located within 30 m of a watercourse or wetlands.				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the proper WAWA permit has been obtained?				
	Are there any environmentally sensitive areas in or near the pit?				
	Verify if any impact will be made on ESA prior to start clearing or striping operations.				
	Maintain vegetated buffer zones around pits to reduce the noise and dust.				
	Are all the sediment control measures installed prior to commencement of the operation?				
	Has the pit been left in a neat and safe condition free from overhanging banks?				
Stockpiling	Are stockpiled materials located at least 30 m away from a watercourse or wetland?				
	Are all you sedimentation control measures installed and properly functioning?				
	Ensure that no erosion of the stockpile is occurring.				
	Are stockpiled materials containing erodible material (such as topsoil) stabilized by mulching to prevent erosion?				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Is runoff water and site drainage being directed away from the stockpiles?				
	In dry, windy conditions, stockpiles may require wetting for dust control to reduce off-site environmental impacts.				
Quarries	Ensure that quarry sources are developed and operated in accordance with all applicable provincial guidelines, policies, acts, regulation and permits requirements.				
	Has the proper WAWA permit has been obtained?				
	Does the proponent have a valid approval to operate certificate?				
	Ensure that the quarry only operates between the hours of 7am to 7pm. And unless authorized in the permit, there shall be no mining and processing on Sundays and Statutory Holidays.				
	Has an undisturbed buffer strip been maintained at least 15 m wide between the final perimeter of a quarry and a public highway, or non-residential property? The undisturbed buffer strip between the quarry and a residential property shall be at least 50 m wide.				
	Ensure that no excavation takes place to a depth that will permanently impact the water table.				
	Has the proponent performed a representative pre-blast survey of all structures and wells within 500 m?				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Does the quarry have a means of containing all runoff water and sediment within the work area?				
	Does the quarry have a means of containing fugitive dust within the work area?				
	Does the owner/operator have a means of controlling noise pollution created by the quarry operations?				
	Ensure that the final reclamation of a quarry is done to the satisfaction of NBENV.				
Temporary Access Roads	Have erosion and sedimentation control been installed prior to the construction of temporary access roads?				
	Ensure that erosion and sedimentation control measures are inspected and maintain.				
	Are you crossing a watercourse/wetland? If so do you have your WAWA permit, including the section for watercourse crossing?				
	Are the field staff familiar with the WAWA permit?				
	If temporary watercourse crossing are required, see Temporary Stream Crossings under Section 5.17.6.				
	Ensure that proper ditching is constructed to prevent runoff from flowing directly into watercourses or wetlands.				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that the access road is capped with rock/gravel to ensure sedimentation does not occur.				
	Ensure the amount of noise is kept to a minimum if close to residential areas.				
	Ensure that fugitive dusts are kept to a minimum and that there is a water truck available if required.				
	Ensure that the abandoned detour site is cleaned up, and approaches and streambanks are stabilized.				
Temporary Crossing with a Structure	Ensure that WAWA permit is obtain, adhere to, and a copy is available on site.				
	Are the field staff familiar with the WAWA permit?				
	Where feasible, temporary crossing structures will be used instead of culverts to reduce the impact on aquatic habitat.				
	Has the temporary crossing been designed/sized for peak flows expected during the life of the crossing?				
	Has the crossing location been chosen where the stream channel is straight and narrow?				
	Has the temporary crossing been constructed at right angles to the watercourse?				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that the sedimentation measures have been installed and are maintain as required.				
	Ensure that the crossing structure and all construction materials are removed from the watercourse and that the banks and all exposed soil are stabilized.				
Fords	A ford should only be considered as an alternative to constructing a bridge or installing a culvert if the number of crossings is to be kept to a minimum and confined to the low flow period between June 1st and September 30th.				
	Has the crossing been approved and you have a copy of the WAWA permit?				
	Are the field staff familiar with the WAWA permit?				
	Ensure that all conditions set in the WAWA permit are being adhered to.				
	Has the fording location been chosen to minimize disturbance to the banks?				
	Are approaches to the crossing been stabilized and access roads to crossing covered with clean gravel?				
	Ensure that the proper sedimentation and erosion control measures are installed and properly functioning.				
	Ensure that fording takes place perpendicular to the watercourse.				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that felled trees, slash and/or debris is not hauled through the watercourse.				
	Ensure that no sediments are being tracked into the watercourse.				
	Ensure that no vehicle using this fording is leaking petroleum products.				
	Ensure that the crossing is removed as soon as it is no longer required.				
	Ensure that the crossing is restored to the original condition after no longer required				
Marshalling Yards & Lay Down Areas	Open sites are preferred to forested sites that require clearing.				
	Ensure that environmental protection measures are implemented for clearing (Section 5.3), dust control (Section 5.6), erosion and sediment control (Section 5.7), grubbing (5.11), and other relevant sections, as required.				
	Ensure that noise and dust is kept to a minimum.				
Storage of Explosives	Ensure that the storage of blasting agents is off site at an approved facility.				
	Ensure that only the amount of blasting materials required for one day is transported to the site.				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	All unused blasting materials shall be returned to the approved storage facility.				
	Ensure that certification for handling and transporting is available.				
Work Camps	Have you applied for the necessary permits for the site?				
	Ensure that camps are not located within 100 m of any watercourse/wetlands.				
	Utilize existing cleared areas for camps; however if this is not possible, the area to be cleared should be minimized.				
	Maintain existing vegetation where possible.				
	Has erosion and sedimentation control measures been installed to prevent sediment from leaving area?				
	Is garbage stored in containers to minimize litter and to minimize the potential for wildlife encounters?				
	Waste disposal shall be carried out according to Section 5.20 – Waste Management.				

Section 5.17 Temporary Ancillary Facility Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Decommissioning Temporary Ancillary Facilities	Ensure that temporary ancillary facilities are cleaned up and stabilized.				
	Ensure that erosion and sediment control measures are maintained until which time vegetation has established.				
	Wastes shall be disposed of as outlined in section 5.20 – Waste Disposal.				

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Section 5.18 Topsoil Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
General	Ensure that the stockpile location has been approved by NBDOT.				
	Has the topsoil stockpile been located a minimum of 30 m from any watercourse or wetland and where it will not block natural drainage?				
	Has sediment control fencing been installed around the stockpile to contain any sediment?				
	Has the stockpiles been mulched in accordance with section 5.22-Work Progression?				
	Are there any erosion control measures installed down gradient from the stockpile to prevent any runoff to directly enter a watercourse/wetland?				
	Ensure that once the areas have been topsoiled, it is stabilized as soon as possible.				

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Section 5.19 Vehicle & Equipment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Servicing & Maintenance	Ensure that tankers are not washed out where the wash water could enter a watercourse or wetland.				
	Ensure that routine washing with water takes place at sites equipped with oil-water separators so that any petroleum product can be removed prior to discharge of the wastewater.				
	At sites without oil/water separators, wash areas shall be positioned where the wash water will not directly enter a watercourse/wetland				
	Ensure that the washing of specialized equipment (e.g., chipseal vehicles, engines) takes place at facilities that are properly equipped to treat the contaminated wastewater.				
	Have your vehicles and equipment been serviced in accordance with the service manual or prescribed by Vehicle Management?				
	Has your equipment been inspected daily to ensure that the equipment is operating properly and there are no leaks?				
	Have equipment leaks been repaired immediately upon detection? Refer to section 5.12 – Spill Management.				

Section 5.19 Vehicle & Equipment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has care been taken to prevent oil, antifreeze, and other hazardous liquids from entering floor drains?				
	Have oil filters been thoroughly drained, tied up in a plastic bag, and recycled or disposed of at a solid waste disposal facility?				
	Ensure that no more than 500 litres of waste oil is stored in temporary storage containers.				
	Are all containers, drums, and pails closed and provided with a drip pan?				
	Ensure that there is a supply of absorbent materials to pick up spills at all maintenance depots, and in maintenance vehicles equipped to service equipment in the field.				
Idling	Ensure that diesel construction equipment is turned off when not in active use.				
	Ensure that dump trucks that are idling for 5 minutes or more are turned off.				
	Ensure that all light-duty vehicles such as (¼ or ½ ton trucks) are turned off while unattended, or while not moving for 5 minutes or more.				
	If the weather is expected to be extremely cold, can you park the vehicle or equipment in an enclosed garage?				

Section 5.19 Vehicle & Equipment Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Limit morning vehicle warm-ups to 3-5 minutes.				
	Ensure that idling equipment is located away from sensitive receptors such as fresh air intakes to buildings.				
	Remember the number 5…if your vehicle or equipment is running and is not in active use, if you have to leave your vehicle or equipment unattended or if your vehicle or equipment needs a morning warm-up…turn it off after 5 minutes.				

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Section 5.20 Waste Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Disposal Areas	Have disposal area locations been identified?				
	Has approval from NBDOT been granted for the disposal area?				
	Has the property owner granted approval of the proposed disposal area?				
	Has the proposed site been inspected to see if there are any ESA's?				
	Ensure WAWA permits are obtained where required.				
	Ensure that the disposal area shall be located no closer than 30 metres from a watercourse/wetland.				
	Are the disposal areas blocking natural drainage?				
	Ensure that all proper erosion and sedimentation control measures are installed and functioning properly.				

Section 5.20 Waste Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the disposal area been left with a neat and finished appearance and permanently stabilized?				
Construction & Demolition Debris	Only C&D debris will be disposed of at an approved C&D site.				
	Ensure that proof of "approval to operate' certificate is available.				
Garbage & Other Wastes	Ensure that rags and other potentially combustible materials used in equipment maintenance are kept in a covered container separate from other materials until the combustible material can be removed from site for disposal.				
	Are waste diesel fuel, transmission oils, hydraulic oils, and motor oil stored in a labeled tank or drum for off-site recycling at a waste oil recycler, as per Section 5.13.5?				
	Have hazardous waste been collected and disposed of off-site at a certified disposal facility approved for receiving liquid industrial wastes?				
	Burning of waste is not permitted on the site.				
	Ensure that domestic waste from site offices and camps is gathered daily and stored in closed steel containers for removal and disposal.				
	In order to minimize wildlife encounters, food waste is to be removed from site.				

Section 5.20 Waste Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Litter Barrels & Litter Pickup	Have litter barrels been serviced at regular intervals to minimize the nuisance potential of the sites?				
	Ensure that all litter collected is disposed of at the closest Regional Solid Waste Commission landfill.				
Recycling or Reuse of Highway Construction Waste	Where practical, NBDOT shall recycle old asphalt concrete pavement.				
	Topsoil shall be salvaged and reused on finished roadway slopes.				
	Utilize poor subsoils in deep fills, and moisture condition wet subsoils instead of disposing of the material.				
	Reuse steel guide rails and wooden guide posts, where practical.				
	Overlay old aluminum signs with new reflective sheeting.				
	Reuse aluminum products, such as sign posts, light or signal poles, overhead sign structures, and bridge rails.				
	Non-reusable material shall be sold as scrap and recycled.				

Section 5.20 Waste Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Vegetation Waste	Ensure that chipped vegetation waste is spread over ground or used in the fill to minimize the size of disposal areas.				
	Chipped vegetation can be used for mulch.				
	Utilize grubbings in fills to minimize the size of disposal areas.				

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Section 5.21 Winter Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Snow Removal & Disposal	Ensure that snow storage areas are located away from environmentally sensitive locations.				
	Ensure that NBDOT personnel and snow removal contractors deposit snow in designated areas away from surface waters (watercourses and wetlands) and sensitive groundwater areas, especially drinking water sources				
Sanding	Ensure that the amount of salt added to winter sand is kept to a minimum (2.5% - 4%) to minimize the amount of salt entering the environment.				

Section 5.21 Winter Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Salting	Ensure that the Salt Management Policy and Salt Management Plan are followed.				
	To maximize the effectiveness of salting operations while minimizing the salt requirements, ensure that salt is applied at the rates that achieve the desired effect but will not subject the surrounding environment to excess salt loadings.				
	Ensure operators are aware of the specified application rate.				
	Ensure that salt usage spreaders should are calibrated, and spinners are adjusted to prevent overthrow (waste).				
	Utilize steaming versus calcium chloride for blocked culverts.				
Winter Materials Storage	Ensure that only minimal quantities of winter maintenance materials are stored on site (*i.e.,* only one season's supply of materials).				
	Ensure that all salt is stored in a structure designed for salt storage (salt dome or salt shed).				
	Ensure that loading of salt into vehicles takes place inside the storage structure or as close to the entrance as possible.				

Section 5.21 Winter Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	To minimize spillage, ensure that loader buckets are only partially full during loading.				
	Ensure that any salt spilled in the yard is immediately cleaned up and re-stockpiled.				
	Are brooms and shovels kept at the dome entrance in the event of salt spills?				
	Ensure that site drainage is directed away from the storage locations and stockpiled material.				
	Where possible, ensure that blended sand is stored in domes.				
	When blended sand is stored outside, ensure that quantities are minimal and that piles are put up as late in the season as possible.				
	Ensure that stockpiling procedures as outlined in the Highway Maintenance Management System Manual are followed.				
	Utilize covers to prevent salt from leaching from stockpiles.				
	Where possible, stockpile sand away from locations where there is potential for contamination of groundwater sources.				

Section 5.21 Winter Highway Maintenance Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Install sediment control fencing where there is a risk of runoff from sand stockpiles to leave the property and impact adjacent properties, watercourses and/or wetlands.				

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 5.22 Work Progression Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
General	Ensure that you limit the size of the disturbed area and the duration it is exposed.				
	Ensure that existing vegetation is maintained wherever possible.				
	Ensure that areas that cannot be completed within the timeframes are stabilized by using mulch.				
	Are you required to work within 30 m of a watercourse and/or wetland? If yes, then you require a WAWA permit. Do not start any work until a permit has been issued.				
	Have the work areas been identified?				
	Is the work area too large to complete within 30 days? If so, consider reducing the size of the work area.				
	Do you have a plan for inspecting work progression? The work area should be inspected prior to, during and after any rainfall. Repairs to erosion control structures and/or stabilized areas are to be done immediately.				

Section 5.22 Work Progression Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Do you have a method of removing sediment built up behind the erosion control structures? (If applicable)				
	Do you have a location to dispose of sediment that is at least 30 m away from any watercourse/wetland? (If applicable)				
	Have you arranged to have the exposed areas stabilized (i.e. mulched or hydroseeded)? Arrangements should be made before the 30 days expires not on the 30th day.				

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Agricultural Lands	Have arrangements been made with private property owners to get access through their property during construction?				
	Have accesses been identified and clearly marked in the field?				
	Ensure that personnel and equipment passage only use identified accesses.				
	Ensure that all erosion control measures are installed				
	Ensure that any fences have been cut as a result of construction activities are repaired and/or replaced to original condition immediately, if needed for containment of farm animals.				
	Ensure that any damage to the property resulting from execution of work is repaired as soon as possible.				

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Archaeological, Heritage & Paleontological Resources	Ensure that the NB Museum is contacted in the event of a discovery of paleontological resources.				
	In the event of the discovery, has work been halted until the appropriate mitigation is determined?				
	Ensure that any fossils and other remains or items of geological or archaeological interest or value discovered remain the property of the Crown.				
	Have you taken all reasonable precautions to prevent employees or other persons from removing or damaging any discoveries?				
	Ensure that a qualified archaeologist is present during the work in the area of concerns.				
Forest Resources	Ensure that the clearing activities are not carried beyond the marked limits.				
	Ensure that all merchantable timber is salvaged during the clearing operation.				
	Ensure that vegetation control shall be carried out as specified in section 5.16 – Summer Highway Maintenance and Related Activities.				
	Ensure that fire prevention measures are followed as indicated in Section 5.10 – Fire Prevention and Contingency.				

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Groundwater Wells	Have all residential wells been decommissioned as per the NBENV Guidelines for decommissioning (abandonment) of Water Wells?				
	Have groundwater wells within 500 m of construction activities been sampled prior to the work commencing (where applicable)?				
	Have any dug wells within 50 m of construction activities been sampled prior to the work commencing (where applicable)?				
	Ensure that proper documentation was done prior to any work commencing near residential wells.				
	If wells are adversely affected by construction, has temporary water been provided to the property owner?				
	Wells found to be permanently damaged as a result of NBDOT activities will be repaired or replaced.				

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Mineral Resources	Ensure that the amount of lands required for the highway corridor which contain valuable mineral resources is minimized.				
	Ensure that areas with potential for subsidence are avoided, when possible.				
	Have arrangements been made with private property owners to get access through their property during construction?				
	Have accesses been identified and clearly marked in the field?				
	Ensure that personnel and equipment passage only use identified accesses.				
Noise Sensitive Areas	Has equipment been maintained in good working order for noise suppression standards?				
	Ensure that where complaints of excess noise are received, noise monitoring is conducted and corrective action taken if warranted.				
	Construction activities may be restricted to daylight hours if complaints and follow-up noise monitoring identify a problem.				

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Rare Plants	Ensure that the clearing limits are flagged where populations of rare plants are located within or adjacent to the ROW.				
	Are site staff aware of any rare plant locations?				
	Ensure that ancillary facilities are not placed in an area outside of the ROW where rare plant populations have been identified.				
Watercourses, Fish & Fish Habitat	Ensure that all required WAWA permits are obtained prior to any work within 30 m of a watercourse.				
	Are the field staff familiar with the WAWA permit?				
	Ensure that all conditions of approval in the required permits are followed.				
	Ensure that site-specific erosion and sediment control plans (or SSEPP) that have been developed for work within 30 m of a watercourse are followed.				
	Are all erosion and sediment control measures in place, inspected and maintained?				
	Ensure that no blasting is carried out in or near a watercourse without the authorization of DFO.				

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that equipment is free of deleterious substances such as oil and grease, before working in the wetted portion of a watercourse.				
	Does equipment that is working within 30 m of a watercourse have a spill kit on board or is there a spill kit nearby to permit rapid containment of leaks?				
	Prior to structure or culvert installation or maintenance, has a fish rescue been carried out on the affected portions of the watercourse by qualified biologist?				
Watershed & Wellfield Protection Zones	Has an exemption has been obtained prior to any commencement of work on a watershed or wellfield protected zone?				
	Has the proper WAWA permit has been obtained?				
	Are the field staff familiar with the WAWA permit?				
	Ensure that any condition of approval is adhered to.				
	Ensure that the limits of the watershed and/or wellfields are clearly marked in the field.				
	Ensure that no rutting/ground disturbance occurs within the watershed or wellfield protected area during clearing.				

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Conduct hand clearing if ground conditions are soft such that rutting is likely.				
	Ensure that refueling of equipment takes place outside of the watershed or wellfield protected area.				
Wetlands	Ensure that construction and related activities in wetlands is limited to within the ROW.				
	Ensure that vehicles and equipment used during construction use only designated roadways and access areas.				
	Ensure that all applicable erosion and sediment control measures are properly installed.				
	Ensure that all equipment is in good working condition and there are no leaks.				
	In order to minimize the spread of invasive plant species, ensure that machinery is cleaned of mud and vegetation prior to entering and leaving wetlands.				
	As required, ensure that wetlands remaining following partial impacts by highway construction are monitored to visually assess wetland hydrology, introduction of invasive plant species, and use by recreational vehicles.				

Section 5.23 Working Near Environmentally Sensitive Areas Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
Wildlife & Wildlife Habitat	Ensure that in areas where high wildlife concentrations (e.g. deer or moose) are expected to interact with the highway, the possibility of incorporating wildlife crossing into the highway design is investigated.				
	Ensure that wildlife crossings are located in consultation with DNR wildlife biologists.				
	Ensure that construction activities are scheduled, wherever possible, to avoid periods when deer may be yarded up in deer wintering areas near the ROW.				
	Ensure that only designated roadways and access are used.				
	In order to avoid the attraction of nuisance animals, ensure that domestic waste from site offices and camps including food waste are gathered daily and stored in closed steel containers for removal and disposal at an approved waste disposal site.				
	Have you notified DNR about persistent wildlife encounters?				
	Ensure that you document any wildlife encounters.				

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 5.24 Working Near Pipelines & Other Underground Services Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
General	Have you contacted the underground service providers prior to digging?				
	Ensure that no excavation or other ground-breaking activities takes place until approvals are obtained.				
	Ensure that excavation locations are marked on-site prior to a clearance request being submitted.				
	Ensure that clearance requests are submitted a minimum of 48 hours prior to any work taking place.				
	Have you received clearance to dig?				

Project Name:	**Surveyor's Name:**
Contract Number:	**Survey Consultant:**
Date:	**Checked By:**

Section 5.25 Sulphide Bearing Rock & Acid Rock Drainage Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
General	Ensure that the following procedures and guidelines are follow when encountering SBR in the field.				
	• Acid Rock Protocol (NBDOT 2000);				
	• Guidelines for Using Sulphide Bearing Rock (NBDOT 2002);				
	• Assessment of Field Monitoring Methods for Sites with Rock Materials That May Cause Acidic Drainage (Al 2007); and				
	• Environmental Impacts from Acid Rock Drainage: Interpretation Criteria for Water Quality Monitoring Data (Al 2005).				
	In areas that have been identified as containing SBR, avoidance must be shown by:				
	• Raising the grade vertically of the highway to avoid excavation;				
	• Moving the alignment horizontally to avoid the mineralization.				

Section 5.25 Sulphide Bearing Rock & Acid Rock Drainage Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that where complete avoidance is not possible, that monitoring plans and site-specific management and contingency plans are developed.				
	In areas that contain rock materials that may cause ARD, ensure that monitoring programs are carried out before, during, and after construction. In addition, ensure that weekly water quality monitoring, in the form of pH readings, are done.				
	Has the disposal area been identified and approved?				
	Ensure that SBR generated during highway construction is placed in specially designated fills and covered with a low permeable cover.				
	Ensure that exposed rock cuts are checked regularly by the NBDOT Geological Engineer to determine if there are any additional areas of mineralization.				
	Ensure that blasting patterns are designed to minimize rock fragmentation.				
	Ensure that disposal areas are located within the project footprint (if feasible) or located on NBDOT owned property.				
	Ensure that wetlands are not used for disposal of SBR unless the wetland is impacted by the project footprint (i.e. roadway goes through wetland).				
	Ensure that SBR disposal areas are not located within 100 m of a wetland or watercourse. This distance may increase if the topography indicates that drainage is towards the watercourse/wetland.				

Section 5.25 Sulphide Bearing Rock & Acid Rock Drainage Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Has the toe of the disposal area been grubbed? Have the undulations also been removed?				
	Has the source for the low permeable cover material been identified and approved for use?				
	Ensure that SBR is covered with low-permeable material. The cover must have a minimum thickness of 600 mm under the roadbed and 800 mm on the slopes to minimize moisture penetration into and runoff out of the SBR.				
	Ensure that fill slopes are shaped and covered with a low-permeability material, topsoiled, and hydroseeded. If the fill foreslope is steep (i.e. 2:1), utilize jute mats to minimize erosion.				
	Ensure that SBR cut/fill/cover work is carried out continuously and diligently until completed.				
	For SBR disposal in non-wetland areas, ensure that culverts are gasketed to prevent leakage.				
	For SBR disposal in wetland areas, ensure that culverts are gasketed as well as encapsulated with a low permeable material prior to the placement of the SBR material.				
	For SBR disposal in wetland areas, ensure that SBR is not placed within 1 m of the groundwater table.				
	For all culverts placed within SBR fill areas, any fill material required below the culvert will not be sulphide bearing. Material within the 1 m shall be non-SBR material.				
	Ensure that ditches and median (if applicable) are designed to minimize standing water, and thus seepage, into the SBR fill area.				

Section 5.25 Sulphide Bearing Rock & Acid Rock Drainage Management Checklist

	Protection Measure/ Environmental Consideration	Acceptable	Not Acceptable	Not Applicable	Comments
	Ensure that the grades for the highway and adjacent ditches are designed to direct water away from SBR fill areas.				
	Ensure that ditches at the toe-of-slope up-gradient of SBR areas are sloped away from SBR fill areas.				
	Ensure that the cover in median areas of SBR fill areas has at least a thickness of 1.4 m.				
	To minimize the potential for runoff from exposed SBR rock cuts reaching a watercourse, where possible, ditch drainage will be cut off by cross-culvert, with the outlet draining into the woods to low-lying areas that do not drain directly to any watercourse.				
	Ensure that drainage from rock ditches and rock faces along SBR cut areas are diverted, where possible, into adjacent wooded areas away from any watercourses or wetlands.				
	Ensure that any runoff from SBR cut and fill areas is monitored, and treated if required prior to discharge.				
	Ensure that foreslopes and ditches in SBR rock cuts are covered with topsoil and seeded to minimize rock exposure.				
	If SBR is encountered in an area where it was not expected, ensure that work is stopped at that location and have the site assessed and a mitigation plan developed.				

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Appendix “B” – Permits

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New Nouveau Brunswick

ENVIRONMENT

WATERCOURSE AND WETLAND ALTERATION PACKAGE

Enclosed you will find the following:

1. A section entitled, "Before You Alter or Perform Work Within 30 metres of a Watercourse or Wetland",
2. A list of required documents,
3. A fee schedule, and
4. An application form for a watercourse and wetland alteration permit.

(REVISED April 12, 2006)

Before You Alter or Perform Work Within 30 metres of a Watercourse or Wetland

Things you should know:

In advance of planning or performing:

a) a change or alteration to a watercourse or a wetland, or,
b) a disturbance of the ground within 30 metres of a watercourse or a wetland,

there are important facts that you should be aware of. The purpose of the Watercourse and Wetland Alteration Regulation is to protect the streams, rivers, wetlands and lakes of New Brunswick from work or ground disturbance in or near watercourses or wetlands.

The Clean Water Act defines an "alteration" a "watercourse" and a "wetland" as follows:

> "**alteration**" when it refers to a watercourse or a wetland, means a temporary or permanent change made at, near, or to a watercourse or a wetland, or to water flow in a watercourse or wetland, and includes:
>
> > any changes made to existing structures in the watercourse or wetland including repairs, modifications or removal, whether the water flow in the watercourse or wetland is altered or not;
> >
> > the operation of machinery on the bed of a watercourse other than at a recognized fording place;
> >
> > the operation of machinery in or on a wetland;
> >
> > any deposit or removal of sand, gravel, rock, topsoil or other material into or from a watercourse or wetland or within thirty metres of a wetland or the bank of a watercourse;
> >
> > any disturbance of the ground within thirty metres of the bank of a watercourse, except grazing by animals, the tilling, plowing, seeding and harrowing of land, the harvesting of vegetables, flowers, grains and ornamental shrubs and any other agricultural activity prescribed by regulation for the purposes of this paragraph, that occur more than five metres from a wetland or the bank of a watercourse;
> >
> > any removal of vegetation from the bed or bank of a watercourse;
> >
> > any removal of trees within thirty metres of the bank of a watercourse, and
> >
> > any removal of vegetation from a wetland or from within thirty metres of a wetland except the harvesting of vegetables, flowers, grains and ornamental shrubs and any other agricultural activity prescribed by regulation for the purposes of this paragraph, that occur more than five metres from a wetland.

"**watercourse**" means the full width and length, including the beds, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.

"**wetland**" means land that:

either periodically or permanently, has a water table at, near or above the land's surface or that is saturated with water, and

sustains aquatic processes as indicated by the presence of hydric soils, hydrophytic vegetation and biological activities adapted to wet conditions.

It is **illegal** to make or perform any watercourse or wetland alteration, or cause any watercourse or wetland alteration to be commenced, made or performed, unless authorized to do so by a permit issued by the Minister of Environment.

How to Make an Application for a Permit

The completed application form, including the required documents and the application fee, should be submitted to the Stewardship Branch – Watercourse and Wetland Alteration Program, at the address below, at least **2 MONTHS IN ADVANCE of the anticipated project starting date,** to ensure sufficient time for review of the application.

Department of Environment
Watercourse and Wetland Alteration Program
565 Priestman Street, Suite 301 (E3B 5X8)
P.O. Box 6000,
Fredericton, NB
E3B 5H1

Telephone: (506) 457-4850
Fax: (506) 453-6862

If You Do Not Receive a Permit

If your proposed works are considered to have a negative impact on the best interest of the public water resource, or the aquatic habitat, you will receive a letter from the Watercourse and Wetland Alteration Program of the Department of Environment explaining why your proposal was not approved.

If you are not satisfied with the explanation you receive from the Department, you may appeal to the Minister of Environment.

What If You Do Not Comply with the Clean Water Act?

When carrying out a watercourse or wetland alteration, you must have in your possession a valid permit, perform only the work included in the "Description of Watercourse/Wetland Alteration(s)", and comply with all the "Conditions of Approval" included on the permit. Failure to fulfill any of the above requirements could result in a prosecution under the Clean Water Act. In the case of a conviction under the Act, the following fines can be levied:

1. In the case of an individual, a fine of not less than five hundred dollars ($500) and not more than fifty thousand dollars ($50,000) and, in default of payment, liability to imprisonment in accordance with Subsection 31(3) of the Summary Convictions Act, and
2. In the case of a person other than an individual, a fine of not less than one thousand dollars ($1000) and not more than one million dollars ($1M).

If you live within an incorporated municipality, or within the boundaries of a Local Service District, **you should make certain that your proposed watercourse or wetland alteration does not violate any local municipal or planning by-laws.** It is the applicant's responsibility to obtain any necessary approvals that may be required in addition to a Watercourse and Wetland Alteration Permit.

Required Documentation

The document, which must be submitted with a Watercourse and Wetland Alteration Application, varies with the type of alteration proposed. Table 1 on Page vi indicates which documents are required for each type of alteration. A description of the documents is given below:

Engineering Scale Drawings	Fully dimensioned scale drawings prepared with the use of drafting instruments and showing all dimensions necessary to describe the size, shape and location of the proposed alteration, relative to the watercourse or wetland. These drawings must be prepared by or under the direct supervision of a person licensed to practice as a Professional Engineer in New Brunswick, pursuant to the Engineering Profession Act. The Drawings must bear the seal of the Professional Engineer.
Drawings to Scale	Fully dimensional scaled drawings prepared with the use of drawing instruments and showing all dimensions necessary to describe the size, shape location of the proposed alteration, relative to the watercourse or wetland.
Dimensioned Sketches	Freehand drawings with all the dimensions necessary to describe the size, shape and location of the proposed alteration, relative to the watercourse or wetland.
Map	**Is not meant to be a hand drawn sketch**. Road maps, topographical maps, etc., or copies thereof are acceptable. If LRIS maps, legal surveys or air photos are used, it is the applicant's responsibility to be sure that they clearly show the position of the project area relative to well known landmarks such as watercourses, railways, roads and/or transmission lines, etc. Also, whenever possible, please include the PID# for the property where the alteration is to take place.

REQUIRED DOCUMENTS

TABLE 1

Type of Alteration	Required Documents	No. of copies
Bridges	Drawings to scale (plan, profile, x-section)	4
Culverts and Pipe Arches	Dimensioned sketches showing size, alignment and slope	4
Miscellaneous Drainage Changes such as landscaping	Dimensioned sketches	4
Erosion Control - including rip-rap, gabions and crib work Tree and Brush Removal Debris Removal	Dimensioned sketches	4
Breakwaters	Drawings to scale (plan, profile, x-section)	4
Fords, Beaches	Dimensioned sketches	4
Land Extensions - the extension of land by infilling a watercourse or a wetland By-pass Ponds	Drawings to scale (plan, profile, x-section)	4
Settling Ponds, Channel Cleaning	Dimensioned sketches	4
Causeways	Drawings to scale (plan, profile, x-section)	4
Channelization, Diversions Cut-offs Dredging	Bed material analysis Drawings to scale (plan, profile, x-section)	4
Dams, Fishways, Weirs	Engineered scale drawings (plan, profile, x-section)	4
Draining of ponds, lakes and wetlands	Dimensioned sketches	4
Subdivisions and Alignments	Drawings to scale (plan, profile, x-section)	4
Pipe Line Crossings Water Intakes	Drawings to scale (plan, profile, x-section)	4

IMPORTANT NOTE:

FAILURE TO SUBMIT THE REQUIRED DOCUMENTS COULD RESULT IN THE RETURN OF YOUR APPLICATION BEFORE PROCESSING.

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Fee Schedule

The following fees are required for processing applications pursuant to the Watercourse and Wetland Alteration Regulation, Section 15(1) and (2).

1.	A single permit respecting one alteration.	$ 25.00
2.	A multiple permit respecting more than one alteration having some appropriate factor in common.	$ 20.00 *for each alteration (maximum $200)*
3.	A permit renewal, extension and/or revision.	$10.00

NOTE: Fees must accompany each application and be in the form of a cheque or money order payable to the **Minister of Finance** for New Brunswick.

The required fee is for processing/review of the permit application and in cases where a permit is denied, the fee **will not** be returned.

Municipalities, Provincial, and Federal agencies, and Crown Corporations are **EXEMPT** from the processing fee.

Provisional Permits

Under certain conditions, **outside designated water supply watersheds**, the following applications could qualify for a **Provisional Permit**. A provisional permit application can be obtained from your local office of the Department of Environment (DENV).

If your proposed project appears to be one of the following types, please contact your local DENV office regarding your application and advice on whether the provisional permit process applies to your project.

a) Beaver dam management and removal
b) Centreline Clearing
c) Constructions of by-pass ponds
d) Construction of dugout ponds
e) Culvert maintenance/replacement (NB Department of Transportation)
f) Cutting of non-marketable woody vegetation
g) Existing boat launching ramps, ferry landings, and recognized fords
h) Geotechnical investigations
i) Instream data collection devices
j) Pipeline and cable crossings and outfall pipes
k) Removal of man-made obstructions and alterations
l) Retaining walls
m) Rip-rap/Armor stone
n) Selective harvesting
o) Surface runoff & drainage changes
p) Water intake structures

APPLICATION FOR A WATERCOURSE and WETLAND ALTERATION PERMIT

(In accordance with the Watercourse and Wetland Alteration Regulation under the Clean Water Act, Chapter C-6.1, Acts of New Brunswick, 1989.)

I have submitted this application on behalf of: (**PLEASE PRINT**)

NAME OF APPLICANT
(Dept./Company/Group/Person) _____

Mailing Address _____

_____ Postal Code _____

Telephone Bus.: _____ Home: _____ Fax: _____
E-mail: _____

If different from above:

Contact Person: _____ Telephone: _____
E-mail: _____ Fax: _____

The applicant accepts the liability for any damage done while commencing, carrying out or completing the watercourse or wetland alteration(s) described herein.

Name of Watercourse/Wetland _____ County _____

Tributary to _____ Parish _____

PID # of property where alteration is to be performed: _____

For Office Use Only

_____ Accepted for processing. Required fee of $_____ enclosed.
_____ Not accepted for processing. Cheque or Money Order # _____
_____ Resubmitted for processing. **FILE #** _____

Category _____ Type _____ 1:50,000 Map _____

Easting _____ Northing _____ Zone _____ NAD _____

DNR Region _____ DENV Region _____ DFO Region _____

EIA Screen _____ Water Supply _____ Water Quality Certificate _____

Wetland _____ Coastal _____

Copies sent to: _____

Date _____ Reviewed by _____
Day Month Year

A. Description of Alteration

Please include a detailed description of the project: type of activity, description of construction method, including materials used, disturbed surface area within 30 metres of the watercourse or wetland and the purpose of the project. This project description should focus attention on the following:

(1) is soil being disturbed, added to, or removed from the watercourse or wetland, or within 30 metres, of a wetland or the shoulder(s) of the watercourse?

(2) is vegetation being added to, or removed from, the watercourse or wetland, or within 30 metres, of a wetland or the shoulder(s) of the watercourse?

(3) are any structures to be installed, constructed, modified or removed from the watercourse or wetland or within 30 metres, of a wetland or the shoulder(s) of the watercourse?

(4) what is the size (length, width and/or height/depth) of the area in or within 30 metres of the watercourse or wetland to be altered in any of the ways exemplified in question (1)?

(5) precisely where will the proposed alteration(s) take place or be situated (located) relative to the watercourse or wetland or the shoulder(s) of the watercourse?

(6) what stabilization and erosion control techniques are to be employed during and upon completion of the proposed project including final slopes and material to be used to blanket all exposed erodible soil in order to minimize the runoff of suspended sediment from the area being altered?

(7) does project access already exist or what alteration(s) exemplified in question (1) are necessary within 30 metres of the wetland or of the shoulder(s) of the watercourse to facilitate the proposed undertaking?

NOTE: If your project involves a culvert installation, you must include culvert shape, type, length and diameter or span and rise. If your alteration involves a bridge, you must include the rise (distance from stream bed to the underside of the stringers), span (the distance between abutments) and type and average size of bed material.

Equipment to be operated in the wetted portion of the channel _____

NOTE: Instream work should be completed during the low water period, which is between June 1st and September 30th, in order to lessen potential damage to the environment. **All requests for permits outside this time frame will require input from our advisory agents and may be rejected, or subjected to intensive fish habitat protection measures.**

Desired period of construction: _____ to _____
Month Day Year Month Day Year

Desired period of instream work: _____ to _____
Month Day Year Month Day Year

The period for instream work is necessary beyond the June 1st to September 30th period because:

B. Sketch of the Project

Please enclose the required documents for the proposed project, including all dimensions and distances relative to the watercourse or wetland (see pages v and vi). These documents are not intended to be a location sketch (see section C.)

C. Location

Please submit a **map** (not a hand drawn sketch), which clearly shows the location of your proposed project relative to well known and labeled landmarks such as watercourses, railways, roads and/or transmission lines, etc. Whenever possible, please include the PID# for the property where the alteration is to take place.

Copies of relevant maps may be obtained from any office of:

New Brunswick Department of Environment
New Brunswick Department of Natural Resources
New Brunswick Department of Agriculture, Fisheries and Aquaculture
New Brunswick Department of Transportation
The Federal Department of Fisheries and Oceans

D. Description of Watercourse or Wetland (please submit photographs)

Are the banks of the watercourse or wetland eroding in the vicinity of the proposed project?

If this structure replaces an existing structure, give details on the existing structure (see section A).

What is the width of the watercourse from edge of bank to edge of bank (for flowing watercourses only)?

What is the height of the right bank (looking downstream for flowing watercourses)?

What is the height of the left bank (looking downstream for flowing watercourses)?

E. Property Ownership

Are you the legal owner of the property on which the project will take place? Yes _____ No _____

If "No", attach a letter of consent signed by the property owner, indicating that the property owner approves of the proposed project.

F. Application Fee

I have enclosed the required fee of $_____ in the form of a ____ money order, ____ cheque made payable to the **Minister of Finance.**

F. Declaration of Applicant

I hereby request a permit to commence, make or perform the watercourse or wetland alteration as described on this application form. It is understood that the submission of this application does not allow me to commence, make or perform the alteration as described in this application.

It is understood that the issuance of a permit does not exempt me from the provisions of any Act of the Legislature of New Brunswick or the Parliament of Canada or any due process of law, including any municipal by-laws. It is acknowledged that the issuance of the permit does not serve to deprive any person of his rights either under statute or common law to claim damages for loss or injury caused to him or his property by reason of the watercourse or wetland alteration. It is understood that the issuance of a permit places no liability upon the Minister or the Department of Environment.

If I am issued a permit, I agree that only such work as approved on the permit shall be carried out, and all such work shall be done so as to cause a minimum of disturbance to the watercourse or wetland.

It is also understood that it is my responsibility to obtain the approval of the landowner(s) where the alteration is to take place, and that I may be requested by the Minister to obtain the approval of the adjacent landowner(s) who might be affected by the alteration. If the land is owned by the crown in the right of the Province of New Brunswick, I will obtain the approval of the New Brunswick Department of Natural Resources, Crown Lands Branch and submit proof of such before a permit is issued. If the alteration is to take place within an incorporated municipality or within the boundaries of a Planning District, I will obtain the necessary approvals and ensure that the municipal and planning by-laws are not violated.

I certify to the best of my knowledge that the information stated in this form is correct.

Date: _____ Signature of Applicant _____

NOTE: Please enclose the required documents. Failure to submit adequate information in each section of this application will result in the application either being returned or rejected.

Updated : 2006-06-26

New Brunswick Department of Environment
Provisional Permit Notification Form

Centreline Clearing

(In accordance with Regulation 90-80 *Watercourse and Wetland Alteration Regulation – Clean Water Act)*

Applicability:

This provisional permit allows for clearcutting a survey centre line up to 4 metres wide and 1 metre wide perpendicular cross-sectional site lines up to 30 metres long on both sides of the centreline, at 25-metre intervals and at each watercourse crossing throughout the right-of-way of linear development projects, provided that:

a) the clearing is carried out manually using hand held equipment only;
b) access to both sides of each watercourse is achieved either by means of an existing nearby crossing or wading across the watercourse on foot;
c) all the bucked-up woody vegetation and slash is left onsite and moved to areas where it cannot be washed into a watercourse by floodwaters.

If your proposed project is located within a protected area as specified in the Watershed Protected Area Designation Order under section 14(1) of the *Clean Water Act* (i.e. watercourse used as municipal potable surface water supply), 30 metres of a provincially significant wetland, or requires registration under the *Environmental Impact Assessment Regulation,* it does not qualify for a provisional permit.

PLEASE PRINT

Name of Applicant: _____

Address: _____

_____

_____

Postal Code: _____

Telephone: _____ Fax: _____

FOR OFFICE USE ONLY

Category _2_ Easting From: _____ To: _____ DFO Region _____

Type _D_ Northing From: _____ To: _____ DNR Region _____

Map _____ Zone _____ DENV Region _____

Planning Commission _____ File No. ALT_____

Updated : 2006-06-26

DESCRIPTION AND LOCATION OF ACTIVITY

County: _____ Parish(es): _____
P.I.D. # of the adjacent properties at both ends of the linear development: _____

Detailed description of the proposed project including the overall length of the linear development and a listing of the watercourses, the waterbody they are tributary to and all wetlands being crossed:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

What type or variety of vegetation is present within each wetland and the 30-metre zone bordering both sides of each watercourse? _____
_____

Anticipated starting date: _____ Expected completion date: _____
(dd/mm/yy) (dd/mm/yy)

Is the applicant the legal owner of the property on which the project will take place? Yes/No
If "No", and the applicant, through legislation, has not been granted the legal right to survey on any property in the Province of New Brunswick, without the owner's consent, a letter of consent, signed by the property owner, shall be submitted with the application.

Has the Crown notified the property owner in writing of its intent to survey? Yes/No
Date notification mailed out: _____
(dd/mm/yy)

Attach a map to this form with the location of the project site clearly marked. (Examples of acceptable maps include 1:50,000 scale topographic, Department of Transportation District Highway, and Municipal mapping.)

It is the applicant's responsibility to notify all landowners who could be affected by this project.

The required fee of ten (10) dollars in the form of a money order or cheque made payable to the Minister of Finance must be enclosed with the Notification Form.

Updated : 2006-06-26

CONDITIONS OF APPROVAL

1. The scope of this project shall not exceed or differ from the proposed work you described on this "notification form", except where stipulated otherwise in these "conditions of approval".
2. A copy of the signed, provisional permit shall be kept on site at all times during this project.
3. The clearing of vegetation shall be carried out manually using hand held equipment only.
4. Felled woody vegetation shall be left onsite and cast aside wherever necessary to prevent it from being washed into a watercourse by floodwaters.
5. No trees or bushes shall be felled across or into a watercourse.
6. When necessary, to gain access across a watercourse that's too deep to wade, alternate access routes shall be used.
7. The applicant shall take necessary steps to ensure that his/her actions, or those of his/her agent, do not result in noticeable suspended sediment in a watercourse as a result of the activities covered by this approval.
8. Vegetation shall be maintained along the banks of the watercourse in sufficient quantity to provide bank stability and adequate shade to prevent a rise of water temperature, which could adversely affect the fish, fish food, and fish habitat.

Permits obtained under this section are invalid if any of the applicability clauses or "Conditions of Approval" cannot be met.

Updated : 2006-06-26

STATEMENT OF INTENT

I am filing notice of my intent to carry out the proposed alteration, which meets the requirements for a Provisional Permit under the *Watercourse and Wetland Alteration Regulation – Clean Water Act*. I will comply with the "Conditions of Approval" and **limit this project to the Detailed description of the Proposed Project** except where stipulated otherwise in the "Conditions of Approval".

I understand that the staff of the provincial Departments of Environment and Natural Resources, and the Federal Department of Fisheries and Oceans may access the project site for the purpose of determining compliance with this permit. **I also understand that this permit is not valid until it has been signed by an authorized representative of the Department of Environment.**

I understand that the issuance of a permit does not exempt me from the provisions of any Act of the Legislature of New Brunswick or the Parliament of Canada or any due process of law, including any municipal by-laws. I acknowledge that the issuance of a permit does not serve to deprive any person of his/her rights under statute or common law, to claim damages for loss or injury caused to him/her or his/her property by reason of this project. I understand that the issuance of a permit places no liability upon the Minister or the Department of Environment.

I certify to the best of my knowledge that the information stated on this form is correct.

Signature of Applicant: _____ Date: _____

If applying by mail, send the original form with attachments to:
Department of Environment
Region 5 - Fredericton
565 Priestman Street, Suite 301
Fredericton, NB, E3B 5X8

ACKNOWLEDGEMENT OF PROVISIONAL PERMIT

This acknowledges that your Provisional Permit Notification Form, the required documentation, and the fee for this Watercourse and Wetland Alteration Permit, have been received and reviewed by the regulatory authorities, and it has been determined that the project may proceed upon receipt of this signed acknowledgement. Please refer to our file number each time you contact us regarding your proposed alteration. No work is to be started until this signed acknowledgement has been received. Failure to abide by the "Conditions of Approval" that are included with this Notification Form would be a violation of the *Watercourse and Wetland Alteration Regulation* under the *Clean Water Act* and could result in legal action.

THIS PERMIT EXPIRES ON _____

Date: _____ Signature: _____
Department of Environment

Updated : 2006-06-26

New Brunswick Department of Environment
Provisional Permit Notification Form

Geotechnical Investigations

(In accordance with Regulation 90-80 *Watercourse and Wetland Alteration Regulation – Clean Water Act)*

Applicability:

This provisional permit allows for digging test pits and drilling boreholes for composition and bedrock integrity investigations, provided that:

a) no in-channel pits are excavated;
b) all in-channel boreholes are drilled downstream of the head of tide either from a barge or a reliable ice cover;
c) access to both sides of the watercourse is achieved either by means of an existing watercourse crossing in the vicinity or the installation of a temporary bridge which completely spans the watercourse.

If your proposed project is located within a protected area as specified in the Watershed Protected Area Designation Order under section 14(1) of the *Clean Water Act* (i.e. watercourse used as municipal potable surface water supply), 30 metres of a provincially significant wetland, or requires registration under the *Environmental Impact Assessment Regulation,* it does not qualify for a provisional permit.

PLEASE PRINT

Name of Applicant: _____

Address: _____

_____

_____

Postal Code: _____

Telephone: _____ Fax: _____

FOR OFFICE USE ONLY

Category 5	Easting _____	DFO Region _____
Type B	Northing _____	DNR Region _____
Map _____	Zone _____	DENV Region _____
Planning Commission _____		File No. ALT _____

Updated : 2006-06-26

DESCRIPTION AND LOCATION OF ACTIVITY

Name of Watercourse: _____
Tributary to: _____
County: _____ Parish: _____
P.I.D. # of property on which the project will take place: _____

Detailed description of the proposed project including the overall limits of the area to be explored, the equipment to be used, how boreholes are to be sealed, and how all the exposed soil is to be temporarily stabilized throughout and permanently stabilized upon completion of this project. If a bridge is required to access both sides of the watercourse, the distance from the underside of its stringers to the streambed and the clear span length of the structure: _____

Characteristics of the watercourse channel adjacent to the area where the exploration is to take place and where a temporary bridge, if required, is to span the watercourse. (banks are identified by looking downstream)

Channel Width: _____ Depth of Water: _____
Left Bank Height: _____ Right Bank Height: _____

Anticipated starting date: _____ (dd/mm/yy) Expected completion date: _____ (dd/mm/yy)

Is the applicant the legal owner of the property on which the project will take place? Yes/No
If "No", and the applicant, through legislation, has not been granted the legal right to make boring and sink test pits on any land in the Province of New Brunswick, without the owner's consent, a letter of consent, signed by the property owner, shall be submitted with the application.

Attach a map to this form with the location of the project site clearly marked. (Examples of acceptable maps include 1:50,000 scale topographic, Department of Transportation District Highway, and Municipal mapping.)

Attach a photo to this form, clearly indicating the area to be altered unless otherwise agreed by an authorized representative of the Department of Environment.

It is the applicant's responsibility to notify all landowners who could be affected by this project.

The required fee of ten (10) dollars in the form of a money order or cheque made payable to the Minister of Finance must be enclosed with the Notification Form.

Updated : 2006-06-26

CONDITIONS OF APPROVAL

1. The scope of this project shall not exceed or differ from the proposed work you described on this "notification form", except where stipulated otherwise in these "conditions of approval".
2. A copy of the signed, provisional permit shall be kept on site at all times during this project.
3. The intake of a suction hose placed in a watercourse shall be screened in accordance with the Department of Fisheries and Oceans Canada "Freshwater Intake End-of-Pipe Fish Screen Guideline".
4. Equipment used for this project shall be in good working order, and shall not be losing fuel, lubricating oil, hydraulic fluid, or any cargo.
5. No in-channel test pits shall be excavated at any time.
6. All test pits shall be backfilled and smooth graded immediately following collection of the required data, and all exposed erodible soil shall be covered with evergreen boughs or mulch.
7. When necessary, to gain access to the other side of a watercourse, alternate access routes, temporary bridges or pre-fabricated, laminated, squared timber "swamp mats" one for each wheel track shall be used. The use of temporary crossings shall be limited to the greatest extent possible through the use of alternate access routes. In situations where a temporary crossing is not feasible the Department of Fisheries and Oceans Canada and NBDELG office responsible for the site must be consulted either verbally or electronically at least 7 days in advance and afforded an opportunity to visit the site if desired and approve of a request to ford the watercourse.
8. Temporary bridges and pre-fabricated, laminated, squared timber "swamp mats" shall be installed such that the span does not constrict the natural flow of the water. When the ground is frozen solid, the ends of a temporary bridge may be founded on the *insitu* soil a minimum of 0.61 metres landward of shoulders of the watercourse, otherwise, if the crossing is to be in place for more than 1 day, daylight must be visible between the stringers and ground beneath at both ends of the structure and the minimum space between the highest anticipated water level throughout the period the structure will be placed and the underside of the stringers must be 450 millimetres.
9. In-channel test drilling equipment must either be stationed on a barge or a reliable ice cover in the portion of a watercourse downstream of the head of tide.
10. Where possible, drilling near a watercourse shall be carried out using a Hollow Stem Auger (dry bit) as opposed to a Rotary Drill, which utilizes pressurized cooling flushing fluid.
11. Where possible, in-channel drilling shall be carried out using a rotary drill in isolation of the streamflow within an area enclosed by a sandbag cofferdam overlain with plastic.
12. When drilling is carried out, from the ice cover, in portion of a watercourse downstream of the head of tide, all cuttings shall be removed from the ice before the equipment leaves the site.
13. All boreholes drilled near a watercourse or in the portion of a watercourse downstream of the head of tide shall be backfilled upon completion of the survey.
14. At the first evidence of the drill rig or backhoe excavator creating ruts within a wetland or the 30-metre wide buffer bordering a watercourse or wetland, to avoid further rutting and compaction, the equipment may only advance further into and operate within these zones on swamp mats, which must all be removed as the equipment is leaving these areas, or when the ground is frozen solid. Any ruts created shall be immediately smooth graded and overlain with slash that is trampled into place.
15. All exposed erodible soil in a wetland or within 30 metres of a watercourse or wetland shall be blanketed with evergreen boughs or hay mulch immediately following completion of drilling or test pitting.

Permits obtained under this section are invalid if any of the applicability clauses or "Conditions of Approval" cannot be met.

Updated : 2006-06-26

STATEMENT OF INTENT

I am filing notice of my intent to carry out the proposed alteration, which meets the requirements for a Provisional Permit under the *Watercourse and Wetland Alteration Regulation – Clean Water Act*. I will comply with the "Conditions of Approval" and **limit this project to the Detailed description of the Proposed Project** except where stipulated otherwise in the "Conditions of Approval".

I understand that the staff of the provincial Departments of Environment and Natural Resources, and the Federal Department of Fisheries and Oceans may access the project site for the purpose of determining compliance with this permit. **I also understand that this permit is not valid until it has been signed by an authorized representative of the Department of Environment.**

I understand that the issuance of a permit does not exempt me from the provisions of any Act of the Legislature of New Brunswick or the Parliament of Canada or any due process of law, including any municipal by-laws. I acknowledge that the issuance of a permit does not serve to deprive any person of his/her rights under statute or common law, to claim damages for loss or injury caused to him/her or his/her property by reason of this project. I understand that the issuance of a permit places no liability upon the Minister or the Department of Environment.

I certify to the best of my knowledge that the information stated on this form is correct.

Signature of Applicant: _____ Date: _____

If applying by mail, send the original form with attachments to:
Department of Environment
Region 4 – Saint John
8 Castle Street, P.O. Box 5001
Saint John, NB, E2L 4Y9

ACKNOWLEDGEMENT OF PROVISIONAL PERMIT

This acknowledges that your Provisional Permit Notification Form and the required documentation for this Watercourse and Wetland Alteration Permit, have been received and reviewed by the regulatory authorities, and it has been determined that the project may proceed upon receipt of this signed acknowledgement. Please refer to our file number each time you contact us regarding your proposed alteration. No work is to be started until this signed acknowledgement has been received. Failure to abide by the "Conditions of Approval" that are included with this Notification Form would be a violation of the *Watercourse and Wetland Alteration Regulation* under the *Clean Water Act* and could result in legal action.

THIS PERMIT EXPIRES ON _____

Date: _____ Signature: _____
Department of Environment

Appendix “C” – Sulphide Bearing Rock Information

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October, 2000

New Brunswick Department of Transportation
Acid Rock Protocol

Selection of Planning Corridor

Once a project area has been identified by the New Brunswick Department of Transportation (NBDOT) as an area where the study of upgrading options is warranted, Planning Engineers identify a wide planning corridor. The corridor is typically one kilometre in width, and is selected based on transportation needs, and on the features that can be identified from available topographic mapping.

Identification of Constraints

The selected planning corridor is forwarded to other provincial and federal agencies for their input on constraints within the study area, including acid generating rock. In house geotechnical and geological staff are also consulted at this point. If an area is identified as being known to contain acid rock, or having geology that is potentially associated with its presence, the location(s) are incorporated into the constraint mapping for the project.

The outside agencies that are typically contacted at this stage of the planning process include:

New Brunswick Department of Environment (NBENV)
New Brunswick Department of Natural Resources (NBDNR)
New Brunswick Department of Agriculture & Aquaculture (NBDAA)
Business New Brunswick (BNB)
New Brunswick Rural Planning District Commission
NB Power
Aliant
Department of Fisheries & Oceans (DFO)
Environment Canada (EC)

If it is anticipated that the project may be required to undergo screening under the Canadian Environmental Assessment Act (CEAA) due to federal involvement in funding, land ownership, or any other CEAA trigger, the affected federal agency will be contacted at this stage.

Preliminary Alignment

At this stage, planning staff identifies preliminary alignments within the planning corridor. If the potential for acid-generating bedrock has been identified within the corridor, the NBDOT practice is to, if possible, completely avoid the constraint area. However, if due to physical, social, or economic factors, complete avoidance is impossible, the potential environmental impact will be minimized by:

- Minimizing the length of the alignment crossing through the identified area, and;
- Ensuring that the vertical alignment is such that solid rock excavation within the constraint area is minimized, or preferably, avoided altogether.

It should be emphasized that the potential environmental impact of excavating a deposit of acid-generating rock and the cost of the associated mitigation are very high. Therefore, complete avoidance of the constraint will be the preferred option.

NBDOT Stakeholder Review

The preliminary alignments are reviewed with staff from within the Department of Transportation. The committee is comprised of technical staff from highway design, structural design, hydraulic design, construction, maintenance, traffic engineers, and district staff from the project area. The review includes an explanation of the various factors that were considered in developing the alignments, including the constraints that have been identified, and any potential impacts to these sensitive areas.

Committee members may recommend revisions to the plans based on their expertise.

Senior Management Review & Ministerial Approval

The plans are reviewed with Senior Management from the Department of Transportation. Once again, the review includes an explanation of the various factors that were considered in developing the alignments, including the constraints that have been identified, and any potential impacts to these sensitive areas. Members of Senior Management may recommend revisions to the plans, and select a preferred alignment, before presentation to the Minister for approval.

Public Consultation

The plans, which are still considered preliminary at this point, are presented to the general public at an informal, "open house" information session(s) conducted in the project area. NBDOT planning staff is available to explain the plans to those in attendance, and to listen to any concerns with the alignment.

After the meeting(s), planning staff reviews any issues that were raised at the public information sessions with the affected NBDOT stakeholders and recommends modifications, if required. If significant changes are made, the plans go back to Senior Management for review, ministerial approval, and through the public consultation process again.

Functional Statement & Plan

The Functional Statement & Plan are the documents that officially describe the Province's upgrading plans for a major project area. They are developed by planning staff after the consultation process is complete.

Provincial Environmental Screening Registration

Upon completion of the planning process, the project is registered with the New Brunswick Department of Environment (NBENV) for a determination of its potential environmental impact. NBENV circulates the plans to the provincial environmental review committee that is made up of both federal and provincial agencies that have expertise in assessing impacts. Environmental studies that have been required are completed and submitted to the committee for evaluation. Based on the committee's recommendations, NBENV makes a determination for the project.

Request for Approval *to* Commence Survey

The Department of Transportation requests approval from the Department of Environment to commence field survey activities within the highway corridor. Approval is granted based on either a narrow, or wide, centreline survey, and it allows NBDOT to access the project area so that preliminary survey activities and environmental studies can commence.

Field Survey / Preliminary Design / Soil Testing

The preliminary field survey information allows designers to develop preliminary horizontal and vertical alignments for roadways within the project area. The alignments and survey information are forwarded to geotechnical staff in the Department of Transportation so that a soil testing program can be developed.

Geological mapping, published geological data, and past experience are all employed to assess the potential for encountering acid producing bedrock during the construction of the highway. Areas that are considered to potentially contain acid-producing bedrock are tested with a higher density of test pits and bedrock cores than non-suspect areas.

An excavator is used to dig test pits along the proposed highway alignment. The test pits are located on the centreline and at offsets that are determined based on the proposed grade, terrain, and the soils encountered. Test pits are excavated to a depth of 6 metres, depending on the proposed grade and soils that are encountered. If the depth of cut is expected to be greater than 6 metres, and acidic material or host rock is not encountered at shallower depths, an auger drill is used to test to a depth of 1 metre below the anticipated subgrade.

When bedrock is encountered, grab samples are taken at various locations along the alignment for analysis. The NBDOT geological engineer and a geologist from the Department of Natural Resources inspect them for sulphides, or any other evidence of the potential for acid production. If either of these inspections detect a potential for acid production, the bedrock samples are sent to the Research & Productivity Council (RPC) in Fredericton for testing to determine the degree of potential for acid production. If the results of their tests are inconclusive, or require verification, another independent laboratory is consulted. The following table outlines the requirements for lab analysis of samples:

Condition	**Testing Requirement**
Sulphide obviously present and material assumed to be acidic	Limited testing, if any
Sulphide present in questionable concentrations	Testing
Sulphide is not expected, but possible due to geological unit	Random testing required on 10% of samples. Increase percentage of samples tested if sulphides are detected.
Sulphide not possible based on geology and past experience	No testing required

In the final stage of soil investigation, bedrock cores are taken at various locations along the proposed highway alignment based on the proposed grade, the terrain, and the depth to bedrock. The bedrock cores are then subjected to the same inspection and testing procedures as has been described above for the grab samples of bedrock. Often, in areas of the province where mineral claims have been staked, the individual who has staked the claim also inspects the bedrock cores. The results of this investigation, if applicable, are also considered in the final evaluation of the acid potential of the bedrock.

The findings of the soil investigation are forwarded to the assigned highway and structural designers.

Detailed Design

At this stage of the project (after the environmental screening is complete), design staff completes the detailed design. The final horizontal and vertical alignments, and cross-sections are determined based on the standard of roadway being designed, existing terrain, soil investigation, and other physical, environmental, or social factors that have been identified within the project area.

If the results of the soil investigation indicate that there is, or may potentially be, acid-generating rock on the highway alignment, the designers will investigate the feasibility of relocating the alignments to avoid the material. This may be done by relocating the horizontal alignment to avoid the acid rock, and/or setting the grades so that no solid rock excavation will be required in the identified area.

While it is recognized that it may not always be possible to completely avoid the excavation of acid-generating bedrock, the designer will make every reasonable effort to do so. The potential environmental impact of acid leaching from this material, and the economic cost of the associated mitigation are very high. Therefore, avoidance will be the preferred option.

In cases where complete avoidance is not possible, the designer will minimize the quantity of solid rock excavation in the identified area. An "action" committee of experts will be formed to develop a site-specific mitigation plan. The committee will be comprised of design, construction, and geotechnical staff from NBDOT, as well as representatives from NBENV, NBDNR, and Environment Canada. Examples of mitigation measures that may be recommended to prevent environmental impact include: covering the exposed bedrock with impermeable membranes and clay, submerging the excavated material in water, and diversion of water from the exposed bedrock to avoid interaction.

Contract Preparation & Tender

Design staff, in preparation for tender, finalizes contract plans and particular specifications. These documents will clearly identify areas where acid-producing rock may be encountered, and they will detail the mitigation plan.

Construction

For contracts where the potential for encountering acid-generating bedrock is believed to exist, a geologist will inspect the excavated exposed rock throughout the periods when solid rock excavation is underway. Samples of the material will be taken, and they will be subjected to the same inspection and testing process described under the heading "Field Survey / Preliminary Design / Soil Testing" above. The administration of the inspection and testing processes during the construction phase will be conducted by Construction Branch.

In those areas where it is known that acid-producing bedrock will be encountered during excavation, and a site-specific mitigation plan has been formulated in the design stage, the maximum period from disturbance of the material to covering/disposal will be 30 days. Although it is acknowledged that this may not be achievable in every case, reasons for delay must have a solid engineering basis and will be documented, and filed appropriately, by NBDOT construction staff.

If acid-producing bedrock is encountered in an area where it was not expected, further disturbance will be minimized, and an "action" committee of experts will be formed to develop a site-specific mitigation plan. The committee will be comprised of design, construction, and geotechnical staff from NBDOT, as well as representatives from NBENV, NBDNR, and Environment Canada. The mitigation prescribed by this committee will be implemented within a 30-day period after exposure/excavation. If the 30-day time frame is not achieved, the reasons for the delay will be documented, and filed appropriately, by NBDOT construction staff.

For all contracts where it is believed, or known, that acid rock may be encountered during excavation, a stream-monitoring program will be conducted. The acidity of the streams in the contract area will be measured prior to construction, at regular intervals throughout construction and thereafter. The details of the stream monitoring program will be site-specific and should be developed in consultation with NBENV, NBDNR and EC. The administration of this program will be the responsibility of Construction Branch.

NEW BRUNSWICK DEPARTMENT OF TRANSPORTATION

Guidelines For Using Sulphide Bearing Bedrock

Revised April 29, 2002

This guideline outlines procedures taken by the Department of Transportation when sulphide bearing bedrock is encountered during highway construction. It is intended to supplement the NBDOT Acid Rock Protocol of October 2000.

Background

Sulphide bearing rocks, when exposed to oxygen and water, produce sulphuric acid, which may result in acid and metal contamination of soils, groundwater and surface water systems.

NBDOT adopted an Acid Rock Protocol in October 2000. This protocol was developed to apply to the Highway Corridor and addresses situations where sulphide bearing rock is identified both during the planning and construction phases. Requirements for “action” committees are defined within this protocol and membership includes representatives from both the provincial and federal government departments. Although the protocol was developed for federally funded projects, NBDOT intends to apply it to all capital highway work.

As described in the protocol, the Department investigates for sulphide bearing rock (potential acid producing rock) at all stages of planning, design and construction of highways. The investigation involves literature search, visual inspections, field testing and laboratory analysis. Due to the potential environmental impact of excavating a deposit of acid-generating rock and the high costs associated with their mitigation, complete avoidance of acid-generating bedrock is the preferred option.

Sulphide Rock Chemistry

Acid rock drainage occurs when iron-sulphide minerals such as pyrite and pyrrhotite react with oxygen and water to form sulphuric acid. Although these materials are naturally occurring, excavation increases the exposed sulphide-mineral surface area, resulting in a large increase in reaction rates compared to natural conditions. Crushing bedrock to produce aggregate further increases the potential for acidic runoff.

The presence of sulphide minerals in rock suggests that the rock may have acid-generating potential. However, many rock types contain minerals such as calcite that act to neutralize acidity generated by the sulphide minerals. Whether or not excavation of the rock materials actually causes acid drainage depends on the balance between acid-generating and acid-neutralizing minerals and the rates of reactions.

These properties of the rock can be determined using a material-testing method called acid-base accounting (ABA). In the mining industry, ABA is the standard procedure used for predicting the potential for acidic drainage. This approach involves the chemical analyses that determine the acid-neutralization capacity (neutralization potential, NP) of minerals within the sample and the acid-generating capacity (acid potential, AP) from sulphide minerals contained within the sample. The NP is compared to the AP to determine if there is excess acid-generating potential.

The sulphur that is contained in unweathered samples is generally present as sulphide. The sulphide converts to sulphate upon oxidation. Sulphate does not contribute to acid-generating potential in the rock. Based on this, the acid generating potential (AP) is commonly calculated on the basis of sulphide sulphur only. The more conservative approach taken by NBDOT is to calculate AP in terms of total sulphur. This is done because most samples are collected from rock surfaces or exposed stockpiles and have some degree of weathering. For unweathered material normally encountered during deeper excavation, the total sulphur will approximate the sulphide sulphur.

Testing Methodology

NBDOT uses a two-step testing methodology. Samples are first screened based on the total sulphur content. Those with a total sulphur greater than 0.3 % by weight are then subjected to the “Modified” Sobec ABA procedure based on the total sulphur content.

NBDOT assesses the ABA results in accordance with the following criteria based:

NPR	Suitability
< 2	Unacceptable
2 to 3	Undesirable
>3	Acceptable

Where: NPR = NP/AP

An NPR value of 1 would theoretically indicate no acid-generating potential. However, higher values are required to address the uncertainty in the relative rates of the reactions (i.e. a relatively fast-reacting acid-generating mineral combined with a slow-reacting acid-neutralizing mineral).

Complete mineralogical assessments and kinetic testing would be required in order to consider modifications to these criteria.

Guidelines for Use

Areas of Known Acid Generating Bedrock

Bedrock that has an NPR less than 2 is avoided either by changing the highway alignment or raising the grade of the highway to avoid excavating the bedrock. Bedrock with an NPR of more than 3 is used as normal highway fill. Samples of bedrock with an NPR between 2 and 3 are avoided whenever possible during highway construction.

As outlined in the Acid Rock Protocol, an action committee is required whenever complete avoidance is not possible. Acid generating rock with NPR values between 2 and 3, and in quantities less than 500 m3 in-situ, will not normally be considered for mitigative measures other than restricting their use within 60 m of a watercourse.

Excavated bedrock with an NPR between 2 and 3 must be placed so that the rock is not subjected to air and water. Where possible the material should be placed under water in swamps located on the highway alignment. Materials than cannot be placed in a swamp will be located in the center of highway fills surrounded by a low permeability material. These areas are located as far as possible from watercourses.

Bedrock cuts with an NPR between 2 and 3 will be line drilled at the backslope location to reduce the surface area of exposed bedrock and construct a stable slope.

Areas of Potential Acid Generating Rock

In areas where the potential for encountering acid-generating bedrock is believed to exist (as well as in known areas), the size of blasts to loosen bedrock should be kept to less than 25 metres in length. Blasting patterns should be designed to minimize rock fragmentation. A knowledgeable geologist or geological engineer will inspect the bedrock exposed after each blast in bedrock cuts. If this inspection identifies potential sulphide bearing rock, samples will be obtained for testing. The final use of the bedrock will be in accordance with the criteria established above.

Imported Material

All imported material must have an NPR greater than 3. Source approval rests with NBDOT. Sampling and testing, if deemed necessary, will be carried out by NBDOT.

Guidelines for the use of sulphide bearing aggregates used in the production of asphalt concrete will come into effect in 2003.

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Environmental Impacts from Acid Rock Drainage: Interpretation Criteria for Water-Quality Monitoring Data

Prepared for: The New Brunswick Department of Transportation

By: Tom A. Al, PhD, P.Geo.

June 13, 2005

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1. Introduction

In the past five years, the New Brunswick Department of Transportation (NBDOT) has taken a number of steps toward secure handling and disposal of sulphide-bearing (potentially acid-generating) bedrock materials.

- In October 2000 an Acid Rock Protocol was established to define the approach that is taken by the Department when potentially acid generating rock materials are encountered during the design and construction of highways.
- In April 2002 guidelines for assessing the potential for acid generation in rock materials from road cuts and quarries were established.
- In July 2002 NBDOT adopted water-quality monitoring methods for streams, as proposed by Al (2002), for sites that display potential for acid rock drainage.

The purpose of this report is to outline criteria with which the results of the water quality monitoring, carried out in accordance with the July 2002 methods, can be interpreted.

2. Objectives

The purpose of the NBDOT water-quality monitoring program is to protect surface and ground water resources and ecosystem health. This is accomplished by carrying out:

- Baseline Monitoring: to determine the natural, pre-construction, water- and sediment-quality conditions that may be used as a reference for post-construction changes in water and sediment quality,
- Sulphide Oxidation Monitoring: to detect impacts to water quality that result from the oxidation of sulphide minerals in rock materials that are disturbed during road construction activities.

3. Interpretation of Data for the Detection of Water Quality Impacts

Sulphide-mineral oxidation, and the resulting generation of sulphuric acid in drainage, may be encountered when bedrock materials are excavated during road building and other construction activities. The problem occurs when the excavated rock materials contain iron-sulphide minerals such as pyrite [FeS_2] and pyrrhotite [FeS], which are unstable in the presence of atmospheric oxygen and react with oxygen, e.g.:

$$FeS_{2(s)} + {}^{15}/_{4}O_{2(gas)} + {}^{7}/_{2}H_2O \rightarrow Fe(OH)_{3(solid)} + 2SO_4{}^{2-}{}_{(aqueous)} + 4H^{+}{}_{(aqueous)} \quad [1]$$

The problem occurs because the excavation of these materials, and the consequent **increase in exposed sulphide-mineral surface area**, results in a large increase in reaction rates compared to the natural condition in unbroken bedrock. The greatest potential source of acidic drainage in road construction is therefore the rock mass excavated from rock cuts rather than the exposed backslopes or ditches.

In order to use aqueous geochemical data to detect water quality impacts related to sulphide oxidation, **time-series variations** in several key chemical parameters (pH, SO_4, Fe and Al) should be monitored. The importance of pH and SO_4 are obvious from Reaction [1], and Fe and Al are useful indicators of acidification because the solubility of the common oxyhydroxide

forms of Fe and Al increases significantly with a pH decrease below ~5.5 (Al) and ~4.5 (Fe). As a result, the concentrations of Fe and Al are expected to increase due to the dissolution of Fe and Al oxyhydroxide minerals, e.g.:

$$FeO(OH)_{(s)} + 3H^{+} \rightarrow Fe^{3+}_{(aq)} + 2H_2O \quad [2]$$

$$AlO(OH)_{(s)} + 3H^{+} \rightarrow Al^{3+}_{(aq)} + 2H_2O \quad [3]$$

In the case where water samples are filtered as suggested by Al (2002), elevated concentrations of Al and Fe are not generally expected unless the pH decreases below 5.5 and 4.5 respectively, except in the unusual circumstances where elevated fluoride (F) concentrations occur, or in the case of Fe, where anoxic Fe-rich ground water discharges to the stream.

Sulphate (SO_4) is commonly the most rapid indicator of sulphide oxidation because it is easily transported with flowing water from the rock pile where sulphide oxidation occurs, to nearby stream systems. Except in extreme cases, elevated SO_4 concentrations alone are not generally considered harmful in aquatic ecosystems. A decrease in pH that accompanies increased SO_4 concentrations is the most direct indicator of sulphide oxidation, but the acidity that causes the pH decrease is commonly neutralized in rock piles and soils, at least in the early stages of acid generation. Consequently, it is not uncommon to observe an initial period of elevated SO_4 concentrations with neutral pH, followed by a decrease in pH when the neutralization capacity of the rock and soil is depleted. The decrease in pH would coincide with increases in the concentrations of dissolved Fe and Al. The general trends in stream water quality that are expected as a consequence of sulphide oxidation are illustrated in Figure 1.

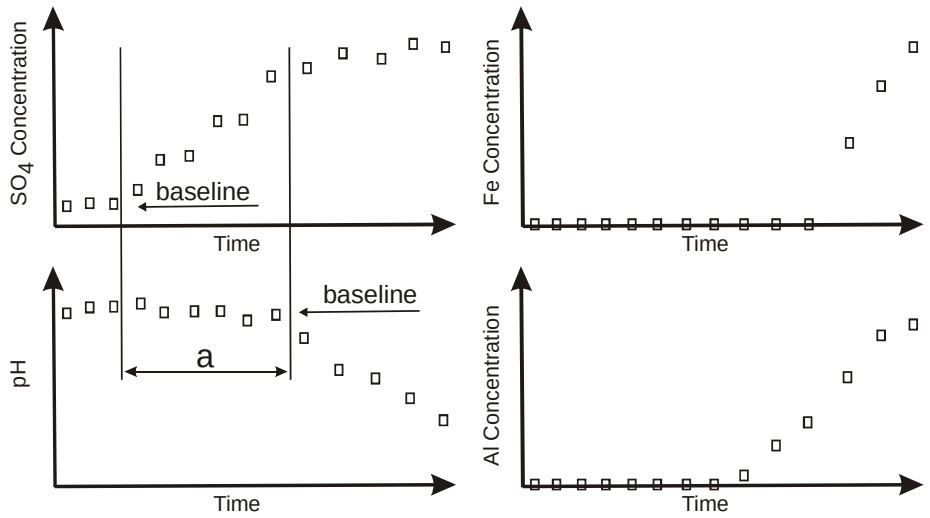

Figure 1. Conceptual representation of the expected trends in stream water-quality parameters SO_4, pH, Fe and Al, versus time as a result of the onset of acidification due to sulphide oxidation. The time lag (a) between increased SO_4 and decreased pH varies as a function of the neutralization capacity between the rock pile and the stream.

4. Suspended Solids and Filtering

The monitoring method outlined by Al (2002) involves filtering (less than 0.45 µm) the water samples in the field in order to eliminate suspended solids and ensure analytical results represent the metals present in the aqueous phase only. This practice leads to results that reflect the true nature of the water sample, greater reproducibility and data that are well suited to interpretation. The CCME guidelines, including those for Fresh Water Aquatic Life, are based on unfiltered samples making direct comparison of monitoring results with CCME trigger values invalid.

5. Criteria for Determining Impact

A trend to elevated SO_4 concentrations presents evidence that sulphide oxidation is affecting water quality, however, evidence for detrimental impact is restricted to conditions where a coincident pH decrease is observed. **In conditions where impacts are observed, it is therefore recommended that additional unfiltered samples be collected to allow for comparison with CCME guidelines in assessing the magnitude of impact and the need for corrective action.** The following pH-based criteria will be used in assessing the monitoring data to determine whether this change in protocol is warranted.

- Impact to water quality will be acknowledged on the basis of pH data when pH decreases below 6.0 from baseline values for two consecutive sampling events. In the unusual case where baseline (preconstruction) pH values below 6.0 are recorded, impact will be acknowledged on the basis of pH when values decrease greater than 1 pH unit below baseline values for two consecutive measurement periods.

- Increases in the concentrations of Fe and Al will be used as supporting evidence for impacts related to sulphide oxidation.

6. Duration of Monitoring

It is proposed that monitoring will be conducted in accordance with the methods outlined by Al (2002) for a period of three years following construction activities, and if water-quality impacts are not evident after this period monitoring would be discontinued. In those instances where SO_4 concentrations indicate some effect on water quality but acid generation is not evident, it is further proposed that monitoring will continue for an additional two years and then discontinued if acid generation has not been detected.

7. References

Al, T.A. 2002. Assessment of field monitoring methods for sites with rock materials that may cause acidic drainage. Report prepared for the New Brunswick Department of transportation.

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Assessment of Field Monitoring Methods For Sites With Rock Materials That May Cause Acidic Drainage

Prepared For: New Brunswick Department of Transportation

By: Tom A. Al, PhD, P.Geo
Date: June 19, 2007

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1. Introduction

An increased awareness of the environmental impacts of acid generation from sulphide-bearing rock materials has lead to the design and adoption of new guidelines and protocols for handling these materials during highway construction activities. Generally the guidelines advise that sulphide-bearing materials should not be disturbed during construction, however, in some cases, these materials have been used in past construction activities. In addition, there may be cases in the future where complete avoidance is not possible. Under these circumstances, the New Brunswick Department of Transportation (NB DoT) has undertaken to monitor water quality at sites where sulphide-bearing materials have been disturbed. This type of monitoring has been ongoing for several years at existing rock cuts, and additional monitoring is anticipated in the future. Water quality monitoring is also necessary prior to construction activities in order to assess the baseline environmental conditions.

In June 2002 the NB DoT requested an assessment of their field monitoring methods in order to ensure that the monitoring programs are meeting objectives, and to make recommendations for refining the protocols. The assessment was prepared and submitted in draft form, and recently NB DoT requested that the assessment be updated. The original objectives which are presented below remain relevant.

Baseline Monitoring Objective: To determine the natural, pre-construction, water- and sediment-quality conditions that may be used as a reference for post construction changes in water and sediment quality.

Sulphide Oxidation Monitoring Objective: To monitor surface water and ground water to determine whether highway construction activities have impacted water quality and the migration of contaminants off the site.

2. Controls on Data Quality and Reproducibility

Sampling programs that are designed to assess changes in water quality related to anthropogenic activity such as road construction must be designed to minimize variability in analyte concentrations that result from natural conditions, or from sampling and analytical methods. Otherwise, the results will show poor reproducibility, masking important trends in the data and possibly resulting in erroneous conclusions. For the purpose of monitoring the impact of sulphide oxidation on water quality, assuming the analytical laboratory is of high quality, the most important sources of variability relate to seasonal variation in oxidation rates, hydrological conditions, and the use of sampling methods that limit the effects of mineral-water reaction processes and provide high-quality pH measurements.

2.1. Seasonal Changes in Sulphide-Oxidation Rate

Sulphide oxidation in the natural environment is a chemical reaction that is catalyzed by bacteria, most commonly of the thiobaccillus genus. This is important because the activity of the bacteria controls the rate of the oxidation reaction, which in release to the environment.

In the relatively small waste piles that result from highway construction activities, the temperature sensitivity of bacterial growth leads to a strong temperature control on the reaction, consequently, the rate of sulphide oxidation is insignificant through the late fall, winter and early spring. The rate generally increases dramatically through the summer as temperature increases. In the relatively large waste piles that occur at mine sites, the heat released by the oxidation reactions may maintain significant bacterial activity throughout the year.

2.2. Hydrology

2.2.1. Groundwater

The characteristics of a groundwater flow system in proximity to a contaminant source such as sulphide-bearing rock have a significant influence on the geochemistry of the groundwater. Assuming a relatively constant rate of sulphide oxidation (contaminant production) at the source, the principal parameter of interest is the groundwater flux since this determines the degree of dilution. The flow path of groundwater proximal to the contaminant source is also very important. If sulphide oxidation in the excavated rock materials occurs in a groundwater recharge area, then there is concern for the quality of water in the down gradient groundwater.

2.2.2. Surface water

Variations in a stream hydrograph due to precipitation events lead to changes in solute concentrations for two principal reasons.

1. **Dilution**: When solutes such as H^+, SO_4, and Fe(II) that are derived from sulphide oxidation enter a stream via groundwater or surface water pathways, an increase in the direct runoff component during a precipitation event will result in dilution of the solute concentrations in the stream (Fig. 1).
2. **Re-suspension of metal-contaminated sediments**: The sediments in a streambed commonly contain metals that are adsorbed to the particle surfaces (see Section 2.3.1 below). As the discharge increases through a rainfall-runoff event, increasing turbulence in the stream results in the re-suspension of sediments. When water samples are collected and analysed without removal of the suspended sediments, the results commonly display a significant increase in metal concentrations in the stream as a result of the sediment re-suspension. When interpreting water sample data, the reported concentrations are generally considered to be in the dissolved form, and the increases in concentration that result from suspended sediment are misleading.

2.2.3. Seasonal variations in the hydrograph

The baseflow recession curve for the hydrograph from a natural stream varies seasonally and annually according to climatic conditions. In New Brunswick, this results in relatively large discharge in the spring and fall (Fig. 2). Assuming a constant rate of contaminant release from sulphide oxidation in bedrock, the seasonal hydrologic variation will result in variable dilution of the solutes in the stream as described in 2.2.2.

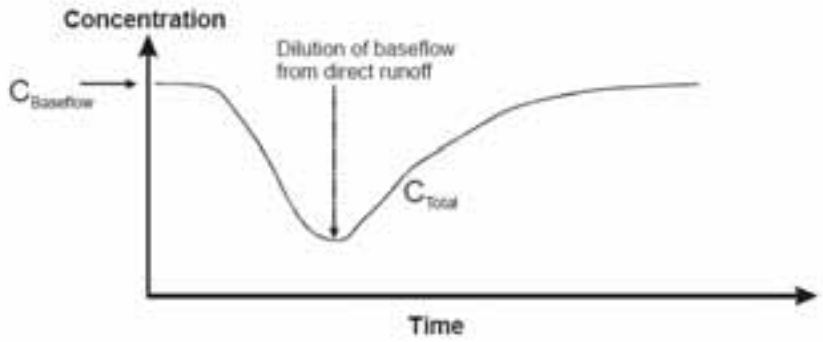


Figure 1. Variation in stream water solute concentration as a result of dilution from direct runoff during a rainfall-runoff event.

Figure 2. Example hydrograph from the Middle Branch of Nashwaaksis Stream displaying the average daily discharge for 2005 (red), and the 40-year minimum (blue) and maximum (green) daily discharge.

2.3 Mineral-water Reactions and Metal Mobility

2.3.1. Precipitation and Adsorption Reactions

The mobility of metals increases dramatically under conditions where metals are soluble in the aqueous phase. However, in most natural systems the mobility of most metals is very limited because they partition to the solid phase (sediment) as a result of precipitation and adsorption reactions.

[1] e.g. lead carbonate precipitation: $Pb^{2+}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow PbCO_{3(s)}$

[2] e.g. lead adsorption on ferric hydroxide $Pb^{2+} + \equiv Fe\text{-}OH^{o} \quad \equiv Fe\text{-}OPb^{+} + H^{+}$

Where: ≡Fe-O represents iron oxide at the mineral surface

2.3.2. Effect of pH

Where sulphide oxidation occurs, the acid generation leads to a depression of the water pH. The effect of the pH depression is to increase metal mobility in several ways. First, common anions such as HCO_3^- in the example above, as well as CO_3^{2-}, OH^- and SO_4^{2-} that may promote precipitation reactions, are removed from the aqueous system at low pH.

[3] e.g. $CO_3^{2-} + 2H^+ \rightarrow CO_2 + H_2O$

Second, at low pH, mineral surfaces are coated by hydrogen ions that adsorb strongly to the surface. This protonation of the mineral surface leads to the development of a significant positive surface charge that effectively repels metal cations that may be present in solution. In this way, adsorption of metals on mineral surfaces is minimized at low pH and the mobility of metals in solution increases.

3 Conclusions and Recommendations for Sampling Programs

3.1 Surface Water versus Groundwater

Water sampling should focus primarily on surface water, however, each site should be professionally appraised for the potential for groundwater contamination. If there is potential for groundwater contamination then piezometers or monitoring wells should be located to monitor for the transport of contamination off the site.

3.2 Seasonal Variability

Sampling should be conducted at a number of times throughout the year such as immediately following the spring freshet, during mid to late summer, and in late fall. These sampling times should capture variability associated with seasonal variation in sulphide oxidation rates as well as variation in the stream hydrograph. If a schedule of sampling three times per year is considered excessive, then the spring and/or fall sampling event could be eliminated.

Data should not be considered directly comparable if they are collected at different times of the year.

3.3 Hydrology

In order to minimize variability associated with short-term changes in the stream hydrograph, samples should be collected when the stream is at baseflow. However, when sampling is conducted at the same time each year, baseflow conditions may vary considerably from year to year, and efforts should be made to describe the ambient flow conditions at the time of sampling. This could include the recording of stream flow data for a nearby hydrometric station on the date of sampling.

3.4. Field Methods

3.4.1. pH Measurements

Water samples that are impacted by sulphide oxidation commonly contain significant amounts of ferrous iron (Fe^{2+}). Ferrous iron is unstable in the presence of atmospheric oxygen and oxidizes to ferric iron, which subsequently forms a colloidal precipitate. The oxidation reaction releases protons and therefore causes the pH of the water to change with time following sample collection.

[4] $$Fe^{2+} + {}^{1}/_{4}O_2 + {}^{5}/_{2}H_2O \rightarrow Fe(OH)_3 + 2H^{+}$$

Although this is the most important pH-modifying reaction in samples of this type, other reactions may also contribute to changing pH following the collection of the sample. Therefore the pH reported by the lab may be significantly different than the pH measured in the field.

In order to avoid this variability, it is recommended that pH measurements be made in the field using a carefully calibrated electrode or commercially available, high precision pH strips.

3.4.2. Suspended Solids and Filtering

As noted above, metals partition strongly to suspended solids in a water sample. It is therefore bad practice to use sampling methods that agitate the sample during collection. When sampling groundwater, dedicated sample tubing and low flow (100-300 ml/min) peristaltic pumps represent a suitable means of obtaining water samples with minimum agitation. In many cases where the hydraulic conductivity of the formation is high, and the static water level above the piezometer screen is also high, purging is not required provided the sample pump does not cause drawdown of the water level in the standpipe.

The common practice of collecting unfiltered samples for analysis leads to imprecision and lack of reproducibility in analytical results due to the presence of variable amounts of suspended solids. The inclusion of suspended solids in the sample may also significantly overestimate the metal concentrations in the water due to the tendency for metals to partition to the solid phase. When samples are filtered (less than 0.45 μm) in the field, suspended solids are eliminated and the analytical results will represent the metals present in the aqueous phase only. This practice leads to results that reflect the true nature of the water sample, greater reproducibility and data that are well suited to interpretation.

3.4.3. Sample Acidification

In many cases, water samples collected in the field undergo chemical reactions during transport to the lab and storage prior to analysis. These reactions may have the effect of removing metals from solution by precipitation and adsorption (e.g. reactions 1, 2 and 4 above). In order to eliminate the variability in analytical results that relates to these types of reactions, samples collected for major cations and trace metals should be acidified with high purity nitric acid in the field (to pH <1) prior to sample storage and transport. The acidification step makes the sample unsuited for anion analysis, so a separate bottle should be collected for anions, filtered but not acidified. Therefore, a single water sample is represented by two bottles, one for cations (filtered, acidified and refrigerated) and a second for anions (filtered and refrigerated).

3.5. Collection of Samples to Assess Metals in Sediment

Stream systems proximal to sulphide-bearing bedrock commonly manifest the effects of natural sulphide oxidation, however, the effects are rarely evident in the water chemistry. More commonly the natural flux of metals released to the stream may be detected by the analysis of metal concentrations in the sediments. The sediments are a much more sensitive indicator of the release of metals to the stream due to the strong tendency for dissolved metals to partition to mineral surfaces (e.g. reaction 2 above).

In the case where samples are collected for the purpose of establishing baseline environmental conditions, it would be useful to sample and analyze sediments in addition to water. This approach would minimize the possibility that natural contamination would be overlooked in a baseline sampling program.

In order to obtain sediment samples that provide good reproducibility and consistent, comparable data, the following guidelines should be used for the collection of sediment samples.

- For monitoring programs, samples should be collected repeatedly from the same location in the stream.
- Samples should be wet-sieved in the field using stream water and stainless-steel sieves.
- The samples should be collected from a narrow range of grain size near the silt fraction (62 μm > x > 2 μm). For example, the standard 200 mesh (75 μm) and 320 mesh (45 μm) sieves represent a suitable range. It is important and necessary to collect the fine-grained material but this commonly makes sampling difficult and time-consuming in streams with small amounts of fine sediment. If the time required for the field sieving process is considered prohibitive, then samples could be pre-screened in the field to remove the coarse material and then returned to the lab for final sizing. In this case, the samples should be sieved dry because the chemistry of lab water will be different from the stream water, and wet sieving in the lab could cause changes in the sediment composition.
- In order to compare data from one sampling event to another, the range of grain sizes selected should always be the same.
- Prior to analysis, a suitable method should be adopted for extracting the metals into aqueous solution (e.g. USEPA Method 3050A). In order to ensure that future data are comparable, the adopted method should be adhered to in the future for all sampling programs.

Generic Contingency Plan for Sulphide Bearing Rock

(Insert Project Specifics)

The following contingency plan has been developed to address any unforeseen events or emergencies that may impact the environment as a result of the exposure and disposal of Sulphide Bearing Rock (SBR). The Department has taken various measures to address the concerns of SBR and Acid Rock Drainage (ARD) on this project and these measures can be found in the Screening Report prepared by *(Insert Consultant's Name if applicable)*.

NBDOT has a number of documents, procedures and guidelines to follow when encountering SBR in the field. More specifically they are;

- Acid Rock Protocol (2000)
- Guidelines for Handling Sulphide Bearing Rock (2002)
- Environmental Impacts from Acid Rock Drainage: Interpretation Criteria for Water-Quality Monitoring Data (2005)
- Assessment Of Field Monitoring Methods For Sites With Rock Materials That May Cause Acidic Drainage (2007)
- Environmental Management Manual (2010)

Mitigative measures taken by NBDOT for the SBR rock cuts is to pre-shear the backslope to minimize the overbreak and to provide a vegetative cover on the foreslopes and ditches, including median ditches. In the SBR disposal area, the SBR will be covered with a low permeability material (of varying thicknesses), a growing medium (topsoil layer), jute mats as well as seeding and mulching.

Should an unforeseen event or emergency occur, the following contingency plan would address the more common concerns, which could occur during the construction phase and operation phase. The following concerns are addressed;

1. Vegetation Loss
    A. Accidents
    B. Erosion
    C. Fires
    D. Vegetation Mortality
2. ARD runoff
    A. Contamination of Groundwater
    B. Contamination of Surface Water
3. Infrastructure
4. Spills

1. Vegetation Loss

The key to effective performance of the low permeable covering material is the growing medium. Although, only 100 mm thick (NBDOT standard topsoil depth), the growing medium sustains the vegetation and protects the low permeability material.

While the net percolation will be restricted by the presence of the low permeability covering material, the growing medium's ability to store and release moisture will remain as a significant factor influencing net percolation to the SBR.[1]

Significant potential exists for increasing the hydraulic conductivity of the compacted layer (low permeable covering material) as a result of altering the structure of the layer during wet-dry cycles or freeze-thaw cycles. Hence while it is commonly accepted that the characteristics of the low permeability material are the most important components of a cover system, the thickness and characteristics of the overlying growing medium are just as critical, if not more so, in terms of long term performance of the compacted layer as the entire cover system.[2]

The hydraulic conductivity of a saturated soil is often taken as a constant whereas the hydraulic conductivity of an unsaturated soil will change with the degree of saturation of volumetric water content. The coefficient of diffusion through a dry soil is nearly four orders of magnitude higher than it would be for a saturated soil.[3]

The growth medium will provide a means of satisfying the demand for moisture from evapotranspiration during the inevitable dry summer period.[4] The vegetative cover will minimize the possibility of the low permeability covering material drying out and allowing water to infiltrate the SBR.

Vegetation loss may result from a number of incidents including accidents, erosion, fire or mortality.

A. Accidents

Accidents as a result of vehicular collision(s) may damage the vegetative cover and/or the low permeability covering material. In addition to accidents, damage by recreational vehicles to the vegetative cover and/or low permeability covering material may occur.

B. Erosion

The potential exists for erosion on site due to precipitation particularly during the construction phase. Erosion can damage the vegetative cover as well as the low permeability covering material. Prolonged exposure of the SBR can lead to ARD.

1, 2, 3, 4 [Mine Environmental Neutral Drainage (MEND) – "Design, Construction and Performance Monitoring of Cover Systems for Waste Rock and Tailings" (Series 2.21.4)]

Erosion control, through the use of sediment control fence, erosion control structures and soil stabilization will be implemented in accordance with Section 5.7 of the Environmental Management Manual (EMM) and Section 600 of the NBDOT Standard Specifications. For added erosion control, jute mats will be installed on the foreslopes of the SBR disposal site to minimize the potential for erosion of the growing medium. In turn this area will also be seeded with Hydroseed "B" which includes seed and an application of hay mulch. In addition to these measures above, work progression will be followed (Item 946 of the Standard Specifications) to ensure that exposed work areas are completed and stabilized in a diligent manner.

C. Fires

The primary concern of a fire would be the damage caused to the vegetative cover of the SBR disposal area and/or SBR rock cut. In the case of the SBR disposal area, this vegetative loss could allow water to penetrate the growing medium and affect the performance of the low permeability covering material.

Fires would be handled in accordance with Section 5.10 of the NBDOT Environmental Management Manual.

D. Vegetation Mortality

Vegetation mortality may occur due to the factors noted above as well as by natural means. Climate may impact the growth of vegetation as well as operational factors such as the application of salt.

Areas affected by fires and/or vegetation mortality would be repaired and the vegetative cover re-established by re-seeding. Areas affected by accidents and/or erosion will be re-instated. If the low permeability covering material is affected, it will be reshaped (if additional material is required, it will be hauled in) and re-compacted. The vegetative cover will be re-established by re-seeding the affected areas. Mulch would be used to cover the affected area until such time as the vegetation has re-established. The use of mulch would minimize any erosion of the low permeability covering material as well as the growing medium. Repairs to vegetation loss would be carried out immediately upon discovery.

2. ARD Runoff

The generation of acid from SBR is a complex issue. In the event that the threshold values are exceeded, NBDOT will carry out a comprehensive hydrogeological study to identify the site specific drainage and soil conditions contributing to the acid drainage problem. Based on the results of the study, NBDOT would implement a number of appropriate treatments.

A. Surface Water Contamination

There are *(insert the # of w/c)* watercourses identified Screening Report that either cross the project or run along the project limits. In addition, *(insert the # of wetlands)* wetlands were identified and similar to the watercourses, either cross the project or run adjacent to the project limits.

(Identify where the SBR will be disposed of. For example - Because of the numerous water features on this project, any SBR excavation will be hauled off the project site and to the St. David Ridge area to be incorporated into the new interchange ramps.) Any fill areas near watercourses will be in-filled with non-sulphide bearing material. NBDOT has conducted water sampling of the watercourses and wetlands crossed by the project.

Handling of ARD runoff from either the fill area or rock cuts shall be in accordance with the established guidelines, documents and protocols.

Mitigation for construction activities will prevent contamination of surface water including designing ditches to direct water away from the SBR fill sites, minimizing standing water in the ditches and median and diverting water into the adjacent wooded area prior to entering any watercourses.

Should there be impact from ARD to surface water; the site would be assessed to determine the appropriate measures. Measures such as redirecting drainage, providing additional neutralization material, providing additional cover materials and establishing a natural wetland to promote sulphate reduction may be implemented.

B. Groundwater Contamination

(Discuss the potential for groundwater contamination including residential, and municipalities. For example – There is low potential for groundwater contamination to existing wells. Currently, the water supply for the Town of St. Stephen is from Maxwell Crossing (Moore's Mills area), which is over 2.3 km (north-east) from the easterly end of the project site.

With respect to residential wells, there are five major impact areas, those being the Church Street area (encompassing Church Street, Royree Road and Barter Settlement Road), the Five Corners area (encompassing Union St, Hayman St, Route 725 and Route 735), the West St. area, the Hawthorne St. area (encompassing Hawthorne St. and Route 740) and the Route 3 area. Properties located on Church Street are on Town water supply. Properties located on the Royree Road and Barter Settlement Road would be on private wells. Properties located on Union St. and Hayman St. are on Town water supply, properties on Route 725 and Route 735 would be on private wells. Properties located on West St. and Hawthorne St. would be on Town water supply. Properties located on Route 740 and on Route 3 would be on private wells.

In general, the topography of the areas in question would indicate that contamination, should it occur, would be to properties below the project area (i.e. properties already on Town water supply). Therefore these areas will not be impacted by ARD.

Because of the numerous water features on this project, any SBR excavation will be hauled off the project site and to the St. David Ridge area to be incorporated into the new interchange ramps.)

NBDOT has conducted well sampling of all residential and commercial properties within 500 m of the project site. Should sampling during construction indicate that the surface water is impacted, groundwater sampling of wells in the impacted area will be taken. Should the groundwater be impacted, remedial action will be implemented. A temporary water supply (such as bottled water) will be provided to impacted properties. In addition if the well has been contaminated, a new water supply would be provided (drilling a new well) or extending the existing Town water supply.

Background sampling as described above will determine pre-existing conditions and enable NBDOT to compare future sampling to background and trigger any action should it be required.

3. Infrastructure

It is not anticipated that there will be any impacts from SBR and/or ARD on the infrastructure during the construction phase. Should there be any impact to the infrastructure during the operation phase, the impacted infrastructure would be repaired. If there are any culverts installed in the SBR disposal areas requiring future repair, these repairs would be assessed and actions would be taken to prevent or minimize disturbance to the SBR.

4. Spills

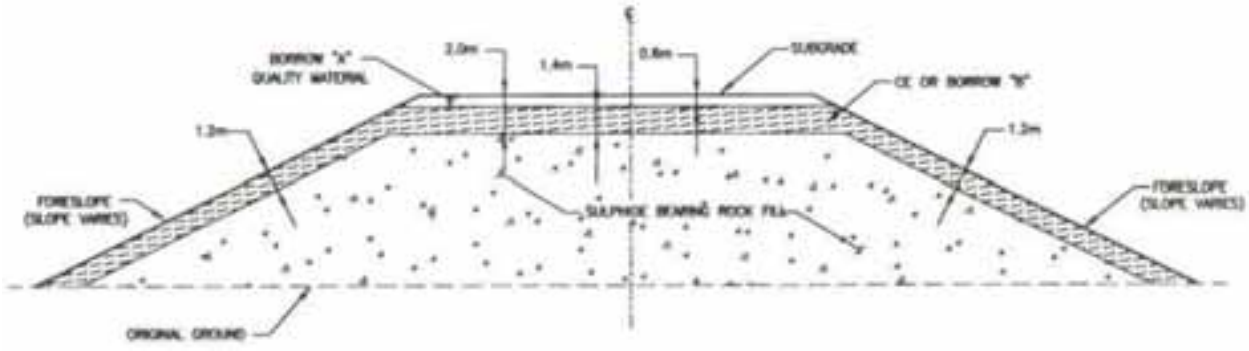
Spills can cause numerous impacts to the environment including water quality, both surface and groundwater, as well as other land use. In addition, a spill occurring in the area of the SBR rock cut and/or the SBR disposal area could impact the vegetation cover, the low permeability cover material and possibly the SBR. Inspection of construction equipment will be carried out to ensure that any leaks are repaired immediately. In the event of a spill, it shall be handled in accordance with Sections 5.12, 5.13 and 5.14 of the EMM.

In general, contaminated material would be excavated and removed from the spill site and disposed of in accordance with all federal and provincial regulations. Areas affected by spills would be repaired as warranted and the vegetative cover re-established. Mulch would be used to cover the affected area until such time as the vegetation has re-established. The use of mulch would minimize any erosion.

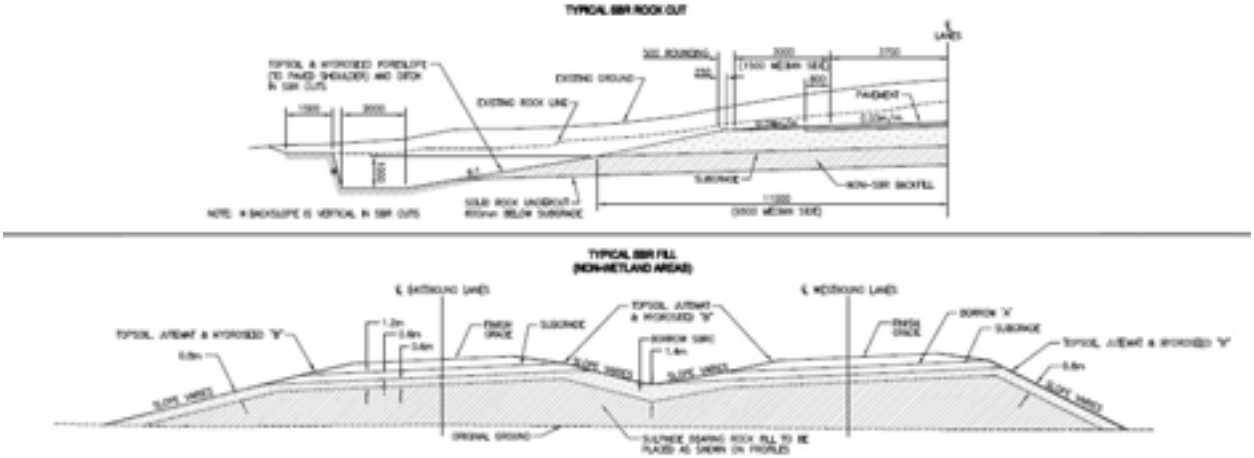
Summary

The implementation of this Contingency Plan will be as a result of unforeseen events or emergencies; however there are instances where natural actions can impact the mitigation measures incorporated into the design, construction and operation of the highway, such as erosion due to heavy precipitation events or vegetation mortality. Education and a regular inspection program by operational staff to monitor concerns addressed in this Contingency Plan will be conducted to ensure that the ARD does not impact the environment.

Typical Sections – SBR



Typical Section of SBR Disposal Area – 2 Lane Highways



Typical Section of SBR Disposal Area – 4 Lane Highways

Culvert Treatment – Wetland & Non-wetland Applications

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Appendix “D” – Wet Weather Shutdown Guidelines

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Wet Weather Shutdown Guidelines

The Engineer will order shutdown of the Contractor's work on culverts due to rainfall, in accordance with the following:

a) Excavation of the temporary diversion channels in earth.

- If rainfall is light, such that no runoff occurs, work may continue. Upon commencement of runoff, or moderate to heavy rainfall, the work shall immediately cease.

b) Excavation for the culvert bed and/or headwalls in earth. As for (a).

c) Placement of pipe bedding on earth. As for (a).

d) Forming and pouring concrete headwalls.

- Pouring of concrete will be stopped in moderate to heavy rainfall to prevent toxic ingredients in the fresh concrete from leaching out of the forms, and to prevent reducing concrete quality.

- Construction of formwork and placement of rebar has little, or no, environmental impact in a rainfall event. Therefore, the Engineer, in the event of wet weather will not order stoppage for this type of work.

e) Placing culvert sections

- Pipe sections are placed on clean, granular bedding in a trench that is removed from the stream flow. Therefore, the Engineer will order a shutdown of these activities only if the workers' safety appears to be compromised.

f) Backfilling culvert sections

1. Backfilling is done with clean, granular material and a rainfall during this stage of construction serves to improve compaction results. However, if runoff develops while backfilling is underway, the Engineer will order a work stoppage.

g) Preparation of rip rapped channels at end of culverts. As for (a).

h) Diverting stream flow into the completed culvert

- This will not be attempted during a rainfall event. It will be scheduled for a time when rainfall is unlikely.

Note: Rainfall rates of fall cannot be measured onsite in mm/hr, but shall be measured as light, moderate, or heavy. “Light” means up to 2.5 mm an hour. "Moderate" means the rate of fall is between 2.6 mm to 7.6 mm per hour. "Heavy" means over 7.6 mm per hour. (Source – *The Weather Network*)

Monitoring Plan

The work site, and its erosion and sediment control devices and measures, will be monitored for conformance to NBDOT Specifications, Plans, EMM, and for effectiveness, as follows:

a) Pre-construction

Appropriate buffer zone demarcation and protection will be prepared:

Sediment Control Fence (Standard Specs 948.2.1.5).
Temporary access & working pad (Standard Specs 948.2.1.6)
Bales of hay or straw shall be available for spreading over exposed soils, as required.

b) During Construction

Exposed soil will be mulched at the end of the day of exposure. If rain begins during earthwork, then mulching shall begin upon commencement of the rain.

Effectiveness of the mulching, and of other erosion and sediment control measures, will be monitored before and during rainfalls. The Engineer and/or Contractor will note deficiencies, and they will be addressed immediately, if practicable, or as soon as possible afterwards.

c) Post-construction

The site will be inspected before the commencement of autumn rains to determine the effectiveness of the permanent erosion and sediment control measures, including grassed slopes, riprapped slopes and channels, and sediment ponds with spillways (if any).

The effectiveness of fish weirs inside the culvert, and elevation of water in the outlet pool, will be checked. Deficiencies will be noted and corrected, in accordance with DFO recommendations.

d) Follow-up year

The site will be inspected after spring run-off to identify any deficiencies that may have developed such as slope failures, washout of riprap, or sedimentation of outlet pool by materials washed from upstream of the work site. Deficiencies will be noted and corrected, in accordance with DFO recommendations.