Environment Canada Environnement Canada

Environment Canada Guidance Related to the

Environmental Assessment of Aggregate Pit Mines and Quarries in the Atlantic Provinces

April 2008

Table of Contents

Canada

Introduction

The general guidance offered below is applicable to the development, expansion or decommissioning of aggregate pit mining and quarry projects. It should be emphasized that the guidance is offered only as a starting point for an environmental assessment (EA) given the need to investigate and assess impacts associated with project-specific activities and site-specific environmental sensitivities. In the context of such an EA effort, Environment Canada (EC) is prepared to work with Responsible Authorities in identifying suitable, project-specific mitigation and monitoring measures.

Wildlife and Habitat

Every effort should be taken to ensure that the development, expansion and decommissioning of pit mining and quarry projects will not impact wetlands, habitats harbouring wildlife[1] at risk, or other sensitive habitats (e.g. bird concentration areas).

Wildlife at Risk

The *Species at Risk Act* (SARA) amends the definition of "environmental effect" in subsection 2(1) of the *Canadian Environmental Assessment Act* to clarify, for greater certainty, that a federal EA must always consider impacts on a listed wildlife[1] species, its critical habitat or the residences of individuals of that species. The complete text of SARA, including prohibitions, is available at www.sararegistry.gc.ca.

SARA requires that the person responsible for a federal EA must, without delay, notify the competent minister(s) in writing if the project being assessed is likely to affect a listed wildlife species or its critical habitat. Notification is required for all effects, including adverse and beneficial effects, and the requirement to notify is independent of the significance of the likely effect. The person must also identify adverse effects of the project on listed species and their critical habitat. And if the project is implemented, the person must ensure that measures are taken to avoid or lessen adverse effects and that effects are monitored. Mitigation measures must be consistent with recovery strategies and action plans for the species.

Atlantic Canada Conservation Data Centre (ACCDC) data is important to an EA, but should not be used as the sole source of information to establish whether wildlife at risk potentially occur in the project area. ACCDC data is only available for areas where surveys have been conducted, and the fact that a species has not been confirmed in an area does not necessarily mean that it does not occur there, especially if habitat appropriate for that species is available. It is generally recommended that data obtained from the ACCDC, and other sources such as provincial wildlife agencies and local naturalists, be supplemented by field surveys by

[1] The term "wildlife species" means a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and; (a) is native to Canada; or (b) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years. "Wildlife at risk" includes those rare or imperilled species designated or identified as candidates for designation by: federal and provincial species at risk legislation, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the provincial government wildlife experts, and the Atlantic Canada Conservation Data Centre (AC CDC).

professional biologists (with expertise at conducting the types of surveys required) at the appropriate time of year in habitats potentially harbouring wildlife at risk.

The EC publication, *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada*, should be referenced for further information. The publication is accessible at: www.cws-scf.ec.gc.ca/publications/eval/index_e.cfm.

The Wood Turtle, which is listed as *Special Concern* on Schedule 3 of SARA and listed as *Threatened* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), is often encountered within the footprint of pit mines and quarry projects in Atlantic Canada. While the Wood Turtle has not yet been added to Schedule 1 of SARA, the applicability of the precautionary principle is highlighted in the SARA preamble. Where the wood turtle is found to be present in the general study area, there should be a description of the use of the area by wood turtles, potential effects of the project on turtles and their habitat, and any mitigation and monitoring to be implemented (including measures to be employed by staff should they encounter a Wood Turtle).

Migratory Birds

An EA should include a consideration of potential effects on migratory birds. The following information should be taken into account in the assessment, mitigation and follow-up monitoring of potential adverse effects.

Regulatory Requirements

Migratory birds, their eggs, nests, and young are protected under the *Migratory Birds Convention Act* (MBCA). Migratory birds protected by the MBCA generally include all seabirds except cormorants and pelicans, all waterfowl, all shorebirds, and most landbirds (birds with principally terrestrial life cycles). Most of these birds are specifically named in the Environment Canada publication, *Birds Protected in Canada under the Migratory Birds Convention Act*, Canadian Wildlife Service Occasional Paper No. 1, which can be made available upon request.

Migratory birds, their eggs, nests, and young are protected under the *Migratory Birds Convention Act* (MBCA). Should migratory birds, or their nests, eggs, or chicks be harmed, charges can and have been laid.

Under Section 6 of the *Migratory Birds Regulations* (MBR), it is forbidden to disturb, destroy or take a nest or egg of a migratory bird; or to be in possession of a live migratory bird, or its carcass, skin, nest or egg, except under authority of a permit. It is important to note that under the current MBR, no permits can be issued for the incidental take of migratory birds caused by development projects or other economic activities. Should migratory birds, or their nests, eggs, or chicks be harmed, charges can and have been laid.

Subsection 5.1 of the MBCA describes prohibitions related to deposit of substances harmful to migratory birds:

> (1) No person or vessel shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area.
>
> (2) No person or vessel shall deposit a substance or permit a substance to be deposited in any place if the substance, in combination with one or more substances, results in a substance — in waters or an area frequented by migratory birds or in a place from which it may enter such waters or such an area — that is harmful to migratory birds.

It is the responsibility of the proponent to ensure that activities are managed so as to comply with the MBCA and associated regulations.

Best Management Practices

Interactions with Nests

General

When planning construction activities, including site preparation, a proponent should take the following points into consideration in fulfilling its responsibilities for MBCA compliance:

- The breeding season for most migratory birds in Newfoundland and Labrador extends from May 1st to July 31st while the breeding season for most migratory birds in the Maritime Provinces extends from May 1st to August 31st, however, some nest outside this timeframe.
- While most migratory bird species construct nests in trees and shrubs, several nest at ground level (e.g. Common Nighthawk, Killdeer, sandpipers) and some (e.g. Bank Swallows) may nest in burrows in stockpiles of overburden or the banks of pits.
- Some migratory birds (e.g. Barn Swallows, Cliff Swallows, Eastern Phoebes) may nest on human-built structures (e.g. bridges, ledges, gutters).
- Some migratory birds (e.g. certain waterfowl species) may nest in head ponds created by beaver dams.

One method frequently used to minimize the risk of destroying bird nests, including nesting waterfowl, consists of avoiding certain activities, such as clearing, during the nesting period for migratory birds in the region.

One method frequently used to minimize the risk of destroying bird nests, including nesting waterfowl, consists of avoiding certain activities, such as clearing, during the nesting period for migratory birds in the region. Risk of impacting active nests or birds caring for pre-fledged chicks, discovered during project activities outside the breeding season, can be minimized by measures such as the establishment of vegetated buffer zones around nests, and minimization of activities in the immediate area until nesting is complete and chicks have naturally migrated from the area. It is incumbent on the proponent to identify the best approach, based on the circumstances, to complying with the MBCA.

Environment Canada would not endorse any request to conduct activities that could disturb birds during the breeding season as it is unlikely that any proposed mitigation measures (e.g. nest surveys just prior to clearing activities) would be considered adequate or useful. Adult birds generally avoid approaching their nests in a manner that would attract predators to their eggs or chicks, making it difficult to locate nests. The amount of habitat to be searched also often limits the success of surveys intended to locate active nests.

Specific Considerations related to Ground Disturbance

Particular care should be taken in selecting erosion prevention and control measures if migratory birds are found nesting in stockpiles of overburden. For example, during the breeding season it is important that nests not be hydroseeded or otherwise disturbed by erosion prevention and control measures.

For a species such as Bank Swallows, the period when the nests would be considered active would include not only the time when birds are incubating eggs or taking care

of flightless chicks, but also a period of time after chicks have learned to fly since swallows return to their colony to roost.

Specific Considerations related to Removal of Beaver dams

Beaver dams may require removal during project construction and maintenance. In fulfilling its responsibility for MBCA compliance under such circumstances, a proponent should take steps to establish waterfowl use of a pond, and avoid alterations to beaver dams until waterfowl have raised their young.

Noise

Concentrations of birds should not be approached when accessing a project site from water or land. Engines should be properly maintained, and well muffled to reduce disturbance due to noise. Other mitigation measures may include reducing travel speeds around potentially sensitive habitats or colonies, using alternative travel routes, and rescheduling high disturbance activities.

Proponents should implement, on a year-round basis, an appropriate blasting guideline for the protection of migratory birds (e.g. buffer zone, scheduling) and design a monitoring program that allows for detection of potential adverse effects and implementation of timely adaptive management actions.

Lighting

Attraction to lights may result in collision with lit structures or their support structures, or with other birds.

Lights can result in adverse impacts on birds. In Atlantic Canada, nocturnal migrants and night-flying seabirds (e.g. storm-petrels) are the birds most at risk of attraction to lights especially during periods of fog, drizzle, and haze. Attraction to lights may result in collision with lit structures or their support structures, or with other birds. Disoriented birds are prone to circling a light source and may deplete their energy reserves and either die of exhaustion or drop to the ground where they are at risk of depredation. Stranding on vessels is also of concern.

In assessing the impacts of lights, a focus should be placed on the most vulnerable species and the occurrence of infrequent, but potential large-scale events (e.g. events associated with weather conditions, migratory seasons). Proponents should indicate how they would take the following best management practices into consideration in planning their projects:

- Only the minimum amount of pilot warning and obstruction avoidance lighting should be used.
- Only lights with short flash durations and the ability to emit no light during the 'off phase' of the flash (e.g., as allowed by strobes and modern LED lights), should be used on tall structures at night. These lights should operate at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada.
- Only the minimum number of lights should be used as possible and the use of solid-burning or slow-pulsing red warning lights at night should be avoided.
- The time of operation of exterior decorative lights, such as spotlights and floodlights, should be minimized or avoided in cases where such lights are only intended to highlight features of structures, or to illuminate an entire structure. Especially on humid, foggy or rainy nights, the glow of such lights can draw birds from considerable distances. In the interest of protecting birds, it would

be best if these lights were turned off, at least during the migratory season, when the risk to birds is greatest.

- Task lighting, as well as lighting for the safety of the employees, should be shielded to shine down and only to where it is needed, without compromising safety.

Proponents should prepare a plan for minimizing potential adverse interactions between birds and lighting that includes a detailed avian collision monitoring program designed in consultation with Environment Canada. The monitoring program should concentrate survey efforts on peak spring and fall migration periods, as well as mornings following inclement weather, so as to facilitate the timely detection of adverse effects and implementation of appropriate adaptive management actions. Proponents should confirm that they are prepared to provide such monitoring results to Environment Canada in a timely manner, including immediate notification (within 24 hours) of any collisions involving a single species at risk or large numbers of birds (>10).

Contaminants

Project design and operational measures should be put in place to prevent harmful exposure of migratory birds to contaminants. For example, birds may be attracted to ponds used by a proponent for management of site drainage and wastewater. Proponents should take steps to minimize the risk of birds accessing such facilities. A contingency plan should include the following details:

- Measures that would be taken to keep birds away from a spilled substance; and,
- Procedures for dealing with accidents in which birds are oiled and/or sensitive habitat(s) are contaminated, including whether birds would be left alone, captured and cleaned, or euthanized.

Mature Forest Habitats

Understanding the potential loss and fragmentation of interior and mature forests is an important consideration in determining a project's effect on migratory birds.

Several types of migratory bird habitat are in decline, including mature and interior forest habitats. Many of the bird species that rely on mature habitats (e.g., mature coniferous, deciduous and mixed forests) are experiencing population declines. Furthermore, some bird species generally known as "interior species" only prosper when the tracts of forest (including mature and immature stands) are relatively large and unfragmented.

Understanding the potential loss and fragmentation of interior and mature forests is an important consideration in determining a project's effect on migratory birds, including Partners in Flight priority species, and in identifying opportunities to avoid such impacts in undertaking a proposed project. Therefore, where interactions with forest habitat may occur, it is important that an environmental assessment include the following:

- Mapping that identifies mature and interior forest habitat for migratory birds in the project area (e.g., study area and footprint area);
- The area (in hectares) of mature coniferous, mature hardwood, mature mixed forest, and interior forest habitat for migratory birds that would be lost as a result of the project;

- Stand descriptions for any mature forest stands that would be affected by the project;
- The rationale for why such habitat cannot be avoided through project routing and siting and a description of specific steps taken to minimize any unavoidable losses;
- The bird species that use areas of mature and interior forest on the site as habitat, established through suitable ground surveys and available information; and,
- An analysis of project impacts on mature and interior forest habitat for migratory birds on a regional scale, taking into account cumulative losses.

If the above information indicates the presence of priority forest habitat for migratory birds, appropriate mitigation measures to address habitat losses may be required or losses/alteration of the habitat may be deemed unacceptable given potential implications for migratory birds. Environment Canada would be in a position to assist regulators and the proponent in developing a suitable approach in such cases.

Wetlands

An EA should include a consideration of potential impacts on wetland habitats.

The Federal Government has adopted *The Federal Policy on Wetland Conservation* (FPWC) with its objective to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future." In support of this objective, the Federal Government strives for the goal of No Net Loss of wetland function on federal lands or when federal funding is provided. The goals of the policy are to be considered in these circumstances, and the hierarchical sequence of mitigation alternatives (avoidance, minimization, and as a last resort, compensation) recommended in the FPWC should be followed.

Avoidance of impacts to wetlands is the preferred mitigation option.

Avoidance of impacts to wetlands is the preferred mitigation option. Avoidance refers to elimination of adverse effects on wetland functions, by altering the siting or modifying the design of a project. In the event that avoidance is not possible, the reasons why elimination of adverse effects on wetland functions were not possible should be clearly demonstrated in the EA, and EC should be contacted for advice on next steps to follow for compliance with the FPWC.

Invasive Species

To diminish the risk of introducing invasive species, the following best management practices should be taken into account in identifying appropriate mitigation and monitoring measures:

- It is recommended that a variety of species of plants native to the general area be used in revegetation efforts. Should seed mixes for herbaceous native species for the area not be available, it should be ensured that plants used in revegetation efforts are not known to be invasive.
- It is recommended that construction equipment be cleaned and inspected prior to transport from elsewhere to ensure that no matter is attached to the machinery that could introduce an invasive species into the area (e.g., use of pressure water hose to clean vehicles prior to transport).

- It is recommended that equipment be regularly inspected prior to, during and immediately following construction in wetland areas and in areas found to support Purple Loosestrife to ensure that vegetative matter is not transported from one construction area to another.

Water Quality

An environmental assessment should include a consideration of potential effects on the quality of the aquatic environment. The following information should be taken into account in the assessment, mitigation and follow-up monitoring of potential adverse effects.

Regulatory Requirements

In addition to Section 5.1 of the MBCA, pollution prevention and control provisions of the *Fisheries Act* are administered and enforced by Environment Canada. Subsection 36(3) of the *Fisheries Act* prohibits "anyone from depositing or permitting the deposit of a deleterious substance of any type in water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter such water".

It is the responsibility of the proponent to ensure that activities are managed so as to prevent the release of substances deleterious to fish. In general, compliance is determined at the last point of control of the substance before it enters waters frequented by fish, or, in any place under any conditions where a substance may enter such waters.

Best Management Practices

Acid Rock Drainage

Once acid generation begins, it often continues for decades if not longer, and is very costly to mitigate compared to the cost of avoidance strategies.

Acid rock drainage (ARD) is water that is acidic as a result of contact with naturally oxidizing sulphide minerals contained in recently fractured rock which is exposed to air and water. These sulphide minerals undergo chemical and biological reactions producing low pH water capable of leaching heavy metals and other soluble constituents contained in the 'acid rock'. Disturbance during construction/mining is a major cause of exposure of these sulphide bearing materials to air and water.

Once acid generation begins, it often continues for decades if not longer, and is very costly to mitigate compared to the cost of avoidance strategies. The level of acid generation activity is affected by concentration of sulphides, interim pH, exposure period, surface area of exposed material, temperature, competency of the host rock, and the presence/absence of oxygen, water, carbon dioxide, nutrients and acid-neutralizing materials. It is the responsibility of the proponent to ensure that activities are managed so as to prevent the release of substances deleterious to fish or harmful to migratory birds.

For projects proposed in areas where ARD may be a concern, proponents are encouraged to gather and consider the following information in an effort to minimize the risk of ARD generation and adverse effects on water quality:

- A geological map of the area to determine potential for acid producing type materials;
- General site map and information including rock type, topography, hydrology, and hydrogeology, soil depths, etc;
- Determination of general project footprints that may initiate acid generation;
- Criteria and rationale for determining potential of host rock to generate acid, sampling/analysis protocol; sampling design, and analytical results for the area to be disturbed;
- Project relocation or design alternatives for avoiding potentially acid-producing rock;
- Locations, and quantities of excavated/disturbed material;
- Procedures to minimize blasting, or modify blasting to reduce overbreakage, and maximize size of material excavated;
- Overall timing / scheduling of construction work;
- Plans for management of in-situ and excavated material for both temporary and permanent situations;
- ARD management options including measures to reduce leachate volume and concentrations; leachate treatment methods; and contingency planning during construction, operation and decommissioning phases.

Concrete Production

Discharges from project work involving the use of concrete, cement, mortars and other Portland cement or lime-containing construction materials may have a high pH, and work should be planned and conducted to ensure that sediments, debris, concrete, and concrete fines are not deposited, either directly or indirectly into the aquatic environment. Any potentially contaminated water (e.g. exposed aggregate wash-off, wet curing, equipment and truck washing), should be prevented from entering the aquatic environment unless it can be confirmed that this water will not be deleterious to fish or harmful to migratory birds. Containment facilities should be provided at the site as required.

For larger scale projects that involve concrete production on-site, the location and design of the concrete production area and yard should be described with provisions for environmental protection. Drainage from concrete production and aggregate storage areas, and washwater from the cleaning of batch plant mixers, mixer trucks, conveyors and pipe delivery systems, should be directed to a suitable control structure. Effluent should be treated as appropriate before release to receiving waters, or alternatively, reused.

Blasting Operations

Blasting operations entail the controlled use of explosives to excavate or remove rock. In terms of water quality, EC concerns are principally related to projects that can involve ongoing blasting activities within a project area over an extended period of time.

Ammonia from explosives can spread into surface and groundwater through shot rock and ore, spillage, and incomplete detonation. The available scientific literature

indicates that that environmental risks associated with ammonia are related to both its acute and chronic toxicity to freshwater organisms, as well as contributing to eutrophication and algal blooms. The Canadian water quality guideline for the protection of aquatic life for un-ionized ammonia has a freshwater value of 0.019 mg/L.

The best means of minimizing effects of ammonia during blasting are well documented best management practices based on prevention principles. Proponents may wish to consider Gordon F. Revey's 1996 paper, Practical Methods to Reduce Ammonia and Nitrate Levels in Mine Water (Mining Engineering, 48(7):61-64), which provides useful recommendations on ammonia residue reduction.

Dust Suppression

The application of water is the preferred method of dust suppression

Water, calcium chloride, magnesium chloride and lignin-based dust suppressants are often selected as dust suppressants for application throughout a project lifecycle. Excessive use or poor application of chemical dust suppressants can have adverse environmental effects. Proponents should consider the following factors in selecting suppressants and in determining when, where and how suppressants are to be applied:

- From an environmental quality perspective, the application of water is the preferred method of dust suppression.
- Aquatic toxicities of lignin-based lignosulfonates are considered low, but the potential offsite movement of lignosulfonates into watercourses is of ecological concern as they may reduce dissolved oxygen and increase colour and suspended solids in water. Prior to application, it should be determined if any significant migration via water drainage might occur into local streams, rivers, ponds, or lakes and thereby affect the oxygen needs of aquatic communities.
- If either calcium chloride or magnesium chloride is considered for use as a dust suppressant, it should only be used in accordance with guidance offered in the Environment Canada report entitled, *Best Practices for the use and Storage of Chloride-Based Dust Suppressants*: www.ec.gc.ca/nopp/roadsalt/reports/chlorideBP/en/toc.cfm.

Monitoring and Adaptive Management

Proponents are encouraged to prepare an effluent discharge and/or water quality monitoring program (including location and number of sampling sites, sampling protocols (parameters, sampling frequency) that allows for timely detection of water quality changes) and identifies action thresholds for implementation of appropriate adaptive management measures. Such a program should take into account existing and appropriate regulations, or Section 36 (3) of the Fisheries Act, the Canadian Council of Ministers of the Environment publication, Environmental Quality Guidelines for the protection of aquatic life (http://www.ccme.ca/publications/ceqg_rcqe.html) in conjunction with existing ambient water quality and site-specific factors.

Air Quality and Greenhouse Gases

An EA should include a consideration of potential impacts on air quality and greenhouse gas emissions. Where the project entails the expansion of an existing mine site, EC suggests that the proponent examine any monitoring data that may have already been collected in relation to the existing aggregate pit site. It is recommended that the proponent list any emissions associated with the proposed pit development and use emission factors and formulas to estimate emissions generation. An assessment of the size fractions of emissions expected from this type of operation should be considered and potential effects of emissions should be described with respect to neighbouring areas. Total Suspended Particulates (TSP) has historically been the parameter of most concern from pit operations. However, the proponent should also be aware of PM2.5 (Canada-wide Standards which will be applicable in 2010) and PM10 (included in the list of Toxic Substances in Schedule 1 of the *Canadian Environmental Protection Act*).

EC supports any commitment on the part of the proponent to adhere to suspended particulate levels outlined in provincial guidelines.

EC supports any commitment on the part of the proponent to adhere to suspended particulate levels outlined in provincial guidelines. EC suggests that a monitoring program could be conducted during initial operation stages to confirm whether the guideline limits are being met. Additionally, if not already planned, it is recommended that a mechanism be developed for tracking complaints about visible or nuisance dusting. The proponent should describe any residential buildings that will be near the proposed site and the nearest residential area should be identified.

To reduce greenhouse gas emissions, opportunities to reduce equipment idling should be considered. Additionally, using native shrubs and trees in reclamation activities to augment the degree of carbon sequestration (compared to hydroseeding) and to counter emissions might be considered as well. This approach to reclamation could also augment the value of the reclaimed land.

National Pollutant Release Inventory

An EA should include consider the applicability of the National Pollutant Release Inventory to the project design and operations. The National Pollutant Release Inventory (NPRI) is a federally administered program that collects data on annual on-site emissions of substances to the air, water, and land, as well as off-site transfers of substance disposal or recycling. Information is collected to assess whether risk-management activities for various industrial sources of criteria air contaminants (CACs) are resulting in reduced emissions, and to support various domestic and international programs including the Canada-wide Standards for PM and Ozone and development of Ambient Air Quality Objectives. Facilities that meet certain reporting criteria for any of the listed substances are required to report information to EC through the NPRI. Reporting to the NPRI is a legal requirement and mandatory under Canadian Law; the legal authority for the NPRI is the Canadian Environmental Protection Act, subsection 46(1).

Pits and quarries with a production quantity of 500,000 tonnes annually are required to report. As well, reporting is required when emissions of particulate matter are released to air from road dust where more than 10,000 vehicle kilometers are traveled

on unpaved roads annually at a contiguous facility. For pits and quarries that are required to report under these provisions, total particulate matter, PM2.5 and PM10 must be reported (particulate matter is classified as a CAC). Other substances that might be subject to reporting from a pit or quarry operation depend on the activities occurring at the site. For example, additional CAC reporting might be required if there are stationary combustion activities occurring at the facility. Metal releases to water may be subject to reporting in the event that monitoring data of influent and effluent is available.

A spreadsheet has been designed to assist with estimating the releases of NPRI substances from crushed stone processing. This spreadsheet is available in the NPRI toolbox at www.ec.gc.ca/npri.

Generally, facilities must review their activities and determine if there are additional substance emissions that are subject to reporting. Further details on NPRI reporting requirements may be found at www.ec.gc.ca/npri, or by contacting the Atlantic Region NPRI office either at (902) 426-4805 or by email to the following address: NPRI_ATL@ec.gc.ca.

Effects of the Environment on the Project

Sensitivities to climate elements should be identified and assessed, including a demonstration of how the project design would mitigate extreme events such as flooding.

An EA must include a consideration of the effects of the environment on the project. Sensitivities to climate elements should be identified and assessed, including a demonstration of how the project design would mitigate extreme events such as flooding over its operational lifetime.

Climatological data required to support the EA can be found at http://www.climate.weatheroffice.ec.gc.ca/, and value-added data can be obtained from EC's Climate Services. Contact: 1-900-565-1111 or email: weather.info.meteo@ec.gc.ca. Hydrometric station data, both archived and real-time, are available at www.wsc.ec.gc.ca, or by contacting Guy R. Leger at (506) 452-4021 or email: guy.leger@ec.gc.ca.

When applying meteorological information to design parameters for infrastructure, the proponent is encouraged to consider the report, *Water Sector: Vulnerability and Adaptation to Climate Change* (GSCI and MSC, 2000). In this report it is indicated that when accounting for the effect of climate change on extreme events, such as particularly heavy precipitation, the return periods for these events could reduce by at least a factor of two. This would result, by the end of the century, in 100 year event amounts becoming 50 year event amounts. EC encourages the proponent to consider appropriate climatological factors and best available data so as to take steps that would help ensure structures remain effective during and after storm events. Site water management should also be discussed in terms of effects of climate change on reclamation design.

In considering the full life-cycle of the project, any sensitivity to climate change should be identified and adjustments made if necessary. It may be more cost-effective to adjust design criteria at this stage than to retrofit in future.

Accidents and Malfunctions

A federal EA must include a consideration of impacts resulting from possible accidents and malfunctions. Based on such an analysis, it should be indicated how contingency plans will be prepared, and response measures implemented, to reflect site-specific conditions and sensitivities.

The following regulatory requirements and best management practices should be taken into account in identifying appropriate mitigation and monitoring measures:

Regulatory Requirements

The proponent should be advised that the deposit of a deleterious substance into waters frequented by fish is prohibited (Section 36, *Fisheries Act*). In addition, Section 5.1 of the MBCA describes prohibitions related to the deposit of substances harmful to migratory birds.

Best Management Practices

Hazardous materials (e.g. fuels, lubricants, hydraulic oil) and wastes (e.g. waste oil) should be managed so as to minimize the risk of chronic and/or accidental releases. For example, proponents are encouraged to undertake refueling and maintenance activities on level terrain, at a suitable distance from environmentally sensitive areas including watercourses, and on a prepared impermeable surface with a collection system.

Proponents are encouraged to prepare contingency plans that reflect a consideration of potential accidents and malfunctions and that take into account site-specific conditions and sensitivities. The Canadian Standards Association publication, *Emergency Preparedness and Response,* CAN/CSA-Z731-03, is a useful reference.

All spills or leaks, such as those from machinery or storage tanks, should be promptly contained and cleaned up (sorbents and booms should be available for quick containment and recovery), and reported to the 24-hour environmental emergencies reporting system (Maritime Provinces 1-800-565-1633; Newfoundland and Labrador 1-800-563-9089).