Environment Canada
Environmental Protection Service

Environnement Canada
Service de la protection de l'environnement

Environmental Code of Good Practice for General Construction

Regulations, Codes and Protocols
Report EPS 1-EC-80-1

Environmental Impact Control Directorate
March 1980

ENVIRONMENTAL PROTECTION SERVICE REPORT SERIES

Reports pertaining to Regulations, Codes, and Protocols describe current legislation and administrative approaches favoured by the Environmental Protection Service.

Other categories in the EPS series include such groups as Policy and Planning; Economic and Technical Review; Technology Development; Surveillance; Training Manuals; Briefs and Submissions to Public Inquiries; and, Environmental Impact and Assessment.

Inquiries pertaining to Environmental Protection Service Reports should be directed to the Environmental Protection Service, Department of the Environment, Ottawa, Ontario, Canada, K1A 1C8.

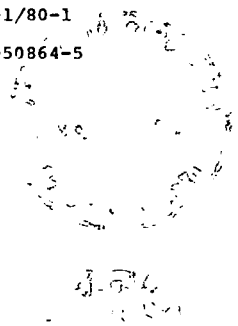
ENVIRONMENTAL CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

Federal Activities Branch
Environmental Impact Control Directorate
Environmental Protection Service
Department of Environment

EPS 1-EC-80-1
March 1980

Cat.No. EM 46-1/80-1

ISBN 0-662-50864-5



ABSTRACT

Practices are recommended to minimize construction-related environmental problems. The recommendations indicate, in a general way, what can be done to minimize these problems but presume additional engineering and environmental inputs at the more detailed, project-specific level. Further, the recommendations are intended to supplement, not replace, existing federal, provincial and municipal legislation, regulations and guidelines.

TABLE OF CONTENTS

1 INTRODUCTION

Recommended practices which may be used to minimize the environmental impacts associated with general construction activities are outlined. Emphasis is given to practices which are applicable to a broad range of project types - pipelines, power transmission lines, highways, etc. Primary information sources include existing federal documents on this subject, notably ones which deal with the Pickering Airport and the MacKenzie Valley and Alaska Highway Gas Pipelines, and Environmental Protection Service (EPS) Regional staff.

Prospective users include:

- Those who require a ready reference for the practices or mitigating measures which are known to be useful in minimizing the environmental impacts likely to be associated with general construction projects.

- Those who conduct environmental assessments of federal construction projects and who must, as part of such assessments, propose mitigating measures to minimize environmental impacts.

- Those who must develop an environmental briefing program for construction project personnel and who require an information base for such a program.

- Those who must monitor construction projects and who require a checklist of desirable practices against which to compare the practices actually in use.

- Those who require a general basis upon which to develop the detailed terms and conditions attached to tender documents, territorial water and land use permits, etc. It is envisioned that EPS Regional and District staff and others intimately involved with specific projects should provide this detail.

2 USE OF THE DOCUMENT

Select an activity from among those listed in the Table of Contents and turn to the page indicated for a listing of recommended practices. Activities appear on the left, in Column A. Recommended practices are listed opposite, in Column B.

3 CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.1 Location and Timing of Construction	**3.1.1** Road and airstrip alignment and design provisions should be partially based on the following: a) topographical features b) availability of embankment materials c) terrain types (type of subgrade) d) surface water runoff e) thermal regimes in permafrost locations f) erosion control g) construction techniques h) local regulations i) natural and cultural sensitive areas. **3.1.2** Temporary roads should be avoided where possible. **3.1.3** Locate roads in a manner that will, to the maximum extent practicable, preserve natural beauty, minimize erosion, and include smooth, gradual curves. **3.1.4** Access roads grades should normally not exceed 12%. Access roads located near river banks should not have grades in excess of 5%. **3.1.5** Any road or airstrip should be located so as to provide a buffer strip of at least 100 m (328 feet) of undisturbed land between itself and any water bodies. **3.1.6** In locating roads or airstrips, unstable slopes and areas subject to mudflows, landslides, mudslides, avalanches, rockfalls and other types of movement should be avoided. **3.1.7** To minimize terrain disturbance, extensive muskeg areas such as palsa and peat plateaus should be avoided where practicable because of the poor drainage and low bearing capacity of peat soils. **3.1.8** If valleys must be followed, locate the route on terraces; these are usually better drained and are above normal flood levels. When roads must connect to adjacent terraces, the links should be at carefully controlled and protected locations.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
ACTIVITY		RECOMMENDED PRACTICES
3.1	**Location and Timing of Construction (cont'd)**	**3.1.9** Electrical transmission lines should follow existing transportation corridors wherever possible. **3.1.10** Terrain evaluation studies should be conducted at proposed transmission tower sites. These studies should define: a) soil type b) depth to bedrock c) depth to water table d) thickness of insulating mat in permafrost areas e) steepness of slopes f) topographic features g) areas of soil instability h) ground ice. **3.1.11** Electrical transmission lines should avoid open expanses of water and wetlands particularly those located within flight paths of migratory birds. Wildlife concentration areas such as nesting and rearing areas, winter yarding areas, and endangered species habitat should be avoided. **3.1.12** Transmission lines should be designed to blend in with their surroundings by judicious use of shape, size and colour. **3.1.13** The spacing of transmission poles and towers should be the maximum allowable under the loading conditions of the area. **3.1.14** When possible, construction should be performed during periods of low wildlife occurrence. It may be necessary, for example, to avoid construction during waterfowl migration. **3.2.1** All proposed sources of borrow material should be approved by local authorities and regulatory agencies. **3.2.2** Documentation of biological, hydrological and other environmental components should be required before new borrow operations are approved. **3.2.3** Wherever possible, existing borrow sites should be used in preference to the initiation of new excavations.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.2 Borrow Pit Sites (cont'd)	**3.2.4** New borrow sites should blend with natural land patterns as much as possible. High ground locations separated from streams and lakes by a buffer zone of at least 100 m (328 feet) are preferred. **3.2.5** Documentation regarding surface materials and land forms should be required to ensure than sensitive areas are not disturbed. **3.2.6** Whenever possible, borrow sites should be utilized for additional purposes (e.g. stormwater retention, sediment collection and groundwater recharge). They should be screened from roads by a natural screen of vegetation not less than 30 meters (100 feet) wide.
3.3 Site Clearing	**3.3.1** Site clearing boundaries should be fully specified on construction drawings prior to commencement of clearing activities. **3.3.2** Rights-of-way should not be cleared of vegetation unless absolutely necessary. Where this does occur, the topsoil should be replaced and stabilized without undue delay by the planting of appropriate vegetation (preferably native). **3.3.3** Sensitive areas should be cleared in a manner which will minimize disturbance to surface vegetation and soils. Areas such as stream crossings should be cleared immediately prior to construction using light equipment. **3.3.4** The activities of vehicles used by hand clearing crews should be strictly controlled in environmentally sensitive areas. **3.3.5** Whenever possible, clearing for roads and airstrips should be limited to the width required for the roadbed, drainage requirements, and user safety. **3.3.6** Avoid disturbance to low cover vegetation. **3.3.7** Sites for disposal of debris and soil generated from clearing operations should be deposited away from watercourses, should be surrounded by a natural vegetative buffer, should be screened from the road and should be identified on construction drawings.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A ACTIVITY	COLUMN B RECOMMENDED PRACTICES
3.3 Site Clearing (cont'd)	**3.3.8** Clearing boundaries should be flagged at the construction site prior to commencement of clearing operations. **3.3.9** Bulldozers, graders, and other clearing and grubbing equipment should not be operated outside of designated clearing boundaries and should have a restricted turning radius. **3.3.10** Vegetation and top soil should not be removed to obtain fill for road construction purposes within 30 meters (100 feet) of wetlands, lakes, rivers and major streams. **3.3.11** Trees and other vegetation outside the clearing boundary should not be cut or removed; trees or snags posing a danger to operations would be an exception. **3.3.12** Trees and debris should not be permitted to fall outside cleared areas or into water courses. **3.3.13** Fallen trees and debris should be removed without injuring remaining trees and shrubs. Ropes, guys, or other means should be used where necessary for tree or debris removal. **3.3.14** Whenever possible, organic debris and topsoil removed during grading operations should be stored for use during site restoration. Such stockpiles should be located well away from any stream or water body and should be covered with coarse material to minimize wind and water erosion. **3.3.15** Trees should be cut as flush to the ground as possible. Where snow cover prevents this, a stump removal program should take place the following summer. **3.3.16** Where feasible, merchantable timber should be delimbed and stacked for pickup at a designated pre-cleared site. **3.3.17** Logs should not be skidded, forwarded or yarded across any streams or driven into any watercourse without permission from appropriate authorities.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.4 Grubbing	**3.4.1** Grubbing operations should only be carried out where required to ensure subgrade support for shallow road fills and to remove unsatisfactory materials from soil required for embankment construction. The vegetative mat should be disturbed in the grubbing operations area only. **3.4.2** No debris from clearing operations should be allowed to enter any stream, lake or wetland. **3.4.3** Stumps should not be grubbed within 2 m (6.5 feet) of standing timber at the edge of the area to be cleared. This will minimize the danger of blowdown. **3.4.4** Grubbing operations should not be conducted adjacent to any waterbody or wetland. Pertinent buffer zone requirements should be specified on a site specific basis. **3.4.5** Areas that have been mistakenly grubbed should be revegetated or otherwise rehabilitated as soon as possible.
3.5 Slash Disposal	**3.5.1** In some instances, slash can be disposed of by burning. Consideration should also be given to using mechanical chippers. Wood chips are a good insulating material and would be suitable as a temporary measure for reinsulating ice rich soils from which the vegetative cover has been removed. Particular attention needs to be given to slash disposal to avoid obstructing wildlife movements (by burning, discontinuous windrows, etc.). **3.5.2** Burning of slash on permafrost or ice rich soils should be carried out on sleds or racks designed for that purpose, or on rock outcrops where subsidence due to thawing will not occur. Burning should also be carried out under controlled conditions in consultation with local forestry officials regarding permit requirements, forest fire risk, risk to nearby inhabitated areas and desirable meteorological conditions for burning. **3.5.3** No burn areas should be located within 200 m (656 feet) of any stream, river, or lake.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.6 Excavation	**3.6.1** The development plan should fit the topographic, soil, and vegetative characteristics of the area with a minimum of clearing and grading. Natural cover should be retained and protected wherever possible. Critically erodible soils, steep slopes and stream banks should be identified. Development can then be planned to disturb these vulnerable areas as little as possible. Special consideration should be given to the maintenance of existing vegetative cover in areas of high erosion potential (e.g. steep slopes and the banks of streams). A buffer zone of vegetation should be left between construction operations and such critical areas. **3.6.2** When vegetation must be removed, then the extent and duration of exposure should be kept to a minimum. Plan the phases of development so that only areas which are actively being developed are exposed. **3.6.3** Areas of unstable clays should be left undisturbed; aggregate should not be removed from streams. **3.6.4** Sediment traps, basins, or ponds, whether temporary or permanent, should be installed before construction begins on the rest of the site. **3.6.5** Topsoil from excavated sections should be stockpiled for subsequent application to side slopes requiring revegetation. Steep slopes on stockpiles should be avoided in order to prevent erosion. **3.6.6** Extensive man-made slopes should be terraced and smaller slopes corrugated to prevent erosion and to encourage revegetation. **3.6.7** Bulldozers should be equipped with full U-blades when excavating slopes. These blades minimize the quantity of material that can escape to the side of the cut and slide downhill. **3.6.8** The tops of excavated slopes should always be rounded.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.7 Cut and Fill	**3.7.1** Cut and fill slopes should not exceed 33°. **3.7.2** Steep slopes and ditch bottoms should be blanketed for insulation and/or containment and as protection against erosion. The blankets should generally consist of free draining, stable, granular materials or wood chips. Terraces should be used, particularly at the top and bottom of steep slopes leading to lakes, streams and wetlands. **3.7.3** Roads built on steep slopes usually require extensive cuts to maintain suitable grades. If these cuts extend through aquifers they could severely disrupt groundwater flow. Use of sheet piling to support excavation walls and embankments should not block the movement of groundwater.
3.8 Trenching and Backfilling	**3.8.1** Existing disturbed areas should be used wherever possible. **3.8.2** Trenching should not be carried out near wetlands, watercourses, lakes, and ponds or other natural sensitive areas (see Sec. 3.13). **3.8.3** Long stretches of trench particularly in flood plains, require breakers to avoid the creation of drainage channels. **3.8.4** When the avoidance of migrating channels is not possible, then sand bags should be located to prevent erosion. **3.8.5** Cut banks should be constructed to avoid erosion and prevent slides. **3.8.6** Where terrain instability is encountered during trenching, proper dewatering measures should be provided to ensure the stability of trench and side slopes. The trench and side drainage should be discharged to settling areas before being permitted to enter a stream or other water body. **3.8.7** Where surface or subsurface flows exist, adequate provision should be made for cross-drainage and prevention of erosion.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.8 Trenching and Backfilling (cont'd)	**3.8.8** If berm erosion is likely, then protective measures which will both stabilize the berm materials and encourage the establishment of new vegetation should be specified in the construction drawings. **3.8.9** Topsoil from excavated sections should be stockpiled for subsequent use during revegetation whenever possible. Such stockpiles, however, should be located well away from any stream or water body, and should be covered with coarse material to minimize wind and water erosion. They should be graded to conform to the natural topography and to minimize erosion. **3.8.10** Plugs approximately 3 m (10 feet) wide and sloping into the trench should be left at 400 m (1312 feet) intervals to allow passage of animals across the trench and to allow means of escape. **3.8.11** Mobile ground equipment should not be operated on water/land interfaces or in water. **3.8.12** The area cleared for trenching should be kept to a minimum. Material removed from the trench should be stockpiled so that wind and water erosion will not occur. **3.8.13** Tree removal should be minimized, particularly in the vicinity of shorelands. **3.8.14** Where terrain instability may be encountered during trenching, proper drainage should be provided to ensure the stability of trench and side slopes. **3.8.15** Additional practices related to trenching in a watercourse are listed in Sec. 3.13.
3.9 Blasting	**3.9.1** Detailed plans regarding drilling and blasting methods and techniques should be submitted to regulatory agencies for approval prior to any use of explosives.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.9 Blasting (cont'd)	**3.9.2** The location of sensitive areas, human population centers, wildlife populations, natural scenic areas, wells, water impoundments, and stream channels should be known prior to the commencement of blasting. Adequate measures should be taken to prevent blast side effects at such sites. **3.9.3** Blasting within 400 m (1312 feet) of a water body should not be permitted without the specific approval of the appropriate agency. **3.9.4** Before any blasting takes place in any water body supporting a wildlife population, regulatory agencies should be notified so that any such population may be relocated or harvested. **3.9.5** Millisecond delays should be used to decrease the vibration level of the blasting. In addition, the number of holes per shot should be limited, using millisecond delays in series to minimize concussion and noise. **3.9.6** Only authorized personnel should be permitted to use explosives. Such personnel should be aware of the environmental problems and the mitigating measures associated with the use of explosives. **3.9.7** The pattern, depth, size, and loading of drill holes should be designed to provide retention ridges of rock when blasting along the outer edges of bench cuts. The retention ridges keep the blasted material from rolling down slopes. **3.9.8** When temperature inversions prevail, blasting should be avoided. Weather conditions can cause an increase in airborne noise. **3.9.9** Blasting should be avoided if the wind is likely to carry noise and other pollutants toward nearby residential areas or critical wildlife habitat. **3.9.10** The control of dust and other air pollutants should be made the responsibility of the contractor and may require the use of drilling apparatus equipped with dust controlling systems.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.10 Erosion Control	**3.10.1** When an area is exposed during construction, proper erosion control measures such as surface roughening, interception and diversion practices, vegetative soil stabilization, and non-vegetative soil stabilization should be used. **3.10.2** Construction should be planned and scheduled so that the amount of land exposed (and the length of time involved) is kept to a minimum. Relevant activities would include cutting and filling, grubbing, excavation and clearing. **3.10.3** Prior to construction, an erosion and sediment control plan should be prepared by trained and experience personnel, in consultation with appropriate agencies. The plan should include: a) location of critical features such as streams and groundwater recharge zones, soil type, topography, water table, and vegetative cover type; b) areas where ground cover will be altered; c) sites for borrow pits, material stockpiles and spoil areas; d) location of temporary and permanent stream crossings and areas where stream modifications such as straightening will be carried out; e) location of erosion and sediment control structures, along with pertinent design information and a description of areas to be stabilized; f) location of monitoring stations; g) procedures for maintenance of erosion and sediment control structures including plans for the disposal of materials from such structures; h) mapping of land drainage; i) mapping of streams to indicate pattern and speed of channel migration. j) scheduling for terrain disturbance and rehabilitation measures - terrain should be disturbed only when construction is to proceed at stream crossings, etc. Rehabilitation measures should be instituted immediately after the construction work has been completed.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A ACTIVITY	COLUMN B RECOMMENDED PRACTICES
3.10 Erosion Control (cont'd)	**3.10.4** Since compaction of fill is an important factor in erosion control, the upper one foot of sloped surface should be compacted to 90% of maximum density at optimum moisture as determined by the Modified Proctor test. **3.10.5** Wherever sand dune ridges are to be traversed with cuts, wind erosion problems may result. To mitigate the effects of wind erosion, the cut slope and embankment surfaces should be capped with a silt-clay material approximately 2 cm (1 inch) thick whenever possible. Where this method is not economically feasible, revegetation and mulching procedures should be investigated. **3.10.6** Grade surfaces should be roughened perpendicular to the direction of the flow of surface water in order to retard runoff and enhance infilitration. Discing and light scarification will accomplish this. **3.10.7** When top dressing is applied to slopes, it is essential that the dressing soil be bonded to the existing soil in order to prevent slippage. This can be accomplished by roughening the slope before the top dressing is applied. **3.10.8** Slopes greater than approximately 35° should not be used because of vegetative, soil stability and maintenance problems. As a general rule, slopes with a gradient no greater than 33° may be considered if the soil is not highly erodible and there is adequate moisture holding capacity. However, for optimum stability slopes having a gradient below 25° are most desirable. **3.10.9** See also pertinent erosion control practices listed in Sec. 3.11 and Sec. 3.12.
3.11 Location and Construction of Desilting Basins	**3.11.1** Impoundments or diversion structures should be used to control runoff at the crossing site. They should allow the release of runoff at a controlled rate, so as not to exceed the natural flow in the stream, and at the same time trap sediment. **3.11.2** Surface and subsurface investigations (soil tests, stability analyses, infiltration characteristics, local groundwater uses, runoff computation, and peak flows) should be carried out before the size and location of a desilting basin is decided upon.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.11 Location and Construction of Desilting Basins (cont'd)	**3.11.3** The basin should be ready for use when construction begins. **3.11.4** Inflow channels and the basin itself should be of sufficient capacity to pass the design flood (1 in 50 year occurrence) without overflow. Protection against scour can be achieved by avoiding excessive gradients for inflow or outflow structures and by providing energy dissipators (such as riprap) when necessary. **3.11.5** The basin should be located as close as possible to the proposed construction area to reduce the need for long transmission channels. **3.11.6** The entrance to the outlet channel should be baffled to prevent floating debris from entering the channel. Accumulated debris should be removed periodically. A landfill site may be required to ensure that this material does not enter water and does not litter the area. **3.11.7** The outlet from the basin should be provided with weirs to provide adequate water quality control through extended retention periods. Outflow levels should be regulated. **3.11.8** Where the outlet channel enters a watercourse, outflow levels should be regulated to ensure that local scouring or turbidity generation does not occur. **3.11.9** Various types of material may be used in sediment retention structures where runoff is small. At inlets to storm sewers and in ditches, material such as straw bales, sandbags, and crushed stone may be used. Filter strips consisting of thick growing grasses can also be used around storm drains to retard flow and filter out sediment. **3.11.10** Dyke construction should be closely supervised to ensure the proper selection and placement of fill material as well as its correct moisture content and compaction. Organic material such as peat, silt, grass or wood should not be incorporated into the embankment.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.11 Location and Construction of Desilting Basins (cont'd)	**3.11.11** All topsoil should be removed and a proper foundation prepared before placing the fill. Selection should be such that the most impervious material is placed in the centre of the embankment. **3.11.12** Topsoil material stockpiled for later use should be protected against erosion. **3.11.13** The inlet structures leading to the basin should be protected against erosion and, when necessary, incoming velocities should be reduced to protect the basin from scour. **3.11.14** When the inflow contains large amounts of colloidal material, chemical treatment (e.g. flocculation) may be required. **3.11.15** The rate and volume of discharge to a watercourse should not cause the watercourse to exceed its maximum carrying capacity. **3.11.16** The quality of the effluent from the desilting basin should not adversely affect local fish populations or their habitat. Sanitary, domestic and industrial wastes should not be permitted to enter the basin or its channels.
3.12 Ditch Construction and Installation of Culverts and Bridges	**3.12.1** Scour erosion in roadway ditches is dependent upon numerous factors including discharge, channel gradient, sediment in water, soil characteristics such as grain size, density, organic binder, cementation and ice content. Methods used in road construction to control or prevent scour erosion include the following: a) blanketing ditch floors with stable, free-draining granular materials; b) reducing the effective ditch gradient by constructing a series of properly spaced ditch checks on the ditch floor; c) diverting runoff water out of the ditch onto natural vegetation by using ditch blocks.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.12 Ditch Construction and Installation of Culverts and Bridges (cont'd)	**3.12.2** Cross-drainage and groundwater seepage areas should be avoided where possible because they often produce icing and surface water problems. **3.12.3** All cross-drainage structures should be sized from accurate topographical information and knowledge of runoff potential, storm frequencies and intensities. **3.12.4** Roads located across deep ravines or gullies usually require deep fills. Culverts should be placed to maintain drainage. **3.12.5** Where surface drainage is collected on slopes, appropriate structures (e.g. chute or pipe) should be provided to prevent erosion of the slope by runoff water. **3.12.6** When bridge or culvert construction is underway, no more than 1/3 of the stream width should be blocked. **3.12.7** Culverts should be installed on the natural stream gradient (not horizontally) and inverts should be installed below the natural stream bottom. **3.12.8** Excavation for piers, footings and abutments should be conducted to keep the work area separated from the flowing stream. **3.12.9** Waterway banks should be stabilized at crossings, outfalls, and along man-made channels. Flexible revetments, such as stone riprap and gabions, at a slope of 33° are satisfactory. In most cases deflection structures consisting of stone, concrete or wood can also be used. Such structures should be stationed in the waterway at an outward angle to deflect the current away from the critical area of the streambank. **3.12.10** For minor waterways that only flow during periods of precipation, vegetation should be used for channel lining. As a guide, seeding should only be done in waterways where the design velocity is 1.2 m/s (4 fps) or less, while sodding is recommended where velocities approach 2.1 m/s (7 fps). It should be noted, however, that these limits are only for erosion resistant soils. When higher scouring velocities are encountered, channel linings of rock, concrete or ashalt should be used.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.12 Ditch Construction and Installation of Culverts and Bridges (cont'd)	**3.12.11** Alignments should be chosen such than routes do not parallel closely to streams and such that stream crossings are minimized. **3.12.12** Stream crossings should not be located where banks are actively eroding; they should be located at the narrowest points having stable banks. Low banks are also preferred to lessen the size of cuts. **3.12.13** In-stream construction should be scheduled to avoid periods of fish migration. **3.12.14** Roads which cross deep ravines or gullies usually require deep fills. Culverts should be placed to maintain drainage and to protect fishery resources. **3.12.15** Whenever possible, watercourses should be crossed at right angles and well down stream from fish spawning/nursery areas. Consultation with fisheries staff well in advance of such operations is essential. **3.12.16** Vegetation removal along stream banks could increase stream temperature and streambank erosion. Such removal also reduces friction of water flows so that channel resistance to flood flow is reduced. Streambank vegetation should be retained wherever possible; where it is removed, the stripped bank should be protected from erosion. **3.12.17** Icing and drainage problems can best be avoided if stream crossing structures are designed on the basis of hydrological data demonstrably relevant to the proposed area of operations. The value of such data increases as the number of years over which it is gathered increases. **3.12.18** At locations of existing and potential fisheries resources, consideration should be given to the following: a) Bridge crossings should be considered as an alternative to culvert crossings. b) Culverts should have sufficient capacity to ensure that ponding does not occur at the upstream end of

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.12 Ditch Construction and Installation of Culverts and Bridges (cont'd)	the culvert. Backwater effects should be kept to a minimum. Culverts should be designed to prevent the occurrence of drop-falls. c) Culverts should be designed such that the average cross-sectional velocity through any culvert section does not exceed 0.9 m/s (3 fps) during fish migration periods, unless it can be satisfactorily demonstrated that the culvert design includes a selected region wherein velocities are low enough to permit fish passage. This selected region should be continuous throughout the culvert length and of sufficient size to permit the fish to locate it and to swim through it. Culvert inverts should be placed below the river bed level to maintain flow at a natural gradient. The culvert gradient should be equivalent to the natural stream or river gradient. The facility should be designed to minimize streambank erosion and downstream siltation. **3.12.19** Gravel and fill should not be removed from any active stream channel or flood plain unless a permit has been obtained from the appropriate provincial/territorial authorities. **3.12.20** Original stream flow regimes should be followed as closely as possible when designing diversion structures. **3.12.21** The diversion structure should not impede fish migration and should not block more than one-third of the active stream channel at one time. **3.12.22** Plans for diversion structure construction should include measures that will protect the stream from siltation. **3.12.23** Where a dyke or cofferdam is used to divert stream flow from instream construction, a sheet metal cofferdam (bottom conditions permitting) may prove more effective than an earthfill structure. **3.12.24** River diversions should not block existing channels such that fish become trapped.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.12 Ditch Construction and Installation of Culverts and Bridges (cont'd)	**3.12.25** Where a river diversion results in increased flow in the downstream channel, then the downstream channel should be protected from bottom scouring and bank erosion. **3.12.26** Work on or near navigable waters should not obstruct vessel traffic. **3.12.27** The working site at the crossing should be protected by riprap. **3.12.28** Pipe or cable placed beneath river beds should be covered with backfill material similar to the dredged material. This fill should not be taken from elsewhere in the streambed nor should it contain debris. The section above the low water mark on each side of the river should be completely backfilled and all underwater contours re-established. **3.12.29** Any temporary stream crossings should be removed immediately after use in construction operations. **3.12.30** Construction operations in a watershed should be performed so that sediment loads, velocities, and temperatures are maintained as closely as possible to the normal conditions of the stream. **3.12.31** If toxic materials are accidentally spilled into a stream, supervisors, local regulatory agencies and the nearest EPS district or regional office (see Appendix II) should be notified immediately so that emergency cleanup operations can begin promptly. **3.12.32** Watercourses should not be crossed in the spring and fall when water levels are high; the likelihood of streambank and bottom degradation is greatest at this time of year. **3.12.33** Fish spawning and nursery areas should be protected from sediment resulting from construction activities. Sediment settling basins and other barriers should be established to prevent sediment originating at the construction site from entering water bodies.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A ACTIVITY	COLUMN B RECOMMENDED PRACTICES
3.12 Ditch Construction and Installation of Culverts and Bridges (cont'd)	**3.12.34** Construction traffic should be prohibited along streambanks. Crossing points should be clearly marked and culverts or temporary bridges should be constructed to accommodate construction traffic. A bed of stone laid across stream channels at crossing points can serve to stabilize banks and channels and reduce turbidity. Care would have to be taken to ensure that the crossings do not obstruct fish. **3.12.35** Trampling by concentrations of domestic animals is a serious factor in accelerating erosion. Easy access along rights-of-way combined with palatable browse may attract domestic animals. Thus, in critical areas, it may be necessary to erect temporary fences to secure rapid rehabilitation of sites. **3.12.36** Where stream, creek, or river crossings are encountered, construction equipment should use existing bridges, temporary bridges, or established crossings. **3.12.37** Work vehicles and other construction equipment should be restricted to the area of operations (e.g. rights-of-way, access roads, work camps, etc.). **3.12.38** Mobile ground equipment should be kept out of all watercourses except for crossings within the right-of-way limits, and then only in a manner that minimizes disturbance.
3.13 Trenching in a Watercourse	**3.13.1** In order to minimize siltation and possible smothering of spawning areas, proper trenching procedures should be followed. **3.13.2** When watercourses must be crossed by trenching, do so at right angles and at a time of year when the resident fish are not migrating. The trench crossings should not be planned within 450 m (1476 feet) of river mouths, lake outlets or known spawning grounds. **3.13.3** Watercourses should not be crossed when water levels are high (normally in the spring); the likelihood of stream bank and bed degradation is highest at this time of year.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.13 Trenching in a Watercourse (cont'd)	**3.13.4** Excavation of the trench across a river channel should be scheduled for rapid completion to reduce sedimentation problems. The following precautions are recommended: a) Assemble all materials and equipment on shore before any excavation begins in the river channel. b) Install the pipe immediately after the trench has been excavated. c) Excavations on land should terminate at least 15 m (49 feet) from water crossings leaving an adequate plug of undisturbed material at each bank. Plugs should be left in place to contain sediment until the excavation in the streambed is completed and should not be removed until absolutely necessary. d) Stockpile dredging spoil on river banks within dyked areas to prevent sediment from washing back into the river. e) Pump particularly silty water from the trench into an upland area well back from the river bank. f) Use an impervious clay plug around the pipe to avoid sluicing of backfill material; slope river banks to natural contours after the pipe is installed using rip-rap if erosion is a problem; above the rip-rap, terrace the river bank in a natural gradient and sod one of the terraces to catch surface runoff and prevent sediment from entering the watercourse. g) Revegetate disturbed approaches.
3.14 Controlling Hunting and Fishing	**3.14.1** To discourage indiscriminent hunting, capturing, or disturbance of animals, birds, or fish by clearing and construction personnel the proponent should: a) Prohibit the use of any ground vehicles, aircraft, or water vehicles for hunting, fishing or trapping. b) Control firearms issued to security and safety staff and keep a record of time, location and purpose of discharge of any firearm. **3.14.2** Temporary rules regarding hunting and fishing for the period of construction should be made in consultation with the appropriate provincial or territorial fish and wildlife agency.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.15 Snow Road Construction	**3.15.1** Snow clearing and snow road construction equipment should be tracked, gross weight should not exceed 11,000 kg (25,000 lbs) and ground pressure should not exceed 55 kPa (8 psi). **3.15.2** Snow roads should be constructed and maintained utilizing snow only from pre-cleared rights-of-way. Transport vehicles required for access to emergency snow sources outside pre-cleared rights-of-way should not exert ground pressures in excess of 28 kPa (4 psi). **3.15.3** Ice bridges should be located so as to minimize approach grades. River and stream banks should not be cut. **3.15.4** Temporary crossings should be constructed of compacted snow and ice whenever possible. The use of limbed logs as reinforcement material should be limited. Brush, dirt or other debris should not be included. All temporary structures should be removed and the area restored to its natural condition upon completion of the work and before spring break up. **3.15.5** Snow or ice stream crossings should be constructed so as not to interfere with, or impede, winter flows in any river or stream.
3.16 Establishment and Management of Work Camps	**3.16.1** The construction manager should have a knowledge of pollution control practices applicable to workcamp construction, as well as a knowledge of pertinent laws, ordinances, and regulations. **3.16.2** Clearing and grubbing should be carried out so as to minimize environmental disruption. **3.16.3** Where practicable, topsoil from excavated sections should be stockpiled for subsequent use during revegetation. Stockpiles should not be placed in areas of active or potential waterflow. **3.16.4** Grading should be conducted so as to minimize erosion and should conform to the natural topography.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.16 Establishment and Management of Work Camps (cont'd)	**3.16.5** The construction manager should prepare fire contingency plans to detect and control fires resulting from construction activities. The plans should provide for the placement of the necessary equipment caches and the availability of properly trained personnel for fire-fighting. **3.16.6** Area-wide pest control should be avoided; such practice frequently leads to ecological imbalances. Pesticides should be limited to non-persistent types. When pesticides are used, only those approved by regulatory agencies should be used. The procedures to be used should also be approved. Recommended application methods and amounts should be strictly followed. **3.16.7** Silenced equipment and low-noise practices should be used wherever possible. **3.16.8** Care should be taken in selecting water bodies for water supplies. In general, small water bodies (particularly those known to contain fish) should be avoided.
3.17 Handling of Fuel and Hazardous Materials	**3.17.1** Dangerous goods or materials whose release into the environment could cause adverse effects should be stored and handled in a manner which gives due regard to the security and safety of both the material and the personnel working with them. **3.17.2** Pipelines should be clearly marked by lettering (coded or otherwise), to indicate the product being transferred. The coding should conform to federal and provincial requirements. **3.17.3** Buried installations should be cathodically protected if soil conditions warrant. A section of the line should be accessible and inspected annually. **3.17.4** All above-ground valves and pipelines should be subjected to a regular monthly inspection at which time the general condition of items, such as flange joints, valve glands and bodies, catch trays, pipeline supports, locking of valves and metal surfaces, should be assessed.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A ACTIVITY	COLUMN B RECOMMENDED PRACTICES
3.17 Handling of Fuel and Hazardous Materials (cont'd)	**3.17.5** The above-ground portions of any pipeline should be clearly marked in order to prevent damage to the system. Consideration should be given to protective measures such as fencing. **3.17.6** No material toxic to fish or any aquatic life should be permitted to enter any stream, river, or lake. This should include, but not be limited to lubricants, fuels, testing fluids, insecticides, detergents, herbicides, cement, lime and concrete. If a spill of toxic materials should occur, supervisors and the local regulatory agency should be informed immediately so that cleaning operations can begin promptly. **3.17.7** For additional practices, see Section 7, Waste Disposal and Recovery.
3.18 Air and Noise Pollution Control	**3.18.1** Internal combustion engines, heavy earth moving equipment, generators, air compressors, cranes and other equipment should be fitted with mufflers to reduce noise levels to acceptable levels. **3.18.2** The level of noxious fumes, odors and smoke pollution at consturction sites should be minimized or eliminated where possible to comply with local, provincial and federal air pollution regulations. The use of efficient equipment, adherence to established operating procedures and maintenance of proper engine adjustments will reduce exhaust emissions. **3.18.3** Project personnel and nearby residents should be protected from the health hazard and nuisance of dust by applying water to unpaved roads, using wood chips in heavy traffic areas, etc. Streams known to contain sport fish should not be used as a water supply for dust control operations. Permanent weirs should not be constructed on streams in order to obtain water for dust control operations. Small holes, rather than weirs should be used to obtain water from shallow streams.
3.19 Revegetation	**3.19.1** Vegetation design considerations are just as important as those for structural design. Erosion and sedimentation hazards can be minimized on construction sites by the proper integration of vegetation stabilization practices and mechanical structures.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.19 Revegetation (cont'd)	**3.19.2** When selecting plant materials to stabilize soils on construction sites, the following criteria should be considered: a) high degree of resistance to heat, cold, insects and diseases, b) potential for a rapidly proliferating root system, c) capacity for low, compact growth, d) potential for nitrogen fixation by root system, e) low maintenance requirements, f) high drought resistance, g) responsiveness to fertilizers, h) attractiveness to wildlife, i) successful local plant species. **3.19.3** Soil analysis should be conducted for pH, phosphorus, potassium, nitrogen, and other plant nutrients to establish the correct amount and frequency of application of commercial fertilizers and limestone for successful plant growth. Soil samples should be tested for the physical factors which limit plant growth. These include but are not limited to, available soil moisture, soil texture, porosity, aeration, slope angle, exposure and soil temperature. **3.19.4** Where seed or imported stock is used in the revegetation plan, it should be free of parasites, disease and insects and should not be treated with pesticides, fungicides or any other biotoxin. The object is to avoid poisoning wildlife. **3.19.5** Plant species and varieties which are not native to the area should not be used if they are noxious, harmful to wildlife, or liable to invade adjoining ecosystems. **3.19.6** Revegetation should be initiated as soon as possible after construction operations have been completed. A quick growing, herbaceous cover may be used in conjunction with the planting of shrubs and trees to obtain maximum site protection. **3.19.7** Consideration should be given to the establishment of native vegetation of value as food and cover for wildlife. **3.19.8** Seeding and planting should generally be conducted as early as possible in the first growing season.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
3.19 Revegetation (cont'd)	**3.19.9** Seeding from aircraft should be scheduled and conducted to avoid disturbing wildlife. **3.19.10** Mulching should be carried out when critical erosion problems are encountered. Mulches such as hay and straw serve to enhance seed germination. Preference should be given to lightly applied wood chips where disposal of unsalvageable wood presents a problem. In most cases, the mulches should be secured so that they will not be washed or blown away. For steep slopes, netting should be used to secure the mulch. **3.19.11** For slopes which may be highly unstable, even when covered with mulch or wood chips, sodding may be useful in the prevention of excess slumping, erosion or sedimentation (although overloading with sod may increase the likelihood of slumping). **3.19.12** Procedures and devices which are designed to discourage wildlife from hampering revegetation efforts should not prevent normal migrations of wildlife and should not present a risk to the life or the health of wildlife. **3.19.13** Fertilizers and growth hormones should not be stored where they could accidently contaminate a water body. They should be stored in permanent, fenced installations, disposed of by incineration, deposited in a sanitary landfill, or transported out of the area.

4 OPERATION AND MAINTENANCE

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
4.1 Erosion	**4.1.1** All erosion prone cuts and fills should be covered with vegetation or some other stabilizing material. **4.1.2** Loessial soils should be allowed to come to stability by letting the slopes become nearly vertical; this is the most stable slope for these materials. Under such conditions, drainage should be provided and maintained to prevent water from running over the upper edge of the cut bank. **4.1.3** Monitoring stations should be established to measure flow, turbidity and sediment load in areas where erosion or sedimentation could endanger stream life. **4.1.4** To ensure that erosion and sediment control measures are effective, monitoring stations should be established to measure flow, dissolved oxygen, temperature, turbidity and sediment load. **4.1.5** Maintenance inspection intervals should be established so that routine maintenance occurs when roads are firm, dry or frozen.
4.2 Revegetation	**4.2.1** The revegetation program should be evaluated by qualified personnel at least once every two months during the first two growing seasons; recommendations should be implemented. **4.2.2** Care should be taken in the disposal of wastes (e.g. petroleum seepage should be avoided, especially into highly permeable soils, wetlands and natural drainage systems). **4.2.3** Special care should be taken not to disturb stabilized slopes with maintenance equipment. Vegetation mowing equipment should be selected according to terrain conditions, type of vegetation and intensity of management. The mowed area should not exceed 12-15 feet in width except at bends in the road. Mowing should not be permitted within 10 meters (30 feet) of any stream lake or wetland. Road graders should not be used for vegetation maintenance clearing.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
4.2 Revegetation (cont'd)	**4.2.4** Service roads should be maintained with native grass cover and properly sloped to prevent soil erosion. If use by recreational vehicles is excessive (i.e. results in extensive erosion problems), then the road should be gated. **4.2.5** The maintenance of an effective roadside turf will require adequate fertilization. A fertilization program should be developed on the basis of a comprehensive study by a qualified professional agronomist. **4.2.6** Herbicide spraying should be selective and should be used only where it will have acceptable ecological and aesthetic consequences. Provincial regulatory agencies should be contacted. **4.2.7** The ultimate condition desired on most transmission line rights-of-way is a stabilized, low-growing plant community. Shrubs should be maintained (where possible). They provide a greater variety of food and cover for wildlife than grass. **4.2.8** Native vegetation which is of value to fish and wildlife and which is non-hazardous to the transmission line should be allowed to grow on the right-of-way. **4.2.9** Native grass cover should be maintained in areas immediately adjacent to transmission towers. **4.2.10** Native trees, shrubs, herbs and grass should be allowed to grow at acceptable distances from transmission facilities. **4.2.11** Herbicides should be applied selectively and in a manner consistent with the protection of fish, wildlife and desirable indigenous vegetation. **4.2.12** Mechanical equipment should be considered as an alternative to herbicides for brush control.
4.3 Borrow Pit Maintenance	**4.3.1** Borrow pit excavations should be such that interference with the flow, direction, level and quality of groundwater is minimized.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
	ACTIVITY	RECOMMENDED PRACTICES
4.3	**Borrow Pit Maintenance (cont'd)**	**4.3.2** Aggregate borrow sites should not be used for servicing vehicles for sanitary landfill or for stockpiling material (other than aggregate and overburden). **4.3.3** If quarrying is included in the borrow operation then the crushing operation should be subjected to local stipulations and regulations regarding air pollutants, noise and washing of wastes. **4.3.4** Stripping should be limited to those sections of the borrow pit which are needed to supply current fill requirements. **4.3.5** The topsoil from borrow areas should be stripped and stockpiled for later redistribution on the disturbed area. The stockpiles should be located on the uphill side of the excavated area wherever possible so that they can act as surface runoff diversions. The borrow area should then be shaped, covered with topsoil and seeded. No slope should exceed 25°. **4.3.6** Borrow areas used for construction, should later be used for road maintenance. New borrow areas should not be developed unless absolutely necessary.
4.4	**Ditch, Sediment Basin and Culvert Maintenance**	**4.4.1** Sediment basins should be emptied when half to two thirds full. **4.4.2** Material cleared from ditches and basins should not be deposited in areas where it can wash into watercourses. **4.4.3** Ridges should not be left on the edge of the roadway. Such ridges act as berms and prevent lateral drainage. **4.4.4** De-icing measures should adhere to local and provincial regulations. **4.4.5** Culverts should be checked for obstruction by debris or the accumulation of sediment. **4.4.6** Measures to control icing include: a) steaming, draping the entrances of culverts with hessian cloth, blasting, grading, and fire pots;

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
	ACTIVITY	RECOMMENDED PRACTICES
4.4	**Ditch, Sediment Basin and Culvert Maintenance (cont'd)**	b) underdrains can be constructed to prevent seepage from coming to the surface; French drains and stepped culverts can be installed to prevent icing; freezing belts can be located above the road by keeping the ground cleared of snow, to allow the frost to penetrate down and eventually block the flow (care should be taken, however, not to severely damage the vegetation mat over sensitive terrain); ponding areas created upslope from the drainage structures by dyking or ditching will create icing conditions away from the highway.
4.5	**Blasting**	**4.5.1** Once drilling and blasting operations have been completed, mitigating measures should be taken to guard against wind and water erosion, sediment transport and water pollution from runoff. **4.5.2** No drilling and blasting should proceed without the assurance of immediate follow-up by excavation and construction crews.
4.6	**Traffic Control, Winter Maintenance, and Inspections**	**4.6.1** Speed limits should be reduced on any road when caribou or other migratory animals are crossing or travelling along such a road. **4.6.2** During the inspection process, whether by aircraft or land vehicles, special care should be exercised so as not to disturb wildlife. Consultation with local fish and wildlife agencies is encouraged. **4.6.3** Care should be taken to ensure that snow banks and snow fences do not act to block wildlife movements, especially caribou. Snow banks and fences should be discontinuous.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

5 ABANDONMENT

COLUMN A ACTIVITY	COLUMN B RECOMMENDED PRACTICES
5.1 General	**5.1.1** Remove construction facilities, structures, materials and debris and restore the land to an approximation of its preconstruction condition. **5.1.2** If possible, overburden and other materials removed during construction operations should be reused in the restoration operation. **5.1.3** The entrance to access roads should be closed to prevent public vehicular use. **5.1.4** Replacement of earth adjacent to water crossings should be at slopes less than the normal angle of repose for the soil type involved. Sodding or seeding should be accomplished without undue delay.
5.2 Cut and Fill	**5.2.1** All cut and fill slopes should be left in a stable condition. **5.2.2** Scars, cuts, fills, or other aesthetically degraded areas should be seeded or planted as soon as possible to reduce erosion, improve the area aesthetically and provide food and cover for wildlife. **5.2.3** Soil which has been excavated during construction and left unused should be spread evenly over the cleared area or else removed from the site. The soil should be graded to conform with the local topography. Topsoil should be spread over the cleared area and appropriate vegetation planted and fertilized.
5.3 Borrow Pit	**5.3.1** Borrow stockpile and spoil areas should be stabilized. **5.3.2** Runoff should be diverted away from exposed areas during the excavation process. Channels should then be used to convey the runoff to areas which are much less erosion prone. **5.3.3** Erosion in borrow areas may be controlled with dykes, diversions and slope drains.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
ACTIVITY		RECOMMENDED PRACTICES
5.3	**Borrow Pit (cont'd)**	**5.3.4** Regrading should be carried out so that the disturbed area conforms with the local topography and is properly drained. Stockpiled topsoil should then be spread evenly over the area and a permanent vegetative cover established.
5.4	**Workcamp Abandonment**	**5.4.1** After construction is completed, temporary buildings, equipment, lumber, refuse, surplus materials, fencing and other such items should be removed; drainage deficiencies should be corrected, and all excavated areas (with the exception of gravel covered sites in permafrost) should be revegetated.
5.5	**Erosion Control**	**5.5.1** Temporary erosion or drainage control structures should be removed when no longer needed.
5.6	**Transmission Line Abandonment**	**5.6.1** All transmission towers, line, fencing, ancillary buildings and debris should be removed and the sites should be restored to near natural condition. **5.6.2** Oils from transformers and large capacitors may contain polychlorinated biphenyls (PCBs). They should be segregated from regular waste oils and disposed of after consultation with the regional office of EPS and Provincial environment departments (see Section 9).
5.7	**Handling of Fuel and Hazardous Materials**	**5.7.1** Dangerous goods should be removed from the site after consultation with the appropriate regulatory agency. When equipment is no longer required, it should be properly decontaminated and removed. **5.7.2** Contaminated soil and containment structures should be decontaminated or disposed of in an acceptable manner. **5.7.3** The entire area should be revegetated (preferably with native species) and returned to a grade which is compatible with the surrounding area. **5.7.4** Pipe sections and valves that are not buried and are not in water should be removed. Buried pipe sections should not be removed and should be properly marked after pipeline deactivation.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
ACTIVITY		RECOMMENDED PRACTICES
5.7	**Handling of Fuel and Hazardous Materials (cont'd)**	**5.7.5** For additional practices see Section 7, Waste Disposal and Recovery.
5.8	**Culvert Abandonment**	**5.8.1** All culverts on abandoned roads should be removed and the streams restored to near-natural conditions. Stream banks should be stabilized. (see Sec. 4.1, 4.2).

6 PERMAFROST CONSTRUCTION

COLUMN A ACTIVITY	COLUMN B RECOMMENDED PRACTICES
6.1 General	**6.1.1** Obvious problem areas can be avoided when selecting the construction site by favouring ridges and other relatively dry areas. **6.1.2** Extensive muskeg areas (e.g. palsa and peat plateaus) should be avoided when practicable. Drainage is poor and bearing capacities are low in such areas. **6.1.3** Ice rich soils should be avoided (patterned ground, and the presence of thermokarst terrain indicate the presence of ice rich soils). Poorly drained low ground is also usually ice rich. South facing slopes on the other hand, may be free of frost. **6.1.4** Vegetative cover should not be unnecessarily breached when working in permafrost areas. This would include areas immediately adjacent to the construction site. In the case of road construction, it means placing fill directly on top of undisturbed vegetation (when permafrost is continuous and in ice rich areas).
6.2 Road and Airstrip Construction	**6.2.1** All roads (winter or snow roads excepted) should be constructed using either granular fills or a combination of insulating materials and granular fills. The fills should be of sufficient thickness to minimize disturbance to the existing thermal regime and should be designed to withstand the design load. **6.2.2** Roads should be designed to minimize cuts in ice rich terrain. **6.2.3** Allowance should be made for soil consolidation if frozen material is placed in an embankment. The original embankment should be above the designed grade to allow for subsequent settling when the material thaws and consolidates. **6.2.4** The use of frozen high ice content silts and clays in the core of large embankments should be practiced only in areas located north of the Arctic Circle. These materials should be totally capped and enclosed with a better quality material so as to prevent the escape of any silts and clays into adjacent drainage systems.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
ACTIVITY		RECOMMENDED PRACTICES
6.2	**Road and Airstrip Construction (cont'd)**	**6.2.5** Depressions contiguous to the road between cross drainage culverts should be filled to prevent standing water from thawing permafrost and weakening road shoulders.
6.3	**Workcamp Construction**	**6.3.1** Workcamps should be constructed on a gravel pad when sited in ice-rich soil areas. **6.3.2** Construction workers should be briefed on the environmental problems associated with construction in permafrost areas. **6.3.3** Utilidor systems should be designed to follow existing transportation or utility corridors. **6.3.4** Utilidor systems should be clearly marked. **6.3.5** Utilidor systems should be designed not to intercept drifting snow in significant quantities. **6.3.6** Heat from the generation of electrical power may be utilized to maintain liquid flow within utilidors. **6.3.7** Construction should be scheduled to minimize terrain damage and adverse impacts on natural drainage systems and wildlife.
6.4	**Site Clearing**	**6.4.1** Machine clearing should not commence until frost has penetrated the active layer to a minimum depth of 20 cm (8 inches) and it should be scheduled for completion by the end of February. Clearing thereafter may proceed on a day-to-day basis but should halt when the active layer thaws. **6.4.2** Clearing should not be undertaken too far in advance of construction, in sensitive terrain. **6.4.3** All stream and river approaches and slopes with unstable or ice rich soils should be hand cleared. **6.4.4** All bulldozer blades should be equipped with skid shoes.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
6.4 Site Clearing (cont'd)	**6.4.5** When approval is given for clearing well in advance of construction, the following stipulations should apply: a) sensitive slopes in excess of 10% should not be cleared; b) stream banks and approaches to streams should not be cleared; c) ice-rich areas should not be cleared; d) only traffic directly related to clearing operations should be allowed to use access roads; e) terrain disturbance (e.g. removal of the organic mat or leveling of hummocks) should not be allowed in environmentally sensitive areas. **6.4.6** Slash and unmarketable timber may be disposed of by burning or chipping. Trees and brush may be placed across the centerline and later covered by road bed material when permanent or summer roads are to be built. **6.4.7** Slash should be burned on sleds or rafts designed for that purpose. Alternatively, rock surfaces can be used (such that subsidence due to thawing will not occur). Slash should not be burned when approval has not been obtained from local regulatory authorities, when the risk of starting a forest fire is significant, when wind conditions are poor, when nearby communities may be threatened or when sensitive areas may be damaged or destroyed. **6.4.8** Burning should not take place within 200 m (656 feet) of any stream, river or lake unless sleds or rafts are used and the danger of contamination is minimal. **6.4.9** Burned material and ashes should be completely cooled before disposal in order to prevent permafrost degradation and ground fires.
6.5 Ditching	**6.5.1** Ditching should be avoided in permafrost areas whenever possible.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
6.5 Ditching (cont'd)	**6.5.2** When ditching is needed in a permafrost area (e.g. to eliminate a ponding problem), the following guidelines should be followed: a) If soil materials are stable both during and after thaw, then ditching should be carried out in the conventional manner. b) If soil materials are unstable, then the use of narrow, vertical sided ditches should be considered. c) Because of the general susceptibility of permafrost materials to erosion when thawed or thawing, the gradient of any necessary ditches should be kept as flat as possible. Where a gradient is unavoidably steeper than that considered safe for the material in question, or where there is a likelihood of uncontrolled thermal and hydraulic erosion, then the ditch should be lined with an erosion resistant material.
6.6 Excavation	**6.6.1** Vertical cuts should be used when it becomes necessary to excavate soil with high ice content. **6.6.2** Ice waste piles should be compact and covered with some form of insulating material; otherwise, mud flows may result and impacts on adjacent streams may follow. **6.6.3** Conventional sloping techniques can be used when excavating permafrost areas when the materials are stable during and after thaw.
6.7 Cut and Fill	**6.7.1** Although cut and fill balancing is the most economical method of road construction, the presence of permafrost may dictate placing fill directly over undisturbed vegetation. Fill of sufficient depth to prevent or retard melting would be required. **6.7.2** The road should be located to avoid steep gradients (i.e. to avoid deep cuts which could lead to slumping). **6.7.3** When cuts are absolutely required in ice rich soils, the back slopes should be vertical. A wide ditch should be provided to allow for removal of the material which will eventually subside after thawing has commenced. Brush and trees should be hand cleared from the top of the slope back to a distance

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
	ACTIVITY	RECOMMENDED PRACTICES
6.7	**Cut and Fill (cont'd)**	equal to one and a half times the depth of the cut. This will allow the top mat to subside with the soil without becoming detached. The mat will retard the rate of thaw and a new stable thermal regime will become more quickly established. When vertical slopes are planned, slope stabilization should be considered. **6.7.4** The subgrade in the cut should be sub-excavated and backfilled with stable free-draining granular materials to provide an insulating cover for the frozen materials underneath. The use of wood chips or manufactured insulation should also be considered for improved insultating capabilities. The depth to which excavation and backfill should take place at any particular location should be determined on the basis of the anticipated success of the insulating effort as well as the ice content and soil characteristics of the subgrade.
6.8	**Sewage Lagoon Location and Construction**	**6.8.1** In permafrost areas, the lagoon should be sited in a flat, low area or in a natural depression where no significant surface or subsurface drainage systems will be affected. **6.8.2** Core samples should be taken under the proposed lagoon site in order to determine whether problems with ice rich soils, massive ice or permafrost are likely. **6.8.3** Berm designs should contain features which will tend to raise the permafrost level underneath the berm. This will reduce slumping and erosion problems. **6.8.4** Lagoon effluent should be diverted to existing drainage channels or to ditches in unsaturated soils which are free of massive ice deposits. **6.8.5** Lagoons and berms should be constructed in the late fall to avoid thermokarst problems. Insultating soils or artificial insulating layers should be used to preserve the frozen foundation.
6.9	**Abandonment and Deactivation**	**6.9.1** Wheeled and tracked vehicles in permafrost areas should be restricted to the right-of-way.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
	ACTIVITY	RECOMMENDED PRACTICES
6.9	**Abandonment and Deactivation (cont'd)**	**6.9.2** When a site is abandoned, all equipment, fixtures and litter should be removed and all disturbed terrain restored and revegetated.

7 WASTE DISPOSAL AND RECOVERY

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
7.1 General	**7.1.1** Volume, type, ease of removal and variability in composition of waste should be considered in establishing a management policy for disposal or recovery of waste materials generated during construction activities. In determining procedures to be used for the handling and disposal of hazardous or toxic substances, one should be aware that these materials may be more hazardous in combination than alone; for example, oxidizing materials may be more dangerous if mixed with organic materials. **7.1.2** No material toxic to fish or any aquatic life should be discharged into, or be permitted to enter, any stream, river, or lake. This should include, but not be limited to, lubricants, fuels, testing fluids, insecticides, detergents, herbicides, cement, lime and concrete. **7.1.3** Slash and flammable debris should be incinerated and the resultant ash disposed of in the proper manner. A disposal method other than burning should be used in populated areas where air pollution and fly ash could cause disturbance. **7.1.4** All domestic solid wastes generated in camp operations should be collected on a daily basis, or more often as required, and stored in approved storage areas. **7.1.5** All trash should be either baled for storage or placed in storage compounds. The compounds should be designed to prevent trash from being blown away by the wind. **7.1.6** Storage areas for wastes (other than areas for storage of waste in sealed containers) should be located a minimum of 45 m (150 feet) from any kitchen or living quarter, unless such storage is within a combustion incinerator. **7.1.7** All waste storage areas should be enclosed with a fence of a type proven effective against bears, foxes, wolves, wolverines, etc.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
ACTIVITY		RECOMMENDED PRACTICES
7.1	**General (cont'd)**	**7.1.8** Sanitary landfill sites may be used to dispose of those wastes which when buried do not adversely affect ground water quality. **7.1.9** Incinerators should be used with caution to prevent forest and tundra fires. **7.1.10** All non-flammable wastes (e.g. oil drums, metal scrap, discarded equipment, etc.) should be stockpiled in enclosed storage areas and should eventually be removed from the site and disposed of in landfill sites, or else recycled. **7.1.11** Toxic or potentially toxic materials should not be disposed of in landfill sites.
7.2	**Decontamination Facilities**	**7.2.1** Drainage from personnel and equipment decontamination facilities should be collected in a seep-proof sump or storage basin. If testing reveals excess concentration, the liquid should be treated according to the disposal procedure specified for that type of material.
7.3	**Sewage Systems and Lagoons**	**7.3.1** The sewage collection system should be designed to operate under the varied climatic conditions found in Canada. **7.3.2** Below ground facilities should be designed to allow for periodic flushing, should not freeze up in winter, and should not cause subsurface soil changes which would result in system shifting and rupture. **7.3.3** A utilidor system should be considered in permafrost areas for transporting sewage to a central disposal area. **7.3.4** The sewage collection system should discharge into a sewage disposal facility which will meet applicable federal, provincial or territorial standards. **7.3.5** The lagoon should provide effective methods of wastewater disposal without creating objectionable conditions or public health hazards in the vicinity, or in the receiving watercourse.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
7.3 Sewage Systems and Lagoons (cont'd)	**7.3.6** Lagoons should have the following characteristics: they should be structurally sound and aesthetically acceptable; they should be free from objectionable odors or nuisance conditions; they should not provide a breeding ground for insects or other macro-invertebrate pests, and they should not seep into drinking water aquifers or surface streams. **7.3.7** Oil, grease, floating materials, and settleable solid levels in the effluent should meet applicable effluent standards. **7.3.8** Lagoon effluent should be diverted into existing drainage channels or into ditches in unsaturated soils; the soils should be free of ice deposits. **7.3.9** The operation of the wastewater treatment disposal facilities should be carried out by personnel who have successfully completed training in an approved wastewater treatment plant operators course. **7.3.10** Effluent quality should be monitored by the operator of the wastewater treatment facilities. Monthly composite samples of the effluent should be obtained and analyzed for BOD, suspended solids and total coliform content. **7.3.11** Sanitary waste disposal facilities and lagoons should be operated after abandonment until water quality is sufficient to allow the discharge of lagoon contents into the receiving stream. The lagoons should then be filled and compacted.
7.4 Sewage Discharge	**7.4.1** This disposal method should only be used for wastes proven to have no detrimental effect on biological treatment systems. In some cases, biodegradation of these compounds only takes place after a considerable initial time lag. These compounds should be bled into the sewer slowly (over days or weeks) and only on approval of the sewage treatment facility authority. **7.4.2** If sewers are in the area, municipal waste treatment personnel should be advised of the possibility of materials draining into sewers either directly or via runoff water.

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A	COLUMN B
ACTIVITY	RECOMMENDED PRACTICES
7.5 Landfill	**7.5.1** Sanitary landfills should be established only where geological and hydrological conditions are such that the possibility of contamination beyond the proposed landfill area is negligible.
7.6 Pesticides	**7.6.1** Disposal of waste pesticides and pesticde containers poses a potentially serious environmental hazard. Where possible, waste pesticides should be returned to the manufacturer for recovery. Where recovery is not possible, waste pesticides and containers should be disposed of by high temperature incineration, or by landfill after adequate chemical detoxification. **7.6.2** If adequate incineration facilities, designated landfill facilities, or other approved facilities are not available, temporary storage of pesticides for disposal should be undertaken. Storage facilities, management procedures, safety precautions and fire and explosion control procedures should conform to municipal, provincial and federal guidelines. Open-burning of small quantities of pesticides may be permissible if location, regulations and meteorological conditions permit. Municipal solid waste incinerators should not be used to incinerate excess pesticides or pesticide containers.
7.7 Petroleum, Oils and Lubricants (POL)	**7.7.1** POL wastes include cleaning fluids, solvents, thinners, hydraulic fluids, equipment lubricants and fuels. **7.7.2** Oils from transformers and large capacitors which contain polychlorinated biphenyls (PCBs) should be segregated from regular waste oils. The regional offices of EPS (see Section 9) should be consulted regarding the handling and disposal of PCBs or materials containing PCBs. **7.7.3** There are four main ways to recover or dispose of POL waste: a) recovery and re-use of some or all waste components; b) recovery of the heat value of some or all waste components; c) incineration of some or all waste components without recovery of heat; d) road stabilization (oils).

CODE OF GOOD PRACTICE FOR GENERAL CONSTRUCTION

COLUMN A		COLUMN B
ACTIVITY		RECOMMENDED PRACTICES
7.7	**Petroleum, Oils and Lubricants (POL) (cont'd)**	**7.7.4** Incineration without recovery of heat value may be the most economical solution in many cases, particularly for non-recoverable fractions of POL waste. The objective should be to dispose of the waste at low cost.

8 BIBLIOGRAPHY

1. American Society of Agricultural Engineers, Compaction of Agricultural Soil, (1971).

2. Anonymous, Methods of Stabilizing Vegetation, (1973).

3. Beak Consultants, Technical Guidelines for Environmental Protection from Oil Pipelines, under contract to EPS, (1976).

4. Canplan Oceanology, Environmental Protection Guidelines for Offshore Drilling, under contract to EPS, (1976).

5. Canplan Oceanology, Environmental Protection Guidelines for Ports, (1976).

6. Canada Centre for Inland Waters, Environment Canada, Evaluation Procedures for Removing and Decontaminating Bottom Sediments in the Lower Great Lakes, (1972).

7. Celanese Fibers Marketing Company, Eliminate Water-Caused Soil Erosion, Technical Bulletin TO1 23.

8. Canplan Oceanology, Environmental Protection Guidelines for Offshore Gathering Pipelines, (1976).

9. Civil Engineering, Sediment Runoff During Highway Construction, ASCF p. 76-80, (1976).

10. Department of Labour, Occupational Health and Safety, (1974).

11. Environmental Protection Service, Environment Canada, Environmental Guidelines for the Construction and Operation of the Pickering Airport, (1974).

12. Environmental Protection Service, Environment Canada, Air Pollution Guidelines Applicable to Incinerators at Federal Establishments, EPS 1-EC-78-5, (August 1978).

13. Environmental Protection Service, Environment Canada, Guidelines for Erosion and Sediment Control Planning and Implementation, (1972).

14. Environmental Protection Service, Environment Canada, Joint Construction Sediment Control Project, EPS - 660/2-73-035, (1974).

15. Envirocon, Environmental Protection in Strip Mining, under contract to EPS, (1974).

16. Environmental Protection Service, Environment Canada, Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Facilities.

17. Environmental Protection Service, Environment Canada, Recommended Environmental Code of Good Practice for Gas Pipeline Development, EPS 1-EC-77-1, (1977).

18. Environmental Protection Service, Northwest Region, Environmental Canada, An Environmental Code for the Proposed MacKenzie Valley Gas Pipeline, (1976).

19. Environment Protection Board, Environmental Impact Assessment of the Portion of the MacKenzie Valley Gas Pipeline from Alaska to Alberta, Volume II.

20. Environmental Protection Agency, Processes, Procedures and Methods to Control Pollution Resulting from all Construction Activity, EPA 430/9-73-007, (1973).

21. Environmental Protection Service, Code of Good Practice for Handling Solid Wastes at Federal Establishments, EPS 1-EC-77-3, (1977).

22. Environmental Protection Service, Code of Good Practice on Dump Closing or Conversion to Sanitary Landfill at Federal Establishments, EPS 1-EC-77-4, (1977).

23. Environmental Protection Service, Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments, EPS 1-EC-76-1, (1976).

24. Environmental Protection Service, Environmental Design For Northern Road Developments, EPS 8-EC-76-3, (1976).

25. Environmental Protection Service, Recommended Environmental Practices For The Proposed Alaska Highway Gas Pipeline, EPS 1-PR-77-1, (1977).

26. Fisheries and Marine Service, Environment Canada, Guidelines for the Protection of the Fish Resources of the Northwest Territories During Highway Construction and Operation, (1975).

27. Grainage, J.W., Edwards, R., Heuchert, K.R., and Shaw, J.W., Management of Waste from Arctic and Sub-Arctic Work Camps.

28. Hittman Associates Inc., Columbia, Maryland, Control of Sediments Generated on Construction Sites Workbook, (1973).

29. Heinke, Professor G., Department of Civil Engineering, University of Toronto and Environmental Protection Service, Environment Canada, Some Problems of Solid and Liquid Waste Disposal in the Northern Environment, A series of eight reports.

30. Highway Research Board, Washington, Erosion Control on Highway Construction, National Cooperative Highway Research Program, Synthesis of Highway Practice.

31. Highway Research Board, Washington, Soil Erosion: Causes and Mechanisms, Prevention and Control, Special Report 135, Proceedings of a Conference Workshop, (1973).

32. Hittman Associates Inc., Columbia, Maryland, Control Runoff During Construction, (1973).

33. Indian and Northern Affairs, Building and Operating Winter Roads in Canada and Alaska, North of 60°, Environmental Studies No. 4, Ottawa, QS-8162-000-EE-A-1, (1978).

34. Inland Waters Branch, Environment Canada, Guidelines for Water Quality Objectives and Standards, Technical Bulletin No. 67, (1973).

35. IPC, Science and Technology Press, Landscape Reclamation.

36. Michigan Water Resources Commission, Department of Natural Resources-Lansing, A Better Environment Through Soil Erosion and Sedimentation Control, (1972).

37. Michigan Department of Natural Resources, Michigan Soil Erosion and Sedimentation Control Guidebook, (1975).

38. Ontario Ministry of Natural Resources, Forest Management Branch, Division of Forests, Guidelines for Pits and Quarries Rehabilitation, (1975).

39. Michigan, Soil Conservation Service, Streambank Protection by Vegetation Measures, Publication No. 580B-1 Sec, (1971).

40. Ministry of Natural Resources, Ontario, Design Guidelines for Forest Management.

41. McGuire and Associates, Feasibility of Industrial Site Reclamation in the Moshassuk Valley, (1965).

42. Ministry of the Environment, Ontario, Evaluating Construction Activities Impacting on Water Resources, (1973).

43. Ministry of Transporation and Communication, Ontario, Specification for Hydraulic Seeding and Mulching, MTC Form 421, (1973).

44. Northern Pipeline Agency, Environmental Requirements for the Pipeline for the Transmission of Natural Gas From Alaska Across Canada, (1978).

45. Ontario Department of Mines and Industrial Minerals, A Guide to Site Development and Rehabilitation of Pits and Quarries, Report 33, (1970).

46. Ontario Ministry of Treasury, Economics and Intergovernmental Affairs, The Haldimand-Norfolk Environmental Appraisal, Victor Chanasyk, Two Volumes, (1970).

47. Service de Protection de l'environnement, Quebec, L'erosion, (1975).

48. Roche and Associates, Environmental Guidelines for Highways and Railways, (1976).

49. Roche and Associates, Environmental Guidelines for Power Transmission Lines, under contract to EPS, (1976).

50. Row, Hartland R., Department of Biology, University of Calgary, Use of Swampland as a Natural Sink for Receipt of Sewage Effluent.

51. Ports, M.A., International Public Works Congress, NPWA Institute for Water Resources, Toronto, Canada, Sediment and Erosion Control Design Criteria, (1974).

52. Science Dimensions 2. A Costly Engineering Riddle-Sensitive Clays, (1975).

53. Trans-Canada Pipeline, Guidelines - Environmental Protection and Mitigation, Pipeline Construction, (1975).

54. Tennessee Valley Authorities, Division of Environmental Planning, A Limited Study of the Effects of Dredging and Gravel from the Tennessee River, Report No. E-WQ-73-2, (1973).

55. Tourbier, J. and Westmacott, R, Water Resources Protection Measures Inland Development, A Handbook, University of Delaware, Newark, Delaware, (1974).

56. U.S. Army Corps of Engineers, Seattle District, Environmental Protection Measures for Construction Operations, (1971).

57. U.S. Army Corps of Engineers, Seattle District, Environmental Protection Guide Specifications, Civil Works Construction, C.E. 1300, (1973).

58. U.S. Department of Agriculture, Washtenaw County Soil Conservation District, Standards and Specification for Soil Erosion and Sediment Control, (1974).

59. U.S. Department of Interior, Bureau of Reclamation, Environmental Guidebook for Construction, (1975).

60. University of Illinois, Practical Operating Procedures for Progressive Rehabilitation of Sand and Gravel Sites, Project No. 2, (1966).

61. U.S. Department of the Interior, Bureau of Reclamation, Environmental Guidebook for Construction, (1974).

62. University of Illinois, Simultaneous Excavation and Rehabilitation of Sand and Gravel Sites, Project No. 1, (1964).

63. University of Delaware, Neward, Delaware, Concern Models for the Christina River Basin, Water Resources Center, (1972).

9 FEDERAL ADDRESSES FOR FURTHER INFORMATION

9.1 Environmental Protection Service Regional and District Offices

Regional Director, Atlantic Region, Environmental Protection Service, Environment Canada, Bank of Montreal Tower, 5151 George Street, Halifax, Nova Scotia. B3J 1M5 (902) 426-3593

Regional Director, Quebec Region, Environmental Protection Service, Environment Canada, 2020 University Street, Montreal, Quebec. H3A 2A5 (514) 283-7377

Regional Director, Ontario Region, Environmental Protection Service, Environment Canada, 135 St. Clair Avenue W., Toronto, Ontario. M4V 1P5 (416) 996-6406

Regional Director, Northwest Region, Environmental Protection Service, Environment Canada, 8th Floor, 9942-108 Street, Edmonton, Alberta. T5K 2J6 (403) 425-4580

Regional Director, Pacific Region, Environmental Protection Service, Environment Canada, Kapilano 100 - Park Royal, West Vancouver, British Columbia. V7T 1A2 (604) 666-4798

District Director, Newfoundland Environmental Protection Service, Environment Canada, P.O. Box 9367, Building 310, Pleasantville, St. John's, Newfoundland. A1A 2Y3 (709) 737-5488

District Director, P.E.I. Environmental Protection Service, Environment Canada, Box 1115, Charlottetown, P.E.I. C1A 4A9 (902) 892-8551

District Director, New Brunswick- Environmental Protection Service, Environment Canada, Box 600, Fredericton, New Brunswick (506) 453-2864

District Director, National Capital Area, Ontario Region, Environmental Protection Service, Environment Canada, River Road, Ottawa, Ontario. K1A 0H3 (613) 998-3420

District Director, Manitoba Environmental Protection Service, Environment Canada, 800 Kensington Building, 273 Portave Ave., Winnipeg, Manitoba. R3B 2B3 (204) 985-2961

District Director, Saskatchewan Environmental Protection Service, Environment Canada, 2002 Victoria Avenue, Regina, Saskatchewan. S4P 0R7 (306) 569-6464

District Director, Northwest Territories Environmental Protection Service, Environment Canada, 9th Floor, Bellanca Building, Yellowknife, Northwest Territories. X0E 1H0 (403) 873-3456

District Director, Yukon Territory Environmental Protection Service, Environment Canada, Room 225, Federal Building, Whitehorse, Yukon Territory. Y1A 2B5 (403) 667-6487)

9.2 Regional Screening and Coordinating Committees & Secretariats

Pacific Region

Secretariat, Pacific Region Screening & Coordinating Committee,
c/o Environmental Protection Service,
Department of the Environment,
Kapilano 100, Park Royal,
West Vancouver, British Columbia
V7T 1A2 (604) 666-6711

Northwest Region

Secretariat, Northwest Region Screening & Coordinating Committee
c/o Department of the Environment,
9942 108th Street,
Edmonton, Alberta
T5K 2J5 (403) 426-6977

Ontario Region

Secretariat, Ontario Region Screening & Coordinating Committee,
Environmental Protection Service,
Department of the Environment,
135 St. Clair Avenue, West,
Toronto, Ontario
M4V 1P5 (416) 966-7511

Quebec Region

Secretariat, Quebec Region Screening & Coordinating Committee,
Environmental Protection Service,
Department of the Environment,
P.O. Box 1330, Station B,
Montreal, Quebec
M3B 3K9 (514) 283-4670

Atlantic Region

Secretariat, Atlantic Region Screening & Coordinating Committee,
Environmental Protection Service,
Department of the Environment,
P.O. Box 2406,
Halifax, Nova Scotia
B3J 3E4 (902) 426-6121

Ottawa

Federal Activities Branch,
Environmental Protection Service,
Department of the Environment,
Ottawa, Ontario
K1A 1C7 (819) 997-1831

Executive Chairman,
Federal Environmental Assessment Review Office,
Department of the Environment,
Fontaine Building, 13th Floor,
Ottawa, Ontario
K1A 0H3 (819) 997-1000