



Energy, Mines and
Resources Canada

Énergie, Mines et
Ressources Canada

CANMET

Canada Centre
for Mineral
and Energy
Technology

Centre canadien
de la technologie
des minéraux
et de l'énergie

**A DIGEST OF ENVIRONMENTAL REGULATIONS
PERTINENT TO OPEN PIT MINING IN CANADA
(Current at April 1975)**

DAMES AND MOORE, TORONTO

June 1976

MINERALS RESEARCH PROGRAM

MINING RESEARCH LABORATORIES

CANMET REPORT 76-16

© Minister of Supply and Services Canada 1976

© Ministre des Approvisionnements et Services Canada 1976

Available by mail from

En vente par la poste:

Printing and Publishing
Supply and Services Canada,
Ottawa, Canada K1A 0S9

Imprimerie et Édition
Approvisionnement et Services Canada,
Ottawa, Canada K1A 0S9

CANMET
Energy, Mines and Resources Canada,
555 Booth St.,
Ottawa, Canada K1A 0G1

CANMET
Énergie, Mines et Ressources Canada,
555, rue Booth
Ottawa, Canada K1A 0G1

and at Canadian Government Bookstores:

et dans les Librairies du gouvernement du Canada:

HALIFAX
1683 Barrington Street

HALIFAX
1683, rue Barrington

MONTREAL
640 St. Catherine Street West

MONTREAL
640 ouest, rue Ste-Catherine

OTTAWA
171 Slater Street

OTTAWA
171, rue Slater

TORONTO
221 Yonge Street

TORONTO
221, rue Yonge

WINNIPEG
393 Portage Avenue

WINNIPEG
393, avenue Portage

VANCOUVER
800 Granville Street

VANCOUVER
800, rue Granville

or through your bookseller

ou chez votre libraire.

Catalogue No.
M38-13/76-16

Price: Canada: \$1.75
Other countries: \$2.10

Price subject to change without notice

N° de catalogue
M38-13/76-16

Prix: Canada: \$1.75
Autres pays: \$2.10

Prix sujet à changement sans avis préalable

A Digest of Environmental Regulations
pertinent to
Open Pit Mining in Canada
(current at April 1975)

prepared by
DAMES AND MOORE, TORONTO
Supervising manager: J.H. Shillabeer
Technical staff: P.S. Martin
L.M. Whitby-Costescu

for the
MINING RESEARCH LABORATORIES, OTTAWA
Contract Officer: D.F. Coates

This digest has been prepared as part of the
PIT SLOPE PROJECT
of the
MINING RESEARCH LABORATORIES
CANADA CENTRE FOR MINERAL AND ENERGY TECHNOLOGY
DEPARTMENT OF ENERGY, MINES AND RESOURCES
OTTAWA

FOREWORD

The policy of the branch, from the first concern over environmental effect of both social and industrial activity has been that industry can take care of its own contamination. The corollary to this is that new operations would keep to a minimum all forms of degradation.

Open pit mining, admittedly, has a degree of environmental impact. This impact, as well as the cost of eliminating or reducing it to acceptable levels, can be kept to a minimum if all pertinent factors are taken into account in plant and site layouts. For this reason, a chapter has been included in the Pit Slope Manual providing guidelines for good environmental planning, including the important topic of reclamation by revegetation.

This report was originally conceived of as an appendix to that chapter. It was felt that a compilation of regulations that constrain open pit mining would be useful. When it was recognized that regulations undergo frequent change, it was decided not to include them in the manual. They are being made available as a branch report, which will be relatively easy to revise.



(D. F. Coates)

Acknowledgements

The willing and earnest cooperation of the many federal and provincial agencies concerned with the environment is gratefully acknowledged.

ABSTRACT

This digest summarizes federal and provincial acts and regulations governing the environmental impact of open pit mining and lists the important agencies involved. Municipal regulations, which may be more stringent, are not considered. Experience to date shows the maximum benefit to all involved accrues if environment-related activities are considered from the earliest stages of mine planning. Agencies can and will in this case use maximum flexibility in assisting the producer conform to regulations. The trend in current legislation is towards overall management of natural resources. This, coupled with the application of "nuisance" law - ie, the freedom of the public to enjoy commonly established rights - places the onus on producers to show adequate compliance with regulations. Required land rehabilitation after mining is an example. However, Canadian experience shows that early attention to overall management can directly enhance the success of mining.

The major relevant federal legislation is the Fisheries Act, 1970 (to some extent replacing the Canada Water Act) which controls pollution of all waters (fresh and marine) supporting fish. The Clean Air Act, 1971 is also important, together with numerous acts specific to the Northwest Territories and the Yukon.

The Maritime Provinces all have acts governing disposal of wastes on land, in air, or in water; in some cases noise pollution is regulated. Quebec has enacted powerful legislation in the Environment Quality Act 1972, which deals with all forms of pollution including noise. This is supported directly by provisions of the Mining Act 1965. Ontario has an

RESUME

Ce recueil résume les lois et les règlements fédéraux et provinciaux gérant l'impact de l'exploitation à ciel ouvert sur l'environnement et énumère les organismes importants qui y sont impliqués. Les règlements municipaux ne sont pas pris en considération. L'expérience, à ce jour, démontre que tous ceux qui y sont impliqués peuvent en bénéficier davantage si l'on tient compte des activités reliées à l'environnement dès les premiers stades de la planification minière. Les organismes peuvent et utiliseront, dans ce cas, un maximum de souplesse dans leur intervention auprès des producteurs afin de les aider à se conformer aux règlements. La tendance actuelle, en législation, s'oriente vers une gestion générale des ressources naturelles. Ceci, associé à l'application d'une loi dite "d'incommodité" - ie la liberté pour le public de bénéficier des droits établis pour tous - met les producteurs dans une situation où ils doivent se conformer convenablement aux règlements. La restauration du terrain, requise après l'exploitation, en est un exemple. Par contre, l'expérience au Canada démontre qu'une attention portée tôt à la gestion générale peut améliorer directement le succès de l'exploitation minière.

La principale loi fédérale pertinente est la Loi de la pêche de 1970 (dans une certaine mesure, elle remplace la Loi canadienne sur les eaux poissonneuses (douces et marines). La Loi sur la lutte contre la pollution atmosphérique de 1971 est aussi importante, ainsi que plusieurs lois propres aux Territoires du Nord-Ouest et au Yukon.

Chacune des provinces maritimes possède des lois gérant l'élimination des déchets du sol, de l'air et de l'eau; dans certains cas, la pollution est aussi réglementée. Le Québec a voté une puissante loi concernant la qualité de l'environnement (Loi de la qualité de l'environnement de 1972) qui s'attaque à toute forme de pollution, même le bruit. Elle est appuyée

Environmental Protection Act 1971 which has some relevance to open pit mining; the proposed Environmental Assessment Act 1975, which will be expanded to cover mining specifically, is expected to be more pertinent. The Prairie Provinces have legislation dealing with groundwater pollution as well as acts to maintain the quality of the environment generally. Alberta additionally has the Coal Conservation Act 1973, which includes requirements for environmental management. British Columbia also has regulations directly for coal mining, as well as the more general Mines Regulations Act 1967 and the Pollution Control Act 1967.

The digest includes tables, abstracted from legislation, of objectives for quality of mine emittants.

directement par les dispositions législatives de la Loi des mines de 1965. L'Ontario possède une loi sur la protection de l'environnement (Environmental Protection Act 1971) qui s'adresse plus ou moins à l'exploitation à ciel ouvert; la Loi sur l'évaluation de l'environnement (Environmental Assessment Act 1975) est proposée justement dans le but de s'occuper plus précisément de l'exploitation minière. Les provinces de l'ouest, elles, possèdent des lois concernant la pollution des eaux territoriales ainsi que des lois pour maintenir la qualité de l'environnement en général. L'Alberta a de plus une loi sur la conservation du charbon (Coal Conservation Act 1973) qui inclue les exigences d'une gestion de l'environnement. La Colombie Britannique a aussi des règlements qui s'adressent directement à l'exploitation du charbon en plus de la "Mines Regulations Act 1967" et de la "Pollution Control Act 1967."

Ce recueil comprend aussi des tableaux, tirés des lois, sur les objectifs de qualité des déchets de mine.

CONTENTS

	Page
INTRODUCTION	1
A GUIDE FOR USING THIS DIGEST	1
DISCUSSION	2
TRENDS	3
KEY AGENCY CONTACTS	5
FEDERAL AND PROVINCIAL LEGISLATION	9
Federal	9
Newfoundland	12
Nova Scotia	13
New Brunswick	14
Prince Edward Island	15
Quebec	15
Ontario	17
Manitoba	19
Saskatchewan	20
Alberta	22
British Columbia	24
APPENDICES	
1 Federal Regulations: Schedules from the Ambient Air Quality Objectives under the Clean Air Act 1971	27
2 Ontario Regulations: Air Pollution Control Schedules and Water Quality Objectives	31
3 Saskatchewan Regulations: Quantitative Ambient Air Regulations and Surface Water Quality Criteria	41
4 Alberta Regulations: Air Quality Regulations	45
5 British Columbia Regulations: Desirable levels of Ambient Air Quality - Mining, Mine- milling, Smelting and Associated Industries	47

INTRODUCTION

1. The body of this digest consists of tables of Federal and Provincial Acts and their Regulations pertinent to open pit mining. For each jurisdiction, those acts which may be employed to control operations are listed in a logical sequence. Their individual intent is first briefly discussed and this is followed in each case by a precis of the available important regulations. In certain instances, either no regulations, or none which are applicable to mining, have been published under an act. In some cases, guidelines supplement the regulations. Applicable guidelines or quantitative regulations are appended to this digest.

2. This digest has been prepared to fulfil several specific objectives, namely:-

- to provide a single, easily-available information source presented in a concise and readable form;
- to assist a mine operator, faced with a specific problem, in identifying the regulations with which he must conform;

- by providing a list of key contacts, to help those in industry considering a new operation in a different locality establish liaison with those charged with administering the controlling legislation;
- by identifying and discussing current trends and requirements, and by providing a thorough digest of existing regulations, to assist those new to the field in gaining a valid overview of proposed and actual environmental restraints on mining.

3. In this digest, attention is focused on regulations and guidelines that control the various phases of operation of the mine and its immediate supporting services. Much of the environmental legislation is not specific to mining and very little concerns open pit mining. Many aspects of possible contamination of the environment are covered under general regulations. Although they are not specific to mining, mining can fall under the generality of the legislation.

A GUIDE FOR USING THIS DIGEST

4. The intention of this digest is to provide, in capsule form, a precis of environmental regulations and guidelines to aid in quickly identifying specific controlling legislation. This is not an exhaustive treatment. The reader is strongly advised to read the whole of that section which relates to a province to obtain the necessary background, and then refer to the original act and its regulations when faced with a specific problem. He should also be certain that it contains the most up-to-date amendments and additions to the legislation. Office consolidation copies (which are in the nature of summaries prepared for internal use by government departments) are sometimes readily available and may be used in the first instance with discretion. By contacting the key staff identified on pages 7-10, the user may verify that he has the complete and

current version.

5. In the interests of brevity and readability, definitions which normally precede the main body of an act have been omitted. Definitions can, and do, vary - not only from one province to another, but also between acts within a province.

6. There are cases where, within a given province, more than one act and its regulations jointly relate to a given potential source of pollution. In each case, the acts have been selected on the basis of their importance and direct relationship to mining and the environment. This has entailed an element of judgement.

7. Among the statutes of the provinces are Municipal Acts, enabling local municipalities to pass by-laws controlling or permitting pollution within their boundaries. Municipal Acts are not

quoted in this digest. By-laws related to pollution are never less demanding than provincial regulations. For these reasons, where operations are planned within a Municipal area, (not in an unorganised township), it is also advisable to check for existing pertinent by-laws that may, for example, set rehabilitation requirements.

8. Typically, Highway Traffic Acts enable provinces to restrict the weight of vehicles operating on public roads. This may provide a mechanism for residents bothered by noise or dust to limit their discomfort. Usually, Traffic Acts are somewhat peripheral to mining operations and their environmental impacts, and therefore are not quoted in this digest.

9. Federal regulations are intended to set national standards across Canada, to which all

must conform. Provincial regulations, where they exist, are never less stringent than the federal requirements. In instances where no provincial regulations have been introduced, federal standards are applicable. In view of the current trend among all provinces to gradually extend their framework of statutory environmental control, conforming with federal requirements can only be considered as a short-term expedient. Federal regulations assume special importance where pollution effects may cross provincial or international boundaries. Elsewhere, both levels of government can have different viewpoints on the same pollution source because of their differing technical approaches to environmental protection.

DISCUSSION

10. It is advisable for a mine developer or operator to commence his environment-related activities as early as he reasonably can. These activities should include establishing contact with key people in those agencies charged with administering the legislation. Not only is this common sense, but it should be borne in mind that many of the environmental regulations and guidelines are comparatively new, and that mining operations are not so common that regulations need ever be applied indiscriminately. In this context, agencies are left with considerable discretion in ensuring that degradation of the environment is avoided or minimized. By involving key officials in the formative stages of a project, and establishing clear lines of communication, it can be expected that decisions will be arrived at in a reasonable manner, minimizing the chances of untoward action later, or the imposition of unnecessary constraints, or burdensome investigations.

11. In this light, when faced with a specific problem of perhaps exceptional complexity, or where possible solutions are uneconomic, it is entirely reasonable to expect that government

agencies will exercise discretion by permitting the operator in good faith to apply "the best practicable technology"; negotiating a reasonable schedule within which specific abatements must be achieved; or allowing an exemption in certain instances. Generally, persuasion and negotiation, rather than prosecution, are preferred as means of accomplishing specific objectives.

12. Another reason for commencing environment-related activities early and for establishing communications, is that recent additions to the legislation have placed increasing demands on the administering agencies. Staff with the necessary expertise are not readily available to either industry or government. In certain provinces, they may therefore be overloaded. Only in a few provinces has there been sufficient administrative precedent established to expedite decisions in most cases. Cases of jurisdictional conflict between agencies can still occur. Precedent from case law is rare. Hence, the processing of applications can be expected to be slow.

13. A regulation is a statutory measure, often

a standard, that is enacted by the legislature or by parliament after passage of an act. Regulations are supplementary to their acts and can be promulgated at any time the act is in force. Regulations are a basis for enforcement and prosecution can be obtained for contravention of regulations. Guidelines, however, vary in importance; they may be informal guides to assist agencies in applying regulations, statements of policy, statements of long-term objectives or non-statutory requirements which are similar in importance to regulations.

14. In the context of administering environmental control, codes of practice are comparatively rare: typically, they are recommendations of good engineering practice intended to assist professionals in meeting their responsibilities under a given set of regulations.

15. The common law doctrine of "nuisance" is an important concept in all jurisdictions except that of Quebec. Although not formally recognized by the Napoleonic Civil Code, the courts of Quebec apply a doctrine of nuisance which is compatible with the rules of civil liability in that province. Elsewhere and in addition to any remedial action that may be available under statutory legislation, where a specific pollution situation amounts to a nuisance at common law, damages may be recoverable and a permanent injunction may be obtained. A common law nuisance is one which violates the freedom of the public and individuals to enjoy

their commonly established rights. Nuisances can be either "public" (affecting the public at large, or a significant portion of it), or "private" (affecting an individual or specific group). Private nuisances are those of major concern in pollution matters. A typical example of a private nuisance would be where a hazard results from pollution of a neighbour's well, directly attributable to groundwater contamination from waste dumping on adjacent land. In private nuisance cases, it is not necessary to establish either a duty of care, or a failure to take reasonable care (as in tort). It is sufficient to show that the nuisance exists, and that it emanates from land occupied by the defendant. Negligence need not be an essential part; however, damage is a necessary element. It must be substantial, though not necessarily financial, and it must be definitely established, unless, as in certain instances, it can be presumed. Presumed damage is most usually applicable under certain provisions of public health statutes, in which, in most provinces, a number of activities are declared as constituting nuisances. Such presumed nuisances can be important for mine-related pollution matters. Further discussion of common law aspects of pollution is beyond the scope of this digest. A comprehensive introduction to the doctrine of nuisance under common law is given in "Mining and Environmental Law" by Gary McGee (Mineral Bulletin MR138, Dept. of Energy Mines and Resources, Ottawa, 1973).

TRENDS

16. The direction of the more recently introduced legislation has been towards the overall management of natural resources. The developing requirement for Environmental Impact Assessment procedures is an example of a trend towards a comprehensive multi-disciplinary resource management policy. This requirement is in force in certain federal areas, Alberta and British Columbia. It is imminent in Ontario (for government projects only), Manitoba,

Quebec, Saskatchewan, New Brunswick and Newfoundland. In this policy, all of man's activities are viewed as inter-related and affecting the environment materially. It should be noted that the need for Environmental Impact Assessment procedures to be undertaken for a specific project is usually determined at the discretion of the Minister, presumably depending on the scope and nature of planned operations. Recent Canadian experience has demonstrated that

such procedures can be successfully integrated with overall mine planning, need not be especially onerous, and can contribute to the long-term success of an operation.

17. Currently, increasing emphasis is being placed on the use of guidelines for the control of specific pollution effects. Guidelines are generally favoured over regulations to preserve flexibility in administration, and preserve and employ the concept of "best practicable technology". Increasing use of quantitative guidelines reflects a growing body of knowledge and experience as expertise and current research results become available.

18. Among regulations specific to mine operations, the most noticeable trend is towards the requirement that land rehabilitation be commenced as soon as possible. Permit systems, the filing of reclamation plans, and the posting of bonds, all serve to reinforce requirements

for concurrent reclamation practices wherever possible.

19. Western Canadian provinces generally possess recent and more stringent environmental controls. These are frequently directed towards mining, and have been formulated in response to public concern about the growth in open pit mining, unique attractions of the scenery, the wildlife and the natural topography in the western part of the country. The Eastern provinces are finding it necessary to revise their positions, and some (eg Nova Scotia and Quebec) are actively seeking to formulate their own statutory requirements. It is to be expected that in many instances such provinces will draw on administrative experience gained by the other provinces, and that specific regulations will be compiled to suit their own environmental, social and economic conditions.

KEY AGENCY CONTACTS

FEDERAL GOVERNMENT

Environment Canada

Headquarters	Fontaine Building, Ottawa K1A 0H3	
Canadian Environmental Advisory Council	Fontaine Building, Ottawa K1A 0H3	(613)-997-2393
Planning and Finance Service	Fontaine Building, Ottawa K1A 0H3	(613)-996-7681
Fisheries and Marine Services	Fontaine Building, Ottawa K1A 0H3	(613)-997-2136
Environment Management Services	Place Vincent Massey, Hull K1A 0H3	(613)-997-1252
Canadian Wildlife Service	Place Vincent Massey, Hull K1A 0H3	(613)-997-1301
Inland Water Directorate	Place Vincent Massey, Hull K1A 0H3	(613)-997-2019
Environmental Protection Service	Place Vincent Massey, Hull K1A 0H3	(613)-997-1575
Air Pollution Control Directorate	Place Vincent Massey, Hull K1A 0H3	(613)-997-1649
Water Pollution Control Directorate	Place Vincent Massey, Hull K1A 0H3	(613)-997-1299

Department of Indian Affairs and Northern Development

Northern Affairs Program	Centennial Tower, 400 Laurier Avenue West, Ottawa K1A 0H4	(613)-996-6294
--------------------------	--	----------------

NEWFOUNDLAND AND LABRADOR

Department of Provincial Affairs
and Environment

Elizabeth Towers, St. John's A1C 5T7	(709)-753-2140
--------------------------------------	----------------

Department of Tourism

Wildlife Division	Confederation Building, St. John's A1C 5T7	(709)-722-0711
-------------------	--	----------------

Department of Health

Health Inspection Division	Confederation Building, St. John's A1C 5T7	(709)-726-2610
----------------------------	--	----------------

NOVA SCOTIA

Department of the Environment

Environmental Assessment Division	P.O. Box 2107, Halifax B3J 3B7	(902)-424-4340
Environmental Control Council	P.O. Box 2107, Halifax B3J 3B7	(902)-424-5678

Department of Lands and Forests

Dennis Building, 1740 Granville Street, P.O. Box 698, Halifax B3J 2T9	(902)-424-4121
--	----------------

Department of Mines

Mining Engineering and Inspection	P.O. Box 1087, Halifax B3J 2X1	(902)-424-4007
	P.O. Box 1087, Halifax B3J 2X1	(902)-424-4049

NEW BRUNSWICK

<u>Department of Environment</u>	Centennial Building, Fredericton E3B 5H1	(506)-453-2766
Pollution Control Branch, Industrial Waste Section	Centennial Building, Fredericton E3B 5H1	(506)-453-2861
<u>Department of Natural Resources</u>	Centennial Building, Fredericton E3B 5H1	(506)-453-2501
Mineral Resources	Centennial Building, Fredericton E3B 5H1	(506)-453-2729

PRINCE EDWARD ISLAND

<u>Department of the Environment and Tourism</u>	Provincial Affairs Building, Box 2000, Charlottetown, C1A 7N8	(902)-892-7352
Environmental Control Commission	Provincial Affairs Building, Box 2000, Charlottetown, C1A 7N8	(902)-892-3561
Fish and Wildlife Division	Provincial Affairs Building, Box 2000, Charlottetown, C1A 7N8	(902)-892-3561
<u>Department of Industry and Commerce</u>	P.O. Box 2000, Charlottetown C1A 7N8	(902)-892-1381

QUEBEC

<u>Environment Protection Services</u>	2360 chemin Sainte-Foy, Sainte-Foy, Quebec G1V 4H2	(418)-643-7860
Industrial Environment Directorate, Air Pollution Control Branch	2360 chemin Sainte-Foy, Sainte-Foy, Quebec G1V 4H2	(418)-643-2474
Research and Planning Directorate, Environmental Assessment Branch	2360 chemin Sainte-Foy, Sainte-Foy, Quebec G1V 4H2	(418)-643-3740

ONTARIO

<u>Ministry of the Environment</u>	135 St. Clair Avenue West, Toronto M4V 1P5	(416)-965-5115
Environmental Assessment and Planning Division	135 St. Clair Avenue West, Toronto M4V 1P5	(416)-965-5115
Pollution Control Planning Branch	135 St. Clair Avenue West, Toronto M4V 1P5	(416)-965-6871
Environmental Approvals Branch	135 St. Clair Avenue West, Toronto M4V 1P5	(416)-965-6973
<u>Ministry of Natural Resources</u>	Whitney Block, Parliament Buildings, Toronto, M7A 1W3	(416)-965-2701
Division of Mines	Whitney Block, Parliament Buildings, Toronto, M7A 1W3	(416)-965-4271
Conservation Authorities Branch	Whitney Block, Parliament Buildings, Toronto, M7A 1W3	(416)-965-6287
Pits and Quarries Section	Whitney Block, Parliament Buildings, Toronto, M7A 1W3	(416)-965-3127

MANITOBA

Department of Mines, Resources and Environmental Management

	Legislative Building, Winnipeg R3C 0V8	(204)-946-7701
Clean Environment Commission	139 Tuxedo Boulevard, Building 2, Winnipeg, R3C 0V8	(204)-489-4511
Environmental Management	139 Tuxedo Boulevard, Building 2, Winnipeg, R3C 0V8	(204)-489-4511
Water Resources Division	693 Taylor Avenue, Winnipeg R3H 0W4	(204)-284-4470
Mineral Resources Division	993 Century Street, Winnipeg R3H 0W4	(204)-786-7931
Mining Engineering and Inspection Branch	442 William Avenue, Winnipeg R3A 0J6	

SASKATCHEWAN

Department of the Environment

	Saskatchewan Power Building, Regina S4P 0R9	(306)-523-9676
Environmental Protection Service	Saskatchewan Power Building, Regina S4P 0R9	(306)-523-9676
Water Pollution Control Branch	Saskatchewan Power Building, Regina S4P 0R9	(306)-523-9676
Land Protection Branch	Saskatchewan Power Building, Regina S4P 0R9	(306)-523-9676
Policy, Planning and Research Branch	Saskatchewan Power Building, Regina S4P 0R9	(306)-523-9676

Department of Agriculture

Conservation and Land Improvement Branch	Administrative Building, Regina S4S 0B2	(306)-522-5659
--	---	----------------

Department of Tourism and Renewable Resources

Fisheries and Wildlife Branch	Administrative Building, Regina S4S 0P2 Administrative Building, Regina S4S 0B2	(306)-522-8292 (306)-522-1691
-------------------------------	--	----------------------------------

Department of Mineral Resources

Mines Engineering (Chief Engineer of Mines)	Administrative Building, Regina, S4S 0B2 2708 12th Avenue, Regina S4S 0B2	(306)-522-9257 (306)-527-8581
---	--	----------------------------------

ALBERTA

Department of the Environment

	Milner Building, 10040-104 Street, Edmonton	(403)-427-2739
Interdepartmental and Multidisciplinary Development and Reclamation Committee	Milner Building, 10040-104 Street, Edmonton	(403)-427-2739
Pollution Control Division	Milner Building, 10040-104 Street, Edmonton	(403)-427-2739
Land Conservation and Reclamation Division	Milner Building, 10040-104 Street, Edmonton	(403)-427-2739
Conservation and Utilization Committee	Milner Building, 10040-104 Street, Edmonton	(403)-427-2739

Land Conservation and Reclamation Council	Milner Building, 10040-104 Street, Edmonton	(403)-427-2739
Standards and Approvals Division	Milner Building, 10040-104 Street, Edmonton	(403)-427-2739
<u>Department of Energy and Natural Resources</u>		(403)-427-2739
Minerals Division	Petroleum Plaza South, Edmonton	(403)-426-2150
Land Division	Natural Resources Building, Edmonton	(403)-261-8393
<u>Energy Resources Conservation Board</u>		
Coal Department	J.J. Bowlen Building, Calgary	(403)-261-8311

BRITISH COLUMBIA

<u>Department of Lands, Forests and Water Resources</u>	Parliament Buildings, Victoria V8V 4S5	(604)-387-3982
Water Resources Service	Parliament Buildings, Victoria V8V 4S5	(604)-387-3400
Pollution Control Branch, Mining Section	Parliament Buildings, Victoria V8V 4S5	(604)-387-5321
Pollution Control Board	Parliament Buildings, Victoria V8V 4S5	(604)-387-3400
<u>Department of Recreation and Conservation</u>	Parliament Buildings, Victoria V8V 4S5	(604)-387-6482
Fish and Wildlife Branch	Parliament Buildings, Victoria V8V 4S5	(604)-387-6409
<u>Environmental and Land Use Committee</u> (Secretariat)	Parliament Buildings, Victoria V8V 4S5	(604)-387-3630
<u>Department of Mines and Petroleum Resources</u>	Parliament Buildings, Victoria V8V 4S5	(604)-387-6242
Mine Reclamation Branch	Parliament Buildings, Victoria V8V 4S5	(604)-387-3630

FEDERAL AND PROVINCIAL LEGISLATION

FEDERAL

Act: THE FISHERIES ACT 1970

Area: CANADIAN WATERS

Relevance: The federal government's mandate to protect and manage Canada's fisheries, both marine and fresh water, is conferred on the government by the British North America Act.

The Fisheries Act was amended in 1970 to significantly strengthen its provision for pollution control and is now intended as the major piece of controlling legislation surpassing the Canada Water Act.

The Act prohibits the deposition of deleterious substances of any type in water frequented by fish or the indirect deposition of such substances into water frequented by fish. Any waste which is likely to contravene this requirement must be brought to the attention of the Minister of the Environment.

Development of draft regulations and guidelines for the mining industry began in January 1973 and they are expected to become applicable in late 1975. Initially, these will apply only to the base metal, uranium and iron ore mining and milling segments of the industry. Regulations are to be promulgated for new operations only; guidelines, to be issued concurrently, will apply to existing mining operations. Although the intent is to have existing mines eventually meet the same standards as new operations wherever practicable, the use of guidelines allows for a period of compliance to be negotiated between government and industry, on a plant-by-plant basis. This should enable existing plants to achieve new plant requirements over a

period of time. New plants will be expected to meet the federal regulations following startup. Failure to adhere to a guideline is not an outright breach of the law but such a failure may result in a violation of the general provisions of the law, the Fisheries Act in this instance.

The regulations and guidelines embrace mine water drainage, mill process effluent and surface drainage. The maximum levels of pollutants to be allowed in final effluents are prescribed in terms of concentrations rather than as daily or monthly quantities.

The guidelines cover specific chemical and physical parameters and give acceptable levels of final effluent. Supplementary guidelines state explicitly the manner in which mine operators should sample and analyze any contaminated or effluent waters. Procedures for reporting these findings to the Regulatory Agency (which can vary according to the jurisdiction) are also cited.

It is important to remember that the above points are extracts from a draft, that prescribed limits have not been finalized, and that they may be subject to revision.

Act: CANADA WATER ACT 1970

Area: CANADIAN WATER

Relevance: The Act is a major piece of federal legislation with respect to regional Canadian waters and provides for the twin objectives of water resources management and water quality management. The Act provides for Federal - Provincial water quality management

through the formation of agencies who will assume responsibilities for planning, initiating and implementing programs to restore, preserve, and enhance the water quality in that agency's area of administration.

No regulations specific to mining are in force under the Act.

Act: CLEAN AIR ACT 1971

Area: CANADIAN AIR

Relevance: The Act is Canada's major legislation with respect to air pollution and the establishment of air quality objectives.

No regulations or guidelines with respect to open pit mines as such have yet been made under this Act. Currently one regulation is being developed: The National Emission Standard for Asbestos Emissions from the Asbestos Mining and Milling Industry. This is scheduled for initial publication in 1975 or early 1976.

Environment Canada has formulated the "Ambient Air Quality Objectives" for five major air pollutants: sulphur dioxide, particulate matter, carbon monoxide, oxidants (ozone) and nitrogen dioxide.

Under the Act, the national ambient air quality objectives are designed to protect public health and welfare by setting limits on the levels of pollutants in the air. The Act calls for three levels of air quality, "desirable", "acceptable", and "tolerable". These initial objectives concern only the first two of these levels. The objectives are tabulated in Appendix 1.

Act: CRIMINAL CODE 1970

Area: CANADIAN AIR, LAND, WATER

Relevance: The Criminal Code concerns itself with

the "committing of a nuisance" and thereby either a) danger to life, safety or health of the public or b) physical injury to any person. Persons who pollute the environment are deemed to be criminally negligent and hence render themselves punishable by fines or imprisonment.

The Act has only limited application in environmental legislation since it is preferred that the specific environmental acts should be the basis for controlling Canada's environment.

No regulations specific to pollution of the environment exist under the Code.

Act: ENVIRONMENTAL PROTECTION ORDINANCE 1973

Area: TERRITORIES AIR, LAND, WATER

Relevance: The Ordinance applies to protection of the environment, including animal and plant life, in the territories.

No regulations specific to mining are in force under the Ordinance, although it does prohibit the discharge of contaminants that would have a detrimental effect.

Act: MIGRATORY BIRDS CONVENTION ACT 1970

Area: WATER (frequented by migratory birds)

Relevance: The Act seeks to protect migratory birds within all the territories and provinces of Canada, and hence is concerned with the quality of the inland water frequented by such birds.

Regulations cover the pollution of such water by stating that: "No person shall deposit or permit the deposit of oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds".

This regulation does not apply to the deposit of a substance of a type, in a quantity and under conditions authorized by regulations made by the Governor in Council under any other Act in

any waters in respect of which those regulations are applicable.

Act: NORTHERN INLAND WATER ACT 1970

Area: TERRITORIES INLAND WATERS

Relevance: This Act covers inland water resources in the Yukon Territory and Northwest Territories, and specific areas are identified in the regulations. The uses of water are split into 12 categories, one of which, (c) "a use for industrial purposes", includes mining. Persons who wish to use regulated water are required to obtain licences, the application for which should contain plans of proposed dams and water crossings together with descriptions of any industrial operation associated with the application. A schedule of fees for the use of the water is tabulated.

A security bond can be demanded by the licencing board of up to \$100,000, or 10% of the estimated capital cost of the proposed work.

Each licensee is required to keep records of the quantities of water used and to submit an annual report of the water consumed.

Act: NORTHWEST TERRITORIES PUBLIC HEALTH ORDINANCE 1957

Area: TERRITORIES AIR, LAND, WATER

Relevance: The Ordinance is concerned with the promotion and preservation of public health in the Northwest Territories. Provision exists for rules, orders or regulations governing pollution. No regulations relating to mining have been made.

Act: YUKON TERRITORIES PUBLIC HEALTH ORDINANCE 1958

Area: TERRITORIES AIR, LAND, WATER

Relevance: The Yukon ordinance is similar to the Northwest Territories Public Health

Ordinance.

Regulations are in effect which cover emissions from smoke stacks or chimneys from industrial enterprises. No schedule of limits is given.

Act: TERRITORIAL LANDS ACT 1970

Area: TERRITORIES LAND

Relevance: The Act is concerned with the protection of the ecological balance of the physical characteristics of the territorial (ie Crown) lands in the Yukon and the Northwest Territories. The Governor in Council may set aside areas as a land management zone. He may also designate mining districts. Regulations made under the Act (1971) require land use permits to be applied for prior to any earth moving work in a zoned area. The regulations deal with water crossings, campsites, fuel storage, clearing of lines, tracts and use of lands. Plans of proposed work, and siting of buildings need to accompany the application for land use permits, for which fees are payable. Progress reports must be submitted regularly and a security deposit may be demanded by the scheduled engineer who is required to monitor the work performed under the permit.

Act: INTERNATIONAL RIVER IMPROVEMENT ACT 1970

Area: WATER

Relevance: The Act is concerned solely with international rivers; that is water flowing from any place in Canada to any place outside Canada.

Regulations are in force requiring persons who wish to 'improve' an international river, by means of a dam, obstruction, canal, reservoir or other work to obtain a valid licence for the work from the Minister. Details of the proposed work, its duration, and its

effects on the water flows need to be included in the application, together with environmental and economic statements on the direct and indirect benefits of the projected work.

Act: ARCTIC WATERS POLLUTION PREVENTION ACT 1970

Area: ARCTIC WATERS

Relevance: The Act is concerned with the dispersion of waste material into Arctic waters which might change or damage the natural ecological balance of the water, or its associated plant, animal, or fish life.

Regulations are in force which govern waste from industrial and domestic complexes. All waste deposited must be of such a nature as to be within limits set by other legislation, particularly

the Northwest Territories and Yukon Public Health Ordinances.

Act: AGRICULTURAL AND RURAL DEVELOPMENT ACT 1966-67

Area: LAND, WATER

Relevance: The rehabilitation of mined-out areas might be regarded as being within the scope of this act. The Act is concerned with ensuring that the best use is made of land in rural areas, and that the people inhabiting rural areas gain maximum benefit from the land available. The Act allows for rural development and soil and water conservation projects to be undertaken and financed in part from federal funds in any province or territory. No regulations exist under the Act.

NEWFOUNDLAND

Act: THE DEPARTMENT OF HEALTH ACT 1970

Area: WATER

Relevance: This Act provides the Minister of Health with power to administer and control all services, measures and institutions having to do with the preservation and promotion of the health of the people of the province. Regulations: The Public Health (Sanitation) Regulations 1963 prohibit the discharge of industrial wastes into any stream, pool, lake, watercourse or other waters except with the written approval of an inspector of the department.

the quality of the natural environment; (b) the conservation, development, control, improvement and utilization of the province's water resources.

Regulations: The Environmental Control (Water and Sewage) Regulations 1974 set specific standards for the composition of water or other material to be discharged either directly or indirectly into a public sewer, or any body of water. Draft regulations are also being prepared with regard to air and soil pollution.

Act: THE DEPARTMENT OF PROVINCIAL AFFAIRS AND ENVIRONMENT ACT 1973

Area: AIR, WATER, LAND

Relevance: The Act established the Department of Provincial Affairs and Environment and gave it jurisdiction over:
(a) the protection and enhancement of

Act: ORE TREATMENT TAILINGS (LABRADOR) DISPOSAL ACT 1965

Area: LAND, WATER

Relevance: The Act restricts the rights of owners, occupiers and users of land adjacent to lands or water affected by ore treatment tailings from iron mines. Within a specified geographical area, the Act stops such individuals from obtaining

injunctions which would halt the disposal of tailings from iron mining operations.

No regulations currently exist under this Act.

Act: THE WASTE MATERIAL (DISPOSAL) ACT 1973

Area: LAND, WATER

Relevance: The objective of this Act is to exercise co-ordinated control, on a province-wide basis, over the disposal of waste materials, where waste material is given its most liberal interpretation. A system of Certificates of Approval for waste disposal sites is established under the Act.

Regulations: Waste Disposal Regulations are available in draft form. They set minimum standards for the management of all waste disposal systems and contain specific requirements with regard to landfilling and sanitary landfilling sites amongst others. Mine tailings are mentioned and approval is required before the construction and operation of a tailings disposal system.

Act: WATERS PROTECTION ACT 1964

Area: WATER

Relevance: This Act provides for the general monitoring and care of all inland waters in Newfoundland for the purpose of keeping them fit for drinking and domestic use wherever possible. Regulations are in force which prohibit any pollution, defiling, discolouring, or dumping of refuse into a scheduled pond. A list of scheduled ponds is appended to the regulations.

Act: THE WILDLIFE ACT 1952

Area: LAND, WATER

Relevance: The Act is designed to aid the protection, preservation and propagation of wild life in the province, and as such concerns itself with the obstruction or pollution of non-tidal waters frequented by fish.

Regulations: No regulations have been made with regard to this part of the Act.

NOVA SCOTIA

Act: ENVIRONMENTAL PROTECTION ACT 1973

Area: AIR, LAND, WATER, NOISE

Relevance: This Act prohibits the discharge, deposition or emission of any waste which may affect the environment. It covers the use of minerals and construction of facilities that may affect the environment. It controls waste disposal and waste management and promotes restoration and reclamation of degraded or despoiled areas of the environment. Regulations are proposed under this Act that will cover open pit mines in Nova Scotia concerning the best use of the resource, development of pits and quarries considering the ultimate use of the mine site, proper control and

treatment of natural runoff from the mine area and process water, control of blasting methods in urban areas and rehabilitation of the site with planned ultimate use, consistent with surrounding topography and land use.

Act: PUBLIC HEALTH ACT 1967

Area: AIR, LAND, WATER

Relevance: The Act covers mainly human health problems rather than environmental protection and conservation. It prohibits contamination of the air, water or soil by any substances that may endanger the public's health or may become a nuisance.

Regulations under this Act do not per-

tain specifically to open pit mines.

Act: WATER ACT 1967

Area: WATER

Relevance: This Act manages the water resources of Nova Scotia and prohibits the discharge of any contaminant into a watercourse. Regulations require plans of any facility related to water flow diversion or alteration to be submitted to the Minister of the Environment for approval. Regulations outline the procedures to be followed for applications to use water in a process or

change the watercourse or flow. The regulations mainly concern sewage treatment plants but may be applied to open pit mines.

Act: MINERAL RESOURCES ACT 1975 (PROPOSED)

Area: LAND

Relevance: Draft proposals are before the legislators to introduce this Act, which will concern itself with mineral resource development in the province and the reclamation of lands used for the exploitation of minerals.

NEW BRUNSWICK

Act: CLEAN ENVIRONMENT ACT 1971

Area: AIR, LAND, WATER

Relevance: This Act prohibits deposition into water, air or soil, of any contaminant or waste by any person either directly or indirectly. Any facility that may contaminate the environment must be regulated by the Minister of the Environment.

Regulations outline procedures for applying for permits and licences to operate any facility that will be a stationary source of air pollution. They restrict the operation of any facility that will cause discomfort to persons, loss of enjoyment or normal use of property, interfere with normal conduct of business or cause damage to property. There are no other regulations under this Act pertinent to open pit mining.

any lands or into any waters.

Regulations passed under this Act do not pertain to the environmental aspects of open pit mining.

Act: WATER ACT 1961

Area: WATER

Relevance: This Act governs the efficient use of water resources in New Brunswick and prohibits the discharge or disposal of any material into any watercourse that may impair the quality of water for beneficial use.

Regulations restrict the discharge of solids into water and require their elimination. They cover the general provisions for disposal of liquid or solid wastes in water. The New Brunswick Water Authority published recommended standards for Waste Stabilization Ponds.

Proposed regulations set out the system of permits and approvals that must be followed by anyone using a facility (including open pit mines) that is likely to impair water quality. The operator will be required to list potential pollutants and their quantities, as well as methods for reducing these quantities.

Act: MINING ACT 1961

Area: LAND, WATER

Relevance: This Act provides for the safe and efficient operation of mines in New Brunswick. The Minister may make regulations concerning the disposal of tailings, slimes, waste products or any noxious or deleterious substances upon

PRINCE EDWARD ISLAND

Act: ENVIRONMENTAL CONTROL COMMISSION ACT
1971

Area: AIR, WATER, LAND

Relevance: The Environmental Control Commission has the power to investigate causes of pollution, prepare plans and programs for mitigation of pollution, and co-ordinate public programs to combat pollution. The Commission exercises exclusive control of the use and allocation of surface, ground and shore water, alteration of terrain affecting water bodies, and pollution matters within the province. The Commission may order remedial action and set prescribed fines. Powers under the Water Authority Act are vested in the Commission and it has particular responsibilities with regard to sewage. The Commission's status is expected to change to that of a department during 1975.

No relevant regulations are in force under this Act. Drafts are being prepared for open discussion at a later date.

Act: THE FISH AND GAME PROTECTION ACT 1959

Area: WATER

Relevance: The Act provides for the establishment of preserves and wildlife management areas; it prohibits the discharge of deleterious substances (including lime) into water frequented by trout and salmon.

No regulations of immediate relevance to mining are in force under this Act.

Act: THE OIL, NATURAL GAS AND MINERALS ACT
1971

Area: LAND

Relevance: This Act is directed towards oil and gas exploitation; however there is provision to make regulations requiring reclamation of the land surface or watercourses.

No existing regulations are relevant under this Act.

Act: RECREATION DEVELOPMENT ACT 1969

Area: LAND

Relevance: Under the Recreation Development Act, the Minister may effectively designate any area on the island as a public park, or a protected area or beach. This includes areas of land lying under tidal water or adjacent to it.

Regulations have been made which cover "Sand Removal in a Protected Area". The removal of sand, rock, gravel or earth unless under a Sand Removal Permit for other than domestic uses, is prohibited in a protected area. Permit holders are required to file monthly reports stating quantities of restricted material removed from each assigned permit area. A royalty of five cents per cubic yard is payable on all sand, rock, gravel or earth removed under a permit.

Permits may be cancelled or revoked if the Minister believes any permanent damage to the protected area is imminent, or any regulations have been violated.

QUEBEC

Act: ENVIRONMENT QUALITY ACT 1972

Area: AIR, WATER, LAND, NOISE

Relevance: The primary responsibility for air, water and soil pollution control and

solid waste disposal is vested in the Minister of the Environment and in the Environment Protection Services by means of the Environment Quality Act.

This Act encompasses all phases of environmental protection, and is the most significant provincial legislation in the province.

Of the three regulations made under this Act to this date, only one concerns air, water or soil pollution. It applies to hot mix asphalt plants. Seven other draft regulations have been published in the Quebec Official Gazette and are awaiting approval by the Lieutenant-Governor-in-Council. Moreover, regulations dealing with environmental matters and made under the old Public Health Act remain in force until altered or amended in accordance with the Environment Quality Act.

It is to be emphasized that the Environment Quality Act was designed to be applied with or without regulations. Thus, no one may erect or alter a structure, undertake to operate an industry, carry on an activity, use an industrial process, or increase the production of any goods or services if it seems likely that this will result in an emission, deposit, issuance or discharge of contaminants into the environment or a change in the quality of the environment, unless he obtains from the Director a certificate of authorization. Such authorization is also required before construction of water or sewage treatment facilities and installation of anti-pollution devices. The Quebec Water Board had consultations with a number of industries to determine the extent of the pollution resulting from their operations. As a result, directives were issued to the mining industry, giving deadlines for meeting specific water quality objectives.

Although the Water Board Act has been repealed and the Quebec Water Board dissolved, these directives remain the

policy of the Environment Protection Services.

Because the effluents of mining operations usually contain contaminants common to all of them or to large groups of them, the Quebec Water Board deemed it appropriate to issue directives applicable to all the mines or groups of mines.

The Quebec Water Board and its successor, the Environment Protection Service, therefore stipulate that, as of July 1 1969:

Objective No 1 - the net concentration of suspended solids in the effluent of tailings ponds shall not exceed 30 mg/l.

Objective No 2 - the pH of the effluent of tailings ponds shall be maintained at a level that will not adversely affect the pH of the main receiving stream.

Objective No 3 - the concentration of cyanide in the effluent of tailings ponds shall be set by the Quebec Water Board at a level that will not produce a concentration greater than 0.025 mg/l in the receiving stream.

Objective No 4 - the concentration of dissolved metals in the effluent of tailings ponds shall be kept at a level that will not affect the aquatic life of the receiving stream.

These four objectives also cover the waters pumped from underground and open pit workings.

The Quebec Water Board also requested that from July 1, 1969, each and every mine forward to its office, a quarterly report showing the average results of weekly analyses indicating:

- (a) outflow of tailings ponds in imperial gallons per day;
- (b) daily tonnage of tailings sent to pond;
- (c) net concentration of suspended

solids in effluent in mg/l;
 (d) the range of pH;
 (e) the concentration of cyanide in the effluent expressed as mg/l of CN.
 These objectives have been set to protect the waters of the province. Therefore, the main receiving stream shall be sampled above and below the point of entrance of the tailings ponds effluent. Such sampling shall take place twice a year. In cases where access to the stream involves too large an expenditure of time and money, such sampling shall take place once a year during the low flow period.

Act: INDUSTRIAL ESTABLISHMENTS ACT 1964

Area: WATER, LAND, AIR

Relevance: The Act concerns itself with the proper disposal of refuse and the ventilation and cleanliness of industrial establishments, including mine workshops and mills.
 No regulations are in effect that are specific to open pit mining.

Act: MINING ACT 1965

Area: AIR, LAND, WATER, NOISE

Relevance: The Quebec Mining Act provides comprehensive legislation on all matters pertaining to the management and operation of mining leases within the province. The Act concerns itself with the

material well-being of persons employed within the industry as opposed to the effects of mining on the general environment.

Selected regulations could have a broad interpretation, and hence are interesting from an environmental standpoint. In particular:

"The operator of every pit and quarry shall take precautions to protect workers from harmful concentrations of dust from theoperations."

and

"Noise levels cannot exceed levels acceptable to the Chief Inspector of Mines, provided that when suitable standards are exceeded then protective equipment shall be provided,.... by the employer and utilized by the employee."

Act: PUBLIC HEALTH PROTECTION ACT 1972

Area: WATER, AIR, LAND

Relevance: This Act is designed to enable the Minister of Social Affairs to co-ordinate provincial measures for the protection of public health and the distribution and supervision of the associated services; as such, it is concerned with the maintenance of a healthy working environment.
 No regulations are in effect that directly relate to open pit mining operations.

ONTARIO

Act: CONSERVATION AUTHORITY ACT 1971

Area: WATER

Relevance: This Act establishes conservation authorities to manage natural resources in watersheds. It prohibits placement or discharge of any material that may cause flooding or pollution.
 Regulations require companies to check with the conservation authorities so that a mine is not located in any

conservation area covered by this Act.

Act: ENVIRONMENTAL PROTECTION ACT 1971

Area: AIR, LAND, WATER, NOISE

Relevance: This Act prohibits dumping or discharge into the environment of substances that will result in harm to any person, animal, bird, plant or any living thing directly or as a result of inhalation or ingestion of any plant, fish, or

other living matter in water or soil. Regulations under the Air Pollution Control Act remain in force under this Act. These outline the use of air pollution indices and smoke density charts in Ontario. Schedule 1 gives standards for concentrations of air contaminants from stationary sources of air pollution at a point of impingement while Schedule 2 gives desirable ambient air quality criteria. Schedules 1 and 2 are given in Appendix 2. These will apply marginally to open pit mining, but can be applied to over-all operations.

Waste Management Act Regulations are in force under this Act. These exempt rock fill and mill tailings from a mine, but the regulations are still sound practice for the placement of tailings for protection of watersheds and final rehabilitation of sites.

Effluent Guidelines and Receiving Water Quality Objectives for the Mining Industry (see Appendix 2) are general guidelines for mines. Provision is made to treat each mine's discharge on an individual basis.

Act: MINING ACT 1970

Area: AIR, LAND

Relevance: This Act covers mainly the safe and efficient operation of mines in Ontario. It prohibits discharge into air of contaminants from roasting, smelting or refining operations, but has limited application to actual open pit mining operations.

Regulations require mine operators to plant and maintain vegetation or otherwise stabilize tailings that are no longer required as a disposal area. The operator must prove that the deposition of tailings will not affect man or biological life or health. The operator must provide adequate

compensation for anything affected by tailings. One year before cessation of operations, detailed revegetation and rehabilitation plans for the area must be submitted along with a bond or security deposit in the amount necessary to complete the rehabilitation. Work must be completed to the satisfaction of the chief engineer of mines.

Act: ONTARIO WATER RESOURCES ACT 1973

Area: WATER

Relevance: This Act prevents the deposition in water, or in a place where it will end up in water, of any material that will pollute or affect the health and safety of persons, animals or birds that may consume any plant, fish or other living organism from that water.

Regulations under this Act primarily concern sewage treatment. However, the Ministry of the Environment can impose an injunction on any company to halt water pollution and require them to clean up any pollutants. Guidelines and Criteria for Water Quality Management in Ontario are published under this Act and, although open pit mines and mine wastes are not listed under these guidelines, the Ministry can impose them on any operation.

Act: PITS AND QUARRIES CONTROL ACT 1971

Area: AIR, LAND, WATER

Relevance: This Act covers the safe and efficient operation of pits and quarries in 121 townships in Ontario.

Regulations outline the procedures for applying for necessary permits and licences to operate open pit mines. They outline the possible objections to any pit operation, such as damage to a watershed.

Applications to start an open pit mine must be accompanied by a description of

the proposed rehabilitation of the site and require a security deposit in the estimated amount of the rehabilitation costs. It also requires establishment and maintenance of a greenbelt of vegetation around the pit or quarry, and continuous rehabilitation of the site as mining proceeds.

Act: PUBLIC HEALTH ACT 1970

Area: AIR, LAND, WATER, NOISE

Relevance: This Act covers any operation that may be injurious to health or termed a nuisance.

Regulations leave the definition of a presumed nuisance to the discretion of the local Medical Officer of Health. The Medical Officer of Health will control nuisances and may restrict the establishment of offensive trades, which includes mines, and their services.

Act: THE ENVIRONMENTAL ASSESSMENT ACT 1975 (PROPOSED)

Area: AIR, WATER, LAND, NOISE

Relevance: The Act provides for assessment of the effects on the environment of undertakings by the provincial government agencies, Crown corporations or public bodies. Such undertakings will require the formal approval of the Minister prior to the issuing or granting of a licence, permit, etc.

The scope of the Act will be widened to include all commercial and business activities, at some date in the future, as yet undecided. This will certainly include open pit mines and their regulated facilities.

No regulations are in effect under this Act at the present time.

Note: This is a new Act, expected to become law during 1975.

MANITOBA

Act: CLEAN ENVIRONMENT ACT 1972

Area: AIR, LAND, WATER

Relevance: No person, directly or indirectly, shall cause, suffer or permit contamination of air, water or soil in excess of prescribed limits.

Regulations may be made covering all operations where there is a contaminant discharged to the environment. Unless exempted by the regulations, no operation may be conducted unless a proposal is filed with the Department and emission limits for the operation are established.

groundwater purity may be placed in or near wells. This Act is reinforced by the Water Rights Act, the Clean Environment Act and the Public Health Act and the regulations made under these Acts.

Regulations - A licence is required to carry on the business of drilling water wells. During drilling, adequate protection of groundwater supplies must be undertaken to avoid diminishing the purity of groundwater in the area. Dry or abandoned wells must be sealed in the proper manner.

Act: GROUNDWATER AND WATER WELL ACT 1969

Area: WATER

Relevance: This Act requires that precautions be taken in drilling of water wells to avoid pollution of groundwater and further that no substances which may pollute, contaminate or diminish

Act: MINES ACT 1973

Area: LAND

Relevance: This Act governs the disposition of Crown minerals and the safe and efficient operation of mines and provides for the protection and rehabilitation of the surface of lands

used during the course of mining. The Minister may prohibit commencement or continuation of mining operations when, in his opinion, it is against the public interest, taking into account resource management and protection of the environment.

Regulations (proposed) under this Act, will require an environmental impact assessment and a description of rehabilitation plans before permits to operate a mine are issued. Present regulations ensure that abandonment of mines and service buildings poses no threat to human or biological safety.

Act: MINING AND METALLURGY COMPENSATION ACT 1957

Area: AIR, LAND, WATER, NOISE

Relevance: This Act sets aside several districts in which no action or proceedings for injunction or damage shall be taken against the person operating a work or plant for mining, milling, smelting or refining.

No regulations are in effect which relate directly to open pit mining.

Act: PUBLIC HEALTH ACT 1970

Area: AIR, WATER, LAND

Relevance: This Act is concerned mainly with gen-

eral public health matters but would apply to open pit mining with respect to water supply, sewage disposal and working and living conditions.

Regulations under this Act can be applied to open pit mining with respect to water and soil contamination and the workplace environment.

Act: WATER RIGHTS ACT 1972

Area: WATER

Relevance: This Act governs the use and management of water in Manitoba, both surface and groundwater. This Act prohibits use, diversion, damming, impounding, etc of water without a licence. The Act outlines the methods for applying for permits and licences to construct works.

No regulations are presently in effect under this Act.

Act: INDUSTRIAL MINERALS DRILLING ACT 1962

Area: WATER

Relevance: This Act governs the boring of wells for the purpose of exploring for or obtaining certain minerals and provides for the issue of permits and certificates.

No regulations are presently in effect under this Act.

SASKATCHEWAN

Act: AIR POLLUTION CONTROL ACT 1965

Area: AIR

Relevance: This Act prohibits emission into the atmosphere of any contaminant that may affect the quality of the atmosphere. Regulations require mine operators to undertake waste control programs to prevent the pollution of air, and indirectly to protect water or soil from pollution caused by the air-borne transport of contaminants. The maximum quantities of certain solids and gases

in the outdoor atmosphere permissible under the regulations are given in Appendix 3. These standards are provisional and will be revised yearly in line with federal regulations under the Clean Air Act, and the requirements imposed by the Department of Mineral Resources.

Act: DEPARTMENT OF THE ENVIRONMENT ACT 1972

Area: AIR, LAND, WATER, NOISE

Relevance: This Act establishes the Department of

the Environment and gives the Minister control over all the Acts concerning the environment.

No regulations are presently in effect under this Act. However, provision has been made for the Minister to enact regulations that would apply to open pit mining.

Act: GROUNDWATER CONSERVATION ACT 1965

Area: WATER

Relevance: This Act provides for management of groundwater resources in Saskatchewan. Regulations require any person utilizing groundwater for an industrial source or changing the groundwater patterns, to submit detailed specifications for a licence. Even after fulfilling the requirements of the Mineral Resources Act, it still requires the operator to apply for the use of groundwater.

Act: MINERAL RESOURCES ACT 1965

Area: AIR, LAND, WATER

Relevance: The objective of this Act is to protect and enhance the capacity of the provincial mineral resource to serve the widest possible range of uses in the most efficient manner.

Regulations under this Act cover disposal of gaseous, liquid and solid wastes as well as rehabilitation of mines after completion of mining. Operators cannot discharge any industrial wastes (gaseous, liquid or solid) into the environment, without approval of the Minister. The operation must conform to all the environmental regulations of the provincial and federal governments. The requirements necessary to apply for approval are outlined under the regulations.

The Manual for Waste Disposal Procedures also gives details of infor-

mation required for approval to construct any plant that will discharge liquid wastes. It may require the implementation of a monitoring system to prevent pollution of air, water or soil. Criteria to be used to evaluate embankment retention systems designed to impound solid waste materials discharged as slurries are also given.

Pollution Prevention Regulations for the Mineral Industry apply to prevention and control of gaseous, liquid and solid waste pollution resulting from any process of the mining industry or from development of any mineral resource. Prior to abandonment, the operator must ensure that all waste structures are stabilized so that they do not fail and cause pollution or endanger life. Proposed under these regulations will be the necessity to conduct environmental impact assessments of mining operations, and the future rehabilitation of all areas disturbed by mining.

Act: MINES REGULATIONS ACT 1971

Area: AIR, LAND, WATER

Relevance: This Act provides for the safe and efficient operation of mines in Saskatchewan, including strip mines, open pit mines and quarry operations.

Regulations provide for an overall land-use plan for the mine property and surrounding areas to be developed. Operators must institute a program to protect and reclaim land and water-courses affected by the mine. The operator must submit a plan for approval outlining the operations, assessment of the impacts and any alternatives, before the operation starts.

Act: WATER RESOURCES MANAGEMENT ACT 1972
Area: WATER
Relevance: This Act is designed for the management of water resources in Saskatchewan. No person shall discharge, deposit, drain or release any substance capable of changing the quality of water or causing water pollution. It requires persons causing the pollution to consequently remove the contaminant.

Regulations outline the procedures for applying for licences and permits to use water as an industrial source and ensure that the quality of the water is not reduced. The Water Quality Criteria originally published under the Water Resources Commission Act are used in conjunction with this Act. (See Appendix 3).

ALBERTA

The Alberta Conservation and Utilization Committee publishes "A Guide to Assist the Prospective Businessman in Alberta". This lists all the licences, permits and certificates required under every act in Alberta. This guide is extremely useful to any business contemplating any operation in the province of Alberta.

Act: CLEAN AIR ACT 1971
Area: AIR
Relevance: The purpose of this Act is to ensure a high quality of air throughout the province of Alberta.
 Regulations prohibit the release of toxic air contaminants without prior written approval. The regulations outline the requirements for permits to construct any operation that may affect air quality and for licences to operate plants. Clean Air (Maximum) Regulations (Appendix 4) give the maximum permissible levels of various air pollutants. Many of these will not apply to open pit mines but may apply to their associated services.

water quality. Clean Water (General) Regulations require written approval to discharge, deposit, drain, release or allow to be deposited near water, anything that may cause contamination or alter the quality of a water body. They outline the procedures to obtain a licence to use water. The requirements to be followed in cases of accidental spills of toxic materials are listed. Clean Water (Industrial Plants) Regulations require permits to construct and licences to operate industrial waste water facilities. The Surface Water Quality Criteria were developed in cooperation with Manitoba and Saskatchewan. The main features of these affecting open pit mines are given under the Saskatchewan Water Resources Management Act 1972.

Act: CLEAN WATER ACT 1973
Area: WATER
Relevance: The purpose of this Act is to ensure the high quality of water in the province of Alberta.
 Regulations prohibit the dumping of any deleterious substance that may impair

Act: COAL MINE REGULATION ACT 1970
Area: LAND
Relevance: This Act provides for the safe and efficient operation of coal mines in Alberta.
 Regulations require that the land on which a strip mine is located shall be filled and levelled as the operations progress and shall be restored as nearly as possible to its original condition.

Act: COAL CONSERVATION ACT 1973

Area: LAND, WATER

Relevance: This Act provides for the appraisal of coal reserves, markets, conservation of coal for the future and the efficient and economic development of resources. It aims to ensure safe and efficient practices in exploration and processing.

Regulations require an operator to carry out a program of environmental management, including pollution control and surface reclamation to the satisfaction of the Department of the Environment. The regulations include details necessary in applying for licences to operate coal mines, and require a description of the mining methods to be used, a planned sequence of the proposed mining, and concurrent reclamation schemes. The evaluation of coal deposits and their economic development is the prime concern of this Act.

Act: DEPARTMENT OF THE ENVIRONMENT ACT 1971

Area: AIR, LAND, WATER, NOISE

Relevance: This Act covers conservation, management, utilization and prevention of pollution of natural resources, prevention of noise from industry, and preservation of natural resources for aesthetic value. The Minister may make regulations concerning the environmental aspects of any individual operation regarding pollution prevention, water protection and land surface disturbance. He may also prohibit any operation likely to impair the quality of the environment.

No regulations currently exist under this Act.

Act: GROUNDWATER CONTROL ACT 1955

Area: WATER

Relevance: This Act provides for the conservation

and protection of groundwater in Alberta.

Regulations require that all uses of groundwater are approved and permits are required for any well commencement or groundwater utilization. The operator must show that precautions are taken to prevent contamination of groundwater.

Act: LAND SURFACE CONSERVATION AND RECLAMATION ACT 1973

Area: LAND

Relevance: This Act provides for the conservation of the land surface, and all organisms relying on the land surface, and the reclamation of any land surface disturbed for any activity.

Regulations require any person undertaking any activity that may cause surface disturbance to submit a report detailing the development, which should contain an assessment of the environmental impact of the proposed development. The contents of the report will be detailed and must contain an assessment of conservation, management and utilization of natural resources; prevention and control of pollution of natural resources; prevention and control of noise; preservation of natural resources for aesthetic values and protection of wildlife and vegetation during the life of the operation. The regulations outline the procedures that must be followed to obtain approval to disturb the land surface for any reason. The Minister will determine the status of reclamation of operating or abandoned mine properties.

The Development and Reclamation Review Committee will review the application and assess the operator's past and present performance before making any recommendations on the submission at hand. If the proposed operation is

likely to be detrimental to the environment, approval may be withheld until reclamation plans are submitted. "Regulated Coal Surface Operations" regulations cover all aspects of coal mining - exploration, opening, operation, alteration, extension and abandonment. The regulations cover the requirements and methods for approval which must contain details of the operation and plans for abandonment and reclamation. Security deposits are required to ensure reclamation.

Land Conservation Guidelines are available under this Act and are a good practical guide for every province.

Act: PUBLIC LANDS ACT 1970

Area: LAND

Relevance: This Act governs all public lands in Alberta.

Regulations pertain to conditioning, maintenance and reclamation of surface lands affected by opening, operation, or abandonment of a mine or quarry. They require a licence to disturb the surface of any public lands, and prohibit the use public land if it will

contaminate water or cause soil erosion. The mine operator must pay the costs of reclamation. The restoration of the land surface must occur as the exploration, stripping, excavation and other operations progress. Restoration must be completed to the satisfaction of the Minister of Energy and Natural Resources and Forests, and must also conform to the Land Surface Conservation and Reclamation Act 1973.

Act: WATER RESOURCES ACT 1972

Area: WATER

Relevance: This Act governs the management and conservation of Alberta's water resources.

Regulations require approval before any person may divert or use any water; construct near or over any watercourse, or remove any material from a stream bed that may interfere with the present or future development or management of the watercourse. Regulations outline the procedures for applying for licences to use water, but are not specific to open pit mines.

BRITISH COLUMBIA

Act: COAL MINES REGULATIONS ACT 1969

Area: LAND, WATER

Relevance: This Act provides for the safe and efficient operation of mines as well as protection of the environment during mining operations.

Regulations require each mine owner to fulfil a program for protection and reclamation of surface land, and surface and groundwater. The regulations require an over all land-use plan for the area during and after operations. Reclamation programs must conform to those listed under the Mines Regulations Act 1967; however, in the

case of coal mines, environmental impact assessments and reclamation plans are required before the use of any mechanical equipment or operation that will disturb the land surface in cleaning, stripping or trenching. Guidelines for the design, construction and operation of tailings impoundments are published under this Act. They detail the reports necessary for approval of a tailings dam. Erosion control, interference with watercourses and seepage through the dam must be considered and any area downstream that would be affected by dam failure must

be identified. Instrumentation and monitoring of groundwater must be provided. Supervision of staff to carry out these procedures is needed so that they conform to the given specifications.

Act: ENVIRONMENTAL AND LAND USE ACT 1971

Area: LAND

Relevance: This Act ensures that all aspects of preservation and maintenance of the natural environment are fully considered in administration of land use and resource development, commensurate with a maximum beneficial land use. Adverse environmental effects are to be minimized.

Regulations are not presently published under this Act, but the Act has been used a few times to reduce the impact of a mine on an area.

Act: HEALTH ACT 1960

Area: AIR, LAND, WATER

Relevance: This Act ensures the safety of the public.

Regulations prohibit the deposition of any waste or solid refuse into water that may affect its flow or pollute the water. No poisonous, noxious or polluting liquid may be dumped into water unless purified to the best possible condition. Any spill, by accident or design, of potentially toxic solid, liquid or gaseous chemical must be reported, along with the circumstances of the spill, to the nearest Medical Officer of Health. No substance that may endanger life or safety of the public may be placed in the environment.

Act: MINES REGULATIONS ACT 1967

Area: LAND, WATER

Relevance: This Act governs the safe and efficient operation of mines in British Columbia,

as well as environmental protection and conservation.

Regulations cover reclamation programs to return disturbed resources and the environment to the best and fullest use. Reclamation reports and programs are to be prepared before production starts, and especially in the case of coal mines, before any land surface is disturbed. The report must contain details of how mining will proceed and how the reclamation program will be concurrent with mining. It must contain an assessment of present and past land usage, effects of mining on the ecosystems, minimization of adverse impacts and how the land will be returned to its best and fullest use after production. A security deposit for reclamation is required and the reclamation must be finished to the satisfaction of the Minister of Mines and Petroleum Resources.

Regulations concerning sand and gravel pits require reclamation programs to be submitted before any work is begun. Topsoil and overburden are to be removed first and stockpiled for future rehabilitation. No pollution of the land or water by stockpiles is allowed. Watercourses should be protected and, if necessary, returned to their original condition after cessation of mining. Residual lakes deeper than five feet can be left if the edges are reclaimed and stabilized. Residual lakes less than five feet deep must be backfilled to three feet above the maximum water level. The buildings must be removed and the land left in a neat, safe, clean condition, regraded if necessary to a gently undulating nature (maximum slope is 1 vertical to 1.5 horizontal) and then revegetated to the maximum potential.

Guidelines for the design, construction

and operation of tailings impoundments apply under this Act as well as the Coal Mines Regulations Act 1969.

All mines now in the exploration phase will come under these regulations. Present mines will be upgraded at the discretion of the Minister.

Published under the Mines Regulations Act are a number of guidelines and criteria for environmental protection. They explain in detail the types of problems that may arise with mining in the province, and outline alternatives for reducing adverse impacts. These practical, comprehensive guides should be of interest to operators outside British Columbia, as well as within the province. They include Criteria for Land Reclamation Standards in British Columbia (A. Reclamation Land-use Objective, B. Surface Drainage Control, C. Ground Cover, D. Ecological Stability, E. Plant Vigour); Reclamation Guidelines for Exploration (A. Reclamation, B. Roads, C. Clearing, Stripping and Trenching, D. Adits and Drill sites, E. Condition of the Operation at the End of the Work Season, F. Condition of the Land on Termination of Exploration Operations, G. Placer Gold Guidelines). Published under these are Suggested Seed Mixtures for Reclamation of Exploration Operations in British Columbia. There are also Guidelines for Preparation of a Reclamation Program and Report.

air, water or land of any contaminant that may impair environmental quality. They require a permit to discharge any potential pollutant and outline the details for application for permits and licences. Each application is treated on its own merits and standards are set for each establishment. Pollution Control Objectives for Mining, Mine Milling and Smelting Industries of British Columbia (Appendix 5) have a three-tiered structure for allowable emissions and discharges. Level A objectives must be met by all new mining operations, while Level C objectives should be met by all presently operating mines. Operating mines are expected to upgrade their operations to Level B and then to Level A as the available technology becomes feasible. Upgrading time limits will be determined on an individual basis. The objectives recommend a pre-operational study for each new site to determine what may be affected by the new operation, what the extent of damage may be, assessment of all processes that may damage the ecosystems and sample testing programs and simulation tests to ascertain the impact.

Act: POLLUTION CONTROL ACT 1967

Area: AIR, LAND, WATER

Relevance: This Act is the primary body for water and air pollution control in British Columbia. This Act requires an assessment of environmental impacts for new mining operations.

Regulations prohibit the discharge, either directly or indirectly, into

APPENDIX 1

FEDERAL REGULATIONS
SCHEDULES FROM THE AMBIENT AIR QUALITY OBJECTIVES
UNDER THE CLEAN AIR ACT 1971

Schedule 1

<u>AIR CONTAMINANTS</u>	<u>CONCENTRATIONS</u>	<u>RANGE OF QUALITY</u>
1. Sulphur Dioxide	a) 0 to 30 micrograms per cubic metre, annual arithmetic mean.	
	b) 0 to 150 micrograms per cubic metre, average concentration over a 24 hour period.	Desirable
	c) 0 to 450 micrograms per cubic metre, average over a one-hour period.	
2. Sulphur Dioxide	a) 30 to 60 micrograms per cubic metre, annual arithmetic mean.	
	b) 150 to 300 micrograms per cubic metre, average concentration over a 24-hour period.	Acceptable
	c) 450 to 900 micrograms per cubic metre, average concentration over a one-hour period.	
3. Suspended Particulate Matter	0 to 60 micrograms per cubic metre, annual geometric mean.	Desirable
4. Suspended Particulate Matter	a) 60 to 70 micrograms per cubic metre, annual geometric mean.	
	b) 0 to 120 micrograms per cubic metre, average concentration over a 24-hour period.	Acceptable
5. Carbon Monoxide	a) 0 to 6 milligrams per cubic metre, average concentration over an 8-hour period.	
	b) 0 to 15 milligrams per cubic metre, average concentration over a one-hour period.	Desirable
6. Carbon Monoxide	a) 6 to 15 milligrams per cubic metre, average concentration over an 8-hour period.	
	b) 15 to 35 milligrams per cubic metre, average concentration over a one-hour period.	Acceptable

Schedule 1 (cont)

<u>AIR CONTAMINANTS</u>	<u>CONCENTRATIONS</u>	<u>RANGE OF QUALITY</u>
7. Oxidants (ozone)	a) 0 to 30 micrograms per cubic metre, average concentration over a 24-hour period.	Desirable
	b) 0 to 100 micrograms per cubic metre, average concentration over a one-hour period.	
8. Oxidants (ozone)	a) 0 to 30 micrograms per cubic metre, annual arithmetic mean.	Acceptable
	b) 30 to 50 micrograms per cubic metre, average concentration over a 24-hour period.	
	c) 100 to 160 micrograms per cubic metre, average concentration over a one-hour period.	
9. Nitrogen Dioxide	a) 0 to 60 micrograms per cubic metre, annual arithmetic mean.	Desirable
10. Nitrogen Dioxide	a) 0 to 100 micrograms per cubic metre, annual arithmetic mean.	Acceptable
	b) 0 to 200 micrograms per cubic metre, average concentration over a 24-hour period.	
	c) 0 to 400 micrograms per cubic metre, average concentration over a one-hour period.	

Schedule 2CONTAMINANTSMETHOD OF MEASUREMENT

- | | |
|---------------------------------|--|
| 1. Sulphur Dioxide | West-Gaeke Method (Pararosaniline Method)
Report No EPS 1-AP-72-4. |
| 2. Suspended Particulate Matter | High Volume Method
Report No EPS 1-AP-73-2. |
| 3. Carbon Monoxide | Non-dispersive Infra-red Spectrometry Method
Report No EPS 1-AP-73-1. |
| 4. Oxidants (ozone) | Chemiluminescent Method
Report No EPS 1-AP-73-7. |
| 5. Nitrogen Dioxide | Chemiluminescent Method
Report No EPS 1-AP-74-2. |

APPENDIX 2

ONTARIO REGULATIONS
AIR POLLUTION CONTROL SCHEDULES
AND WATER QUALITY OBJECTIVES

Schedule 1
STANDARDS FOR EMITTED CONTAMINANTS

<u>Item</u>	<u>Name of Contaminant</u>	<u>Unit of Concentration</u>	<u>Concentration at Point of Impingement Half Hour Average</u>
1	Acetic Acid	Micrograms of acetic acid per cubic metre of air	2,500
3	Ammonia	Micrograms of ammonia per cubic metre of air	3,600
4	Antimony	Total micrograms of antimony in free and combined form per cubic metre of air	75
5	Arsenic	Total micrograms of arsenic in free and combined form per cubic metre of air	75
8	Beryllium	Total micrograms of beryllium in free and combined form per cubic metre of air	0.03
12	Boron	Total micrograms of boron in free and combined form per cubic metre of air	100
13	Bromine	Micrograms of bromine per cubic metre of air	70
14	Cadmium	Total micrograms of cadmium in free and combined form per cubic metre of air	5.0
15	Carbon Monoxide	Micrograms of carbon monoxide per cubic metre of air	6,000
21	Chlorine	Micrograms of chlorine per cubic metre of air	300
22	Chlorine Dioxide	Micrograms of chlorine dioxide per cubic metre of air	85

Schedule 1 (cont)
STANDARDS FOR EMITTED CONTAMINANTS

<u>Item</u>	<u>Name of Contaminant</u>	<u>Unit of Concentration</u>	<u>Concentration at Point of Impingement Half Hour Average</u>
23	Chromium	Total micrograms of chromium in free and combined form per cubic metre of air	30
24	Copper	Total micrograms of copper in free and combined form per cubic metre of air	100
33	Dustfall	Micrograms per square metre	8,000
37	Ferric Oxide	Micrograms of ferric oxide per cubic metre of air	75
38	Fluorides (Gaseous) (April 15 to October 15)	Micrograms of gaseous, inorganic fluoride per cubic metre of air expressed as hydrogen fluoride	4.3
39	Fluorides (Total) (April 15 to October 15)	Total micrograms of inorganic fluoride per cubic metre of air expressed as hydrogen fluoride	8.6
40	Fluorides (Total) (October 16 to April 14)	Total micrograms of inorganic fluoride per cubic metre of air expressed as hydrogen fluoride	17.2
42	Hydrogen Chloride	Micrograms of hydrogen chloride per cubic metre	100
43	Hydrogen Cyanide	Micrograms of hydrogen cyanide per cubic metre of air	1,150
44	Hydrogen Sulphide	Micrograms of hydrogen sulphide per cubic metre of air	30
45	Iron (metallic)	Micrograms of metallic iron per cubic metre of air	10
46	Lead	Total micrograms of lead in free and combined for per cubic metre of air	10

Schedule 1 (cont)
STANDARDS FOR EMITTED CONTAMINANTS

<u>Item</u>	<u>Name of Contaminant</u>	<u>Unit of Concentration</u>	<u>Concentration at Point of Impingement Half Hour Average</u>
48	Lithium	Total micrograms of lithium in other than hydride compounds per cubic metre of air	60
49	Magnesium Oxide	Total micrograms of magnesium oxide per cubic metre of air	100
50	Manganese	Total micrograms of manganese in free and combined form per cubic metre of air	100
52	Mercury (alkyl)	Total micrograms of mercury compounds per cubic metre of air	1.5
53	Mercury	Total micrograms of mercury in free and combined form per cubic metre of air	5.0
59	Nickel	Total micrograms of nickel in free and combined form per cubic metre of air	5
60	Nickel Carbonyl	Micrograms of nickel carbonyl per cubic metre of air	1.5
61	Nitric Acid	Micrograms of nitric acid per cubic metre of air	100
62	Nitrogen Oxides	Micrograms of nitrogen oxides per cubic metre of air expressed as NO ₂	500
63	Ozone	Micrograms of ozone per cubic metre of air	200
68	Phosphoric Acids	Micrograms of phosphoric acids per cubic metre of air expressed as P ₂ O ₅	100
70	Silver	Total micrograms of silver in free and combined form per cubic metre of air	3

Schedule 1 (cont)
STANDARDS FOR EMITTED CONTAMINANTS

<u>Item</u>	<u>Name of Contaminant</u>	<u>Unit of Concentration</u>	<u>Concentration at Point of Impingement Half Hour Average</u>
71	Sulphur Dioxide	Micrograms of sulphur dioxide per cubic metre of air	830
72	Sulphuric Acid	Micrograms of sulphuric acid per cubic metre of air	100
73	Suspended Particulate Matter (particulate less than 44 microns in size)	Total micrograms of suspended particulate matter per cubic metre of air	100
75	Tin	Total micrograms of tin in free and combined form per cubic metre of air	30
76	Titanium	Total micrograms of titanium in free and combined form per cubic metre of air	100
81	Vanadium	Total micrograms of vanadium in free and combined form per cubic metre of air	5.0
84	Zinc	Total micrograms of zinc in free and combined form per cubic metre of air	100

NOTE: This schedule has been edited for relevance to open pit mining and only those contaminants relevant to mining are quoted in this appendix.

Schedule 2
 AMBIENT AIR QUALITY CRITERIA

<u>Item</u>	<u>Name of Contaminant</u>	<u>Unit of Measurement</u>	<u>Average Amount of Concentration or Total Amount of Contaminant</u>	<u>Period of Time</u>	<u>Approximate Equivalent at 10°C and 760 mm Hg pressure</u>
1	Arsenic	Micrograms of Arsenic per cubic metre of air	25	24 hours	
2	Cadmium	Micrograms of cadmium per cubic metre of air	2.0	24 hours	
3	Carbon Monoxide	Parts of carbon monoxide per one million parts of air by volume	30	1 hour	36,200 µg/m ³
			13	8 hours	15,700 µg/m ³
4	Dustfall	Tons of dustfall per square mile per month	20 Total	30 days	
			13	1 year	
5	Fluorides (Gaseous) April 15 to October 15	Parts of fluorides per billion parts of air by volume (Expressed as HF)	1.0	24 hours	0.86 µg/m ³
			0.4	30 days	0.34 µg/m ³
6	Total Fluorides (Gaseous and particulate) April 15 to October 15	Parts of fluorides per one billion parts of air by volume (Expressed as HF)	2.0	24 hours	1.72 µg/m ³
			0.8	30 days	0.69 µg/m ³
7	Total Fluorides (Gaseous and particulate) October 16 to April 14	Parts of fluorides per one billion parts of air by volume (Expressed as HF)	4.0	24 hours	3.44 µg/m ³
			1.6	30 days	1.38 µg/m ³
11	Hydrogen Sulphide	Parts of hydrogen sulphide per one million parts of air by volume	0.02	1 hour	30 µg/m ³
12	Lead	Micrograms of lead per cubic metre of air	5.0	24 hours	
			2.0 geometric mean	30 days	
14	Mercury	Micrograms of mercury per cubic metre of air	2.0	24 hours	

Schedule 2 (cont)
 AMBIENT AIR QUALITY CRITERIA

<u>Item</u>	<u>Name of Contaminant</u>	<u>Unit of Measurement</u>	<u>Average Amount of Concentration or Total Amount of Contaminant</u>	<u>Period of Time</u>	<u>Approximate Equivalent at 10°C and 760 mm Hg pressure</u>
15	Nickel	Micrograms of nickel per cubic metre of air	2.0	24 hours	
16	Nitrogen Dioxide	Parts of nitrogen dioxide per one million parts of air by volume	0.20	1 hour	400 µg/m ³
			0.10	24 hours	200 µg/m ³
17	Oxidants (total)	Parts of total oxidants per one million parts of air by volume	0.10	1 hour	
18	Ozone	Parts of ozone per one million parts of air by volume	0.008	1 hour	165 µg/m ³
19	Soiling	Coefficient of Haze per 1,000 feet of air	1.0	24 hours	
			0.5	1 year	
20	Sulphation	Milligrams of sulphur trioxide per 100 sq cm of exposed lead peroxide per day	0.7	30 days	
21	Sulphur Dioxide	Parts of sulphur dioxide per one million parts of air by volume	0.25	1 hour	690 µg/m ³
			0.10	24 hours	275 µg/m ³
			0.02	1 year	55 µg/m ³
22	Suspended particulate Matter	Micrograms of suspended particulate matter per cubic metre of air	2.0	24 hours	
23	Vanadium	Micrograms of vanadium per cubic metre of air	2.0	24 hours	

NOTE: This schedule has been edited for relevance to open pit mining and only these contaminants relevant to mining are quoted in this appendix.

EFFLUENT GUIDELINES AND RECEIVING WATER QUALITY OBJECTIVES
FOR THE MINING INDUSTRY IN ONTARIO 1973

(ONTARIO MINISTRY OF THE ENVIRONMENT)

1. The "Mine-Mill Effluent Guidelines" presented below represent the minimum degree of treatment necessary at existing and future mining operations in the province of Ontario regardless of the available dilution in the receiving water. More stringent mine-mill effluent guidelines will be defined by the Ontario Ministry of the Environment for a specific mining property or for a specific mining area should such action be warranted.
2. Each new mining operation in the province of Ontario will receive an individual set of mine-mill effluent guidelines from the Ontario Ministry of the Environment. Each set of mine-mill effluent guidelines will reflect as accurately as possible the environmental and other factors that influence the mining development in question.
3. Specific mine-mill effluent guidelines will be defined, on an individual basis, by the

Ontario Ministry of the Environment for all existing mining operations. These guidelines will be influenced by local environmental and other considerations.

4. The "Mine-Mill Effluent Guidelines" of the Ontario Ministry of the Environment will be influenced by positive mine-mill waste treatment practices such as wastewater re-use.
5. The "Receiving Water Quality Objectives" presented below take into consideration existing and potential uses of the receiving water.
6. The "Receiving Water Quality Objectives" will apply at the periphery of a mixing zone which will be defined on the basis of the hydrological, physical, chemical and biological characteristics of the receiving water.
7. The "General Water Quality Objectives" presented below relate to the aesthetic quality of the receiving watercourse including the mixing zone.

MINE-MILL EFFLUENT GUIDELINES

Metals

8. The total concentration of any individual metal (excluding calcium, magnesium, potassium and sodium) in a mine-mill effluent should not exceed 1 milligram per litre (mg/litre) unless otherwise indicated by the Ontario Ministry of the Environment.
9. In addition, the cumulative concentration of copper, lead, zinc and nickel in a mine-mill effluent should not exceed 1 milligram per litre.
10. At any mine-mill location, cadmium and mercury should not be discharged in effluents in concentrations in excess of natural cadmium and mercury background concentrations found in the immediate area of the operation. In cases of extremely low concentrations, where chemical analysis is of questionable accuracy, a detection level agreed upon by the Ontario Ministry of the Environment and the company concerned will

constitute background.

Substances of Unknown Toxicity

11. All mine-mill wastes containing materials such as flotation agents, chemical additives, etc, of unknown toxicity should be considered harmful until bioassay tests in keeping with the specifications of the Ontario Ministry of the Environment have shown otherwise.

Sulphates and Total Dissolved Solids

12. The policy of the Ontario Ministry of the Environment is to minimize the build-up of sulphates and total dissolved solids in Ontario's receiving waters.
13. Sulphate and total dissolved solids concentrations in mine-mill effluents should be kept as low as possible using the best available practicable technology.

Ammonia

14. Ammonia concentrations in mine-mill effluents should be kept as low as the best available practicable technology permits. Until the technology for the removal of ammonia from waste streams improves, the use of ammonia and/or ammonium based compounds by the mining industry should be minimized whenever and wherever possible.

Oxygen Demand

15. The oxygen demand (chemical or biochemical) of a mine-mill effluent should be limited to a level which will not cause depression at any time of dissolved oxygen concentrations below 6

mg/litre in receiving waters supporting cold water fisheries and 5 mg/litre in receiving waters supporting warm water fisheries.

Suspended Solids

16. A mine-mill effluent should not contain more than 15 mg/litre of suspended solids.

pH

17. The pH of a mine-mill effluent must be maintained within the range 5.5 to 10.6 at all times. The pH should never be permitted to drop below 5.5. Sudden changes in pH values should be avoided.

RECEIVING WATER QUALITY OBJECTIVES

PARAMETER	HARD WATER	SOFT WATER
	(mg/l)	
Chromium (dissolved)	0.5 (0.05)*	0.5 (0.05)*
Cobalt (dissolved)	0.5	0.5
Copper (dissolved)	0.07	0.03
Iron (dissolved)	0.3	0.3
Lead (dissolved)	0.1 (0.05)*	0.05
Nickel (dissolved)	1.0	0.4
Zinc (dissolved)	0.2	0.02
Cyanide (dissolved)	0.01	0.01
Ammonia (Ammonia Nitro- gen as N)	1.5	1.5
Arsenic (dissolved)	0.05	0.05

*Public Surface Water Supply Objective.

Note 1

18. The Objectives are intended to provide adequate protection of fish and aquatic life. Other water uses, such as potable water supplies, may necessitate the adoption of more stringent objectives for individual parameters.

19. It is not the intention that these concentrations be regarded as desirable levels in natural waters since, generally speaking, levels at

or close to natural background levels must be considered most desirable. However, when not exceeded over limited areas of receiving waters in proximity to industrial discharges, these objectives should afford adequate protection to the aquatic biota under the majority of naturally-occurring environmental conditions. It should also be noted that these objectives will be reviewed routinely and are subject to change in light of new findings.

Note 2

20. Soft water is designated as 100 mg/litre hardness as CaCO_3 or less. Hard water is designated as greater than 100 mg/litre hardness as CaCO_3 . Both definitions refer to natural water hardness. Almost all hard rock mines in the province of Ontario are located in areas that fall into the "soft water" category.

Note 3

21. Where the natural background concentration in the receiving watercourse exceeds the value given for any parameter in the table the natural background concentration will become the receiving water quality objective.

GENERAL WATER QUALITY OBJECTIVES

Oil

22. Oil, petrochemicals or other immiscible substances that will cause visible films or toxic, noxious or nuisance conditions, should not be added to water.

Colour or Transparency

23. For effective photosynthetic production of oxygen, it is required that 10 percent of the incident light reach the bottom of any desired photosynthetic zone in which adequate dissolved oxygen concentrations are to be maintained.

Floating Materials

24. All floating materials, other than those of

natural origin, should be excluded from streams and lakes.

Tainting Substances

25. All materials that will impart odor or taste to fish or edible invertebrates should be excluded from receiving waters at levels that produce tainting.

Nutrients

26. It is the policy of the Ontario Ministry of the Environment to discourage or minimize the discharge of substances which may promote excess plant growth in a receiving watercourse.

APPENDIX 3
SASKATCHEWAN REGULATIONS
QUANTITATIVE AMBIENT AIR REGULATIONS
and
SURFACE WATER QUALITY CRITERIA

Table 1

PROVISIONAL MAXIMUM QUANTITIES OF CERTAIN SOLIDS AND GASES IN THE OUTDOOR ATMOSPHERE
PERMISSIBLE UNDER THESE REGULATIONS FOR 1970

(Regulations under the Air Pollution Control Act)

<u>Solid</u>	<u>Standard Measurement Device Used</u>	<u>Maximum Average Concentration for a One-Hour Period</u>	<u>Maximum Average Concentration for a 25-Hour Period</u>	<u>Maximum Average Concentration for a 30-Day Period</u>
Suspended particulates	High volume air sampler	.....	150 $\mu\text{g}/\text{m}^3$	.....
Settleable particulates	ASTM standard fallout jar	.....	.....	2.0 mg/sq cm
Soil Index	AISI filter tape sampler	.....	1.5 c.o.h. units	.....
Potash	ASTM standard fallout jar	.....	.....	0.3 mg KCl/sq cm
<u>Gases</u>				
Fluorides	Willard-Winter Distillation	.....	3.0 $\mu\text{g}/\text{m}^3$ (0.004 ppm)(expressed as HF)	.....
Hydrogen Sulphide	Methylene Blue Method	70 micrograms/ m^3 (0.05 ppm)	7 $\mu\text{g}/\text{m}^3$ (0.005 ppm)	.....
Sulphur Dioxide	1. West-Gaeke (0.4 ppm)	1000 micrograms/ m^3 (0.08 ppm)	200 $\mu\text{g}/\text{m}^3$	.....
	2. Lead Peroxide Candle (DSIR)	.....	.....	4 mg/100 sq cm
Chlorine	o-Tolidine Method	300 micrograms/ m^3 (0.1 ppm)	30 $\mu\text{g}/\text{m}^3$ (0.01 ppm)	.....
Nitrogen Dioxide	Jacobs and Hockheiser method	40 micrograms/ m^3 (0.02 ppm)	20 $\mu\text{g}/\text{m}^3$ (0.01 ppm)	.....

NOTE: The ASTM standard fallout jar test and DSIR sulphation test are done on a monthly basis, therefore several months are required to establish a concentration. Gaseous concentrations based on 26°C and 760 mm mercury.

SURFACE WATER QUALITY CRITERIA

1. These criteria have been prepared in cooperation with the provinces of Alberta and Manitoba and represent water quality suitable for most uses either through direct use or prepared for use by an economically practical degree of treatment. Only the parameters of interest to the mining industry are listed. The reader is advised to obtain the complete copy from the Department of the Environment.

2. Dissolved Oxygen A minimum of five mg/l at any time.

3. Biochemical Oxygen Demand Dependent on the assimilative capacity of the receiving water. The BOD must not exceed a limit which would create a dissolved oxygen content of less than five mg/l.

4. Suspended Solids Not to be increased by more than 10 mg/l over background value.

5. pH To be in the range of 6.5 to 8.5 pH units but not altered by more than 0.5 pH units from background value.

6. Temperature Not to be increased by more than 3°C above ambient water temperature.

7. Odour The cold (20°C) threshold odour number not to exceed eight.

8. Colour Not to be increased more than 30 colour units above natural value.

9. Turbidity Not to exceed more than

25 Jackson units over natural turbidity.

10. Inorganic Chemicals:

<u>Constituent</u>	<u>Maximum Concentration(mg/l)</u>
Boron	0.5
Copper	0.02
Fluoride	1.5
Iron	0.3
Manganese	0.05
*Nitrogen (Total Inorganic and Organic)	1.0
*Phosphorus as PO ₄ (Total Inorganic and Organic)	0.15
Sodium (as per cent of cations)	between 30 and 75
Sulphide	0.05
Zinc	0.05

*These criteria are presently under study and may require adjusting according to naturally-occurring concentrations or conditions.

Note: The predominant cations of sodium, calcium and magnesium and anions of sulphate, chloride and bicarbonate are too variable in the natural water quality state to attempt to define limits. Nevertheless, in order to prevent impairment of water quality, where effluents containing these

ions are discharged to a water body the permissible concentration will be determined by the Department of the Environment in accordance with existing quality and use.

11. Organic Chemicals:

<u>Constituent</u>	<u>Maximum Concentration(mg/l)</u>
Carbon Chloroform Extract (CCE) (includes Carbon Alcohol Extract)	0.2
Methyl Mercaptan	0.05
Methylene Blue Active Substances	0.5
Oil and Grease	- substantially absent no irridescent sheen
Phenolics	0.005
Resin Acids	0.1

12. Toxic Chemicals:

<u>Constituent</u>	<u>Maximum Concentration(mg/l)</u>
Arsenic	0.01
Barium	1.0
Cadmium	0.01
Chromium	0.05
Cyanide	0.01
Lead	0.05
Mercury	0.0001

Selenium 0.01

Silver 0.05

13. Radioactivity
Gross Beta not to exceed 1,000 pCi/l
Radium 226 not to exceed three pCi/l.
Strontium 90 not to exceed 10 pCi/l.

14. Unspecified Substances
Substances not specified herein should not exceed values which are considered to be deleterious for the most critical use as established by the Department of the Environment.

APPENDIX 4

ALBERTA REGULATIONS
AIR QUALITY REGULATIONS

MAXIMUM PERMISSIBLE CONCENTRATIONS OF CONTAMINANTS IN AMBIENT AIR

<u>Contaminant</u>	<u>Maximum Concentration</u>	<u>Length of Time</u>
Sulphur Dioxide	30 $\mu\text{g}/\text{m}^3$	1 year
	150 $\mu\text{g}/\text{m}^3$	24 hours
	450 $\mu\text{g}/\text{m}^3$	1 hour
	525 $\mu\text{g}/\text{m}^3$	0.5 hours
Hydrogen Sulphide	4 $\mu\text{g}/\text{m}^3$	24 hours
	14 $\mu\text{g}/\text{m}^3$	1 hour
	17 $\mu\text{g}/\text{m}^3$	0.5 hours
Suspended Particulates	60 $\mu\text{g}/\text{m}^3$	1 year
	100 $\mu\text{g}/\text{m}^3$	24 hours
Total Dustfall	5.3 g/m^2 (residential)	30 days
	15.8 g/m^2 (industrial)	30 days

MAXIMUM CONCENTRATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

Particulates	0.85 lb per 1,000 lbs effluent (adjusted to 50% excess air for products of combustion)
--------------	--

APPENDIX 5

BRITISH COLUMBIA REGULATIONS
DESIRABLE LEVELS OF AMBIENT AIR QUALITY
MINING, MINE-MILLING, SMELTING AND ASSOCIATED INDUSTRIES

AMBIENT CONTROL OBJECTIVES
FOR GASEOUS AND PARTICULATE EMISSIONS FOR SPECIFIC PROCESSES

<u>CONTAMINANT</u>	<u>OBJECTIVE LEVELS*</u>			<u>MONITORING</u>
	<u>A</u>	<u>B</u>	<u>C</u>	
1. Mining and Milling..... Total Suspended Particulate Matter				Collection on a 0.3 μ fibre filter by high volume sampler operated for one 24-hr period once per week. Gravimetric analysis.
a) (including background)				
Annual Geometric Mean ($\mu\text{g}/\text{m}^3$)	60	70	75	
Max 24 hr ($\mu\text{g}/\text{m}^3$)	200	150	260	
b) Maximum allowable (above background)				
Annual Geometric Mean ($\mu\text{g}/\text{m}^3$)	15	20	30	
2. Coal Preparation..... Coke Plants and Bulk Loading Facilities				Collection on a 0.3 μ glass-fibre filter by a high volume sampler operated for one 24-hr period once per week. Analyses-total particulate by gravimetric analysis. Coal by coal extraction method.
a) Total Suspended Particulate Matter (including background)				
Annual Geometric Mean ($\mu\text{g}/\text{m}^3$)	60	70	75	
Max 24 hr ($\mu\text{g}/\text{m}^3$)	200	150	260	
b) Coal or coke in Suspended Particulate Matter				
Annual Geometric Mean ($\mu\text{g}/\text{m}^3$)	5	15	20	

*NOTE: Level C objectives must be met by all presently operating mines. Level A objectives must be met by all new mining operations. Current operations must upgrade to Level B and then to Level A as technology becomes available, on a schedule to be decided for each operation.

<u>CONTAMINANT</u>	<u>UNITS</u>	<u>LEVEL A</u>	<u>LEVEL B</u>	<u>LEVEL C</u>	<u>MONITORING</u>
3. Suspended Particulate Matter.....					24 hours/week
a) Total Annual Geometric Mean	$\mu\text{g}/\text{m}^3$	60	70	75	
Max 24 hours	$\mu\text{g}/\text{m}^3$	150	200	260	
b) Lead					
Annual Geometric Mean	$\mu\text{g}/\text{m}^3$	2	2	3	
Max 24 hours	$\mu\text{g}/\text{m}^3$	4	4	6	
c) Zinc					
Annual Geometric Mean	$\mu\text{g}/\text{m}^3$	3	3	4	
Max 24 hours	$\mu\text{g}/\text{m}^3$	5	5	8	
d) Cadmium					
Annual Geometric Mean	$\mu\text{g}/\text{m}^3$	0.05	0.05	0.1	
Max 24 hours	$\mu\text{g}/\text{m}^3$	0.1	0.1	0.3	
4. Dustfall.....					Collected over one month period
a) Residential	$\text{mg}/\text{cm}^2/\text{mo}$	0.525	0.525	0.700	
	$\text{tons}/\text{m}^2/\text{mo}$	15	15	20	
b) Other	$\text{mg}/\text{cm}^2/\text{mo}$	0.875	0.875	1.225	
	$\text{tons}/\text{m}^2/\text{mo}$	25	25	35	

NOTE: Edited for relevance to open pit mining.

CHARACTERISTICS	DESCRIPTION	Unit of Measure- ment	Marine Water Discharge			Fresh Water Discharge		
			Level A	Level B	Level C	Level A	Level B	Level C
Arsenic (As)	Dissolved in the effluent	mg/l	0.05	0.25	1.00	0.05	0.25	1.00
Cadmium (Cd)	Dissolved in the effluent	mg/l	0.005	0.01	0.02	0.005	0.01	0.02
Chromium (Cr)	Dissolved in the effluent	mg/l	0.05	0.30	0.50	0.05	0.30	0.50
Cobalt (Co)	Dissolved in the effluent	mg/l	0.10	0.50	1.00	0.10	0.50	1.00
Copper (Cu)	Dissolved in the effluent	mg/l	0.05	0.30	1.00	0.05	0.30	1.00
Cyanide (CN)	Total Cyanide in the effluent	mg/l	0.10	0.50	2.00	0.10	0.50	2.00
Fluorine (F)	Dissolved in the effluent	mg/l	2.50	5.00	15.00	2.50	5.00	15.00
Iron (Fe)	Dissolved in the effluent	mg/l	0.30	1.00	5.00	0.30	1.00	5.00
Lead (Pb)	Dissolved in the effluent	mg/l	0.05	0.10	0.50	0.05	0.10	0.50
Manganese (Mn)	Dissolved in the effluent	mg/l	0.05	0.50	1.50	0.05	0.50	1.50
Magnesium (Mg)	Dissolved in the effluent	mg/l				150.00	300.00	500.00
Mercury (Hg)	Total Mercury in the effluent	mg/l	0.001	0.003	0.01	0.001	0.003	0.01
Molybdenum (Mo)	Dissolved in the effluent	mg/l	0.50	1.00	10.00	0.50	1.00	10.00
Nickel (Ni)	Dissolved in the effluent	mg/l	0.30	0.50	1.00	0.30	0.50	1.00
Nitrates/Nitrites as N	Dissolved in the effluent	mg/l	10.00	25.00	50.00	10.00	25.00	50.00
Phosphorus (P)	Total in the effluent	mg/l	2.00	5.00	10.00	2.00	5.00	10.00
Selenium (Se)	Dissolved in the effluent	mg/l	0.05	0.10	1.00	0.05	0.10	1.00
Silver (Ag)	Dissolved in the effluent	mg/l	0.10	0.50	1.00	0.10	0.50	1.00
Sulphate (SO ₄)	Dissolved in the effluent	mg/l				50.00	250.00	1000.00
Uranyl (UO ₂)	Dissolved in the effluent	mg/l	2.00	5.00	10.00	2.00	5.00	10.00

OBJECTIVES FOR EFFLUENT DISCHARGES
MINING, MINE-MILLING, SMELTING AND ASSOCIATED INDUSTRIES

CHARACTERISTICS	DESCRIPTION	Unit of Measure- ment	Marine Water Discharge			Fresh Water Discharge		
			Level A	Level B	Level C	Level A	Level B	Level C
Total Suspended Solids (non-filterable residue)	That portion of the effluent as discharged which is retained by an approved filter.	mg/l	50 ³	150 ³	(²)	50 ³	150 ³	(²)
Total Dissolved Solids (filterable residue)	That portion of the effluent as discharged which passes through on approved 0.45 micron pore filter.	mg/l				<2500	<3500	<5000
Colour ¹	Colour of the effluent at the point of discharge.	Approved units						
pH ²	The pH of the effluent at the point of discharge.	pH units	6.5-8.5	6.5-9.5	6.0-10	6.5-8.5	6.5-9.5	6.0-10

¹ To be reviewed

² Daily sampling

³ Initially, semi-quarterly sampling of effluents and at control and test stations in receiving waters; quarterly sampling of effluent discharged to closed systems.

Specific Compounds and Elements*

Aluminum (Al)	Dissolved in the effluent	mg/l	0.50	1.00	10.00	0.50	1.00	10.00
Ammonia as N	Dissolved in the effluent	mg/l	0.50	1.00	10.00	0.50	1.00	10.00
Antimony (Sb)	Dissolved in the effluent	mg/l	0.05	0.25	1.00	0.05	0.25	1.00

Zinc (Zn)	Dissolved in the effluent	mg/l	0.50	5.00	10.00	0.50	5.00	10.00
Oil and Grease	Total in the effluent	mg/l	15.00	15.00	15.00	15.00	15.00	15.00

Note 1 Acceptable concentrations for characteristics not appearing in this list are to be determined as required.

Note 2 When all liquids are totally recycled, the applicability of the above objectives will be assessed.

*Material contained in the effluent, at the point of discharge, which passes an approved 0.45-micron pore filter (Except where total values are required).

OBJECTIVES FOR TOXICITY FOR EFFLUENT CONCENTRATIONS
MINING, MINE-MILLING, SMELTING AND ASSOCIATED INDUSTRIES

<u>CHARACTERISTICS</u>	<u>Marine Water Discharge</u>			<u>Fresh Water Discharge</u>			<u>FREQUENCY OF MONITORING</u>
	<u>Level A</u>	<u>Level B</u>	<u>Level C</u>	<u>Level A</u>	<u>Level B</u>	<u>Level C</u>	
Limit Toxicity ¹	100%	40%	10%	100%	80%	20%	Quarterly on an initial basis.
Assessing Toxicity ²	-	-	-	-	-	-	As required, prior to start up; and semi-annually after start up.
In-situ Toxicity ³	-	-	-	-	-	-	As required in the field, in special cases.

¹50 per cent survival of test fish in designated effluent concentration over a 96-hour exposure time.

²Determine effluent concentration at which 50 per cent survive over a 96-hour exposure time.

³Undertaken in site-specific situations where an effluent toxicity potential is indicated for downstream populations of aquatic organisms.

OBJECTIVES FOR RECEIVING WATER QUALITY
MINING, MINE-MILLING, SMELTING AND ASSOCIATED INDUSTRIES

<u>PARAMETER</u>	<u>MARINE WATER</u>	<u>FRESH WATER</u>
Dissolved oxygen mg/l	90 percent of seasonal natural value	90 per cent of seasonal natural value ²
pH ¹ pH units	± 0.2	± 0.2
Turbidity ¹ APHA units	+ 5	+ 5
Colour ³ APHA units	-----	-----
Floatable solids mg/l	None	None
Toxicity	Below detectable limit	Below detectable limit
Aesthetic	No decrease	No decrease
Temperature ¹ °C	+ 3°	+ 3°
Alkalinity ¹ mg/l equiv CaCO ₃	-----	- 20 per cent
Chloride ¹ mg/l	-----	+ 25
Fecal Coliforms MPN/100 ml	-----	-----

¹Variations in water quality, due to the discharge of waste, should not exceed the numerical increments listed.

²Excluding lake stations, which should be assessed individually.

³To be reviewed.

CANMET PUBLICATIONS

Recent CANMET publications presently available or soon to be released through Printing and Publishing, Supply and Services, Canada (addresses on inside front cover), or from CANMET Publication Office, 555 Booth Street, Ottawa, Ontario K1A 0G1

CANMET Reports:

- 76-1 Metals and Alloys for Arctic Use; by R. C. A. Thurston;
Catalogue No. M38-13/76-1; Price: \$0.75 Canada, \$0.90 other countries.
- 76-2 Mineral Waste Source Report No. 1 - Mining Wastes in Ontario;
by R. K. Collings;
Catalogue No. M38-13/76-2; Price: \$0.75 Canada, \$0.90 other countries.
- 76-3 Certified and Provisional Reference Materials Available from CANMET;
by G. H. Faye;
Catalogue No. M38-13/76-3; Price: \$1.00 Canada, \$1.20 other countries.
- 76-4 The Preparation of Mica Cylinders for the Measurement of Thermal Conductivity;
by F. G. McDonald and V. V. Mirkovich;
Catalogue No. M38-13/76-4; Price: \$0.50 Canada, \$0.60 other countries.
- 76-5 Tungsten Ores CT-1, BH-1, and TLG-1: Their Characterization and Preparation
for Use as Certified Reference Materials; by G. H. Faye, W. S. Bowman and
R. Sutarno;
Catalogue No. M38-13/76-5; Price: \$1.00 Canada, \$1.20 other countries.
- 76-6 On the Determination of the Lattice Type and Unit Cell Parameters of a
Crystal Using Electron Diffraction; by K. S. Milliken;
Catalogue No. M38-13/76-7; Price: \$0.50 Canada, \$0.60 other countries.
- 76-7 Catalogue and Index of CANMET Scientific and Technical Papers Published in
or Submitted to Periodicals and Presentations, 1967-1973; by Technology
Information Division;
Catalogue No. M38-13/76-7; Price: \$2.00 Canada, \$2.40 other countries.
- 76-8 Comparison of Pull-Out Strength of Concrete with Compressive Strength of
Cylinders and Cores, Pulse Velocity and Rebound Number; by V. M. Machotra and
G. Carette;
Catalogue No. M38-13/76-8; Price: \$1.00 Canada, \$1.20 other countries.
- 76-9 Catalysts for Hydrocracking and Refining Heavy Oils and Tars Part 3: The
Effect of Presulphiding Conditions on Catalyst Performance; by M. Ternan
and M. J. Whalley;
Catalogue No. M38-13/76-9; Price: \$4.00 Canada, \$4.80 other countries.
- 76-10 Recent Advances in Copper Electrowinning; by D. J. MacKinnon and V.I. Lakshman;
Catalogue No. M38-13/76-10; Price: \$1.50 Canada, \$1.80 other countries.
- 76-11 The Determination of Radium 226 in Uranium Ores and Mill Products by Alpha
Energy Spectrometry; by J. B. Zimmerman and V. C. Armstrong;
Catalogue No. M38-13/76-11; Price: \$1.00 Canada, \$1.20 other countries.
- 76-12 Lightweight Aggregates for Structural Concrete; by H. S. Wilson;
Catalogue No. M38-13/76-12; Price: \$3.75 Canada, \$4.50 other countries.
- 76-13 Development of a Zirconia Electrolyte for Use in a Steel-Making Oxygen
Probe; by T. A. Wheat;
Catalogue No. M38-13/76-13; Price: \$5.00 Canada, \$6.00 other countries.