Environment Canada Environnement Canada

The Effects Monitor

Environmental Effects Monitoring Newsletter for the Atlantic Region

Volume 1 Number 2 July 1994

Environmental Effects Monitoring for the Mining Industry

The Metal Mining Liquid Effluent Regulations (MMLER) do not require mining operations to conduct environmental effects monitoring. However, many mining companies do conduct EEM programs on their own or as a requirement of their provincial operating permits. In November, 1992 a national workshop was held in Toronto to discuss the MMLER and the need for amendments. Representatives of federal and provincial governments, environmental groups, the mining industry and native groups reviewed the present requirements of the MMLER and recommended areas where changes should be considered.

One of the main recommendations of the meeting was that the current MMLER should be evaluated to determine if they were effective at protecting the aquatic environment. In response, Environment Canada initiated a program called the **Assessment of the Aquatic Effects of Mining in Canada (AQUAMIN)**. A Steering Committee was formed with representation from the federal government, the mining industry, several provinces, environmental organizations and First Nations. The objectives of **AQUAMIN** are to make recommendations on amendments to the MMLER and the design of a national EEM program for mining. Areas requiring further research will be identified.

AQUAMIN will rely on existing information (published reports, government studies, consultant's reports) to evaluate the aquatic impacts of mining and will focus on base metals, gold and uranium mines. Working groups have been formed to complete specific tasks for **AQUAMIN.** Working Group #1 developed selection criteria for choosing information to be used in the assessment process. Their task was completed in February, 1994 and a consultant was hired to use the the selection criteria to screen the several hundred reports related to aquatic effects of mining that the **AQUAMIN** Secretariat had assembled. In 1993, the Secretariat drafted a background document on the Canadian mining industry, existing federal and provincial environmental requirements and the effects of metals and other mining related chemicals in the aquatic environment. Working Group #2 was formed to revise and edit this background report for the final **AQUAMIN** report.

Four other working groups, based on geological regions, have been formed. Their task will be to use the information screened by the consultant to prepare an assessment of the aquatic impacts from the mining operations in their regions. These four regional reports are due by the end of 1994 and will be the basis of the overall assessment of aquatic effects due to the activities of the mining industry.

Status of EEM Studies at Atlantic Region Pulp Mills

To date, six pre-design reports and EEM Study designs have been submitted for approval to the Regional Authorization Officer for Environment Canada. The most recent report was received from Fraser's Inc. in Edmundston, N.B. The Nova Scotia and New Brunswick Technical Advisory Panels are reviewing these submissions and have held several meetings and telephone confer-

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ence calls to discuss the reports received. Approvals for several of these mills to proceed with their proposed studies are expected to be issued in July.

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Aquatic Effects Technology Evaluation

The Canadian Centre for Mineral and Energy Technology (CANMET) and the Mining Association of Canada have recently initiated a four-year joint study into testing procedures for environmental monitoring of mining operations. This multi-stakeholder program will undertake a review of appropriate technologies for assessing the impacts of mining effluents on the aquatic environment. The program will focus on three main technical areas: acute and chronic toxicity testing methods; biological monitoring methods for receiving waters; and water and sediment monitoring methods. The program has two separate but complementary objectives: to help the Canadian mining industry meet its environmental effects monitoring and related requirements in as cost-effective manner as possible; and to benefit the Canadian environment by evaluating new and existing technologies for the assessment of environmental impacts and indicating the benefits and weaknesses of each technology.

The program complements **AQUAMIN** and will make recommendations on the best tools and techniques to use for designing a national EEM program for metal mining.

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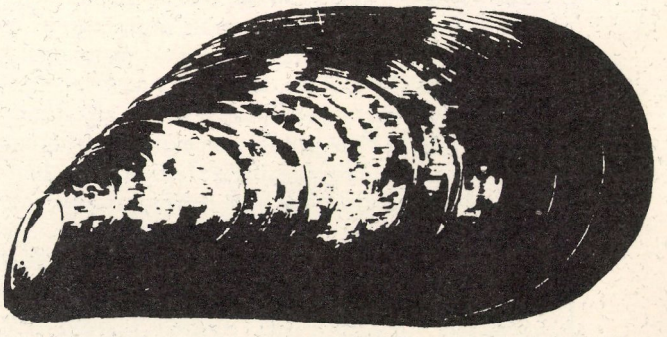
Shellfish Growing Area Surveillance

Regional shellfish growing area surveillance activities got under way in May. The program conducts annual evaluations of bacteriological water quality and shoreline sanitary conditions throughout large portions of the coastline in all four Atlantic provinces. Typically in the growing area re-evaluation surveys, near-surface water samples are collected for fecal coliform analysis on ten to fifteen occasions, representing a variety of tidal and weather conditions during the May to November period. Due to the unstable nature of bacteria, samples must be processed within six hours of collection. As a result, analyses are conducted in nearby facilities such as DOE mobile laboratories, Fisheries and Oceans area Inspection Laboratories or other CSSP (Canadian Shellfish Sanitation Program) certified facilities. In addition, key reference stations in several shoreline areas are sampled five times per year. The data collected is used to ensure that the areas are not a danger to public health and comply with CSSP water quality and sanitary standards. Approximately ten thousand samples are collected and analyzed each year.



This summer, field operations will be centred from laboratories in Yarmouth, N.S.; Bedford Institute of Oceanography in Dartmouth, N.S.; CFB Chatham, N.B.; Black's Harbour, N.B.; Charlottetown, PEI; and Terra Nova National Park, Newfoundland. The areas which will be surveyed in Nova Scotia will include the French Shore from Meteghan to Tusket River, the Northumberland Strait shore and parts of the eastern and southern Atlantic shore. In New Brunswick, surveys will be completed from Tracadie to the Richibucto River and from Musquash to the St. Croix River. All shellfish growing areas in Prince Edward Island will be sampled during the summer and fall period.

Shoreline surveys to identify possible sources of fecal coliform pollution to the marine environment will be conducted in conjunction with these surveys and will also be conducted along outer shore areas in Cape Breton. A joint sanitary study with the New Brunswick Department of Health will be conducted on the St. Croix Estuary.

The monitoring of mussels for organic and inorganic contaminants including PAH's, PCB's, chlorinated pesticides and certain metals will continue in selected growing areas in all four provinces. Sites this year will include Murray Harbour and St. Peters Bay in PEI; Caraquet Bay, Kouchibouguac and Bouctouche, New Brunswick and Whitehead Harbour and Barrington Bay in Nova Scotia.

The information obtained from these surveys will be used to classify coastal waters as to their suitability for harvesting shellfish for direct marketing, aquaculture development and marine environmental quality trend analysis.

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Mercury Contamination from Pesticide Use on Golf Courses

Golf course turf usually consists of one or two grass species which, like any monoculture, can be prone to disease that can thrive under the stressful conditions produced by heavy traffic on the turf. This can intensify the need for pesticide treatments. Despite the fact that the persistence and toxicity of mercury are well documented and that alternatives are available, mercurial fungicide use on golf courses in Canada has continued. In contrast, mercurial fungicides are no longer registered for use in the United States.

In 1991, Environment Canada conducted a study of pesticide use patterns for golf courses in the Atlantic provinces. This study indicated that fungicides containing organic mercury as the active ingredient were applied at a mean annual rate of 184 kilograms per hectare (kg/ha). The survey also revealed that fungicides containing forms of inorganic mercury as the active ingredients were applied at an annual mean rate of 5.1 kg/ha.

In 1992 and 1993, triplicate core samples of golf green soil and water course sediments were taken from thirteen selected golf courses in the Atlantic provinces. Nine of these locations had soil concentrations of mercury which exceeded the Canadian Council of Ministers of the Environment (CCME) soil remediation criteria for residential and park land of 2000 g/kg. Ten of the locations exceeded the remediation criteria for industrial areas of 10000 g/kg. Mean total mercury concentrations in golf green soils ranged from less than 30 up to 100667 g/kg. In watercourse sediments, mercury concentrations ranged from less than 30 - 2205 g/kg.

At one golf course, lake bottom sediments and tissue from freshwater mussels inhabiting the lake were collected. This lake was bordered by several golf greens. The analytical results for these samples indicated that the lake was contaminated by mercury. Methyl mercury contamination patterns in the mussel tissue indicated that mercurial fungicide use on the golf greens was the probable source of the observed mercury contamination. These results are supported by several previous studies and suggest that applications of mercurial fungicides within the limits specified on product labels have resulted in accumulation of mercury at golf courses. The degree of contamination, the propensity for off-site contamination and ramifications for future land use, question the wisdom of continued mercurial fungicide use.

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Chlorinated Sewage Effluents Studied

In support of the national Priority Substances Assessment of chlorinated municipal waste water effluents, the Environmental Protection Branch, Atlantic region conducted a study of the aquatic toxicity and environmental impact of chlorinated waste water effluent discharges from four sewage treatment plants in Nova Scotia in 1991.

Chemical screening identified a wide variety of non-chlorinated and some chlorinated phenolic compounds in effluents. The acute toxicity of the effluent to rainbow trout, threespine stickleback, water flea and bacteria was more pronounced with effluent from plants which had mean total residual chlorine concentrations above 0.2 mg/L. Abnormal shell development in larval oysters was observed at concentrations as low as 0.2% effluent after a 48-h exposure to effluent from one plant. Total residual chlorine was responsible for some, but not all of the observed effluent toxicity as indicated by toxicity tests run on dechlorinated samples. None of the effluents tested were toxic to a freshwater algae (*Selenastrum capricornutum*) and a freshwater invertebrate (*Ceriodaphnia dubia*) and were not mutagenic according to the Ames test.

A statistically significant decrease in the diversity of benthic macroinvertebrates was observed at sampling stations less than one metre from the effluent outfall of all plants and at 50 metres downstream of the outfall of one plant discharging to a brook. It was not possible to positively determine whether residual chlorine or other contaminants in the chlorinated waste water contributed to these observed effects on benthic community at the study sites.

The results of the study formed part of the data set which was used in the Priority Substances Assessment which determined that chlorinated waste water effluents are toxic as defined by the Canadian Environmental Protection Act. Control strategies are currently being developed for those substances. The results of the Atlantic region study will soon be published in the Proceedings of the 20th Annual Aquatic Toxicity Workshop, Quebec City, October 1993.

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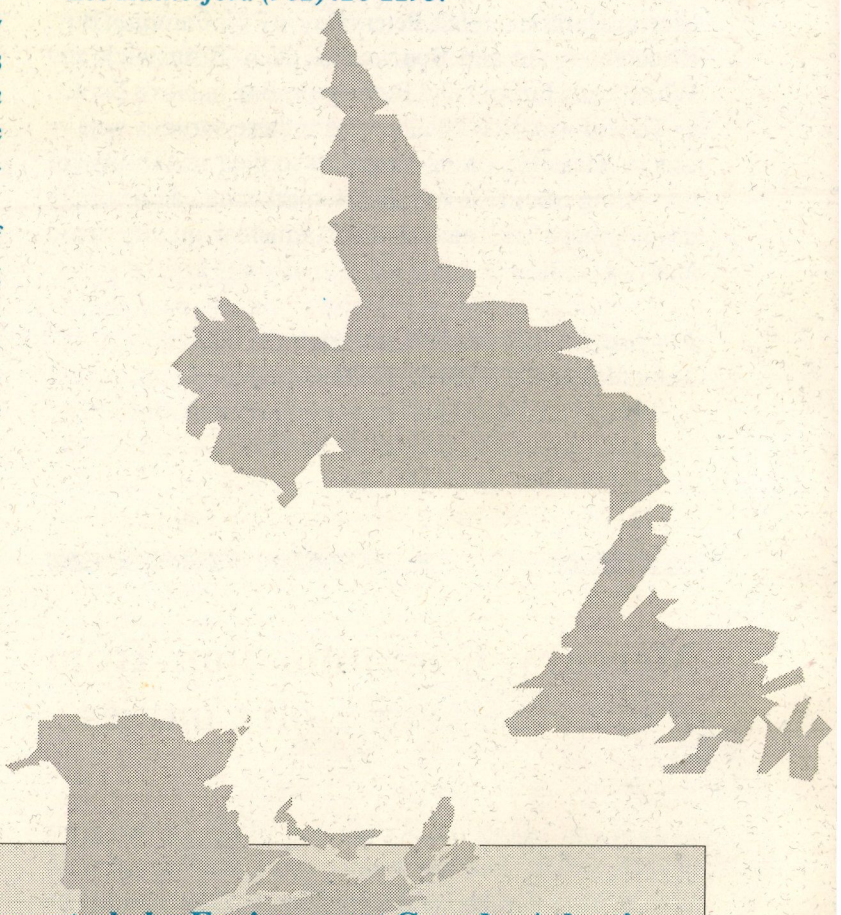

Cat. No. ISSN #1198-4031(E))

The Effects Monitor will be published quarterly by Environment Canada, Atlantic Region. Anyone interested in receiving a copy of the newsletter, submitting an article for the newsletter or making any comments or suggestions, should contact:

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