

THE CLEAN ENVIRONMENT COMMISSION

REPORT ON PUBLIC HEARINGS

ON THE

DRAFT REGULATION RESPECTING ATMOSPHERIC EMISSIONS

OF SULPHUR DIOXIDE AND PARTICULATES

FROM

INCO LIMITED IN THOMPSON

AND

HUDSON BAY MINING AND SMELTING CO. LIMITED, IN FLIN FLON

OCTOBER, 1987

REPORT ON PUBLIC HEARINGS ON THE DRAFT REGULATION  
RESPECTING ATMOSPHERIC EMISSIONS FROM INCO LIMITED IN THOMPSON  
AND HUDSON BAY MINING AND SMELTING CO. LIMITED, IN FLIN FLON

Table of Contents

	<u>PAGE</u>
INTRODUCTION	1
BACKGROUND	3
THE PROPOSED REGULATION	
Sulphur Dioxide Emissions	5
Inco Limited	5
Hudson Bay Mining and Smelting Co. Limited	6
Particulate Emissions	6
Inco Limited	6
Hudson Bay Mining and Smelting Co. Limited	6
Monitoring Requirements	7
Studies to Reduce SO <sub>2</sub> Emissions	7
General	7
THE INDUSTRY POSITION	
INCO Limited	8
Hudson Bay Mining and Smelting Co. Limited	11
The United Steelworkers of America - Thompson	13
The United Steelworkers of America - Flin Flon	14
The Mining Association of Manitoba	14
THE POSITIONS OF OTHER INTERESTED PARTIES	16
The Environmental Organizations Position	16
The Canadian Coalition On Acid Rain	16
The Manitoba Environmental Council	17
Mr. Brian Pannell	18
The Community Position	18
The City of Thompson	18
Thicket Portage	19
The Environment Canada Position	19
The Manitoba Department of Health Position	21
RECOMMENDATIONS AND ANALYSIS	22
Sulphur Dioxide Emissions	22
INCO Limited	22
Hudson Bay Mining and Smelting Co. Limited	24
Particulate Emissions	25
INCO Limited	25
Hudson Bay Mining and Smelting Co. Limited	26
Monitoring and Data Submission	26
Further Studies	28
Unallocated Portion of Sulphur Dioxide	29
Deposition Limits	30
APPENDIX I - Manitoba Regulation Respecting Atmospheric Emissions From Inco Limited in Thompson and Hudson Bay Mining and Smelting Co. Limited, in Flin Flon - Draft #6 Dated - March 23, 1987	31

## INTRODUCTION

Acidic precipitation (acid rain) is one of today's most widespread and serious environmental problems.

For a number of years, the Canadian government has been extremely concerned about the damage being done by acid rain and has attempted to conclude an agreement with the United States, whereby emissions of sulphur dioxide from industry and public utilities would be reduced substantially. The arrangement of such an agreement has been difficult and there is still no formal agreement to effect specified reductions. However, in February of 1985, provinces east of the Manitoba-Saskatchewan border agreed to reduce total emissions by fifty percent by 1994. A formal agreement was signed by Canada and Manitoba on April 10, 1987, whereby Manitoba agreed to limit sulphur dioxide emissions in Manitoba to an annual level of 550 kilotonnes by 1994. This agreement will contribute to the goal of a 50 percent reduction in Canadian sulphur dioxide emissions east of the Saskatchewan/Manitoba boundary by 1994, and parallels actions taken by the provinces in eastern Canada.

A Regulation to accomplish this was drafted and on December 1, 1986 the Minister of Environment and Workplace Safety and Health, the Honourable Gerard Lecuyer, requested the Clean Environment Commission to hold public hearings to review the draft Regulation and to provide him with the Commission's recommendations following the hearings. The draft Regulation is attached to this report as Appendix I.

After advertisement of scheduled hearings, the Commission held hearings in Thompson on May 26, 1987, in Flin Flon on May 27, 1987 and in Winnipeg on June 4, 1987.

The staff of the Environmental Management Division of the Department of Environment and Workplace Safety and Health made a presentation at each hearing, giving background information on the acid rain problem and details of the proposed Regulation on sulphur dioxide and particulate emissions, as well as proposed monitoring and study requirements contained in the draft Regulation.

Both INCO Limited (Inco) and the Hudson Bay Mining and Smelting Co. Limited (HBM&S) made detailed presentations to the Commission, concerning the draft Regulation, at Thompson and Flin Flon respectively. Inco personnel also attended the Flin Flon and Winnipeg hearings and made an additional presentation at the Winnipeg hearing.

INTRODUCTION - continued

A number of individuals and organizations made presentations as follows:

THOMPSON: Mr. Barrie Briscoe - Environment Canada  
Mr. Ken Lacroix - Manitoba Environmental Council  
Mr. Eric McCormick - City of Thompson  
Mr. Blake McGrath - United Steelworkers of America  
Mr. Gilbert Pronteau - Mayor of Thicket Portage

FLIN FLON: Mr. Barrie Briscoe - Environment Canada  
Mr. Steve Hamon - United Steelworkers of America and  
the Manitoba Environmental Council

WINNIPEG: Mr. Barrie Briscoe - Environment Canada  
Mr. Dennis Muldrew - Manitoba Naturalists Society  
Mr. Brian Pannell - Winnipeg  
Mr. Michael Perley - Canadian Coalition on Acid Rain  
Dr. N. S. Rihal - Manitoba Department of Health  
Mr. Marc Trottier - Manitoba Environmental Council  
Mr. Jim Young - Environment Canada

## BACKGROUND

The adverse effects of acid rain have been documented both in North America and in Europe where there has been extensive damage to lakes and forests.

In North America, the acid precipitation is caused mainly by the emission of sulphur dioxide from coal-burning electric power generating plants and mine smelting operations. Nitrous oxides, mainly from the exhaust of internal combustion engines in transportation vehicles, also contribute substantially to acid rain. In the atmosphere, these gases react with moisture to form dilute sulphuric and nitric acid. The precipitation of these acids, falling to earth in rain, snow and dust has contaminated many lakes to the extent that most aquatic life in them has been destroyed. There is also increasing evidence of damage to extensive forest areas.

In general, acid rain can reduce soil fertility, damage crops and forest, kill fish and other aquatic life in lakes, contaminate drinking water - by leaching metals from contact soils - and corrode buildings and statues.

In Canada, the large Pre-Cambrian Shield areas of Eastern Canada have, to date, been the most severely affected; however, documented damage has not been limited to these areas.

The Pre-Cambrian Shield covers approximately two thirds of Manitoba, including areas that can be impacted by emissions of sulphur dioxide from the metallurgical complexes at Thompson and Flin Flon; however, not all areas of the Shield in Manitoba are vulnerable to the impacts of acid rain. Many of Manitoba's waters are protected by a natural alkalinity. In some areas, the soils provide a buffer to acid rain because of alkalinity in the soil but in other areas, which are sandy and low in organic matter, the soils are already acidic and offer little buffering against acidification.

At present, Manitoba does not have a documented problem from the effects of acid rain but large quantities of sulphur dioxide are generated within the Province and, thus, a potential problem is present. Because of this potential problem, Manitoba has developed a program which monitors air, precipitation, soil, geology, vegetation and water to provide information on the effects of acid rain. Although there is not a documented acid rain problem in Manitoba, acid precipitation has been recorded regularly at some of the monitoring sites. Studies have also shown adverse effects from the sulphur dioxide emissions on the forest ecosystem in close proximity to the metallurgical complexes at Flin Flon and Thompson.

If protection is to be provided for all surface waters, it has been recommended that wet sulphate deposition should not exceed 10 kilograms per hectare per year and that areas with moderate sensitivity should not be subject to a deposition exceeding 20 kilograms per hectare per year. Current wet sulphate deposition in Manitoba is below 10 kilograms per hectare per year.

BACKGROUND - continued

Studies of the long range transport of air pollutants have shown that sulphur dioxide emissions from Manitoba have been a minor contributor to acid deposition in northwestern Ontario and an even lesser contributor to depositions in the sensitive and badly damaged Muskoka area of Ontario.

In addition to emissions from Canadian locations, sulphur dioxide emitted from sources in the United States is carried into Eastern Canada by prevailing winds. The total emissions from this source are a major contributor to the acid rain precipitation in parts of Canada.

There are two main sources of sulphur dioxide emission in Manitoba - the mine smelters of Inco in Thompson and HBM&S in Flin Flon. Ninety-five percent of the total sulphur dioxide emissions within the Province originate from these two sources.

For many years, these smelting operations have been regulated by orders of The Clean Environment Commission. With the Canada-Manitoba agreement to reduce total Manitoba emissions to a predetermined limit, it was appropriate to control the emission from these operations by a Provincial regulation under the Clean Environment Act. This Regulation will replace the Clean Environment Commission orders.

## THE PROPOSED REGULATION

The proposed Regulation is designed to fulfil Manitoba's commitment to regulate provincial sulphur dioxide emissions to an annual limit of 550 kilotonnes by 1994. The Regulation will replace existing Clean Environment Commission orders 483V000 and 899V0 which control air emissions from the metallurgical complexes at Thompson and Flin Flon.

The Regulation proposes control limits on atmospheric emissions of sulphur dioxide and particulates, to become effective immediately, as well as limits on these emissions which would come into effect on January 1, 1994.

In developing the proposed 1987 emission limits, the Department's premise was that the selected limits would permit both Companies to operate at current full plant production capacity, without immediate modification of present existing plant equipment and facilities.

In order to incorporate all of the conditions of the existing Commission orders, the Regulation also addresses stack emission of particulate matter, as well as monitoring and research study requirements.

The proposed Regulation would restrict annual sulphur dioxide emissions to a level 130 kilotonnes below the agreed Provincial limit. This proposal results in an unallocated surplus of sulphur dioxide emissions.

### 1. SULPHUR DIOXIDE EMISSIONS

#### INCO LIMITED

The Regulation proposes that, after January 1, 1987, Inco be required to restrict sulphur dioxide emissions to 300 kilotonnes per year and 31 kilotonnes per month. On and after January 1, 1994 the sulphur dioxide limits would be reduced to 220 kilotonnes per year and 23 kilotonnes per month. The monthly limits are intended to minimize environmental impacts in the area surrounding the smelter stack and are predicated on a 300 day operating year and a 31 day month, e.g.,  $\frac{220 \times 31}{300} = 23$ . The 300 day operating year was

designed by the Environment Department to provide the Company with flexibility to operate at full production while allowing for periods of reduced operations and for vacation and maintenance shut-down.

Actual levels of sulphur dioxide emission from Inco over the period 1980-86 have been below the 1994 proposed level because of production limitations. Levels were considerably higher in a number of previous years.

## THE PROPOSED REGULATION - continued

In order to achieve the proposed 1994 limits and maintain a full production capability Inco would have to increase its pyrrhotite rejection program to a 61.8 percent level. NOTE: The Department's estimate of costs for INCO to meet the 1994 emission limit is \$3,700,000 capital and \$6,000,000 additional annual operating cost respectively (1984/85 dollars), based on information provided by Inco in 1985. Inco's current (1987) estimate of these costs is \$12,000,000 capital requirement and \$14,200,000 additional annual operating cost, which includes an allowance for meeting additional problems that had not been identified in 1985. These cost estimates had not been verified by the Department at the time of the hearing.

### HUDSON BAY MINING AND SMELTING CO. LIMITED

The Regulation proposes that, after January 1, 1987, HBM&S would be required to restrict sulphur dioxide emissions to 275 kilotonnes per year and 28 kilotonnes per month with a reduction after January 1, 1994 to 200 kilotonnes per year and 21 kilotonnes per month.

HBM&S emission levels during the interval 1980-86 were below the limits proposed for immediate application but in excess of the proposed 1994 limits.

In order to meet the limits proposed for 1994, HBM&S proposes to install a new pressure leach technology for its zinc refining operation. The Department estimated that a capital expenditure of \$70,500,000 would be required but there would be significant savings in operating costs.

## 2. PARTICULATE EMISSIONS

### INCO LIMITED

The Regulation proposes that Inco be required to meet a limit for particulate emissions of 3000 tonnes per year and 310 tonnes per month immediately and in 1994.

In proposing these limits, the Department's belief was that these limits can be achieved by Inco, on both a monthly and annual basis, without substantial alterations or additions to existing plant facilities.

### HUDSON BAY MINING AND SMELTING CO. LIMITED

The Regulation proposes that HBM&S be required to meet an immediate limit for particulate emissions of 5000 tonnes per year and 517 tonnes per month and that on and after January 1, 1994, the annual limit would be 2500 tonnes and the monthly limit would be 258 tonnes of particulate emissions.

## THE PROPOSED REGULATION - continued

In proposing these limits, the Department's belief was that the proposed 1987 annual and monthly particulate limits can be met by HBM&S with existing plant facilities.

The Department also believes that the proposed 1994 annual and monthly limits for particulate could be met if the proposed new pressure leach process for the production of zinc were to be installed.

### 3. MONITORING REQUIREMENTS

Both companies would be required to continuously monitor ambient sulphur dioxide concentrations and particulates in their stack emissions and submit the data to the Department on a monthly basis.

A mass balance calculation for sulphur dioxide would have to be undertaken on a daily basis and submitted to the Department monthly.

Detailed in-stack sampling would be required a minimum of once every 3 years.

No sampling or monitoring by the Department is proposed to verify the data provided by HBM&S and Inco, i.e., the Department proposes to rely entirely on industry figures.

### 4. STUDIES TO REDUCE SO<sub>2</sub> EMISSIONS

The draft Regulation also includes a requirement for both companies to conduct studies on means to further reduce sulphur dioxide levels below those specified for 1994.

### 5. GENERAL

The measures proposed in the Regulation would fulfill Manitoba's commitment to the National Acid Rain Program which aims at a reduction of sulphur dioxide from non-ferrous smelters in eastern Canada (including Manitoba) from a 1980 annual level of 2504 kilotonnes to a 1994 annual level of 1070 kilotonnes.

## THE INDUSTRY POSITION

### 1. INCO LIMITED

The main part of the Inco presentation was made by Mr. Ted Sinclair who is in charge of the Manitoba Division's environmental programs. Also present and contributing to the presentation were Mr. Roy Aitken, Executive Vice-president of Inco; Mr. Lorne Ames, President of Inco's Manitoba Division; Mr. Charles Ferguson, Director of Environmental Affairs for Inco; and Mr. John Ashton, Superintendent of Environment Control at Thompson.

The Thompson operation consists of mining, milling, smelting and refining of nickel. The ore that is currently mined from both the Thompson underground mine and open pit is transferred to the mill. Waste rock in the form of tailings, are rejected, including pyrrhotite (an iron sulphide material). This rejection of pyrrhotite is the process that has been enhanced and encouraged over the past decade to dispose of sulphur in order to reduce sulphur dioxide emissions from the smelter operation. The pyrrhotite rejection process has resulted in an increase in rejected sulphur from approximately 5 percent in 1974 to approximately 50 percent in 1986. Concentrate from the mill, which contains residual sulphides, is directed to the smelter for refining. The mill also produces a concentrate from the ore called "pentlandite" which has been forwarded to a refinery in Alberta for further processing. Sulphur dioxide is generated when the sulphides in the concentrate are oxidized in the smelting process.

Over a number of years, Inco has been studying further ways of reducing sulphur emissions in cooperation with both the Canadian and Manitoba governments under the Canada/Manitoba Joint Mineral Development Agreement. Extensive studies presented to the Commission in 1985 demonstrated that sulphur dioxide removal by alternative methods, such as the generation of sulphuric acid, is not economic at Thompson. NOTE: The Department accepts this analysis and agrees that pyrrhotite rejection is the logical and practical method to control and reduce sulphur dioxide emissions at Thompson (the best practicable technology).

Pilot scale testing has achieved a sulphur rejection rate of up to 56 percent; however, at this sulphur rejection level two major disbenefits have been identified, namely - (a) the additional loss of nickel, as waste, to the tailings and (b) an energy deficiency problem in the smelter. The energy problem results from the inability of the smelter to maintain a necessary temperature in the absence of sufficient sulphur in the form of iron sulphide in the smelter concentrate, i.e., sulphide ore is a fuel for the smelting process. The outcome is that the addition of supplementary energy for heat would be required in the smelter, resulting in an increase in production costs.

## THE INDUSTRY POSITION - continued

The Canada/Manitoba studies will continue to examine practical and economic limits of pyrrhotite rejection, with the study concluding in 1989. The Inco position is that until the study results are available in 1990, final 1994 limits should not be set. Inco proposes that the studies be assessed, hearings held and the practical and economic limits of pyrrhotite rejection identified as a means of containing sulphur in the Thompson operation. Sufficient time would be available to put in place by 1994 the appropriate facilities required to meet new limits.

The Company reported that their studies, as well as those of the government, have shown that the identified effect of emissions on the environment from the nickel complex has been minimal, being confined to an area within 5 kilometres of the stack. Results of satellite studies indicate that the damage has not progressed further afield, to date. Long range implications based on modelling have shown that the impact of Manitoba's sulphur dioxide emissions have been minimal in Ontario - an estimated 1 percent of the deposition in the Muskoka area and 3 1/2 percent in Northwestern Ontario.

The imposition of the proposed 1994 sulphur dioxide limits on the Thompson operation could undermine the effects of many positive measures that have been taken by the Company to make the Manitoba operation more viable. These measures include the development of the Thompson open pit mine, bulk underground mining methods, consolidation of the electro refining process at Thompson and upgrading of the anode casting line in the smelter. These and other actions by the Company have succeeded in achieving a competitive position for the Thompson Division operations in a market that has been severely depressed over the past several years. This improvement has now enabled the Company to reach a point of full plant production after several years of reduced production caused by deteriorated market conditions.

The proposed sulphur dioxide emission limits could face the Company with two unattractive choices - a major reduction in production or a significant increase in the unit costs of production. Either choice would not only be detrimental to the Company but also to both the community and the Province. It would also impact on the husbandry of the mineral resource of Manitoba due to a loss of nickel to the tailings pond with the increased pyrrhotite rejection.

One method of meeting the 1994 sulphur dioxide emission limit of 220 kilotonnes per year would be to reduce production of nickel by 32,000,000 pounds from the name plate capacity of 140,000,000 pounds annually. Inco stated that this would result in the loss of 450 jobs out of a total work force of 1980 and a loss of purchases of goods and services amounting to \$23,000,000. The goods and services are purchased both locally and elsewhere within the Province.

THE INDUSTRY POSITION - continued

Alternatively, if the Company attempted to reach the name plate capacity of the operation at 140,000,000 pounds of nickel annually with additional pyrrhotite rejection, the annual cost increase is estimated by Inco to be \$14,200,000, most of which is associated with the extra nickel that would have to be mined to compensate for the 10,000,000 pounds of nickel discharged as waste, resulting from a 61.8 percent sulphur rejection rate. The end result of this proposal would be an estimated increased cost of 10 cents for each pound of nickel produced.

In addition to this direct cost impact, there would be a significant effect on the ore reserves. The nickel loss to the tailings area and an inability to process some of the ore economically over the life of the reserves (about 25 years estimated by Inco), due to its low grade, would amount to a loss of an estimated 304,000,000 pounds. This would be the equivalent of taking all of the production from the Thompson open pit and discarding it.

In response to a question concerning the difference in cost between the Environment Department and Inco presentation with respect to meeting the 1994 sulphur dioxide limits, Inco noted that the Department representative had used figures that Inco had produced in 1985. Subsequently in a 2 year interval, Inco has discovered that both the costs and conditions of rejecting sulphur have changed substantially as a result of the determination of the smelter energy problem and the increased metal losses involved in increased pyrrhotite rejection (See NOTE - Page 6).

In the view of Inco, monthly limits, as recommended in the proposed Regulation, do not help to provide additional relief from the primary concern of total, accumulative acid precipitation loading. Monthly limits also do not protect against short term "shock effects", which occur in a much shorter time frame - hours rather than a month. Short term protection is provided through the requirements of the ambient air monitoring and by the Company voluntary emission reduction program. As far as is known by Inco, other jurisdictions do not require monthly production limitations. Monthly limits could have an adverse effect on the efficiency of the Thompson operation. It is necessary to be able to catch up on production after the rate of production has been reduced to avoid environmental impacts. These necessary fluctuations in the operation may result in exceedances of the proposed monthly emission limits. Variable operations are also necessitated by changes in the composition of the ore, equipment failures, the management of energy and market fluctuations.

During Inco's supplementary presentation at the third hearing in Winnipeg, the departmental representative agreed with the Inco position that the monthly limit is of more value in preventing local environmental damage from heavy metal emissions (particulate) than in controlling the local shock effects of sulphur dioxide emission. Both emissions are a concern but the concern is greater, as regards short term fluctuations, for the heavy metal aspect than for sulphur dioxide. Inco conceded that the proposed monthly limit on particulate emissions could be met.

## THE INDUSTRY POSITION - continued

Inco does not disagree with the withholding of some unassigned sulphur dioxide quota within the Provincial limit. As proposed, this unassigned portion of 130 kilotonnes annually is approximately 24 percent of the Provincial emission limit. Inco disagrees with the size of this surplus because it believes that it is achieved at the expense of existing industry. The Inco reduction of sulphur dioxide, required by the proposed Regulation, is a 47 percent drop by 1994 as opposed to the Provincial commitment for an overall 25 percent reduction. In Inco's view, the requirements of existing industry should be first serviced adequately before a surplus is established.

### 2. HUDSON BAY MINING AND SMELTING CO. LIMITED

The HBM&S presentation was made by Mr. Wayne Fraser, Director of Safety and Environment at Flin Flon.

In spite of a cash loss of over \$118,000,000 since the end of 1980, HBM&S has continued capital spending to maintain and enhance the Company's competitive position during the past several year's difficult market period. The future of HBM&S as a major mining company and as a major employer and economic force in Manitoba is now at a critical juncture. Major investments in mine and plant development need to be initiated to ensure long term ore supplies and improve the competitive position in terms of unit costs of production. Additional expenditures required to meet new environmental regulations or initiatives must therefore be in reasonable balance with the expected benefits.

The Company has worked hard and undertaken many measures to improve productivity, during recent years of poor market and price conditions and, by virtue of this effort can currently sell full plant production in the still existing extremely competitive situation. In addition to corporate re-organization, exploration to locate new ore reserves and development of new mines - all of which are ongoing - there is a need to upgrade the metallurgical process of the smelter and refinery. Primarily because of age, the copper smelter and zinc refinery are badly outmoded.

Alternate technology to upgrade and reduce sulphur dioxide emissions from the copper smelter would cost upwards of \$130,000,000. Currently, the smelter is only marginally profitable.

The current zinc production technology will not remain competitive in spite of the investment of \$20,000,000 over the past decade. It is not feasible to effect sulphur dioxide emission control with the present plant process. A new pressure zinc leaching process has been proven to be technically feasible. This process would essentially eliminate sulphur dioxide and particulate emissions from the zinc plant (but would not effect emissions from the copper smelter) and would result in a more economically efficient process. The required capital expenditure (\$77,000,000 estimated in 1987 dollars) would reduce operating costs while providing a 25 percent

THE INDUSTRY POSITION - continued

reduction in overall sulphur dioxide emissions. Coupled with continued availability of sufficient ore and feed stocks, the zinc leaching process would allow the Company to remain a zinc metal producer for the long term. Without this technology, the Company's ability to produce zinc, even in the short term, is questionable.

Actual sulphur dioxide emission data, for the first four months of 1987 plus budgeted production, indicates that total annual emissions for 1987 may be of the order of 297 kilotonnes, which is higher than the current CEC order limit. This is also higher than the historical high level of emissions and is due to increasing use of concentrate produced from the Company's own mines. Ores with lower sulphur content, obtained in the past from other sources, will not continue to be readily available. With regard to the higher level of sulphur dioxide emissions experienced in the first quarter of 1987, it is not expected that there will be any production delays such as an operational shut down or a major smelter maintenance program which would reduce the annual total.

The proposed Regulation calls for an immediate reduction of the existing sulphur dioxide limit by 6 percent from the existing level (and actual forecast) of 293 kilotonnes annually to a level of 275 kilotonnes per year and a further reduction of 27 percent to 200 kilotonnes per year by 1994. HBM&S contends that current operating facilities can not achieve a full and optimum economic operation with the proposed 1987 sulphur dioxide limit and that even the addition of the new zinc pressure leach technology will not allow an optimum economic production at the proposed 1994 emission limit. The present regulated annual limit for sulphur dioxide emissions in the existing control order No. 899VO is 293 kilotonnes. The predicted 1987 total annual emissions - based on first quarter achieved production and actual emissions - will reach this level. Based upon the existing and required 1987 limit of 293 kilotonnes annual emissions and allowing for a 25 percent reduction in sulphur dioxide emissions - after installation of a zinc pressure leach process - the 1994 annual limit that the Company believes to be appropriate and necessary for full production is 220 kilotonnes.

The Company has no objections to monthly sulphur dioxide limits as long as they are based on the present annual emission limit of 293 kilotonnes, which is at or near the current actual rate of emission from production achieved since the beginning of 1987.

HBM&S believes that the annual particulate limit proposed for both 1987 and 1994 should be obtainable; however, the proposed monthly limits are probably not attainable due to an inability to operate dust containment equipment in a consistent manner. In the Company's view, if overall emissions and long term effects are the basis for control requirements, there would appear to be no logical need for a fixed, short term, monthly limit.

## THE INDUSTRY POSITION - continued

The Company questioned the need to operate an ambient air monitoring program for sulphur dioxide. Recently the Company had discontinued operating three continuous ambient sulphur dioxide monitors within the Flin Flon area. Considering the knowledge and data available from past years of monitoring, the Company questions the real value of additional data whether for enforcement or research purposes. Operation of the monitors resulted in an annual expenditure of \$50,000.

The Company proposed a continuation of the measurement of daily sulphur dioxide emissions by means of a mass balance calculation and the submission of such data to the Department, as required.

A three year detailed stack sampling for determination of the components and quantity of the particulate matter, as well as the quantity of sulphur dioxide emissions, is acceptable.

Clause 9 of the proposed Regulation, which requires continuous particulate monitoring from the stack, is not acceptable to the Company. Currently, the Company employs an on-stream particulate monitor which measures relative loss rates from the zinc plant roaster off-gases. Even with upgrading, this unit would not be capable of accurate particulate loss measurement in the main stack. The Company is not aware of any reasonably priced system that would provide accurate data for particulate loss in the main stack.

The Company requested that a mechanism be built into the Regulation such that existing operations would have access to the unallocated or surplus Manitoba sulphur dioxide quota, if expansion or other opportunities involving additional sulphur dioxide emissions should become available to the existing operations.

The Company also believes that the proposed Regulation must have a review or variance mechanism.

### 3. THE UNITED STEELWORKERS OF AMERICA - THOMPSON

Mr. Blake McGrath, representing local 6166 of the United Steelworkers of America, commended the government on its efforts to reduce the damage from sulphur dioxide emissions and its participation in the Federal/Provincial agreement to reduce total sulphur dioxide emissions.

Local 6166 supports both the monthly and annual levels that were proposed by the draft Regulation. In their view, the monthly limits would serve to balance the shock effect on the environment of large surges of emissions and would also help the economic stability of the community of Thompson by levelling production peaks and valleys and avoiding unnecessary shutdown of operations.

## THE INDUSTRY POSITION - continued

The approximate 100 kilotonne surplus could be used to attract industry to the Province and might also be used, if necessary, to help Inco meet the proposed monthly requirements. In addition to Inco, the Province should consult Local 6166 with respect to utilization of the surplus or buffer for the Inco operation.

Monthly reports from the Company should include a substantiation of the effort to meet the 1994 limits and these reports, along with the Canada/Manitoba study report, should be utilized at a hearing in 1990 to determine if the company has made an appropriate effort to meet the proposed 1994 limit of 220 kilotonnes per year.

### 4. THE UNITED STEELWORKERS OF AMERICA - FLIN FLON

Mr. Steve Hamon representing the membership of Local 7106 of the United Steelworkers of America, Flin Flon, noted that the membership was concerned with both the environment and jobs.

The Union feels that monthly limits are important since, without a monthly limit, companies could operate full-out, emitting excessive pollutants, for part of the year and then shut down to meet an annual quota.

He felt that air pollution controls governing the Flin Flon operation should have remained under an order of the Clean Environment Commission, rather than as a Regulation, since the Commission process receives input from all concerned persons, including the public.

While recognizing the basic importance of environmental protection, the Union does not want a regulation that can not be met or puts the mining companies out of business because the operation of H.B.M. & S. has been, and still is, a precarious one in terms of economic viability. Technology that will protect both the Company and the environment should be possible to attain.

### 5. THE MINING ASSOCIATION OF MANITOBA

Mr. W. K. Newman, represented the Mining Association of Manitoba.

The mineral industry occupies a fundamental place in the economy of Manitoba as exemplified by the expenditure in 1986 of some \$547,000,000. If one were to look at a job multiplier of three, the 4000 jobs associated with the Manitoba mineral industry accounts for a very substantial factor of employment (directly and indirectly) in the Province. Since 1981, the recession has forced the industry to implement major improvements to increase efficiency and productivity. Notwithstanding such efforts, all of the member companies recorded either losses or minimal earnings in the first quarter of 1987.

THE INDUSTRY POSITION - continued

In terms of acid rain, Inco and HBM&S have undertaken continuing and extensive research aimed at reducing their emissions. The base metal industry alone cannot support the application of new and costly technology during this period of depressed demand and prices for its products. Manitoba is fortunate to have soils with buffering capacity. The Association is not aware of evidence showing that acid rain from Manitoba sources is a significant problem within or outside the Province.

The reductions in emissions proposed by the Regulation will impose a severe economic burden on the industry while having little beneficial effect on the environment. The mining industries position is that a proper balance must be maintained between an "untouched environment" and the economic health of communities, the Province and the Nation.

# THE POSITIONS OF OTHER INTERESTED PARTIES

## THE ENVIRONMENTAL ORGANIZATIONS POSITION

### 1. THE CANADIAN COALITION ON ACID RAIN

Mr. Michael Perley Executive Coordinator of the Canadian Coalition On Acid Rain commended the government for moving forward on this Regulation.

Reference was made to a discrepancy in the 1980 base line sulphur dioxide emissions ascribed to Manitoba. In a 1980 U.S.A./Canada Memorandum of Intent, Manitoba is cited as emitting some 490,000 tonnes of sulphur dioxide in total (actual sulphur emission) but the base line figure used for establishing the Manitoba emission rate is 738,000 tonnes (allowable sulphur dioxide emission). Based upon the figure cited in the 1980 memorandum of intent, negotiators in the U.S.A. might reach the conclusion that the current program leading to an annual limit of 550 kilotonnes of sulphur dioxide could represent an increase in Provincial emissions. The Coalition recommends that when the Regulation is made public that this distinction be made clear and also that the surplus sulphur dioxide figure be accompanied by an explanation that future allocations of sulphur dioxide will be made based upon industry employing best available technology for sulphur dioxide control.

Mr. Perley emphasized the importance of monitoring emissions. Government must rely on emission monitoring data developed independently of the Companies. He recommended that a continuous stack sampling program be substituted for the ambient air monitoring program in Section 8 of the proposed Regulation. This will inspire more confidence on the part of the public in the government's program to control acid rain. He pointed out that the Prime Minister had announced that a fund of \$150,000,000 had been set aside by government for possible use by smelting companies for modernization and clean-up of their facilities. It might be possible that some of these funds would be available for monitoring purposes.

The Environment Department representative noted that the mass balance determination for sulphur dioxide, as proposed in the Regulation, would not be as exact as actual stack monitoring; however, the Department is not convinced that there is a reliable continuous monitor for smelters available on the market. He also noted that owing to a requirement to reduce spending, departmental monitoring programs - including ambient sulphur dioxide monitoring at Thompson and Flin Flon - had been discontinued. This being the case, the Coalition representative recommended that the mass balance data be scrutinized very carefully by the Department. However, from his experience in discussion with knowledgeable people, Mr. Perley felt that there are reliable in-stack methods for monitoring sulphur dioxide.

## THE POSITIONS OF OTHER INTERESTED PARTIES - continued

An Inco representative stated that continuous stack monitoring is difficult and, in any case, results compare reasonably well with the material or mass balance calculation method. The material balance is considered to be the true long term value while stack sampling is carried out periodically to accurately determine emissions only over the short period during which actual sampling takes place.

Mr. Perley stated that the Canadian acid rain control program, of which Manitoba's regulation on sulphur dioxide is a part, is very important in terms of bi-lateral cooperation with the U.S.A. Every action that Canada takes on acid rain is scrutinized very carefully by the U.S.A.

### 2. THE MANITOBA ENVIRONMENTAL COUNCIL

Mr. K. Lacroix, a Thompson member of the Manitoba Environmental Council and Mr. M. Trottier, a Council member from Winnipeg presented the Council's views on the proposed Regulation at the Thompson and Winnipeg hearings respectively. Mr. Steve Hamon spoke on behalf of the Council at the Flin Flon hearing.

The Council agreed in principle with the draft Regulation. In addition to emission control, the Council urged that the Regulation include a deposition standard of 10 kilograms wet sulphate per hectare per year. Such a standard would take into account depositions originating from within Manitoba as well as sources outside of the Province and would protect all surface waters. There are precedents for this type of legislation in the United States (e.g., the State of Minnesota, 1986, where a deposition standard of 11 kilograms of wet sulphate per hectare per year has been adopted).

Because deposition standards would require thorough monitoring, two or three additional monitoring stations would be needed in northern Manitoba. A deposition standard would need a computer modelling capability, which is thought to exist within the Atmospheric Environment Services of Environment Canada in Downsview, Ontario.

An Environment Department representative pointed out that the Western Canada Technical Committee For The Long Range Transport of Air Pollutants has sanctioned a proposal for the Western Provinces to evaluate deposition loading values for the West, specific to western conditions. This measure is supported by Manitoba and it is possible that a suggested limit other than 20 kilograms wet sulphate per hectare per year will result from these deliberations.

### 3. THE MANITOBA NATURALISTS SOCIETY

Mr. Dennis Muldrew presented a brief on behalf of the Manitoba Naturalists Society.

## THE POSITIONS OF OTHER INTERESTED PARTIES - continued

The Society agrees in principle with the draft Regulations and can see no reason why the proposed emission reductions can not be achieved.

The Society believes that while the proposed Regulation is a step in the right direction, it falls short of providing true protection to the lakes, streams, forests, wildlife and citizens of Manitoba as the regulated smelters are not the only sources of emissions and no reduction has been agreed to for emissions from other western provinces.

The Society concurs with the Manitoba Environmental Council in the suggested adoption of a comprehensive deposition standard.

### 4. MR. BRIAN PANNELL

Mr. Brian Pannell, President of the Manitoba Environmentalists Inc. spoke as a citizen.

He gave general support to the Department's initiative and also the recommendation of the Manitoba Environmental Council for a deposition limit of 10 kilograms wet sulphate limit per hectare per year.

He felt strongly that the department should not abandon its monitoring role, otherwise credibility is lost.

Although it may not be known what sulphur dioxide level Inco can achieve until current studies are concluded in 1990, a 1994 limit of 220 kilotonnes should be established at the outset. If, following the studies, Inco demonstrates that the 1994 limit can not be met, there would be sufficient lead time for Inco to present its case to both the government and the public for due consideration.

Mr. Perley supported Mr. Pannell's contention that the forcing of technology is necessary to achieve environmental quality.

## THE COMMUNITY POSITION

### 1. THE CITY OF THOMPSON

Mr. Eric McCormick, Clerk for the City of Thompson presented a brief on behalf of the City.

City Council agrees that emission reductions and controls are admirable and necessary goals; however, there is concern that environmental objectives must be kept in balance with social and economic goals.

## THE POSITIONS OF OTHER INTERESTED PARTIES - continued

The City believes that Inco has shown a strong commitment to the environment by virtue of past actions. The City recommends that 1994 limits should not be set until the current Canada/Manitoba study is completed in 1990. If Inco was required to reduce production by 1994 in order to meet emission limits, this would result in another unwelcome recession for the community.

Any emission level set in a Regulation for 1994 application should be only a target, subject to what is determined to be technically, economically and socially feasible and acceptable. More of the surplus sulphur dioxide limit should be assigned to the existing industries.

### 2. THICKET PORTAGE

Mr. Gilbert Pronteau, the mayor of the Thicket Portage Community Committee and a representative of a number of other organizations, spoke on behalf of these organizations.

He stated that his community has requested studies on local ecosystems based on impacts from the Thompson operation. There was once an abundance of fur bearing and game animals in the area and now these numbers are substantially reduced. The same is true of fish. The local people feel that the emissions from the mine complex are responsible. The reduction in numbers of fish and animals is also reflected in the loss of many jobs in northern communities (estimated 6000).

A Departmental representative noted that a number of studies in connection with the Thompson complex had been undertaken and agreed to forward copies to Mr. Pronteau.

## THE ENVIRONMENT CANADA POSITION

Environment Canada was represented by both Mr. Barrie Briscoe, Manitoba District Manager of Environmental Protection Service, Winnipeg and Dr. Jim Young, Director of the Air Quality and Inter-Environmental Research Branch of the Atmospheric Environmental Service(AES), Downsview, Ontario.

Mr. Briscoe noted that in order to reach the Federal Government's goal of a 50 percent reduction in sulphur dioxide emissions in the Eastern Provinces by 1994, a reduction of a further 175,000 tonnes of emissions remains to be obtained from among the seven eastern provinces. The proposed Manitoba Regulation would provide Manitoba with an unallocated surplus within its sulphur dioxide quota and thus an opportunity to increase its commitment to the Canadian acid rain reduction program by adopting a total emission limit less than the agreed upon 550,000 tonnes per year.

THE POSITIONS OF OTHER INTERESTED PARTIES - continued

Manitoba Environment representatives responded to a question about the apparent surplus by noting that there was no pre-conceived plan for the creation or use of this buffer.

Mr. Briscoe also pointed out that the Federal Cabinet had authorized a commitment of \$20,000,000 to be spent in Manitoba towards smelter modernization - with particular reference to the zinc pressure leach process at HBM&S.

Dr. Young dealt with 2 modelling approaches; source modelling and receptor modelling, i.e. the analysis of data from monitoring stations and attempts to relate this data to the sources of the emissions. The emission inventory model for the year 1980 includes an annual volume of 487 kilotonnes of sulphur dioxide emissions for northern Manitoba, with this contribution representing approximately 1.5 percent of the total North American sulphur dioxide emission.

An AES long range transport model was used to estimate the sulphur dioxide contribution of northern Manitoba to the air concentration and wet deposition at several sensitive Canadian receptor sites outside Manitoba using 1978 and 1980 meteorology. The largest Manitoba contribution to sulphur dioxide in air at receptor sites shows up at Pickle Lake, Ontario (350 kilometres NE of Kenora). Fifty-one percent of the sulphur dioxide monitored at that site was attributed to the two smelters in northern Manitoba; however, it is only 51 percent of a very small number (less than one microgram per cubic metre). The normal background level for wet sulphur deposition, in the region in which this receptor site is located, is estimated to be 4 to 6 kilograms per hectare whereas the largest contribution associated with the Manitoba sources is 0.33 kilograms - well below the background level.

The receptor model estimate suggests that the two Manitoba smelters could contribute about 10 percent of the air-borne sulphate or sulphur dioxide loading at Kenora on days of high concentration. Wet sulphate deposition in the Kenora area is at a level of about 4 to 5 kilograms per hectare per year.

Very recent data has shown that at Chalk River, near Ottawa, there is some indication of pollution originating from the area of the Manitoba smelters in addition to a large mass of pollutants from the U.S.A. Therefore, there is evidence that pollutants from the major sources in Manitoba can be detected outside of Manitoba.

In terms of 9 sensitive areas in eastern Canada the model did not implicate Manitoba as the source of sulphur dioxide emissions that should be cut back, based on the goal of a wet sulphate deposition of 20 kilograms per hectare per year.

If sensitive areas in Manitoba, closer to the 2 smelters, were chosen for monitoring Dr. Young felt that impacts from wet sulphate deposition would start to show, especially if 10 kilograms was chosen as the target level.

## THE ENVIRONMENT CANADA POSITION - continued

Mr. Perley of the Canadian Coalition on Acid Rain brought up the question of the effects of sulphur dioxide on public health. Much of this information is just now emerging from the United States Environmental Protection Agency and Health and Welfare Canada. Dr. Young pointed out that the concentration of sulphur dioxide in the Kenora area originating from Manitoba would be 0.5 microgram per cubic metre or less, which is nowhere near a level causing health effects.

One questioner felt that the Regulation should take into account nitrogen oxides as well as sulphur dioxide and that this emission should be included in the modelling exercise. Mr. Briscoe noted that the Federal Government was bringing in tighter automobile emission legislation for the 1988 model year which would further restrict the nitrogen oxides.

## THE MANITOBA DEPARTMENT OF HEALTH POSITION

Dr. N. S. Rihal of the Manitoba Department of Health spoke about the effects of air pollution on human health. Particulates and sulphur dioxide are two of these pollutants.

Acute air pollution episodes can result from high concentrations of air-borne pollutants in conjunction with certain kinds of meteorological conditions. Such a smog caused an estimated 4000 deaths in a 5 day period in London in 1952.

Health effects from chronic, low level exposure to air pollutants such as sulphur dioxide and particulates has been more difficult to demonstrate. A review of the medical literature suggests that there is a link between chronic low level exposure to air-borne pollutants and obstructive pulmonary disease, bronchial asthma, cardiovascular disease and most likely cancer. Therefore, any measures to reduce emission levels of sulphur dioxide and particulates would be very desirable.

## RECOMMENDATIONS AND ANALYSIS

### 1. SULPHUR DIOXIDE EMISSIONS:

#### (a) INCO LIMITED

##### The Commission recommends:

Effective immediately, emissions of sulphur dioxide from the Inco Limited smelter complex shall not exceed 300 kilotonnes per calendar year and 31 kilotonnes per month.

On and after January 1, 1994, emissions of sulphur dioxide shall not exceed 220 kilotonnes per calendar year and 23 kilotonnes per month. However, a review of the Regulation should take place on or around June 30, 1990 to hear and address the reported results of the Can-Man studies on pyrrhotite rejection at the Thompson plant. If Inco, at that time, is able to persuade the government and the public that the 1994 limits are unreasonably restrictive, an additional part of the total Manitoba surplus dioxide limit of 550 kilotonnes per year could be granted to Inco to increase the 1994 sulphur dioxide emission limit accordingly.

The Company should be encouraged to continue the voluntary emission reduction program to protect against the more severe local effects from stack emissions of sulphur dioxide.

The Department, during its presentation, stated that proposed 1987 limits for sulphur dioxide and particulate matter were intended to allow full production at the Inco smelter facilities until further emission reduction was required in 1994, following the introduction of new technology involving additional pyrrhotite rejection. A report on the investigation of the practicability of this technology by a Federal-Provincial INCO study team is expected in 1990.

Inco indicated no concern in meeting a 1987 annual limit of sulphur dioxide of 300 kilotonnes, as recommended in the draft Regulation.

Inco did underscore a problem in attempting to meet a monthly limit of 31 kilotonnes for sulphur dioxide emissions. Changes in the composition of the ore, equipment failures, management of energy and market fluctuations all require production variability that will result in fluctuation of emissions that would lead to exceedance of the proposed monthly emission rate. The stated purpose of the proposed monthly limits is to protect the environment from undesirable shock or short term loading effects; however, the Company contended that environmental shock effects occur within a much shorter time frame than one month. Inco believes that shock effects are already controlled by the Company's voluntary emission reduction program which protects the environment in a more effective manner than by imposing a monthly emission limit.

RECOMMENDATIONS AND ANALYSIS - continued

The Union representative of local 6166 of the United Steelworkers of America supported monthly limits as a device to balance the shock effect of surges of emissions on the environment as well as to balance production swings and hence to assist the economic stability of the community.

The Department representative at the Winnipeg hearing reiterated the recommendation for both annual and monthly limits for sulphur dioxide and particulates. He did agree with the contention of Inco representatives that monthly limits were more important for particulates than for sulphur dioxide emissions with regard to protection of the environment against the effects of short term or shock loadings.

Inco expressed a major concern with respect to the 1994 sulphur dioxide limits. The recommendation of the reduction of sulphur dioxide emission to a level of 220 kilotonnes per year was predicated on the increased use of the currently practised method that rejects pyrrhotite from the ore at the mill stage, prior to smelting, with consequent reduction in the generation of sulphur dioxide. At present, approximately 50 percent of the sulphur is being rejected with the pyrrhotite at the mill. Earlier laboratory studies had indicated that a 61.8 percent reduction of the sulphur might be possible; however, more recent pilot plant studies have indicated a practical rejection level of only 56 percent sulphur.

Utilizing the pyrrhotite rejection method, some nickel is lost by discharge to the tailings pond. As sulphur rejection is increased the nickel rejection losses also increase. The nickel lost from production results in an increase in the cost of production. This also effectively reduces the ore reserves since it becomes uneconomic to process lower grade ores.

Of additional importance is the fact that, as sulphur rejection increases beyond 50 percent, supplementary heat (oil or electrical energy) must be added to the smelting process to make up for the heat of chemical reaction that is lost due to the removal of sulphur with the tailings. There is also an increased cost in both capital and operating expense.

Inco made the point that there was an on-going study under a Canada/Manitoba agreement that was specifically examining the pyrrhotite rejection process and its concomitant problems. The study will be concluded in 1989 and a report will be ready in 1990. As the optimum level of pyrrhotite that can be rejected practically has not yet been established, the Company requested that there be a delay in setting the 1994 targetted sulphur dioxide limits until 1990, after a review of the CAN-MAN report. In the interim, if a 1994 sulphur dioxide limit must be set in the Regulation, it should be stipulated to be a guideline.

The City of Thompson in its brief supported the establishment of only a target level for 1994 pending the outcome of the Can-Man studies in 1990.

ANALYSIS AND RECOMMENDATIONS - continued

Mr. Brian Pannell felt that a 1994 sulphur dioxide level of 220 kilotonnes annually should be established. Following completion of the studies in 1990, the onus would be on Inco to persuade the government and the public if the 1994 limits were considered to be too restrictive.

Atmospheric Environment Services of Environment Canada confirmed that modelling to date had shown only very small impacts outside of Manitoba from the sulphur dioxide emitted from the Manitoba non-ferrous smelters.

(b) HUDSON BAY MINING AND SMELTING CO. LIMITED

The Commission recommends:

Effective immediately, emissions of sulphur dioxide from the Hudson Bay Mining and Smelting Co. Limited smelter complex shall not exceed 293 kilotonnes per calendar year and 30 kilotonnes per month.

On and after January 1, 1994 emissions of sulphur dioxide into the atmosphere shall not exceed 220 kilotonnes per calendar year and 23 kilotonnes per month.

Based upon an examination of sulphur dioxide emission rates over the period from 1980 to 1986, the Department has recommended an annual sulphur dioxide limit of 275 kilotonnes per year from the HBM&S metallurgical complex at Flin Flon to apply in 1987 and until 1994 when reduced limits, requiring the application of new technology for zinc production operations, would apply.

The Company noted that a number of factors in its operation had changed, beginning rather recently, resulting in increased production and a need for continuation of the present sulphur dioxide limit of 293 kilotonnes per year to allow full plant capacity production to be maintained. Current full production, achieved in the first several months of 1987, has resulted in emissions which would actually exceed this limit, on an annualized basis. In future, the smelter and refinery will be utilizing less concentrate purchased from suppliers outside the Company. The ore from the Company mines contains higher concentrations of sulphur. During 1987 the Company is not predicting a need for any shutdowns which would result in a reduction of total annual emissions.

## ANALYSIS AND RECOMMENDATIONS - continued

With regard to the proposed 1994 limit of 200 kilotonnes per year, the new proposed zinc pressure leach process has the capability of eliminating sulphur dioxide emissions, thus reducing total sulphur dioxide emissions by 25 percent (emissions from the copper smelter would not be affected). The Company contends that this reduction calculates to a level of 220 kilotonnes per year based on a present required emission rate of 293 kilotonnes per year.

The Company indicated that changes are necessary in zinc processing operations to make the process economic. Although there would be both economic and environmental benefits to a new zinc pressure leach process, HBM&S stated that sufficient ore reserves would have to be found to justify the capital costs of the facility.

The Mining Association, in its brief, noted that the base metal mining industry, without assistance, could not support the application of new and costly technology during the present period of depressed demand and prices for its product.

## 2. PARTICULATE EMISSIONS

### (a) INCO LIMITED

#### The Commission recommends:

Effective immediately emissions of total particulate matter into the atmosphere from the Inco Limited smelter complex shall not exceed 3000 tonnes per calendar year and 310 tonnes per month.

The primary environmental concern with particulate matter discharged from a non-ferrous smelter is the heavy metal content. A number of studies have been done by both the Federal and the Provincial Governments and the Company concerning damage to the ecosystem in the down-wind vicinity of the smelter stack. Some damage was found 20 kilometres from the stack but most of the identified damage was located within 5 kilometres of the stack. The Department recommended that the emission of total particulate matter from the Inco Ltd. smelter complex not exceed 310 tonnes per calendar month and 3000 tonnes per calendar year commencing in 1987, with no change in 1994.

While the Company indicated concern and difficulty in meeting a monthly limit for sulphur dioxide, it conceded that the operation would not be adversely affected by a monthly limit for particulate matter.

RECOMMENDATIONS AND ANALYSIS - continued

(b) HUDSON BAY MINING AND SMELTING CO. LIMITED

The Commission recommends:

Effectively immediately emissions of total particulate matter into the atmosphere from the Hudson Bay Mining and Smelting Co. Limited smelter complex shall not exceed 5000 tonnes per calendar year and 517 tonnes per month.

On and after January 1, 1994 total particulate emissions shall not exceed 2500 tonnes per calendar year and 258 tonnes per month.

Studies of environmental effects from particulate emissions on the area surrounding the Flin Flon metallurgical complex have not been as extensive as those in the Thompson area. If a new zinc pressure leach process were installed, total particulate matter from the complex would be substantially reduced.

The Department has proposed that total particulate emission into the atmosphere from the Flin Flon complex not exceed 517 tonnes per calendar month and 5000 tonnes per calendar year in 1987 and that on and after January 1, 1994 these amounts be reduced to 258 and 2500 tonnes respectively.

The Company stated that the proposed monthly limits are probably not attainable due to operational difficulties in capturing particulates in a consistent manner with the existing plant processes and equipment.

The monthly limits proposed by the Regulation greatly exceed the limits in the current order and the Commission believes that the Company should be capable of meeting a monthly limit of 517 tonnes. Zinc pressure leach technology should also result in a capability of meeting a monthly particulate limit of 258 tonnes after 1994.

### 3. MONITORING AND DATA SUBMISSION

The Commission recommends:

Effective immediately, Inco Limited and Hudson Bay Mining and Smelting Co., Limited shall:

- (a) operate an ambient air monitoring program for sulphur dioxide in a manner and at locations approved by the Department;
- (b) submit the data from the sulphur dioxide ambient air monitoring program to the Department on a monthly basis within fifteen days of the end of the month in which the data was collected;

RECOMMENDATIONS AND ANALYSIS - continued

- (c) submit a summary of the preceding months daily sulphur dioxide emissions (based on a mass balance calculation as approved by the Department) to the Department within fifteen (15) days of the end of the month in which the emissions occurred;
- (d) once every three years, or more frequently as may be requested by the Department, conduct detailed stack sampling in the main smelter stack to determine:
  - (i) the quantity of all particulate matter;
  - (ii) the identification and quantity of each major component (as identified by the Department) of the particulate matter;
  - (iii) the quantity of sulphur dioxide being emitted to the atmosphere.

The stack sampling shall be conducted in accordance with methods specified by the Department and results from the stack testing program shall be submitted to the Department within 60 days of completion of the testing, the first report being required by December 1, 1987.

Effective immediately Inco Limited shall:

- (a) install and operate, as approved by the Department, a continuous particulate emission monitor to measure particulate emissions from the main smelter stack;
- (b) submit a report of the preceding months particulate matter emissions, based on the results obtained from the continuous particulate emission monitor specified in a), to the Department within fifteen (15) days of the end of the month in which the emissions occurred.

Effective immediately HBM&S Co. Limited shall;

- (a) measure particulate matter by a method and at a frequency satisfactory to the Department and
- (b) submit a report of the preceding months particulate matter emissions, based on the results obtained from the particulate emission program specified in a), to the Department within fifteen (15) days of the end of the month in which the emissions occurred.

RECOMMENDATIONS AND ANALYSIS - continued

On or before October 1, 1989 HBM&S Co. Limited shall;

- (a) install and operate, as approved by the Department, a continuous particulate emission monitor to measure particulate emissions from the main smelter stack;
- (b) submit a report of the preceding months particulate matter emissions, based on the results obtained from the continuous particulate emission monitor specified in a), to the Department within fifteen (15) days of the end of the month in which the emissions occurred.

This section of the proposed Regulation deals with continuous sulphur dioxide ambient air monitoring, daily sulphur dioxide emission calculations (based on a mass balance calculation), detailed stack sampling (with a minimum 3 year frequency) and the continuous measurement of particulate matter.

The representative of the Canadian Coalition on Acid Rain expressed the view that there should be a requirement to continuously measure sulphur dioxide in the stack. Inco representatives opposed this on the basis that it was impractical, unreliable and costly.

HBM&S has discontinued the continuous measurement of sulphur dioxide in ambient air at 3 stations in the Flin Flon area. The Department has also removed their monitors from Flin Flon. HBM&S contends that the ambient sulphur dioxide monitors have no value as either an enforcement or research tool and are expensive to operate. HBM&S is also opposed to measuring particulate matter on a continuous basis from the main stack. The Company is not aware of any reasonably priced system that would provide accurate particulate loss data in the main stack.

#### 4. FURTHER STUDIES

The Commission recommends:

- (a) that Inco Limited and Hudson Bay Mining and Smelting Co., Limited be required to conduct studies into methods to further reduce sulphur dioxide emission levels from those levels specified to take effect on January 1, 1994. Such studies shall identify the amount of possible further reduction of sulphur dioxide and particulates, costs to achieve the reduction, and the time frame required for implementation. These studies should be required to be submitted to the Department on or before January 1, 1990.

The Inco Limited studies shall include those currently being undertaken under the Canada/Manitoba Joint Mineral Development Agreement.

RECOMMENDATIONS AND ANALYAIS - continued

The studies required by the Hudson Bay Mining and Smelting Co. Limited shall include a component that examines the possibility of reducing particulates from the copper smelter operation in order to further reduce both the annual and monthly particulate emission levels proposed by the Regulation to take effect in 1994.

- (b) that hearings to review the progress being achieved by both companies in meeting the 1994 emission requirements and other study requirements be held on or about June 30, 1990.

## 5. UNALLOCATED PORTION OF SULPHUR DIOXIDE

The Commission recommends:

- (a) that of the 114 kilotonne surplus of sulphur dioxide available, an additional 20 kilotonne be allocated to HBM&S to raise the proposed 1994 limit.
- (b) that a review of the 1994 INCO limit for sulphur dioxide emissions be conducted following receipt of the CAN-MAN study in 1990.
- (c) that the balance of the total January 1, 1994 agreed limit of 550 kilotonnes per year be held in reserve for future consideration and possible allocation to new or expanded industry in Manitoba as the need may be identified and justified.

As part of a national program to reduce the sulphur dioxide emission rates in those provinces east of the Saskatchewan-Manitoba boundary, Manitoba agreed to reduce sulphur dioxide emissions to an annual level of 550 kilotonnes by January 1, 1994. The Department, in its proposal, recommended that the two non-ferrous smelters in Manitoba be required to reduce their sulphur dioxide emissions to a total of 440 kilotonnes. Another 16 kilotonnes is currently allocated to other industries. In its evaluation of the evidence and presentations received at the hearings, the Commission has recommended that HBM&S be allowed emission of an additional 20 kilotonnes per year from the Flin Flon operation (from 200 to 220 kilotonnes).

The Commission recommends a review of the Sulphur Dioxide Regulation in 1990. One of the principal purposes of this review would be to determine the outcome of the Can-Man studies on pyrrhotite rejection at the INCO operation in Thompson. If the study conclusively demonstrates that the 220 kilotonne level is not practically attainable by pyrrhotite rejection, additional consideration would have to be given to the appropriateness of the proposed January 1, 1994 limit of 220 kilotonnes per year.

## RECOMMENDATIONS AND ANALYSIS - continued

The Department's position is that the remaining portion of the 550 kilotonne per year total sulphur dioxide limit was not designed to be allocated but might be considered for new or expanded industry as the need arises. An Environment Canada representative noted that in order to reach the Canadian Eastern Provinces goal of a 50 percent total sulphur dioxide reduction by 1994, a reduction of a further 175 kilotonnes remains to be obtained from among the 7 eastern provinces involved in the agreed-upon reduction program. The surplus identified in Manitoba would allow Manitoba an opportunity to increase its commitment to the Canadian acid rain reduction program.

### 6. DEPOSITION LIMITS

#### The Commission recommends:

The wet sulphate deposition standard for Manitoba shall be 10 kilograms per hectare per year to protect all surface waters and studies should continue, to determine the suitability of that deposition value.

The Manitoba Environmental Council, supported by others, urged that the regulation should include a deposition standard of 10 kilograms of wet sulphate per hectare per year. It was noted that such limits would have to take into account depositions of wet sulphate originating from both Manitoba sources and elsewhere.

The Department in its presentation stated that to protect all surface waters, wet sulphate deposition should not exceed 10 kilograms per hectare per year and for those waters with only moderate sensitivity the loading should not exceed 20 kilograms per hectare per year.

The Canada-Manitoba agreement on acid rain includes a deposition goal of 20 kilograms per hectare per year.

The departmental representative noted that the Western Canada Technical Committee for the Long Range Transport of Air Pollutants has sanctioned a contract to evaluate a possible deposition value for western Canada. Currently, the accepted deposition level is 20 kilograms per hectare; however, the new evaluation may result in a level other than 20 kilograms per hectare. The departmental representative noted that the current wet sulphate deposition occurrence in Manitoba is less than 10 kilograms per hectare.

PRELIMINARY DRAFT  
 MANITOBA REGULATION NO. \_\_\_\_\_  
 RESPECTING ATMOSPHERIC EMISSIONS FROM INCO LIMITED IN THOMPSON  
 AND HUDSON BAY MINING AND SMELTING CO. LIMITED, IN FLIN FLON

SO<sub>2</sub> EMISSIONS INCO

1. On and after January 1, 1987, emissions of sulphur dioxide into the atmosphere from the Inco Limited smelter complex shall not exceed 31 kilotonnes per calendar month and 300 kilotonnes per calendar year.
2. On and after January 1, 1994, emissions of sulphur dioxide into the atmosphere from the Inco Limited smelter complex shall not exceed 23 kilotonnes per calendar month and 220 kilotonnes per calendar year.

SO<sub>2</sub> EMISSIONS HBMS

3. On and after January 1, 1987, emissions of sulphur dioxide into the atmosphere from the Hudson Bay Mining and Smelting Co. Limited smelter complex shall not exceed 28 kilotonnes per calendar month and 275 kilotonnes per calendar year .
4. On and after January 1, 1994, emissions of sulphur dioxide into the atmosphere from the Hudson Bay Mining and Smelting Co., Limited smelter complex shall not exceed 21 kilotonnes per calendar month and 200 kilotonnes per calendar year.

PARTICULATE EMISSIONS INCO

5. On and after January 1, 1987, emissions of total particulate matter into the atmosphere from the Inco Limited smelter complex shall not exceed 310 tonnes per calendar month and 3000 tonnes per calendar year.

PARTICULATE EMISSIONS HBMS

6. On and after January 1, 1987, emissions of total particulate matter into the atmosphere from the Hudson Bay Mining and Smelting Co., Limited smelter complex shall not exceed 517 tonnes per calendar month and 5000 tonnes per calendar year.
7. On and after January 1, 1994, emissions of total particulate matter into the atmosphere from the Hudson Bay Mining and Smelting Co., Limited smelter complex shall not exceed 258 tonnes per calendar month and 2500 tonnes per calendar year.

MONITORING AND DATA SUBMISSION

8. On and after January 1, 1987, Inco Limited and Hudson Bay Mining and Smelting Co., Limited shall:

- a) operate an ambient air monitoring program for sulphur dioxide in a manner and at locations approved by the department.
- b) submit the data from the sulphur dioxide ambient air monitoring program to the department on a monthly basis within fifteen days of the end of the month in which the data was collected;
- c) submit a summary of the preceding months daily sulphur dioxide emissions (based on a mass balance calculation as approved by the department) to the department within fifteen (15) days of the end of the month in which the emissions occurred;
- d) once every three years, or more frequently as may be requested by the department, conduct detailed stack sampling in the main smelter stack to determine:
  - i) the quantity of all particulate matter;
  - ii) the identification and quantity of each major component (as identified by the department) of the particulate matter;
  - iii) the quantity of sulphur dioxide being emitted to the atmosphere.

The stack sampling shall be conducted in accordance with methods specified by the department and results from the stack testing program shall be submitted to the department within 60 days of completion of the testing, the first report being required by December 1, 1987.

9. On or before January 1, 1987, Inco Limited and Hudson Bay Mining and Smelting Co., Limited shall:

- a) install and operate, as approved by the Department, a continuous particulate emission monitor to measure particulate emissions from the main smelter stack;
- b) submit a report of the preceding months particulate matter emissions, based on the results obtained from the continuous particulate emission monitor specified in a), to the department within fifteen (15) days of the end of the month in which the emissions occurred.

STUDIES

10. Inco Limited and Hudson Bay Mining and Smelting Co., Limited shall conduct studies into methods to further reduce sulphur dioxide emission levels from those levels specified in Clauses 2 and 4 of this regulation. Such studies will identify the amount of further reduction, and costs to achieve the reduction, and the time frame required for implementation. Such studies are to be submitted to the department on or before January 1, 1991.

ORDERS REVOKED

11. Clean Environment Commission Orders No.'s 483V000 and 899VO are revoked.

Draft 6.

Mar. 23, 1987