THE

ONTARIO WATER RESOURCES

COMMISSION

THE COBALT CAMP

A PRELIMINARY ASSESSMENT OF
WATER POLLUTION BY MINING
WASTES IN THE COBALT AREA

1967

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INTRODUCTION

Mining operations have been carried on in the Cobalt area since the beginning of the present century. Little or no thought was given to the proper disposal of mill tailings, with the result that today much of the water resources of the area is unfit for human use or recreational activity.

This survey was carried out as a preliminary assessment of the nature, extent and effects of pollution (past, present and future) by mining wastes in the Cobalt area.

The report describes the general characteristics of the area, surface water systems and land use. Since the report is primarily concerned with water pollution resulting from mining operations, various aspects of this industry are considered in some detail.

Recommendations are made for further study in depth of the area.

SUMMARY

In 1903, silver was found at Long Lake 103 miles north of North Bay. In the more than sixty years since that time, the Cobalt Camp has produced more than 500,000,000 ounces of the white metal.

Due to the absence of a programme of water resources management, a serious pollution problem has resulted from the discharge of mill tailings to the lakes of the area. Lakes have been filled with

tailings in such a manner that the drainage streams carry off the material, deposit it along their courses and transport it to bodies of water not directly affected by the original disposal of the waste. In this way, much of the water resources of the area has been contaminated by solids and arsenic, rendering these resources unfit for most uses.

Rehabilitation of the lakes into which tailings have been discharged, by returning them to their original condition, is impossible, but progressive pollution of other lakes and watercourses, due to the transport of tailings away from the original disposal sites, can and should be prevented.

Resolution of the problem will be complicated by the fact that many of the mining companies responsible for the pollution are now defunct, and it would appear that much of the responsibility for implementation of any palliative measures adopted will fall to the Government of Ontario.

SECTION I

THE COBALT AREA

Boundaries (Appendix 4)

The camp is located almost entirely in the Township of Coleman, but an effective consideration of the area must include part of the Township of Gillies Limit to the south and the Township of Bucke to the north.

Topography

The Cobalt area is characterized by rugged topography with an average elevation of about 1,000 feet above sea level. Regional relief is around 300 feet with local relief up to about 200 feet. Topography is controlled by the bed-rock structure with faulting in the area which has a generally north-west/south-east trend. Crosswise Lake and Kirk Lake appear to lie along a major fault in the area. Cross faults probably also exist throughout this area. The drainage is very disorganized, many depressions being filled with water and poorly connected. The regional bed-rock type appears to be diabase or greenstone. The rugged topography formed by the bed-rock is generally subdued by sand and gravel, cobbles and boulders of glacial, deltaic and lacustrine origin. In the vicinity of mileage 104 north of North Bay at the community of O'Brien, the material is principally relatively thin clay till. In the north Cobalt area, this till is underlain in some places by a few feet of coarser gravelly material. In other places the till rests directly on the bed-rock.

Drainage

(a) North-flowing:

The main streams are Sasaginaga Creek, Mill Creek, Peterson Creek and Farr Creek. Sasaginaga Creek carries drainage from Green Lake, Clear Lake and Sasaginaga Lake, while Mill Creek drains Brief Lake, Short Lake and Cobalt Lake. Cart Lake drains to Peterson Lake which drains via Peterson Creek and flows into Crosswise Lake. Suddie, Goodwin, Nicol, Chown, Kirk and Crosswise Lakes form the chain draining to Farr Creek. At the Community of O'Brien, Sasaginaga Creek and Mill Creek are confluent with Farr Creek which flows a further five miles and empties into Lake Timiskaming.

(b) South-flowing:

Kerr Lake, Glen Lake and Giroux Lake form the chain draining to Giroux Creek and thence to the Montreal River which flows south-east to Lake Timiskaming.

Land Use

The immediate area of the Cobalt Camp is unsuitable for farming on any scale. The area is forested and this, apart from mining, represents virtually the only land use.

The Department of Lands and Forests gives the following ratings:

Agricultural use Capability:	7th rate
Forest use Capability:	5th rate
Wildlife use Capability:	4th rate
Recreational use Capability:	4th rate

Recommended use:

Agriculture	7
Forestry	6
Wildlife	5
Recreation	5

The rating scale is from 1 (excellent) to 7 (unsuitable), but it should be realized that the above uses are to a greater or lesser extent interdependent and an assessment of land use capability should be made accordingly.

SECTION II

THE PRESENT SITUATION

Since the inception of the camp, the accepted method of mill tailings disposal has been to utilize the nearest lake or watercourse. In some cases, the tailings were discharged on to the land without provision of an impoundment system. Tens of millions of tons have been discharged in this manner, without consideration of the consequences and a serious pollution problem has therefore resulted. (Figures II-1, II-2, II-3)

A description of the affected lakes and watercourses follows.

Cobalt Lake

The lake (Figure II-4) is contained between the Ontario Northland Railway tracks on the west and by high ground on the east and south. The lake is approximately 5,000 feet long and not more than 800 feet wide. It is fed at the south-west corner by Short Lake and Brief Lake and empties at the north-east corner into Mill Creek.

The lake has been used extensively for disposal of tailings and is almost completely full. Three dams have been built across the lake:

Dam #1: A wooden dam near the influent behind which Agnico Mines Limited takes water for their tailings reclaim mill.

Dam #2: A rockfill dam almost half-way along the lake.

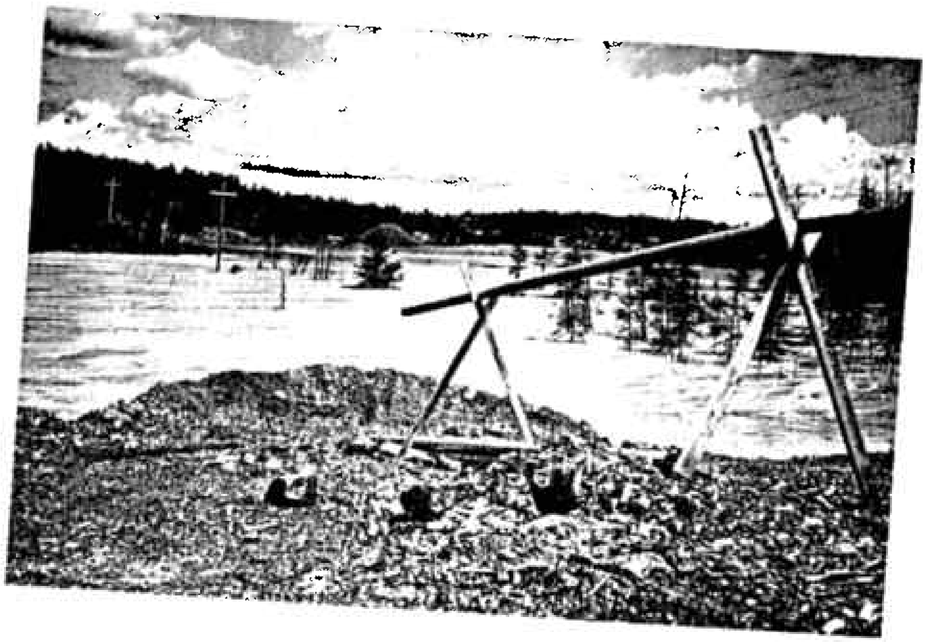
Dam #3: A rockfill dam about 3,500 feet from the influent end.

Figure II-1

Tailings Deposits in Crosswise Lake

Clearly shown is the erosion of tailings by runoff water. The tailings are constantly carried into the drainage watercourse.

Figure II-2



Tailings Deposits in Cart Lake

These tailings have been discharged to the end of the lake farthest from the drainage watercourse. As a result, the quantity of tailings carried away is small during periods of normal runoff.

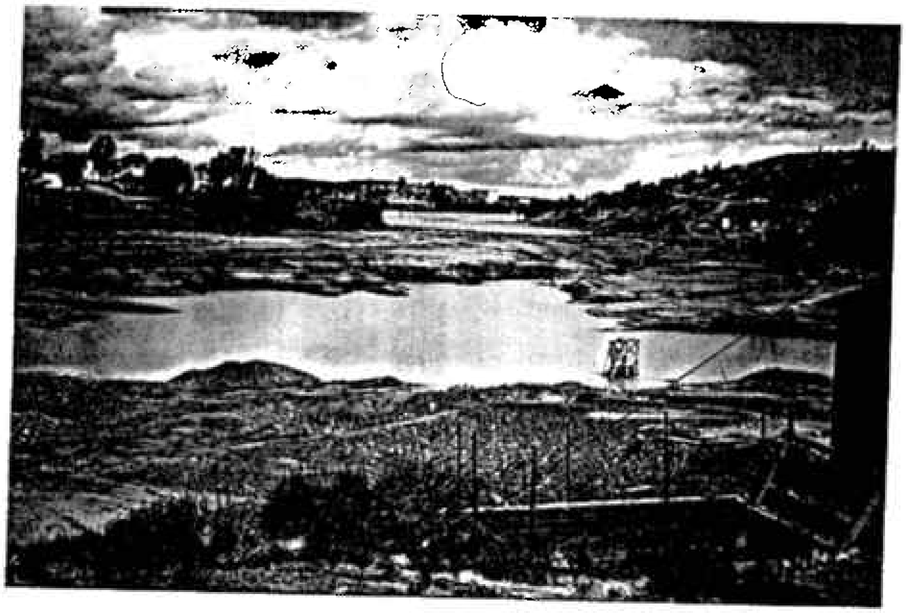
Note the waste rock and mine water discharge pipe in the foreground, and the two waste rock piles on the opposite shore.

Figure II-3

Tailings Deposits in Cobalt Lake

The water level has been lowered to expose the tailings which Agnico Mines Limited are re-milling. The barge carrying the monitors and pumps is seen at the extreme right of the photograph. The tailings are pumped as a slurry to the mill for processing.

Figure II-4



Cobalt Lake Looking North from Agnico Mines Limited Tailings Reclaim Mill

The water level has been lowered to allow re-processing of the tailings.

Dam #2 is across the lake at the end of the tailings deposit.

Dam #3 can be seen farther along the lake.

Cobalt Lake Looking South, Showing The Agnico Mines Ltd.
Tailings Reclaim Mill

Fig. II-5a

Fig. II-5b

Cobalt Lake Looking West

Agnico Mines Limited has drained the south end of the lake (Figures II-5a, II-5b) and is engaged in re-milling the tailings from the bottom of the lake. The re-milled tailings are being discharged to the north end of the lake along the east side. (Figure II-6)

Agnico Mines Ltd. - Tailings Mill Discharge

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
400912	400586	326	8.0	98.50	2.48

Concentrations in ppm (except pH)

Approximately 1,000,000 tons will be processed during the next five years.

Mill Creek

Mill Creek leaving Cobalt Lake

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
118	11	107	8.3	2.4	0.59
782	11	771	7.8	0.00	0.00
256	19	237	6.5	4.55	2.02
388	54	334	8.3	1.38	1.38

Concentrations in ppm (except pH)

Figure II-6

Cobalt Lake Looking North-West From Dam #3

This shows clearly the build-up of tailings around the discharge point. The trestle and pipe will be extended along the east side of the lake, to ensure that a channel remains open along the west side.

Mill Creek carries the flow from Cobalt Lake and runs in a north-easterly direction along the railway tracks for approximately one mile where it is confluent with Sasaginaga Creek, one-quarter mile west of the Community of O'Brien.

At a point approximately one-half mile from the Town of Cobalt it receives the tailings discharge from the La Rose Mill. From this point to its confluence with Sasaginaga Creek, Mill Creek flows through an area where tailings have been land dumped.

<u>Sasaginaga Creek</u>

The north branch of the creek flows from Sasaginaga Lake and joins the south branch which apparently rises to the north of the Town of Cobalt.

The south branch flows through an area where tailings were land-dumped, to the junction with the north branch. The creek then flows one-half mile east to its confluence with Mill Creek, one quarter mile west of the community of O'Brien. From this point, the watercourse is known as Mill Creek and flows east and south-east for approximately one mile where it joins Farr Creek.

This watercourse carries a high concentration of tailings in suspension. (Figure II-7)

Figure II-7

Mill Creek at Culvert under Highway #11 at the Community of O'Brien

The high suspended solids content of the stream is easily seen. This is a result of tailings carry-over from Cobalt Lake and from areas where tailings were land dumped in the past. From this point, the creek flows approximately one half mile to its confluence with Farr Creek.

Mill Creek at Highway #11

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
7810	7566	244	7.5	3.42	0.96

Concentrations in ppm (except pH)

Cart Lake

This is a fairly small lake, approximately one-half mile long and not more than 1,000 feet wide. It is not fed by any single discernable watercourse, but empties via a small stream at the north end to Peterson Lake.

The south end of the lake is full of tailings and at present one mill is using this end of the lake as a disposal site. (Figure II-8)

The north end of the lake appears to be fairly clean and it is likely that only during periods of heavy runoff is there any substantial quantity of tailings carried to Peterson Lake.

Peterson Lake

A U-shaped lake with a narrows at the southern end. The western portion of the lake is approximately three-quarters of a mile long by three-tenths of a mile wide, while the eastern part measures approximately one-half mile long by three-tenths of a mile wide.

Figure II-8

Tailings Deposits in Cart Lake

The lake is approximately half full, but the north end is relatively unaffected since the deposits are fairly stable. One mill is discharging tailings to this lake and as the north end becomes full, it is likely that progressively greater quantities of solid material will be carried to Peterson Lake, into which Cart Lake empties.

Peterson Lake is fed by Cart Lake via a small watercourse entering at the south-west corner. It empties from the north-west corner into Peterson Creek.

This lake has not been used for the direct disposal of tailings. Two mines are at present operating on Peterson Lake, but neither mine has a mill and consequently, the only material being disposed of to the lake is waste rock. Ore from both properties is being hauled away to other mills for treatment.

The only source of tailings to this lake is the runoff from Cart Lake and this is not heavy except at peak runoff times.

Flow from Cart Lake to Peterson Lake

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
68 198	12 12	56 186	8.2 7.6	1.23 0.96	0.31 0.96

Concentrations in ppm (except pH)

The water in the lake appears clean and is chemically of fairly good quality, with respect to the tests performed. The lake appears to offer a suitable environment for fish since, at the time of the survey, a large number of minnows of an unidentified type was seen.

Peterson Lake - North East Corner

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
184	3	181	8.2	0.47	0.32

Concentrations in ppm (except pH)

Peterson Creek

This small creek runs north from Peterson Lake for approximately 3,500 feet where it enters a small pond which is used as a supply of mill feed water. From the pond, the creek continues east for some 2,000 feet, through an area which was originally part of Crosswise Lake but is now full of tailings, and joins Farr Creek near the former western shoreline of Crosswise Lake.

Crosswise Lake

This lake is fed from the south east by a chain of lakes, none of which contain tailings and therefore will not be considered here.

Crosswise Lake originally was some two miles long and three-tenths of a mile wide. Tailings were deposited at the northern end of the lake (Figures II-9a, II-9b) which gradually reduced the effective

Crosswise Lake Looking South, Showing Tailings Deposits

Fig. II-9a

Fig. II-9b

Crosswise Lake Looking North, Showing Filled Northern Portion.

length of the lake to its present one mile and one-half. The unaffected portion of the lake appears clean and is of good chemical quality with respect to the tests performed. (Figure II-10)

Crosswise Lake - West shore, south of tailings deposit

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
136	6	130	7.8	0.80	0.06

Concentrations in ppm (except pH)

At the time of the survey, one mill was discharging tailings to the filled portion at the north end, but tailings migration appears to be northward and, unless other mills are re-activated, it is unlikely

Deer Horn Mines Ltd. - O'Brien Mill Discharge

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
99638	99468	170	8.1	27.25	0.15
196048	195738	310	8.1	13.50	0.13

Concentrations in ppm (except pH)

Figure II-10

Crosswise Lake looking south-east, showing clean southern portion of the lake.

The Deer Horn mine is seen on the opposite shore.

that the southern part of the lake will become affected.

The lake drains from the north end to Farr Creek. (Figure II-11)

Farr Creek

This creek drains from the north end of Crosswise Lake

Farr Creek at outlet from Crosswise Lake

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
430 6136	372 5796	58 340	8.1 8.0	2.38 11.80	0.14 0.59

Concentrations in ppm (except pH)

and flows for a distance of some one and one quarter miles through tailings deposits.

Approximately 1,600 feet from Crosswise Lake, the creek is joined by Peterson Creek and a further 1,500 feet downstream by Mill Creek.

The combined streams flow over tailings deposits to a point south of North Cobalt (Figure II-12).

Figure II-11

Farr Creek looking north-east from outflow of Crosswise Lake.

Note the tailings carried by the stream and the tailings deposits on both sides of the watercourse.

Figure II-12

The flood-plain of Farr Creek looking south-west from a point just south of North Cobalt.

Note the spread of tailings across the flood plain.

Note also the physiography of the area. If a dam were constructed near this point to retain tailings, it would appear that the resulting rise in water level would not cause problems in this area.

Farr Creek just south of North Cobalt

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
170 706	114 506	56 200	8.1 8.1	0.48 2.68	0.48 0.80

Concentrations in ppm (except pH)

From this point, the bed of the stream is hard rock, as are the banks. The banks have a light overburden and are well vegetated.

Farr Creek flows for a further four miles and empties into Lake Timiskaming, one mile south of the Town of Haileybury.

Farr Creek at Lake Timiskaming

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
178	94	84	8.1	0.53	0.53

Concentrations in ppm (except pH)

Kerr Lake

This small lake (Figure II-13), approximately five hundred yards long and two hundred yards wide, is being pumped out to allow mining operations to recommence on the bottom. The water is being discharged to the north-east side of Glen Lake.

Although Kerr Lake has been pumped out and mined in the past, no tailings were deposited there and consequently, the water pumped to Glen Lake is low in suspended solids content. It has, however, a relatively high arsenic content.

Flow from Kerr Lake to Glen Lake

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
170 266	1 3	169 263	7.6 7.7	5.15 5.90	1.35 1.20

Concentrations in ppm (except pH)

The suspended solids and arsenic contents of these samples cannot be correlated. This must be ascribed to analytical error. However, since the test for arsenic is fairly precise and that for suspended solids in this range is not, the arsenic contents will be taken as correct.

Figure II-13

Kerr Lake

This lake is at present being dewatered to allow mining to be carried out. The lake has been pumped out and mined in the past and it is instructive to note the condition in which the area was left when mining operations last ceased. Even in the absence of vegetation on the fairly steep banks, the lake affords a pleasant view for passers-by.

Le Heup Lake

This very small lake drains to the north-west corner of Glen Lake and is used as the discharge point for underground water from Agnico's Nipissing 407 shaft.

Glen Lake

Glen Lake is approximately one-half mile long and not more than three hundred yards wide. It is fed by Le Heup Lake and Kerr Lake and drains from the south-west corner via a small pond to Giroux Lake.

Two mills discharge tailings to the lake which is almost full apart from a small portion at the north end. (Figure II-14)

Glen Lake Silver Mines Ltd. - Tailings Discharge

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
64016	63716	300	8.0	101.0	0.53

Concentrations in ppm (except pH)

The tailings are fairly stable and only during periods of heavy runoff is there any danger of large quantities of solids being carried to Giroux Lake. However, due to the high rate at which Kerr Lake is

Figure II-14

<u>Glen Lake looking east towards the Penn Mill</u>

At this point, the lake is completely full.

The strip of vegetation in the middle of the lake is not growing on tailings, but is a mound of muskeg pushed up by the tailings discharged from both sides of the lake.

being pumped into Glen Lake, the tailings are being disturbed and consequently, the solids and arsenic content of the flow to Giroux Lake has probably been increased. Since no samples were taken prior to the commencement of the dewatering of Kerr Lake, this contention cannot be supported by analytical evidence.

Flow from Glen Lake to Giroux Lake

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
132 230	49 14	83 216	8.1 7.9	1.8 6.65	0.84 1.33

Concentrations in ppm (except pH)

Giroux Lake

This is a fairly large lake, approximately one and one-half miles long by one-half mile wide.

Past and present mining operations do not appear to have affected the quality of the water, especially since no tailings have been deposited in this lake. It was reported by a local resident that a fish had been caught which was suffering from skin lesions, but from the analysis of the lake water it does not seem likely that the damage to the fish was caused by chemical contamination. Giroux Lake appears to offer a suitable environment for trout and other game fish.

Giroux Lake at North side

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
200	1	199	8.4	0.48	0.48

Concentrations in ppm (except pH)

The lake is fed by Glen Lake at the north-west side and empties into Giroux Creek at the south-west corner.

Giroux Creek

Giroux Creek carries runoff from Giroux Lake and flows south, being joined by several small streams on its five mile course to the Montreal River, into which it flows three-tenths of a mile above Red Pine Rapids.

The creek water appears to be of acceptable chemical quality and trout are regularly introduced by the local Game and Fish Association.

Giroux Creek at outflow from Giroux Lake

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
190	3	187	7.7	0.59	0.59

Concentrations in ppm (except pH)

SECTION III

NATURE, EXTENT AND EFFECTS OF THE PROBLEM

Nature

The natural resources of the Cobalt area include minerals, forests, farmland, lakes and streams, fish and wildlife. It is right and proper that these resources be utilized for the benefit of the community at large. Where various natural resources are closely associated with each other, as in the Cobalt area, it is manifestly impossible to exploit one resource without affecting any other. This is particularly true of the mining industry.

In an ore body, the values may be concentrated in veins which may assay from 100 to 10,000 oz. per ton, or in the wall rock which may run from 8 - 40 oz. per ton. Veins are, therefore, very rich, but may be from only a crack to several inches wide. It is evident, therefore, that no matter how the values are found, great quantities of waste material must be mined to obtain these values. In the Cobalt camp, the rock is very stable and the mines are fairly shallow, therefore back-filling is not required. Consequently, virtually all rock broken is brought to surface and remains there, whether or not further processing takes place. It is the final disposition of this waste material, whether waste rock from the mine or tailings from the mill, which requires large tracts of land and water and disrupts the normal equilibrium of the natural resources of the area. (Figure III-1)

Figure III-1

A Mining Landscape.

In Cobalt, the adverse effects of mining operations have been confined largely to water resources. Lakes have been used as disposal sites for mill tailings and as a result, some lakes are full or partly full of settled solid material (Figure III-2). This of itself is not the present day problem. Rather it is the carrying away (Figure III-3) of settled material by runoff water (springs, rainfall, etc.) into the drainage watercourses, which may lead to the pollution of presently unaffected waters. It should also be borne in mind that the discharge from a mill is partly "colloidal" in nature and is difficult to settle, especially in conditions of even slight flow or turbulence. Tailings may therefore be carried long distances from the original discharge point and exert their pollutional effects over a wide area (Figure III-4). It is this progressive pollution which is the major source of concern.

Suspended solids and arsenic are the most important contaminants, other metals and pH being within acceptable concentrations. Examination of raw tailings analyses shows that the arsenic content is virtually completely in the insoluble state and is thus related to the suspended solids content. Removal of the suspended solids will effect a marked reduction in the pollutional characteristics of mill tailings. Various possible means of preventing migration of tailings, thereby reducing the pollutional load to lakes and watercourses not presently affected to a great extent, are discussed in another section of this report.

Figure III-2

Glen Lake looking south from Glen Lake Silver Mines Ltd. property.

The tailings have covered the road at this point.

Figure III-3

Crosswise Lake showing erosion and washing out of tailings.

Figure III-4

Farr Creek at North Cobalt

Representative tailings discharges from various mills in the Cobalt Area

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
99638	99468	170	8.1	27.25	0.15
196048	195738	310	8.1	13.50	0.13
64016	63716	300	8.0	101.00	0.53
400912	400586	326	8.0	98.50	2.48
132200	131960	240	8.4	-	0.34

Concentrations in ppm (except pH)

The nature of the problem is, therefore, quite straightforward. Past and present disposal of mill tailings in an unsatisfactory manner allows solid material to migrate from the original discharge point and exert a pollutional effect over a wide area. This is a perfect example of progressive pollution.

Extent

Although the tailings are fairly localized in several areas, the pollutional effects of the deposits extend over a large area, due to the transport of tailings away from the disposal points by local watercourses.

The tailings deposits occupy about 300 acres and include two lakes filled and two lakes half filled. Depth of tailings varies from a few inches to around fifty feet.

The area affected, however, is much larger, extending from the Montreal River in the south to Haileybury in the north, and from Cobalt east to Crosswise Lake. At the present time, there is no evidence that the Montreal River is being affected, although arsenic is present in Giroux Creek.

Giroux Creek at outflow from Giroux Lake
Five miles from Montreal River

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
190	3	187	7.7	0.59	0.59

Concentrations in ppm (except pH)

Lake Timiskaming, into which Farr Creek empties, is being affected by suspended solids and arsenic. However, since this lake is an extremely large body of water, it is doubtful if the quantities of solid material and arsenic carried by Farr Creek seriously affect the lake. Samples of the lake water would be required to determine this.

Farr Creek at Lake Timiskaming

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
178	94	84	8.1	0.53	0.53

Concentrations in ppm (except pH)

Effects

As already stated, the major contaminants are solids and arsenic.

The pollutional effects of solids include difficulties with water purification, silting up of stream beds, injury to the habitat of fish and other aquatic life, and aesthetic effects rendering the water unfit, or at least undesirable, for recreational purposes.

Pollution by arsenic is serious and the spread of this toxic element by water must be regarded with much concern. The extreme toxicity of arsenic is well-known and a dose as small as 130 milligrams has proved fatal to humans. Furthermore, arsenic is a cumulative poison and repeated small doses may become fatal. The Ontario Water Resources Commission in its Drinking Water Objectives, 1967, gives a maximum

SECTION IV

THE SOLUTION

If it is accepted that the exploitation of mineral resources is important not only to the Cobalt area but to the economy of the country as a whole, then a certain degree of pollution must be accepted, since it appears that in the Cobalt area it is economically not feasible to eliminate pollution entirely. However, since nothing is more important to every facet of the growth of this country than "clean" water, progressive pollution cannot and must not be allowed to continue, for it is this which represents the greatest threat to water resources as a whole. Progressive pollution must be eliminated and residual pollution must be minimized.

Before any discourse on the possible means of pollution abatement is tendered, the question of whether or not lakes may properly be used for mill tailings disposal must be answered. The view that lakes may not be used as disposal sites is, in this case, purely idealistic, since tailings have been discharged in this way for more than sixty years. Any discussion of the merits of this view is academic and has no place in this report.

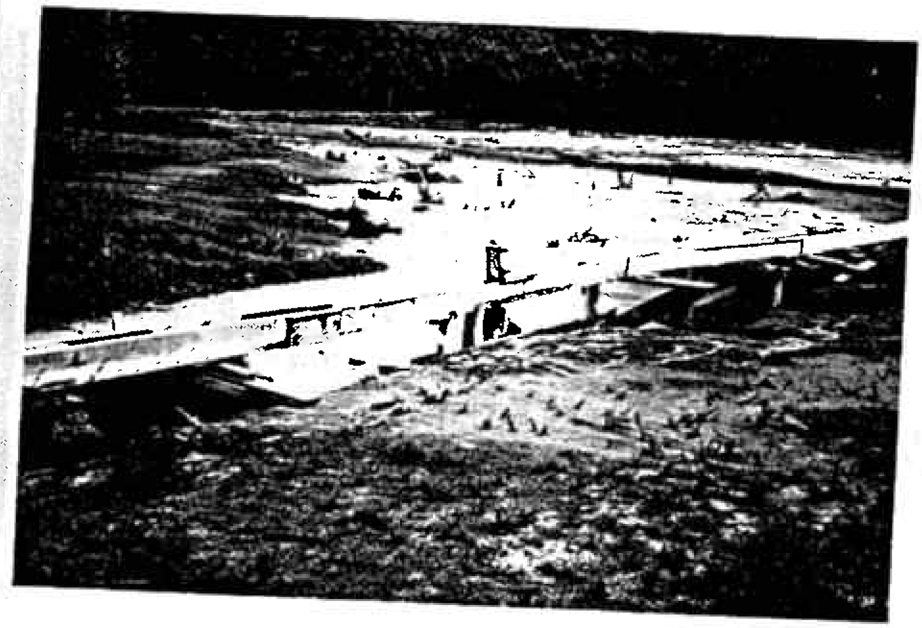
The opposite view, that lakes may be used unconditionally as disposal sites, is irresponsible and has led to the present unsatisfactory situation in the Cobalt area.

In view of the fact that lakes have been and are being used for disposal of mill tailings, the realistic answer to the question is that steps must be taken to minimize pollution resulting from past operations and that controls and conditions must be applied to present and future use of the lakes as tailings disposal sites. However, controls and conditions do not represent the whole key to the solution of present and continuing pollution problems. Perhaps more important is recognition of the fact that where lakes are used to contain mill tailings, the essence of the operation is containment. That is, rather than merely convenient disposal sites, lakes used in this way should be effective impoundment areas. Under no circumstances should this view be construed as a licence to pollute. It is not. Rather, it is the acceptance of resources management, of striking a balance between economic exploitation of one resource and the detrimental effects of such exploitation on other resources.

That the mining industry in the Cobalt area has not recognized the need for a programme of resources management is patently obvious. However, to say that tailings have been discharged haphazardly is not accurate. On the contrary, pains were taken to ensure that tailings were laundered directly to the nearest lake or watercourse. This is still true of present operations. (Figure IV-1)

At issue here is not the fact that lakes and streams were and are presently being used to dispose of mill tailings, but the manner in which they were and are being used. Absolutely indefensible is the practice of discharging tailings at or near the outflow end of a lake,

Figure IV-1



Deer Horn (O'Brien) Mill discharge to Crosswise Lake especially a lake which is fed by a chain of lakes and has a constant flow-through, thereby allowing little or no retention time with consequent carry-over of tailings to the drainage watercourse.

Farr Creek - Flow from Crosswise Lake

SOLIDS			pH	ARSENIC	
Tot	Susp	Diss		Tot	Sol
430 6136	372 5796	58 340	8.1 8.0	2.38 11.8	0.14 0.59

Concentrations in ppm (except pH)

Also to be condemned is the attitude of "laissez-faire" with respect to the continued discharge of tailings to a lake which has become full.

Solving the Problem

The solution to a problem of a nature and scale such as that existing in the Cobalt area will only be found through a concerted effort by Government and industry. The responsibilities of various departments of Government and of industry must be clearly delineated and accepted. These responsibilities include political, legislative, economic, social and health factors, all of which must be considered in conjunction with the responsibility for the technological solution to the problem. That the purely physical solution is straightforward, although not simple, and certainly within our technological capabilities, is beyond doubt. However, the present work was carried out as a preliminary assessment of the situation and, therefore, information was not obtained in great enough depth or diversity to suggest a complete solution. However, the following points should be considered:

(1) The purpose of any remedial action should be to eliminate progressive pollution, minimize residual pollution and, within reason, rehabilitate water resources and land areas.

(2) Tailings carried to Lake Timiskaming by Farr Creek may possibly be retained by construction of a dam at a suitable location south of the Community of North Cobalt (Figure IV-2). If further studies indicate that such a dam would successfully retain tailings, it would represent the solution to the major problem since the tailings carried by Sasaginaga Creek, Mill Creek and Farr Creek would be impounded. However, this would involve a constant build-up of tailings behind the dam which if not removed would probably in the future render the dam useless. In addition, the effects

Figure IV-2

Farr Creek just south of North Cobalt

Note the steep banks and the hardrock bed. This appears to be the most suitable point for construction of a dam to impound the tailings carried by Farr Creek - Mill Creek.

The stream is obviously heavily polluted at this point, only three miles from Lake Timiskaming.

of the rise in water level in the system would require to be carefully considered.

(3) The flow through Crosswise Lake, Cobalt Lake, Sasaginaga - Mill Creek flood plain and Farr Creek flood plain may be piped or culverted through the tailings deposits, but this may be impractical on economic grounds. Also, the problem of runoff water from the immediate area of these lakes and creeks would still exist.

(4) Instead of culverts, open ditches could be constructed and faced with a material which would not wash away. However, decant structures would be required to ensure that runoff would not carry tailings into the open ditches.

(5) Egress of tailings from Glen Lake to Giroux Lake and from Cart Lake to Peterson Lake should be prevented, perhaps by means of dams.

(6) A programme of re-vegetation of tailings areas should be actively pursued.

(7) In future, tailings should not be deposited in any lake or watercourse not already affected.

(8) The tailings disposal practices of the presently operating mines should be examined with a view to improving tailings impoundment.

The above points are not to be construed as recommendations, but only as suggestions as a basis for further study of the area.