

DRAINAGE
of
BLACK LAKE

Project

United Asbestos Corporation Ltd
May 1953

PLANS AND SPECIFICATIONS PREPARED ON BEHALF OF UNITED ASBESTOS CORPORATION LIMITED (NO PERSONAL LIABILITY) FOR SUBMISSION BY IT TO THE LIEUTENANT-GOVERNOR OF THE PROVINCE OF QUEBEC IN COUNCIL PURSUANT TO SECTIONS 117a AND FOLLOWING OF THE QUEBEC MINING ACT, R.S.Q. 1941, CHAPTER 196, AS AMENDED, COVERING THE PROPOSED DRAINAGE OF WATER OF, AND THE REMOVAL OF MUD FROM, BLACK LAKE IN THE TOWNSHIPS OF IRELAND AND COLERAINNE, COUNTY OF MEGANTIC, AND SETTING FORTH THE PROPOSED WORKS FOR CARRYING OUT THE SAME.

The results of a recent investigation by Lake Asbestos of Quebec, a subsidiary of the American Smelting and Refining Company, indicate that there exist, beneath Black Lake, deposits of Asbestos ore which can be mined most economically by open-pit method. Because of the nature of the rock, it is believed that only a portion of the ore could be mined by underground methods, even if the lake was drained and some of the mud removed.

→ see table p 72
Black Lake covers an area of 580 acres. The water is 20 to 30 feet deep and is underlain by black organic ooze, clay, sand, gravel and glacial till. The maximum thickness of overburden is about 250 feet and the average over the deposits is about 100 feet.

The Becancour River discharges into the eastern side of the Lake and flows out from its extreme northwesterly end. A small stream discharges into the south end of the Lake. The watershed of the Becancour River above Black Lake has an area of approximately 67 square miles and that of the small stream discharging into the south end of the lake has an area of approximately 8 square miles.

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In order to permit the mining of the deposits by open-pit mining, it will be necessary to divert the flow of the streams that flow into the Black Lake, drain the water and organic ooze and remove by hydraulic means the mud, sand and gravel that cover the deposits. Suitable storage areas and settling basins will have to be provided for the material removed, right of ways will have to be obtained for pipe lines, transmission lines and the relocation of 1½ miles of paved highway. It will be necessary to clean out and widen the channel of the Becancour River below Black Lake to insure a rapid run-off of the water during flood periods and, so as to compensate in some measure for the loss of the natural regulating effect of Black Lake, construct a permanent dam at Trout Lake.

*2 -
P. 10*

Lake Asbestos of Quebec engaged the services of Construction Aggregate Corporation of Chicago to advise on the feasibility of draining Black Lake and removing the overburden by

hydraulic means. This Corporation has been working on the Steep Rock Iron Mines project for the past few years. United Asbestos Corporation Limited has retained the services of Mr. Guillaume Piette, Ing. P., M. Sc. E. Consulting Engineer of Quebec City and a specialist in soil mechanics to cooperate in this project. Their findings have been incorporated in the plans that are being submitted.

DESCRIPTION OF PROPOSED WORK

The various projects contemplated are indicated on maps No. 1 to No. 22 included. Maps No. 1 and 2 are general maps covering and showing the whole project.

All datum referred to in the following description and on all plans are geodetic elevations according to Bench Marks established in the district by the Dept. of Interior, Canada.

1.- Excavation of Material Overlying Deposits:-

It is proposed to install a suction dredge on Black Lake and to remove a total of about 20,000,000 cubic yards of material overlying the Asbestos deposits.

This quantity is made up as follows:-

Black organic ooze — 5,000,000 cubic yards

1.- Excavation of Material Overlying Deposit:-(Cont'ed)

Clay with some sand — 7,000,000 cubic yards
Sand with some clay — 8,000,000 cubic yards

This estimate of material to be excavated is based on the survey made by the Construction Aggregates Corporation, who put down 62 holes, totalling 5610 feet, to sample the materials under the waters of Black Lake. Copies of the bore hole logs and analyses of bore hole samples made by the Quebec Department of Mines are on record with it.

Maps Nos. 3 to 9 inclusive show the depths of the water in Black Lake, the bedrock surface contours, location of the bore holes and the occurrence of the various materials under the waters of the lake. The amount and types of material to be excavated are shown on the attached longitudinal sections (Maps Nos. 10 and 11).

2.- Becancour River Diversion Channel and Dikes:-

The construction of a diversion channel, some 7,000 feet long by 75 feet wide and 12.5 feet deep is planned to the North of Black Lake to divert the flow of the Becancour River which now discharges into the northeast end of the Lake. To prevent the river from overflowing its banks during flood periods it is proposed to construct dikes some 25 feet high, with side slopes of 5 to 1,

2.- Becancour River Diversion Channel and Dikes: (cont'ed)

on both sides of the diversion channel. The area to the north of the river diversion will be utilized for the disposal of some of the dredge material and will be known as Disposal Area "A".

The dikes will be built of sand, gravel and clay, excavated during the construction of the river diversion. Surface areas affected by the diversion belong to United Asbestos Corporation.

Maps showing the works above described are maps Nos 1, 2, 12, 13, 15, 19.

3.- Dam at South End of Black Lake, Water Diversion and Intercepting Channel:-

It is proposed to build a dam at the south end of Black Lake as shown on plan No. 2 and No. 12 to protect the working area of Black Lake where excavation will be made against the water coming from the watershed above the dam site. This dam will be built with a rock core to insure absolute stability and impermeability will be provided by two blankets built of impervious material to a slope of 5 to 1. On the west side of the dam there will be a diverting ditch alongside the mountain to direct the water into the Becancour River. Details of the dam are shown on plans No. 12 and No. 20.

If the construction of the dam proves to be

3.- Dam at South End of Black Lake, Water Diversion and Inter-
ception Channel:- (Cont'ed)

impossible or inadvisable with further studies, prevention of the water to reach the open-pit area could be obtained by an alternate method.

It would then be proposed to construct an interceptor ditch of 30 feet in width by 6.5 feet deep, along the west side of Black Lake or to erect a dam of permanent nature at the south throat of the Lake to store or to handle the surface run-off water on the west side of the Lake and also the small stream flowing into the south end of the Lake. (See Maps Nos. 1, 2, 12, 20). It is possible that the small stream discharging into the south end of the Lake may be diverted southward, into the Coleraine River, in which event the interceptor ditch will be shortened and used only to handle surface run-off waters. This proposed channel will be approximately 4 miles long, with a bottom width of 30 feet, a depth of 6.5 feet and bank slopes of 2 to 1. If the stream flowing into the south end of the lake is diverted southward, the interception ditch will be constructed with a smaller cross-sectional area. To prevent percolation from the channel into the open-pit area, the sides and bottom of the channel will be treated with asphalt wherever necessary.

3.- Dam at South End of Black Lake, Water Diversion and Intercepting Channel:- (cont'ed)

Lands affected by these intercepting ditches and by the dam are believed to be owned by the Crown, Asbestos Corporation Limited, the Mutual Chemical Co. Ltd., and are located in Ireland and Coleraine Townships.

4.- Water Interception Ditch (East Side):-

A small diversion ditch, approximately 15 feet wide by 6 feet deep and 3 miles long is planned on the east side of the lake along the railroad to handle surface run-off water (Ref: Maps Nos. 2 and 12). This ditch will be on ground of ownership other than United Asbestos Corporation.

5.- Relocation of Highway:-

In the mining of the asbestos deposit which occurs near the east shore of the Lake, approximately $1\frac{1}{4}$ miles of the Sherbrooke-Thetford-Mines highway will be affected. It is proposed to relocate this stretch of highway, on some line between the lake and the railroad which is about 900 feet to 1000 feet from the shore of the lake. (See Maps Nos. 2 and 12).

6.- Improvement of Becancour River Channel Below Black Lake:-

The Becancour River is badly congested for about 2 miles down stream from the point where the diversion channel would enter the stream. In places the river is as narrow as 60 feet for distances of up to 1000 feet. The bottom of the channel is rough and uneven and large boulders up to 3' and 4' in diameter, are present on this 2 miles stretch. Much scouring of the bottom has taken place causing deep holes and wide shallow shoals. Near the lower end of the 2 miles congested stretch two islands split the river and hinder the flow of water. The bridge crossing the river on the Vimy Ridge Road is an artificial obstruction as its center pier occupies about 20% of the river width.

It is proposed to remedy the above conditions as follows so that the river can handle the momentary peak flows during flood period. (See Map Nos. 15.)

A) Widen the channel where necessary along congested stretch to 100 feet and clean out the bottom and sides.

B) Remove constriction at point where two islands occur in the channel about 2 miles downstream. This could be done by widening the channel and removing part of one island and all of the other.

6.- Improvement of Becancour River Channel Below Black Lake:- (cont'd)

C) Improve the Vimy Road Bridge which at present has a built up crib as a center pier. The present north abutment of the bridge could be converted to a pier and the abutment moved north one span.

7.- Disposal Area "A":-

It is propose to utilize the area to the north of the Becancour River diversion, as a storage site for some of the more stable material (mostly sand and gravel) that will be removed near the conclusion of the dredging operation. (See maps Nos. 1, 2 and 19). It is estimated that 7,000,000 to 9,000,000 cubic yards of dredge material can be stored at this location. As the lower strata to be removed are composed principally of coarse material, no settling problems are expected. However, if some should arise the overflow water could be readily run back into the lake.

Surface areas affected by Disposal Area "A" are almost entirely owned by United Asbestos Corporation.

8.- Disposal Area "C":-

This disposal area is located about 3 miles downstream from Black Lake (Ref. Maps Nos. 1, 2, 13, 14, 21). It is a basin shaped area with a narrow neck that can be readily dammed off and is especially suitable as a disposal site. This area will

8.- Disposal Area "C":- (cont'ed)

hold approximately 25,000,000 cubic yards of dredge material.

It is planned to store approximately 13,000,000 cubic yards of material at this site, which will take care of all the organic ooze and much of the clayey and sandy material dredged from the upper portion of the lake bottom.

Some of the land affected by this work is under option to the United Asbestos Corporation. A right of way will also be required from Asbestos Corporation Limited, and other private owners of land to accomodate the dredge discharge pipe line between Black Lake and the "C" disposal area during the period dredging operations are in progress.

9.- Dam at Disposal Area "C":-

It is proposed to construct an Earth Dam at the North end of the Disposal Area "C", so that this area can be used as an effective storage site for dredge material. (See maps Nos. 2, 13, 14 and 21).

The dam will be, 4,700 feet long and 72 feet high at its highest point. Its construction will start with the laying of a broad base of local fill material or select dredge material to insure against shear failure due to lateral pressures.

9.- Dam at Disposal Area "C":- (Cont'ed)

This base will cover an area of sufficient size so that the dam will have a 200 feet top width at Elevation 833 and 835 and 5 to 1 side slopes. It is estimated that 2,000,000 cubic yards of fill will be required for a dam of the above dimensions, most of which could be select dredge material, sand and pea gravel, from the dredging of the lake bottom. As dredge fill would be built southward from the dam the heavy particles would deposit adjacent of the dam which would have the effect of broadening the base as the project proceeded, thereby progressively increasing its stability.

Due to the large dimensions of this proposed dam its internal stability is greatly increased and the pressures which it will transmit to the underlaying soils and rock will be distributed over a large area.

There will be no spillway constructed in that dam. The crest will be at all times kept at least five feet above the retained water. An overflow pipe of sufficient diameter to eliminate the pumped water plus the local water will be installed at the center of the disposal area and will pass underneath the dam and discharge either in the Becancour River or in the settling basin. It is anticipated that the dredge pumping capacity will be 33000 g.p.m. or

9.- Dam at Disposal Area "C":- (cont'ed)

100 c.f.s. It is intended to keep a velocity of 5 feet second in the overflow pipe; a diameter of 5 feet is proposed for the overflow pipe.

Settling basins an planned downstream in the vicinity of Trout Lake. The small settling basins originally planned at the base of the "C" disposal area are eliminated because of their small area. An alternate proposal is first to build the dam at the base of the disposal area in which case some 30,000,000 to 35,000,000 cubic yards of sludge (consisting of about 75% water and 25% organic ooze, mud, and sand) can be pumped into this basin before any overflowing of surplus water occurs. The pumping of this quantity of sludge will have removed from the lake bottom the 5,000,000 cubic yards of organic ooze that is to be dredged and some 3,000,000 cubic yards of the 8,000,000 cubic yards of the clayey and sandy material that will be stored at this site.

During the time consumed in the removal of the above quantities of ooze, clay and sand, it is felt that all of the fine material except a very small percentage of the colloidal material will have settled out. Using Stoke's law of sedimentation of particles in viscous fluid, the dam outlet will be kept high e-

9.- Dam at Disposal Area "C":- (Cont'ed)

nough above sedimentation level that clear flow can be obtained. No settling problem is anticipated in the overflow of the dam.

10.- Dam at Trout Lake:-

Because of the elimination of Black Lake and of its natural regulating effect, it is proposed to erect at Trout Lake at site (11) indicated on plan No. 1, a permanent dam. The surface area of Black Lake is 580 acres and the surface area behind the proposed dam at the east end of Trout Lake is approximately 500 acres. The created basin would then have the regulating effect of the eliminated Black Lake.

It is planned to build this dam up to the 652 feet contour or a height of 12 feet above the low water level contour of the lake (low level contour 640') high water level contour 648'). The dam will have a 140 feet base and a 20 feet width at the top. Properly constructed spillways will be built in the dam to control the flow of water at the same rate as the flow passing underneath the bridge at the west end of the lake. The flow section at that bridge is 1400 square feet at maximum. Openings and sluice gates will be left in the dam so that, during periods of medium to low flow, the reservoir level will be lowered and be ready to act as a surge basin

10:- Dam at Trout Lake:- (Cont'ed)

for the next flood flow. The dam will be built on a sandy gravelly foundation. Its length will be approximately 2900. The materials used in the construction will be earth and concrete. The spillway section will be entirely made of concrete.

Previous studies had led to the selection of a site at west end of Trout Lake and plans had been prepared to that effect. That construction had some undesirable effect on some cultivated land bordering the lake and the regulating effect of the Trout Lake was overcompensating for the elimination of Black Lake by more than 3 times. The selection of the site at the east end of the lake creates a basin which regulating effect is just compensating the Black Lake and is not flooding any developed land. Ref. Maps. Nos. 1, 2, 16 and 22.

11.- Area Affected by dam at east side of Trout Lake:-

Most of the land affected by the raising of the water before Trout Lake to the 650 feet contour is swamp land and no cultivated land is affected.

All the land affected by the flooding is privately owned. It is expected that it will be required only during the period of flood. Ref. Maps Nos. 2 and 16.

12:- Approximately 200 feet of land along each side of the Becancour River may be required between Black Lake and Trout Lake to accomodate operations incidental to the execution of the project described in this report.

13:- In order to protect continuity of dredging operating during possible dry seasons, it may be found necessary to obtain sufficient water from sources other than the Becancour River.

14:- Attached is a list of properties which may be affected by the proposed works and a list of the lots, the whole or part of which, ^{or} ~~and~~ real rights in respect of the whole or part of which, are necessary to the execution of the proposed works and will require to be expropriated.

Respectfully submitted.



GUILLAUME PIETTE, Ing.P., M.Sc.E.

Consulting Engineer.

Quebec, May 5th 1953.

Page 15-

Appendix , No. 1.

Item No 14:-

Lots (shown on plan No 2) which may be affected, in whole or in part, by the execution of the proposed works.-

<u>AREA</u>	<u>RANGE</u>	<u>LOT NO.</u>
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I - TROUT LAKE.

Lots that may be affected by the construction of a dam at the east end of Trout Lake.

Township of Ireland	II	88
"		89
"		90
"		92
"		93
"		94
"		97
"	III	178
"		176
"		177
"		179
"		180
"		181
"		182
"	IV	222
"		223

AREA	RANGE	LOT NO.
<u>I - TROUT LAKE.</u> (Cont'ed)		
Township of Ireland	IV	224
"		225
"		226
"		227
"		228
"	V	293
"		294
"		295

II - "C" DISPOSAL AREA

Lots that may be affected by the proposed Disposal Area "C".

Township of Ireland	I	57
"		58
"		59
"		60
"		61
"		62
"		63
"		64
"		65
"		66
"	II	79 -1
"		80

AREA	RANGE	LOT NO.
<u>II - "C" DISPOSAL AREA (Cont'ed)</u>		
Township of Ireland	II	81
"		82
"	III	192
"		193
"		194
"		195
"		196

III - "A" DISPOSAL AREA

Lots that may be affected by the proposed Disposal Area
"A".

Township of Ireland	V	317
"		318
"		319
"	VI	324
"		325
"		326
"		327

AREA	RANGE	LOT NO.
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IV - SOUTH PART OF BLACK LAKE

Land that may be affected by the construction of a dam and the impounding of water.

Township of Coleraine	X	19-10
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19-11

Mining Block Transmission Line	"A"-1 238
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V - HECANCOUR RIVER

A strip up to 300 feet wide along both banks of the river affecting the following lots may be required.

Township of Ireland	III	190
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"		191
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"		192
---	--	-----

"		193
---	--	-----

"		194
---	--	-----

"		195
---	--	-----

"		196
---	--	-----

"	IV	197 207
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"		208
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"		209
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AREA	RANGE	LOT NO.
<u>V - BECANCOUR RIVER (Cont'ed)</u>		
Township of Ireland	IV	210
"		211
"		216
"		217
"		218
"		219
"		220
"		221
"		222
"		223
"		224

VI - DISCHARGE PIPELINE (Black Lake to Disposal Area "C")

A temporary right-of-way may be required on the following lots. This right-of-way will be up to 100 feet wide.

Township of Ireland	III	195
"		196
"		197
"	IV	206

AREA	RANGE	LOT NO.
<u>VI - DISCHARGE PIPELINE (Black Lake to Disposal Area "C") (Cont'ed)</u>		
Township of Ireland	IV	207
"		208
"		209
"	V	319
"		320
<u>VII - INTERCEPTION DITCH (West Shore)</u>		
This ditch may require a strip up to 300' wide, affecting the following lots.		
Township of Ireland	IV	204
"		205
"		206
"		207
"	V	320
"		321
Township of Coleraine	Mining Block Transmission Line	"A"-1 238

AREA	RANGE	LOT NO.
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VIII - INTERCEPTING DITCH (East Shore)

This ditch may require a strip up to 200' wide, affecting the following lots.

Township of Ireland	V	321
"	VI	322
"		323 }
"		324 }
Township of Coleraine	Mining Block	"A"-1
"	Transmission Line	240 ?
"	X	19 -7
"		19 -8
"		19 -9
"		19-12
"		19-13
"		18
"		17

IX - DIVERSION CHANNEL (South End of Black Lake)

This channel may require a strip up to 200' wide, affecting the following lots:

Township of Coleraine	Mining Block	"A"-1
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AREA	RANGE	LOT NO.
<u>X - BLACK LAKE</u>		
Dredging operations may affect a strip of land up to 200' wide around the shore of Black Lake or the following lots:		
Township of Ireland	V	318
"		319
"		320
"		321
"	IV	204
Township of Coleraine	Mining Block Transmission Line	"A"-1 239

XI - HIGHWAY RELOCATION.

A strip of land up to 200 feet wide will be required affecting the following lots:-

Township of Ireland	V	321
"	VI	322
Township of Coleraine	Mining Block Transmission Line	"A"-1 239

Appendix, No. 1-A.

Item No 14:-

Lots, the whole or part of which, ^{or} and real rights, ^{in respect of} the whole or part of which, are necessary to the execution of the proposed works and will ~~be~~ required to be expropriated.

AREA	RANGE	LOT NO.
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I - TROUT LAKE

Lots that will be required for the construction of a dam at the east end of Trout Lake.

Township of Ireland	II	88
		89
		90
		92
		93
		94
		97
	III	176
		177
		178
		179
		180
		181
		182
	IV	222
		223
		224
	V	293
		295

II - "C" DISPOSAL AREA

Lots that will be required for the proposed Disposal Area "C".

Township of Ireland	I	57
		58
		59
		60
		61
		62
		63
		64
		65
		66
	II	79-1
		80
		81
		82
	III	194-
		194-
		194-

AREA	RANGE	LOT NO.		
<u>II - "C" DISPOSAL AREA (Cont'ed)</u>				
Township of Ireland	III	195-1		
		195-2		
		195-3		
		195-4		
		196-4		
		196-5		
		196-6		
	196-7			
		<u>III - "A" DISPOSAL AREA</u>		
		Township of Ireland	V	- 317
			VI	324-312
				324-311
				324-310
				324-309
		324-308A		
		324-302A		
		324-303A		
		325		
		326		
		327		
<u>IV - SOUTH PART OF BLACK LAKE</u>				
Lots that will be required for the construction of a dam and the impounding of water.				
Township of Coleraine	X	19-10		
		19-11		
	Mining Block Transmission Line	A-1		
		238		
<u>V - BECANCOUR RIVER</u>				
A strip up to 300 feet wide along both banks of the river affecting the following lots will be required.				
Township of Ireland	III	190		
		191		
		194-1		
		194-2		
		194-3		
		195-1		
		195-2		
		195-4		
		196-4		
		196-5		
		196-6		
		196-7		
		197-1		
		197-2		

V - BECANCOUR RIVER (Cont'd)

Township to Ireland	IV	207
		208-1
		208-2
		208-3
		208-4
		209-1
		209-2
		209-3
		209-4
		210-1
		210-2
		210-3
		210-4
		211-2
		216
		217
		218
		219
		220
		221

VI - DISCHARGE PIPELINE (Black Lake to Disposal Area "C")

A temporary right-of-way will be required on the following lots: This right-of-way will be up to 100 feet wide.

Township of Ireland	III	195-3
		195-4
		196-4
		196-5
		196-6
		196-7
		197-1
		197-2
	IV	206
		207
		208-2
		208-4
		209-2
		209-4

VII - INTERCEPTION DITCH (West Shore)

This ditch will require a strip up to 300 feet wide affecting the following lots.

Township of Ireland	IV	204 ✓
		205 ✓
		206 ✓
Township of Coleraine	V	321
	Mining Block	A-1
	Transmission Line	238

VIII - INTERCEPTION DITCH (East Shore)

This ditch will require a strip up to 200 feet wide affecting the following lots.

Township of Ireland	V	321
	VI	322
		323
		324-308A
		324-309
		324-310
		324-311
Township of Coleraine	Mining Block	A-1
	Transmission Line	240
	X	19-7
		19-8
		19-9
		19-12
		19-13
		18
		17

IX - DIVERSION CHANNEL (South end of Black Lake)

This channel will require a strip up to 200' wide, affecting the following lots:

Township of Coleraine	Mining Block	"A"-1
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X - BLACK LAKE (Dredging)

A strip of land up to 200' wide around the shores of Black Lake will be required, affecting the following lots:

Township of Ireland	IV	204
	V	321
Township of Coleraine	Mining Block	"A"-1
	Transmission Line	239

XI - HIGHWAY RELOCATION

A strip of land 200' wide will be required affecting the following lots:

Township of Ireland	V	321
	VI	322
Township of Coleraine	Mining Block	"A"-1
	Transmission Line	2