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FEASIBILITY STUDY, MICA DEPOSITS, PROVINCE OF QUEBEC

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FEASIBILITY STUDY

MICA DEPOSITS

PROVINCE OF QUEBEC

CANADA

for the

KOIZUMI GROUP - U.S.A.. INC.

Prepared by

LALONDE, GIROUARD, LETENDRE & ASSOCIATES

Consulting Engineers

Montreal, Quebec

Canada   April 1975

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INTRODUCTION

I - INTRODUCTION

The purpose of this Study is to outline the engineering and
economic feasibility of developing a Suzorite-type mica depo-
sit near Parent, Québec. The mining rights to this deposit,
which has an estimated reserve of 10,000,000 tonnes of mica
at an average content of about 70%, are held by Mr. F. N.
Charlebois of Grand Mère, Québec. This study has been carried
out at the request of the Koizumi Group - U. S. A., Inc.; it
updates and supercedes an earlier study carried out by Lalonde,
Girouard, Letendre & Associates in 1972.

This report is based on information obtained from a variety of
reliable sources shown in the references in the Appendix.
All cost estimates have been updated and additional laboratory
tests carried out to confirm previous chemical analyses and
provide further information on the type of mica contained in
the deposit. The additional laboratory test work was carried
out on samples obtained by the Quebec Department of Natural
Resources from Mr. Charlebois and is, to the best of our know-
ledge representative of the mica ore in the deposit for which
he has the mining rights.

The mica property comprises fifteen hundred and twenty (1520)
acres, in thirty eight (38) mining claims located about one
mile north of the Village of Parent in Lamy Township, in
Laviolette County, in the Province of Québec. The location

of Parent, in relation to Montreal and other St. Lawrence ports, is shown in Figure 1. Parent lies on a mainline of Canadian National Railways and is accessible by automobile from Montreal via Mont Laurier.

Although an existing bush trail connects the mica property to the r ail line, a new access road for trucks will be necessary. The cost of this new access road has been included in the capital cost estimate.

Mica, as Suzorite, does not occur as large plates, but as small flakes and liminae and in this form it appears to be an ideal source for mica as ground and micronized products. For the purpose of this report it has been assumed that the average mica content of the Parent ore body is 70%, although mica content as high as 85% has been indicated in some examinations.

In its natural state the mica rich rock, suzorite is relatively dense; however, when it is ground or mechanically stressed, it expands by exfoliation to many times the original volume. This basic characteristic which make it attractive for many industrial applications dictates the procedure which must be followed for mining, transportation, beneficiation and marketing. The specific volume should be kept as low as possible until the product is close to the market, or at least to water transportation to the eventual market.

Railroad transportation rates vary directly with the value of the product and inversely as the bulk density of the material being shipped.

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The economic disadvantage of shipping a 70% mica ore by rail
to a dock side beneficiating site would be relatively small
compared to the increase in rail transportation cost which
might result from a large decrease in specific volume, or an
increase in the value per unit weight of the product resulting
from beneficiating at the mine.

SUMMARY &

RECOMMENDATIONS

II - SUMMARY & RECOMMENDATIONS

1.   Information now available indicates that the Parent mica
        deposit contains sufficient reserves of high grade mica ore
        to warrant a further drilling program provided the physical
        and chemical properties of this deposit meet the specifica-
        tions required for the proposed market and end products.

2.   The estimated cost of mining the Parent mica ore by open pit
        methods varies from $11.40 per tonne*at a mining rate of 25,000
        tonnes per year to $3.80 per tonne at a mining rate of 200,000
        tonnes per year. The initial cost of rail transportation to a
        seaway port close to Montreal is $32.19. It is anticipated
        that this rail rate can be substantially reduced by negotia-
        tions to establish a specific commodity rate. As soon as
        annual tonnages become large enough, special and much lower
        unit train railroad shipping rates become available.

3.   The established cost to ship mica, or mica concentrate, in
        chartered vessels (12,000 tonnes minimum cargoes) to Japan is
        $32.55 per tonne, including the cost of dock storage and han-
        dling. There is a possible saving of $0.82 per tonne of con-
        tained mica in the ocean transportation cost between Montreal
        and Japan by beneficiating the ore at a site close to the
        Canadian shipping port.

* Unless otherwise indicated all tonnes in this report refer to metric
  tonnes.

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4. Before undertaking the development of this ore body at the minimum economic mining rate of 25,000 tonnes per year, an additional diamond drilling program of approximately 1700 ft. of drilling, at a cost of approximately $50,000, is recommended to:

    a) confirm the extent of the deposit,

    b) develop data to design the open pit, and

    c) establish the necessary correlation between a bulk sample and the average physical and chemical characteristics of the ore body.

5. The diamond drilling program should be followed by a pilot plant tests on a bulk sample of at least 100 tonnes. The purpose of this pilot plant test program would be to:

    a) Establish the detailed design criteria for a beneficiating plant, and

    b) correlate the physical and chemical characteristics of the mica concentrate with "end use" specifications.

FIGURE 1
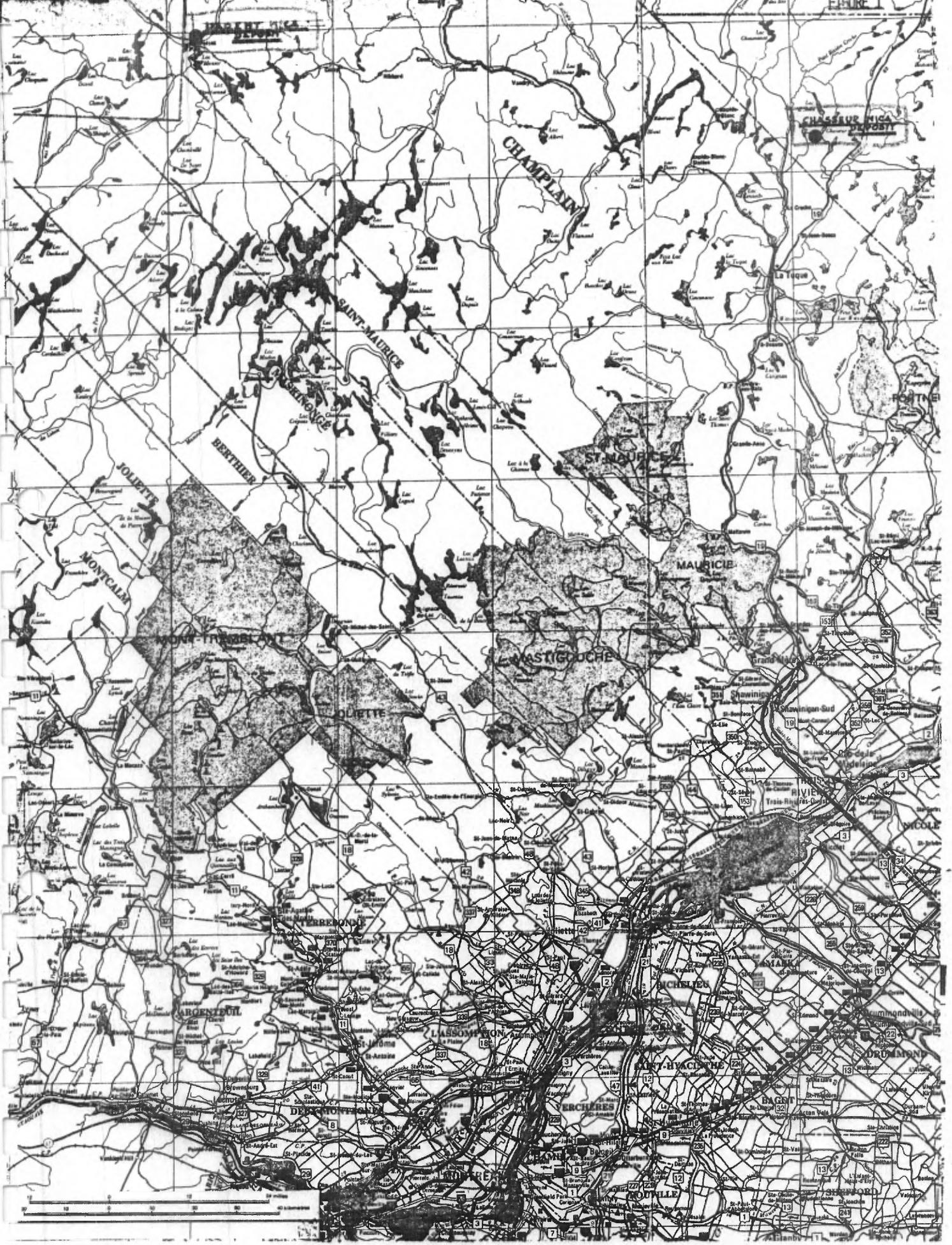
ORE & ORE BODY

III - ORE & ORE BODY

The Parent ore body is typical of the suzorite type mica
deposits first discovered and recorded in 1931. The Parent
deposit was discovered in 1964. It was owned by Laviolette
Mining and Metallurgical Corporation for several years. When
their claims lapsed in November 1970, it was acquired by F. N.
Charlebois.

The main characteristic of the Quebec Suzorite deposits are
high mica contents of 70 - 95 percent which occur not as the
conventional sheets, but flakes. It is a recognized fact that
this material could provide a good source of ground mica. Pro-
duct development programs have been in progress for more than
five years to establish more extensive industrial applications
for suzorite. The Laviolette Mining and Metallurgical Corp.
alone, and more recently with Marietta Resources International
Limited, have been the most active developers of suzorite. It
is reported that they own the most favorable deposit with a
mica content of 90-95 percent. F. N. Charlebois is the next
most active developer with product development based on the
Parent deposit. His development work includes a program at
Batelle Memorial Institute at Columbus, Ohio.

Suzorite shows considerable promise as a fire retardant material
in industrial applications and as a filler for plastics. There
is already an established North American market for more than

300,000 tonnes of ground mica per year. This market was previously supplied as a by-product from the now obsolete sheet mica industry.

Another characteristic of suzorite has been controversy over the mineralogical classification of the mica itself. When suzorite was first observed by geologists in 1936, it was described as brown biotite. Later, on the basis of a high magnesia content it was classified as phlogopite. We have attempted to clarify this point by submitting new samples to the Province of Québec Department of National Resources for metallographic examination and X-ray diffraction analysis. They confirm a mica content of seventy percent, but classify it as phlogopite-biotite.

A similar sample submitted to the geo-chemical section at McGill University confirmed a mica content of approximately seventy percent, but classified it as biotite.(Exhibit A).

Despite the continuing lack of agreement on the mineralogical characteristics, it is important to note that both investigators reported the absence of fibrous material. This is of particular importance since mica in some fields of industrial application is competitive with asbestos fiber which is becoming unwelcome for its carcinogenic character.

The exact mineralogy of Parent mica may not be a final factor in its successful industrial application, but we would recommend more careful correlation with the specified physical and chemical properties of the proposed market products before large scale development of the ore body. This could be done by more diamond drilling and bulk sample pilot plant tests.

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Available data on chemical analysis from previous work on the
Parent ore deposit is included for reference as Exhibit D in
the appendix.

To confirm our opinion that further diamond drilling and test-
ing was necessary before full development of the ore body, we
commissioned an independent evaluation by MPH Consultants
Limited of Toronto, Ontario. Their report is included in the
appendix as Exhibit B.

They recommend additional diamond drilling at an estimated
cost of $50,000 before proceeding to develop the ore body.

MINING

IV - MINING

It is recommended that the Parent ore body be open-pit mined by ripping, rather than by the more conventional open-pit mining procedures which involve blasting.

Ripping and stockpiling with standard bulldozers and attachments is expected to keep mica exfoliation to a minimum during the mining operation. It will also produce a rock size range which can be transported by truck and railroad without the need to crush the ore until it is later beneficiated close to the point of ship loading or the point of industrial application.

An average open-pit mining rate of 200,000 tonnes per year for the first 10 years would be an economically effective program for the Parent ore body. It is understood, however, that market development has not reached the point where mining at a rate of 200,000 tonnes per year can be justified. The estimated capital and operating cost of mining has therefore been developed on the basis of a program starting with 25,000 tonnes of ore in the first year, and gradually increasing to the planned production rate of 200,000 tonnes per year by the seventh year. This program would give a projected open-pit mine life of seventeen years. See Table 1.

TABLE 1

PARENT MICA DEPOSIT

PROPOSED MINING PROGRAM

Year	Ore tonnes	Waste tonnes	Ore & Waste Total	Shifts per year	Operating Cost	Operating Cost $/tonne Ore
1	25,000	70,000*	95,000	79	$ 285,000	$ 11.40
2	35,000	78,000*	113,000	94	314,000	8.97
3	50,000	130,000*	180,000	150	418,000	8.36
4	50,000	130,000*	180,000	150	418,000	8.36
5	100,000	80,000	180,000	150	478,000	4.78
6	100,000	80,000	180,000	150	478,000	4.78
7	200,000	160,000	360,000	300	762,000	3.80
8	200,000	160,000	360,000	300	762,000	3.80
9	200,000	160,000	360,000	300	762,000	3.80
10	200,000	160,000	360,000	300	762,000	3.80
11	200,000	160,000	360,000	300	762,000	3.80
12	200,000	160,000	360,000	300	762,000	3.80
13	200,000	160,000	360,000	300	762,000	3.80
14	200,000	160,000	360,000	300	762,000	3.80
15	200,000	160,000	360,000	300	762,000	3.80
16	200,000	160,000	360,000	300	762,000	3.80
17	200,000	160,000	360,000	300	762,000	3.80

* Includes a total of 90,000 cu. yds. of pre-production stripping.

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No attempt has been made to plan for the underground mining
of the remaining reserve of 6,000,000 tonnes of ore. The
rate at which additional ore will be required will be a
function of market and product development. At a minimum
annual underground mining rate of 200,000 tons per year, the
cost of mining can be expected to be somewhat more costly
than that of recovery by open-pit techniques. The increase
in mining cost will however be relatively small compared to
the cost of transportation.

The estimated capital and operating cost of mining are based
upon the production rates shown in Table 2. Approximately
90,000 cu.yds. (approximately 180,000 tonnes) of preproduction
stripping of overburden will be required before open pit mining
can be started.

Geological and diamond drilling reports available to-date in-
dicate that it will be necessary to also remove 0.80 tonnes
of rock and overburden for each ton of ore recovered after
the initial 90,000 cu. yds. of preproduction stripping - a
production stripping ratio of 0.40 to 1.0. On this basis
of this stripping ratio, it is estimated that there is approxi-
mately 2.27 million tonnes of mica ore recoverable by open pit
mining methods.

The estimated cost of equipment and facilities is outlined in
Table 2. This capital cost estimate is based on 1975 costs
with no provision for escalation which may occur between now
and project commitment. It is possible that much of this initial
capital expenditure of $610,000. could be delayed by sub-con-
tracting the mining in early years to mining contractors which

TABLE 2

PARENT MICA DEPOSIT

ESTIMATED CAPITAL REQUIREMENT FOR MINING
(200,000 tonnes of Mica Ore/year)

Equipment

1	5 cu.yd. Front end loader	$ 182,000
1	TD8 Bulldozer	187,000
2	20-ton Trucks	94,000
1	20-foot Drill on Tracks and Auxiliary Air Compressor	82,000
2	Pick-up Trucks	12,000
1	Diesel Generator	11,000
	Miscellaneous mine buildings & equipment	42,000

Total Equipment and Buildings	$ 610,000
Preproduction Development and Stripping	322,000
TOTAL	$ 932,000

TABLE 3

PARENT MICA ORE DEPOSIT

PROPOSED PRODUCTION SCHEDULE DATA

	TONNES ORE	TONNES* WASTE	TONNES MATERIAL
Year (8 months)	200,000	160,000	360,000
Shift (8 hours)	739	591	1,330

* An initial 90,000 cu.yds. of overburden must be moved before
  the proposed open pit mining rate can be achieved.

are available in Canada.

A work force of approximately 12 persons would be necessary to sustain a mining rate of 200,000 tonnes per year. See Table 4. The direct cost of mining has been estimated on the basis of starting the operation at a rate of 79 shifts per year in approximately four summer months, 25,000 tonnes of ore and 50,000 tonnes of preproduction stripping would be excavated.

The planned mining rate envisions a gradual increase in production until the planned annual production of 200,000 tonnes would be reached in the seventh year. All preproduction stripping would be completed by the end of year four.

TABLE 4

PARENT MICA DEPOSIT

MANPOWER REQUIREMENT FOR MINING

Job Classification	Number
Mine foreman	1
Front loader operator	1
Haulage truck drivers	2
Tractor operators	2
Driller	1
Mechanic welders	2
Tireman – bit grinder	1
Labour	2
TOTAL:	12

TABLE 5

PARENT MICA DEPOSIT

ESTIMATED OPERATING COST OF MINING
(200,000 tonnes of Mica Ore/year)

	Cost $	$/tonne Mica Ore
Labour - Usage rates $6.50-$8.50/hour		
Fringe benefits 30% direct labour cost	249,000	1.24
Overtime & bonus 15% direct labour cost		
Supplies - Fuel Oil 0.75 per gallon		
Lubricants 30% fuel cost		
Drill bits (3½") $300.bit		
Explosive factor @ 0.8 lbs/ton		
Explosive cost @ $0.35/lb		
Allowance made for tires, rooter teeth, etc.	317,000	1.58
Provision for Management cost	120,000	0.60
Depreciation mine equipment	76,000	0.38
TOTAL ANNUAL COST:	$ 762,000	$ 3.80

TRANSPORTATION,

STORAGE & HANDLING

V - TRANSPORTATION, STORAGE & HANDLING

It is recommended that mica ore will be trucked from the
Parent deposit directly to a Canadian National railway track
loadout facility and shipped by rail to an ocean port in
the Montreal area. Initially, the ore can be unloaded from
rail cars at the Iron Ore Company of Canada dock at Contre-
coeur, Québec, stockpiled, reclaimed and loaded on ocean
vessels by a stevedoring company. The most effective point to
load on ocean vessels would be Quebec City, but at this time
there is not any well-established traffic pattern between
this point and Japan.

Typical transportation rates are shown in Table 6 and a typical
quotation from the A.W.W. Kyle Company Limited of Montreal
(Exhibit C - Appendix).

The rail transportation rate of $32.19 per tonne is based on
only preliminary discussions with the railroad company and it
is believed that a substantially lower commodity rate can be
obtained before shipments are started and that an even lower
unit train rail shipping rate of approximately $15.00 per
tonne would be available when full production, at the rate of
200,000 tonnes of ore per year, is achieved.

On the basis of initial discussions with the railroad and the
minimum mining and handling rate of 25,000 tonnes of mica ore

TABLE 6

PARENT MICA DEPOSIT

ESTIMATED INITIAL TRANSPORTATION COST
(25,000 tonnes/year)

	$/tonne ore	$/tonne contained mica
Rail Transport Parent deposit to Contrecoeur, Québec	$ 32.19	$ 45.99
Discharge from hopper cars - load to vessel	1.90	2.71
Dead storage on dock	0.35	0.50
Ocean freight to Tokyo, Japan 86 lbs/cu.ft.	33.00	47.14
	$ 67.44	$ 96.34

per year, the estimated cost of transportation from the mine to Japan is $67.44 per tonne of ore, or $96.34 per tonne of contained mica.

Assuming that the ore must be concentrated before final usage, there is an indicated saving of $0.82 per tonne of mica possible by beneficiating in Canada, close to the point of ocean ship loading. Ocean shipping rates seem to be less susceptible to differences in bulk density than rail rates. There is no indicated saving in transportation cost by beneficiating close to the mine, since rail rates increase almost proportionately to any reduction in the bulk density. It is also a recognized fact that railroad rates increase with the value of the product, so that any net saving in the amount of waste shipped on the railroad is seldom recoverable, since it results in increased railroad rates.

On the basis of anticipated unit train rates of $15.00 per metric tonne and a possible saving from beneficiating prior to ocean shipment, the final estimated total cost of transporting 200,000 tonnes per year to Tokyo, Japan is $70.95 per tonne of mica (See Table 7).

It is not possible to fully evaluate the effect of beneficiation on the cost of transportation, storage and handling without more specific knowledte of market and end product. Beneficiation of suzorite is based on air separation techniques which take advantage of the effective difference in bulk density between the gangue and the exfoliated mica after crushing or mechanical stressing. In pilot plant test work on the beneficiation of suzorite ores a high grade mica concentrate is by definition one with a bulk density of less than 17 pounds per cubic foot.

TABLE 7

PARENT MICA DEPOSIT

ESTIMATED REDUCED TRANSPORTATION RATE
(200,000 tonnes/year)

	$/tonne ore	$/tonne contained mica
Parent mica deposit to Contrecoeur		
Estimated unit train rate (Parent to beneficiating plant)	$ 15.00	$ 21.42
Discharge from hopper cars and load to vessel	1.90	2.71
Dead storage on dock	0.35	0.50
Ocean freight to Tokyo, Japan (17# cu.ft.)	-	46.32
		$ 70.95

This bulk density of the product is not permanent, mica plates realign in a flat position as the result of ram pressing. In water slurries, the effective bulk density approaches the specific density of the mineral and mica can be transported and handled with the same ease as any other ore slurry. By chemical treatment there can be end products from mica which might justify other beneficiation techniques, and products of higher bulk density. The choice of beneficiation technique and location of the beneficiation plant may well depend on the required end product rather than possible reduction in transportation cost.

For reference, a typical beneficiation process flow sheet for suzorite is presented in Figure 2. It is based on the concept of impact crushing, screen and air classification to specific particle size and the separation of gangue on Kipp-Kelly air separator units to produce a concentrate of less than 17 pounds per cubic foot density and about ninety-five percent mica. The material flow rates and recoveries shown here are based on limited pilot plant test work carried out at the Department of Natural Resources, Province of Québec, on a 23-ton sample of Parent mica ore in 1972. A more extensive program would be necessary to develop the engineering design criteria necessary to build a commercial sized plant. This typical flow sheet is presented here to show the nature and order of magnitude capital cost of a primary beneficiation facility for suzorite type ores.

The approximate capital cost of a beneficiation plant and associated storage facilities would be $900,000. The direct operating unit cost would be approximately $2.75 per ton of ore.

TABLE 8

PARENT MICA DEPOSIT

ESTIMATED COST OF MINING AND TRANSPORT TO JAPAN
AT INITIAL MINING RATE
(25,000 tonnes of ore per year)

	Annual Cost	$ tonne mica ore	$ tonne contained mica
Mining	$ 285,000	$ 11.40	$ 16.28
Rail transportation	804,750	32.19	45.99
Unload R.R. hopper cars - and transfer to vessel	47,500	1.90	2.71
Transportation - Ocean vessel charter	825,000	33.00	47.14
TOTAL COST FOB TOKYO, JAPAN:	$ 1,962,200	$ 78.49	$ 112.12

TABLE 9

PARENT MICA DEPOSIT

ESTIMATED COST MINING, BENEFICIATION, TRANSPORTATION TO JAPAN
AT PLANNED MINING RATE
(200,000 TONNES PER YEAR)

	Annual Cost	$ tonne mica ore	$ tonne contained mica
Mining	$ 762,000	3.80	5.43
Rail Transportation	3,000,000	15.00	21.43
Unload R.R. hopper cars and transfer to vessel	380,000	1.90	2.71
Beneficiation and storage	550,000	2.75	3.87
Ocean transportation - charter vessel	8,800,000	44.00	62.86
TOTAL ESTIMATED COST - FOB TOKYO, JAPAN	$ 13,492,000	$ 94.95	$ 96.30

Includes 18-year straight line depreciation on cost of plant and equipment.

APPENDIX

Report on X-ray diffraction, X-ray fluorescence and optical study
of Parent mica Sample LGL File # 610

Mica schist LGL File # 610 was analysed by X-ray

diffraction. A microscopic study of a thin section and on separate

thin sheets of the mica confirmed its mineralogy. Rapid X-ray

fluorescence analysis of fused specimen revealed the chemical

composition, corresponding to its mineralogy.

The schist contains approximately 60 - 65% of biotite,

15 - 20% of fine grained antigorite, 10 - 15% of clinopyroxene and

not more than 3% of accessories, mainly apatite and traces of

magnetite.

Biotite

I am aware of the fact, that mica in this schist was

previously described as phlogopite. On the weathered surface the

colour really resembles the one of a typical phlogopite, but on

fresh cut surfaces it is a pronounced black. Except for this fact, it

is much darker in thin section than phlogopite, has higher pleochroism,

shows higher interference colours; birefringence is 0.060, while

phlogopite does not show a higher one than 0.040. It is magnetic,

which is a proof of presence of an appreciable amount of Fe (the

magnetic flakes were microscopically checked for the absence of

inclusions of magnetite, which could otherwise induct a similar effect.)

The chemical whole rock analysis revealed an appreciable amount of

titanium, an element very unlikely to be present in other of remaining

minerals and a very typical one for biotite. X-ray diffraction

analysis shows an ideal pattern for biotite, with $\underline{d}$ spacing for
the three most intensive reflections 10.1, 3.37 and 2.66.
Accidently a rare double spaced "phlogopite 2M" was described with
$\underline{d}$ spacing 10.1, 3.36 and 2.62. However all of those three
intensities for phlogopite 2M should be of the same value, while for
biotite (and the mica in our specimen) the third intensity is weaker,
which is not a convincing enough argument. Thus the usually most
discriminating procedure of conventional X-ray diffraction in this
unfortunate case is not the most valid. Only detailed Quinier camera
X-ray diffraction powder pattern can bring an undubitable answer.
Also chemical electron microprobe analysis can bring the proof, that
iron and titanium revealed in whole rock analysis, are present in mica.
However, very probably this question is not that of principal
importance.

Antigorite.

The large green pseudomorphic individuals are filled with
an olivine alteration product, mainly fine grained platelets of anti-
gorite, which is partially further altered to talc flakes and plate-
lets are very characteristic for antigorite and therefore some
authors, considering this characteristic structural form only, exclude
antigorite from the serpentine group and include it in a group of
chlorites or minerals of kaolinite group. Fibrous serpentine is not
present. Small amounts of talc present here is striking by high
interference colors in parts of this green individuals in a thin

section.

Pyroxene in this mica schist is a clinopyroxene of diopside-
hedenberite series, close to pure diopside.

Chemical X-ray fluorescence analysis revealed
practically identical chemical composition as you had available
previously with an exception of lower calcium content. This
difference can be explained in such a coarse grained rock, when only
a small specimen is available for analysis. This small piece usually
contains grained mineral and therefore is not fully representative
for the whole rock analysis.
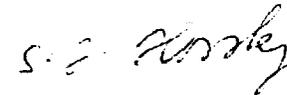
S. J. Horsky, MsC
Geochemist

REPORT

OF THE

PARENT MICA (SUZORITE) PROSPECT

LAMY TOWNSHIP, CHAMPLAIN COUNTY, QUEBEC

FOR

LALONDE, GIROUARD, LETENDRE & ASSOCIATES LIMITED

Toronto, Ontario   G. A. Tremblay, P.Eng.
April 07, 1975

MPH Consulting Limited

Suite 1510,   100 Adelaide Street West,   Toronto, Ontario,   M5H 1S3.

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S U M M A R Y

The Parent mica (suzorite) prospect held by P. N. Charlebois consists
of thirty-eight contiguous unpatented mining claims covering an area
of 1,520 acres in Lamy Township, Champlain County, Quebec.

The property is underlain by granite gneiss, paragneiss and suzorite.
All these rocks are Precambrian in age and have been intruded by
granitic to pegmatitic masses. The suzorite zone averages between
65% and 85% mica with high grade sections containing from 85% to 90%
mica.

In 1971 a very limited diamond drilling programme consisting of 1,289
lineal feet in seven holes was carried out over a small area of the
southwest extension of the mica zone.

An exploration programme to be carried out in three phases is recommended.
In the first phase line cutting and geological mapping over the mica
zone and its vicinity should be done at an estimated cost of $5,500.00,
followed by diamond drilling, level survey, metallurgical testing and a
preliminary feasibility study in the second phase at an estimated cost
of $46,200.00. If encouraging results are obtained from Phase I and II,
the third phase consisting of detailed diamond drilling should be under-
taken, followed by bulk sampling and more metallurgical testing before
embarking on a full scale feasibility study. The cost of the third
phase cannot be estimated before completion of Phases I and II.

I N T R O D U C T I O N

The writer was commissioned by Ivan MacPherson, Eng. of Lalonde,
Girouard, Letendre & Associates of Montreal to examine geological
data obtained from a very limited diamond drilling programme
carried out in 1971 over the southwest extension of the Parent mica
zone and analytical data from petrographic study, x-ray diffraction,
optical microscopy, x-ray fluorescence, atomic absorption and
colorimetry.

The writer has never visited the Parent mica prospect.

The general information set out in the following report as well as
the data under study was entirely obtained from the Comprehensive
Report on the Parent mica deposit, Lamy Township, Champlain County,
Quebec by R. A. Marleau, D.Sc., February 15, 1971 and revised
September 5, 1972.

THE PROPERTY

The mica prospect is presently held by F. N. Charlebois and lies in
the Township of Lamy, Champlain County, Quebec.

The property consists of a group of thirty-eight (38) contiguous
unpatented mining claims covering an area of fifteen hundred and twenty
(1520) acres and registered in the name of F. N. Charlebois at the
Quebec Department of Natural Resources under the following prospector's
licences:

Prospector's Licence	Claims
310398	1,2,3,4,5
313172	1,2,3,4,5
313173	3
313176	2,3,4,5
313177	1, 4,5
313238	1,2,3,4,5
313239	1,2,3,4,5
313240	1,2,3,4,5
313241	1,2,3,4,5

The property is located approximately one mile north of the village of
Parent, which can readily be reached, all year round, by the Canadian
National Railways and by car via Mont Laurier, Quebec. A bush winter
trail links the railroad with the south-central part of the property.

H I S T O R Y

The Parent mica prospect was first found by prospector Eddy Talbot in 1964. It was later owned by Laviolette Mining for a few years. The Laviolette's claims lapsed in November, 1970. In late December 1970 F. N. Charlebois acquired the mica prospect by the staking of thirty-eight mining claims which are still in good standing.

In January and February 1971 a small area of the southwest extension of the mica zone was subjected to a very limited diamond drilling programme. The programme consisted of 1,289 lineal feet of AQ wireline drilling in seven holes.

GEOLOGY

The property is mainly underlain by granite gneiss, paragneiss and suzorite. All these rocks are Precambrian in age. Granitic to pegmatitic masses are abundant and are seen to intrude the granite gneiss, the paragneiss and the suzorite rock. The underlying rock units have a more or less northeasterly trend and dip to the south-east at angles ranging from 35 to 40 degrees.

The suzorite identified as a basic intrusive rock forms a sill-like mass concordant with the dip of the surrounding gneisses. The sill-like mass has a strike length of several thousand feet and an average thickness of 75 feet. Diamond drilling indicates that the suzorite zone has a minimum depth extension of several hundred feet.

The Parent suzorite zone averages between 65% and 85% mica with high grade sections containing 85% to 90% mica.

The very limited exploration diamond drilling programme carried out in 1971 covers only a small area of the southwest extension of the Parent mica zone. To explore systematically the several thousand feet of strike length of the Parent mica zone, it is recommended that line-cutting and geological mapping be done over the mica zone and its vicinity (Phase I), followed by diamond drilling, level survey of drill sections, metallurgical testing and a preliminary feasibility study (Phase II). If the results are encouraging after completion of Phases I and II, a detailed diamond drilling programme should be undertaken, followed by bulk sampling and more metallurgical testing (PhaseIII).

PHASE I

A control grid consisting of one baseline and thirty-eight crosslines must be cut and chained. The baseline should have a northeast direction and approximately 7,500 feet in length. The crosslines should be perpendicular to the baseline and have lengths ranging from 900 to 1300 feet. It is estimated that a cumulative total of 9.5 linemiles has to be cut and chained. The location of the control grid is shown on a drawing (see pocket).

Using the 200-foot gridelines for mapping control, outcrops and contacts encountered along the lines, and on traverses carried out between these lines, should be recorded on a base map.

During the execution of the geological mapping representative surface samples of the mica zone should be taken and sent out for weight recovery tests.
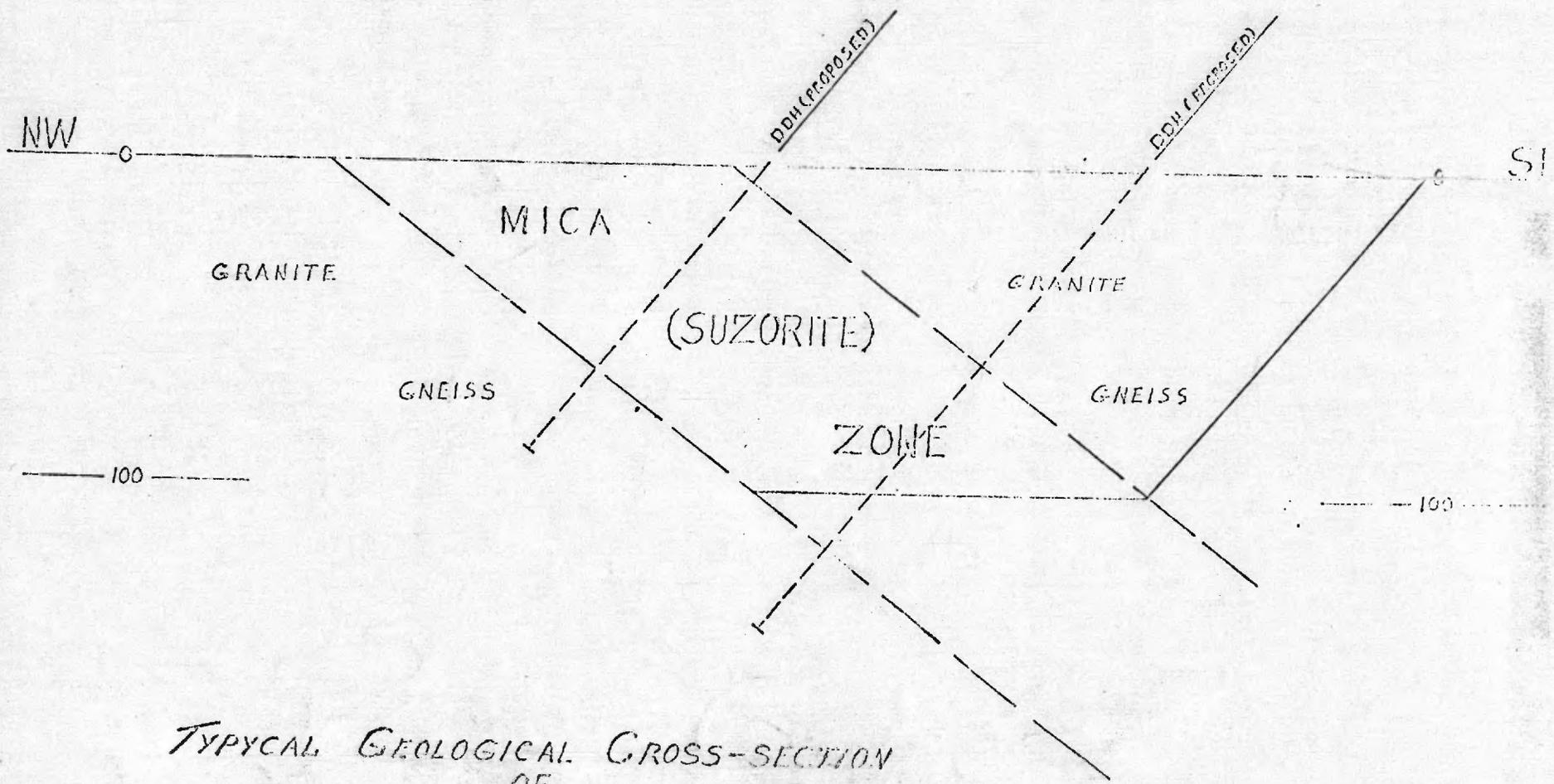
The total cost of Phase I is estimated at $5,500.00.

PHASE II

To explore in a preliminary manner several thousands feet of strike length of the suzorite zone to a vertical depth of approximately 100 feet, which is suitable for shallow open cut mining, it is recommended that eleven (11) holes totalling approximately 1,700 lineal feet of AQ drilling be completed along seven (7) sections spaced at 800-foot intervals. Four drill sections should contain two holes and three drill sections one hole. All the proposed holes should be drilled to the northwest at an angle of 50° below the horizontal. A typical geological cross-section with two proposed diamond drill holes is shown on the next page. The general distribution of the recommended diamond drill holes is shown on a drawing (see pocket).

During the execution of the drilling programme a level survey should be carried out over each of the drill sections to determine the relative topography. This information should be utilized to complete the surface profiles on the drill sections.

Metallurgical testing should be done on drill core, followed by a pre-liminary feasibility study.

NW   0

SE

MICA

GRANITE

(SUZORITE)

GNEISS

GRANITE

GNEISS

ZONE

DDH (PROPOSED)

DDH (PROPOSED)

100

100

TYPICAL GEOLOGICAL CROSS-SECTION
OF
THE MICA (SUZORITE) PROSPECT
WITH
PROPOSED DIAMOND DRILL HOLES

Scale: 1"=50'

Date: April 1975

By: C. R. Trembley

The cost of the diamond drilling programme, the level survey, the metallurgical testing and the preliminary feasibility study is estimated at $46,200.00.

PHASE III

If encouraging results are obtained from Phase I and II, a diamond drilling programme should be designed to detail more fully the picture of selected strike lengths of the mica zone by drilling along intermediate sections spaced at 400-foot and/or 200-foot intervals, followed by bulk sampling and more metallurgical testing before embarking on a full scale feasibility study.

The cost of Phase III cannot be estimated before completion of Phases I and II.

PHASE I

Linecutting	$ 1,400.00	
Linecutting Supervision	400.00	
Geological Mapping	1,900.00	
Report Preparation and Drafting	700.00	
Travel, Accommodations and Communications	600.00	
	$ 5,000.00	
Contingency 10%	500.00	$ 5,500.00

PHASE II

Diamond Drilling (AQ core) - 1,700 feet at $15.00/foot	$ 25,500.00	
Level Survey	500.00	
General Supervision and Consulting	1,500.00	
Drill Supervision	6,000.00	
Report Preparation and Drafting	2,500.00	
Travel, Accommodations and Communications	2,000.00	
Metallurgical Testing	4,000.00	
	$ 42,000.00	
Contingency 10%	4,200.00	$ 46,200.00
TOTAL OF PHASES I AND II		$ 51,700.00

PHASE III

NOTE: Cost estimate of Phase III can only be determined after completion of Phases I and II.

Respectfully submitted,

G. A. Tremblay, P. Eng.

EXHIBIT C
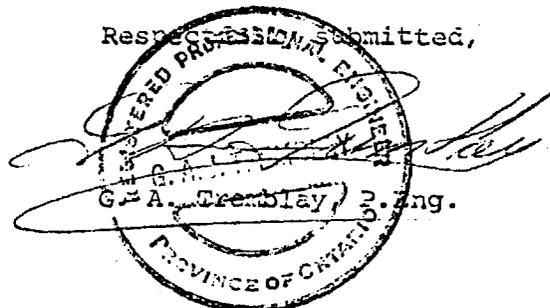
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Montreal, Quebec
April 3, 1975

Messrs. Lalonde, Girouard & Letendre
159 Jean Talon West
Montreal, Quebec.

Gentlemen:

As per your inquiry into costs involved in shipping mica ore from Parent, Quebec, to Japan in containers, this would be uneconomical and we would suggest that you ship this material in bulk per chartered vessel. The following rates are applicable:

RAIL

Parent, Quebec to Quebec City			– $1.27/100 lbs.
"	"	" Montreal	– $1.39/100 lbs.
"	"	" Valleyfield	– $1.46/100 lbs.
"	"	" Contrecoeur	– $1.46/100 lbs.

Car switching in Quebec City			– $9.00
"	"	" Montreal	– $12.00
"	"	" Valleyfield & Contrecoeur	– Not applicable as this (is not N.H.B. property.

The above rates do not include unloading and are subject to a minimum of 50,000 lbs. per car. (Release value not exceeding $0.05 per lb.)

SHIP

If mica ore is shipped as 86 lbs. per cubic foot a vessel today would cost approximately $30.00/ton.

If measuring 17 lbs. per cubic foot for 12,500 tons a 30,000 ton vessel would be required, thus bringing the rate to between $40.00/ton and $45.00/ton.

......2

Messrs. Lalonde, Girouard & Letendre


HANDLING CHARGES AT PORT OF CONTRECOEUR

Discharging of Hopper Cars
and Loading of Vessel   — $1.90/Long Ton (2240 lbs
Dead Storage   — $0.22/ "   "
Transport from Stockpile to Vessel— $0.35/ "   "
Line Handling   —$125.00/per Vessel
Canvas or Tarpaulin covering   — To be advised

We enclose our invoice for services and look forward
to the opportunity of being of assistance to you.

                              Yours very truly,

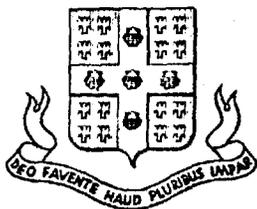   THE A.W.W. KYLE COMPANY LIMITED
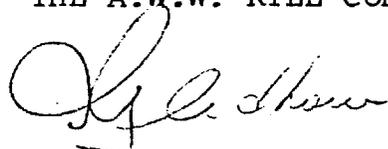
DG:kbf   Walter Honeywill
encl.   Traffic Manager.

P.S. Presently there is no commodity rate covering
     mica ore. The above are class rates. To
     obtain a lower rate (commodity rate) a formal
     request must be made to the railway.

                              W.H.

UNIVERSITÉ LAVAL

FACULTÉ DES SCIENCES

CITÉ UNIVERSITAIRE

QUÉBEC 10e. CANADA

DÉPARTEMENT DE GÉOLOGIE

Quebec, August 27, 1971.

Mr. Francis Charlebois,
Grand-Mère,
Comté de Shawinigan.

Subject:　Identification of minerals
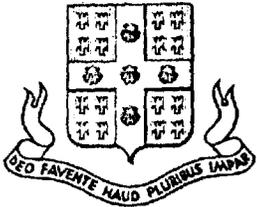in concentrated phlogopite
samples.

Dear Mr. F. Charlebois:

　　　　　The X-ray spectra of the concentrated phlogopite
samples 661-Lamy 3A, 3B, 3D, 1 and 3 were recorded with a Philips
X-ray diffractometer operating at maximum amplification (100 c.p.s.)
and power (48 Kv, 20 ma) on random powders and well oriented films.
The only impurity is made up of platy antigorite crystals. The
total amount of this lamellar mineral is less than 2%. The X-ray
spectra of oriented films and the scanning electron micrographs
(Nos. 13383, 13382, 13380, 13378, 13376) indicate the platy morpho-
logy of the crystals and the absence of fibrous minerals.

Sincerely yours,

Robert L. Ledoux, Ph.D.,
Mineralogist.

RLL/am

UNIVERSITÉ LAVAL

FACULTÉ DES SCIENCES

CITÉ UNIVERSITAIRE

QUÉBEC 10₀, CANADA

DÉPARTEMENT DE GÉOLOGIE

August 23, 1971.

Mr. Francis Charlebois,
Grand-Mère,
Comté de Shawinigan,

Subjet: Identification of
         Minerals in sample
         661 - Lamy-Head.

Dear Mr. Charlebois:

The X-ray spectrum of the rock sample 661-Lamy-Head crushed with a shatterbox and recorded with a Philips X-ray diffractometer operating at maximum amplification (100 c.p.s.) and power (48 Kv, 20 Ma) indicates that the most abundant mineral is phlogopite. The gang minerals are pyroxene (± 10%) and feldspar (± 5%) and occur in subordinated quantity to the phlogopite. The pyroxene and feldspar grains can be easily separed from the mica in order to concentrate the phlogopite. There is no evidence of fibrous minerals in this rock.

Robert L. Ledoux, Ph.D.,
Mineralogist,
Department of Geology,
Université Laval,
Québec 10.

RLL/am

PROVINCE DE QUÉBEC

MINISTÈRE
DES RICHESSES NATURELLES
LABORATOIRES

ANNEXE E.—HÔTEL DU GOUVERNEMENT

QUÉBEC

PROVINCE OF QUEBEC

DEPARTMENT
OF NATURAL RESOURCES
LABORATORIES

ANNEX E.—PARLIAMENT BUILDINGS

CERTIFICAT
CERTIFICATE No. 701-10366.   G.   Québec, le 3 mars 1971.

1 Echantillon soumis par __M Jacques Turgeon,__
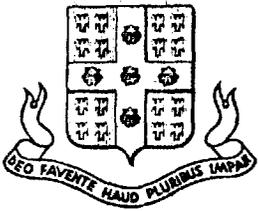*Sample submitted by*   Recherche & Developpement .

Projet- 652.

BT + 65. 701-10366.

SiO_2	39.45%
Al_2O_3	11.85%
Fe_2O_3	2.50%
FeO	6.72%
MgO	20.60%
CaO	0.32%
Na_2O	0.36%
K_2O	9.95%
H_2O-	.13%
H_2O+	3.72%
TiO_2	2.67%
MnO	0.06%
BaO	0.20%
F	0.71%
Cu	.005%
Ni	.03%
Cr	0.13%
V	.07%

Le Directeur: Joseph Gagnon

TABLE – LMR – Lamy Mica Rock

SiO_2	44.54%
Al_2O_3	7.98%
MgO	20.18%
FeO	5.33%
Fe_2O_3	1.83%
Cr_2O_3	0.43%
TiO_2	1.49%
MnO	0.094%
BaO	0.30%
K_2O	5.21%
Na_2O	0.34%
CaO	7.04%
P_2O_5	1.12%
H_2O^+	2.96%
H_2O^-	0.45%
F^-	0.42%
LiO_2	12 ppm

TOTAL	99.71%

Robert L. Ledoux

DR ROBERT L. LEDOUX
DÉPT. DE GÉOLOGIE.
UNIVERSITÉ LAVAL
QUÉBEC 10, QUÉ. CANADA.
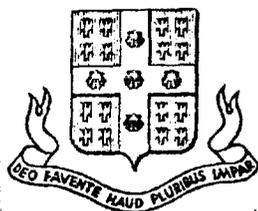
TABLE - LMC - Lamy mica concentrate

SiO_2	39.61%
Al_2O_3	12.65%
MgO	23.14% *Mg 12.6*
FeO	5.42% *4.5 Fe*
Cr_2O_3	0.65%
TiO_2	1.96%
MnO	0.26%
BaO	0.33%
K_2O	8.29%
Na_2O	0.25%
CaO	0.15%
P_2O_5	0.015%
H_2O^+	4.12%
H_2O^-	0.75%
F^-	0.59% *0.79*
LiO_2	19 ppm
TOTAL	100.4%

Robert L. Ledoux

Dr ROBERT L. LEDOUX
DÉPT. DE GÉOLOGIE.
UNIVERSITÉ LAVAL
QUÉBEC 10. QUÉ. CANADA.