PROGRESS REPORT ON THE MOOSE RIVER BASIN KAOLIN - SILICA SAND PROJECT SEPTEMBER 1, 1959 - SEPTEMBER 1, 1960

INTRODUCTION

The following report was prepared for submission to the Ontario Department of Mines in partial fulfillment of the agreement between the company (Ventures Limited - American Nepheline Limited) and the Department for the granting of a concession for exclusive exploration of an area in the Moose River Basin, northern Ontario, for clays and silica sand. The work and results obtained during the first year up to September 1, 1960, are described herein. Accompanying this report, as required in the Concession Agreement, are the logs and sections for holes drilled, and a two mile equals one inch map showing their location. A financial accounting of expenditures incurred on the project is also included.

CONCESSION AGREEMENT

The company is granted permission to carry out exploration activities in the search for kaolin, fireclays, and silica sand, in the following eleven townships: Burstall, McBrien, Garden, Wright, Acres, Kipling, Amery, Hambly, McCausland, Habel, and Mahoney. The concession is to be held for a period of three years starting with September 1, 1959. In return for the concession the company agrees to pay an annual rent of $1100., payable in advance, the first payment being due on September 1, 1959. In addition to which, the company agrees to spend $125,000. over the period of three years, and to submit reports, logs, etc. and to provide an account of expenditures covering the previous twelve months within thirty days of each anniversary date of the signing of the agreement.

LOCATION OF CONCESSION

The eleven townships forming the concession are located in the James Bay lowlands, between the Missinaibi and Mattagami Rivers, about thirty-five miles above their confluence with the Moose River which flows into James Bay. The southern boundary of the concession lies close to the Precambrian escarpment which delimits the lowlands on the south and runs about due east-west in this region.

Access to the Concession may be had by the Spruce Falls Power and Paper Company's private railroad running between Kapuskasing and Smoky Falls. The latter is a hydro power development on the Mattagami River, about three miles above the south boundary of Kipling township on the south-east corner of the concession. The only practicable method of transportation, however, is by air from Remi Lake near Kapuskasing, to convenient landing locations along the rivers traversing the concession.

The lowlands area in which the concession occurs is a flat plain, sloping gently northward to James Bay from the Precambrian escarpment. The two major rivers, Missinaibi and Mattagami, with their tributary streams, have cut into this flat surface to depths of over a hundred feet in many places. The only high ground is found adjacent to the river banks and it is here that the timber growth — spruce, pine, and poplar, is abundant and fairly heavy. A half mile or so from all stream banks the ground gives way to muskeg, with a sparse to moderate growth of spruce and tamarac. A few small lakes occur in the area, which provide some access by use of aircraft for landing, otherwise, transportation around the concession is difficult except along the main rivers.

PRELIMINARY INVESTIGATIONS

Three preliminary trips were made to the area by management and staff of the company to obtain information of value in determining the best course to follow in the exploration work. One of these trips was a two week journey down the Missinaibi in September of 1959 to examine and take samples of Cretaceous outcrops along the river, to become generally familiar with the country, and to investigate the feasibility of moving heavy equipment along the river.

The conclusions reached on the basis of these preliminary investigations were that drilling, with possibly some geophysical work, were the only approaches that could be efficiently used. Winter operations would be necessary in order to move heavy equipment around the concession area with some freedom. It was noted that the muskeg and general conditions along the rivers which prevail during most of the summer would prohibit the use of anything but the lightest of equipment.

A drilling program was subsequently planned which envisaged the systematic drilling of the whole concession on a grid

system. The distance between holes was tentatively planned at four miles, although it was planned to drill the first few holes at closer intervals to obtain a more detailed picture of the geology. This was subsequently done and the first seven holes were spaced at half mile intervals in lines two miles apart as shown in the accompanying map. It was also decided to drill the holes to depths of 100', as this was considered a maximum for economic operations of any kaolinitic deposits that might be found. However, here again we decided to drill the first holes to greater depths in order to obtain more detailed information on the subsurface geology.

The Joy Manufacturing Company was employed to do the drilling. It was planned to use only the one drill at first and possibly later a second drill would be brought in. It soon became evident that the problem of drilling the glacial till and Cretaceous deposits in the area was going to be considerably more troublesome than had at first been expected, and it was, therefore, decided that only the one drill would be used on the job.

After drilling was suspended in the spring owing to thawing conditions the program was reappraised in the light of the winter's experience. Two factors were evident: that this type of drilling was very expensive, and, continued drilling to depths of more than about fifty feet was not required for the purposes of the program. It was, therefore, decided to investigate the use of a light portable auger drill, which could be used in areas of the concession accessible by canoe, aircraft, or short portages. Furthermore, by drilling from creek and river beds, or close to them, advantage could be taken of the natural erosion of the streams, which might vary up to one hundred feet. A survey of the whole concession was made in July, using a Supercub aircraft to test the feasibility of such a program, and, at the same time, fifteen holes were spotted in the western part of the concession. A small auger drill was obtained, and after preliminary successful trials, a summer auger drilling program was initiated early in August, which is still under way at the writing of this report.

DRILLING PROGRAMS

Winter Drilling

The winter drilling was carried out using a type 22 diamond drill with a hydraulic head — one of the heaviest available. The large drill was brought in mainly for the purpose of pulling casing. The first holes drilled were started with 6" pipe as a

collar, using a 5½" tricone bit. As the hole descended, smaller diameter casing and bits were used down to 2 15/16". The last few holes drilled were started with NX casing, as they were to be limited to shallower depths. Heavy mud was used in all cases during this part of the program, although casing was used at the same time in most cases in an attempt to prevent caving of the holes. The intention was to remove samples at 10' intervals, however, the obtaining of proper samples proved to be very difficult, and so sampling at greater intervals was usually the case. Soil sampling techniques were used with both Shelby and split tubes.

In spite of the fact we were in muskeg in all holes, water for drilling proved to be a problem in a few cases, and it was found necessary to haul water up to a mile in distance. During the course of the winter program the drilling crew occupied three camps which were spaced at about nine mile intervals. First camp was on the Mattagami, and the second two were in the interior of the concession. Servicing of camps and drilling was done by aircraft, although the initial and final moves of heavy equipment were by way of the Spruce Falls Power and Paper Company railroad.

Problems in drilling proved to be mainly penetration of the glacial till, which was extremely hard, and of course made more difficult by the contained cobbles and boulders, and also the continuous caving of the poorly consolidated Cretaceous silica sands. The latter were under hydraulic pressure and rose 25' or more up the hole on the withdrawal of the bit, in spite of the use of the barite loaded mud. The same two probelms resulted in difficulties in obtaining samples. The till in most cases was very difficult to penetrate, using either the Shelby or split tubes. Caving of the hole, of course, made impossible the obtaining of representative samples. Results were that the taking of samples consumed a much larger proportion of time than was anticipated, and often, were only represented by a few cuttings from the tricone bit.

Summer Drilling

The auger drill being used is a 7½ horsepower McCullock drive with a chain driven transmission, and chuck which turns the augers. The whole assembly weighs only seventy pounds. The augers are four feet long by three inch in diameter. They are connected one to another as the hole descends to give a continuous flight of augers throughout the hole. A tripod is used with the drill to

enable the pulling of the augers from the hole by means of a block and pulley system. In this way holes have been drilled to depths of up to 56'.

Samples are normally taken every eight feet when the augers are pulled from the hole. They are obtained from the bottom 12" of the auger where the clay or other material being penetrated is removed from the flights, and although disturbed, are considered representative of the material at the depths from which they are taken. The method is not applicable to a coarse till where boulders interfere, although fine till can be penetrated with little difficulty.

The program is being carried out by a party of five which camps on the main rivers, moving down them by canoe as the work proceeds. A Supercub aircraft moves men and equipment quickly in and out of the small lakes where a number of holes have been spotted, and also services the camp.

RESULTS

The winter's drilling program was started late in November, 1959, and was discontinued early in April, 1960. During the interval thirteen holes were drilled in Kipling, Acres, and McCausland townships to depths of between 72.0 and 221.5 feet. The last nine holes were terminated at 100 feet. The results of drilling are given in detail in the bore hole logs of the MR series which accompany this report.

Holes numbered 1, 3, and 4 intersected Cretaceous horizons at 208.0, 100.0, and 65.0 feet respectively below surface. All other holes were stopped in glacial material. Except for a few thin bands of fireclay the Cretaceous material intersected consisted of a mixture of silica sand and kaolinite. The kaolinite content was found to run about five percent or less throughout most of the intersections, although in hole MR4 some samples contained up to about 20 percent kaolinite.

The summer's drilling was started August the 8th and is still underway. Up until September nine holes were completed in Burstall and McBrien townships on the west side of the concession. The drilling results obtained are contained in the accompanying logs of the MRA series. Three of these, numbered 2, 6A, and 8 were collared in Cretaceous fireclays. Number 2 penetrated 40 feet

of red fireclay before it was stopped because of the problem of recovering the drill rods in the very sticky clay. Number 6A was drilled to 44 feet through light bluish-grey fireclay and cherty layers before stopping on what was believed to be bed rock. Number 8 broke into kaolinitic sand two feet below the collar and was stopped at 56 feet in the same material. The kaolin content was judged to be less than five percent. All other holes were drilled to various depths up to 52 feet in glacial till, or stoneless clays.

Geology

There were five principal stratigraphic horizons intersected in the drilling completed up to September 1st. These are illustrated in the accompanying sections of each hole.

1. Muskeg - Roots, soil, and other plant life. In depth it normally varied between 5 and 10 feet from surface.

2. Silts, sand and gravel, and marine clay - This underlay the muskeg in some holes and is all post glacial in age. The marine clay is sometimes difficult to differentiate from the glacial lake clays, but the presence of white shells is always an indication. It is also considered to be structureless compared to the varved glacial lake clays.

3. Glacial till - The till may occur directly below the muskeg or below either silts, sand, etc., or glacial lake clay. Great variations occurred in its appearance. It was found to be all highly calcareous, and with predominantly carbonate pebbles and boulders. The till was intersected at different horizons in the same hole, separated by stoneless clay, sand, and gravel. It was encountered at a maximum depth of about 200 feet.

4. Glacial lake stoneless clay, silts and sands - These may occur either directly below the muskeg, or separating different horizons of glacial till. The clays exhibited the usual varves of light and dark coloured layers. A wide variety of constituents were found in it — bark, roots, plant stems, hair-like inclusions, and peaty, or carbonaceous material. The greater thicknesses were

encountered in the holes located toward the interior of the concession.

5. Kaolin, fireclay, and silica sand - These belong to the Mattagami series, Lower Cretaceous in age, described by Keele, Dyer, and Crozier. The kaolin occurs as a constituent of the silica sand beds which were intersected in drilling to thicknesses of up to 125 feet. The percent kaolin was found to be in the order of five percent or less, with a few exceptions where clayey layers contained up to 20 percent. The fireclay is a very dense, smooth, plastic material, exhibiting bright hues of red, blue, brown, through to off-shades of white. It was found to occur in some cases just below the till in a thin bed overlying the sand, and again below the sand where holes were stopped within two or three feet. In other locations, on the west side of the concession, holes started in fireclay penetrated up to 44 feet in the same material before being stopped. The fireclay was found to be associated with bands of chert in these latter holes.

   The silica sand is characteristically composed of clear quartz grains, sub-angular in shape, and medium to coarse grained (mainly between 48 and 10 mesh). In addition to the associated kaolin, minor feldspar, and dark coloured grains are present.

The concession occupies part of a broad Cretaceous basin-like structure to the north of the Precambrian escarpment. Previous field investigations have shown that the Cretaceous sand and clay deposits were derived from the Precambrian uplands to the south and were transported into their present position by streams. The Cretaceous surface was greatly modified by glacial action and the irregular glaciated level surface was levelled to its present form by the filling of depressions with material of recent age — silt, marine clays, etc.

The general picture has been unchanged by the recent drilling. It is suggested, however, that glaciation irregularly furrowed the originaly Cretaceous surface leaving valleys and hummocks in the upper surface of the existing Cretaceous horizon. This renders the prediction of its depth from surface extremely uncertain when

distances in the order of a half mile are being considered. The only generalization that can, therefore, be made at this time which is of use as a guide to drilling, is that Cretaceous deposits are more likely to be encountered at shallower depths near the periphery of the basin.

Laboratory Results

Samples from the drilling were evaluated in laboratories of American Nepheline Limited, Lakefield Research Limited, and the Mines Branch at Ottawa. The objects of this work were to determine a method of separating the kaolin from the sand, and the physical and chemical properties of the separated products.

The kaolin-sand separations were first investigated on a laboratory scale in order to develop a method for establishing the kaolin content of small bore hole samples. A technique involving sedimentation was evolved whereby the sample is dispersed in a solution of sodium carbonate and sodium metaphosphate and thoroughly agitated followed by setting periods of different lengths of time, depending on the size of separation required. The size of the settled constituents was calculated on the basis of Stoke's law and checked with a Bouyoucas hydrometer.

Clay determinations were made for composition, using chemical and differential thermal analyses, and, ceramic properties. Determinations on the sand were made for chemical composition and grading.

The results of this work are tabulated below:

Clay-Sand Separations and Clay Composition

Sample No.	% - 10 micron	Kaolinite * Content	Quartz * Content
MR1-4921	5.7		
22	4.4		
23	2.2		
24	3.1		
25	1.4		
MR3-4937	6.3		
38	24.6	70	15
48	12.8		
48A	12.7		
MR4-4955	11.7		
56	14.6	85	11

Clay-Sand Separations and Clay Composition (cont'd)

Sample No.	% - 10 Micron	Kaolinite * Content	Quartz * Content
MR4-4957	6.0		
58	5.8		
60	20.6	81	6
65	22.2	77	8
66	6.4		
Composite MR4	7.8	60	2

* By differential thermal analysis of the -10 micron fractions

Several samples were separated at five microns, and compositions of the fractions determined:

Clay-Sand Separations, and Compositions Separated at 5 Microns

	% - 5 Micron	Kaolinite Content %	Quartz Content %
MR4 Comp. Water Washed	7.1	75	2
MR4 Comp. Acid Washed	7.1	60	1
MR4-4965	17.2	67	1

Composite samples of the clay from No. MR4 were fired to determine some ceramic properties:

	PCE	Colour
MR4 comp. - 5 microns	33-34	tan
MR4 comp. - 10 microns	33	tan

Samples of - 5 micron clay were water and acid washed separately and then chemically analyzed:

	Water Washed	Acid Washed *
Fe_2O_3	1.64	1.43
Al_2O_3	36.07	35.54
CaO	0.36	0.17
LOI 500°C	13.68	12.93
LOI 900°C	14.81	13.82

* In 20% HCL for 30 minutes

Samples of kaolinitic sands were obtained from exposures along the Missinaibi River bank, which were graded and analyzed for iron:

Sieve Analysis

Sieve No.	Cumulative % Retained					
	#3 Sample	#4	#5	#7	#8	#9
10	0.1	14.4	0.1	1.2	1.0	4.2
20	1.3	63.0	4.1	16.3	17.1	29.6
35	10.6	85.1	28.6	51.1	79.9	72.6
48	39.2	89.0	56.5	73.9	88.4	81.7
65	66.4	90.6	79.9	86.1	91.2	84.5
100	87.3	93.9	90.7	91.6	95.9	87.7
% Fe_2O_3	0.091	0.066	0.196	0.088	0.33	0.22

The above samples when screened on 100 mesh with the undersize discarded were reduced to .05% Fe_2O_3 or less.

CONCLUDING REMARKS

This report contains a description in abbreviated form of all relevent work carried out by the Industrial Minerals Division of Ventures Limited - American Nepheline Limited between August 31, 1959 and September 1, 1960.

Exploration drilling is currently underway in the northern part of the concession in Habel township and will continue to the end of September, 1960.

Plans for future investigations are waiting on the evaluation of the summer's drilling program.

V. A. Haw, Manager
Industrial Minerals Division
Ventures Ltd.-American Nepheline Ltd.

VAH:ehy
September 15, 1960

83-1-18

BORE HOLE LOGS

WINTER DRILLING, 1959 - 60

MR SERIES

MOOSE RIVER KAOLIN

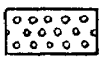
BORE HOLE SECTIONS

Scale 1 inch = 100 feet

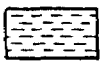
TIME SCALE

Muskeg	RECENT	QUATERNARY
Silt, sands, gravel and marine clay		
Glacial till	PLEISTOCENE	
Glacial lake - stoneless clays, silts, sands etc.		
Fireclay, silica sand and kaolinite	LOWER CRETACEOUS	MESOZOIC

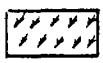
SYMBOLS



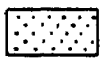
Till



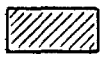
Stoneless clay



Carbonaceous clay



Sand



Fireclay

Contact observed

Contact approximate

LOCATION

Origin for horizontal co ordinates = South-West corner of each township

INDUSTRIAL MINERALS DIVISION
VENTURES LTD – AMERICAN NEPHELINE LTD.

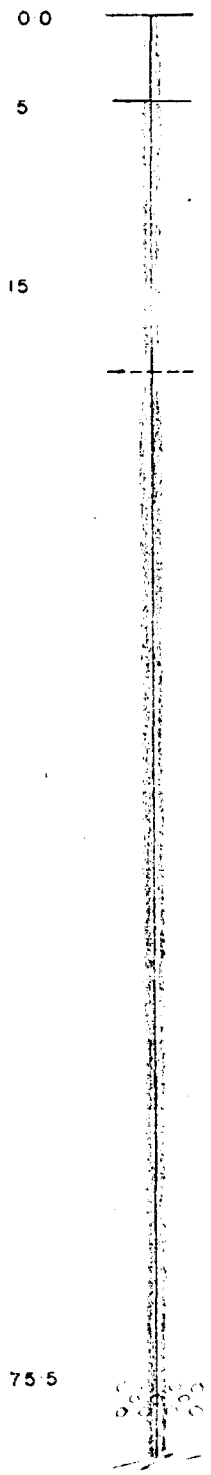
MOOSE RIVER KAOLIN

BORE HOLE MR 1

KIPLING TOWNSHIP

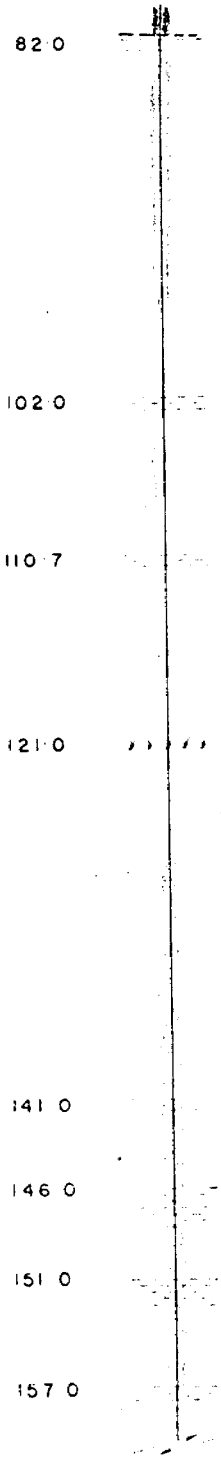
18,270' NORTH
11,590' EAST
ELEV.

1" = 10'



MR 1

1" = 10'



82·0 OCCASIONAL LARGE BOULDER

102·0 VARVED

110·7 VARVED

121·0 STRATIFIED, CARBONACEOUS AND PEATY

141·0 OCCASIONAL BOULDERS

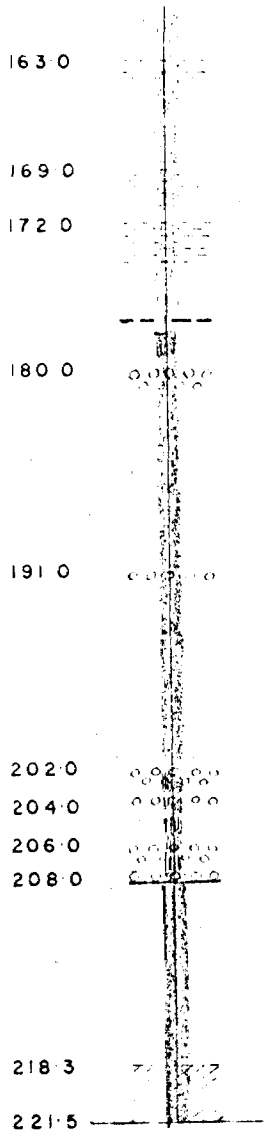
146·0

151·0

157·0

MR 1

1" = 10'



SLIGHTLY SILTY

SILTY TO SANDY

GRAVEL AND BOULDERS

COBBLES AND BOULDERS COMMON

90% QUARTZ, MEDIUM CONTENT OF GRAY CLAY

95% QUARTZ, MEDIUM GRAINED,
LOW CLAY CONTENT

CREAM-GRAY TO BUFF

END OF HOLE

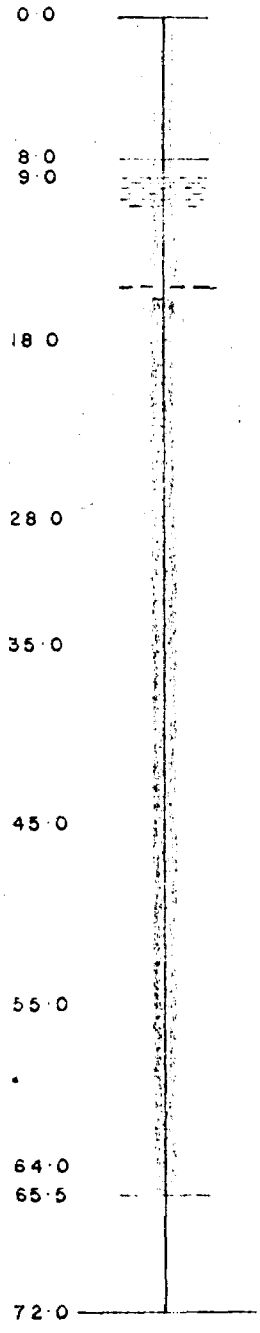
MOOSE RIVER KAOLIN

BORE HOLE MR 2

KIPLING TOWNSHIP

20,910' NORTH
10,270' EAST
ELEV.

1" = 10'



0·0	COLLAR
	MUSKEG
8·0	
9·0	
18·0	TILL, SOME BOULDERS AND SAND
28·0	TILL, COBBLES AND BOULDERS COMMON
35·0	TILL, ABUNDANT COARSE GRAVEL AND COBBLES
45·0	TILL, LARGE BOULDERS COMMON
55·0	TILL, BOULDERS ABUNDANT
64·0	SAND, GRAY GRANITIC
65·5	BOULDER
72·0	END OF HOLE

MOOSE RIVER KAOLIN

BORE HOLE MR 3

KIPLING TOWNSHIP

23,600 ' NORTH
10,270 ' EAST
ELEV.

1" = 10'

0·0	COLLAR
	MUSKEG
9·5 10·0	
	INCLUSIONS MOSTLY PEBBLES
25·0	THINLY LAMINATED, SILTY TO SANDY
35·0	LOW CLAY CONTENT
47·0	50 % QUARTZ
	MODERATE NUMBER OF BOULDERS
68·0	VARVED
77·0	BLACK CARBONACEOUS, WITH INCLUSIONS OF LIGHT-COLOURED CLAY AND HAIR-LIKE ROOTS

MR 3

1" = 10'

88·0 LAMINATED BLACK CARBONACEOUS, WITH INCLUSIONS OF ROOTS, COARSE SAND, AND GRAY CLAY.

98·0 80 % QUARTZ, LOW CLAY CONTENT

108·0 95 % QUARTZ

110·0 75% QUARTZ, VERY COARSE, (CAVED ?)

117·0 98% QUARTZ, MED. TO HIGH CLAY (WHITE)

120·0 99 % QUARTZ, MED. CLAY CONTENT

124·0 98 % QUARTZ, MED. GRAINED, LOW CLAY CONTENT

QUARTZ SAND (SAMPLES WASHED FROM MUD RETURN)

151·0 80 % QUARTZ, MED. CLAY CONTENT

156·5 95 % QUARTZ, LOW CLAY

MR 3

1" = 10'

160·0 QUARTZ SAND (WASHED FROM MUD RETURN)

170·0 98 % QUARTZ., LOW CONTENT OF ORANGE-BROWN CLAY

196 0 FIRECLAY ? (NO SAMPLE)

201·0 END OF HOLE

999

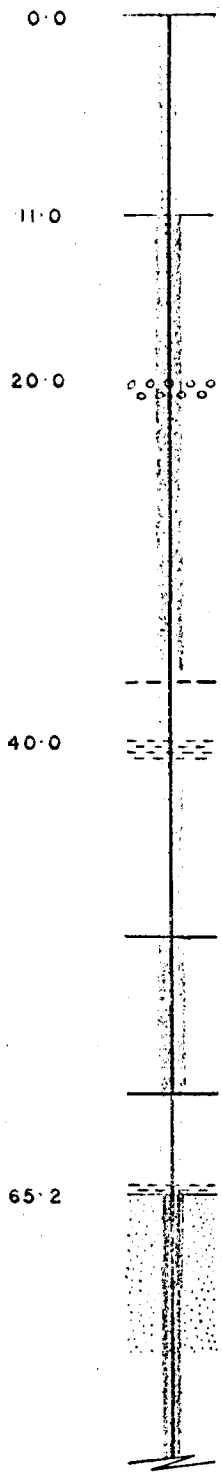
MOOSE RIVER KAOLIN

BORE HOLE MR 4

KIPLING TOWNSHIP

26,240' NORTH
10,270' EAST
ELEV.

1" = 10'



0·0 COLLAR

MUSKEG

11·0

20·0

ABUNDANT COARSE GRAVEL

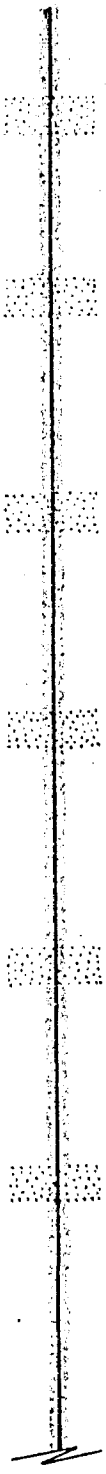
40·0 THIN RIPPLY LAMINATIONS, SILTY TO SANDY

OCCASIONAL BOULDERS AND HARDPAN

65·2 99% QUARTZ, FINE TO MED. GRAINED, MEDIUM CONTENT OF WHITE CLAY.

MR 4

1" = 10'



85·0 — 99 % QUARTZ, MEDIUM CONTENT OF WHITE CLAY.

95·0 — LOW TO MED. CONTENT OF MOTTLED WHITE AND ORANGE-BROWN CLAY.

107·0 — 95 % QUARTZ, COARSE, LOW CLAY.

119·0 — 95 % QUARTZ, COARSE, OCCASIONAL RUSTY GRAINS, LOW CLAY.

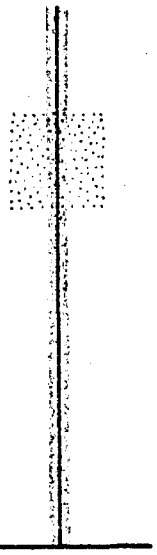
130·0 — THIN BAND OF RED FIRECLAY ?

132·0 — 99 % QUARTZ, LOW CLAY (RED-BROWN).

144·0 — VERY FINE GRAINED, MEDIUM CONTENT OF MOTTLED WHITE AND BROWN CLAY.

MR 4

1" = 10'



166·0

99% QUARTZ, MED. GRAINED, LOW TO MED. CONTENT OF RED-BROWN CLAY.

190·0

END OF HOLE

G.F.G

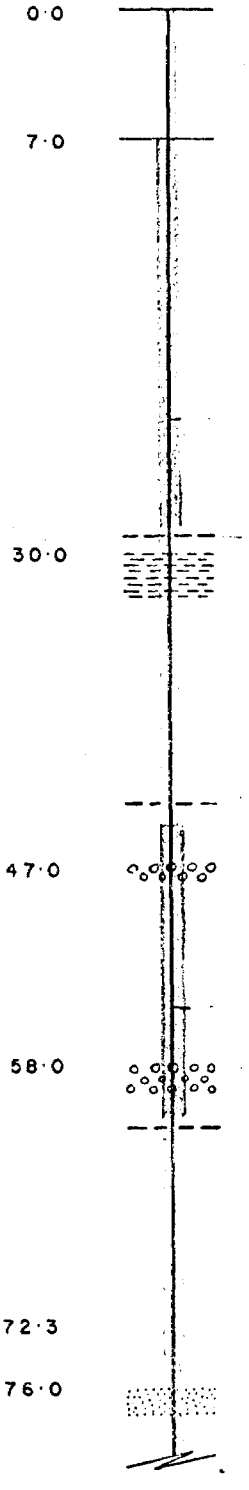
MOOSE RIVER KAOLIN

BORE HOLE MR 5

KIPLING TOWNSHIP

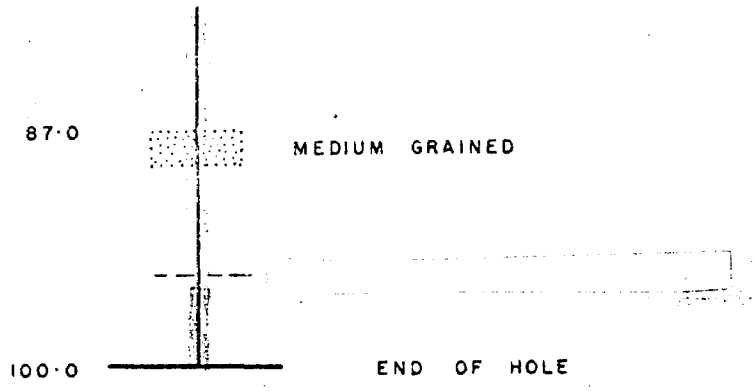
31,520' NORTH
10,270' EAST
ELEV.

1" = 10'



MR 5

1" = 10'



S.P.S.
26.2.20

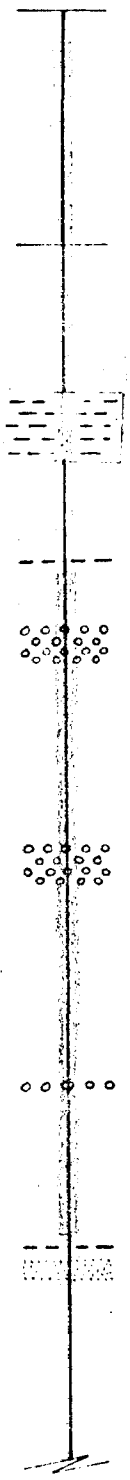
MOOSE RIVER KAOLIN

BORE HOLE MR 6

KIPLING TOWNSHIP

26,240' NORTH
2,350' EAST
ELEV.

1" = 10'



0·0 COLLAR

MUSKEG

13·0

22·0 PEBBLES VERY SCARCE (MARINE CLAY ?)

34·0 INCLUSIONS OF PEBBLES AND ORGANIC MATERIAL.

46·0 INCLUSIONS OF ROOTS AND PEBBLES, BOTH SCARCE.

59·0 ABUNDANT STONEY INCLUSIONS.

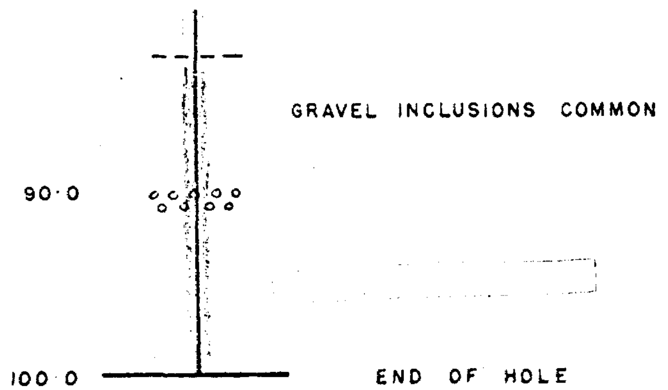
MODERATE NUMBER OF COBBLES AND SMALL BOULDERS.

69·0

OCCASIONAL COBBLES

MR 6

1" = 10'



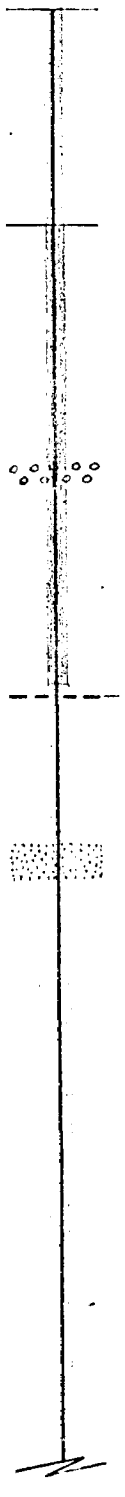
MOOSE RIVER KAOLIN

BORE HOLE MR 7

KIPLING TOWNSHIP

26,240' NORTH
2,350' EAST
ELEV.

1" = 10'



0·0 COLLAR

MUSKEG

12·0

GRAVELY TILL

25·0

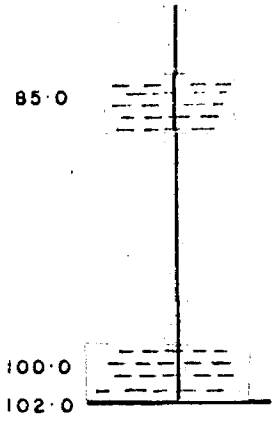
OCCASIONAL SMALL BOULDERS

46·0

FINE GRAINED

OCCASIONAL COBBLES AND THIN GRAVEL BEDS

MR 7



LOW CONTENT OF SAND INCLUSIONS

LOW CONTENT OF SAND INCLUSIONS
END OF HOLE

MOOSE RIVER KAOLIN

BORE HOLE MR 8

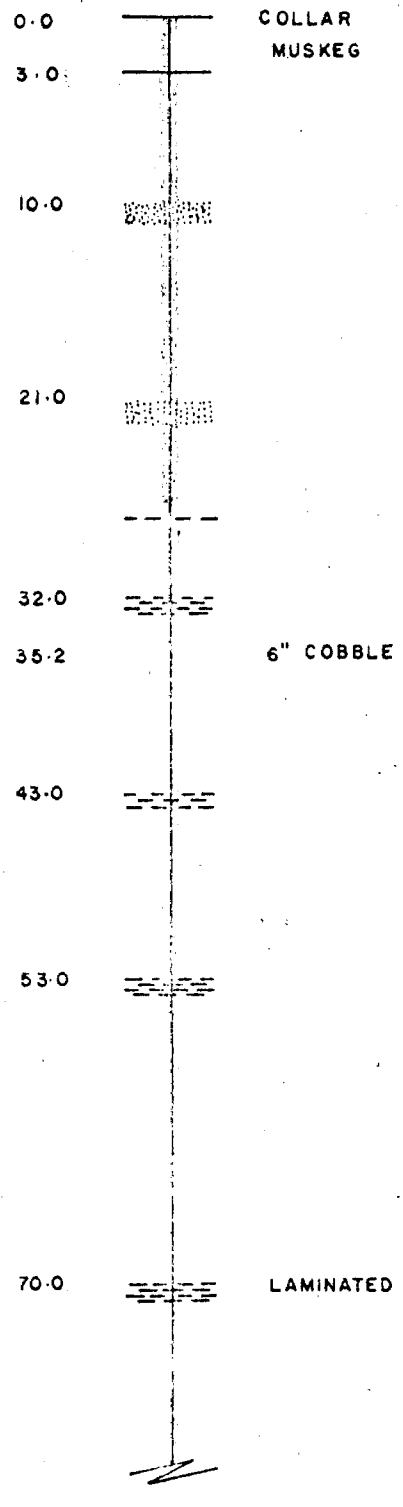
ACRES TOWNSHIP

18,880' NORTH

28,910' EAST

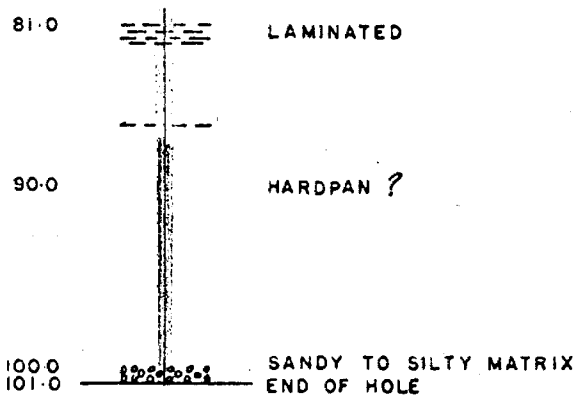
ELEV.

1" = 10'



MR 8

1" = 10'


81.0
LAMINATED
90.0
HARDPAN ?
100.0
SANDY TO SILTY MATRIX
101.0
END OF HOLE

MOOSE RIVER KAOLIN

BORE HOLE MR 9

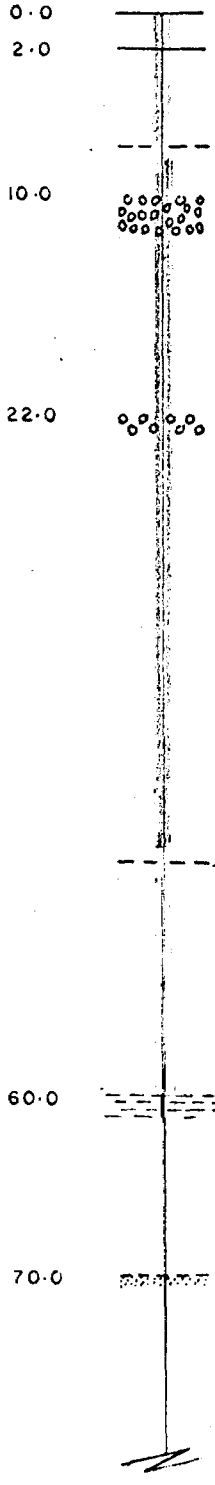
ACRES TOWNSHIP

38,890' NORTH

27,540' EAST

ELEV.

1" = 10'



0.0 COLLAR

2.0 MUSKEG

10.0 SAND & PEBBLE INCLUSIONS TO 1/2"

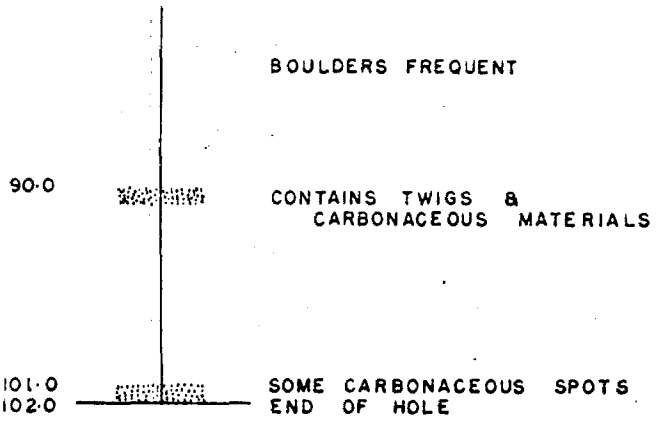
22.0

60.0 WITH VARVED SECTIONS & CARBONACEOUS INCLUSIONS

70.0 STRATIFIED CLAY, SILT, & SAND

MR 9

1" = 10'


BOULDERS FREQUENT
90·0
CONTAINS TWIGS & CARBONACEOUS MATERIALS
101·0
SOME CARBONACEOUS SPOTS
102·0
END OF HOLE

MOOSE RIVER KAOLIN

BORE HOLE MR 10

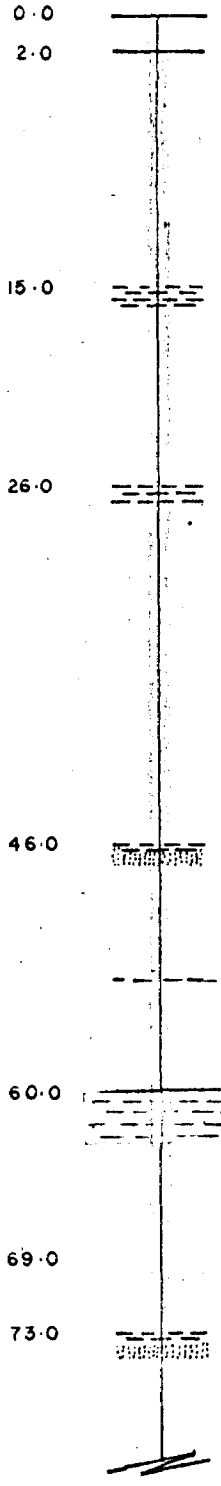
ACRES TOWNSHIP

39,600 NORTH

7,128 EAST

ELEV.

1" = 10'



0.0 COLLAR
2.0 MUSKEG

15.0 MARINE, OCCASIONAL SHELLS & PEBBLES

26.0 STRATIFIED MARINE CLAY & SAND

46.0 MARINE CLAY & SAND, INCLUSIONS OF SHELLS & ROOTS

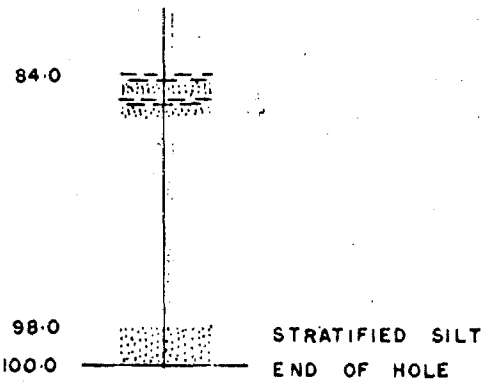
60.0 SCARCE PEBBLES TO 1/4"

69.0 3' BOULDER

73.0

MW 10

1" = 10'



MOOSE RIVER KAOLIN

BORE HOLE MR II

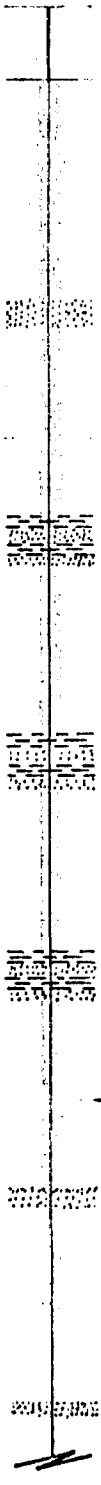
ACRES TOWNSHIP

18, 480 NORTH

7,128 EAST

ELEV.

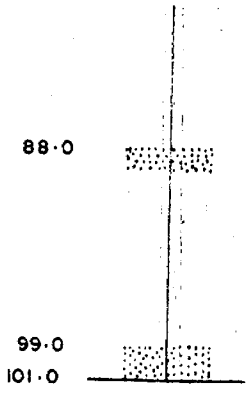
1" = 10'



0·0	COLLAR
	MUSKEG
4·0	
16·0	YELLOW SILT; SCARCE INCLUSIONS OF TREE BARK & STONES TO 1/4".
28·0	LAMINATED MARINE CLAY & SILT WITH OCCASIONAL SHELLS.
40·0	AS ABOVE, WITH INCLUSIONS OF SHELLS, STONES & WOOD.
52·0	AS ABOVE.
65·0	THINLY LAMINATED SILT
77·0	FINE YELLOW SAND

MR 11

1" = 10'



88.0 AS ABOVE, WITH BLACK ORGANIC PATCHES

99.0 YELLOW SILT

101.0 END OF HOLE

MOOSE RIVER KAOLIN

BORE HOLE MR 12

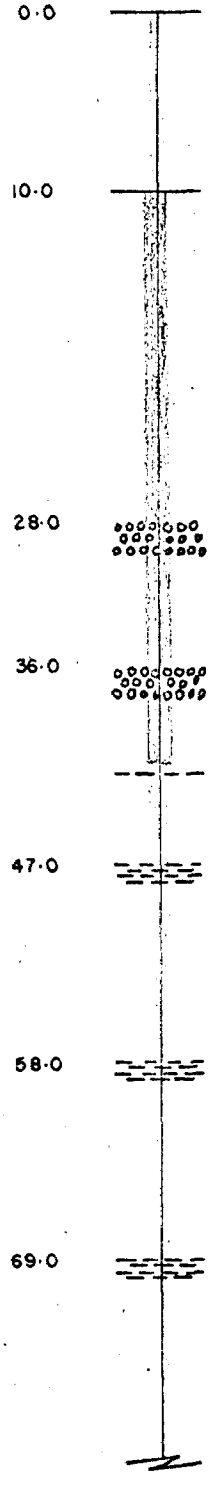
McCAUSLAND TOWNSHIP

13,040 NORTH

28,120 EAST

ELEV.

1" = 10'



0.0 COLLAR

MUSKEG

10.0

28.0 SILTY MATRIX ; MODERATE CONTENT OF PEBBLES TO 3/4"

36.0 MODERATE CONTENT OF COARSE SAND

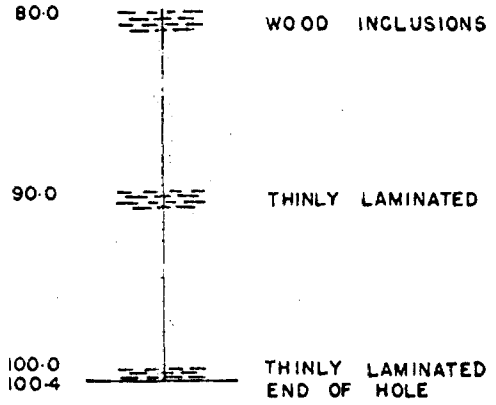
47.0 (MARINE ?) THINLY LAMINATED

58.0 HAIR-LIKE ROOTS & SAND

69.0 THINLY LAMINATED

MW-7

1" = 10'


80.0
WOOD INCLUSIONS
90.0
THINLY LAMINATED
100.0
100.4
THINLY LAMINATED
END OF HOLE

MOOSE RIVER KAOLIN

BORE HOLE MR 13

Mc CAUSLAND TOWNSHIP

34,160' NORTH

28,120 EAST

ELEV.

1" = 10'

0·0 COLLAR

MUSKEG

8·0

28·0 RARE SMALL PEBBLES

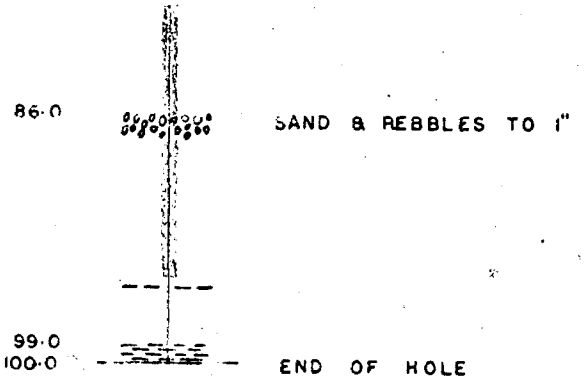
40·0 MARINE CLAY; WOOD, SHELLS, ETC.

52·0

64·0 MARINE CLAY

MW 13

1" = 10'



AUGER HOLE LOGS

SUMMER DRILLING 1960

MRA SERIES

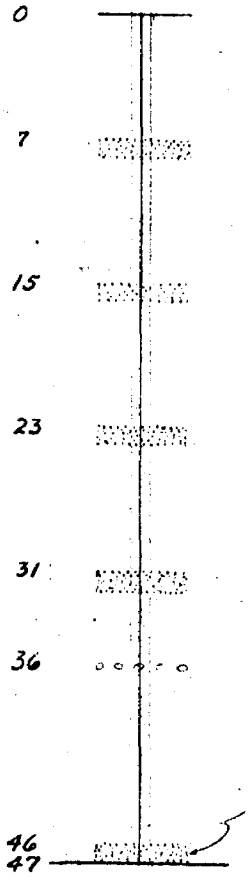
MOOSE RIVER KAOLIN

AUGER HOLE MRA 1

BURSTALL TOWNSHIP

3·2 MILES NORTH
4·3 MILES EAST
ELEV.

1" = 10'



0 COLLAR

7 COARSE, LIGHT-COLOURED

15 MEDIUM GRAINED, DARKER COLOURED

23 AS ABOVE, RARE PEBBLES TO 1"

31 FINE TO MEDIUM, DARK COLOURED

36

46 COARSE, MOSTLY LIMESTONE & DARK GRAINS

47 BOULDER. END OF HOLE.

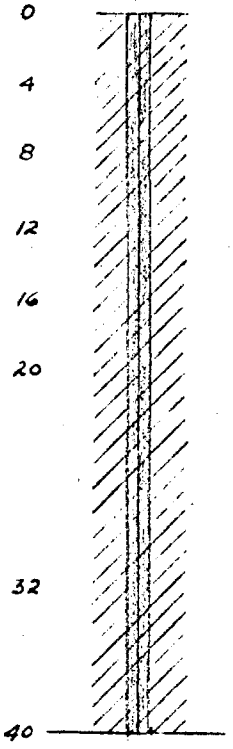
MOOSE RIVER KAOLIN

AUGER HOLE MRA 2

BURSTALL TOWNSHIP

2·9 MILES NORTH
5·3 MILES EAST
ELEV.

1" = 10'



COLLAR

BRICK-RED WITH THIN CREAM-BUFF BANDS.

AS ABOVE

AS ABOVE

AS ABOVE

BRICK-RED WITH THIN OLIVE-BROWN BANDS.

AS ABOVE WITH RARE SMALL CLOTS OF FINE WHITE SILICA SAND AND KAOLIN.

AS ABOVE, VERY DENSE

END OF HOLE

G.R.G.

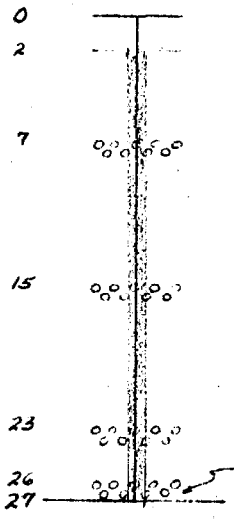
MOOSE RIVER KAOLIN

AUGER HOLE MRA 3

BURSTALL TOWNSHIP

5.1 MILES NORTH
5.0 MILES EAST
ELEV.

1" = 10'



COLLAR
MUSKEG
LOW CONTENT OF MEDIUM SAND INCLUSIONS
AS ABOVE
MODERATE COARSE SAND INCLUSIONS.
AS ABOVE
END OF HOLE

595

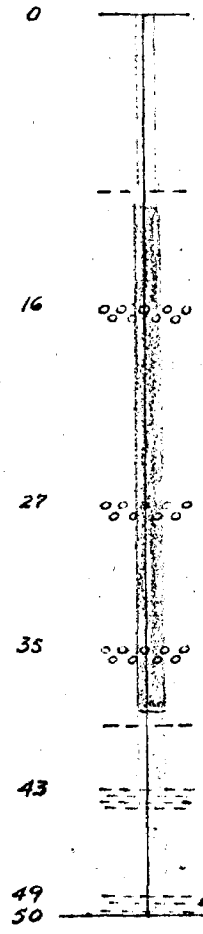
MOOSE RIVER KAOLIN

AUGER HOLE MRA 5

McBRIEN TOWNSHIP

3.5 MILES NORTH
1.2 MILES EAST
ELEV.

1" = 10'



0 COLLAR

16 ABUNDANT COARSE SAND INCLUSIONS TO ½"

27 SCARCE SAND INCLUSIONS

35 AS ABOVE

43 SMOOTH TO SILTY

49 AS ABOVE

50 END OF HOLE

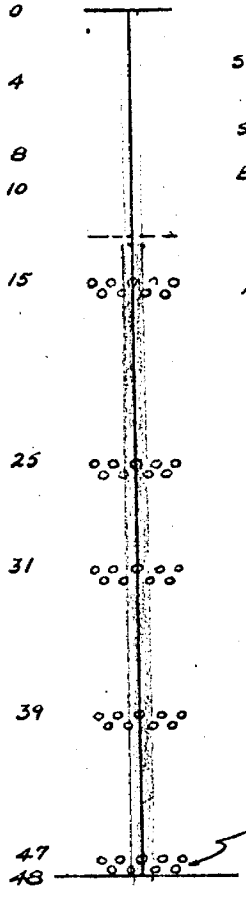
MOOSE RIVER KAOLIN

AUGER HOLE MRA 6

McBRIEN TOWNSHIP

3.4 MILES NORTH
1.1 MILES EAST
ELEV.

1" = 10'



0 COLLAR

SILT

4

SAND + GRAVEL

8

10 BOULDER, COBBLE BED

15 ABUNDANT COARSE SAND INCLUSIONS TO 1/2".

25 AS ABOVE

31 AS ABOVE

39 AS ABOVE

47 AS ABOVE

48 END OF HOLE

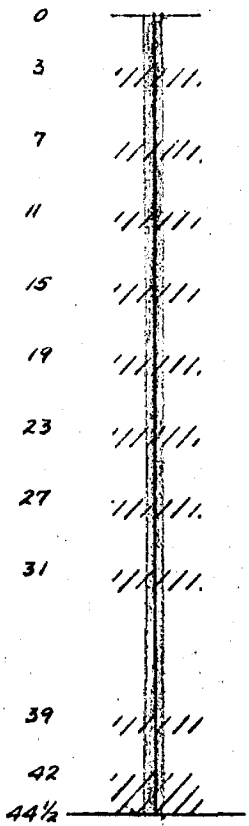
MOOSE RIVER KAOLIN

AUGER HOLE MRA 6A

McBRIEN TOWNSHIP

2·7 MILES NORTH
1·0 MILES EAST
ELEV.

1" = 10'



0	COLLAR
3	GREEN-GRAY FIRECLAY.
7	
11	
15	OLIVE GREEN, BUFF, BROWN.
19	
23	BLUE GREY
27	
31	
39	BLUE GREY WITH RED STREAKS.
42	RED BROWN WITH OLIVE YELLOW PATCHES.
44½	BEDROCK ? END OF HOLE.

S.R.G.

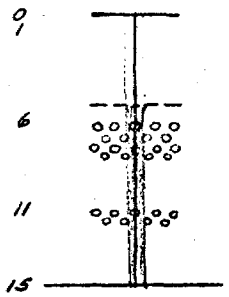
MOOSE RIVER KAOLIN

AUGER HOLE. MRA 7

McBRIEN TOWNSHIP

4·9 MILES NORTH
4·8 MILES EAST
ELEV.

1" = 10'



0	COLLAR
1	ROOTS + LOAM
	SAND + GRAVEL
6	SANDY WITH PEBBLES TO ½".
11	AS ABOVE
15	BOULDER, END OF HOLE.

G.R.G.
3/12/65

MOOSE RIVER KAOLIN

AUGER HOLE MRA 8

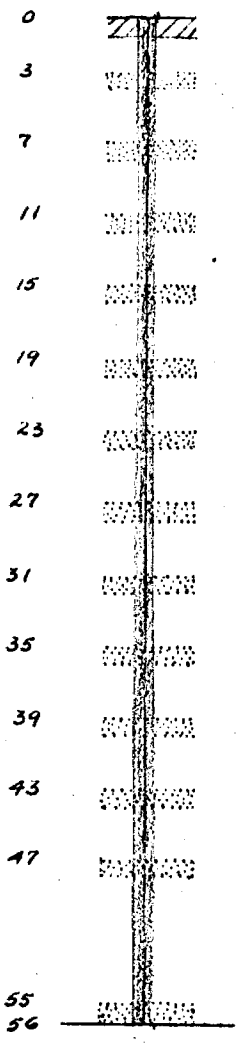
McBRIEN TOWNSHIP

5.4 MILES NORTH

5.5 MILES EAST

ELEV.

1" = 10'



COLLAR

MAUVE FIRECLAY

RUSTY

CREAM - BUFF
MEDIUM GRAINED
LOW KAOLIN

END OF HOLE

C 79

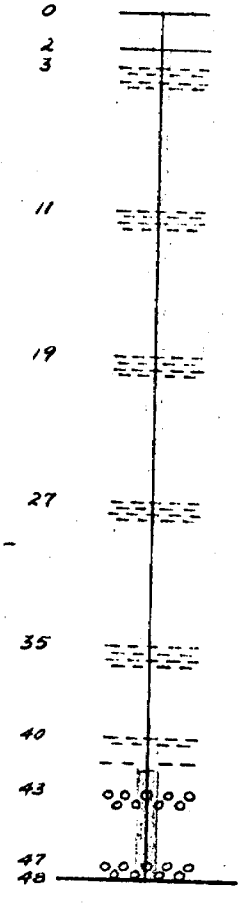
MOOSE RIVER KAOLIN

AUGER HOLE MRA 20

WRIGHT TOWNSHIP.

1.6 MILES NORTH
0.2 MILES EAST
ELEV.

1" = 10'



COLLAR

MUSKEG

ORGANIC INCLUSIONS

BLUE GREY

MOTTLED GREY + BUFF

BLUE GREY

SANDY BUFF, INCLUSIONS SCARCE + FINE.

END OF HOLE

SRS

MOOSE RIVER KAOLIN

VENTURES – A.N.L. CONCESSION

1 INCH = 2 MILES

N

LEGEND

- ⊕ MR 7 — BORE HOLES COMPLETED DURING 1959-60 SEASON
- ○ — BORE HOLES PROPOSED
- × — CRETACEOUS OUTCROPS
- ⊠ — FIELD CAMPS
- WINTER ROADS
- ----- PRECAMBRIAN CONTACT (APPROXIMATE)
- ——— BOUNDARY OF CONCESSION AREA

HABEL

MAHONEY

AMERY

HAMBLY

McCAUSLAND

BURSTALL

McBRIEN

GARDEN

WRIGHT

ACRES

KIPLING

MISSINAIBI R.

OPASATIKA R.

MATTAGAMI RIVER

New Calcined Plant

Gravel ridge 368' a.s.l.

River level 295' a.s.l.

AMERICAN NEPHELINE LIMITED

MOOSE RIVER KAOLIN

VENTURES – A.N.L. CONCESSION

REdrng		
1 INCH = 2 MILES		60-10-61
April 25, 1960.		