BEAUCAGE MINES LIMITED

GEOLOGICAL REPORT

O.E.OWENS

North Bay, Ontario
August 10, 1956

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INTRODUCTION

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There are five islands in the Manitou group arranged in a ring about 1½ miles in diameter. The total land area of these islands is 328.7 acres.

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Diamond drilling from the ice during the winter of 1953 indicated 4,037,685 tons of metamorphic alkaline rocks grading more than 0.5% Cb_2O_5 and 0.04% U_3O_8.

This was followed by a detailed geological and magnetometer investigation of the other islands, and the area as a whole. Small occurrences of columbium-uranium bearing rocks were uncovered on Big Manitou and Calder Islands.

Further diamond drilling on the main Newman Zone during that winter of 1955 increased the tonnage of ore to 5,431,000 tons at a grade of 0.53% Cb_2O_5 and 0.039% U_3O_8, established continuity to the zone, and indicated the presence of higher grade cores to

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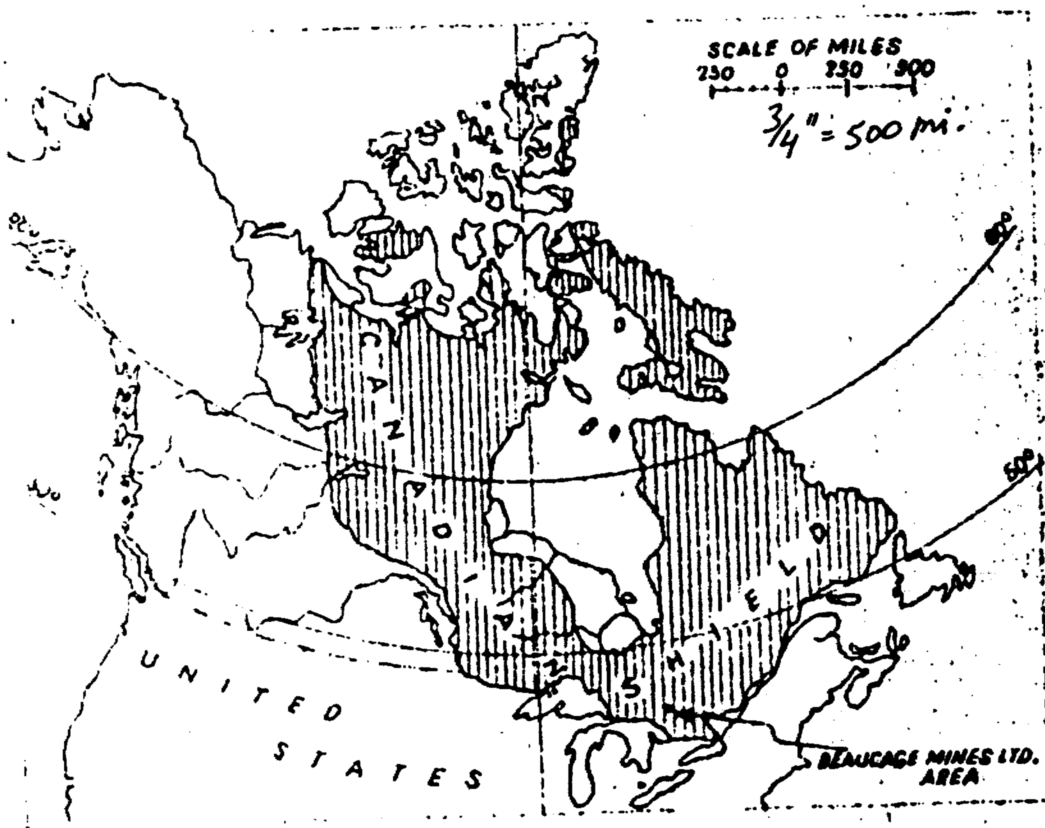
SCALE OF MILES
250 0 250 500
3/4" = 500 mi.
CANADIAN SHIELD
UNITED STATES
BEAUCAGE MINES LTD. AREA

the ore masses.

Shaft sinking commenced in September 1954. The shaft is bottomed at 427 feet with one level at 400'. To date 2500 feet of drifting and crosscutting have been completed on this level.

Underground sampling, diamond drilling and a re-evaluation of the surface drilling in the light of undergroung data indicates the presence of 3,384,740 tons of ore rock in the Newman Zone at a grade of 0.73% Cb_2O_5 and 0.053% U_3O_8.

Property:

The property of Beaucage Mines Limited consists of 7923.72 acres held under License of Occupation No.12268, of which 328.62 acres comprise the Manitou Islands as follows:

Great Manitou Island	203.0 acres
Little Manitou Island	69.22 acres
Calder Island	26 acres
Rankin Island	22.75 acres
Newman Island	7.15 acres

Type of Work to Date:

The Manitou Islands were orginally prospected at the suggestion of Mr. J. Strohl, Tunkhannock, Penn. by Mr. M. Vanclieaf of North Bay in association with Mr. J. J. Kenmey

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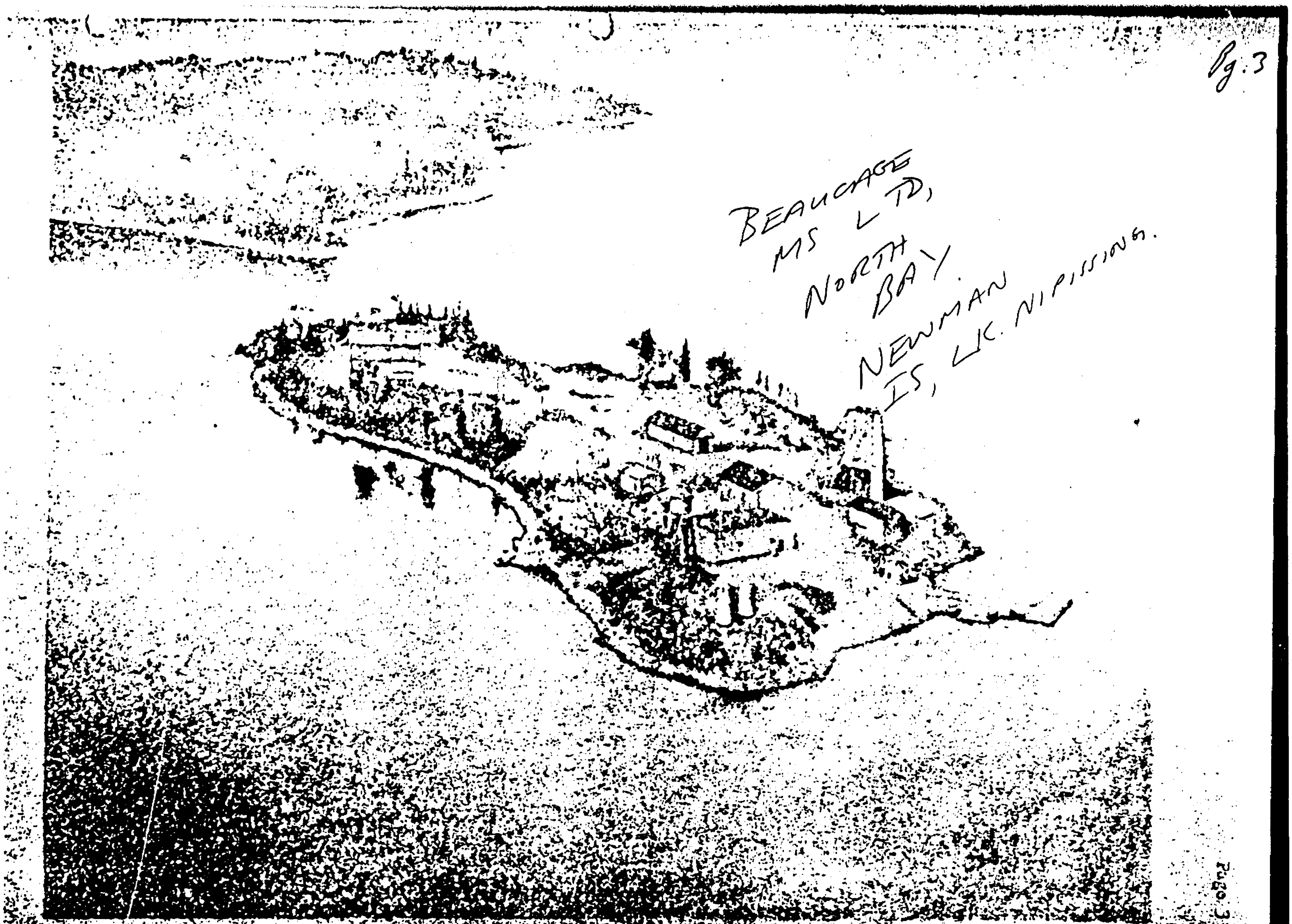

NEWMAN ISLAND LAKE NIPISSING

BEAUCAGE MINES LTD. NORTH BAY ONTARIO

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During the winter of 1953 7510 feet of diamond drilling was carried out from the ice in the area east of Newman Island, which is now referred to as the Newman Zone. During March of the same year a magnetometer survey was made of the Newman Zone. A substantial tonnage of rock of probable economic value was indicated and Battelle Memorial Institute of Columbus, Ohio and others were engaged to conduct metallurgical studies on the ore.

Diamond drilling was continued on Calder (6,010) and Big Manitou (9,697') islands during the spring and summer. At the same time geological and scintillation surveys were made of the islands, and an aeromagnetic survey was conducted of the Manitou Island area.

Drilling was resumed in the Newman Zone in January 1954 and 7069' were drilled from the ice. Interestin aeromagnetic anomalies were surveyed with a ground magnetometer survey during the same winter.

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Underground operations commenced on September 17th, 1954 and 427' of four-compartment shaft was completed by February. Stations were cut at the 275' and 400' levels. Since this time 2422 feet of drifting and crosscutting have been completed on the 400 foot level, 12,769 tons of stope sills have been mined for pilot plant operation, and 12,944 feet of underground diamond drilling has been completed.

Construction of a 50 ton per day pilot plant commenced during June of 1955 on the mainland 10 miles west of the City of North Bay with the flotation section commencing operation in December and the chemical section in July 1956.

REGIONAL GEOLOGY

The rocks in the North Bay area are typical Grenville, quartz-feldspar paragneisses. Their altitude varies from place to place, but commonly they are folded into open folds with an irregular increase in metamorphic grade which results in areas of nearly massive granitic gneisses. This assemblage is intruded by dykes and larger intrusive bodies of basic composition. Some of these are slightly radioactive and contain traces of columbium.

The only geological mapping in the area is a reconnaissance map of the region south of Lake Nipissing which was done by J. Satterly of the Ontairo Department of Mines in 1943. This map shows numerous is lands of Grenville limestone within the quartz feldspar gneisses.

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The topography of the district is typical of that of the Canadian Shield; difference of relief is about 200-300 feet.

The area is on strike of two topographic breaks, one along the Ottawa-Mattawa River valleys and the other along the C. N. R. mainline to Ottawa. There is not sufficient geological information on the subject to indicate whether these breaks are due to faulting, however this is a likely hypothesis.

Lake Nipissing is a large shallow lake lying at the headwaters of rivers flowing to Georgian Bay and the Ottawa River. The maximum depth of the lake is about 50 feet.

The Manitou Islands rise less than 100 feet above lake level.

GEOLOGY MANITOU ISLANDS

The rocks exposed underground and in diamond drill cores are mainly paragneisses, crystalline limeston, alkaline intrusives and metamorphoses equivalents. It is a complex assemblage typical of the Grenville province but with local peculiarities, notably concentrations of sodium, phosphorous, fluorine, uranium and columbium; as well as a regional brecciation of the rocks.

Resting unconformably upon these rocks are scattered patches of Palaeozoic conglomerate, limestone, anddolomite.

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BEAUCAGE MINES LTD.

TABLE I

TABLE OF FORMATIONS

PALAEOZOIC	8	Ordovician
	8c	Lower Trenton limestone
	8b	Upper Black River dolomite
	8a	Upper Black River conglomerate
	7	Oxidized Precambrian Rocks

U N C O N F O R M I T Y

PRECAMBRIAN	6	Ore
	5	Lamprophyre Dykes
	4	Diorite
	4b	Diabase
	3	Feldspar acmite gneiss
	3a	Grey feldspar
	3b	Pink feldspar
	3br	Red feldspar
	$3b_2$	Pegmatite
	3aa	Fine grain acidic dyke
	$3b_1$	Distinct gneissic landing
	2	Basic Silicate Rock (probably skarn)
	2a	Fine grain biotite predominant mineral
	2b	Acmite and calcite predominant minerals
	2c	Acmite and feldspar predominant minerals
	2f	Acmite and apatite predominant minerals
	2g	Basic dykes
	1	Grenville type limestone
	1a	Laminated grey limestone
	$1b_1$	Massive white carbonate
	$1b_2$	White carbonate porphyroblasts acmite
	1c	Carbonate dykes
	0	Quartz feldspar gneiss

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The Precambrian assemblage has been divided into seven main groups with subdivision as listed in Table 1. There is generally a gradation between the rock types.

Geological details and the results of a magnetometer survey suggest a circular structure to the rock units.

Granite Gneiss

The outermost unit in the rock series is a medium grained equigranular quartz feldspar gneiss. Gneissic banding is poorly developed largely because of its fine texture and subsequent alteration which includes streaks of migmatite and 1-3 mm. wide stringers of acmite*. This member is well exposed on the islands.

The rock is composed of 5-20% quartz, 60% pink feldspar (mainly potash type) and 30% ferromagnesian minerals (mainly acmite with lesser amounts of biotite and arfvedsonite**). The grain size of the rock is between 1 and 3 millimeters although in places there are segregations of corrser(?) grained material resembling migmatite structure.

The features of the gneiss which distinguish it from other rocks in the North Bay area are finer and more even grain size, a general brecciation of the rock, the presence of fine stringers of acmite intimately cutting the rock, and the low quartz content.

* Soda Pyroxene ** Soda Amphabole

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Grenville Limestone

The Grenville limestone is exposed on Calder Island and in the drill cores from Calder, Big Minitou and Newman Island. It may be subdivided on the basis of appearance and mineral composition into three types:

1 (a) "Laminated" Cargonate

1 (b) Carbonate, Porpyroblasts of Acmite or Biotite

1 (c) Carbonate veins

The "Laminated" Carbonate is a crystalline colcium carbonate with a variegated appearance due to irregular streaks, layers, beds or disseminated grains of biotite, acmite, apatite, magnetite and fledspar. The carbonate, which is almost entirely calcite, is medium grained and white to light grey in colour. In appearance the rock closely resumbles Grenville limestone in many parts of Ontairo and Quebec. The nearest reported occurrance of Grenville limestone is in Lount Township about 36 miles south of North Bay.

The Carbonate, Porpyoblasts of Acmite or Biotite is exposed on Calder and Big Manitou Islands were it occurs as 5 to 75 feet thisk bands separated by sheet like masses of syenite gneiss. It is composed of medium grained crystalline carbonate and 10-30% of porpyroblasts of acmite, biotite and magnetite. The porphyroblasts of acmite are commonly about ¼ - ½ inches in diameter and are partially repoaced by arfvedsonite and biotite. The calcite is white and medium to coarse grained. Apparently this rock is the recrystallized and altered equivalent of the Laminated Carbonate.

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North of Rankin island a large area of this member has been intersected by diamond drilling. Results listed on page 24 show that this type of rock contains a major tonnage of columbium. It is believed that it should have separate metallurgical study because of its high calcite content, (see p.18) and because the pyrochlore is associated with concentration of apatite and acmite.

The carbonate veins are 1 to 6 inch wide dyke-like masses of carbonate which cut all other rocks in the area. They are composed especially of crbonate and fluorite, with small amounts of feldspar, pyrite and hematite. The carbonate varies in composition; much of it is calcite, but dolomite, siderite and very rarely rhodochrosite are present. The fluorite fraction which varies between 10 and 40% of the whole, is a deep purple variety and although it is commonly fine grained, locally it occurs as well developed grain up to 3/8" diameter.

Basic Silicate rock

The Basic silicate group of rock types contains most of the ore developed to date. It is medium grained and consists essentially of acmite and biotite with lesser amounts of calcite, apatite or feldspar. The rock may be subdivided into three types on the basis of the percentage of calcite, apatite or feldspar.

This rock type is restircted to the ore zone on Newman and Big Manitou Islands and will be described in the Economic Geology section.

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Syenite Gneiss

The syenite gneiss is fine to medium grained and equigranular. It usually consists of 70% potash feldspar and 30% acmite with small amounts of carbonate, apatite, pyrite, magnetite, arfvedsonite, and uranium pyrochlore.

The acmite occurs as dark gneissic bands, irregular blobs and fine stringers. Phto #2 show the gradual change from fine gneissic banding to a massive syenite. The photographs are taken of core picked in sequence across the zone from south (right) to north (left). The alteration is more intense on the north side of the Newman Zone. Generally speaking, most of the syenite gneiss from the ore zone is only faintly gneissic and shows nearly a massive texture similar to the centre pieces of core in the photograph. Apparently the various types of gneiss represent the gradual development of metasomatic alteration with the source to the north of the Newman Zone. The syenite gneiss, throughout the one zone, is shattered and cut by fine acmite stringers.

DIORITE

Diamond drill holes from Big Manitou, Little Manitou and Newman Islands have intersected a medium grained rock consisting of about 55% pearl grey potash feldspar, 40% acmite or its altered aquivalent, and magnetite, Diorite is the field term for this rock since the more correct name, syenite, might be confused with the syenite gneiss.

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The Diorite apparently has the form of a ring dyke on the inner side of the islands. The grain size, and relative proportions of feldspar and dark minerals vary along and across the strike. It is common on Big Manitou Island to find phases with grain size in excess of ½". These dykes may be a gradation of the more common medium to coarse grain diorite, or parallel pegmatitic structures intruding the Syenite Gneiss and Basic Silicate Rock group.

Apparently water-rich solution shave been important in the process of emplacement of the diorite. It is believed that the diorite is an offshoot of a deeper more significant intrusive.

PALAEOZOIC ROCKS

There is a total of about 6 acres of Palaeozoic limestone at or near the surface on Newman, Rankin, Calder, Big Manitou and Little Manitou Islands. The greatest measureable thickness is 25'. These are buff weathering grey limestones and dolomites of Ordovician age. The uppermost unit is Lower Trenton limestone which is separated from the Black River dolomite by a thin shale stratigraphic horizon. These rocks are nearly flat lying, resting unconformably on the underlying Pre-cambrian rock.

The lower most unit of the Palaeozoic series is a conglomerate with fragments of syenite gneiss altered in a manner similar to that of the ore zone; also the gneiss fragments are slightly radioactive. The limestone is not cut by any other rock type.

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It is thus most likely that the Beaucage ore is pre-Black River in age.

STRUCTURE

The rocks in the vicinity of the Manitou Islands are crystalline limestone, steeply dipping gneisses and various intrusives. Diamond drill intersections and surface mapping indicate that these rocks strike parallell to the circumference of the islands. The similarity of the rocks on each island and the constant sequence on each, suggests a circular structure to the bedrock pattern. Also the contours of the airborne magnetometer survey form a circular pattern about the islands with local variations following deviations in bedrock structure. The circular magnetic highs may be due to topographic features, but this does not seem likely.

Superimposed on this circular bedrock structure is a regional brecciation or shattering of the gneisses, with an intimate network of secondary acmite stringers.

In certain localities such as the area east of Newman Island this shattering is intense and apparently has produced a porous zone favourable for the deposition of columbium and uranium.

Within the Newman Zone the areas containing the highest columbium and uranium content are those with the highest

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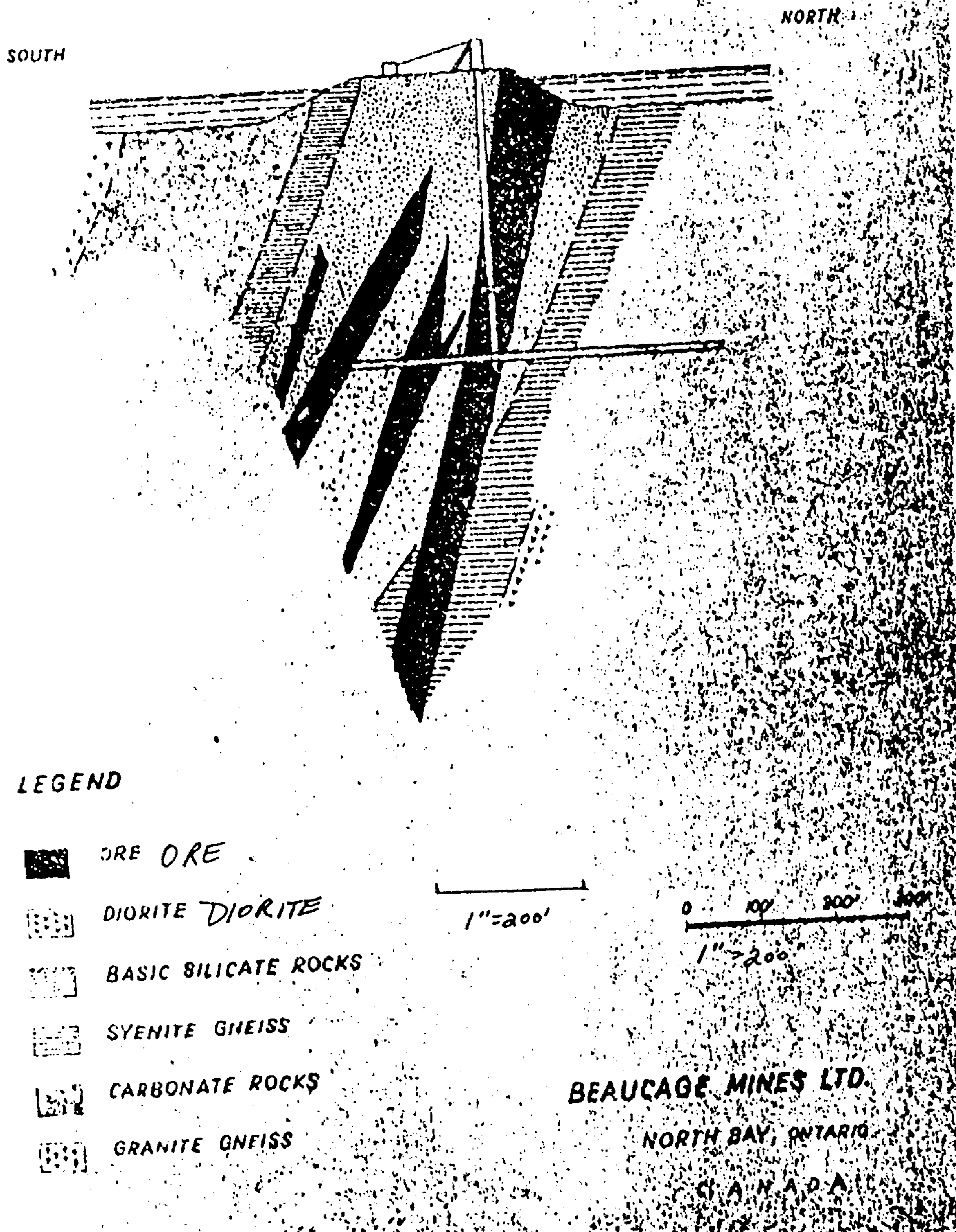
SOUTH
NORTH
LEGEND
ORE ORE
DIORITE DIORITE
BASIC SILICATE ROCKS
SYENITE GNEISS
CARBONATE ROCKS
GRANITE GNEISS
1"=200'
0 100' 200' 300'
1"=200'
BEAUCAGE MINES LTD.
NORTH BAY, ONTARIO
CANADA

degree of brecciation, and the most intense secondary alteration.

The limestone member of the series has evidently yielded plastically to the forces which caused brecciation of the gneiss, as evidenced by the swirls and irregular flowage banding of the carbonate rocks.

ECONOMIC GEOLOGY

The Beaucage columbium-uranium deposit contains an unusually high percentage of sodium, phosphorus, and iron and is closely associated with masses of carbonate rocks.

The carbonate rocks resemble Grenville limestone, such as that outcropping to the south of Lake Nipissing. It seems logical to classify the carbonate rocks as recrystallized Grenville limestones, which may perhaps in many instances, have been mobilized and squeezed into new locations.

A characteristic feature of the rocks in the vicinity of the Manitou Island is a regional brecciation. This brecciation is most intense in the vicinity of the Newman deposit, and is the dominent structural feature of the ore zone.

The main tonnage of rock, outlined to date, containing more than 0.5% Cb_2O_5, occurs in a brecciated series of Acidic Silicate Rocks along the contact with Grenville Limestone.

All the uranium and columbium in the rock is contained in the mineral, uranian-pyrochlore. This mineral is associated with concentrations of acmite, apatite, red feldspar, biotite, magnetite, and pyrite.

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Newman ore zone

A group of rocks terms Basic Silicate Rocks constitute the major part of the Newman Ore zone. They are acmite-biotite-arfvedsonite-rich rocks which appear to have formed as a result of metasomatic alteration of pre-existing limestone and acidic gneisses. They may conveninently be sub-divided into two types :

Ferromagnesian - Calcite rock

Ferromagnesian - Feldspar rock

The ferromagnesian-calcite rock which consitutes about 60% of the total ore, is composed of about 50% ferromagnesian minerals, and 30% calcite and apatite, with lesser amounts of feldspar pyrrhotite, pyrite, magnetite, fluorite, and uranian-pyrochlore. The rock consists of 2-8 mm. diameter porphyroblasts of acmite and biotite in a medium grained groundmass of white calcite and pale green apatite. The acmite is a dark dull green in hand specimen and a medium green in thin section. The grains may be clear or altered to a felty mass of biotite, arfvedonite, and chlorite.

The ferromagnesian Calcite type of rock occurs as a matrix in, and as a replacement of, a brecciated area of syenite gneiss, and also as a replacement in the limestone stratigraphic horizon. The more intense the brecciation and replacement the higher the percentage of iron silicates in the rock. They appear to have formed as a result of metasomatic alteration of limestone material which has been squeezed

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Ferromagnesian - Calcite Rock

Ferromagnesian - Feldspar Rock

The Ferromagnesian - Calcite Rock which constitutes about [illegible] of the total ore, is composed of about 50% ferromagnesian minerals, and 30% calcite and apatite, with lesser amounts of feldspar pyrrhotite, pyrite, magnetite, fluorite, and uranian-pyrochlore. The rock consists of 2-8 mm. diameter porphyroblasts of acmite and biotite in a medium grained groundmass of white calcite and pale green apatite. The acmite is a dark dull green in hand specimen and a medium green in thin section. The grains may be clear or altered to a felty mass of biotite, arfvedsonite, and chlorite.

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COMPOSITION BEAUCAGE ORE

CHEMICAL ANALYSIS

Cb^2O5	.59
Ta^2O5	Nil
U^3O8	.034
P^2O5	3.1
ScO2	26.7
CaO	19.2
Fe	12.2
CO^2	11.4
Al^2O^3	4.6
MgO	5.3

SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSIS

ErO^2	.03 - .3%
TiO^2	.2 - 2%
Na^2O	.5 - 5%
K^2O	1 - 5%

MINERAL COMPOSITION

Pyrochlore	
Calcite	10 - 50%
Acmite	25 - 50%
Biotite	5 - 30%
Arfredsonite	
Feldspar	5 - 60%
Apatite	0 - 30%
Zincon	
Hematite	
Magnetite	

COMPOSITION B[illegible]UCAGE ORE

CHEMICAL ANALYSIS

Cb_2O_5	.59
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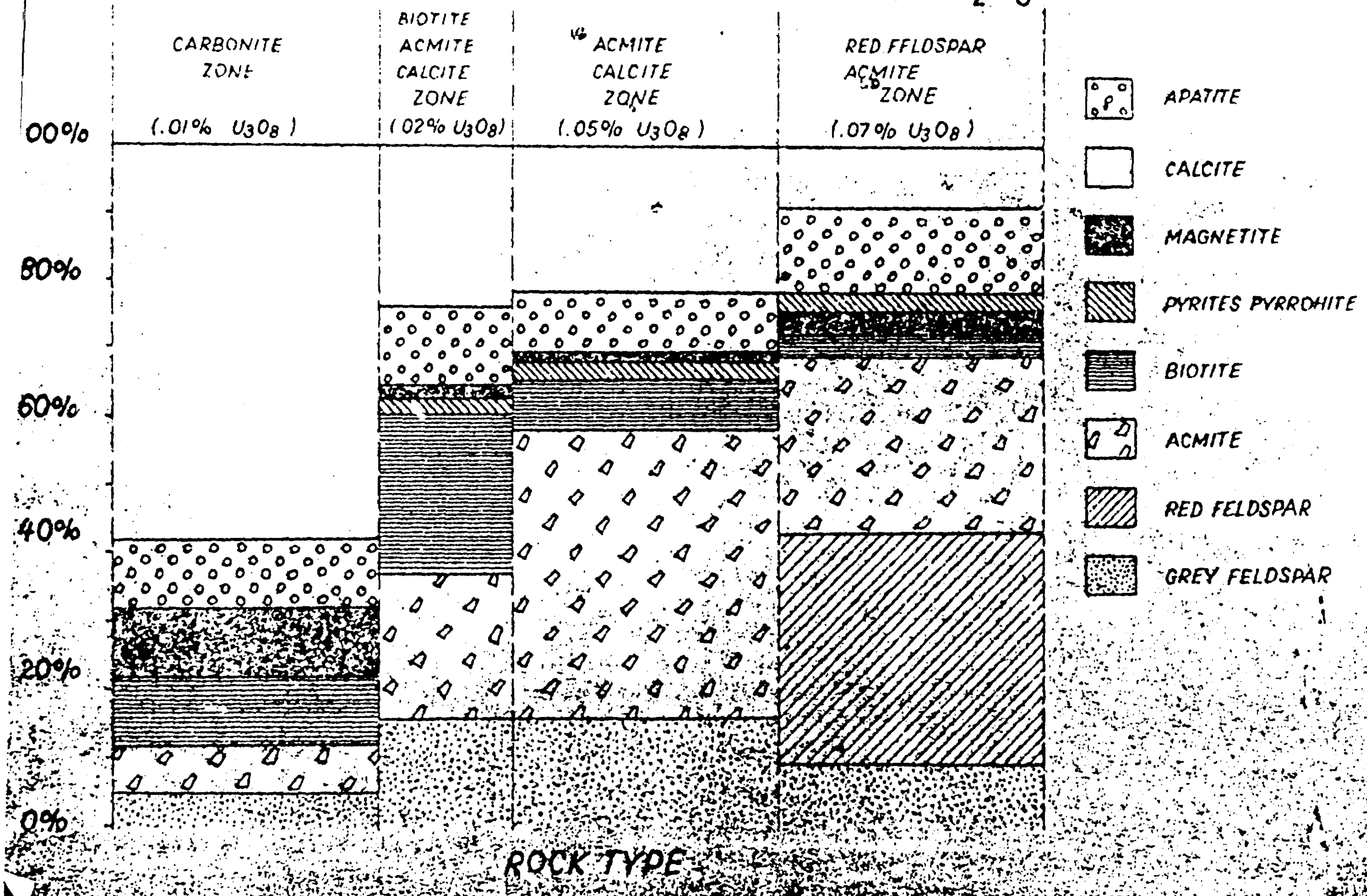
MINERAL COMPOSITION

Pyrochlore	
calcite	10 - 50%
Aomite	25 - 50%
Biotite	5 - 30%
Arfre dsonite	
Feldspar	5.-60%
Apatite	0 - 30%
Zircon	
Hematite	
Magnetite	

TABLE 2

COMPOSITION OF ROCK AT GRADE OF 0.70% Cb_2O_5



into the adjacent brecciated syenite. Apparently this zone is one of recurrent brecciation which provided a porous structure, in a chemically favourable zone, for replacement by solutions rich in iron, sodium, phosphorus, fluorine, columbium and uranium.

The composition of this type of ore is not constant, but varies with the degree of alteration. Table II shows the range in average composition but in practive there is a considerably greater variation than this. The acmite content varies between 20 and 60%; the calcite between 10 and 40%; the apatite between 2 and 30%; the biotite between 10 and 30%; and the magnetite, pyrite and pyrrhotite content generally increases in with grade to a combined maximum of about 20%. The fledspar content of the ore diminishes as the percentage of columbium increases. The most intensely brecciated, and most completely altered sections contain the highest persentage of columbium and the lowest amount of feldspar.

The colour and appearance of the uranian-pyrochlore varies as the columbium-uranium ratio. The high uranian-pyrochlore is dark steel grey to brown in colour with a vitrous to metallic luster and is partially opaque in thin section; while the low uranian-pyrochlore is honey yellow in cloour and clear in thin section. The grains vary in size between 0.01 and 0.5 mm. Detailed thin section study, with the aid of short exposure autoradiographs, indicates that the radioactivity is restricted to the dark chocloate brown to black part of the pyrochlore grain which commonly occurs as a border to, or along cracks in, the clear pyrochlore core. Photo #12 shows two into the adjacent brecciated syenite. Apparently this zone is one of recurrent brecciation which provided a porous structure, in a chemically favourable zone, for replacement by solutions rich in iron, sodium, phosphorus, fluorine, columbium and uranium.

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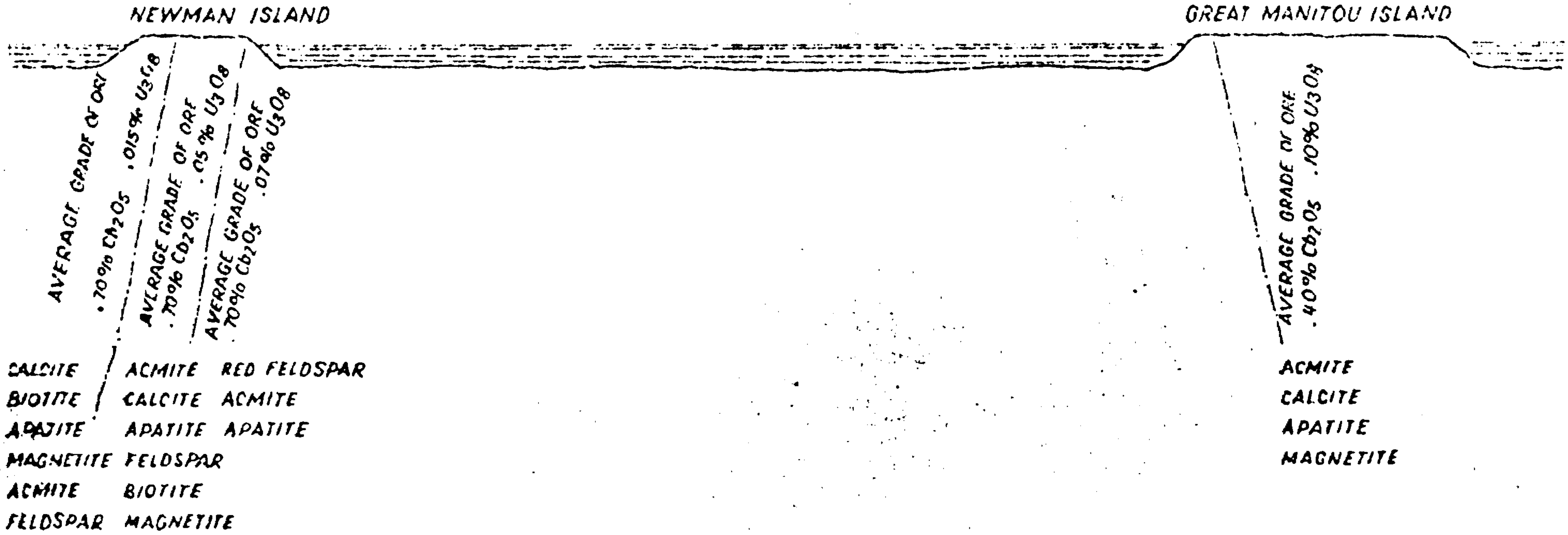
FIGURE I



MINERALS LISTED IN DECREASING ORDER OF ABUNDANCE
FOR VARIOUS TYPES OF ORE

VERTICAL CROSS SECTION MANITOU ISLANDS

BEAUCAGE MINES LTD.
NORTH BAY, ONTARIO
C A N A D A

pyrochlore grains with a slightly offset autoradiograph. Note how the pattern of the alpha tracks corresponds to the outline of the dark material in the pyrochlore grain. These plates were exposed for 48 hours. It seems likely that this dark material is a replacement phenomena, and is close to Ellsworthite or Betafite in composition. The higher the percentage of uranium in the rock the greater the percentuge of dark grains of pyrochlore or the amount of dark material constituting the pyrochlore grains.

The composition of the pyrochlore has been determined by calculating the weight of pyrochlore in the rock with the aid of two thin sections, cut at right angles, and by assaying the enclosing rock fragments for uranium and columbium. This method indicates that the pyrochlore contains between 0.6 and 11% U_3O_8 and between 20 and 50% Cb_2O_5.

Pyrochlore with a low uranium content is clear and commonly occurs in the southern part of the ore zone, in the high calcite and the high biotite type of rocks, while the darker variety occurs in the northern part of the ore zone in those rocks containing a high percentage of acmite and red feldspar (see figureI).

The average composition of the feldspar acmite type of Basic Silicate Rock is 45% potash fledspar, 25% acmite, 10% calcite, 13% apatite, 3% pyrite and pyrrhotite, 3% magnetite, and 3% biotite. The rock is commonly equigranular, medium grained with veinlets of acmite and fledspar. The majority of the feldspar contains fine disseminated red-coloured dust-like material believed to be hematite, pyrochlore grains with a slightly offset autoradiograph. Note how the pattern of the alpha tracks corresponds to the outline of the dark material in the pyrochlore grain. These plates were exposed for 48 hours. It seems likely that this dark material is a replacement phenomena, and is close to Ellsworthite or Betafite in composition. The higher the percentage of uranium in the rock the greater the percentage of dark grains of pyrochlore or the amount of dark material constituting the pyrochlore grains.

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Newman Ore Reserves

The Newman zone of columbium-bearing rock strikes east-west and dips steeply south. It is about 500 feet wide, and so far has been traced for a length of 1,000 feet, and to a depth of 1100 feet. Within this zone are definable lenses or lensitic pipes of ore at higher grades. To date 2,536,000 tons at a grade of 0.053% U_3O_8 and .77% Cb_2O_5 have been indicated by surface and underground diamond drilling. This is largely contained in lensitic pipes between 20-150 feet in width, 300 feet in length and extending to a depth of at east 1100 feet.

All the ore intersections uncovered to date are associated with higher than normal amounts of magnetite, and magnetometer anomalies have been the most favouravle zones for investigation.

The underground work has shown that the ore is a clearly recognizable rock; however because it occurs as a matrix in a breccia zone, it has assay walls (allrock fragments of Syenite Gneiss are waste).

*(Providing ore outlines 25' on either side of ore areas on section)?

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The ore zone has been nearly completely drilled to a depth of 700'. There is an indicated tonnage of 1,821,290 tons at a grade of .056% U_3O_8 and .81% Cb_2O_5 between the 300' level and an average depth of 700'. i.e. 4,560 tons per vertical foot below the 300 foot level.

Of the total tonnage developed to date 903,170 tons consists of the Basic Silicate, Ferromagnesian Feldspar type of ore. The grade of this material is .062% U_3O_8 and 0.78% Cb_2O_5.

A considerable part of the wider sections of ore is above mine grade, and it is possible that substantial units of ore might be outlined at grades up to 1% Cb_2O_5. In the figures included in the appendix, 617,650 tons averages .077(?) U_3O_8 and .92% Cb_2O_5.

One of the major considerations in arriving at an estimate of the columbium content of the Beaucage ore has been assaying. In the early stages of the operation, duplicate analysis sent to different assay laboratories and duplicates sent to the same laboratory, did not check. To improve this situation and reduce the cost of analysis the Geology Department of McGill University developed an X-Ray Fluorescent method of columbium analysis. Repeated checks by rerunning splits of original samples produced consistant results and the McGill results were chosen as a standard. Subsequent checks with later methods developed by the United States Geological Survey and the Canadian Geological Survey indicated that the McGill results were lower by 15-24%. With the

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Up until March 9, 1956 X-Ray Assay Laboratories results were reduced by 15% to equate them with checks at McGill.

Thus the results listed on all development plans, sections, and reports to date including those listed in this report are probably low by 15%*. A list of check analysis is included in the appendix.

All Beaucage analysis are presently conducted in our own labs, by a colorimetric method; the results are standardized on McGill plus 15%.

Uranium check analysis suggest that the Beaucage uranium assaying may be gigh by 5%.

The average grade of the ore exposed in the underground development completed to date, as indicated by muck samples is .04% U_3O_8 0.51% Cb_2O_5, as indicated by face samples is .04% U_3O_8 .63% Cb_2O_5 (15% above standard of foregoing figures). The calculated grade of this material on diamond drill sections is .05% U_3O_8 and 175% Cb_2O_5. It appears that the grade of the

*Exception 1955 Beaucage Mines Limited Annual Report Radiometric Method.

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* Exception 1955 Beaucage Mines Limited Annual Report

[illegible] method.
RADIOMETRIC METHOD.

ore removed to date is about 28% lower than calculated grade (though only 13% lower in absolute Cb_2O_5 content). This is not due to wall rock dilution, but apparently is a result of geometric difficulties in relating diamond drill hole results, in a brecciated rock, to actual grade of rock in place; especially in narrow sections of ore which have been developed to date.

Big Manitou Island Ore Zone

During the summer season of 1953, some 40 diamond drill holes were drilled along a broad zone of radioactivity on the south west arm of Big Manitou Island. Most of the holes intersected at least 5 feet of material grading more than .10% U_3O_8 or .40% Cb_2O_5; however these intersections were scattered and are not part of a continuous mass of ore. An exception to this was found at the south end of the zone where some 20 short vertical holes, at 50' centres, indicated 27,000 tons of ore grading .104% U_3O_8, .38% Cb_2O_5, and 10% P_2O_5. This ore is at the surface and could be easily removed. It is interesting to note the high uranium ratio on this island.

Rankin Ore Zone

Three diamond drill holes, at 200' intervals have been drilled in the area just north of Rankin Island. These holes were 437',495 and 679' in length and averaged .01% U_3O_8 and .33% Cb_2O_5 for their combined total lengths. As these holes were drilled at-55°, and the ore on the Beaucage property is believed to dip steeply, they indicate a major tonnage of low grade material. These holes also have correlateable intersections of rock grading .01% U_3O_8 and .60 - 1.00% Cb_2O_5. This is the high carbonate type of ore shown in table 2, p.18. The pyrochlore is associated with concentrations of apatite.

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This area of ore is of considerable importance, since it lies along the shortest distance from the Newman Ore Zone to Rankin Island where an ideal second opening to the underground workings sould be located.

North-east of this ore, and 1500' due east of the Newman ore bodies is another important magnetic anomaly, as yet not drilled, which probably contains important columbium reserves.

Calder Island

Nineteen diamond drill holes were drilled on Calder Island in the spring of 1953. Carbonate, and Syenite Gneiss rocks were intersected, but with only widely scattered, low values, in columbium and uranium.

ORIGIN

The Beaucage columbium-uranium deposits re believed to be hydrothermal deposits connected with contact metasomatism of soda-iron rich intrusives. The matamorphic grade of the Syenite Gneiss suggests that the locus of the most intense alteration is in the vicinity of the centre of the Manitou Islands.

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In regions of intense repeated brecciation of the Syenite Gneiss, Basic Silicate Rock was formed by squeezing in of adjacent LImestone, and alteration of the breccia zone by solution rich in soda, iron, phosphorus, columbium, uranium, titanium, zinconium, and fluorine.

The inferred paragenisis of the ore is shown in figure II. Acmite, calcite and feldspar are the earliest minerals in the ore. The acmite has been subsequently partially altered to arfvedsonite and biotite. Biotite also replaced feldspar. Next in the sequence is apatite and honey yellow columbium pyrochlore. Apparently the first stage of pyrochlore is uranium free. This followed, perhaps in part simultaneously, by dark uranian-pyrochlore(notedark borders and dark stringers in pyrochlore in uranium-bearing rock). This phase is closely followed by deposition of iron oxides and iron sulphides. The last stage is late calcite as blob-like replacements and narrow dykes or veins.

Recommendations

The Beaucage columbium-uranium deposit is one of numerous reported deposits containing exceptional quantitites of columbium. Some of these are located at Oka, Province of Quebec; Nemagos, Province of Ontario; Mountain Pass, California; Magnet Cove, Arkansas; Manono, Belgium Congo; Panda Hill, Tanganyika;

stone was recrystallized, mobalized, and partially replaced by acmite, biotite, apatite, and magnetite.

In regions of intense repeated brecciation of the Syenite Gneiss, Basic Silicate Rock was formed by squeezing in of adjacent limestone, and alteration of the breccia zone by solution rich in soda, iron, phosphorus, columbium, uranium, titanium, zirconium, and fluorine.

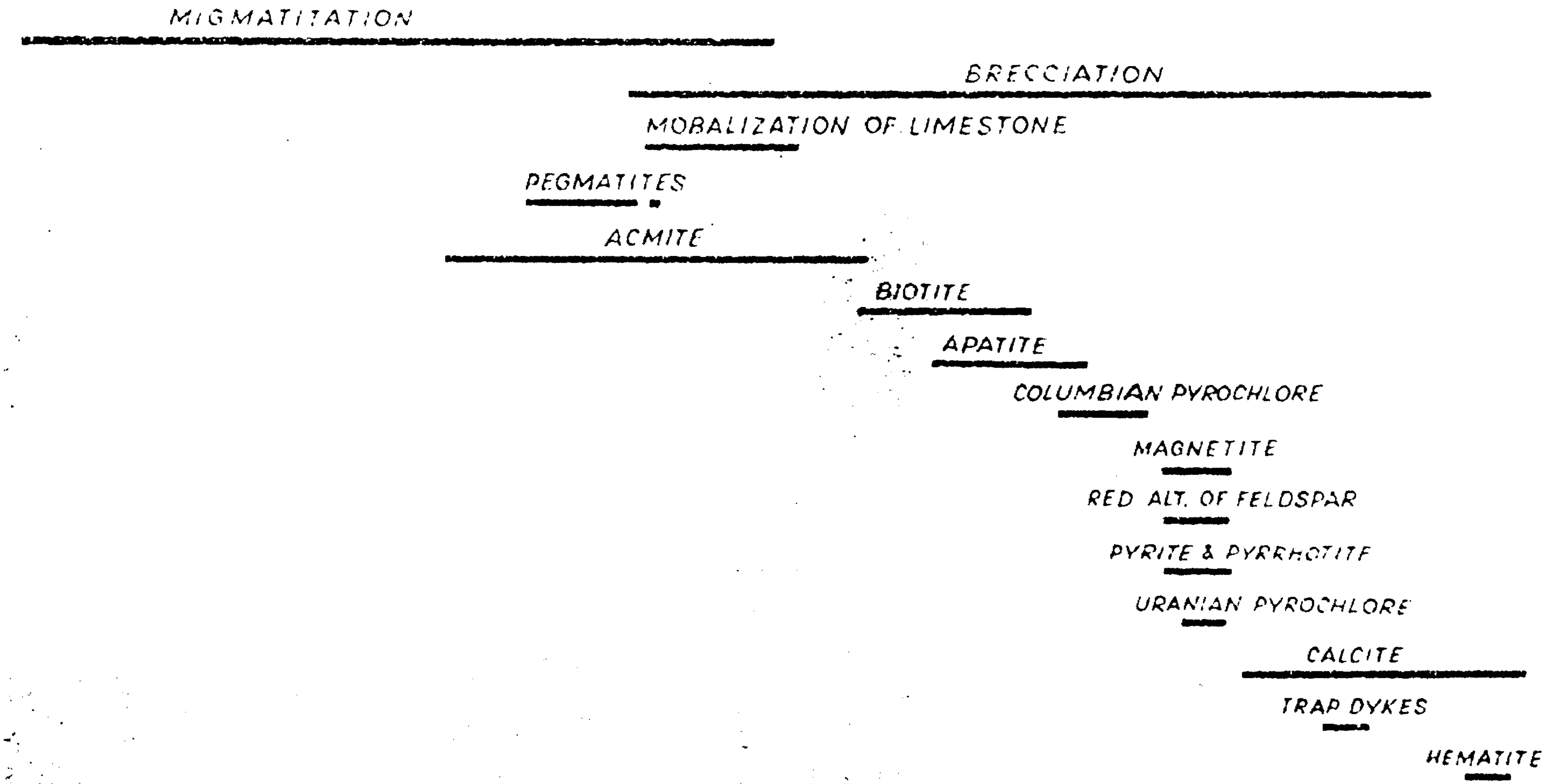
The inferred paragenisis of the ore is shown in figure II. Acmite, calcite and feldspar are the earliest minerals in the ore. The acmite has been subsequently partially altered to arfvedsonite and biotite. Biotite also replaced feldspar. Next in the sequence is apatite and honey yellow columbium pyrochlore. Apparently the first stage of pyrochlore is uranium free. This followed, perhaps in part simultaneously, by dark uranian-pyrochlore (note dark borders and dark stringers in pyrochlore in uranium bearing rock). This phase is closely followed by deposition of iron oxides and iron sulphides. The last stage is late calcite as blob-like replacements and narrow dykes or veins.

INTERPRETATIONS

The Beaucage columbium-uranium deposit is one of the few reported deposits containing exceptional quantities of columbium. Some of these are located at Oka, Province of Quebec; [illegible], Province of Ontario; Mountain Pass, California; Magnet Cove, Arkansas; Manono, Belgium Congo; Panda Hill, Tanganyika;

FIGURE II

PARAGENESIS OF BEAUCAGE ORE



Mrima Hill, Kenya; Sukulu, Uganada; Chilwa Island, Southern Nyasaland; Tundulu, Nyasaland, Tororo Uganda; Kola Peninsula Russia, and some granites of Nigeria.

From the limited information avaialbel to date it appears that the Beaucage, Newman Island deposit is higher in grade than the fore mentioned deposits, and is the only one with any significant amount of underground development. Also indications in the Rankin island area suggest that Beaucage has a major tonnage of low grade material.

Themineralogy of the Beaucage deposit may turn out to be its most significant feature. The only ore material found in the extensive studies to date is pyrochlore. The pyrochlore is tantalum free. It contains upto 10% uranium, but no thorium, nor are any rare earths present in the deposit. Information released by other columbium properties suggests that Beaucage may be unique in having such simple mineralogy. This mono mineralistic ore, without other rare earths simplifies the metallurgical picture (relative to other potential producers), and may enable production, of a relatively pure columbium metal, to be undertaken at a considerably lower cost than other properties.

With this view in mind it is important to examine the metallurgical details of the different types of ores and studies should not be conducted only on one type of ore from one localityin the ore zone.

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With this view in mind it is important to examine the metallurgical details of the different types of ores and tests should not be conducted only on one type of ore from one locality in the ore zone.

The discrepancy between calculated grade and grade mined, in the narrow sections of the ore mined on the 400 feet level, points out the need for further underground development, at deeper levels, in the wider sections of ore, to ascertain more closely actual grade of rock which may be obtained. It seems likely thta the wider sections of ore will average closer to calculated grade.

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APPENDIX

APPENDIX

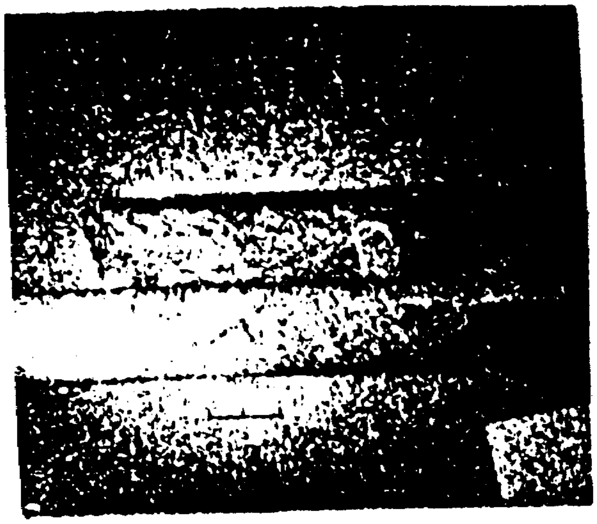


Photo #1 - Diamond Drill cores of Granite Gneiss. Note acmite stringer in large section of core, and brecciated nature of smaller core.

Photo #2 - Diamond drill core of a Syenite Gneiss series across the ore zone from south (right) to north (left).

Photo #3 - Handspecimen Laminated Carbonate

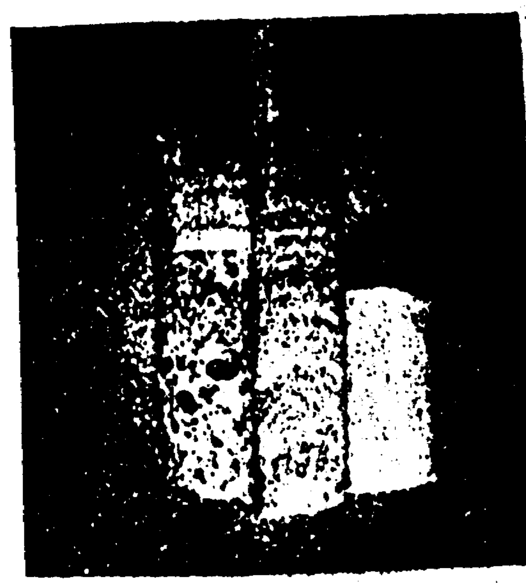


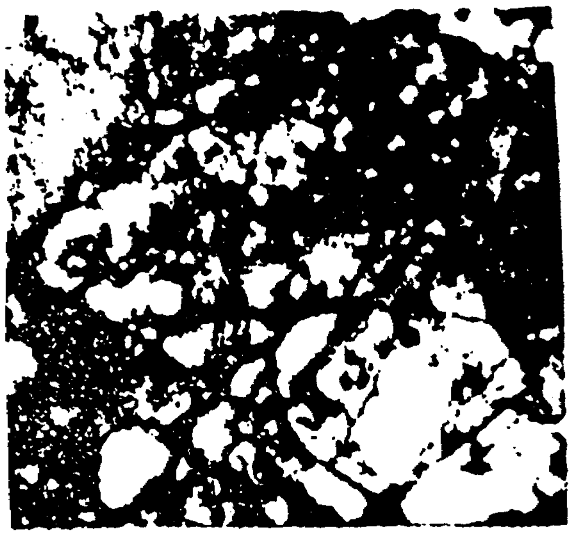
Photo #4 - Diamond Drill cores of White Carbonate (right) Laminated Carbonate (centre) Carbonate Porphyroblasts Acmite &Biotite (left)

Photo #5 Handspeciman
Basic Silicate Rock
Ferromagnesian Calcite type.

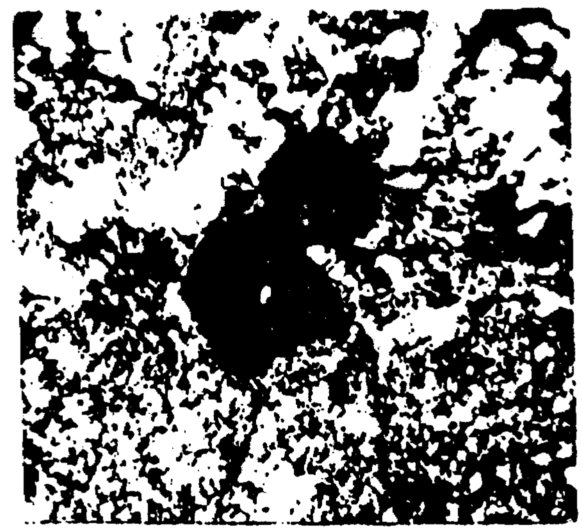
Photo #6 - Diamond Drill cores Basic Silicate Rock Ferromagnesiam Calcite type (top) Ferromagnesian Feldspar type (bottom)

Photo #7 Diamond Drill core. Basic Silicate Rock. Ferromagnesian Calcite type with breccia fragments of pink Syenite Gneiss.

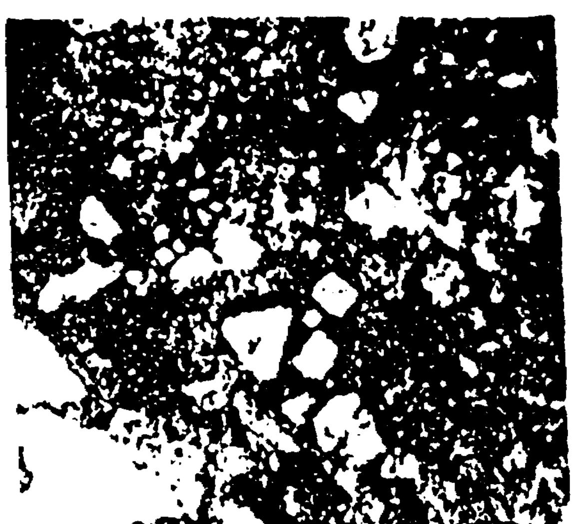
Photomicrograph #8
Basic Silicate Rock
Ferromagnesian Calcite
Type, x 65, ordinary light
Acmite (a) Apatite (ap)
Calcite (c) Pyrochlore (p)



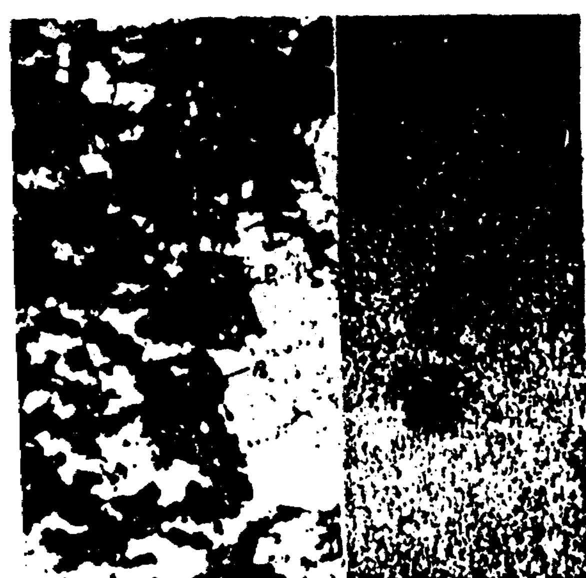
Photomicrograph #9
Pyrochlore grain, x 65
Ordinary light. Note dark
stringers cutting clear pyrochlore.



Photomicrograph #10
Two dark pyrochlore
grains in Basic Silicate
matrix. x 65, ordinary light.



Photomicrograph #11
Clear pyrochlore grains (p)
in Basic Silicate matrix
x 50, ordinary light



Photomicrograph #12
Pyrochlore grains with offset
nuclear track plate showing
alpha track pattern corres-
ponding to dark section of
pyrochlore grains

TOTAL TONNAGE NEWMAN ZONE

SECTION	AREA	TONS	%U_3O	%Cb_2O	TONS x %U_3O	TONS x %Cb_2O
5190E	A	17,770	.014	.66	248.78	11,728.20
	B	22,220	.014	.85	311.09	17.887.00
5240E	A	8,300	.011	.81	91.30	6,723.00
	D	6,250	.013	.56	81.25	3,500.00
	E	48,800	.025	.87	1,220.00	42,456.00
	F	3,680	.023	.68	84.64	2,502.40
	G	12,000	.062	.76	744.00	9,120.00
	H	28,500	.03	.58	855.00	16,530.00
5290E	A	14,000	.038	.99	532.00	13,860.00
	B	33,800	.077	.94	2,602.60	31,772.00
	C	22,500	.057	.60	1,282.50	13,500.00
	D	15,750	.074	.75	1,165.40	11,812.50
	F	70,800	.06	.70	4,248.00	49,560.00
5240E	A	25,200	.06	.61	1,512.00	15,372.00
	B	20,000	.07	.66	1,400.00	13,200.00
	C	102,000	.041	.69	4,182.00	70,380.00
	D	22,020	.046	.66	1,012.92	14,533.20
	E	10,800	.05	.64	540.00	6,912.00
	F	16,600	.035	.69	581.00	11,454.00
	G	32,600	.055	.82	1,793.00	26,732.00
	H	8,000	.038	.58	304.00	4,640.00
	I	8,000	.035	.55	280.00	4,400.00
	J	36,000	.075	.81	2,700.00	29,160.00
	K	222,000	.063	.81	13,986.00	179.820.00
	L	30,600	.066	.64	2,019.60	19,584.00
5390E	A	23,400	.073	.68	1,708.20	15,912.00
	B	14,000	.057	.80	798.00	11,200.00
	C	137,500	.097	1.15	13,337.50	158,125.00
5440E	A	50,400	.075	.64	3,780.00	34,776.00
	B	10,000	.056	.69	560.00	6,900.00
	D	42,700	.08	.72	3,416.00	30,744.00
	E	33,200	.055	.56	1,826.00	18,592.00
	F	53,300	.086	1.04	4,583.80	55,432.00
	I	39,100	.066	.92	2,580.60	35,972.00
5490E	A	14,000	.01	.63	140.00	8,820.00
	B	19,000	.012	.82	228.00	15,580.00
	C	44,000	.034	.73	1,496.00	32,120.00
	D	31,000	.11	1.07	3,410.00	33,170.00
	E	9,000	.071	.77	639.00	6,930.00
5540E	A	24,300	.061	.76	1,482.30	20,403.00
	B	13,850	.14	1.21	1,939.00	16,758.50
	C	14,400	.107	1.11	1,540.80	15,984.00

cont'd...

TOTAL TONNAGE NEWMAN ZONE

SECTION	AREA	TONS	%U_3O_8	%Cb_2O_5	Tons x %U_3O_8	Tons x %Cb_2O_5
5190E	A	17,770	.014	.66	248.78	11,728.20
	B	22,220	.014	.85	311.09	18,887.00
5240E	A	8,300	.011	.81	91.30	6,723.00
	D	6,250	.013	.56	81.25	3,500.00
	E	48,800	.025	.87	1,220.00	42,456.00
	F	3,680	.023	.68	84.64	2,502.40
	G	12,000	.062	.76	744.00	9,120.00
	H	28,500	.03	.58	855.00	16,530.00
5290E	A	14,000	.038	.99	532.00	13,860.00
	B	33,800	.077	.94	2,602.60	31,772.00
	C	22,500	.057	.60	1,282.50	13,500.00
	D	15,750	.074	.75	1,165.50	11,812.50
	F	70,800	.06	.70	4,248.00	49,560.00
5340E	A	25,200	.06	.61	1,512.00	15,372.00
	B	20,000	.07	.66	1,400.00	13,200.00
	C	102,000	.041	.69	4,182.00	70,380.00
	D	22,020	.046	.66	1,012.92	14,533.20
	E	10,800	.05	.64	540.00	6,912.00
	F	16,600	.035	.69	581.00	11,454.00
	G	32,600	.055	.82	1,793.00	26,732.00
	H	8,000	.038	.58	304.00	4,640.00
	I	8,000	.035	.55	280.00	4,400.00
	J	36,000	.075	.81	2,700.00	29,160.00
	K	222,000	.063	.81	13,986.00	179,820.00
	L	30,600	.066	.64	2,019.60	19,584.00
5390E	A	23,400	.073	.68	1,708.20	15,912.00
	B	14,000	.057	.80	798.00	11,200.00
	C	137,500	.097	1.15	13,337.50	158,125.00
5440E	A	50,400	.075	.64	3,780.00	34,776.00
	B	10,000	.056	.69	560.00	6,900.00
	D	42,700	.08	.72	3,416.00	30,744.00
	E	33,200	.055	.56	1,826.00	18,592.00
	F	53,300	.086	1.04	4,583.80	55,432.00
	I	39,100	.066	.92	2,580.60	35,972.00
5490E	A	14,000	.01	.63	140.00	8,820.00
	B	19,000	.012	.82	228.00	15,580.00
	C	44,000	.034	.73	1,496.00	32,120.00
	D	31,000	.11	1.07	3,410.00	33,170.00
	E	9,000	.071	.77	639.00	6,930.00
5540E	A	24,300	.061	.76	1,482.30	20,403.00
	B	13,850	.14	1.21	1,939.00	16,758.50
	C	14,400	.107	1.11	1,540.80	15,984.00

Cont'd

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	TONS x $\%U_3O_8$	TONS x $\%Cb_2O_5$
5590E	A	23,000	.054	.52	1,242.00	11,960.00
5640E	A	10,200	.085	.41	867.00	4,182.00
	B	7,150	.058	1.29	414.70	9,223.50
	C	15,600	.045	1.22	702.00	19,032.00
5690E	A	17,000	.045	.60	765.00	10,200.00
	B	9,500	.05	.51	475.00	4,845.00
5740E	A	36,000	.01	1.31	360.00	47,160.00
	B	90,000	.01	.54	900.00	48,600.00
	C	58,800	.037	.91	2,175.60	53,508.00
	D	68,000	.05	.71	3,400.00	48,280.00
	E	142,000	.066	.62	9,372.00	88,040.00
	F	120,200	.063	.78	7,572.60	93,756.00
	G	144,000	.055	.71	7,920.00	102,240.00
	H	35,070	.04	.60	1,402.80	21,042.00
5790E	A	12,500	.054	.80	675.00	10,000.00
5840E	A	16,500	.031	.89	511.50	14,685.00
	B	19,600	.077	1.16	1,509.20	22,736.00
5890E	A	35,000	.052	1.00	1,820.00	35,000.00
5940E	A	52,000	.015	.75	780.00	39,000.00
	B	79,600	.044	.61	3,502.40	48,556.00
	C	17,250	.04	.70	690.00	12,075.00
	D	22,800	.007	.56	159.60	12,768.00
6140E	A	57,000	.01	.93	570.00	53,010.00
	B	36,000	.02	.86	720.00	30,960.00
TOTAL		2,536,110	.053	.77	135,748.78	1,986,415.30

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	Tons x $\%U_3O_8$	Tons x $\%Cb_2O_5$
5590E	A	23,000	.054	.52	1,242.00	11,960.00
5640E	A	10,200	.085	.41	867.00	4,182.00
	B	7,150	.058	1.29	414.70	9,223.50
	C	15,600	.045	1.22	702.00	19,032.00
5690E	A	17,000	.045	.60	765.00	10,200.00
	B	9,500	.05	.51	475.00	4,845.00
5740E	A	36,000	.01	1.31	360.00	47,160.00
	B	90,000	.01	.54	900.00	48,600.00
	C	58,800	.037	.91	2,175.60	53,508.00
	D	68,000	.05	.71	3,400.00	48,280.00
	E	142,000	.066	.62	9,372.00	88,040.00
	F	120,200	.063	.78	7,572.60	93,756.00
	G	144,000	.055	.71	7,920.00	102,240.00
	H	35,070	.04	.60	1,402.80	21,042.00
5790E	A	12,500	.054	.80	675.00	10,000.00
5840E	A	16,500	.031	.89	511.50	14,685.00
	B	19,600	.077	1.16	1,509.20	22,736.00
5890E	A	35,000	.052	1.00	1,820.00	35,000.00
5940E	A	52,000	.015	.75	780.00	39,000.00
	B	79,600	.044	.61	3,502.40	48,556.00
	C	17,250	.04	.70	690.00	12,075.00
	D	22,800	.007	.56	159.60	12,768.00
6140E	A	57,000	.01	.93	570.00	53,010.00
	B	36,000	.02	.86	720.00	30,960.00
TOTAL		2,536,110	.053	.77	135,748.78	1,986,415.30

TONNAGE BETWEEN 300' - 700' LEVEL
NEWMAN ZONE

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	Tons x $\%U_3O_8$	Tons x $\%Cb_2O_5$
5190E	A	17,770	.014	.66	248.78	11,728.20
	B	22,220	.014	.85	311.09	18,887.00
5240E	A	8,300	.011	.81	91.30	6,723.00
	D	6,250	.013	.56	81.25	3,500.00
	E	48,800	.025	.87	1,220.00	42,456.00
	F	3,680	.023	.68	84.64	2,502.40
	G	12,000	.062	.76	744.00	9,120.00
	H	28,500	.03	.58	855.00	16,530.00
5290E	A	14,000	.038	.99	532.00	13,860.00
	B	33,800	.077	.94	2,602.60	31,772.00
	C	22,500	.057	.60	1,282.50	13,500.00
	D	15,750	.074	.75	1,165.50	11,812.50
	F	70,800	.06	.70	4,248.00	49,560.00
5340E	A	25,200	.06	.61	1,512.00	15,372.00
	E	10,800	.05	.64	540.00	6,912.00
	F	16,600	.035	.69	581.00	11,454.00
	G	32,600	.055	.82	1,793.00	26,732.00
	H	8,000	.038	.58	304.00	4,640.00
	I	8,000	.035	.55	280.00	4,400.00
	J	36,000	.075	.81	2,700.00	29,160.00
	K	222,000	.063	.81	13,986.00	179,820.00
	L	30,600	.066	.64	2,019.60	19,584.00
5390E	A	23,400	.073	.68	1,708.20	15,912.00
	B	14,000	.057	.80	798.00	11,200.00
	C	137,500	.097	1.15	13,337.50	158,125.00
5440E	F	53,300	.086	1.04	4,583.80	55,432.00
	I	39,100	.066	.92	2,580.60	35,972.00
5490E	A	14,000	.01	.63	140.00	8,820.00
	B	19,000	.012	.82	228.00	15,580.00
	C	44,000	.034	.73	1,496.00	32,120.00
	D	31,000	.11	1.07	3,410.00	33,170.00
	E	9,000	.07	.77	639.00	6,930.00
5540E	C	14,400	.107	1.11	1,540.30	15,984.00
5590E	A	23,000	.054	.52	1,242.00	11,960.00
5640E	C	15,600	.045	1.22	702.00	19,032.00

cont'd....

TONNAGE BETWEEN 300' - 700' LEVEL
NEWMAN ZONE

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	TONS x $\%U_3O_8$	TONS x $\%Cb_2O_5$
5190E	A	17,770	.014	.66	248.78	11,728.20
	B	22,220	.014	.85	311.09	18,887.00
5240E	A	8,300	.011	.81	91.30	6,723.00
	D	6,250	.013	.56	81.25	3,500.00
	E	48,800	.025	.87	1,220.00	42,456.00
	F	3,680	.023	.68	84.64	2,502.40
	G	12,000	.062	.76	744.00	9,120.00
	H	28,500	.03	.58	855.00	16,530.00
5290E	A	14,000	.038	.99	532.00	13,860.00
	B	33,800	.077	.94	2,602.60	31,772.00
	C	22,500	.057	.60	1,282.50	13,500.00
	D	15,750	.074	.7[illegible]	1,165.50	11,812.50
	F	70,800	.06	.[illegible]	4,248.00	49,560.00
5340E	A	25,200	.06	.61	1,512.00	15,372.00
	E	10,800	.05	.64	540.00	6,912.00
	F	16,600	.035	.69	581.00	11,454.00
	G	32,600	.055	.82	1,793.00	26,732.00
	H	8,000	.038	.58	304.00	4,640.00
	I	8,000	.035	.55	280.00	4,400.00
	J	36,000	.075	.81	2,700.00	29,160.00
	K	222,000	.063	.81	13,986.00	179,820.00
	L	30,600	.066	.64	2,019.60	19,584.00
5390E	A	23,400	.073	.68	1,708.20	15,912.00
	B	14,000	.057	.80	798.00	11,200.00
	C	137,500	.097	1.15	13,337.50	158,125.00
5440E	F	53,300	.086	1.04	4,583.80	55,432.00
	I	39,100	.066	.92	2,580.60	35,972.00
5490E	A	14,000	.01	.63	140.00	8,820.00
	B	19,000	.012	.82	228.00	15,580.00
	C	44,000	.034	.73	1,496.00	32,120.00
	D	31,000	.11	1.07	3,410.00	33,170.00
	E	9,000	.07	.77	639.00	6,930.00
5540E	C	14,400	.107	1.11	1,540.80	15,984.00
5590E	A	23,000	.054	.52	1,242.00	11,960.00
5640E	C	15,600	.045	1.22	702,00	19,032.00

Cont'd

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	Tons x $\%U_3O_8$	Tons x $\%Cb_2O_5$
5690E	A	17,000	.045	.60	765.00	10,200.00
	B	9,500	.05	.51	475.00	4,845.00
5740E	A	36,000	.01	1.31	360.00	47,160.00
	B	90,000	.01	.54	900.00	48,600.00
	D	68,000	.05	.71	3,400.00	48,280.00
	F	120,200	.063	.78	7,572.60	93,756.00
	G	144,000	.055	.71	7,920.00	102,240.00
	H	35,070	.04	.60	1,402.80	21,042.00
5790E	A	12,500	.054	.80	675.00	10,000.00
5840E	A	16,500	.031	.89	511.50	14,685.00
	B	19,600	.077	1.16	1,509.20	22,736.00
5890E	A	35,000	.052	1.00	1,820.00	35,000.00
5940E	C	17,250	.04	.70	690.00	12,075.00
6140E	B	36,000	.02	.86	720.00	30,960.00
TOTAL		1,821,290	.055	.81	100,026.06	1,470,432.10

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	Tons x $\%U_3O_8$	Tons x $\%Cb_2O_5$
5690E	A	17,000	.045	.60	765.00	10,200.00
	B	9,500	.05	.51	475.00	4,845.00
5740E	A	36,000	.01	1.31	360.00	47,160.00
	B	90,000	.01	.54	900.00	48,600.00
	D	68,000	.05	.71	3,400.00	48,280.00
	F	120,200	.063	.78	7,572.60	93,756.00
	G	144,000	.055	.71	7,920.00	102,240.00
	H	35,070	.04	.60	1,402.80	21,042.00
5790E	A	12,500	.054	.80	675.00	10,000.00
5840E	A	16,500	.031	.89	511.50	14,685.00
	B	19,600	.077	1.16	1,509.20	22,736.00
5890E	A	35,000	.052	1.00	1,820.00	35,000.00
5940E	C	17,250	.04	.70	690.00	12,075.00
6140E	B	36,000	.02	.86	720.00	30,960.00
TOTAL		1,821,290	.055	.81	100,026.06	1,470,432.10

TONS BASIC SILICATE ROCK FERROMAGNESIAN FELDSPAR TYPE

SECTION	AREA	TONS	%U_3O_8	%Cb_2O_5	Tons x %U_3O_8	Tons x %Cb_2O_5
5240E	G	12,000	.062	.76	744.00	9,120.00
	H	28,500	.03	.58	855.00	16,530.00
5290E	B	33,800	.077	.94	2,602.60	31,772.00
	C	22,500	.057	.60	1,282.50	13,500.00
	D	15,750	.074	.75	1,165.50	11,812.50
	F	70,800	.06	.70	4,248.00	49,560.00
5340E	G	32,600	.055	.82	1,793.00	26,732.00
	H	8,000	.038	.58	304.00	4,640.00
	I	8,000	.035	.55	280.00	4,400.00
	J	36,000	.075	.81	2,700.00	29,160.00
	K	222,000	.063	.81	13,986.00	179,820.00
	L	30,600	.066	.64	2,019.60	19,584.00
5390E	C	68,700	.097	1.15	6,664.20	79,062.00
5440E	I	39,100	.066	.92	2,580.60	35,972.00
5490E	E	9,000	.071	.77	639.00	6,930.00
5690E	B	9,500	.05	.51	475.00	4,845.00
5740E	G	144,000	.055	.71	7,920.00	102,240.00
	F	60,000	.063	.78	3,780.00	46,800.00
	H	35,070	.04	.60	1,402.80	21,042.00
5940E	G	17,250	.04	.70	690.00	12,075.00
TOTAL		903,170	.062	.78	56,131.80	705,596.50

TONS BASIC SILICATE ROCK FERROMAGNESIAN FELDSPAR TYPE

SECTION	AREA	TONS	%U308	%Cb205	Tons x %U308	Tons x %Cb205
5240E	G	12,000	.062	.76	744.00	9,120.00
	H	28,500	.03	.58	855.00	16,530.00
5290E	B	33,800	.077	.94	2,602.60	31,772.00
	C	22,500	.057	.60	1,282.50	13,500.00
	D	15,750	.074	.75	1,165.50	11,812.50
	F	70,800	.06	.70	4,248.00	49,560.00
5340E	G	32,600	.055	.82	1,793.00	26,732.00
	H	8,000	.038	.58	304.00	4,640.00
	I	8,000	.035	.55	280.00	4,400.00
	J	36,000	.075	.81	2,700.00	29,160.00
	K	222,000	.063	.81	13,986.00	179,820.00
	L	30,600	.066	.64	2,019.60	19,584.00
5390E	C	68,700	.097	1.15	6,664.20	79,062.00
5440E	I	39,100	.066	.92	2,580.60	35,972.00
5490E	E	9,000	.071	.77	639.00	6,930.00
5690E	B	9,500	.05	.51	475.00	4,845.00
5740E	G	144,000	.055	.71	7,920.00	102,240.00
	F	60,000	.063	.78	3,780.00	46,800.00
	H	35,070	.04	.60	1,402.80	21,042.00
5940E	C	17,250	.04	.70	690.00	12,075.00
TOTAL		903,170	.062	.78	56,131.80	705,596.50

TONNAGE "HIGH GRADE" SECTION NEWMAN ZONE

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	Tons x $\%U_3O_8$	Tons x $\%Cb_2O_5$
5290E	B	33,800	.077	.94	2,602.60	31,772.00
	D	15,750	.074	.75	1,165.50	11,812.00
	F	70,800	.06	.70	4,248.00	49,560.00
5340E	K	222,000	.063	.81	13,986.00	179,820.00
5390E	C	137.500	.097	1.15	13,337.50	158,125.00
5440E	F	53,300	.086	1.04	4,583.80	55,432.00
	I	39,100	.066	.92	2,580.60	35,972.00
5490E	D	31,000	.11	1.07	3,410.00	33,170.00
5540E	C	14,400	.107	1.11	1,540.80	15,984.00
5640E	C	15,600	.045	1.22	702.00	19,032.00
5840E	A	16,500	.031	.89	511.50	14,685.00
	B	19,600	.077	1.16	1,509.20	22,736.00
5890E	A	35,000	.052	1.00	1,820.00	35,000.00
6140E	B	36,000	.0	.86	720.00	30,960.00
TOTAL		740,350	.071	.94	52,717.50	694,060.00

TONNAGE "HIGH GRADE" SECTION NEWMAN ZONE

SECTION	AREA	TONS	$\%U_3O_8$	$\%Cb_2O_5$	TONS x $\%U_3O_{8_N}$	TONS x $\%Cb_2O_5$
5290E	B	33,800	.077	.94	2,602.60	31,772.00
	D	15,750	.074	.75	1,165.50	11,812.00
	F	70,800	.06	.70	4,248.00	49,560.00
5340E	K	222,000	.063	.81	13,986.00	179,820.00
5390E	C	137,500	.097	1.15	13,337.50	158,125.00
5440E	F	53,300	.086	1.04	4,583.80	55,432.00
	I	39,100	.066	.92	2,580.60	35,972.00
5490E	D	31,000	.11	1.07	3,410.00	33,170.00
5540E	C	14,400	.107	1.11	1,540.80	15,984.00
5640E	C	15,600	.045	1.22	702.00	19,032.00
5840E	A	16,500	.031	.89	511.50	14,685.00
	B	19,600	.077	1.16	1,509.20	22,736.00
5890E	A	35,000	.052	1.00	1,820.00	35,000.00
6140E	B	36,000	.0	.86	720.00	30,960.00
TOTAL		740,350	.071	.94	52,717.50	694,060.00

Section 5190E		D.D.Hs. U16, U20
Area A	average grade	.014% $U^{3}O8$ and $Cb^{2}O5$
	true width	27'
	assumed depth	131'
	assumed length	50'
	Tons 17,770 @	.014% $U^{3}O8$ and .66% $Cb^{2}O5$
Area B	average grade	.014% $U^{3}O8$ and .85% $Cb^{2}O5$
	true width	34'
	assumed depth	131'
	assumed length	50'
	Tons 22,200 @	.014% and .85%

[illegible]		D. D. H.'s U16,U20
Area A	average grade	.014% U_3O_8 & .66% Cb_2O_5
	true width	27'
	assumed depth	131'
	assumed length	50'
	Tons 17,770 @	.014% U_3O_8 & .66% Cb_2O_5
Area B	average grade	.014% U_3O_8 & .85% Cb_2O_5
	true width	34'
	assumed depth	131'
	assumed length	50'
	Tons 22,200 @	.014 & .85

SECTION 5240E		D.D.H's U2, U3, U8, U12, U14, U23
Area A	average grade	.011% U_3O_8 & .81% Cb_2O_5
	true width	20'
	assumed depth	83'
	assumed length	50'
	Tons 8,300 @	.011 & .81
Area D	average grade	.013% U_3O_8 & .56% Cb_2O_5
	true width	25'
	assumed depth	50'
	assumed length	50'
	Tons 6,250 @	.013 & .56
Area E	average grade	$\frac{.012 + .038}{2}$ = .025% U_3O_8 $\frac{.56 + 1.18}{2}$ = .8 % Cb_2O
	true width	$\frac{58 + 65}{2}$ = 61'
	assumed depth	160'
	assumed length	50'
	Tons 48,800 @	.025 & .87
Area F	average grade	.023% U_3O_8 & .68% Cb_2O_5
	true width	21'
	assumed depth	35'
	assumed length	50'
	Tons 3,680 @	.023 & .68
Area H	average grade	.03% U_3O_8 & .58% Cb_2O_5
	true width	38'
	assumed depth	150'
	assumed length	50'
	Tons 28,500 @	.03 & .58
Area G	average grade	.062% U_3O_8 & .76% Cb_2O_5
	true width	24'
	assumed depth	100'
	assumed length	50'
	Tons 12,000 @	.062 & .76

<u>SECTION 5240E</u> — <u>D.D.H.'s U2, U3, U8, U12, U14, U23</u>

Area A	average grade	.011% U_3O_8 & .81% Cb_2O_5
	true width	20'
	assumed depth	83'
	assumed length	50'
	Tons 8,300 @	.011 & .81
Area D	average grade	.013% U_3O_8 & .56% Cb_2O_5
	true width	25'
	assumed depth	50'
	assumed length	50'
	Tons 6,250 @	.013 & .56
Area E	average grade	$\frac{.012 + .038}{2}$ = .025% U_3O_8 $\frac{.56 + 1.18}{2}$ = .8 % Cb_2
	true width	$\frac{58 + 65}{2}$ = 61'
	assumed depth	160'
	assumed length	50'
	Tons 48,800 @	.025 & .87
Area F	average grade	.023% U_3O_8 & .68% Cb_2O_5
	true width	21'
	assumed depth	35'
	assumed length	50'
	Tons 3,680 @	.023 & .68
Area H	average grade	.03% U_3O_8 & .58% Cb_2O_5
	true width	33'
	assumed depth	150'
	assumed length	50'
	Tons 28,500 @	.03 & .58
Area C	average grade	.062% U_3O_8 & .76% Cb_2O_5
	true width	24'
	assumed depth	100'
	assumed length	50'
	Tons 12,000 @	.062 & .76

SECTION 5290E		D.D.H.'s U15, U17, U19, U46		
Area A	average grade	.038% U_3O_8	&	.99% Cb_2O_5
	true width	14'		
	assumed depth	200'		
	assumed length	50'		
	Tons 14,000 @	.038	&	.99
Area B	average grade	.077% U_3O_8	&	.94% Cb_2O_5
	true width	54'		
	assumed depth	125'		
	assumed length	50'		
	Tons 33,800 @	.077	&	.94
Area C	average grade	.057% U_3O_8	&	60% Cb_2O_5
	true width	45'		
	assumed depth	100'		
	assumed length	50'		
	Tons 22,500 @	.057	&	.60
Area D	average grade	.074% U_3O_8	&	.75% Cb_2O_5
	true width	45'		
	assumed depth	70'		
	assumed length	50'		
	Tons 15,750 @	.074	&	.75
Area F	average grade	.06% U_3O_8	&	.70% Cb_2O_5
	true width	86'		
	assumed depth	165'		
	assumed length	50'		
	Tons 70,800 @	.06	&	.70

SECTION 5290E		D.D.H.'s U15, U17, U19, U46		
Area A	average grade	.038% U_3O_8	&	.99% Cb_2O_5
	true width	14'		
	assumed depth	200'		
	assumed length	50'		
	Tons 14,000 @	.038	&	.99
Area B	average grade	.077% U_3O_8	&	.94% Cb_2O_5
	true width	54'		
	assumed depth	125'		
	assumed length	50'		
	Tons 33,800 @	.077	&	.94
Area C	average grade	.057% U_3O_8	&	.60% Cb_2O_5
	true width	45'		
	assumed depth	100'		
	assumed length	50'		
	Tons 22,500 @	.057	&	.60
Area D	average grade	.074% U_3O_8	&	.75% Cb_2O_5
	true width	45'		
	assumed depth	70'		
	assumed length	50'		
	Tons 15,750 @	.074	&	.75
Area F	average grade	.06% U_3O_8	&	.70% Cb_2O_5
	true width	86'		
	assumed depth	165'		
	assumed length	50'		
	Tons 70,800 @	.06	&	.70

SECTION 5342E — D.D.H.'s 9,30,34,U5,U7,U13,U18,U34,NX3

Area A	average grade	.06% U_3O_8	&	.61% Cb_2O_5
	true width	28'		
	assumed depth	180'		
	assumed length	50'		
	Tons 25,200 @	.06	&	.61
Area B	average grade	.07% U_3O_8	&	.66% Cb_2O_5
	true width	20'		
	assumed depth	200'		
	assumed length	50'		
	Tons 20,000 @	.07	&	.66
Area C	average grade	.041% U_3O_8	&	.69% Cb_2O_5
	true width	102'		
	assumed depth	200'		
	assumed length	50'		
	Tons 102,000 @	.041	&	.69
Area D	average grade	.046% U_3O_8	&	.66% Cb_2O_5
	true width	42'		
	assumed depth	105'		
	assumed length	50'		
	Tons 22,020 @	.046	&	.66
Area E	average grade	.05% U_3O_8	&	.64% Cb_2O_5
	true width	54'		
	assumed depth	40'		
	assumed length	50'		
	Tons 10,800 @	.05	&	.64
Area F	average grade	1035% U_3O_8	&	.69% Cb_2O_5
	true width	19'		
	assumed depth	175'		
	assumed length	50'		
	Tons 16,600 @	.035	&	.69
Area G	average grade	.055% U_3O_8	&	.82% Cb_2O_5
	true width	31'		
	assumed depth	210'		
	assumed length	50'		
	Tons 32,600 @	.055	&	.82
Area H	average grade	.038% U_3O_8	&	.58% Cb_2O_5
	true width	8'		
	assumed depth	200'		
	assumed length	50'		
	Tons 8,000 @	.038	&	.58

<u>SECTION 5342E</u> | <u>D.D.H.'s 9,30,34,U5,U7,U13,U18,U34,NX3.</u>

Area A	average grade	.06% U_3O_8	&	.61% Cb_2O_5
	true width	28'		
	assumed depth	180'		
	assumed length	50'		
	Tons 25,200 @	.06	&	.61
Area B	average grade	.07% U_3O_8	&	.66% Cb_2O_5
	true width	20'		
	assumed depth	200'		
	assumed length	50'		
	Tons 20,000 @	.07	&	.66
Area C	average grade	.041% U_3O_8	&	.69% Cb_2O_5
	true width	102'		
	assumed depth	200'		
	assumed length	50'		
	Tons 102,000 @	.041	&	.69
Area D	average grade	.046% U_3O_8	&	.66% Cb_2O_5
	true width	42'		
	assumed depth	105'		
	assumed length	50'		
	Tons 22,020 @	.046	&	.66
Area E	average grade	.05% U_3O_8	&	.64% Cb_2O_5
	true width	54'		
	assumed depth	40'		
	assumed length	50'		
	Tons 10,800 @	.05	&	.64
Area F	average grade	.035% U_3O_8	&	.69% Cb_2O_5
	true width	19'		
	assumed depth	175'		
	assumed length	50'		
	Tons 16,600 @	.035	&	.69
Area G	average grade	.055% U_3O_8	&	.82% Cb_2O_5
	true width	31'		
	assumed depth	210'		
	assumed length	50'		
	Tons 32,600 @	.055	&	.82
Area H	average grade	.038 U_3O_8	&	.58% Cb_2O_5
	true width	8'		
	assumed depth	200'		
	assumed length	50'		
	Tons 8,000 @	.038	&	.58

SECTION 5340E Cont'd — D.D.H.'s 9,30,34,U5,U7,U13,U18,U34,NX3.

Area I	average grade	.035% U_3O_8	&	.55% Cb_2O_5
	true width	8'		
	assumed depth	200'		
	assumed length	50'		
	Tons 8,000 @	.035	&	.55
Area J	average grade	.075% U_3O_8	&	.81% Cb_2O_5
	true width	24'		
	assumed depth	300'		
	assumed length	50'		
	Tons 36,000 @	.075	&	.81
Area K	average grade	.08/3 + .056/3 + .053/3 = .063% U_3O_8		
		.91/3 + .85/3 + .65/3 = .81% Cb_2O_5		
	true width	120'		
	assumed depth	370'		
	assumed length	50'		
	Tons 222,000 @	.063	&	.81
Area L	average grade	.066% U_3O_8	&	.64% Cb_2O_5
	true width	18'		
	assumed depth	340'		
	assumed length	50'		
	Tons 30,600 @	.066	&	.64

SECTION 534 E Cont'd

D.D.H.'s 9,30,34,U5,U7,U13,U18,U34,NX3.

Area I	average grade	.035% U_3O_8	&	.55% Cb_2O_5
	true width	8'		
	assumed depth	200'		
	assumed length	50'		
	Tons 8,000 @	.035	&	.55
Area J	average grade	.075% U_3O_8	&	.81% Cb_2O_5
	true width	24'		
	assumed depth	300'		
	assumed length	50'		
	Tons 36,000 @	.075	&	.81
Area K	average grade	.08/3 + .056/3 + .053/3 = .063% U_3O_8 .91/3 + .85/3 + .65/3 = .81% Cb_2O_5		
	true width	120'		
	assumed depth	370'		
	assumed length	50'		
	Tons 222,000 @	.063	&	.81
Area L	average grade	.066% U_3O_8	&	.64% Cb_2O_5
	true width	18'		
	assumed depth	340'		
	assumed length	50'		
	Tons 30,600 @	.066	&	.64

SECTION 5390E		D.D.H.'s U10, U11, U51		
Area A	average grade	.073% U_3O_8	&	.68% Cb_2O_5
	true width	39'		
	assumed depth	120'		
	assumed length	50'		
	Tons 23,400 @	.073	&	.68
Area B	average grade	.057% U_3O_8	&	.80% Cb_2O_5
	true width	14'		
	assumed depth	200'		
	assumed length	50'		
	Tons 14,000 @	.057	&	.80
Area C	average grade	.097% U_3O_8	&	1.15% Cb_2O_5
	true width	157'		
	assumed depth	175'		
	assumed length	50'		
	Tons 137,500 @	.097	&	1.15

SECTION 5390E — D.D.H.'s U10, U11, U51

Area A	average grade	.073% U_3O_8	&	.68% Cb_2O_5
	true width	39'		
	assumed depth	120'		
	assumed length	50'		
	Tons 23,400 @	.073	&	.68
Area B	average grade	.057% U_3O_8	&	.80% Cb_2O_5
	true width	14'		
	assumed depth	200'		
	assumed length	50'		
	Tons 14,000 @	.057	&	.80
Area C	average grade	.097% U_3O_8	&	1.15% Cb_2O_5
	true width	157'		
	assumed depth	175'		
	assumed length	50'		
	Tons 137,500 @	.097	&	1.15

SECTION 5440E		D.D.H.'s 37, U21, U22, U31, U40	
Area A	average grade	.075% U_3O_8	& .64% Cb_2O_5
	true width	56'	
	assumed depth	180'	
	assumed length	50'	
	Tons 50,400 @	.075	& .64
Area B	average grade	.056% U_3O_8	& .69% Cb_2O_5
	true width	10'	
	assumed depth	200'	
	assumed length	50'	
	Tons 10,000 @	.056	& .69
Area D	average grade	.08% U_3O_8	& .72% Cb_2O_5
	true width	45'	
	assumed width	190'	
	assumed length	50'	
	Tons 42,700 @	.08	& .72
Area E	average grade	.055% U_3O_8	& .56% Cb_2O_5
	true width	51'	
	assumed depth	130'	
	assumed length	50'	
	Tons 33,200 @	.055	& .56
Area F	average grade	.086% U_3O_8	& 1.04 Cb_2O_5
	true width	82'	
	assumed depth	130'	
	assumed length	50'	
	Tons 53,300 @	.086	& 1.04
Area H	average grade	.066% U_3O_8	& .92% Cb_2O_5
	true width	46'	
	assumed depth	170'	
	assumed length	50'	
	Tons 39,100 @	.066	& .92

SECTION 5440E **D.D.H.'s 37, U21, U22, U31, U40**

Area A	average grade	.075% U_3O_8	&	.64% Cb_2O_5
	true width	56'		
	assumed depth	180'		
	assumed length	50'		
	Tons 50,400 @	.075	&	.64
Area B	average grade	.056% U_3O_8	&	.69% Cb_2O_5
	true width	10'		
	assumed depth	200'		
	assumed length	50'		
	Tons 10,000 @	.056	&	.69
Area D	average grade	.08% U_3O_8	&	.72% Cb_2O_5
	true width	45'		
	assumed width	190'		
	assumed length	50'		
	Tons 42,700 @	.08	&	.72
Area E	average grade	.055% U_3O_8	&	.56% Cb_2O_5
	true width	51'		
	assumed depth	130'		
	assumed length	50'		
	Tons 33,200 @	.055	&	.56
Area F	average grade	.086% U_3O_8	&	1.04 Cb_2O_5
	true width	82'		
	assumed depth	130'		
	assumed length	50'		
	Tons 53,300 @	.086	&	1.04
Area H	average grade	.066% U_3O_8	&	.92% Cb_2O_5
	true width	46'		
	assumed depth	170'		
	assumed length	50'		
	Tons 39,100 @	.066	&	.92

SECTION 5440E — **D.D.H.'s 37, U21, U22, U31, U40.**

Area A	average grade	.075% U_3O_8	&	.64% Cb_2O_5
	true width	56'		
	assumed depth	180'		
	assumed length	50'		
	Tons 50,400 @	.075	&	.64
Area B	average grade	.056% U_3O_8	&	.69% Cb_2O_5
	true width	10'		
	assumed depth	200'		
	assumed length	50'		
	Tons 10,000 @	.056	&	.69
Area D	average grade	.08% U_3O_8	&	.72% Cb_2O_5
	true width	45'		
	assumed depth	190'		
	assumed length	50'		
	Tons 42,700 @	.08	&	.72
Area E	average grade	.055% U_3O_8	&	.56% Cb_2O_5
	true width	51'		
	assumed depth	130'		
	assumed length	50'		
	Tons 33,200 @	.055	&	.56
Area F	average grade	.086% U_3O_8	&	1.04% Cb_2O_5
	true width	82'		
	assumed depth	130'		
	assumed length	50'		
	Tons 53,300 @	.086	&	1.04
Area H	average grade	.066% U_3O_8	&	.92% Cb_2O_5
	true width	46'		
	assumed depth	170'		
	assumed length	50'		
	Tons 39,100 @	.066	&	.92

SECTION 5490E		D.D.H.'s U24, U25, U47		
Area A	average grade	.10% U_3O_8	&	.63% Cb_2O_5
	true width	14'		
	assumed depth	200'		
	assumed length	50'		
	Tons 14,000 @	.01	&	.63
Area B	average grade	.012% U_3O_8	&	.82% Cb_2O_5
	true width	19'		
	assumed depth	200'		
	assumed length	50'		
	Tons 19,000 @	.012	&	.82
Area C	average grade	.034% U_3O_8	&	.73% Cb_2O_5
	true width	44'		
	assumed depth	200'		
	assumed length	50'		
	Tons 44,000 @	.034	&	.73
Area D	average grade	.11% U_3O_8	&	1.07% Cb_2O_5
	true width	31'		
	assumed depth	200'		
	assumed length	50'		
	Tons 31,000 @	.11	&	1.07
Area E	average grade	.071% U_3O_8	&	.77% Cb_2O_5
	true width	9'		
	assumed depth	200'		
	assumed length	50'		
	Tons 9,000 @	.071	&	.77

SECTION 5490E D.D.H.'s U24, U25, U47.

Area A	average grade	.01% U_3O_8	&	.63% Cb_2O_5
	true width	14'		
	assumed depth	200'		
	assumed length	50'		
	Tons 14,000 @	.01	&	.63
Area B	average grade	.012% U_3O_8	&	.82% Cb_2O_5
	true width	19'		
	assumed depth	200'		
	assumed length	50'		
	Tons 19,000 @	.012	&	.82
Area C	average grade	.034% U_3O_8	&	.73% Cb_2O_5
	true width	44'		
	assumed depth	200'		
	assumed length	50'		
	Tons 44,000 @	.034	&	.73
Area D	average grade	.11% U_3O_8	&	1.07% Cb_2O_5
	true width	31'		
	assumed depth	200'		
	assumed length	50'		
	Tons 31,000 @	.11	&	1.07
Area E	average grade	.071% U_3O_8	&	.77% Cb_2O_5
	true width	9'		
	assumed depth	200'		
	assumed length	50'		
	Tons 9,000 @	.071	&	.77

SECTION 5540E — D.D.H.'s 13, 16, U29, U30, U42.

Area A	average grade	.061% U_3O_8	&	.70% Cb_2O_5
	true width	32'		
	assumed depth	152'		
	assumed length	50'		
	Tons 24,300 @	.061	&	.70
Area B	average grade	.14% U_3O_8	&	1.21% Cb_2O_5
	true width	21'		
	assumed depth	132'		
	assumed length	50'		
	Tons 13,850 @	.14	&	1.21
Area C	average grade	.107% U_3O_8	&	1.11% Cb_2O_5
	true width	32'		
	assumed depth	90'		
	assumed length	50'		
	Tons 14,400 @	.107	&	1.11

SECTION 5540E | D.D.H.'s 13, 16, U29, U30, U42.

Area A	average grade	.061% U_3O_8	&	.70% Cb_2O_5
	true width	32'		
	assumed depth	152'		
	assumed length	50'		
	Tons 24,300 @	.061	&	.70
Area B	average grade	.14% U_3O_8	&	1.21% Cb_2O_5
	true width	21'		
	assumed depth	132'		
	assumed length	50'		
	Tons 13,850 @	.14	&	1.21
Area C	average grade	.107% U_3O_8	&	1.11% Cb_2O_5
	true width	32'		
	assumed depth	90'		
	assumed length	50'		
	Tons 14,400 @	.107	&	1.11

SECTION 5590E — D.D.H.'s U33.

Area A	average grade	.054% U_3O_8	&	.52% Cb_2O_5
	true width	23'		
	assumed depth	200'		
	assumed length	50'		
	Tons 23,000 @	.054	&	.52

SECTION 5590E **D.D.H's U33.**

Area A	average grade	.054% U_3O_8	&	.52% Cb_2O_5
	true width	23'		
	assumed depth	200'		
	assumed length	50'		
	Tons 23,000 @	.054	&	.52

SECTION 5640E | **D.D.H.'s 33, U32, U35, U41.**

Area A	average grade	.085% U_3O_8	&	.41% Cb_2O_5
	true width	17'		
	assumed depth	120'		
	assumed length	50'		
	Tons 10,200 @	.085	&	.41
Area B	average grade	.058% U_3O_8	&	1.29% Cb_2O_5
	true width	13'		
	assumed depth	110'		
	assumed length	50'		
	Tons 7,150 @	.058	&	1.29
Area C	average grade	.045% U_3O_8	&	1.22% Cb_2O_5
	true width	24'		
	assumed depth	130'		
	assumed length	50'		
	Tons 15,600 @	.045	&	1.22

SECTION 56405 | D.D.H.'s 33, U32, U35, U41.

Area A	average grade	.085% U_3O_8	&	.41% Cb_2O_5
	true width	17'		
	assumed depth	120'		
	assumed length	50'		
	Tons 10,200 @	.085	&	.41
Area B	average grade	.058% U_3O_8	&	1.29% Cb_2O_5
	true width	13'		
	assumed depth	110'		
	assumed length	50'		
	Tons 7,150 @	.058	&	1.29
Area C	average grade	.045% U_3O_8	&	1.22% Cb_2O_5
	true width	24'		
	assumed depth	130'		
	assumed length	50'		
	Tons 15,600 @	.045	&	1.22

SECTION 5690E **D.D.H.'s U37, U38.**

Due to lack of drilling on this section ore intersection used to substantiate masses outlined on Section 5740E. Ore calculated on Section 5740E projected to Section 5690E.

Area A	average grade	.045% U_3O_8	&	.60% Cb_2O_5
	true width	34'		
	assumed depth	200'		
	assumed length	25'		
	Tons 17,000 @	.045	&	.60
Area B	average grade	.05% U_3O_8	&	.51% Cb_2O_5
	true width	19'		
	assumed depth	200'		
	assumed length	25'		
	Tons 9,500 @	.05	&	.51

SECTION 5690E

D.D.H.'s U37, U38.

Due to lack of drilling on this section ore intersection used to substantiate masses outlined on Section 5740E. Ore calculated on Section 5740E projected to Section 5690E.

Area A	average grade	.045% U_3O_8	&	.60% Cb_2O_5
	true width	34'		
	assumed depth	200'		
	assumed length	25'		
	Tons 17,000 @	.045	&	.60
Area B	average grade	.05% U_3O_8	&	.51% Cb_2O_5
	true width	19'		
	assumed depth	200'		
	assumed length	25'		
	Tons 9,500 @	.05	&	.51

SECTION 5740E **D.D.H.'s 15, 18, 20. U43, U44.**

Due to lack of drill holes on adjacent sections, ore masses on this section are projected 50' E & to' W.

Area A	average grade	.01% U_3O_8	&	1.31% Cb_2O_5
	true width	18'		
	assumed depth	200'		
	assumed length	100'		
	Tons 36,000 @	.01	&	1.31
Area B	average grade	.01% U_3O_8	&	.54% Cb_2O_5
	true width	40'		
	assumed depth	225'		
	assumed length	100'		
	Tons 90,000 @	.01	&	.54
Area C	average grade	.037% U_3O_8	&	.91 % Cb_2O_5
	true width	42'		
	assumed depth	140'		
	assumed length	100'		
	Tons 58,800 @	.037	&	.91
Area D	average grade	.05% U_3O_8	&	.71% Cb_2O_5
	true width	40'		
	assumed depth	170'		
	assumed length	100'		
	Tons 68,000 @	.05	&	.71
Area E	average grade	.066% U_3O_8	&	.62% Cb_2O_5
	true width	64'		
	assumed depth	222'		
	assumed length	100'		
	Tons 142,000 @	.066	&	.62
Area F	average grade	.063% U_3O_8	&	.78% Cb_2O_5
	true width	46'		
	assumed depth	262'		
	assumed length	100'		
	Tons 120,200 @	.063	&	.78
Area G	average grade	.055% U_3O_8	&	.71% Cb_2O_5
	true width	54'		
	assumed depth	268'		
	assumed length	100'		
	Tons 144,000 @	.055	&	.71

SECTION 5740E | D.D.H.'s 15, 18, 20, U43, U44.

Due to lack of drill holes on adjacent sections, ore masses on this section are projected 50' E & 50' W.

Area A	average grade	.01% U_3O_8	&	1.31% Cb_2O_5
	true width	18'		
	assumed depth	200'		
	assumed length	100'		
	Tons 36,000 @	.01	&	1.31
Area B	average grade	.01% U_3O_8	&	.54% Cb_2O_5
	true width	40'		
	assumed depth	225'		
	assumed length	100'		
	Tons 90,000 @	.01	&	.54
Area C	average grade	.037% U_3O_8	&	.91% Cb_2O_5
	true width	42'		
	assumed depth	140'		
	assumed length	100'		
	Tons 58,800 @	.037	&	.91
Area D	average grade	.05% U_3O_8	&	.71% Cb_2O_5
	true width	40'		
	assumed depth	170'		
	assumed length	100'		
	Tons 68,000 @	.05	&	.71
Area E	average grade	.066% U_3O_8	&	.62% Cb_2O_5
	true width	64'		
	assumed depth	222'		
	assumed length	100'		
	Tons 142,000 @	.066	&	.62
Area F	average grade	.063% U_3O_8	&	.78% Cb_2O_5
	true width	46'		
	assumed depth	262'		
	assumed length	100'		
	Tons 120,200 @	.063	&	.78
Area G	average grade	.055% U_3O_8	&	.71% Cb_2O_5
	true width	54'		
	assumed depth	268'		
	assumed length	100'		
	Tons 144,000 @	.055	&	.71

SECTION 5740E Cont'd D.D.H.'s15, 18, 20, U43, U44.

Area H	average grade	.04% U_3O_8	&	.60% Cb_2O_5
	true width	21'		
	assumed depth	167'		
	assumed length	100'		
	Tons 35,070	.04	&	.60

SECTION 5740E Cont'd — D.D.H.'s 15, 18, 20, U43, U44.

Area H	average grade	.04% U_3O_8	&	.60% Cb_2O_5
	true width	21'		
	assumed depth	167'		
	assumed length	100'		
	Tons 35,070 @	.04	&	.60

SECTION 5790E

Due to lack of drilling on this section ore outlined on section 5740E projected to this section.

Area A	average grade	.054% U_3O_8	&	.80% Cb_2O_5
	true width	25'		
	assumed depth	200'		
	assumed length	25'		
	Tons 12,500 @	.054	&	.80

SECTION 5790E

Due to lack of drilling on this section ore outlined on section 5740E projected to this section.

Area A	average grade	.054% U_3O_8	&	.80% Cb_2O_5
	true width	25'		
	assumed depth	200'		
	assumed length	25'		
	Tons 12,500 @	.054	&	.80

SECTION 5840E — **D.D.H.'s U49, U52, U54.**

Area A	average grade	.013% U_3O_8	&	.89% Cb_2O_5
	true width	30'		
	assumed depth	110'		
	assumed length	50'		
	Tons 16,500 @	.031	&	.89
Area B	average grade	.077% U_3O_8	&	1.16% Cb_2O_5
	true width	28'		
	assumed depth	140'		
	assumed length	50'		
	Tons 19,600 @	.077	&	1.16

SECTION 5840E — D.D.H.'s U49, U52, U54.

Area A	average grade	.013% U_3O_8	&	.89% Cb_2O_5
	true width	30'		
	assumed depth	110'		
	assumed length	50'		
	Tons 16,500 @	.031	&	.89
Area B	average grade	.077% U_3O_8	&	1.16% Cb_2O_5
	true width	28'		
	assumed depth	140'		
	assumed length	50'		
	Tons 19,600 @	.077	&	1.16

SECTION 5890E | **D.D.H.'s U56, U57.**

Area A	average grade	.052% U_3O_8	&	1.00% Cb_2O_5
	true width	35'		
	assumed depth	200'		
	assumed length	50'		
	Tons 35,000 @	.052	&	1.00

SECTION 5S90E D.D.H.'s U56, U57.

Area A	average grade	.052% U_3O_8	&	1.00% Cb_2O_5
	true width	35'		
	assumed depth	200'		
	assumed length	50'		
	Tons 35,000 @	.052	&	1.00

SECTION 5940E — D.D.H.'s 17, 31.

Area A	average grade	.015% U_3O_8	&	.75% Cb_2O_5
	true width	26'		
	assumed depth	200'		
	assumed length	100'		
	Tons 52,000 @	.015	&	.75
Area B	average grade	.044% U_3O_8	&	.61% Cb_2O_5
	true width	26'		
	assumed depth	245'		
	assumed length	125'		
	Tons 79,600 @	.044	&	.61
Area C	average grade	.04% U_3O_8	&	.70% Cb_2O_5
	true width	5'		
	assumed depth	230'		
	assumed length	125'		
	Tons 17,250 @	.04	&	.70
Area D	average grade	.007% U_3O_8	&	.56% Cb_2O_5
	true width	11'		
	assumed depth	180'		
	assumed length	125'		
	Tons 22,800 @	.007	&	.56

SECTION 59/OE

D.D.H.'s 17, 31.

Area A	average grade	.015% U_3O_8	&	.75% Cb_2O_5
	true width	26'		
	assumed depth	200'		
	assumed length	100'		
	Tons 52,000 @	.015	&	.75
Area B	average grade	.044% U_3O_8	&	.61% Cb_2O_5
	true width	26'		
	assumed depth	245'		
	assumed length	125'		
	Tons 79,600 @	.044	&	.61
Area C	average grade	.04% U_3O_8	&	.70% Cb_2O_5
	true width	6'		
	assumed depth	230'		
	assumed length	125'		
	Tons 17,250 @	.04	&	.70
Area D	average grade	.007% U_3O_8	&	.56% Cb_2O_5
	true width	11'		
	assumed depth	180'		
	assumed length	125'		
	Tons 22,800 @	.007	&	.56

SECTION 6140E — D.D.H.'s 19, 38.

Area A	average grade	.01% U_3O_8	&	.93% Cb_2O_5
	true width	19'		
	assumed depth	200'		
	assumed length	150'		
	Tons 57,000 @	.01	&	.93
Area B	average grade	.02% U_3O_8	&	.86% Cb_2O_5
	true width	12'		
	assumed depth	200'		
	assumed length	150'		
	Tons 36,000 @	.02	&	.86

SECTION 6140E | D.D.H.'s 19,38.

Area A	average grade	.01% U_3O_8	&	.93% Cb_2O_5
	true width	19'		
	assumed depth	200'		
	assumed length	150'		
	Tons 57,000 @	.01	&	.93
Area B	average grade	.02% U_3O_8	&	.86% Cb_2O_5
	true width	12'		
	assumed depth	200'		
	assumed length	150'		
	Tons 36,000 @	.02	&	.86

APPENDIX I

Columbium Oxide %   Analysis Checks

Sample No.		McGill	X-Ray	USGS	Battelle	TS.L Mines Branch Col. X-Ray Fl.
78		.38		.47		
561	Ins.	.15		.16		
710	"	.96		1.15		
3017	"	.23		.27		
3024	"	.39		.50		
3038	"	.39		.51		
3043	"	.80		.96	.76	
3005	"	.60		.89		
3024	"	.39		.73	.53	
3196	"	.48		.74	.63	
5313	"	1.60		1.80		
3533	"	1.56		1.40		
3704	"	.52		.66		
4293	"	2.20		2.20		
3792	"	.48		.54	.52	
3814	"	.50		.76	.49	
3814	"	.78		1.00	.86	
3767	"	.62			.79	
3921	"	1.03		1.30	.93	
3969	"	.24		.36		
3984	"	.81		.83		
4017	"	.68		.63		
4097	"	.51		.70		
4109	"	5.21		5.00		
500	"	.64	.72			
659		.36	.43			
660		.29	.52			
661		.48	.52			
693		1.00	1.14			
695		.90	1.09			
696		.65	.74			
697		.82	.95			
698		.50	.62			
699		.14	.14			
70'		.40	.48			
691		.44	.48			
692		.95	1.08			
693		1.00	1.11			
694		1.08	1.35			
1374		2.01	2.20			
3911	Ins.	1.24	1.57			
2645	"	.63	.85			
734	"	.84	.86			
1385		.76	.92			
3812	"	.25	.30			
3813	"	.50	.60			
3816	"	.26	.34			

APPENDIX I

Columbium Oxide % **Analysis Checks**

Sample No.	McGill	X-Ray	USGS	Battelle	TS.L.	Mines Branch Col. X-Ray Fl.
78	.38		.47			
561 Ins.	.15		.16			
710 "	.96		1.15			
3017 "	.23		.27			
3024 "	.39		.50			
3038 "	.39		.51			
3043 "	.80		.96	.76		
3005 "	.60		.89			
3024 "	.39		.73	.53		
3196 "	.46		.74	.63		
5313 "	1.60		1.80			
3533 "	1.56		1.40			
3704 "	.52		.66			
4293 "	2.20		2.20			
3792 "	.48		.54	.52		
3814 "	.50		.76	.49		
3814 "	.78		1.00	.86		
3767 "	.62			.79		
3921 "	1.03		1.30	.93		
3969 "	.24		.36			
3984 "	.81		.83			
4017 "	.68		.63			
4094 "	.51		.70			
4109 "	5.21		5.00			
500 "	.64	.72				
659	. 36	.43				
660	.29	.52				
661	.48	.52				
693	1.00	1.14				
695	.90	1.09				
696	.65	.74				
697	.82	.95				
698	.50	.62				
699	.14	.14				
701	.40	.48				
691	.44	.48				
692	.95	1.08				
693	1.00	1.11				
694	1.08	1.35				
1374	2.01	2.20				
3911 Ins.	1.24	1.57				
2645 "	.63	.85				
734 "	.84	.86				
1385	.76	.92				
3812 "	.25	.30				
3813 "	.50	.60				
3816 "	.26	.34				

Sample No.	McGill	X-Ray	USGS	Battelle	T.S.L.	Mines Branch Col.	Mines Branch X-Ray Fl.
16M	.60	.83			.62	.72	.75
2331	.72	.94			.85	.74	.80
77M	.72	.93			.88		
2344	1.43	1.86			1.60		
915		.58			.66	.62	.63
928		1.18			1.35	1.42	1.32
984		1.17			1.20	1.29	1.32
1392		2.25			2.30	2.35	2.55
1458		.67			.72	.78	.81
2567		.80			.75	.73	.73
2687		.74			.65	.70	.78
96M		.62			.55	.53	.52

McGill = McGill University X-ray Laboratory.
X-Ray = X-Ray Laboratories, Ltd., Toronto.
USGS = United States Geological Survey.
Battelle = Battelle Memorial Institute, Columbus, Ohio.
T.S.L. = Technical Service Laboratories, Toronto.
Col. = Colorimetric method.
X-Ray Fl. = X-Ray Fluorescence.

APPENDIX I

Page 2

Sample No.	McGill	X-Ray	USGS	Battelle	T.S.L.	Mines Branch Col.	Mines Branch X-Ray Fl.
16M	.60	.83			.62	.72	.75
2331	.72	.94			.85	.74	.80
77M	.72	.93			.88		
2344	1.43	1.86			1.60		
915		.58			.66	.62	.63
923		1.18			1.35	1.42	1.32
984		1.17			1.20	1.29	1.32
1392		2.25			2.30	2.35	2.55
1458		.67			.72	.78	.81
2567		.80			.75	.73	.73
2587		.74			.65	.70	.78
96M		.62			.55	.53	.52

McGill = McGill University X-ray Laboratory.
X-Ray = X-Ray Laboratories, Ltd., Toronto.
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T. S. L. = Technical Service Laboratories, Toronto.
Col. = Colorimetric method.
X-Ray Fl. = X-Ray Fluorescence.

URANIUM ANALYSIS CHECKS

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Uranium Oxide %

Sample No.	Insp	Mines Branch, Ottawa				T.S.L.	Prob.
		Chem.	Calc.	Eq gamma	Eq beta		ThO_2
2969	.081	.077	.074	.076	.075	.051	
3742	.028	.023	.028	.030	.029	Tr	
3766	.069	.059	.064	.067	.066	.031	
3815	.136	.12	.12	.141	.135		
3909	.186	.18	.17	.164	.168		
4072	.10	.094	.10	.094	.097		
4163	.033	.029	.034	.029	.031		
3151	.102					.098	
3194	.08					.072	
3533	.01					nil	
3610	.005					nil	
3737	.015					Tr	
781		.044					
782		.026					
783		.062					
784		.029					
Bulk Sample		.15	.15				
53	.10		.06	.06	.06		
62	.10		.086	.090	.088		
996	.05		.060	.063	.062		
1106	nil		.032	.034	.033		
1751	.042		.037	.044	.041		
1921	.046		.050	.042	.046		
926	.062		.070	.075	.072		
2873	.138		.11	.124	.117		
2874	.049		.047	.045	.046		
2888	.08		.072	.081	.077		
2889	.136		.11	.129	.121		
1967	.08		.077	.086	.082		
2230	.16					.19	
815	.015	.012	.016	.016	.016	.019	
865	.083	.083	.083	.074	.078	.082	
882	.046	.041	.045	.045	.045	.043	
889	.065	.058	.059	.073	.067	.059	.036
915	.072	.072	.068	.079	.074	.061	.03
928	.07	.070	.073	.073	.073	.064	
9884	.111	.12	.12	.12	.12	.12	
1392	.106	.11	.10	.108	.105	.080	
1458	.059	.054	.054	.063	.059	.042	
2567	.041	.035	.037	.039	.038	.043	
2587	.068	.063	.065	.067	.066	.066	
96M	.062	.055	.059	.061	.060	.065	
3163	.075	.070	.069	.074	.072	.074	
3164	.08					.085	
3165	.043	.037	.043	.045	.044	.037	
3166	.047					.052	

URANIUM ANALYSIS CHECKS

Page 3

Uranium Oxide %

Sample No.	Insp	Mines Branch, Ottawa Chem.	Calc.	Eq gamma	Eq beta	T. S. L.	Prob. ThO_2
2969	.081	.077	.074	.076	.075	.051	
3742	.028	.023	.028	.030	.029	Tr	
3766	.069	.059	.064	.067	.066	.031	
3815	.136	.12	.12	.141	.135		
3909	.186	.18	.17	.164	.168		
4072	.10	.094	.10	.094	.097		
4163	.033	.029	.034	.029	.031		
3157	.102					.098	
3194	.08					.072	
3533	.01					nil	
3610	.005					nil	
3737	.015					Tr	
781		.044					
782		.026					
783		.062					
784		.029					
Bulk Sample		.15	.15				
53	.10		.06	.06	.06		
62	.10		.086	.090	.088		
996	.05		.060	.063	.062		
1106	nil		.032	.034	.033		
1751	.042		.037	.044	.041		
1921	.046		.050	.042	.046		
926	.062		.070	.075	.072		
2873	.138		.11	.124	.117		
2874	.049		.047	.045	.046		
2888	.08		.072	.081	.077		
2889	.136		.11	.129	.121		
1967	.08		.077	.086	.082		
2230	.16					.19	
815	.015	.012	.016	.016	.016	.019	
865	.083	.083	.083	.074	.078	.082	
882	.046	.041	.045	.045	.045	.043	
889	.065	.058	.059	.073	.067	.059	.036
915	.072	.072	.068	.079	.074	.061	.03
928	.07	.070	.073	.073	.073	.064	
9834	.111	.12	.12	.12	.12	.12	
1392	.106	.11	.10	.108	.105	.080	
1452	.059	.054	.054	.063	.059	.042	
2567	.041	.035	.037	.039	.038	.043	
2587	.068	.063	.065	.067	.066	.066	
96M	.062	.055	.059	.061	.060	.065	
3163	.075	.070	.069	.074	.072	.074	
3164	.08					.085	
3165	.043	.037	.043	.045	.044	.037	
3166	.047					.052	

Composition Pyrochlore

Information based on send-quantitative spectrographic analyses and calculations by E.H. Nickel, Department of Mines and Technical Surveys, Mines Branch, Ottawa, Ontario.

Na_2O	5%
CaO	13
FeO	5
MgO	7
La_2O_3	0.3
U_3O_8	7
ThO_2	0.8
TiO_2	4
Nb_2O_5	56

The specific gravity is reported by S. Kaiman as being 5.2.

Composition Pyrochlore

Information based on semi-quantitative spectrographic analyses and calculations by E. H. Nickel, Department of Mines and Technical Surveys, Mines Branch, Ottawa, Ontario.

Na_2O	5%
CaO	13
FeO	5
MgO	7
La_2O_3	0.3
U_3O_8	7
ThO_2	0.2
TiO_2	4
Nb_2O_5	56

The specific gravity is reported by S. Kaiman as being 5.2.

BIBLIOGRAPHY

Barlow, Alfred Ernest : Second Edition of a Report on the Geology and Natural Resources of the Area included by the Nipissing and Timiskaming Map-Sheets Comprising Portion of the District of Nipissing, Ontario, and the County of Pontiac, Quebec; Geol, Survey, Canada, Pub. No. 962, 1908.

Fawley, A. P.; James, T.C: A pyrochlore Carbonatitte Southern Tanganyika; Ec. Geol. Vol. 50, No. 6, 1955

Kaiman, S: Investigation of the Liberation size of the Uranium Mineral in the Inspiration Mining and Development Company Ore. Special Report No SR-155/53, Department of Mines and Tech. Surveys, Mines Branch, Ottawa, Ontarion, June 12, 1953; Unpublished.

MacKay, R.A., Beer, K. E., and Rockingham, J.E: The Albite-Riebeckite-Granites of Nigeria; Geol. Surv. and Mus., London Rept. GSM/AED. 95, 25pp., 1952

Nickel, E.H. Report of the Mineral Dressing and Process Metallurgy Division, Investigation No.MD3126, Department of Mines & Tech. Surveys, Mines Branch, Ottawa, June 29, 1956;Unpublished.

Palache, Charles, Bernan, Harry and Frondel, Clifford: The System of Mineralogy; John Wiley & Sons Inc. N w York, vol. 1, 1944

Rowe,Robert B: Notes on Geology and Mineralogy of the Newman Columbium-Uranium Deposit, Lake Nipissing, Ontario; Geol. Surn. Canada, Paper 54-5, States Geol.Sur. Bull. 1015-B, 57 pp. 1954

Rowe, Robert B: Notes on Columbium Mineralization, Oka District, Two Mountains County, Quebec; Geol.Surv., Canada Paper 54-23(In preparation).

Rowe, Robert B: Association of Columbium Minerals and Alkaline Rocks; Canadian Mining Journal, March 1955

Satterly, J: Portions of the District of Parry Sound and Muskoka Prov. Ont. Report in Vol. 51, Ont. Dept. Mines Annual Report, 1942

Stevenson, John S. : Report on Beaucage Mineralization; unpublished report., May 8, 1953

United Senate report No. 1627: Accessibility of Strategic and Critical materials to the United States in Time of War and for our expanding economy: United States Government Pritning Office, Washington, pp. 220-228-1954

Winchell, Alexandar N., and Winchell, Horace: Elements of Optical Mineralogy, John Wiley & Sons Inc. New York, 1951.

BIBLIOGRAPHY

[illegible], Alfred Ernest: Second Edition of a Report on the Geology and Natural Resources of the Area Included by the Nipissing and Timiskaming Map-Sheets Comprising Portions of the District of Nipissing, Ontario, and the County of Pontiac, Quebec; Geol. Surv., Canada, Pub. No. 962, 1908.

[illegible]ley, A. P.; James, T.C.: A pyrochlore Carbonatite Southern Tanganyika; Ec. Geol. Vol. 50, No. 6, 1955.

Kaiman, S: Investigation of the Liberation size of the Uranium Mineral in the Inspiration Mining and Development Company Ore. Special Report No. SR-155/53, Department of Mines and Tech. Surveys, Mines Branch, Ottawa, Ontario June 12, 1953; Unpublished

[illegible], R. A., Beer, K. E., and Rockingham, J.E.: The Albite-Riebeckite-Granites of Nigeria; Geol. Surv. and Mus., London, Rept. GSM/AED. 95, 25 pp., 1952.

[illegible], R. H. Report of the Mineral Dressing and Process Metallurgy Division. Investigation No. MD3126, Department of Mines & Tech. Surveys, Mines Branch, Ottawa, June 29, 1956; Unpublished.

[illegible], Charles, Berman, Harry, and Frondel, Clifford: The System of Mineralogy; John Wiley and Sons, Inc., New York, vol. 1,1944.

[illegible], Robert B: Notes on Columbium Mineralization, Oka District, Two Mountains County, Quebec; Geol. Surv., Canada Paper 54-23 (In preparation).

[illegible], Robert B: Notes on Geology and Mineralogy of the Newman Columbium-Uranium Deposit, Lake Nipissing, Ontario; Geol. Surv. Canada Paper 54-5, States Geol. Surv., Bull. 1015-B, 57 pp. 1954.

[illegible], [illegible]: Association of Columbium Minerals and Alkaline Rocks; Canadian Mining Journal, March 1955

[illegible], [illegible]: Portions of the Districts of Parry Sound and Muskoka [illegible]. Report in Vol. 51, Ont. Dept. Mines Annual Report [illegible].

[illegible], John S.: Report on Beaucage Mineralization; unpublished [illegible], [illegible] 8, 1953.

[illegible] Senate Rept. No. 1627: Accessibility of Strategic and Critical Materials to the United States in Time of War and for Our Expanding Economy: United States Government Printing Office, Washington, [illegible]-1954.

Winchell, Alexander N., and Winchell, Horace: Elements of Optical Mineralogy; John Wiley and Sons, Inc., New York, 1951.