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Report on the Geology and Economic Potential
of the
Prairie Lake Carbonatite-Alkalic Complex

Anthony N. Mariano Ph.D.

November 30, 1979

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Lake Carbonatite-Alkalic Complex

by

Anthony N. Mariano Ph.D.

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Introduction

The Prairie Lake Carbonatite Complex is a quasi circular structure with an approximate surface area of 10 km². The complex has been age dated by several investigators at 1 billion years. It intrudes Archean granitoid country rocks which show moderate to intense fenitization.

Rocks in the complex include søvites, ijolite-urtites, nepheline syenite-malignites and a variety of lamprophyres.

The ijolitic rocks actually grade into silicocarbonatite* in much of the complex. From petrographic investigation it is apparent that the silicate minerals and the carbonates were co-crystallized as immiscible fractions from the same magma.

Wollastonite is a secondary mineral replacing earlier silicates in the silicocarbonatite, ijolites and malignites. In some areas wollastonite is a major mineral. The occurrence of wollastonite in the complex is variable.

Although some investigators have attempted to describe the geology of the Prairie Lake Complex, the actual spatial relationship of rock types is not known. This is due in part to a scarcity of outcrops and partly because the complex has only received cursory attention from past investigators.

Economic minerals in the complex which are potential ore targets include pyrochlore-betafite, apatite and wollastonite.

Location and Extent of holdings

The Prairie Lake Complex is situated in the Province of Ontario ~ 26 kilometers north from the shore of Lake Superior at the coordinates 49°02'N, 86°43'W.

The complex is covered by 39 claims that are totally held by NUINSCO (see sketch provided by NUINSCO in Figure 1).

*Silicocarbonatite in this context is defined as an igneous rock consisting of approximately equal amounts of carbonates and silicates that were co-crystallized as primary minerals.

Access

Access to the property can be made easily by vehicle. A convenient travel route would be from Thunder Bay traveling east on Canadian Highway 17 to Deadhorse Creek Road which is just east of Terrace Bay. Deadhorse Creek Road runs in a north south direction along the west flank of the complex.

Access to the property may also be made by float-equipped aircraft landing on Prairie Lake.

In aerial photographs the Prairie Lake Complex stands out as a positive relief feature consisting of rather steep slopes (\approx 80 meters above the surrounding plains) on the south side of the circular structure, and more gentle slopes on the north side. Glacial debris and regolith material cover most of the complex which is heavily forested. Dead falls and thick vegetation are an aggravation to surface geologic reconnaissance.

Climate

The cool-temperate to sub-arctic climatic character at Prairie Lake keeps transpiration and evaporation down to a minimum allowing the rocks and soil to be almost constantly in contact with water. In addition mechanical disintegration of rocks from freezing and thawing brought on by diurnal temperature shifts during the spring and autumn is also affective in selective erosion of the carbonate rocks. These two agents enhance the selective solution and removal of the carbonates from the system while all other minerals including apatite are virtually unaffected. Such climatic conditions are conducive to the formation of local karst areas where heavy minerals or apatite can form alluvial or placer enrichments. Exploration for ore accumulations of this type cannot be performed on a cursory level.

The minerals that contain uranium in Prairie Lake are refractory in character and are chemically inert to the existing climatic conditions. Therefore there should be no fear of environmental contamination brought on by the weathering of

uranium minerals that might be exposed in a mining operation.

History

For information on previous exploration and results see Sakrison (1977 and 1977a) and Archibald (1978).

General Geology

Regional Geologic Setting

The Prairie Lake ring complex is an intrusive plug emplacing continental shield Archean felsic igneous and metamorphic rocks. The complex is spatially and age related (see Gittens et al., 1967) to the miaskitic nepheline syenite complexes of Coldwell to the southeast and Killala Lake to the northeast. It is reasonable to assume that these complexes represent differentiated segments of magma that have traveled in different paths but that have been generated from the same magma source. The differentiation in such cases may be extensive such that the petrology of the complexes and economic geology can show strong dissimilarities.

The Prairie Lake complex can also be seen to fall within the North American Mid-Continent gravity high and the major regional Carb Structure which includes several carbonatite complexes and extends for a distance of at least 800 km (see Erdosh, 1979).

Both magnetic and radiometric positive anomalies superimpose the topographic circular structure of Prairie Lake. In aerial photographs there is no evidence of doming of the country rocks immediately peripheral to the complex suggesting that the emplacement was relatively deep seated.

Local Geology of Prairie Lake

Because of the masking conditions at Prairie Lake which consist of a glacial debris cover and heavy forest growth, outcrops are scarce and much of the geology has been discerned in an inarticulated fashion from float material and trenching

performed on a spotty level.

Rock types encountered in the Prairie Lake Complex include sylvites, ijolite-urtites, nepheline syenite-malignites and fenite. Lamprophyre dikes and alkali basalt dikes are also present and are assumed to be filling late tensional fractures that developed from contractional effects produced after the initial emplacement of the complex.

Very brief field examinations made by the writer confirm the presence of an outer annulus of sylvite that has been described by previous investigators[Sage et al., (1976) and Watkinson (1979)].

Arcuate lenses of ijolite-urtite occur as concentric bands within the sylvite and as the more intermediate annulus within the complex is approached, ijolite-urtite and nepheline syenite-malignite rocks become more pronounced although their exact relationship is not well established.

The more central area of the complex has outcrops of sylvite carbonatite breccia, ijolite-urtite with extensive wollastonite replacement, and fenite.

Sylvites

Numerous sylvites occur in the Prairie Lake Complex but because the petrology of the complex has not been adequately studied on an economic geology level, it is not adequate to attempt to classify these sylvites on either a paragenetic or economic level.

The writer uses the term sylvite as a plutonic calcite carbonatite where calcite comprises more than 50% of the rock. In sylvites containing appreciable amounts of other minerals, I use the names according to the proposal made by Eckermann (1948, p. 13) hinging the mineral name as a prefix on the name sylvite e.g., apatite-sylvite, biotite-sylvite.

When the rock contains \approx equal amounts of carbonate minerals and silicate minerals that are co-crystallized by evidence of petrography and macro observation, I prefer to use the term silicocarbonatite as proposed by Brøgger (1921) and as aptly

revived by Pecora (1962).

The distinction between carbonatite and silicocarbonatite has important implications at Prairie Lake because some of the highest grade values for pyrochlore-betafite mineralization occur in rocks that are = 1:1 in carbonates and silicates. These rocks often consist of ijolite mineral components and calcite. In such cases it is incorrect to classify them as ijolites or as s ϕ vites. From the petrography it is evident that the carbonates and silicates are co-crystallized. This is interpreted to be largely the product of immiscibility processes within magmas emanating from the mantle. Watkinson (1979) suggests that uranium-bearing pyrochlore-group (betafite) concentrations occur at the contacts between ijolite and carbonatite, and this has led some geologists examining the property to conclude that ore mineralization is confined to thin stringers at ijolite-carbonatite contacts. In fact pyrochlore occurs in s ϕ vite, ijolite and silicocarbonatite. The highest values occur in silicocarbonatite and s ϕ vites. This is in accord with niobium mineralization in other carbonatite deposits which are currently being mined for niobium.

The Prairie Lake s ϕ vites include biotite-s ϕ vites, olivine-apatite-s ϕ vites, salite-apatite-s ϕ vites and apatite-s ϕ vites. They are generally equigranular medium-grained and usually exhibit flow texture as evidenced by alignment of ovoid apatite grains and other silicate minerals. Magnetite is usually an accessory.

Ijolite-Urtite

Igneous rocks containing major amounts of nepheline and salite are abundant in Prairie Lake. In places the rocks grade into pyroxenites with nepheline occurring only as a minor component. The igneous origin for these rocks is evident from their geochemistry which shows Fe²⁺ in the salite (Fe²⁺ rich diopside member). Diopside-salite is the typical pyroxene in rocks which have formed from alkali olivine basalt magma, especially during its crystallization in a hypabyssal environment. Whereas in ijolites of fenite origin, the stabilization of ferric iron

due to the increase of alkalis (see the "alkali-ferric-iron effect", Carmichael and Nicholls 1967, p. 4667) causes the formation of aegirine rather than diopside-salite.

The ijolite-urtite-pyroxenite rocks display many variations in mineral ratios and texture but they may be regarded as variations in the same theme of mineral components whose relative abundance and texture is a direct response to the local physio-chemical conditions of the magma.

In virtually all cases, calcite is present as a primary accessory interstitial mineral in the ijolite-urtite. As previously stated when calcite approaches the 50% by volume category, the rock should be classified as a silicocarbonatite.

The principal constituents of the ijolite series are by definition nepheline and pyroxene. Other primary minerals present include calcite, apatite, andradite-melanite garnet, sphene, biotite, titaniferous magnetite and the ore minerals pyrochlore-betafite, and wöhlerite. The most abundant secondary mineral is wollastonite but in some cases it gives the appearance of being primary. Calcite also occurs as a secondary mineral along with several zeolites.

Because of the relatively high silica activity of the Prairie Lake complex as evidenced by the presence of nepheline syenites, the mineral perovskite is only rarely encountered.* It has been observed in several rocks that are free of feldspar including a silicocarbonatite occurring between Anomaly and Centre Lake and in the extraordinary orbicular ijolite dike which outcrops in the southeast edge of the complex.

* In igneous rocks perovskite is virtually never associated with feldspar (see Carmichael et al., 1974, p. 248).

Ijolite and silicocarbonatite show imperceptible gradations within the intermediate annulus of the complex and since they share the same major minerals and also have the same accessory minerals it is logical to assume that they represent differentiated immiscible carbonate-silicate fractions from a parent magma. Ijolite samples have also been observed in the edges of the complex on the northwest, north, east and southeast edges.

In many of the exposed trenches of the intrusion, biotite is the major mineral and the rock approaches being a glimmerite or biotitite. Some of the highest grade niobium and uranium values occur in the glimmerite-type rocks.

Urtite becomes more prominent in the central area being encountered at depth in drill core and as an outcrop of micro-wollastonite-urtite at the east side of the narrow neck of Centre Lake. Wollastonite is often a major mineral in the urtite. It is frequently observed as polycrystalline aggregates replacing earlier minerals. Because of the brilliant cathodoluminescence properties of wollastonite, its recognition is effectively enhanced under electron excitation.

Nepheline Syenite-Malignite

Although K feldspar does appear as a minor phase in some of the ijolites, it becomes a major mineral in rocks encountered in drill core in the west side of the complex, just southeast of anomaly lake (DDH 24) and in drill core just southwest of Centre Lake (DDH 17, 26, 27). In many of these rocks dark minerals approach or exceed 50% by volume consisting of salite, biotite, melanite garnet, titaniferous magnetite, sphene and trace amounts of pyrrhotite and niobium-bearing wöhlerite. Orthoclase feldspar is a major constituent appearing as subhedral to anhedral grains and as dactylic intergrowths with nepheline. Wollastonite is often abundant as a primary mineral in dactylic intergrowths with an unidentified calcium-aluminum silicate mineral. Apatite and calcite are accessories. The high pyroxene content of these rocks, the large melanite garnet cumulates with

poikilitic inclusions and the nepheline-feldspar fingerprint intergrowths are mineralogical and textural features which resemble malignite from Poohbah Lake, Ontario.

The nepheline syenite-malignite rocks and the ijolite-urtites grade into one another and the exact configuration of these rock types is not clear.

Identification of rock types by hand specimen observation or drill core logging is indeed difficult, but it is clear to the writer that at some stage of exploration in the Prairie Lake complex, a careful separation of rock types will be a necessary guide for an affective drilling program.

In places the nepheline syenites show characteristics of internal fenitization (late alkali-ferric ion metasomatism) as indicated by peripheral bands of aegirine around salite cores and by the presence of Fe^{3+} as a substitutional impurity in the K feldspars.

Fenite

Contacts between country rock and igneous rocks from the complex have not been uncovered along the periphery of the intrusion. A large outcrop of fenitized country rock appears on the east shore of the narrow neck at Centre Lake. This rock is a quartz-feldspar gneiss with advanced incipient fenitization consisting of the introduction of sodic feldspar, aegirine and calcite along the quartz-feldspar interstitials, and engulfing and replacing country rock plagioclase. The aegirine occurs as aggregates of radiating prisms intimately crystallized with calcite, while the Na fenite plagioclase follows micro-fractures, intersitital voids and peripheral replacements around the primary country rock feldspar grains.

The occurrence of a fenite outcrop almost in the center of the complex raises a few questions; 1) Is the outcrop a large xenolith that was incorporated by the intrusive rocks during their emplacement? If so, it managed to survive chemical assimilation. 2) Is the fenite a piece of country rock that

rolled into the center of the complex from the edge of the intrusion? 3) Could the fenite outcrop actually represent the upper limit of the ascent of the intrusion, where carbonatite and genetically related igneous rocks made contact with the country rock? If this is the case, the present erosion surface at Prairie Lake is essentially the top of the intrusion.

The geology of the Prairie Lake complex is not well known because of the lack of exposures, insufficient trenching and very shallow drilling. It is not clear whether the peripheral s ϕ vite is the same intrusion as the s ϕ vite which outcrops at Centre Lake or as the carbonatite veins and breccias which transect much of the ijolite-urtite and nepheline syenite-malignite rocks. The map of Prairie Lake shown in Figure 2 is largely inferred based on observations by previous investigators, however included in this map are triangular symbols implying ore grade outcrops that have been carefully analyzed by the writer. The wide spread distribution of ore grade rocks in carbonatite and silicocarbonatite within the complex is indeed a positive sign for economic potential.

Economic Minerals and Potential

The Prairie Lake carbonatite complex shows excellent economic potential for several elements, most important of which are niobium and uranium. These elements both occur in minerals of the pyrochlore group which are found in the carbonatites, silicocarbonatites and ijolites. The composition of the pyrochlores show local variations from uranium-rich uranopyrochlore and betafite to the uranium impoverished species, pyrochlore. For a classification of the pyrochlore system nomenclature the reader is referred to Hogarth (1977). The uranium content of the pyrochlores does not appear to be dependent on the rock type.

Of the pyrochlore group minerals (including the species pyrochlore, uranopyrochlore and betafite), betafite is most frequently encountered in the Prairie Lake rocks. Quantitative electron microprobe analyses on betafite from Prairie Lake show average U_3O_8 values of 18.01 wt.% (Mariano, 1979), and 16.8-25.5 wt.% (Watkinson, 1979).

In some of the silicocarbonatite rocks from Prairie Lake the betafite content was found to exceed 10% by volume.

At least 3 niobium minerals occur in the Prairie Lake complex. They include the minerals of the pyrochlore group, wöhlerite $[(Na, Ca)_3(Zr, Ti, Nb)Si_2O_7(O, OH, F)_3]$ and calzirtite $[Ca(Zr, Ca)_2Zr_4(Ti, Nb, Fe)_2O_{16}]$. Confirmation of the identification of wöhlerite was made by x-ray diffraction. This mineral is easily mistaken for pyroxene in normal petrographic examination, but through the use of cathodoluminescence wöhlerite from Prairie Lake is seen to exhibit a strong green luminescence due to Mn^{2+} activation (Maraino, 1979). Wöhlerite occurs as a trace accessory mineral in silicocarbonatite, ijolite-urtite and nepheline syenite-malignite. The Nb_2O_5 content of the wöhlerite is ≈ 15 wt.%. In some rocks wöhlerite accounts for all of the niobium.

The mineral calzirtite was only tentatively identified based on optical examination and energy dispersive x-ray analyses (Mariano, 1979). Irrespective of the confirmation of the mineral identity, there are at least 3 niobium minerals in the Prairie Lake complex.

Some of the pyrochlore minerals in the complex contain > 2 wt. % Ta₂O₅. Although carbonatite pyrochlores are believed to be unusually low in tantalum content (Bakes et al., 1964 and Deans in Tuttle and Gittens, 1966, p. 399) some carbonatite pyrochlores have Nb/Ta ratios as high as 3. It is possible that tantalum could be a byproduct metal from Nb and U ore in pyrochlore, providing that economic extraction of these 3 elements is feasible.

Regardless of the presence of wöhlerite and calzirtite?? in some of the Prairie Lake rocks, betafite is by far the most abundant niobium carrier in the complex, however the presence of the other niobium-bearing minerals can be a problem in the interpretation of Nb assays.

Niobium mineralization has a very wide spread of distribution in the complex, occurring in early as well as late emplaced rocks. Pyrochlore-type minerals occur as inclusions in calcite, biotite, pyroxene, apatite and magnetite, reflecting a high niobium content for the source magma. It is characteristic in carbonatites that pyrochlore concentrates in late transgressive carbonatites as a differentiate associated with anyone of several minerals or in combination with them. These minerals are magnetite, biotite, apatite and late carbonate. It is in such differentiates that ore grade pyrochlore often occurs. It should be emphasized that alluvial enrichment is not a prerequisite for the development of ore grade pyrochlore.

Prairie Lake has a very high potential for the existence of ore grade pyrochlore. It is strongly recommended that the complex should be subjected to a well planned exploration program including systematic trenching and a series of deep

drill holes in order to uncover the ore grade niobium-uranium zone.

Based on past exploration there is good indication that both apatite and wollastonite* will be byproducts in a mining operation at Prairie Lake.

In any carbonatite mining operation, assuming that the complex has not been subjected to extensive lateritic weathering, calcite can be concentrated as a byproduct source of lime. With the occurrence of the Prairie Lake complex so close to the Great Lakes, transportation costs for lime to be used as fertilizer or for use in coal gasification, would be at a minimum. It is therefore justifiable to assume that lime would be a viable byproduct of a Prairie Lake mining operation.

Conclusions and Recommendations

From a knowledge of other world sources of niobium-bearing carbonatites it is well established that they characteristically contain localized areas where ore grade mineral differentiation occurs on an impressive scale.

The pervasive anomalous niobium and uranium contents of the primary sévite and ijolite at Prairie Lake establishes that the complex is enriched in those elements. Knowing that carbonatites form localized differentiated bodies of Nb rich mineralization, it follows that somewhere within the complex a large localized body of Nb-U mineralization has differentiated most probably as a silicocarbonatite composed of mica, calcite, apatite and betafite.

Within the Prairie Lake complex the two lakes represent the areas of greatest topographic depression and they undoubtedly reflect the higher susceptibility to dissolution of a late carbon-

*Wollastonite is used in ceramics, paint, plastics, refractories and related fields. The open pit wollastonite operation in Willsboro, New York produces = 70,000 tpa of wollastonite (Industrial Minerals, March, 1979, p. 17).

atite core. In Brasil, several of the nearly perfect circular structured carbonatites contain a central depression which is the source of the highest concentration of Nb (e.g. Araxá, Tapira, Catalão I and Serra Negra). Both of the lake areas in the Prairie Lake complex are drilling targets. I have further noticed that a blank area occurs just southwest of Centre Lake. This area is apparently concealed by overburden which masks both the geology and any existing radiometric source. It should be considered a primary drilling target followed by the Centre Lake and Anomaly Lake areas.

I strongly recommend the immediate initiation of a drilling program testing the above mentioned areas and a follow up program to systematically drill other target areas that may be indicated by the use of a detailed low flying close spaced airborne magnetic and radiometric survey.

The drilling program should include 30,000' of BQ drilling estimated at a cost of \approx \$11.00/foot (Canadian). Total cost of drilling - \$330,000.00 Canadian.

An airborne geophysical survey has already been recommended by the writer to NUINSCO Resources Limited and a proposal was made in June of 1979 by Northway Surveys. For this survey they estimated a cost of \$30,750, not including the Federal Sales Tax of 0.9%.

This entire exploration program should receive additional support both in the field and in the laboratory by a consultant carbonatite expert. Estimated costs for a 20 day month period including consulting fee and laboratory and field expenses is \$12,500.00. A minimum of two months would be required for this work, giving a total of \$25,000.00.

Assaying of drill core should be conducted for every 10 feet at a total estimated cost of \$45,000.00.

Core splitting and field supervision costs are judged at \$45,000.

A sum of \$20,000.00 should be included for miscellaneous

costs.

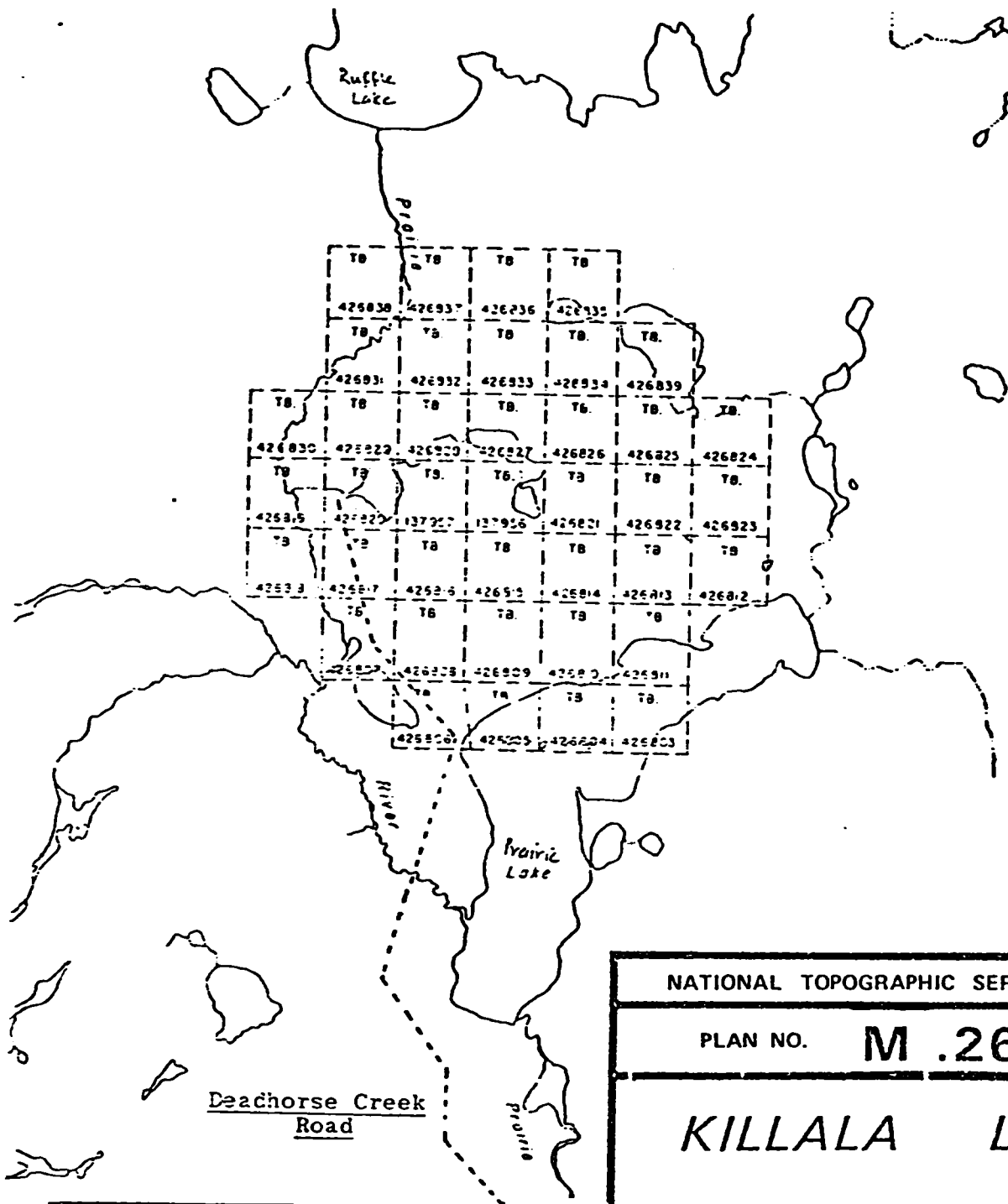
Total costs are summarized below....

Drilling -----	\$330,000.00
Airborne Geophysics -----	35,000.00
Consulting Carbonatite Expert field and laboratory-	25,000.00
Assaying -----	45,000.00
Core splitting and field supervision -----	45,000.00
Miscellaneous -----	<u>20,000.00</u>
Total -----	\$500,000.00

These are my recommendations for an ideal exploration program on the Prairie Lake complex. The company will have to take these recommendations within the framework of their available funds.

Anthony N. Mariano

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Consulting Economic Geologist
Carbonatite Expert



NATIONAL TOPOGRAPHIC SERIES 42 E 2
PLAN NO. M .2681
KILLALA LAKE
DISTRICT OF THUNDER BAY ONTARIO THUNDER BAY MINING DIVISION
SCALE: 1 - INCH = 40 CHAINS

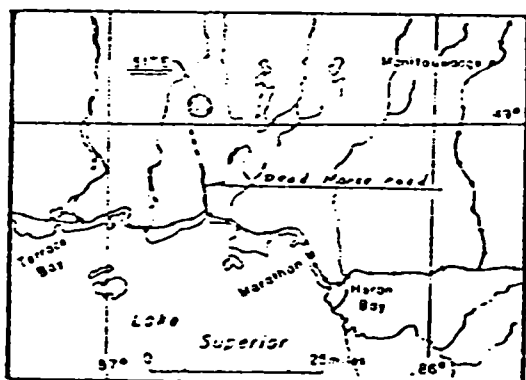
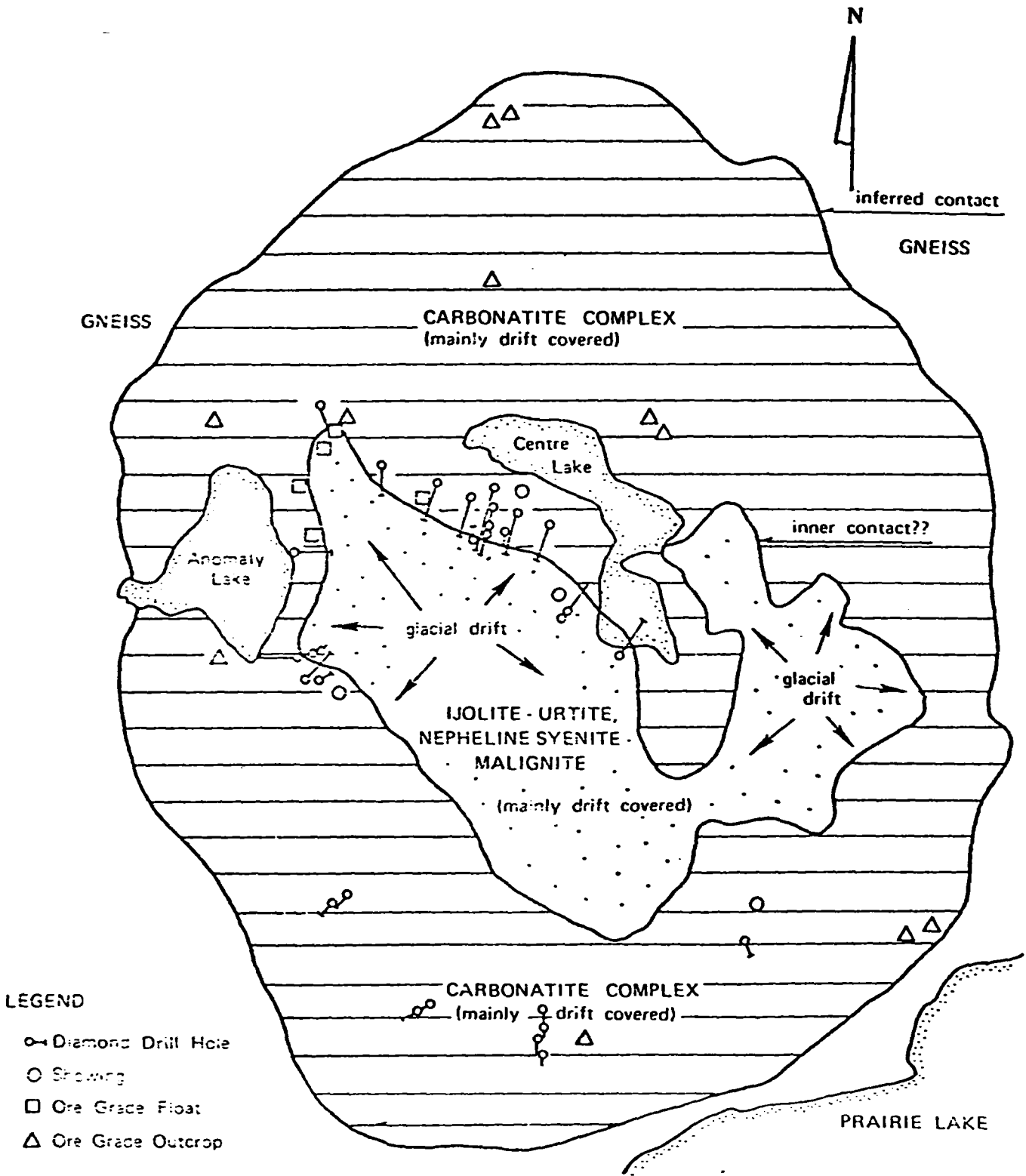


Figure 1.



**NUINSCO URANIUM PROSPECT
 PRAIRIE LAKE CARBONATITE COMPLEX**

Figure 2.

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CERTIFICATE

I, Anthony N. Mariano, of Carlisle, Massachusetts, do hereby certify that:

- 1) I am a private consulting economic geologist.
- 2) I am a graduate of Boston University where I received a Ph.D. in Geology.
- 3) I was employed by Kennecott Copper Corporation from 1963 through 1972 where I was involved in geologic exploration research on a world level.
- 4) I was employed by the United Nations for 1 1/2 years in which time I worked on mineral exploration programs in Colombia, South America.
- 5) For the past 6 years I have been working as a consultant geologist exclusively on carbonatite exploration, evaluation and characterization.
- 6) My experience on carbonatites is on a world wide level, including the most economic carbonatites that are currently being mined.
- 7) My interest in NUINSCO is on a consulting level. I have no direct or indirect interest nor do I expect to receive any interest in the properties or securities of NUINSCO Resources Limited.
- 8) I hereby consent to the use of my report dated November 30, 1979 to satisfy the requirements of any securities commission or stock exchange in Canada.

Anthony N. Mariano

Anthony N. Mariano Ph.D.

Consulting Economic Geologist
Carbonatite Expert

DRAFT

NUINSCO RESOURCES LIMITED

To the Shareholders:

PROGRESS REPORT

December 19, 1981

A Special Report was forwarded to the shareholders on September 23rd, outlining details of current work programs. This letter updates the September report and previews our immediate exploration plans.

Deep Drill Test at Lake Dufault

Results of DDH #218 are highly promising. Sulphides in heavy and trace quantities were encountered intermittently from near surface to the bottom of the hole. While no ore was discovered, several interesting new geological features were disclosed, the most significant of which is a 257' thick quartz feldspar porphyritic (QFP) flow at 3125', underlain by a 62' section of exhalative sediments. It is possible the faulted equivalent of this unit was encountered again at a depth of 3752'.

The significance of the QFP flow is that it relates favourably in texture and stratigraphic position to a similar QFP flow hosting the Millenbach mine to the west. The ash-sized tuffaceous sediment (exhalite) defines a significant time break, coincident with rhyolite volcanism - the same as at Millenbach.

Due to freeze-up, drilling on the island was suspended at a depth of 5129'. The hole did not flatten as expected and is now at about -82 degrees, from -87 at the collar. The last 15' of core was a rhyolitic rock, which may be the Anulet rhyolite. Several hundred feet of additional drilling, planned for the new year, will be required to make a reliable identification of the rock unit at the bottom of the hole.

Upon completion of drilling the hole will be tested by down-hole geophysics seeking sulphide conductors which may be detected close to the hole. Should a target be identified it would be tested by wedging.

As noted on the Geological Interpretation overleaf, the Inco alteration zone is north and west of DDH #218, off the section. The next most likely target is the intersection of the alteration zone and the westerly extension of the QFP flow described above. Early in '82, we expect to probe this area at a depth of about 3000' with a vertical hole collared about 1250' north-west of #218.

Cameron Lake Gold Property

Plans are underway to resume drilling the known gold zone as soon as ice conditions permit the transport of a heavy drill. No preliminary studies are required prior to drilling. The next program will consist of 22,000 feet of drilling, split into two equal phases. Results will be reported as received.

Petroleum and Natural Gas

The Hoffman #1 well in Trumbull County, Ohio is delivering gas to Columbia Gas Transmission Company, on an 8 hour daily schedule, at an initial rate of about 25 mcf per day, at a price of \$5.10 per mcf. This well is also producing oil at about 30 BPD. The Kovar #1 well should be on stream prior to month end. Net revenue interest in these wells is about 60%.

In Grimes County, Texas the company holds an 8.33% participation in a 10,000' Georgetown formation test for gas and oil. Drilling is in progress and results will be known shortly.

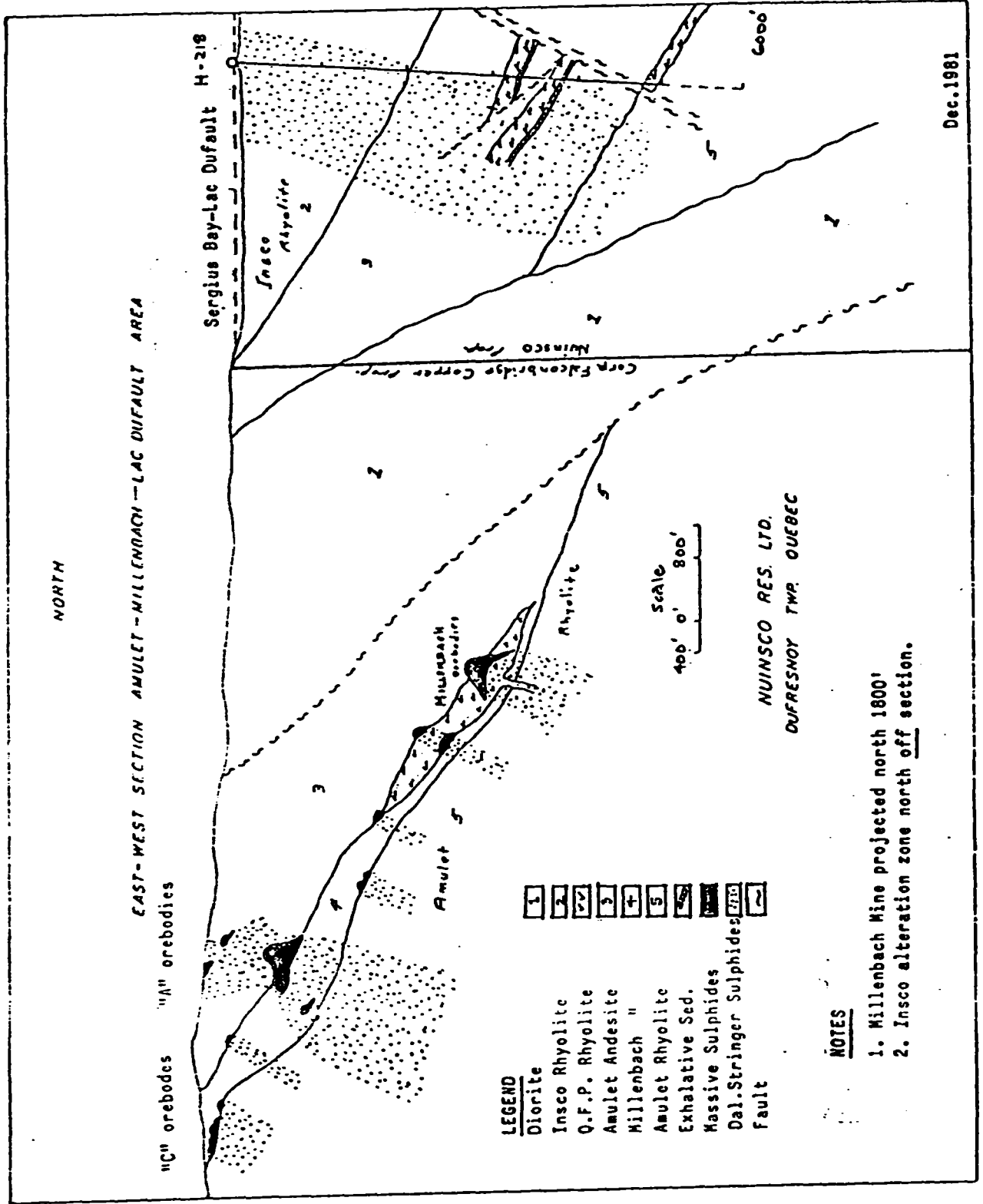
General

Funding for current exploration work is being provided through bank credit. In the meanwhile, financing alternatives are under review for long term exploration and development programs on all the company's mineral and gas and oil properties.

Respectfully submitted
on behalf of the Board

H. Douglas Hure
President

GEOLOGICAL INTERPRETATION DDH #218



ANTHONY

CONS

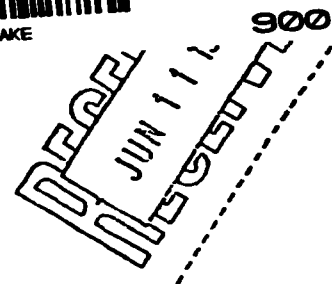
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CARLISLE, MASSACHUSETTS 01741

617-369-9242



42E025E0013 63.3856 KILLALA LAKE



June 4, 1979

Mr. H. Douglas Hume, President
New InSCO Mines LTD.
Executive Offices
Suite 306
4198 Dundas St. West
Toronto, Ontario M8X 1Y6

Dear Doug;

Here is a summary on my recent field examination of the Prairie Lake Carbonatite Complex.

Based on all available rock outcrops and trench exposures the complex appears to be composed of an early sövite intruded by arcuate lenses of ijolitic rocks and silicocarbonatite. There is good evidence that a large portion of the complex consists of this early sövite as indicated by the abundant exposures found in the west, southwest, south and southeast areas. This sövite consists of major calcite and evenly disseminated accessory minerals including olivine, Ti-rich biotite, magnetite and pyrochlore-betafite. Although the pyrochlore-betafite mineralization is well below ore grade, the average value of Nb_2O_5 is between 0.1-0.2 wt.% Nb_2O_5 . This consistent positive anomaly for Nb in the sövite clearly indicates that the source magma is rich in Nb. The primary nature of the sövite is indicated by the mineral mode, ratios, and texture. It should be emphasized here that the Nb_2O_5 grade of the primary sövite in the Araxá carbonatite (the major world source of niobium) averages < 0.2 wt.% Nb_2O_5 .

Late pulses of igneous activity at Prairie Lake include an intermediate anulus of ijolite with localized arcuate lenses of immisible silicocarbonatite which contains high grade mineralization of betafite. As you know, the mineral betafite contains major quantities of Nb and U. In some of the silicocarbonatite lenses the betafite content is $> 20\%$ by volume.

A lobe of almost pegmatoid texture wollastonite-urtite occurs just west-southwest of the center of the complex. The actual center of the complex is covered by a shallow lake. The two lakes within the complex represent the areas of greatest

topographic depression and they undoubtedly reflect the higher susceptibility to dissolution of a late carbonatite core. In Brasil several of the nearly perfect circular structure carbonatites contain a central depression which is the source of the highest concentration of Nb (e.g., Araxá, Tapira, Catalão I and Serra Negra). Both of the lake areas in the Prairie complex are drilling targets. I have further noticed that a blank area occurs just southwest of Center Lake. This area is apparently concealed by overburden which masks both the geology and any existing radiometric source. It should be considered a primary drilling target followed by the Center Lake and Anomaly Lake areas.

It should be emphasized that carbonatite complexes characteristically show localized areas where ore mineral differentiation occurs on an impressive scale.

The pervasive anomalous niobium and uranium contents of the primary sövite at Prairie Lake establishes that the complex is enriched in those elements. Knowing that carbonatites form localized differentiated bodies of Nb rich mineralization, it follows that somewhere within the complex a large localized body of Nb-U mineralization has differentiated as a silicocarbonatite composed of mica, calcite, apatite and betafite.

I strongly recommend the immediate initiation of a drilling program testing the above mentioned areas and a follow up program to systematically drill other target areas that may be indicated by the use of a detailed low flying close spaced airborne magnetic and radiometric survey.

In my estimation the Prairie Lake carbonatite is one of the best targets that I have examined in several years.

I will be submitting the rock samples which I collected on this field study for thin-section fabrication and in due course I shall examine them and prepare a report on the mineralogy, geochemistry and petrology and how it applies to the exploration program and economics of Prairie Lake. This report may be delayed by a short period of time because of other carbonatite commitments that I had already accepted.

Best wishes,



Anthony N. Mariano

ANTHONY N. MARIANO, Ph.D.

CONSULTING GEOLOGIST

48 PAGE BROOK ROAD

CARLISLE, MASSACHUSETTS 01741

617-369-9242

June 12, 1981

Mr. H. Douglas Hume, President
Nuinsco Resources Limited
Suite 306
4198 Dundas St. West
Toronto, Ontario M8X1Y6

Re: Report on the Geology and Economic Potential of the
Prairie Lake Carbonatite-Alkalic Complex

Dear Mr. Hume;

Inflation factors have raised exploration costs principally diamond drilling since my report was prepared. A 20% cost increase in the budget proposed from \$500,000.00 to \$600,000.00 is recommended. Company geologists could split the program into 3 phases of \$200,000.00 each involving not less than 10,000' of drilling in each phase.

The airborne survey could perhaps be deferred to a later stage of the exploration program.

The completion of the exploration program in 3 stages should permit the company to test the Prairie Lake complex within its budgeting and financing capability.

Sincerely yours,

Anthony N. Mariano

Anthony N. Mariano

NUINSCO RESOURCES LIMITED

MINE OFFICE
P O BOX 275
NORANDA,
QUEBEC

EXECUTIVE OFFICES
SUITE 306
4198 DUNDAS ST. WEST
TORONTO, ONTARIO, M8X 1Y6

PLEASE REPLY TO

December 17, 1981

Executive Offices

Mr. R.P. Sage
Geologist
Ontario Geological Survey
917-77 Grenville St.
Toronto M5S 1B3

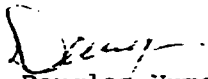
Dear Ron:

Thank you for your letter of December 8th.

A copy of Dr. Mariano's report on Prairie Lake is enclosed herewith.
We have no objection to the report being on the public record.

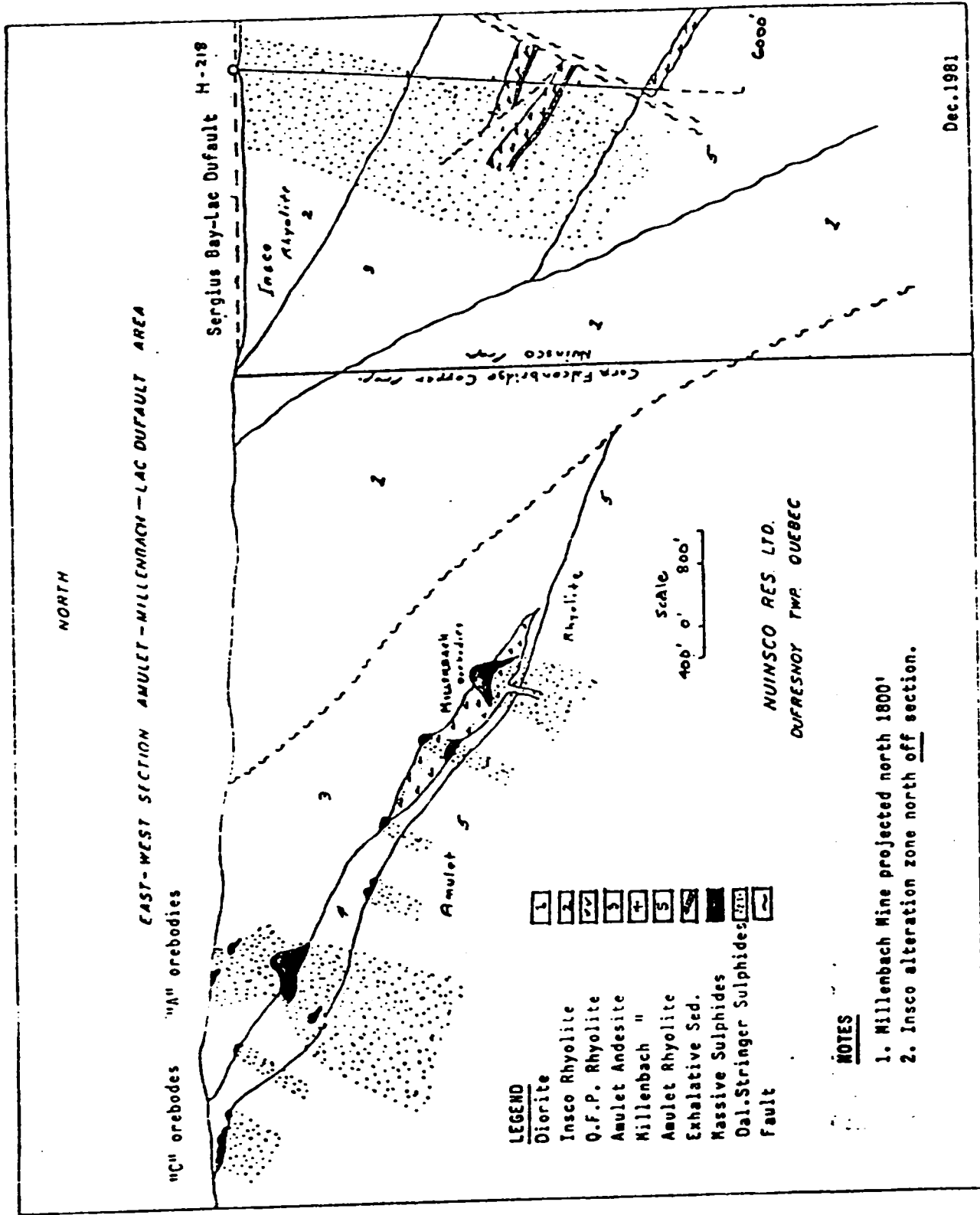
Your remarks on our Kenora and Lake Dufault projects are appreciated.
A "draft" copy of a shareholder report on these projects is enclosed for
your information.

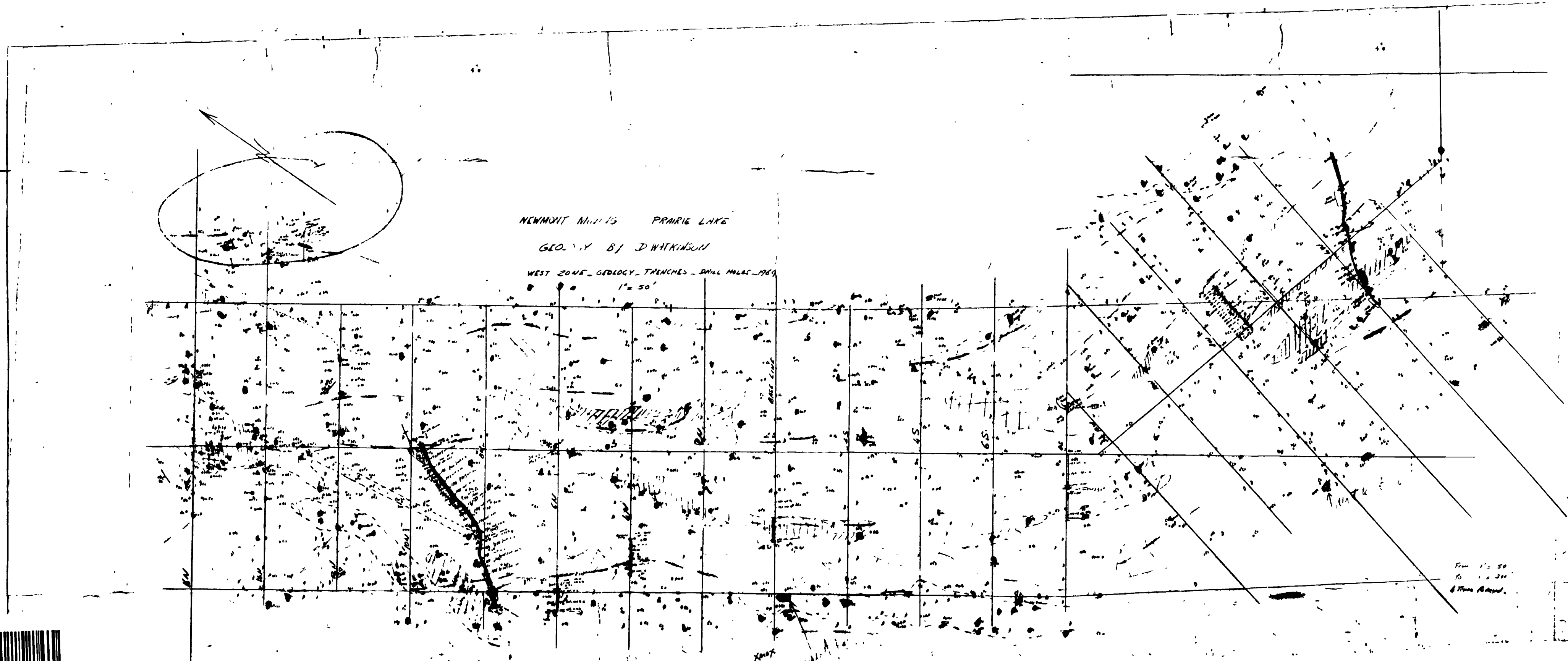
Yours sincerely,


H. Douglas Hume
President

encls.

Telephone
(416) 231-5603



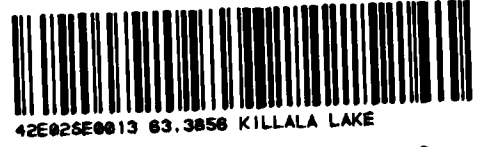


NEWMONT MINING PRAIRIE LAKE

GEOLOGY BY D. WATKINSON

WEST ZONE GEOLOGY TRENCHES - DWAL MISC - 1969
1" = 50'

1" = 50'
10' = 200'
8 Times Reduced



200

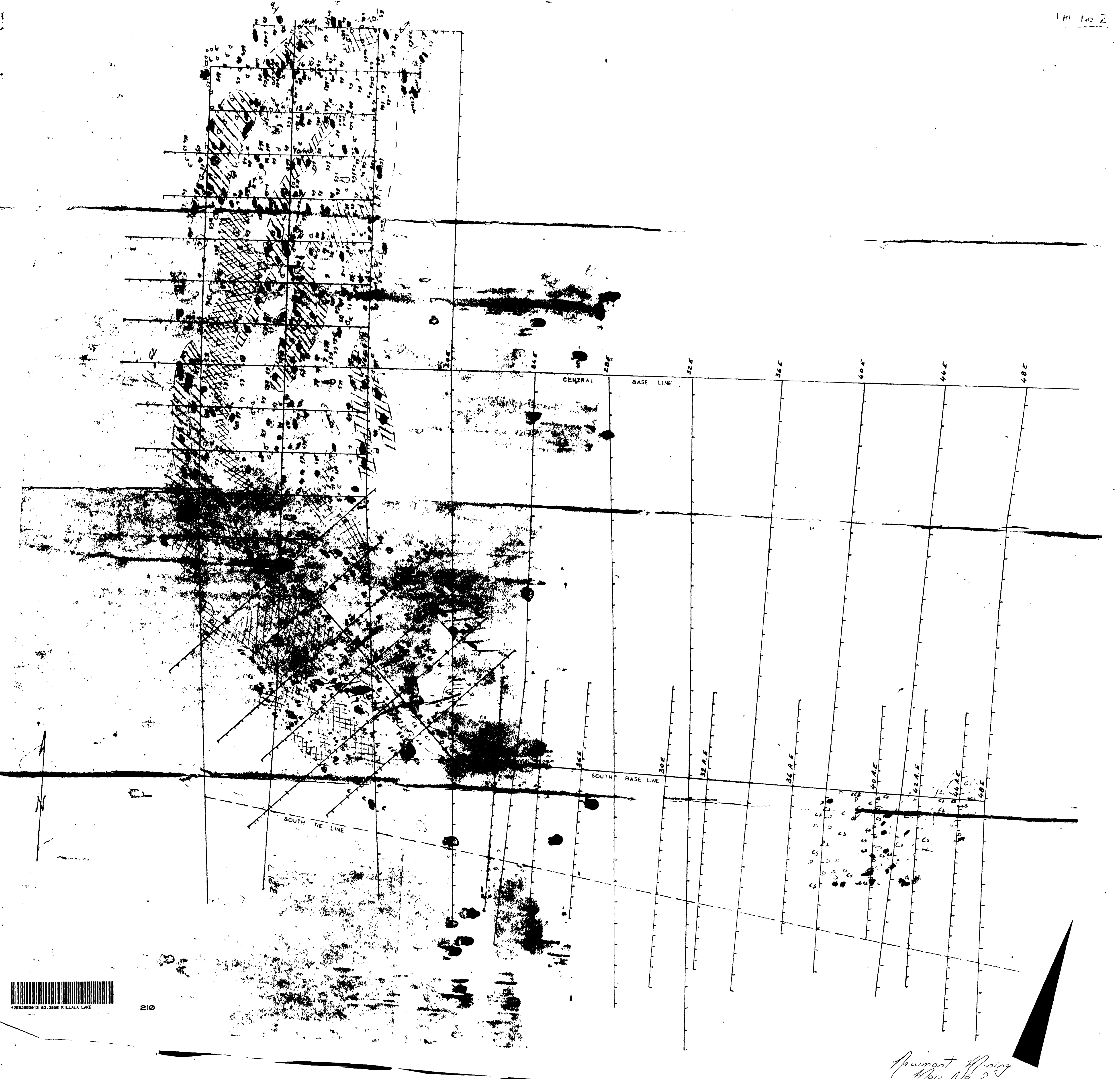
S = Sand (weathered loose stuff)
Legend

- ① Carbonatite
 - ② Pyroxenites
944
 - ③ Metites
741
 - ④ Breccia
 - ⑤ Ferrite
- Calcite + Mica + magnetite + olivine + pyroxene + dolo
↓ alteration products
Pyroxene + Nepheline always +
= Pink grey zeolite Alteration
Nepheline + dark green sodic pyroxene (aegirine) + melonite garnet
+ wallastonite + sphene + magnetite + calcite.
aegirine filled fractures + removal of quartz.

- 743
- Rad
- Main Mig. Trend
- Linear s.
- Bottom of Prairie hill slope
- Clay lens
- Trails
- Pit
- Trench + line of Pits
- Sample number.

1" = 50'
WEST ZONE COOL.

Newmont Mining
Prairie Lake



424282810 83.3658 KILLALIA LAKE

*Newmont Mining
Map No 2*