MINISTRY OF ENERGY, MINES
AND PETROLEUM RESOURCES
KAMLOOPS, B.C.
Rec'd JUL 14 1987

PROPERTY FILE
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THIS PROSPECTUS CONSTITUTES A PUBLIC OFFERING OF THESE SECURITIES ONLY IN THOSE JURISDICTIONS WHERE THEY MAY BE LAWFULLY OFFERED FOR SALE AND THEREIN ONLY BY PERSONS PERMITTED TO SELL SUCH SECURITIES.

NO SECURITIES COMMISSION OR SIMILAR AUTHORITY IN CANADA HAS IN ANY WAY PASSED UPON THE MERITS OF THE SECURITIES OFFERED HEREUNDER AND ANY REPRESENTATION TO THE CONTRARY IS AN OFFENCE.

PROSPECTUS **DATED: MARCH 3, 1987**

NEPHELINE RESOURCES LTD.
(hereinafter called the "Issuer")

PUBLIC OFFERING

300,000 Common Shares

	Price to Public	Commission	Net Proceeds to be Received by the Issuer *
Per Share	$0.35	$0.05	$0.30
Total	$105,000	$15,000	$90,000

*Before deduction of the costs of the issue estimated to be $10,000.

THERE IS NO MARKET FOR THE SECURITIES OF THE ISSUER.

A PURCHASE OF THE SECURITIES OFFERED BY THIS PROSPECTUS MUST BE CONSIDERED AS SPECULATION. ALL OF THE PROPERTIES IN WHICH THE ISSUER HAS AN INTEREST ARE IN THE EXPLORATION AND DEVELOPMENT STAGE ONLY AND ARE WITHOUT A KNOWN BODY OF COMMERCIAL ORE. NO SURVEY OF ANY PROPERTY OF THE ISSUER HAS BEEN MADE AND THEREFORE IN ACCORDANCE WITH THE LAWS OF THE JURISDICTION IN WHICH THE PROPERTIES ARE SITUATE, THEIR EXISTENCE AND AREA COULD BE IN DOUBT. SEE ALSO THE HEADING "RISK FACTORS" HEREIN.

THIS OFFERING IS SUBJECT TO A MINIMUM SUBSCRIPTION BEING RECEIVED BY THE ISSUER WITHIN 180 DAYS OF THE EFFECTIVE DATE OF APRIL 22, 1987 FURTHER PARTICULARS OF THE MINIMUM SUBSCRIPTION ARE DISCLOSED ON PAGE 2 UNDER THE CAPTION "SHARE OFFERING AND PLAN OF DISTRIBUTION".

THE VANCOUVER STOCK EXCHANGE HAS CONDITIONALLY LISTED THE SECURITIES BEING OFFERED PURSUANT TO THIS PROSPECTUS. LISTING IS SUBJECT TO THE ISSUER FULFILLING ALL THE LISTING REQUIREMENTS OF THE VANCOUVER STOCK EXCHANGE ON OR BEFORE OCTOBER 19, 1987 INCLUDING PRESCRIBED DISTRIBUTION AND FINANCIAL REQUIREMENTS.

NO PERSON IS AUTHORIZED BY THE ISSUER TO PROVIDE ANY INFORMATION OR TO MAKE ANY REPRESENTATION OTHER THAN THOSE CONTAINED IN THIS PROSPECTUS IN CONNECTION WITH THE ISSUE AND SALE OF THE SECURITIES OFFERED BY THE ISSUER.

UPON COMPLETION OF THIS OFFERING THIS ISSUE WILL REPRESENT 20.69% OF THE SHARES THEN OUTSTANDING AS COMPARED TO 51.72% THAT WILL THEN BE OWNED BY THE CONTROLLING PERSONS, PROMOTERS, DIRECTORS AND SENIOR OFFICERS OF THE ISSUER AND ASSOCIATES OF THE AGENT. REFER TO THE HEADING "PRINCIPAL HOLDERS OF SECURITIES" HEREIN FOR DETAILS OF SHARES HELD BY DIRECTORS, PROMOTERS AND CONTROLLING PERSONS AND ASSOCIATES OF THE AGENT.

ONE OR MORE OF THE DIRECTORS OF THE ISSUER HAS AN INTEREST, DIRECT OR INDIRECT, IN OTHER NATURAL RESOURCE COMPANIES. REFERENCE SHOULD BE MADE TO THE HEADING "DIRECTORS AND OFFICERS" HEREIN FOR A COMMENT AS TO THE RESOLUTION OF POSSIBLE CONFLICTS OF INTEREST.

WE, AS AGENT, CONDITIONALLY OFFER THESE SECURITIES SUBJECT TO PRIOR SALE, IF, AS AND WHEN ISSUED BY THE ISSUER AND ACCEPTED BY US IN ACCORDANCE WITH THE CONDITIONS CONTAINED IN THE AGENCY AGREEMENT REFERRED TO UNDER "PLAN OF DISTRIBUTION" IN THIS PROSPECTUS.

AGENT

CANARIM INVESTMENT CORPORATION LTD.
2200 - 609 Granville Street
Vancouver, British Columbia

EFFECTIVE DATE: APRIL 22, 1987

NEPHELINE RESOURCES LTD.

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SUMMARY OF PROSPECTUS

The following summary is qualified by the more detailed information contained in this Prospectus.

THE COMPANY: Nepheline Resources Ltd. (the "Issuer") was incorporated under the British Columbia Company Act on May 7, 1986 and the principal business of the Issuer is the acquisition, exploration and development of natural resource properties of merit.

In the ongoing search of the Issuer for meritorious properties to acquire, explore and develop, the Issuer has pursuant to an assignment agreement dated April 25, 1986 between Racer Resources Ltd. and the Issuer, as amended pursuant to an agreement dated September 30, 1986 between the Issuer, Racer Resources Ltd. and Richard Addison and Okanagan Nepheline Ltd., on November 14, 1986, the Issuer acquired the option to purchase up to a 75% interest in and to the NEP Mining Claims. The claims contain deposits of a mineral called nepheline syenite which is a silica-deficient rock used primarily in the manufacture of ceramics and glass.

ISSUE: 300,000 commmon shares (the "Shares").

PRICE: $0.35 per share.

USE OF PROCEEDS: The estimated net proceeds from the sale of the Shares will amount to approximately $90,000 after deducting Agent's Commissions. Pursuant to favourable engineering reports dated September, 1986, the Company expects to expend $85,000 on the exploration program on the Property.

RISK FACTORS: An investment in the Shares involves a high degree of risk due to the speculative nature of the business of the Issuer and the present stage of its development. See "Risk Factors" for a discussion of certain factors which could effect the business of the Issuer.

SHARE OFFERING AND PLAN OF DISTRIBUTION

Offering

The Issuer by its Agent hereby offers (the "Offering") to the public through the facilities of the Vancouver Stock Exchange (the "Exchange") 300,000 shares (the "Shares") of the Issuer at a price of $0.35 per share (the "Offering Price"). The Offering will be made in accordance with the rules and policies of the Exchange and on a day (the "Offering Day") determined by the Agent and the Issuer, with the consent of the Exchange, within a period of 180 days from the date (the "Effective Date") upon which the Shares of the Issuer are conditionally listed on the Exchange.

Appointment of Agent

The Issuer, by an agreement (the "Agency Agreement") dated December 3, 1986 as amended March 3, 1987, appointed the following as its agent ("Agent") to offer the Shares through the facilities of the Exchange as follows:

Name of Agent	Participation
Canarim Investment Corporation Ltd.	300,000

The Agent will receive a commission of $0.05 per share.

The Agent reserves the right to offer selling group participation, in the normal course of the brokerage business to selling groups or other licenced broker-dealers, brokers and investment dealers, who may or may not be offered part of the commissions or bonuses derived from this Offering.

The obligations of the Agent under the Agency Agreement may be terminated before the opening of the market on the Offering Day at the Agent's discretion on the basis of its assessment of the state of the financial markets and may also be terminated at any time upon the occurrence of certain stated events.

The Issuer has granted the Agent a right of first refusal to provide future equity financing to the Issuer for a period of twelve (12) months from the Effective Date.

Those persons holding an interest of not less than 5% in Canarim Investment Corporation Ltd. are A.E. Turton, Peter M. Brown, Brian D. Harwood, C. Channing Buckland, and Michael W. Murphy.

There are no payments in cash, securities or other consideration being made, or to be made, to a promoter, finder or any other person or company in connection with the Offering.

The Directors, Officers and other Insiders of the Issuer may purchase shares from this Offering.

The Vancouver Stock Exchange has conditionally listed the securities being offered pursuant to this Prospectus. Listing is subject to the Issuer fulfilling all the listing requirements of the Vancouver Stock Exchange on or before October 19, 1987 including prescribed distribution and financial requirements.

Minimum Subscription

This Offering is subject to a minimum of 300,000 shares being sold on the Offering Day within the period of 180 days from the Effective Date. All funds received from the sale of the Shares will be held in trust by Montreal Trust Company until the minimum of 300,000 shares have been sold and the subscription price of $105,000 has been received. If the minimum of 300,000 shares are not sold within 180 days from the Effective Date, all funds will be returned to the purchasers without deduction. If the minimum of 300,000 shares are sold and notice of the release of funds is given to the Superintendent, the proceeds received will be paid to the Issuer less the commission payable to the Agent.

RISK FACTORS

The securities offered hereby are considered speculative due to the nature of the Issuer's business and the present stage of its development. A prospective investor should consider carefully the following factors.

Resource exploration and development is a speculative business and involves a high degree of risk. The marketability of natural resources which may be acquired or discovered by the Issuer will be affected by numerous factors beyond the control of the Issuer. These factors include market fluctuations, the proximity and capacity of natural resource markets and processing equipment, government regulations, including regulations relating to prices, taxes, royalties, land tenure, importing and exporting or minerals and environmental protection. The exact effect of these factors cannot be accurately predicted, but the combination of these factors may result in the Issuer not receiving an adequate return on invested capital.

The existence of title opinions should not be construed to suggest that the Issuer has good and marketable title to all of the properties described in this Prospectus. The Issuer follows the usual industry practice in obtaining title opinions with respect to its lands.

The securities being offered by this Prospectus represent 20.69% of the shares that will be issued and outstanding after the completion of the offering compared to 51.72% of the shares that will be held by the promoters, directors and officers and substantial security holders.

The offering price per share, exceeds the net tangible book value per common share, assuming the issuance of 300,000 shares, by $0.21 determined as follows:

Net tangible book value, before distribution;	$107,501
Increase in net tangible book value attributable to the issuance of common shares;	$ 90,000
Net tangible book value after the distribution.	$197,501
Net tangible value per share after distribution	$0.14
Dilution of subscribers per share	$0.21
Percentage of dilution in relation to the offering price	60%

There appears to be a limited international market for the Issuer's product. And the high transportation costs as compared to the production costs may result in limiting the feasible markets for the product.

There have been no metallurgical tests done to determine whether a sufficiently clean separation of iron can be attained to produce a marketable product.

The property of the Issuer contains a lower soda to potash ratio than other suppliers of the product which may cause sales resistance.

USE OF PROCEEDS

The estimated minimum net proceeds to be derived by the Issuer from the sale of the securities being offered hereby is $90,000. The principal purposes for which the minimum net proceeds are to be spent, together with working capital as at February 28, 1987 in the approximate amount of $33,300 for a total of $123,300 are, in order of priority, as follows:

(a)	to pay expenses of this issue (including legal, audit and printing)	$ 10,000
(b)	to carry out Phase I of the exploration program on the NEP Claims as recommended by John G. Payne, Ph.D., P.Geol., in his report dated September, 1986	$ 45,000
(c)	to provide reserve for working capital and general administrative expenses	$ 68,300
	Total:	$123,300

In the event of any material change in the affairs of the Issuer during the primary distribution of the shares offered by this Prospectus, an amendment to this Prospectus will be filed. Following completion of the primary distribution of the shares offered by this Prospectus, shareholders will be notified of changes in the affairs of the Issuer in accordance with the requirements of the appropriate regulatory authorities.

If the first stage of the exploration program is unsuccessful and the Issuer elects not to proceed with the subsequent stages of the program, the funds will be used to provide additional working capital. The Issuer has retained Charles K. Ikona as a consultant with respect to geological matters.

No part of the proceeds will be used to invest, underwrite or trade in securities other than those that qualify as investments in which trust funds may be invested under the laws of the jurisdiction in which securities offered by this Prospectus may be lawfully sold. Should the Issuer propose to use the proceeds to acquire non-trustee type securities after initial distribution of the securities offered by this Prospectus, approval of the shareholders must first be obtained, and prior disclosure must be made to the securities regulatory bodies having jurisdiction over the sale of the securities.

SHARE AND LOAN CAPITAL STRUCTURE

Designation of Security	Amount Authorized to issue	Amount Outstanding at 10/15/86	Amount Outstanding as of the date of this Prospectus	Amount Outstanding on Completion of Offering
Common Shares Without Par Value	10,000,000	1,150,001	1,150,001	1,450,001

NAME AND INCORPORATION

The full name of the Issuer is Nepheline Resources Ltd. The Issuer was incorporated by Memorandum and Articles under the British Columbia Company Act on May 7, 1986. The head office of the Issuer is situated at 700 - 675 West Hastings

Street, Vancouver, British Columbia, V6Z 1G3, its registered and records offices are situated at 1600-609 Granville Street, Vancouver, British Columbia.

DESCRIPTION OF BUSINESS AND PROPERTY OF THE ISSUER

Description of Business

The principal business of the Issuer is the acquisition, exploration and development of natural resource properties of merit. At present the Issuer is proposing to conduct an exploration program on certain mining claims as more particularly described below. The claims contain deposits of a mineral called nepheline syenite which is a silica-deficient rock used primarily in the manufacture of ceramics and glass, where the material is valued as a flux, and as a source of the oxides of aluminum, sodium and potassium. For greater detail of the nature and uses of nepheline syenite reference is made to the Lodell Report which Report is attached hereto and also is summarized below.

The Issuer is continually examining additional projects for acquisition, exploration and development.

Properties of the Issuer

NEP Claims, Osoyoos Mining Division, British Columbia

Pursuant to an Assignment Agreement made the 8th day of May, 1986 between Racer Resources Ltd., of 700 - 675 West Hastings Street, Vancouver, ("Racer") and the Issuer, as amended pursuant to an agreement dated September 30, 1986 between the Issuer, Racer and Richard Addison, and Okanagan Nepheline Ltd., both of 1141 West 33rd Avenue, Vancouver, British Columbia on November 14, 1986. The Issuer acquired the option to purchase up to a 75% interest in and to the NEP Mining Claims (the "NEP Claims"), located in the Osoyoos Mining Division, British Columbia. The agreement calls for the Issuer to pay Racer $10,000 (which has been paid) and to expend not less than $100,000 on exploration and development work on the NEP Claims on or before February 7, 1989 at which time the Issuer will have earned a 50% interest in the NEP Claims (the "First Option"). In order to earn an additional 25% interest in the NEP Claims the Issuer must on or before November 1, 1990 cause the commencement of commercial production from the NEP Claims, and upon doing so will have earned a total 75% interest in the NEP Claims (the

"Second Option"). Upon the Issuer exercising the First Option or the Second Option, as the case may be, the parties will enter into a joint venture agreement in order to commence commercial production or continue commercial production on the NEP Claims.

Location and Access

The NEP Claims are located approximately 10 kilometers west of the Town of Osoyoos in South Central British Columbia and access is by road from the junction of Highways 3 and 97 just north of Osoyoos. The NEP Claim block is comprised on nine (9) units.

Prospecting History

From 1963 to 1985 the previous exploration work undertaken in the area consisted of sampling and chemical analysis. In 1963 a Mr. Ken Butler sampled the predecessor claims and had them analysed by B.C. Research Council and by International Minerals and Chemical Corp. In 1972 Bethlehem blasted several small pits and sampled for chemical analysis and metallurgical study. Also a J.R. Bellamy undertook geological mapping which appears to be of little value.

Geology

The NEP Claims are the subject of a report (the "Payne Report") prepared by John G. Payne, Ph.D., P.Geol. which is appended hereto and forms a part of this Prospectus. The information set out below is taken from the Payne Report, which report should be referred to for greater detail.

The regional geology of the area between Osoyoos and the Similkameen Valley, as mapped by the Geological Survey of Canada in 1961, shows two (2) major units, the Kobau Group and the Nelson Intrusions. The Kobau Group of Carboniferous age consists of metamorphosed siliceous sediments and intermediate volcanic rocks; these strike north-south and dip moderately to locally steeply to the west. Further north the unit is more complexly folded. A major fault along the Okanagan Valley juxtaposes these rocks against tightly paragneiss of the Early Paleozoic Monashee Group. The Kobau group rocks are intruded by the Nelson Intrusions of Jurassic to Cretaceous age. These include the Kruger alkalic rocks, a dorite batholith, and stocks of monzonite with minor pegmatite. Rocks of the Kobau Group show moderate contact metamorphism and metasomatism along the borders of the intrusive rocks.

The Kruger alkalic rocks form sills conformable to foliation in themselves and in rocks of the Kobau group. Four (4) main sills are designated East, Main, South and Northwest. The sills are dominated by nepheline syenite with locally abundant syenite.

The main batholith is dominated by diorite, with local gabbroic diorite zones near the eastern margin. Much of the diorite is unfoliated, with more strongly foliated varieties mainly to the west of the property. Scattered stocks and dikes of monzonite and much less pegmatite cut the diorite; some of these also show a penetrative foliation.

Minor dacite porphyry dikes and patches probably are of Tertiary age, and related genetically to a large zone of Tertiary volcanic rocks to the north.

Several late faults cut the region. Some show slight left-lateral offset on the Kruger sills. Two (2) large faults trend northeastwards; these also may have left-lateral offset of up to 1,000 meters.

Thin section study of 53 samples of nepheline syenite and syenite show three (3) main types of nepheline syenite characterized by different assemblages of mafic minerals, and designated (1) hornblende zone, (2) aegirine-augite zone, and (3) biotite zone. The hornblende zone commonly is much finer grained than the other two (2), and occurs along the borders of the sills. Textures are mainly metamorphic, with relic primary igneous features preserved in some clots of mafic minerals and possibly as some K-fledspar phenocrysts. The nepheline syenite has a much higher K20/Na20 ratio than most nepheline syenite bodies.

Exploration Work Undertaken by the Issuer

During June of 1986, the Issuer undertook an magnetometer survey and collected large grab samples from outcrops along survey lines and nearby. Eleven samples were analyzed, which results are more particularly set out in Table 3 of the Payne Report.

The purpose of the two (2) reconnaissance magnetometer surveys undertaken by the Issuer were to determine if geological units had a characteristic magnetic response, which could be used to trace geological units into areas of no outcrop. The survey undertaken in May, 1986 included four (4) lines with the station spacing of 10 meters along lines. The June, 1986 survey included five (5) lines with station spacing of 20 meters along lines. Results of the surveys are shown in Figure 5 of the Payne Report.

The surveys agree in general, and indicate that different units have different magnetic responses, with most geological contacts between units marked by a sharp break in magnetic response. Correlation between lines and surveys is not as sharp as along lines, possibly because of an overall increase in magnetite content towards the south end of the NEP Claims. Values from the different units which comprise the NEP Claims are listed in Table 3 of the Payne Report.

On the basis of the responses in areas of abundant outcrop, the magnetometer survey results were used to extend geological boundaries into the North into areas of little or no outcrop. As well, the location and shape of some boundaries were somewhat refined.

To confirm tonnage estimates based on geological data, a diamond-drilling program was undertaken. The original purpose was to drill one (1) hole up to 300 meters long through the main sill. Hole 86-1 was set up for that purpose (see Figure 4 of the Payne Report), however, due to drilling problems it was terminated at a depth of 170 meters. Hole 86-2 was drilled parallel to Hole 86-1 from a point 140 meters due north, however, it was also terminated because of technical problems at 120 meters. Hole 86-3 was drilled from this same station as Hole 86-2, and inclined 60 degrees to the southwest and drilled to a depth of 40 meters to complete the drilling contract. It was nepheline syenite throughout its length.

The drill hole results agree with the geological data that the sills are tabular bodies extending to depths of at least 170 meters. The main and east sills are targets for development of quarries and based on a mining depth of about twice the width of the sills, the tonnages which are present in the two sills are 11.5 x 10(6) in the main sill and 13.2 x 10(6) in the southern half of the east sill. The northern half of the east sill is not included because it is uncertain how much of it is nepheline syenite and how much is syenite. For further details, please refer to page 14 of the Payne Report.

As at the date hereof the Issuer has expended $51,603 on exploration.

Metallurgical Factors

A critical factor in the economic feasibility of nepheline syenite for the glass and ceramic industry is the content of iron in the final product. This depends on the original iron content of the rock, and the extent to which the iron-bearing minerals can be removed from the rock by simple methods. In the Kruger sills, these minerals are hornblende, biotite, aegirine-augite, and garnet. The standard method of removal of iron-bearing phases is a high intensity, dry magnetic separation in a series of stages, with grinding of material between stages. The purpose is to produce a product composed of grains and aggregates of feldspars and nepheline, with a minimal amount of intergrowths of iron-bearing phases. The texture of the rocks is an important guide to evaluation of the suitability of a raw material to yield a desired product low in iron.

Metallurgical tests are necessary for different types of nepheline syenite to determine whether or not a sufficiently clean separation of iron can be attained to produce a marketable product.

Recommendations

The Payne Report recommends that the next stage of exploration include the following:

1. A detailed geological mapping within the deposit to attempt to outline mineralogical zones more accurately, and to determine the northern extent of nepheline syenite in the east sill. This will involve follow-up thin section analysis, which will also be useful in determination of textures;

2. Bulk sampling of the different mineralogical zones of nepheline syenite for metallurgical testing to determine the optimum materials and extraction methods to obtain a product with as low an iron content as possible. Extraction methods should be those ammenable for use in normal million activity, preferably dry, high-intensity magnetic separation in a stage program, with grinding between stages.

The estimated cost of the program is $45,000.

Contingent upon the results of the Phase I program, the Payne Report recommends a follow-up phase in the amount of $40,000. This next stage of work consists of diamond drilling to determine the extent of favourable zones within the main sills, with follow-up petrographic and milling studies to confirm the distribution of favourable and unfavourable zones in the parts of the sills available for quarrying.

The NEP Claims contain a deposit of nepheline syenite, however it is yet to be determined if the iron can be extracted in order to make the deposit commercially viable. The program to be undertaken by the Issuer is to first determine which part of the deposit is most suitable for metallurgical testing and secondly, to determine through metallurgical testing if the iron can be extracted.

EXAMINATION OF MARKETS FOR NEPHELINE SYENITE - LOBDELL REPORT

In order to gather market and economic information to judge the merits of incurring the expense of the recommended work program, the Issuer commissioned a study to evaluate the potential economic gain of the program. Although there is a lack of economically significant technical data with respect to the NEP Claims and the deposit, it was considered appropriate to undertake such a study in order to evaluate the concept of producing nepheline syenite.

The objectives of the study were to identify the potential market region, to obtain the current production and consumption statistics for aluminous materials within the market regions, to define consumer specifications and competitive forces which materials from the deposit would encounter, and to postulate what costs and revenues would likely result from any future development.

It is to be noted that the study is a preliminary one and many assumptions had to be made in order to incorporate the results of the market study into an economic evaluation of the project as a concept.

The Issuer retained D.G. Lobdell Consulting, of P.O. Box 3103, Kamloops, British Columbia, V2C 6B8 which Report was reviewed by Alex Burton, P. Eng, (the "Lobdell Report"). The information set out below is taken from the Lobdell Report, which is appended hereto and forms a part of this Prospectus. For greater detail of the information set out below, the Lobdell Report should be referred to directly.

Nature and Use of Nepheline Syenite

Nepheline syenite is a silica-deficient crystalline rock composed of albite and microcline feldspars and nepheline, together with varying amounts of mafic silicates and accessory minerals. Glass and ceramic-quality nepheline syenite is produced commercially at three (3) locations by Indusmin Ltd. at Nephton, Ontario, Norsk Nefelin at Stjernoy Island near the northern tip of Norway, and most recently by Austral Ltd., near Rio de Janeiro, Brazil.

Commercial operations involving other uses include two (2) sites in the Soviet Union where nepheline syenite is used as a source of alumina in the production of aluminum. Portland cement, sodium carbonate and potassium carbonate are produced as co-product and by-product materials from this unique Russian process of winning aluminum.

Lastly, construction aggregates and roofing granules are produced from a bastard nepheline syenite in Arkansas.

Nepheline syenite is readily substituted by feldspar, feldspathic sands (a feldspar-silica mixture), aplite, and steel mill flag. The choice is largely dependent upon the effective delivered cost of each oxide source, with credits for each desired oxide (aluminia, silica, and alkalies) and penalites deleterious constituents (usually iron). In some ceramic applications, particularly tile manufacture, pyrophyllite can also substitute for nepheline syenite.

Marketability of Kruger Nepheline Syenite

Past work in the area of the NEP Claims is considered of no real value in assessing the economic potential of the nepheline syenite. The preliminary field and laboratory work being conducted by the Issuer suggests the iron content in the deposit might be reduced to a level suitable for some economic applications but would be difficult to reduce the iron content to a level required by high-quality glass and ceramic applications. The ratio of sodium to potassium is much lower than that used by the glass industry. The high potassium content might be favourable for some uses. For the purposes of the Lobdell Report, it is assumed that the iron content can be reduced to an acceptable level and that the market resistance associated with the low sodium/potassium ratio could be overcome.

Geographical Market Scope

It is probable that material from the NEP Claims would be competitive in markets east of the 110th Meridian, as those to the east are well-served by established, inexpensive, high-quality products from nearby. Nepheline syenite produced at Nephton, Ontario dominates the eastern market for over 1,000 mile. A material produced in Western Canada might compete effectively over similar radius. Markets in North America were examined west of the 110th meridian and as far south as California. Significant glass and ceramic production is known to occur only in Alberta, British Columbia, Washington, Oregon and California. As information for selected Pacific Rim countries was readily available and due to the location of the NEP Claims, this information was also incorporated into the study.

The study is limited to an examination of glass and ceramic markets only, as about 90% of the expected markets for nepheline syenite relate to its use in the manufacture of glass and ceramics.

Study Limitations

The manufacturer of glass appears to be dominated by a few large, high-profile companies who are readily identified, thus the glass markets for western regions of the United States and Canada are considered to be well-defined by this study. On the other hand, the ceramic industry is comprised of numerous, small, low-profile companies thus it is likely that the markets for ceramic-grade materials are significantly underestimated in this study. Only the sanitary white wear manufacturers were identified as major users of ceramic-grade nepheline syenite.

Market Study

Most of the North American glass industry combine high purity silica sand with a suitable aluminus material in their batch formulations, the point being they buy silica and alumina separately and combine them during batching. Due to geologic history, western North America has an abundance of feldspathic sands (quartz-feldspar mixtures) and an acute shortage of high-purity sands such as are found in the East. Where silica is scarce, feldspathic sands have a competitive edge over highly-aluminous materials due to their high silica content. Therefore, it is important to recognize the importance of both silica and alumina supplies in a market study involving nepheline syenite.

Northwest Markets

The glass industry in western Canada is presently confined to the manufacture of container glass and fibreglass insulation, with five (5) operations in Alberta and British Columbia. In the United States Pacific Northwest, container glass is manufactured in Seattle and Portland and a new flat glass operation is coming on-line in Chehalis, Washington.

High-quality silica is supplied from producers in Selkirk, Manitoba, Golden, British Columbia, and Valley, Washington. These silica deposits have ample reserves and are centrally located with respect to the markets they serve (except for the Selkirk operation, which is outside and east of the consuming region).

Alumina is supplied to western Canada largely from nepheline syenite from Nephton, Ontario, although a feldspathic sand deposit near Emmett, Idaho, supplied this market prior to the marked devaluation of the Canadian dollar.

The only identified user of alumina in ceramic production in the Northwest is sanitary white wear manufacture, Crane Canada Inc., at Coquitlam, British Columbia. Reference is made to Table 7 of the Lobdell Report which summarizes the supply-and-demand relationships for aluminous materials in the Northwest.

California Markets

The glass industry in California consists of three (3) flat-glass plants, three (3) fibreglass plants, and 15 container glass manufacturers. The latter are centered in the Los Angeles/San Francisco areas with much of the container glass production being wine bottles.

Silica sand is produced for its own use by Owens-Illinois Co. in Ione, California and as well supply other consumers. Several producers in the Overton, Nevada area provide most of the non-captive silica to California.

California is short of high-quality silica sand, but has an ample supply of feldspathic sand. Reference is made to Table 8 in the Lobdell Report for details on the supply-and-demand relationships for aluminous materials used in California glass and ceramic manufacture.

Pacific Rim Markets

It appears all Pacific Rim countries have adequate indigenous sources of aluminous material except Australia and possibly Hong Kong. Japan is known to have imported about 6,000 short tonnes of feldspar from China and India in 1979 and in addition, produced 500,000 short tonnes of indigenous materials. Australia would appear to be a potential market if transportation costs were sufficiently low. Australia has imported some nepheline syenite but the exact details are not known. It would appear then that only Australia would offer potential sales for nepheline syenite for offshore Pacific Rim markets and this market should be better investigated.

Market Evaluation

The Lobdell Report considered deposit location, ore reserves, physical and chemical character of chemical product, production costs, user requirements and competitive sources of product in order to evaluate the economics of the nepheline syenite project. Each of these factors has been briefly described below.

Deposit Location: The NEP Claims are centrally located with respect to Northwest markets and all infrastructural needs are close-by.

Ore Reserves: Industrial mineral economics usually require at least 20 years ore reserves or in this case, one (1) million tonnes. The coarsely-crystalline nature of this type of an intrusive strongly suggests that if a material suited to beneficiation could be located, it would likely be found in sufficient volume to meet needed ore reserve requirements.

Physical and Chemical Character of Commercial Product: It is evident that any commercial product from the NEP Claims would have a low sodium/potassium ratio and possibly a high iron content, relative to materials normally used in the manufacture of glass. The NEP Claims may also contain deleterious materials such as refractory minerals, or intolerable levels of impurities chromium, cobalt, manganese, titanium or copper.

The sodium/potassium ratio represents a marketing problem which time should solve, as the product becomes accepted through usage.

Production Costs: As no processing methods or equipment have been identified as suitable, there is no basis to estimate production costs. However, for purposes of the Lobdell Report, production costs for the NEP Claims have been estimated at $40 per ton which has been calculated by using the selling price for nepheline syenite by Indusmin Ltd. and adjusting for higher waste costs which may be associated with the NEP Claims.

User Requirements: The Lobdell Report has assumed that a commercially acceptable material can be produced. The most contentious part of this assumption being the reduction of iron to acceptable levels.

Competitive Sources: In the Northwest, there are three (3) sources of aluminous materials being nepheline syenite from Nephton, Ontario, and feldspathic sands from Emmett, Idaho, and Coos Bay, Oregon.

The nepheline syenite dominates the Canadian market, selling for about $30 per ton. In Nephton and landing into western Canada for about $110 to $130 per ton, depending upon the destination. The Emmett sand sells for about $21 per ton and would land into Seattle and Portland for about $45 to $50 per ton. The effective landed cost of the Emmett sand would be over $100 per ton when compared to hypothetical material from the NEP Claims.

The California feldspathic sands would land at their destinations for about $25 to $40 per ton. Because of the expense of silica, the effective landed costs of these materials would be less in most cases, when compared to more aluminous materials. Therefore, materials high in aluminia would be most competitive in the California marketplace for most uses.

Considering the above factors and assuming the production from the NEP Claims has a total iron content less than 0.25%, it would be reasonable for the material to capture most of the market a three (3) year period or about 25,000 tons annually.

<u>Economic Analysis</u>

Using the assumptions as set out in the section above and assuming total capital infusion of $1,500,000 expended equally over a three (3) year period the Lobdell Report bases its economic analysis upon a pilot/small scaled commercial operation in year one (1), expansion to commercial operation in year two (2), and finally in year three (3) permanent facility.

Conclusions and Recommendations

The Lobdell Report has concluded that given certain assumptions (which assumptions are set out on page 14 of the Lobdell Report), that the materials found on the NEP Claims are potentially economic. The Lobdell Report recommends that further work concentrate on determining the most suitable zone for development, in order to identify suitable processing methods, define equipment requirements and operating costs, and produce materials representative of an expected commercial product. Moreover, it is critical to demonstrate acceptable iron levels be achieved and that samples be sent to the glass manufacturers to test for deleterious minerals and substances.

INCORPORATION WITHIN ONE YEAR PRELIMINARY EXPENSES

As set out in the audited financial statements of the Issuer for the period ending October 15, 1986, as attached hereto, the following preliminary expenses were incurred by the Issuer since its incorporation on May 7, 1986;

(a)	Deferred exploration, development and other expenses	$51,603
(b)	Acquisition of resource properties for cash and shares	$10,000
(c)	Administrative expenses, including incorporation expenses	$11,644

PROMOTERS

Pursuant to the definition of the Securities Act of the Province of British Columbia, Brian H. Scharf, Edwin A. Philpot, and Patrick Harrison are the promoters of the Issuer in that they took an active part in the organization of the Issuer and/or by virtue of having received more than

10% of the common stock of the Issuer. Brian Scharf purchased 750,000 escrow shares in the Issuer at $0.01 per share.

ISSUANCE OF SHARES

The authorized capital of the Issuer consists of 10,000,000 common shares without par value.

The securities offered by this Prospectus are common shares of the Issuer. Each common share of the Issuer ranks equally as to dividends, voting rights, participation and assets and in all other respects. Each common share carries one vote per share at meetings of the shareholders of the Issuer. These are no indentures or agreements limiting the payment of dividends and there are no conversion rights, special liquidation rights, preemptive rights or subscription rights attached to the common shares. The shares presently issued are not subject to any calls or assessments and the shares offered under this Prospectus will not be subject to any calls or assessments.

DIVIDEND POLICY

No dividends have been paid on any shares of the Issuer since the date of incorporation nor is it intended to pay a dividend on any of its shares in the immediate future.

DIRECTORS AND OFFICERS

The following are the full names, home addresses, positions with the Issuer and principal occupations within the preceding five years of all of the directors and officers of the Issuer:

Name, Address and Position with Issuer	Principal Occupation for the Past Five Years
BRIAN HOWARD SCHARF * 2277 McGill Street Vancouver, B.C. V6E 1E1 **PRESIDENT AND DIRECTOR** **CHIEF EXECUTIVE AND FINANCIAL OFFICER**	School teacher for the past 18 years; Director of Hennessey Resources Ltd., Time Square Resources Ltd., and Golden Coin Resources Ltd., 1985-1986.

EDWIN ALEXANDER PHILPOT *
#51 - 1122 Haro Street
Vancouver, B.C. V5J 1Z6
DIRECTOR AND PROMOTER

Salesman for The Printers 1986 to Present; Salesman for Schuman Harte 1975-1985.

PATRICK THOMAS HARRISON *
700 - 675 West Hastings Street
Vancouver, B.C.
V6B 1N2
DIRECTOR AND PROMOTER

Member of Vancouver School Board 1981-1986.

RONDA JAY ROSS
19459 - 0 Avenue
R.R.#8
Surrey, B.C.
V3S 5J9
SECRETARY

Self-employed Business Consultant to reporting companies.

* Denotes members of the Audit Committee.

Certain of the directors of the Issuer also serve as directors of other companies involved in natural resource development. Accordingly, it may occur that certain natural resource properties will be offered to both the Issuer and such other companies and that the Issuer and such other companies will be participating in the same properties. In order to avoid the possible conflict of interest which may arise between the directors' duties to the Issuer and their duties to the other companies on whose Boards they serve, the directors and officers have agreed to the following:

(a) Participation in natural resource prospects offered to the directors will be allocated between the various companies on the basis of prudent business judgment and the relative financial abilities and needs of the companies to participate; and

(b) Prospects formulated by or through the other companies in which the directors and officers are involved will not be offered to the Issuer except on the same or better terms than the basis on which they are offered to third party participants and no commissions or other consideration will be paid to such directors and officers.

The Issuer has retained Charles K. Ikona, Geologist, as a consultant with respect to geological matter.

EXECUTIVE COMPENSATION

The Issuer, at the present time has one (1) executive officer. During the most recently completed financial year a management fee in the total amount of $8,000 was paid to the executive officer for managing the affairs of the Issuer. There have been no incentive stock options granted to the directors or executive officer during the recently completed financial year. Reference is made to the heading "Escrowed Shares" for details of shares issued as principal shares.

ESCROWED SHARES

Designation of Class	No. of Shares held in Escrow	Percentage of Issued Shares
Common	750,000	65.21%

As at the date of this Prospectus 750,000 shares are held in escrow by Montreal Trust Company, 510 Burrard Street, Vancouver, British Columbia, V6C 3B9 subject to the direction or determination of the Superintendent of Brokers for British Columbia (the "Superintendent") prior to listing of the Company's shares on the Vancouver Stock Exchange (the "Exchange"); and, after listing, to the direction of the Exchange.

The escrow restrictions provide that the shares held in escrow may not be traded in, dealt with in any manner whatsoever or released, nor may the Issuer, its transfer agent or an escrow holder make any transfer or record any trading of shares without the consent of the Superintendent (prior to listing of the Issuer's shares on the Exchange) or the Exchange (after listing).

The escrow arrangements also provide, among other matters,

(a) for a pro-rata release of shares at the discretion of the appropriate regulatory authorities based upon a formula acceptable to the Superintendent;

(b) the consent of the appropriate regulatory authority to effect a transfer of registration of such shares held within escrow to succeeding principals; and

(c) that any escrow shares not released at the end of ten (10) years from the date of issuance by the Superintendent of a receipt for a prospectus relating to the Issuer's first primary distribution to the public shall be cancelled.

The complete text of the escrow agreement is available for inspection at the registered office of the Issuer, 1600 - 609 Granville Street, Vancouver, British Columbia.

POOLED SHARES

Other than the shares acquired by an associate of the Agent, as more particularly described under the heading "Principal Holders of Securities", there are no shares of the Issuer held in pool.

PRINCIPAL HOLDERS OF SECURITIES

As at the date of this Prospectus, the following are particulars of the holders of 10% or more or the issued shares of the Issuer:

Name and Address	Designation of Class	Type of Ownership	No. of Shares	Percentage Issued Shares
Brian Howard Scharf 306-2277 McGill Street Vancouver, BC V5L 1C3	Common	Direct	750,000	65.21%

The Directors and Senior Officers, as a group, own directly or indirectly the following percentage of without par value shares of the Issuer:

Designation of Class	Percentage of Class
Common	65.22%

An associate of the Agent has purchased an aggregate of 40,000 shares of the Issuer at a price of $0.25 per share. The holder of these shares has undertaken not to sell or otherwise deal with the shares until the expiration of six

(6) months from the date of listing and no shares acquired during the non-reporting stage will be sold until at least seven (7) days after notice of the intended sale is filed with the Superintendent and the Exchange and such sale of shares so acquired to be limited to:

(a) 25% within the first three (3) months after the expiry of six (6) months following listing on the Exchange; and

(b) not more than 25,000 shares each three (3) month period thereafter.

PRIOR SALES

Shares for Cash:

The following is a summary of the shares allotted for cash by the Issuer during the period from its incorporation on May 7, 1986 to the date of this Prospectus:

Number of Shares	Price per Share
1	$1.00
750,000	$0.01
400,000	$0.25

INTEREST OF MANAGEMENT AND OTHERS IN MATERIAL TRANSACTIONS

The directors and officers of the Issuer have no other interest in any material transactions in which the Issuer has participated or intends to participate at this time, other than as disclosed in this Prospectus.

AUDITORS, TRANSFER AGENT AND REGISTRAR

The auditors of the Issuer are Smythe, Ratcliffe & Associates, Chartered Accountants, of 7th Floor, Marine Building, 355 Burrard Street, Vancouver, British Columbia, V6C 2G8.

The transfer agent and registrar of the Issuer is Montreal Trust Company, of 510 Burrard Street, Vancouver, British Columbia, V6C 3B9.

MATERIAL CONTRACTS

Escrow Agreement dated October 7, 1986, refer to the heading "Escrowed Shares".

Agency Agreement dated December 3, 1986 as amended March 3, 1987 refer to the heading "Share Offering and Plan of Distribution".

Assignment Agreement dated May 8, 1986 between Racer Resources Ltd. and the Issuer, refer to the heading "Properties of the Issuer".

Amending Agreement dated September 30, 1986 between Racer Resources Ltd, Richard Addison, Okanagan Nepheline Ltd. and the Issuer, refer to the heading "Properties of the Issuer".

Examination of markets for Nepheline Syenite dated October, 1986, refer to the heading "Properties of the Issuer".

Letter Agreement dated March 10, 1987 between the Company and Charles Ikona, Geologist, refer to the heading "Use of Proceeds".

There are no material contracts except as disclosed in this Prospectus, or entered into in the ordinary course of the Issuer's business, all of which may be inspected at the registered and records office of the Issuer at Suite 1600, 609 Granville Street, Vancouver, British Columbia during normal business hours while primary distribution of the shares offered hereunder is in progress and for the period of thirty (30) days thereafter.

STATUTORY RIGHTS OF RESCISSION AND WITHDRAWAL

The British Columbia Securities Act (the "Act"), provides purchasers with a right of action for damages or rescission against a dealer who does not send the purchaser:

(a) before entering into the written confirmation of the sale agreement resulting from the order or subscription, or

(b) not later than midnight on the second business day after entering into the agreement, the latest prospectus respecting the security. The purchaser also has the right to withdraw from an agreement to purchase securities within two (2) business days after receipt or deemed receipt of a prospectus.

The Act also provides a purchaser with a right of action for damages or rescission of a prospectus containing a misrepresentation.

The remedies provided in the Act must be exercised by the purchaser within the time limits prescribed in the Act and Regulations. The purchaser should refer to the provisions of the Act for the particulars of these rights or consult with a lawyer.

NEPHELINE RESOURCES LTD.

FINANCIAL STATEMENTS

October 15, 1986

SMYTHE RATCLIFFE & ASSOCIATES
CHARTERED ACCOUNTANTS

AUDITORS' REPORT

To The Directors
Nepheline Resources Ltd.

We have examined the balance sheet of Nepheline Resources Ltd. as at October 15, 1986 and the statements of deferred exploration and administrative expenditures and changes in financial position for the initial 161 day period then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the company as at October 15, 1986 and the results of its operations and the changes in its financial position for the initial period then ended in accordance with generally accepted accounting principles.

Smythe Ratcliffe & Associates

VANCOUVER, B.C.
April 13, 1987

CHARTERED ACCOUNTANTS

NEPHELINE RESOURCES LTD.

BALANCE SHEET

October 15, 1986

ASSETS

CASH	$ 35,254
INVESTMENT IN MINERAL PROPERTY OPTION (Notes 3, 4 and 6)	10,000
DEFERRED EXPLORATION AND ADMINISTRATIVE EXPENDITURES	63,247
	$ 108,501

LIABILITY

ACCOUNT PAYABLE	$ 1,000

SHAREHOLDERS' EQUITY

CAPITAL STOCK (Note 5)	107,501
COMMITMENT (Note 6)	$ 108,501

Approved by the Directors:

Patrick D. Harrison .... Director

.... Director

See notes to financial statements.

NEPHELINE RESOURCES LTD.

STATEMENT OF DEFERRED EXPLORATION AND ADMINISTRATIVE EXPENDITURES

For the Initial 161 Day Period Ended October 15, 1986

EXPLORATION		
Mineral property		$ 51,603
ADMINISTRATIVE		
Management fee	$ 8,000	
Office and miscellaneous	1,217	
Audit	1,000	
Incorporation costs	917	
Director's fee	500	
Bank charges	10	11,644
DEFERRED EXPLORATION AND ADMINISTRATIVE EXPENDITURES AT END OF PERIOD		$ 63,247

See notes to financial statements.

NEPHELINE RESOURCES LTD.

STATEMENT OF CHANGES IN FINANCIAL POSITION

For the Initial 161 Day Period Ended October 15, 1986

INVESTMENT ACTIVITIES	
Deferred exploration and administrative expenditures	$ (63,247)
Acquisition of mineral properties	(10,000)
Account payable	1,000
	(72,247)
FINANCING ACTIVITY	
Shares issued for cash	1
Shares subscribed for cash	107,500
	107,501
CASH AT END OF PERIOD	$ 35,254

See notes to financial statements.

NEPHELINE RESOURCES LTD.

NOTES TO FINANCIAL STATEMENTS

For the Initial 161 Day Period Ended October 15, 1986

1. SIGNIFICANT ACCOUNTING POLICIES

(a) General:

The company is in the development stage and has yet to generate significant revenues.

(b) Deferred exploration and administrative expenditures:

The company defers all expenditures until such time as a mineral property commences production on a commercial basis, is sold or abandoned.

Upon attainment of commercial production from a property, applicable deferred expenditures will be depleted by the unit of production method, based upon the property's total estimated reserves.

Upon sale or abandonment of a property, the net gain or loss arising from disposal will be charged against earnings.

Expenditures are recorded at cost to the company.

2. INCORPORATION

The company was incorporated May 7, 1986 under the Laws of the Province of British Columbia.

3. REALIZATION OF ASSETS

The interest in mineral property and deferred exploration and administrative expenditures comprise a significant portion of the company's assets.

Realization of the company's investment in these assets is dependent upon the attainment of successful production from the properties or from the proceeds of their disposal.

4. INVESTMENT IN MINERAL PROPERTY OPTION

NEP Claims, Osoyoos Mining Division,
British Columbia

Acquired for cash	$ 10,000

NEPHELINE RESOURCES LTD.

NOTES TO FINANCIAL STATEMENTS

For the Initial 161 Day Period Ended October 15, 1986

5. CAPITAL STOCK

(a) Authorized:

10,000,000	Common shares without par value	
Issued:		
1	Common share	$ 1
Subscribed:		
1,150,000	Common shares	107,500
		$ 107,501

(b) During the period, the company:

(i) issued 1 common share for $1.00 cash;

(ii) allotted 400,000 common shares for $100,000 cash; and

(iii) allotted 750,000 common shares to be held in escrow for $7,500 cash.

6. COMMITMENT

The company has agreed to acquire a 75% joint venture interest in nine mineral claims in the Osoyoos Mining Division, British Columbia. The agreement calls for the company to expend $100,000 on exploration and development work, on or in respect of the Property before February 7, 1989 in order to exercise a first option for a 50% joint venture interest, and to commence commercial production before November 1, 1990 to exercise a second option for a further 25% joint venture interest.

GEOLOGICAL REPORT
NEP CLAIM GROUP
Osoyoos Mining Division

NTS 82-E/4

49°2'N, 119°35'W

for

Nepheline Resources Limited

by

John G. Payne, PhD.

877 Lillooet Road,
North Vancouver, B.C.,
V7J 2H6

(604) 986-2928

September 1986

GEOLOGICAL REPORT

NEP CLAIM GROUP

Osoyoos Mining Division

A Nepheline Syenite Prospect

NTS 82-E/4

49°2'N, 119°35'W

INTRODUCTION

At the request of Nepheline Resources Ltd., I examined the NEP claim group between May 20th and 24th, 1986. Previously, on November 13th, 1985, I had made a preliminary examination of the property. The purpose of the study was to map in detail the geology of the nepheline syenite and surrounding rocks, and to make a preliminary tonnage estimate of the deposit. The field examination was followed by a petrographic examination of 53 thin sections to determine the mineralogy of the deposit, in particular with reference to mineral zonation, which might be important in terms of separation of Fe-bearing minerals. Eleven large grab samples were collected for whole rock analysis. A diamond-drill program was carried out to begin to confirm the tonnage estimate based on geological data. A total of 1000 feet of drilling was completed in three holes.

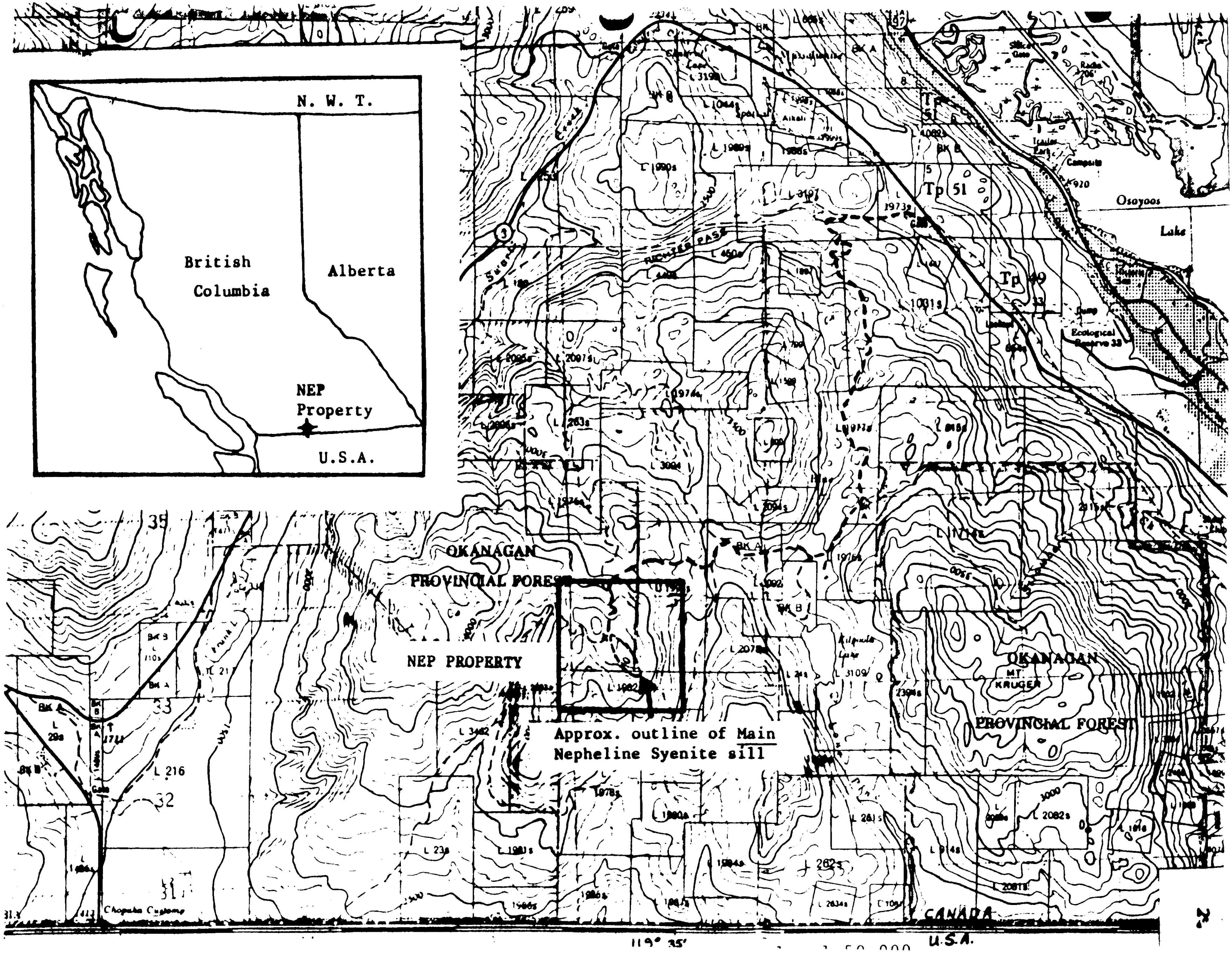
Nepheline syenite is sought in large quantity by the glass industry, and to a lesser extent by the ceramic industry. It is finding increasing use as a filler in many other industrial products, including paint, plastic, paper, and foam. In the glass industry, it is preferred to feldspar because of its lower melting temperature (because of its higher content of alkalis), which reduces fuel consumption and lengthens the life of refractory liners in furnaces.

Indusmin, at Blue Mountain, Ontario, is the only producer of nepheline syenite in Canada, and few others exist in the world. A source of nepheline syenite in Western Canada would be in a favorable position to supply markets in Western U.S.A. and Canada, as well as the Pacific Rim countries.

LOCATION AND ACCESS (see Figure 1)

The deposit outcrops at elevations between 970 and 1228 m. on top of and along the eastern flank of a broad ridge 10 km. west of the town of Osoyoos in south-central B.C. Access by road from the junction of Highways 3 and 97 just north of Osoyoos is as follows:

1) west on Hwy 3 for 6.6 km; left turn up paved road into Osoyoos Estates housing development.
2) at 1.7 km., just past the end of pavement, left turn onto a gravel road leading to Blue Lake and Kilpoola Lake.
3) at 5.4 km., follow road straight ahead, just ahead keep to the right fork, and at 0.9 km. keep to the left one.
4) at 0.7 km. from last fork, sharp right turn up winding road.


N. W. T.
British Columbia
Alberta
NEP Property
U.S.A.
Osoyoos
Lake
Tp 51
Tp 49
Ecological Reserve 33
OKANAGAN PROVINCIAL FOREST
NEP PROPERTY
Approx. outline of Main Nepheline Syenite sill
OKANAGAN
MT. KRUGER
PROVINCIAL FOREST
Kilpoola Lake
CANADA
U.S.A.
119° 35'
1:50,000

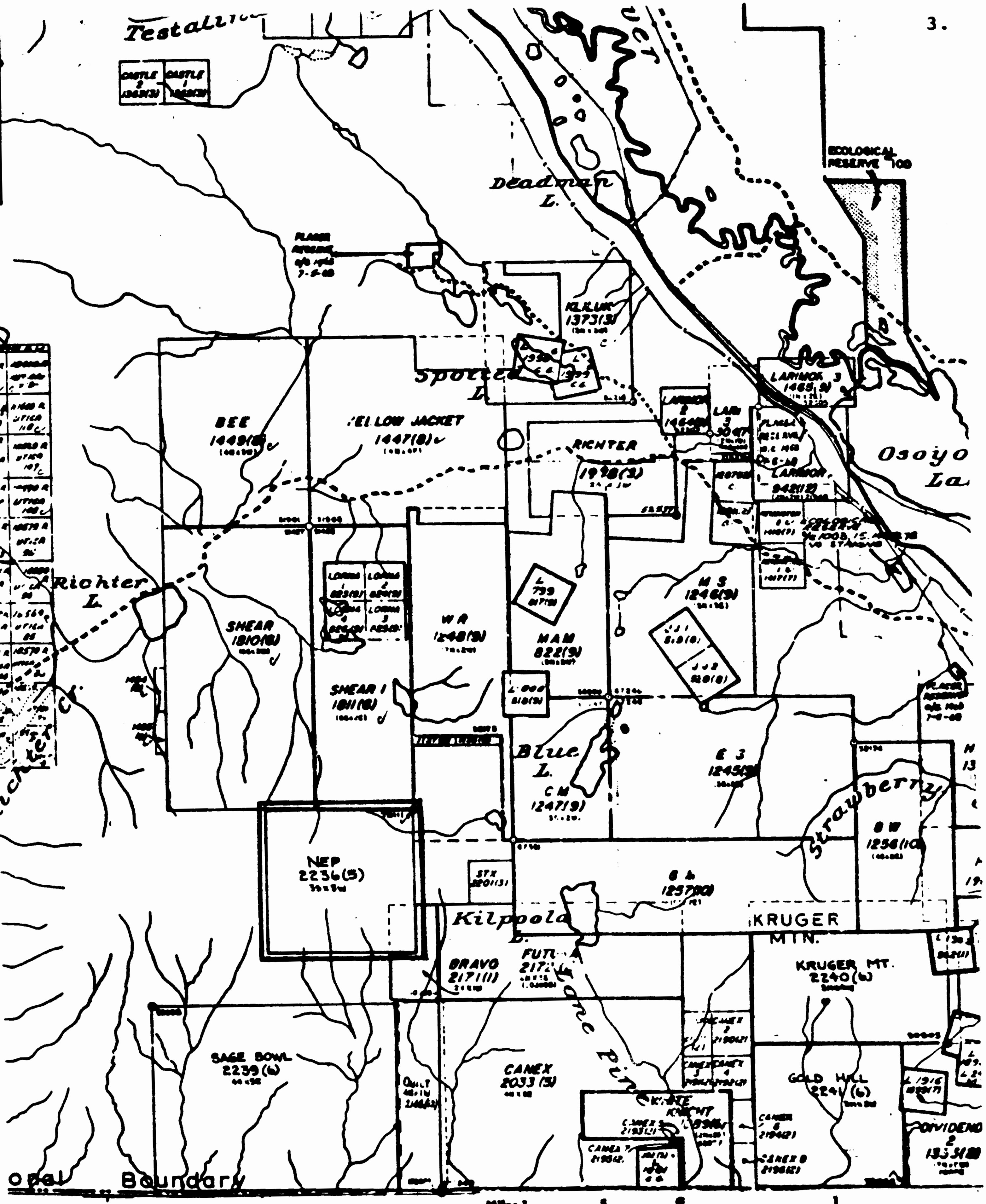


Figure 2. Claim Location Map

5) at 2.05 km., left turn at junction, continue on narrow road which climbs to the top of the ridge in the middle of the property (this is main road on property map - Figure 4).

CLAIM DATA (see Figure 2)

The NEP claim block is a 3 x 3 block staked by Walter Bonin on May 24, 1985, and in good standing [Claim No. 2236(5)]. The northeast corner bears the mining tag number 78111.

TOPOGRAPHY and VEGETATION

Semi-arid, sage- and grass-covered highland valleys to the south rise abruptly to prominent, barren cliffs and sparsely forested ridges to the north. Further north, outcrop decreases in abundance; vegetation is dominated by a thin to moderate coniferous forest, from which the largest trees have been removed by logging. Still further north, outcrop is minimal in a gently northerly sloping region covered by a moderate coniferous forest.

EXPLORATION HISTORY

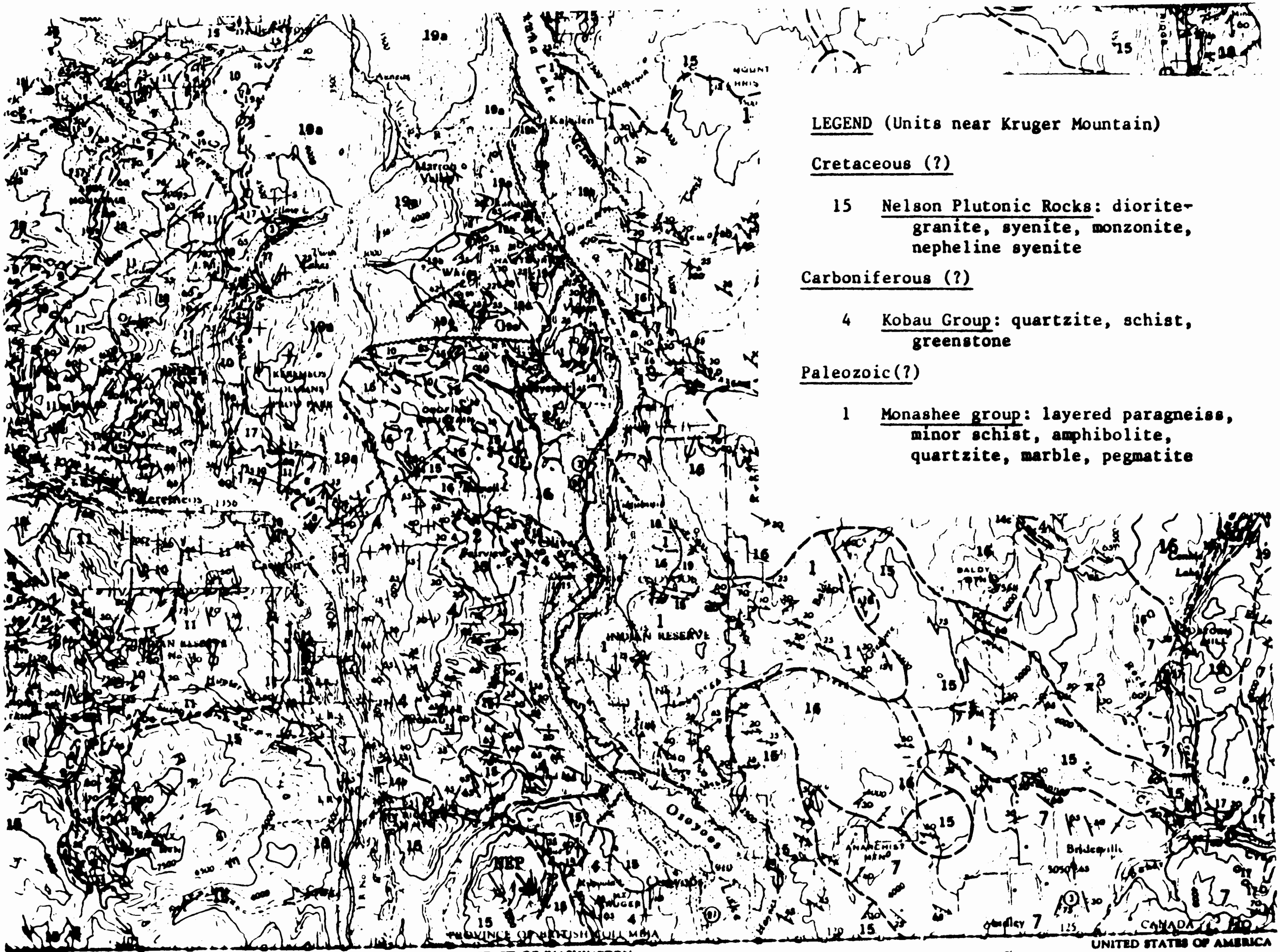
1963 Aug. 29: Buck 1-3 claims staked by Ken Butler; nepheline syenite was sampled and analysed by B.C. Research Council and by International Minerals and Chemical Corp. Beneficiation methods were tested by the Minerals Resource Branch, Dept. of Energy, Ottawa.

1971 Sept. 10: claims lapsed

1972 Mar. 29: Buck 1-4 claims staked by Bethlehem. Several small pits were blasted and sampled for chemical analysis and metallurgical study. Geological mapping was done by J.R. Bellamy (only part of his report is available, and is not of much value).

1984 May: claims staked by Denis Atkinson.

1985 May 24: NEP claims staked by Walter Bonin, ownership transferred to Okanogan Nepheline.



LEGEND (Units near Kruger Mountain)

Cretaceous (?)

15 Nelson Plutonic Rocks: diorite-granite, syenite, monzonite, nepheline syenite

Carboniferous (?)

4 Kobau Group: quartzite, schist, greenstone

Paleozoic(?)

1 Monashee group: layered paragneiss, minor schist, amphibolite, quartzite, marble, pegmatite

PUBLISHED, 1961
COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

MAP 15-1961

PRINTED BY THE SURVEYS AND MAPPING B

REGIONAL GEOLOGY (see Figure 3)

Bostock (1929-1930) prepared Keremeos Map 341A at a scale of 1:63,360. Little (1961) published the geology of Kettle River (West Half) as G.S.C. Map 15-1961.

Between Osoyoos and the Similkameen valley to the west, Little mapped two major units, the Kobau group and the Nelson intrusions. The Carboniferous? Kobau group consists of metamorphosed siliceous sediments and intermediate volcanic rocks. They strike north-south and dip moderately to locally steeply to the west. Further north the unit is more complexly folded. A major fault along the Okanogan Valley juxtaposes these rocks against tightly contorted paragneiss of the Early Paleozoic Monashee group. In the latter unit, axial planes of isoclinal folds generally are relatively flat-lying.

The Kobau group rocks are intruded by plutons and batholiths of Jurassic to Cretaceous age (Nelson intrusions). An earlier nepheline syenite to syenite unit forms sills in the Kobau group. Later plutonic rocks include diorite and quartz monzonite; some of these show a moderate to prominent penetrative foliation. The rocks of the Kobau group show moderate contact metasomatism or metamorphism along the borders of the Nelson intrusions.

North of the map area is a large basin of Tertiary volcanic rocks, described as the Penticton Tertiary Outlier by Church, 1979. A few minor stocks and dikes of dacite porphyry in the map area may belong to this unit.

DETAILED GEOLOGY (see Figure 4, inside back cover)

Kobau group rocks (Unit 1) include metamorphosed intermediate to basic volcanic rocks, and fine grained clastic to cherty metasedimentary rocks. Three main subunits form mappable zones, and may indicate a stratigraphic sequence.

To the east (at the base? of the section) is subunit 1b, a finely laminated, generally lensy metasedimentary-exhalative rock dominated by pale green to grey lenses and beds of chert, generally less than 7 mm. in thickness. These are separated by thinner beds and seams of mafic-rich material dominated by hornblende or biotite/chlorite. Locally, especially along the base of the Eastern sill of nepheline syenite, subunit 1b grades into subunit 1a, a dark green to black amphibolite consisting of similar material to that in the mafic-rich zones of subunit 1b. Grain size and abundance of hornblende increases towards the border of the nepheline syenite sill, suggesting a contact metamorphic halo in the hornblende hornfels metamorphic facies.

Above the Eastern sill, and mainly at the southern end of the area is subunit 1d, a porphyritic meta-dacite to meta-andesite, with abundant plagioclase phenocrysts less than 1 mm. across in an extremely fine grained groundmass. It commonly shows a hornfelsic texture. Above (to the west) and to the north, subunit 1d grades into subunit 1c.

Subunit 1c is a very fine grained siltstone to tuffaceous siltstone of intermediate composition. Variations in texture reflect original variations and variations due to different degrees of metamorphism. Locally the subunit is gneissic (subunit lcg), with a moderate segregation of felsic and mafic minerals into wispy lenses. In the field, some of the rocks are difficult to distinguish from finer grained varieties of nepheline syenite. Between East and Main sills, subunit lc commonly is silicified, with a hornfelsic texture (subunit lch), and locally contains abundant, extremely fine grained, disseminated pyrite.

Rocks of the Kobau group are intruded by at least three ages of plutonic rocks, which in the absence of radiometric dates, are grouped as Jurassic-Cretaceous. The oldest consists of sills of nepheline syenite and lesser syenite (Kruger alkalic rocks) (Unit 2). This was intruded by plutons of medium to coarse grained diorite and much less gabbro (Unit 3). Younger plutonic rocks consist of small stocks and dikes of mozonite and pegmatite (Unit 4).

The Kruger alkalic rocks form sills mainly conformable to foliation in themselves and in the Kobau group rocks. Four main sills are designated East, Main, South, and Northwest.

The sills, particularly the larger two (Main and East), have a very fine to fine grained border zone (subunit 2a), which grades inwards into a fine to medium grained zone (subunit 2b). This in turn grades inwards to a medium to coarse grained core (subunit 2c) with local pegmatite patches. In East sill towards the north, white to bluish grey nepheline syenite (mainly subunit 2b) appears to grade into cream-colored to pink syenite (subunit 2d) with decreasing content of nepheline and increasing content of plagioclase. Thin section study of a few samples from this region show that many of the rocks classified as syenite in the field actually are nepheline syenite. Further work must be done to determine the northern limit of nepheline syenite in the East sill.

Near the base of East sill is an unusual zone exposed in two outcrops. It is characterized by unfoliated, coarse to pegmatitic K-feldspar with interstitial mafic minerals, and lesser plagioclase and nepheline. The larger occurrence is a 4-meter wide band parallel to foliation in surrounding rocks of subunit 2a. The smaller is a 2-meter wide outcrop which grades upwards into subunit 2b. The unusual texture of these rocks (designated subunit 2p) may have formed by settling of early-formed crystals from the nepheline syenite magma.

At the south end of the property at the top of the East sill and locally at the north end of South sill are zones of nepheline syenite with an unusual lensy texture (subunit 2e). These contain lenses parallel to foliation of leucocratic nepheline syenite enclosed in a very fine grained groundmass of melanocratic (mafic-rich) nepheline syenite. Lenses range up to a few cm. long and 1 cm. wide.

Much of the nepheline syenite and syenite is porphyritic, with 5 to 20 per cent phenocrysts of K-feldspar and 2 to 5 per cent phenocrysts and clots of mafic minerals. K-feldspar phenocrysts commonly have an elongated prismatic habit, with lengths averaging 1 to 3 cm.

Much of the western and extreme southeastern parts of the property are underlain by a medium to locally coarse grained diorite to gabbroic diorite (over 50 per cent mafic minerals).

Most common is a massive to weakly foliated diorite (subunit 3a), with 30 to 40 per cent mafic minerals, and a medium to locally coarse grain size. Near the eastern contact of the main body is a zone of coarser grained gabbroic diorite to gabbro (subunit 3c). Along the western part of the property, subunit 3a grades into a mottled, porphyritic diorite (subunit 3b), with a moderate foliation parallel to the regional trend.

Scattered through the area are small plugs and dikes of massive to slightly foliated monzonite intruding rocks of Units 1 and 3. Subunit 4a is very fine to fine grained and commonly leucocratic. Subunit 4b is fine to medium grained wtih 10 to 30 per cent mafic minerals. Subunit 4c is a mainly leucocratic pegmatite.

A few scattered outcrops consist of dacite porphyry (Unit 5), with abundant plagioclase phenocrysts and lesser, smaller hornblende phenocrysts in an unfoliated groundmass of extremely fine grained feldspars, ragged amphibole, and abundant secondary epidote. In one outcrop, a dike of Unit 5 cuts foliation in Unit 1. In another, a body of Unit 5 up to 3 m. across occurs along a fault in Unit 2. Contact relations in other outcrops are unclear. On the basis of the crosscutting nature of this unit, it is correlated with the Tertiary volcanic rocks to the north.

STRUCTURE

All units (except Unit 5) are more or less penetrated by a regional foliation, which trends north-south and dips moderately to steeply westward. Foliation is most intense in subunit 1b, and in parts of subunits 1c, 2a, and 3b. It is weak to absent in most of subunits 2c, 3a, 3c, and Unit 4.

In the Kruger sills are several zones of moderate to intense cataclastic deformation, in which originally coarser grained rocks are smeared out along foliation, and coarser crystals are deformed and partly recrystallized to extremely fine grained aggregates. This type of deformation is most common in subunit 2a. The sheared zones commonly have a darker grey color than the adjacent, less strongly sheared rocks.

Several late faults cut the region. Some show slight, left-lateral offset of the Kruger sills. A major topographic depression trends north-south along the west side of the main ridge in Main sill; however, offset along this structure appears to be small.

The geology is compatible with the presence of two large faults trending northeastward, with left-lateral offset of from 200 to over 1000 m. One would offset Northwest sill from the north end of Main sill. The other would offset the contact of Units 1 and 3 at the southeast corner of the property. This is the major fault shown at the southeast corner of the property on the regional map (Figure 3).

PETROLOGY OF NEPHELINE SYENITE/SYENITE

Thin section analysis of 53 samples show three main types of nepheline syenite, characterized by different assemblages of mafic minerals. These are as follows:

1) Hornblende zone - abundant hornblende, porphyroblasts of almandine garnet, minor aegirine-augite, biotite, and granular aggregates of grossularite-almandine-andradite garnet.

2) Aegirine-augite zone - moderately abundant aegirine-augite, mainly in cores of mafic clots, moderately abundant hornblende, biotite, and both types of garnet

3) Biotite zone - abundant biotite, both types of garnet, lesser hornblende, minor aegirine-augite.

The hornblende zone is characterized by a finer grain size and lower mafic content than the other two zones. Almost all samples from subunit 2a are from the hornblende zone. Other than that, no obvious correlation exists between textural types as distinguished in the field and mineralogical zones from thin section studies.

Modal analyses of the main zones of nepheline syenite are listed in Table 1, with individual analyses in Appendix 1. As well, for comparison, modal anlayses for corresponding mineralogical zones in the Blue Mountain nepheline syenite are presented in Table 1. A detailed description of the mode of occurrence of each mineral is given in Appendix 2.

Textures of nepheline syenite and syenite are mainly metamorphic, with relic primary features preserved in some mafic clots and possibly as some K-feldspar phenocrysts. However, probably many of the latter are metamorphic porphyroblasts, as suggested by their common orientation within the foliation plane, and locally by a strong lineation produced by parallel orientation of the porphyroblasts in the foliation plane. The latter feature is most prominent in subunit 2a. Many mafic clots, especially in subunit 2c, contain early-formed, magmatic aegirine-augite phenocrysts, rimmed by hornblende and/or biotite/garnet-b. Much of the hornblende may be primary magmatic overgrowths on and replacements of aegirine-augite. Biotite/garnet-b overgrowths and garnet-a porphyroblasts are of metamorphic origin.

CHEMICAL ANALYSES

During the June magnetometer survey, large grab samples were collected from outcrops along survey lines and nearby. Eleven were analysed for major elements. Three samples were from subunit 2a and eight were from subunit 2b/2d. Average results from the two subunits are shown in Table 3, individual analyses are in Appendix 3, and sample locations are on Figure 4.

Table 3. Average Chemical Analyses (values in % except Ba in ppm)

Zone	No. of analyses	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO	Ba	LOI
2a	3	56.1	21.22	3.27	0.4	2.4	6.0	8.6	0.4	0.09	0.11	1010	0.8
2b/2d	8	53.8	19.44	5.56	1.3	4.5	4.3	7.8	0.5	0.27	0.14	1660	1.7

Comparison with chemical analyses from modal analyses (Table 2) suggests that K-feldspar contains a higher content of Na than used in calculations from modal analyses, and that the mafic content was underestimated in the modal analyses.

Table 1 — Modal Analyses of Mineralogical Zones (including comparison with major zones in the Blue Mountain body)

Zone	K-feld Ø	K-feld gm	Nep	Alb	Mafic Ø	Mafic tot	A-a	Hbl	Bio	Garnet a	Garnet b	Sph	Apa	Opq	Epi
Kruger sills															
Hblde	3	63	17	7	2	10	0.1	6.0	0.5	2.5	0.4	0.4	0.05	0.1	0.05
Biot	7	53	13	10	5	17	0.2	2.0	7.5	3.5	3.0	0.6	0.1	++	+
Aeg-A	5	55	15	8	4	17	2.0	5.5	3.0	3.5	3.0	0.5	0.1	+	-
2p	-	50	7	12		30	2.0	10.0	7.0	8.0	3.0	0.2	0.1	-	++
2e	-	70	17	1		12	-	-	7.5	3.3	0.1	0.9	-	0.2	-
Blue Mountain body (from Payne, 1968)															
Hblde	-	23	25	48	-	4	0.2	3.0	0.2	0.2	-	-	-	0.4	-
Biot	-	19	24	52	-	4	-	-	2.7	-	(Mu 0.7, Ct 0.1)			0.5	-

Abbreviations

- K-feld - K-feldspar (microcline)
- Nep - nepheline
- Alb - albite (plagioclase)
- A-a - aegirine-augite
- Hbl - hornblende
- Bio - biotite
- Garnet a - almandine? prophyroblasts
- Garnet b - grossularite-andradite-almandine aggregates
- Sph - sphene
- Apa - apatite
- Opq - opaque (mostly magnetite in Blue Mountain)
- Epi - epidote
- Mu - muscovite
- Ct - calcite

- Ø - phenocrysts, mafic crystal aggregates
- gm - non-porphyritic K-feldspar
- tot - total (including crystal aggregates)

- ++ - minor
- + - trace
- \- - absent

Table 2 Chemical Analyses from Modal Analyses (including comparison with Blue Mountain body)

Zone	SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	H_2O	Total Alkali
Kruger sills										
Hblde	59.6	21.0	3.0	0.26	1.0	3.6	11.6	0.15	0.12	15.2
Biot	58.5	20.1	4.7	0.74	1.3	3.3	11.4	0.25	0.33	14.7
Aeg-A	58.7	20.4	4.0	0.68	2.2	3.3	10.9	0.20	0.22	14.2
Blue Mountain body (from Payne, 1968)										
Hblde	58.8	23.2	2.2*	0.04*	0.77*	9.2*	5.1*	0.00*	0.3	14.3
Biot	59.4	23.0	2.0*	0.03*	0.55*	9.2*	4.6*	0.00*	0.4	13.8

Notes:

1. Total Fe reported as Fe_2O_3
2. * denotes values from spectrographic analysis (they agree very closely with those from modal analyses, but are considered more accurate)
3. Much lower content of Mg and Ti, lower content of Fe, Ca, and K; higher content of Na and Al in Blue Mountain body. These reflect lower content of mafic minerals, higher abundances of nepheline and albite (plagioclase) in the Blue Mountain body.

MAGNETOMETER SURVEYS

Two reconnaissance magnetometer surveys were conducted on the property, one by John Payne on May 24th, and the other by Bob Chaplin on June 5th and 6th. The purpose was to determine if geological units had a characteristic magnetic response, which could be used to trace geological units into areas of no outcrop. The May survey included four lines with station spacing of 10 meters along lines. The June survey included five lines with station spacing of 20 meters along lines. Results of the surveys are shown in Figure 5.

The surveys agree in general, and indicate that different units have different magnetic responses, with most geological contacts between units marked by a sharp break in magnetic response. Correlation between lines and between surveys is not as sharp as along lines, possibly because of an overall increase in magnetite content towards the south end of the property.

Values from different units and subunits are listed in Table 3, with Unit 2 divided into two subunits, one including rocks along the top (southwest) of sills and the northern end of Main sill (mainly from subunits 2a and 2b), and the other including rocks in the cores and lower parts of sills, and from the southern end of Main sill (mainly subunits 2c and 2b).

Table 4. Values and Ranges of Magnetic Response of Rock Units

Rock unit	Average (gammas)	Frequency distribution in '00's of gammas 0-3	3-5	5-7	7-9	9-11	11-13	13-15	15-19	19-25	25-40
2top	380	6	21	8	10	2	-	-	-	-	-
2bot	1000	-	-	4	8	-	1	3	4	-	-
1	1420	-	2	8	10	13	13	15	25	23	1
3	1950	-	-	3	6	3	4	2	6	17	8

On the basis of the responses in areas of abundant outcrop, the magnetometer survey results were used to extend geological boundaries to the north into areas of little to no outcrop. As well, the location and shape of some boundaries were somewhat refined.

DIAMOND DRILLING

To begin to confirm tonnage estimates based on geological data, a diamond drilling program was undertaken. The original purpose was to drill one hole up to 300 meters long through the Main sill. Hole 86-1 was set up for that purpose (see Figure 4 for drill hole locations and orientations. Due to drilling problems, it was terminated at 170 m. depth within the nepheline syenite sill. Hole 86-2 was drilled parallel to 86-1 from a point 140 m. due north. It was terminated because of technical problems at 120 m. Hole 86-3 was drilled from the same station as Hole 86-2, inclined 60° to the southwest. It was drilled to a depth of 40 m. to complete the drilling contract. It also was in nepheline syenite throughout its length.

The drill hole results agree with the geological data, that the sills are tabular bodies extending to depths of at least 170 m. (and probably much more from geological data).

PRELIMINARY TONNAGE ESTIMATES

The Main and East sills are targets for development of quarries. Based on a mining depth of about twice the width of the sills, the following tonnages are present in the two sills (Specific Gravity of rock is estimated at 2.65 for the calculations):

Table 5. Preliminary Tonnage Estimates in Main and East Sills

Sill	length	width	depth	volume	metric tons
Main	340 m.	80 m.	160 m.	4.35×10^6 m³	11.5×10^6
East*	700 m.	60 m.	120 m.	5.0×10^6 m³	13.2×10^6
Total tonnage					25×10^6

* values for East sill are for area outlined as subunits 2a,2b, and 2c in Figure 4. The thin section study indicates that nepheline syenite extends at least a few hundred meters further north.

METALLURGICAL FACTORS

A critical factor in the economic feasibility of nepheline syenite for the glass and ceramic industries is the content of iron in the final product. This depends on the original iron content of the rock, and the extent to which the iron-bearing minerals can be removed from the rock by simple methods. In the Kruger sills, these minerals are hornblende, biotite, aegirine-augite, and garnet. The standard method of removal of iron-bearing phases is a high-intensity, dry magnetic separation in a series of stages, with grinding of material between stages. The purpose is to produce a product composed of grains and aggregates of felspars and nepheline, with a minimal amount of intergrowths of iron-bearing phases, such that the Fe_2O_3 content is less than 0.1 per cent for high quality glass, and below 0.25 per cent for lower quality glass.

The texture of the rock is an important guide to evaluation of the suitability of a raw material to yield a desired product low in iron.

The Blue Mountain nepheline syenite has a very low content of iron-bearing minerals (generally less than 3 per cent). It is a medium to coarse grained rock showing a variety of mineralogical zones, in part similar to those of the Kruger sills. At Blue Mountain, the biotite zone has yielded a much better product than the hornblende zone, because biotite is more coarsely intergrown with feldspars than hornblende, and hence more readily separable.

The Kruger sills have a higher content of mafic minerals than the Blue Mountain body. The hornblende zone averages 10 per cent and the biotite and aegirine-augite zones average 17 per cent. The Kruger rock generally is finer grained than that at Blue Mountain. These factors would suggest that separation of iron-bearing minerals from the Kruger deposit would not be as complete as for the Blue Mountain body. However, a moderate amount of the mafic minerals in the Kruger deposit are concentrated in clots, which should separate relatively easily from the felsic minerals. Also, a moderate amount of the felsic material is in K-feldspar phenocrysts and in felsic aggregates, both of which are relatively free of mafic minerals. Thus, although a larger amount of the raw material will be rejected in purification of the material, the quality of the final product is expected to be low enough in iron for some economic applications.

Metallurgical tests are necessary on the different types of nepheline syenite to determine whether or not a sufficiently clean separation of iron can be attained to produce a marketable product.

CONCLUSIONS

1. The Kruger nepheline syenite consists of two large sills (Main and East) and two much smaller sills (South and Northwest).

2. Preliminary estimates of tonnage available for quarrying are 11.5 x 10^6 in Main Sill and 13.2 x 10^6 in the southern half of East Sill. The northern half of East Sill is not included because it is uncertain how much of it is nepheline syenite and how much is syenite. The latter is not as desirable as nepheline syenite because syenite contains lower alumina and alkalis.

3. The Kruger nepheline syenite contains lower alumina, and higher alkalis and iron than the Blue Mountain nepheline syenite, the major Canadian source of this material. Also, the Kruger deposit has a much higher K/Na ratio than the Blue Mountain body.

4. The Kruger deposit contains rocks of three different mineralogical zones (based on abundance of mafic minerals). The zones are biotite, hornblende, and aegirine-augite. The margins of the sills are finer grained than the cores, and contain a much lower content of iron-bearing minerals. These factors and other textural features may be significant in separation of iron-bearing minerals.

5. The body has sufficient size and is of appropriate chemical composition and texture, that further work is warranted to examine its economic feasibility.

RECOMMENDATIONS

A two-stage program is recommended, with costs being $45,000 for the first stage, and $40,000 for the second (this will be done based on positive results of stage 1).

Stage 1

1) Detailed geological mapping in the deposit to outline mineralogical zones in detail, and to determine the northern extent of nepheline syenite in East Sill. Thin section analysis will follow field work, and will be useful in determining textures and guiding milling techniques.

2) Bulk sampling of mineralogical zones of the nepheline syenite for metallurgical testing to determine optimum materials and extraction methods to obtain a product as low in iron as possible. Extraction methods should be those amenable to normal milling procedures, preferably dry, high-intensity magnetic separation in a staged program, with grinding between stages.

Stage 2

1) Diamond drilling to determine extent of favorable zones within the main sills, with follow-up petrographic and milling studies to confirm the distribution of favorable and unfavorable zones in the parts of the sills available for quarrying.

John G. Payne

John G. Payne,
September 1986.

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CERTIFICATE of ENGINEER

I, John G. Payne, do hereby certify that:

1. I am a consulting geological engineer.
2. I graduated from Queen's University in Kingston, Ontario in 1961 with a BSc in Geological Engineering. I received a PhD in Geochemistry from McMaster University, Hamilton, Ontario, in 1966.
3. I have practiced geology since graduation from university for 20 years, mainly in the North American Cordillera.
4. My report is based on a 5-day field examination of the NEP property, plus follow-up laboratory examination of thin sections from the property. The examination took place in May and June, 1986. Other studies included in the report include magnetometer surveying, chemical analysis, and diamond drilling. These were completed in the summer of 1986.
5. I am a Fellow of the Geological Association of Canada.
6. My address is 877 Old Lilloet Road, North Vancouver, B.C., V7J 2H6.
7. I am under contract for this report to Nepheline Resources Limited, 700 - 675 West Hastings Street, Vancouver, B.C.
8. I have no direct or indirect interest in the NEP claim block or in Nepheline Resources Limited.
9. This report may be used by Nepheline Resources Limited in a Statement of Material Facts or Prospectus for public financing.

Dated at North Vancouver, B.C., September 29th, 1986.

John G. Payne

APPENDIX 1 - Modal Analyses

Sample	Field Class	K-feld Ø	K-feld gm	Nep	Alb	Mafic Ø	Mafic Tot	Aug	Hbl	Bio	Garnet a	Garnet b	Sph	Apa	Opq	Epi	Ct	Cc	Mu	Sd	Fl
Hornblende Zone																					
114	2c	17	48	17	12	7	16	0.5	8.	1.5	4.	1.5	0.7	0.1	+	0.05			+		
116	2c	7	52	15	8	7	18	0.3	10.	2.	4.	1.5	0.5	0.05							
147	2a	-	64	15	10	2	11	0.1	7.	0.2	3.	0.4	0.3	0.05		0.05					
184	2a	5	70	15	6	2	9	-	6.5	0.3	1.3	0.2	0.4	0.05	0.1						
186	2b	2	64	17	8	2	9	-	6.5	0.4	1.2	0.4	0.4	++	0.1	++	++		++		
239	2a	8	62	17	5	-	8	-	5.	0.1	2.5	++	0.5	0.05	0.2	0.05			++		+
247	2a	4	59	22	7	2	8	++	5.	0.1	2.5	++	0.3	++	0.1	+	+	+	+		
255	2a*	0.3	64	17	10	3	9	-	5.	0.3	3.	0.4	0.2	0.1							+
258	2a*	1	66	18	5	2	9	-	6.5	0.3	1.3	0.2	0.4	0.05	0.1	++		0.1			+
260	2a**	1	70	13	7	3	10	0.3	4.	0.3	4.	0.2	0.5	+	+	0.1	0.1	0.1			
311	2b	2	50	18	20	1	9	-	6.	0.3	2.	0.2	0.6	0.1	++			++			+
335	2b	2	56	20	12	2	10	0.5	8.	++	1.0	-	0.6	-	+	+	++	+			
338	2a**	4	61	14½	12	1½	9½	0.1	6.	1.2	1.0	0.7	0.2	++	0.05	0.2		1.5			+
327	2b	3	61	20	6	3	10	+	6.	1.0	2.	0.4	0.4	0.05		0.05		0.3		0.7	
342a	2c	5	63	17	6	3	9	-	5.	0.3	2.5	0.2	0.4	0.1	+	0.3		0.3			+
353	2b*	5	57	14	12	3	12	0.4	7.5	0.8	2.3	0.3	0.4	0.1	0.05	0.2	++	++	++		
356	2a**	0.5	72	13	7	1	8	-	5.	1.2	1.2	0.1	0.2	0.05	0.5	0.2			+		
357	2b	4	66	14	6	3	9½	0.3	5.5	0.6	2.	0.2	0.3	0.1	0.3	0.2	++	0.4	+		
372	2a*	-	68	17	3	2	12	0.1	8.	0.5	3.	0.5	0.2	++							
460	2a*	0.5	67	15	7½	2½	10	0.1	7.	0.8	1.3	0.5	0.2	0.1	1.0			0.5	++		
465	2b	-	65	25	2	1	10	-	6.	1.0	2.5	0.3	0.3	++	0.1			1.0			

Abbreviations: K-feld - K-feldspar (microcline), Ø - phenocrysts, gm - groundmass, Nep - nepheline, Alb - albite, Tot - total, A-A - aegirine-augite, Hbl - hornblende, Bio - biotite, Garnet a - phenocrysts, Garnet b - extremely fine grained aggregates, Sph - sphene, Apa- apatite, [illegible]

APPENDIX 1 (continued)

Sample	Field Class	K-feld ∅	K-feld gm	Nep	Alb	Mafic ∅	Mafic tot	Aug	Hbl	Bio	Garnet a	Garnet b	Sph	Apa	Opq	Epi	Ct	Cc	Mu	Sd	Fl
Aegirine-Augite Zone																					
17a	2b*	4	63	8	8	4	17	0.8	3.	6.	4.	2.6	0.5	0.1	+	+					
44	2c	-	56	25	1	2	16½	14	+	+	+	-	0.3	++	2.0						
141	2c	8	53	17	5	4	17	1.0	7.	2.	4.	3.	0.5	++				++	0.1		
159	2b	1½	51	17	12	4	18	2.	5.	3.	6.	2.	0.4	0.1	++						
281	2b	10	42	15	17	3	17	1.0	7.	2.5	4.	0.4	2.0	0.1				++			
324	2b	5	54	15	6	3	20	2.	7.	4.	4.	3.	0.3	++	++					0.1	
341	2c	2	55	18	8	4	18	2.5	8.5	0.2	3.5	2.5	0.7	++		+	++				
342b	2c	5	53	12	12	7	19	2.5	6.	2.	5.	3.	0.5	+		0.1	0.5		++		
345	2c	5	59	14	5	4	17	1.5	4.5	3.	4.	3.	1.0	0.5	+	++		0.2			
349	2c	5	54	17	6	4	18	1.5	9.5	1.	2.5	3.	0.6	0.1		+					
370	2c	15	46	17	5	6	17	3.	6.	2.	2.	4.	0.4	0.1				0.3	++		
371	2c*	8	53	17	5	5	17½	2.5	2.5	5.	2.	5.	0.5	0.1	+			++			+
376	2b**	7	60	13	5	5	15	3.	5.	2.	2.	2.	0.8	0.1	+	0.1	+	++			
386#	2b*	7	48	12	15	3	17	2.	2.	6.5	3.	3.	0.5	++	0.05						
396	2b	3	59	12	8	2	17	2.	3.	5.	6.	1.	0.2	++	++						
314#	2c	15	41	15	10	9	19	0.4	6.5	4.	4.	2.5	1.3	0.15	+	0.15					

\# intermediate between aegirine-augite zone and biotite zone

Cataclastic deformation

* moderate
** strong
*** intense

+ trace

++ minor

APPENDIX 1 (continued)

Sam-ple	Field Class	K-feld Ø	K-feld gm	Nep	Alb	Mafic Ø	Mafic tot	Aug	Hbl	Bio	Garnet a	Garnet b	Sph	Apa	Opq	Epi	Ct	Cc	Mu	Sd	Fl
Biotite Zone																					
46	2c	8	48	17	10	5	18	0.2	1.0	9.	3.	4.	0.5	0.1		0.3			+		
140a	2c**	4	54	12	12	7	18	0.2	2.	8.	4.	3.	0.8	++	++	+			+		
140b	2b***	10	48	5?	20	3	17	-	-	10.	3.	3.5	0.4	0.05				++			
156	2b*	4	54	7	18	6	18	0.3	3.	7.	4.2	2.5	1.0	++	++						
240	2c*	7	58	12	7	5	16	0.3	2.	7.	4.	2.	0.5	0.1	+			++	++		
262	2a*	0.5	73	12	7	0.2	5	-	++	2.5	2.0	0.1	0.1	++	0.7	0.3		0.3			
302	2b	7	53	10	12	5	18	0.2	-	10.	3.	5.	0.5	0.05	+	+					
314#	2c	15	41	15	10	9	19	0.4	6.5	4.	4.	2.5	1.3	0.15	+	0.15					
364	2b	3	68	14	5	0.5	10	0.1	1.0	5.	0.2	3.	0.3	0.1	1.0	0.2	+	3.0	1.5		
368	2c	10	45	17	10	7	18	0.2	1.0	9.5	4.	3.	0.2	0.1				1.0	0.1		
374	2c	12	54	15	5	4	14	0.3	3.	5.	2.	3.	0.8	0.2	+	++		0.2	+		
386#	2b*	7	48	12	15	3	17	2.	2.	6.5	3.	3.	0.5	++	0.05						
Cumulus Zone																					
303	2p	-	50	7	12		30	2.	10.	7.	8.	3.	0.2	0.1		++		++	++		
Lensy Zone																					
52	2e	-	75	17	1	-	7	-	-	5.	1.5	0.05	0.3	-	0.1		0.2	1.5			
436	2e	-	65	16	1	-	18	-	-	11.	5.	0.1	1.5	-	0.2		++				
Other samples																					
58	2b	-	70	15	7	2	8	0.3	2.0	1.5	0.1	2.5	0.1	++	2.0		0.2				
203	2d	-	30	-	53	-	16	6.	7.	+	-	-	+	0.4	2.0	0.5					

APPENDIX 2

Mode of Occurrence of Minerals in Nepheline Syenite

This is a general petrographic description of the mode of occurrence of minerals in the nepheline syenite and associated syenite.

1. K-feldspar

K-feldspar occurs in two distinct modes. It forms conspicuous, elongated, euhedral prismatic phenocrysts up to a few cm long (average 1-2 cm). These occur in well over half the outcrops of nepheline syenite, and locally are as abundant as 20% of the rock, particularly in the coarse grained cores of the sills. The phenocrysts commonly are slightly to moderately perthitic, with irregular, wispy lenses of albite in subparallel orientation parallel to a major crystallographic direction in the host. As well, phenocrysts contain irregular, equant patches up to 0.2 mm in average size of nepheline, with local coarser patches up to 0.5 mm across.

K-feldspar also occurs in the groundmass as anhedral, commonly elongated grains, whose size ranges from very fine in Unit 2a, up to about 1 mm long in Unit 2c. All K-feldspar is microcline.

2. Nepheline

Nepheline forms anhedral grains, commonly interstitial in part to K-feldspar. In most rocks they are of similar grain size to groundmass K-feldspar, but locally nepheline forms coarser grains up to 1.5 mm across. Nepheline is variably altered to at least three different secondary assemblages. Weak alteration is mainly to hydronepheline. This type of alteration locally is intense, such that little nepheline remains. Other samples are slightly to locally moderately altered in patches to very fine to fine grained cancrinite and generally lesser very fine grained muscovite. In samples cut by veinlets of zeolite (up to 2 mm in width), nepheline is strongly altered to extremely fine to very fine grained aggregates of zeolite of undetermined composition.

3. Albite

In nepheline syenite, albite mainly occurs as irregular patches of very fine to fine grains interstitial to coarser grains of K-feldspar. In samples with more abundant albite (and possibly oligoclase), the plagioclase forms a few coarser, subhedral grains. In syenite, plagioclase (oligoclase?) forms moderately abundant subhedral coarser grains surrounded by a finer grained aggregate of plagioclase and K-feldspar. Albite is fresh. It also occurs in perthitic intergrowths with K-feldspar in phenocrysts as described above.

4. Mafic minerals

In coarser grained samples, mafic minerals form moderately abundant clusters of grains in patches up to a few mm across. These are in part primary and in part metamorphic in mineralogy and texture. Mafic grains also are scattered through the groundmass of the rock, mainly as finer single grains and aggregates of a few grains.

5. Aegirine-augite

Aegirine-augite occurs mainly as subhedral to anhedral prismatic grains from 1 to 2 mm in size in cores of mafic clusters. The mineral is pale green in color with weak pleochroism. It commonly is rimmed and partly replaced by aggregates of hornblende (possibly of primary magmatic origin), and it and hornblende are replaced in some samples by irregular, extremely fine to very fine grained intergrowths of biotite and garnet-b.

In a few samples, aegirine-augite is the most abundant mafic mineral; in these it commonly occurs as irregular, anhedral very fine to fine grains scattered through the rock. Composition of the pyroxene in these samples may be closer to augite.

6. Hornblende

Hornblende forms rims on aegirine-augite as described above, and also forms scattered phenocrysts and clusters of crystals with no core of pyroxene. Pleochroism is strong from medium yellowish green to dark green. Hornblende also forms moderately abundant, anhedral very fine to fine grains scattered through the groundmass.

7. Biotite

Biotite occurs mainly in mafic clusters, generally intergrown with minor to abundant garnet-b, and commonly replacing hornblende and/or pyroxene. In a few samples biotite is the dominant mafic mineral; in some of these it appears to be of primary origin,being scattered through the rock. In others it is mainly in mafic clusters, and is of metamorphic origin. Pleochroism is mainly from light to dark brown to orangish brown.

8. Garnet-a

Garnet-a forms metamorphic porphyroblasts averaging 1-2 mm in size, with minor to abundant intergrown K-feldspar. Garnet-a generally is free of mafic inclusions or intergrowths. It is medium orange in thin section, suggesting a composition of almandine. It is common in all mineralogical zones.

9. Garnet-b

Garnet-b forms extremely fine grained, metamorphic aggregates alone or with coarser porphyroblasts of biotite, replacing primary aegirine-augite and hornblende. Replacement is very irregular within a thin section, grading from only slight replacement in some mafic clusters to almost complete replacement in others. Garnet-b is pale orange to neutral in thin section, and locally gradational to garnet-a; it is probably intermediate among grossularite, almandine, and andradite. It is abundant in all zones except the hornblende zone.

10. Sphene

Sphene occurs in mafic clusters, with scattered mafic grains and alone as anhedral to euhedral, equant to elongated grains averaging 0.1-0.5 mm in size, with coarser grained rocks containing grains up to 1 mm across. It is relatively uniform in abundance throughout the nepheline syenite, being slightly less abundant in the hornblende zone.

11. Apatite

Apatite forms anhedral to subhedral, equant to slightly prismatic grains, moderately concentrated in mafic clusters.

12. Opaque

Opaque occurs in two main modes. In coarser grained rocks it forms grains from 0.1-0.3 mm in size intergrown with hornblende and lesser biotite or aegirine-augite in mafic clusters. In finer grained rocks, it forms extremely fine, anhedral disseminated grains and concentrations of grains, mainly unassociated with mafic grains. The low magnetic response of the finer grained rocks su-gests that the opaque mineral in them is hematite. The higher magnetic response of the coarser grained rocks suggests that the opaque mineral is partly magnetite. Some opaque grains are rimmed by thin overgrowths of sphene this suggests that the opaque mineral is ilmenite. Intergrowths of oxide phases is probable.

13. Epidote

Epidote is present sporadically throughout the nepheline syenite, being most abundant and ubiquitous in the hornblende zone. It forms anhedral to subhedral, slightly elongated porphyroblasts up to 0.3 mm in size. It also occurs as anhedral grains associated with mafic clusters.

14. Calcite

Calcite is present in a few samples as interstitial, anhedral very fine grains. It is most abundant in the hornblende zone and in the lensy zone.

15. Cancrinite

Cancrinite forms very fine to locally fine grained, anhedral aggregates and single grains replacing nepheline in all mineralogical zones.

16. Muscovite

Muscovite occurs with cancrinite as a secondary replacement of nepheline. It is less abundant than cancrinite, but almost as widespread. Grain size is mainly less than 0.1 mm.

17. Sodalite

Sodalite occurs in a very few samples as anhedral grains up to 0.5 mm in size. It is distinguished by its isotropic character and higher R.I. than fluorite. Sodalite is colorless in thin section.

18. Fluorite

Fluorite is moderately widespread in the hornblende zone and rare in other zones. It forms irregular interstitial patches of very fine to locally fine grain size. It is characterized by a variable color, with purple patches of varying intensity of color scattered through a colorless background.

Appendix 3. Whole Rock Chemical Analyses

ACME ANALYTICAL LABORATORIES LTD. 852 E.HASTINGS ST.VANCOUVER B.C. V6A 1R6 PHONE 253-3158 DATA LINE 251-1011

WHOLE ROCK ICP ANALYSIS

A .1000 GRAM SAMPLE IS FUSED WITH .60 GRAM OF LIBO2 AND IS DISSOLVED IN 50 MLS 5% HNO3. SAMPLE TYPE: ROCK CHIPS

DATE RECEIVED: JUNE 21 1986 DATE REPORT MAILED: June 27/86 ASSAYER. D. Toye. DEAN TOYE. CERTIFIED B.C. ASSAYER.

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SAMPLE#	SiO2 %	Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	Cr2O3 %	Ba PPM	LOI %	Sum
5-13	55.88	21.24	3.62	.45	2.42	5.90	8.45	.40	.09	.11	.01	1614	.9	99.78
5-14	56.19	21.12	3.51	.43	2.34	6.10	8.65	.41	.08	.11	.01	632	.8	99.87
5-27	54.03	19.54	5.53	1.29	4.42	4.40	7.85	.53	.26	.13	.01	1708	1.5	99.82
5-29	53.94	19.34	5.59	1.29	4.55	4.00	7.85	.54	.27	.14	.01	1751	1.9	99.76
5-31	54.65	20.24	4.68	.92	3.66	4.90	8.05	.47	.18	.13	.01	1243	1.7	99.83
5-33	54.09	19.43	5.37	1.23	4.42	4.25	7.65	.52	.26	.14	.01	1700	2.1	99.80
4-2D-NE	53.68	19.05	6.07	1.48	5.13	4.00	7.60	.59	.33	.14	.01	1759	1.4	99.82
4-2D-E	54.13	19.51	5.64	1.33	4.67	4.25	7.75	.55	.28	.13	.01	1723	1.3	99.88
6-5	53.55	19.31	5.77	1.39	4.76	4.25	7.75	.56	.29	.14	.01	1844	1.7	99.84
6-7	53.63	19.07	5.84	1.43	4.81	4.05	7.50	.56	.30	.14	.01	1700	2.0	99.67
6-8	56.13	21.30	3.59	.45	2.48	5.90	8.55	.40	.09	.12	.01	781	.7	99.87
STD SO-4	67.31	10.43	3.47	.98	1.65	1.40	2.15	.55	.22	.07	.02	773	11.4	99.80

EXAMINATION OF MARKETS FOR NEPHELINE SYENITE:

WESTERN NORTH AMERICA AND SELECTED PACIFIC RIM COUNTRIES

Report 87-4rev : April 1987

for

Nepheline Resources Limited
Vancouver, British Columbia

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PREFACE

This report is a revision of an earlier report (R86-3, October 1986) in which deletions were made at the request of the client. The single purpose of this report is to satisfy the requirements of the Office of the Superintendent of Brokers and Real Estate, specifically in reference to a letters dated 17 February 1987 and 27 March 1987.

Except for changes of an editorial nature, most changes occur in Section 6.0 where a section discussing degree of market capture has been added; and in Section 7.0, where cash flow projections have been deleted; and comments have been made to suggest the potential scale of operation, recognizing that potential problems are unaddressed which may preclude successful development.

1.0 INTRODUCTION

This report summarizes the results of an investigation which identified potential markets for nepheline syenite in western North America and selected Pacific Rim countries. Nepheline syenite is a silica-deficient rock used primarily in the manufacture of ceramics and glass, where the material is valued as a flux, and as a source of the oxides of aluminum, sodium and potassium. The study was commissioned by Nepheline Resources Inc., Mr. B. H. Scharf, President.

Nepheline Resouces Limited holds mineral title to the NEP claim group in the Richter Pass area west of Osoyoos, British Columbia. The Company proposes to conduct an exploration program on the properties, followed by subsequent laboratory testing designed to characterize the nature of the deposit and identify commercially suitable beneficiation methods.

The purpose of this study is to gather market and economic information in order to judge the merits of incurring the expense of the proposed work plan, relative to the potential economic gain. This study evaluates the concept, not the deposit, and does so despite the lack of economically significant technical data regarding the deposit.

The study objectives are to identify the market region potentially available to the NEP deposit, to obtain the current production and consumption statistics for aluminous materials within that region, to define consumer specifications and competitive forces which materials from the deposit would encounter, and to postulate what costs and revenues would likely result from any future development. It is a preliminary study in which many assumptions had to be made in order to incorporate the results of the market study into an economic evaluation of the project as a concept.

Sources of information included telephone communications with producers and consumers during August and September 1986, available published information, and the past work and experience of the writer.

This report is intended to be a supporting document to a master geological report being prepared by John G. Payne, on behalf of Nepheline Resources Limited. The reader is referred to this report for the details regarding the deposit and its geology, as this report does not contain such information.

2.0 TERMS OF REFERENCE

Nepheline Resources Limited informed the writer that the Company had obtained rights by mineral claim to the NEP claim group, which contain bodies of nepheline syenite rock. Company management asked if sufficient markets existed for nepheline syenite to justify the expense of proposed exploration and laboratory work designed to evaluate the deposit.

In other words the client asked, if a saleable nepheline product could be produced, would consumers buy the material in sufficient quantity and at such a price that would make the proposed effort worthwhile? The client also wanted to know what constituted a commercially acceptable product (i.e., consumer specifications), and what cash flow might be expected from such an operation. This study was commissioned to answer these questions.

Market studies and a project evaluation are necessary to answer these questions, but a seemingly paradoxical situation exists in that inputs regarding the deposit are necessary to an evaluation of the merits of proceeding with the very work which would supply the required information. Actually, the paradox is not real, if one recognizes that it is a concept being evaluated, and not a specific deposit or project.

In a conceptual evaluation, all that is required is to:

1. Assume that all aspects of the deposit are positive to the extent not contradicted by fact,

2. Obtain a quantitative statement of the economic and market environment in which the development of any deposit must operate,

3. And finally, incorporate the deposit-specific assumptions and the results of the market study into an economic evaluation of a hypothetical operation.

If the the evaluation of the economic and market conditions are considered positive for a hypothetical operation, then the implication is that it is reasonable to proceed with work to investigate the deposit to determine if it can the meet the same criteria required of a feasible hypothetical operation.

Since assumptions are made which subsequent work may reveal to be inaccurate, and because this market study and evaluation is preliminary in nature, the results of this work must be considered a first approximation.

Despite the limitations of this type of study, it remains the most effective tool available to management to evaluate the advisability of proceeding with proposed work, and furthermore, will assist in the design of the work program.

3.0 GENERAL BACKGROUND INFORMATION

3.1 Definition and Uses of Nepheline Syenite.

Nepheline syenite is a silica deficient crystalline rock composed of albite and microcline feldspars and nepheline, together with varying amounts of mafic silicates and accessory minerals. The poly-mineralic material is of economic significance because of the high alumina content (over 20% Al_2O_3), and the contained alkalies (over 15% combined K_2O and Na_2O).

Glass- and ceramic-quality nepheline syenite is produced commercially at three locations: by Indusmin Ltd. at Nephton, Ontario (a nearby operation formerly owned by IMC has been recently purchased by Indusmin); by Norsk Nefelin on Stjernoy Island, near the northern tip of Norway; and most recently by Austral Ltd., near Rio de Janeiro, Brazil.

Commercial operations involving other uses include two sites in the Soviet Union where nepheline syenite is used as a source of alumina in the production of aluminum. Portland cement, sodium carbonate, and potassium carbonate are produced as co-product and by-product materials from this unique Russian process of winning aluminum. Lastly, construction aggregates and roofing granules are produced from a bastard nepheline syenite in Arkansas.

In the case of the Indusmin and Norsk Nefelin deposits, 80-85% of the material is used in glass manufacture; 12% in ceramics; and 3-8% is sold for other uses, largely as an industrial filler.

Nepheline syenite is readily substituted by feldspar, feldspathic sands (a feldspar-silica mixture), aplite, and steel mill slag. The choice is largely dependent upon the effective delivered cost of each oxide source, with credits for each desired oxide (alumina, silica, and alkalies) and penalties for each deleterious constituent (usually iron). In some ceramic applications, particularly tile manufacture, pyrophyllite can also substitute for nepheline syenite.

Typical commercial product specifications for glass-grade nepheline syenite appear in Table 1; and for ceramic-grade in Table 2. World production figures for aluminous materials are found in Table 3, excepting nepheline syenite, which would add another million tons. Table 4 provides typical whole-rock chemical and mineralogical compositions of some nepheline syenites. And Table 5 provides typical analyses for nepheline syenite and its substitutes, in the context of readily available commercial products in North America. (All Tables are found in Appendix A.)

Table 6 is a listing of approximate chemical compositions of commercial glasses. The original source of the material is dated, but for gross information is still useful. In tonnage, soda-lime-silica glass accounts for over 90% of total glass production; common glasses usually contain 70% silica, 15% soda, 5-10% lime, and 1-3% alumina.

Nepheline syenite is added to the glass batch primarily as a source of alumina, which imparts chemical stability and strength to the glass product; it is a secondary source of alkalies, which lower the melting point of the batch and affect viscosity. As a rule of thumb, each unit per cent of Al_2O_3 in the final glass composition translates to about 4.5% contained nepheline syenite. Ceramics tend to contain the equivalent of 15-25% nepheline syenite.

4.0 PROBLEM DEFINITION

4.1 Definition of Starting Point.

Geological reports and maps are available for the area, and while they do provide some insight into the character of the subject materials, they provide little in the way of economically significant detail. Past work in the area by those evaluating the economic potential of the nepheline syenite are not considered valuable, since modern methods of beneficiation were not employed, nor were the personnel and companies necessarily the best suited for the task. The preliminary field and laboratory work presently being conducted on behalf of Nepheline Resources is of limited utility because it is either in progress, or is confined to whole-rock mineralogy.

In short, chemical analyses of beneficiated samples are not available, therefore it is not known exactly what the deposit might potentially offer for sale. However, all available information suggests the iron content in the deposit could be difficult to reduce to a level comparable to the best commercially available materials; and that the ratio of sodium to potassium is quite low relative to the materials normally used by the glass industry. For the purposes of this report, there is no practical choice but to assume that the iron content is reducible to an acceptable level, and that the market resistance associated with a non-standard material would be overcome.

Furthermore, it is necessary to speculate as to the probable chemistry of a beneficiated product. The mineralogical composition of geological units 2c and 2e (John Payne, June 1986) appear to average approximately 60% K-spar, 8% Na-spar, 4.5% Ca-spar, and 17% nepheline. Assuming beneficiation would yield a product containing only these minerals, and in the same proportions, the chemistry of the resulting mixture was calculated using the compositions of the pure end-members of nepheline and the feldspars; a 1/2-% was allowed for iron and other oxides.

The results of this exercise predict that a beneficiated product from the NEP claim group might have the following chemistry:

Al_2O_3	-	22.4%
SiO_2	-	59.2%
K_2O	-	12.8%
Na_2O	-	4.1%
CaO	-	1.0%
Other	-	0.5%

Accepting the above chemistry to be the chemical composition of a saleable beneficiated product from the NEP claim group, and the uncertainty as to whether such a product could in fact be realized, it then became necessary to determine the size and distribution of the markets in which the NEP group materials would be competitive. Consequently, potential markets were researched, a cursory transportation study was made, and the results formed the basis for the market report and evaluation contained in Sections 5 and 6.

4.2 Geographical Market Scope.

Since about 90% of the expected markets for nepheline syenite relate to its use in the manufacture of glass and ceramics, the study of other market uses becomes irrelevant. Hence, this study is limited to an examination of glass and ceramic markets only.

Geographically, it is unlikely that material from the NEP claim group would be competitive in markets east of the 110th meridian, as these areas of North America are already well-served by well-established, inexpensive, high-quality products from relatively close proximity. The nepheline synenite produced at Nephton, Ontario, dominates the market for over a 1000-kilometre radius; and it is considered possible that a western-produced material might compete effectively over a similar radius. Thus markets in North America were examined west of the 110th meridian and as far south as California. Actually, significant glass and ceramic production is known to occur only in Alberta, British Columbia, Washington, Oregon and California.

Since information for selected Pacific Rim countries was readily available, and because the NEP claim group is only a few hundred kilometres from tidewater, this information was also incorporated into the report.

4.3 Study Limitations.

Glass manufacturing tends to be dominated by a few large, high-profile companies who are readily identified; thus the glass markets for western regions of the U. S. and Canada are considered to be well-defined by this study.

On the other hand, the ceramic industry is comprised of numerous, small, low-profile companies, and it would be an unwieldy task to research such a consumer group. Thus it is likely that the markets for ceramic-grade materials are significantly under-estimated in this study. In fact, only the sanitary whiteware manufacturers were identified as major users of ceramic-grade nepheline syenite.

Nonetheless, this study very likely identifies over 80% of the potential markets in western North America for nepheline syenite in all applications. In the case of potential offshore markets, the data presented is incomplete.

5.0 MARKET STUDY

Most of the North American glass industry combine high-purity silica sand with a suitable aluminous material in their batch formulations; the point being they buy silica and alumina separately and combine them during batching. Due to geolgic history, western North America has an abundance of feldspathic sands (quartz-feldspar mixtures) and an acute shortage of high purity silica sands such as are found in the East. Where silica is scarce, feldspathic sands have a competitive edge over highly aluminous materials due to their higher silica content. Therefore it is important to recognize the importance of both silica and alumina supplies in a market study involving nepheline syenite.

5.1 Northwest Markets.

The glass industry in western Canada is presently confined to the manufacture of container glass and fibreglass insulation, with five operations in Alberta and British Columbia. In the U.S. Pacific Northwest, container glass is manufactured in Seattle and Portland, and a new flatglass operation is coming on line in Chehalis, Washington.

High quality silica is supplied from producers in Selkirk, Manitoba; Golden, British Columbia; and Valley, Washington. These silica deposits have ample reserves and are centrally located with respect to the markets they serve (except for the Selkirk operation, which is outside and east of the consuming region).

In fibreglass and coloured-glass production, local feldspathic sands (supplied from Coos Bay, Oregon; and Bruderheim, Alberta). provide a low-quality but inexpensive source of silica, as well as alumina A high-iron silica is supplied from Ravensdale, Washington, and is used in coloured-glass production at Seattle, and sometimes in fibreglass production at Mission, B. C.

Alumina is supplied to western Canada largely from nepheline syenite from Nephton, Ontario, although a feldspathic sand deposit near Emmett, Idaho, supplied this market prior to the marked devaluation of the Canadian dollar. Emmett continues to retain a small residual Canadian market, and supplies the demand for low-iron material in Portland and Seattle without competition. The Coos Bay feldspathic sand replaced Emmett sands in the manufacture of coloured-glass at Portland, and is used in the manufacture of fibreglass at Mission, British Columbia.

The only identified user of alumina in ceramic production in the Northwest is the sanitary whiteware manufacturer, Crane Canada Inc. at Coquitlam, British Columbia.

Table 7 summarizes the supply and demand relationships for aluminous materials in the Northwest, with current consumption estimated at 27,000 short tons annually, in terms of nepheline syenite (22% alumina) equivalent. In better economic times, over 30,000 short tons would be consumed annually by these industries.

It will be noticed that Table 7 contains no consumption information regarding the PPG flat-glass facility at Chehalis. Unfortunately North American flat-glass manufacturers do not include alumina in their batch formulations, but the industry is reportedly reviewing the role of alumina in flat-glass and may in the future use alumina, as the Japanese currently do.

5.2 California Markets.

The glass industry in California consists of three flat-glass plants, three fibreglass plants, and fifteen container glass manufacturers. The latter are centered in the Los Angeles and San Francisco areas, with much of the container glass production being wine bottles. In fact, the largest container glass plant in North America is operated by Gallo Wines in Modesto, who has five lines producing wine bottles for its own consumption.

Silica sand is produced for its own use by Owens-Illinois Co. in Ione, California, and as well supply other consumers. Several producers in the Overton, Nevada, area (principally Simplot Silica Products) supply most of the non-captive silica to California. Feldspathic sands are supplied by California Silica at San Juan Capistrano, Crystal Silica at Oceanside, Gillibrand Sands at Simi Valley, Santa Cruz Aggregates at Felton, and Unimin Corporation at Byron (all within California).

California is short of high-quality silica sand, but has an ample supply of feldspathic sands. The feldspathic sands are moderate-to-high in iron and contain from 4 - 9% alumina. The industry reportedly has made adjustments to their glass-batch formulations in response to the economics of the available materials.

Consequently, some container glasses in California contain up to 6% alumina, though these same companies produce 1 - 3% alumina glass elsewhere. Producers in California tend to view alumina as free, and pay for silica. Feldspathic sand prices apparently are in the range of US$12 - 20/short ton, FOB the producer. Truck is the principal delivery mode, but most if not all plants have rail capabilities.

Supply and demand relationships for aluminous materials used in California glass and ceramic manufacture are found in Table 8. This study identified an annual consumption of about 272,400 short tons of nepheline syenite equivalent in California.

5.3 Pacific Rim Markets.

Feldspar production data in Table 3, suggests that all Pacific Rim countries have adequate indigenous sources of aluminous materials, except Australia and possibly Hong Kong. Japan is known to have imported about 6,000 short tons of feldspar from China and India in 1979 (Industrial Minerals, November 1981), and in addition produced 500,000 short tons of indigenous materials (primarily aplite and Toseki, and some feldspar).

Australia would appear to be a potential market if transportation costs were sufficiently low. Australia has imported some nepheline syenite, but the exact details are not known. In 1981 a high-quality potassium-rich feldspar deposit was expected to come on stream in western Australia, but its present status is not known.

Nothing was found to suggest that countries in Central America or on the west coast of South America would be a potential market, with Mexico (140,000 tons), Guatemala (13,000 tons), Colombia (30,000 tons), Peru (10,000 tons) and Chile (1,000 tons) all having feldspar production in 1980.

In summary, only Australia would appear to offer potential sales for nepheline syenite in offshore Pacific Rim markets, and this market should be investigated when the NEP claims are better characterized.

6.0 MARKET EVALUATION

6.1 Specific Factors.

Five **deposit-specific factors** are of paramount importance in the evaluation of the economics of an industrial mineral project: the deposit location and distance to markets, the nature of the ore reserves, the beneficiation methods best suited to the ore, the physical and chemical character of the commercial product, and the direct and indirect costs associated with producing and delivering a commercial product.

The important **market-specific factors** are the user requirements in terms of quality and quantity, the location of alternative suppliers, the character of the established commercial materials, and the effective landed cost of these products.

These deposit- and market-specific factors are synthesized to determine the value of the replacement product at the point of production, to forecast market share or volume of sales, and to estimate the vulnerability of the established producers to competition. Finally, the preliminary cash flow is then analyzed to provide an initial evaluation of the merits of the project.

Considering the factors:

6.1.1 Deposit Location. The deposit is centrally located with respect to Northwest markets, and all infrastructural needs are closeby (Burlington Northern Railway, Highways 3 and 97, the Keremeos-Osoyoos-Oroville population centers, B.C. Hydro, and Inland Natural Gas). A processing facility could be located on either side of the international boundary. The 400 kilometres to tidewater would add at least $15/short ton to sea transportation costs. Truck freight to San Francisco would be at least $50/ton, and to Los Angeles at least $75/ton. Transportation costs to all markets identified in the Northwest would be less than $40/ton.

6.1.2 Ore Reserves. Industrial mineral economics usually require at least 20 years ore reserves, or say at least a million tons in this case. The coarsely-crystalline nature of this type of intrusive strongly suggests that if material suited to beneficiation could be located, it would likely be found in sufficient volume to meet needed ore reserve requirements.

6.1.3 Physical and Chemical Character of Commercial Product. It is evident that any commercial product from the NEP claim group would have a low sodium/potassium ratio and possibly a high iron content, relative to materials normally used in the manufacture of glass. It may also contain deleterious materials such as refractory minerals, or intolerable levels of impurities such as chromium, cobalt, manganese, titanium or copper.

The sodium/potassium ratio represents a marketing problem which time should solve, as the product becomes accepted through usage. For a viable operation, the total iron content must be reduced to less than 0.25% (reported as Fe_2O_3). And the glass companies themselves will quickly point out any deleterious minerals or substances on laboratory samples submitted from the earliest beneficiation tests.

The bulk of the markets demand a commercial product to have a grain-size predominantly in the range of -30 x +200 U.S. Standard mesh, and thus the liberation grain-size in the milling process must be conducive to producing this size of material.

6.1.4 Production Costs. Considering no suitable processing methods or equipment have been identified as suitable, there really is no basis to estimate production costs. For the purposes of this scenario, it would be reasonable to assume that production costs for the NEP deposit would be no more than Indusmin's selling price for nepheline syenite, or say $30/ton; but since higher wastes are associated with this deposit, a more conservative figure of $40/ton is used.

6.1.5 User Requirements. In this study it is assumed a commercially acceptable material can be produced. The reduction of iron to acceptable levels is the most contentious part of this assumption. As a rule of thumb, the glass industry considers a material to be acceptable when the ratio of %-alumina to %-iron oxide is greater than 100. Few if any western sources meet this standard, and the industry settles for less.

For instance, the Emmett material which once dominated the Northwest market has a ratio of 77, and none of the present California feldspathic sands are known to have a ratio any higher than about 75. Thus with a ratio of 88 (22% alumina/0.25% iron oxide), the hypothetical product from the NEP deposit should be competitive, in terms of iron content.

Appendix B contains one manufacturer's specification for nepheline syenite puchased from Indusmin, and would be considered typical. It is important to note that in many cases chemical and physical consistency is more important than the actual actual oxide concentrations. Consumer specifications in the glass industry, incidentally, should be viewed with discretion since they reflect more the nature of current supplies than the actual needs in making glass.

6.1.6 Degree of Market Capture. The Northwest market is relatively well-supplied with silica, but is deficient in aluminous materials. It is assumed that a nepheline syenite product of acceptable quality would capture 90%* of the Northwest market, since current sources are either of inferior grade (Emmett and Coos Bay), or excessively distant from the consuming destinations (Nephton). While this assumption is optimistic, it is not unreasonable. In fact, the success of this project is dependent upon almost total market capture in view of the small market available.

A good case can be made that 90% market capture* is possible, based upon the following facts:

1.) There is regional precedence. Prior to the sharp decline in the value of the Canadian dollar (circa 1982), nearly all (if not all!) aluminous materials in western Canada and the U.S. Northwest were supplied by Emmett. With the exception of requirements for coloured and fibreglass production in Portland, Seattle and Vancouver, Emmett is quite capable of recapturing all of these lost markets should the value of the Canadian dollar rise sufficiently.

2.) There is commodity precedence. The one nepheline syenite operation at Nephton supplies approximately 50% of all North America's requirements for aluminous materials. Excluding coastal states, it dominates market regions north of the Ohio and Missouri Rivers (Industrial Minerals, September 1979 issue). It is the only commercial source of aluminous materials known in Canada, and probably supplies well over 90% of this country's needs. As a source of alumina, it is almost 50% more effective than a feldspar, and 200% more effective than a feldspathic sand, on a weight basis.

3.) Even if current suppliers were to supply their products at no charge, so that delivered cost included only the cost of freight, it is possible that a material from the subject deposit could be supplied at a slight profit margin to at least half the markets identified, all other things being equal.

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***DISCLAIMER: 90% market capture presumes that the high potassium-to-sodium ratio will be acceptable to customers and that the iron content can be reduced to less than 0.25% Fe_2O_3. Should either presumption prove to be unfounded, then it is not reasonable to assume 90% market capture.**

****

California, in marked contrast, is short of silica and long on alumina; many glass companies consider they are buying silica in feldspathic sands, and the alumina is free. The potential of the California market is dependent upon two factors, the effective landed costs of each alternative aluminous material and the availability of high-quality silica.

6.1.6 Competitive Sources. In the Northwest there are three sources of aluminous materials: nepheline syenite from Nephton, Ontario, running 23.4% alumina; and feldspathic sands from Emmett, Idaho, and Coos Bay, Oregon, which both contain 8 - 8.5% alumina. (See Appendix B for Emmett sand and Nephton syenite specifications.)

The nepheline syenite dominates the Canadian market, selling for about $30/ton FOB Nephton, and landing into western Canada for about $110 - $130/ton, depending upon the destination. The Emmett sand sells for about C$21/ton, and would land into Seattle and Portland for about C$45 - 50/ton; the Emmett sand's effective landed cost would be over C$100/ton, when compared to hypothetical material from the NEP deposit. If the NEP claims were to be developed, the Coos Bay material would not be able to compete in Vancouver, but it might continue at its present sales level in Portland.

The California feldspathic sands sell for C$17.50 - 28/ ton, and probably land at their destinations at C$25 - 40/ton. Because of the expense of silica, the effective landed costs of these materials would be <u>less</u> in most cases, when compared to more aluminous materials. Therefore, materials high in alumina would not be competitive in the California marketplace, for most uses.

6.2 Market/Project Synthesis. It is reasonable to assume 90% of the Northwest market (say 25,000 tons) could be captured* in three years, and the effective value of the hypothetical material from the NEP claim would average at least $65/ton, FOB the mine/mill. The large market capture for the hypothetical product is due to its lower effective landed cost to the consumer; the $65/ton value is determined on the basis of its lowest competitive value within the Northwest.

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Given the lack of silica production within California, it would appear that currently there is little market for a high-alumina product, except for perhaps a 20,000 ton/year specialty market. This study assumes half of this specialty market could be captured, or about 10,000 tons annually. The whiteware manufacturers, hobby potterers, and the like would constitute specialty markets.

The writer has knowledge of several proposed silica developments which could potentially alter the market for high-alumina materials in California. But even then, the minimum C$50/ton freight from Osoyoos to San Francisco would probably mean that the NEP material would have to sell for less than $50/ton FOB the mine/mill. Whether or not it is possible to sell higher tonnages into California requires more information on the NEP claims than currently exists, would be the subject of another market study, and would depend upon the progress of proposed silica developments in California .

A potential offshore market exists in Australia, but there is insufficient information to comment further.

6.3 Summary. This report assumes that if the NEP product had a total iron content less than 0.25% (reported as Fe_2O_3), it would be reasonable for the material to capture most of the Northwest market* in a three-year period, or about 25,000 tons annually. In this market, the product should have a mill value of at least C$65/short ton. And it is estimated 10,000 tons could be sold annually into California and other specialty markets at C$50/ton. Thus the mill might possibly produce and sell 35,000 tons annually* by the third year of operation, with a projected average mill value of C$60/ton, at an estimated production cost of $40/ton.

7.0 ECONOMIC ANALYSES

For the purpose of this report, it is important to recognize that the references to revenue, expenses, profits, and payback are not projections of what is likely to occur, but rather are provided to indicate the potential scale of operation, to establish an order of magnitude for potential reward, and to set benchmark conditions which a viable operation will likely need to achieve.

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***DISCLAIMER: 90% market capture presumes that the high potassium-to-sodium ratio will be acceptable to customers and that the iron content can be reduced to less than 0.25% Fe_2O_3. Should either presumption prove to be unfounded, then it is not reasonable to assume 90% market capture.**

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7.1 Revenue & Expenses.

The assumptions regarding revenues and expenses summarized in Section 6.3 form the basis of the evaluation in this section.

7.2 Capital Investment.

To conclude the scenario and allow a preliminary analysis, it is assumed that total capital infusion will be $1.5-million, expended equally over a three-year period. This phased investment represents a pilot/small-scale-commercial operation in year 1; expansion to commercial in year 2; and finally, year three will see permanent facilities.

Ongoing capital expenditures will be funded from operating budgets, and are internalized within the category Operating Expenses.

The $1.5-million dollar estimate stems from the observation that this is about the limit of investment recoverable under attractive conditions, considering the size of markets. It is felt this size of budget may be reasonable for the small tonnages involved, and it is thought that much of the drilling, blasting, mining and crushing could be done using standard aggregate machinery on contract. Flotation/magnetic-separation, sizing, storage and shipping would possibly be the only functions not practical to contract-out.

8.0 CONCLUSIONS AND RECOMMENDATIONS.

The market data produced in this study, when combined with a reasonable scenario for this project, suggest that the materials found on the NEP claim group are potentially economic. The assumptions fundamental to the scenario presented are:

(1) That a saleable product in the -30 x +200-mesh size can be produced with total iron (reported as Fe_2O_3) being below 0.25% and containing no other deleterious minerals or substances which would preclude its use in the manufacture of glass and ceramics.

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***DISCLAIMER: 90% market capture presumes that the high potassium-to-sodium ratio will be acceptable to customers and that the iron content can be reduced to less than 0.25% Fe_2O_3. Should either presumption prove to be unfounded, then it is not reasonable to assume 90% market capture.**
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(2) That 90% of the Northwest glass and ceramic markets* for aluminous materials can be captured and that sales of 10,000 tons can be sold annually into California specialty markets, for total annual sales of 35,000 tons*, by year 3.

(3) That the material will sell for an average price of C$60/short ton, FOB mine/mill, with production costs less than $40/ton.

(4) That capital costs can be held below $1.5-million, incurred over a three-year period.

Should it be found during the course of the subsequent field, laboratory, and economic studies that any of the above assumptions are in fact significantly erroneous, then this scenario becomes inappropriate. New developments and changes in currency exchange rates could also have dramatic effects upon the potential profits of this project.

Nonetheless, the markets which are identified above and the results of the preliminary analysis of the project economics according to this scenario give ample cause to proceed with further work designed to test these critical assumptions.

It is recommended that further work concentrate on determining the most suitable zone for development, upon which beneficiation studies would identify suitable processing methods, define equipment requirements and operating costs, and produce materials representative of an expected commercial product. Moreover, it is critical to demonstrate that acceptable iron levels can be achieved, and that samples be sent to the glass manufacturers to test for deleterious minerals and substances.

Should the work program proceed, an experienced industrial mineral specialist should review proposed activities and future results.

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***DISCLAIMER: 90% market capture presumes that the high potassium-to-sodium ratio will be acceptable to customers and that the iron content can be reduced to less than 0.25% Fe_2O_3. Should either presumption prove to be unfounded, then it is not reasonable to assume 90% market capture.**

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9.0 CLOSURE

This study identifies sufficient markets to support an economically viable nepheline operation on the NEP claim group, provided adequate reserves are established and beneficiation methods can be devised to supply commercially acceptable products at a reasonable cost. The writer has no reservations recommending more study to determine whether or not these conditions can be met.

RESPECTFULLY SUBMITTED;

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APPENDIX A:

TABLES REFERRED TO IN REPORT

TABLE 1—Nepheline Syenite—Typical Product Specifications, Glass Grades

	Indusmin		IMC		Norsk Nefelin
Product Designation Typical Chemical Analysis	330, %	333, %	Summit, %	Ridge, %	North Cape, %
Silica	59.9	60.0	60.2	60.1	55.9
Alumina	23.5	23.4	23.5	23.4	24.2
Ferric Oxide	0.08	0.35	0.07	0.5	0.1
Calcia	0.6	0.7	0.3	0.3	1.3
Magnesia	0.1	0.1	trace	trace	trace
Soda	10.2	9.9	10.6	10.5	7.9
Potash	5.0	4.8	5.1	4.9	9.0
BaO	–	–	–	–	0.3
SrO	–	–	–	–	0.3
P_2O_5	–	–	–	–	0.1
L.O.I.	0.6	0.7	0.4	0.3	1.0

Typical Sieve Analysis

US Sieve No.	330	333	Summit (−30)	Summit (−40)	Ridge (−30)	Ridge (−40)	Tyler Sieve No.	North Cape
On 25 mesh %	0.0	0.0					On 28 mesh %	0.0
30	0.1	0.1	0.2		1.3		32	0.1
40	14.5	14.0	15.7	1.0	19.5	0.3	35	4.9
50	48.0	46.0	—	—	—	—	48	30.0
60	—	–	50.8	32.1	43.3	40.1	65	52.0
100	86.0	84.0	20.1	31.9	13.0	38.7		
140	—	–	6.3	16.5	10.2	13.4		
200	98.0	97.2	3.9	7.9	5.4	3.5	200	89.0
pan	2.0	3.0	2.0	10.6	7.3	4.0	pan	11.0

TABLE 2—Nepheline Syenite—Typical Product Specifications, Ceramic Grades

	Indusmin			IMC			Norsk Nefelin
Product Designation	A-200	A-270	A-400	Crest	Peak	Apex	North Cape
Typical Chemical Analysis	%	%	%	%	%	%	%
SiO_2	60.7	60.7	60.7	60.2	60.2	60.2	56.0
Al_2O_3	23.3	23.3	23.3	23.5	23.5	23.5	24.2
Fe_2O_3	0.07	0.07	0.07	0.07	0.07	0.07	0.1
CaO	0.7	0.7	0.7	0.3	0.3	0.3	1.2
MgO	0.1	0.1	0.1	trace	trace	trace	trace
Na_2O	9.8	9.8	9.8	15.3-0.4	15.3-0.4	15.3-0.4	7.8
K_2O	4.6	4.6	4.6	15.3-0.4	15.3-0.4	15.3-0.4	9.1
L.O.I.	0.7	0.7	0.7	0.4	0.4	0.4	1.0

Sieve Analysis

US Sieve No.	A-200	A-270	Crest	Peak	Tyler Sieve No.	North Cape
On 70 mesh %	0.01	0.0	—	—	On 32 mesh %	–
100	0.05	0.01	—	—	35	–
140	0.20	0.05	—	—	48	–
170	–	–	—	—	65	–
200	0.70	0.15	0.3	0.3	200	0.1
270	2.00	0.40	—	—	270	–
325	5.25	1.75	4.7	2.9	325	0.5
pan	94.75	98.25	95.0	96.8	pan	99.4

Microns	A-200	A-270	A-400	Apex 400	Apex 700		North Cape
% Finer than 30	70.0	78.0	98.0	98.0		% Finer than 30	–
20	55.0	65.0	90.0	90.0	98.0	20	–
10	33.5	42.0	65.0	60.0	90.0	10	50
5	19.0	23.0	33.5	35.0	60.0	5	–
2.5	10.0	12.5	16.0	18.0		2.5	–

Tables 1 & 2 from Minnes, et. al. (1983)

TABLE 3—World Production of Feldspar, by Countries, 1959-1980

Country*	1959-1962 (Average; lt)	1963-1966 (Average; lt)	1967-1970	1971-1974	1975 St	1976	1977	1978*	1979	1980
North America										
Canada	11,678	8,836	9,834	10,026†						
Guatemala				29,464‡	•33,000	•22,000	14,408	16,950	15,000	13,000
Mexico	ND	ND	76,320	118,133	80,732	80,732	•83,000	140,604	140,000	140,000
United States	510,014	604,050	651,334	676,311	669,898	739,684	733,963	735,000	•740,000	710,000
South America										
Argentina	6,885	15,393	22,692	46,230	63,934	75,204	85,274	51,034	52,000	47,000
Brazil				103,547§	73,167	92,742	•94,000	118,085	129,000	405,000
Chile	1,497	731	1,661	1,789	421	106	•110	995	1,000	—
Colombia	14,894	13,284	20,899	27,039	36,376	•36,500	36,500	29,162	30,000	33,000
Peru	505	613	1,585	1,958	•3,300	4,305	•4,500	10,759	9,900	10,000
Uruguay	659	1,029	996	1,019	1,939	1,262	1,700	2,199	3,000	3,000
Europe										
Austria	4,225	1,646	1,886	2,860	‖			3,181	3,000	8,000
Finland	11,624	16,232	55,287	60,483	75,593	75,192	•77,000	78,628	77,000	75,000
France¶	123,304	195,418	166,670	197,414	219,360	207,234	•215,000	•208,000	209,000	220,000
Germany, W.	243,694	293,183	325,662	352,782	436,331	462,944	•475,000	425,040	430,000	408,000
Italy	84,165	109,271	173,620	333,146	206,522	201,287	244,000	276,771	276,000	325,000
Norway**	71,330	73,966	120,156	225,781	49,557	41,546	44,000	78,264	78,300	77,000
Poland*	NA	26,720	28,750	29,464	33,000	33,000	33,000	44,000	44,000	44,000
Portugal	2,276	5,290	27,281	22,317	14,506	14,686	11,908	18,987	29,000	29,000
Romania*				NA	64,000	64,000	64,000	66,000	66,000	66,000
Spain¶	10,395	18,036	47,630	67,425	95,102	•100,000	•100,000	•110,000	99,000	138,000
Sweden	52,426	44,674	31,494	29,850	49,320	49,324	•50,000	•57,000	57,000	55,000
USSR*	192,500	220,000	240,000	260,714	310,000	310,000	320,000	330,000	340,000	340,000
United Kingdom (China Stone)*	ND	ND	ND	52,785	55,000	55,000	55,000	55,000	55,000	55,000
Yugoslavia	21,221	39,660	43,120	51,389	60,129	27,983	•27,600	•63,000	60,000	60,000
Africa										
Egypt	423	4,032	NA	2,870	937	2,346	•2,400	3,678	3,690	4,000
Ethiopia	1,460	3,939	ND	NA	NA	NA	NA	NA	NA	—
Kenya	ND	ND		2,194	1,781	•1,800	2,060	1,046	NA	1,000
Malagasy Republic (Madagascar)	ND	ND	NA	NA	753			•1	1	—
Mozambique*	ND	ND	7,000	409	950	950	950	1,000	1,000	—
Nigeria*				NA	5,500	5,500	5,500	NA	NA	6,000
South Africa (Republic of)	19,595	39,542	21,090	26,769	33,460	50,858	56,172	57,921	58,000	55,000
Zambia				NA	1,294	570	•900	368	550	—
Asia										
Burma	ND	ND	ND	607	840	981	1,356	2,205	2,000	2,000
Hong Kong	1,593	1,425	1,555	1,180	2,270	2,534	•2,800	3,480	3,300	20,000
India	12,212	24,442	30,141	46,360	46,817	58,878	•58,741	52,672	50,000	55,000
Japan‡‡	62,407	55,719	58,190	54,450	43,494	45,434	•47,000	•46,000	•45,000	40,000
Korea (Republic of)	6,085	14,012	21,989	24,218	22,198	28,889	54,425	76,280	75,000	88,000
Pakistan	NA	634	ND	1,250	2,981	3,299	•3,300	15,769	13,000	16,000
Philippines	8,858	8,766	NA	37,791	4,307	16,799	15,988	18,966	20,000	19,000
Sri Lanka	81	283	674	551	859	3,526	3,600	3,483	3,500	4,000
Thailand§				NA	14,358	13,511	•14,000	35,917	35,000	28,000
Turkey	NA	NA	NA	NA	NA	63,714	82,894	83,004	80,000	79,000
Oceania										
Australia	7,972	8,550	4,388	3,036	3,366	4,958	•3,300	3,053	2,000	5,000
Total	††	††	††	††	2,895,141	2,935,564	3,044,505	3,401,953	3,410,000	3,782,000

Source: Compiled from *Minerals Yearbooks*, US Bureau of Mines.

* In addition to the countries listed, People's Republic of China, Czechoslovakia, and South-West Africa (Namibia) produce feldspar, but available information is inadequate to make reliable estimates of output levels.
† No production after 1972.
‡ Production first reported 1974.
• Estimated
ND No data.
NA Not available.
§ Production first reported 1973.
‖ No production after 1973.
¶ Includes pegmatite.
** Described in source as lump feldspar; does not include nepheline syenite.
†† Total omitted for reasons stated in text.
* Preliminary
‡‡ In addition, the following quantities of aplite and other feldspathic rock were produced:

1963-65 (average) 250,694 lt, 1966-68: 325,675 lt, 1969-71: 444,251 lt, 1972-74: 472,912 lt, 1975: 357,056 st, 1976: 394,533 st.

From Rogers, et. al. (1983)

TABLE 4—Typical Chemical and Mineralogical Composition of Some Nepheline Syenites, %

	Canada,[*] Methuen Township		Norway,[†] Stjernoy		Krasnoyarsk[‡]	United States,[§] Litchfield, Maine	USSR,[#] Khibiny	Greenland,[¶] Ilimaussaq	Congo[**]	Portugal[††]	Malawi[‡‡]	Brazil,[§§] Cannon Mine
Chemical Composition	Hornblende	Biotite	Pyroxene	Biotite								
SiO_2	58.8	59.4	52.73	52.37	54.57	60.39	54.01	49.46	55.44	55.22	55.77	57.8
Al_2O_3	23.0	23.0	23.71	23.22	22.56	22.51	21.50	23.53	23.59	22.59	22.26	23.5
Fe_2O_3	0.8	0.7	1.9	1.1	3.44	0.42	2.60	3.04	0.44	1.14	1.33	0.1
FeO	1.4	1.5	1.89	1.14	—	2.26	1.80	1.02	1.42	1.17	2.50	—
TiO_2	0.004	0.004	0.51	0.61	0.15	—	1.20	0.16	0.20	0.59	0.50	—
Na_2O	9.4	9.5	7.78	6.87	9.69	8.44	9.50	14.71	10.20	8.76	8.05	10.9
K_2O	5.2	4.9	8.08	8.30	5.51	4.77	5.30	4.34	6.26	5.59	6.66	6.2
CaO	0.82	0.64	2.54	3.11	1.61	0.32	1.80	0.80	1.56	2.12	1.25	0.5
MgO	0.04	0.03	0.24	0.25	0.19	0.13	0.77	trace	0.14	0.28	0.58	0.05
MnO	0.049	0.045	0.06	0.09	—	0.08	0.17	0.17	0.15	0.13	0.19	—
P_2O_5	0.01	0.01	0.05	0.09	0.02	—	0.09	n.a.	0.18	—	0.21	—
CO_2	0.05	0.15	0.77	1.88	—	trace	—	—	—	nil	0.07	—
H_2O	0.3	0.4	0.26	0.26	—	0.57	1.14	1.38	1.07	2.16	0.50	—
BaO	—	—	0.40	0.47	—	—	0.12	—	—	—	—	—
Ignition Loss	—	—	—	—	—	—	—	—	1.62	—	—	0.9
Mineralogical Composition												
Albite	48.4	52.0	trace	6.0	20.3	47.8						
Microcline	22.7	18.9	—	—	37.8	16.5						
Microperthite	—	—	—	—		—						
Perthite	minor	minor	57.0	55.5	—	—						
Nepheline	24.9	24.1	37.0	29.0	26.9	23.7						
Biotite	0.1	2.2	trace	3.5	0.1	5.5						
Hornblende	3.0	—	1.0	—	—	—						
Pyroxene	0.2	—	1.0	—	6.1	—						
Magnetite	0.4	0.5	1.0	1.5	—	—						
Calcite	—	0.1	2.0	5.0	—	—						
Muscovite	—	0.7	—	—	—	—						
Zeolite	—	—	—	—	8.7	6.5						

Sources:
[*] Payne, 1966, p. 140.
[†] Heier, 1966.
[‡] Leucocratic nepheline syenite; Central Tartar Massif, 1968, Krasnoyarsk Territory, Siberia. Allen and Charsley, 1968, p. 109.
[§] Allen and Charsley, 1968, p. 134.
[#] Gerasimovskii, 1956; Allen and Charsley, 1968, p. 101.
[¶] Greenland—Ilimaussaq. Allen and Charsley, 1968, p. 127.
[**] Nepheline syenite Kirumba, Democratic Republic of The Congo. Allen and Charsley, 1968, p. 114.
[††] Algarve Province. Allen and Charsley, 1968, p. 95.
[‡‡] Biotite and hastingsite nepheline syenite, Lulwe Hill, Malawi. Allen and Charsley, 1968, p. 54.
[§§] Harben, 1981.

From Minnes, et. al. (1983)

TABLE 5—Typical Analyses, Feldspathic and Aluminous Materials*

Soda Flotation Feldspar, Spruce Pine, NC

SiO_2	67.54%
Al_2O_3	19.25
Fe_2O_3	0.06
CaO	1.94
MgO	Trace
K_2O	4.05
Na_2O	6.96
Loss	0.13

Potash Flotation Feldspar, Kings Mountain, NC

SiO_2	67.04%
Al_2O_3	18.02
Fe_2O_3	0.04
CaO	0.38
MgO	Trace
K_2O	12.10
Na_2O	2.12
Loss	0.30

Dry Ground Feldspar, Custer, SD

SiO_2	71.84%
Al_2O_3	16.06
Fe_2O_3	0.09
CaO	0.48
MgO	Trace
K_2O	7.60
Na_2O	3.72
Loss	0.20

Feldspathic Sand, Bessemer City, NC

SiO_2	79.20%
Al_2O_3	12.10
Fe_2O_3	0.06
CaO	0.52
MgO	Trace
K_2O	2.62
Na_2O	4.80
Li_2O	0.35
Loss	0.35

Low Iron Aplite, Montpelier, VA

SiO_2	63.71%
Al_2O_3	21.89
Fe_2O_3	0.09
CaO	5.70
MgO	Trace
TiO_2	0.43
K_2O	2.37
Na_2O	5.60
Loss	0.21

Canadian Nepheline Syenite Nephton, Ont., Canada

SiO_2	61.40%
Al_2O_3	22.74
Fe_2O_3	0.06
CaO	0.70
MgO	Trace
K_2O	4.95
Na_2O	9.54
Loss	0.60

Steel Mill Slag ("Calumite")

SiO_2	38.8%
Al_2O_3	10.5
Fe_2O_3	0.3
MnO	8.3
CaO	38.5
MgO	1.4
K_2O	0.5
Na_2O	0.4
Sulfur cpds.	1.1

From Rogers, et. al. (1983)

TABLE 6

Approximate Compositions of Commercial Glasses (Shand, 1958)

	Oxide Constituents, %								
Glass Designation	SiO_2	Na_2O	K_2O	CaO	MgO	BaO	PbO	B_2O_3	Al_2O_3
Fused Quartz	99.99	------------	------------	------------	$<1X10^{-2}$	------------	------------	------------	------------
96% Silica Glass	96.3	<0.2	<0.2	--	--	--	--	3	0.4
Soda-Lime (window)	71-73	12-15	--	9	2.5	--	--	--	1
Soda-Lime (plate)	71-73	12-14	--	11	3.0	--	--	--	1
Soda-Lime(containers)	70-74	13-16		10-13		0.5	--	--	2.0
Soda-Lime(light bulbs)	74	16	0.6	5	4	--	--	--	1
Lead-Alkali	63	8	6	0.3	0.2	--	21	0.2	0.6
Lead-Alkali	35	--	7	--	--	--	58	--	--
Alumino Borosilicate	75	6	0.5	1	--	2	--	10	6
Borosilicate	80	4	0.4	--	--	--	--	13	2
Borosilicate	70	--	0.5	--	--	--	--	28	1
Borosilicate	67	5	1	--	0.2	--	--	25	2
Aluminosilicate	57	1	--	6	12	--	--	4	20

TABLE 7: SUPPLY AND DEMAND RELATIONSHIPS FOR ALUMINOUS MATERIALS USED IN NORTHWEST GLASS AND CERAMIC MANUFACTURE

COMPANY	OUTPUT	SUPPLIER	% Al_2O_3	CONSUMED	22% Al_2O_3 E
Consumers Glass Co. Lavington, BC	container glass	Indusmin Ltd. Nephton, ON	32.4	3,300	3,500
Crane Canada Inc. Coquitlam, BC	ceramic whiteware	Indusmin Ltd. Nephton, ON	23.3	1,800	1,900
Domglas Inc. Redcliff, AB	container glass	Indusmin Ltd. Nephton, ON	23.4	3,300	3,500
Fibreglas Canada Inc. Mission, BC	fibreglass insulation	Coos Bay Silica Coos Bay, OR	8	2,200	800
Fibreglas Canada Inc. Sherwood Park, AB	fibreglass insulation	Indusmin Ltd Nephton, ON	23.4	1,800	1,900
Manville Canada Inc. Innisfail, AB	fibreglass insulation	Indusmin Ltd. Nephton, ON	23.4	3,700	4,000
Northwestern Glass Co. Seattle, WA	container glass	Unimin Corp. Emmett, ID	8.5	25,000	9,700
Owens-Illinois Glass Portland, OR	coloured container	Coos Bay Silica Coos Bay, OR	8	750	300
	flint container	Unimin Corp. Emmett, ID	8.5	4,300	1,700
				TOTAL	27,300

TABLE 8: SUPPLY AND DEMAND RELATIONSHIPS FOR ALUMINOUS MATERIALS USED IN CALIFORNIA GLASS AND CERAMIC MANUFACTURE (ALL DATA IN SHORT TONS PER YEAR)

COMPANY	OUTPUT	SUPPLIER	% Al_2O_3	CONSUMED	22% Al_2O_3
Northern California Consumers					
Brockway Glass Oakland, CA	coloured container	Santa Cruz Ag Felton, CA	8.5	25,000	9,700
	flint container	Unimin Corp. Byron, CA	4	50,000	9,100
Certainteed Chowchilla, CA	fibreglass insulation	Santa Cruz Ag Felton, CA	8.5	40,000	15,500
Gallo Wines Modesto, CA	wine bottles	Unimin Corp. Byron, CA	4	290,000	52,700
Latchford Glass San Leandro, CA	container glass	Santa Cruz Ag Felton, CA	8.5	18,600	7,200
Madera Glass Madera, CA	container glass	Unimin Corp. Byron, CA	4	55,000	10,000
Manville Corp. Sacramento, CA	fibreglass insulation	?	?	?	15,000
Owens-Corning Santa Clara, CA	fibreglass insulation	Unimin Corp. Byron, CA	4	30,000	5,500
		Santa Cruz Ag Felton, CA	8.5	20,000	7,700
				SUBTOTAL	132,400
Southern California Consumers					
Ball Brothers El Monte, CA	container glass	Cal Silica San Juan Cap.	7.6	35,000	12,100
Brockway Glass Pamona, CA	container glass	Crystal Silica Oceanside, CA	6.75	60,000	18,400
Foster-Forbes Los Angeles, CA	container glass	Gillibrand Simi Valley, CA	8.3	19,000	7,200
Kerr Glass Santa Ana, CA	container glass	Crystal Silica Oceaside, CA	6.75	20,000	6,100
Latchford Glass Los Angeles, CA	container glass	Crystal Silica Oceanside, CA	6.75	44,800	13,700
				SUBTOTAL	57,500
Apparent Cal Silica/Owens-Illlinois Silica Backhaul Situation					
Diamond Bathurst Antioch, CA Vernon, CA Hayward, CA	container glass	Cal Silica San Juan Cap.	7.6	40,000	13,800
Owens-Illinois Vernon, CA	container glass	Cal Silica San Juan Cap.	7.6	60,000	20,700
Owens-Illinois Oakland, CA	container glass	Cal Silica San Juan Cap.	7.6	52,000	18,000
Owens-Illinois Tracy, CA	container glass	Cal Silica San Juan Cap.	7.6	58,000	20,000
				SUBTOTAL	72,500
Aggregated Statistics					
Five (5) California Ceramic Manufacturers	sanitary whiteware	?	?	?	10,000
				TOTAL	272,400

APPENDIX B:

WRITTEN PRODUCT SPECIFICATIONS

EMMETT PLANT

WHOLE GRAIN SAND

	No. 8	No. 16	No. 20	No. 30	No. 70	No. 30IF
% Retained on U.S. No. 8	1					
% Retained on U.S. No. 12	17					
% Retained on U.S. No. 16	54	3	Trace			
% Retained on U.S. No. 20	21.5	34	2	Trace		
% Retained on U.S. No. 30	5	49	47	1	Trace	1
% Retained on U.S. No. 40	1	10	41	24	0.5	10
% Retained on U.S. No. 50	0.5	2.5	7	37	1	21
% Retained on U.S. No. 70	Trace	1	1.5	19	23.5	21
% Retained on U.S. No. 100		0.5	1	9	34	10
% Retained on U.S. No. 140			0.5	5.5	23	14
% Retained on U.S. No. 200			Trace	3	11	8
% Retained on U.S. No. 270				1	5	4
Pan	Trace	Trace	Trace	0.5	2	2

TYPICAL CHEMICAL ANALYSIS

Silicon dioxide	(SiO_2)	84.7
Iron oxide	(Fe_2O_3)	.11
Aluminum oxide	(Al_2O_3)	8.5
Calcium oxide	(CaO)	.93
Magnesium oxide	(MgO)	.02
Potassium oxide	(K_2O)	3.0
Sodium oxide	(Na_2O)	2.0

Note: All physical and chemical properties, as listed, are approximate.

WEDRON®

WEDRON SILICA COMPANY
400 West Higgins Road, Park Ridge, Illinois 60068 • 312/692-3322

DOMGLAS INC.

CORPORATE OFFICE
2070 HADWEN ROAD
MISSISSAUGA, ONTARIO L5K 2C9
TELEPHONE (416) 823-3860

September 4, 1986

Mr. D. Lobdell
P.O. Box 3103
Kamloops, B.C.
V2C 6B8

Dear Mr. Lobdell:

Attached, as requested, is a copy of our specification for Syenite.

Should there be any development of your site, we would be interested in additional discussion.

Yours truly,

W. Casely
Purchasing Manager

WC/kb
Att.

DOMGLAS LTÉE LTD.

RAW MATERIALS SPECIFICATION

Material	Plant
Nepheline Syenite/Feldspar	
Supplier	**Source**

Chemical Specification

	Domglas	Supplier
SiO_2	Constant ± 0.5%	
Fe_2O_3	0.09% Max.	
Al_2O_3	Constant ± 0.1%	
CaO	Constant ± 0.2%	
MgO	Constant ± 0.1%	
Na_2O	Constant ± 0.3%	
K_2O	Constant ± 0.2%	
SO_3		
S:		
TiO_2		
Cr_2O_3	Nil	
Co_3O_4	Nil	
MnO		
BaO		
B_2O_3		
F_2		
C		
L.O.I.	0.10% Max.	
Ash		
Zn		
Cu	Nil	
Ni	Nil	
Pb		
CaO		
Se		
Cl		
H_2O	0.1% Max.	
$NaNO_3$		
NaCl		
AS_2O_3		
Sb_2O_3		
P_2O_5		
Organics	0.2% Max.	

Physical Specification

Screen	Domglas	Supplier
12		
14		
16		
20		
25		
30	NIL	
35		
40	0.4% Max	
50		
60		
70		
100		
-100		
140		
-140		
200		
-200	4% Max.	
	All Values Cumulative	
	U.S. Std. Screens	

Miscellaneous

Revision 1 April 11/83
Nominal Specification
for Prospective Suppliers.

APPENDIX C:

CERTIFICATES

CERTIFICATE

I, David G. Lobdell, of the City of Kamloops, Province of British Columbia, do hereby certify that:

1. I am a Consulting Geologist with my place of business at 1278 Dalhousie Drive, Kamloops, B.C. and mailing address at P.O. Box 3103, Kamloops, B.C. V2C 6B8.

2. I am a graduate of the University of Montana (B.A.-Geology, 1971) and have post-graduate education at the Universities of Alberta and Guelph. I am a graduate candidate at the University of Idaho, College of Mines, with a degree pending (B.Geol.E.).

3. I am a Professional Geologist registered in the Province of Alberta (APEGGA).

4. I am an industrial minerals specialist with about 15 years professional experience as a geologist, the last seven years exclusively in the field of industrial minerals. My specialized expertise is the economic geology regarding the production and consumption of industrial minerals in the Northwest. I am the President of Amrock Processors Inc., a company actively involved in the brokerage and distribution of industrial minerals. I am a member of the American Institute of Mining Engineers, The Northwest Mining Association, and a participant in the Forum on the Geology of Industrial Minerals (An annual meeting of North American industrial mineral specialists).

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of NEPHELINE RESOURCES LIMITED or any affiliate.

6. The statements made in this report are based upon literature research, past studies conducted by the writer, and telephone and written communications with all the producers and consumers mentioned in this report, and other parties considered appropriate. Information was gathered during the months of August and September, 1986.

7. Permission is granted to use this report as required by any securities commission or stock exchange, in whole or in part, and for assessment purposes relating to the maintenance of claims under the terms of the B. C. Mineral Act.

Dated at Kamloops,
APRIL, 1987

David G. Lobdell, P.Geol.(Alberta)

C E R T I F I C A T E

I, Alex Burton do hereby certify that I am an independent Consulting Geologist with offices at 810 - 626 West Pender Street, Vancouver, B.C. V6B 1V9. I FURTHER CERTIFY THAT:

1. I am a geology graduate of the University of British Columbia and a registered Professional Engineer in B.C. with Certificate No. 6262 and Fellow of the Geological Association of Canada. I have practised my profession for many years both as an independent consultant and in senior managerial capacity for major mining companies in Canada and other countries.

2. I have no personal interest, directly or indirectly in the securities of NEPHELINE RESOURCES LTD. or the NEP CLAIM, nor do I expect to receive directly or indirectly any interest in such property or securities.

3. I have reviewed the revised April, 1987 Report of David G. Lobdell, P. Geol. entitled EXAMINATION OF MARKETS FOR NEPHELINE SYENITE: WESTERN NORTH AMERICA AND SELECTED PACIFIC RIM COUNTRIES. Mr. Lobdell has considered the location, ore reserves, and probable composition limits, particularly in regard to iron content of the Nepheline Syenite on the Nep Claim. He has also done a market study and an evaluation of the markets that a hypothetical product from the Nep Property might capture. His data, methodology, and conclusions seem reasonable to me.

I concur that testing of the different sections in the deposit to see if a product of acceptable chemical composition can be produced is well justified.

If a product with less than .1% iron oxides can be produced all markets should be open, and if a product ranging from .1 to .25% iron oxides with high soda to potash ratio is produced, then the ceramics and lower quality portion of the market can be served. I have read the John G. Payne, PhD. Report on the NEP CLAIM referred to by Mr. Lobdell. I know Mr. Payne and endorse his Report.

4. I consent to the use of this report by NEPHELINE RESOURCES LTD., in any prospectus or Statement of material facts.

PROVINCE OF A. D. K. BURTON BRITISH COLUMBIA ENGINEER

ALEX BURTON, P. Eng., Consulting Geologist

April 3, 1987

BURTON CONSULTING INC.

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CERTIFICATE OF THE ISSUER

The foregoing constitutes full, true and plain disclosure of all material facts relating to the securities offered by this Prospectus as required by the Securities Act (British Columbia) and its regulations.

DATED: March 3, 1987

BRIAN HOWARD SCHARF
Chief Executive Officer and
Chief Financial Officer

EDWIN ALEXANDER PHILPOT
Director and Promoter

PATRICK THOMAS HARRISON
Director and Promoter

CERTIFICATE OF THE AGENT

To the best of our knowledge, information and belief, the foregoing constitutes full, true and plain disclosure of all material facts relating to the securities offered by this Prospectus as required by the Securities Act (British Columbia) and its regulations.

DATED: March 3, 1987

CANARIM INVESTMENT CORPORATON LTD.

Per: M.W. Murphy