ACID TREATMENT OF NEPHELINE SYENITE SAMPLES

PROJECT 90155

REPORT 90155-88-1

Prepared For: Jayfran Exploration

Prepared By: I.M.D. Laboratories Ltd.
March 3, 1988
1.0. Summary

The Nepheline syenite samples submitted by Mr. Robert Morse consulting geologist have been processed with the following results.

<table>
<thead>
<tr>
<th>Sample #</th>
<th>% Acid Solubles Including Nephelite</th>
</tr>
</thead>
<tbody>
<tr>
<td>406 - control sample (not on property)</td>
<td>31.3</td>
</tr>
<tr>
<td>409</td>
<td>28.0</td>
</tr>
<tr>
<td>Composite - 1987 A = 407 + 408</td>
<td>24.8</td>
</tr>
<tr>
<td>Composite - 1987 B = 410 + 411</td>
<td>27.8</td>
</tr>
</tbody>
</table>

A great deal of difficulty was experienced in processing the samples as requested. A different approach had to be used to determine the Nephelite content of the samples. This is explained in detail in this report.

2.0 Introduction

Six samples of fist size pieces of Nepheline Syenite were submitted by Mr. R. Morse, consulting geologist, with the request to process these samples as per his letter of July 30, 1987.

A significant effort was made to follow the procedure as outlined. However, despite considerable efforts on our part, it was not possible to do so and obtain meaningful results.

The single largest difficulty was drying of the leach solutions. This was caused by (a) large volume of leach and wash solutions; (b) gelling of the leach solution, making drying exceedingly difficult. For this type of drying a spray or flash drier is required.

A further difficulty was the fact that the sulphates produced by the sulfuric acid used in leaching, caused difficulties in the chemical analysis.
A third problem was that the samples contained significant amounts of iron bearing minerals that partly dissolved in the acid plus there was a loss of CO₂ from carbonates present in the rock. Also it was difficult to leach the material with all of the non feldspathic components. Difficulties were experienced after leaching, with filtration of residues due to formation of hydrated silica.

Despite a number of repeated tests we were not able to achieve success, filtration was virtually impossible.

As a result of these problems, it was necessary to remove most of the iron bearing minerals by low and high intensity magnetic separation. This removed primarily iron bearing minerals, however small amounts of nepheline syenite were lost as well.

Once iron bearing minerals had been removed, leaching was no longer a problem. However we did have further problems with drying the leach solution. Also the high sulphate content in the dried leach solution caused difficulties with chemical analysis.

An effort was made to remove sulphates from leach solutions by precipitation as calcium sulphate using calcium chloride. This was partially successful but converted the leach solution to the chloride form which caused dehydration of dissolved silica, causing filtration problems.

The ultimate solution to this problem was to conduct the leaching on magnetically separated nepheline syenite which is the usual procedure but rather than drying the leach solution it was decided to determine the amounts of silica, alumina and other constituents dissolved by analyzing the feed material prior to leaching and to analyze the insoluble residues after careful washing.

This allowed a fairly precise method of calculating the amounts of silica, alumina etc. removed by leaching and attributable to the mineral nephelite.
3.0 Magnetic Separation

The samples were prepared by crushing to 20 Mesh.

The minus 20 mesh material was given low and high intensity magnetic separation to remove iron bearing minerals. This resulted in the following.

<table>
<thead>
<tr>
<th>Sample #</th>
<th>% Magnetics</th>
<th>% Non Magnetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>16.0%</td>
<td>84.0%</td>
</tr>
<tr>
<td>409</td>
<td>23.8%</td>
<td>76.2%</td>
</tr>
<tr>
<td>1987 A</td>
<td>33.1%</td>
<td>66.9%</td>
</tr>
<tr>
<td>1987 B</td>
<td>25.8%</td>
<td>74.2%</td>
</tr>
</tbody>
</table>

4.0 Leaching

One thousand (1000) gram samples of the separated product were leached in 2.7 litres of water containing 270 millilitres of concentrated sulphuric acid. The slurry was agitated constantly for 1 hour after which the slurry was filtered off and washed three times with clean water.

Insoluble residues were dried and weighed and the percentage of acid solubles calculated as a percent of the feed weight to the leaching and as a percent of the sample on the "as received" basis.
Table II
Leaching Results

<table>
<thead>
<tr>
<th>Sample</th>
<th>Weight before Leaching</th>
<th>Weight after Leaching</th>
<th>% Solubles Based on Magn. Sepn.</th>
<th>Unseparated Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>1000 Gram.</td>
<td>627.4</td>
<td>37.26%</td>
<td>31.3%</td>
</tr>
<tr>
<td>409</td>
<td>1000 Gram.</td>
<td>632.2</td>
<td>36.78%</td>
<td>28.0%</td>
</tr>
<tr>
<td>1987 A</td>
<td>1000 Gram.</td>
<td>629.6</td>
<td>37.04%</td>
<td>24.8%</td>
</tr>
<tr>
<td>1987 B</td>
<td>1000 Gram.</td>
<td>625.2</td>
<td>37.48%</td>
<td>27.8%</td>
</tr>
</tbody>
</table>

5.0 Chemical Analysis

Chemical analysis were conducted on the following.

1. As received samples

2. Magnetic separation products

3. Leach residues

Chemical Analysis are shown in tables III, IV, and V.
### TABLE III
Chemical Composition of as Received Samples

<table>
<thead>
<tr>
<th>Element</th>
<th>SAMPLE 406</th>
<th>SAMPLE 409</th>
<th>1987A</th>
<th>1987B</th>
</tr>
</thead>
<tbody>
<tr>
<td>S\textsubscript{1}O\textsubscript{2}</td>
<td>49.1</td>
<td>47.4</td>
<td>46.3</td>
<td>47.0</td>
</tr>
<tr>
<td>Al\textsubscript{2}O\textsubscript{3}</td>
<td>25.6</td>
<td>24.4</td>
<td>25.0</td>
<td>24.9</td>
</tr>
<tr>
<td>CaO</td>
<td>2.48</td>
<td>3.76</td>
<td>3.90</td>
<td>3.29</td>
</tr>
<tr>
<td>MgO</td>
<td>0.22</td>
<td>0.19</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Na\textsubscript{2}O</td>
<td>10.5</td>
<td>10.4</td>
<td>10.0</td>
<td>9.61</td>
</tr>
<tr>
<td>K\textsubscript{2}O</td>
<td>4.58</td>
<td>3.70</td>
<td>4.12</td>
<td>4.93</td>
</tr>
<tr>
<td>Fe\textsubscript{2}O\textsubscript{3}</td>
<td>4.52</td>
<td>5.98</td>
<td>5.94</td>
<td>5.76</td>
</tr>
<tr>
<td>MnO</td>
<td>0.10</td>
<td>0.15</td>
<td>0.16</td>
<td>0.15</td>
</tr>
<tr>
<td>TiO\textsubscript{2}</td>
<td>0.22</td>
<td>0.31</td>
<td>0.28</td>
<td>0.33</td>
</tr>
<tr>
<td>P\textsubscript{2}O\textsubscript{5}</td>
<td>0.09</td>
<td>0.10</td>
<td>0.11</td>
<td>0.07</td>
</tr>
<tr>
<td>L.O.I.</td>
<td>1.47</td>
<td>2.62</td>
<td>2.85</td>
<td>2.31</td>
</tr>
<tr>
<td>SR.</td>
<td>0.11</td>
<td>0.09</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>Ba.</td>
<td>0.12</td>
<td>0.07</td>
<td>0.11</td>
<td>0.17</td>
</tr>
</tbody>
</table>

### TABLE IV
Chemical Composition of Magnetic Separation Products
Feed for Leaching

<table>
<thead>
<tr>
<th>Element</th>
<th>SAMPLE 406</th>
<th>SAMPLE 409</th>
<th>1987A</th>
<th>1987B</th>
</tr>
</thead>
<tbody>
<tr>
<td>S\textsubscript{1}O\textsubscript{2}</td>
<td>51.6</td>
<td>51.5</td>
<td>49.6</td>
<td>50.4</td>
</tr>
<tr>
<td>Al\textsubscript{2}O\textsubscript{3}</td>
<td>26.7</td>
<td>25.9</td>
<td>26.3</td>
<td>26.3</td>
</tr>
<tr>
<td>CaO</td>
<td>2.45</td>
<td>4.04</td>
<td>4.30</td>
<td>3.41</td>
</tr>
<tr>
<td>MgO</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Na\textsubscript{2}O</td>
<td>11.2</td>
<td>11.7</td>
<td>11.8</td>
<td>11.2</td>
</tr>
<tr>
<td>K\textsubscript{2}O</td>
<td>4.61</td>
<td>3.04</td>
<td>3.38</td>
<td>4.56</td>
</tr>
<tr>
<td>Fe\textsubscript{2}O\textsubscript{3}</td>
<td>0.32</td>
<td>0.25</td>
<td>0.25</td>
<td>0.35</td>
</tr>
<tr>
<td>MnO</td>
<td>0.02</td>
<td>0.04</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>TiO\textsubscript{2}</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>P\textsubscript{2}O\textsubscript{5}</td>
<td>0.09</td>
<td>0.10</td>
<td>0.12</td>
<td>0.08</td>
</tr>
<tr>
<td>L.O.I.</td>
<td>1.85</td>
<td>3.16</td>
<td>3.23</td>
<td>2.31</td>
</tr>
<tr>
<td>SR.</td>
<td>0.13</td>
<td>0.12</td>
<td>0.12</td>
<td>0.13</td>
</tr>
<tr>
<td>Ba.</td>
<td>0.13</td>
<td>0.06</td>
<td>0.08</td>
<td>0.15</td>
</tr>
</tbody>
</table>
TABLE V
Chemical Composition of Leach Residues

Sample #

<table>
<thead>
<tr>
<th>Element</th>
<th>406</th>
<th>409</th>
<th>1987 A</th>
<th>1987 B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiO₂</td>
<td>57.0</td>
<td>55.5</td>
<td>52.8</td>
<td>54.1</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>22.9</td>
<td>21.6</td>
<td>21.9</td>
<td>22.1</td>
</tr>
<tr>
<td>CaO</td>
<td>3.19</td>
<td>5.86</td>
<td>6.20</td>
<td>4.91</td>
</tr>
<tr>
<td>MgO</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Na₂O</td>
<td>9.20</td>
<td>10.20</td>
<td>10.2</td>
<td>9.0</td>
</tr>
<tr>
<td>K₂O</td>
<td>4.11</td>
<td>1.77</td>
<td>2.15</td>
<td>3.82</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>0.40</td>
<td>0.43</td>
<td>0.45</td>
<td>0.50</td>
</tr>
<tr>
<td>MnO</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>TiO₂</td>
<td>0.03</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>P₂O₅</td>
<td>0.11</td>
<td>0.14</td>
<td>0.16</td>
<td>0.10</td>
</tr>
<tr>
<td>L.O.I.</td>
<td>1.62</td>
<td>3.16</td>
<td>4.00</td>
<td>3.23</td>
</tr>
<tr>
<td>SR.</td>
<td>0.19</td>
<td>0.18</td>
<td>0.16</td>
<td>0.18</td>
</tr>
<tr>
<td>Ba.</td>
<td>0.19</td>
<td>0.08</td>
<td>0.12</td>
<td>0.23</td>
</tr>
</tbody>
</table>

6.0 Metallurgical Balance Calculations

The following calculations are based on chemical analysis of the magnetic separation product and the leach residue. Results are shown for the amount of SiO₂, Al₂O₃, Na₂O and K₂O dissolved, the basic constituents of Nephelite.
### WEIGHT OF $SiO_2$ DISSOLVED/1000 GRAMS

<table>
<thead>
<tr>
<th>Sample #</th>
<th>$SiO_2$/1000 GR.</th>
<th>In Leach Residue</th>
<th>$SiO_2$ Dissolved Per 1000 Gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>516</td>
<td>(627.4 x 57.0)</td>
<td>357.6 = 158.4 GRAM</td>
</tr>
<tr>
<td>409</td>
<td>515</td>
<td>(632.2 x 55.5)</td>
<td>350.9 = 164.1 GRAM</td>
</tr>
<tr>
<td>1987 A</td>
<td>496</td>
<td>(629.6 x 52.8)</td>
<td>332.4 = 163.6 GRAM</td>
</tr>
<tr>
<td>1987 B</td>
<td>504</td>
<td>(625.2 x 54.1)</td>
<td>338.2 = 165.8 GRAM</td>
</tr>
</tbody>
</table>

### WEIGHT OF $Al_2O_3$ DISSOLVED/1000 GRAMS

<table>
<thead>
<tr>
<th>Sample #</th>
<th>$Al_2O_3$/1000 GR.</th>
<th>In Leach Residue</th>
<th>$Al_2O_3$ Dissolved Per 1000 Gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>267</td>
<td>(627.4 x 22.9)</td>
<td>143.7 = 123.3 GRAM</td>
</tr>
<tr>
<td>409</td>
<td>259</td>
<td>(632.2 x 21.6)</td>
<td>135.5 = 123.5 GRAM</td>
</tr>
<tr>
<td>1987 A</td>
<td>263</td>
<td>(629.6 x 21.9)</td>
<td>137.9 = 125.1 GRAM</td>
</tr>
<tr>
<td>1987 B</td>
<td>263</td>
<td>(625.2 x 22.1)</td>
<td>138.2 = 124.8 GRAM</td>
</tr>
</tbody>
</table>
### WEIGHT OF Na₂O DISSOLVED/1000 GRAMS

<table>
<thead>
<tr>
<th>Feed Sample</th>
<th>Na₂O/1000 Gr.</th>
<th>In Leach Residue</th>
<th>Grams Na₂O Dissolved Per 1000 Gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>112</td>
<td>(627.4 x 9.20)</td>
<td>57.72 = 54.28 GRAM</td>
</tr>
<tr>
<td>409</td>
<td>117</td>
<td>(632.2 x 10.2)</td>
<td>64.48 = 52.52 GRAM</td>
</tr>
<tr>
<td>1987 A</td>
<td>118</td>
<td>(629.6 x 10.2)</td>
<td>64.22 = 53.78 GRAM</td>
</tr>
<tr>
<td>1987 B</td>
<td>112</td>
<td>(625.2 x 9.0)</td>
<td>56.30 = 55.70 GRAM</td>
</tr>
</tbody>
</table>

### WEIGHT OF K₂O DISSOLVED/1000 GRAM

<table>
<thead>
<tr>
<th>Feed Sample</th>
<th>K₂O/1000 Gr.</th>
<th>In Leach Residue</th>
<th>Grams K₂O Dissolved Per 1000 Gram</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>46.1</td>
<td>(627.4 x 4.11)</td>
<td>25.79 = 20.31 GRAM</td>
</tr>
<tr>
<td>409</td>
<td>30.4</td>
<td>(632.2 x 1.77)</td>
<td>11.19 = 19.21 GRAM</td>
</tr>
<tr>
<td>1987 A</td>
<td>33.8</td>
<td>(629.6 x 2.15)</td>
<td>13.54 = 20.26 GRAM</td>
</tr>
<tr>
<td>1987 B</td>
<td>45.6</td>
<td>(625.2 x 3.82)</td>
<td>23.88 = 21.72 GRAM</td>
</tr>
</tbody>
</table>
### SUMMARY

Grams Dissolved
From 1000 Grams of Magnetically Separated Nepheline Syenite

<table>
<thead>
<tr>
<th></th>
<th>406</th>
<th>409</th>
<th>1987 A</th>
<th>1987 B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grams</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$SiO_2$</td>
<td>158.4</td>
<td>164.1</td>
<td>163.6</td>
<td>165.8</td>
</tr>
<tr>
<td>$Al_2O_3$</td>
<td>123.3</td>
<td>123.5</td>
<td>125.1</td>
<td>124.8</td>
</tr>
<tr>
<td>$Na_2O$</td>
<td>54.28</td>
<td>52.52</td>
<td>53.78</td>
<td>55.70</td>
</tr>
<tr>
<td>$K_2O$</td>
<td>20.31</td>
<td>19.21</td>
<td>20.26</td>
<td>21.72</td>
</tr>
</tbody>
</table>

Total Grams: 356.29, 359.33, 362.74, 368.02
Acid Solubles %: 35.63, 35.93, 36.27, 36.80

Calculated From Chemical Analysis

<table>
<thead>
<tr>
<th>Sample</th>
<th>% Dissolved/1000 Gram of Separated Product</th>
<th>% Dissolved Based on Unseparated Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>35.63</td>
<td>X Separation Factor 0.84 = 29.92%</td>
</tr>
<tr>
<td>409</td>
<td>35.93</td>
<td>X Separation Factor 0.762 = 27.38%</td>
</tr>
<tr>
<td>1987 A</td>
<td>36.27</td>
<td>X Separation Factor 0.669 = 24.26%</td>
</tr>
<tr>
<td>1987 B</td>
<td>36.80</td>
<td>X Separation Factor 0.742 = 27.30%</td>
</tr>
</tbody>
</table>
### Comparative Results

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Based on Weight Loss</th>
<th>Based on Chemical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>406</td>
<td>31.3%</td>
<td>29.92%</td>
</tr>
<tr>
<td>409</td>
<td>28.0%</td>
<td>27.38%</td>
</tr>
<tr>
<td>1987 A</td>
<td>24.8%</td>
<td>24.26%</td>
</tr>
<tr>
<td>1987 B</td>
<td>27.8%</td>
<td>27.30%</td>
</tr>
</tbody>
</table>

This is very good agreement between acid solubles based on weight and as calculated from chemical analysis.

### Conclusions

To leach this type of material it is considered advisable to remove iron bearing minerals. This simplifies leaching, filtration, and results in less contamination of the leach solution with iron.
GEOLOGICAL EXPLORATION

MINING CLAIMS 973164 TO 973170

DUNGANNON TOWNSHIP PROPERTY

REPORT # 11

for Pipawa Explorations Limited

by Robert H. Morse, Ph.D., P.Eng.

September 8, 1987

RECEIVED

MAY 5, 1988

MINING LANDS SECTION
SUMMARY

Seven new claims have been staked in Dungannon Township to extend the Jayfran-Pipawa property to the north and east. The new claims, which total about 350 acres, have been mapped geologically at a scale of 1 inch to 100 feet and the geological maps, in two sheets, accompany this report.

Detailed mapping, outcrop stripping and blasting in the south part of claim number 973169 have confirmed the extension of nepheline gneisses northwards from the previously held claim number 840009. Nepheline content of these rocks appears, on visual examination, to be as rich as any yet exposed on the Jayfran-Pipawa property. Outcrops of non-nepheline-bearing rocks in this area are very minor. Several points have been blasted to obtain fresh samples for analyses, which are not yet available. The rocks are exposed on a hill which straddles the claim boundary. The hill is about 500 feet by 700 feet and reaches an elevation of 130 feet above York River with an average of 90 feet. They dip steeply east-northeast. A rough calculation based on these surface examinations indicates a possibility of delineating 2.6 million tons above the level of York River. Drilling is recommended. This tonnage is in addition to possibilities further south on claims 840009 and 840010 and on Jayfran’s patented lots to the west.

Other nepheline-bearing rocks have been delineated on the new claims north of York River. The outcrops are small and mixed in with outcrops of other rock types. Follow-up exploration has a lower priority here than the area described above.

Further lab tests are required to evaluate the commercial production of chemicals from the nepheline-bearing rock.

Respectfully submitted,

September 8, 1987

Robert H. Morse, Ph.D., P.Eng.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMARY</td>
<td>1</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>3</td>
</tr>
<tr>
<td>ACCESS</td>
<td>5</td>
</tr>
<tr>
<td>LAND USE</td>
<td>6</td>
</tr>
<tr>
<td>PREVIOUS WORK</td>
<td>6</td>
</tr>
<tr>
<td>SURVEY CONTROL</td>
<td>7</td>
</tr>
<tr>
<td>WORK PROGRAM AND METHODS</td>
<td>8</td>
</tr>
<tr>
<td>TOPOGRAPHY</td>
<td>9</td>
</tr>
<tr>
<td>GEOLOGY</td>
<td>10</td>
</tr>
<tr>
<td>NEPHELINE DEPOSITS</td>
<td>11</td>
</tr>
<tr>
<td>RADIOACTIVE ANOMALIES</td>
<td>12</td>
</tr>
<tr>
<td>RECOMMENDATIONS</td>
<td>13</td>
</tr>
</tbody>
</table>

Figure 1 -- Portion of Dungannon Township Showing Property

Figure 2 -- Geology, Sampling and Radioactivity, Concession XV

Figure 3 -- Geology and Radioactivity, Claim 973167

Figure 4 -- Section Across South Boundary of Claim 973169
The Jayfran-Pipawa property in Dungannon Township comprises ten patented lots owned by Jayfran Enterprises Limited and ten mining claims owned by Pipawa Explorations Limited, a closely associated company (see figure 1). Total area is about 1,500 acres. The patented property is made up of lots 16 to 20, concessions XIII and XIV. The mining claims are as follows:

Claim EO-820095, S½ lot 15 concession XIV, recorded October 25, 1984
Claim EO-840009, N½ lot 14 concession XIV, recorded June 3, 1985
Claim EO-840010, S½ lot 14 concession XIV, recorded June 3, 1985
Claim EO-973164, S½ lot 15 concession XV, recorded May 19, 1987
Claim EO-973165, N½ lot 16 concession XV, recorded May 19, 1987
Claim EO-973166, S½ lot 16 concession XV, recorded May 19, 1987
Claim EO-973167, W½ lot 13 concession XIV, recorded May 19, 1987
Claim EO-973168, N½ lot 15 concession XV, recorded May 19, 1987
Claim EO-973169, S½ lot 14 concession XV, recorded May 19, 1987
Claim EO-973170, N½ lot 14 concession XV, recorded May 19, 1987

The present report describes a geological survey carried on the most recent group of seven claims, recorded May 19, 1987.
Figure 1 -- Portion of Dungannon Township Showing Property

Nepheline outcrops

Scale: 1" = 1/4 mile
ACCESS

Access to the north part of the new claims, north of York River, is by the road past Vardy Settlement and then on foot. A bush road extends from this road south along the east boundary of lot 16 and a small amount of road repair would allow vehicle access to a point 600 feet south of the north boundary of the property.

A second bush road follows the north boundary of concession XV and then swings southwards and ends at the northwest corner of York River near the northeast corner of the patented lots. Again a small amount of road work would be required to make this road passable to cars.

Access to the southwest part of the new claims, northwest of York River, could equally be by means of the bush road on the patented lots, which extends from Highway 28 almost to the northeast corner. This route was not used in the present study.

Access to the portion of the new claims which lies south of York River is by the forest access road which runs north from Highway 28 just east of York River bridge.

A canoe was also found to be useful for crossing York River and for examining outcrops along its bank. Access to the cabin in claim number 973169 is by canoe from the forest access road.

A pack trail was cut with an axe to improve foot access from the forest access road to the south boundary of claim number 973169.
LAND USE

Surface rights for claim number 973167 belong to the crown. Surface rights for the other six claims are privately held.

The forest access road brings campers and boaters to York River. The campsite is not maintained or designated as such.

The north boundary passes through the south part of an old field. Other smaller and older fields are found near the cabin by York River. None are in use.

The cabin in claim number 973169 sees very little use. Elsewhere on the property there are no signs of recent use for any purpose.

PREVIOUS WORK

The property is covered by ODM maps P2524 (1982) at a scale of 1:10,000, and 1955-8 at a scale of 1 inch to 1 mile. GSC aeromagnetic map 15G at a scale of 1 inch to 1 mile also covers the property. In 1958 the mining claims to the south were investigated by G. R. Guillette for American Nepheline Limited (Indusmin). His map covered Pipawa's claim numbers 84009, 840010 and 820095 and the southern portion of 973169. His report and map are filed at the ministry under number 63A-359.

The present report is the eleventh in a series of studies which address the mineral potential of the property. Previous reports in this series are as follows:

1- Radiometric and Geological survey September 19, 1983
2- Uranium and nepheline exploration November 21, 1983
3- Uranium and nepheline exploration November 8, 1984
4- Discussion of lab results and proposed program February 6, 1985
5- Nepheline as a chemical feedstock; marketing study April 19, 1985
6- Uranium and nepheline exploration May 13, 1985
Studies of the nepheline potential were supplemented by lab studies at I.M.D. Laboratories Ltd. These lab studies are described in various reports by I.M.D. Another brief report from I.M.D. on the samples submitted from the present work is expected shortly.

SURVEY CONTROL

Control for the geologic mapping and radiometric survey was by a series of chain and compass lines flagged every hundred feet. A cut and chained baseline runs from the north boundary south through the center of the claims a distance of 2,300 feet to the beaver pond in the York River flood plain. The chain and compass lines were checked by reference to chaining along the claim lines. Along the south boundary of concession XV the chain and compass lines were tied to iron bars which mark the north corners of surveyed claim number 25791 which belongs to Indusmin. Near the west edge this south boundary follows an old blazed line and barb wire fence. The north boundary near the center also follows an old blazed line. The south boundary of claim number 973167 is tied to iron bars at each corner. Field notes from the original 1864 survey, obtained from the Department of Crown Lands, were useful in establishing control along the south boundary of concession XV.
WORK PROGRAM AND METHODS

The present work program comprises geological mapping accompanied by a topographic and radiometric survey. The geological mapping was supported by outcrop stripping in the favourable areas. Several points on the hill in the southwest part of claim number 973169 were plugger drilled and blasted to obtain fresh samples of the nepheline-rich rock.

Elevations were determined along the chained lines by means of a clinometer or Brunton. Elevations posted on figures 2 and 3 are relative to an arbitrary datum of 973 feet for York River. Inch to quarter mile air photos were examined in stereo and linear depressions were plotted on the geological map.

Levels of gamma radiation were determined by means of a MoPhar model TV-1A portable gamma-ray spectrometer (scintillometer). The instrument was set on T1 fast and held at hip level. Readings were taken every hundred feet and between the readings radioactivity was monitored by an audio alarm. At radioactive points soil was excavated with a grub hoe and readings taken on channels T2 and T3 to determine relative amounts of uranium and thorium.

Total length of chained line equals 13.5 miles and scintillometer readings totalled 399. Field work commenced July 1 and ended July 29. The writer was accompanied by two field assistants.
TOPOGRAPHY

The maximum relief on the property, established by chain and clinometer, is almost 200 feet. The highest area is near the northwest corner and the lowest is York River and its floodplain. The terrain is rugged, with the highest cliff reaching 90 feet.

North of the river the drainage is through a series of creeks and beaver dams into an elongate pond along the flood plain. There is no flowing water on the property south of the river and the swamp which crosses the south boundary of claim number 973169 was almost dry in July. Absence of water in this nepheline-rich area and farther south was noted in the earlier reports. Nepheline is a relatively soluble mineral and the drainage may be downwards as in the Karst topography found in limestone terrain. Lack of water in the swamp suggests a nepheline exploration target under the swamp itself.
GEOLOGY

The property is underlain by high grade gneisses of the Hastings Highlands gneiss complex of the Grenville Province of the Canadian Shield. Of secondary importance are outcrops of Grenville marble and feldspar pegmatite. Quartz is rare, both in the gneisses and in the pegmatites. In certain areas the gneisses are very rich in nepheline.

Strike directions on the property are variable, with the most common being north-northwest, parallel to the aeromagnetic trend. The most common dip is steeply to the east. No evidence was found for the northeasterly Holland Lake Fault shown on ODM map P2524.

The chief economic interest in the property lies in the nepheline-rich rocks. Detailed geologic studies were directed to assessing the possibilities of delineating large bodies rich in nepheline and to designing follow-up programs.
R. H. Morse & Associates Ltd.

NEPHELINE DEPOSITS

The largest body of nepheline-rich rocks, and the chief economic interest on the property, lies south of York River in the southwest part of claim number 973169. This nepheline deposit is exposed in a hill which extends from 300 feet north of the claim line south a further 350 feet into the earlier Pipawa claim number 840009. It extends from 50 feet west of the claim line to 550 feet east, making an oblong shape 650 feet by 600 feet. A very small portion of this hill is on Indusmin claim number 25791. Much of the hill is 100 feet or more above York River. Similar nepheline-rich rocks farther south on the Pipawa and Indusmin claims are described in previous reports.

Nepheline content of the rocks exposed on this hill appear, on visual examination, to be as high as, or slightly higher than, those sampled further south in previous studies. These earlier samples ran about 28.8% acid soluble, which we equate roughly with nepheline content. A small part of this acid soluble material might be carbonate but in any case magnetic separation of the mafics will yield a feed richer in soluble alumina and silica than Indusmin's nepheline syenite.

As shown in the geological map (figure 2) outcrops on this hill of non-nepheline bearing rocks, including syenite gneiss and marble, are minor. Strike is fairly uniform to the northwest and dip steep to the northeast. The major unknown is what underlies the overburden-covered intervals between the stripped outcrops. Outcrop distribution (figure 2) is, however, sufficient to postulate a fairly uniform nepheline-rich deposit which, considering the fairly uniform strike and dip, can be projected downwards with some confidence. Calculations indicate a possibility of 2.6 million tons above the level of York River. This must of course be tested by drilling.
This tonnage, if confirmed, is in addition to a second hill of similar potential further south on claim number 840009 and to the deposits on the Jayfran's patented lots to the southwest. It is readily accessible by open pit.

Elsewhere on the new claims nepheline-rich outcrops are small and scattered and surrounded in part by outcrops of non-nepheline-bearing rocks. In the southwest part of claim number 973164 nepheline-rich rock is exposed on Line 4N. North and west of this outcrop is an overburden-covered area. This area is smaller than the area of the hill described above and even if entirely underlain by nepheline-rich rocks the potential is much less. A similar situation exists in claim number 973170 near the east boundary of the property. Here the potential is further limited by the property line, unless the patented land to the east is acquired. It is recommended that work be concentrated on the main hill described above.

**RADIOACTIVE ANOMALIES**

A uraniferous feldspar pegmatite is exposed in the cliff in the southeast corner of claim number 973164. It was described in report number 7. The radioactivity is spotty and the spectrometer indicates that the uranium values are too low to warrant sampling and assaying.

A few hundred feet east of here thorium anomalies were discovered in rusty syenite gneiss. They too were described in report number 7.

At the north edge of claim number 973170 thorium anomalies were discovered in a fine grained rock. The anomaly may be related to skarn-like rocks further east.

No follow-up is recommended for the radioactive anomalies.
RECOMMENDATIONS

The nepheline-rich rocks discovered and delineated on the property should be followed up in conjunction with work on similar deposits on Pipawa's and Jayfran's other property in the area. The main nepheline-rich hill near the south boundary of claim number 973169 should be tested by diamond drilling. Relatively flat, 30-degree holes across the strike and dip are recommended (see figure 2 and figure 4). The drilling would test the uniformity of the deposit, determine what is under the overburden-covered areas, provide representative samples for testing, and test the deposit at depth.

Further laboratory studies are required to evaluate the potential of commercial production of alumina and silica chemicals from the nepheline-rich rock.
DUNGA NON TOWNSHIP PROPERTY
SECTION ACROSS SOUTH BOUNDARY
OF CLAIM 973169

Scale 1" = 100' or 1:1200

Looking North West

PROPOSED DRILL HOLES

NOTE:
For Legend see Figure 2

FIGURE 4
**Ministry of Natural Resources**

**Report of Work**

(Geophysical, Geological, Geochemical and Expenditures)

<table>
<thead>
<tr>
<th>Township or Area</th>
<th>(G 3/4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dungannon</td>
<td></td>
</tr>
</tbody>
</table>

---

### Claim Holder

**Pipawa Explorations Limited**

Address: Suite 804, 581 Avenue Road, Toronto

MAY 2K4

---

### Survey Company

R. H. Morse & Associates Ltd.

Name and Address of Author (of Geo-Technical report)

Robert H. Morse, Ph.D., P.Eng., 298 Beech Ave., Toronto

MAY 3 1988

---

### Type of Survey(s)

- Geological, Radiometric and Airborne

---

### Survey Company Address

Suite 804, 581 Avenue Road, Toronto

MAY 2K4

---

### Prospector's Licence No.

T 1243

---

### Type of Survey(s)

- Geophysical
- Geological
- Radiometric
- Geochemical

---

### Expenditures (Excludes power stripping)

- **Geophysical**: $2,500.00
- **Magnetometer**: $1,500.00
- **Radiometric**: $1,000.00

---

### Total Days Credits

- **Total Days Credits**: 15

---

### Credits Requested per Each Claim in Columns at right

- **Geophysical**: 20
- **Magnetometer**: 40
- **Radiometric**: 20
- **Other**: 40

---

### Mining Claims Traversed (List in numerical sequence)

- 973164
- 973165
- 973166
- 973167
- 973168
- 973169
- 973170

---

### Total Expenditures

- **Total Expenditures**: $3,500.00

---

### Date

April 29, 1988

---

### Name and Address of Person Certifying

Robert H. Morse, Ph.D., P.Eng., 298 Beech Ave., Toronto

APR 29 1988
**Report of Work**

Ministry of Northern Development and Mines

**Document No.** W8809-38

**Type of Work:** Geological, Geochemical and Expenditures

**Claim Holder:** DUNGANON EXPLORATIONS LIMITED

**Prospector's Licence No.:** T 1743

**Address:** Suite 808, 581 Avenue Road, Toronto M4Y 2K4

**Survey Company:** RH Morse & Associates, Ltd.

**Survey Company Address:** 298 Cedar Ave, Toronto M4E 3T7

**Date of Survey:** June 17, 1988

**Miles of Line Cut:** 13.5

**Credits Requested:**

<table>
<thead>
<tr>
<th>Mining Claim</th>
<th>Expended Days Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>973/166</td>
<td>60</td>
</tr>
<tr>
<td>973/166</td>
<td>60</td>
</tr>
<tr>
<td>973/169</td>
<td>60</td>
</tr>
</tbody>
</table>

**Expenditure Days Credits**

Total Expenditures: $ 2,199.80

Total Days Credits: 146.71

**Special Provisions**

For first survey:
- Enter 40 days (This includes line cutting)

For each additional survey:
- Enter 20 days (for each)

**Man Days:**

<table>
<thead>
<tr>
<th>Days per Claim</th>
<th>Geophysical</th>
<th>Geochemical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electromagnetic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Magnetometer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radiometric</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geological</td>
<td></td>
</tr>
</tbody>
</table>

**Expenditures (Excludes Power Stripping):**

**Type of Work Performed:** Analytical

**Calculation of Expenditure Days Credits**

Total Days Credits: 146.71

**Certification Verifying Report of Work**

I hereby certify that I have personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

**Certified by:**

Robert H. Morse, Ph.D., P.Eng.

Date Certified: April 29, 1988

**Instructions:**

Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.
Ministry of Northern Development and Mines

Technical Assessment Work Credits

Ontario

Date: June 16, 1988

File: W8809-37

Recorded Holder: Pipawa Explorations Limited

Township: Dungannon

<table>
<thead>
<tr>
<th>Type of survey and number of Assessment days credit per claim</th>
<th>Mining Claims Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical</td>
<td></td>
</tr>
<tr>
<td>Electromagnetic</td>
<td></td>
</tr>
<tr>
<td>Magnetometer</td>
<td></td>
</tr>
<tr>
<td>Radiometric</td>
<td></td>
</tr>
<tr>
<td>Induced polarization</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Geological</td>
<td>40 days</td>
</tr>
<tr>
<td>Geochemical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Man days [ ]</td>
</tr>
<tr>
<td></td>
<td>Special provision [ ]</td>
</tr>
<tr>
<td>Section 77 (19) See &quot;Mining Claims Assessed&quot; column</td>
<td></td>
</tr>
<tr>
<td></td>
<td>So 973164 to 68 inclusive</td>
</tr>
</tbody>
</table>

Special credits under section 77 (16) for the following mining claims

20 days

So 973169-70

No credits have been allowed for the following mining claims

[ ] not sufficiently covered by the survey

[ ] insufficient technical data filed

The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical - 80; Geological - 40; Geochemical - 40; Section 77(19) - 60.
Recorded Holder: Pipawa Explorations Limited
Township: Dungannon

<table>
<thead>
<tr>
<th>Type of survey and number of Assessment days credit per claim</th>
<th>Mining Claims Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical</td>
<td></td>
</tr>
<tr>
<td>Electromagnetic</td>
<td></td>
</tr>
<tr>
<td>Magnetometer</td>
<td></td>
</tr>
<tr>
<td>Radiometric [16] days</td>
<td>SO 973164 to 70 inclusive</td>
</tr>
<tr>
<td>Induced polarization</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Section 77 (19) See "Mining Claims Assessed" column

Geological days

Geochemical days

Men days [ ] Airborne [ ]

Special provision [x] Ground [x]

- Credits have been reduced because of partial coverage of claims.
- Credits have been reduced because of corrections to work dates and figures of applicant.

Special credits under section 77 (16) for the following mining claims

No credits have been allowed for the following mining claims

- [ ] not sufficiently covered by the survey
- [ ] insufficient technical data filed

The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical - 80; Geological - 40; Geochemical - 40; Section 77(19) - 60.
June 8, 1988

Mining Lands Section
Queen’s Park

Gentlemen:

Re. File 2,11146 -- sample locations

Sample 1987-A is a composite of samples 407 and 408.
Sample 1987-B is a composite of samples 410 and 411.
Sample 406 is a control sample from off the property.

Yours sincerely,

Robert H. Morse, Ph.D., P.Eng.
**Ontario Ministry of Natural Resources**

**GEOPHYSICAL - GEOLOGICAL - GEOCHEMICAL TECHNICAL DATA STATEMENT**

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

**Type of Survey(s)**

Geological and radiometric

**Township or Area**

Dungannon

**Claim Holder(s)**

Pipawa Explorations Limited

**Survey Company**

R. H. Morse & Associates Ltd.

**Author of Report**

Robert H. Morse, Ph.D., P.Eng.

**Address of Author**

298 Beech Ave., Toronto M4E 3J2

**Covering Dates of Survey**

July 1 to July 29 (linecutting to office)

**Total Miles of Line Cut**

13.5

**SPECIAL PROVISIONS CREDITS REQUESTED**

<table>
<thead>
<tr>
<th>Geophysical</th>
<th>DAYS per claim.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electromagnetic</td>
<td></td>
</tr>
<tr>
<td>Magnetometer</td>
<td></td>
</tr>
<tr>
<td>Radiometric</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

**AIRBORNE CREDITS** (Special provision credits do not apply to airborne surveys)

- Magnetometer
- Electromagnetic
- Radiometric

**DATE:**

**SIGNATURE:** 2/16/60

Author of Report or Agent

**Res. Geol.**

Qualifications

**Previous Surveys**

<table>
<thead>
<tr>
<th>File No.</th>
<th>Type</th>
<th>Date</th>
<th>Claim Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL CLAIMS**

7

**MINING CLAIMS TRAVERSED**

List numerically

<table>
<thead>
<tr>
<th>Claim</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>EO 973164</td>
<td></td>
</tr>
<tr>
<td>EO 973165</td>
<td></td>
</tr>
<tr>
<td>EO 973166</td>
<td></td>
</tr>
<tr>
<td>EO 973167</td>
<td></td>
</tr>
<tr>
<td>EO 973168</td>
<td></td>
</tr>
<tr>
<td>EO 973169</td>
<td></td>
</tr>
<tr>
<td>EO 973170</td>
<td></td>
</tr>
</tbody>
</table>
### GEOPHYSICAL TECHNICAL DATA

**GROUND SURVEYS** – If more than one survey, specify data for each type of survey

<table>
<thead>
<tr>
<th>Number of Stations</th>
<th>Number of Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>399</td>
<td>399</td>
</tr>
</tbody>
</table>

Station interval: 100

Profile scale:

Contour interval:

**Instrument**

Accuracy – Scale constant

Diurnal correction method

Base Station check-in interval (hours)

Base Station location and value

**ELECTROMAGNETIC**

**Instrument**

Coil configuration

Coil separation

Accuracy

Method: □ Fixed transmitter □ Shoot back □ In line □ Parallel line

Frequency (specify V.L.F. station)

Parameters measured

**GRAVITY**

**Instrument**

Scale constant

Corrections made

Base station value and location

Elevation accuracy

**Induced Polarization**

**Method** □ Time Domain □ Frequency Domain

Parameters – On time

– Off time

– Delay time

– Integration time

Power

**Electrode array**

**Electrode spacing**

Type of electrode
SELF POTENTIAL
Instrument ___________________________ Range ___________________________
Survey Method ____________________________________________________________
Corrections made __________________________________________________________

RADIOMETRIC
Instrument McPhar TV-1A ______________________________________________________
Values measured ___________________________________________ counts per minute
Energy windows (levels) $T_1$ (K, U, Th) plus $T_2$ and $T_3$ on anomalies
Height of instrument 2½ feet Background Count 1,000 to 2,000 cpm
Size of detector 1½" by 1½"
Overburden sandy soil (up to 30 feet thick) (type, depth – include outcrop map)

OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)
Type of survey __________________________________________________________
Instrument _____________________________________________________________
Accuracy _________________________________________________________________
Parameters measured ______________________________________________________
Additional information (for understanding results) __________________________________

AIRBORNE SURVEYS
Type of survey(s) _________________________________________________________
Instrument(s) _______________________________ (specify for each type of survey)
Accuracy _______________________________ (specify for each type of survey)
Aircraft used _____________________________________________________________
Sensor altitude ___________________________________________________________
Navigation and flight path recovery method ___________________________________
Aircraft altitude _________________________________________________________ Line Spacing
Miles flown over total area ____________________________________________ Over claims only
GEOCHEMICAL SURVEY – PROCEDURE RECORD

Numbers of claims from which samples taken

<table>
<thead>
<tr>
<th>Total Number of Samples</th>
<th>Type of Sample (Nature of Material)</th>
<th>Average Sample Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Method of Collection

Soil Horizon Sampled

Horizon Development

Sample Depth

Terrain

Drainage Development

Estimated Range of Overburden Thickness

---

**ANALYTICAL METHODS**

Values expressed in: per cent ☐
p. p. m. ☐
p. p. b. ☐

Cu, Pb, Zn, Ni, Co, Ag, Mo, As, (circle)

Others

Field Analysis (tests)

Extraction Method

Analytical Method

Reagents Used

Field Laboratory Analysis

No. (tests)

Extraction Method

Analytical Method

Reagents Used

Commercial Laboratory (tests)

Name of Laboratory

Extraction Method

Analytical Method

Reagents Used

---

**SAMPLE PREPARATION**

(Includes drying, screening, crushing, ashing)

Mesh size of fraction used for analysis

General

---
July 4, 1988

Your file: W8809-37
Our file: 2.11146

Mining Recorder
Ministry of Northern Development and Mines
10 Wellesley Street East
1st floor
Toronto, Ontario
M4Y 1G2

Dear Madam:

Re: Notice of Intent dated June 16, 1988
Geophysical (Radiometric) and Geological Survey submitted on Mining Claims SO 973146 et al in the Township of Dungannon

The assessment work credits, as listed with the above-mentioned Notice of Intent, have been approved as of the above date.

Please inform the recorded holder of these mining claims and so indicate on your records.

Yours sincerely,

W. R. Cowan, Manager
Mining Lands Section
Mines & Minerals Division

Whitney Block, Room 6610
Queen's Park
Toronto, Ontario
M7A 1W3

Telephone: (416) 965-4888

Enclosure

cc: Mr. G. H. Ferguson
Resident Geologist
Mining and Lands Commissioner
Toronto, Ontario

Pipawa Explorations Limited
Suite 804
581 Avenue Road
Toronto, Ontario
M4V 2K4