NORANDA MINING AND EXPLORATION INC.

DUFF PROJECT - 009

REPORT ON EXPLORATION WORK
CONDUCTED IN 1996

Rouyn-Noranda (Québec)
May 1996

Real-Jr. Parent
Project Geologist
Eastern Canada Region
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1- INTRODUCTION

1.1 GENERAL

Between February 10 and March 11, 1996, a High Powered Transmitted Electromagnetic (HPTEM) survey and a drilling program was carried out by Noranda Mining and Exploration Inc. in Duff Township. A 13.2-kilometre geophysical survey and a 195-metre drill hole were completed. Quantec Consulting Inc. did the survey and Dominik Diamond Drill did the drilling.

1.2 LOCATION AND ACCESS

The property (figure 1) is located 32 kilometres south of Cochrane in Duff Township. It is directly accessible by truck via secondary roads.

1.3 PHYSIOGRAPHY

The property is covered in part by swamps and forest, and the topography is very flat. It is covered by thick glacial deposits that can reach 80 meters and are mainly composed of sand and clay.

1.4 PROPERTY DESCRIPTION

The property is composed of 2 claims (1193104, 1193105) (figure 2), of 16 and 4 units for a total of 20 units, covering 324 hectares. The property was optioned from Cross Lake Minerals Ltd. in November 1994, and the agreement is that Noranda Mining and Exploration can earn a 60% interest in the property by making payments of $17,500 in the first three years of the agreement and by spending $250,000 in exploration work over a five-year period.

2- PREVIOUS WORK

Partial list of the work done on the property:

<table>
<thead>
<tr>
<th>T-855</th>
<th>Sarimco Mines Ltd.</th>
<th>Electromagnetic and magnetometer survey and 1 drill hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-957</td>
<td>Cromarty Exploration</td>
<td>1 drill hole on the property</td>
</tr>
<tr>
<td>T-1024</td>
<td>Geophysical Engineering Ltd.</td>
<td>1 drill hole and E.M. survey</td>
</tr>
<tr>
<td>T-1361</td>
<td>International Nickel Co.</td>
<td>1 drill hole</td>
</tr>
<tr>
<td>T-1827</td>
<td>Rosario Resources Canada Ltd.</td>
<td>1 drill hole and E.M. survey</td>
</tr>
<tr>
<td>T-1847</td>
<td>Amoco Canada Petroleum</td>
<td>3 drill holes</td>
</tr>
<tr>
<td>T-3078</td>
<td>Hudson Bay Exploration &amp; Dev Co.</td>
<td>1 drill hole</td>
</tr>
</tbody>
</table>
Duff Option (009) / Abitibi belt Area
3- REGIONAL AND LOCAL GEOLOGY

The property is located in the Tisdale Supergroup, but is also referred as Keewatin sediments, in a previous report (Jonsmith Mines Ltd. report on a geological survey 1965, Mann Township, T-1070). The stratigraphy of the area is not well established due to outcrop paucity and poor correlation between drill holes. The property is underlain by a sequence of felsic volcanics, graphitic tuffs and sediments which are intruded by ultramafic sills and dykes. These units are west-southwest-trending and north-dipping at 50-60 degrees.

The felsic volcanics, as seen in the drill core, are composed of massive rhyolite with flow breccia and flow banding structures. There is also cross-cutting phreatic breccia features. The breccias show weak chloritization and sericitization. Fracture controlled fuchsite and ankerite are observed.

The graphitic units are: 1) graphitic ash tuff with coarser fragments of felsic volcanics and graphitic claystone intraclasts, 2) graphitic lapilli tuff with some fragments of laminated chert, felsic volcanics and black claystone, 3) graphitic sandstone and siltstone. Massive graphite bands of 1.0 to 1.5 metres thick also occur within the graphitic tuffs and sediments. These bands contains pyrite nodules. These bands may be the conductive units reported in the geophysical report.

The ultramafic dykes and/or sills range in composition from peridotite to gabbro. The peridotites are massive, fine to medium grained, locally altered in talc and crosscut by serpentine veinlets. They are locally magnetic. In situ differentiation or wall-rock assimilation can be deduced from leucocratic porphyry horizons (gabbro) at the top of these intrusions.

4- GEOPHYSICAL SURVEY

A high power transient electromagnetic profiling survey (HPT-EM) was conducted by Quantec on the property, covering an area of 1.4 km by 1.2 km (see the report in appendix). Two conductors were defined. The strongest one occurs from line 3+00N to 9+00N at the baseline 0+00 and it is grid north striking. The second conductor ranges from line 3+00N to 7+00N at 2+00E. It is striking grid north.

5- 1996 DIAMOND DRILLING

A 195-m (BQ) hole was drilled by Dominik Diamond Drilling to test the strong electromagnetic anomaly that was defined by the HPT-EM survey at L5+00N, 1+50W. Massive graphite within graphitic tuffs and sediments was the probable cause of the anomaly. A rhyolitic flow with flow and phreatic breccias was intersected, with weak chloritization, sericitization and ankeritization, but no significant mineralization was found. Seven lithogeochemical samples were taken.
Summary log

DF-96-01

L5+00N, 1+50W
Azimuth: N/123
Dip: -55°
Depth: 195.0 m

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>30.00 BW casing (left in hole)</td>
</tr>
<tr>
<td>30.00</td>
<td>75.00 Peridotite</td>
</tr>
<tr>
<td>75.00</td>
<td>111.42 Leucocratic gabbro</td>
</tr>
<tr>
<td>111.42</td>
<td>154.70 Graphitic tuffs/sediments</td>
</tr>
<tr>
<td>154.70</td>
<td>180.25 Rhyolite</td>
</tr>
<tr>
<td>180.25</td>
<td>195.00 Gabbro</td>
</tr>
</tbody>
</table>

6- CONCLUSIONS AND RECOMMENDATIONS

The hole successfully explained the geophysical anomaly. It was caused by graphite in tuffs and sediments. A rhyolitic flow with flow and phreatic breccias was intersected, with weak chloritization, sericitization, traces of fuchsite and ankeritization, but no significant mineralization was found.

It is therefore recommended that the option be terminated, since most of the conductors on the property were explained by graphite, and returned no significant mineralization.

Noranda Mining and Exploration Inc.

Real-Jr. Parent
Project Geologist
Eastern Canada Region
7- CERTIFICATION

I, Real Jr. Parent, hereby declare that:

1. I reside at 364 avenue Lajoie, Rouyn-Noranda, Quebec, J9X 6H3 and I am presently employed with Noranda Mining and Exploration Inc. of Rouyn-Noranda, Quebec.

2. I have a Bachelor of Science Degree in geology, and graduated from University of Montreal, Montreal, Quebec in 1991.

3. I have continuously practiced my profession in Canada since graduation.

4. I am a member of "L'Association professionnelle des géologues et des géophysiciens du Québec".

5. The statements I made in this report represent my best opinion and judgment based on the information and the drill core available to me at the time of the writing of this report.

Date: __________

Real-Jr. Parent
Project Geologist
Eastern Canada Region
ASSESSMENT REPORT

on

HIGH POWER TRANSIENT ELECTROMAGNETIC PROFILING SURVEY

over the

DUFF TOWNSHIP PROPERTY

in

NORTHEASTERN ONTARIO

on behalf of

NORANDA MINING AND EXPLORATION INC.
   ROUYN-NORANDA, QC

Porcupine, Canada  April 1996
QCI Project: C328

C. Williston
S.T. Coulson
Quantec Consulting Inc.
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1.0 INTRODUCTION

During the period of February 12th to 21st, 1996, Quantec Consulting Inc. of Porcupine, Ontario conducted a High Power Transient Electromagnetic (HPTEM) in-loop surface profiling survey over the Duff Township Grid, located in northeastern Ontario. The survey was performed on behalf of Noranda Mining and Exploration Inc. of Rouyn-Noranda, QC under the direction of Mr. Rejean Pineault of Noranda. The objective of the survey was to detect deep bedrock conductors. To meet this objective, a total of 13.2 line km of HPTEM surveys were completed over the property.

This assessment report outlines the survey technique used, the geophysical work undertaken, and presents the final data results, including a summary interpretation.
2.0 GENERAL SURVEY DETAILS

2.1 Location and Access

The Duff Township survey area is located in northeastern Ontario, approximately 45 kilometers northeast of the city of Timmins. The grid itself is situated in the northeastern corner of Duff Township. The southwestern edge of the grid is approximately .5 kilometers northeast of Crawfish Lakes. The crew stayed in Timmins and accessed the grid area via 4 x 4 truck and snowmobile.

2.2 Survey Lines

The survey grid in Duff Township covers an area 1.4 km by 1.2 km (Figure 2). All survey lines were cut by Noranda Mining and Exploration Inc. prior to the survey. The NS and EW positions for all the profiles are referenced to the existing coordinate systems. The grid consists of eleven (11) east-west grid lines, 3+00N to 13+00N, oriented on an azimuth of 57 degrees west.

---

**Figure 2: Survey lines and transmit loop over the Duff Township Grid**
3.0 SURVEY WORK UNDERTAKEN

3.1 Generalities

The geophysical program over the Duff Township Grid was undertaken between February 12th and 21st, 1996. The HPTEM in-loop survey was carried out from one transmit loop (Figure 2). Lines 3+00N through 13+00N which are 1.2 kilometers long and spaced 100 meters apart were surveyed for a total of 13.2 line kilometers of coverage. A production summary can be found in Appendix B which includes the survey dates, lines and line coverage.

3.2 Survey Personnel

Paul Plazek
Crew Leader/Geophysicist
Renfrew, ON

Chad Polson
Field Assistant
Notre Dame du Nord QC

Paul Presseauft
Field Assistant
Notre Dame du Nord, QC

3.3 HPTEM Equipment and Survey Procedure

The HPTEM surveys implemented a high power TEM system that combines the Digital Protem/EM-42 transient electromagnetic receiver and frequency controller, manufactured by Geonics Limited, Mississauga, Ontario, the GGT-25/ZMG-20/VR-1 universal geophysical transmitter, and regulator manufactured by Zonge Engineering and Research Organization (ZERO), of Tucson, Arizona, U.S.A. with a 85 hp Duetz generator. The Digital Protem receiver is a variable-gain, three channel, back-pack portable, digital data acquisition system. The Rx unit measures the primary pulse and the time rate of decay of the secondary electromagnetic field across 20 time-gates (80 microseconds to 80 millisecond delay time) during the "off-time" using a pulse repetition frequency (time base) of 3, 7.5 or 30 Hz. The unit is synchronized to the transmitter through the EM-42 controller either via quartz clock synchronization or hard-wire link.

The transmitted primary field is supplied by the GGT-25 time/frequency domain transmitter (maximum output voltage 1 KV). The EM-42 controller provides frequency control for the transmitter as well as phase reference and timing synchronization for the remotely located receiver. These units provide the receiver with a stable current and TEM signal with a standard wave form while transmitting through a loop source. The Tx unit transmits a square-wave signal, at a switch-selectable pulse-repetition frequency (3,7.5,30 Hz), creating an impulse signal through a linear ramp shut-off (20-450 μs). Transmit loops are constructed of #10 gauge copper wire having a resistance of 3.3 ohms/km. The transmitter is powered by a ZMG-20, 3-phase, 400 Hz., 32 kilowatt alternator driven by the Duetz engine. Input voltage and frequency is regulated by the ZERO VR-1 voltage regulator.

The A/D conversion and digital data storage are performed within the Protem receiver. The magnetic field sensor consists of a Geonics three component air-core coil having an effective area of 200 meters². The magnetic flux of the secondary magnetic field is measured across a 40 kHz bandwidth.
To ensure optimum anomaly resolution and noise suppression, the following system parameters were selected for the Duff Township Grid HPTEM profiling surveys:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse repetition frequency</td>
<td>30 Hz</td>
</tr>
<tr>
<td>Gain</td>
<td>4-5</td>
</tr>
<tr>
<td>Integration number</td>
<td>15 sec.</td>
</tr>
<tr>
<td>Loop size</td>
<td>1400m x 1200m</td>
</tr>
<tr>
<td>Current</td>
<td>24 amps</td>
</tr>
<tr>
<td>Turn-off time</td>
<td>425\mu s</td>
</tr>
<tr>
<td>Gate positions</td>
<td>80-6136 \mu s</td>
</tr>
<tr>
<td>Synchronization mode</td>
<td>crystal clocks</td>
</tr>
</tbody>
</table>

**Table I: System parameters for HPTEM surveys over the Duff Township Grid**

The in-loop survey procedure consisted of lines read inside one large fixed transmit loop. Measurements of the vertical (Hz), in-line horizontal (Hx) and cross line horizontal (Hy) vector components of the secondary magnetic field were made at 25 meter station intervals along east-west oriented lines using a single frequency of 30Hz. In keeping with the industry standard, the primary field was considered positive up inside the loop and negative down outside. Similarly, the receiver coil was oriented up for the Hz, east for the Hx and north for the Hy throughout the in-loop survey (Figures 3-4).

![Figure 3: Loop configuration and polarity conventions for in-loop surface profiling surveys.](image-url)
Figure 4: Primary field sign convention for surface HPTEM surveys.

At the end of each survey day, the stored data are transferred to a microcomputer where it is corrected for the turn-off time, loop area, system gain and current, and converted from millivolts to nanoVolts per ampere meter squared. The data is then transferred to disk for storage and processing. Report quality field plots were generated on site, using a 24-pin printer in order to monitor the data characteristics and to provide a preliminary interpretation capability.

The following equations govern the transient EM response for buried plate-like conductive bodies.\(^1\)

**Target Response to Transmitter Current Waveform:**

\[
\text{emf} = \frac{1}{\tau} e^{-t/\tau}
\]

where: 
- \(t\) = fixed time
- \(e\) = exponential decay
- \(\tau\) = time constant of conductor

The time constant of the response is alternatively defined as the slope of the lin-log decay curve (Geonics) or, more exactly, as the time channel where the amplitude of the decay collapses to 37% (1/e) of its maximum value.

Next, consider the corollary between the latter definition of \(\tau\) and the more common use of decay strength (i.e. the number of channels responding) as an indicator of conductor quality. Relating the time-constant to the conductivity-thickness product is shown by the following equation for a vertically dipping conductive sheet:

\[
\tau = \frac{\sigma \mu \cdot \text{th}}{\mu} \quad \text{for a thin plate}
\]

where:
- \(\sigma\) = conductivity of target
- \(\mu\) = magnetic susceptibility
- \(t\) = thickness of plate
- \(h\) = vertical extension of plate

\(^1\) From Geonics Limited, EM-37 TEM System Design Parameter, Mississauga, Ont., 1982
thereby giving, for an infinite vertical sheet:

\[
\sigma t = \frac{\tau^2}{\mu h} \approx 0.31 \text{ mhos/metre (siemens)}
\]

From these equations and relationships, it therefore becomes obvious of the common use of the anomaly strength of decay as a simple, rule-of-thumb indicator of the relative conductivity-thickness product for TEM surveys.

3.4 Difficulties encountered and accuracy of TEM measurements

The quality of measurements in the field was closely monitored throughout the course of the survey in order to detect any weaknesses, either technical or natural, which could have affected the quality of the data collected. To ensure optimum data quality, readings were repeated intermittently to check the repeatability of decays and the extent of any external noise.

Overall, the quality of the data and their repeatability are both relatively high - in the order of ±5% or higher at the late times. This is shown by the smoothness of the decay curves and profiles, particularly over later decay times in the data.

3.5 Data Reduction and Presentation of TEM Results

Data collected during the survey was digitally stored in the receiver and subsequently downloaded to computers each evening. From their RAW form, the reduction of the data was carried out using DATEM, written by Geonics Limited. Corrections for loop size, system gain, current and ramp time were made, providing output files in units of nanoVolts per ampere meter-squared\(^2\) (nV/Am\(^2\)). Following this, the reduced files were then edited, converted into ASCII XYZ format and readied for plotting in profile and plan view using the Geosoft 2D Mapping System™.

The High Power TEM data is presented through 4-axis profile plots of individual lines and components of the secondary electromagnetic field (channels 1-20) at a 1:5000 horizontal scale. These plots feature Channels 1 to 5, 6 to 10, 11 to 15, and 16 to 20 presented on separate axes with individual linear scales. In addition, a total secondary field plan map was generated using the three components (Hx, Hy and Hz) in the following formula:

\[
H_{tot} = \sqrt{Hx^2 + Hy^2 + Hz^2} \text{ nanoVolt / Am}^2
\]

\(^2\) Crone units of nanoTesla/ampere-sec are identical to Geonics units of nanoVolts/ampere-metre\(^2\).
The digital data set provided is in ASCII format on 3.5 inch HD (1.44 Mbyte) diskette and the XYZ file data adopt the following format:

a) raw data dump files, according to acquisition date (DDMMYY.RAW)

Geonics Digital Protem format (refer to manual)

b) reduced XYZ ASCII data files, according to line and component (LINEk.XYZ, k = Z,X or Y)

Column 1: EW station position (m)
Column 2: NS line position (m)
Column 3: Primary pulse (millivolts)
Column 4: Channel 1 secondary rate of decay of transient EM field (nV/amp meter²)
Column 5: Channel 2 ...
....
....
Column 23: Channel 20 secondary rate of decay of transient EM field (nV/amp meter²)
4.0 SUMMARY INTERPRETATION AND RECOMMENDATIONS

The HPTEM survey over the Duff Property was successful in delineating two zones of conductivity. The highest priority is Conductor A striking grid north from L3+00N to L9+00N around BL 0+00. The second, Conductor B, is a low priority conductor striking grid north from L3+00N to L7+00N near 2+00E. Both of these conductors are influenced by a strong background response from conductive overburden. The overburden appears uniformly thick over most of the grid but thinning to the southeast.

Conductor A is a high conductivity conductor, dips shallow to grid west and has an estimated depth to the top of 100 meters. The conductor axis indicated on the interpretation map is the interpreted up dip edge picked from the Hx component peak. The calculated Total Field displaces the maximum some 100 meters to 150 meters west. This is interpreted as the center of the conductor. The Total Field peak in the area of L9+00N, 1+00W is probably an overburden related response.

Conductor B is a weak to moderate strength conductor. Depth estimates are not possible due to the strong influence from Conductor A, however, the conductor does appear to be relatively shallow.

It is recommended that these conductors be reviewed in relation to geology and previous work to determine their relative importance prior to drill testing.

RESPECTFULLY SUBMITTED

Quantec Consulting Inc.
April 1996

S.T. Coulson
Geophysicist

C. Williston
Junior Geophysicist
APPENDIX A

STATEMENT OF QUALIFICATIONS

I, Sherwood T. Coulson, hereby declare that:

1. I am a consulting geophysicist with residence in Porcupine, Ontario and am presently employed in this capacity with Quantec Consulting Inc. of Porcupine, Ontario.

2. I am a graduate of Cambrian College, Sudbury, Ontario in 1974 with an Honours Diploma in Geophysical Engineering Technology.

3. I have practiced my profession in Europe and North America continuously since graduation.

4. I am a member of the Canadian Society of Exploration Geophysicists and the Prospectors and Developers Association.

5. I have no interest nor do I expect to receive any interest, direct or indirect, in the properties or securities of Noranda Mining and Exploration Inc.

6. The statements made by me in this report represent my best opinion and judgment based on the information available to me at the time of the writing of this report.

Porcupine, Ontario
April, 1996.

S.T. Coulson, Dipl. Geoph.
Geophysicist
STATEMENT OF QUALIFICATIONS

I, Christine Williston, hereby declare that:

1. I am a processing geophysicist with residence in South Porcupine, Ontario and am presently employed in this capacity with Quantec Consulting Inc. of Porcupine, Ontario.

2. I am a graduate of York University, North York, ON, in 1994, with an Honours Bachelor of Science Degree in Earth and Atmospheric Science.

3. I have practiced my profession in Canada since graduation.

4. I have no interest nor do I expect to receive any interest, direct or indirect, in the properties or securities of Noranda Mining and Exploration Inc.

5. The maps created in this report accurately represent the information given to me at the time of the preparation of this report.

Porcupine, Ontario
April, 1996.

Christine Williston, B.Sc.
Junior Geophysicist
## APPENDIX B

### PRODUCTION SUMMARY

**NORANDA EXPLORATION AND MINING INC.**
**DUFF TOWNSHIP GRID - HPTEM IN-LOOP PROFILING SURVEY**

<table>
<thead>
<tr>
<th>Date</th>
<th>DESCRIPTION</th>
<th>Line</th>
<th>Start</th>
<th>End</th>
<th>Total (m)</th>
<th>Total/day (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-Feb</td>
<td>Grid located and HPTEM equipment mobilized and tested. Surveying begins in PM</td>
<td>3+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td>1,200</td>
</tr>
<tr>
<td>13-Feb</td>
<td>Surveying is stopped early in PM due to generator/transmitter problems</td>
<td>4+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td>2,400</td>
</tr>
<tr>
<td>14-Feb</td>
<td>Down - generator/transmitter system not supplying constant current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-Feb</td>
<td>Down - Transmitter not operating. Replacement parts on order.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-Feb</td>
<td>Survey day</td>
<td>6+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td>4,800</td>
</tr>
<tr>
<td>21-Feb</td>
<td>Survey Day</td>
<td>10+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13+00N</td>
<td>8+00W</td>
<td>4+00E</td>
<td>1,200</td>
<td>4,800</td>
</tr>
</tbody>
</table>

**TOTAL (m)**

13,200
## TEM ANOMALY CHART

### NORANDA EXPLORATION AND MINING INC.
**DUFF TOWNSHIP GRID - HPTEM IN-LOOP PROFILING SURVEY**

<table>
<thead>
<tr>
<th>Station</th>
<th>Line</th>
<th># of Channels</th>
<th>Estimated Depth</th>
<th>Quality</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 + 00N</td>
<td>0 + 12W</td>
<td>18</td>
<td>100m</td>
<td>Good</td>
<td>Good conductor. Shallow dip to the west. Hx peak indicates east edge of conductor. Total field indicates center of conductor @ 1 + 25W-1 + 50W. Strong influence from conductive overburden.</td>
</tr>
<tr>
<td>3 + 00N</td>
<td>2 + 25E</td>
<td>12</td>
<td></td>
<td>Poor</td>
<td>Poor conductor near surface</td>
</tr>
<tr>
<td>4 + 00N</td>
<td>0 + 25W</td>
<td>18</td>
<td>100m</td>
<td>Good</td>
<td>Good conductor. Shallow dip to the west. Hx peak indicates east edge of conductor. Total field indicates center of conductor @ 1 + 25W. Strong influence from conductive overburden.</td>
</tr>
<tr>
<td>4 + 00N</td>
<td>1 + 75E</td>
<td>13</td>
<td></td>
<td>Poor</td>
<td>Poor conductor near surface</td>
</tr>
<tr>
<td>5 + 00N</td>
<td>0 + 25W</td>
<td>18</td>
<td>100m</td>
<td>Good</td>
<td>Good conductor. Shallow dip to the west. Hx peak indicates east edge of conductor. Total field indicates center of conductor @ 1 + 25W-1 + 75W. Strong influence from conductive overburden.</td>
</tr>
<tr>
<td>5 + 00N</td>
<td>1 + 75E</td>
<td>12</td>
<td></td>
<td>Poor</td>
<td>Poor conductor near surface</td>
</tr>
<tr>
<td>6 + 00N</td>
<td>0 + 25W</td>
<td>19</td>
<td>100m</td>
<td>Good</td>
<td>Good conductor. Shallow dip to the west. Hx peak indicates east edge of conductor. Total field indicates center of conductor @ 1 + 75W. Strong influence from conductive overburden.</td>
</tr>
<tr>
<td>6 + 00N</td>
<td>1 + 75E</td>
<td>12</td>
<td></td>
<td>Poor</td>
<td>Poor conductor near surface</td>
</tr>
<tr>
<td>7 + 00N</td>
<td>0 + 12E</td>
<td>19</td>
<td>100m</td>
<td>Good</td>
<td>Good conductor. Shallow dip to the west. Hx peak indicates east edge of conductor. Total field indicates center of conductor @ 1 + 75W. Strong influence from conductive overburden.</td>
</tr>
<tr>
<td>7 + 00N</td>
<td>2 + 00E</td>
<td>12</td>
<td></td>
<td>Poor</td>
<td>Poor conductor near surface</td>
</tr>
<tr>
<td>8 + 00N</td>
<td>0 + 50E</td>
<td>19</td>
<td>100m</td>
<td>Good</td>
<td>Good conductor. Shallow dip to the west. Hx peak indicates east edge of conductor. Total field indicates center of conductor @ 1 + 50W. Strong influence from conductive overburden.</td>
</tr>
<tr>
<td>Station</td>
<td>Line</td>
<td># of Channels</td>
<td>Estimated Depth</td>
<td>Quality</td>
<td>Comments</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>---------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>9 + OON</td>
<td>1 + OOE</td>
<td>18</td>
<td>?</td>
<td>Moderate-Good</td>
<td>Probably off end of conductor.</td>
</tr>
<tr>
<td>10 + OON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No conductor. Response due to conductive overburden.</td>
</tr>
<tr>
<td>11 + OON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No conductor. Response due to conductive overburden.</td>
</tr>
<tr>
<td>12 + OON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No conductor. Response due to conductive overburden.</td>
</tr>
<tr>
<td>13 + OON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No conductor. Response due to conductive overburden.</td>
</tr>
</tbody>
</table>
## APPENDIX D

### INSTRUMENTATION

GEONICS LIMITED

PROTEM Ground Transient Electromagnetic System

Technical Specifications

<table>
<thead>
<tr>
<th>Digital Protem Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measured Quantity:</strong></td>
</tr>
</tbody>
</table>
| **Sensors:**             | 1) L.F. - Air-cored coil of bandwidth 60kHz; 100cm dia.  
                            2) H.F. - Air-cored coil of bandwidth 850kHz; 100cm dia.  
                            3) 3D-3 - Three orthogonal component sensor, simultaneous operation  
                            4) 3D-1 - Three orthogonal component sensor, sequential operation |
| **Time Channels:**       | 20 geometrically spaced time gates for each base frequency gives range from 6μs to 800ms. |
| **Repetition Rate:**     | 0.3 Hz, 0.75 Hz, 3 Hz, 7.5 Hz, 30 Hz, 75 Hz, 285 Hz, for countries using 60 Hz power line frequency.  
                            0.25 Hz, 0.625 Hz, 2.5 Hz, 6.25 Hz, 25 Hz, 62.5 Hz, 237.5 Hz, for countries using 50 Hz power line frequency. |
| **Synchronization:**     | 1) Reference cable  
                            2) High stability quartz crystal. |
| **Integration Time:**    | 2, 4, 8, 15, 30, 120, 240 sec. |
| **Calibration:**         | Internal self calibration  
                            External Q coil calibration |
| **Keyboards:**           | Two 3 x 4 matrix sealed key pads with positive tactile feedback |
| **Gain:**                | Automatic or manual control |
| **Dynamic Range:**       | 23 bits (132 dB) |
| **Display Quantity:**    | 1) Table of time rate of decay of magnetic flux (dB/dt)  
                                2) Curve of rate of decay of magnetic flux (dB/dt)  
                                3) Table of apparent receptivity (Pa)  
                                4) Curve of apparent resistivity (Pa)  
                                5) Profile of dB/dt |
6) Real time noise monitor
7) Calibration curve
8) Data acquisition statistics (real time)

Storage: Solid state memory with capacity for over 3000 data sets
Display: 8 lines by 40 characters (240 x 64 dot) graphic LCD
Data Transfer: Standard RS-232 communication port
Processor: CMOS 68HC000 8 MHz CPU
Receiver Battery: 12 volt rechargeable Gel-Cel; for 8 hours continuous operation; 6 hours in XTAL mode
Receiver Weight: 15 kg
Operating Temperature: -40°C to 50°C

Note: PROTEM Digital Receiver can be used with all three Geonics transmitters - TEM47, TEM57 and TEM37
APPENDIX E

LIST OF MAPS

a) **HPTEM Multi-channel 4-Axis Profile Plots:** (time rate of decay of the secondary electromagnetic field, X, Y and Z components, 1:5000 horizontal scale, ch. 1-20 divided according to 4 vertical (linear) axes, nanoVolts per Ampere-meter$^2$)

<table>
<thead>
<tr>
<th>Component</th>
<th>Location 1</th>
<th>Location 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-component</td>
<td>L3+00N C328-4AXIS-Z-3+00N</td>
<td>L4+00N C328-4AXIS-Z-4+00N</td>
</tr>
<tr>
<td></td>
<td>L13+00N C328-4AXIS-Z-13+00N</td>
<td></td>
</tr>
<tr>
<td>X-component</td>
<td>L3+00N C328-4AXIS-X-3+00N</td>
<td>L4+00N C328-4AXIS-X-4+00N</td>
</tr>
<tr>
<td></td>
<td>L13+00N C328-4AXIS-X-13+00N</td>
<td></td>
</tr>
<tr>
<td>Y-component</td>
<td>L3+00N C328-4AXIS-Y-3+00N</td>
<td>L4+00N C328-4AXIS-Y-4+00N</td>
</tr>
<tr>
<td></td>
<td>L13+00N C328-4AXIS-Y-13+00N</td>
<td></td>
</tr>
</tbody>
</table>

b) **Total Field Plan Maps:** (X, Y and Z Components, Channel 16, contoured plan map and posted profile map, 1:5000 horizontal scale)

- Posted Profile Plan Map: C328-DUFF-TF
- Contoured Plan Map: C328-DUFF-TF-2

C) **Interpretation Plan Map:** (1:5000 horizontal scale)

- Interpretation Plan Map: C328-DUFF-INT
APPENDIX F

PROFILE AND PLAN MAPS
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

- Transmitter Frequency: 30 Hz (50% duty cycle)
- Tx Loop Size: 1400m x 1200m
- Tx Loop Location: 0+000-14+000 x 4+000-8+900N
- Transmitter Current: 24 Amps
- Transmitter Turn-Off Time: 425 ms
- Station Interval: 25m
- Profile Units: microV/m
- Receiver Coil Orientation: Hz = positive up
- Hy = positive east
- Hx = positive north

Date: FEBRUARY 13, 1996
Instrumentation: Rx = Digital Protein (3x20 Channels)
Geonics 3D Coil (3x20m-2)
x = Zonde 800:250 (250 W)

Surveyed & Processed by:
QUANTEC CONSULTING INC.
**Line 4+00N - Z Component**

Scale 1:5000

**NORANDA EXPLORATION INC.**
**DUFFER TOWNSHIP**
**NE ONTARIO**

**HPTEM IN-LOOP PROFILING SURVEY**

Secondary Electromagnetic Field (dB/dt)

- Transmitter Frequency: 30 Hz (30C Hz cycle)
- Tx Loop Size: 1400m x 1200m
- Tx Loop Location: 0+00N-16+00N x 4+00E-9+00W
- Transmitter Current: 24 Amps
- Transmitter Turn-Off Time: 425 usec
- Station Interval: 25m
- Profile Units: nV/km/m^2
- Receiver Coil Orientation:
  - Hz - positive up
  - Hx - positive east
  - Hy - positive north

**Date:** FEBRUARY 13, 1996

**Instrumentation:**
- Rx = Digital Protem (3x20 Channels)
- Geonics 30 Coi (5x200m^2)
- Tx = Zonge GST-25 (25 kW)

Surveyed & Processed by

QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitter Frequency</td>
<td>30 Hz (50% duty cycle)</td>
</tr>
<tr>
<td>Tx Loop Size</td>
<td>1400m x 1200m</td>
</tr>
<tr>
<td>Tx Loop Location</td>
<td>ODE-90-14-050 x 4+00E-8+00N</td>
</tr>
<tr>
<td>Transmitter Current</td>
<td>24 Amps</td>
</tr>
<tr>
<td>Transmitter Turn-Off Time</td>
<td>425 us</td>
</tr>
<tr>
<td>Station Interval</td>
<td>25m</td>
</tr>
<tr>
<td>Profile Units</td>
<td>native/lin/nt</td>
</tr>
<tr>
<td>Receiver Coil Orientation</td>
<td>Hx - positive east</td>
</tr>
<tr>
<td></td>
<td>Hy - positive north</td>
</tr>
<tr>
<td></td>
<td>Hz - positive up</td>
</tr>
<tr>
<td>Date</td>
<td>FEBRUARY 13, 1996</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>Rx = Digital Protem (3x20 Channels)</td>
</tr>
<tr>
<td></td>
<td>Genics 2D C9I (3000m²)</td>
</tr>
<tr>
<td></td>
<td>3x = Zoomer (50 x 25 cm²)</td>
</tr>
</tbody>
</table>

Surveyed & Processed by:
QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

- Transmitter Frequency: 30 Hz (50% duty cycle)
- Tx Loop Size: 1400m x 1200m
- Tx Loop Location: C6-00N-144W x +400E-900W
- Transmitter Current: 24 Amps
- Transmitter Turn-Off Time: 425 us
- Station Interv: 25m
- Profile Units: not specified
- Receiver Coil Orientation: Hz = positive east
- Surveyed & Processed: QUANTEC CONSULTING INC.

Instrumentation:
- Rx = Digital Protem (3x20 Channels)
- Geometrics 3D Cal (3-200,ncm2)
- Tx = Range Unit (25, 25, 25)

Surveyed & Processed by QUANTEC CONSULTING INC.
Dwg. No. C52d-4-AX
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPITEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (50% duty cycle)
Tx Loop Size: 1400m x 1200m
Tx Loop Location: 0+00N-14+00N x 4+00W-6+00W
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25m
Profile Units: nV/m/A/m²
Receiver Coil Orientation:
Hz = positive up
Hx = positive east
Hy = positive north

Date: FEBRUARY 20, 1996
Instrumentation: Rx = Digital Protem (3x20 Channels)
Geonics 3D Coil (3x200m²)
Tx = Zonge G01-25 (25 W)

QUANTEC CONSULTING INC.
DAT NO. C075-48X06-1-6-00N
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (50% duty cycle)
Tx Loop Size: 1400m x 1200m
Tx Loop Location: D+00N-14+00N x E+00E-6+00W
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25m
Profile Units: nV/m vs/2
Receiver Coil Orientation: Hz = positive up
Hy = positive north

Scale 1:5000

Line 6+00N – Z Component

Surveyed & Processed by:
QUANTEC CONSULTING INC.

Instrumentation:
Rx = Digital Frotom (3x20 Channels)
Geonics 3D Cal (3x200 Channels)
Tx = generator: GCT-25 (25W)

Surveyed: FEBRUARY 30, 1996
Processed: FEBRUARY 30, 1996
Line 7+60N - Y Component

Scale: 1:5000

(metres)

NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/cft)

Transmitter Frequency: 30 Hz (50% duty cycle)
Tx Loop Size: 1400m x 1200m
Tx Loop Location: 0-00N-14-00N x 0-00E-60-00W
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 ms
Station Interval: 25m
Profile Units: nanovolts/meter
Receiver Coils Orientation: Hz - positive up
Hy - positive north

Date: FEBRUARY 20, 1996
Instrumentation: Rx = Digital Preamp (3x20 Channels)
Geonics 3D Coil (10-004m2)
Tx = Zonge GGT-25 (25 kVA)

Surveyed & Processed by:
QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (50% duty cycle)
Transmission Spec: 100 m x 120 km
Transmitter Location: 800 km - 14 km
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 us

Station Interval: 25 m
Profile Units: feet
Receiver Coil Orientation:
Hz = positive north
Hx = positive east
Hy = positive up

Date: FEBRUARY 20, 1996
Instrumentation: Rx = Digital Protem (3 x 20 Channels)
Geonics 3D Coils (1500 mm)
Tx = Zentre GIS-25 (25 kHz)

Surveyed & Processed by:
QUANTEC CONSULTING INC.
OME NO. CSZ-EXS-2-7+00N
Line 8+00N – X Component

Scale 1:5000

NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (50% duty cycle)
Tx Loop Size: 1400m x 1200m
Tx Loop Location: 0+00N-14+000 x 4+00E-5+00E
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25m
Profile Units: nanoVolt/m
Receiver Coil Orientation: Hz - positive up
Hy - positive east
Hx - positive north

Date: FEBRUARY 20, 1996
Instrumentation: Rx = Digital Proton (3x20 Channels)
Geometrics 312 Coil (2x2000mHz)
Tx = Transmitter (Q-10, 25 Kw)

QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HiTEM IN-LOOP PROFILING SURVEY

Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (90% duty cycle)
Tx Loop Size: 1400m x 200m
Tx Loop Location: CHOGN-144-GQN x 4
Tx Loop Design:

Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 475 us
Station Interval: 25m
Profile Units: 

Receiver Coil Orientation:

Chs 6-10

Chs 11-15

Chs 16-20

Date: FEBRUARY 20, 1996
Instrumentation:

Surveyed & Processed by:

QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency:
30 Hz (50% duty cycle)

Tx Loop Size:
1400m x 1200m

Tx Loop Location:
0+00N-14+00N x 4+00E-8+00W

Transmitter Current:
24 Amps

Transmitter Turn-Off Time:
425 us

Station Interval:
25m

Profile Units:
nanovolt/m²

Receiver Coil Orientation:
Hx - positive east
Hy - positive north

Date:
FEBRUARY 20, 1996

Instrumentation:
Rx = Digital Proton (3x20 Channels)
Geonics 3D Cal (3x20 Cal)

Tx = Geonics (82-250, 25-100)

Surveyed & Processed by:
QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HIPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Frequency: 30 Hz
Tx Loop Size: 1400 m x 1200 m
Tx Loop Location: 0+00N-14+00W x 4+00E-6+00W
Receiver Current: 74 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25 m
Profile Units: nanovolts/m²
Receiver Coil Orientation: Hz - positive up
Hy - positive east

Date: FEBRUARY 20, 1996
Instrumentation: Rx = Digital Protein (3x20 Channels)
Geoexpl 3D Coil (3x700m²)
Tx = Geoexpl GCT-25 (30 kW)

Surveyed by: NORANDA EXPLORATION INC.
Processed by: QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.  
DUFF TOWNSHIP  
NE ONTARIO  

HIPTEM IN-LOOP PROFILING SURVEY  
Secondary Electromagnetic Field (dB/dt)  

Transmitter Frequency: 30 Hz (50/5 duty cycle)  
Tx Loop Size: 1400m x 1200m  
Tx Loop Location: O(-X)-0-1400m x 5-0000-3000W  
Transmitter Current: 24 Amps  
Transmitter Turn-Off Time: 420 usec  
Station Interval: 25m  
Profile Units: nT/m (or)  
Receiver Coil Orientation: Hz - positive up  
Hy - positive west  
Hx - positive north  

Date: FEBRUARY 20, 1996  
Instrumentation: Rx = Digital Protem (3x20 Channels)  
Geonics 20 Coll (3x2000n2)  
Tx = Zonge DT-25 (75kW)  

Surveyed & Processed by  
QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (50% duty cycle)
Tx Loop Size: 1000 m x 1000 m
Tx Loop Location: U0001-14-001 x 1-00E-000
Transmitter Current: 24 kAmp
Transmitter Turn-Off Time: 475 us
Station Interval: 2 m
Profile Units: nanoVolt/Amp2
Receiver Coil Orientation: Hx - positive east
Hy - profile north

Date: FEBRUARY 20, 1986
Instrumentation: Rx = Digital Protem (4x20 Channels)
(Centric 3D Coil 1520Amps)
Tx = Range 05-25 02 00

Surveyed & Processed by QUANTEC CONSULTING INC.
DWG. NO. C32S-4-AXIS-Z-9003
Line 10+00N – Y Component

NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 kHz (30 Hz cycle)
Tx Loop Size: 1400m x 1200m
Rx Loop Location: 5000m to 14000m x 4000m to 6000m
Transmitter Current: 24 Amps
Transmitter Turn-On Time: 425 ms
Station Interval: 25m
Profile Units: northing
Receiver Coil Orientation: Hz - positive up
Hy - positive east
Hx - positive north

Date: FEBRUARY 21, 1996
Instrumentation: Rx = Digital Protem (3x20 Channels)
                Hy = Digital Protem (3x20 Channels)
                Hx = Large GSE (25 CI)

Surveyed & Processed by QUANTEC CONSULTING INC.
Dwg. No.: C328-4AXS-Y-10+00N
Line 10+00N – Z Component

NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

- Transmitter Frequency: 30 Hz (50% duty cycle)
- Tx Loop Size: 1400m x 1200m
- Tx Line Location: 6000 = 14000m x 41000 = 8300m
- Tx Transmitter Current: 24 Amps
- Transmitter Turn-Off Time: 425 us

Station Intervals: 25m
Profile Units: nanovolt/meter
Receiver Coil Orientation:
Hx = positive east
Hy = positive north
Hz = positive up

Date: FEBRUARY 21, 1996
Instrumentation:
Rx = Digital Protem (3x20 Channels)
Geonics 3D Cal (3x200 channels)
3s = Range 000 to 0500 mW

Surveyed & Processed by:
QUANTEC CONSULTING INC.
DRAW. NO. C328-4AXIS-Z-10+00N
Line 11+00N - X Component

Scale 1:5000

NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (20 Hz, 60 Hz)
Tx Loop Size: 1400m x 1200m
Tx Loop Location: 0-1400m x 4-100E-5-00W
Transmitter Current: 74 Amps
Transmitter Turn-Off Time: 625 sec

Station Interval: 25m
Profile Units: nV/m
Receiver Coil Orientation: He - positive up
Hy - positive north

Date: FEBRUARY 21, 1996
Instrumentation: Rx = Digital Protem (3x20 Channels)
Geometrics 3D coil (20,000 nV/m)

Surveyed & Processed by:
QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HIPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Parameter Frequency: 30 Hz (50% duty cycle)
T-Loop Size: 1400m x 1000m
T-Loop Location: 74W X 144E X 14400m
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25m
Profile Units: nanolvts/Ameter
Receiver Coil Orientation:
Hx - positive north
Hy - positive east
Hz - positive up

Date: FEBRUARY 21, 1996
Instrumentation:
Hx = Digital Protem (3x20 Channels)
Geonics 3D Coil (3x200m2)
Tb = Zonge GST-25 (25 W)

Surveyed & Processed by:
QUANTEC CONSULTING INC.
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO
HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Secondary Loop Size: 1400m x 1200m
Secondary Loop Location: 6+00S-14+00N x 4+00E-6+00N
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 ms
Station Interval: 25m
Profile Units: meters
Receiver Coil Orientation: Hz - positive up
Hx - positive east
Hy - positive north

Date: FEBRUARY 21, 1996
Instrumentation: Rx = Digital Protein (3x20 Channels)
Geonics 3D Coil (3x2000Hz)
Hx = [range 0-253 (25 kHz)]

Surveyed & Processed by:
QUANTEC CONSULTING INC.
Dwg. No. C328-4AXIS-X-12+00N
Line 12+00N – Y Component

Scale 1:5000

NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

- Transmitter Frequency: 30 Hz (50% duty cycle)
- Tx Loop Size: 1400m x 1200m
- Tx Loop Location: 0+00N 14+00W x 4+00E 8+00E
- Transmitter Current: 24 Amps
- Transmitter Turn-Off Time: 425 us
- Station Interval: 25m
- Project Unit: nV/m/Hz
- Receiver Coil Orientation: Hz = positive up
- Hy = positive east
- Hx = positive north

Date: FEBRUARY 21, 1996

Instrumentation:
- Rx = Digital Proton (3x20 Channels)
- Geometrics 3D Cal (3x200m2)
- Bottom @ 657-25 (25 MHz)

Surveyed & Processed by:
QUANTEC CONSULTING INC.

DWG No: C328-14X5-S-12+00N
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (50% duty cycle)
Tx Loop Size: 1400m x 1200m
Tx Loop Location: D+00N-300E-3000W
Transmitter Current: 2.1 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25m
Profile Units: millivolts/m
Receiver Coil Orientation: Hz - positive up
Rx - positive east
Hx - positive north

Date: FEBRUARY 21, 1996
Instrumentation: Rx = Digital Protem (30 Channels)
Geonics 3D Coil (5200m2)
Tx = Alter 25 watts, 25 kHz

Surveyed & Processed by:
QUANTEC CONSULTING INC.
Dwg. No. C328-4AXXS-X-13+00N
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NE ONTARIO

HITEM IN-LOOP PROFILING SURVEY
Secondary Electromagnetic Field (dB/dt)

Transmitter Frequency: 30 Hz (0.5% duty cycle)
Tx Loop Size: 1400m x 1200m
Tx Loop Location: 1-300N-14K-000N + 4-400E-0-000E
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25m
Profile Units: nanovolts
Receiver Coil Orientation:
Rx = positive up
Hy = positive east
Hx = positive north

Date: FEBRUARY 27, 1996
Instrumentation: Rx = Digital (3x20 Channels)
Hx = Primary (200mV)

QUANTEC CONSULTING INC.
DWO No. C738-844S Y 13+00N
APPENDIX 2

GEOLOGICAL SURFACE PLAN AND CROSS SECTION
APPENDIX 3

DIAMOND DRILL LOGS
Objectifs: EM conductor (HLEM, HFTEM) in the inferred felsic volcanic sequence of the Tisdale Group.

Résultats: No significant mineralisation encountered

Meilleure Analyse:

Géophysique:

Remarques: Casing left in hole
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<thead>
<tr>
<th>DE</th>
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<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>0.00</td>
<td>30.00</td>
<td>Hematite (left in hole)</td>
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<tr>
<td>30.00</td>
<td>75.00</td>
<td>Peridotite</td>
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<td>Massive, black and greenish, fine to medium grained (d=1-4mm), magnetism low to medium, homogeneous aspect.</td>
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<td>Composition: cpx 55% plagioclases 40% olivine 5%</td>
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<tr>
<td>Olivine altered to talc, reaction to acide with calcite veins (tr-1%) crosscutting the unit, with hematite traces associated to fracture zone. Also serpentine veins. No significant mineralization. Low fracturation with fault lines, locally brecciated and cemented with calcite and silica. Inferior contact 80° a/c.</td>
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<td>45.10 - 42.00</td>
<td>Maoi porphyry</td>
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<tr>
<td>Massive, medium to coarse grained, gray and greenish, low magnetism.</td>
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<td></td>
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<tr>
<td>Composition: feldspar 70% (greenish, 50% porphyry) cpx 20% quartz (tr)</td>
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<td>Matrix showing low epidotisation. Superior contact 20-25° a/c. Inferior contact shamed, brecciated. with low silification.</td>
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<tr>
<td>56.72 - 56.42</td>
<td>Brecciated peridotite, injected with feldspar porphyry veins that are disseminated, wall rock brecciated.</td>
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<td>81.50 - 82.40</td>
<td>Low-medium fractures (30-40° a/c) pyroxenite injected with calcite veins, and traces of hematite and pyrite.</td>
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<td>66.20 - 66.75</td>
<td>Medium to highly fractured 30-45° a/c peridotite, fault strias and mud.</td>
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<tr>
<td>75.00</td>
<td>Neo-orthocratic gabbro</td>
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<tr>
<td>Massive, white and greenish-gray, fine to medium grained (2-4mm), heterogeneous, non-magnetic, locally with feldspar porphyry and opx (seen in thin lenses).</td>
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<td>Composition: plagioclases (white matrix) 50% feldspar (porphyry) 32% amph-opx 13% talc clots 5% pyrite tr-1%</td>
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<td>Felspaths are locally zoisiteized. Pyrite is fine grained, disseminated.</td>
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<td>90.10 - 90.30</td>
<td>Pegmatitic horizon, 3-4mm feldspar crystals.</td>
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<td>90.10 - 100.66</td>
<td>Lightly foliated 65-70° a/c, with weak to medium silification, xenomorphic pyrite (tr) disseminated.</td>
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**DESCRIPTION**

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<td>100.56 - 111.42</td>
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<td>Heterogeneous, with gabbro horizon and also fragmental horizons (tuffs?); pyrite and pyrrhotite (tr) disseminated and in veinlets.</td>
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<td>101.30 - 102.00</td>
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<td>Carbonatization (calcite) associated with veinlets and pervasive.</td>
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<td>111.42</td>
<td>114.70</td>
<td>Ash tuffs, sandstone, lapilli tuffs, graphite. Heterogeneous unit composed of tuffs, sediments and bands of graphite. The ash tuffs and sandstone compose 60% of the unit, the ash tuffs have a gray-black matrix lightly graphitic and with 20% of fragments (&lt;2mm) that are subangular, felsic and also graphitic black fragments. 4-5% coarse nodular pyrite and in veinlets. The thickness of bedding varies from 10cm to the meter. The sandstones have thickness that varies from the centimeter to decimeter. (Polarity through the bottom of the hole?). Lapilli tuffs (10%) have decimetric to metric beds. Fragments (2mm-4cm) are principally felsic volcanics, laminated chert and black claystone. Locally carbonatised (calcite) in a matrix with felsic graphite. 5-5% pyrite in medium to coarse nodules and in veinlets. Graphite appears in massive bed (coal) which thickness varies from 10cm to the meter. Locally brecciated and injected with calcite and silica veins, 4-5% coarse nodular pyrite with calcite. Also 2-3% laminated silstone and claystone. Bedding varies from 45-75° a/c.</td>
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<td>114.50 - 114.51</td>
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<td>Bedding: 85° a/c.</td>
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<td>112.50 - 112.51</td>
<td></td>
<td>Bedding: 65° a/c.</td>
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<td>133.50 - 137.40</td>
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<td>Lapilli tuff with massive graphite bands (conductor), 15-20% calcite and silica veinlets.</td>
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<tr>
<td>140.85 - 141.00</td>
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<td>Calcite vein 50° a/c.</td>
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<td>142.10 - 142.89</td>
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<td>50% pyrite (medium grained hypidiotropic crystals).</td>
</tr>
<tr>
<td>144.40 - 145.85</td>
<td></td>
<td>Massive graphite, locally brecciated, injected with quartz and calcite veins (conductor).</td>
</tr>
<tr>
<td>153.80 - 153.82</td>
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<td>Lapilli tuffs, with a graphitic matrix, with a weak to medium carbonatisation of the fragments and of the matrix.</td>
</tr>
<tr>
<td>154.02</td>
<td></td>
<td>Massive graphite (conductor).</td>
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**Rhyolite**

Heterogeneous unit composed of felsic volcanics which composition seems to vary from rhyolite to dacite. Flow banding, hyaloclastic and phreatic breccias are present. Sericitised, locally silicified and epidotised, giving a yellowish to greenish colour. Clots of talc disseminated.

Reaction to acid with cracks and breccia, and locally more pervasive. The hyaloclastic and phreatic breccias have their matrix showing chloritisation with traces of sericite, and the fragments show variable alterations (sericitisation, carbonatization). Lightly mineralised with fine to medium grained pyrite. Superior contact 65° a/c, inferior contact is more gradual.

**Ash felsic tuff or flow banding** with bedding varying from 1mm to the centimeter, crackled, sericite and chlorite associated to bedding. 2% fine pyrite (1-2mm) disseminated and in fine veinlets. Bedding: 65°-70° a/c.

154.70 - 155.20

**Phreatoc? breccia with angular monomineral fragments (clay 3cm), with interstitial chlorite, reaction to acid in cracks, 1-2% pyrite.**

155.20 - 155.70

**Massive rhyolite, centimetric to decimetric beds, lightly sericitised and fine disseminated clots of talc, with chlorite associated to cracks.**

155.70 - 156.46

**Phreatoc? breccia, polymict, with subangular fragments of dacite-rhyolite, cent., gabbro (7%) of dimension varying from 2mm to 10cm, with weak to medium sericitisation of fragments and light chloritisation.**

156.46 - 157.56

**White quartz vein, with fine feldspar crystals and fragments of wall rock incorporated, sericite in veinlets and cracks, low reaction to acid, fine grained disseminated pyrite. Superior contact 15° a/c, inferior contact 30° a/c, waving.**

157.56 - 159.16

**Hyaloclastic breccia, with fragments of rhyolite incorporated in a chloritised hyaloclastic matrix. Irregular distribution of fragments, with dimension of fragments varying from 1mm to 3cm, subangular to subrounded. 2% fine and medium grained disseminated pyrite, foliation 30° a/c.**

159.16 - 161.40

**Felsic in fine veinlets.**

161.40 - 162.28

**Flow banding, with thickness of beds**
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<tbody>
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<td>ranging from 2mm-2cm 30-35° a/c, with dismembered beds at inferior contact; light sericitisation.</td>
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<tr>
<td>162.28</td>
<td>163.20</td>
<td>Phreatic breccia, with angular to subangular rhyolitic fragments of 4mm-2cm, with light chloritisation of the matrix.</td>
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<tr>
<td>163.20</td>
<td>164.20</td>
<td>Massive, with clots of chlorite (2-7mm) with white siliceous halo, locally brecciated, cracks with chlorite, sericite and traces of pyrite.</td>
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<tr>
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<td></td>
<td>163.40 - 163.68 Phreatic? breccia, with subangular to subrounded fragments (2mm-3cm) in a matrix of chlorite and sericite, 2-3% pyrite in fine to medium grained pyrite and in clusters.</td>
</tr>
<tr>
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<td>164.20 - 165.25 Massive, with matrix lightly chloritised, locally brecciated (154.21-164.47), 2% Py in disseminated clusters and crystals.</td>
</tr>
<tr>
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<td></td>
<td>165.25 - 167.05 Hyaloclastic? breccia, with subangular to subrounded fragments (2mm-3cm) in a matrix of chlorite and sericite, 2-3% pyrite in fine to medium grained pyrite and in clusters.</td>
</tr>
<tr>
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<td></td>
<td>167.05 - 169.13 Massive rhyolite locally brecciated (tectonic/phreatic?): low fissuration, with light silicification.</td>
</tr>
<tr>
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<td></td>
<td>167.50 - 167.61 Tectonic/phreatic breccia? with centimetric angular fragments sub in place, mineralised with 10% interstitial pyrite.</td>
</tr>
<tr>
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<td></td>
<td>169.13 - 169.45 Phreatic? breccia, with sub in-place angular fragments (2mm-2cm) included in a chloritised matrix, mineralised with 2% fine pyrrhotite and 1% pyrite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>169.45 - 172.26 Massive rhyolite, lightly crackled with chlorite and sericite, tr-1% pyrite, 2-3% talc clots (1-2mm).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>172.26 - 172.93 Massive rhyolite, silicified, locally with flow-banding 85° a/c, lightly sericitised.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>173.93 - 173.83 Lightly carbonatised and ankeritised rhyolite, pervasively and associated with cracks, 1-2% pyrite associated with cracks.</td>
</tr>
<tr>
<td>DR (M)</td>
<td>A (M)</td>
<td>DESCRIPTION</td>
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<tr>
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<td>173.83 - 176.78</td>
<td>Massive rhyolite, with light sericitisation and epidotisation, flow banding 65-70° a/e.</td>
</tr>
<tr>
<td></td>
<td>176.78 - 177.33</td>
<td>Lightly sericitised and chloritised rhyolite, 1-2% fine quartz veins.</td>
</tr>
<tr>
<td></td>
<td>177.33 - 177.70</td>
<td>Felsic-intermediate dyke, fine grained, medium to high carbonatisation (calcite), 6-7% fine idiomorphic pyrite disseminated, tiny clinopyroxene.</td>
</tr>
<tr>
<td></td>
<td>177.70 - 180.24</td>
<td>Light to medium sericitisation with disseminated fuchsite, 5% pyrrhotite and pyrite in fine veins and disseminated, calcite associated with cracks.</td>
</tr>
<tr>
<td></td>
<td>180.24 - 195.00</td>
<td>Altered gabbro, mostly massive, medium grained (3-4mm), black and greenish, lightly magnetic, radiometric presence of talc, 1-2% calcite veinsite disseminated.</td>
</tr>
<tr>
<td></td>
<td>195.00</td>
<td>FIN DU TROU</td>
</tr>
</tbody>
</table>

180.24 - 195.00
- Altered gabbro
- Mostly massive, medium grained (3-4mm), black and greenish, lightly magnetic, radiometric presence of talc, 1-2% calcite veinsite disseminated.

Composition:
- Olivine: 15%
- Pyrite: <0.5%
- Plagioclase: 45%
- Leucocene: 15%
- Clinopyroxene: 10%

Superior contact diffuse.

195.00
- FIN DU TROU
- Nombre total d'échantillons: 17
- Longueur totale échantillonnée: 12.45
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<th>À (m)</th>
<th>Long. (m)</th>
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<th>TiO2</th>
<th>A12O3</th>
<th>Fe2O3</th>
<th>MnO</th>
<th>MgO</th>
<th>CaO</th>
<th>NA2O</th>
<th>K2O</th>
<th>F2O5</th>
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<th>Cr</th>
<th>PPM</th>
<th>Sr</th>
<th>PPM</th>
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<th>PPM</th>
<th>Rb</th>
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APPENDIX 4

ANALYSES
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### Rapport C96-60985.0 (Complet)

#### Client: Mines et Exploration Noranda Inc.

**Projet:** 009

**Soumis par:** R. Parent

**Date de l'impression:** 1-APR-96

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**Copies du rapport à:** M. Rheal Parent

**Facture à:** M. Rheal Parent

**Par fax:** 819-762-9650
### Certificat d'analyse

**Rapport:** C96-60985.0 (COUPLET)

**Date de l'impression:** 1-APR-96

**Projet:** 009  **Page:** 2A

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### Certificat d'analyse

**Rapport:** C96-60985.0 (Complet)

**Projet:** 009

**Date de l'impression:** 1-APR-96

**Page:** 3B

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CERTIFICAT D'ANALYSE

A: EXPLORATIONS NORANDA LIMITEE
152, Ave. Murdoch, suite 203-4
ROUYN-NORANDA (Québec)
J9X 1E2

M. Réal Jr. Parent

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Les résultats des échantillons ci-dessus sont certifiés

par: Annie Blier B. Sc., M. Env.
chimiste, 95-111
**Report of Work Conducted After Recording Claim**

**Ontario**

**Ministry of Northern Development and Mines**

Personal information collected on this form is obtained under the authority of the Mining Act. This information will be used for correspondence. Questions about this collection should be directed to the Provincial Manager, Mining Lands, Ministry of Northern Development and Mines, Fourth Floor, 159 Cedar Street, Sudbury, Ontario, P3E 6A5, telephone (705) 670-7264.

**Instructions:**
- Please type or print and submit in duplicate.
- Refer to the Mining Act for a complete description of the work required.
- A copy of the mining claim certificate should be submitted with the report.

**Recorded Holder(s)**: MINES ET EXPLORATION NORANDA INC.

**Address**: 152, AVENUE MURDOCH, CH. 303, ROYAL-NORANDA, QUEBEC J9X 1E2

**Mining Division**: PORCUPIE

**Township/Area**: DUFF

**Dates Work Performed**: From: FEB. 12, 1996 To: FEB. 21, 1996

**Work Performed (Check One Work Group Only)**

<table>
<thead>
<tr>
<th>Work Group</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geotechnical Survey</td>
<td>HPT-EM SURVEY (13.2 KM)</td>
</tr>
<tr>
<td>Physical Work, Including Drilling</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation</td>
<td></td>
</tr>
<tr>
<td>Other Authorized Work</td>
<td></td>
</tr>
<tr>
<td>Assays</td>
<td></td>
</tr>
<tr>
<td>Assignment from Reserve</td>
<td></td>
</tr>
</tbody>
</table>

**Total Assessment Work Claimed on the Attached Statement of Costs**: $8655

**Note**: The Minister may reject for assessment work credit all or part of the assessment work submitted if the recorded holder cannot verify expenditures claimed in the statement of costs within 30 days of a request for verification.

**Persons and Survey Company Who Performed the Work (Give Name and Address of Author of Report)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUANTREE CONSULTING INC.</td>
<td>101 KING STREET PORCUPIE CNT. PONICO</td>
</tr>
<tr>
<td>S.T. COXSON AND C. WILLIAMS</td>
<td></td>
</tr>
<tr>
<td>(AUTHOR)</td>
<td></td>
</tr>
</tbody>
</table>

**Certification of Beneficial Interest**

I certify that at the time the work was performed, the claims covered in this work report were recorded in the current holder's name or held under a beneficial interest by the current recorded holder.

**Certification of Work Report**

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

**Certification of Work Report**

<table>
<thead>
<tr>
<th>Name and Address of Person Certifying</th>
<th>Date</th>
<th>Recorded Holder or Agent (Signature)</th>
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<tbody>
<tr>
<td></td>
<td>JUNE 18, 1996</td>
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</table>
Statement of Costs for Assessment Credit  
État des coûts aux fins du crédit d'évaluation  

Mining Act/Lol sur les mines  

Personal information collected on this form is obtained under the authority of the Mining Act. This information will be used to maintain a record and ongoing status of the mining claim(s). Questions about this collection should be directed to the Provincial Manager, Minings Lands, Ministry of Northern Development and Mines, 4th Floor, 159 Cedar Street, Sudbury, Ontario P3E 6A5, telephone (705) 670-7264.


### 1. Direct Costs/Coûts directs

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Amount Montant</th>
<th>Totals Total global</th>
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</thead>
<tbody>
<tr>
<td>Wages Salaries</td>
<td>Labour</td>
<td>626</td>
<td>626</td>
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<td>Supervision sur le terrain</td>
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<td>Contractor's and Consultant's Fees</td>
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<td>Supplies Used</td>
<td>Fournitures utilisées</td>
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<tr>
<td>Equipment Rental</td>
<td>Location de matériel</td>
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**Note:** The recorded holder will be required to verify expenditures claimed in this statement of costs within 30 days of a request for verification. If verification is not made, the Minister may reject for assessment work all or part of the assessment work submitted.

### 2. Indirect Costs/Coûts indirects

**Note:** When claiming Rehabilitation work Indirect costs are not allowable as assessment work. Pour le remboursement des travaux de réhabilitation, les coûts indirects ne sont pas admissibles en tant que travaux d'évaluation.

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<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Amount Montant</th>
<th>Totals Total global</th>
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</tbody>
</table>

**Sub Total of Indirect Costs**  
Total partiel des coûts indirects  

**Note:** The recorded holder will be required to verify expenditures claimed in this statement of costs within 30 days of a request for verification. If verification is not made, the Minister may reject for assessment work all or part of the assessment work submitted.

### Filing Discounts

1. Work filed within two years of completion is claimed at 100% of the above Total Value of Assessment Credit.

2. Work filed three, four or five years after completion is claimed at 50% of the above Total Value of Assessment Credit. See calculations below:

<table>
<thead>
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<th>Total Value of Assessment Credit</th>
<th>Total Assessment Claimed</th>
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</thead>
<tbody>
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<td>x 0.50</td>
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</tbody>
</table>

### Remises pour dépôt

1. Les travaux déposés dans les deux ans suivant leur achèvement sont remboursés à 100 % de la valeur totale susmentionnée du crédit d'évaluation.

2. Les travaux déposés trois, quatre ou cinq ans après leur achèvement sont remboursés à 50 % de la valeur totale du crédit d'évaluation susmentionné. Voir les calculs ci-dessous:

<table>
<thead>
<tr>
<th>Valeur totale du crédit d'évaluation</th>
<th>Évaluation total de dépôt</th>
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<td>x 0.50</td>
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</table>
**Details for Work Report # NEOM96.018**

<table>
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<tr>
<th>Work Report# for Applying Reserve</th>
<th>Claim Number (see note 2)</th>
<th>Value of Assessment Work Done on this Claim</th>
<th>Value Applied to this Claim</th>
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</thead>
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<td>8,655.00</td>
<td>7,055.00</td>
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</table>

<table>
<thead>
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<th></th>
<th>Value Assigned From this Claim</th>
<th>Reserve Work to be deducted From Total Reserve</th>
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**Total**

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<th>Total Number of Claims</th>
<th>Total Value Work Done</th>
<th>Total Value Work Applied</th>
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<tr>
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<td>1,600.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Credits you are claiming in this report may be cut back. In order to minimize the adverse affects of such deletions, please indicate from which claims you wish to prioritize the deletion of credits. Please mark (x) one of the following:

1.Credits are to be cut back starting with the claims listed last, working backwards.

**RECEIVED**

AUG 19 1976

MINING LANDS BRANCH
Report of Work Conducted After Recording Claim

Ministry of Northern Development and Mines
Ontario

Personal information collected on this form is obtained under the authority of the Mining Act. This information will be used for correspondence. Questions about this collection should be directed to the Provincial Manager, Mining Lands, Ministry of Northern Development and Mines, Fourth Floor, 159 Cedar Street, Sudbury, Ontario, P3E 6A5, telephone (705) 670-7264.

Instructions: - Please type or print and submit in duplicate.
- Refer to the Mining Act and Regulations for requirements of filing assessment work or consult the Mining Recorder.
- A separate copy of this form must be completed for each Work Group.
- Technical reports and maps must accompany this form in duplicate.
- A sketch, showing the claims the work is assigned to, must accompany this form.

<table>
<thead>
<tr>
<th>Recorded Holder(s)</th>
<th>Mines Bt Exploration Noranda Inc</th>
<th>Client No.</th>
<th>176208</th>
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<tr>
<td>Address</td>
<td>152 Avenue Murdoch, Ch. 903</td>
<td>Telephone No.</td>
<td>819-769-0813</td>
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<td>Mining Division</td>
<td>Porcupine</td>
<td>Township/Area</td>
<td>Duff</td>
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<tr>
<td>Dates Work Performed</td>
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Work Performed (Check One Work Group Only)

<table>
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<tr>
<th>Work Group</th>
<th>Type</th>
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<tbody>
<tr>
<td>Geotechnical Survey</td>
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<tr>
<td>Physical Work, Including Drilling</td>
<td>DIAMOND DRILLING (D.R. 42-01 = 1950 H)</td>
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<td>Rehabilitation</td>
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<td>Other Authorized Work</td>
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<td>Assays</td>
<td>DRILL CORE (18 SAMPLES)</td>
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<td>Assignment from Reserve</td>
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</table>

Total Assessment Work Claimed on the Attached Statement of Costs $21,315.00

Note: The Minister may reject for assessment work credit all or part of the assessment work submitted if the recorded holder cannot verify expenditures claimed in the statement of costs within 30 days of a request for verification.

Persons and Survey Company Who Performed the Work (Give Name and Address of Author of Report)

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Dominik Drilling</td>
<td>407 King St, Timmins, Ont., P0N 1C0</td>
</tr>
<tr>
<td>Chimitel Ltd.</td>
<td>325, Rue Harricana, Val D'or (Que), J9P 3X6</td>
</tr>
<tr>
<td>Tehui Lab S.G.B. Abitibi Inc.</td>
<td>184, Principale, Ste Germaine de Rocce (Que), J0X1M0</td>
</tr>
</tbody>
</table>

(attach a schedule if necessary)

Certification of Beneficial Interest * See Note No. 1 on reverse side

I certify that at the time the work was performed, the claims covered in this work report were recorded in the current holder's name or held under a beneficial interest by the current recorded holder.

<table>
<thead>
<tr>
<th>Date</th>
<th>Recorded Holder or Agent (Signature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 15, 1996</td>
<td>[Signature]</td>
</tr>
</tbody>
</table>

Certification of Work Report

I certify that I have a personal knowledge of the facts set forth in this Work report, having performed the work or witnessed same during and/or after

[Signatures]
<table>
<thead>
<tr>
<th>Work Report# for Applying Reserve</th>
<th>Claim Number (see note 2)</th>
<th># of Claim Units</th>
<th>Value of Assessment Work Done on this Claim</th>
<th>Value Applied to this Claim</th>
<th>Values Assigned from this Claim</th>
<th>Reserve: Work to be Claimed at a Future Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>P 1,193,104</td>
<td></td>
<td></td>
<td>21,315.00</td>
<td></td>
<td></td>
<td>21,315.00</td>
</tr>
</tbody>
</table>

Credits you are claiming in this report may be cut back. In order to minimize the adverse affects of such deletions, please indicate from which claims you wish to prioritize the deletion of credits. Please mark (x) one of the following:

1. Credits are to be cut back starting with the claims listed last, working backwards.
2. Credits are to be cut back equally over all claims contained in this report of work.
**Statement of Costs for Assessment Credit**

**État des coûts aux fins du crédit d’évaluation**

**Mining Act/Loi sur les mines**

Personal information collected on this form is obtained under the authority of the Mining Act. This information will be used to maintain a record and ongoing status of the mining claim(s). Questions about this collection should be directed to the Provincial Manager, Minings Lands, Ministry of Northern Development and Mines, 4th Floor, 159 Cedar Street, Sudbury, Ontario P3E 6A5, telephone (705) 670-7264.

### 1. Direct Costs/Coûts directs

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Amount</th>
<th>Totals Total global</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wages</td>
<td>Labour</td>
<td>3500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Main-d’œuvre</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Supervision</td>
<td>1500</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>Supervision sur le terrain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractor's</td>
<td>Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and Consultant's Fees</td>
<td>DRILLING</td>
<td>14830</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASSAYING</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>Supplies Used</td>
<td>Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fournitures utilisées</td>
<td></td>
<td>15280</td>
<td></td>
</tr>
<tr>
<td>Equipment Rental</td>
<td>Location de matériel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Direct Costs**

Total des coûts directs

20280

**Note:** The recorded holder will be required to verify expenditures claimed in this statement of costs within 30 days of a request for verification. If verification is not made, the Minister may reject for assessment work all or part of the assessment work submitted.

### 2. Indirect Costs/Coûts indirects

**Note:** When claiming Rehabilitation work Indirect costs are not allowable as assessment work. For the remboursement des travaux de réhabilitation, les coûts indirects ne sont pas admissibles en tant que travaux d’évaluation.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Amount</th>
<th>Totals Total global</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>COMPACT VEHICULE</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GAS R. MAINTENANCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FOCY SR. LODGING D. PERSOOS</td>
<td>385</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nourriture et hébergement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mobilisation and Demobilisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mobilisation et démobilisation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sub Total of Indirect Costs**

Total partiel des coûts indirects

1835

Amount Allowable (not greater than 20% of Direct Costs)

Montant admissible (n’excédant pas 20 % des coûts directs)

**Total Value of Assessment Credit**

Valeur totale du crédit d’évaluation

1635

**Note:** Le titulaire enregistré sera tenu de vérifier les dépenses demandées dans le présent état des coûts dans les 30 jours suivant une demande à cet effet. Si la vérification n’est pas effectuée, le ministre peut rejeter tout ou partie des travaux d’évaluation présentés.

### Filing Discounts

1. Work filed within two years of completion is claimed at 100% of the above Total Value of Assessment Credit.

2. Work filed three, four or five years after completion is claimed at 50% of the above Total Value of Assessment Credit. See calculations below:

<table>
<thead>
<tr>
<th>Total Value of Assessment Credit</th>
<th>Total Assessment Claimed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x 0.50</td>
</tr>
</tbody>
</table>

**Remises pour dépôt**

1. Les travaux déposés dans les deux ans suivant leur achèvement sont remboursés à 100 % de la valeur totale susmentionnée du crédit d’évaluation.

August 30, 1996

Mining Recorder
Ministry of Northern Development & Mines
60 Wilson Ave.
Timmins, Ontario
P4N 2S7

Dear Mr. White:

SUBJECT: APPROVAL OF ASSESSMENT WORK CREDIT ON MINING LAND, CLAIM(S) 1193104 (ET AL.) IN DUFF TOWNSHIP(AREA)

Assessment work credit has been approved as outlined on the Declaration of Assessment Work Form accompanying this submission. The credit has been approved under Section 14, Geophysics(EM) of the Assessment Work Regulation.

The approval date is August 30, 1996. Please indicate this approval on the claim record.

If you have any questions regarding this correspondence, please contact Bruce Gates at (705) 670-5856.

Yours sincerely,

ORIGINAL SIGNED BY:

Ron C. Gashinski
Senior Manager, Mining Lands Section
Mines and Minerals Division

cc: Resident Geologist
Timmins, Ontario
Subdivision of this township into lots and concessions was annulled May 10, 1963.

The information that appears on this map has been compiled from various sources, and accuracy is not guaranteed. Those wishing to stake mining claims should consult with the mining recorder. Ministry of Natural Resources, Ontario.
REFERENCES

AREAS WITHDRAWN FROM DISPOSITION

M.R.O. - MINING RIGHTS ONLY
S.R.O. - SURFACE RIGHTS ONLY
M.+ S. - MINING AND SURFACE RIGHTS

DMerption Order No. On* Disposition Fito
SEC 36/90 W.1/80 8/8/80 M -c S
Minna a suRface memo wn on* unoen raciiON *c
or ne MINING *CT n.a.o. IOSQ—JBQKR w U

The information that appears on this map is compiled from various sources. Accuracy is not guaranteed. Those wishing to stake mining claims should consult with the mining recorder. Consult the 1963 Drainage Act, R.S.O. 1970, Chap. 350, Sec. 6, Subsec. 1.

Subdivision of this township into lots and concessions was annulled May 10, 1963.

SAND and GRAVEL

Quality PERMIT
AU'.- 1 6 1996

The information that appears on the map has been compiled from various sources, and accuracy is not guaranteed. Those wishing to stake mining claims should consult with the mining recorder. Consult the 1963 Drainage Act, R.S.O. 1970, Chap. 350, Sec. 6, Subsec. 1.

Subdivision of this township into lots and concessions was annulled May 10, 1963.

TOWNSHIP
DUFF
M.N.R. ADMINISTRATIVE DISTRICT
COCHRANE
MINING DIVISION
PORCUPINE
LAND TITLES/REGISTRY DIVISION
COCHRANE

SCALE: 1 INCH = 40 CHAINS

LEGEND

DISPOSITION OF CROWN LANDS

TYPE OF DOCUMENT
PATENT, SURFACE & MINING RIGHTS
- SURFACE RIGHTS ONLY
- MINING RIGHTS ONLY
LEASE, SURFACE & MINING RIGHTS
- SURFACE RIGHTS ONLY
- MINING RIGHTS ONLY
LICENSE OF OCCUPATION
ORDER-IN-COUNCIL
RESERVATION
CANCELLED
SAND & GRAVEL
LAND USE PERMIT

NOTE: MINING RIGHTS IN PARCELS PATENTED PRIOR TO MAY 10, 1963, VESTED IN ORIGINAL PATENTEE BY THE PUBLIC LANDS ACT, R.S.O. 1970, CHAP. 350, SEC. 63, SUBSEC. 1.

SCALE: 1 INCH = 40 CHAINS

M.N.R. ADMINISTRATIVE DISTRICT
COCHRANE
MINING DIVISION
PORCUPINE
LAND TITLES/REGISTRY DIVISION
COCHRANE

Ministry of Natural Resources Branch
NORANDA EXPLORATION INC.
DUFF TOWNSHIP
NORTHEASTERN ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Total Secondary Electromagnetic Field (dB/dt)
X, Y and Z Components, Channel 16

Transmitter Frequency:
30 Hz (50% duty cycle)

Tx Loop Size:
1400m x 1200m

Tx Loop Location:
0+00N-4+00N, 4+00E-8+00W

Transmitter Current:
24 Amps

Transmitter Turn-Off Time:
425 us

Station Interval:
25 meters

Contour Intervals:
1, 5 nanoV/m

Receiver Coil Orientation:
Hx - positive up
Hy - positive east
Hz - positive north

Date:
February, 1996

Instrumentation:
Rx = Digital Prm (3x20 Channels)
& Geonics 3D Coil (3x200nr2)
Tx = Inge GDT-25 (25 kW)

Surveyed & Processed by:
QUANTEC CONSULTING INC.
DWG. NO. C328-DFF-1F-2
NORANDA EXPLORATION INC
DUFF TOWNSHIP
NORTHEASTERN ONTARIO

HPTEM IN-LOOP PROFILING SURVEY
Total Secondary Electromagnetic Field (dB/dt)
X, Y and Z Components, Channel 16

Transmitter Frequency: 30 Hz (50% duty cycle)
Transmitter Size: 1400m x 1200m
Transmitter Location: 0400N-1400E-8100W
Transmitter Current: 24 Amps
Transmitter Turn-Off Time: 425 us
Station Interval: 25 meters
Vertical Profile Scale: 1 cm = 10 nanovolt/amp2
Receiver Coil Orientation:
Hx = positive up
Hy = positive east
Hz = positive north

Date: February, 1996
Instrumentation: Rx = Digital Proton (3x20 Channels)
& Geonics Q Coil (3x200m2)
Tx = Zeta (25) (25 kW)

Surveyed & Processed by
QUANTEC CONSULTING INC.
Dwg. No. C.528-D37-1F