August 10, 1984

Re: Savant Lake Claim Group
Dighem Report on Dighem III Survey of the Savant Lake Area for Cumberland Resources Ltd., July 6, 1984 by D.C. Fraser

The attached report is a combined helicopter-borne magnetic and electromagnetic survey from which survey maps for each of the three areas were produced. The maps produced were electromagnetic anomalies, resistivity and total field magnetics and enhanced magnetics. (sheet 1, Evans Lake claim group; sheet 2, Shoehorn claim group; sheet 3, Houghton-Island Lake claim group)

A total of 248 km of survey was flown over three claim blocks totalling 164 claims in the Houghton, Armit, Grebe and Evans Lakes claim maps. All claim groups cover similar geological stratigraphy and structure. Claim boundaries and numbers are superimposed on the enclosed geophysical maps. A detailed list of the claim numbers is attached.

The properties are recorded in the name of Cumberland Resources Limited and owned through legal agreement by Cumberland Resources Limited, Thunder Bay, Ontario 50%; Vestor Explorations Limited, Richmond, B.C. 25% and Redfern Resources Limited, Richmond, B.C. 25%. By agreement of the partners, Cumberland Resources Limited is the manager in charge of exploration on these properties.

All claims were recorded in March, April and December 1983 and are presently held in good standing.

This Dighem III Survey was conducted to fulfil assessment credit Requirements on each claim. In August of 1983 a reconnaissance geochemical survey was carried out along selected claim lines. A total of 501 samples were analysed for 26 elements by the ICP method at Min-En Laboratories in North Vancouver. Copies of this geochemical report were filed with the Ontario Mineral Exploration Program. Encouraging anomalous results led to the airborne geophysical survey.

LOCATION AND ACCESS

The properties are located south of Kashaweogama Lake, approximately 15 km north and northwest of the village of Savant Lake, Ontario. The Houghton-Island Lakes property extends from the northeast corner of Houghton Lake to the west end of Island Lake. The Shoehorn Lake property is adjacent to the north and west portions of Shoehorn Lake on the Armit - Grebe Lakes claim maps. The Evans Lake property is situated south of the Marchington Road west of Evans Lake. Highway 599 runs through the middle of this group. All properties can be reached by conventional vehicles via gravel pulpwood haul-roads, the Marchington Road and Highway 599.

HISTORY AND PREVIOUS WORK

The general area has been explored for precious, ferrous and non-ferrous metal bearing deposits since the turn of the century. Subsequent to the discoveries of viable massive sulfide base-metal deposits at Sturgeon Lake during 1969 and 1970, the Savant Lake area was extensively investigated for similar occurrences. Airborne and ground geophysical surveys were followed with the testing of anomalies by short, mostly isolated diamond drill holes. Umex Corporation has outlined 300,000 tons of massive sulfides to the southeast along the Marchington Road.

Conductive material was encountered during a horizontal loop electromagnetic survey by Noranda Exploration Company Limited on the Houghton-Island Lake claim group. Hudson Bay Oil and Gas drilled a single short hole on the most intense anomaly along this conductor and encountered massive sulfides containing insignificant base-metal values.

Umex Corporation Limited drilled one hole on what is now claim Pa701427. The core contained approximately 46 meters of dacitic tuff and associated volcanogenic sediments all containing disseminated sulfide minerals.

Umex Corporation Limited drilled 2500 feet in 4 holes in the southern claims of the Evans Lake group to encounter mainly intermediate to felsic tuffs with traces of sulfides.

PROPERTY GEOLOGY

The Savant Lake properties are underlain by metavolcanic rocks varying in composition from mafic through intermediate to felsic with the latter two predominating. The majority of the rocks are fragmented and tuffaceous with some fine grained flow facies. Several metasedimentary horizons are interlayered with the metavolcanic rocks. The metasedimentary rocks range from clastic (sandstone, siltstone) to chemical (iron formation) in composition.

The metavolcanics and metasediments occupy the west limits of an isoclinally folded anticlinal sequence that faces north and east and plunges 50-70 degrees to the east-northeast. Within the property boundaries, the bedding and schistosity directions are primarily at azimuths of 80 to 100 degrees with steep dips. In the Evans Lake area the structures trend to the southeast (150°).

This note is prefaced to the geophysical report to comply with the Ontario Ministry of Natural Resources requirements for submitting geophysical survey reports.

Submitted by:

W. E. McCrindle, Geologist,
Cumberland Resources Limited.

REPORT NO. 203

DIGHEM^{III} SURVEY

OF THE

SAVANT LAKE AREA, ONTARIO

FOR

CUMBERLAND RESOURCES LIMITED

BY

DIGHEM LIMITED

TORONTO, ONTARIO
JULY 6, 1984

D.C. FRASER
PRESIDENT

SUMMARY AND RECOMMENDATIONS

A total of 248 km of survey was flown in April 1984, over three claim blocks held by Cumberland Resources Limited in the Savant Lake area.

The survey outlined a few discrete bedrock conductors in the Evans Lake and Houghton Lake areas. Most of these anomalies appear to warrant further investigation using appropriate surface exploration techniques. There were no attractive anomalies in the Grebe-Armit Lakes area, although some conductive structural features were identified.

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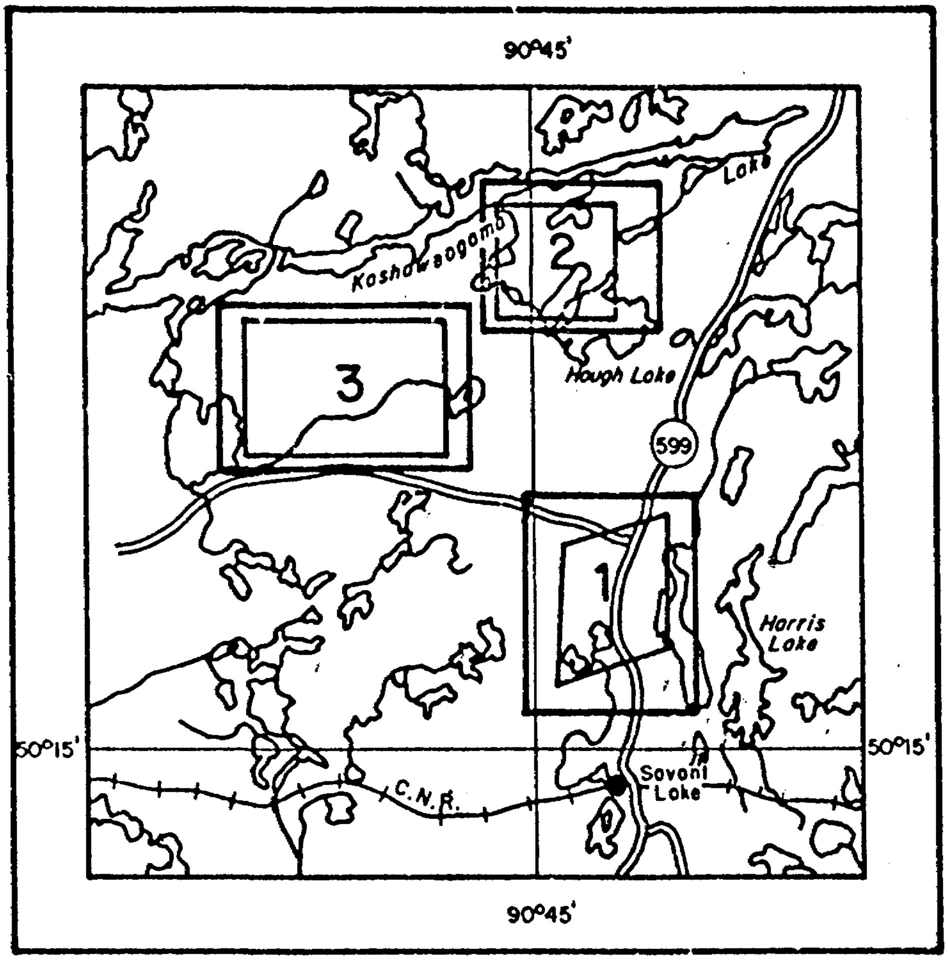
LOCATION MAP



SCALE 1:250,000

FIGURE 1

THE SURVEY AREA

52J07NE0010 52J07SW0026 GREBE LAKE

020C

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INTRODUCTION

A DIGHEM[III] survey totalling 248 line-km was flown with a 200 m line-spacing for Cumberland Resources Limited, on April 20 and 21, 1984, in the Savant Lake area of Ontario (Figure 1).

The Astar turbine helicopter NSM flew at an average airspeed of 110 km/h with an EM bird height of approximately 30 m. Ancillary equipment consisted of a Sonotek PMH 5010 magnetometer with its bird at an average height of 45 m, a Sperry radio altimeter, a Geocam sequence camera, an RMS GR33 analog recorder, a Sonotek SDS 1200 digital data acquisition system and a DigiData 1640 9-track 800-bpi magnetic tape recorder. The analog equipment recorded four channels of EM data at approximately 900 Hz, two channels of EM data at approximately 7200 Hz, two ambient EM noise channels (for the coaxial and coplanar receivers), two channels of magnetics (coarse and fine count), and a channel of radio altitude. The digital equipment recorded the above parameters, with the EM data to a sensitivity of 0.2 ppm and the magnetic field to one nT (i.e., one gamma).

Appendix A provides details on the data channels, their respective sensitivities, and the flight path recovery procedure. Noise levels of less than 2 ppm are generally maintained for wind speeds up to 35 km/h. Higher winds may cause the system to be grounded because excessive bird swinging produces difficulties in flying the helicopter. The swinging results from the 5 m^2 of area which is presented by the bird to broadside gusts. The DIGHEM system nevertheless can be flown under wind conditions that seriously degrade other AEM systems.

The anomalies shown on the electromagnetic anomaly map are based on a near-vertical, half plane model. This model best reflects "discrete" bedrock conductors. Wide bedrock conductors or flat-lying conductive units, whether from surficial or bedrock sources, may give rise to very broad anomalous responses on the EM profiles. These may not appear on the electromagnetic anomaly map if they have a regional character rather than a locally anomalous character. These broad conductors, which more closely approximate a half space model, will be maximum coupled to the horizontal (coplanar) coil-pair and are clearly evident on the resistivity map. The resistivity map, therefore, may be more valuable than the electromagnetic anomaly map, in areas where broad or flat-lying conductors are considered to be of importance.

In areas where magnetite causes the inphase components to become negative (especially the Grebe-Armit Lakes group; sheet 2), the apparent conductance and depth of EM anomalies may be unreliable.

There are several areas where EM responses are evident only on the quadrature components, indicating zones of poor conductivity. Where these responses are coincident with strong magnetic anomalies, it is possible that the inphase component amplitudes have been suppressed by the effects of magnetite. Most of these poorly-conductive magnetic features give rise to resistivity anomalies which are only slightly below background. These weak features are evident on the resistivity map but may not be shown on the electromagnetic anomaly map. If it is expected that poorly-conductive sulphides may be associated with magnetite-rich units, some of these weakly anomalous features may be of interest.

SECTION I: SURVEY RESULTS

CONDUCTORS IN THE SURVEY AREA

The survey covered three areas with 248 km of flying, the results of which are shown on three separate map sheets for each parameter. Tables I-1 to I-3 summarize the EM responses for each of the three areas with respect to conductance grade and interpretation.

The electromagnetic anomaly map shows the anomaly locations with the interpreted conductor type, dip, conductance and depth being indicated by symbols. Direct magnetic correlation is also shown if it exists. The strike direction and length of the conductors are indicated when anomalies can be correlated from line to line. When studying the map sheets for follow-up planning, consult the anomaly listings appended to this report to ensure that none of the conductors are overlooked.

The three surveys each yielded a map of electromagnetic anomalies and contour maps of resistivity, total field magnetics, and enhanced magnetics.

The enhanced magnetic map provides greater detail and better sensitivity than the total field magnetic map. This can be seen in many places, e.g., on sheet 1 at EM anomaly 17E*.

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* This refers to anomaly E on line 17.

TABLE I-1

EM ANOMALY STATISTICS OF THE EVANS LAKE AREA (Sheet 1)
(68 km of survey)

CONDUCTOR GRADE	CONDUCTANCE RANGE	NUMBER OF RESPONSES
6	> 99 MHOS	0
5	50-99 MHOS	0
4	20-49 MHOS	2
3	10-19 MHOS	0
2	5- 9 MHOS	1
1	< 5 MHOS	25
X	INDETERMINATE	9
TOTAL		37

CONDUCTOR MODEL	MOST LIKELY SOURCE	NUMBER OF RESPONSES
B	DISCRETE BEDROCK	4
S	COVER	33
TOTAL		37

(SEE EM MAP LEGEND FOR EXPLANATIONS)

TABLE I-2

EM ANOMALY STATISTICS OF THE GREBE-ARMIT LAKES AREA (Sheet 2)
(61 km of survey)

CONDUCTOR GRADE	CONDUCTANCE RANGE	NUMBER OF RESPONSES
6	> 99 MHOS	0
5	50-99 MHOS	0
4	20-49 MHOS	0
3	10-19 MHOS	0
2	5- 9 MHOS	4
1	< 5 MHOS	63
X	INDETERMINATE	6
TOTAL		73

CONDUCTOR MODEL	MOST LIKELY SOURCE	NUMBER OF RESPONSES
S	COVER	73

(SEE EM MAP LEGEND FOR EXPLANATIONS)

TABLE I-3

EM ANOMALY STATISTICS OF THE HOUGHTON LAKE AREA (Sheet 3)
(119 km of survey)

CONDUCTOR GRADE	CONDUCTANCE RANGE	NUMBER OF RESPONSES
6	> 99 MHOS	0
5	50-99 MHOS	2
4	20-49 MHOS	0
3	10-19 MHOS	0
2	5- 9 MHOS	7
1	< 5 MHOS	80
X	INDETERMINATE	78
TOTAL		167

CONDUCTOR MODEL	MOST LIKELY SOURCE	NUMBER OF RESPONSES
B	DISCRETE BEDROCK	12
S	COVER	155
TOTAL		167

(SEE EM MAP LEGEND FOR EXPLANATIONS)

VLF-EM data were recorded although this was not mandated in the survey agreement. The equipment was available, and so it was used. The data appear as profiles on the analog chart records. It can be used to produce contour maps if Cumberland Resources would find this helpful, e.g., if additional assessment credits were beneficial.

The three survey areas are described below.

Evans Lake (Sheet 1)

The Evans Lake area is highly resistive with background values of 6,000 ohm-m and greater. The lakes tend to be poorly conductive, having resistivities in excess of 1,000 ohm-m.

Four singe-line bedrock conductors were located. These are 7G*, 15B, 19E and 22A. The latter three occur along a weak magnetic unit which is oest defined on the enhanced magnetic map. Conductor 19E is by far the strongest, as can be seen on the resistivity map, where a low of 10 ohm-m occurs.

There is a possibility that 7E-10C represents a slightly conductive structural zone in the bedrock.

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* Anomaly G on line 7.

However, the most probable cause is poorly conductive lake bottom sediments. The resistivity contours tend to follow the lake shore, supporting a lake bottom origin for the conductivity.

Grebe-Armit Lakes (Sheet 2)

The Grebe-Armit Lakes survey area is quite variable in resistivity. The dry ground is extremely resistive, often in excess of 8,000 ohm-m. Where lakes occur, resistivities may drop to as low as 25 ohm-m.

Some resistivity contour patterns may reflect very weakly conductive zones in the bedrock. These patterns run parallel to the magnetic highs as opposed to those resistivity contours which are bounded by lakes. For example, a relatively strong resistivity low (100 ohm-m) occurs for 102B-103D. It coincides with a lake, suggesting it reflects conductive lake bottom sediments. However, there is a small possibility that a bedrock conductor could occur beneath this lake. If so, it may extend eastward to 109D as suggested by the resistivity contour patterns. Other such zones can be seen where resistivity contour patterns run parallel to the enhanced magnetic contours. Apart from such zones, there are no obvious bedrock conductors in the survey area.

The magnetic activity in the Grebe-Armit Lakes area is exceedingly strong. The magnetite has produced strongly negative responses on the inphase EM channels. One DIGHEM channel ("FEO%") on the digital profiles is calibrated in percent magnetite by weight. This can be used to prepare a magnetite contour map if Cumberland Resources should want this done. The magnetite parameter is derived from the EM data. The magnetite map can be quite useful for mapping purposes as it often has a better resolution than the magnetic maps.

Houghton Lake (Sheet 3)

The Houghton Lake survey area is characterized by background resistivities in the range of 1,000 to 8,000 ohm-m. Resistivities commonly drop to 300 ohm-m over lakes.

There appears to be a few bedrock conductor targets. These are described below.

Conductor 215A is a single-line, weak EM response with a very weak resistivity correlation. It occurs on the flank of an enhanced magnetic high. It could be caused by a patch of conductive overburden, but a bedrock source is more likely.

Conductor 216C-217B is an attractive target with excellent conductivity. It yielded a resistivity low of 10 ohm-m, and occurs on the flank of a magnetic high.

Conductor 224A is a possible bedrock conductor. It has a poor resistivity association and a strong magnetic correlation.

Conductors 230F and 235C are two single-line weak EM responses. They may occur along a common horizon, as suggested by the resistivity map; if so, then EM anomalies 231xB, 232B, 233B, 234xC and 236B have a similar source. All the above named anomalies occur along an enhanced magnetic high.

The long conductor 232G-236D appears to reflect a bedrock source of weak to moderate conductivity. It occurs on the flank of a magnetic high. The resistivity map implies that the conductive zone may extend westward to 226C. However, the EM anomalies to the west have the appearance of conductive overburden. A field check should show that the interpretation presented herein is correct. Note also anomaly 232I which may reflect a bedrock source.

SECTION II: BACKGROUND INFORMATION

ELECTROMAGNETICS

DIGHEM electromagnetic responses fall into two general classes, discrete and broad. The discrete class consists of sharp, well-defined anomalies from discrete conductors such as sulfide lenses and steeply dipping sheets of graphite and sulfides. The broad class consists of wide anomalies from conductors having a large horizontal surface such as flatly dipping graphite or sulfide sheets, saline water-saturated sedimentary formations, conductive overburden and rock, and geothermal zones. A vertical conductive slab with a width of 200 m would straddle these two classes.

The vertical sheet (half plane) is the most common model used for the analysis of discrete conductors. All anomalies plotted on the electromagnetic map are analyzed according to this model. The following section entitled **Discrete conductor analysis** describes this model in detail, including the effect of using it on anomalies caused by broad conductors such as conductive overburden.

The conductive earth (half space) model is suitable for broad conductors. Resistivity contour maps result from the use of this model. A later section entitled **Resistivity mapping** describes the method further, including the effect of using it on anomalies caused by discrete conductors such as sulfide bodies.

Geometric interpretation

The geophysical interpreter attempts to determine the geometric shape and dip of the conductor. This qualitative interpretation of anomalies is indicated on the map by means of interpretive symbols (see EM map legend). Figure II-1 shows typical DIGHEM anomaly shapes and the interpretive symbols for a variety of conductors. These classic curve shapes are used to guide the geometric interpretation.

Discrete conductor analysis

The EM anomalies appearing on the electromagnetic map are analyzed by computer to give the conductance (i.e., conductivity-thickness product) in mhos of a vertical sheet model. This is done regardless of the interpreted geometric shape of the conductor. This is not an unreasonable procedure, because the computed conductance increases as the electrical quality of the conductor increases, regardless of its true shape. DIGHEM anomalies are divided into six

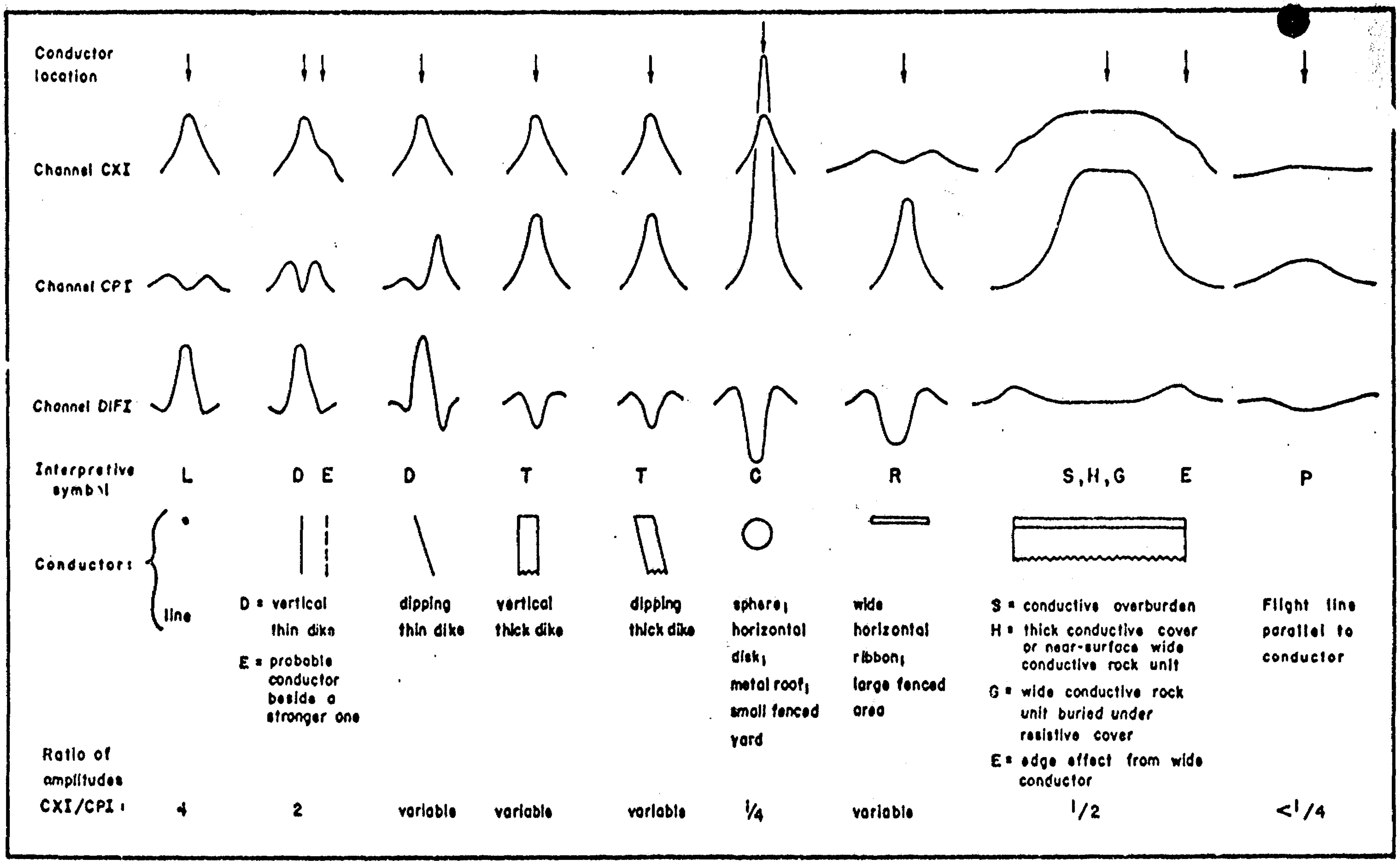

Figure II - 1 Typical DIGHEM anomaly shapes grades of conductance, as shown in Table II-1. The conductance in mhos is the reciprocal of resistance in ohms.

Table II-1. EM Anomaly Grades

Anomaly Grade	Mho Range
6	> 99
5	50 - 99
4	20 - 49
3	10 - 19
2	5 - 9
1	< 5

The conductance value is a geological parameter because it is a characteristic of the conductor alone; it generally is independent of frequency, and of flying height or depth of burial apart from the averaging over a greater portion of the conductor as height increases.[1] Small anomalies from deeply buried strong conductors are not confused with small anomalies from shallow weak conductors because the former will have larger conductance values.

Conductive overburden generally produces broad EM responses which are not plotted on the EM maps. However, patchy conductive overburden in otherwise resistive areas

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[1] This statement is an approximation. DIGHEM, with its short coil separation, tends to yield larger and more accurate conductance values than airborne systems having a larger coil separation.

can yield discrete anomalies with a conductance grade (cf. Table II-1) of 1, or even of 2 for conducting clays which have resistivities as low as 50 ohm-m. In areas where ground resistivities can be below 10 ohm-m, anomalies caused by weathering variations and similar causes can have any conductance grade. The anomaly shapes from the multiple coils often allow such conductors to be recognized, and these are indicated by the letters S, H, G and sometimes E on the map (see EM legend).

For bedrock conductors, the higher anomaly grades indicate increasingly higher conductances. Examples: DIGHEM's New Insco copper discovery (Noranda, Canada) yielded a grade 4 anomaly, as did the neighbouring copper-zinc Magusi River ore body; Mattabi (copper-zinc, Sturgeon Lake, Canada) and Whistle (nickel, Sudbury, Canada) gave grade 5; and DIGHEM's Montcalm nickel-copper discovery (Timmins, Canada) yielded a grade 6 anomaly. Graphite and sulfides can span all grades but, in any particular survey area, field work may show that the different grades indicate different types of conductors.

Strong conductors (i.e., grades 5 and 6) are characteristic of massive sulfides or graphite. Moderate conductors (grades 3 and 4) typically reflect sulfides of a less massive character or graphite, while weak bedrock conductors (grades 1 and 2) can signify poorly connected graphite or heavily disseminated sulfides. Grade 1 conductors may not respond to ground EM equipment using frequencies less than 2000 Hz.

The presence of sphalerite or gangue can result in ore deposits having weak to moderate conductances. As an example, the three million ton lead-zinc deposit of Restigouche Mining Corporation near Bathurst, Canada, yielded a well defined grade 1 conductor. The 10 percent by volume of sphalerite occurs as a coating around the fine grained massive pyrite, thereby inhibiting electrical conduction.

Faults, fractures and shear zones may produce anomalies which typically have low conductances (e.g., grades 1 and 2). Conductive rock formations can yield anomalies of any conductance grade. The conductive materials in such rock formations can be salt water, weathered products such as clays, original depositional clays, and carbonaceous material.

On the electromagnetic map a letter identifier and an interpretive symbol are plotted beside the EM grade symbol. The horizontal rows of dots, under the interpretive symbol, indicate the anomaly amplitude on the flight record. The vertical column of dots, under the anomaly letter, gives the estimated depth. In areas where anomalies are crowded, the letter identifiers, interpretive symbols and dots may be obliterated. The EM grade symbols, however, will always be discernible, and the obliterated information can be obtained from the anomaly listing appended to this report.

The purpose of indicating the anomaly amplitude by dots is to provide an estimate of the reliability of the conductance calculation. Thus, a conductance value obtained from a large ppm anomaly (3 or 4 dots) will tend to be accurate whereas one obtained from a small ppm anomaly (no dots) could be quite inaccurate. The absence of amplitude dots indicates that the anomaly from the coaxial coil-pair is 5 ppm or less on both the inphase and quadrature channels. Such small anomalies could reflect a weak conductor at the surface or a stronger conductor at depth. The conductance grade and depth estimate illustrates which of these possibilities fits the recorded data best.

Flight line deviations occasionally yield cases where two anomalies, having similar conductance values but dramatically different depth estimates, occur close together on the same conductor. Such examples illustrate the reliability of the conductance measurement while showing that the depth estimate can be unreliable. There are a number of factors which can produce an error in the depth estimate, including the averaging of topographic variations by the altimeter, overlying conductive overburden, and the location and attitude of the conductor relative to the flight line. Conductor location and attitude can provide an erroneous depth estimate because the stronger part of the conductor may be deeper or to one side of the flight line, or because it has a shallow dip. A heavy tree cover can also produce errors in depth estimates. This is because the depth estimate is computed as the distance of bird from conductor, minus the altimeter reading. The altimeter can lock onto the top of a dense forest canopy. This situation yields an erroneously large depth estimate but does not affect the conductance estimate.

Dip symbols are used to indicate the direction of dip of conductors. These symbols are used only when the anomaly shapes are unambiguous, which usually requires a fairly resistive environment.

A further interpretation is presented on the EM map by means of the line-to-line correlation of anomalies, which is based on a comparison of anomaly shapes on adjacent lines. This provides conductor axes which may define the geological structure over portions of the survey area. The absence of conductor axes in an area implies that anomalies could not be correlated from line to line with reasonable confidence.

DIGHEM electromagnetic maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a follow-up program. The actual conductance values are printed in the attached anomaly list for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of conductors in terms of length, strike and dip, geometric shape, conductance, depth, and thickness (see below). The accuracy is comparable to an interpretation from a high quality ground EM survey having the same line spacing.

The attached EM anomaly list provides a tabulation of anomalies in ppm, conductance, and depth for the vertical sheet model. The EM anomaly list also shows the conductance and depth for a thin horizontal sheet (whole plane) model, but only the vertical sheet parameters appear on the EM map. The horizontal sheet model is suitable for a flatly dipping thin bedrock conductor such as a sulfide sheet having a thickness less than 10 m. The list also shows the resistivity and depth for a conductive earth (half space) model, which is suitable for thicker slabs such as thick conductive overburden. In the EM anomaly list, a depth value of zero for the conductive earth model, in an area of thick cover, warns that the anomaly may be caused by conductive overburden.

Since discrete bodies normally are the targets of EM surveys, local base (or zero) levels are used to compute local anomaly amplitudes. This contrasts with the use of true zero levels which are used to compute true EM amplitudes. Local anomaly amplitudes are shown in the EM anomaly list and these are used to compute the vertical sheet parameters of conductance and depth. Not shown in the EM anomaly list are the true amplitudes which are used to compute the horizontal sheet and conductive earth parameters.

X-type electromagnetic responses

DIGHEM maps contain x-type EM responses in addition to EM anomalies. An x-type response is below the noise threshold of 3 ppm, and reflects one of the following: a weak conductor near the surface, a strong conductor at depth (e.g., 100 to 120 m below surface) or to one side of the flight line, or aerodynamic noise. Those responses that have the appearance of valid bedrock anomalies on the flight profiles are indicated by appropriate interpretive symbols (see EM map legend). The others probably do not warrant further investigation unless their locations are of considerable geological interest.

The thickness parameter

DIGHEM can provide an indication of the thickness of a steeply dipping conductor. The amplitude of the coplanar anomaly (e.g., CPI) increases relative to the coaxial anomaly (e.g., CXI) as the apparent thickness increases, i.e., the thickness in the horizontal plane. (The thickness is equal to the conductor width if the conductor dips at 90 degrees and strikes at right angles to the flight line.) This report refers to a conductor as thin when the thickness is likely to be less than 3 m, and thick when in excess of 10 m. Thin conductors are indicated on the EM map by the interpretive symbol "D", and thick conductors by "T". For base metal exploration in steeply dipping geology, thick conductors can be high priority targets because many massive sulfide ore bodies are thick, whereas non-economic bedrock conductors are often thin. The system cannot sense the thickness when the strike of the conductor is subparallel to the flight line, when the conductor has a shallow dip, when the anomaly amplitudes are small, or when the resistivity of the environment is below 100 ohm-m.

Resistivity mapping

Areas of widespread conductivity are commonly encountered during surveys. In such areas, anomalies can be generated by decreases of only 5 m in survey altitude as well as by increases in conductivity. The typical flight record in conductive areas is characterized by inphase and quadrature channels which are continuously active. Local EM peaks reflect either increases in conductivity of the earth or decreases in survey altitude. For such conductive areas, apparent resistivity profiles and contour maps are necessary for the correct interpretation of the airborne data. The advantage of the resistivity parameter is that anomalies caused by altitude changes are virtually eliminated, so the resistivity data reflect only those anomalies caused by conductivity changes. The resistivity analysis also helps the interpreter to differentiate between conductive trends in the bedrock and those patterns typical of conductive overburden. For example, discrete conductors will generally appear as narrow lows on the contour map and broad conductors (e.g., overburden) will appear as wide lows.

The resistivity profile (see table in Appendix A) and the resistivity contour map present the apparent resistivity using the so-called pseudo-layer (or buried) half space model defined in Fraser (1978)[2]. This model consists of a resistive layer overlying a conductive half space. The depth channel (see Appendix A) gives the apparent depth below surface of the conductive material. The apparent depth is simply the apparent thickness of the overlying resistive layer. The apparent depth (or thickness) parameter will be positive when the upper layer is more resistive than the underlying material, in which case the apparent depth may be quite close to the true depth.

The apparent depth will be negative when the upper layer is more conductive than the underlying material, and will be zero when a homogeneous half space exists. The apparent depth parameter must be interpreted cautiously because it will contain any errors which may exist in the measured altitude of the EM bird (e.g., as caused by a dense tree cover). The inputs to the resistivity algorithm are the inphase and quadrature components of the coplanar coil-pair. The outputs are the apparent resistivity of the

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2 Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v. 43, p. 144-172.

conductive half space (the source) and the sensor-source distance. The flying height is not an input variable, and the output resistivity and sensor-source distance are independent of the flying height. The apparent depth, discussed above, is simply the sensor-source distance minus the measured altitude or flying height. Consequently, errors in the measured altitude will affect the apparent depth parameter but not the apparent resistivity parameter.

The apparent depth parameter is a useful indicator of simple layering in areas lacking a heavy tree cover. The DIGHEM system has been flown for purposes of permafrost mapping, where positive apparent depths were used as a measure of permafrost thickness. However, little quantitative use has been made of negative apparent depths because the absolute value of the negative depth is not a measure of the thickness of the conductive upper layer and, therefore, is not meaningful physically. Qualitatively, a negative apparent depth estimate usually shows that the EM anomaly is caused by conductive overburden. Consequently, the apparent depth channel can be of significant help in distinguishing between overburden and bedrock conductors.

The resistivity map often yields more useful information on conductivity distributions than the EM map. In comparing the EM and resistivity maps, keep in mind the following:

(a) The resistivity map portrays the absolute value of the earth's resistivity. (Resistivity = 1/conductivity.)

(b) The EM map portrays anomalies in the earth's resistivity. An anomaly by definition is a change from the norm and so the EM map displays anomalies, (i) over narrow, conductive bodies and (ii) over the boundary zone between two wide formations of differing conductivity.

The resistivity map might be likened to a total field map and the EM map to a horizontal gradient in the direction of flight[3]. Because gradient maps are usually more sensitive than total field maps, the EM map therefore is to be preferred in resistive areas. However, in conductive areas, the absolute character of the resistivity map usually causes it to be more useful than the EM map.

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[3] The gradient analogy is only valid with regard to the identification of anomalous locations.

Interpretation in conductive environments

Environments having background resistivities below 30 ohm-m cause all airborne EM systems to yield very large responses from the conductive ground. This usually prohibits the recognition of discrete bedrock conductors. The processing of DIGHEM data, however, produces six channels which contribute significantly to the recognition of bedrock conductors. These are the inphase and quadrature difference channels (DIFI and DIFQ), and the resistivity and depth channels (RES and DP) for each coplanar frequency; see table in Appendix A.

The EM difference channels (DIFI and DIFQ) eliminate up to 99% of the response of conductive ground, leaving responses from bedrock conductors, cultural features (e.g., telephone lines, fences, etc.) and edge effects. An edge effect arises when the conductivity of the ground suddenly changes, and this is a source of geologic noise. While edge effects yield anomalies on the EM difference channels, they do not produce resistivity anomalies. Consequently, the resistivity channel aids in eliminating anomalies due to edge effects. On the other hand, resistivity anomalies will coincide with the most highly conductive sections of conductive ground, and this is another source of geologic noise. The recognition of a bedrock conductor in a conductive environment therefore is based on the anomalous responses of the two difference channels (DIFI and DIFQ) and the two resistivity channels (RES). The most favourable situation is where anomalies coincide on all four channels.

The DP channels, which give the apparent depth to the conductive material, also help to determine whether a conductive response arises from surficial material or from a conductive zone in the bedrock. When these channels ride above the zero level on the electrostatic chart paper (i.e., depth is negative), it implies that the EM and resistivity profiles are responding primarily to a conductive upper layer, i.e., conductive overburden. If both DP channels are below the zero level, it indicates that a resistive upper layer exists, and this usually implies the existence of a bedrock conductor. If the low frequency DP channel is below the zero level and the high frequency DP is above, this suggests that a bedrock conductor occurs beneath conductive cover.

Channels REC1, REC2, REC3 and REC4 are the anomaly recognition functions. They are used to trigger the conductance channel CDT which identifies discrete conductors. In highly conductive environments, channel REC2 is deactivated because it is subject to corruption by highly conductive earth signals. Similarly, in moderately conductive environments, REC4 is deactivated. Some of the automatically selected anomalies (channel CDT) are discarded by the geophysicist. The automatic selection algorithm is intentionally oversensitive to assure that no meaningful responses are missed. The interpreter then classifies the anomalies according to their source and eliminates those that are not substantiated by the data, such as those arising from geologic or aerodynamic noise.

Reduction of geologic noise

Geologic noise refers to unwanted geophysical responses. For purposes of airborne EM surveying, geologic noise refers to EM responses caused by conductive overburden and magnetic permeability. It was mentioned above that the EM difference channels (i.e., channel DIFI for inphase and DIFQ for quadrature) tend to eliminate the response of conductive overburden. This marked a unique development in airborne EM technology, as DIGHEM is the only EM system which yields channels having an exceptionally high degree of immunity to conductive overburden.

Magnetite produces a form of geological noise on the inphase channels of all EM systems. Rocks containing less than 1% magnetite can yield negative inphase anomalies caused by magnetic permeability. When magnetite is widely distributed throughout a survey area, the inphase EM channels may continuously rise and fall reflecting variations in the magnetite percentage, flying height, and overburden thickness. This can lead to difficulties in recognizing deeply buried bedrock conductors, particularly if conductive overburden also exists. However, the response of broadly distributed magnetite generally vanishes on the inphase difference channel DIFI. This feature can be a significant aid in the recognition of conductors which occur in rocks containing accessory magnetite.

EM magnetite mapping

The information content of DIGHEM data consists of a combination of conductive eddy current response and magnetic permeability response. The secondary field resulting from conductive eddy current flow is frequency-dependent and consists of both inphase and quadrature components, which are positive in sign. On the other hand, the secondary field resulting from magnetic permeability is independent of frequency and consists of only an inphase component which is negative in sign. When magnetic permeability manifests itself by decreasing the measured amount of positive inphase, its presence may be difficult to recognize. However, when it manifests itself by yielding a negative inphase anomaly (e.g., in the absence of eddy current flow), its presence is assured. In this latter case, the negative component can be used to estimate the percent magnetite content.

A magnetite mapping technique was developed for the coplanar coil-pair of DIGHEM. The technique yields channel "FEO" (see Appendix A) which displays apparent weight percent magnetite according to a homogeneous half space model.[4] The method can be complementary to magnetometer mapping in certain cases. Compared to magnetometry, it is far less sensitive but is more able to resolve closely spaced magnetite zones, as well as providing an estimate of the amount of magnetite in the rock. The method is sensitive to 1/4% magnetite by weight when the EM sensor is at a height of 30 m above a magnetite half space. It can individually resolve steeply dipping narrow magnetite-rich bands which are separated by 60 m. Unlike magnetometry, the EM magnetite method is unaffected by remanent magnetism or magnetic latitude.

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[4] Refer to Fraser, 1981, Magnetite mapping with a multi-coil airborne electromagnetic system: Geophysics, v. 46, p. 1579-1594.

The EM magnetite mapping technique provides estimates of magnetite content which are usually correct within a factor of 2 when the magnetite is fairly uniformly distributed. EM magnetite maps can be generated when magnetic permeability is evident as indicated by anomalies in the magnetite channel FEO.

Like magnetometry, the EM magnetite method maps only bedrock features, provided that the overburden is characterized by a general lack of magnetite. This contrasts with resistivity mapping which portrays the combined effect of bedrock and overburden.

Recognition of culture

Cultural responses include all EM anomalies caused by man-made metallic objects. Such anomalies may be caused by inductive coupling or current gathering. The concern of the interpreter is to recognize when an EM response is due to culture. Points of consideration used by the interpreter, when coaxial and coplanar coil-pairs are operated at a common frequency, are as follows:

1. Channels CXS and CPS (see Appendix A) measure 50 and 60 Hz radiation. An anomaly on these channels shows

that the conductor is radiating cultural power. Such an indication is normally a guarantee that the conductor is cultural. However, care must be taken to ensure that the conductor is not a geologic body which strikes across a power line, carrying leakage currents.

2. A flight which crosses a line (e.g., fence, telephone line, etc.) yields a center-peaked coaxial anomaly and an m-shaped coplanar anomaly.[5] When the flight crosses the cultural line at a high angle of intersection, the amplitude ratio of coaxial/coplanar (e.g., CXI/CPI) is 4. Such an EM anomaly can only be caused by a line. The geologic body which yields anomalies most closely resembling a line is the vertically dipping thin dike. Such a body, however, yields an amplitude ratio of 2 rather than 4. Consequently, an m-shaped coplanar anomaly with a CXI/CPI amplitude ratio of 4 is virtually a guarantee that the source is a cultural line.

3. A flight which crosses a sphere or horizontal disk yields center-peaked coaxial and coplanar anomalies with a CXI/CPI amplitude ratio (i.e., coaxial/coplanar) of 1/4. In the absence of geologic bodies of this geometry, the most likely conductor is a metal roof or

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5 See Figure II-1 presented earlier.

small fenced yard.[4] Anomalies of this type are virtually certain to be cultural if they occur in an area of culture.

4. A flight which crosses a horizontal rectangular body or wide ribbon yields an m-shaped coaxial anomaly and a center-peaked coplanar anomaly. In the absence of geologic bodies of this geometry, the most likely conductor is a large fenced area.[4] Anomalies of this type are virtually certain to be cultural if they occur in an area of culture.

5. EM anomalies which coincide with culture, as seen on the camera film, are usually caused by culture. However, care is taken with such coincidences because a geologic conductor could occur beneath a fence, for example. In this example, the fence would be expected to yield an m-shaped coplanar anomaly as in case #2 above. If, instead, a center-peaked coplanar anomaly occurred, there would be concern that a thick geologic conductor coincided with the cultural line.

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[4] It is a characteristic of EM that geometrically identical anomalies are obtained from: (1) a planar conductor, and (2) a wire which forms a loop having dimensions identical to the perimeter of the equivalent planar conductor.

6. The above description of anomaly shapes is valid when the culture is not conductively coupled to the environment. In this case, the anomalies arise from inductive coupling to the EM transmitter. However, when the environment is quite conductive (e.g., less than 100 ohm-m at 900 Hz), the cultural conductor may be conductively coupled to the environment. In this latter case, the anomaly shapes tend to be governed by current gathering. Current gathering can completely distort the anomaly shapes, thereby complicating the identification of cultural anomalies. In such circumstances, the interpreter can only rely on the radiation channels CXS and CPS, and on the camera film.

TOTAL FIELD MAGNETICS

The existence of a magnetic correlation with an EM anomaly is indicated directly on the EM map. An EM anomaly with magnetic correlation has a greater likelihood of being produced by sulfides than one that is non-magnetic. However, sulfide ore bodies may be non-magnetic (e.g., the Kidd Creek deposit near Timmins, Canada) as well as magnetic (e.g., the Mattabi deposit near Sturgeon Lake, Canada).

The magnetometer data are digitally recorded in the aircraft to an accuracy of one nT (i.e., one gamma). The digital tape is processed by computer to yield a total field magnetic contour map. When warranted, the magnetic data also may be treated mathematically to enhance the magnetic response of the near-surface geology, and an enhanced magnetic contour map is then produced. The response of the enhancement operator in the frequency domain is illustrated in Figure II-2. This figure shows that the passband components of the airborne data are amplified 20 times by the enhancement operator. This means, for example, that a 100 nT anomaly on the enhanced map reflects a 5 nT anomaly for the passband components of the airborne data.

The enhanced map, which bears a resemblance to a downward continuation map, is produced by the digital bandpass filtering of the total field data. The enhancement is equivalent to continuing the field downward to a level (above the source) which is 1/20th of the actual sensor-source distance.

Because the enhanced magnetic map bears a resemblance to a ground magnetic map, it simplifies the recognition of trends in the rock strata and the interpretation of

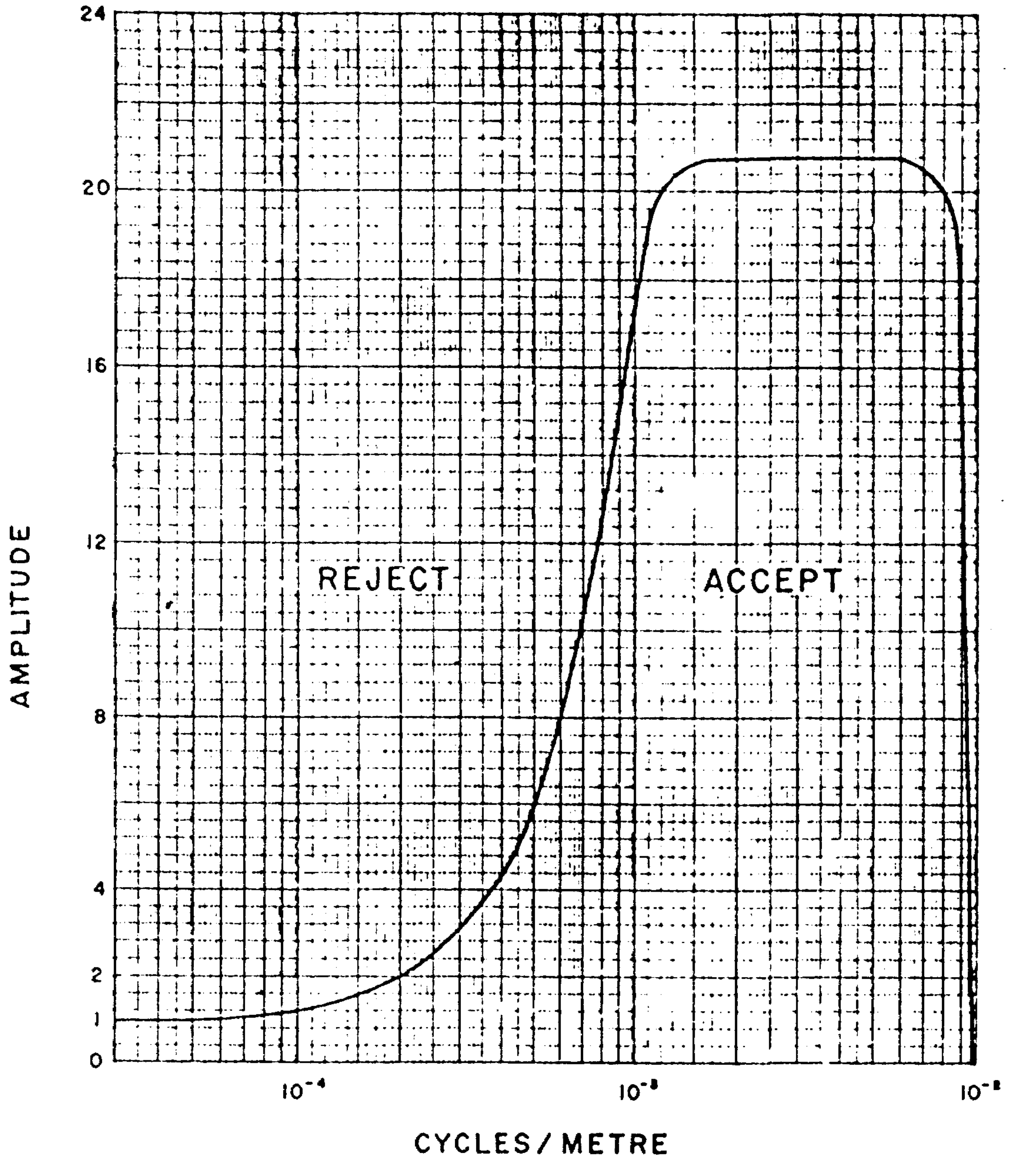

Figure II-2 Frequency response of magnetic enhancement operator.

geological structure. It defines the near-surface local geology while de-emphasizing deep-seated regional features. It primarily has application when the magnetic rock units are steeply dipping and the earth's field dips in excess of 60 degrees.

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MAPS ACCOMPANYING THIS REPORT

Twelve map sheets accompany this report:

Electromagnetic Anomalies	3 map sheets
Resistivity	3 map sheets
Total Field Magnetics	3 map sheets
Enhanced Magnetics	3 map sheets

Respectfully submitted,
DIGHEM LIMITED

D.C. Fraser
President

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A P P E N D I X A

THE FLIGHT RECORD AND PATH RECOVERY

Both analog and digital flight records were produced. The analog profiles were recorded on chart paper in the aircraft during the survey. The digital profiles were generated later by computer and plotted on electrostatic chart paper at a scale of 1:10,000. The digital profiles are listed in Table A-1.

In Table A-1, the log resistivity scale of 0.03 decade/mm means that the resistivity changes by an order of magnitude in 33 mm. The resistivities at 0, 33, 67, 100 and 133 mm up from the bottom of the digital flight record are respectively 1, 10, 100, 1,000 and 10,000 ohm-m.

The fiducial marks on the flight records represent points on the ground which were recovered from camera film. Continuous photographic coverage allowed accurate photo-path recovery locations for the fiducials, which were then plotted on the geophysical maps to provide the track of the aircraft.

The fiducial locations on both the flight records and flight path maps were examined by a computer for unusual helicopter speed changes. Such speed changes may denote an error in flight path recovery. The resulting flight path locations therefore reflect a more stringent checking than is normally provided by manual flight path recovery techniques.

Table A-1. The Digital Profiles

Channel Name (Freq)		Observed parameters	Scale units/mm
MAG		magnetics	10 nT
ALT		bird height	3 m
CXI	(900 Hz)	vertical coaxial coil-pair inphase	1 ppm
CXQ	(900 Hz)	vertical coaxial coil-pair quadrature	1 ppm
CXS	(900 Hz)	ambient noise monitor (coaxial receiver)	1 ppm
CPI	(900 Hz)	horizontal coplanar coil-pair inphase	1 ppm
CPQ	(900 Hz)	horizontal coplanar coil-pair quadrature	1 ppm
CPS	(900 Hz)	ambient noise monitor (coplanar receiver)	1 ppm
CPI	(7200 Hz)	horizontal coplanar coil-pair inphase	1 ppm
CPQ	(7200 Hz)	horizontal coplanar coil-pair quadrature	1 ppm
		Computed Parameters	
DIFI	(900 Hz)	difference function inphase from CXI and CPI	1 ppm
DIFQ	(900 Hz)	difference function quadrature from CXQ and CPQ	1 ppm
CDT		conductance	1 grade
RES	(900 Hz)	log resistivity	.03 decade
RES	(7200 Hz)	log resistivity	.03 decade
DP	(900 Hz)	apparent depth	3 m
DP	(7200 Hz)	apparent depth	m
FEO%	(900 Hz)	apparent weight percent magnetite	0.25%

A P P E N D I X   B

EM ANOMALY LIST

ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 2	(FLIGHT 2)											
A 197 S	0	0	0	0	0	6	1	0	1	43	6268	0
LINE 3	(FLIGHT 2)											
C 272 S	0	1	0	1	3	24	1	0	1	19	2766	0
LINE 4	(FLIGHT 2)											
A 318 S	0	1	1	2	2	24	1	0	1	12	4173	0
LINE 5	(FLIGHT 2)											
B 341 S	0	9	0	29	26	207	1	6	1	28	558	0
C 364 S?	0	2	1	2	0	5	1	22	1	211	1035	0
F 382 S	0	7	0	22	35	169	1	0	1	8	471	0
LINE 7	(FLIGHT 2)											
D 516 S?	0	7	0	18	7	153	1	5	1	36	654	0
E 520 S?	0	4	0	13	7	40	1	1	1	4	1564	0
G 539 B	2	2	2	3	15	19	1	13	1	68	373	38
H 549 S	0	1	1	2	1	15	1	0	1	22	5602	0
LINE 8	(FLIGHT 2)											
A 582 S?	0	2	0	8	12	65	1	0	1	6	1099	0
LINE 9	(FLIGHT 2)											
B 604 S	0	0	3	1	0	8	1	0	1	53	6674	0
D 622 S?	3	6	0	18	26	155	1	0	1	5	618	0
LINE 10	(FLIGHT 2)											
C 696 S?	1	3	0	11	15	92	1	0	1	10	923	0
D 676 S	1	1	0	2	5	13	1	0	1	24	1989	0
LINE 15	(FLIGHT 2)											
B 977 B	5	1	3	2	14	14	33	58	1	136	224	77
C 983 S	3	2	0	5	13	43	1	0	1	12	826	0
LINE 16	(FLIGHT 2)											
D 983 S?	3	2	5	5	14	43	1	0	1	14	722	0
LINE 17	(FLIGHT 3)											
A 336 S	4	0	1	1	2	10	1	0	1	48	2789	1
E 307 S?	0	1	0	6	6	41	1	0	1	56	1280	17
F 301 S?	1	6	1	13	19	87	1	0	1	21	628	0

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

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ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	QUAD PPM	COPLANAR 900 HZ REAL PPM	QUAD PPM	COPLANAR 7200 HZ REAL PPM	QUAD PPM	VERTICAL DIKE COND MHOS	DEPTH* M	HORIZONTAL SHEET COND MHOS	DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	DEPTH M
LINE 18 (FLIGHT 3)												
A 392 S?	1	1	0	11	0	1	1	19	1	62	799	0
LINE 19 (FLIGHT 3)												
D 428 S	0	1	0	1	1	7	1	0	1	52	6279	0
E 409 B	27	14	44	35	94	52	24	12	2	74	47	43
LINE 20 (FLIGHT 3)												
B 507 S	0	1	0	2	2	16	1	0	1	10	4975	0
LINE 21 (FLIGHT 3)												
A 554 S	0	2	0	1	0	12	5	66	1	206	1035	0
B 522 S	2	1	0	2	3	4	1	42	1	64	2388	16
LINE 22 (FLIGHT 3)												
A 609 B	2	2	0	3	13	17	1	23	1	73	447	42

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ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 101 (FLIGHT 3)												
B 2472 S	0	3	0	6	4	53	1	0	1	0	2427	0
E 2483 S	0	6	0	19	22	127	1	1	1	32	656	0
F 2486 S	0	6	0	21	24	156	1	0	1	3	675	0
H 2495 S	0	1	0	3	0	15	1	0	1	13	3904	0
LINE 102 (FLIGHT 3)												
B 2440 S?	0	18	1	58	178	362	1	0	1	0	311	0
LINE 103 (FLIGHT 3)												
B 2343 S	0	0	0	2	2	15	1	0	1	20	5576	0
D 2348 S?	0	28	0	85	191	585	1	4	1	0	239	0
I 2380 S	0	4	0	7	6	56	1	0	1	16	933	0
J 2383 S	6	3	0	7	16	55	6	36	1	58	811	0
LINE 104 (FLIGHT 3)												
E 2290 S	0	2	0	5	10	16	1	1	1	102	972	6
LINE 105 (FLIGHT 3)												
C 2250 S	2	2	0	1	5	18	1	0	1	25	5324	0
E 2275 S	0	1	0	4	5	5	1	2	1	117	1035	0
LINE 106 (FLIGHT 3)												
A 2217 S?	2	1	0	2	7	8	4	71	1	201	1035	0
C 2206 S	0	0	0	3	5	23	1	5	1	215	1035	0
D 2196 S?	0	1	0	2	5	12	1	15	1	120	650	77
G 2178 S	0	1	0	0	7	15	1	0	1	114	1035	0
LINE 107 (FLIGHT 3)												
A 2119 S	0	6	0	15	17	118	1	0	1	6	850	0
C 2155 S	0	2	0	6	7	47	1	0	1	124	1035	0
E 2161 S	0	9	0	22	38	172	1	0	1	4	432	0
LINE 108 (FLIGHT 3)												
A 2106 S?	0	11	0	26	42	199	1	0	1	4	338	0
D 2083 S	5	5	0	22	29	150	2	3	1	39	739	0
F 2070 S	0	2	0	0	0	4	1	0	1	24	5529	0
I 2064 S	0	3	0	5	12	45	1	0	1	16	756	0
LINE 109 (FLIGHT 3)												
D 2013 S?	3	34	0	96	347	502	1	0	1	0	219	0
F 2036 S	0	1	0	1	1	15	1	0	1	22	5748	0

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ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD P...	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 109	(FLIGHT	3)										
J 2049 S	0	4	1	4	2	8	1	5	1	45	5066	0
LINE 110	(FLIGHT	3)										
B 1996 S	0	35	0	94	288	541	1	0	1	0	231	0
C 1992 S	0	46	0	120	465	611	1	3	1	0	181	0
E 1974 S	0	2	0	2	2	21	1	0	1	10	4134	0
J 1953 S	52	6	3	12	34	95	1	0	1	10	379	0
LINE 111	(FLIGHT	3)										
B 1898 S	0	10	0	26	41	166	2	0	1	14	501	0
E 1902 S	5	62	2	171	685	288	1	0	1	0	131	0
F 1905 S	0	60	0	165	479	877	2	0	1	9	45	0
H 1919 S	0	1	2	2	5	18	1	0	1	42	1533	4
K 1935 S	0	2	0	0	0	11	1	0	1	40	5812	0
LINE 112	(FLIGHT	3)										
A 1880 S	0	13	0	27	57	193	1	0	1	9	254	0
B 1876 S	0	9	0	19	58	122	1	0	1	10	171	0
C 1874 S	0	30	0	79	233	462	1	0	1	6	82	0
LINE 113	(FLIGHT	3)										
A 1780 S	0	8	0	19	46	126	1	0	1	8	546	0
C 1785 S?	3	35	10	96	426	290	1	0	1	0	174	0
E 1802 S	0	15	0	36	87	156	1	0	1	0	332	0
L 1822 S	0	2	0	2	3	23	1	0	1	4	3045	0
LINE 114	(FLIGHT	3)										
A 1287 S	0	5	0	14	43	93	1	0	1	5	273	0
E 1271 S	0	16	0	39	46	299	5	9	1	5	354	0
J 1239 S	1	6	2	24	49	166	1	0	1	9	330	0
K 1237 S	2	4	1	19	32	129	1	0	1	8	490	0
LINE 115	(FLIGHT	3)										
A 1119 S	0	8	1	41	50	138	1	0	1	10	239	0
B 1122 S	2	23	0	58	127	293	1	0	1	0	274	0
C 1125 S	0	5	0	13	10	96	3	20	1	50	749	0
D 1138 S	0	1	0	1	0	14	1	0	1	10	4505	0
H 1153 S	0	10	0	31	30	200	1	0	1	17	477	0
LINE 116	(FLIGHT	3)										
B 1109 S	0	12	0	29	47	124	1	0	1	10	414	0

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ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 116 (FLIGHT 3)												
C 1107 S	0	9	0	22	12	20	1	3	1	24	556	0
LINE 117 (FLIGHT 3)												
A 1006 S?	0	13	0	32	75	206	1	0	1	12	456	0
C 1016 S	0	19	0	52	112	330	1	0	1	3	322	0
D 1027 S	26	1	0	2	0	10	1	0	1	36	5677	0
G 1042 S	0	1	4	6	10	24	1	6	1	101	363	67
LINE 118 (FLIGHT 3)												
B 1006 S	0	13	0	36	92	232	1	0	1	9	169	0
D 997 S	0	6	0	14	8	106	1	0	1	39	719	0
E 995 S	11	6	0	19	12	135	1	0	1	0	1152	0
H 986 S	0	1	0	4	2	37	1	0	1	0	3101	0
L 966 S	0	0	0	1	0	18	1	0	1	66	6827	0
LINE 119 (FLIGHT 3)												
D 927 S	0	2	0	11	0	39	2	28	1	21	509	0
E 930 S	0	8	0	6	0	135	8	32	1	37	697	0
K 946 S	1	1	1	7	2	22	1	0	1	16	4043	0
LINE 120 (FLIGHT 3)												
E 890 S	0	4	0	12	0	93	8	33	1	51	756	0
J 877 S	1	7	0	20	31	137	1	0	1	23	643	0

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ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 202	(FLIGHT	3)										
C 3021 S?	0	2	0	8	8	59	1	0	1	13	1421	0
LINE 203	(FLIGHT	3)										
A 3043 S	1	3	1	13	38	91	1	0	1	7	307	0
C 3061 S	0	11	0	40	77	283	1	0	1	3	240	0
E 3072 S	2	2	2	5	7	48	1	0	1	6	1201	0
LINE 204	(FLIGHT	3)										
B 3160 S	0	5	1	14	29	104	1	0	1	6	411	0
F 3138 S	0	5	0	7	11	59	1	0	1	7	935	0
C 3134 S?	3	3	1	2	7	17	1	6	1	51	549	20
H 3130 S	1	4	1	5	15	50	1	0	1	11	501	0
LINE 205	(FLIGHT	3)										
A 3173 S	1	4	3	6	9	52	1	0	1	8	1259	0
B 3180 S	3	2	1	4	6	34	1	0	1	6	1430	0
E 3202 S	2	5	1	12	25	94	1	0	1	10	441	0
LINE 206	(FLIGHT	3)										
D 3282 S	1	1	1	6	7	46	1	0	1	10	1110	0
F 3264 S	1	5	0	14	31	105	1	0	1	8	414	0
G 3246 S	0	2	0	5	10	29	1	0	1	95	960	1
LINE 207	(FLIGHT	3)										
C 3313 S	0	4	1	13	15	102	1	0	1	4	801	0
E 3318 S	0	10	0	28	70	195	1	0	1	8	223	0
F 3320 S	2	10	0	27	68	190	1	0	1	114	1029	9
H 3342 S	0	3	0	3	2	30	2	44	1	168	1035	0
LINE 208	(FLIGHT	3)										
C 3392 S?	0	7	1	8	14	72	1	0	1	106	1035	0
LINE 209	(FLIGHT	3)										
B 3420 S	5	3	1	4	6	42	6	31	1	104	1035	0
D 3445 S	0	1	0	4	6	25	1	1	1	29	1668	0
LINE 210	(FLIGHT	3)										
A 3517 S	2	3	1	2	8	31	1	0	1	30	1004	0
LINE 211	(FLIGHT	3)										
A 3553 S	4	3	1	5	10	37	1	0	1	32	910	1

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 211	(FLIGHT		3)									
B 3562 S	1	2	1	6	10	48	1	0	1	12	854	0
C 3574 S	5	2	0	4	11	29	8	35	1	78	960	0
E 3604 S	3	0	0	2	6	3	2	32	1	59	908	18
LINE 212	(FLIGHT		3)									
A 3666 S	0	2	1	1	5	10	1	0	1	80	880	36
B 3647 S	0	2	1	6	10	45	1	0	1	10	769	0
C 3626 S	2	1	0	3	5	23	1	0	1	31	905	0
LINE 213	(FLIGHT		3)									
A 3688 S	1	1	0	5	7	36	1	0	1	28	749	0
B 3692 S	2	3	1	6	13	48	1	0	1	15	620	0
LINE 214	(FLIGHT		3)									
B 3770 S	2	4	0	11	10	90	1	0	1	10	765	0
C 3765 S?	0	4	0	17	15	108	1	0	1	7	604	0
D 3736 S	1	4	0	8	12	24	1	11	1	12	713	0
E 3727 S?	2	2	0	6	10	41	1	0	1	40	663	6
LINE 215	(FLIGHT		3)									
A 3790 B?	2	3	0	10	16	77	1	0	1	12	547	0
C 3828 S	2	2	0	5	8	40	1	0	1	16	1108	0
LINE 216	(FLIGHT		3)									
A 3882 S	3	3	1	5	7	40	1	0	1	12	1173	0
C 3876 B	8	1	6	2	7	2	78	32	2	168	37	128
D 3846 S	0	2	1	6	7	50	1	0	1	17	1485	0
LINE 217	(FLIGHT		3)									
A 3914 S?	1	6	0	8	9	78	1	1	1	73	867	0
B 3919 B	10	1	8	5	19	4	53	31	2	143	36	106
D 3945 S	4	2	0	4	6	24	1	0	1	36	1389	0
LINE 218	(FLIGHT		3)									
B 3973 S	2	2	0	4	6	33	1	0	1	23	1211	0
LINE 219	(FLIGHT		3)									
A 4067 S	3	2	0	5	5	35	1	0	1	11	1906	0
LINE 220	(FLIGHT		3)									
B 4083 S	1	3	0	6	6	38	1	0	1	14	1146	0

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

203-SH3-SAVANT LAKE

ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 221	(FLIGHT		4)									
A 217 S	0	4	0	13	19	101	1	0	1	7	727	0
B 228 S?	1	2	0	7	7	47	1	0	1	7	1483	0
LINE 222	(FLIGHT		4)									
B 341 S	1	1	0	5	6	41	1	0	1	6	1063	0
C 331 S	2	2	0	5	9	22	1	0	1	24	1038	0
D 307 S	1	3	0	4	3	29	1	0	1	7	2724	0
LINE 223	(FLIGHT		4)									
A 378 S?	3	1	0	5	7	29	1	0	1	26	1194	0
LINE 224	(FLIGHT		4)									
A 459 B?	0	3	0	7	9	54	2	14	1	204	1035	0
B 430 S	0	1	0	2	1	19	1	0	1	6	3834	0
C 424 S	0	0	0	0	2	23	1	0	1	57	6185	0
LINE 225	(FLIGHT		4)									
B 519 S	1	2	1	10	18	46	1	0	1	11	719	0
C 552 S	2	2	1	6	8	35	1	0	1	13	1239	0
LINE 226	(FLIGHT		4)									
B 582 S	3	5	0	9	9	51	1	0	1	13	1267	0
C 563 S	1	1	2	4	5	33	1	0	1	18	1956	0
LINE 227	(FLIGHT		4)									
A 658 S	2	3	0	6	7	38	1	0	1	9	1087	0
C 673 S	1	1	0	7	8	36	1	0	1	23	1170	0
D 679 S	1	2	0	5	7	35	1	0	1	8	1532	0
LINE 228	(FLIGHT		4)									
A 744 S	0	1	0	4	7	25	1	0	1	24	1010	0
D 704 S	1	6	0	10	8	93	1	0	1	1	1583	0
LINE 229	(FLIGHT		4)									
A 782 S	2	3	0	9	10	59	1	0	1	9	1196	0
B 793 S	3	2	0	4	4	32	5	43	1	146	1035	0
C 803 S	0	2	0	4	3	38	1	11	1	207	1035	0
D 813 S	0	2	0	5	6	33	1	0	1	26	1205	0
LINE 230	(FLIGHT		4)									
A 887 S	1553	2	0	11	12	59	1	0	1	12	882	0

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

ANOMALY/ FID/INTERP	COAXIAL 900 HZ REAL PPM	COAXIAL 900 HZ QUAD PPM	COPLANAR 900 HZ REAL PPM	COPLANAR 900 HZ QUAD PPM	COPLANAR 7200 HZ REAL PPM	COPLANAR 7200 HZ QUAD PPM	VERTICAL DIKE COND MHOS	VERTICAL DIKE DEPTH* M	HORIZONTAL SHEET COND MHOS	HORIZONTAL SHEET DEPTH M	CONDUCTIVE EARTH RESIS OHM-M	CONDUCTIVE EARTH DEPTH M
LINE 230 (FLIGHT 4)												
D 869 S	4	2	0	8	7	51	1	0	1	16	1053	0
F 858 B?	0	6	0	10	14	73	1	0	1	106	1006	4
G 848 S	0	2	0	4	2	29	5	49	1	139	1035	0
I 832 S	0	4	0	9	7	66	1	0	1	7	1689	0
LINE 232 (FLIGHT 4)												
A 1001 S	2	2	0	7	10	55	1	0	1	11	1029	0
B 985 S?	0	5	0	7	8	52	1	0	1	24	844	0
E 974 S	0	2	0	2	4	15	1	7	1	24	4733	0
G 959 B?	0	4	0	11	21	84	1	7	1	77	867	0
I 954 B?	0	9	0	28	8	209	2	16	1	37	602	0
LINE 233 (FLIGHT 4)												
B 1041 S?	1	1	0	3	6	30	1	0	1	36	724	7
C 1062 B?	3	5	2	4	8	30	1	0	1	54	661	20
LINE 234 (FLIGHT 4)												
A 1122 S	2	1	0	0	5	17	4	70	1	152	103[illegible]	0
C 1110 S	0	1	0	3	8	51	1	7	1	106	966	11
H 1076 B?	5	8	0	13	22	99	1	0	1	12	624	0
LINE 235 (FLIGHT 4)												
B 1140 S	3	1	0	4	4	23	6	61	1	148	1035	0
C 1160 B?	1	2	0	4	9	16	1	10	1	41	766	8
D 1179 B	7	6	2	7	14	62	6	21	1	79	527	9
LINE 236 (FLIGHT 4)												
A 1232 S	1	2	0	9	11	55	1	0	1	7	788	0
B 1223 S?	3	2	2	7	6	34	1	0	1	32	1452	0
D 1204 B	4	4	4	5	15	15	7	39	2	182	47	140

* ESTIMATED DEPTH MAY BE UNRELIABLE BECAUSE THE STRONGER PART OF THE CONDUCTOR MAY BE DEEPER OR TO ONE SIDE OF THE FLIGHT LINE, OR BECAUSE OF A SHALLOW DIP OR OVERBURDEN EFFECTS.

<u>EVANS LAKE GROUP #1 - SAVANT</u>

Location: Evans Lake M-1774, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83
Recorded: March 21/83

PA659539
PA659540
PA659541
PA659542
PA659543
PA659544
PA659545
PA659546
PA659547
PA659548
PA659549
PA659550
PA659551
PA659552
PA659553
PA659554
PA659555
PA659556
PA659557
PA659558
PA659559
PA659560
PA659561
PA659562
PA659563
PA659564
PA659565
PA659566
PA659567
PA659568
PA659569
PA659570
PA659571
PA659572
PA659573
PA659574
PA659575
PA659576
PA659577
PA659578
PA659579
PA659580

HOUGHTON LAKE - SAVANT GROUP #2

Location: Houghton Lake M-2165, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83
Recorded: April 6/83

PA659511
PA659512
PA659513

PA659515
PA659516

PA659525
PA659526
PA659527
PA659528
PA659529

PA701421
PA701422
PA701423
PA701424
PA701425
PA701426
PA701427
PA701428
PA701429
PA701430
PA701431
PA701432
PA701433
PA701434
PA701435

FISHER LAKE PROPERTY - SAVANT

Location: Grebe Lake M-1804, Armit Lake 2744, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83

Recorded: March 21/83

PA687585
PA687586
PA687587
PA687588
PA687589
PA687590

PA687592
PA687593
PA687594
PA687595
PA687596
PA687597
PA687598
PA687599
PA687600

PA701388
PA701389
PA701390
PA701391
PA701392
PA701393
PA701394
PA701395
PA701396
PA701397
PA701398
PA701399
PA701400

Recorded: April 6/83

PA701401
PA701402
PA701403
PA701404
PA701405
PA701406
PA701407
PA701408
PA701409
PA701410
PA701411
PA701412
PA701413
PA701414
PA701415
PA701416
PA701417
PA701418
PA701419
PA701420

SAVANT - BAY GROUP

Location: Houghton Lake M2165, Patricia Mining Division, Ontario
Ownership: Cumberland Resources Ltd. 100%
Registered: in name of Cumberland Resources Ltd. March 26/84
Recorded: December 13, 1983

PA747384
PA747385
PA747386
PA747387
PA747388
PA747389

PA747394
PA747395
PA747396
PA747397
PA747398
PA747399

PA747404
PA747405
PA747406
PA747407
PA747408
PA747409

PA747414
PA747415
PA747416

ISLAND LAKE - SAVANT GROUP #3

Location: Houghton Lake M-2165, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83
Recorded: March 21/83

PA701301
PA701302
PA701303
PA701304
PA701305
PA701306
PA701307
PA701308
PA701309
PA701310
PA701311
PA701312
PA701313
PA701314
PA701315
PA701316
PA701317
PA701318
PA701319
PA701320

PA701322
PA701323
PA701324
PA701325
PA701326
PA701327
PA701328
PA701329

File

Ministry of Natural Resources

Ontario

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) AIRBORNE GEOPHYSICAL

Township or Area SAVANT LAKE AREA

Claim Holder(s) CUMBERLAND RESOURCES LIMITED

Survey Company DIGHEM LIMITED

Author of Report D. C. FRASER

Address of Author TORONTO ONTARIO

Covering Dates of Survey APRIL 20/21 1984 (linecutting to office)

Total Miles of Line Cut FLOWN 248 KM.

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

	DAYS per claim
Geophysical	
–Electromagnetic	~~40~~
–Magnetometer	~~40~~
–Radiometric	
–Other	
Geological	
Geochemical	

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

Magnetometer 40 Electromagnetic 40 Radiometric ____ (enter days per claim)

DATE: AUG. 17/84 SIGNATURE: William McQuaill
Author of Report or Agent

Res. Geol. ________ Qualifications ________

Previous Surveys

File No.	Type	Date	Claim Holder

RECEIVED
OCT 11 1984
MINING LANDS SECTION

MINING CLAIMS TRAVERSED
List numerically

LIST ATTACHED
(prefix) (number)

PATRICIA MINING DIV.
RECEIVED
AUG 17 1984
A.M. P.M.
7,8,9,10,11,12,1,2,3,4,5,6

TOTAL CLAIMS 160

If space insufficient, attach list

837 (5/79)

66

SELF POTENTIAL

Instrument ______ Range ______

Survey Method ______

Corrections made ______

RADIOMETRIC

Instrument ______

Values measured ______

Energy windows (levels) ______

Height of instrument ______ Background Count ______

Size of detector ______

Overburden ______
(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) AIRBORNE MAGNETOMETER ELECTROMAGNETOMETER

Instrument(s) SONOTEK PMH 5010 DIGHEM III SYSTEM
(specify for each type of survey)

Accuracy 1 GAMMA 0.2 PPM
(specify for each type of survey)

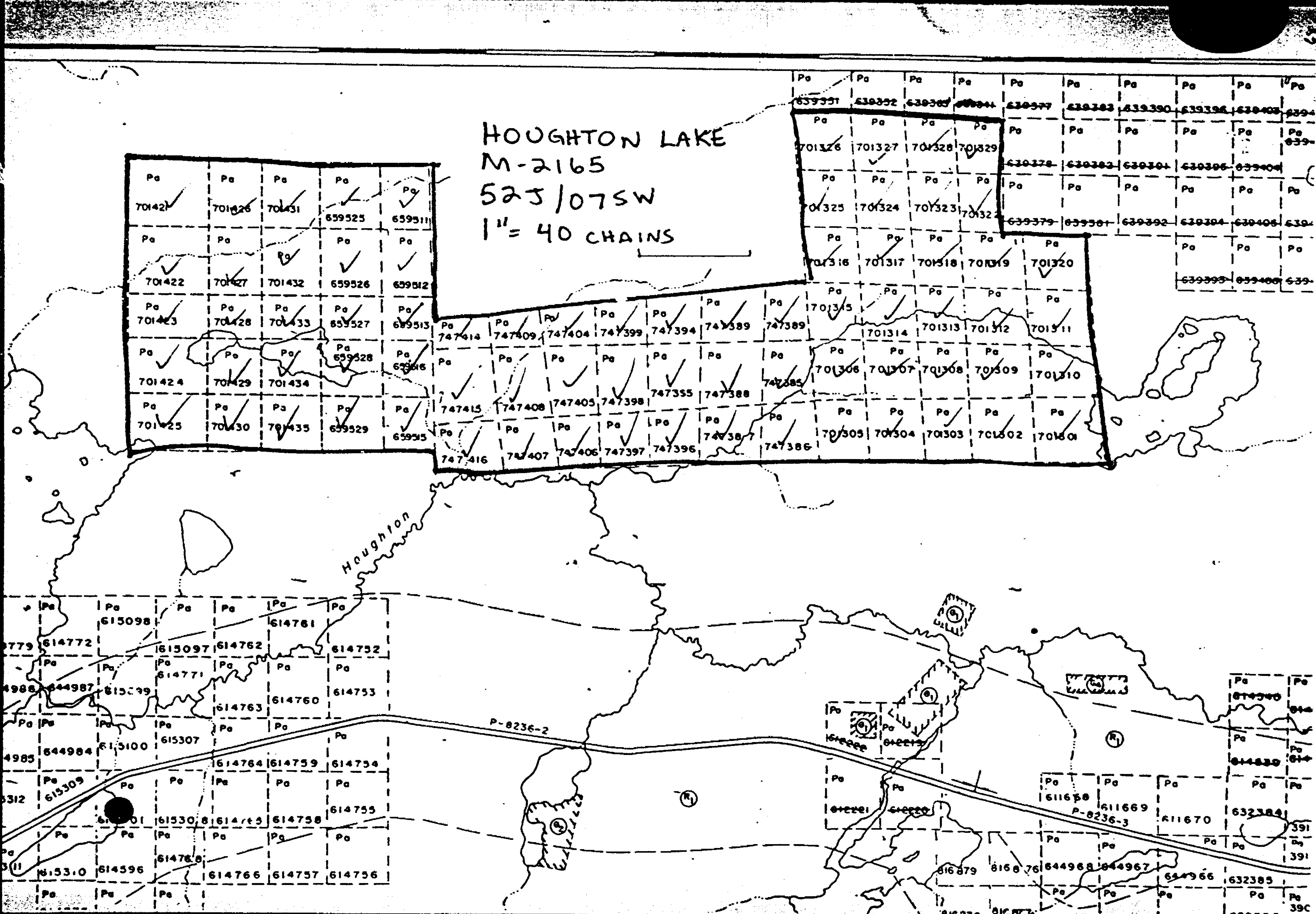
Aircraft used ASTAR TURBINE HELICOPTER

Sensor altitude 30 M.

Navigation and flight path recovery method COLOCAM SEQUENCE CAMERA

Aircraft altitude ______ Line Spacing 200 M

~~Miles~~ flown over total area 248 KMS. Over claims only 146 KMS


HOUGHTON LAKE
M-2165
52J/07SW
1" = 40 CHAINS
701421
701426
701431
659525
659511
701422
701427
701432
659526
659512
701423
701428
701433
659527
659513
701424
701429
701434
659528
701425
701430
701435
659529
659515
747414
747409
747404
747399
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747415
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747388
747416
747407
747406
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747396
747386
701326
701327
701328
701329
701325
701324
701323
701316
701317
701318
701319
701320
701315
701314
701313
701312
701311
701306
701307
701308
701309
701310
701305
701304
701303
701302
701301
Houghton
P-8236-2
P-8236-3
615098
614772
615097
614762
614761
614752
614771
614763
614760
614753
644987
644984
615100
615307
614764
614759
614754
614758
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614596
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614757
614756
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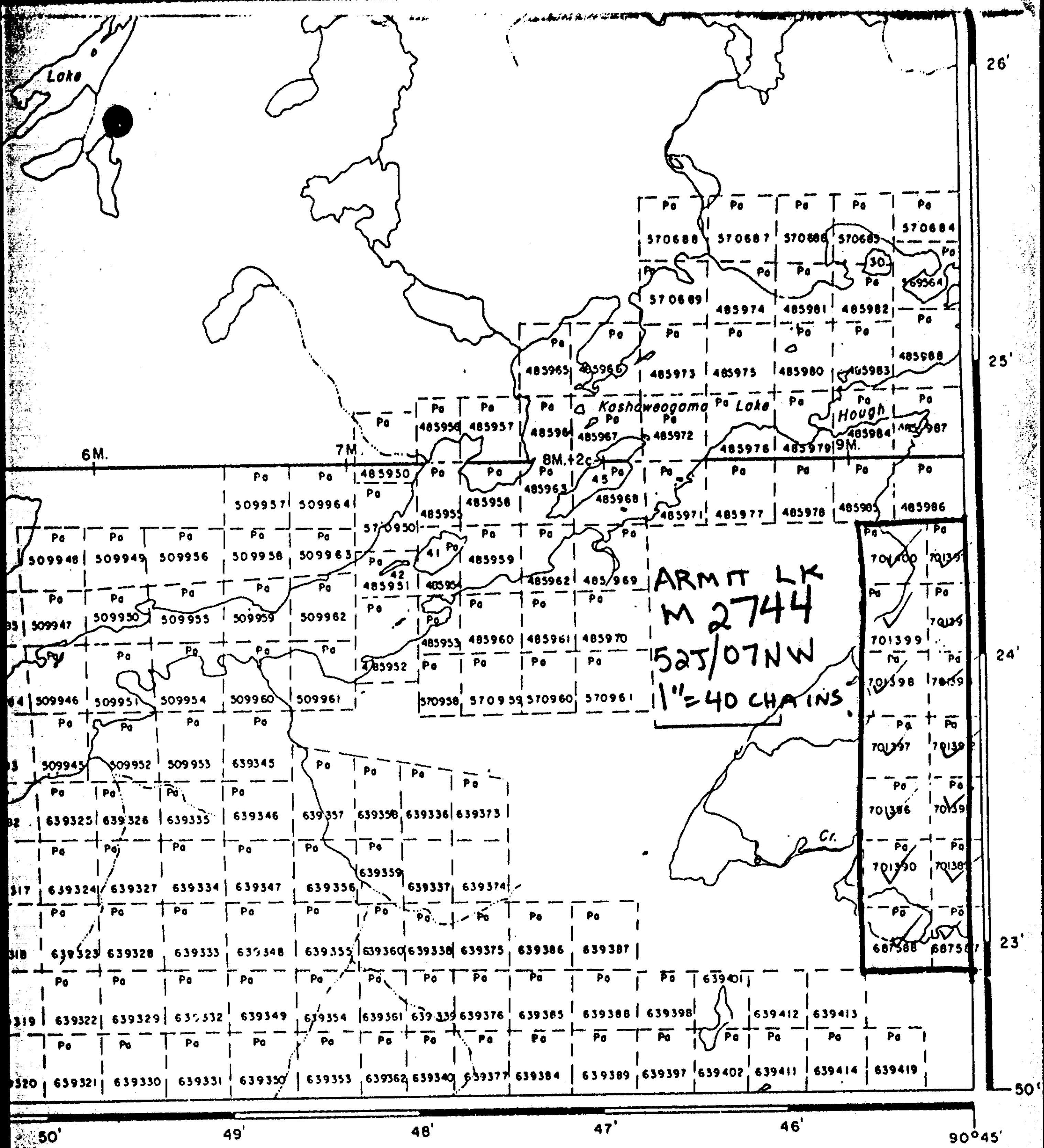
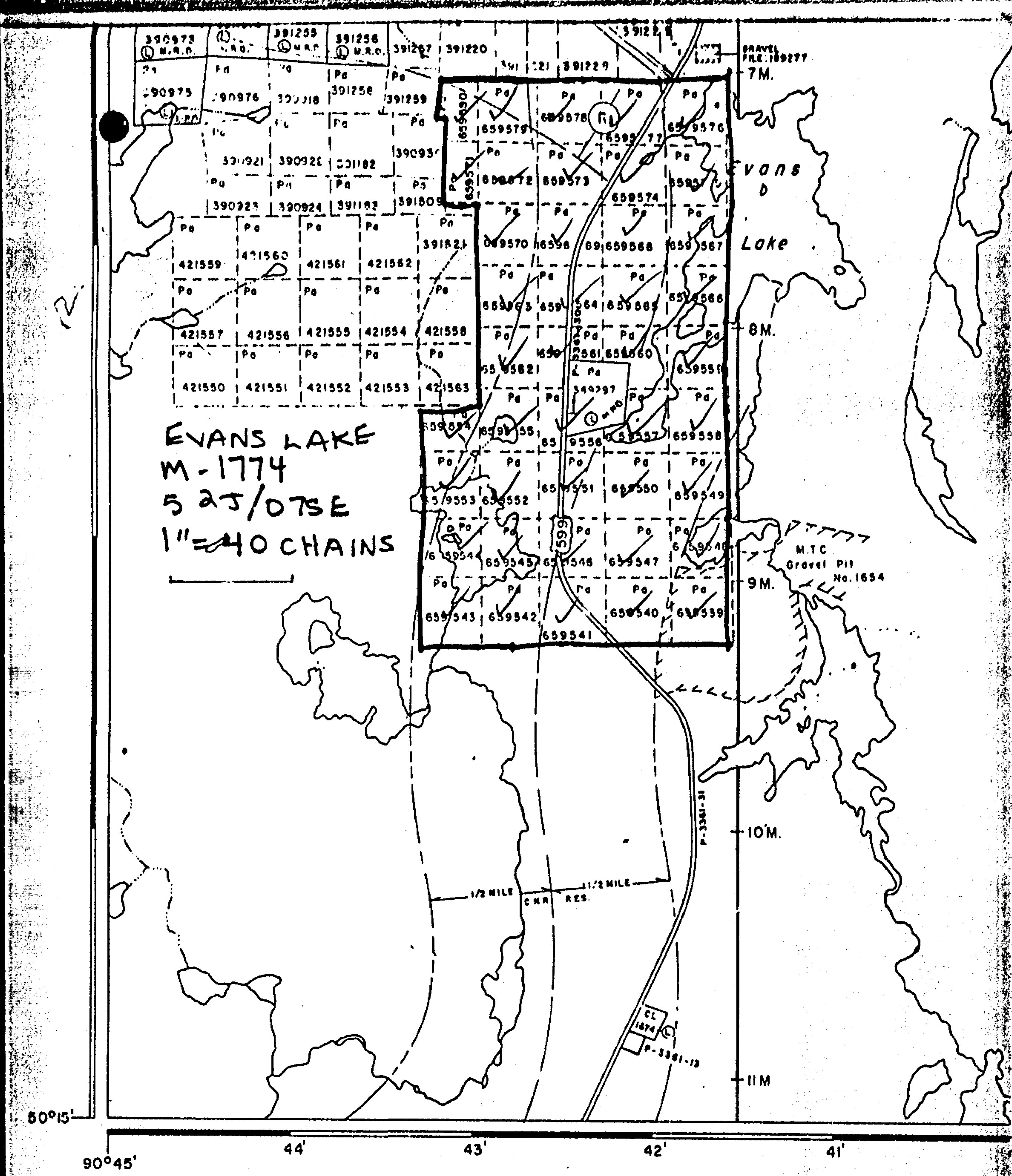
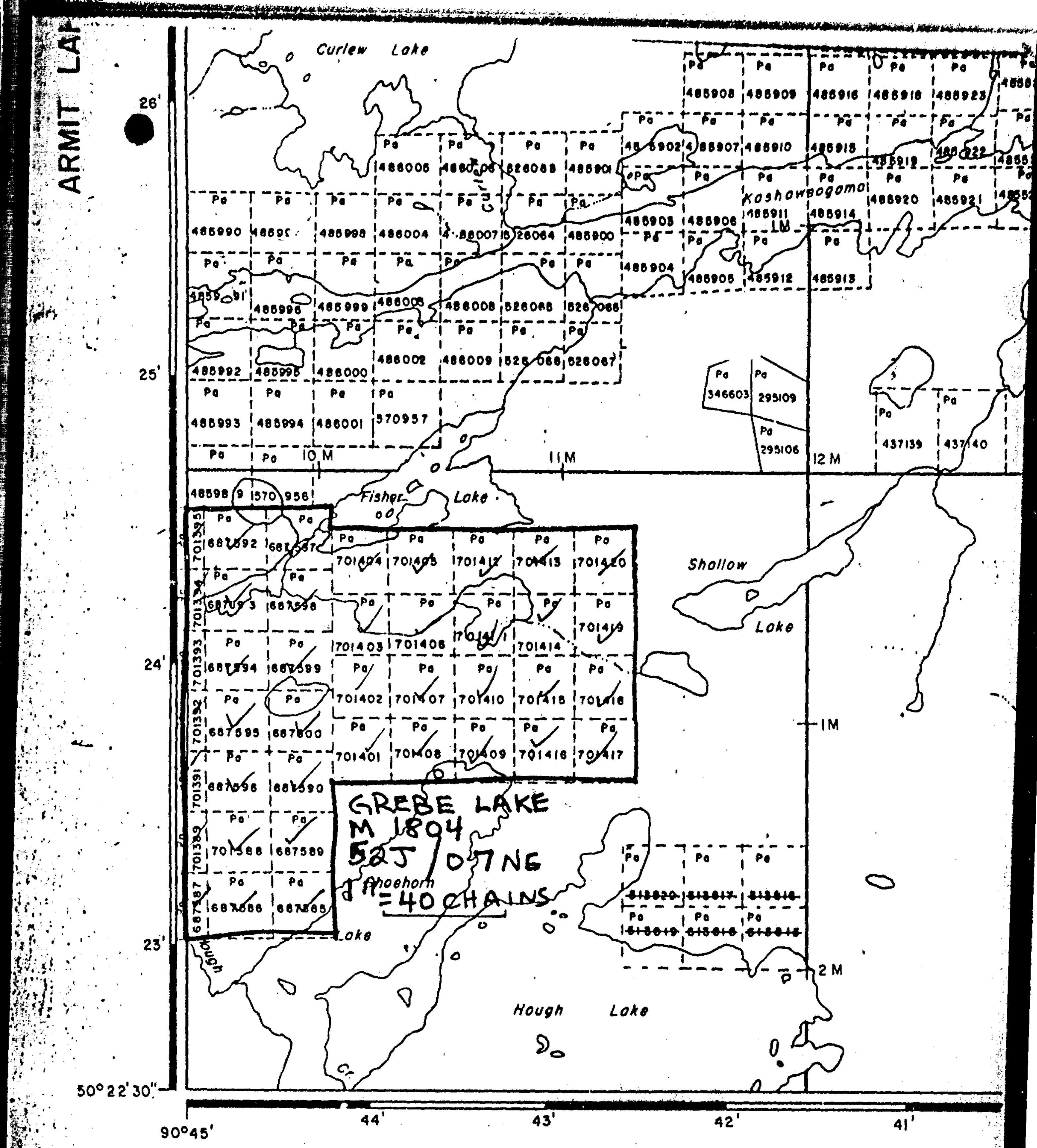
611670
632384
632385
644968
644967
644966


Lake
Kashaweogama Lake
Hough
Cr.
6M.
7M.
8M.+2c
9M.
ARMIT LK
M 2744
52J/07NW
1"=40 CHAINS
26'
25'
24'
23'
50'
50'
49'
48'
47'
46'
90°45'


EVANS LAKE
M-1774
52J/07SE
1"=40 CHAINS
Evans Lake
7M.
8M.
9M.
10M.
11M
M.T.C. Gravel Pit No. 1654
GRAVEL FILE: 189277
1/2 MILE
C.N.R. RES.
1/2 MILE
599
CL 1674
P-3381-13
P-3381-31
50°15'
90°45'
44'
43'
42'
41'


ARMIT LA
Curlew Lake
Koshawogomo
Fisher Lake
Shollow Lake
Shoehorn Lake
Hough Lake
10 M
11 M
12 M
1M
2 M
26'
25'
24'
23'
50°22'30"
90°45'
44'
43'
42'
41'
GREBE LAKE
M 1894
52J/07NE
1" = 40 CHAINS

Ontario Ministry of Natural Resources

Technical Assessment Work Credits

File: 2.7299

Date: 1984 10 30

Mining Recorder's Report of Work No. 84-115

Recorded Holder: CUMBERLAND RESOURCES LIMITED

Township or Area: GREBE LAKE AREA

Type of survey and number of Assessment days credit per claim	Mining Claims Assessed
Geophysical	Pa 687587-88 701389 to 400 incl.
Electromagnetic 23 days	
Magnetometer 23 days	
Radiometric ____ days	
Induced polarization ____ days	
Other ____ days	
Section 77 (19) See "Mining Claims Assessed" column	
Geological ____ days	
Geochemical ____ days	
Man days ☐ Airborne ☒	
Special provision ☐ Ground ☐	
☐ 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:

828 (83/6)

MZ

Ministry of Natural Resources
Ontario

Technical Assessment Work Credits

File
2.7299

Date	Mining Recorder's Report of Work No.
1984 10 30	84-116

Recorded Holder
CUMBERLAND RESOURCES LIMITED

Township or Area
EVANS LAKE AREA

Type of survey and number of Assessment days credit per claim	Mining Claims Assessed
Geophysical	Pa 656539 to 580 incl.
Electromagnetic 23 days	
Magnetometer 23 days	
Radiometric ___ days	
Induced polarization ___ days	
Other ___ days	
Section 77 (19) See "Mining Claims Assessed" column	
Geological ___ days	
Geochemical ___ days	
Man days ☐ Airborne ☒	
Special provision ☐ Ground ☐	
☐ 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:

828 (83/6)

Ontario | Ministry of Natural Resources

Technical Assessment Work Credits

File: 2.7299

Date: 1984 10 30

Mining Recorder's Report of Work No. 84-117

Recorded Holder: CUMBERLAND RESOURCES LIMITED

Township or Area: HOUGHTON LAKE AREA

Type of survey and number of Assessment days credit per claim	Mining Claims Assessed
Geophysical	Pa 659511-12-13-15-16
Electromagnetic 23 days	659525 to 529 incl.
Magnetometer 23 days	701421 to 435 incl.
Radiometric ____ days	747384 to 389 incl.
Induced polarization ____ days	747394 to 399 incl.
Other ____ days	747404 to 409 incl.
Section 77 (19) See "Mining Claims Assessed" column	747414 to 416 incl.
Geological ____ days	701301 to 320 incl.
Geochemical ____ days	701322 to 329 incl.
Man days ☐ Airborne ☒	
Special provision ☐ Ground ☐	
☐ 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:

828 (83/4)

74

Ministry of Natural Resources
Ontario

Technical Assessment Work Credits

File: 2.7299

Date: 1984 10 30

Mining Recorder's Report of Work No. 84-118

Recorded Holder: CUMBERLAND RESOURCES LIMITED

Township or Area: GREBE LAKE AREA

Type of survey and number of Assessment days credit per claim	Mining Cla. s Assessed
Geophysical	Pa 687585-86
Electromagnetic 23 days	687589-90
Magnetometer 23 days	687592 to 600 incl.
Radiometric ____ days	701388
Induced polarization ____ days	701401 to 420 incl.
Other ____ days	
Section 77 (19) See "Mining Claims Assessed" column	
Geological ____ days	
Geochemical ____ days	
Man days ☐ Airborne ☒	
Special provision ☐ Ground ☐	
☐ 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:

828 (83/6)

M.N.R.
Mining Lands

Work
(Geological, Geochemical and Expenditures)
Mining Act

#84-115

2.7299

Type of Survey(s)	Township or Area
AIRBORNE GEOPHYSICAL SURVEY	G 1933 ARMIT LAKE M 2744
Claim Holder(s)	Prospector's Licence No.
CUMBERLAND RESOURCES LIMITED	T-1313
Address	
74 WINNIPEG AVE THUNDER BAY	
Survey Company	Date of Survey (from & to) — Total Miles of line Cut
DIGHEM LIMITED	20 4 84 / 21 4 84 — 248 KMS
Name and Address of Author (of Geo-Technical report)	
TORONTO	

Credits Requested per Each Claim in Columns at right

Special Provisions	Geophysical	Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	- Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Radiometric	
	- Other	
	Geological	
	Geochemical	
Man Days	Geophysical	Days per Claim
Complete reverse side and enter total(s) here	- Electromagnetic	
	- Magnetometer	
	- Radiometric	
	- Other	
	Geological	
	Geochemical	
Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	40
	Magnetometer	40
	Radiometric	

Mining Claims Traversed (List in numerical sequence)

Prefix	Number	Expend. Days Cr.
PA	687587	80
	687588	80
	701389	80
	701390	80
	701391	80
	701392	80
	701393	80
	701394	80
	701395	80
	701396	80
	701397	80
	701398	80
	701399	80
	701400	80

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... 11 1984
MINING LANDS SECTION

PATRICIA MINING DIV.
RECEIVED
AUG 17 1984
A.M. P.M.
7,8,9,10,11,12,1,2,3,4,5,6

Expenditures (excludes power stripping)

Type of Work Performed

Performed on Claim(s)

Calculation of Expenditure Days Credits

Total Expenditures $ ÷ 15 = Total Days Credits

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.

R. 659539

Total number of mining claims covered by this report of work. 14

For Office Use Only		
Total Days Cr. Recorded	Date Recorded	Mining Recorder
1120	Aug. 17, 1984	[signature]
	Date Approved as Recorded	Branch Director
	See Revised Statement	

Date	Recorded Holder or Agent (Signature)
AUG 17/84	[signature]

Certification Verifying Report of Work

I hereby certify that I have a 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.

Name and Postal Address of Person Certifying	Date Certified	Certified by (Signature)
WILLIAM McCANDLE 74 WINNIPEG AVE. THUNDER BAY	Aug 17/84	[signature]

1362 (81/9)

76

F.W.M.
Mining Lands

Work
al, Geological,
al and Expenditures)

#84-116

2.1299

The Mining Act

Instructions – Please type or print. If number of mining claims traversed exceeds space on this form, attach a list.
Note – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s)	Township or Area
Airborne Geophysical	Evans Lake (M-1774)

Claim Holder(s)	Prospector's Licence No.
Cumberland Resources Limited	T-1313

Address: 74 Winnipeg Ave. Thunder Bay P7C 3P9

Survey Company	Date of Survey (from & to)	Total Miles of line Cut
Dighem Limited	20 / 4 / 84 – 21 / 4 / 84 (Day / Mo. / Yr. – Day / Mo. / Yr.)	248 km

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

Credits Requested per Each Claim in Columns at right

Special Provisions	Geophysical	Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	- Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Man Days	Geophysical	Days per Claim
Complete reverse side and enter total(s) here	- Electromagnetic	
	- Magnetometer	
	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	40
	Magnetometer	40
	Radiometric	

Expenditures (excludes power stripping)

Type of Work Performed:

Performed on Claim(s):

Calculation of Expenditure Days Credits

Total Expenditures: $ ______ ÷ 15 = Total Days Credits ______

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.

Date	Recorded Holder or Agent (Signature)
Aug. 17/84	William McClendon (signature)

Mining Claims Traversed (List in numerical sequence)

Prefix	Number	Expend. Days Cr.	Prefix	Number	Expend. Days Cr.
List	Attached	80			

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MINING LANDS SECTION

PATRICIA MINING DIV.
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AUG 17 1984
A.M. 7 8 9 10 11 12 1 2 3 4 5 6 P.M.

Pa. 659539

Total number of mining claims covered by this report of work: 42

For Office Use Only

Total Days Cr. Recorded	Date Recorded	Mining Recorder
3360	Aug. 17, 1984	(signature)
	Date Approved as Recorded	Branch Director
	See Revised	Statement

Certification Verifying Report of Work

I hereby certify that I have a 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.

Name and Postal Address of Person Certifying: William McClendon 74 Winnipeg Ave Thunder Bay Ont.

Date Certified	Certified by (Signature)
Aug. 17/84	William McClendon (signature)

EVANS LAKE GROUP #1 - SAVANT

Location: Evans Lake M-1774, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83
Recorded: March 21/83

PA659539
PA659540
PA659541
PA659542
PA659543
PA659544
PA659545
PA659546
PA659547
PA659548
PA659549
PA659550
PA659551
PA659552
PA659553
PA659554
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PA659556
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PA659578
PA659579
PA659580

F.W.M.
Mining Lands

...of Work
...ical, Geological,
...ical and Expenditures)

#84-117
2.7229

Mining Act

Instructions – Please type or print.
– If number of mining claims traversed exceeds space on this form, attach a list.
Note – Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s): AIRBORNE GEOPHYSICAL	Township or Area: [illegible] LAKE (M-2165)
Claim Holder(s): CUMBERLAND RESOURCES LIMITED	Prospector's Licence No.: T-1312
Address: 74 WINNIPEG AVE THUNDER BAY P7B 3P9	
Survey Company: DIGHEM LIMITED	Date of Survey (from & to): 20 4 84 / 21 4 84 (Day Mo. Yr. / Day Mo. Yr.) — Total Miles of line Cut: 248 KMS.
Name and Address of Author (of Geo-Technical report): TORONTO	

Credits Requested per Each Claim in Columns at right

Special Provisions		Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	Geophysical	
	- Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Man Days		Days per Claim
Complete reverse side and enter total(s) here	Geophysical	
	- Electromagnetic	
	- Magnetometer	
	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	40
	Magnetometer	40
	Radiometric	

Expenditures (excludes power stripping)

Type of Work Performed

Performed on Claim(s)

Calculation of Expenditure Days Credits

Total Expenditures $ ÷ 15 = Total Days Credits

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.

Mining Claims Traversed (List in numerical sequence)

Prefix	Number	Expend. Days Cr.	Prefix	Number	Expend. Days Cr.
LIST	ATTACHED	~~80~~			

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MINING LANDS SECTION

PATRICIA MINING DIV.
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A.M. 7 8 9 10 11 12 1 2 3 4 5 6 P.M.

Pa. 659511

Total number of mining claims covered by this report of work. 74

For Office Use Only		
Total Days Cr. Recorded: 5920	Date Recorded: Aug. 17, 1984	Mining Recorder: [signature]
	Date Approved as Recorded: See Revised Statement	Branch Director

Date	Recorded Holder or Agent (Signature)
AUG. 17/84	William McCrindle

Certification Verifying Report of Work

I hereby certify that I have a 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.

Name and Postal Address of Person Certifying	Date Certified	Certified by (Signature)
WILLIAM McCRINDLE 74 WINNIPEG AVE THUNDER BAY	AUG 1 '84	[signature]

1362 (81/9)

HOUGHTON LAKE - SAVANT GROUP #2

Location: Houghton Lake M-2165, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83
Recorded: April 6/83

PA659511
PA659512
PA659513

PA659515
PA659516

PA659525
PA659526
PA659527
PA659528
PA659529

PA701421
PA701422
PA701423
PA701424
PA701425
PA701426
PA701427
PA701428
PA701429
PA701430
PA701431
PA701432
PA701433
PA701434
PA701435

SAVANT - BAY GROUP

Location: Houghton Lake M2165, Patricia Mining Division, Ontario
Ownership: Cumberland Resources Ltd. 100%
Registered: in name of Cumberland Resources Ltd. March 26/84
Recorded: December 13, 1983

PA747384
PA747385
PA747386
PA747387
PA747388
PA747389

PA747394
PA747395
PA747396
PA747397
PA747398
PA747399

PA747404
PA747405
PA747406
PA747407
PA747408
PA747409

PA747414
PA747415
PA747416

ISLAND LAKE - SAVANT GROUP #3

Location: Houghton Lake M-2165, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83
Recorded: March 21/83

PA701301
PA701302
PA701303
PA701304
PA701305
PA701306
PA701307
PA701308
PA701309
PA701310
PA701311
PA701312
PA701313
PA701314
PA701315
PA701316
PA701317
PA701318
PA701319
PA701320

PA701322
PA701323
PA701324
PA701325
PA701326
PA701327
PA701328
PA701329

F.W.M.
Mining Lands

Ontario

[illegible] Work
[illegible]al, Geological,
Geochemical and Expenditures)

#84-118

2.7299

Mining Act

Instructions: [illegible]
If number of mining claims traversed exceeds space on this form, attach a list.
Note: Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
– Do not use shaded areas below.

Type of Survey(s): Airborne Geophysical Survey	Township or Area: Grebe Lake (M-1809)
Claim Holder(s): Cumberland Resources Limited	Prospector's Licence No.
Address: 74 Winnipeg Ave. Thunder Bay	
Survey Company: [illegible] Limited	Date of Survey (from & to): 20 4 84 (Day Mo. Yr.) – 21 4 84 (Day Mo. Yr.) · Total Miles of line Cut: 248 kms
Name and Address of Author (of Geo-Technical report): ... Toronto	

Credits Requested per Each Claim in Columns at right

Special Provisions		Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	Geophysical	
	- Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Man Days		Days per Claim
Complete reverse side and enter total(s) here	Geophysical	
	- Electromagnetic	
	- Magnetometer	
	- Radiometric	
	- Other	
	Geological	
	Geochemical	

Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	40
	Magnetometer	40
	Radiometric	

Expenditures (excludes power stripping)

Type of Work Performed

Performed on Claim(s)

Calculation of Expenditure Days Credits

Total Expenditures				Total Days Credits
$	+	15	=	

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.

Date	Recorded Holder or Agent (Signature)
Aug. 17/84	William McCrindle

Mining Claims Traversed (List in numerical sequence)

Prefix	Number	Expend. Days Cr.	Prefix	Number	Expend. Days Cr.
List	Attached				

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MINING LANDS SECTION

PATRICIA MINING DIV.
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A.M. 7 8 9 10 11 12 1 2 3 4 5 6 P.M.

Pa. 659539

Total number of mining claims covered by this report of work: 34

For Office Use Only		
Total Days Cr. Recorded	Date Recorded: Aug. 17, 1984	Mining Recorder: [signature]
2720	Date Approved as Recorded: See Revised	Branch Director: Statement

Certification Verifying Report of Work

I hereby certify that I have a 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.

Name and Postal Address of Person Certifying	Date Certified	Certified by (Signature)
William McCrindle 74 Winnipeg Ave. Thunder Bay	Aug. 17/84	W. McCrindle

83

FISHER LAKE PROPERTY - SAVANT

Location: Grebe Lake M-1804, Armit Lake 2744, Patricia Mining Division, Ontario
Ownership: by agreement dated June 1/83
Cumberland Resources Ltd. 50%
Redfern Resources Ltd. 25%
Vestor Exploration Ltd. 25%
Registered: in name of Cumberland Resources Ltd. May 5/83

Recorded: March 21/83

PA687585
PA687586
~~PA687587~~
~~PA687588~~
PA687589
PA687590

PA687592
PA687593
PA687594
PA687595
PA687596
PA687597
PA687598
PA687599
PA687600

PA701388
~~PA701389~~
~~PA701390~~
~~PA701391~~
~~PA701392~~
~~PA701393~~
~~PA701394~~
~~PA701395~~
~~PA701396~~
~~PA701397~~
~~PA701398~~
~~PA701399~~
~~PA701400~~

Recorded: April 6/83

PA701401
PA701402
PA701403
PA701404
PA701405
PA701406
PA701407
PA701408
PA701409
PA701410
PA701411
PA701412
PA701413
PA701414
PA701415
PA701416
PA701417
PA701418
PA701419
PA701420

Ministry of Natural Resources
Ontario

Nov. 14/84

1984 10 30

Your File: 84-115,84-116,84-117 & 84-118
Our File: 2.7299

Mining Recorder
Ministry of Natural Resources
P.O. Box 309
Sioux Lookout, Ontario
POV 2T0

Dear Sir:

Enclosed are two copies of a Notice of Intent with statements listing a reduced rate of assessment work credits to be allowed for a technical survey. Please forward one copy to the recorded holder of the claims and retain the other. In approximately fifteen days from the above date, a final letter of approval of these credits will be sent to you. On receipt of the approval letter, you may then change the work entries on the claim record sheets.

For further information, if required, please contact Mr. R.J. Pichette at 416/965-4888.

Yours sincerely,

S.E. Yundt
Director
Land Management Branch

Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3

S. Hurst:mc

Encls.

cc: Cumberland Resources Limited
74 Winnipeg Avenue
Thunder Bay, Ontario
P7B 3P9
Attention: Mr. William McCrindle

cc: Mr. G.H. Ferguson
Mining & Lands Commissioner
Toronto, Ontario

845

Ministry of Natural Resources

Ontario

Notice of Intent

for Technical Reports

1984 10 30

2.7299/84-115/84-116/84-117/84-118

An examination of your survey report indicates that the requirements of The Ontario Mining Act have not been fully met to warrant maximum assessment work credits. This notice is merely a warning that you will not be allowed the number of assessment work days credits that you expected and also that in approximately 15 days from the above date, the mining recorder will be authorized to change the entries on his record sheets to agree with the enclosed statement. Please note that until such time as the recorder actually changes the entry on the record sheet, the status of the claim remains unchanged.

If you are of the opinion that these changes by the mining recorder will jeopardize your claims, you may during the next fifteen days apply to the Mining and Lands Commissioner for an extension of time. Abstracts should be sent with your application.

If the reduced rate of credits does not jeopardize the status of the claims then you need not seek relief from the Mining and Lands Commissioner and this Notice of Intent may be disregarded.

If your survey was submitted and assessed under the "Special Provision-Performance and Coverage" method and you are of the opinion that a re-appraisal under the "Man-days" method would result in the approval of a greater number of days credit per claim, you may, within the said fifteen day period, submit assessment work breakdowns listing the employees names, addresses and the dates and hours they worked. The new work breakdowns should be submitted direct to the Land Management Branch, Toronto. The report will be re-assessed and a new statement of credits based on actual days worked will be issued.

1984 11 19

Your File: 84-115, 84-116,
84-117, 84-118.
Our File: 2.7299

Mining Recorder
Ministry of Natural Resources
P.O. Box 309
Sioux Lookout, Ontario
POV 2TO

Dear Sir:

RE: Notice of Intent dated October 30, 1984.
Airborne (Electromagnetic & Magnetometer)
Survey on Mining Claims PA 659539 et al
in the Evans, Grebe, Houghton Lake Areas.

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,

S.E. Yundt
Director
Land Management Branch

Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3
Phone:(416)965-6918

S. Hurst:sc

cc: Cumberland Resources Limited
74 Winnipeg Avenue
Thunder Bay, Ontario
P7B 3P9
Attn: Mr. William McCrindle

cc: Mr. G.H. Ferguson
Mining & Lands Commissioner
Toronto, Ontario

cc: Resident Geologist
Sioux Lookout, Ontario

FOR ADDITIONAL

INFORMATION

SEE MAPS:

52J/07SW-0026 #1-12

52J07NE0010 52J07SW0026 GREBE LAKE

900

Mining Lands Section

File No 2.7299

Control Sheet

TYPE OF SURVEY

✓ GEOPHYSICAL

GEOLOGICAL

GEOCHEMICAL

EXPENDITURE

MINING LANDS COMMENTS:

L.D. Gqd.

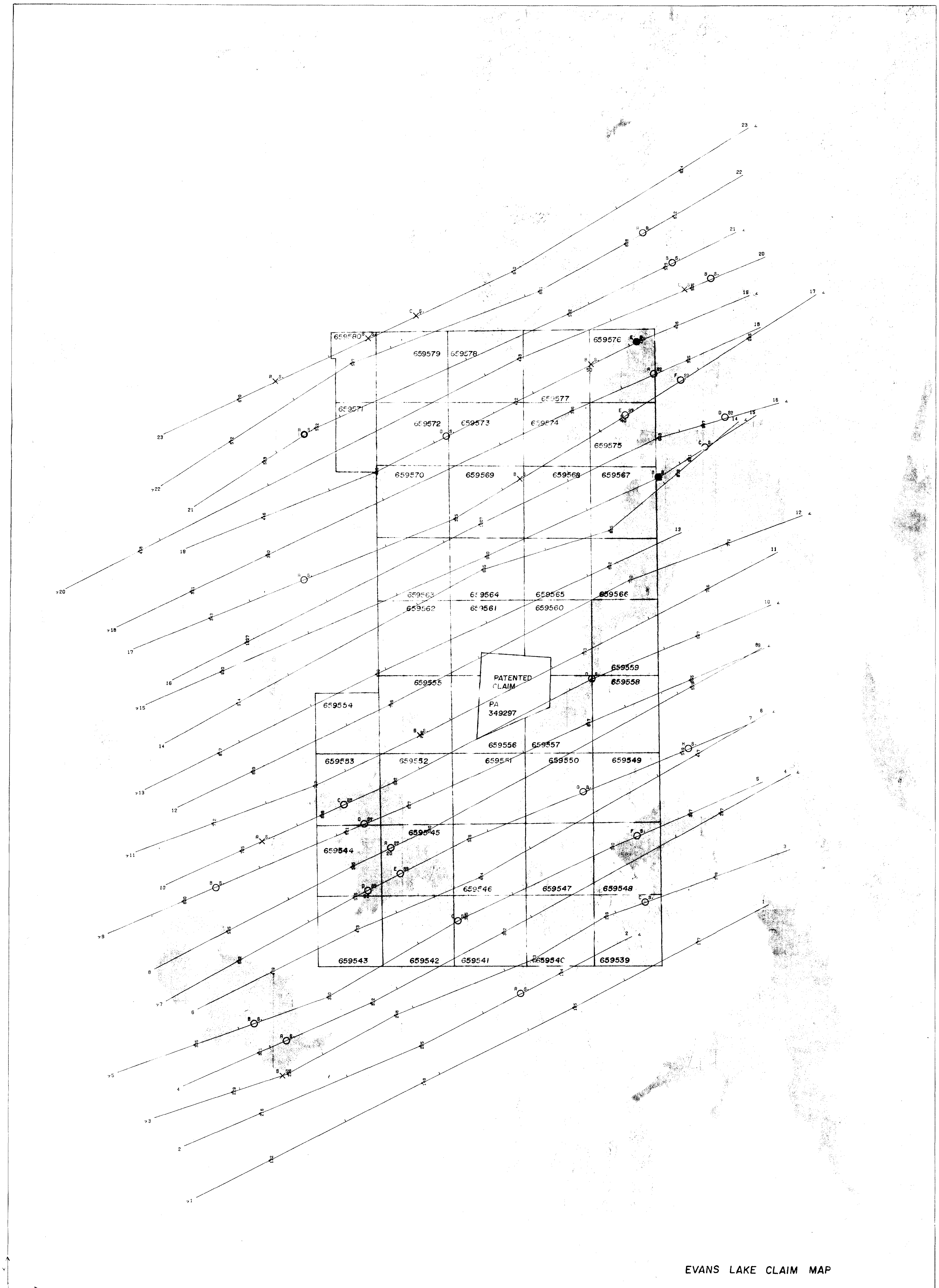
D. Hurst

Signature of Assessor

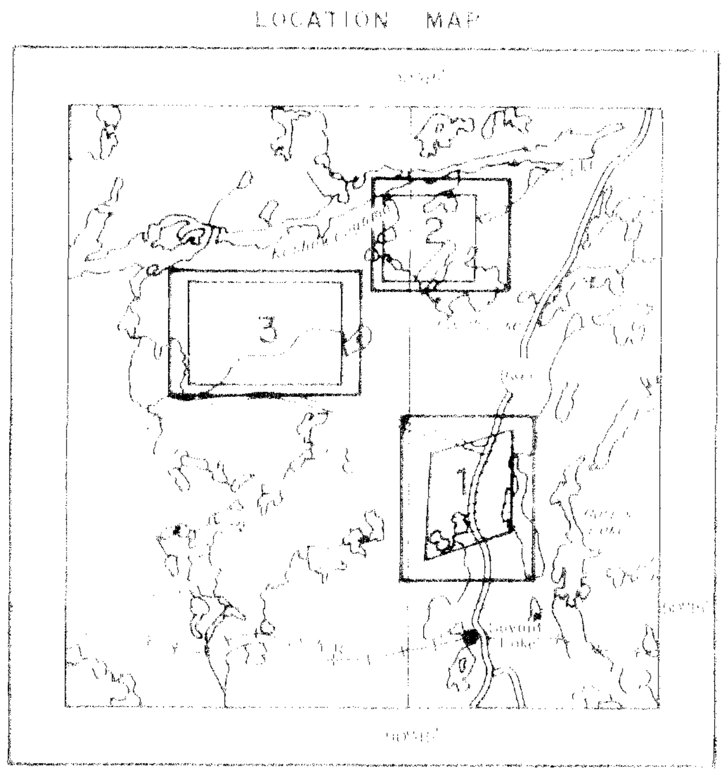
84-10-17

Date

2



LOCATION MAP



SCALE 1:250,000

DIGHEM SURVEY

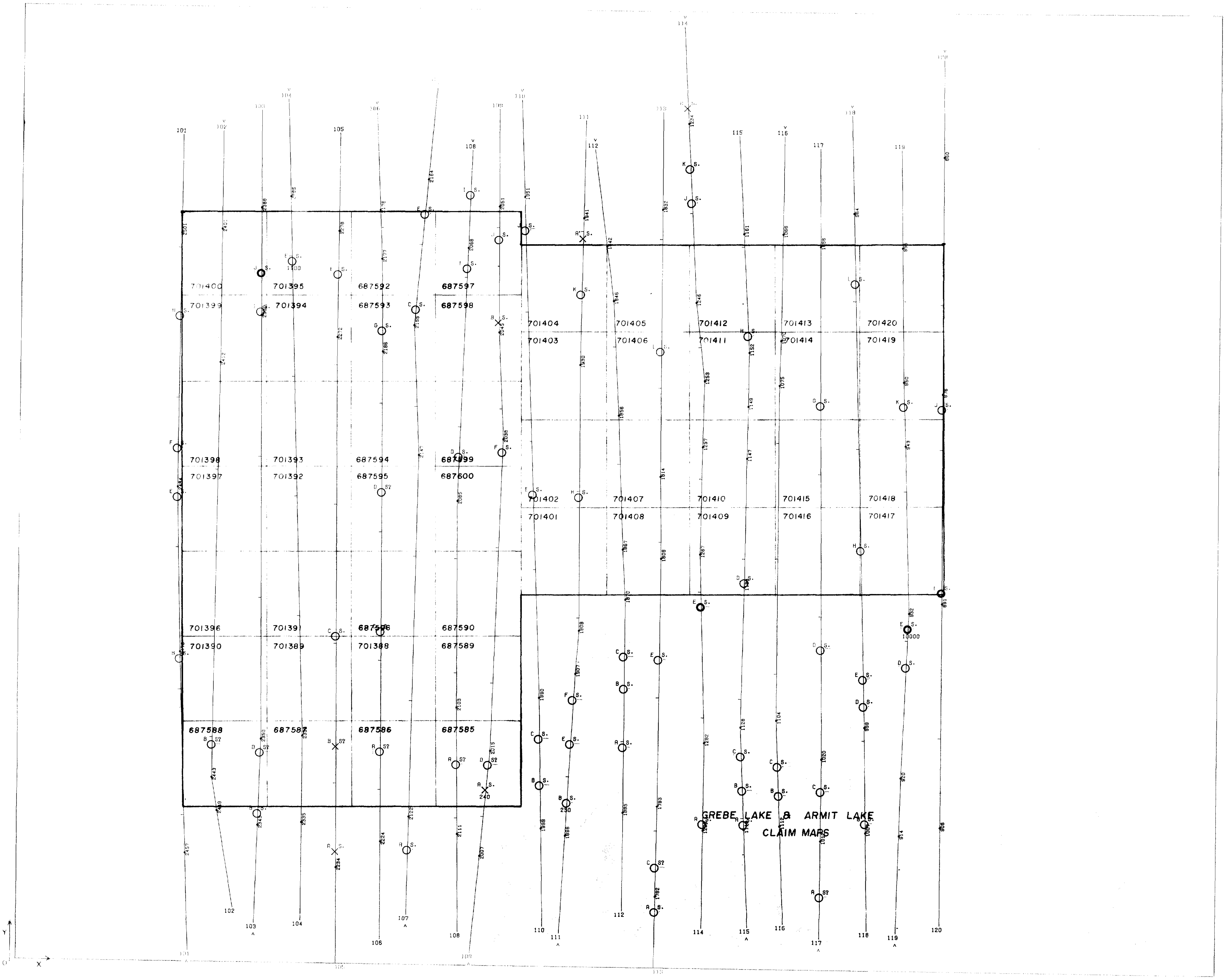
SAVANT LAKE AREA, ONTARIO

ELECTROMAGNETIC ANOMALIES

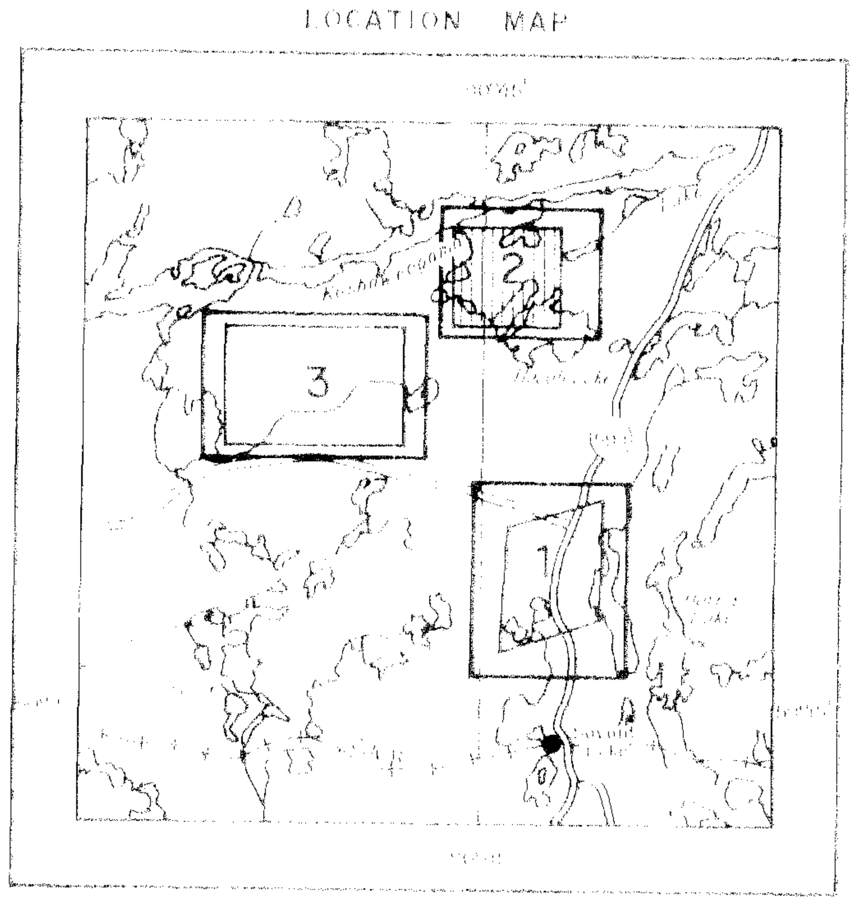
FOR

CUMBERLAND RESOURCES LTD

Scale 1:10,000



LOCATION MAP



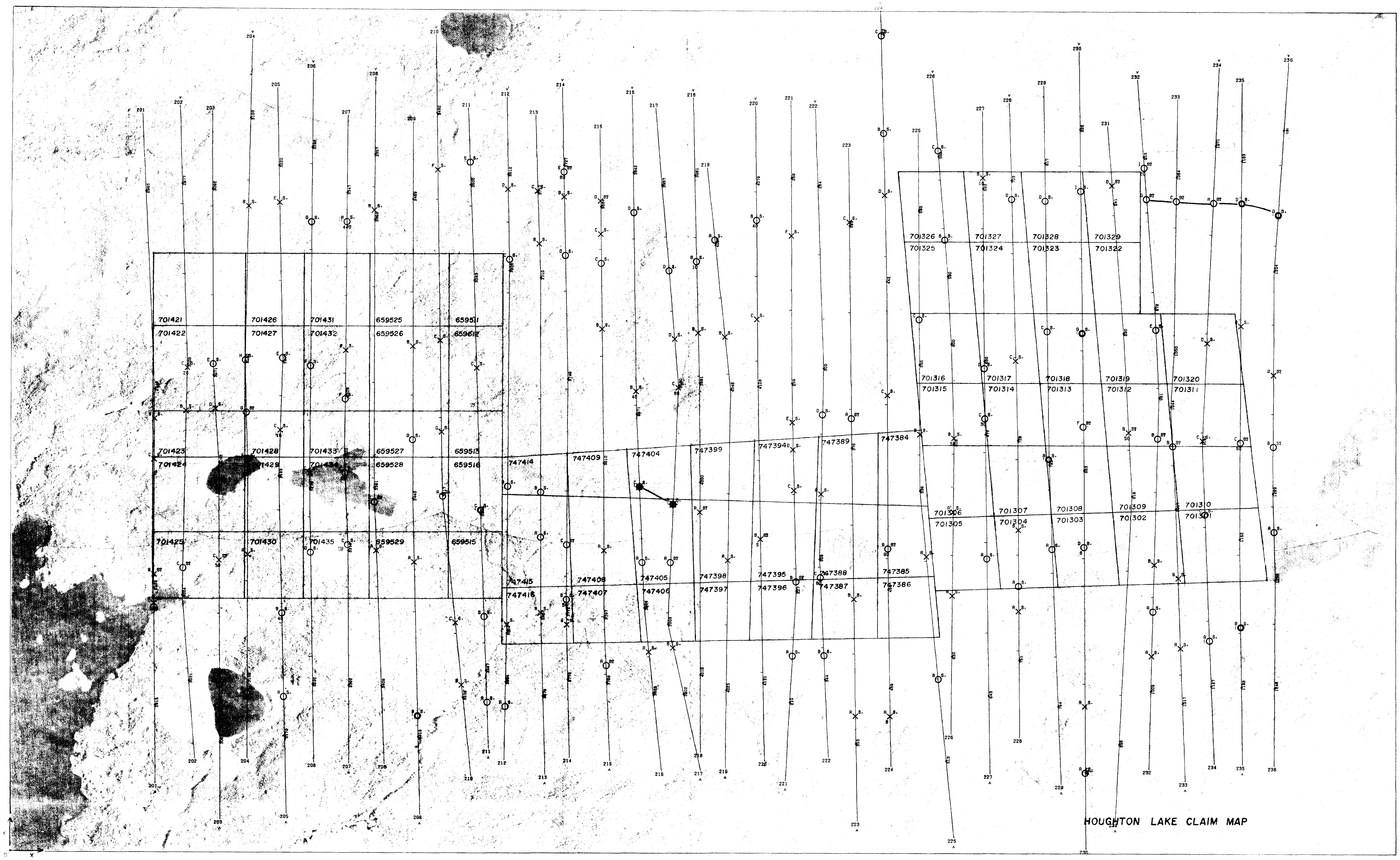
SCALE 1:250,000

DIGHEM SURVEY

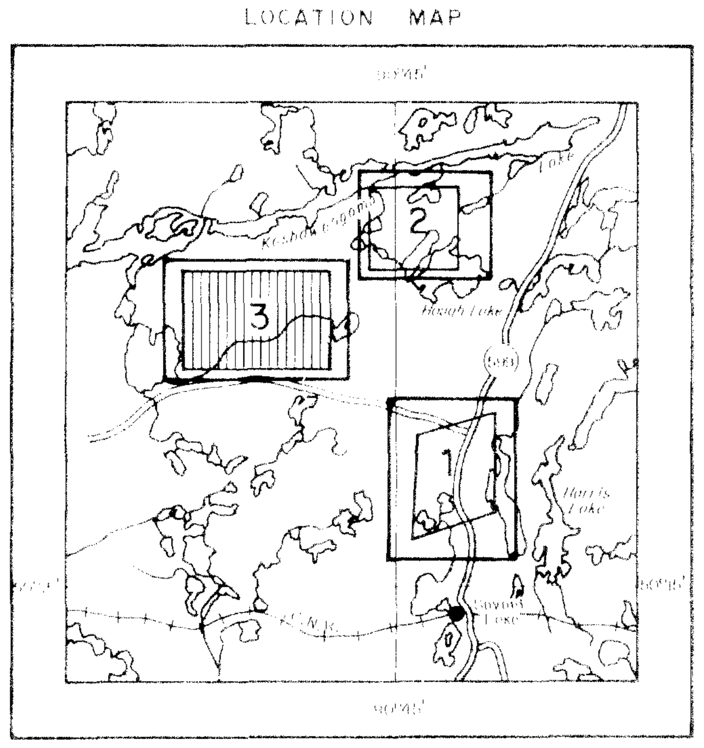
SAVANT LAKE AREA, ONTARIO

ELECTROMAGNETIC ANOMALIES FOR CUMBERLAND RESOURCES LTD.

Scale 1:10,000



LOCATION MAP



SCALE 1:250,000

DIGHEM III SURVEY

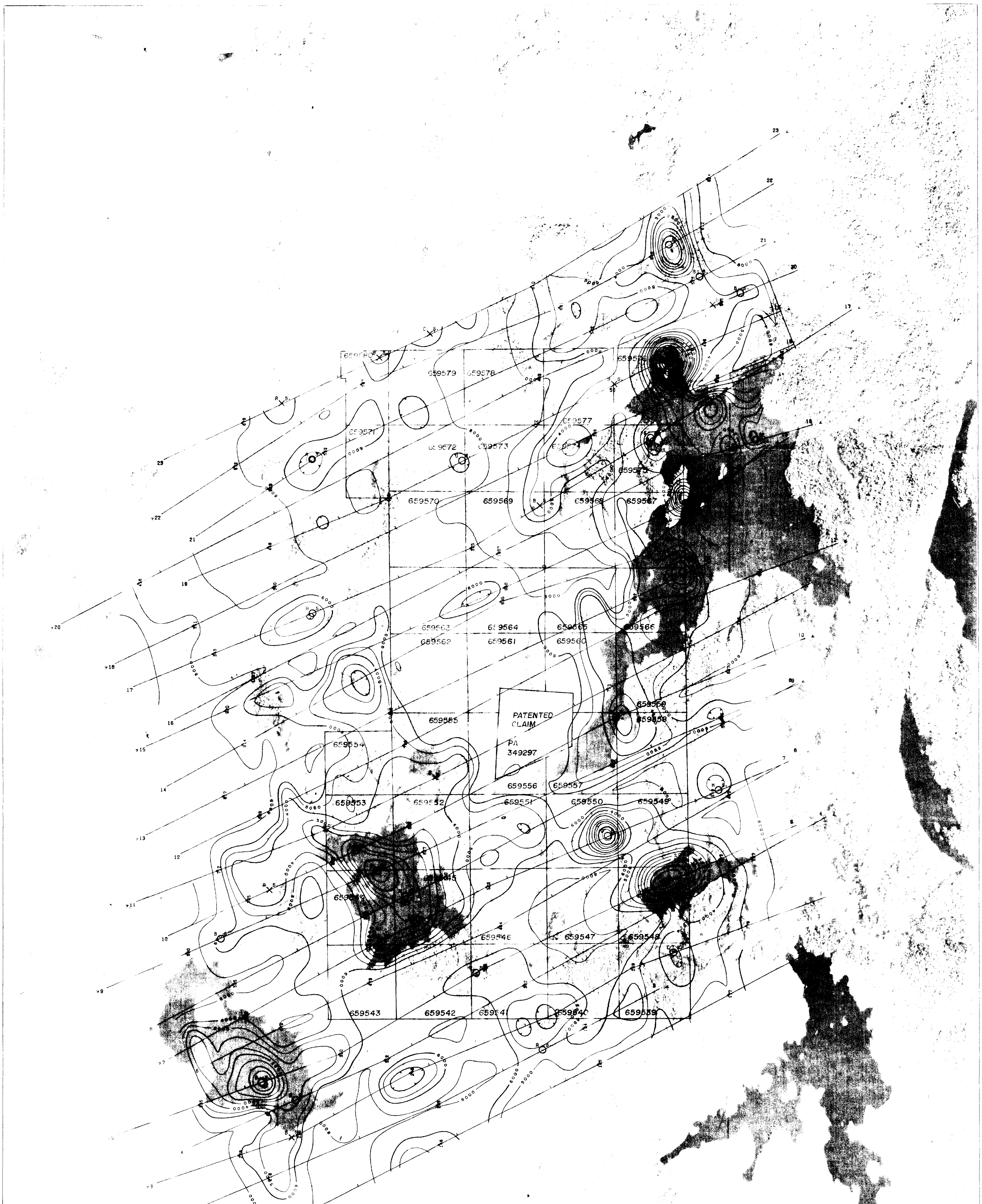
SAVANT LAKE AREA, ONTARIO

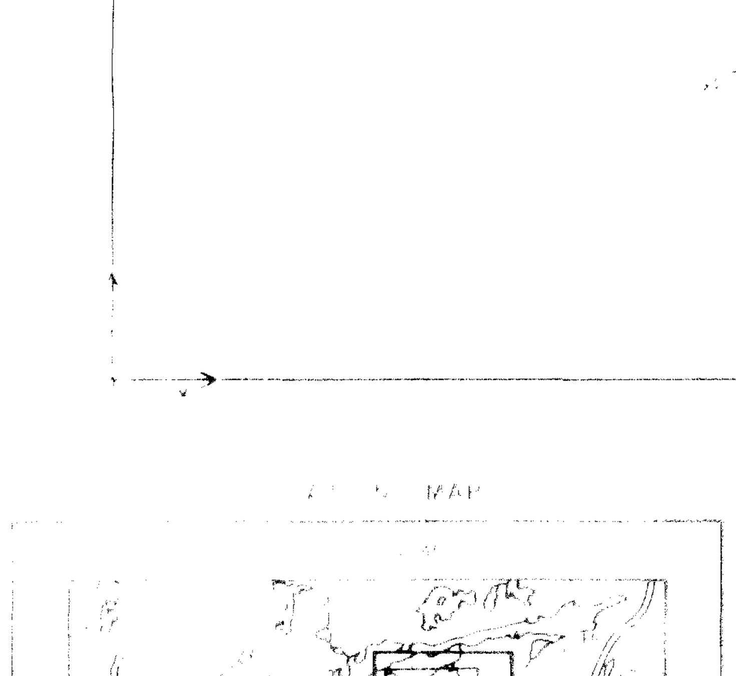
ELECTROMAGNETIC ANOMALIES

FOR

CUMBERLAND RESOURCES LTD.

DATE JULY, 84





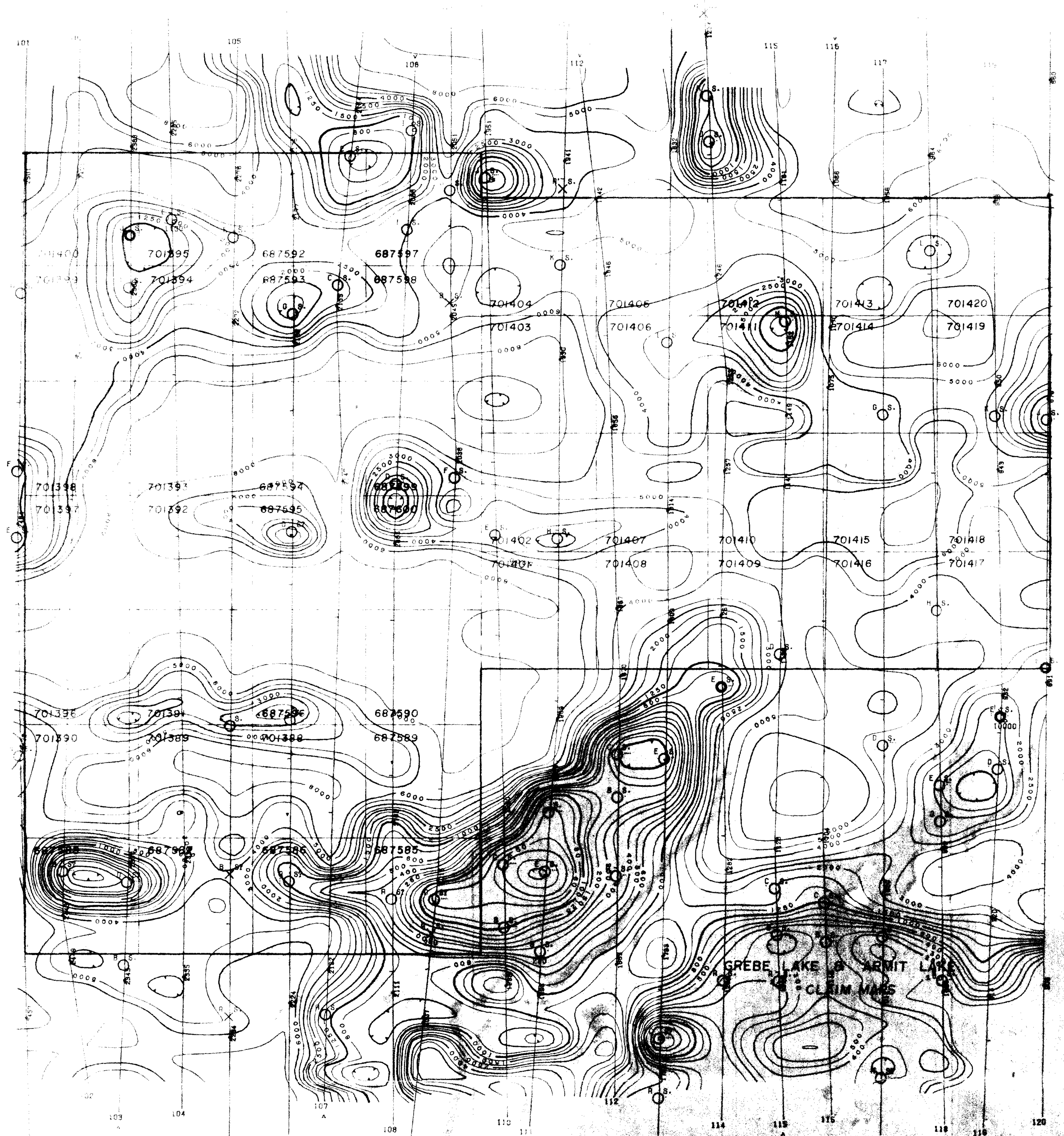
DIGHEM SURVEY

SAVANT LAKE AREA, ONTARIO

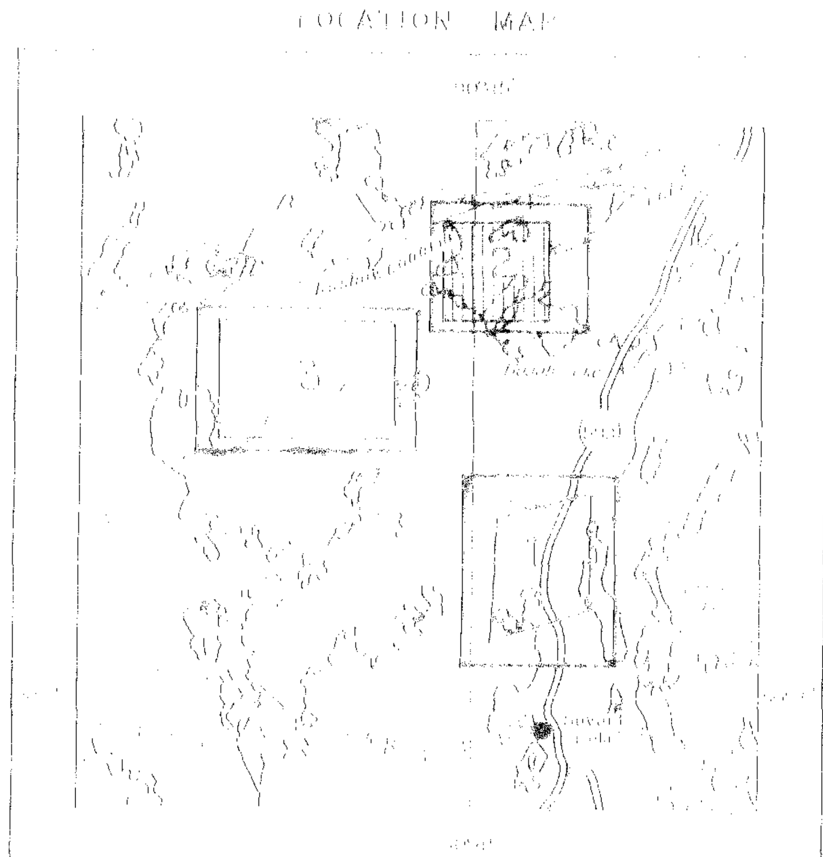
RESISTIVITY

FOR

CUMBERLAND RESOURCES LTD



LOCATION MAP



SCALE 1:250,000

DIGHEM SURVEY

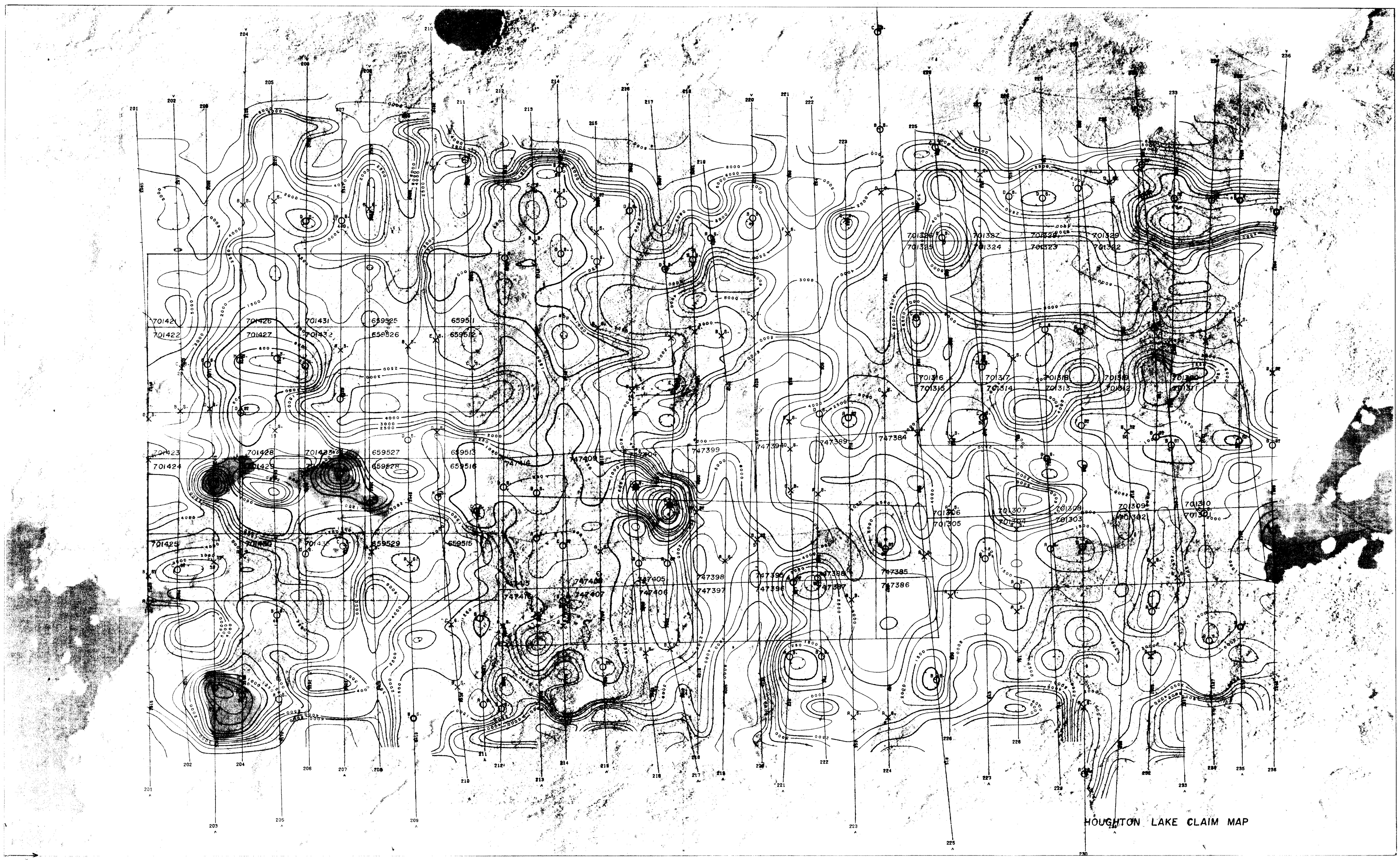
SAVANT LAKE AREA, ONTARIO

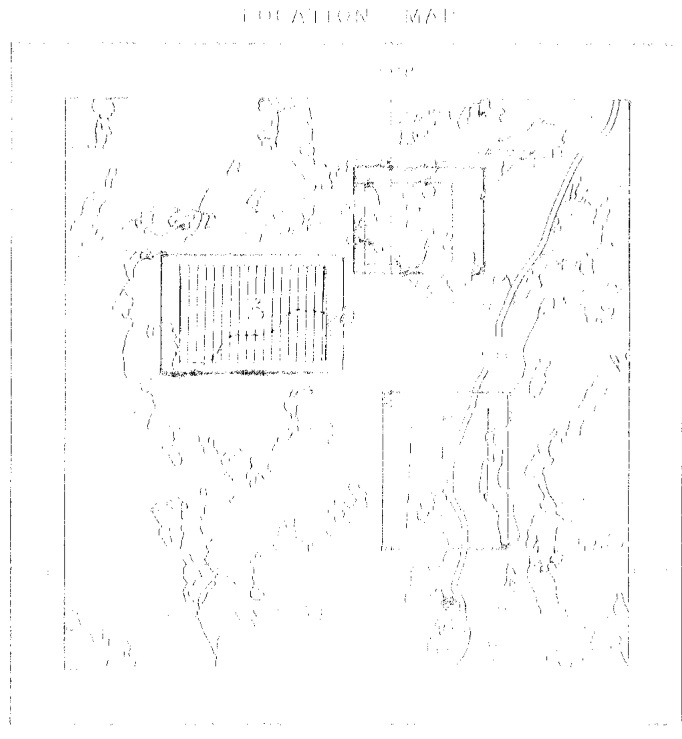
RESISTIVITY

FOR

CUMBERLAND RESOURCES LTD.

Scale 1:10000





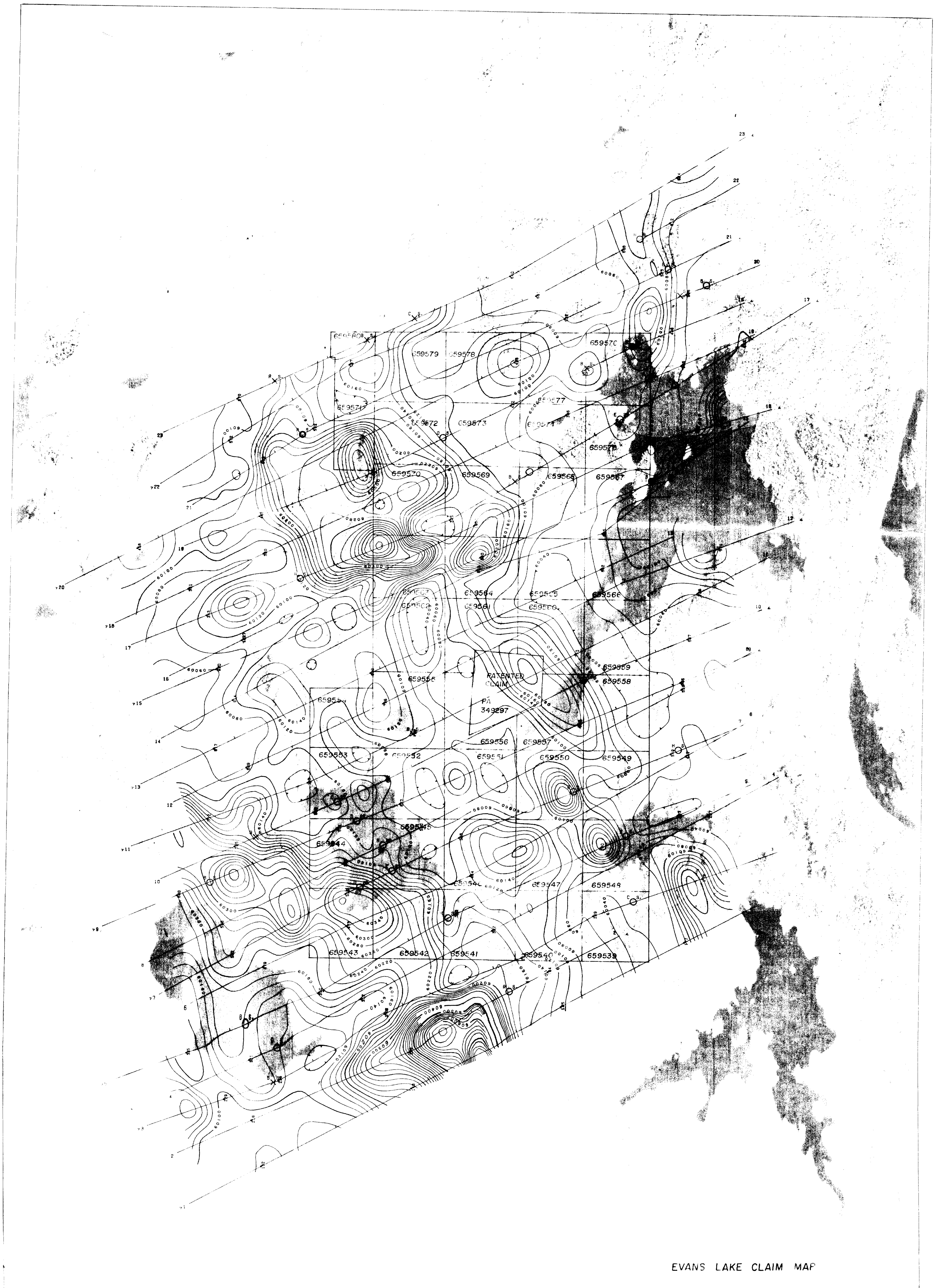
DIGHEM[II] SURVEY

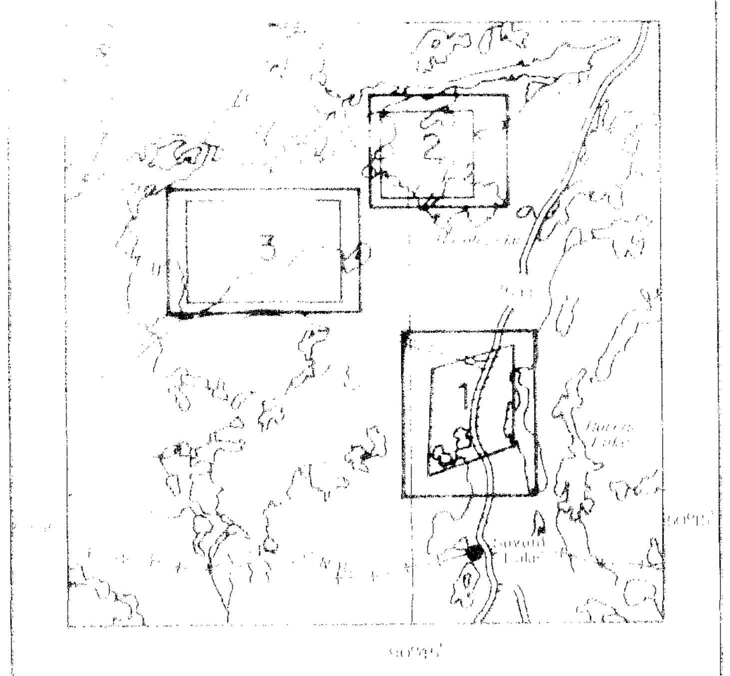
SAVANT LAKE AREA ONTARIO

RESISTIVITY

FOR

CUMBERLAND RESOURCES LTD.





DIGHEM SUR EY

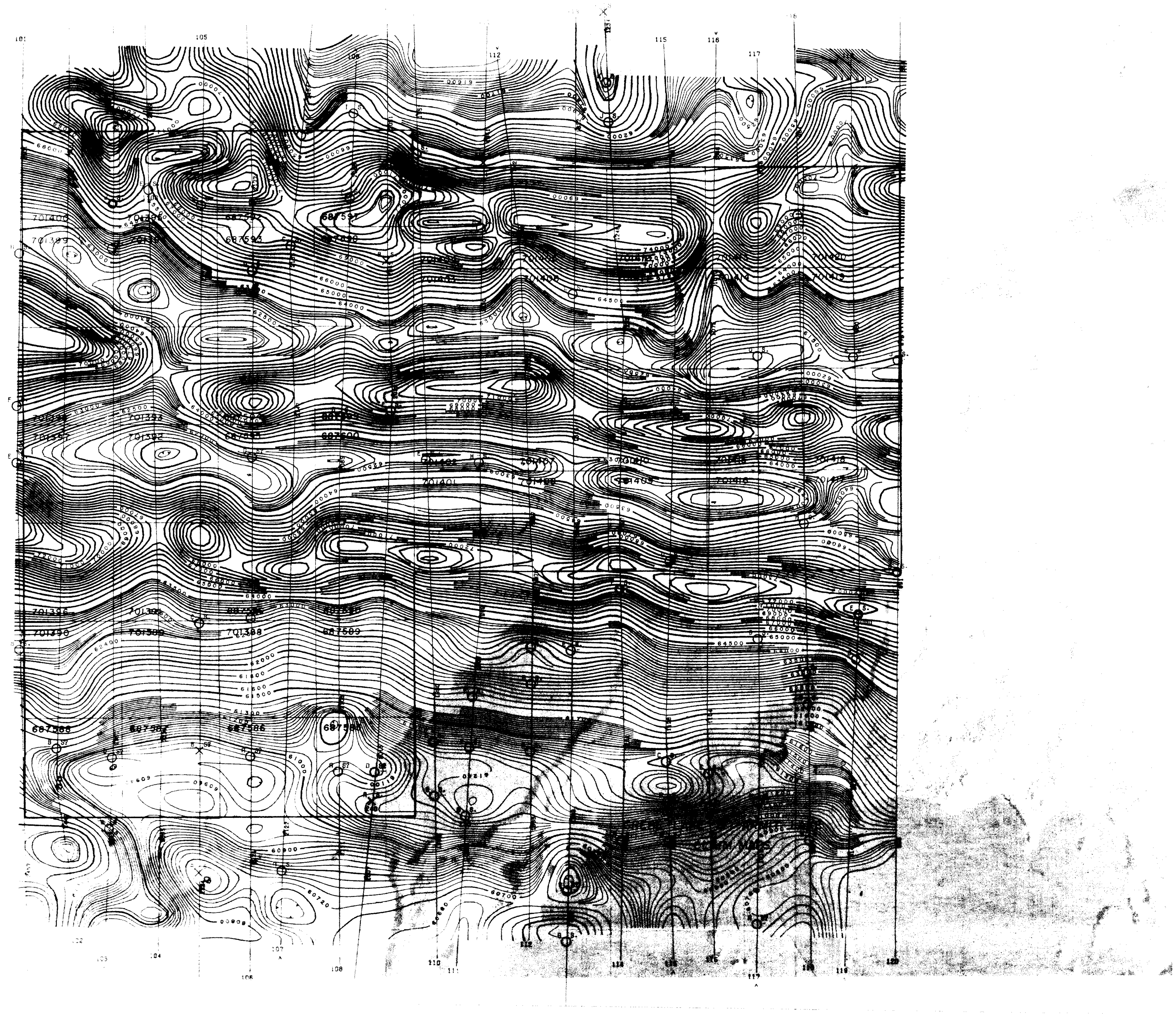
SAVANT LAKE AREA

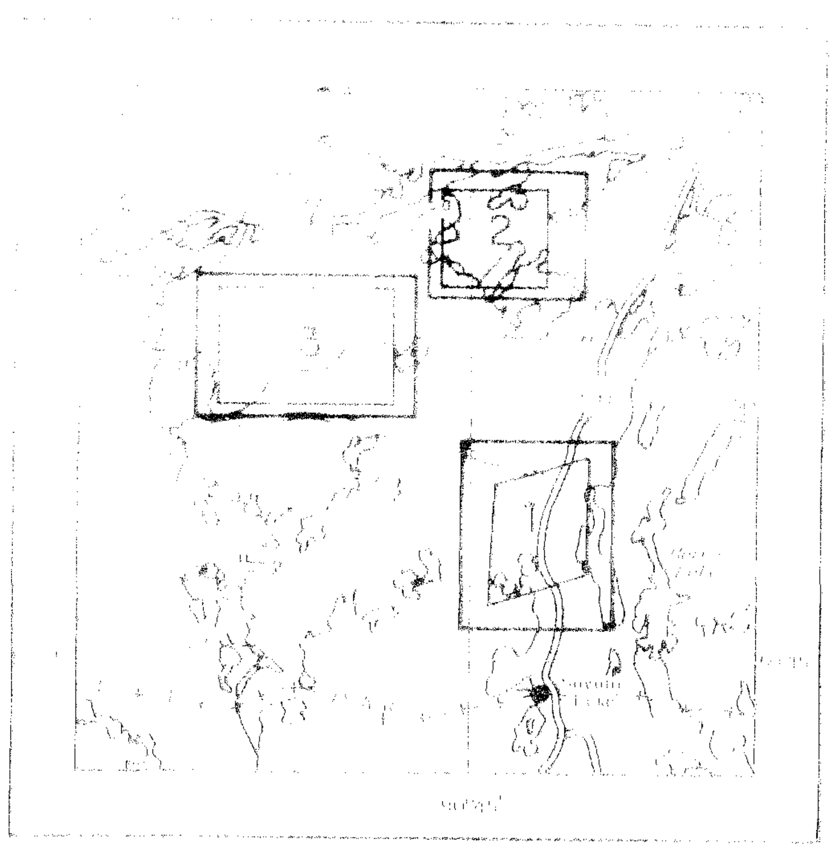
TOTAL FIELD MAGNETI

FOR

UMBERLAND RESOURC

Scale 1:10,000





DIGHEM SURVEY

SAVANT LAKE AREA, ONTARIO

TOTAL FIELD MAGNETICS

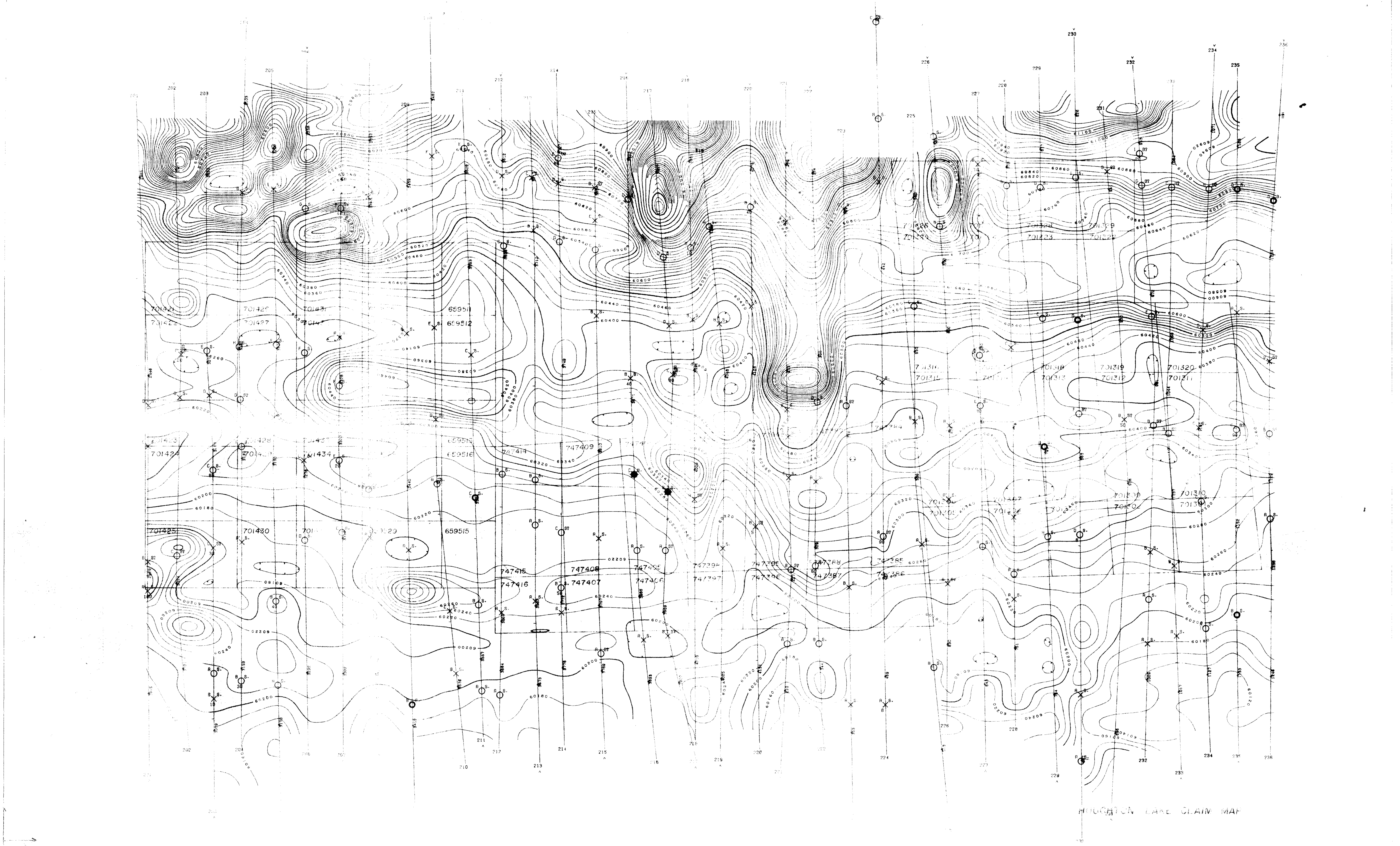
FOR

CUMBERLAND RESOURCES LTD.

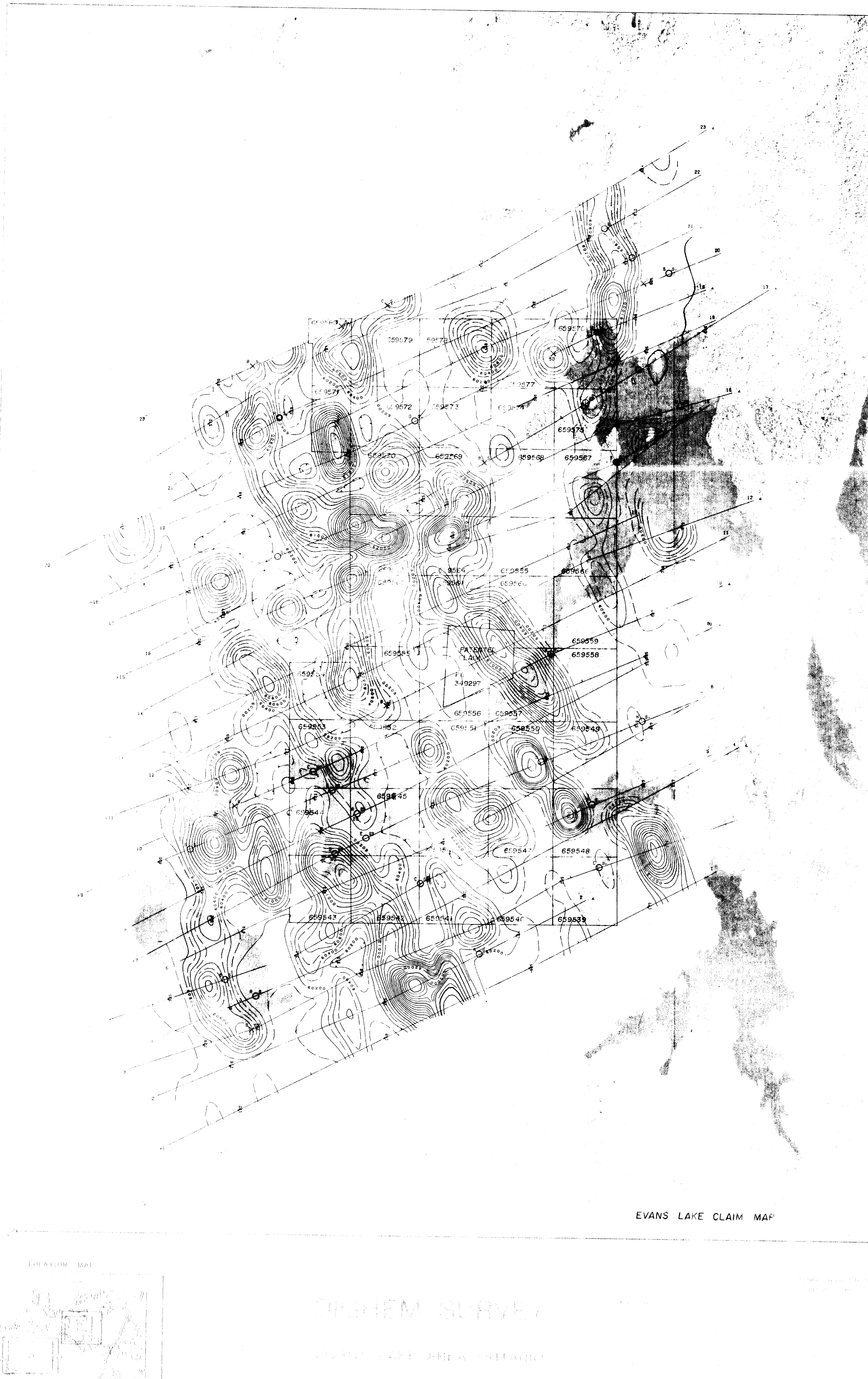
Scale 1:10,000

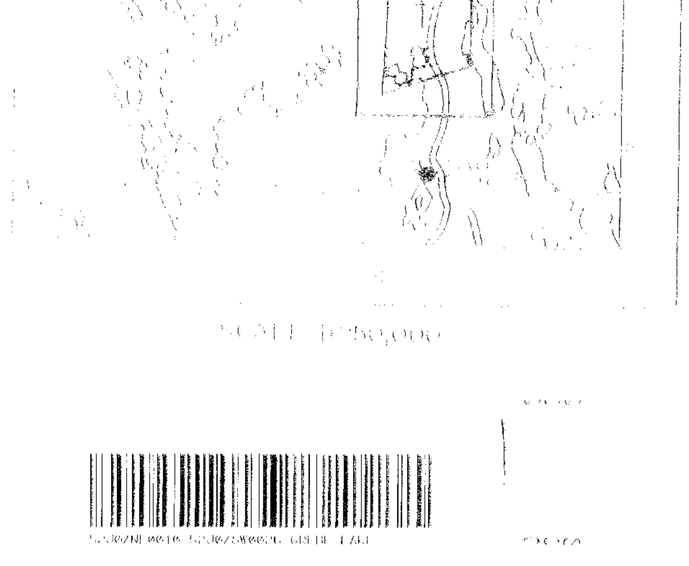
Kilometres

Miles



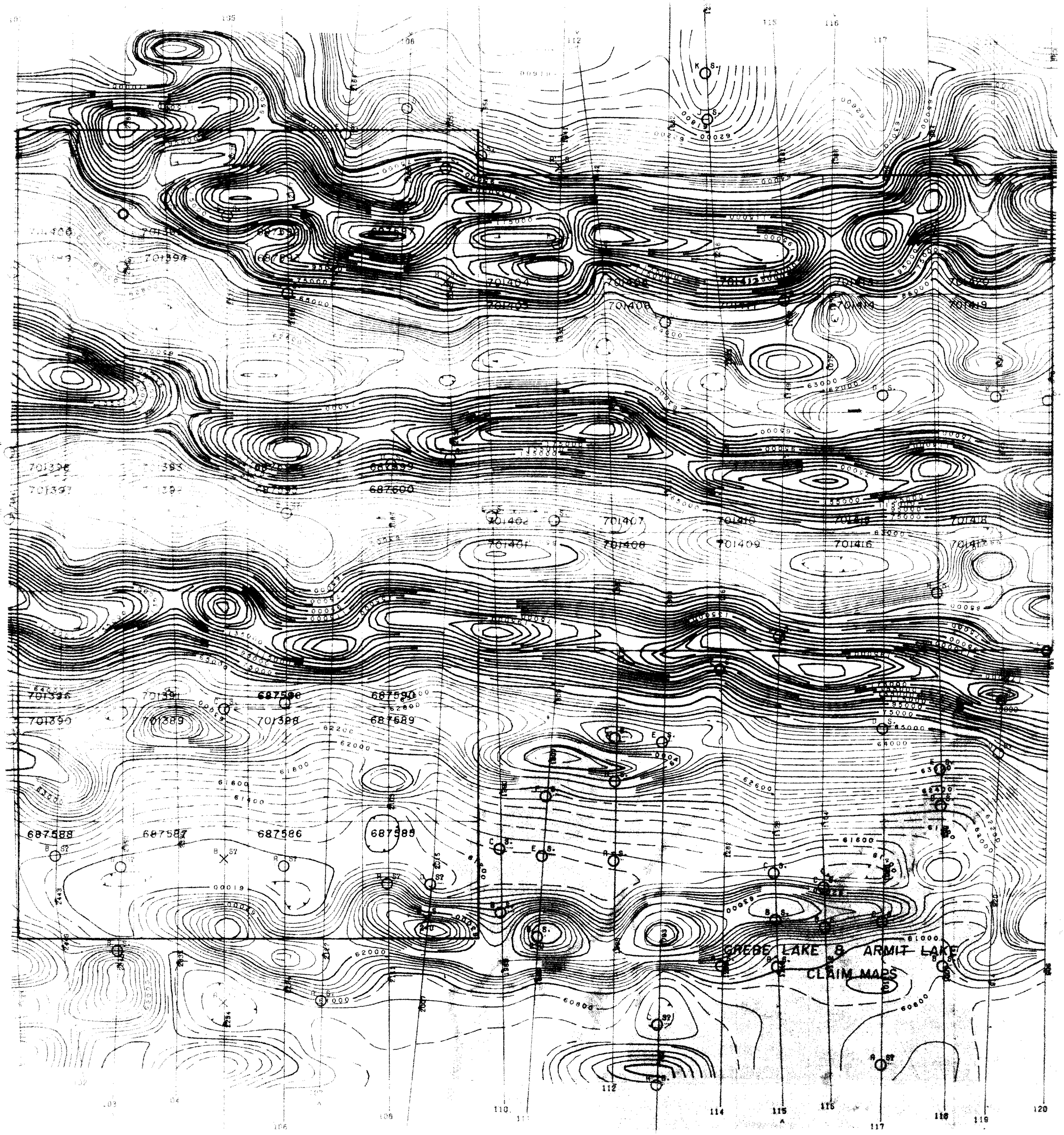
HOUGHTON LAKE CLAIM MAP



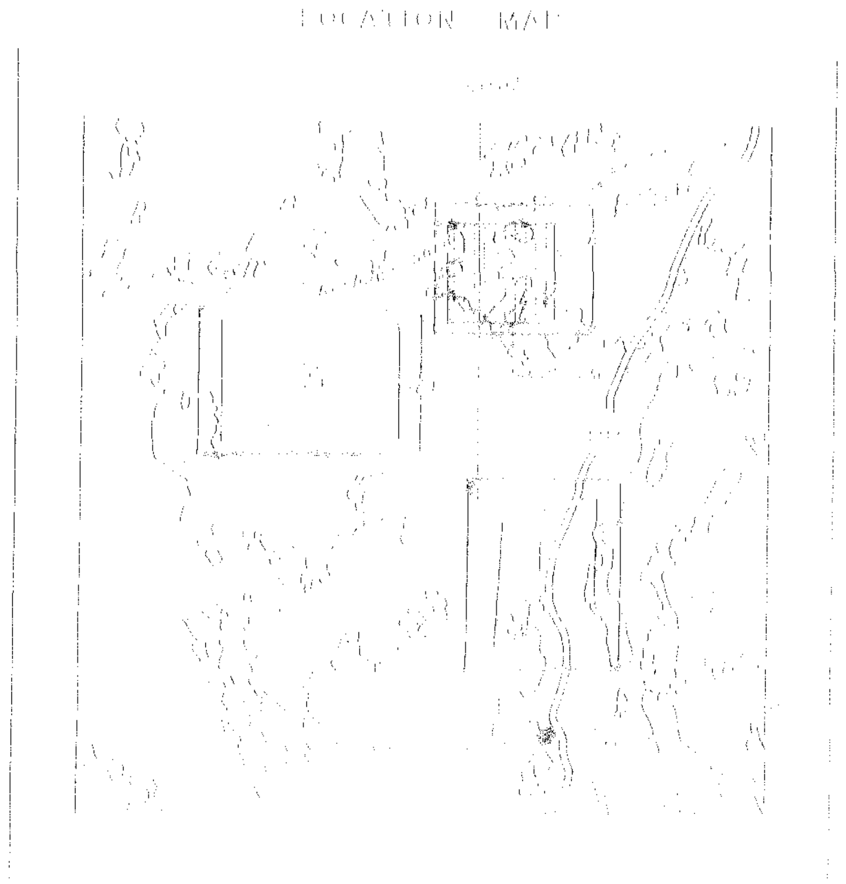


DIGHEM SURVEY

ENHANCED MAGNETICS



LOCATION MAP

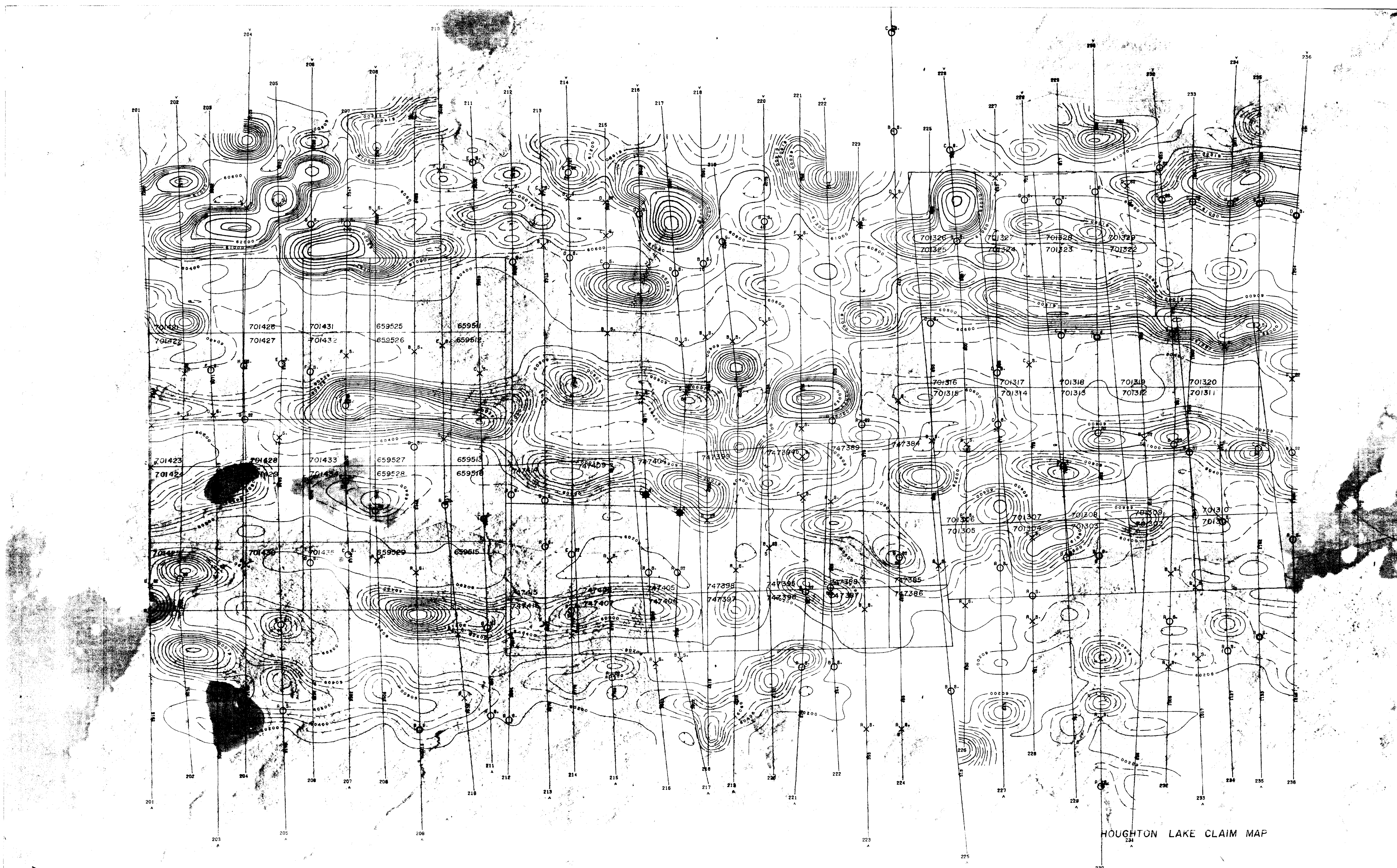


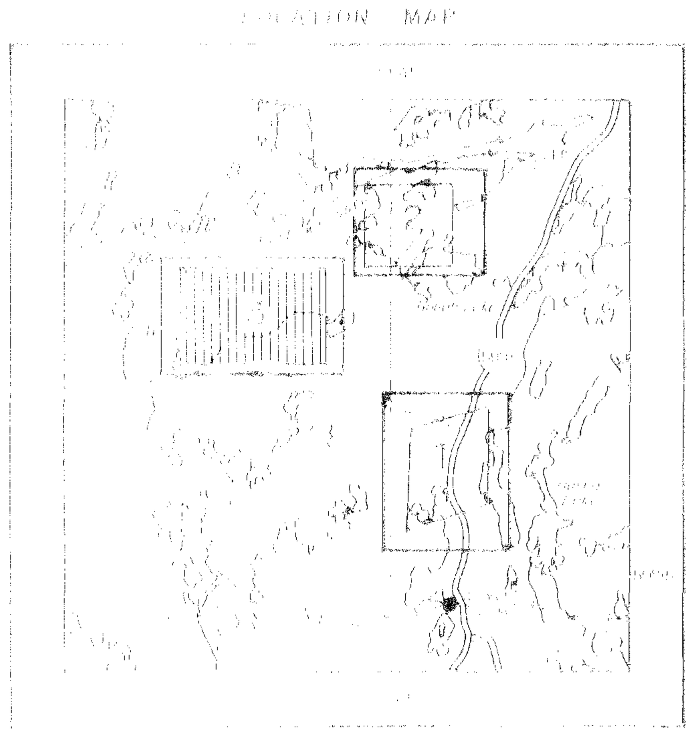
DIGHEM SURVEY

AREA, ONTARIO

ENHANCED MAGNETICS

FOR





DIGHEM SURVEY

SAVANT LAKE AREA, ONTARIO

ENHANCED MAGNETICS

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