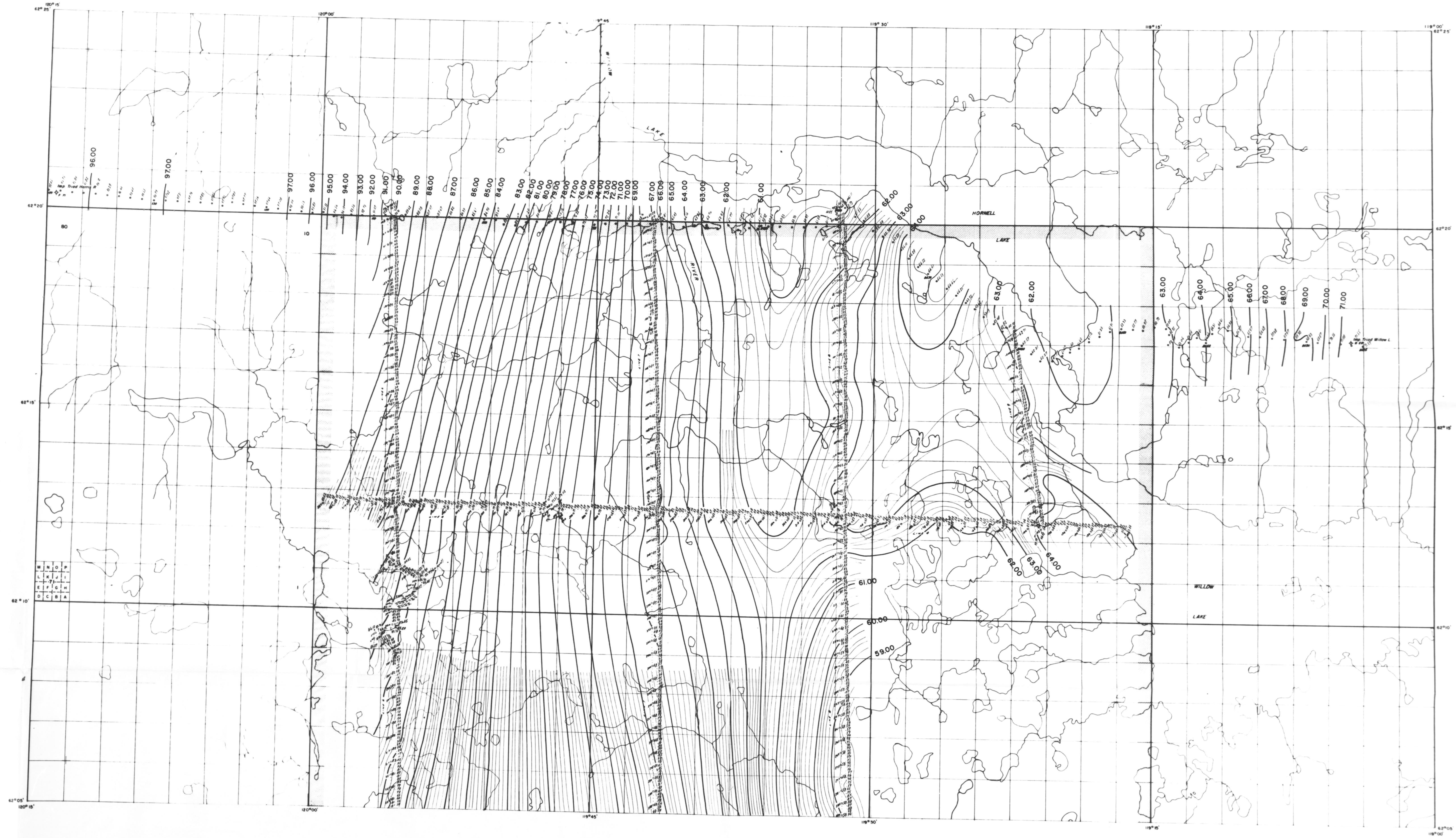

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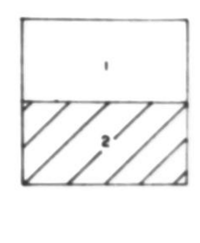

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JEFFERSON LAKE PETROCHEMICALS OF CANADA LTD

HORN MOUNTAIN AREA

NORTHWEST TERRITORIES

TOPOGRAPHY

TXL PARTY 604
INTERPRETED BY W JOHNSON
SUPERVISOR R A SCHWARTZ

DATUM SEA LEVEL

TELEDYNE EXPLORATION LTD

MAY, 1968

Ottawa

MICRO GRAVITY SURVEY

HORN PLATEAU, NORTH WEST TERRITORIES

for

JEFFERSON LAKE PETROCHEMICALS OF CANADA LTD.

by

PRECISION GEOPHYSICAL SERVICE LTD.

MICRO GRAVITY SURVEY

HORN PLATEAU, NORTH WEST TERRITORIES

Latitude: 62°00' - 62°20'

Longitude: 119°15' - 120°00'

for

JEFFERSON LAKE PETROCHEMICALS OF CANADA LTD.

Introduction

Gravimetric and seismic data was obtained simultaneously in the Horn Plateau area of the North West Territories for Jefferson Lake. The seismic program was conducted by Teledyne, crew #604, and the gravimetric survey by Precision Geophysical. The gravity survey commenced in February 21, 1968 and was completed in March 21, 1968 having obtained 143.5 miles of data.

Method

Precision provided a Sharpe CG #2 gravity meter and a meter operator who obtained a measurement of the gravity field at all seismic shotpoints. The horizontal and vertical control for the survey was obtained by Teledyne's survey crew and this survey information was used in the reduction and mapping of the gravimetric data.

It has been previously experienced that the vertical control of a seismic survey is subject to considerable station to station errors that make the gravimetric survey relatively less accurate than if the gravity crew would have obtained their own precise vertical control. However, with Multiple Subsurface coverage type of seismic shooting and shotpoint intervals of 450 feet, elevation errors are minimized. The increase density of gravity readings makes it possible to smooth out the Bouguer gravity values considerably, such that the final Bouguer gravity profile is probably more accurate than a precise gravity survey of one-quarter mile interval. This survey, in particular, has been remarkably free from obvious station to station survey errors. The only indication of possible minor errors in the survey or in the operation of the gravity meter is evidenced on line 7 stations 100 to 181. A low amplitude, high frequency chatter appears present. The rest of the lines are relatively smooth.

Determination of the Elevation Factor

After the survey was completed, all the data was analyzed using a computer program based on Siegert's* method to find the statistically optimum elevation factor. The

*Siegert, A. J. E., Determination of the Bouguer Correction Constant, Geophysics, Vol. 7, 1942, Pages 29-34 method essentially determines the optimum elevation factor as that which will produce the minimum correlation between the gravity readings and the surface elevation. The elevation factor used in the data reduction was 0.0665 milligals per foot. This is equivalent to a surface density of 2.16 gm/cc. Since the surface density could be variable as a result of glaciation and the surface drift, the data was also recomputed using elevation factors of 0.0615 and 0.0715 mg/ft or equivalent surface densities of 2.55 gm/cc and 1.77 gm/cc respectively. Although there were no obvious correlations of surface topography with residual gravity anomalies, minor surface topography did show up as low amplitude noise on the Bouguer gravity profiles and interferred with some residual gravity anomalies.

Imperial Gravity Data

Approximately 40 miles of Imperial Oil Ltd. gravity data was incorporated into the present survey. This data was surveyed at 1/3 mile station intervals and computed using 0.064 milligals/foot for the elevation factor. This data was recomputed using 0.0665 milligals/foot in order to tie the present survey.

Depth Estimation and Method of Interpretation

It is theoretically impossible to find a unique determination of the regional gravity gradient. However, it is possible to construct a smooth curve that will separate most of the shallow from the deep gravity anomalies. For the purposes of this interpretation the REGIONAL is defined as that horizontal gravity gradient that is caused by density changes within the crystalline basement as well as that curve that best isolates shallower local anomalies whose depth of burial is within the sedimentary section. Profiles were plotted of the Bouguer gravity for all the surveyed lines. On these profiles a smooth curve was constructed to represent the regional gravity gradient. This curve was adjusted to fit at the intersection of all east-west and north-south lines.

The maximum depth of burial of all significant anomalies was computed. From this maximum depth of burial it was possible to deduce which geological formation could be the source of the gravity anomaly. By making reasonable estimates as to the density contrasts at these depths, it was possible to make quantitative estimates as to the magnitude of the geological structures involved.

The basic equation used to make depth estimates is $D = \dfrac{0.65\ (G_{max})}{\frac{dg}{dx}}$

D = maximum depth to the anomalous mass,
$\frac{dg}{dx}$ = maximum horizontal gravity gradient,
Gmax = magnitude of gravimetric relief.

The equation is based on a geological model that at the depth of burial the structure can be approximated by vertical sides. It is impossible for an anomaly to be substantially deeper than calculated from the above equation using the horizontal gravity gradient. The anomaly, however, can be shallower if the vertical sided model does not apply. The location of the gravity lines with respect to the subsurface edge of the causative body is important if quantitative measurements of the depth of burial are to be meaningful. A gravity line that crosses the subsurface edge of the anomaly perpendicularly will produce the steepest horizontal gravity gradient and the shallowest depth of burial. In a detailed survey where the causative body is crossed by several lines, the shallowest computed maximum depth of burial is used.

For those anomalies that have considerable horizontal extent, such as faults or biostromal reefs, and where it is difficult to measure the horizontal gravity gradient or Gmax, the "Half Width Method" applies. The depth of burial of these anomalies is approximately equal to one-half the horizontal distance between the inflection points at the "up" and "down" side of the anomaly (IPu, IPd).

The basic equation used to determine the magnitude of gravimetric relief of an anomaly is $G = 2\theta\gamma\sigma t$ where G is the magnitude of the gravity anomaly subtended by the solid angle θ at the surface. For an anomaly that has appreciable horizontal extent, $\theta = \pi$ radians. The universal gravitational constant is γ, the amount of structural relief is t, and the density contrast responsible for the anomaly is σ.

Profile Sections and Mapping

The Bouguer gravity for all the lines was plotted on a scale of 1 inch equal to 1 mile (horizontal) and equal to 1 milligal (vertical). These Bouguer gravity profiles were used to determine the regional and to isolate the anomalies. Three maps were prepared:

1. Surface elevation,
2. Bouguer gravity,
3. Residual gravity.

The SURFACE ELEVATION map shows the topography over the surveyed area. This map can be used to verify that the "elevation factor" is satisfactory for the area. Pronounced topographic changes should not be apparent on either the Bouguer or Residual gravity maps.

The BOUGUER gravity map shows the total gravity field in the area; a combination of the gravity fields from the crystalline basement, from density contrasts within the sedimentary formations, and from the near-surface density changes within or at the base of the glacial drift. Because of the pronounced regional gravity gradient in this area and the considerable near-surface interference, the Bouguer gravity map has limited value in localizing anomalies of geologic interest.

The REGIONAL gravity map was not constructed for this project because of the reconnaissance nature of the survey. With lines approximately 5 miles or greater apart, the contours would have been meaningless and of no value to the interpretation.

The RESIDUAL gravity map was constructed to show the gravity anomalies that appear to have an origin from density contrasts within the sedimentary section. The maximum depth of burial of all the anomalies has been computed and indicated on the map. It should be noted, however, that this depth estimate is only an approximation; especially because of the reconnaissance nature of the survey and insufficient control on the regional and surface and near-surface interference. Most of the detected anomalies were seen on single lines. Consequently, their depth analysis may be in error. It is unlikely that these anomalies will be substantially deeper; they may, however, be shallower. The obvious near-surface anomalies (showing a very steep horizontal gravity gradient or having a very narrow width) are not mapped.

Expected Source of Gravity Anomalies

The major gravity anomalies in the Horn Plateau area are expected to come from:

	Depth Subsurface
1. Density changes within or at the base of glacial drift;	shallow
2. Density changes between the Horn River shales and the Lonely carbonates;	2200 $\pm$ 200 feet
3. Density changes between the Chinchaga salts and the carbonates, shales, anhydrites of the Mirage and Red Beds formations.	2600 $\pm$ 300 feet
4. Density changes at the top or within the crystalline basement rocks.	$\geq$ 3000 feet

Some of the minor gravity anomalies may originate from the compaction of the shallower shales over the deeper more competent carbonate structures.

There is no density information available in this area. However, it is possible to make estimates as to the relative magnitude of possible density contrasts on the basis of the known lithology.

It is probable that the density contrast between the Horn River shales and the Lonely carbonates is 0.35 ± .10 gm/cc. The density contrast between the Chinchaga salts and the reef carbonates, shales, or anhydrite is considerably larger, or approximately ± 0.50 ± .10 gm/cc. It is unlikely that a sufficient density control exists between the sedimentary and the crystalline basement rocks. Therefore, it is unlikely that basement structure will show up on the gravity survey unless the structure involves the shallower rocks. Although these density contrasts are only approximate, they can be used to compute the approximate magnitude of the structural relief of a given residual gravity anomaly.

Interpretation

Anomaly A

Location:	approx. 62° 20' latitude, 120° 10' longitude
Grade:	fair
Magnitude:	-0.35 milligals
Dc:	≤ 2500 feet subsurface
Probable origin:	density changes at or near the surface or structure or topography on top of the Lonely carbonates or variation in the isopach of the Chinchaga salt.
Structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, $t = 120 \pm 30$ feet

This anomaly is controlled by gravity stations 1/3 mile apart and as a result accurate depth values cannot be determined. It is felt that this anomaly could be considerably shallower than 2500 feet and probably originates from near surface density changes.

Anomaly B

Location:	approx. 62° 19' latitude, 119° 57' longitude
Grade:	poor
Magnitude:	+0.40 milligals
Dc:	≤ 1500 feet subsurface
Probable origin:	density changes at or near the surface

Both flanks of the anomaly have a shallow depth of burial. Therefore, it is probable that the anomaly originates from density changes within the drift.

Anomaly C

Location:	approx. 62° 20' latitude, 119° 52' longitude
Grade:	fair

Magnitude:	approx. +1.00 milligals
Dc	≤ 2700 ± feet subsurface
Probable origin:	structure or topography on top of the Lonely carbonates or density contrasts involving the devonian salts
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, $t = 410 \pm 125$ feet

This anomaly is difficult to resolve adequately because of the large station spacing. It is impossible to tell if there are two anomalies located very close together, or there exists some shallow interference that creates the saddle at station 99 between the two peaks at stations 97 and 100. The magnitude of the anomaly also appears to be some-what high. However, this could be changed by adjusting the Regional gravity gradient.

Anomaly D

Location:	approx. 62° 15' 30" latitude, 119° 57' longitude
Grade:	poor
Magnitude:	+0.24 milligals
Dc	≤ 4900 feet subsurface
Probable origin:	density changes within the basement rocks
Possible structural relief:	assuming $\sigma = 0.45$ gm/cc, $t = 120 \pm 30$ feet

Although the maximum depth of burial suggests an intra-basement origin, it is still possible that the anomaly could originate from shallower density contrasts, particularly if it has gently sloping sides.

Anomaly E

Location:	approx. 62° 13' 30" latitude, 119° 57' longitude
Grade:	good
Magnitude:	(a) +0.47 milligals (b) +0.34 milligals
Dc	≤ 2000 to 3000 feet subsurface
Probable origin:	structure or topography on top of the Lonely carbonates or density changes involving the devonian salts
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, then (a) $t = 230 \pm 50$ feet (b) $t = 190 \pm 40$ feet

There is some shallow interference present that makes this anomaly difficult to evaluate. Although it has been contoured to appear as two distinct features, it is possible that it is one anomaly with the saddle between the two peaks caused by shallow noise.

Anomaly F

Location:	approx. 62° 06' 30" latitude
Grade:	poor
Magnitude:	+0.22 milligals
Dc	≤ 3400 feet subsurface
Probable origin:	near surface density changes or structure or topography on top of the Lonely carbonates
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, $t = 150 \pm 40$ feet

The depth cannot be determined adequately for this anomaly because of its low magnitude and some noise. It could originate from anywhere in the section.

Anomaly G

Location:	approx. 62° 03' latitude, 119° 56' longitude
Grade:	fair
Magnitude:	+0.45 milligals
Dc	≤ 2130 feet subsurface
Probable origin:	structure or topography on top of the Lonely carbonates or near surface density changes
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, $t = 155 \pm 35$ feet

The presence of possible shallow interference on the south flank of the anomaly makes depth calculations and the origin of the anomaly indeterminate. The anomaly could be shallower than the indicated 2130 feet.

Anomaly H

Location:	approx. 62° 12' 30" latitude, 119° 42' longitude
Grade:	fair
Magnitude:	+0.46 milligals
Dc	≤ 2000 feet subsurface
Probable origin:	near surface density changes or structure or topography on top of the Lonely carbonates.
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, $t = 155 \pm 40$ feet

AND

Anomaly I

Location:	approx. 62° 09' latitude, 119° 42' longitude

Grade:	fair
Magnitude:	+0.20 milligals
Dc	≤ 2170 feet subsurface
Probable origin:	near-surface density changes
	or
	structure or topography on top of the Lonely carbonates
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, then $t = 100 \pm 25$ feet

AND

Anomaly K

Location:	approx. 62° 02' latitude, 119° 42' longitude
Grade:	poor
Magnitude:	+0.26 milligals
Dc	≤ 2170 feet subsurface
Probable origin:	near surface density changes
	or
	structure or topography on top of the Lonely carbonates
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, then $t = 135 \pm 30$ feet

Anomalies H, I & K have a depth of burial that is close to the expected top of the Lonely formation. However, at these relatively shallow depths gravity anomalies from the top of the Lonely formation should have been slightly deeper. This may be a function of the surface interference or perhaps the compaction of the overlying shales may have made the depth appear shallower. Therefore the origin of these anomalies is somewhat indeterminate.

Anomaly J

Location:	approx. 62° 04' to 06' latitude, 119° 42° longitude
Grade:	fair
Magnitude:	+ 0.36 milligals
Dc	≤ 2600 feet subsurface
Probable origin:	structure or topography on top of the Lonely
	or
	density changes involving devonian salts
Possible structural relief.	assuming $\sigma = 0.45 \pm .10$ gm/cc, $t = 130 \pm 30$ feet

AND

Anomaly L

Location:	approx. 62° 18' latitude, 119° 32' longitude

Grade:	fair
Magnitude:	+ 0.39 to + 0.55 milligals
Dc	≤ 2900 feet subsurface
Probable origin:	structure or topography on top of the Lonely or density changes involving devonian salts
Possible structural relief:	assuming $\sigma = 0.45 \pm .10$ gm/cc, $t = 235 \pm 100$ feet

AND

Anomaly M

Location:	approx. 62° 12' 30" latitude, 119° 32' longitude
Grade:	fair
Magnitude:	+0.78 milligals
Dc	≤ 2200 feet subsurface
Probable origin:	structure or topography on top of the Lonely or density changes involving devonian salts
Possible structural relief:	assuming $\sigma = 0.45$ gm/cc, $t = 278 \pm 75$ feet

Anomalies J, L, & M are similar in several respects. They all have similar maximum depths of burial suggesting a similar origin. They also appear to consist of either two separate anomalies located very close together or they are interferred by shallower noise to create a reversal or saddle near the centre of the anomaly. Further resolution of the anomalies without additional data is not possible.

Comments on Line 5 (latitude 62° 01' to 02')
longitude 119° 15' to 119° 30')

This line does not have any indication of deeper gravity anomalies. It has, however several large magnitude (up to -0.45 mg) sharp near-surface anomalies. It is possible that surface or near surface interference has abscurred any deeper anomaly.

Conclusions

The reconnaissance nature of the survey made it impossible to be very definitive about most of the detected anomalies. It would be desirable to reinterpret the gravity data in light of the seismic interpretation; similarly, the seismic data should be reinterpreted in those areas where a gravity anomaly was detected. After a thorough comparison of the gravimetric and seismic results is made it would be possible to decide the merits and economics of continuing joint surveys in this or similar areas.

PRECISION GEOPHYSICAL SERVICE LTD.

W. W. Soukoreff, P. Geoph.

W. W. Soukoreff

— NOTE —
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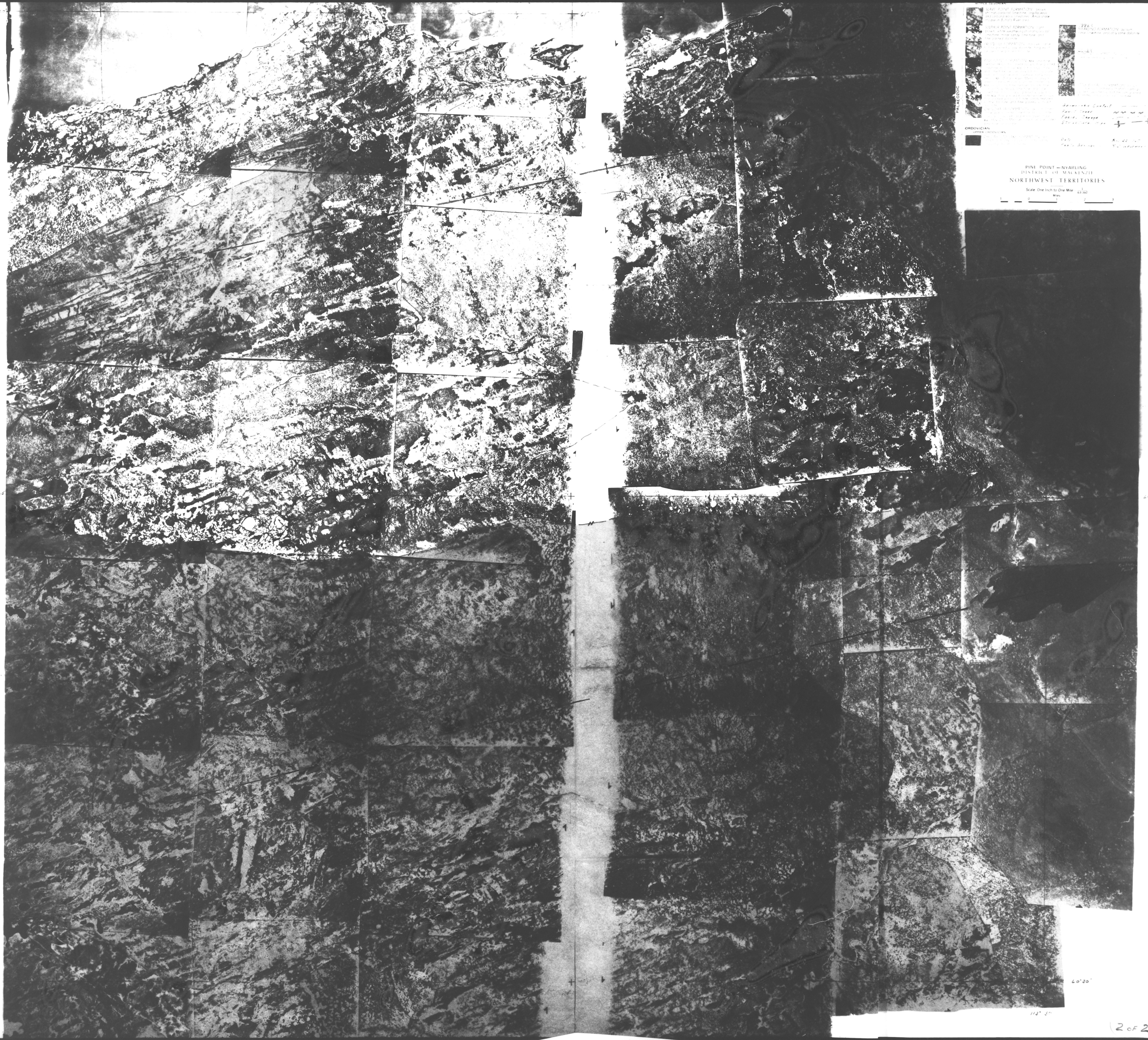

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PHOTOGEOLOGIC STUDY
of the
PINE POINT - NYARLING AREA
by
R.D. Wesemann, P. Engineer
Vancouver
November, 1967

Iskut

PHOTOGEOLOGIC STUDY

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NOVEMBER, 1967

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SUMMARY

A photogeologic study of an area between Great Slave Lake and Wood Buffalo Park was undertaken by Iskut Silver Mines Limited. The purpose of the study was to gain information on a geophysically indicated reef and to determine easiest access for further development.

Topographic expression indicated a reef could be near surface in the Little Buffalo Point - Dry Lake area. The geomorphic pattern indicated a faulted structural high extending south 75°west from Little Buffalo Point. This high is interpreted to be the surface expression of a buried reef. A reef in this stratagraphic position would probably be Upper Ordovician, possible Chedabucto Lake Formation, in age.

Another structural high was located along an axis between Pine Point and Salt Lake. This is thought to be the expression of the reef trend in this area. This shifts the reef trend in a more east-west direction than had been generally assumed.

To prove the presence of reef and to test the known gravity anomalies a minimum of 2,000 feet of diamond drilling is recommended. The estimated cost of the minimum program is $25,000.00.

INTRODUCTION

In the sedimentary area to the south of Great Slave Lake, lead-zinc deposits and petroleum accumulations are associated with a Middle Devonian reef complex. Faults in the Precambrian basement were important factors in both the mineral deposition and in the reef development.[1] A study of published geologic reports and aeromagnetic maps indicated conditions similar to those responsible for the Pine Point deposits could exist in the Little Buffalo-Dry Lake area. A subsequent gravity survey over this area located a strong basement fault and gave good indication of reef development.

Before undertaking a drilling program on its' oil and gas permits and mineral claims, Iskut Silver Mines Limited conducted a Photogeological Survey and summer field inspection of the general area. The purpose of this program was to gather information on the extent and trend of the indicated reef and to determine the easiest means of access for a drilling program and further development.

[1] Campbell, N. "The Lead-Zinc Deposits of Pine Point", The Canadian Mining and Metallurgical Bulletin, (August 1966), p.p. 953-960.

AREA

The area investigated involves approximately 1,600 square miles. It lies between longitudes 113 30' and 114 30' and is bounded to the north by Great Slave Lake and to the south by Wood Buffalo Park. This area covers the Pine Point mineral deposits as well as Oil and Gas Permits 4776, 4777, 4778, 4779 and mineral claims BM, Z, ZM, ZL, ZE controlled by Iskut Silver Mines Limited.

PROCEDURE

Government air photos taken in 1955 were the latest available and were used in the study. The scale of the photography is approximately 5,000 feet to the inch. From these photos controlled mosaics were constructed and were reproduced at scales of one inch to one mile and one inch to four miles. These mosaics were used as the base control of the project.

A preliminary photo study was undertaken to establish the general structure and mappable contacts. The lack of good outcrop and general glacial cover made the interpretation almost completely a geomorphic one. Contacts were based generally on the density and pattern of sinkholes; the density and pattern of muskegs and shallow lakes; drainage patterns; and glacial fluting of the higher ground.

In September, after areas of specific interest were selected, a field inspection was carried out. A helicopter was used for the reconnaissance and transportation in this part of the survey. Geomorphic contacts and possible outcrop areas were checked. A pack-sack drill was used to check the depth of overburden over possible drill sites. Possible campsites and availability of water for drilling purposes were also investigated.

Upon completion of the field inspection, the best access routes and all roads and geophysical lines visible on the photographs were plotted. A final photo interpretation was made incorporating the additional field information. Geomorphic and access maps were completed. A report, including an outline for additional exploration, concluded the photo project.

PHYSICAL FEATURES

Flat and featureless best describes the general topography. The highest elevations are found in the southwest where the altitude is approximately 420 feet above Great Slave Lake. A slightly elevated strip trending west southwest from Salt Lake through Pine Point townsite serves as the watershed between the streams flowing directly into Great Slave Lake and those flowing into the Little Buffalo River. The north watershed is reasonably well drained. The area to the south of the divide is largely covered by muskeg and shallow lakes. The drainage at best is poorly developed and in the central eastern section virtually nonexistant. The general topographic slope averages less than ten feet per mile.

Heavy stands of scrubby black spruce are found in most areas elevated a foot or more above the muskeg. Spruce are even found along the long, narrow ridges winding and crisscrossing the muskeg. In the better drained areas stands of poplar are found mixed with the spruce. The muskegs themselves are largely covered by slewgrass and cattails. Small humps and mounds within the muskeg are generally brush covered.

ACCESS

General access into the south Great Slave Lake area has improved tremendously in the last few years. The completion of the railroad to Pine Point has made the development of resources within the area economically feasible. Sixty miles of good gravel road now connects Hay River with Pine Point. This road continues another 50 miles paralleling Great Slave Lake to Fort Resolution. While this section of the road is not as good as the Hay River - Pine Point section it is all-weather and is being straightened and improved. A recently completed gravel road now connects Fort Smith with the Pine Point - Hay River road at a point a few miles east of the Buffalo River. This road provides access to the south western portion of the project area.

In the past few years a great number of geophysical and access lines were cut within the project boundaries in the intense search for new areas of mineralization. Many of these could still be used as winter access roads. Unfortunately these lines are not recorded on maps available to the public and the air photography was flown before the commencement of much of this activity. New photography would facilitate the accessibility and development of this area. Lines cut prior to 1955 were easily mapped. They lie within the northwest portion of the project. Besides providing access within this area, they also outline the area of original interest.

For the present the only suitable summer access to the major portion of the project area is by helicopter. The muskeg and shallow lakes make foot or wheeled travel almost impossible. Aircraft are available at Hay River but few of the lakes are suitable for float planes. Exploration and development work requiring heavy equipment or large crews cannot be economically considered during the summer.

In spite of the extreme cold and snow the only feasible working time is during the winter while the muskeg is frozen. This would normally fall between the middle of November and the middle of May. The Muskeg will usually freeze hard enough to support a D-6 Caterpillar tractor. The tractor can be used to clear and pack winter tote roads suitable for four wheel drive vehicles.

Most of Iskut Silver Mines holdings are in the southeast and least accessible portion of the project area. At present twelve miles of cut line extends from the Pine Point - Pyramid Camp road to the south east. This can be cleared and packed with little trouble. From the end of this line seventeen miles of line will have to be cut and packed to provide access into the properties. This will provide the fastest and most economic access for a drilling program.

If the economic potential of the holdings require year round access two possible routes are present.

1. Winter access would use the tote road constructed for the drilling program. Summer access would require the construction of twelve miles of road across relatively good ground to Long Island in the Slave River. Barges would be used from here to Hay River.
2. A year round road could be built two to three miles west and paralleling the Little Buffalo River. This road would be on higher ground and tie into the Pine Point - Fort Resolution Road. Approximately 25 miles of road construction would be necessary.

GLACIAL GEOLOGY

The last continental ice sheet to move across this area travelled in the direction of south 65° west. Ample evidence of this is provided by the fluting of the Pine Point High, the southwest area and the Little Buffalo River bluffs. Glaciation has left a mantle of till ranging from a few feet to scores of feet over most of the area. This has obscured nearly all bed rock exposures. Some exposures can be found in the bluffs near Great Slave Lake and Little Buffalo River. A few deep sinkholes in the southwest provide additional bed rock geology.

A number of eskers are in evidence along the Salt Lake - Pine Point High. Minor moraine are present throughout the area. Two separate dune areas in the southwest are believed to be related to the last glacial retreat. These dunes have developed perpendicular to, and have obliterated the glacial fluting. It is assumed these dunes were formed by glacial winds blowing over a sandy member in the Slave Point Formation.

GENERAL GEOLOGY

The entire area is underlain by gently southwest dipping formations of Middle Devonian age. The average formational dip, estimated from drilling logs of wells to the west and north, would not be more than 20 feet per mile. Aeromagnetic maps indicate that basement faults in this area are extensions of major faults exposed on the Precambrian Shield. There is reason to believe that movement along some of these fault planes occurred in Middle Devonian or later times. Fault scarps are believed to be related to the development of the reef complex underlying Pine Point.

A distinct facies change occurs between the formations over and north of the Salt Lake - Pine Point high and the formations to the south. The northern sediments are generally carbonates related to the reef complex while those to the south are generally in the evaporite series. It is beyond the scope of this study to carry a correlation of the two. A general facies line has been drawn south of the Salt Lake - Pine Point High. Each area has been treated separately, both stratigraphically and geomorphically.

STRATIGRAPHY

The Middle Devonian Stratigraphy in this area is exceedingly complex and exhibits numerous and sometimes abrupt facies changes. The table of formations compiled by A.W. Norris in his geological report on the Middle Devonian of this area[2] was used in this report. The general Middle Devonian and Older Paleozoic Nomenclature plus descriptions of the formations involved in this study are reproduced in Fig. 1, 2, and 3.

Little if any additional information can be added to these descriptions as a result of the photo study.

[2]Norris, A.W. "Stratigraphy of Middle Devonian and Older Paleozoic Rocks of the Great Slave Lake Region, Northwest Territories," Geological Survey of Canada, Memoir 322.

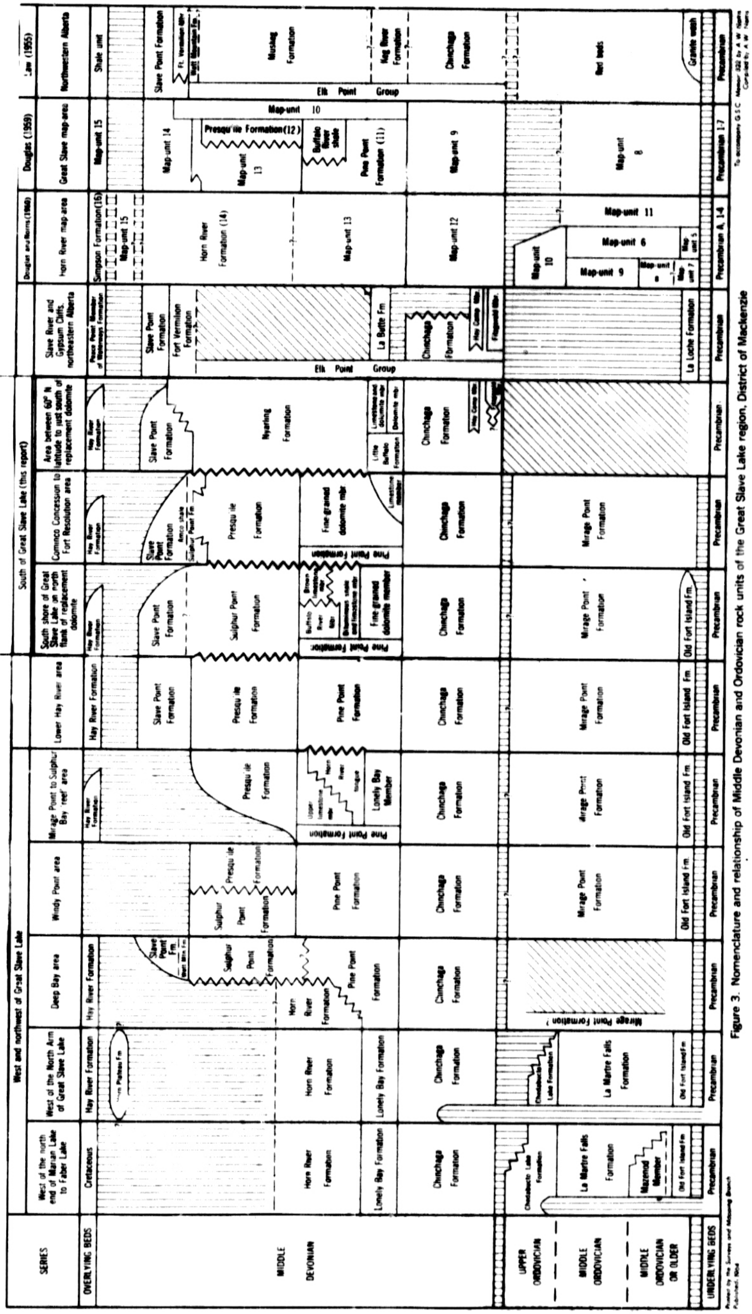


Figure 3. Nomenclature and relationship of Middle Devonian and Ordovician rock units of the Great Slave Lake region, District of Mackenzie

Figure 1

Table of Formations

Era	Period or epoch	Formation or Member	Thickness (feet)	Lithology and distribution
Palaeozoic	Upper Devonian	Hay River	11 max. exposed	Richly fossiliferous argillaceous limestone with shaly partings; brown medium- to coarse-grained dolomite; and olive grey fine-grained limestone.
		?Unconformity		
	Middle Devonian	Slave Point	0– •?310	Brown fine-grained stromatoporoidal limestone; finely fragmental limestone with argillaceous and carbonaceous material; and grey or brown dense argillaceous limestone. Amco Shale marker present at base in Buffalo River area.
		Sulphur Point	*c.* 170	Light brown, white weathering stromatoporoidal limestone; pale to dark brown argillaceous limestone; minor beds of light brown petroliferous and in part sandy limestone; minor medium to dark brown fine-grained dolomite.
		Presqu'ile	0– •260	Massive, coarse-grained, vuggy, in part petroliferous, recrystallized dolomite, probably reefoidal; tongues of bedded brown fine-grained dolomite in Sulphur Bay area.
Palaeozoic	Middle Devonian	Pine Point Formation: Brown Limestone Member	?150 max.	Medium to dark brown thinly bedded fine-grained fossiliferous limestone; dark brown platy in part petroliferous limestone; thinly bedded slightly argillaceous limestone; and minor medium brown, medium- to coarse-grained vuggy dolomite. Exposed on escarpments up to 1.7 miles southwest of Dawson Landing wharf.
		Pine Point Formation: Buffalo River Member	0– •185	Bluish-grey to dark green fissile limy shale containing concretionary iron sulphide. Present in subsurface on south side of Great Slave Lake on north side of recrystallized belt.
		Pine Point Formation: Bituminous Shale and Limestone Member	0– ?200	Medium to dark brown thinly bedded limestone, in part petroliferous and dolomitic; and dark brown fine-grained thinly bedded and nodular limestone interbedded with a dark brown to black bituminous shale; some beds richly fossiliferous. Partly exposed in general vicinity of Pine Point, Dawson Landing wharf, and on Green Islands.
		Pine Point Formation: Fine-grained Dolomite Member	0– •460	Brown, fine-grained, granular, in part vuggy and petroliferous dolomite; sandy textured earthy dolomite; fine-grained dolomite; minor coarse-grained crinoidal dolomite.
		Pine Point Formation: Limestone Member	0– 110±	Medium brown fine-grained to aphanitic limestone; interbedded limestone and brownish grey shale. Partly exposed in Fort Resolution area.

Figure 2

Table of Formations

Era	Period or epoch	Formation or Member	Thickness (feet)	Lithology and distribution
Palaeozoic	Upper Devonian	Hay River	11 max. exposed	Richly fossiliferous argillaceous limestone with shaly partings; brown medium- to coarse-grained dolomite; and olive grey fine-grained limestone.
		?Unconformity		
	Middle Devonian	Slave Point	0–*?310	Brown fine-grained stromatoporoidal limestone; finely fragmental limestone with argillaceous and carbonaceous material; and grey or brown dense argillaceous limestone. Amco Shale marker present at base in Buffalo River area.
		Nyarling	?420	Gypsum, minor limestone, probably some dolomite; poorly exposed in southern part of Great Slave Lake region.
	Middle Devonian	Little Buffalo	115 ±	Medium brown rubbly bedded argillaceous limestone with shale partings, gypsiferous dolomite, medium-grained dolomite, and crinoidal limestone; underlain by brown banded dolomite, and minor argillaceous limestone.
		Chinchaga	?300–?430	Gypsum, limestone, dolomite, limestone and dolomite breccia, salt, and minor green shale.
		Hay Camp Member	35 ±	Limestone, brecciated limestone, nodular limestone, shaly limestone, and brown shale; outcrops on Slave River.
		Unconformity		
Palaeozoic	Upper to Middle Ordovician or Older	Mirage Point	*58–*595	Red beds of dolomite, dolomitic silty mudstone breccia, gypsiferous and sandy dolomite, shale, siltstone, gypsum, anhydrite, and salt; present in southern part of Great Slave Lake region.
	Upper Ordovician	Chedabucto Lake	0–?280	Thickly bedded to massive dolomite, red to brown in south and grey in north, containing some chert and silicified fossils; sandy and conglomeratic dolomite over Precambrian knobs.
	Middle Ordovician	La Martre Falls	90–225+ (south)	Green and dusky red shale; greenish grey quartzose sandstone; and dark brownish grey silty and sandy dolomite in the south.
Palaeozoic	Middle Ordovician or Older	Mazenod Member	0–70+	Argillaceous and silty dolomite; oolitic in part limy dolomite; basal sandy and conglomeratic dolomite and sandstone over Precambrian knobs. Developed in northern part of Great Slave Lake region, in lower part of La Martre Falls Formation.
		Old Fort Island	0–110 ± (south) 0–135 ± (north)	White friable quartzose sandstone, and minor greenish grey siltstone and green shale in south; whitish yellow medium-grained non-calcareous sandstone in north.

Figure 3

GEOMORPHOLOGY

The mappable geomorphic contacts used in this study tied well with the lithologic breaks in the stratagraphic table. Only a few of the formations listed however could be traced with any degree of accuracy. It was possible to split the Nyarling formation into two members which aided considerably in the structural interpretation.

Facies changes within the area made it impossible to carry the same geomorphic contacts throughout the project. Approximately at latitude 60° 45' a sharp geomorphic break occurs. Previous good contacts fade and can not be correlated across. The areas to either side of the break were therefore treated separately.

Northern Sector

In the northern sector a minor topographic break outlined the Presqu'ile formation and compares favourably to the contact as mapped by the Geological Survey of Canada. Two other topographic breaks to the east probably reflect lithologic changes within the Pine Point Formation. The Little Buffalo Formation could not be defined. Several topographic breaks near its projected location gave indications of structure but none were continuous enough to be considered a contact.

Southern Sector

In the southern sector a good break occurs at the Slave Point Nyarling contact. The Slave Point is strongly fluted by glaciation and is mottled with sinkholes. The drainage pattern is poorly developed since most drainage is subterranean. Numerous sinkhole lakes and solution cavities are present but sizeable muskegs are notably missing.

The Nyarling formation can be split into two members. The upper member is apparently transitional from the Slave Point. It is glacially fluted but sinkholes while in evidence are not nearly as numerous. Muskegs and shallow lakes are in more abundance but a defined drainage pattern has also developed.

The lower member of the Nyarling is characterized by large open muskegs. Glacial fluting is not present as there appear to be no resistant lithologic units. The drainage system developed in the upper member fades in the muskeg and is difficult to trace.

The area underlain by the Little Buffalo formation was identified by a series of parallel northwest lineations. These lineations appear to be strike traces and not related to glacial grooving or to former beach strand lines. Although they are masked by a thin glacial till they have definitely influenced the drainage pattern. The Muskeg also forms a different pattern, appearing to be related to a flooded karsk topography.

The Chinchaga formation, being largely nonresistant, was difficult to separate from The Slave River alluvium. In general areas containing the remnants of old stream channels were mapped as alluvium.

GEOMORPHIC INTERPRETATION

Northern Sector

Campbell, in his report "The Lead-Zinc Deposits of Pine Point", considers the reef trend to be south 65° west. Most of the work carried out prior to 1955 appears to have been along this trend. The geomorphic pattern indicates a structural high trending south 80° west from Salt Lake through the Pine Point area. The axis of this structural high should logically coincide with the reef trend.

Several geologic factors probably contributed to the impression that the reef trend was south 65° west rather than more nearly east-west. A reef trend is generally quite straight but the reef itself will vary considerably in thickness and both upper and lower contacts can be extremely irregular. Faults interpreted from aeromagnetic maps strike at south 45° west through the area. The direction of glacial movement was south 65° west. The combination of these factors, together with the limited surface outcrops, may have given the impression that the trend was striking more southerly. The new ore bodies found flanking the old C. M. & S. mining concession indicate the geomorphic evidence may be more correct.

Southern Sector

The most prominent feature in the southern sector is the arcing of the geomorphic contacts to the southwest. An axis through these arcs strikes south 75° west from Little Buffalo Point. The arcing of the sediments indicates a structural high along the axial trend.

The general strike of the Little Buffalo Formation north of Dry Lake is north 15° west. Lineations in the formation to the south indicate a strike of north 40° west. The change in strike and the offset of the contacts indicate a surface fault.

A good east-west topographic break is present between Little Buffalo Point and Dry Lake. The gravity survey located a strong fault striking south 85° west tying into this break. This again indicates a surface fault.

South of the fault trace an isolated east-west topographic high is present. This high is also the eastern end of the axis through the sedimentary arcs. From its location this topographic feature appears to be underlain by a resistant formation older than the Little Buffalo or the Chinchaga.

CONCLUSIONS

The results of the gravity survey and the photo study gave good indications of a faulted reef in the Little Buffalo Point - Dry Lake area. The age of a reef in this area would probably be Upper Ordovician, equivalent to the Chedabucto Lake Formation. Compaction of the younger Chinchaga and Nyarling Formations over the reef would create the structural high, evidenced by the arcing of the sediments.

The general topographic high and geomorphic pattern suggests a structural high from Salt Lake trending south 80° west into the Pine Point area. This high is also believed to be related to reef development. This reef trend is somewhat different than the presently accepted direction of the reef but later locations of ore bodies suggest that it should be investigated further.

RECOMMENDATIONS

The presence of a faulted reef in the Dry Lake - Little Buffalo Point area would duplicate many of the geologic conditions that are present in the Pine Point Lead-Zinc deposits. The more deeply buried portion of the reef to the south west could provide a reservoir for oil and gas. A drilling program of a minimum of 2,000 feet is recommended to determine if a reef is present.

A number of shallow gravity anomalies were located along the projected reef trend. It is recommended that the first hole be drilled to basement on one of these. This would evaluate the anomaly, and determine the presence of reef. The depth to basement in this area should not exceed 800 feet.

The results of the first hold will determine where the succeeding holes will be drilled. If mineralization or reef is encountered in the first hole, the other positive anomalies should be drilled. If neither reef nor mineralization are found in the first hole, a second hole should be drilled on the negative anomaly adjoining it. This should determine the cause of the anomaly. In this area a negative gravity anomaly could be caused by salt or potash deposits.

The cost of a winter drilling program in this area will have to include the building of a winter tote road. The following is an estimate of the cost of a 2,000 foot winter drilling program.

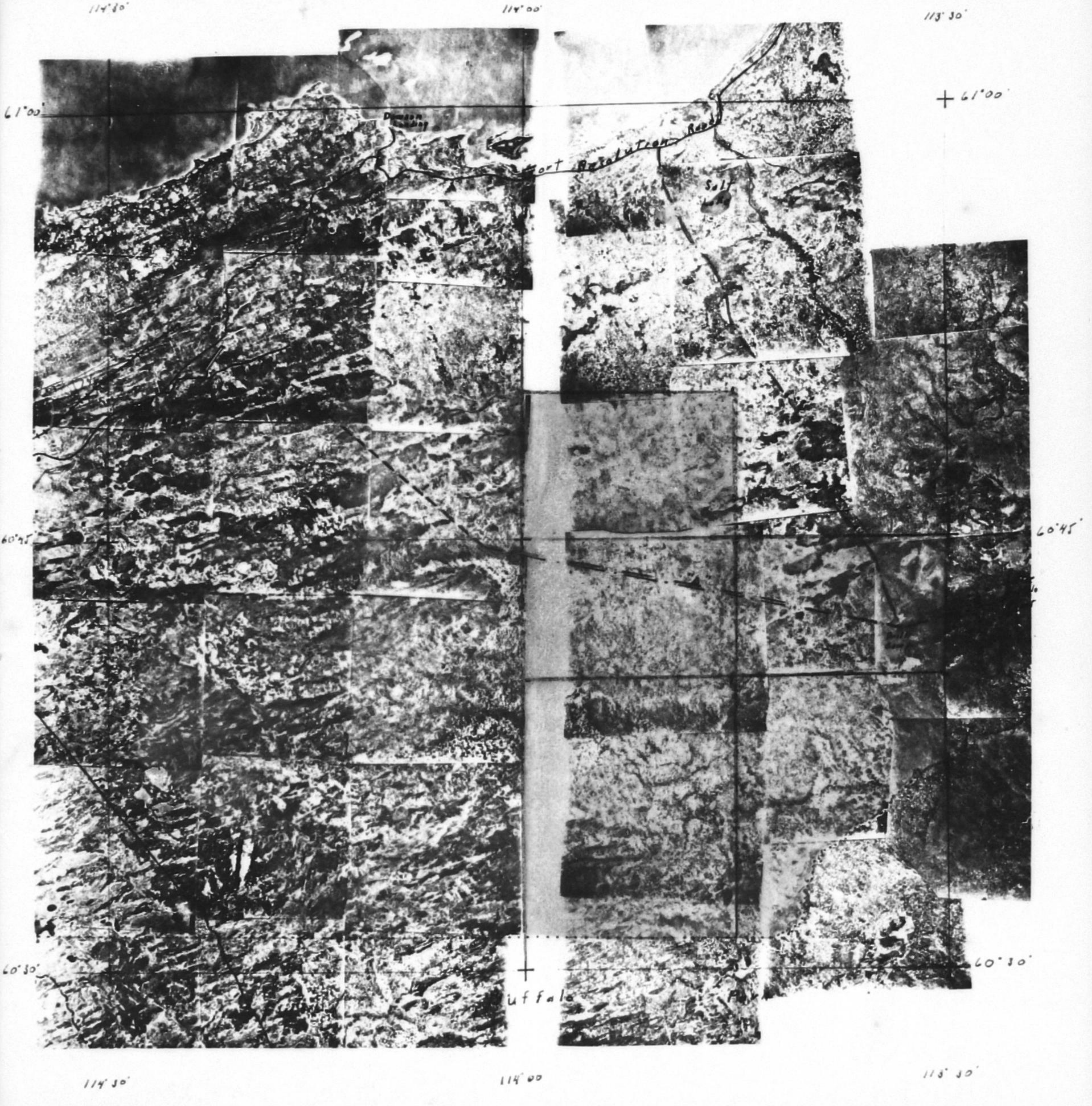
RECOMMENDATIONS (Continued)

Construction and maintenance of 30 miles of winter tote road	$ 2,500.00
Drilling costs (Average $7.00 foot).	14,000.00
Drill moves and setups	2,000.00
Cost to mobilize and demobilize drill.	2,000.00
Supervision and Geology.	2,000.00
Contingencies	2,500.00
	$25,000.00

In addition to the above at least $20,000.00 should be available to continue the drilling program if encouraging results are obtained from the first 2,000 feet. A good portion of the drilling expenses are incurred in the mobilization and setting up of the operation. Considerable money can be saved by being in a position to continue the program without a shutdown.

ACCESS & PERMIT MAP

Scale - 1 inch - 4 miles

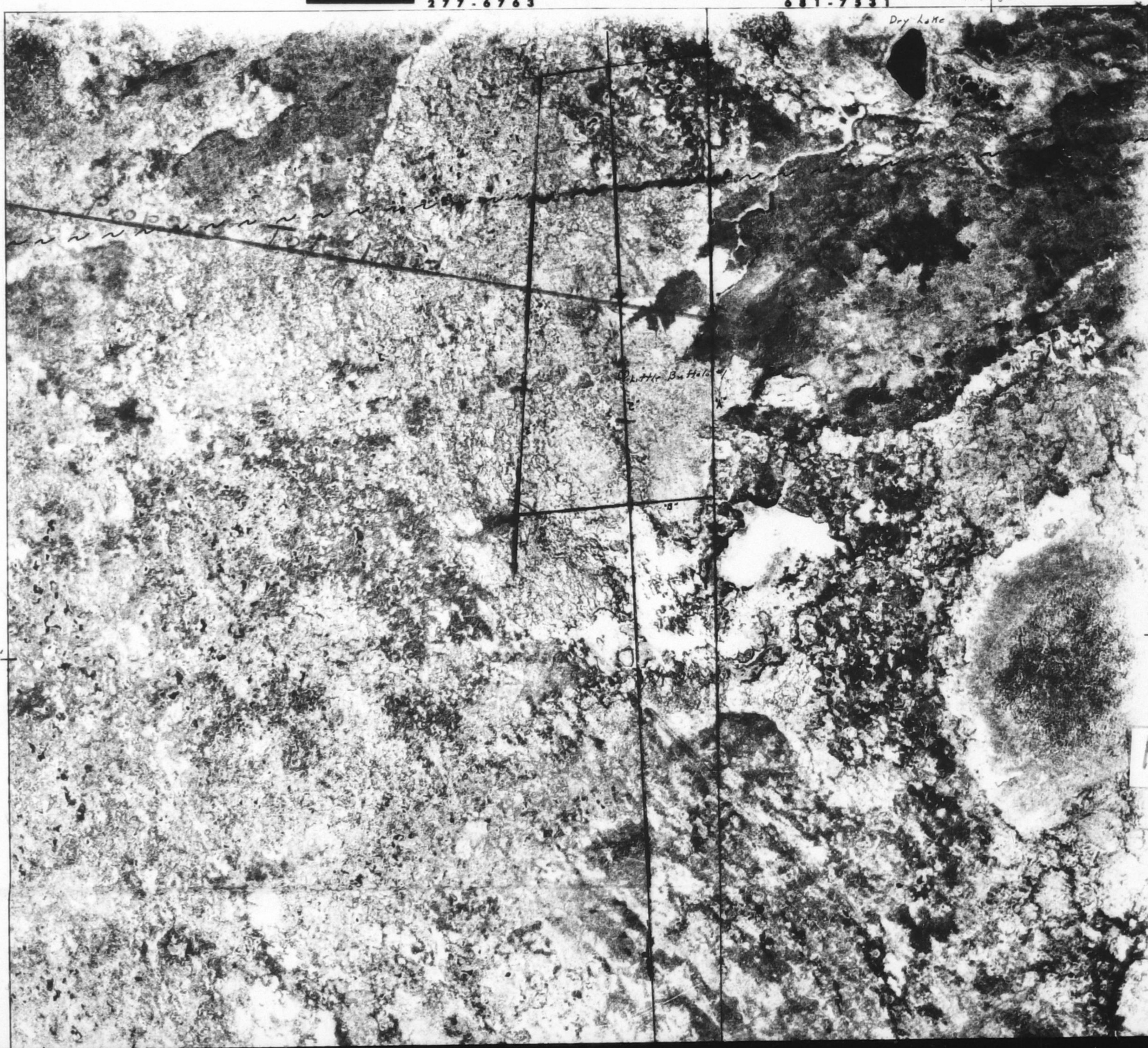


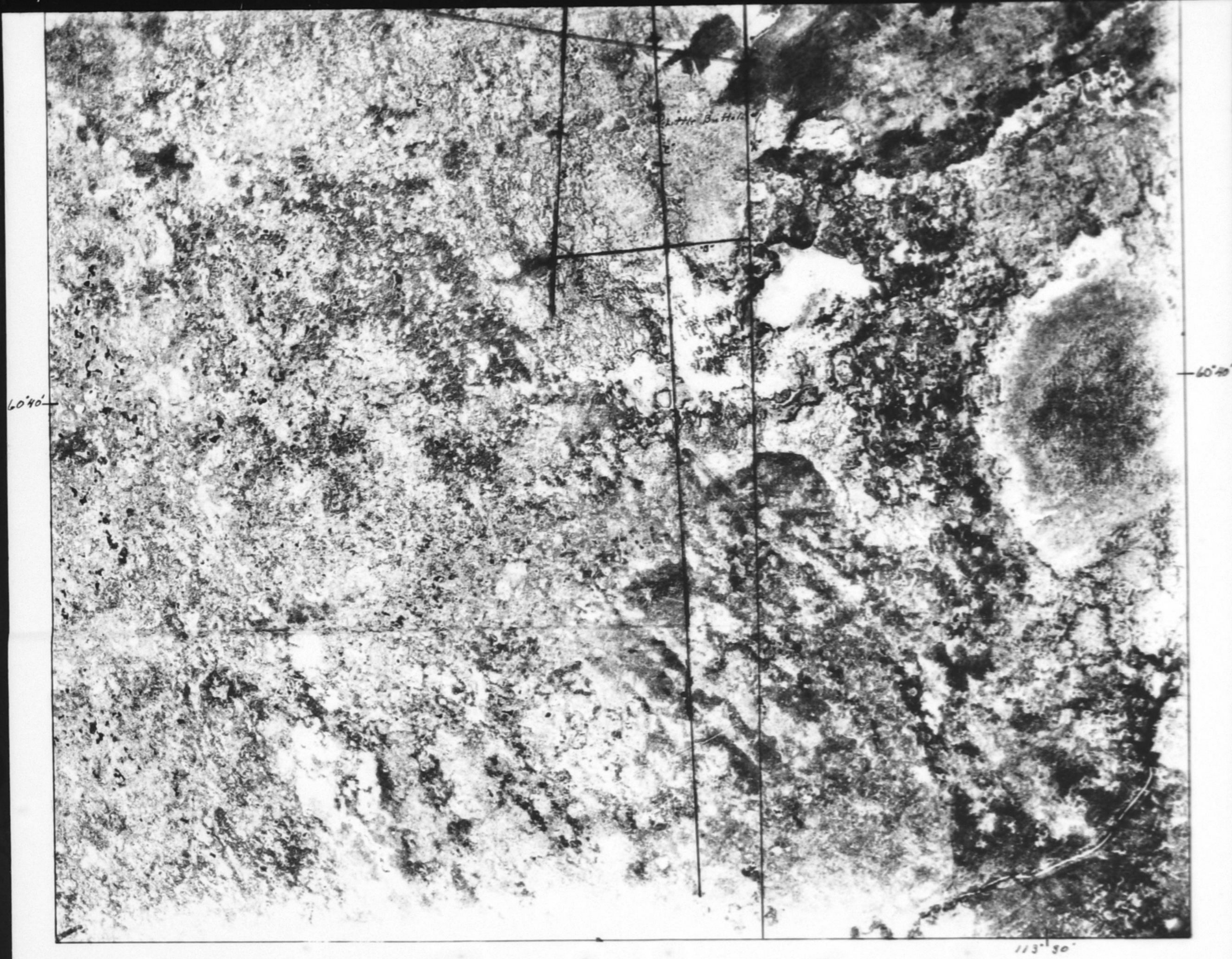
114°30'
114°00'
113°30'
61°00'
61°00'
Fort Resolution Road
Salt
60°45'
60°45'
60°30'
60°30'
114°30'
114°00'
113°30'

ISKUT SILVER MINES LIMITED (N.P.L.)

534 BURRARD STREET, VANCOUVER 1, B.C.

277-6763 681-7531





⊗ Proposed Drill Site

Gravity Survey Lines

~~~~~~ Fault

Approximate Scale 1" - 3,000'

2 of 2
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