

DEGOLYER AND MACNAUGHTON
5625 DANIELS AVENUE
DALLAS, TEXAS

REPORT to TECHNICAL OIL CONSULTANTS, LIMITED
on
CERTAIN PROPERTIES
in the
NORTHWEST TERRITORIES, CANADA

JANUARY 31, 1954

DEGOLYER AND MACNAUGHTON
5625 DANIELS AVENUE
DALLAS, TEXAS

January 31, 1954

Technical Oil Consultants, Limited
129 Sixth Avenue, East
Calgary, Alberta, Canada

Attention: Mr. J. C. Martin, Jr., Manager

Gentlemen:

Technical Oil Consultants, Limited, manages the exploration program of 41 permits comprising 2,188,750 acres of Dominion Government land in the Northwest Territories, Canada. This acreage hereinafter will be referred to as the "Subject Acreage". These permits are located within, adjacent to, and east of the Northwest Territories: Front Range. The major portion of the Subject Acreage lies between the Simpson Road and Great Slave Lake, in the Alberta basin. A regional map accompanying this report outlines and numbers the several permits, showing their locations with respect to latitude and longitude, and in relation to the major natural features of the Territories.

In the Northwest Territories, permits are taken out for an original period of three years, with a provision that they may be renewed annually at the beginning of their fourth, fifth, and sixth years, provided certain approved exploration programs, stipulated by the Dominion Government, are completed. Furthermore, during their first three years of permit life, all permits must be renewed at the end of 18 months. The renewal fee at the beginning of the second 18-months' period is 25 cents per acre. At that time any part, or all, of any acreage held by permit may be renewed at the option of the owners.

DEGOLYER AND MACNAUGHTON

As of this date, much of the Subject Acreage has passed, and the remainder is nearing the end of its first 18 months of permit life.

On October 22, 1953 a preliminary report which predated any permit renewal dates of the Subject Acreage was addressed to your office. This report contained specific recommendations pertaining to permits with renewal dates commencing during October 1953, and running through January 1954. These recommendations are restated in summary form under an appropriate section of this report.

General Geology and Prospective Zones

The permits making up the Subject Acreage have a minimum sedimentary section of about 2,500 feet in thickness under the eastern-most permits. Estimated on the basis of magnetics, the sedimentary section increases westward to a probable maximum thickness of some 17,000 feet. About two-thirds of the permits have rocks of either Devonian or Cretaceous age at the surface. Under some of the permits Cretaceous probably rests on Mississippian rocks. Sediments of either Jurassic, Triassic, or Permian age probably will be absent from all of the permits, excepting under Permits 478, 593, 594, and 595. Even under these four permits these units are thin, and since they outcrop within these permits, they presumably will yield no commercial hydrocarbons.

A relatively small number of deep holes have been drilled in the general area of the Subject Acreage, and, therefore, there is little information regarding the subsurface section. The Slave Point Limestone at the top of the Middle Devonian is the most favorable prospective zone known to be present throughout all of the Subject Acreage. Seepages of

DEGOLYER AND MACNAUGHTON

oil are present in this zone on the surface at Great Slave Lake, and in certain core holes this zone has been found to be saturated with oil. Insofar as is presently known, measureable oil has not been encountered, but measureable gas was found last year in the California Standard's Steen River test (Township 117, Range 5, west of the 6th Meridian) in Alberta about 100 miles south of the Subject Acreage.

The Elk Point Dolomite and Evaporite series, immediately below the Slave Point Limestone, makes up the greater portion of the intervening section between the Slave Point and pre-Cambrian. None of the few deep holes within this general area record measureable oil from the Elk Point, but the California Standard Steen River well, above mentioned, had important measureable gas.

Whether or not Lower Devonian, Ordovician, or Cambrian rocks will be present under a portion of the Subject Acreage is unknown, but from the estimated thickness of the sedimentary section in Area "B" (described below), this at least seems a possibility. Rocks of Silurian age are present, but their limit boundaries are unknown.

The major portion of the sedimentary section under the Subject Acreage has not been explored. Therefore, in addition to the two known prospective horizons, it is possible, and even probable, that new prospective zones will be found when the section is explored by deep drilling. It is of interest to note that the Slave Point, which is the first potential prospective zone under most of the Subject Acreage, is stratigraphically below the Alberta Devonian producing zones. Accordingly, for the most part, we are dealing with a section of rocks which has not produced in Alberta, either because it has not been penetrated, or because in Alberta

its sedimentary character is unfavorable. There is some suggestion that the sedimentary character of this portion of the stratigraphic column in the Northwest Territories is more favorable for production. This will not be known until deep tests are drilled.

Grouping of Permits

In the Northwest Territories the Dominion regulations state that permits may be grouped together for exploratory work and expenditures in one of two ways: (a) 20 permits, or less, may be grouped, provided the permit areas, or any portion of a permit area, are situated within a circle, the radius of which does not exceed 50 miles; (b) 20 permits, or less, may be grouped, if the boundaries of these permits are contiguous. Accordingly, under these regulations, it is advantageous to group the Subject Acreage into the following three areas; unless special arrangements, as suggested below, can be made:

Area "A": Permits 353, 356, 357, 367, 371, 372, 380, 381, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, and 452. These 20 permits comprise 1,075,920 acres, and the cost of their renewal would be \$268,980.

For purposes of discussion, hereinafter Area "A" is divided into two separate groups, Sub-area "A-1" and Sub-area "A-2", as follows:

Sub-area "A-1": Permits 353, 356, 357, 367, 371, 372, 380, 381, 450, 451, and 452. These 11 permits comprise 664,440 acres, requiring a renewal payment of \$166,110. Their renewal payments became due between October 23, 1953, and January 17, 1954.

Sub-area "A-2": Permits 441, 442, 443, 444, 445, 446, 447, 448, and 449. These nine permits comprise 411,480 acres, requiring a

DEGOLYER AND MACNAUGHTON

renewal payment of \$102,870. Their renewal payments became due between January 11, 1954, and January 17, 1954.

Area "B": Permits 438, 439, 440, 478, 479, 578, 579, 593, 594, 595, and 604. These 11 permits comprise 609,980 acres, which would require a renewal rental of \$152,495. Their renewal payments became due starting January 11, 1954 with payment dates extending to May 19, 1954.

Area "C": Permits 511, 512, 525, 572, 573, 574, 575, 576, 577, and 660. These 10 permits comprise 502,850 acres, and would require a renewal rental of \$125,712.50. Their renewal dates extend from February 8, 1954, to May 19, 1954, with the exception that Permit 660 is not due for renewal until November 5, 1954.

Discussion of Permit Areas

Area "A": The permits of Area "A" have been sub-grouped into Sub-areas "A-1" and "A-2" on the basis of regional geology for purposes of renewal payments. It should be pointed out that Permit 381 falls a few miles east of a circle with 50 miles radius, but it has been assumed that arrangements could be made to have it included in this grouping.

The arbitrary division of Area "A" into two sub-areas is based chiefly on the variation in the estimated thickness of the sedimentary column. The estimated thickness of the geologic section for Sub-area "A-1" is less than half of that estimated to underlie Sub-area "A-2", and for this reason Sub-area "A-2" is looked on the more favorably.

Sub-area "A-1": On the basis of the air-borne magnetic maps made available to us, the most favorable magnetic anomaly within Sub-area "A-1" falls within the south half of Permit 372 and the north half

DEGOLYER AND MACNAUGHTON

of Permit 371. In order to properly evaluate this anomaly, at least five structure test-holes would be required sufficiently deep to obtain unquestioned electric log correlations. Since Hay River Limestone outcrops here, it is anticipated that the base of this limestone would afford a satisfactory marker horizon, and it is estimated that the depth of structure test-holes would be not less than 500 nor more than 1,000 feet. Providing such a program demonstrates structural closure, the regional geological factors are sufficiently attractive to recommend a test to the pre-Cambrian basement at an estimated depth of 3,500 to 4,000 feet.

In addition to the magnetic anomaly suggesting favorable structure within Permits 371 and 372, there are two magnetic anomalies within Permit 353 which are worthy of serious consideration and perhaps structure test-hole expenditures, depending on the results secured in Permits 371 and 372.

Sub-Area "A-2": On the basis of magnetic investigation, and regional geological data, these nine permits should be underlain by from 5,000 to 9,000 feet of sedimentary section, and on this basis alone are more desirable than the permits in Sub-area "A-1". We feel that these permits have sufficient merit to justify considerable exploratory expenditures.

Area "A" - General: Inspection of geologic maps of this area suggests that parts of it probably are suitable for surface geological investigation. Such surface mapping would supplement structure test-hole data and probably reduce structure test-hole expense in an exploratory program.

Area "B": The permits in Area "B" are either within or immediately adjacent to the Northwest Territories' Front Range. Their structure is complex and the character of the stratigraphic section, based on data at hand, appears to be only moderately favorable.

The prospects for permits within Area "B" may be roughly evaluated by means of surface geological maps published by the Geological Survey of Canada. On the basis of these data, Permits 438, 439, 440, 578, 579, and 604 are located along a trend of complex faulting where beds of Devonian and Silurian age are exposed at the surface. Permits 593, 594, and 595 are well situated on the Pointed Mountain anticline where beds of Carboniferous and Lower Cretaceous age outcrop. Permits 478 and 479 are located south of the Front Range uplift in a general area of Upper Cretaceous exposures, but in trend with the complex faulting and folding of Devonian and Mississippian beds.

From the foregoing, it is concluded that the prospective value of Permits 593, 594, and 595 far outweighs that of the other permits of Area "B". Second in prospective value are Permits 478 and 479, and considerably down the scale the prospective value of Permits 438, 439, 440, 578, 579, and 604.

Area "C": The 10 permits comprising this group are the eastern-most of the Subject Acreage. They probably have the thinnest sedimentary section, and because of this factor the Area "C" group is looked on as having the least prospective value of the several groups.

From published data, Area "C" appears to be largely, if not completely, covered by a mantle of glacial material. Possibly a thorough search might discover isolated outcroppings of the Upper Devonian beds

DEGOLYER AND MACNAUGHTON

that underlie the masking mantle, but it is doubtful that the expense of a surface survey would yield commensurate results in structural data.

Although airborne magnetic maps of Area "C" are available to this study, magnetic anomalies here appear to be influenced to a large extent by factors other than structural movement. Consequently, these surveys are considered to be almost valueless as an aid to structural interpretation.

Probably profiling with structure test-hole control is the most practical exploration tool for Area "C".

Recommendations

Inasmuch as many of the 41 permits comprising the Subject Acreage have come up for 18-month renewals over the past several months, between October 1953 and the date of this report, our recommendations pertaining to these permits and to the "Areas" within which they are grouped can best be stated by quoting from our preliminary report dated October 22, 1953.

"We recommend that the seven permits coming due for renewal between October 23, 1953 and December 3, 1953 (Permits 353, 356, 357, 367, 371, 372, and 380) be renewed for a renewal payment of \$103,040. Additionally, it is our judgment that an attempt should be made to arrange with the Dominion Government for the placement of all 41 permits into one exploratory and expenditure group. In the event this can be accomplished, we recommend that all of the 41 permits be renewed at the end of their 18-months' period, requiring a total renewal rental payment of \$547,187.50.

DeGOLVER AND MACNAUGHTON

'These conclusions are predicated on several factors.

First, acreage in the Northwest Territories is cheap to obtain and cheaply held. Despite the fact that it would require an expenditure of \$3,283,125 to retain the Subject Acreage for the maximum period of six years allowed by law, such an amount is only \$1.50 per acre for the entire six-year period.... Second, the entire amount spent for rentals on a Northwest Territories' permit is refundable, provided an equal amount is spent on one of several types of exploration stipulated by Dominion regulations. If more than the amount of a rental is spent during any rental period, it may be applied toward the succeeding rental payment. Third, the south half of that portion of the Northwest Territories east of the Front Range is almost solidly held by permits which, if retained by their owners, will involve exploratory drilling by reason of Dominion regulations, and, as a result of such exploration, enough may be learned concerning subsurface stratigraphy and structure that oil and/or gas fields may result. And fourth, since the area, for the most part, has a thick stratigraphic section which should contain numerous prospective zones, both known and unknown, we believe that it justifies a renewal rental of the required half-million dollars. Significant results should accrue from such an expenditure.

'In the event all of the permits cannot be grouped into one expenditure unit, we recommend that the renewal payments be made on the permits involved in Area "A", that decision to renew the permits in Area "B" be temporarily withheld, and that an effort be made to farm out the permits involved in Area "C" prior to their first renewal date on February 8, 1954.

DEGOLYER AND MACNAUGHTON

'Area "A"

'Sub-area "A-1":' Rental payments for 'two permits in Sub-area "A-1" become due within the next few days. It is suggested that these two, and all others in this sub-area, be renewed. An effort should be made to farm-out these 11 permits on the following terms: that a one-half interest be retained, and that the farm-out operator shall bear all costs of a specified exploratory program.

'If structure test-hole drilling of' the magnetic anomaly in 'Permits 371 and 372 does not prove structural closure, the farm-out operator should be prepared to continue the program to include either one or both of the magnetic anomalies on Permit 353.

'If a deep hole on Permit 372 is drilled and found dry, there will still be time to decide as to whether further exploration on this group of permits is justified.

'It is recommended that the structure test-hole drilling of Permits 371 and 372, followed by the drilling of a deep hole, if justified, be accomplished during the forthcoming winter season. Such a program will permit the benefit of two periods of winter operation before the first of the fourth year rentals are due on April 23, 1955.

'Sub-area "A-2":' We feel that these permits have sufficient merit to justify' considerable 'exploratory expenditures. A structure test-hole drilling program to explore one or more of the magnetic anomalies is recommended for the forthcoming winter season.

DEGOLYER AND MACNAUGHTON

'If it should develop that Sub-area "A-1" cannot be farmed out, we then recommend that you start structure test-hole drilling in both Sub-areas "A-1" and "A-2" during the forthcoming field season. If this program in Sub-area "A-1" proves structure closure, it is suggested that a second farm-out attempt be made. Should a second farm-out attempt be unsuccessful, then it is still recommended that a basement test be drilled.'

At this point quotations from the recommendations of our preliminary report of October 22, 1953 end.

Area "B"

Largely on the basis of published geological surface data, plus opinions formed from a limited air reconnaissance during August 1953, the permits of Area "B", for the purposes of our recommendation, are placed in three groups.

Permits 593, 594 and 595: Data at hand indicate that much of the area of these three permits is well located on favorable structure which can be mapped on surface beds.

Regardless of your decision as to payment of renewal rentals on other permits of the Subject Acreage, it is recommended that these three be singled out for payment. If this recommendation is followed, it is suggested that either or both a geophoto survey or a surface detailed survey be made as soon as field conditions permit.

Permits 478 and 479: These two permits came up for renewal payment on January 22, 1954. If these payments were made, it is recommended that these areas be included in any geophoto or surface survey that is made on Permits 593, 594 and 595.

DEGOLYER AND MACNAUGHTON

Permits 438, 439, 440, 578, 579, and 604: Permits 438, 439, and 440 came up for renewal payment on January 11, 1954. Renewal payments on Permits 578, 579, and 604 become due during May 1954. Whether or not Permits 438, 439, and 440 were renewed on January 11, recommendation is made to farm-out either the entire group of six or Permits 578, 579, and 604 at once on any basis that will leave a reasonable interest in your hands and at the same time guarantee a satisfactory exploratory program.

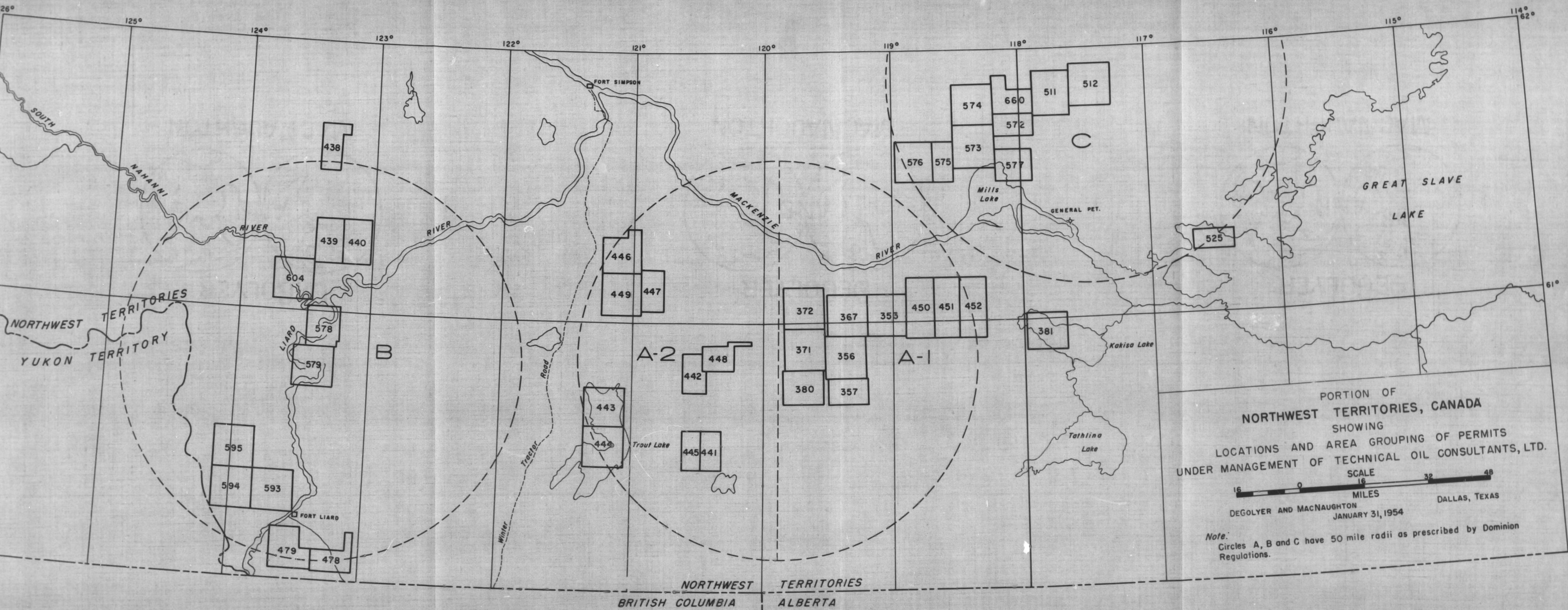
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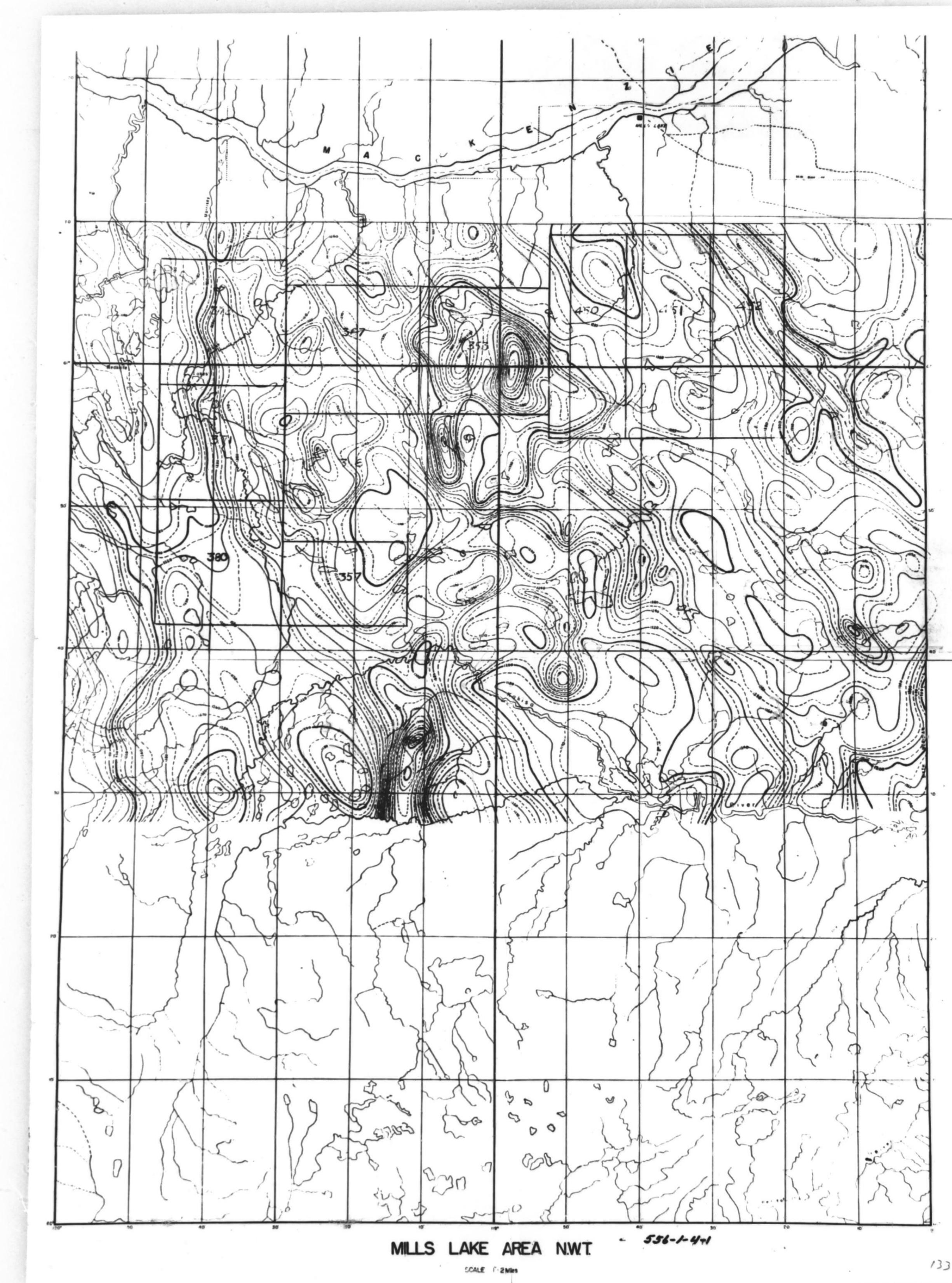
An immediate farm-out of this entire group of permits is recommended, if a deal securing retention of a reasonable interest, plus performance of a satisfactory exploratory program, can be made.

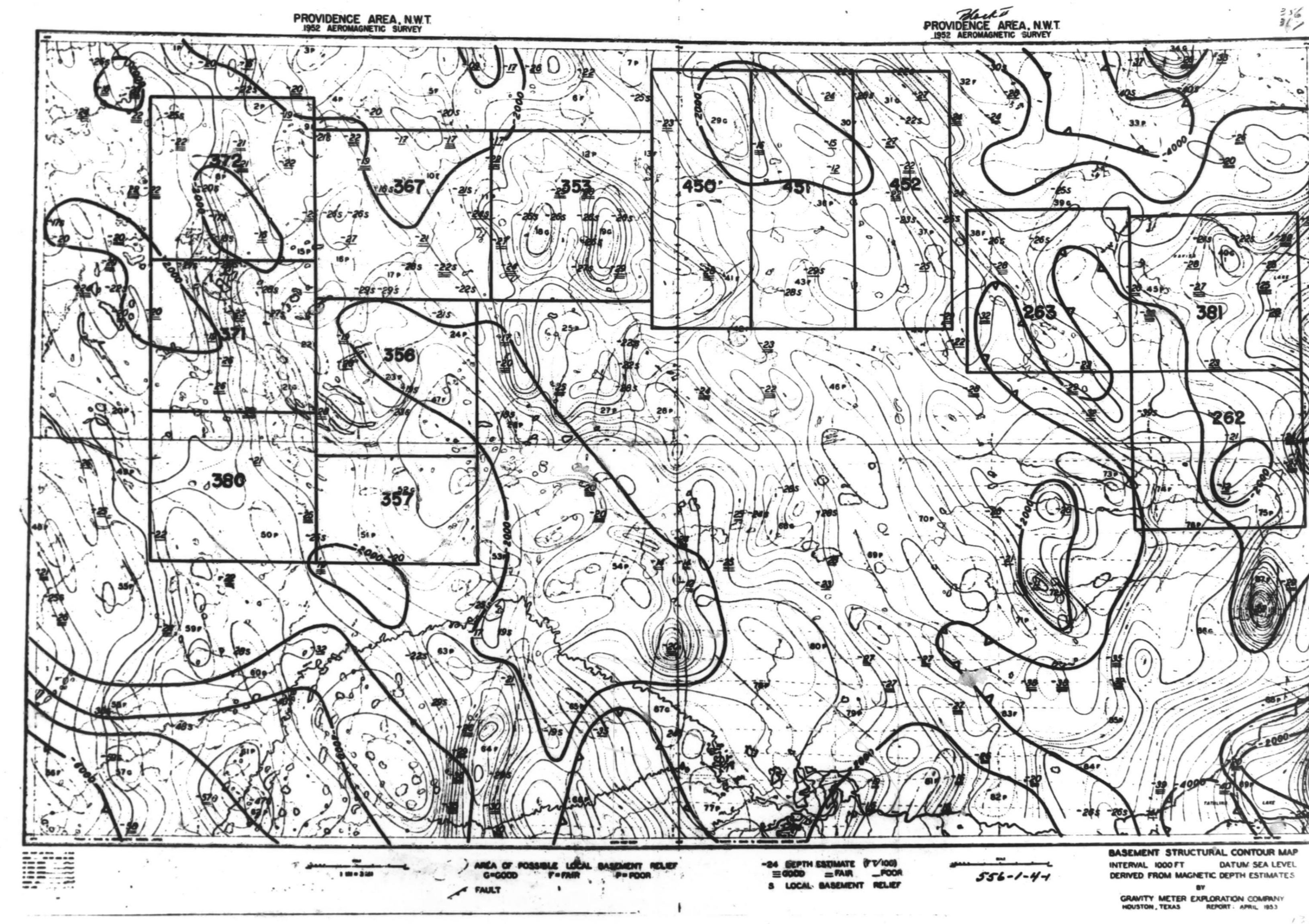
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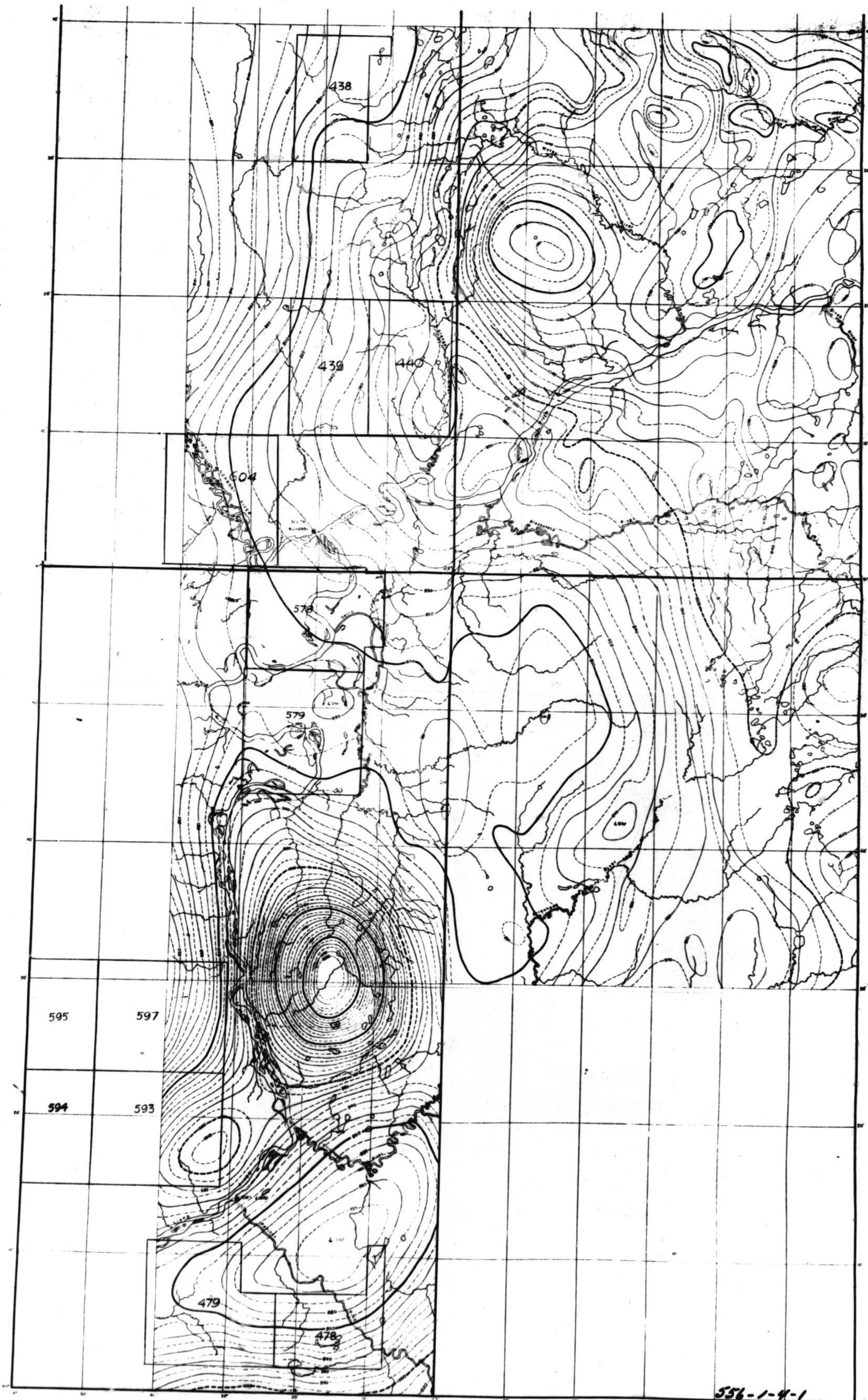
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SOUTH NAHANNI-FORT LIARD AREA N.W.T.

SCALE 1:2 Miles

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