

IMPERIAL OIL ENTERPRISES LTD.

GEOLOGICAL DEPARTMENT.

Report on:

Reflection Seismic Program - Peel Plateau - N.W.T.
 Territorial Oil & Gas Work Bonus Blocks 32-63,
 35-63, 36-63, 37-63, 38-63 & 39-63. For period
 November 18, 1963 to April 25, 1964.

Enclosures: ✓ Six Seismic Station Location and Elevation Maps

*not
returned* { Five Bear Rock Formation Structure Maps

{ Five Bear Rock to Cambrian Shale Isochron Maps

{ One Bear Rock to Upper Cretaceous-Tertiary Structure Map.

By:

J. C. Underhill

Date:

July 30, 1965.

Map References:

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✓106 L	Trail River
✓106 M	Fort McPherson
✓106 N	Arctic Red River
✓106 O	Travaillant Lake
✓107 B	Aklavik.

IMPERIAL OIL ENTERPRISES LTD.
PRODUCING DEPARTMENT - WESTERN REGION.

REFLECTION SEISMIC OPERATIONS - PEEL PLATEAU AREA.

N.W.T. Work Bonus Blocks 32-63, 35-63, 36-63, 37-63,
38-63 and 39-63.

N.W.T. Permits 3594-3601, 3618-3624, 3625-3631, 3632-
3638, 3639-3646 and 3647-3654.

November 1963 - April 1964.

By

J. C. Underhill

July 30, 1965.

PEACE RIVER EXPLORATION DIVISION
DAWSON CREEK, BRITISH COLUMBIA.



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SUMMARY.

Report on reflection seismograph operations conducted by Geophysical Service Incorporated Party No. 26 on behalf of Imperial Oil Enterprises Ltd. in the Peel Plateau Area from November 18, 1963 to April 25, 1964. Submitted in support of application for credit. See Affidavit of Work by. H. W. Johnson dated April 15, 1965.

INTRODUCTION.

Due to winter inaccessibility of the area a program of stockpiling fuel and supplies was carried out during the summer of 1963 via the Mackenzie River. Cat crews moved into the area in November 1963 while the seismic crews were assembled and moved into the area in December. The crews were serviced by company-owned DC-3 and Otter aircraft. Equipment, in addition to a standard reflection seismic operation, consisted of three cats with bulldozers.

REFLECTION SEISMIC OPERATIONS.

Three company survey personnel left Calgary on the I.O.L. DC-3 and arrived at the initial work site on November 18, 1963. The three men loaded 100 propane bottles onto the trailers, cleaned out the frozen stove lines and performed necessary repairs. Supplies were unloaded from the vehicles and placed in storage trailers. The caterpillar contractor, a cook and four cat operators arrived also on November 18, 1963. They commenced snow plowing roads around the camp and cutting a suitable crossing over a deep coulee some eight miles from camp. Some five men, an instrument engineer, a junior observer, a driller, a shooter and a mechanic left Edmonton on a commercial P.W.A. flight and arrived on November 24th. The cats meanwhile commenced stockpiling fuel at the working area.

During the period November 23rd to November 30th, the Party Chief, three staff camp personnel and two cat operators arrived on the I.O.L. DC-3 flight from Fort Nelson and continued to the campsite on November 25th, 1963.

Various members of the crew worked on the following: mounting the instruments and recorder in the dog house, preparing and winterizing the vehicles and equipment for operation as well as moving about three hundred barrels of fuel to higher ground. The dynamite was stockpiled at the edge of the airport and supplies were loaded in and on the end of the trailers. Two cats continued to cut line to the edge of the prospect, a distance of some fifty miles, and completed the job by November 29, 1963. The road surface was very rough and had to be dragged many times before equipment could cross. Several areas of soft muskeg gave the cat crew considerable trouble. Weather during the period was very cold with temperatures ranging from thirty to forty-five below zero with fairly high winds.

From December 1st to December 7th, the first three days were spent moving camp. The camp had been assembled in strings and after picking up supplies and personnel from the incoming DC-3 flight, the camp commenced the move to the initial work area on December 1, 1963. The steep coulee previously mentioned caused some trouble as the cats had to double up to get equipment across. On December 2, 1963, the camp moved some twenty-eight miles by travelling from 0730 to 2300 hours. Cats also had to double up on hills because of the heavily loaded trailers. The camp arrived at its destination about 1800 hours on December 3, 1963. The approximate location was Latitude 67°05' North and Longitude 133°00' West. On December 4th, experimental shooting was commenced to determine methods to obtain the best possible results including various spreads, filters and geophones.

During the period December 8th to 14th, the experimental shooting

was completed and a three hundred foot uphole survey was taken. The first line commenced with a three hundred foot spread using sixteen geophones per trace on the Arctic Red River map. The record quality was fair to poor, with some good quality records being obtained. The main factors hindering production were the very short daylight period, as the sun did not break above the horizon and the pigtails on the geophone strings snapped often in the intense cold. Hard shale and sandstone drilling was encountered on the west half of the line. Other formations were clay and sandstone, clay, gravel and sandstone, muskeg and perma-frost. Two ravines were encountered on the line leading to Arctic Red River. The cats were called back about two miles south of the ravine and given a deflection angle to miss the ravines, and then the line was directed to Arctic Red River. Estimated cutting time of the line was five days. The road was extremely rough with a maximum five mile per hour driving speed. Vertical surveys were based on old work while horizontal control was corrected to the lakes from air photos.

Work continued in the Arctic Red River area from December 15th to the 21st with the east-west line from $67^{\circ}05'$ North, $132^{\circ}45'$ West to $67^{\circ}05'$ North and $133^{\circ}15'$ West being completed. Recording began on December 18th on a line northwest to the town of Arctic Red River approximately forty miles northwest. Record quality was fair to good with the river noise giving continuous interference. Shooting was restricted to near daylight hours.

The cats reached the town of Arctic Red River on December 19, 1963. The fuel dump there was on the east bank of the river and had to be moved across the river when the crew passed through. The camp also was moved to about twenty miles south of the town. Several day's shooting within the period comprised eight geophones per trace with a 150 foot spread. Evaluation and interpretation of these records indicated that sixteen geophones over a three hundred foot spread was equally satisfactory, and the crew returned to this method. It was found that an extra surveyor could be used effectively as the one and one-half hours of daylight available to the surveyors was not sufficient to keep up with the shooting crew. An extra man during the deep winter months allowed both a chaining and elevation team to operate simultaneously.

During the period December 22nd to 28th, good production was obtained with record quality being fair to good. Strong continuous surface noise was prevalent but the crew managed to dampen this with filters. The weather was good with temperatures ranging from minus thirty to minus five degrees. There were no winds or snow to hamper operations. The lines were extremely rough over gently rolling terrain interspersed with lakes. Drilling was good except when encountering hard sandstones.

The camp was moved to six miles southeast of Arctic Red River on December 30th. Cats continued to keep ahead of the seismic crew by use of double shifts. Weather continued relatively mild during the December 29th to January 4th period. Several equipment breakdowns caused some interruptions, especially the light plant and one of the drills.

On January 5th the camp was moved to approximately fifteen miles west-south-west of the Point Separation wellsite as located on the Fort McPherson map. Record quality continued to be mostly fair with strong surface reflections giving trouble. Good weather with no snow or high winds was enjoyed by the crew. Roads continued to be very rough and the terrain changed from gently rolling to small valleys. Drilling was good with mostly hard shales and some gravel being the only problems. Program consisted of a line west-south-west from the Point Separation well.

During the period January 12th to 18th, the crew worked south of Fort McPherson on the west bank of the Peel River in the general region of $67^{\circ} 32'$ North and $134^{\circ} 00'$ West. Record quality was good with satisfactory shallow data. Little difference was found between single and three hole patterns at the same depth. Shallow shots exhibited ground roll which became more severe with decreasing depth. The weather was clear and cold with temperature down to fifty below zero. A fuel shortage caused the crew to lose one cat which had to make a long trip to Arctic Red River for fuel supplies and precipitated the camp move of January 16th. The line was scouted west of Fort McPherson by air on January 16th. The cats were advised to swing well north of their proposed strike to avoid a deep canyon in the area. Some crew delay was due to the Peel River crossing as not one truck, including the four wheel drive shooting unit, could make the hill from the river to the west side of the Peel. All vehicles had to be towed by the cats. It was decided to leave part of the camp at Fort McPherson, including supplies and interpreters. The balance would continue west with the shooting crew. Upon completion of the west line, the shooting

crew camp was to return to Fort McPherson and continue the program southward.

From January 19th to the 25th the crew worked in the area of 67° 25' North and 134° 55' West. The record quality was good to poor with the best records being obtained west of the Peel River. The roads were extremely rough with elevation changes of 350 feet between shotpoints. On January 25th, the terrain forced the crew to return to Fort McPherson after completing some twenty-one miles of line west of the Peel River. Drilling was good, but the drills became often stuck between shotpoints. Camp moves on January 19th, 21st, 24th and 25th cut production somewhat. The light plant continued to give trouble.

Work continued in the Fort McPherson area from January 26th to February 1st and by the end of the period were approximately twelve miles south by fifteen degrees east of Fort McPherson and heading due south. The weather was very cold with temperatures varying from more than minus fifty degrees to high of minus thirty-five degrees below zero. Record quality was fair to good. The terrain was hilly and extremely rough with all equipment becoming stuck in dirt fills. The crew experimented in spraying water on selected fills to see if they could be made more solid. The area south and west of Fort McPherson is above the tree line and each small creek has steeply cut banks. Without trees the vehicles had nothing to winch to. Cats were required to move the drills between locations. The cats, therefore, were only just ahead of the crew shooting line.

On February 8th the camp was at Longitude $134^{\circ} 30'$ West and Latitude $67^{\circ} 06'$ North, approximately twenty-six miles southeast of Fort McPherson and was proceeding south by twenty-six degrees east. The record quality for this area improved with strong deep reflections becoming evident. Weather was quite mild with highs of zero degrees recorded. The area was hilly but the roads were not quite as rough. During the period of February 4th to 6th, an experimental program was conducted in the vicinity of $67^{\circ} 20'$ North and $134^{\circ} 45'$ West. An uphole survey was taken from a depth of 150 feet, a noise analysis was run over varying distances and intervals with an expanded spread over a 1.85 mile distance being shot using three hole inline patterns and seven hole perpendicular patterns. Program results indicated that the most effective shot hole depth was between twenty and sixty-feet - such depth to be determined by drilling problems encountered. Also indicated was a single, strong noise wave of relatively high velocity moving horizontally down the spread and a very high near surface reflection velocity.

On February 10th the camp was moved to $66^{\circ} 47'$ North and $134^{\circ} 15'$ West or approximately forty-six miles south by southeast of Fort McPherson. The weather was very cold with high winds bringing the wind chill factor to about seventy below zero. The country was mostly flat with many lakes and gulleys. The roads improved but still remained rough. The program was conducted on the Trail River map along the south by southeast line from Fort McPherson. The crew then turned east by Northeast on the line which passed Martin House and across the Arctic Red River.

On February 22nd the crew was located at 66° 50' North and 133° 25' West - approximately forty-eight miles south by fifteen degrees east from the town of Arctic Red River and five miles due west of Arctic Red River proper. The weather continued very cold. Crew changes were effected during the interval. The terrain was flat with many lakes. A fuel shortage had initiated reduction of hole patterns. Some experimental shooting was done approximately seven miles due east of Martin House. It was discovered from support aircraft that the proposed tie line to the Ontaratue wellsite could go over some twenty miles of old seismic lines and a prepared river crossing. The fuel shortage was remedied by having P.W.A. transport 10,000 pounds of diesel fuel to the Ontaratue airstrip.

By February 29th the crew had reached 132° 50' West and 66° 54' North or about forty-six miles south by thirty degrees east of Arctic Red River and fourteen miles south of the tie with the first program line. Weather was mild but cloudy causing poor flying weather every day except February 27th. Terrain was flat except crossing the Arctic Red River. All equipment had either to be pulled or winched part of the quarter mile climb up the east bank of the river. The program continued to use inline patterns and cut line as fast as possible to reach the first program line before fuel became critical. As soon as a tie was made fuel sloops were dispatched to the Arctic Red River fuel dump. It was noted that as the program moved southward and the weather became mild the radio communication link with Dawson Creek improved. However, difficulties with air support caused critical situations with fuel and powder.

During the period March 1st to 7th, the camp was located at 66° 43' North and 132° 45' West or approximately fifty-seven miles southeast of Arctic Red River town. Record quality varied considerably due to clay deposits. Nights were very cold with temperatures of minus forty-five degrees and highwinds. Days were mostly sunny and after 1000 hours mild. The country was flat with generally poor roads. Average driving speed was about five miles per hour. With new supplies of fuel the crew commenced seven hole patterns. An experimental program was conducted using anuphole survey and various spread patterns. It was found that strong surface noise continued to exist with three hole perpendicular patterns being the best choice.

From March 8th to 14th the crew worked toward the Ontaratue wellsite on the Martin House map in the general area of 66° 25' North and 132° 15' West. The weather turned very cold. Terrain improved as old seismic lines were followed as much as possible. As one of the drills broke down, double and treble shifts were used on the remaining drill.

Camp moves were required on March 17th, 19th and 20th as short lines completed certain of the projected coverage. Record quality was generally poor with excessive noise on all records. It was discovered that record quality improved west of Martin House. The country near the wellsite was flat but west of Martin House it became hilly and very rough. Three hole perpendicular patterns were shot over 3,600 foot coverage. All shot holes were fifty feet or more as shallow hole records were mostly poor.

On March 22nd the camp was moved to 66° 50' North and 133° 20' West and then to 66° 57' North and 133° 33' West on March 25th. Record quality degenerated especially when crossing many small, shallow lakes which created considerable low frequency noise. A gradual rise in elevation was noted along with drainage ravines from lakes to the Arctic Red River.

By March 31st the crew was located at 67° 05' North and 133° 35' West or twenty-three miles southeast of Arctic Red River while working north to the Arctic Red River settlement. Record quality was fair to poor as the Bear Rock formation remained the only continuous reflector over the area. A distinct warming trend during daylight hours was noted except for one blizzard during the period. The country was flat with generally good roads and many intermittent lakes. The crew began shooting three hole perpendicular patterns using fifteen pound charges and split 1,800 foot spreads. The estimated date of program completion was thought to be about April 28th if continued production was maintained.

During the period April 5th to 11th, the crew reached within eleven miles south of Arctic Red River and continued north. Temperatures dropped during the period with lows of minus thirty-five degrees. The road from the campsite to Arctic Red River was extremely rough - being the worst encountered during the program. As one drill broke down and gravel was predominant, the remaining drill went on double shifts.

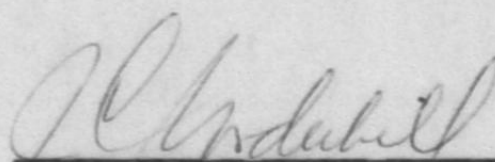
At the end of the April 12th to 18th interval the camp was thirty miles south by forty-six degrees west of Arctic Red River. The crew shot two miles west of camp and headed southwest over cut lines to shoot a projected thirty mile line commencing at 67° 15' North and 133° 50' West. Thawing commenced between April 13th to 16th causing the crew to speed up operations as much as possible. Surface terrain in this area of Fort McPherson is hilly with small lakes and muskeg swamps. Roads ranged from poor to fair. Good drilling was encountered from April 15th onward as gravel was found to be well sorted and rounded along with cemented stringers.

The program was completed on April 24th after the crew had run a fill-in line. With the fair weather winds caused excessive wind noise on records. The terrain for the last period was hilly with lakes. Drilling encountered mostly clay and shale. On April 25th the crew shut down and serviced equipment. The crew was moved out by company-owned DC-3 aircraft while the camp and equipment was moved to the Arctic Red River townsite and stored for the summer.

During the above program, a total of 1,249 shots were taken at 1,123 shotpoint locations to obtain some 2,914 profiles. A total of 373 miles of seismic was shot during the 143 days of actual shooting operations.

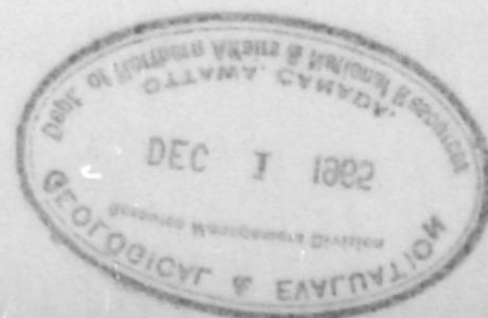
Incorporated with the maps of this report are three seismic trades made with Texaco Exploration, Richfield Oil Corporation and Shell Oil Company. The Shell Oil trade involved some 274 shotpoint locations

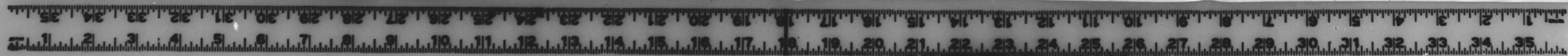
or 128.4 miles of line on the Martin House, Trail River, Fort McPherson and Arctic Red River map sheets. The Richfield seismic trade involved some 212 shotpoint locations or some 65.2 miles of line on the Arctic Red River and Travaillant Lake map sheets. The Texaco seismic trade, entirely off-permit, involved some 534 shotpoint locations or some 130 miles of line on the Arctic Red River, Travaillant Lake and Aklavik map sheets. These are differentiated on the maps by being shown as solid dots whereas the Party No. 26 shooting is shown as open dots.

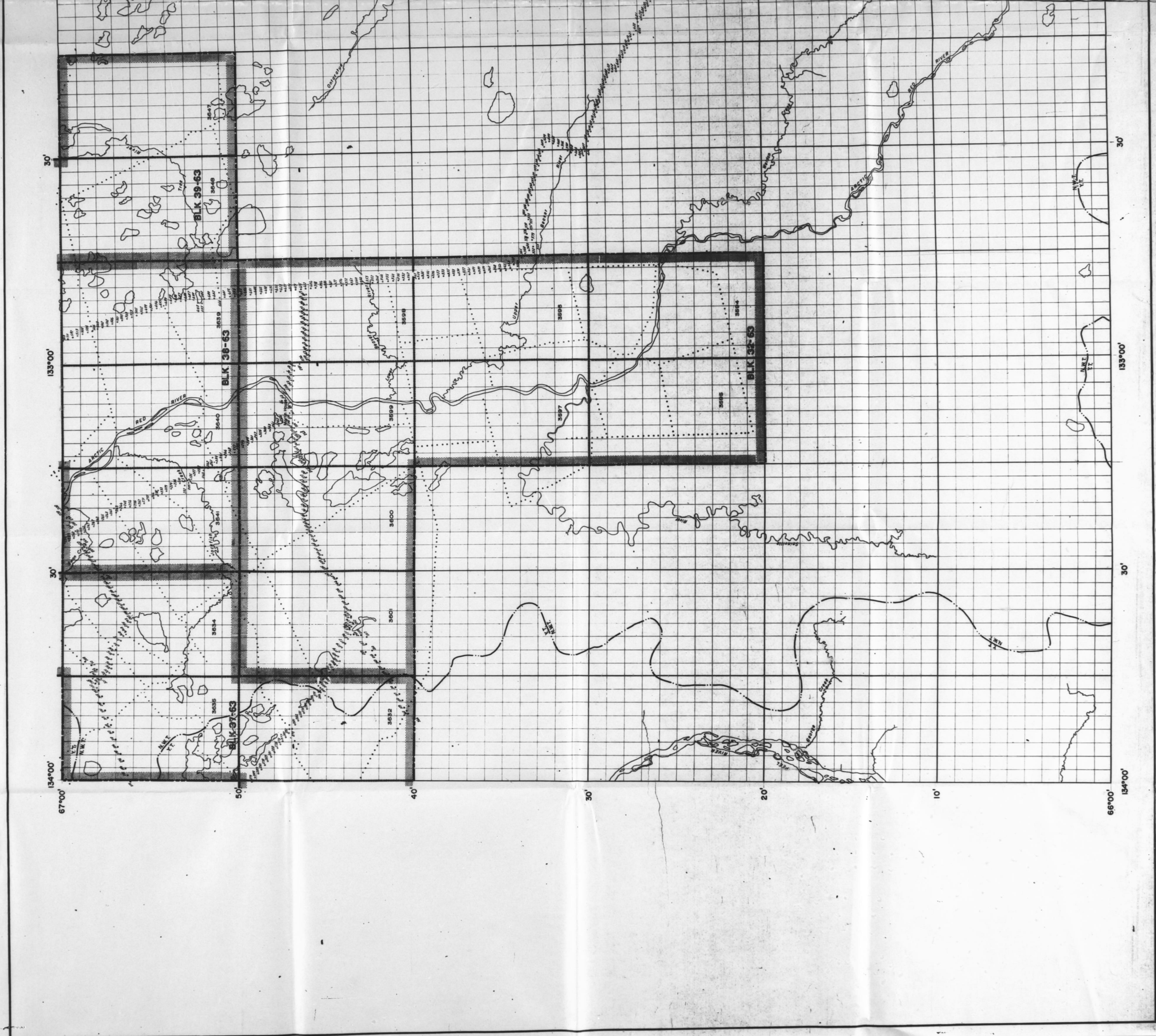


J.C. UNDERHILL,
DIVISION EXPLORATION MANAGER,
PEACE RIVER DIVISION,
IMPERIAL OIL ENTERPRISES LTD.

July 30, 1965.



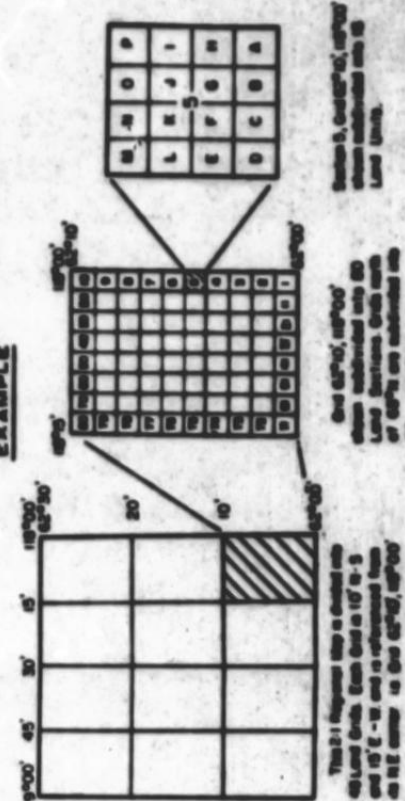




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**N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS**



INDEX TO MAP SHEETS

A 10x10 grid map of the Sacramento-San Joaquin River Delta. The grid is labeled with letters A-J across the top and bottom, and numbers 1-10 along the left and right sides. The map shows various rivers, lakes, and islands. Key features include the Sacramento River (top left), San Joaquin River (top right), and the Delta (center). A shaded area in the center represents the Delta. The map is oriented with North at the top.

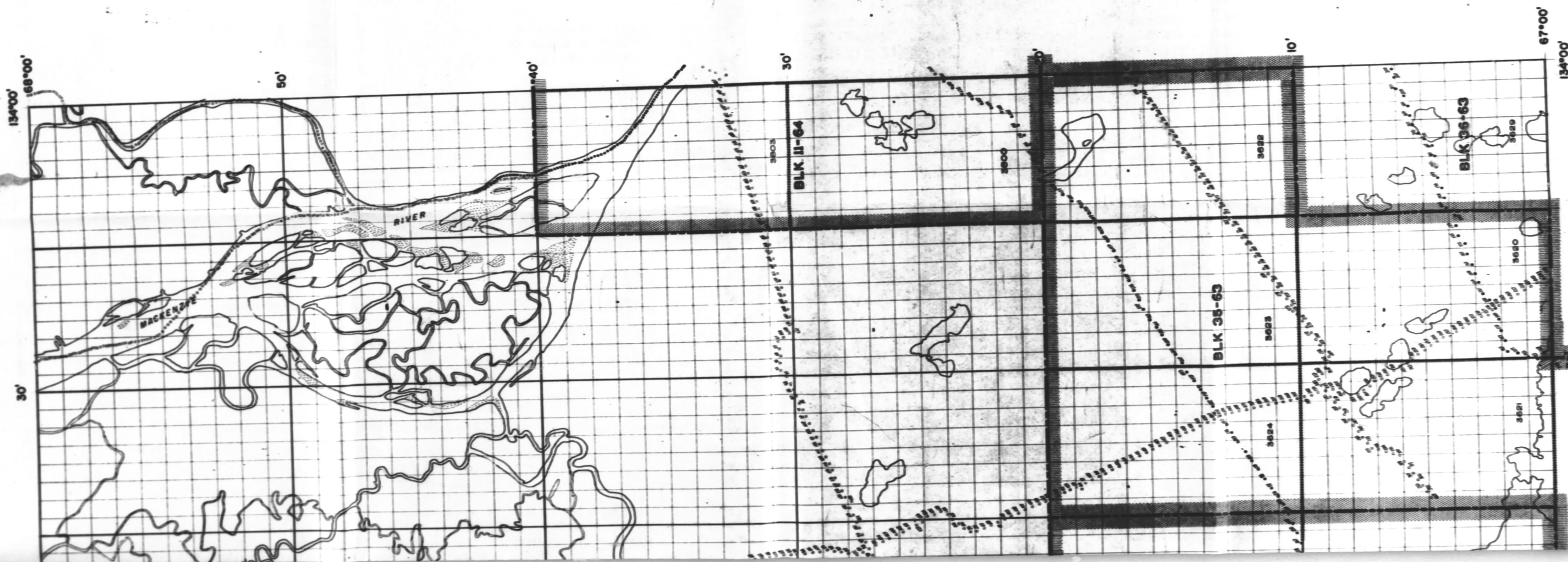
SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval -----
Datum: Plane ----- Velocity -----
REVISED JULY 6, 1963

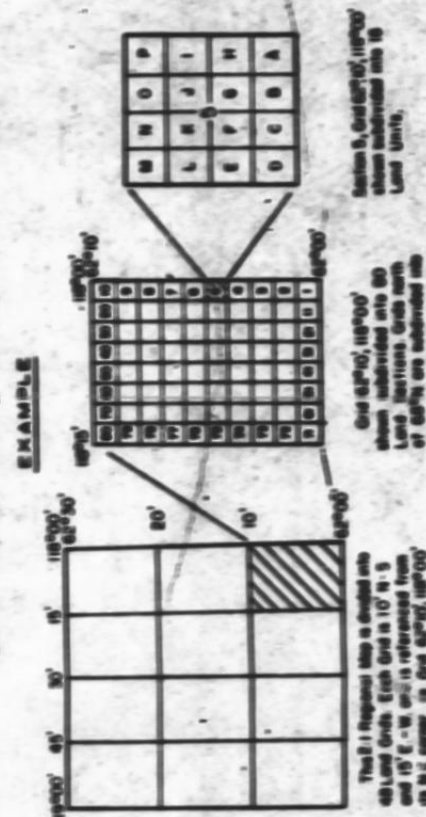


106K MARTIN HOUSE
2 MILES TO 1 INCH

IMPERIAL OIL ENTERPRISES LTD.
EXPLORATION DEPARTMENT PEACE RIVER DIVISION



N.W.T. LAND REFERENCING SYSTEM
TERRITORIAL OIL & GAS REGULATIONS



INDEX TO MAP SHEETS

Block	Section	Sheet	Scale
1	1	1	1:50,000
2	2	2	1:50,000
3	3	3	1:50,000
4	4	4	1:50,000
5	5	5	1:50,000
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32	32	32	1:50,000
33	33	33	1:50,000
34	34	34	1:50,000
35	35	35	1:50,000

SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval: 100 feet
Datum: Mean Sea Level
Velocity: 1.5 km/sec



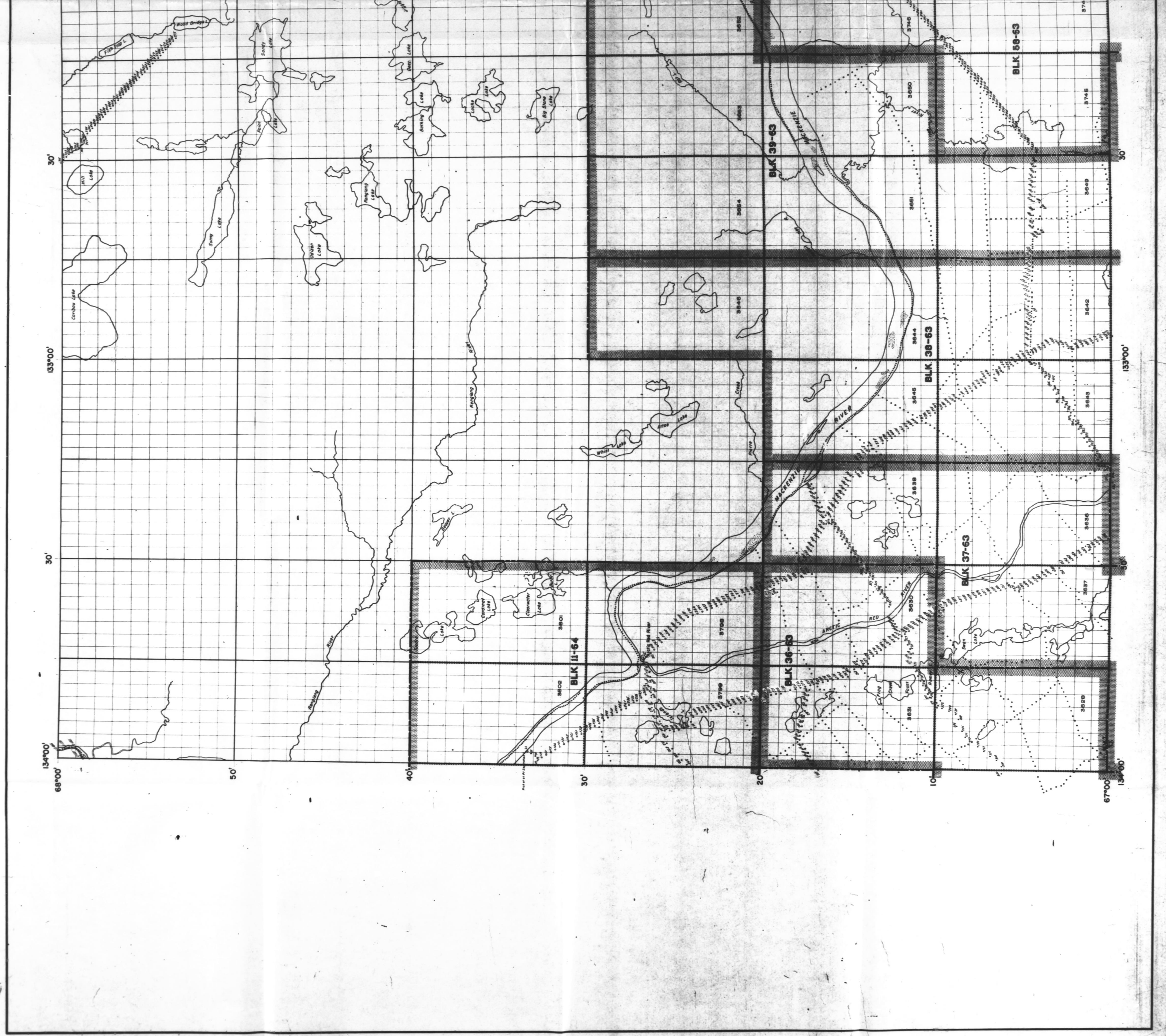
106 M FORT MCPHERSON

2 MILES TO 1 INCH



30x

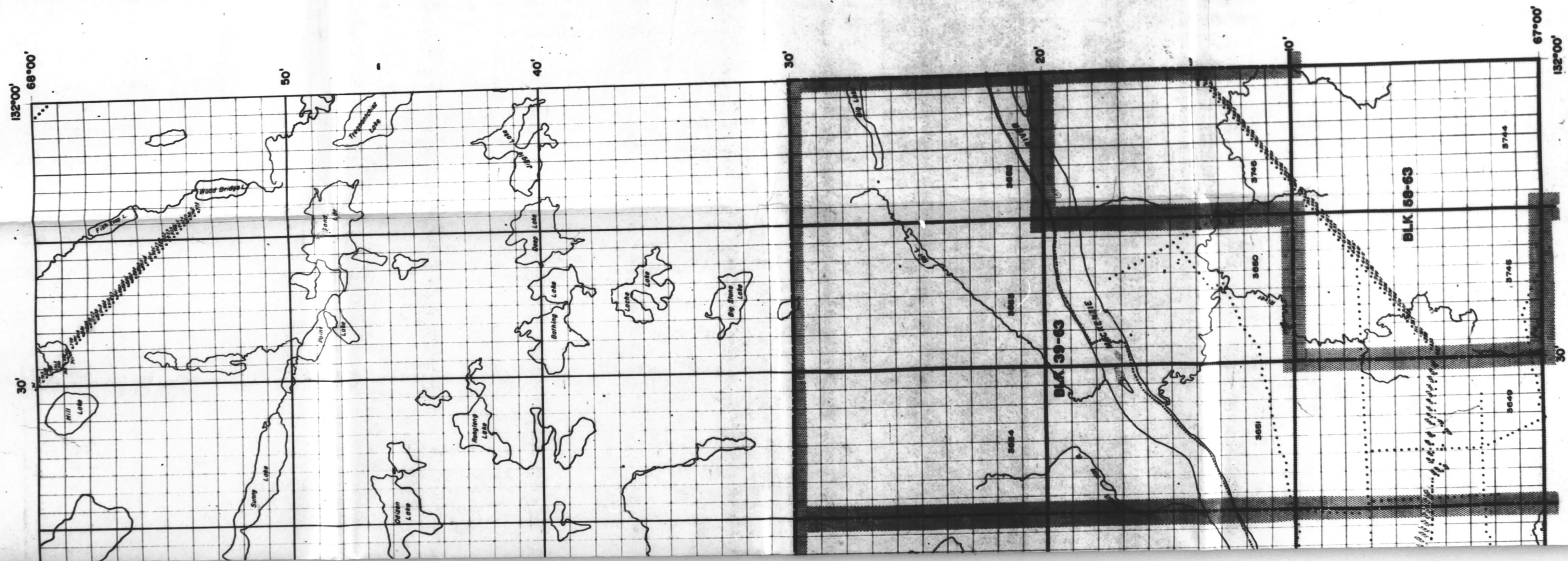
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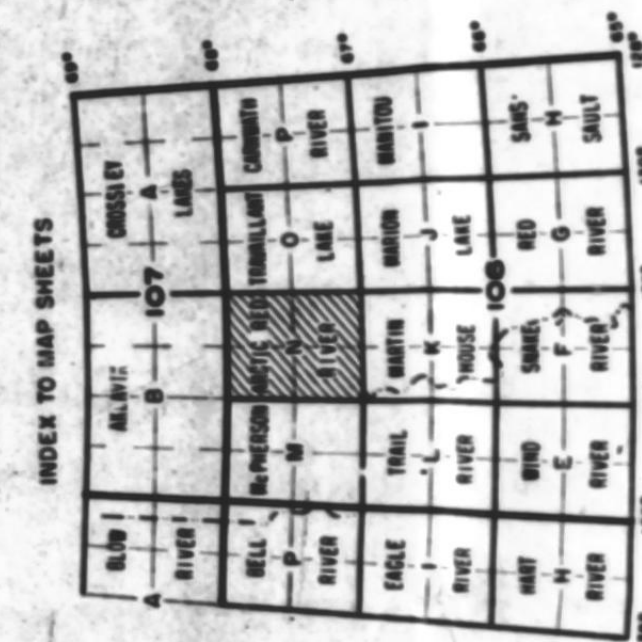
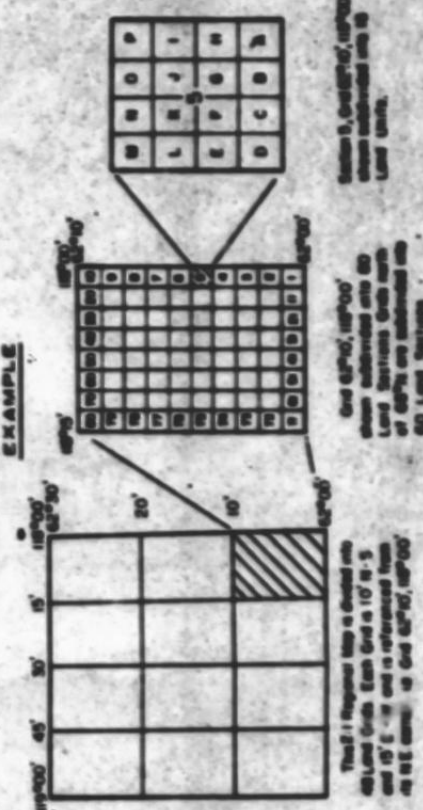
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EXPLORATION DEPARTMENT PEACE RIVER DISTRICT

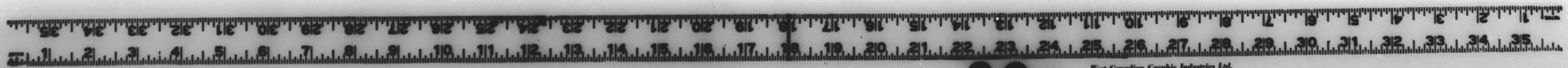


N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS



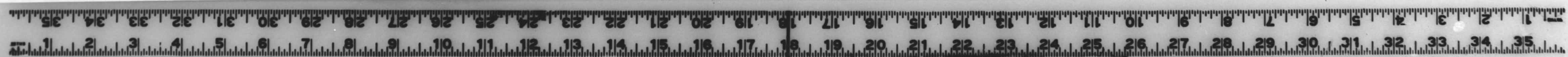
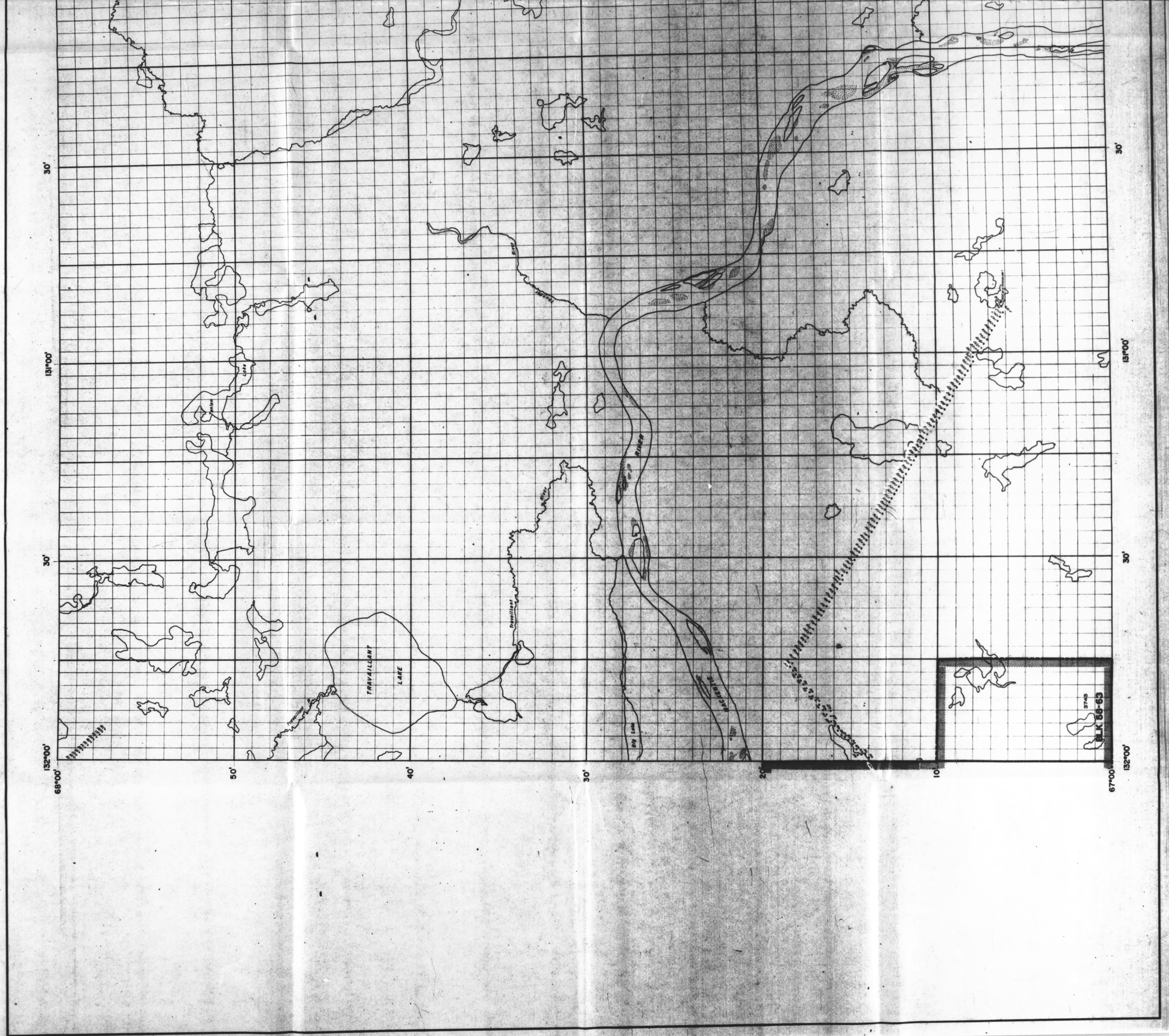
SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS
Compiled by: Imperial Oil Enterprises Ltd.
Revised: 1975, 1976

106 N ARCTIC RED RIVER
2 MILES TO 1 INCH



30x

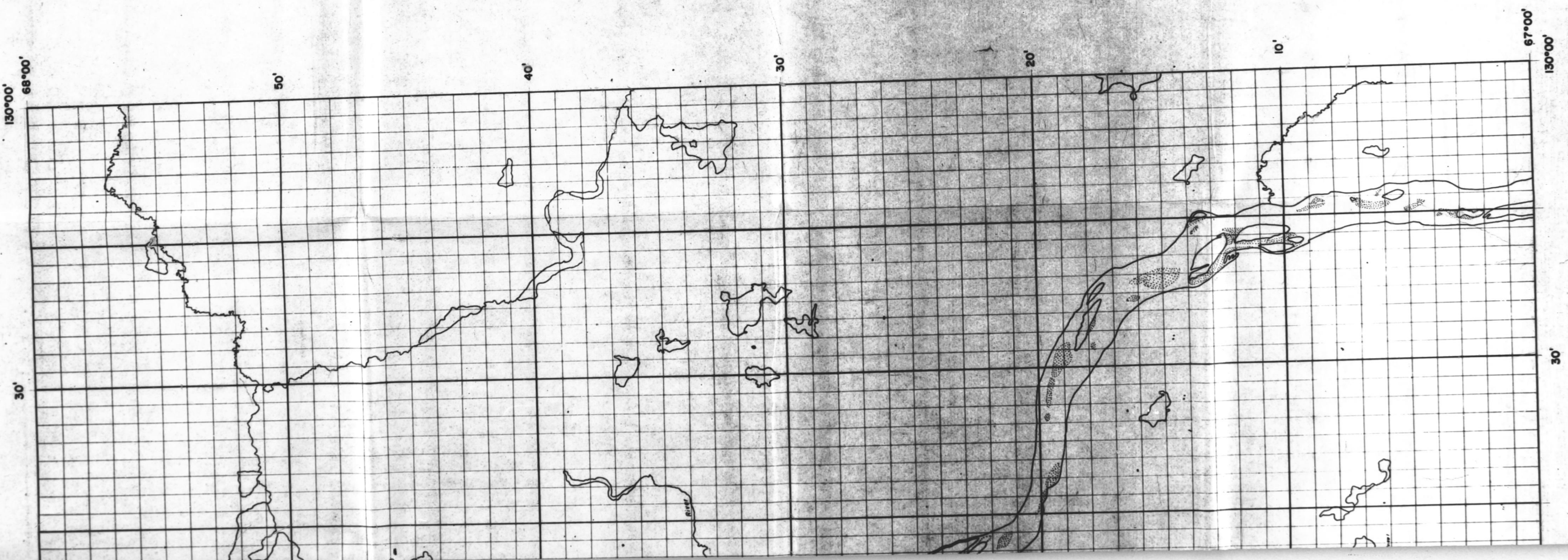
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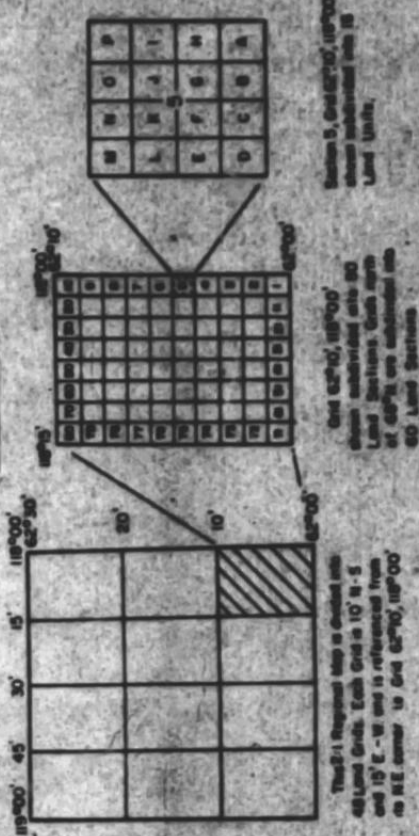
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EXPLORATION DEPARTMENT PEACE RIVER DISTRICT



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EXAMPLE



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20	ALBERTA	126
21	ALBERTA	127
22	ALBERTA	128
23	ALBERTA	129
24	ALBERTA	130
25	ALBERTA	131
26	ALBERTA	132

SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval: 100 feet
Datum: Mean Sea Level
Revised: July 5, 1965

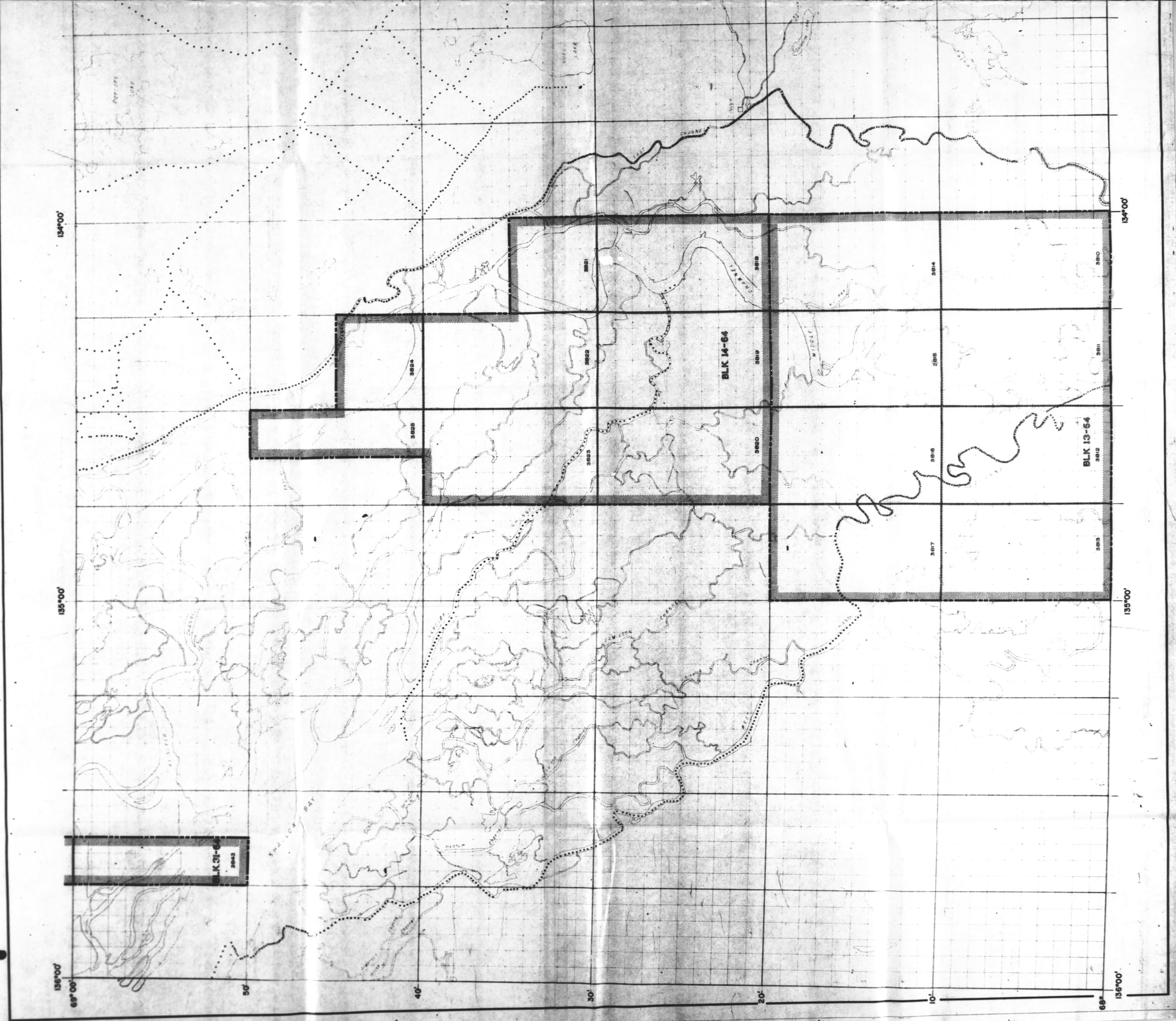


1060 TRAVAILLANT LAKE
2 MILES TO 1 INCH



30x

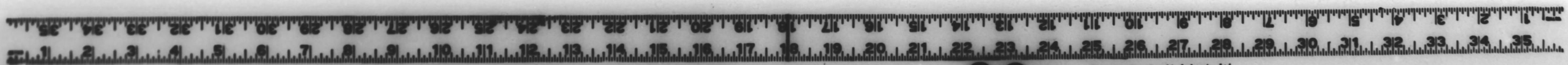
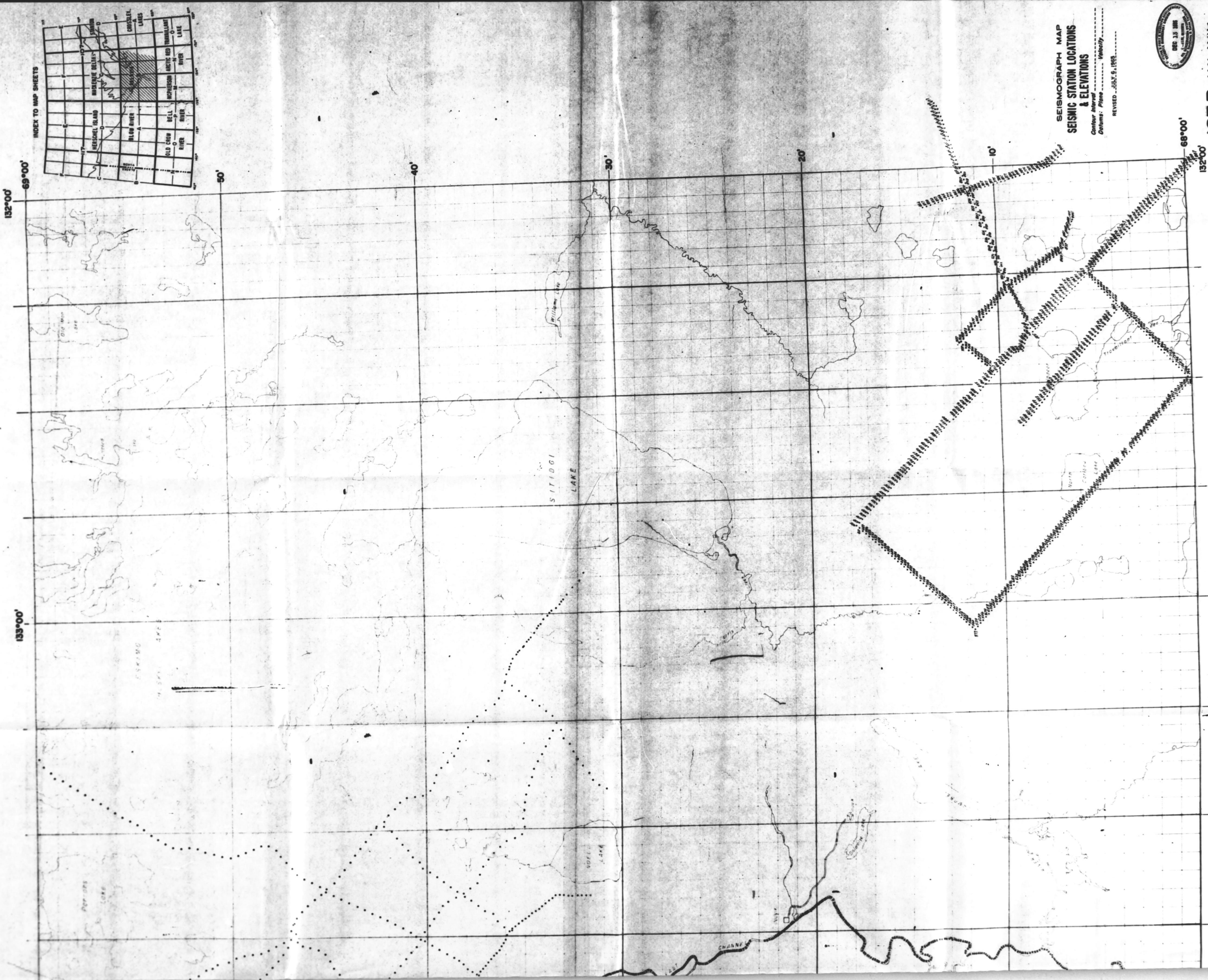
West Canadian Graphic Industries Ltd.



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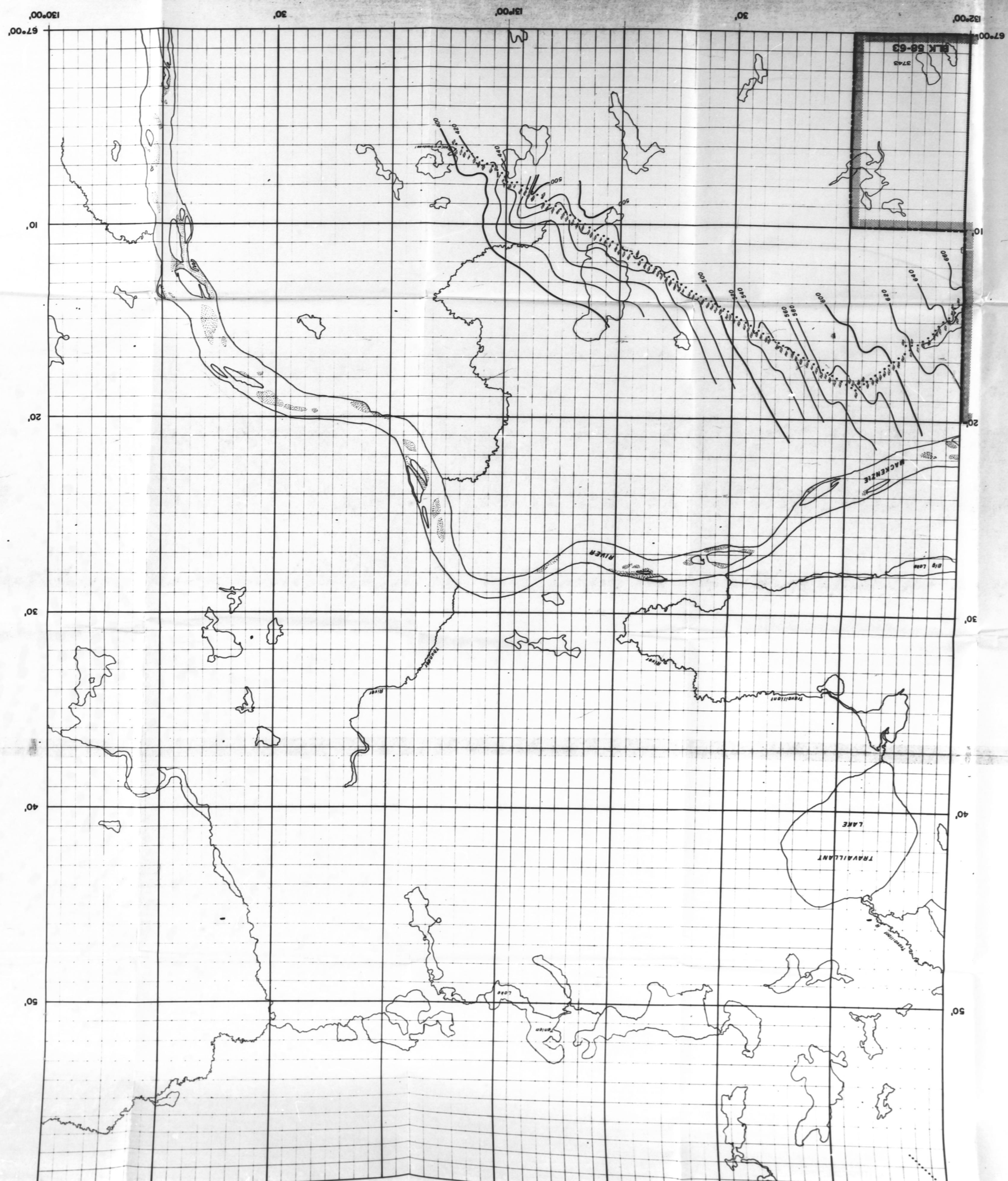
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EXPLORATION DEPARTMENT PEACE RIVER DIVISION



30x

West Canadian Graphic Industries Ltd.



1060 TRAVAILLANT LAKE

2 MILES TO 1 INCH

CONFIDENTIAL

SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK
Contours Interval 1000 Feet
Contours: Plane 1000
Velocity 1000
REVISED JULY 5, 1965

1060	1061	1062	1063	1064	1065
1066	1067	1068	1069	1070	1071
1072	1073	1074	1075	1076	1077
1078	1079	1080	1081	1082	1083
1084	1085	1086	1087	1088	1089
1090	1091	1092	1093	1094	1095
1096	1097	1098	1099	1100	1101
1102	1103	1104	1105	1106	1107
1108	1109	1110	1111	1112	1113
1114	1115	1116	1117	1118	1119
1120	1121	1122	1123	1124	1125
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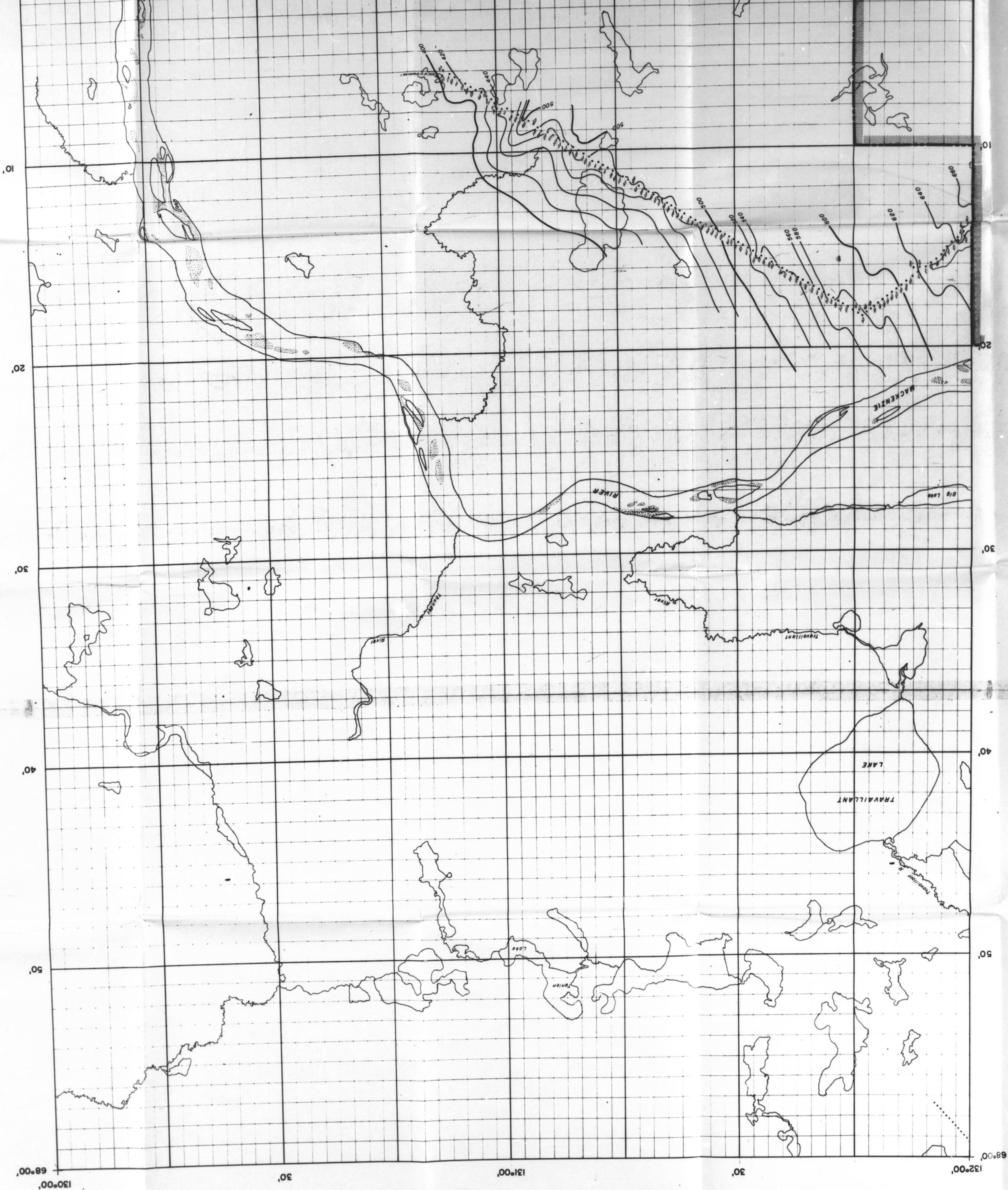
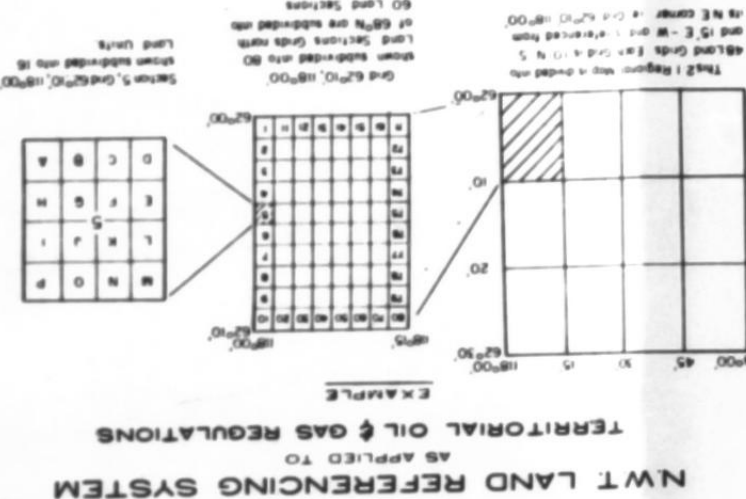
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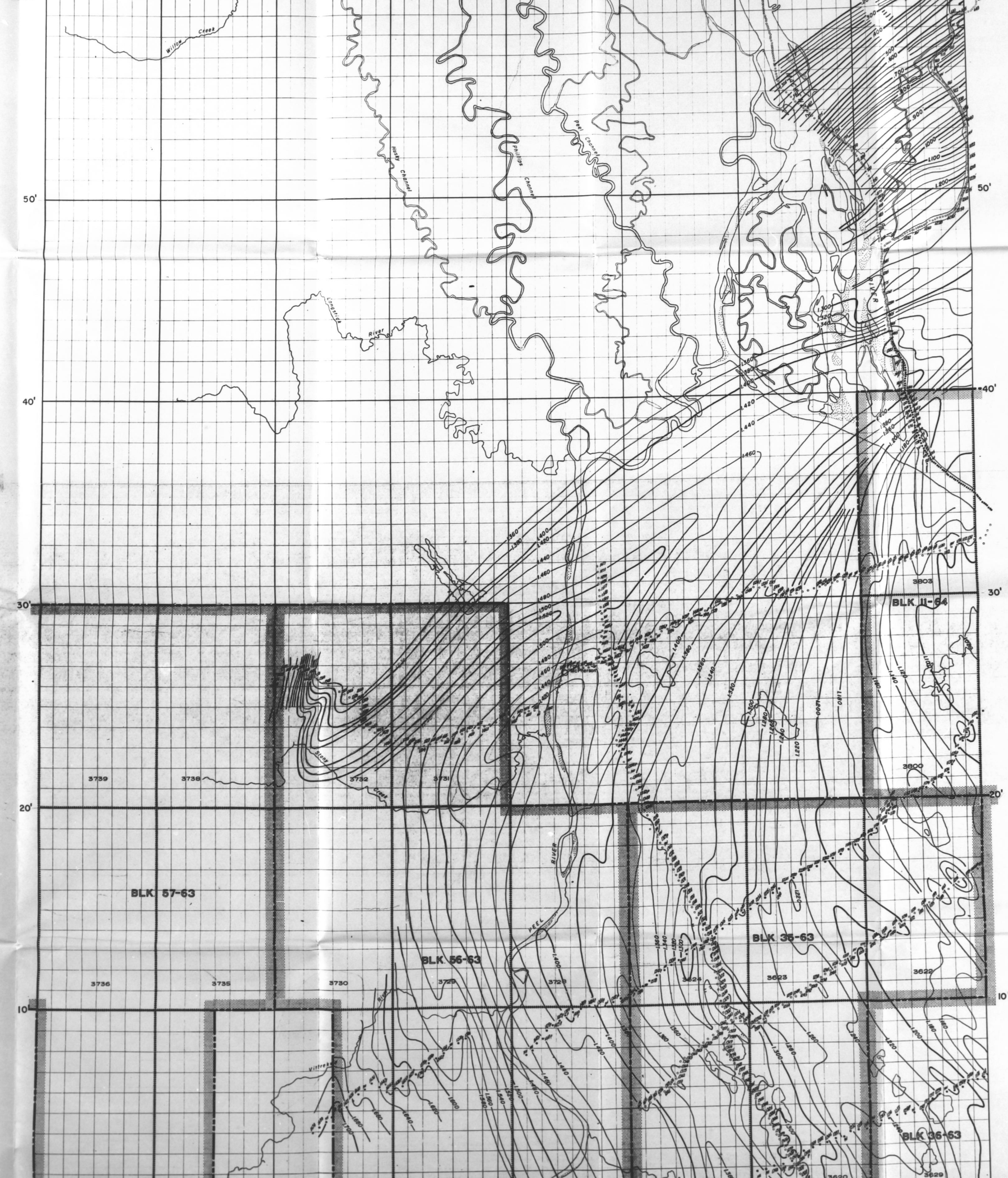
SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK

INDEX TO MAP SHEETS

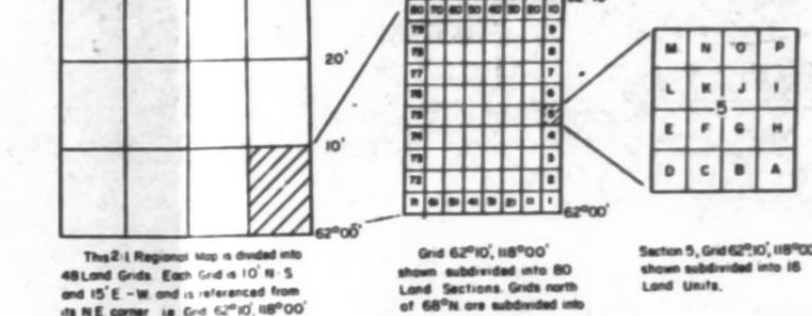
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EXAMPLE

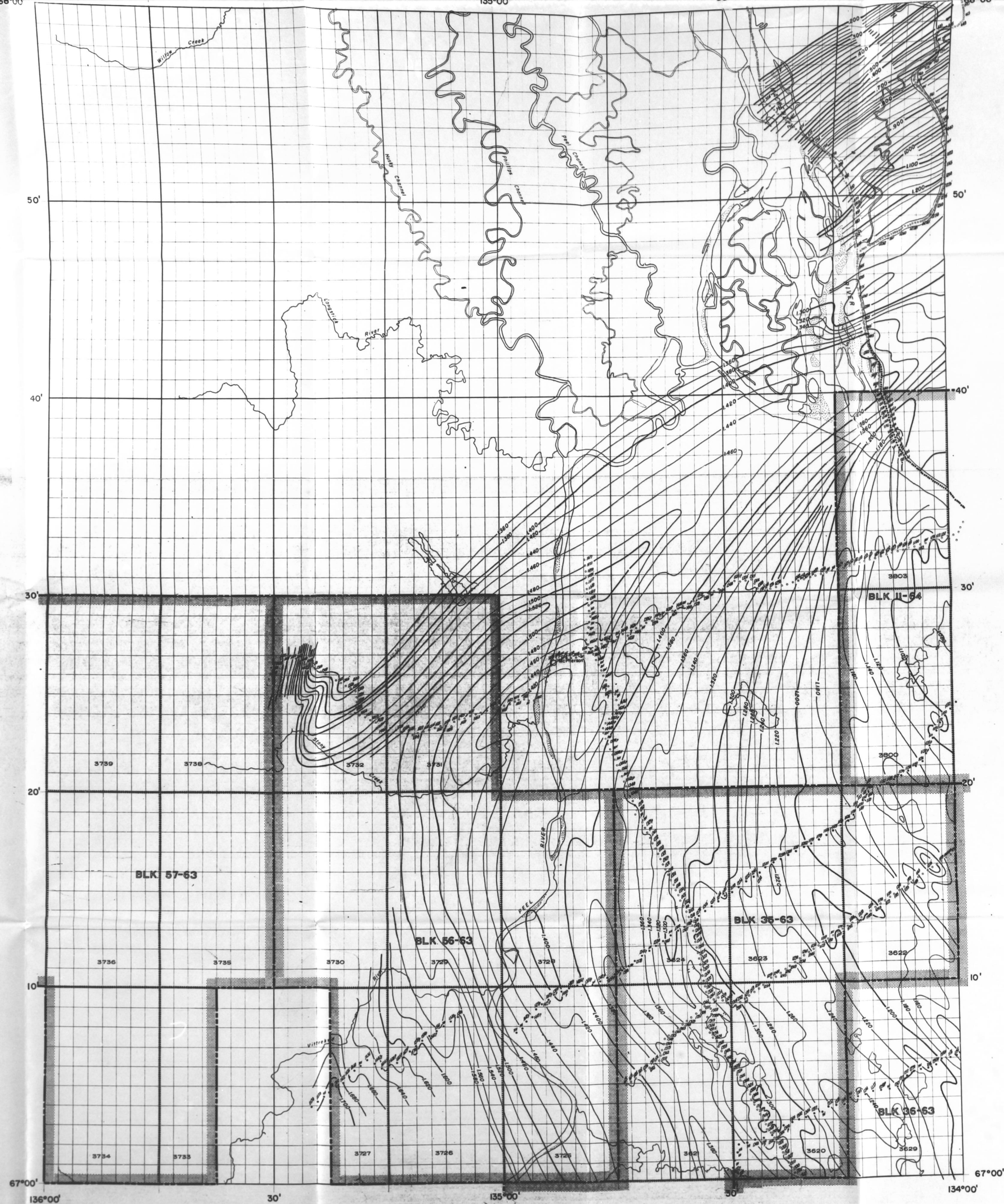
[illegible]

BLIND	REINDEER	SITOU	KADALUK	CROSSLEY
A	B	C	D	E
RIVER	DEPOT	LAKE	RIVER	LAKES
HILL	WATKINS	ARCTIC	TRAILBLAZER	CARDINAL
F	G	H	I	J
RIVER	N	RIVER	LAKE	RIVER
TRAIL	TRAIL	MARTIN	MARION	MARITOU
L	M	N	O	P
RIVER	RIVER	WOOSE	J	I
HART	WIND	SNAKE	RED	SANDS
B	C	D	E	F
RIVER	RIVER	RIVER	RIVER	SAULT

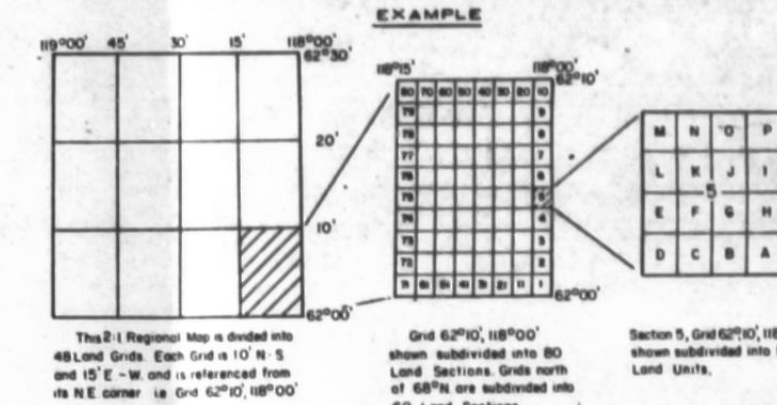
REVISOR JULY 6, 1965-----

24-7763

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N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS



INDEX TO MAP SHEETS

REINDEER	SITOGI	KUGALUK	CROSSLEY
DEPOT	LAKE	RIVER	LAKES
HELL	ARCTIC RED	FRANKLAND	CANADIAN
TRAIL	MARTIN	MARTIN	MARTIN
WIND	SMALL	RED	SARS
RIVER	RIVER	RIVER	SAULT

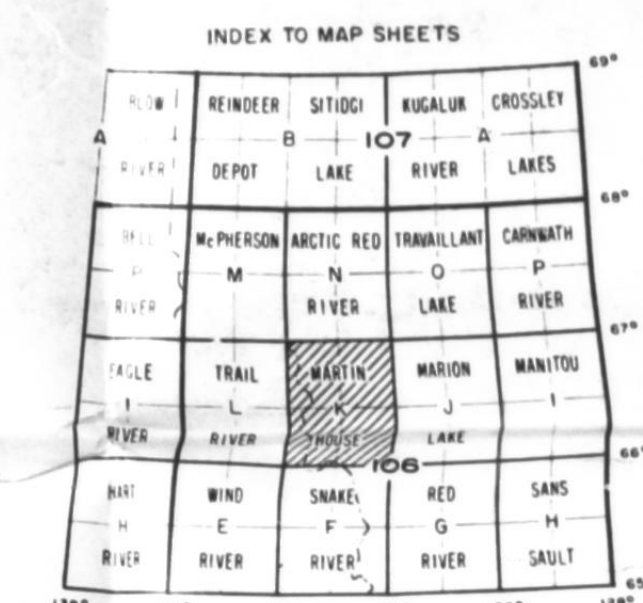
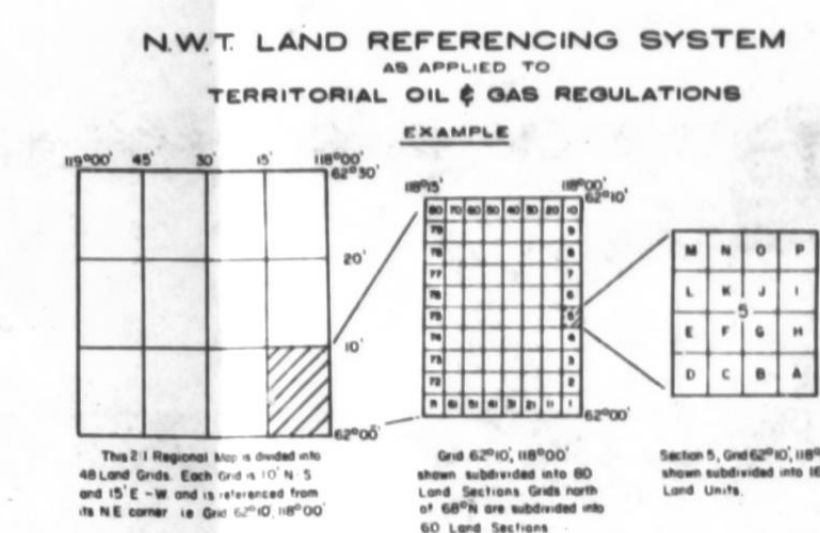
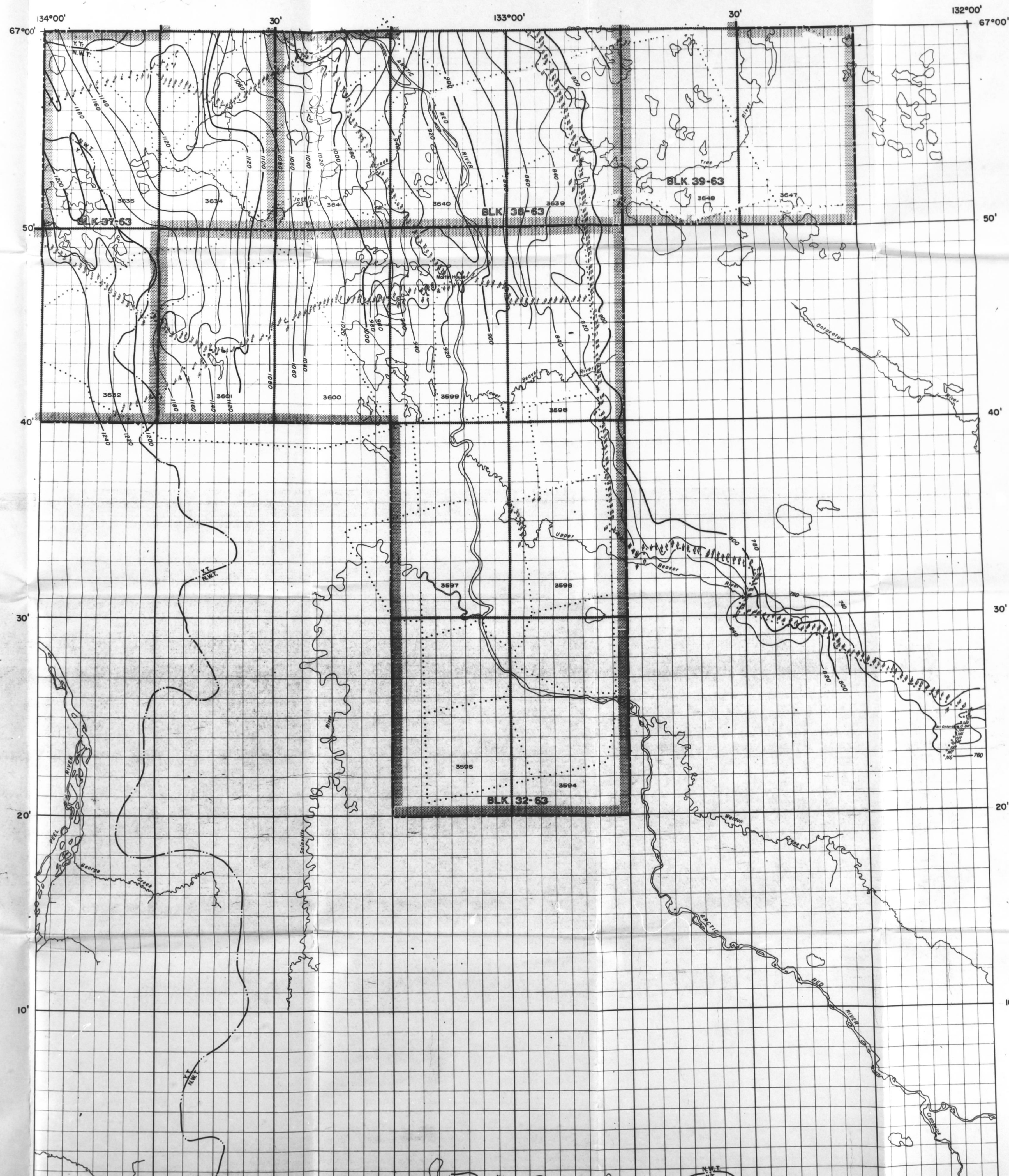
SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK

Contour Interval . . . 200 . . . Feet
Datum: Plane . . . 1950 . . . Velocity . . . 10,000 . . .
REVISED . . . JULY 6, 1965 . . .

20 of 2

CONFIDENTIAL

106 M FORT McPHERSON
2 MILES TO 1 INCH

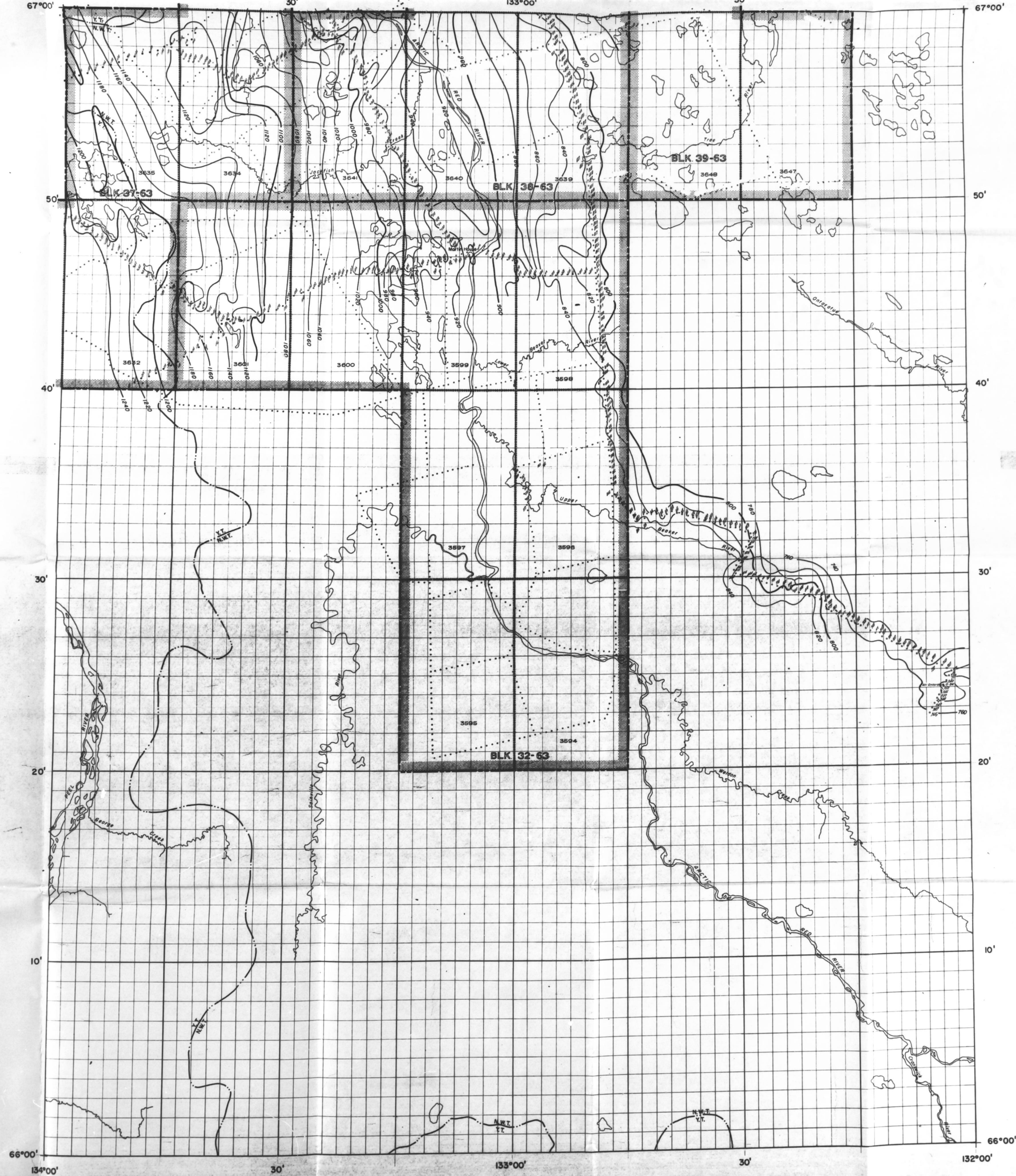


SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK

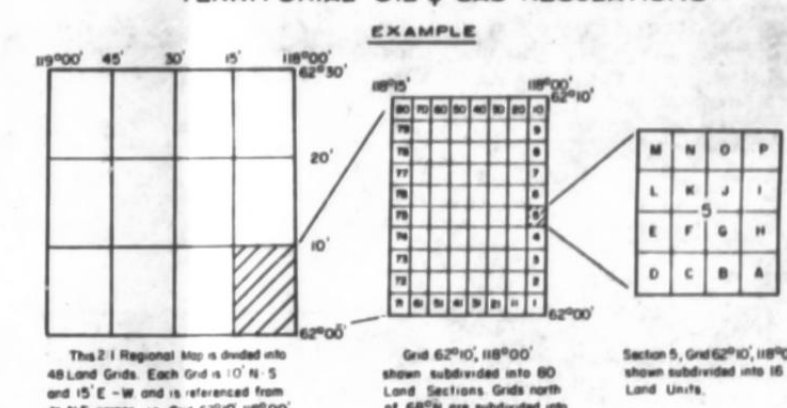
Contour Interval .020 SEC
Datum: Plane .0002 Velocity .0002

REVISED JULY 6, 1965

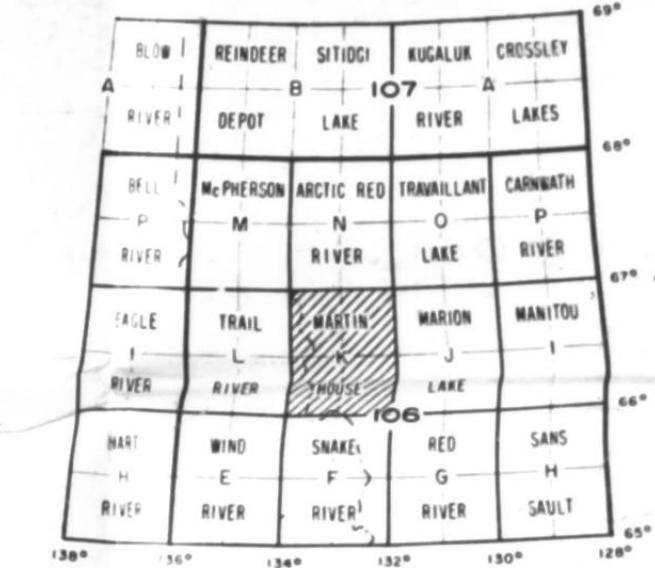
104



N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS



INDEX TO MAP SHEETS



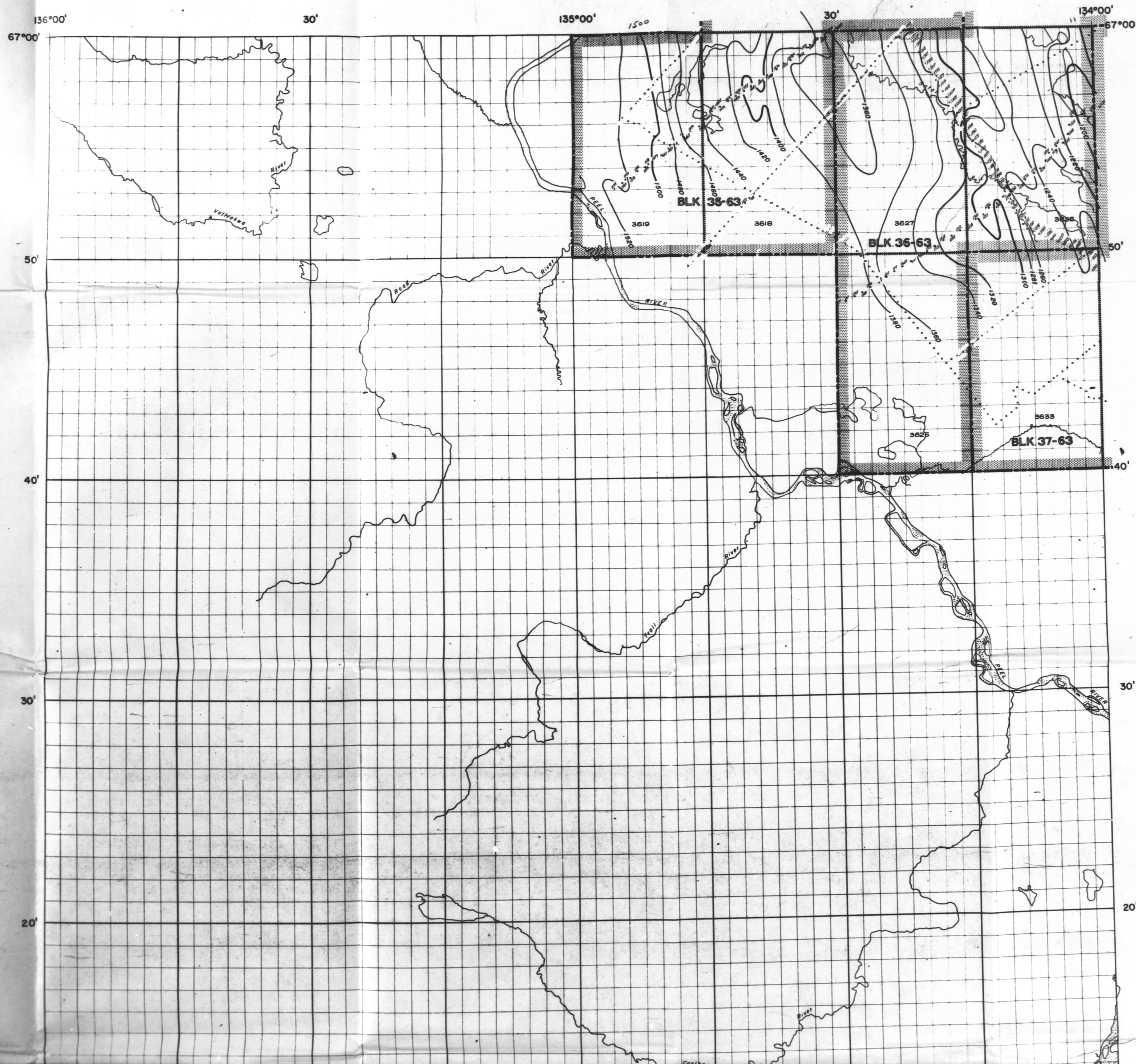
SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK

Contour Interval .020 SEC
Datum: Plane .000" Velocity .0000
REVISED JULY 6, 1965

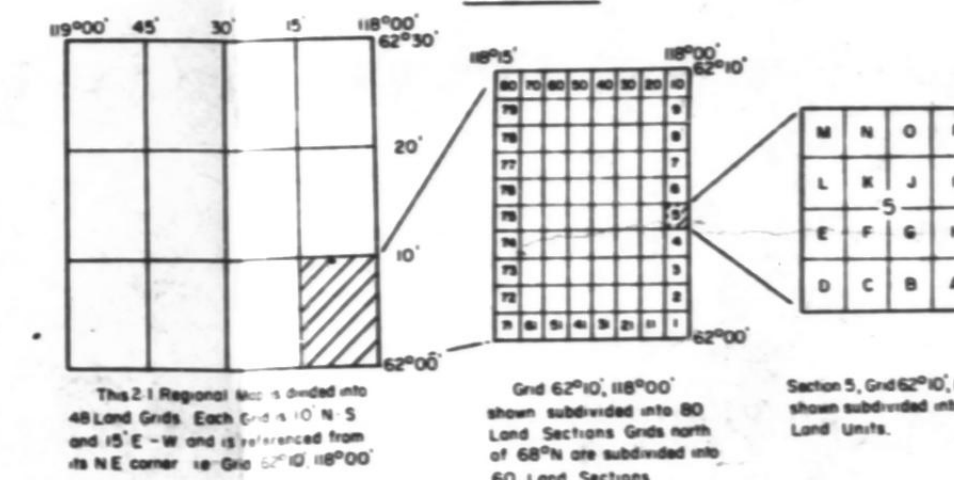
2042

106K MARTIN HOUSE
2 MILES TO 1 INCH

CONFIDENTIAL

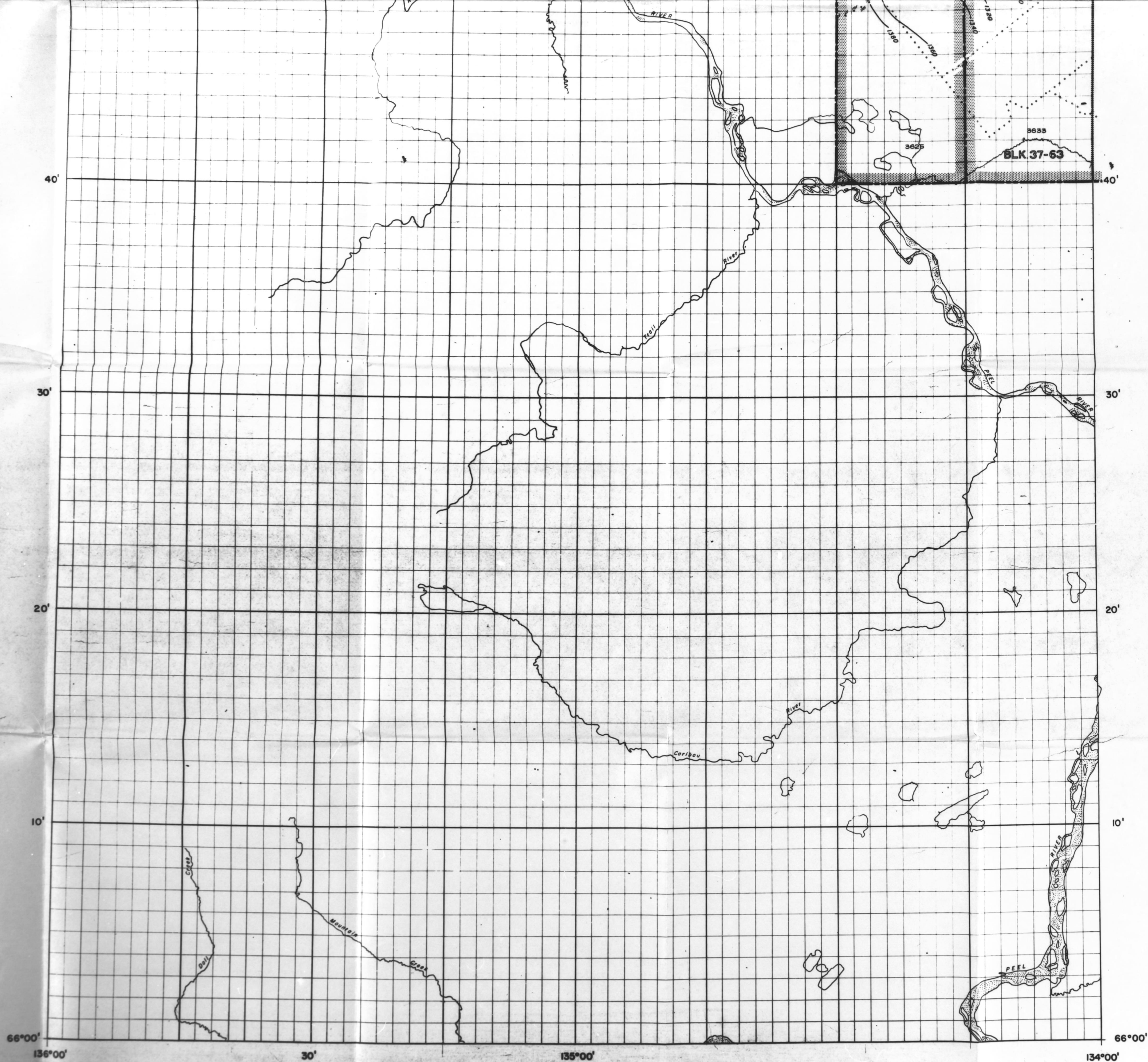


N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS
EXAMPLE

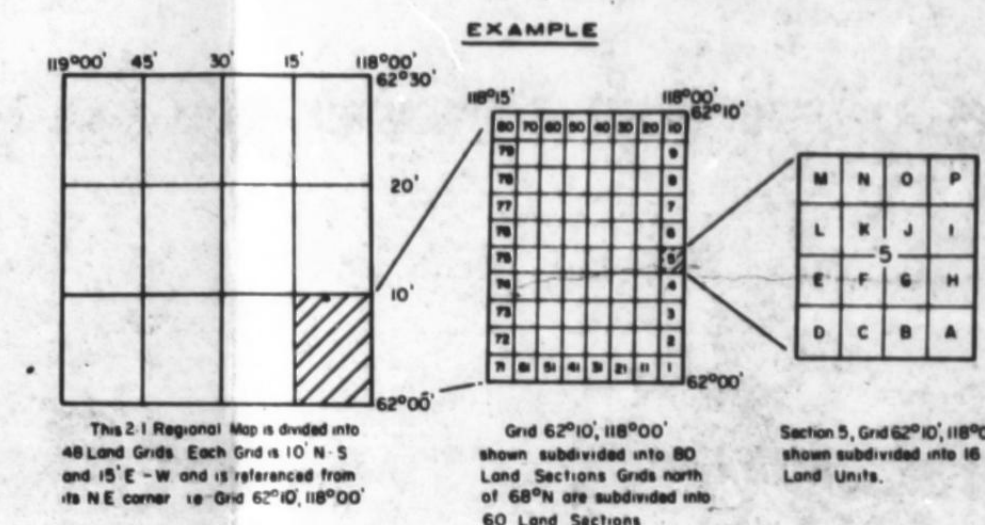


INDEX TO MAP SHEETS

REINDEER	SITIDJI	NUGALUK	CROSSLEY
DEPOT	LAKE	RIVER	LAKES
McPHERSON	ARCTIC RED	TRAVELLANT	CARNATH
RIVER	N	O	P
TRAIL	MARTIN	MARION	MANITOU
RIVER	LAKE	J	I
	HOUSE	LAKE	
		106	



N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS



INDEX TO MAP SHEETS

BLOW I RIVER	REINDEER DEPOT	SITIGI LAKE	RUGALUK RIVER	CROSSLEY LAKES
BELL P RIVER	M RIVER	ARCTIC RED RIVER	TRAVAILANT LAKE	CARNWATH P RIVER
EAGLE RIVER	TRAIL RIVER	MARTIN HOUSE	MARION LAKE	MANITOU I
HART H RIVER	WIND RIVER	SMOKE RIVER	RED RIVER	SANS SAULT

SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK

Contour Interval --- 0.20 SEC.

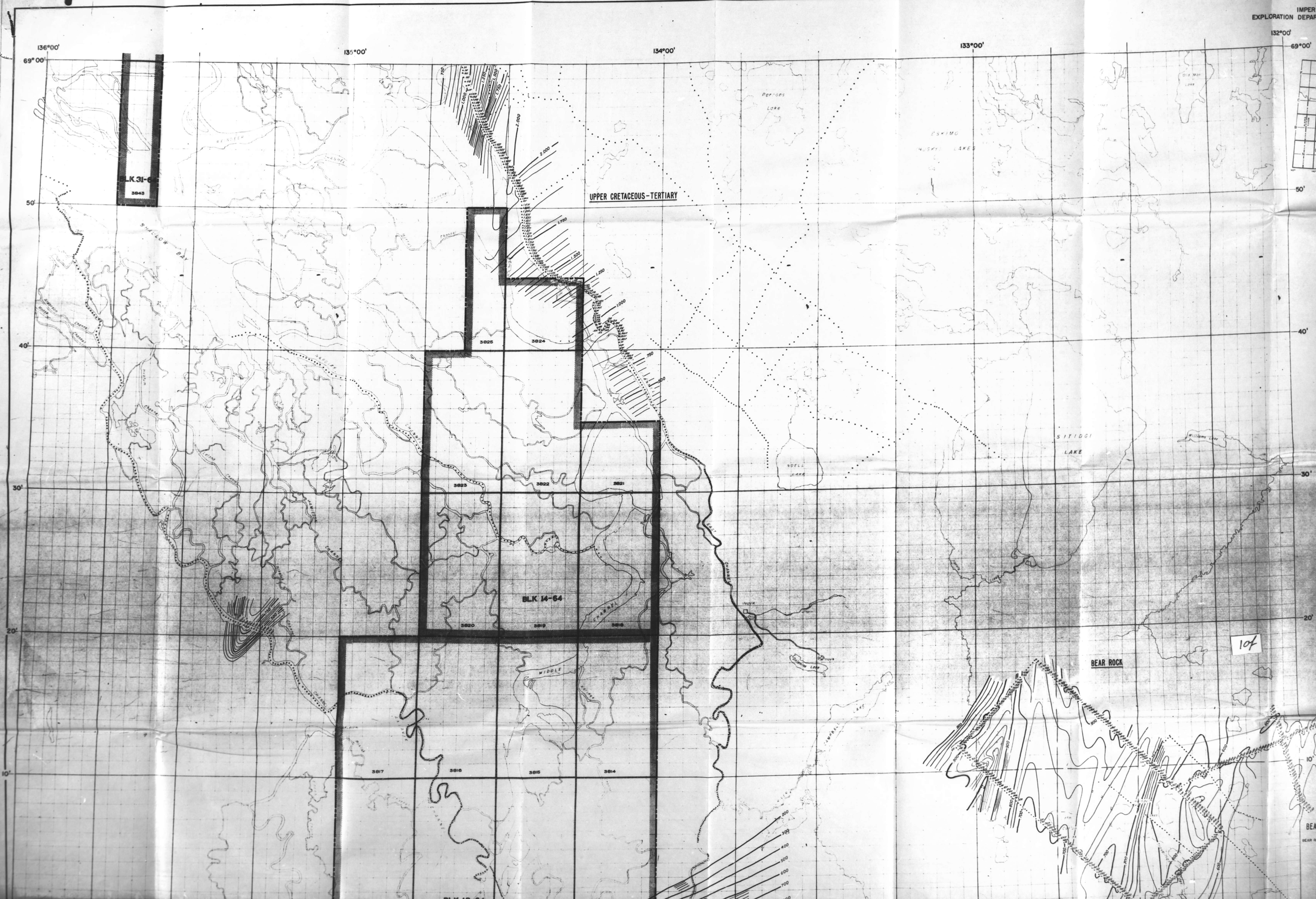
Datums: Plane 1000 --- Velocity 10000 ft/sec

REVISED - JULY 8, 1955

CONFIDENTIAL

2042

106L TRAIL RIVER
2 MILES TO 1 INCH



135°00' 134°00' 133°00' 132°00' 69°00'

INDEX TO MAP SHEETS



UPPER CRETACEOUS-TERTIARY

BLK 14-64

BEAR ROCK

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CONFIDENTIAL

SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK/UPPER CRETACEOUS-TERTIARY
Contour Interval - 500 FEET / 150 M
BEAR R. Datum: Plane - 2000 Velocity - 0.9992
REVISED - JULY 6, 1964

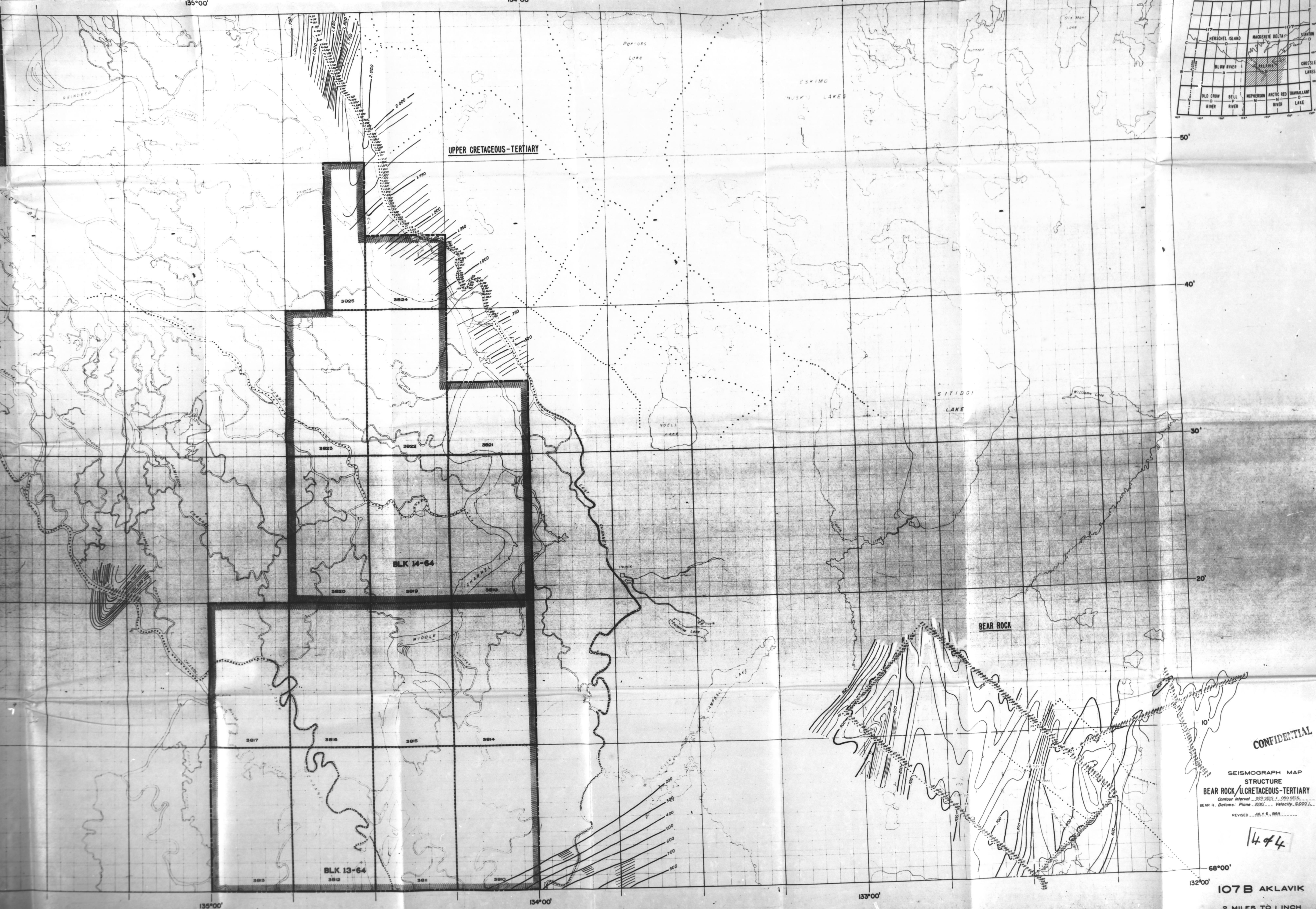
BLK 31-64
3843

UPPER CRETACEOUS-TERTIARY

BLK 14-64

BLK 13-64

BEAR ROCK

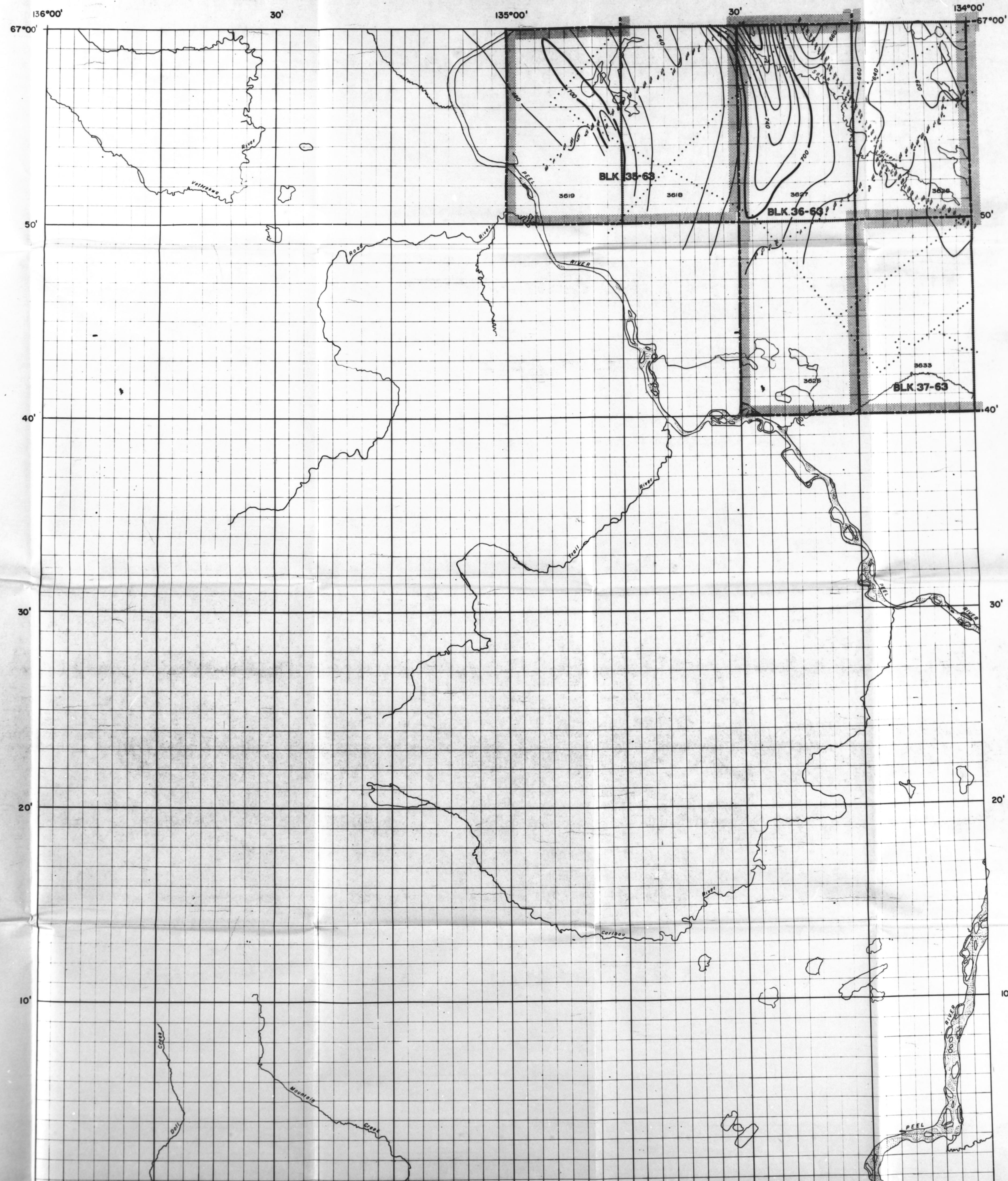


CONFIDENTIAL

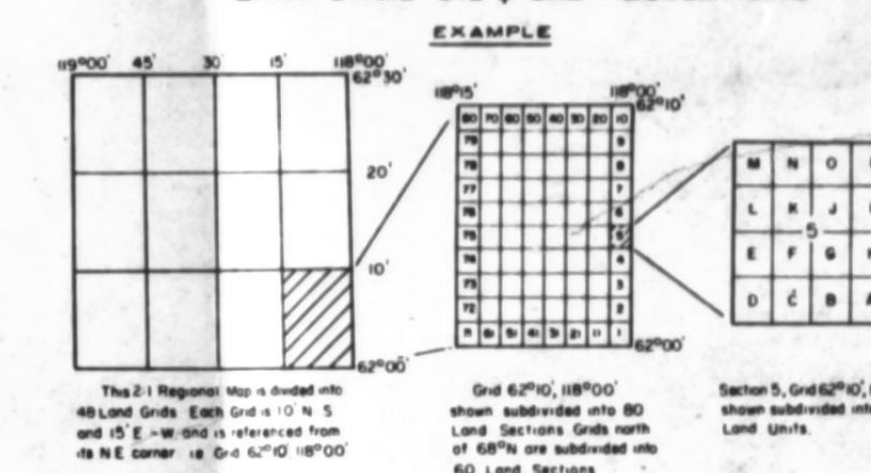
SEISMOGRAPH MAP
STRUCTURE
BEAR ROCK/UPPER CRETACEOUS-TERTIARY
Contour Interval - 990 SECS. / 990 SECS.
BEAR R. Datum: Plane 1000. Velocity 15000 ft/sec.
REVISED JULY 6, 1964

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68°00'
132°00'
107B AKLAVIK
2 MILES TO 1 INCH



N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS



INDEX TO MAP SHEETS

BLK	REINDEER	SITOU	KUSALUK	CROSSLEY
A	DEPOT	LAKE	RIVER	LAKES
B	M. PIERSON	ARCTIC	RED	THANILLANT
C	RIVER	LAKE	O	P
D	LAKE	MARTIN	MARION	MANITOU
E	RIVER	HOUSE	LAKE	
F	WIND	SNARE	RED	SARS
G	RIVER	RIVER	RIVER	SALT

SEISMOGRAPH MAP
ISOCHRON

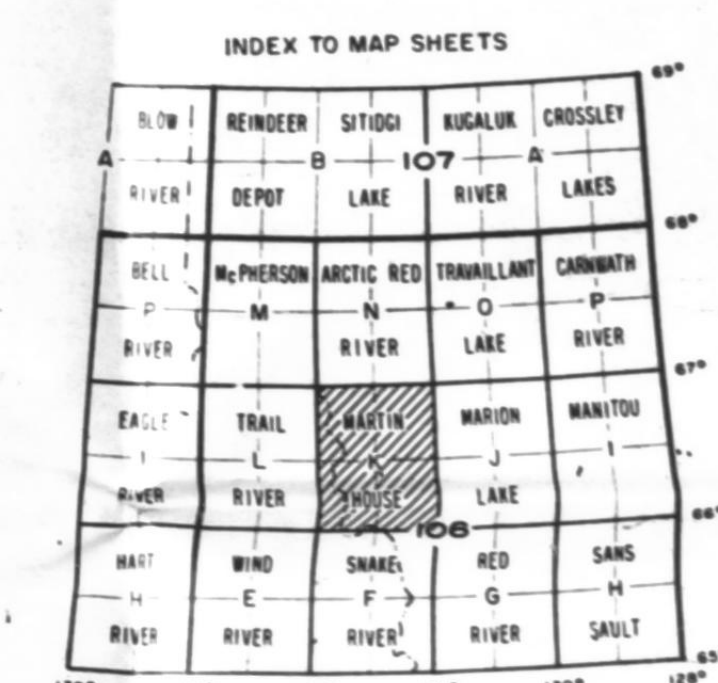
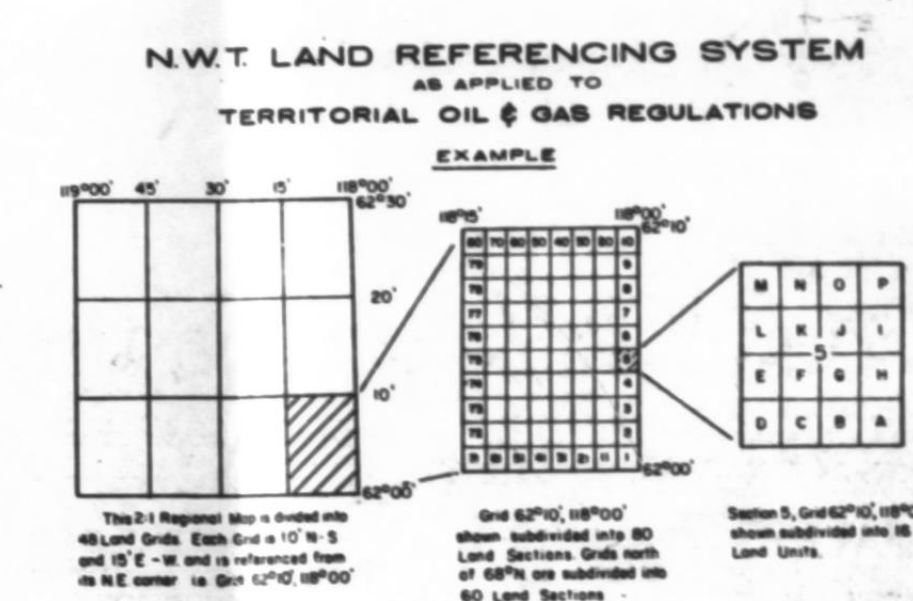
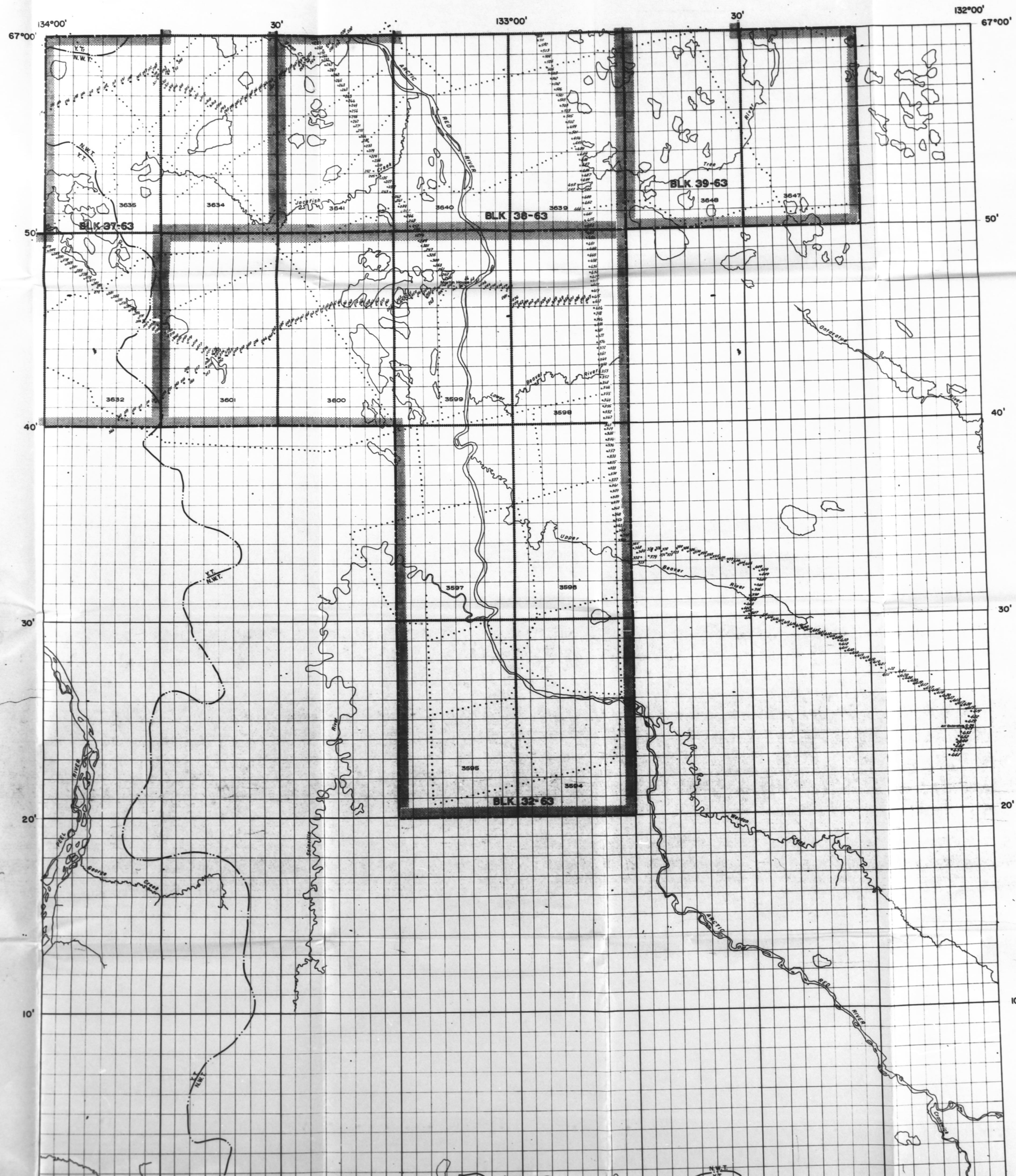
BEAR ROCK TO CAMBRIAN SHALE

Contour Interval 0.20 SEC
Datum: Plane Velocity

REVISED JULY 8, 1968

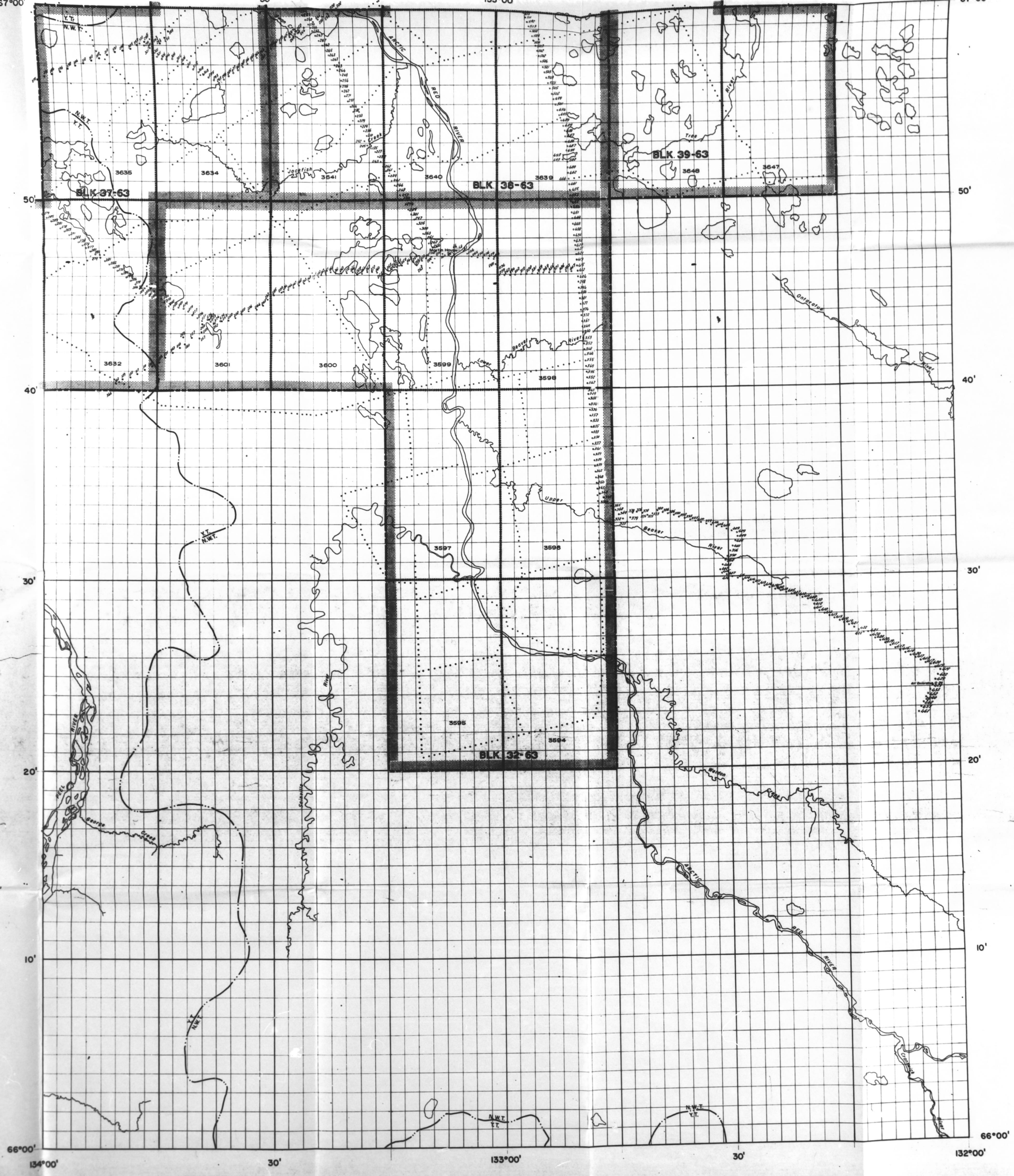
CONFIDENTIAL

107

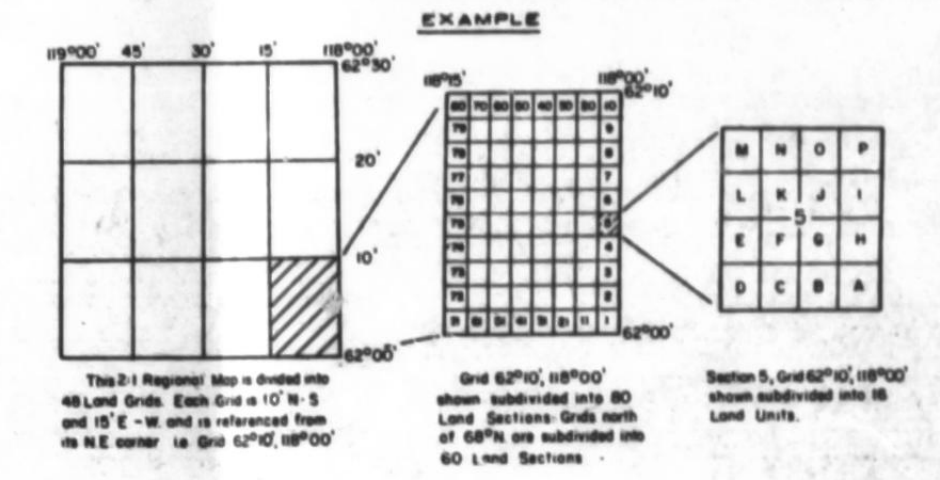
SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval -----
Datums: Plane ----- Velocity -----
REVISED JULY 6, 1965 -----

G.S.I.
P-7674 20



N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS



INDEX TO MAP SHEETS

BLW 1	REINDEER	SITIDGI	RUGALUK	CROSSLEY
RIVER	DEPOT	LAKE	RIVER	LAKE
BELL	McPHERSON	ARCTIC RED	TRINAMANT	CANADIAN
RIVER	RIVER	LAKE	RIVER	RIVER
EAGLE	TRAIL	LAKE	MARTIN	MANTOU
RIVER	RIVER	LAKE	RIVER	RIVER
HART	WIND	SHANE	RED	SANS
RIVER	RIVER	RIVER	RIVER	SAULT

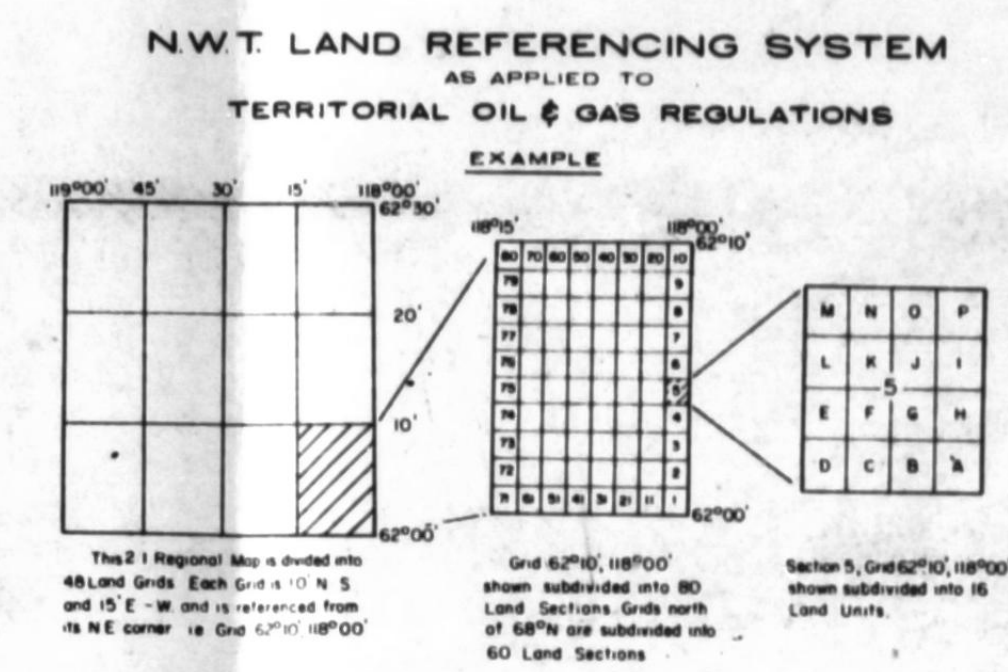
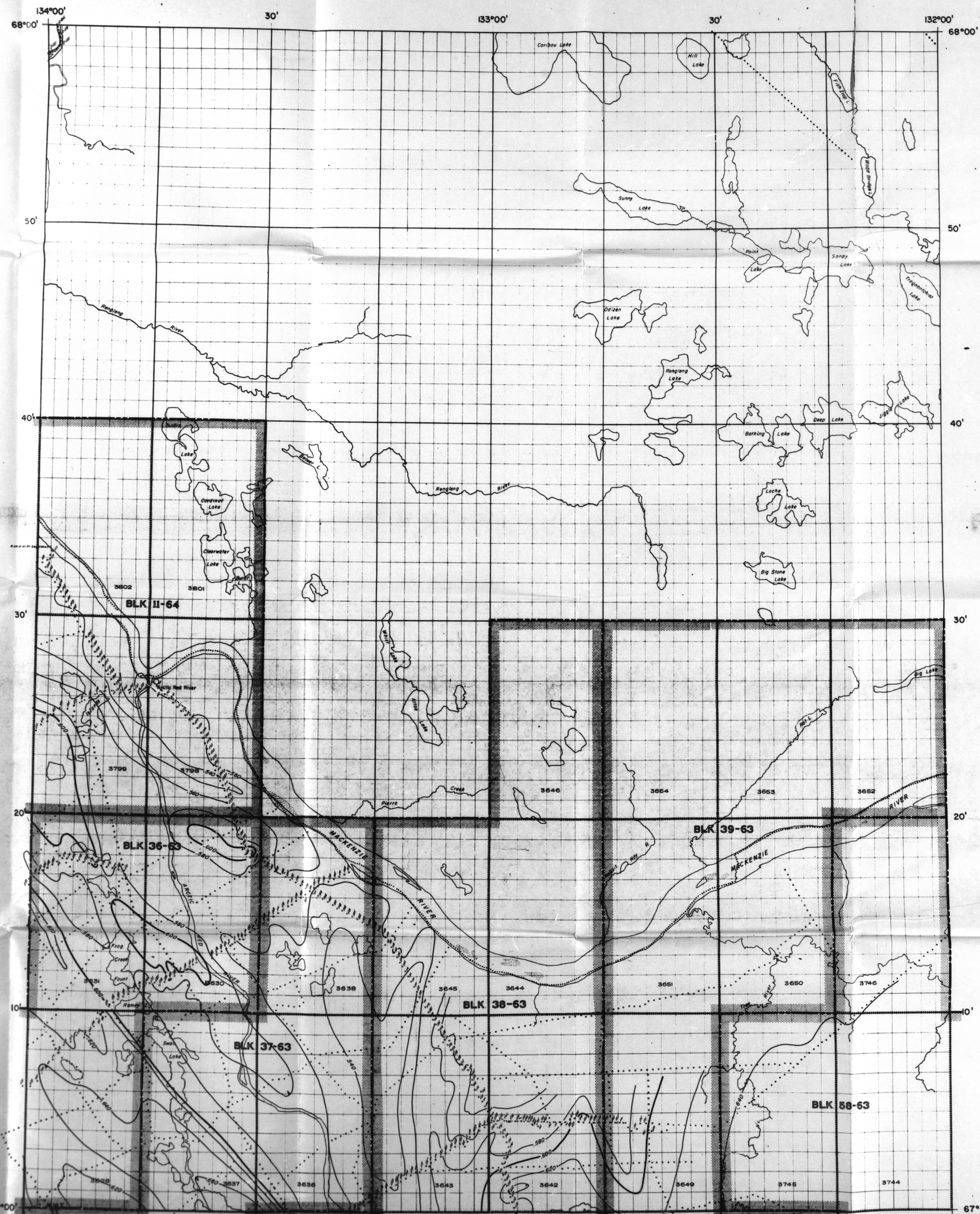
SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval: _____
Datum: Plane _____
Velocity: _____
REVISED: JULY 6, 1965

106 K MARTIN HOUSE
2 MILES TO 1 INCH

CSI
Party 26
29/2

IMPERIAL OIL ENTERPRISES LTD.
EXPLORATION DEPARTMENT PEACE RIVER DISTRICT

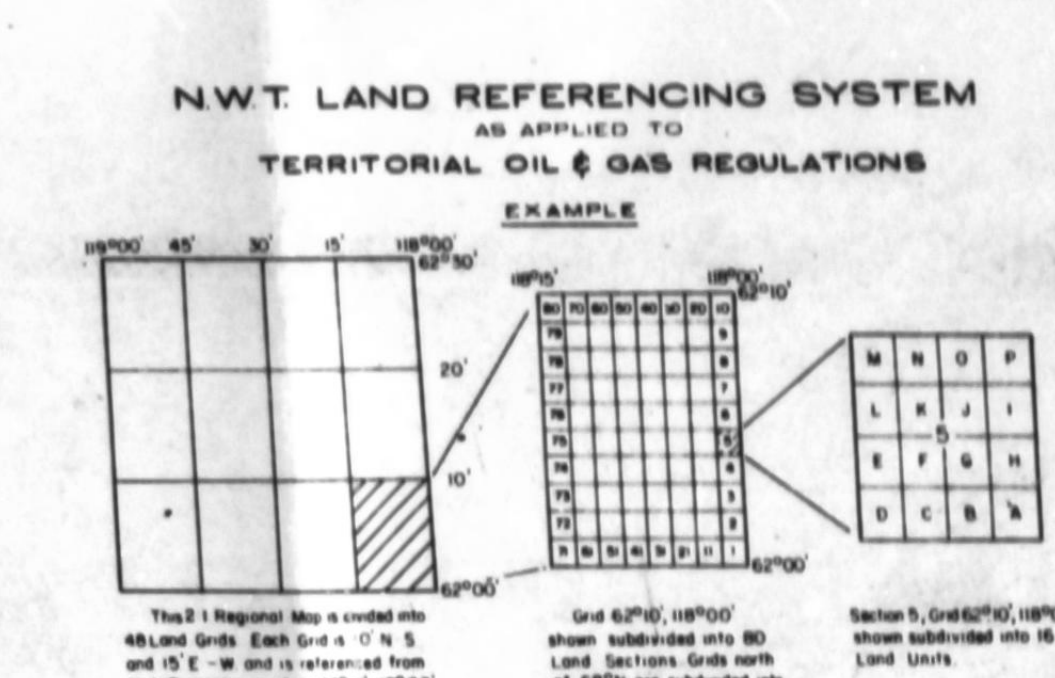
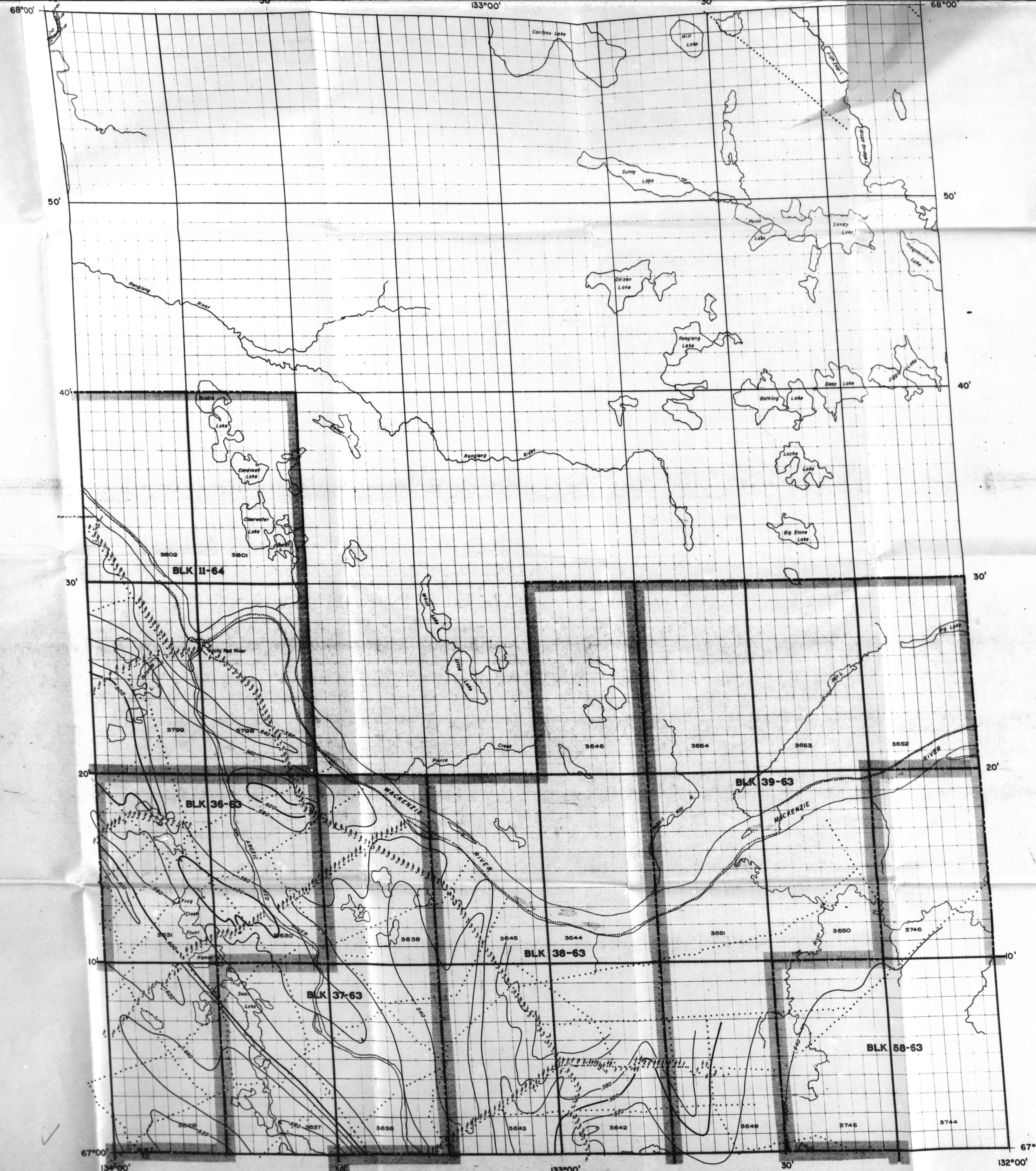


INDEX TO MAP SHEETS

BLK	ARCTIC	CROSS	ET
11	107	A	A
36	107	B	B
37	107	C	C
39	107	D	D
58	107	E	E

SEISMOGRAPH MAP
ISOCHRON
BEAR ROCK - CAMBRIAN SHALE
Contour Interval - 500
Datum - Plane
REVISED - JULY 9, 1968

CONFIDENTIAL



INDEX TO MAP SHEETS

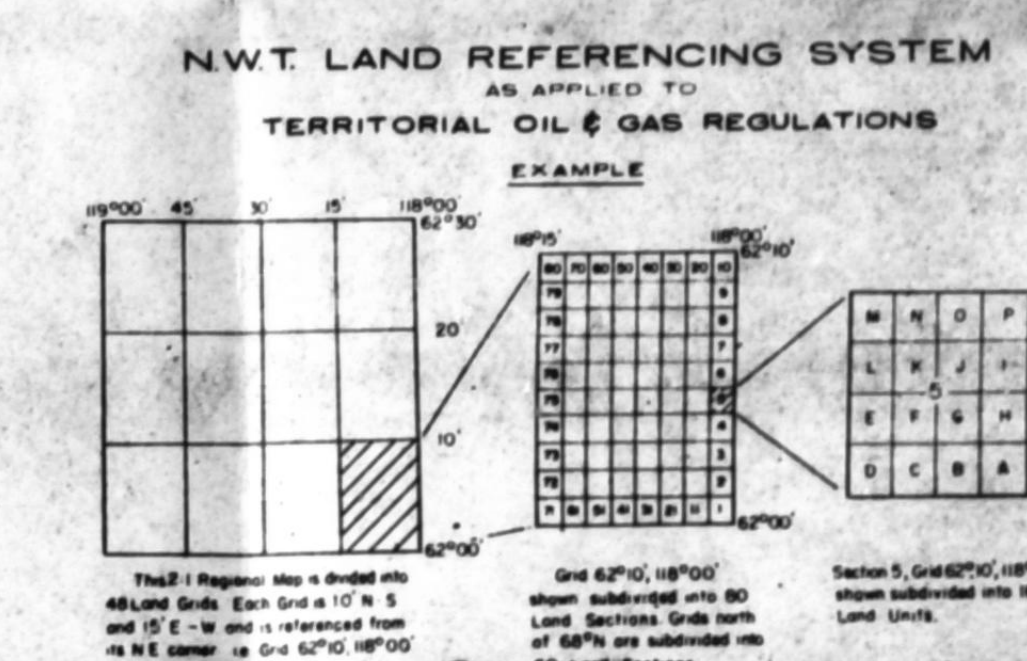
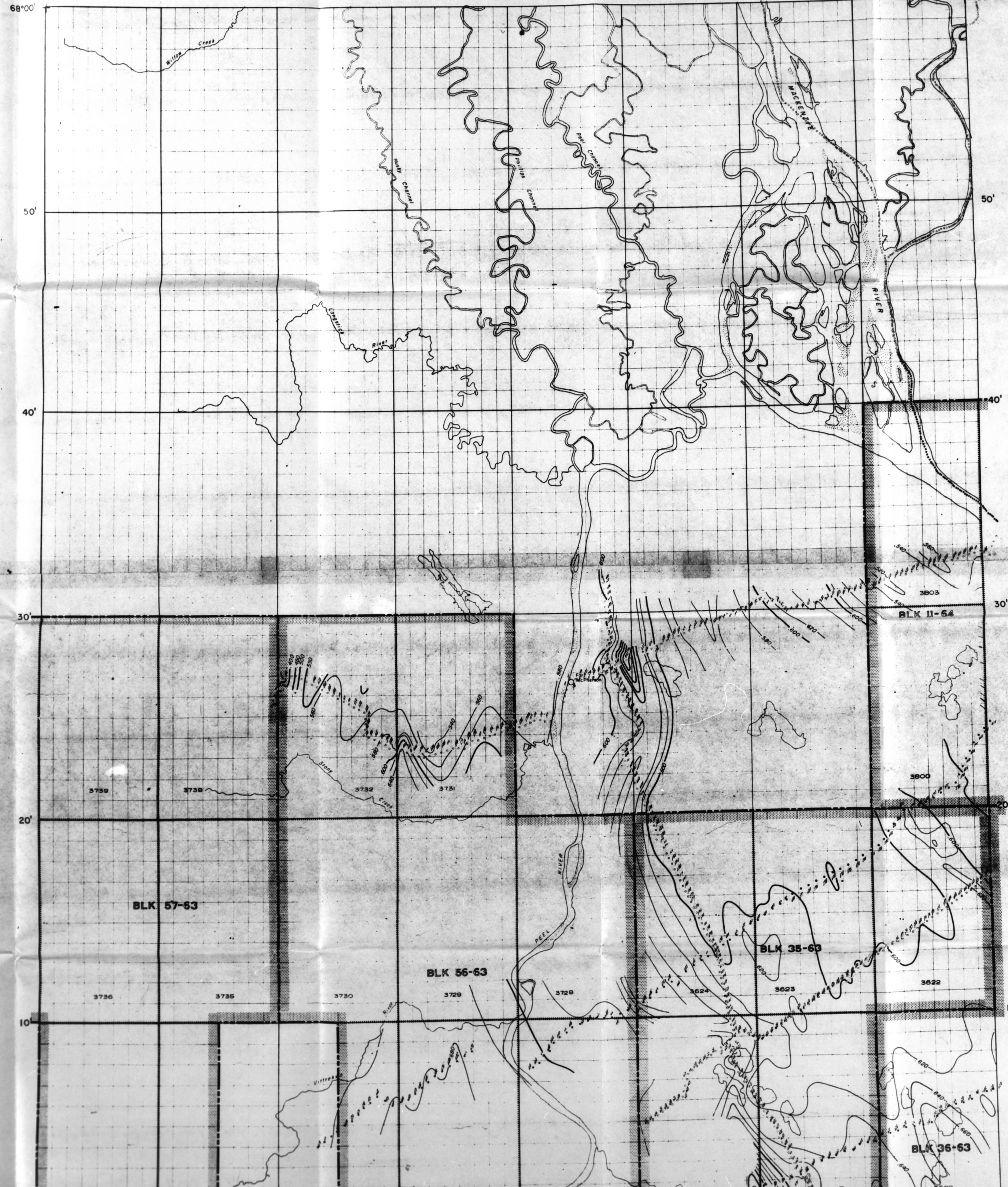
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1	107	107
2	108	108
3	109	109
4	110	110
5	111	111
6	112	112
7	113	113
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SEISMOGRAPH MAP
ISOCHRON
BEAR ROCK-CAMBRIAN SHALE
Contour Interval - 500 SECS
Datum: Plane Velocity
REVISED - July 9, 1968

106N ARCTIC RED RIVER
2 MILES TO 1 INCH

202
CONFIDENTIAL

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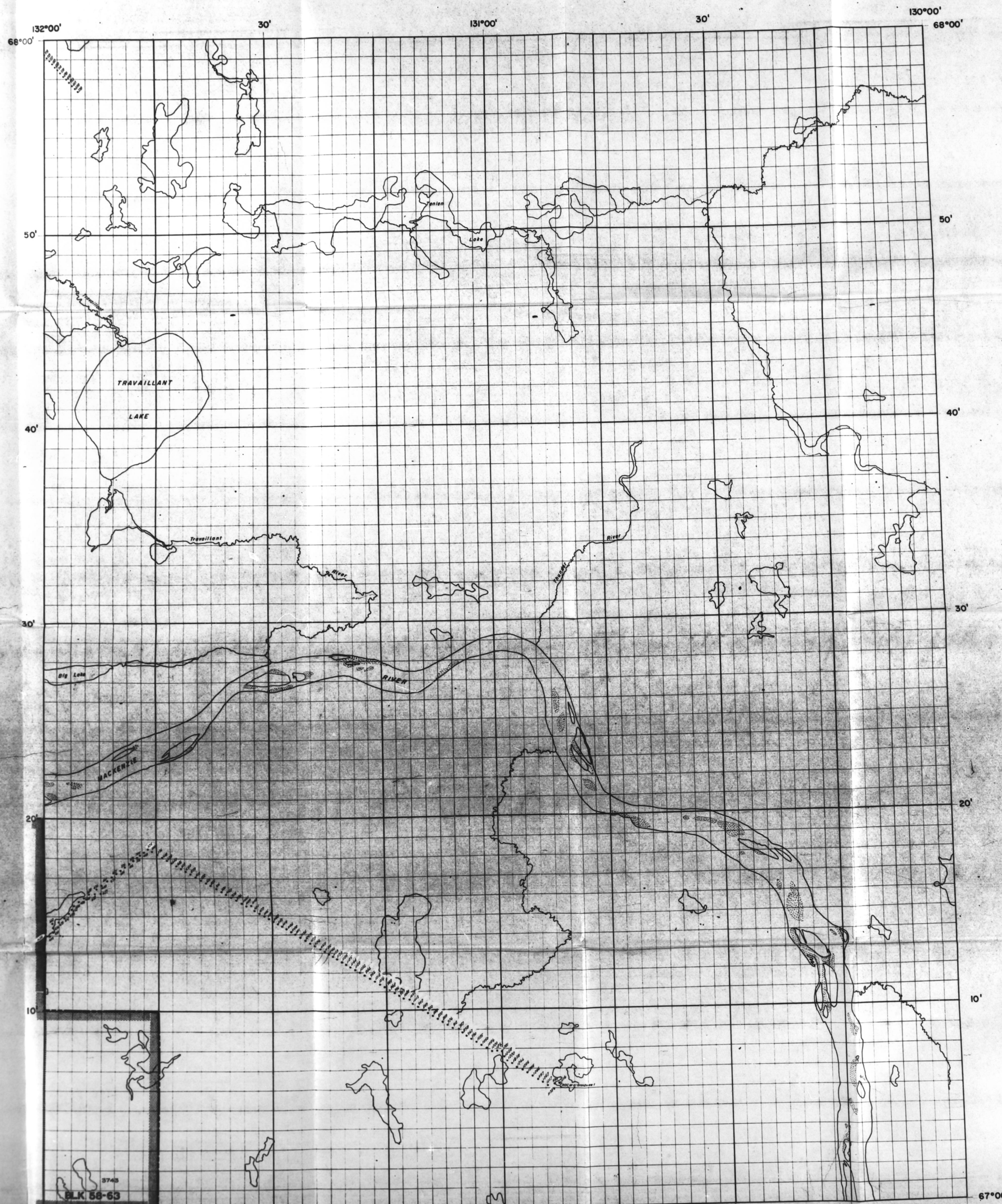


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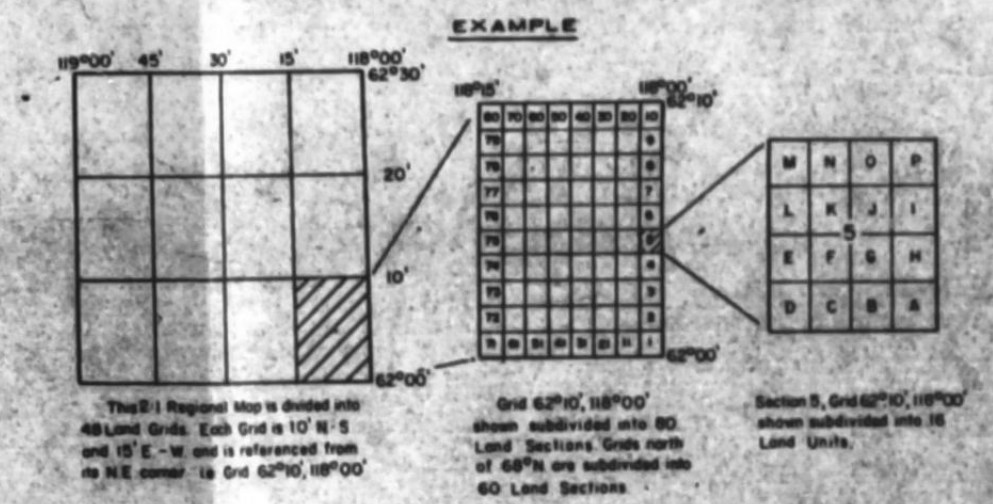
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SEISMOGRAPH MAP
ISOCHRON
BEAR ROCK TO CAMBRIAN SHALE
Contour Interval 1000 SECS
Datum: Plane Velocity
REVISED 1964

CONFIDENTIAL



NWT LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS

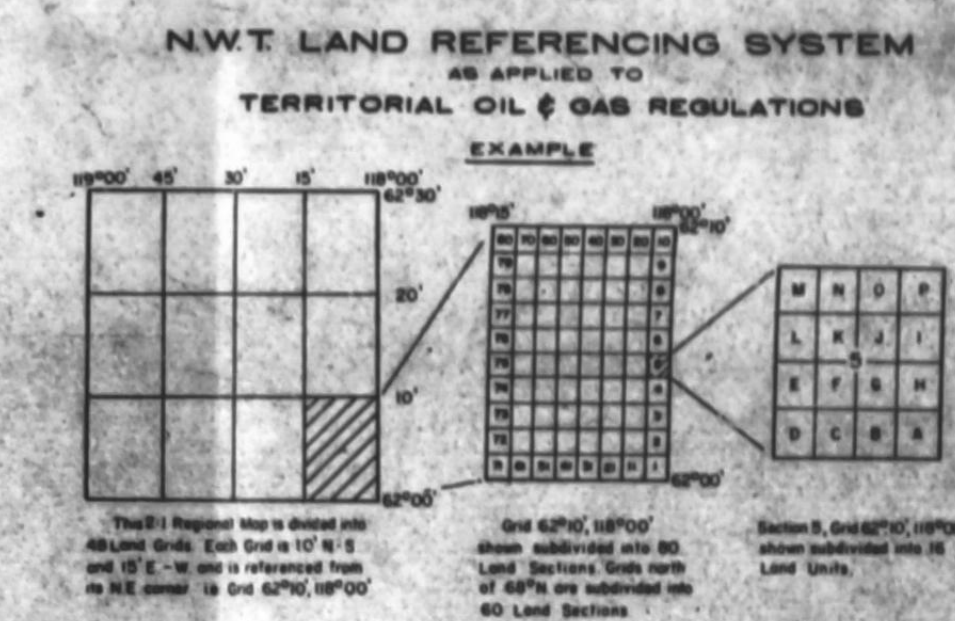
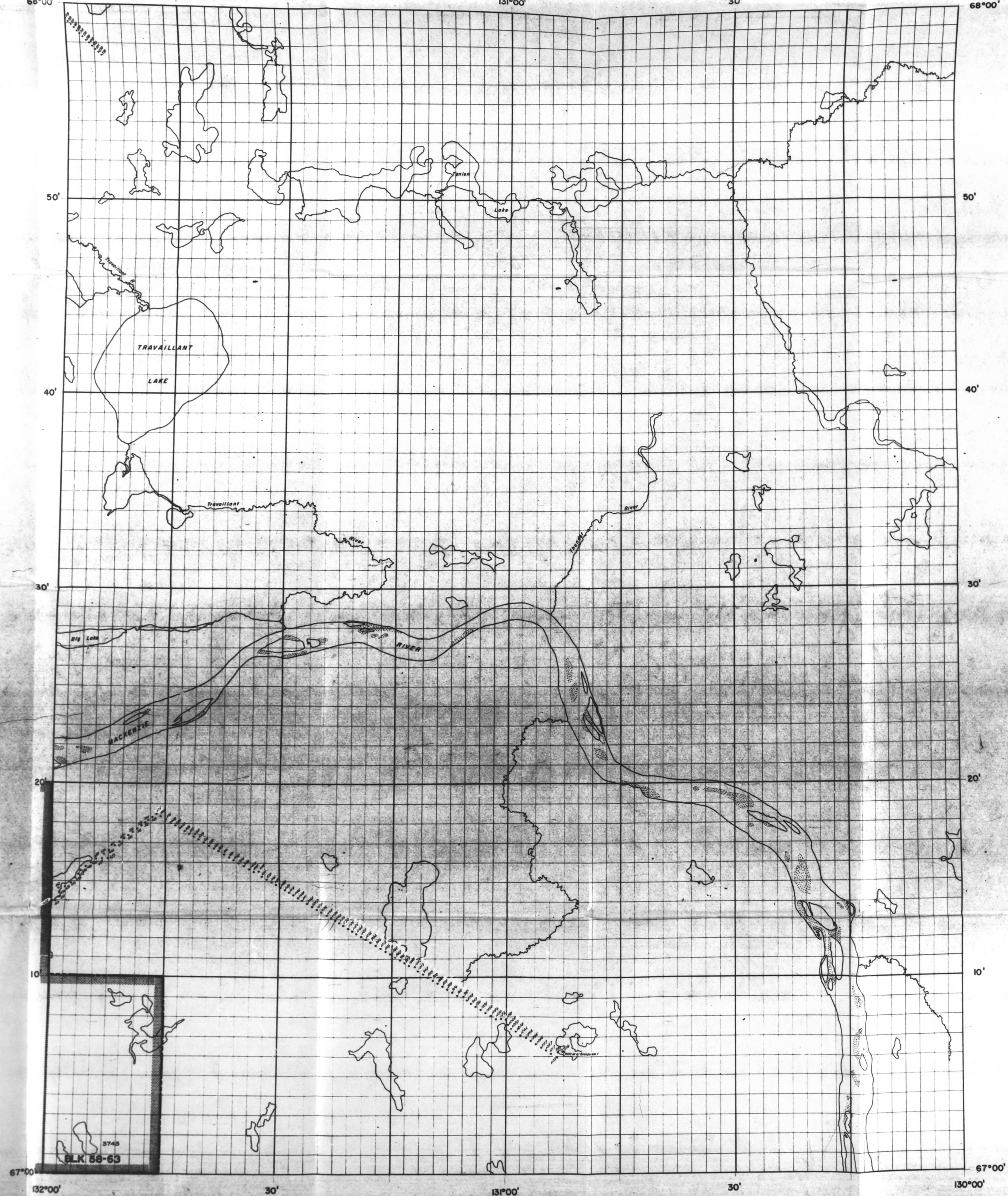


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SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS
Datum: Plane Velocity
REVISED JULY 6, 1965

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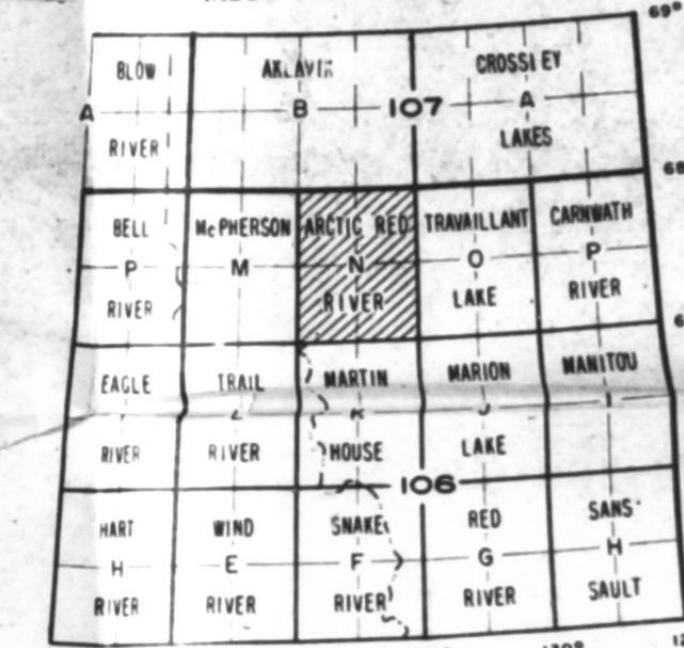
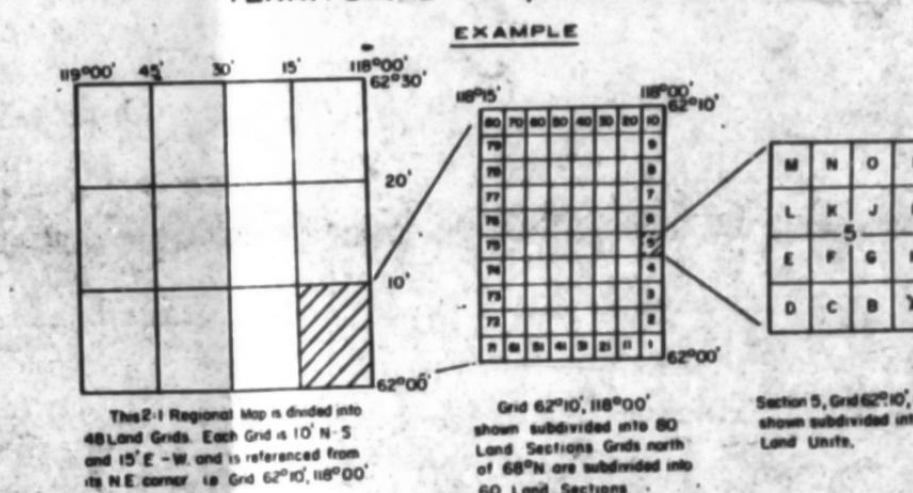
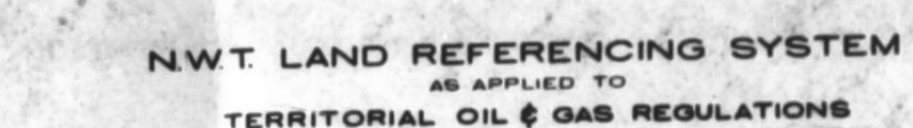
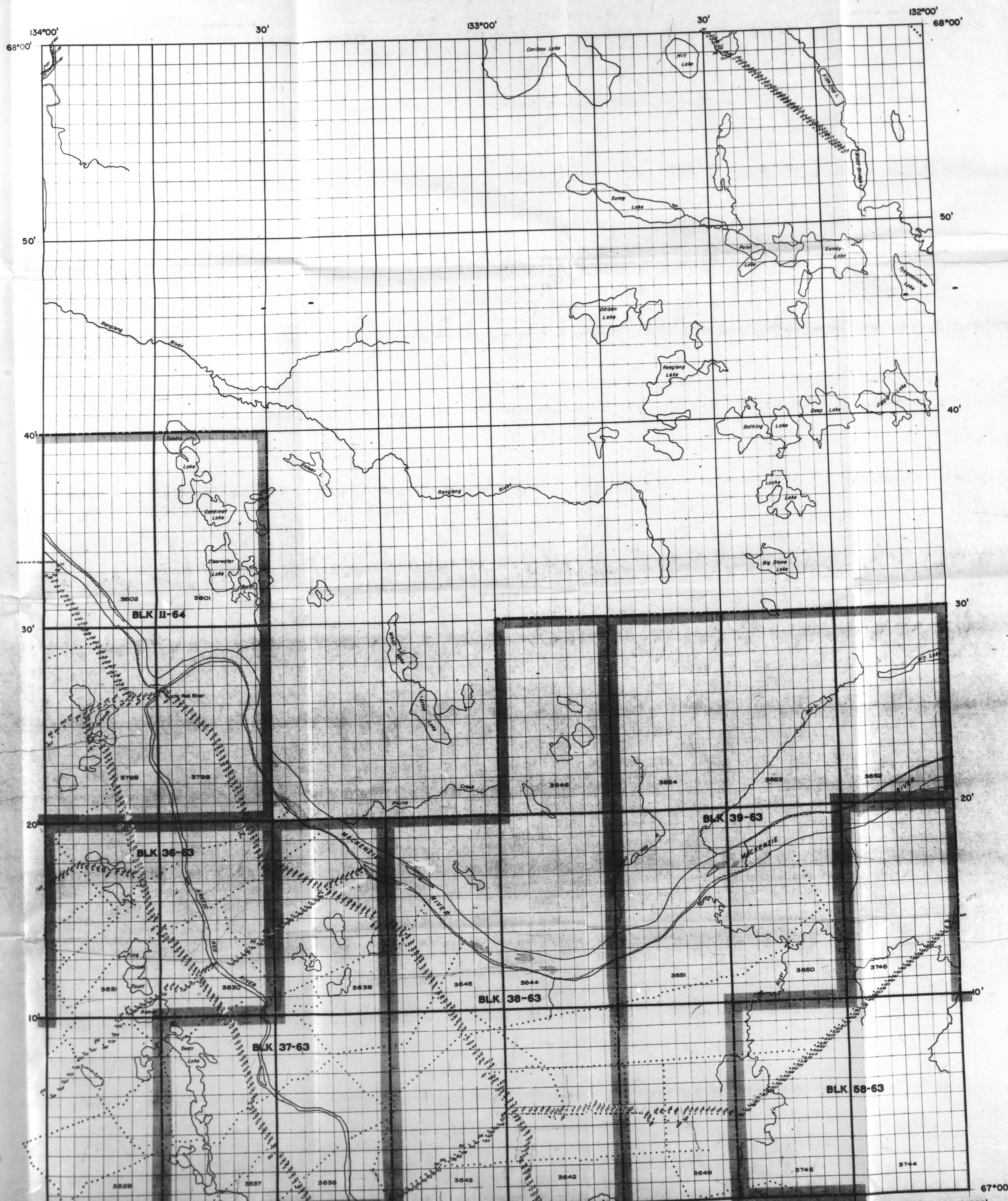
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BLW	ARK	CROSS
RIVER	107	LAKES
BELL	McPHERSON	ARCTIC
P	N	RED
RIVER	RIVER	TRAIL
EALE	TRAIL	MARTIN
RIVER	RIVER	HOUSE
HART	WIND	SHARK
H	E	F
RIVER	RIVER	RIVER

SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS & ELEVATIONS
Contours: Interval _____ Datum: Plane _____ Velocity _____
REVISED: JULY 6, 1965

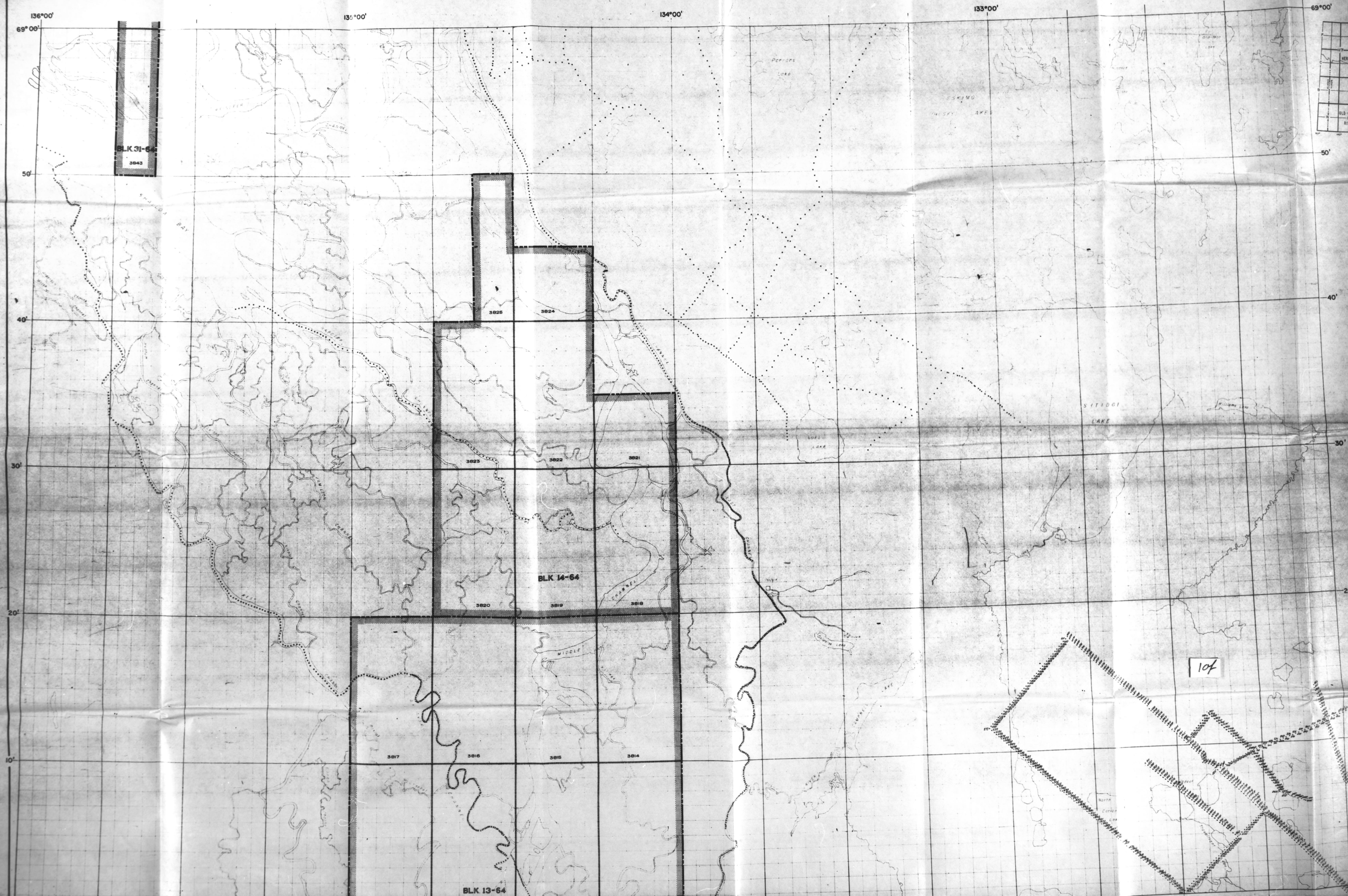
1060 TRAVAILLANT LAKE
2 MILES TO 1 INCH

20/2



SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval -----
Datum: Plane ----- Velocity -----
REVISED JULY 6, 1965





50

—40'

-30-

-20'

SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval -----
Datums: Plane ----- Velocity -----

REVISID JULY 6, 1965

69°00'

BLK 31-64

3843

3825

3824

3823

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BLK 14-64

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3815

3814

BLK 13-64

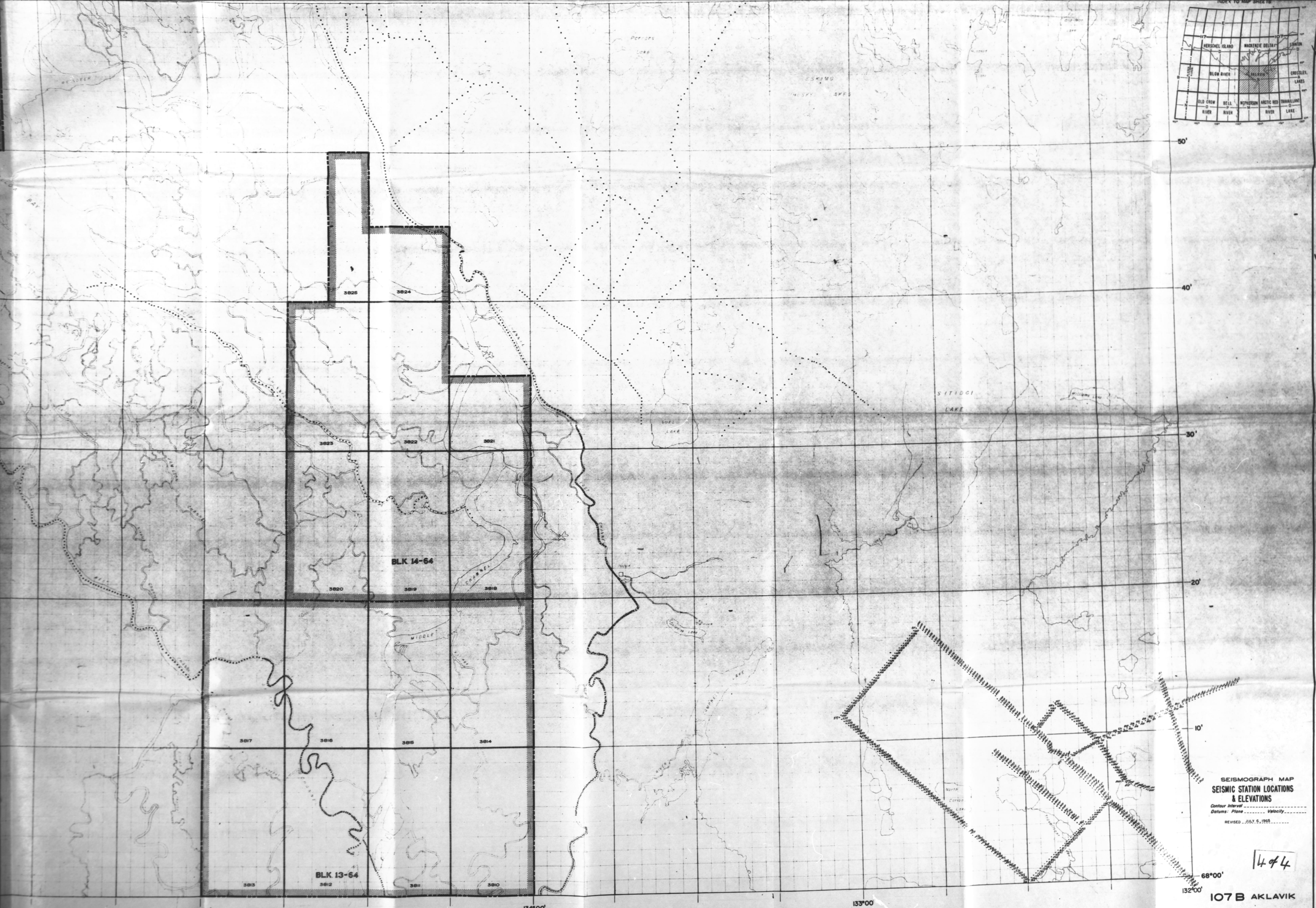
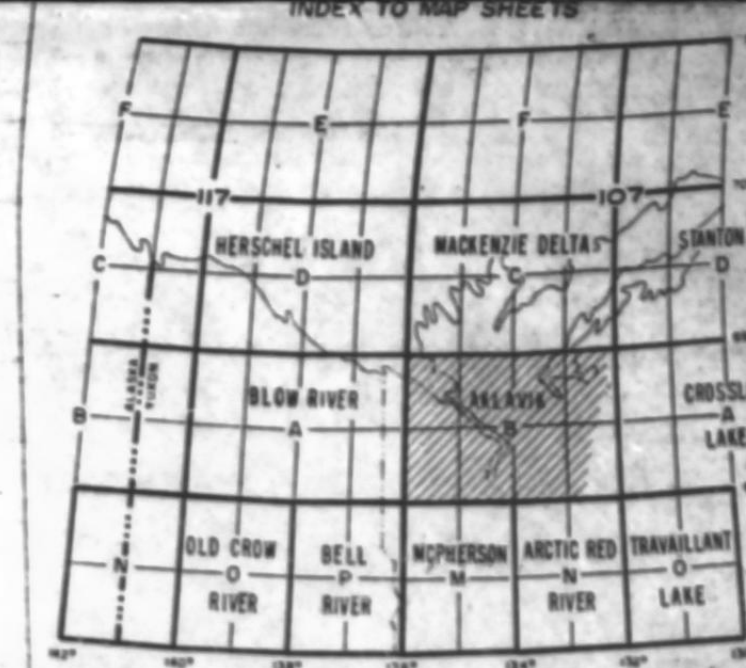
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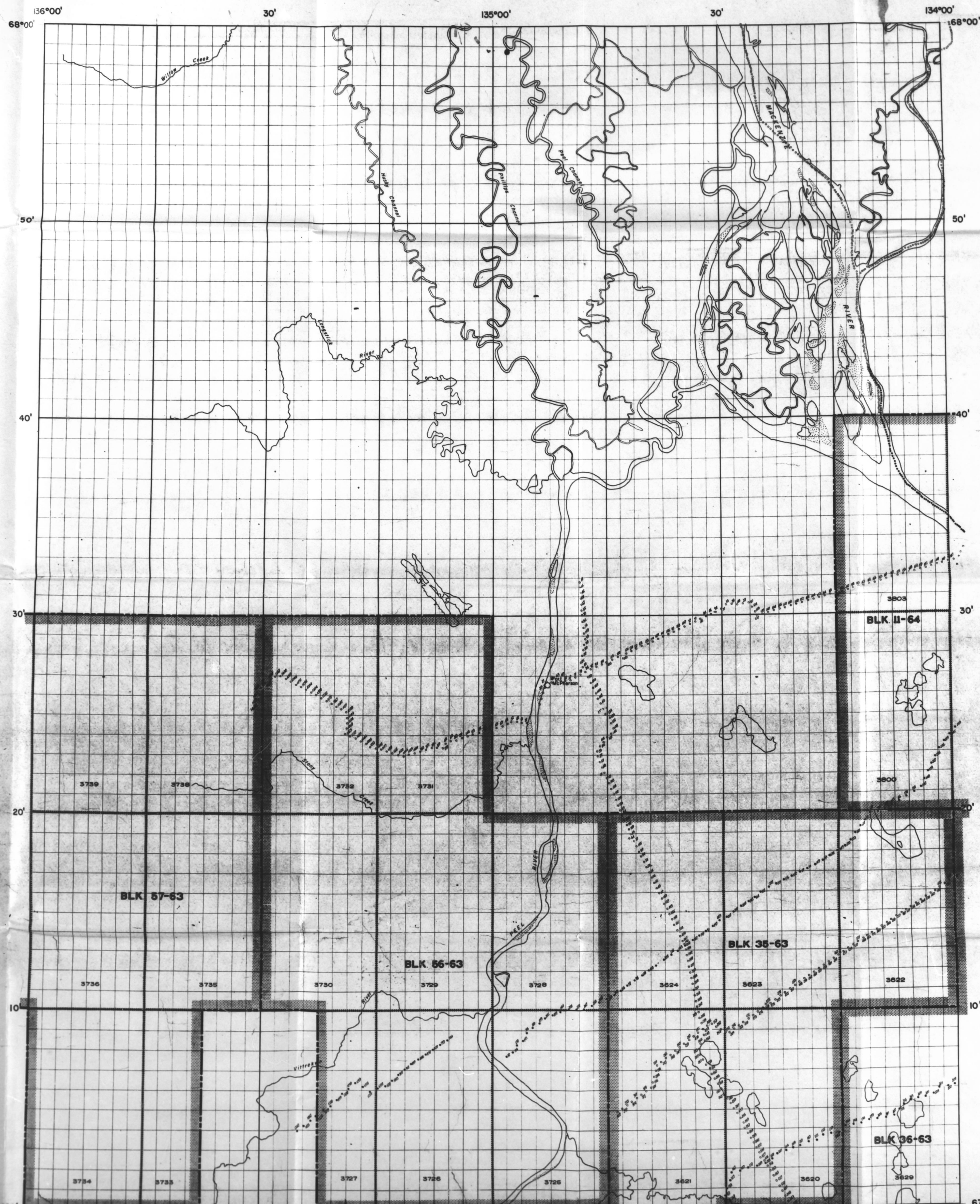
137



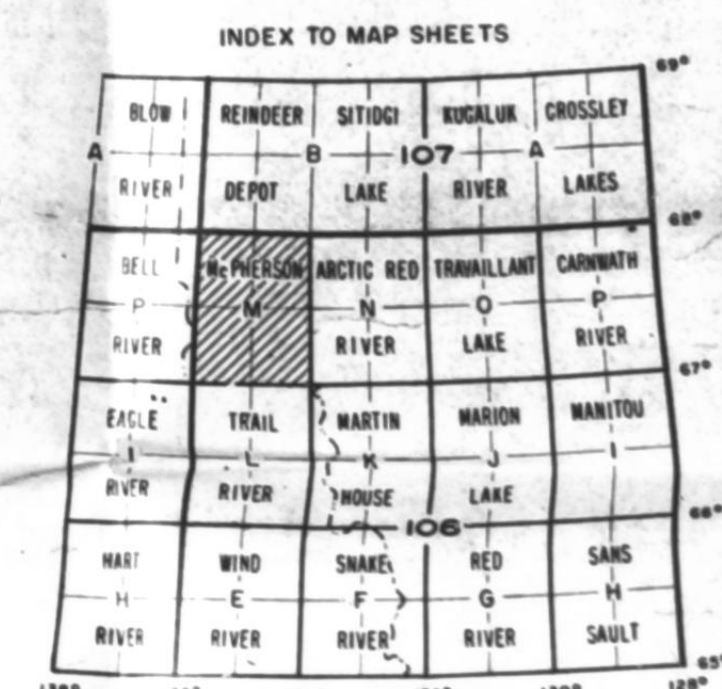
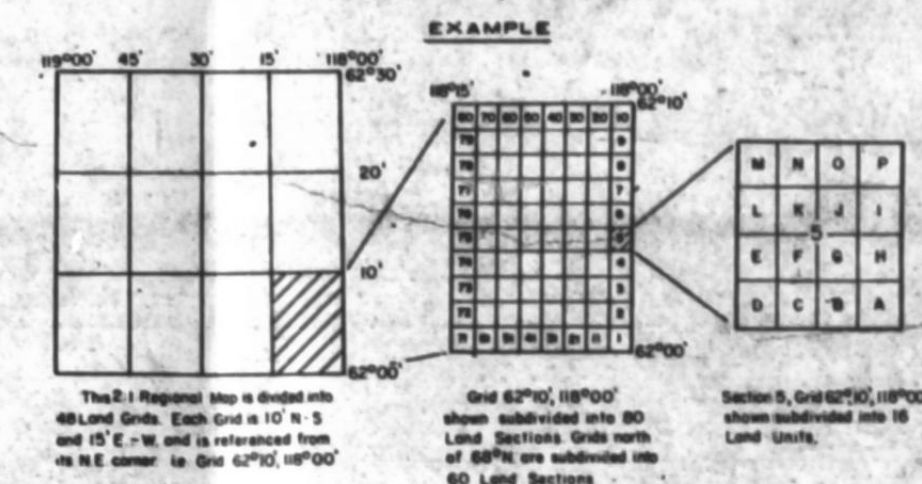
SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS
Contour Interval _____
Datum: _____ Velocity _____
REVISED JULY 5, 1965

4 of 4

68°00'
132°00'
107B AKLAVIK
2 MILES TO 1 INCH



N.W.T. LAND REFERENCING SYSTEM
AS APPLIED TO
TERRITORIAL OIL & GAS REGULATIONS



SEISMOGRAPH MAP
SEISMIC STATION LOCATIONS
& ELEVATIONS

Contour Interval: _____
Datum: _____
Velocity: _____
REVISED: JULY 6, 1965

104

IMPERIAL OIL ENTERPRISES LTD.

GEOLOGICAL DEPARTMENT.

Report on: Reflection Seismic Program - Peel Plateau - N.W.T.
Territorial Oil & Gas Work Bonus Blocks 32-63,
35-63, 36-63, 37-63, 38-63 & 39-63. For period
November 18, 1963 to April 25, 1964.

Enclosures: Six Seismic Station Location and Elevation Maps
Five Bear Rock Formation Structure Maps
Five Bear Rock to Cambrian Shale Isochron Maps
One Bear Rock to Upper Cretaceous-Tertiary Structure Map.

By: J. C. Underhill.

Date: July 30, 1965.

Map References:

106 K Martin House
106 L Trail River
106 M Fort McPherson
106 N Arctic Red River
106 O Travaillant Lake
107 B Aklavik

IMPERIAL OIL ENTERPRISES LTD.
PRODUCING DEPARTMENT - WESTERN REGION.

REFLECTION SEISMIC OPERATIONS - PEEL PLATEAU AREA.

N.W.T. Work Bonus Blocks 32-63, 35-63, 36-63, 37-63,
38-63 and 39-63.

N.W.T. Permits 3594-3601, 3618-3624, 3625-3631, 3632-
3638, 3639-3646 and 3647-3654.

November 1963 - April 1964.

By

J. C. Underhill

July 30, 1965.

PEACE RIVER EXPLORATION DIVISION
DAWSON CREEK, BRITISH COLUMBIA.



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SUMMARY.

Report on reflection seismograph operations conducted by Geophysical Service Incorporated Party No. 26 on behalf of Imperial Oil Enterprises Ltd. in the Peel Plateau Area from November 18, 1963 to April 25, 1964. Submitted in support of application for credit. See Affidavit of Work by. H. W. Johnson dated April 15, 1965.

INTRODUCTION.

Due to winter inaccessibility of the area a program of stockpiling fuel and supplies was carried out during the summer of 1963 via the Mackenzie River. Cat crews moved into the area in November 1963 while the seismic crews were assembled and moved into the area in December. The crews were serviced by company-owned DC-3 and Otter aircraft. Equipment, in addition to a standard reflection seismic operation, consisted of three cats with bulldozers.

REFLECTION SEISMIC OPERATIONS.

Three company survey personnel left Calgary on the I.O.L. DC-3 and arrived at the initial work site on November 18, 1963. The three men loaded 100 propane bottles onto the trailers, cleaned out the frozen stove lines and performed necessary repairs. Supplies were unloaded from the vehicles and placed in storage trailers. The caterpillar contractor, a cook and four cat operators arrived also on November 18, 1963. They commenced snow plowing roads around the camp and cutting a suitable crossing over a deep coulee some eight miles from camp. Some five men, an instrument engineer, a junior observer, a driller, a shooter and a mechanic left Edmonton on a commercial P.W.A. flight and arrived on November 24th. The cats meanwhile commenced stockpiling fuel at the working area.

During the period November 23rd to November 30th, the Party Chief, three staff camp personnel and two cat operators arrived on the I.O.L. DC-3 flight from Fort Nelson and continued to the campsite on November 25th, 1963.

Various members of the crew worked on the following: mounting the instruments and recorder in the dog house, preparing and winterizing the vehicles and equipment for operation as well as moving about three hundred barrels of fuel to higher ground. The dynamite was stockpiled at the edge of the airport and supplies were loaded in and on the end of the trailers. Two cats continued to cut line to the edge of the prospect, a distance of some fifty miles, and completed the job by November 29, 1963. The road surface was very rough and had to be dragged many times before equipment could cross. Several areas of soft muskeg gave the cat crew considerable trouble. Weather during the period was very cold with temperatures ranging from thirty to forty-five below zero with fairly high winds.

From December 1st to December 7th, the first three days were spent moving camp. The camp had been assembled in strings and after picking up supplies and personnel from the incoming DC-3 flight, the camp commenced the move to the initial work area on December 1, 1963. The steep coulee previously mentioned caused some trouble as the cats had to double up to get equipment across. On December 2, 1963, the camp moved some twenty-eight miles by travelling from 0730 to 2300 hours. Cats also had to double up on hills because of the heavily loaded trailers. The camp arrived at its destination about 1800 hours on December 3, 1963. The approximate location was Latitude 67°05' North and Longitude 133°00' West. On December 4th, experimental shooting was commenced to determine methods to obtain the best possible results including various spreads, filters and geophones.

During the period December 8th to 14th, the experimental shooting

was completed and a three hundred foot uphole survey was taken. The first line commenced with a three hundred foot spread using sixteen geophones per trace on the Arctic Red River map. The record quality was fair to poor, with some good quality records being obtained. The main factors hindering production were the very short daylight period, as the sun did not break above the horizon and the pigtales on the geophone strings snapped often in the intense cold. Hard shale and sandstone drilling was encountered on the west half of the line. Other formations were clay and sandstone, clay, gravel and sandstone, muskeg and perma-frost. Two ravines were encountered on the line leading to Arctic Red River. The cats were called back about two miles south of the ravine and given a deflection angle to miss the ravines, and then the line was directed to Arctic Red River. Estimated cutting time of the line was five days. The road was extremely rough with a maximum five mile per hour driving speed. Vertical surveys were based on old work while horizontal control was corrected to the lakes from air photos.

Work continued in the Arctic Red River area from December 15th to the 21st with the east-west line from $67^{\circ}05'$ North, $132^{\circ}45'$ West to $67^{\circ}05'$ North and $133^{\circ}15'$ West being completed. Recording began on December 18th on a line northwest to the town of Arctic Red River approximately forty miles northwest. Record quality was fair to good with the river noise giving continuous interference. Shooting was restricted to near daylight hours.

The cats reached the town of Arctic Red River on December 19, 1963. The fuel dump there was on the east bank of the river and had to be moved across the river when the crew passed through. The camp also was moved to about twenty miles south of the town. Several day's shooting within the period comprised eight geophones per trace with a 150 foot spread. Evaluation and interpretation of these records indicated that sixteen geophones over a three hundred foot spread was equally satisfactory, and the crew returned to this method. It was found that an extra surveyor could be used effectively as the one and one-half hours of daylight available to the surveyors was not sufficient to keep up with the shooting crew. An extra man during the deep winter months allowed both a chaining and elevation team to operate simultaneously.

During the period December 22nd to 28th, good production was obtained with record quality being fair to good. Strong continuous surface noise was prevalent but the crew managed to dampen this with filters. The weather was good with temperatures ranging from minus thirty to minus five degrees. There were no winds or snow to hamper operations. The lines were extremely rough over gently rolling terrain interspersed with lakes. Drilling was good except when encountering hard sandstones.

The camp was moved to six miles southeast of Arctic Red River on December 30th. Cats continued to keep ahead of the seismic crew by use of double shifts. Weather continued relatively mild during the December 29th to January 4th period. Several equipment breakdowns caused some interruptions, especially the light plant and one of the drills.

On January 5th the camp was moved to approximately fifteen miles west-south-west of the Point Separation wellsite as located on the Fort McPherson map. Record quality continued to be mostly fair with strong surface reflections giving trouble. Good weather with no snow or high winds was enjoyed by the crew. Roads continued to be very rough and the terrain changed from gently rolling to small valleys. Drilling was good with mostly hard shales and some gravel being the only problems. Program consisted of a line west-south-west from the Point Separation well.

During the period January 12th to 18th, the crew worked south of Fort McPherson on the west bank of the Peel River in the general region of 67° 32' North and 134° 00' West. Record quality was good with satisfactory shallow data. Little difference was found between single and three hole patterns at the same depth. Shallow shots exhibited ground roll which became more severe with decreasing depth. The weather was clear and cold with temperature down to fifty below zero. A fuel shortage caused the crew to lose one cat which had to make a long trip to Arctic Red River for fuel supplies and precipitated the camp move of January 16th. The line was scouted west of Fort McPherson by air on January 16th. The cats were advised to swing well north of their proposed strike to avoid a deep canyon in the area. Some crew delay was due to the Peel River crossing as not one truck, including the four wheel drive shooting unit, could make the hill from the river to the west side of the Peel. All vehicles had to be towed by the cats. It was decided to leave part of the camp at Fort McPherson, including supplies and interpreters. The balance would continue west with the shooting crew. Upon completion of the west line, the shooting

crew camp was to return to Fort McPherson and continue the program southward.

From January 19th to the 25th the crew worked in the area of 67° 25' North and 134° 55' West. The record quality was good to poor with the best records being obtained west of the Peel River. The roads were extremely rough with elevation changes of 350 feet between shotpoints. On January 25th, the terrain forced the crew to return to Fort McPherson after completing some twenty-one miles of line west of the Peel River. Drilling was good, but the drills became often stuck between shotpoints. Camp moves on January 19th, 21st, 24th and 25th cut production somewhat. The light plant continued to give trouble.

Work continued in the Fort McPherson area from January 26th to February 1st and by the end of the period were approximately twelve miles south by fifteen degrees east of Fort McPherson and heading due south. The weather was very cold with temperatures varying from more than minus fifty degrees to high of minus thirty-five degrees below zero. Record quality was fair to good. The terrain was hilly and extremely rough with all equipment becoming stuck in dirt fills. The crew experimented in spraying water on selected fills to see if they could be made more solid. The area south and west of Fort McPherson is above the tree line and each small creek has steeply cut banks. Without trees the vehicles had nothing to winch to. Cats were required to move the drills between locations. The cats, therefore, were only just ahead of the crew shooting line.

On February 8th the camp was at Longitude $134^{\circ} 30'$ West and Latitude $67^{\circ} 06'$ North, approximately twenty-six miles southeast of Fort McPherson and was proceeding south by twenty-six degrees east. The record quality for this area improved with strong deep reflections becoming evident. Weather was quite mild with highs of zero degrees recorded. The area was hilly but the roads were not quite as rough. During the period of February 4th to 6th, an experimental program was conducted in the vicinity of $67^{\circ} 20'$ North and $134^{\circ} 45'$ West. An uphole survey was taken from a depth of 150 feet, a noise analysis was run over varying distances and intervals with an expanded spread over a 1.85 mile distance being shot using three hole inline patterns and seven hole perpendicular patterns. Program results indicated that the most effective shot hole depth was between twenty and sixty-feet - such depth to be determined by drilling problems encountered. Also indicated was a single, strong noise wave of relatively high velocity moving horizontally down the spread and a very high near surface reflection velocity.

On February 10th the camp was moved to $66^{\circ} 47'$ North and $134^{\circ} 15'$ West or approximately forty-six miles south by southeast of Fort McPherson. The weather was very cold with high winds bringing the wind chill factor to about seventy below zero. The country was mostly flat with many lakes and gulleys. The roads improved but still remained rough. The program was conducted on the Trail River map along the south by southeast line from Fort McPherson. The crew then turned east by Northeast on the line which passed Martin House and across the Arctic Red River.

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On February 22nd the crew was located at 66° 50' North and 133° 25' West - approximately forty-eight miles south by fifteen degrees east from the town of Arctic Red River and five miles due west of Arctic Red River proper. The weather continued very cold. Crew changes were effected during the interval. The terrain was flat with many lakes. A fuel shortage had initiated reduction of hole patterns. Some experimental shooting was done approximately seven miles due east of Martin House. It was discovered from support aircraft that the proposed tie line to the Ontaratue wellsite could go over some twenty miles of old seismic lines and a prepared river crossing. The fuel shortage was remedied by having P.W.A. transport 10,000 pounds of diesel fuel to the Ontaratue airstrip.

By February 29th the crew had reached 132° 50' West and 66° 54' North or about forty-six miles south by thirty degrees east of Arctic Red River and fourteen miles south of the tie with the first program line. Weather was mild but cloudy causing poor flying weather every day except February 27th. Terrain was flat except crossing the Arctic Red River. All equipment had either to be pulled or winched part of the quarter mile climb up the east bank of the river. The program continued to use inline patterns and cut line as fast as possible to reach the first program line before fuel became critical. As soon as a tie was made fuel sloops were dispatched to the Arctic Red River fuel dump. It was noted that as the program moved southward and the weather became mild the radio communication link with Dawson Creek improved. However, difficulties with air support caused critical situations with fuel and powder.

During the period March 1st to 7th, the camp was located at 66° 43' North and 132° 45' West or approximately fifty-seven miles southeast of Arctic Red River town. Record quality varied considerably due to clay deposits. Nights were very cold with temperatures of minus forty-five degrees and highwinds. Days were mostly sunny and after 1000 hours mild. The country was flat with generally poor roads. Average driving speed was about five miles per hour. With new supplies of fuel the crew commenced seven hole patterns. An experimental program was conducted using anuphole survey and various spread patterns. It was found that strong surface noise continued to exist with three hole perpendicular patterns being the best choice.

From March 8th to 14th the crew worked toward the Ontaratue wellsite on the Martin House map in the general area of 66° 25' North and 132° 15' West. The weather turned very cold. Terrain improved as old seismic lines were followed as much as possible. As one of the drills broke down, double and treble shifts were used on the remaining drill.

Camp moves were required on March 17th, 19th and 20th as short lines completed certain of the projected coverage. Record quality was generally poor with excessive noise on all records. It was discovered that record quality improved west of Martin House. The country near the wellsite was flat but west of Martin House it became hilly and very rough. Three hole perpendicular patterns were shot over 3,600 foot coverage. All shot holes were fifty feet or more as shallow hole records were mostly poor.

On March 22nd the camp was moved to 66° 50' North and 133° 20' West and then to 66° 57' North and 133° 33' West on March 25th. Record quality degenerated especially when crossing many small, shallow lakes which created considerable low frequency noise. A gradual rise in elevation was noted along with drainage ravines from lakes to the Arctic Red River.

By March 31st the crew was located at 67° 05' North and 133° 35' West or twenty-three miles southeast of Arctic Red River while working north to the Arctic Red River settlement. Record quality was fair to poor as the Bear Rock formation remained the only continuous reflector over the area. A distinct warming trend during daylight hours was noted except for one blizzard during the period. The country was flat with generally good roads and many intermittent lakes. The crew began shooting three hole perpendicular patterns using fifteen pound charges and split 1,800 foot spreads. The estimated date of program completion was thought to be about April 28th if continued production was maintained.

During the period April 5th to 11th, the crew reached within eleven miles south of Arctic Red River and continued north. Temperatures dropped during the period with lows of minus thirty-five degrees. The road from the campsite to Arctic Red River was extremely rough - being the worst encountered during the program. As one drill broke down and gravel was predominant, the remaining drill went on double shifts.

At the end of the April 12th to 18th interval the camp was thirty miles south by forty-six degrees west of Arctic Red River. The crew shot two miles west of camp and headed southwest over cut lines to shoot a projected thirty mile line commencing at 67° 15' North and 133° 50' West. Thawing commenced between April 13th to 16th causing the crew to speed up operations as much as possible. Surface terrain in this area of Fort McPherson is hilly with small lakes and muskeg swamps. Roads ranged from poor to fair. Good drilling was encountered from April 15th onward as gravel was found to be well sorted and rounded along with cemented stringers.

The program was completed on April 24th after the crew had run a fill-in line. With the fair weather winds caused excessive wind noise on records. The terrain for the last period was hilly with lakes. Drilling encountered mostly clay and shale. On April 25th the crew shut down and serviced equipment. The crew was moved out by company-owned PC-3 aircraft while the camp and equipment was moved to the Arctic Red River townsite and stored for the summer.

During the above program, a total of 1,249 shots were taken at 1,123 shotpoint locations to obtain some 2,914 profiles. A total of 373 miles of seismic was shot during the 143 days of actual shooting operations.

Incorporated with the maps of this report are three seismic trades made with Texaco Exploration, Richfield Oil Corporation and Shell Oil Company. The Shell Oil trade involved some 274 shotpoint locations

or 128.4 miles of line on the Martin House, Trail River, Fort McPherson and Arctic Red River map sheets. The Richfield seismic trade involved some 212 shotpoint locations or some 65.2 miles of line on the Arctic Red River and Travaillant Lake map sheets. The Texaco seismic trade, entirely off-permit, involved some 534 shotpoint locations or some 130 miles of line on the Arctic Red River, Travaillant Lake and Aklavik map sheets. These are differentiated on the maps by being shown as solid dots whereas the Party No. 26 shooting is shown as open dots.



J.C. UNDERHILL,
DIVISION EXPLORATION MANAGER,
PEACE RIVER DIVISION,
IMPERIAL OIL ENTERPRISES LTD.

July 30, 1965.