PR-Goodrich 81(11)A

GULF CANADA RESOURCES INC.

COAL DIVISION

GOODRICH GEOLOGICAL REPORT

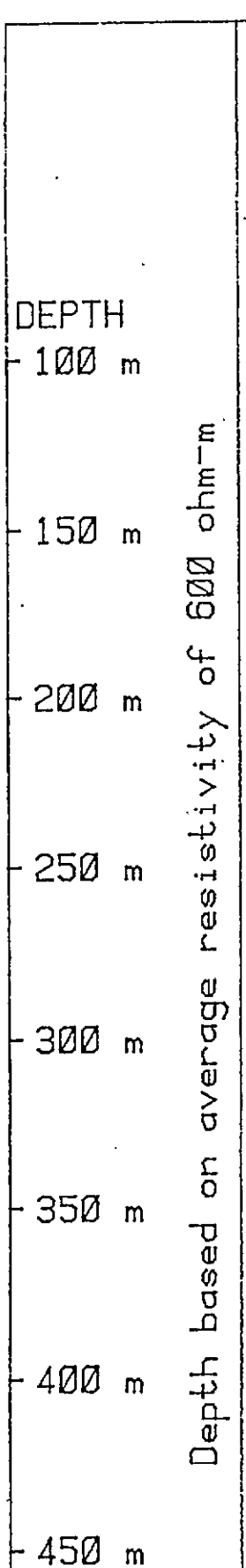
1981

APPENDIX E

1) ELECTROMAG

2) GRAVITY

3) MINI-SOSIE



EM ELECTROMAG EXPLORATION LTD.

2080A-39th AVENUE N.E.

CALGARY, ALBERTA T2E 6P7

ELECTROMAGNETIC SURVEY FOR

GULF CANADA RESOURCES INC.

Coal Division

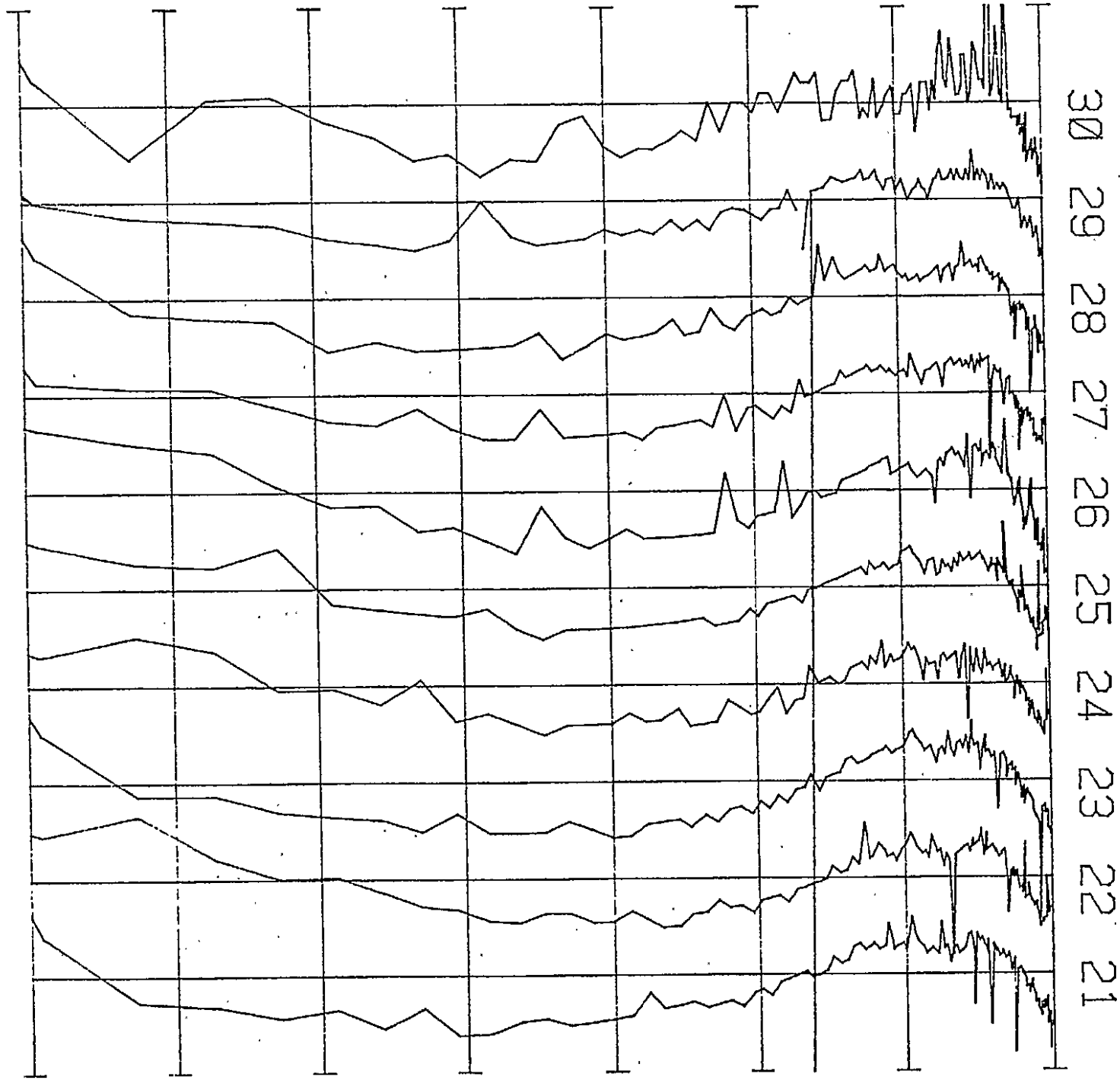
GOODRICH PROJECT, B.C.

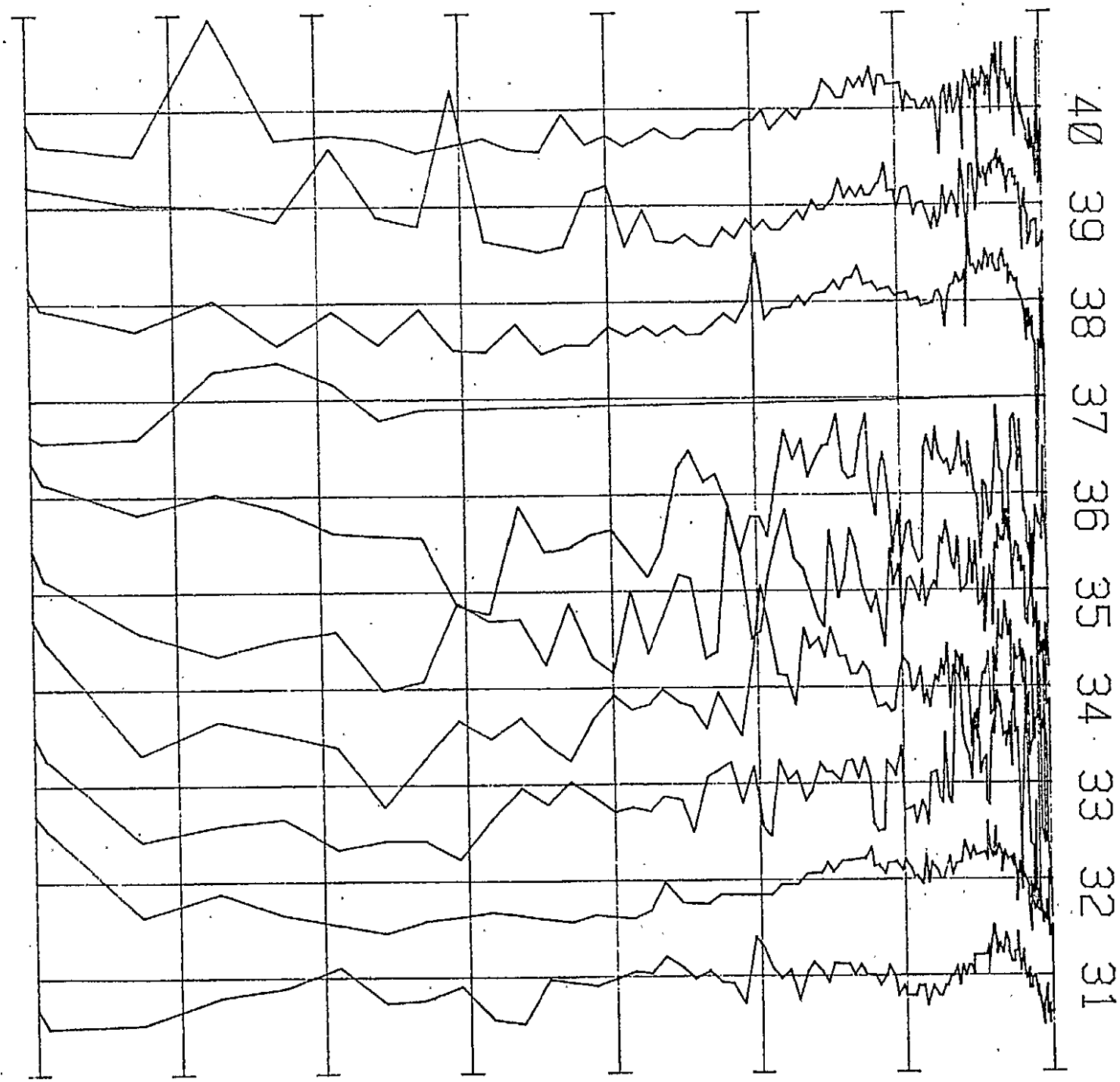
October 1980

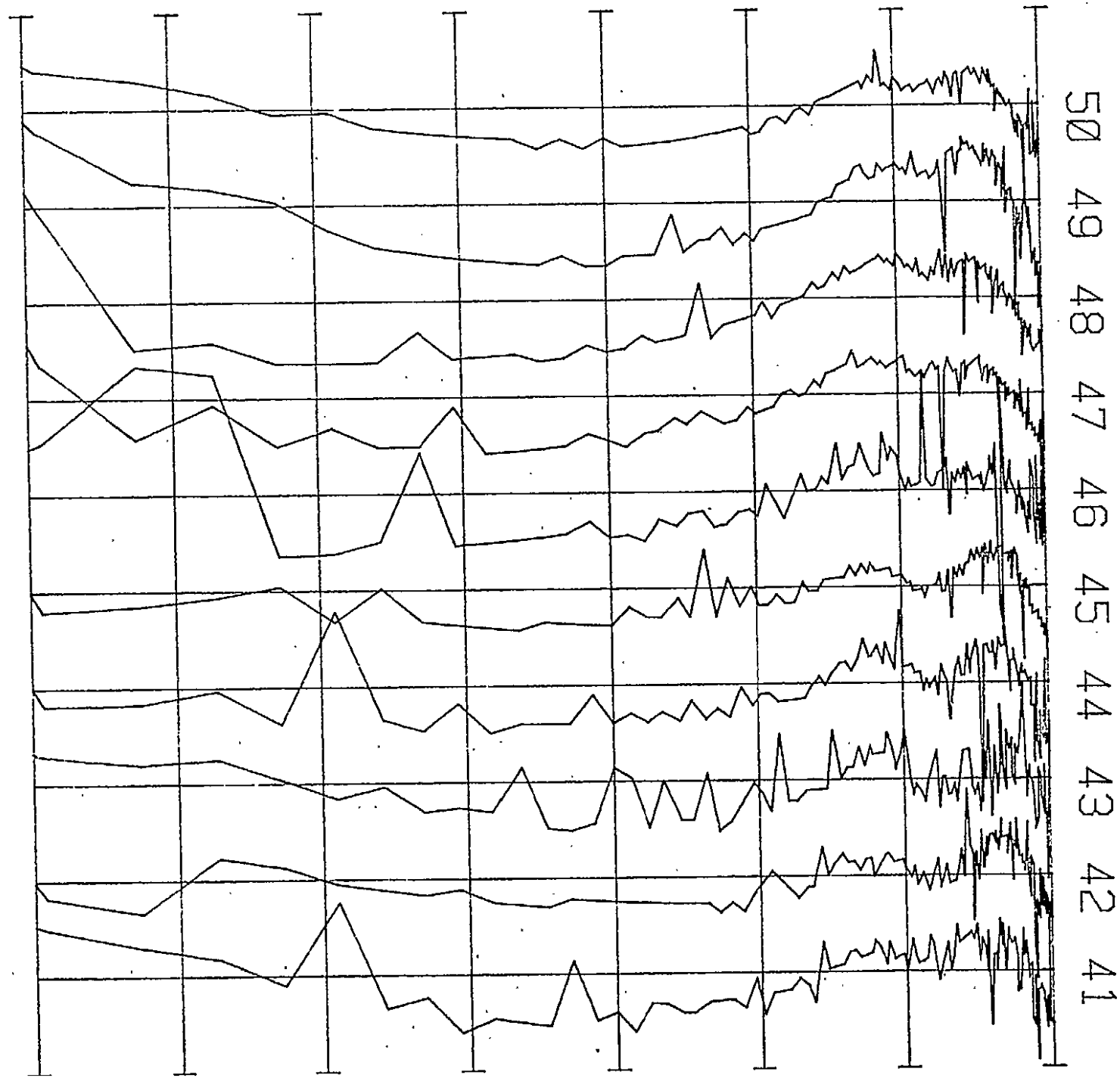
10
9
8
7
6
5
4
3
2
1

HEWLETT
PACKARD

20 19 18 17 16 15 14 13 12 11


30
29
28
27
26
25
24
23
22
21


40
39
38
37
36
35
34
33
32
31


50
49
48
47
46
45
44
43
42
41

60 59 58 57 56 55 54 53 52 51

70 69 68 67 66 65 64 63 62 61

80 79 78 77 76 75 74 73 72 71

90 89 88 87 86 85 84 83 82 81

100 99 98 97 96 95 94 93 92 91

110 109 108 107 106 105 104 103 102 101

120 119 118 117 116 115 114 113 112 111

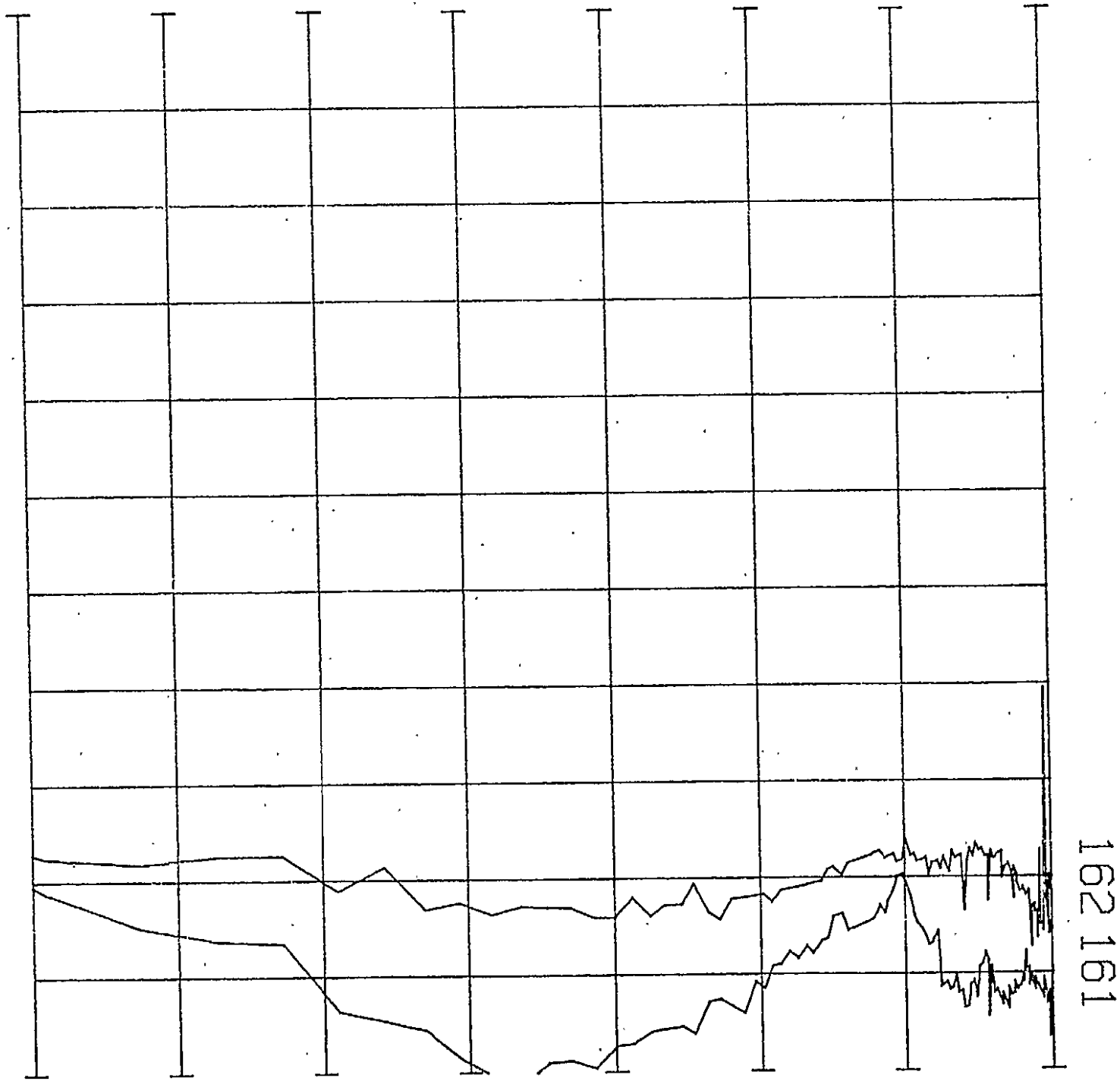
130 129 128 127 126 125 124 123 122 121

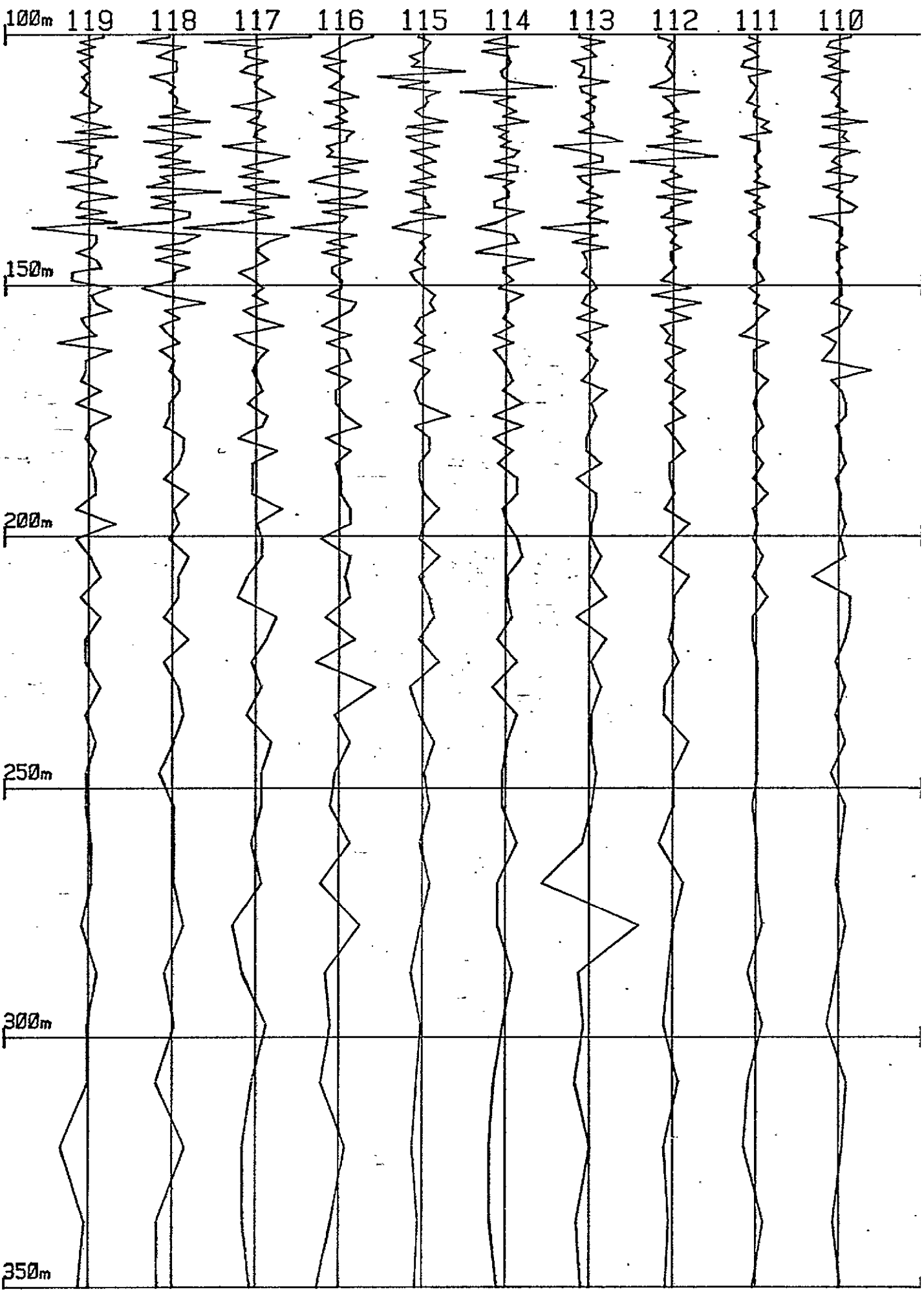
HEWLETT PACKARD

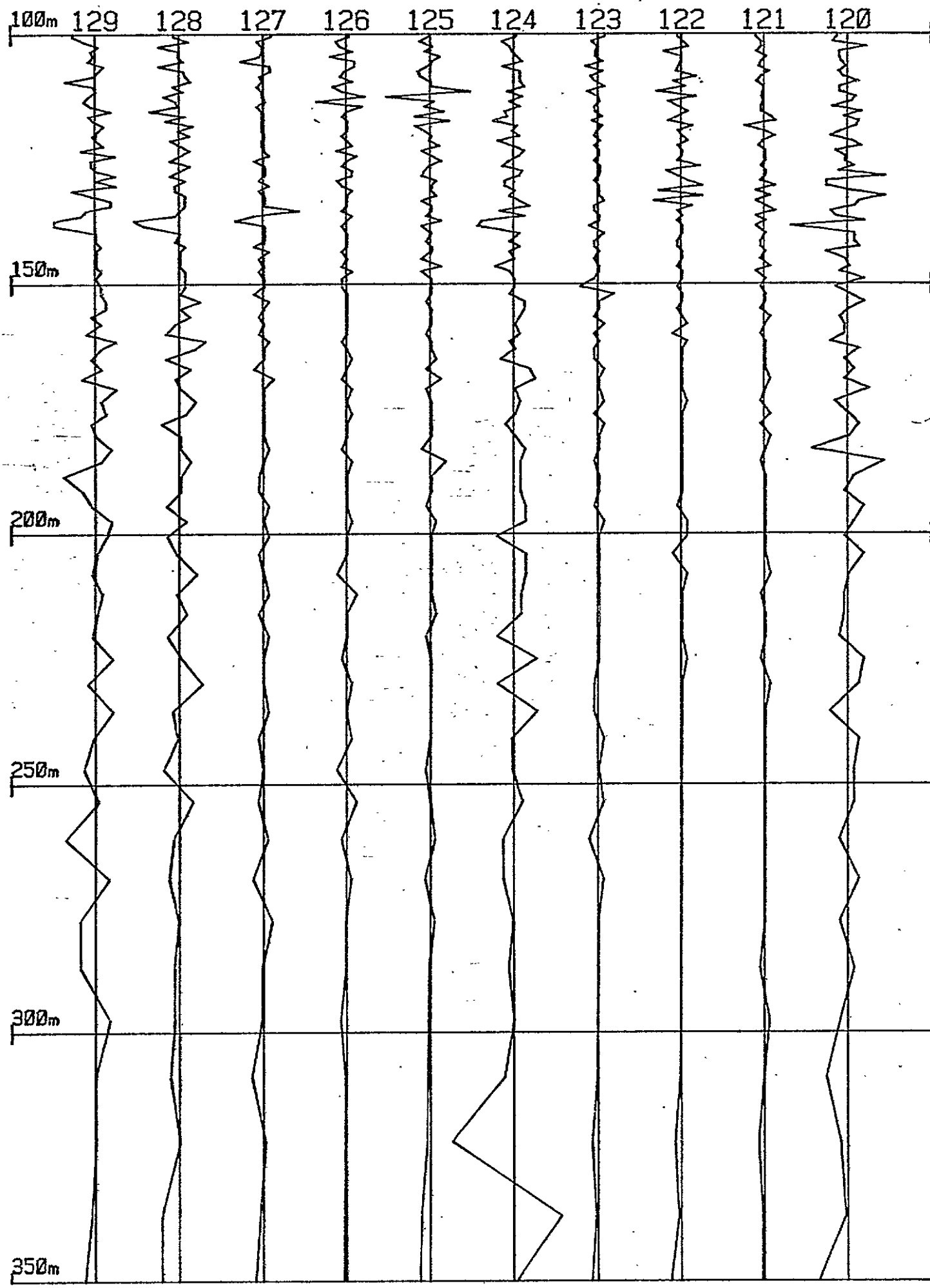
150 149 148 147 146 145 144 143 142 141

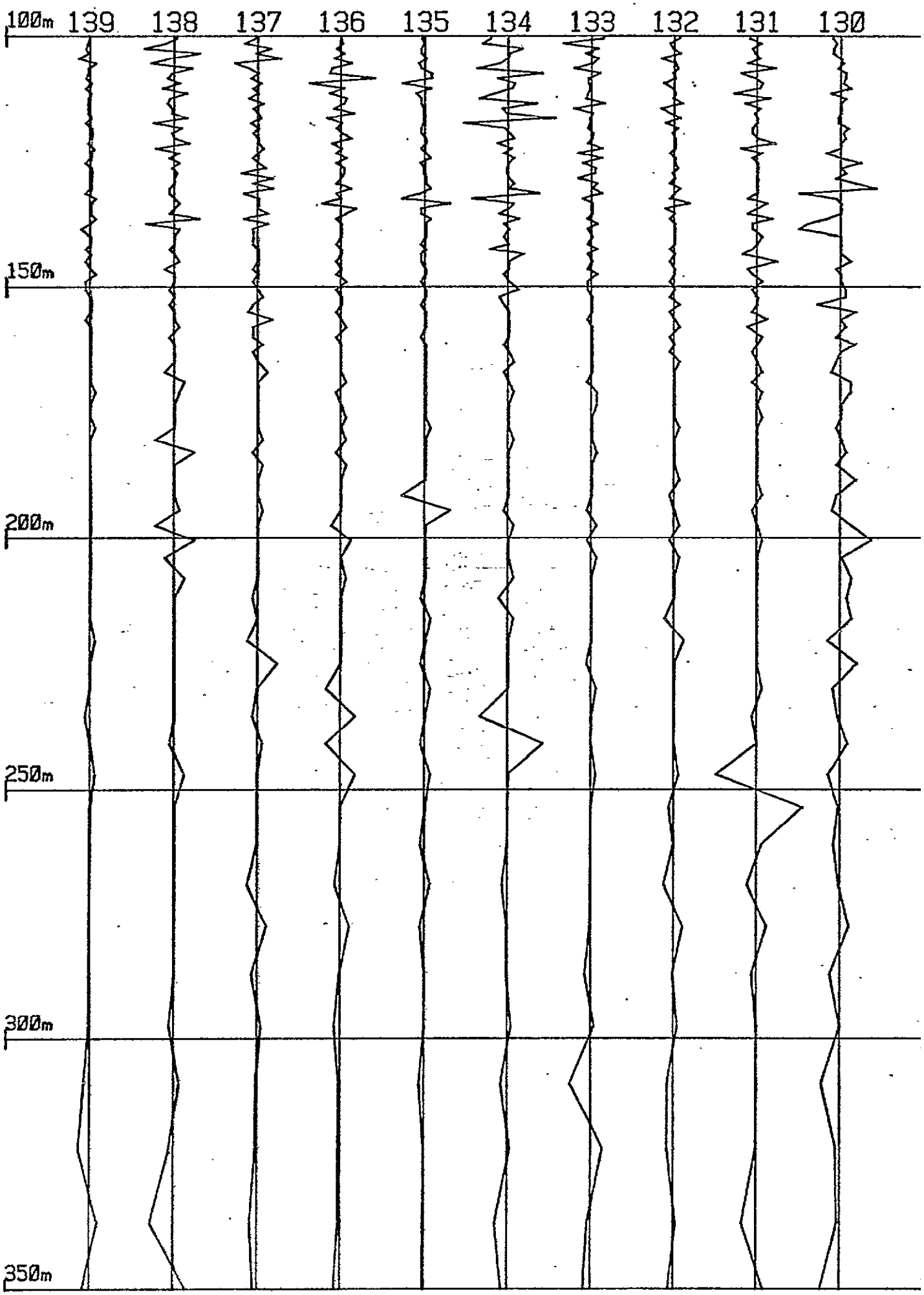
HEWLETT PACKARD

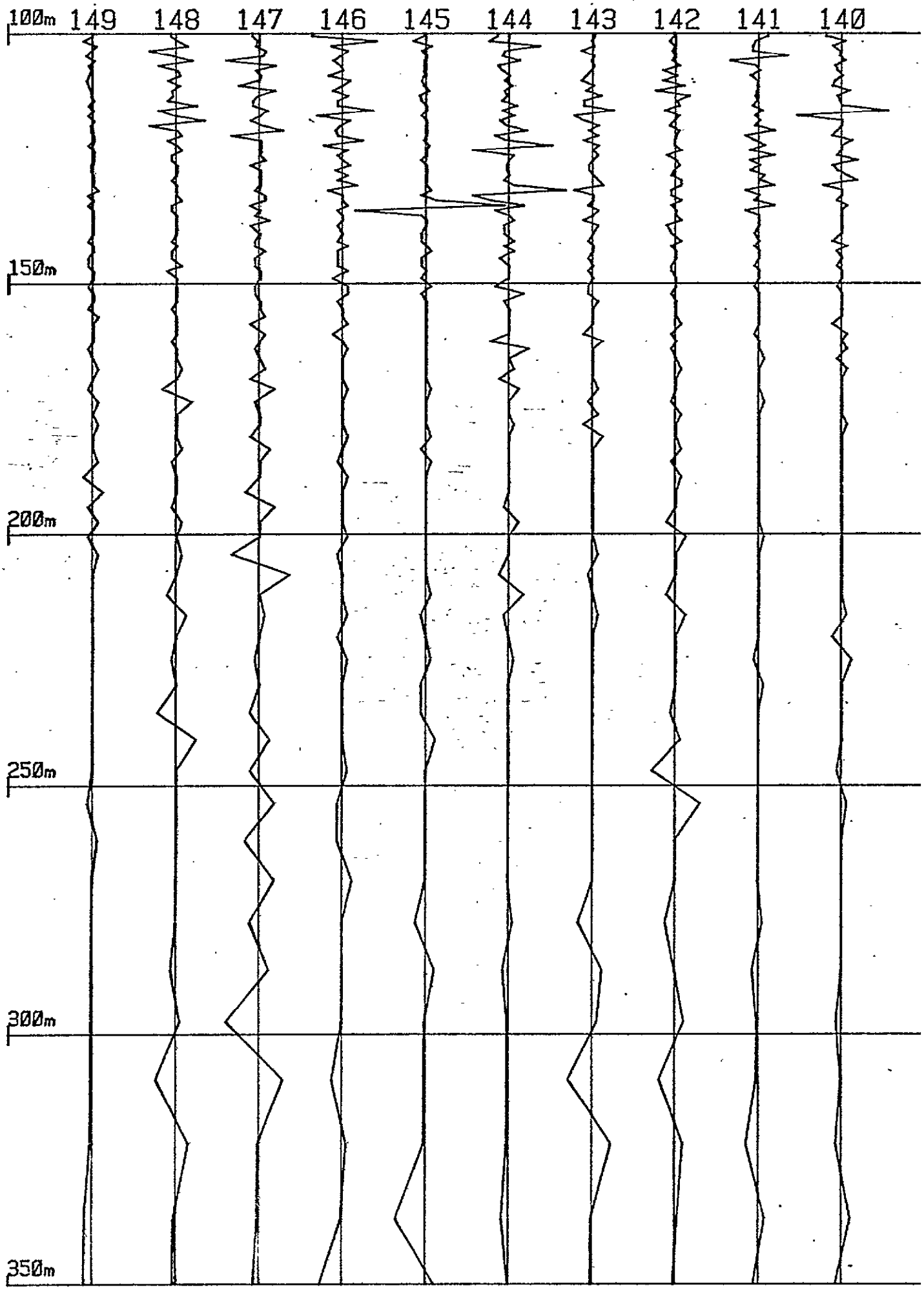
160 159 158 157 156 155 154 153 152 151


162 161


100m
119
118
117
116
115
114
113
112
111
110
150m
200m
250m
300m
350m


100m
129
128
127
126
125
124
123
122
121
120
150m
200m
250m
300m
350m


100m
139
138
137
136
135
134
133
132
131
130
150m
200m
250m
300m
350m


100m
149
148
147
146
145
144
143
142
141
140
150m
200m
250m
300m
350m

AGER, BERRETTA & ASSOCIATES INC.

Telephone: (604) 669-7748
CONSULTING
GEOPHYSICISTS
206 - 595 Howe Street
Vancouver, B.C., Canada
V6C 2T5

SUMMARY

Reconnaissance gravity lines were run across potential coal bearing areas near Chetwynd, B.C.. The method has been successful in that anomalous responses indicative of coal deposits were obtained and drill targets have been located.

Respectfully submitted,

Gordon Ellis,
January 1981

GOODRICH COAL SURVEY

At the request of Gulf Canada Resources Inc. Ager, Berretta & Associates completed a reconnaissance coal survey west of Chetwynd, B.C. The purpose of the survey was to test the effectiveness of the gravity method to locate relatively deeply buried coal deposits and to define drill targets.

SURVEY PROCEDURES

The crew stayed in Chetwynd and drove to and from the survey area. The terrain is relatively flat and survey lines were run along roads at right angles to the assumed geological strike. Station spacing was 15 metres on all lines. Elevations were obtained through standard leveling methods using a Pacific SM-2 automatic level. Station elevations are within a relative accuracy of $\pm$0.01 feet. Elevation datum is arbitrary.

Gravity observations were made using a LaCoste & Romberg Model G gravity meter (serial no. 199) with reading accuracy of $\pm$ 0.02 milligals. Instrument and diurnal drift were accounted for by periodically tying into base stations established in the field and tying into National Network station 9167-67 in Chetwynd every morning and evening. Absolute gravity in the survey areas can be determined through the ties to the National Network station.

GEOLOGIC PARAMETERS

The survey targets lie beneath 100 or more metres of alluvial overburden. The bedrock is highly folded sediments. Drill holes have intersected coal, one section of which was over 100 metres thick. The attitude of the coal is unknown and the 100 metre intersection may be down dip or through a series of tightly folded sections of a much narrower seam. Some of the

other drill holes have intersected relatively narrow seams.

Topography of the overburden/bedrock interface is unknown but it could include considerable relief and be the source of gravity anomalies.

SURVEY RESULTS

The three gravity lines completed will be referred to as follows:

a) top road line, 27 stations, 390 metres long;
b) middle road line, 12 stations, 165 metres;
c) bridge road line, 68 stations, 1005 metres;

Bridge Road Line

The bridge road line (Figure 1) gravity data yields two anomalous zones, one centered at 210 west (station 13) and the other centered at 525 west (station 36). Both anomalies are approximately 0.4 milligals in magnitude. The anomaly at 210 west is coincident with the drill hole which intersected over 100 metres of coal. The gravity response suggests that the true thickness of actual coal is much less - in the order of 30 metres or less depending on the density contrast between the coal and host rock.

The anomaly at 540 west is of the same order of magnitude. The symmetry of the response suggest that the source of the anomaly is dipping fairly steeply to the west. Drill hole location is recommended at 540 west.

There may be a third anomaly on the west end of the grid (990 west) but the data does not extend far enough west to properly define the anomaly. As a lower priority target a drill hole would be placed at 990 west.

Middle Road Line

The middle road line (Figure 2) is too short to delineate any targets of the size or at the assumed depth of those on the bridge road line. There is a gravity anomaly centered at approx -imately 122 west but the magnitude and extent of this response suggests that it is caused by a near surface source. If the overburden were found to be only a few metres thick here, this would become a drill target. If the source is a coal seam, the gravity response suggests that it is very steeply dipping and only a few metres wide. Drill hole location would be critical in this situation.

Top Road Line

The gravity response on this line (Figure 3) exhibits an anomaly almost identical to those on the bridge road line. Symmetry of the response indicates that the source is dipping moderately to the west. A drill hole located at 110 west should explain the source of this anomaly.

CONCLUSION

The gravity survey has defined three primary drill targets, two on the bridge road line and one on the top road line, and two secondary targets. The effectiveness of the system will be determined by the results of the drilling program.

APPENDIX

GRAVITY FUNDAMENTALS

There are a number of steps required in order to obtain meaningful, relative gravity values from raw field data. The final values are referred to as Complete Bouguer Gravity and are derived from the following components;

g_o = observed gravity = field observations corrected for drift and adjusted to National Grid Base.

g_{fa} = free air effect = correction for the relative distance of observation points from the center of mass (earth). This calculation moves all stations to a common elevation and corrects for relative differences in distance from the source mass.

g_{bs} = bouguer slab effect = correction for the relative differences in amounts of surface rock below gravity stations. This calculation requires that a mean density or rock type between the lowest and highest grid elevations be established. All stations are shifted to a common datum as in the free air effect except that the vertical change is through an assumed slab of the derived density.

g_l = latitude correction - correction for change of observed gravity with change in latitude - due primarily to the difference in the earth's radius between the poles and equator.

g_t = terrain correction = correction for variations caused by local terrain. The vertical component of the gravitional effect exerted by nearby hills, or not exerted by valleys or gullys, will effect the net reading obtained at any one station. The overall effect on a given line profile or grid area will be a function of the station spacing relative to the frequency of the terrain correction.

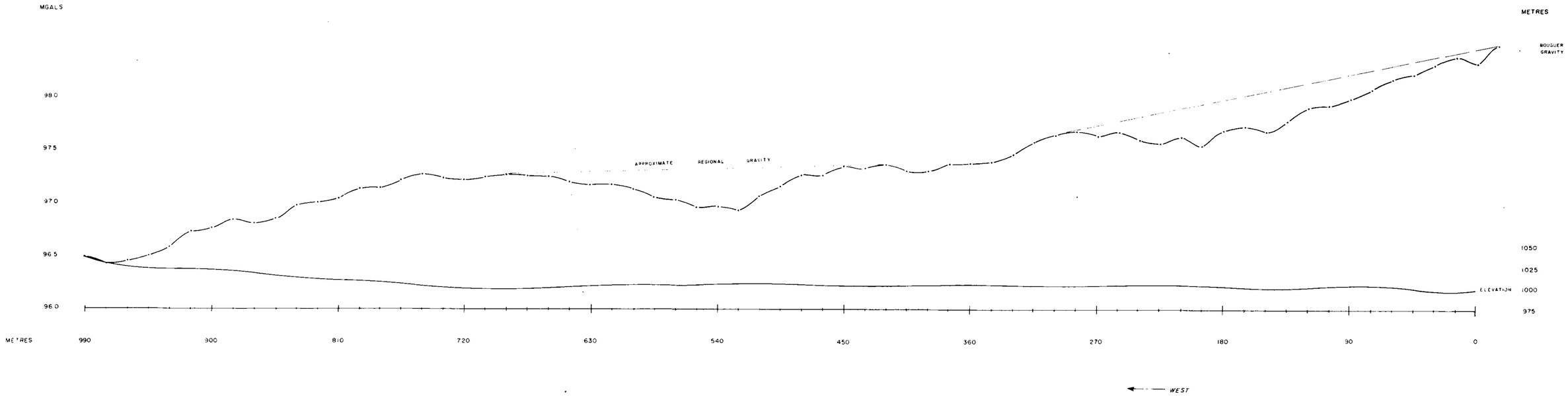
Accurate and appropriate application of the above corrections yields Complete Bouguer Gravity values which are in theory, free from all effects excepts those caused by realtive changes in density within rock units below the survey area.

$G_{cb} = g_o - (g_{fa} + g_{bs} + g_l + g_t) =$ Complete Bouguer Gravity.

Changes in relative gravity values which may result in "anomalous" readings are a function of;

- the difference in densities between rock units.
- the sizes of rock units relative to each other and relative to the grid spacing or "target" size.
- the distance from the area of density contrast to the observation points.

For example; steeply dipping, near surface massive sulphide deposits or coal seams will give sharp featured gravity anomalies, the former greater than background, the latter less than background. Density contrasts at depth, such as slopes or changes in basement stratigraphy, will result in very low frequency changes, often referred to as gradients.



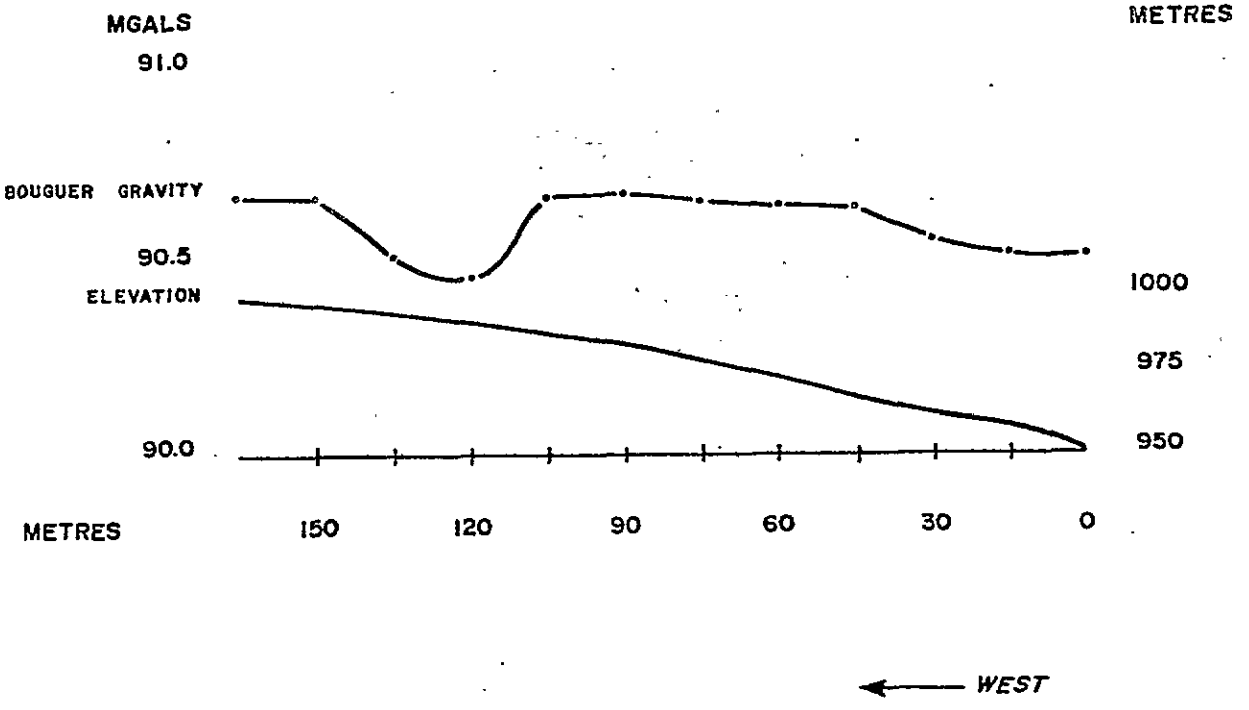
GULF - GOODRICH COAL

BOUGUER PROFILE
BRIDGE ROAD LINE

DATE: JAN 1981

AGER, BERRETTA & ASSOC
VANCOUVER, B C

FIGURE 1



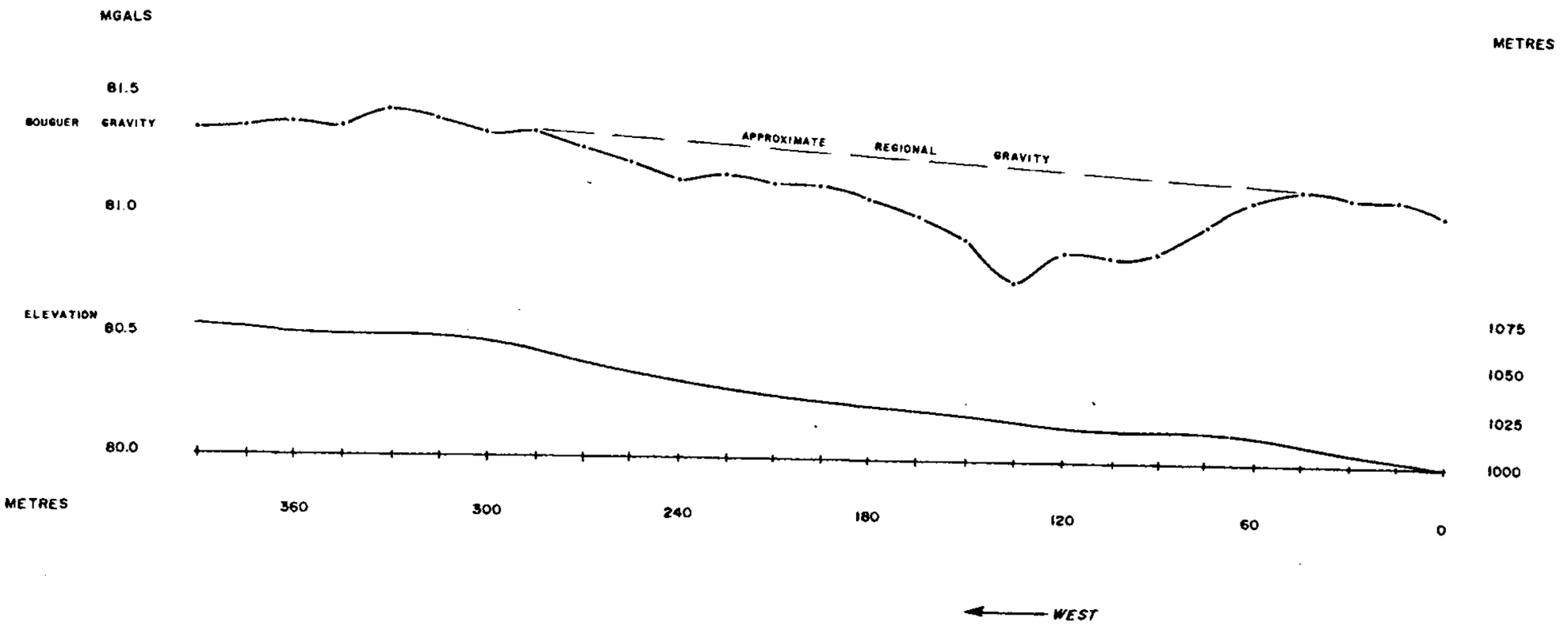
GULF - GOODRICH COAL

BOUGUER PROFILE
MIDDLE ROAD LINE

DATE : JAN. 1981

AGER, BERRETTA & ASSOC.
VANCOUVER, B.C.

FIGURE 2



GULF - GOODRICH COAL

BOUGUER PROFILE
TOP ROAD LINE

DATE : JAN. 1981

AGER, BERRETTA & ASSOC.
VANCOUVER, B.C.

FIGURE 3

GD2850-2

AER

GULF CANADA RESOURCES LTD.

OPERATIONS REPORT

MINI-SOSIE TEST

GOODRICH COAL PROPERTY, CHETWYND, B. C.

(APRIL 1981)

COMPAGNIE GENERALE DE GEOPHYSIQUE

CONTENTS

ENCLOSURES

1. INTRODUCTION

From April 11 to April 22, 1981, Compagnie Generale de Geophysique conducted a high resolution seismic survey for Gulf Canada Resources Ltd., using the Mini-Sosie* technique.

The area of study was located approximately 70 kilometres to the southwest of Chetwynd, B. C., on a Canfor logging access road.

The survey was performed as an experiment to determine the suitability of the Mini-Sosie method for coal exploration in this region.

The target zone of the survey is a series of coal seams in the Upper Gething Formation of the Bullhead Group. The depth of the target zone is between 0 and 150 milliseconds two-way time. Overburden is variable from 0 to 50 metres in thickness, and the coal seams themselves generally vary in thickness from 10 to 100 metres. The geology is very complicated tectonically, characterized by overthrusting strong dips, and several generations of folding. The eastern end of the line is characterized by a thin layer of overburden, and simpler tectonic structures.

Approximately eight and a half kilometres of line were shot.

2. FIELD CONDITIONS

The program was shot between kilometre 37.5 and kilometre 46 on a Canfor logging access road which cuts off Highway 97, approximately 30 kilometres southwest of Chetwynd. The terrain condition itself was relatively good, being snow-covered for the first half of the survey and generally muddy during the latter part. It was necessary to have a grader clear the road for initial access to the survey location. The area was mountainous, with considerable changes in elevation along the survey line.

Access to the line from Highway 97 was very good, except during periods of heavy snow.

The ambient noise was occasionally high, due to gusting wind conditions and the difficulty in planting the geophones solidly into the still frozen surface of the side of the road.

3. PROGRAM

The program consisted of one line along the existing Canfor logging road between kilometre 37.5 and kilometre 46. It was preceded by three tests to determine the most suitable shooting parameters. Test 1 spread was located between flags 553+5 and 576+5, with shots at both east and west ends of the spread. Test 2 spread was located between flags 183+5 and 206+5, again with shots at both ends of the spread. Test 3 was located at flag 118, at

* Trademark of Elf-Aquitaine (Production)

the west end of the line. More than one noise spread was necessary because of the variation in the depth of the overburden from west to east, and because of variation in structural complexity along the seismic line. The corresponding arrays and field operations are described in detail in the monthly report.

All tapes of tests, as well as of production lines, were returned to CGG Data Processing in Calgary for processing.

4. COMPOSITION OF CREW

4.1 Personnel

1 Supervisor
1 Party Manager
1 Observer
1 Surveyor
1 Mechanic
1 Line Truck Driver
5 Helpers

4.2 Vehicles

1 4x4 Recording Truck
1 4x4 Cable and Geophone Truck
1 4x4 Wacker and Spares Truck
1 4x4 Survey Vehicle (Bronco)
1 4x4 Liaison Vehicle

4.3 Equipment

1 24-channel Mini-Sosie Unit made up by interfacing two Input/Output DHR-1632 MS 12-channel Recorders/Processors and Single Tape/Plotter Unit

500 or 1000 samples per channel

Sign-bit recording option

Sample rates: 1/4, 1/2, 1, 2 and 4 ms.

Record length (configuration dependent): 1/8, 1/4, 1/2, 1, 2 or 4 seconds

1	Input/Output RLS-120-24 Rotalong Switch
1	Input/Output MSA-1 Multiple Source Adapter
20	Input/Output SS-1 Source Sensors
1	Tektronics Storage Oscilloscope
4	Wacker GVR 200 Y Rammers (220 lb. each)
3	Wacker GVR 151Y Rammers (150 lbs. each)
441	Mark Products L25E 40 Hz geophones on 49 strings
72	Take-outs on 12 x 6 50-pair Random Lay Cables, take-out interval = 20 metres
2	50-pair 200 metre jumper cables
2	Reels of sensor cable (2,800 ft., 8 conductors)
2	Motorola portable transceiver (5 watts)
1	Wild TO compass theodolite and rod
1	Hewlett-Packard HP-19C programmable calculator
3	General Electric Portable Transceivers

5. PRODUCTION AND STATISTICS

The detailed figures are shown in the attached monthly report. In summary, moving time to and from the field represented approximately 25% of the total time, and the average number of shots per day was 83.

6. TOPOGRAPHIC OPERATIONS

The instruments used were a Wild TO compass theodolite and an inverted rod.

X, Y and Z have been surveyed every three stations (30 metres) from station 101 to station 196.

From station 196 to station 950, every four stations (40 metres) were surveyed.

Coordinates are computed from the values given by Gulf on drill holes along the side of the seismic line. Although coordinates for 50 drill holes were supplied, the surveyor was able to locate only four of these. These four drill holes—DH 29, DH 52, DH 53 and DH 01 were used to establish a bearing (26° 00').

Two closures were made to complete the survey. The first closure between DH 29 and DH 01 tied within three metres for the X - Y coordinates. For the elevation, there was no error in the closure. The second closure, starting at DH 01 and ending back at DH 01 which covers a distance of 12 kilometres, was in error by 10 metres on the Y coordinate and one metre on the X coordinate.

For the elevation, there was an error of one metre.

After completion of the survey, tags were nailed to trees and posts at approximately every 250 metres, and all flags were picked up and removed.

7. PRODUCTION PARAMETERS

Sampling: 1 millisecond

Record Length: 0.5 seconds

CDP Coverage: 1200%

Low Cut Filter: 30 Hz

Trace Interval: 10 metres

Offset: 90 metres

Geophone Array: 9 geophones in a line spread over 30 metres

Ramming Segment: 10 metres

Number of Pops: 1300 with 2 rammers

Geophones, shot point patterns, offset values, etc., are described in detail in the attached monthly report.

8. TESTS

Tests were carried out on two noise spreads, followed by a few final tests at the west end of the line.

Test #1

The first test position consisted of a noise spread of 24 groups of bunched geophones, laid out between flags 553+5 and 576+5. Two shots, with offsets of 5 metres and 10 metres were carried out immediately to the west of flag 553+5, and two shots to the east of flag 576+5, also with offsets of 5 metres and 10 metres.

The first breaks show only one distinct layer, with a velocity of approximately 4,000 metres/second.

The ground roll velocity ranges from 1100 metres/second to 1800 metres/second, with a period of from 15 to 25 milliseconds, a wave length varying between 16 and 40 metres, and a frequency of approximately 40 to 60 Hz.

This first test was carried out in an area of little to no overburden. The reflections of most interest occur from 0 to 150 milliseconds. Because of the shallow depth of the target zone, these reflections interfere with both the first breaks and with the ground roll.

Test #2

The second test position consisted of a noise spread of 24 groups of bunched geophones, laid out between flags 183+5 and 206+5. Two shots, with offsets of 5 metres and 10 metres were carried out immediately to the west of flag 183+5, and two shots to the east of flag 206+5, also with offsets of 5 and 10 metres.

The first breaks show two distinct layers:

a) 2000 metres/second (overburden)
b) 3300 - 3500 metres/second

The ground roll velocity ranges from 450 metres/second to 1000 metres/second:

VELOCITY	FREQUENCY	WAVE LENGTH
450 m/s	20 - 30 Hz	13 - 22 metres
500 m/s	25 - 30 Hz	15 - 20 metres
1000 m/s	25 Hz	40 metres

This second test was carried out in an area with overburden to a depth of approximately 25 to 30 metres. Again, the reflections of most interest occur at around 100 milliseconds, and interfere with both the first breaks and the ground roll.

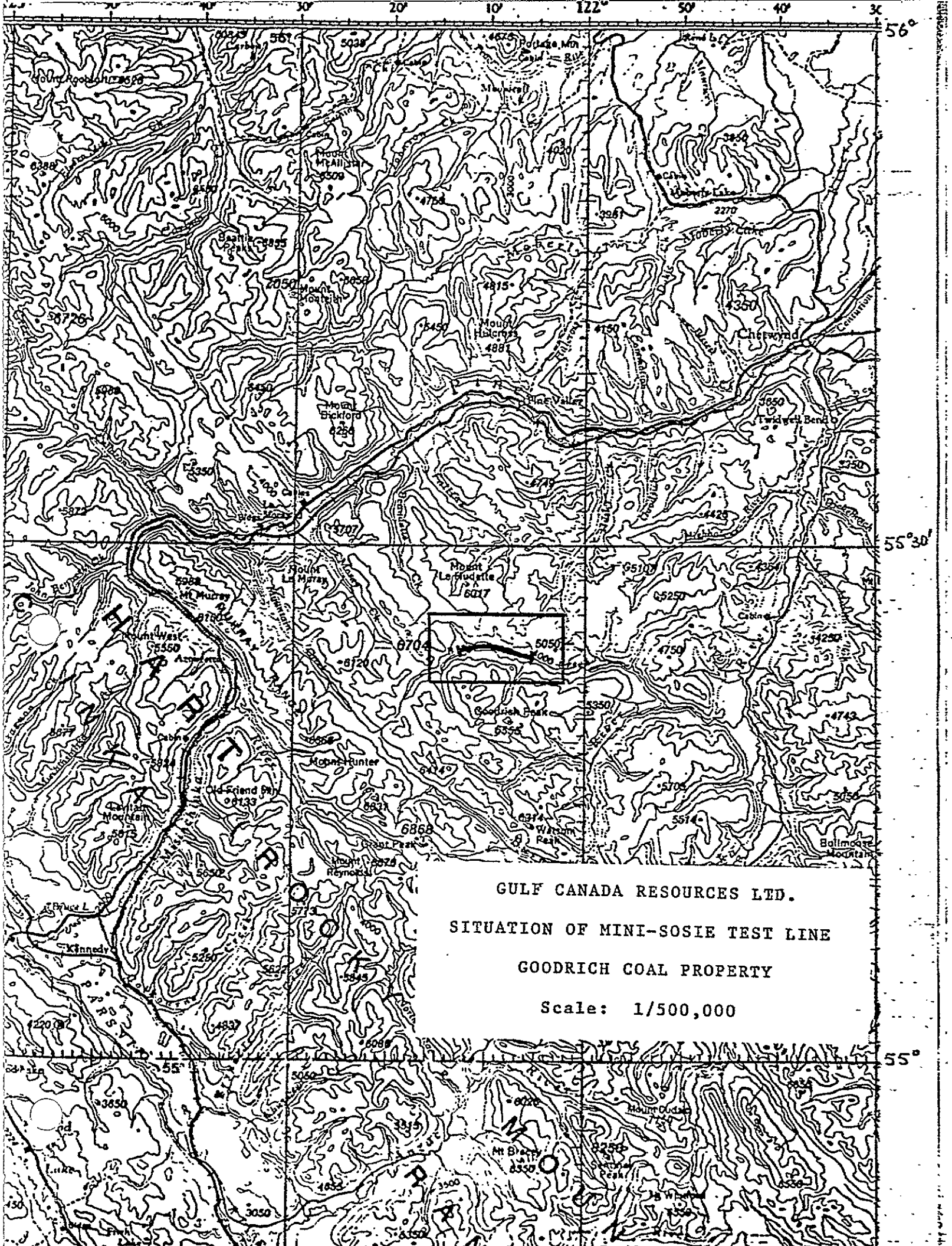
Because the layers of interest are very shallow, the chosen configuration was a split-spread with an offset of 45 metres either side of the shot point, and the recording patch at a distance of from 45 to 155 metres either side of the shot point.

Further tests were performed using 30 Hz, 50 Hz and 60 Hz low-cut filters. The low-cut filter of 30 Hz was then chosen to be applied for the survey.

The geophones were spread over a distance of 30 metres to attenuate some of the ground roll, with a new group of geophones beginning every 10 metres.

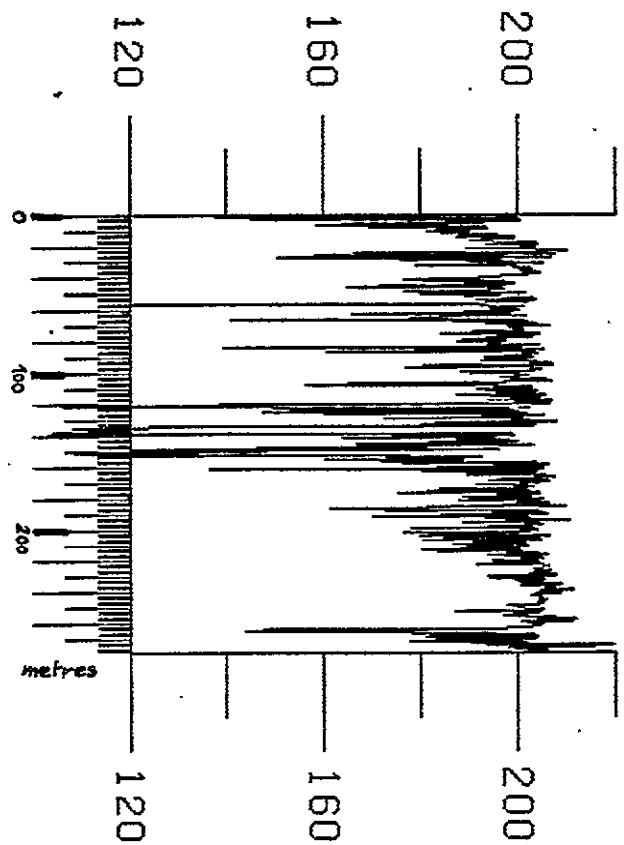
9. CONCLUSIONS

The field results of this program were of varying quality, partially dependent on depth of overburden. Discontinuous shallow reflections were observed, generally with steep dips. Discontinuous reflections at greater depths were also observed.


GULF CANADA RESOURCES LTD.
SITUATION OF MINI-SOSIE TEST LINE
GOODRICH COAL PROPERTY
Scale: 1/500,000

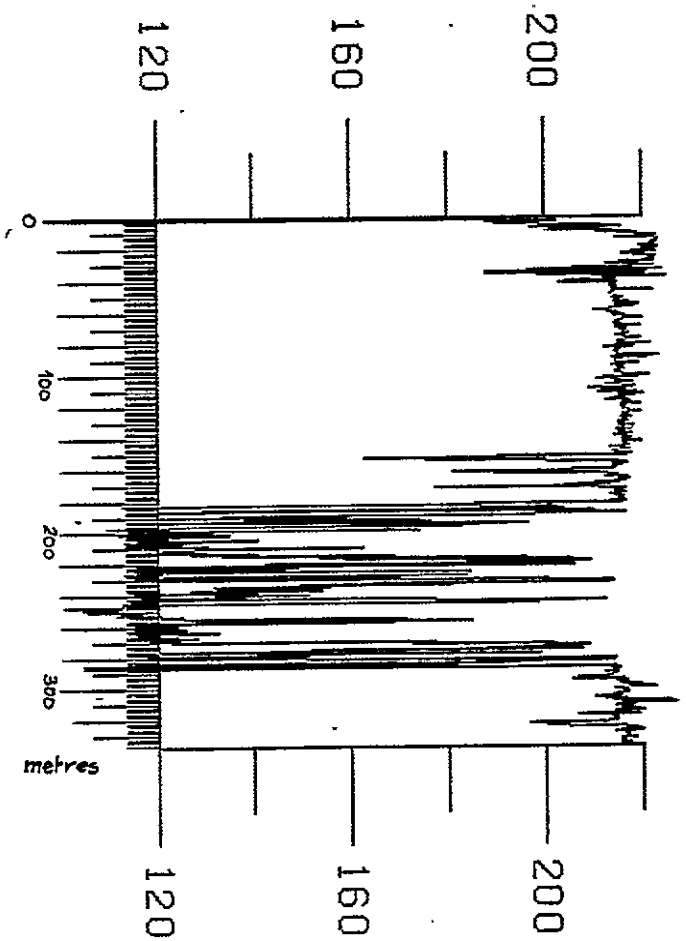
532

DIGITIZING VERIFICATION PLOT
TIME 13.49.37.
DATE 27/05/81
WELL- GULF GR 80-11 GOODRICH
THIS IS A DENSITY LOG
DEPTH SCALE = 125.0000 M./IN.
VERTICAL SCALE = 40.0000 GM./CC./IN.



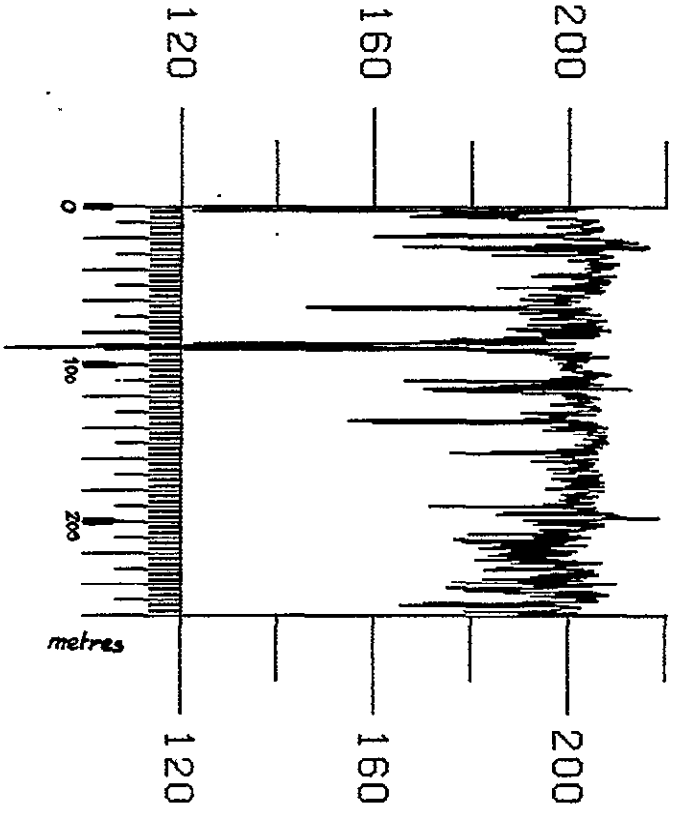
532

DIGITIZING VERIFICATION PLOT
TIME 13.38.15.
DATE 27/05/81
WELL- GULF 80-19 GOODRICH
THIS IS A DENSITY LOG
DEPTH SCALE = 125.0000 M./IN.
VERTICAL SCALE = 40.0000 GM./CC./IN.



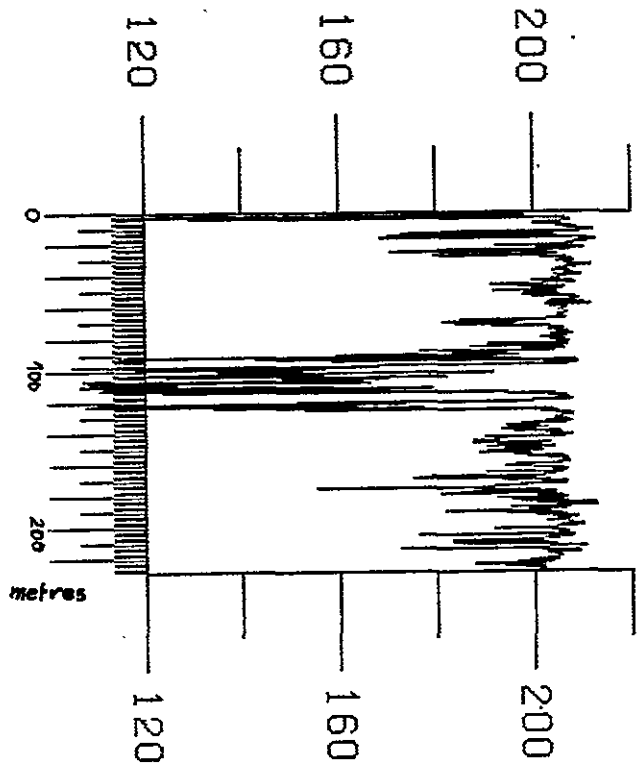
532

DIGITIZING VERIFICATION PLOT
TIME 13.57.45.
DATE 27/05/81
WELL- GULF GR-80-12
THIS IS A DENSITY LOG
DEPTH SCALE = 125.0000 M./IN.
VERTICAL SCALE = 40.0000 GM./CC./IN.



532

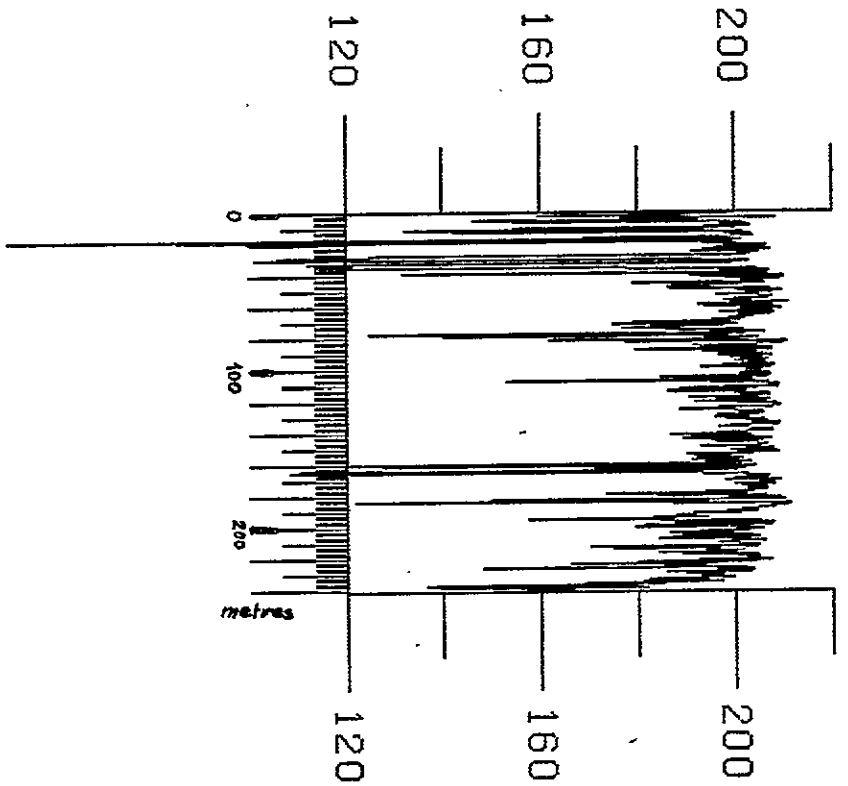
DIGITIZING VERIFICATION PLOT
TIME 13.45.50.
DATE 27/05/81
WELL- GULF GR 80-08 GOODRICH
THIS IS A DENSITY LOG
DEPTH SCALE = 125.0000 M./IN.
VERTICAL SCALE = 40.0000 GM./CC./IN.



PR-Goodrich 81(11)A

532

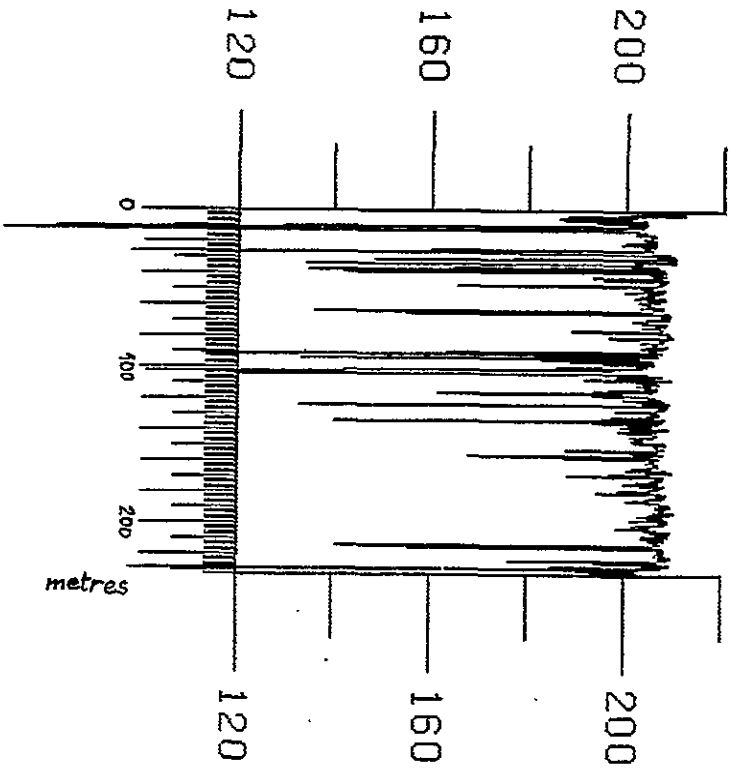
DIGITIZING VERIFICATION PLOT
TIME 14.02.05.
DATE 27/05/81
WELL- GULF GR 80-13 GOODRICH
THIS IS A DENSITY LOG
DEPTH SCALE = 125.0000 M./IN.
VERTICAL SCALE = 40.0000 GM./CC./IN.



PR-Goodrich 81(11)A

532

DIGITIZING VERIFICATION PLOT
TIME 13.53.05.
DATE 27/05/81
WELL- GULF GR-80-02 GOODRICH
THIS IS A DENSITY LOG
DEPTH SCALE = 125.0000 M./IN.
VERTICAL SCALE = 40.0000 GM./CC./IN.



PR-Goodrich 81(11)A

532 X Y Z COORDINATES

JOB # _____ LINE GULF 1 DATE APRIL/81

LINE DIRECTION WEST to EAST SP. SPACING 10 METRE

CLIENT GULF AREA GOODRICH

SHOTPOINT	X EAST	Y NORTH	Z
101	549638	138929	
103	549657	138926	
106	549688	138929	
109	549717	138932	
112	549745	138941	
115	549775	138945	
118	549805	138949	
121	549831	138940	
124	549865	138961	
127	549894	138968	
130	549923	138975	
DH 13	549930.0	139000.0	
133	549952	138982	
136	549981	138989	
139	550009	138996	
142	550039	139002	
145	550069	139008	
148	550097	139020	
151	550123	139035	
154	550151	139047	
DH 12	550160.4	139098.2	
157	550179	139059	
160	550208	139071	
163	550234	139081	
166	550264	139092	

REMARKS: _____

SURVEYOR J GODNEY ___ FEET OR X METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X EAST	Y NORTH	Z
169	550 290	139104	
172	550317	139118	
DH 09	550 319.0	139106.60	
175	550343	139131	
178	550370	139144	
181	550398	139156	
184	550 423	139167	
DH 11	550 424.3	139189.4	
187	550452	139180	
190	550479	139194	
193	550 507	139 207	
FOUND DH 29	550 515.8	139 189.70	
196	550 531	139221	
200	550 567	139240	
204	550 602	139261	
208	550 636	139282	
212	550 669	139 304	
DH 08	550 690	139 338	
216	550704	139 324	
220	550738	139 346	
224	550772	139 365	
228	550 806	139 386	
DH 26	550827	139 376	
232	550 842	139 404	
236	550 875	139 425	
FOUND DH 52	550 889.7	139 447.9	

REMARKS: FROM STA 101 to 196 I SURVEYED EVERY 3rd STATION. AFTER THAT (196 to 950) I SURVEYED EVERY 4

SURVEYOR J. GODSEY ___ FEET OR X METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
240	550910	139445	
244	550945	139464	
DH 14	550962.6	139496.3	
248	550979	139485	
252	551014	139505	
256	551048	139525	
FOUND DH 53	551051.6	139550.9	
260	551082	139545	
264	551118	139565	
DH 15	551125.3	139554.9	
268	551153	139585	
272	551189	139604	
276	551223	139623	
ACCESS CREEK BRIDGE	551248	139637	
280	551258	139643	
284	551292	139664	
288	551327	139685	
292	551362	139705	
296	551399	139717	
300	551439	139720	
304	551478	139717	
308	551518	139710	
312	551556	139699	
316	551594	139688	
320	551632	139677	
324	551670	139665	

REMARKS: _____

SURVEYOR _____ ___ FEET OR X METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
328	551709	139652	
332	551746	139637	
336	551782	139621	
340	551819	139605	
344	551857	139591	
348	551895	139577	
352	551934	139565	
356	551972	139554	
360	552011	139543	
364	552050	139529	
DH03	552055.0	139510.0	
366	552069	139523	
370	552 ~~104~~ 109 10T	139 ~~479~~ 511 511	
374	552145	139501	
DH 02	552150.1	139568.9 NOT SURE	
378	552186	139497	
382	552226	139499	
386	552266	139498	
390	552306	139495	
DH 01 FOUND	552322.9	139572.3	
394	552345	139490	
398	552385	139485	
402	552425	139482	
406	552465	139482	
410	552505	139481	
414	552545	139479	

REMARKS: _____

SURVEYOR _____ ___ FEET OR X METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
418	552 585	139 479	
422	552 625	139 479	
426	552 665	139 481	
430	552 705	139 480	
434	552 745	139 480	
438	552 785	139 480	
442	552 825	139 480	
446	552 865	139 478	
450	552 904	139 474	
454	552 945	139 472	
458	552 985	139 471	
462	553 025	139 472	
466	553 064	139 474	
470	553 105	139 472	
474	553 145	139 473	
478	553 185	139 469	
482	553 224	139 462	
486	553 263	139 459	
490	553 303	139 463	
494	553 342	139 472	
498	553 379	139 485	
502	553 417	139 497	
506	553 457	139 490	
510	553 493	139 474	
514	553 528	139 454	
518	553 561	139 431	

REMARKS: _____

SURVEYOR _____ ____ FEET OR ____ METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
522	553 597	139 413	
526	553 633	139 395	
530	553 671	139 382	
534	553 709	139 371	
538	553 746	139 357	
542	553 784	139 342	
546	553 821	139 328	
DH 07	553 823.5	139 532	
550	553 859	139 315	
554	553 896	139 301	
558	553 934	139 287	
562	553 972	139 274	
566	554 011	139 265	
570	554 049	139 254	
574	554 088	139 243	
578	554 126	139 231	
582	554 165	139 221	
586	554 203	139 209	
DH 04	554 211.3	139 277.3	
590	554 241	139 197	
594	554 278	139 182	
598	554 316	139 169	
602	554 354	139 157	
606	554 393	139 146	
610	554 431	139 135	
614	554 469	139 122	

REMARKS: _____

SURVEYOR _____ ___ FEET OR X METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
618	554508	139113	
622	554547	139113	
626	554587	139117	
630	554625	139130	
634	554665	139135	
638	554704	139131	
642	554744	139128	
646	554785	139127	
650	554825	139129	
654	554866	139127	
658	554906	139127	
662	554946	139124	
666	554986	139121	
670	555026	139118	
BRIDGE 674	555066	139118	
678	555106	139121	
682	555146	139123	
686	555183	139113	
690	555220	139096	
694	555257	139081	
698	555295	139067	
702	555333	139055	
706	555372	139047	
710	555412	139046	
714	555452	139049	
718	555492	139050	

REMARKS: _____

SURVEYOR _____ ___ FEET OR X METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
722	555 532	139 053	
726	555 570	139 060	
730	555 610	139 065	
734	555 641	139 059	
738	555 682	139 049	
742	555 717	139 032	
746	555 753	139 013	
750	555 789	138 996	
754	555 828	138 986	
758	555 867	138 977	
762	555 904	138 961	
766	555 938	138 941	
770	555 973	138 921	
774	556 009	138 902	
778	556 044	138 882	
782	556 079	138 862	
786	556 111	138 839	
790	556 143	138 816	
794	556 178	138 796	
798	556 214	138 779	
802	556 253	138 767	
806	556 291	138 755	
810	556 330	138 741	
814	556 367	138 728	
818	556 405	138 714	
822	556 442	138 701	

REMARKS: _____

SURVEYOR _____ ___ FEET OR X METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
826	556483	138691	
830	556522	138682	
834	556561	138671	
838	556599	138658	
842	556635	138642	
846	556672	138627	
850	556709	138610	
854	556742	138587	
858	556772	138558	
862	556800	138530	
866	556829	138502	
870	556862	138480	
874	556896	138459	
878	556928	138436	
882	556967	138428 ?	
886	556997	138394	
890	557037	138386	
894	557078	138380	
898	557117	138374	
902	557156	138366	
906	557195	138361	
910	557236	138358	
914	557276	138356	
918	557315	138351	
922	557355	138343	
926	557393	138333	

REMARKS: _____

SURVEYOR _____ ___ FEET OR _X_ METERS

X Y Z COORDINATES

JOB # _____ LINE _____ DATE _____

LINE DIRECTION _____ SP. SPACING _____

CLIENT _____ AREA _____

SHOTPOINT	X	Y	Z
930	557432	138321	
934	557470	138309	
938	557508	138297	
942	557545	138283	
946	557584	138270	
950	557622	138258	

REMARKS: _____

SURVEYOR _____ ___ FEET OR X METERS

PR- Goodrich 81 (11)A

COMPAGNIE GENERALE de GEOPHYSIQUE

532

SHOT HOLES ELEVATION

Company: GULF Party: Licence: 1666 Permit:

Area: GOODRICH MNT. Line: GULF 1 Date: APRIL/81

Nr	FEET m	Nr	FEET m	Nr	FEET m	Nr	FEET m	Nr	FEET m	Nr	FEET m	Nr	FEET m
101	1058.3	216	1029.6	324	1030.6	434	1034.9	550	1026.6	6666	1024.4	782	1044.-
104	1058.2	220	1030.0	328	1029.6	438	1035.1	554	1027.5	670	1022.8	786	1047.1
108	1058.5	224	1030.3	332	1028.8	442	1034.9	558	1027.3	674	1022.7	790	1048.9
112	1058.2	228	1030.2	336	1029.1	446	1034.2	562	1028.6	678	1021.2	794	1049.6
116	1057.9	232	1030.1	340	1029.5	450	1032.9	566	1031.7	682	1020.9	798	1050.2
120	1055.5	236	1030.3	344	1030.0	454	1032.0	570	1033.9	686	1020.9	802	1051.4
124	1051.6	DH 52	1030.6	348	1030.3	458	1030.5	574	1035.5	690	1020.8	806	1051.5
128	1048.5	240	1030.5	352	1030.3	462	1029.2	578	1037.8	694	1021.0	810	1053.1
132	1045.0	244	1030.6	356	1030.7	466	1027.9	582	1039.9	698	1024.1	814	1054.-
136	1041.8	248	1030.5	360	1031.0	470	1026.9	586	1040.7	702	1028.4	818	1055.3
140	1041.6	252	1030.5	364	1033.2	474	1024.3	590	1041.5	706	1031.3	822	1055.4
144	1042.3	256	1030.6	366	1034.0	478	1023.0	594	1041.6	710	1032.3	826	1056.3
148	1042.9	DH 53	1030.8	370	1034.7	482	1023.9	598	1042.2	714	1032.9	830	1058.3
152	1042.5	260	1030.8	374	1035.3	486	1023.2	602	1042.8	718	1033.1	834	1059.4
156	1042.7	264	1030.9	378	1037.3	490	1021.9	606	1043.9	722	1030.2	838	1060.1
160	1043.3	268	1031.0	382	1036.9	494	1017.5	610	1043.5	726	1025.3	842	1060.-
164	1043.8	272	1030.7	386	1036.3	498	1015.1	614	1039.5	730	1028.0	846	1061.1
168	1043.9	276	1030.0	DH 01	1038.3	502	1017.8	618	1036.3	734	1031.6	850	1061.4
172	1043.2	280	1029.8	390	1035.6	506	1019.9	622	1033.8	738	1031.6	854	1061.-
176	1041.5	284	1028.5	394	1035.5	510	1019.7	626	1033.0	742	1032.6	858	1061.-
180	1037.0	288	1028.0	398	1035.5	514	1019.5	630	1029.7	746	1033.9	862	1059.-
184	1035.9	292	1028.4	402	1035.8	518	1019.3	634	1026.8	750	1034.5	866	1057.-
188	1035.4	296	1031.1	406	1035.3	522	1019.60	638	1028.6	754	1034.9	870	1053.1
192	1033.0	300	1032.1	410	1034.7	526	1020.8	642	1031.3	758	1035.2	874	1051.-
196	1031.9	304	1032.0	414	1034.3	530	1023.2	646	1031.8	762	1037.3	878	1050.-
200	1030.6	308	1031.8	418	1034.4	534	1024.6	650	1030.0	766	1040.9	882	1033.-
204	1029.1	312	1031.3	422	1034.5	538	1025.8	654	1028.5	770	1043.5	886	1052.-
208	1028.8	316	1031.5	426	1034.4	542	1026.10	658	1027.5	774	1043.8	890	1050.-
212	1029.0	320	1031.4	430	1034.6	546	1026.3	662	1026.0	778	1042.5	894	1049.-

REMARKS:

COMPAGNIE GENERALE de GEOPHYSIQUE

SHOT HOLES ELEVATION

Company: GULF Party: Licence: 1666 Permit:

Area: GOODRICH Line: GULF 1 Date: APRIL/81

Nr	~~FEET~~	Nr	FEET	Nr	FEET	Nr	FEET	Nr	FEET	Nr	FEET	Nr	FEET
898	1045.6												
902	1040.8												
906	1037.9												
910	1034.2												
914	1028.9												
918	1024.5												
922	1022.6												
926	1021.7												
930	1020.7												
934	1019.7												
938	1018.1												
942	1017.1												
946	1016.6												
950	1016.3												

REMARKS:

532

PR-Goodrich 81(11)A

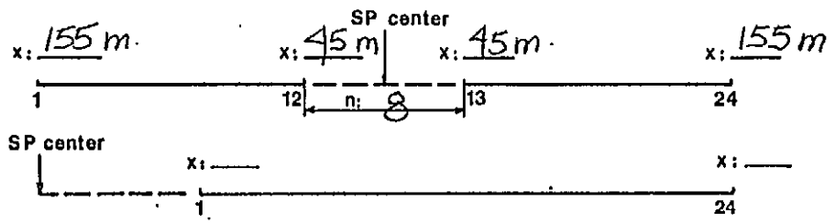
CGG MINI-SOSIE FIELD ACQUISITION PARAMETERS

LINE : 01

CREW: 4992518 CLIENT: GULF RES. DATES SHOT: 12-?? APRIL AREA : GOODRICH STATE: B.C. COUNTY: _____

GEOMETRY (SPLIT) or ~~OFF END~~ GROUP SPACING : 10 m. SHOT SPACING : 10 m. % COVER: 1200%

DIRECTION SHOT W to E TRACE ~~1 or~~ (24 leads (1)) Shot (centered at station) ~~or between stations (1)~~



x: distance from SP center to geophone trace center 1 12 13 24

n: number of dead traces in window

RECORDER Type: DHR 1632 CGG number: _____ N° of channels: 24 Record length: 0.5 Sec. Sample rate: 1 ms.

Constant gains: YES

Filters : low 30 Hz slope _____, high — Hz slope _____, Notch ~~IN or~~ (OUT (1)) Alias 500 Hz slope _____

GEOPHONES Type: L25E Frequency: 40 Hz Number per trace: 9 Length of one geophone spread: 30 m.

Center of trace ~~ON or~~ (BETWEEN flag (1))

SOURCES Type: WACKER 1514 2205 Number of sources: 2 Length of ramming segment : 10 m.

(1) Delete not adapted

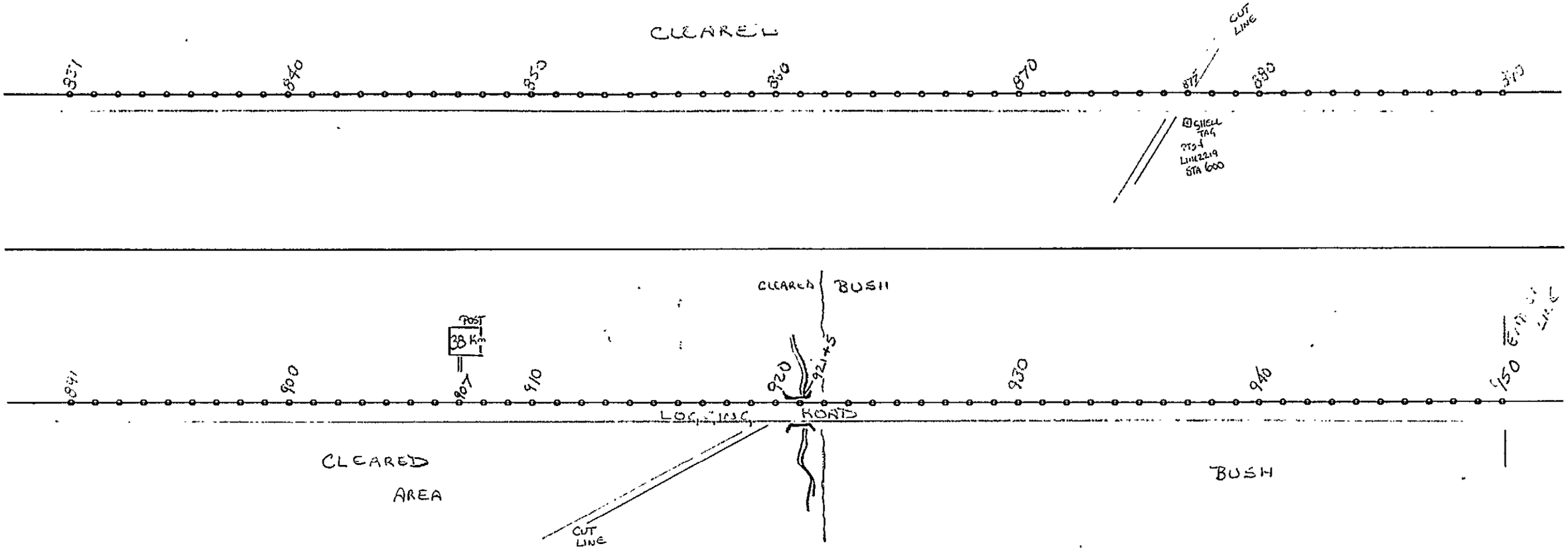
FIELD TAPES N° 001-007

% C.D.P. LINE CHAINING DETAIL REPORT

Prospect _____

Line No. [illegible] LINE APRIL/81 Client GULF Comp. By JOHN GOLDSEN Date APRIL/81 ~~197~~ Party _____

Direction SOUTH Scale → 10 ← Page 5 of 5 Shot Point Spacing [illegible] Hole Pattern _____



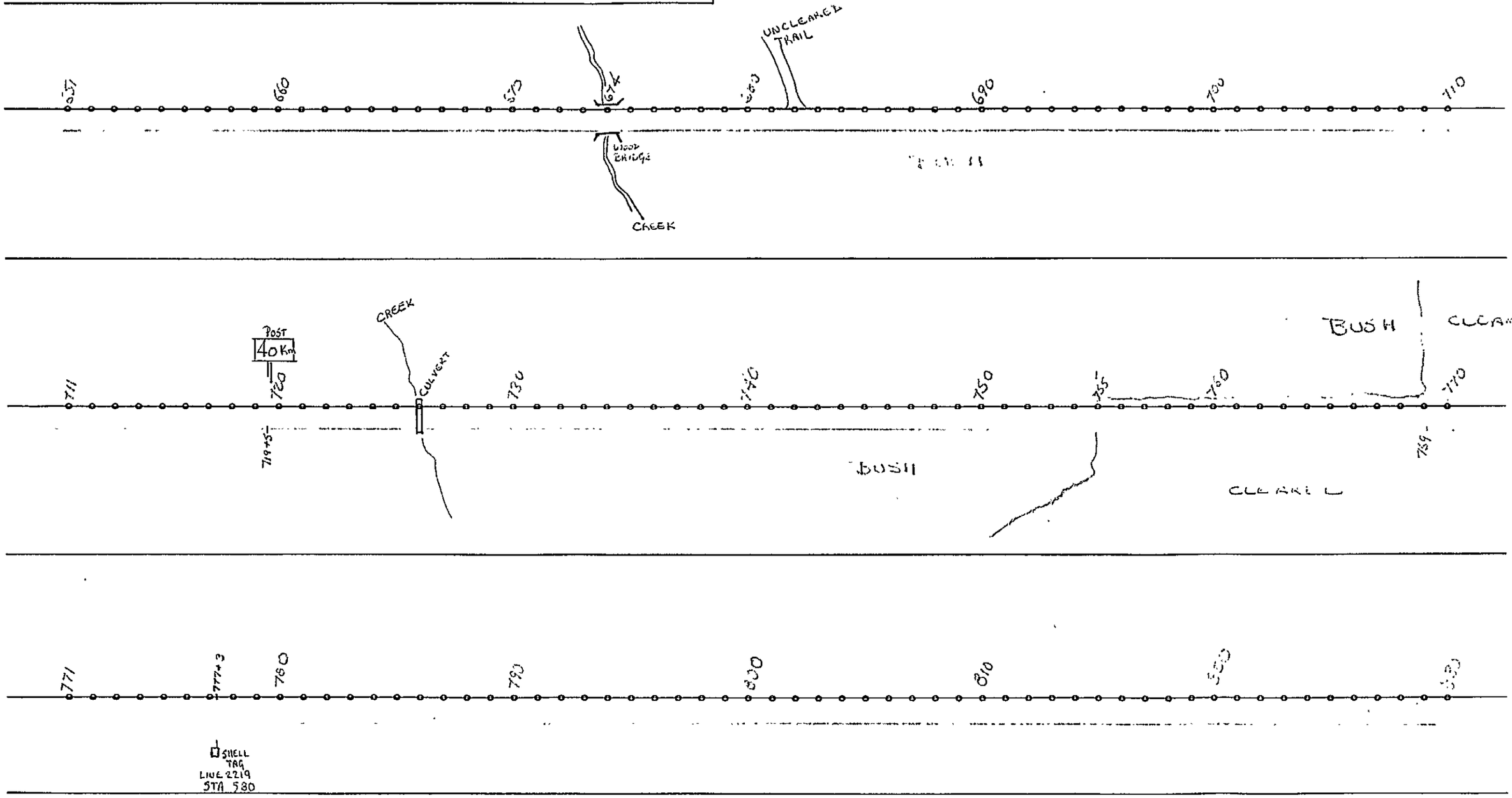
Traverse Stn. EX - Existing Line NC - Newcut Line XD - + Ditching Req'd. Creek River Campsite Airstrip (H) Heliport ==== Railroad ------ Property Bdy. (unfenced) -x-x Property Bdy.(fenced) ____ Old Seismic Line

% C.D.P. LINE CHAINING DETAIL REPORT

Prospect _____

Line No. _____ Client _____ Comp. By _____ Date _____ 197___ Party _____

Direction ——— Scale → ← Page 4 of 5 Shot Point Spacing 10 metre Hole Pattern _____



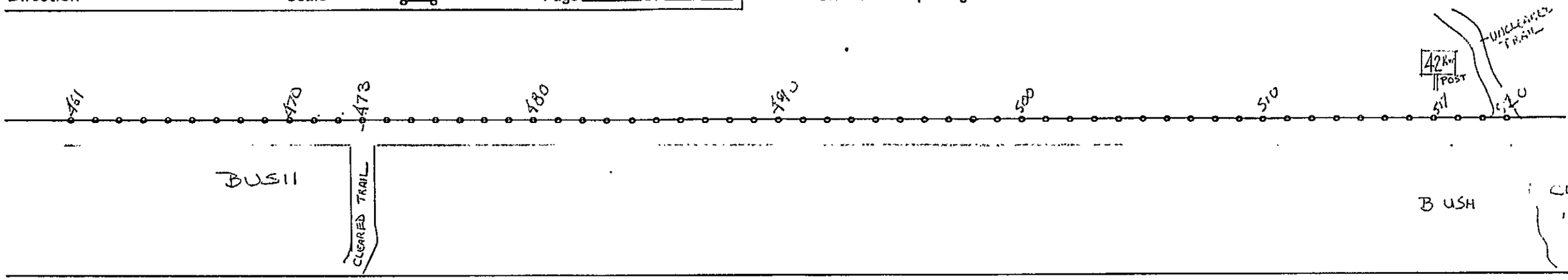
Traverse Stn. EX - Existing Line NC - Newcut Line XD - + Ditching Req'd. Creek River Campsite Airstrip (H) Heliport ==== Railroad ------ Property Bdy. (unfenced) -x-x- Property Bdy. (fenced) — — Old Seismic Line

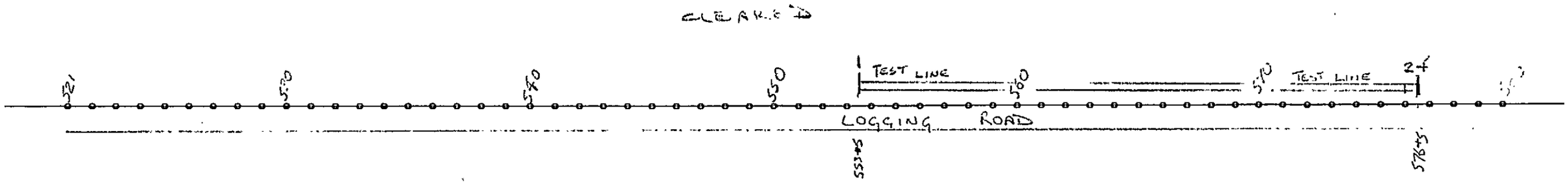
% C.D.P. LINE CHAINING DETAIL REPORT

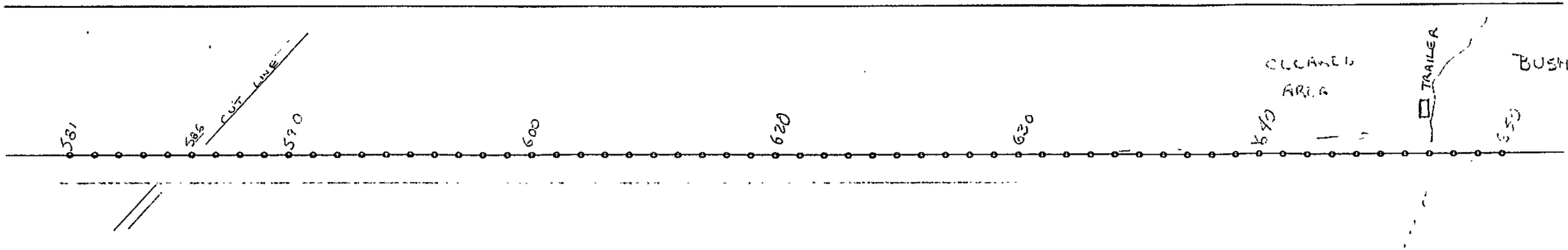
Prospect _____

'Line No. _____ Client _____ Comp. By _____ Date _____ 197___ Party _____

Direction ——— Scale → ← Page 3 of 5 Shot Point Spacing _____ Hole Pattern _____







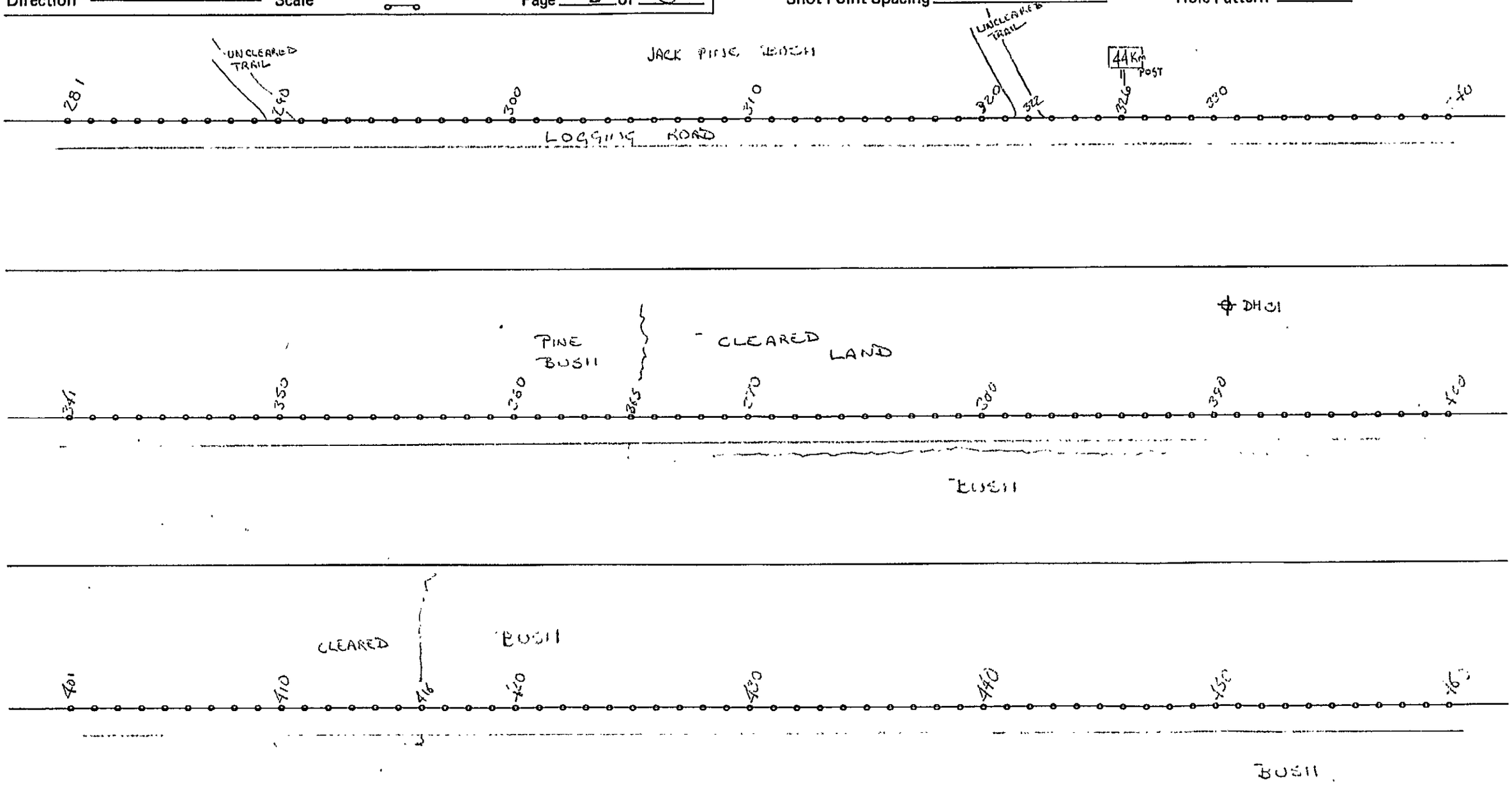
Traverse Stn. EX - Existing Line NC - Newcut Line XD - + Ditching Req'd. Creek River Campsite Airstrip Heliport ==== Railroad ------ Property Bdy. (unfenced) -x-x Property Bdy.(fenced) ——— Old Seismic Line

% C.D.P. LINE CHAINING DETAIL REPORT

Prospect _____

Line No. _____ Client _____ Comp. By _____ Date _____ 197___ Party _____

Direction _____ Scale → ←o—o Page 2 of 5 Shot Point Spacing _____ Hole Pattern _____



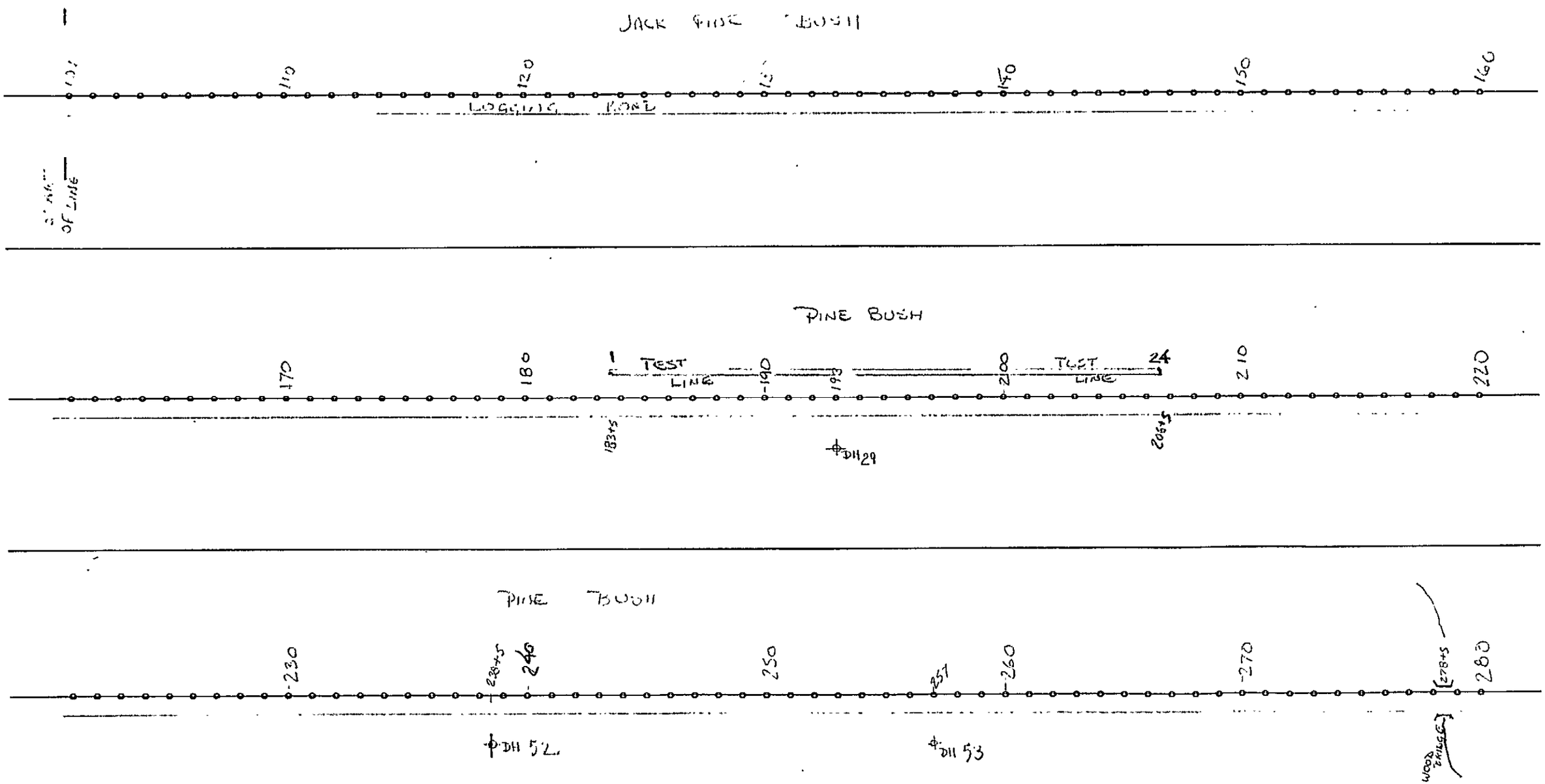
Traverse Stn. EX - Existing Line NC - Newcut Line XD - † Ditching Req'd Creek River Campsite Airstrip Heliport ==== Railroad ------ Property Bdy. (unfenced) -x-x Property Bdy.(fenced) ——Old Seismic Line

% C.D.P. LINE CHAINING DETAIL REPORT

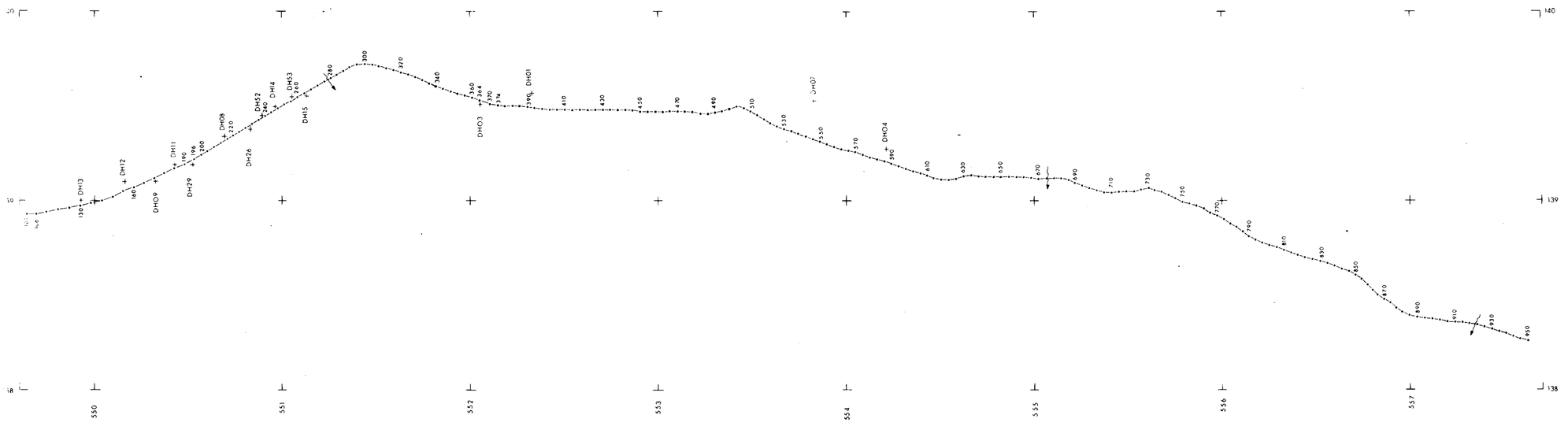
Prospect _____

Line No. GULF TEST LINE APRIL/81 Client GULF Comp. By _____ Date APRIL/81 197__ Party _____

Direction SOUTH Scale 10 cm Page 1 of 5 Shot Point Spacing 10 METRE Hole Pattern _____



Property Bdy. (unfenced) | Property Bdy (fenced) | Old Seismic Line



GULF CANADA RESOURSES INC.

TR Goodrich Evlua

532

MINI - SOSIE TEST

GOODRICH COAL PROPERTY

CHETWYND B.C.

(April 1981)

SCALE 1/10,000

SEISMIC LINE

BRIDGE

DRILL HOLE

COMPAGNIE GENERALE DE GEOPHYSIQUE

Compagnie Générale de Géophysique
47-65 THE VALE, ACTON, LONDON W3 7RR

532

MINI-SOSIE MONTHLY ACTIVITY REPORT

PR-Goodrich E1(11)A

Client: GULF CANADA RESOURCES INC
Area: CHETWYND, B.C.
Month: APRIL | Year: 1981
Party No.: 4992518
Field Base Address: STAGECOACH INN, CHETWYND, B.C.
Telephone:
Party Chief: YVONNE MICHIE
Coverage: 1200%

General Remarks:

Survey (peg intervals and accuracy)
10 METRES

Permitting (problems etc.):

PRODUCTION

DATE	DAY	LINE No	RAM POINT NUMBERS	HOURS MOVING	HOURS TESTING	TIME LOST HOURS	TIME LOST REASONS	REMARKS REFER	HOURS PRODUCTION	TOTAL HOURS	RAM POINTS (R.Ps)	R.Ps MISSED OUT	R.Ps RESHOT	TOTAL R.Ps	Kms SURFACE COVERAGE	SHOTS PER RECORD	TOTAL SHOTS	RAMMING No OF RAMMERS	RAMMING SEPARATION BETWEEN RAMMERS	RAMMING R.P SEPARATION	HOURS CONTRACTED
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9	THURS																				
10	FRI																				
11	SAT																				
12	SUN	01		4.5	5.5																10.0
13	MON	01	118-207	3.0	1.0	2.0	CABLES		8.0	14.0	90			90	0.90	1300		2	—	10m	12.0
14	TUES	01	208-285	3.0					8.0	11.0	77			77	0.77	1300		2		10m	11.0
15	WED	01	286-335	3.0					9.5	12.5	90			90	0.90	1300		2		10m	12.5
16	THURS	01	376-440	3.0					10.5	13.5	65			65	0.65	1300		2		10m	13.5
17	FRI	01	441-520	3.0					10.0	13.0	80			80	0.80	1300		2		10m	13.0
18	SAT	01	521-605	3.0					11.5	14.5	85			85	0.85	1300		2		10m	14.5
19	SUN	01	606-705	3.0					11.0	14.0	100			100	1.00	1300		2		10m	14.0
20	MON	01	706-776	3.0		2.0	CABLES		8.0	13.0	71			71	0.71	1300		2		10m	11.0
21	TUES	01	777-884	3.0					10.0	13.0	108			108	1.08	1300		2		10m	13.0
22	WED	01	885-949	3.0					7.0	10.0	65			65	0.65	1300		2		10m	10.0
23	THURS																				
24	FRI																				
25																					
26																					
27																					
28																					
29																					
30																					
31																					
																					134.5

LEGEND: CLOUDY or VARIABLE; STEADY RAIN; INTERMITTENT RAIN; STORM; FINE; FOG; FOG (Morning/Evening); SNOW; STRONG WIND

DAILY REMARKS

- 9: MOBILIZATION, CALGARY TO CHETWYND
- 10: MOBILIZATION " "
- 11: STANDBY - BAD WEATHER, LINE NOT CLEARED
- 16: WORK SLOW - GEOPHONES & CABLES BURIED BY SNOW
- 18: RAMMING VERY SLOW TO AVOID CORRELATION NOISE
- 20: PROBLEMS W. RAMMER CABLES
- 21: GUSTY WIND CONDITIONS, SNOW SQUALLS
- 23: DEMOBILIZATION TO CALGARY
- 24: DEMOBILIZATION TO CALGARY

Record Quality

Weathering Zone Control

CLIENT CHARGES ITEM	OPENING STOCK	DELIVERIES RECEIVED	CLOSING STOCK	CONSUMPTION
7 TAPES				

MAGNETIC TAPES

	TAPE NUMBER COMPLETED	CONTENTS (LINES AND R.Ps)	TAPE NUMBER DESPATCHED TO PROCESSING CENTRE	TAPE NUMBER DELIVERED TO PROCESSING CENTRE	DESPATCH NOTE NUMBER
1	001 to 007	LINE 01 SP 118 to 949		BY HAND 27 APRIL/81	

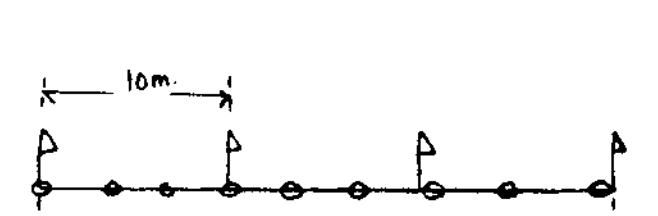
Processing Centre: GEODIGIT, CALGARY
Contractor:
Location:

BASIC CREW ITEMS

	PERSONNEL	EQUIPMENT
OFFICE		
SURVEY		
RECORDING		
RAMMERS		

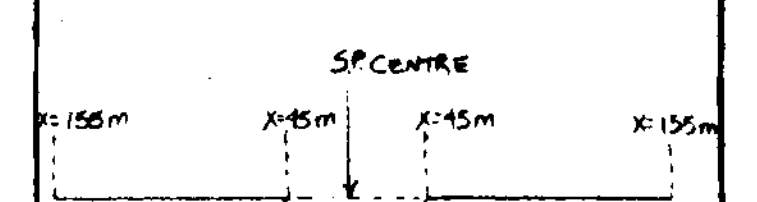
ADDITIONAL ITEMS

GEOPHONE PATTERN

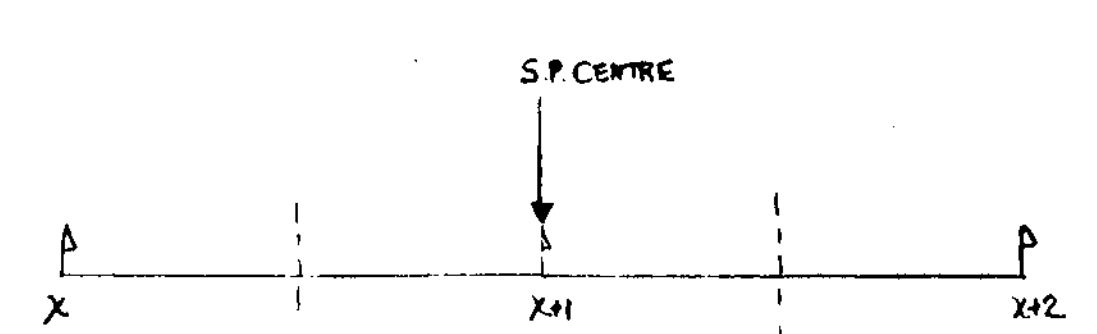


9 geophones spread in a line over 30 metres.

SPREAD CONFIGURATION



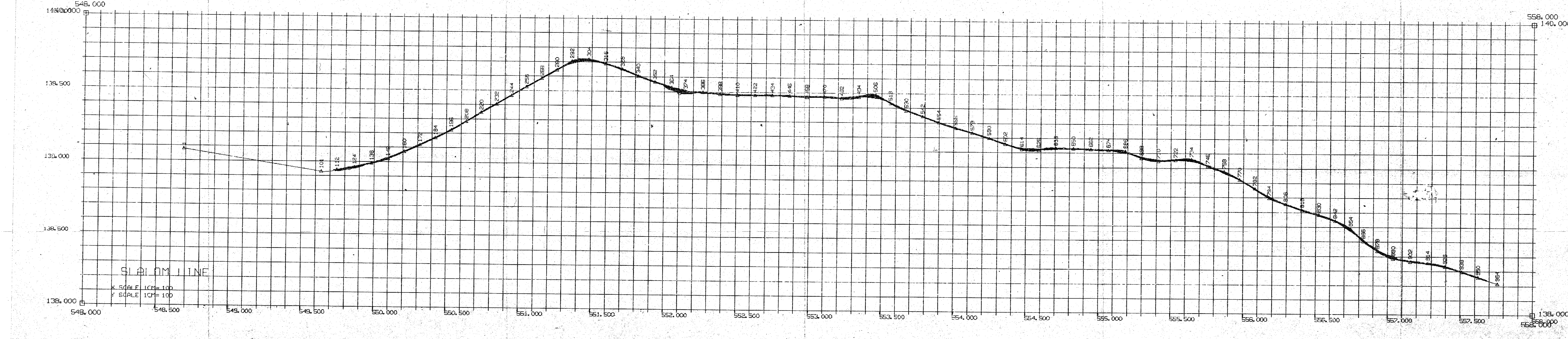
RAMMER PATTERN



PROGRESS MAP

- PROGRAMME
- LINES COMPLETED DURING PERIOD
- LINES COMPLETED BEFORE PERIOD
- LINES COMPLETED PREVIOUS MONTH

▼ STATION NUMBERS



PR-Goodrich 81(11)A **532**

GULF RESOURCES
COMPANY

GOODRICH
AREA

01
LINE

W 101 SHOT POINTS 901 E

CGG - data processing services
CALGARY, ALBERTA

FIELD RECORDING

RECORDED BY C.G.G. DATE
ENERGY SOURCE MINI SOSIE; WACKER GVR 15IY/220Y
RECORDER DHR 1632 AMPLIFIER FORMAT SEG-Y
GAIN CONTROL ☐ AGC ☐ PGC ☐ BINARY ☒ CONSTANT
GEOPHONES/GROUP & INTERVAL 9 AT 30 M GEOPHONE TYPE L25E
No. OF GROUPS 24 INTERVAL 10 M
FILTER 40 / OUT Hz COVERAGE
SWEEP RANGE Hz SWEEP LENGTH Sec
SWEEP/STAT./VIB. No. OF VIBRATORS

COMPUTING

COMPUTED BY C.G.G.
STRUCTURAL DATUM 975 Meters DATUM VELOCITY 2400 M/Sec.
FLATTENED AT Sec SAMPLE INTERVAL: RECORDED ms.
PROCESSED ms.

DIGITAL PROCESSING

A TO D CONVERSION
1 EDIT — DEMULTIPLEXING
AMPLITUDE RECOVERY FROM GAIN
TRACE EQUALIZATION
TRACE SCALING
4 TIME VARYING DECONVOLUTION
OPERATOR LENGTH 50 ms. 1 GATE
PREDICTIVE DECONVOLUTION
OPERATOR LENGTH ms.
GAP ms.
5 AUTOMATIC VELOCITY ANALYSIS
6 N.M.O. (INTERPOLATION FILTER ms.)
TRACE GATHER
7 MUTES
10 BAND PASS FILTER 30/45-105/120
TIME VARYING FILTER

CROSS CORRELATION WITH SWEEP
8 STATICS TO FLOATING DATUM
AUTOMATIC STATICS
9 STACK 1200 %
PRESERVED AMPLITUDE STACK
2 SLALOM LINE PHASE II™ (DISTANCE COMPENSATION FOR CROOKED SPREAD) CGG TRADEMARK
3 GAIN COMPENSATION FOR TRANSMISSION LOSS AND SPHERICAL DIVERGENCE
STATICS TO FLAT DATUM
AUTOMATIC FLATTENING
POLARITY REVERSAL
11 DYNAMIC EQUALIZATION
REGIONAL EQUALIZATION
AMPLITUDE COHERENCY ENHANCEMENT
12 WAVE EQUATION MIGRATION
HAND STATICS
SPECIAL PROCESSING

PAPER DISPLAY
13 FILM DISPLAY

DISPLAY

POLARITY
✓ SEG STANDARD POLARITY ☐ INTENDED
SEG STANDARD NEGATIVE POLARITY
SCALE 25.4 / 1 INCH TRACES VERTICAL SCALE = 30 CM /SECOND

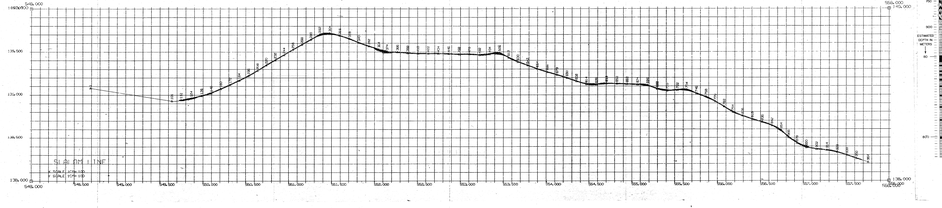
REMARKS

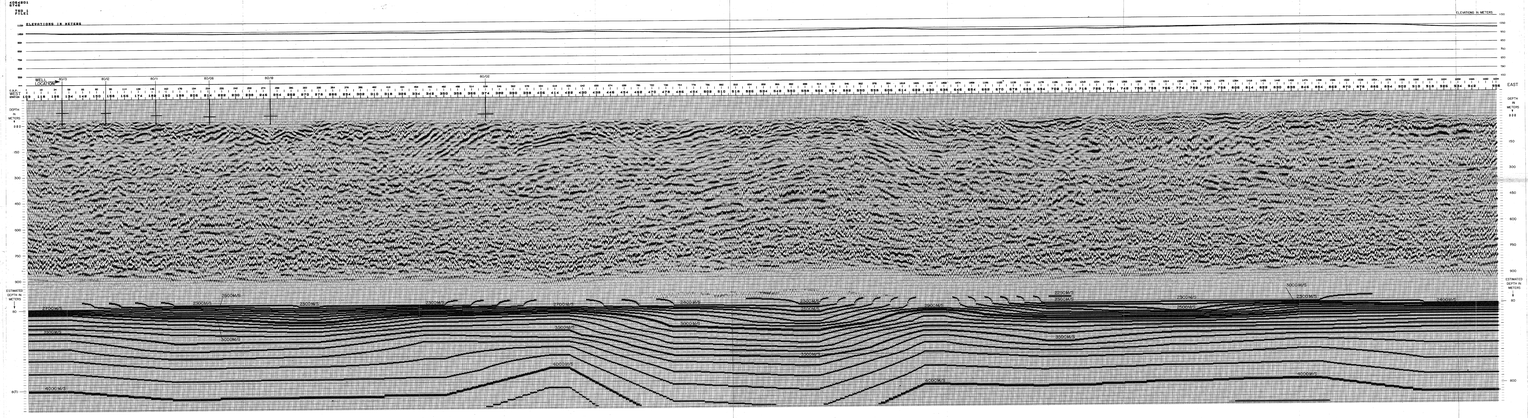
SEG STANDARD RECORDING POLARITY ASSUMED
MIGRATED STACK
NORMAL POLARITY

CONTROL

DATE MAY 1981 REFERENCE NUMBER 40642-01
PROCESSED BY: CHECKED BY:

▼ STATION NUMBERS





532

GULF RESOURCES

GOODRICH

W 101 sect rowrs 9Cl E

GGG - data processing services

FIELD RECORDING

COMPUTING

DIGITAL PROCESSING

DISPLAY

SECTION

CONTROL

25MAY81
4064201
3001

TSD 1
FILE2

PR-Goodrich 81(1)A

532

GULF RESOURCES
COMPANY

GOODRICH
AREA

01
LINE

W 101 SHOT POINTS 901 E

CGG – data processing services
CALGARY, ALBERTA

FIELD RECORDING

RECORDED BY C.G.G. DATE:
ENERGY SOURCE MINI SOSIE; WACKER GVR 151Y/220Y
RECORDER DHR 1632 AMPLIFIER FORMAT SEG-Y
GAIN CONTROL ☐ AGC ☐ PGC ☐ BINARY ☒ CONSTANT
GEOPHONES/GROUP & INTERVAL 9 AT 30 M GEOPHONE TYPE L25E
No. OF GROUPS 24 INTERVAL 10 M
FILTER 40 / OUT Hz COVERAGE
SWEEP RANGE Hz SWEEP LENGTH Sec.
SWEEP/STAT./VIB. No. OF VIBRATORS
1 155M 12 45M 45M 13 24 155M

COMPUTING

COMPUTED BY C.G.G.
STRUCTURAL DATUM 975 Meters DATUM VELOCITY 2400 M/Sec.
FLATTENED AT Sec. SAMPLE INTERVAL: RECORDED ms.
PROCESSED ms.

DIGITAL PROCESSING

A TO D CONVERSION
1 EDIT — DEMULTIPLEXING
AMPLITUDE RECOVERY FROM GAIN
TRACE EQUALIZATION
TRACE SCALING
4 TIME VARYING DECONVOLUTION
OPERATOR LENGTH 50 ms. 1 GATE
PREDICTIVE DECONVOLUTION
OPERATOR LENGTH ms.
GAP ms.
5 AUTOMATIC VELOCITY ANALYSIS
6 N.M.O. (INTERPOLATION FILTER ms.)
TRACE GATHER
7 MUTES
10 BAND PASS FILTER 30/45-105/120
TIME VARYING FILTER

CROSS CORRELATION WITH SWEEP
8 STATICS TO FLOATING DATUM
AUTOMATIC STATICS
9 STACK 1200 %
PRESERVED AMPLITUDE STACK %
2 SLALOM LINE PHASE II** (DISTANCE COMPENSATION FOR CROOKED SPREAD) ** CGG TRADEMARK
3 GAIN COMPENSATION FOR TRANSMISSION LOSS AND SPHERICAL DIVERGENCE
STATICS TO FLAT DATUM
AUTOMATIC FLATTENING
POLARITY REVERSAL
11 DYNAMIC EQUALIZATION
REGIONAL EQUALIZATION
AMPLITUDE COHERENCY ENHANCEMENT
12 WAVE EQUATION MIGRATION
HAND STATICS
SPECIAL PROCESSING
PAPER DISPLAY
13 FILM DISPLAY

DISPLAY

POLARITY:
✓ SEG STANDARD POLARITY ☐ INTENDED
SEG STANDARD NEGATIVE POLARITY

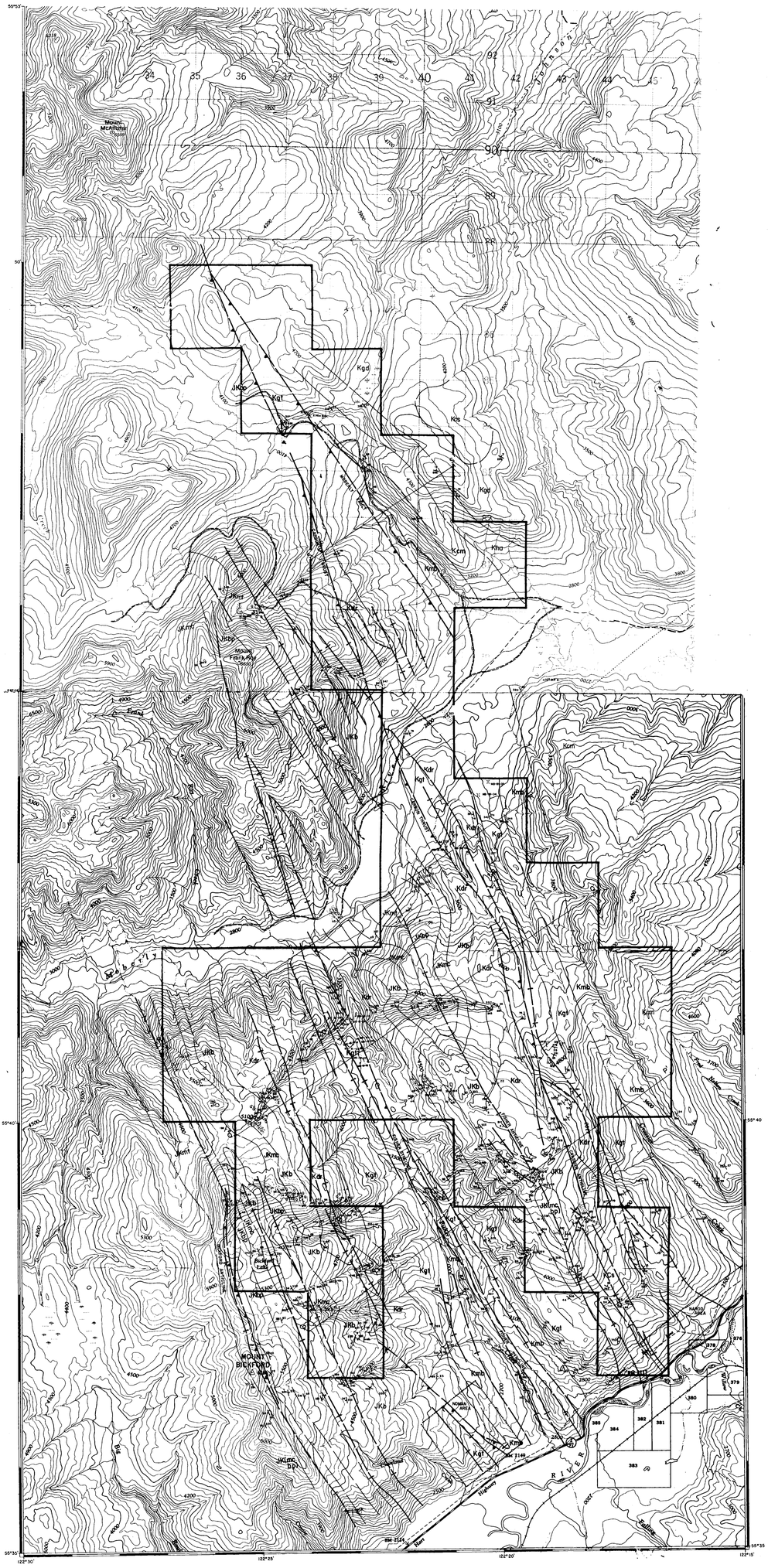
SCALE 25.4 / 1 INCH TRACES VERTICAL SCALE = 30 CM./SECOND

REMARKS

SEG STANDARD RECORDING POLARITY ASSUMED
MIGRATED STACK
NORMAL POLARITY

CONTROL

DATE: MAY 1981 REFERENCE NUMBER: 40642-01
PROCESSED BY: CHECKED BY:



ABLE OF FORMATIONS

	Q	QUATERNARY Glacial deposits and alluvium
Lower Cretaceous — CRAIGSER GROUP	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
	Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
	Kdr Kcd	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. Kcd mostly conglomeratic!
	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
Jurassic to Cretaceous — Transitional — BEAUDETTE GROUP	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

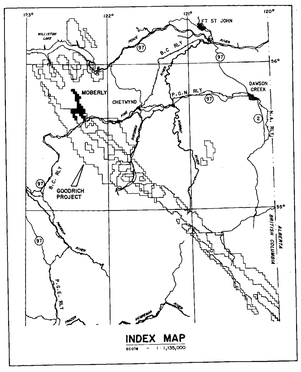
LEGEND

GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, aporox. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

Conglomerate	Claystone/Mudstone
Sandstone	Coal
Siltstone	Silty Claystone
Quartzite	Carbonaceous Claystone



0 500 1000 2000 3000

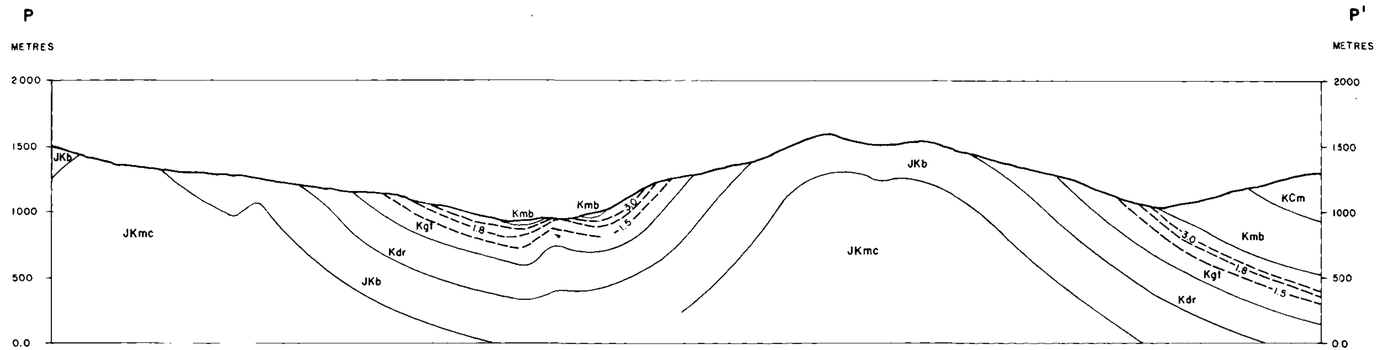
scale in metres
1:25,000

APPENDIX A, PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROJECT
1981
MOBERLY GEOLOGY

PREPARED BY: B. DAVIDSON, E. BOGOSLOWSKI
APPROVED BY: H. ZSCHACH
DATE: DEC. 1981
DRAWING No. 532 4



JURASSIC — TRANSITIONAL — LOWER CRETACEOUS

BEAUDETTE GROUP | CRASSIER GROUP

LEGEND

Q — *QUATERNARY*
Glacial deposits and alluvium

KCm — *COMMOTION FORMATION*
Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates

Kmb — *MOOSEBAR FORMATION*
Mudstones, minor siltstones, marine

Kbs — *BLUESKY*
Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite

Kgt — *GETHING FORMATION*
Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL

Kdr — *DRESSER FORMATION*
Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates

JKb — *BRENOT FORMATION*
Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL

JKmc — *MONACH FORMATION*
Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates

JKbp — *BEATTIE PEAKS FORMATION*
Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding

JKmt — *MONTIETH FORMATION*
Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.

Jf — *FERNIE FORMATION*
Dark grey and black shales, mudstones, sandstones, siltstones, marine

(2) COAL SEAM (line represents seam top)

0 500 1000 1500 2000 2500

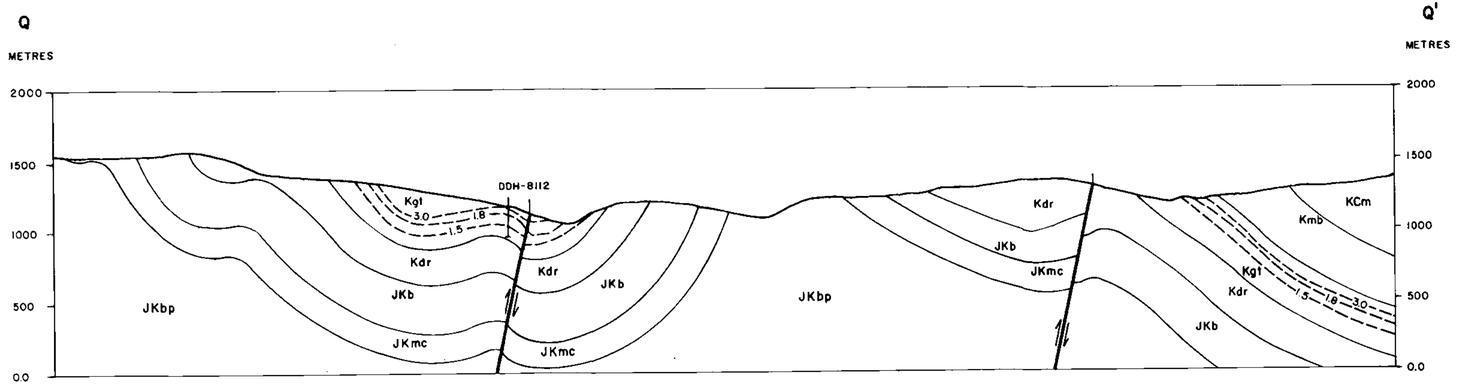
SCALE IN METRES

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROJECT
1981
MOBERLY CROSS-SECTION
P - P'

PREPARED BY B. Davidson, I. Delas
APPROVED BY H. Zschoch
SCALE 1:25,000
DATE Jan. 82
DRAWING No. 4a

532



LEGEND

	Q	QUATERNARY Glacial deposits and alluvium
	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	Kmb	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
	Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
	Kdr	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS

BEAUDETTE GROUP | CRASSIER GROUP

(2) COAL SEAM (line represents seam top)

0 500 1000 1500 2000 2500

SCALE IN METRES

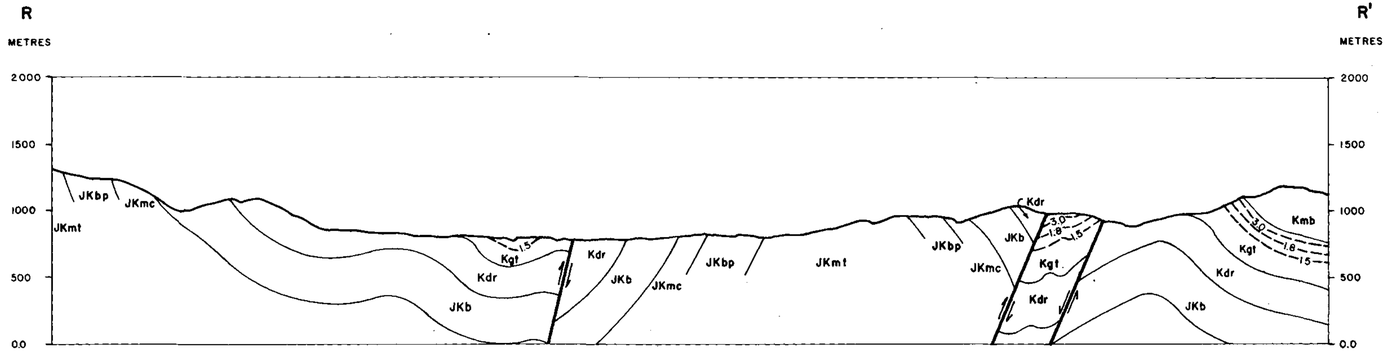
PR Goodrich 81/9/14

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROJECT
1981
MOBERLY CROSS-SECTION
Q-Q'

PREPARED BY B. Davidson, I. Delas SCALE 1: 25,000
APPROVED BY H. Zschach DATE Jan. 82 DRAWING No. 46

532



LEGEND

- **Q** — *QUATERNARY*
  Glacial deposits and alluvium
- **KCm** — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- **Kmb** — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- **Kbs** — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- **Kgt** — *GETHING FORMATION*
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- **Kdr** — *DRESSER FORMATION*
  Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- **JKb** — *BRENOT FORMATION*
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- **JKmc** — *MONACH FORMATION*
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- **JKbp** — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- **JKmt** — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- **Jf** — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS
BEAUDETTE GROUP | CRASSIER GROUP

P.R. Goodrich 88/21A

532

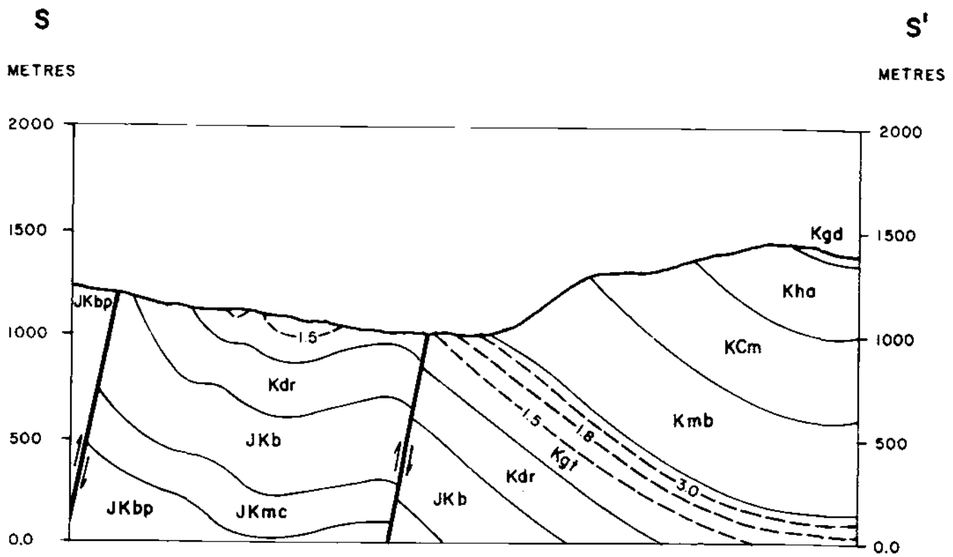
(2) COAL SEAM (line represents seam top)

0 500 1000 1500 2000 2500
SCALE IN METRES

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROJECT
1981
MOBERLY CROSS-SECTION
R-R'

PREPARED BY B. Davidson, I. Delas SCALE 1:25,000
APPROVED BY H. Zaschak DATE Jan 82 DRAWING No.



JURASSIC — TRANSITIONAL — LOWER CRETACEOUS

BEAUDETTE GROUP — CRASSIER GROUP

LEGEND

Q — *QUATERNARY*
Glacial deposits and alluvium

KCm — *COMMOTION FORMATION*
Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates

Kmb — *MOOSEBAR FORMATION*
Mudstones, minor siltstones, marine

Kbs — *BLUESKY*
Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite

Kgt — *GETHING FORMATION*
Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL

Kdr — *DRESSER FORMATION*
Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates

JKb — *BRENOT FORMATION*
Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL

JKmc — *MONACH FORMATION*
Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates

JKbp — *BEATTIE PEAKS FORMATION*
Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding

JKmt — *MONTIETH FORMATION*
Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.

Jf — *FERNIE FORMATION*
Dark grey and black shales, mudstones, sandstones, siltstones, marine

(2) COAL SEAM (line represents seam top)

0 500 1000 1500 2000 2500

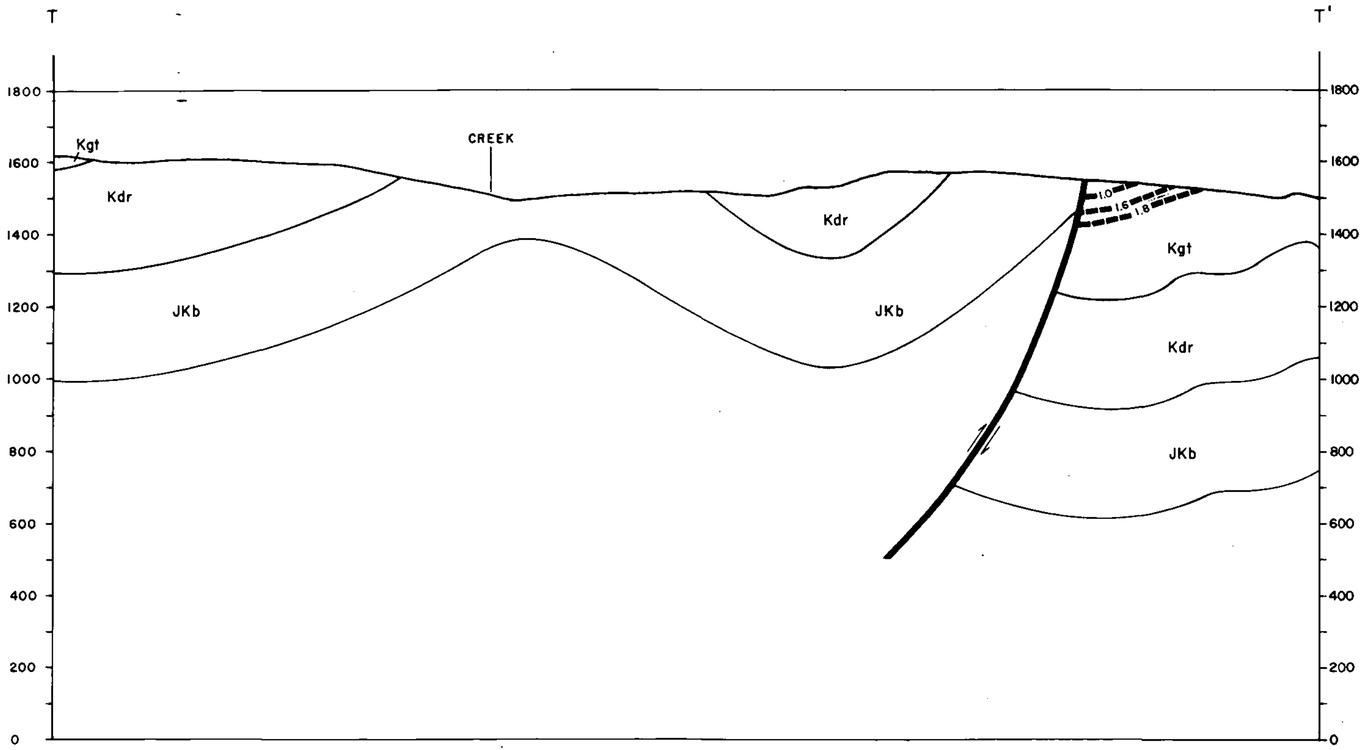
SCALE IN METRES

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROJECT
1981
MOBERLY CROSS SECTION
S-S'

PREPARED BY B. Davidson, I. Delas
APPROVED BY H. Zschach
DATE Jan. 82
SCALE 1: 25,000
DRAWING No. 4d

532



LEGEND

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS

BEAUDETTE GROUP — CRASSIER GROUP

Q	*QUATERNARY* — Glacial deposits & alluvium
KCm	*COMMOTION FORMATION* — Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
Kmb	*MOOSEBAR FORMATION* — Mudstones, minor siltstones, marine
Kbs	*BLUESKY* — Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
Kgt	*GETHING FORMATION* — Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
Kdr	*DRESSER FORMATION* — Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
JKb	*BRENOT FORMATION* — Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
JKmc	*MONACH FORMATION* — Marine lithic and quartzose sandstones, with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates.
JKbp	*BEATTIE PEAKS FORMATION* — Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
JKmt	*MONTIETH FORMATION* — Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
Jf	*FERNIE FORMATION* — Dark grey and black shales, mudstones, sandstones, siltstones. marine

(2) COAL SEAM (line represents seam top).

APPENDIX A PART 1

SCALE 1:10,000

0 500 1000 METRES

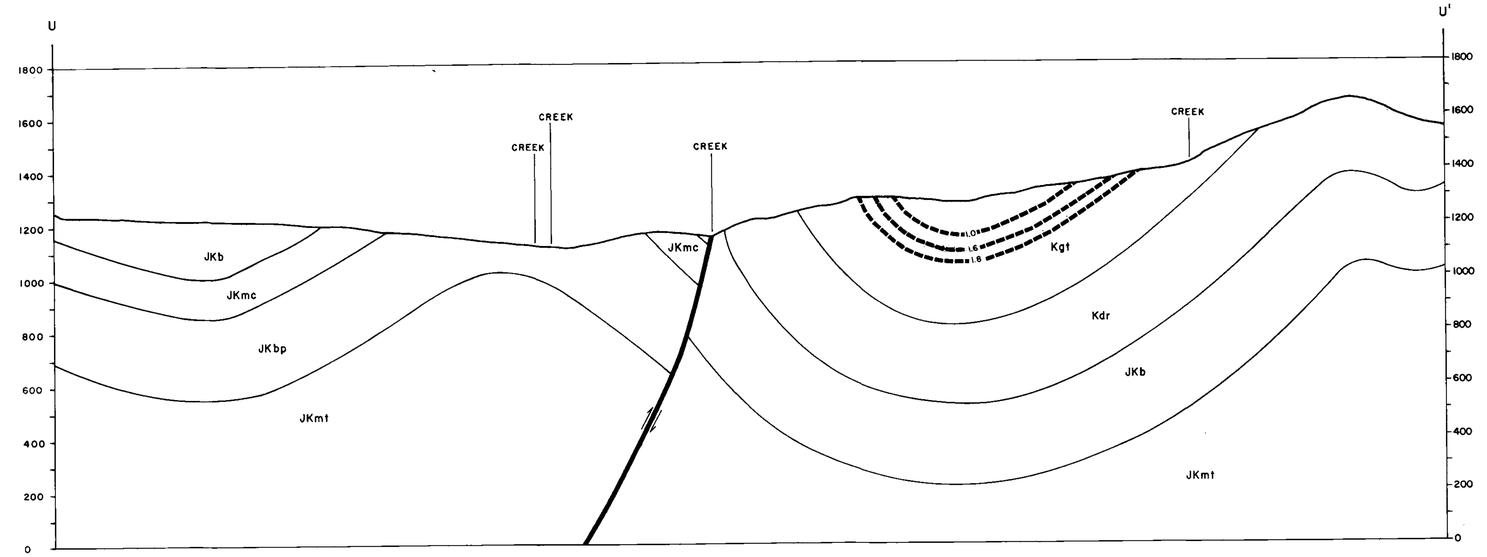
532

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

PR Goodrich 5 2161

GOODRICH PROJECT 1981
WHITERABBIT
STRUCTURE PROFILE T-T'

PREPARED BY:	J. LaMarre I. Deias	SCALE:	1:10,000
APPROVED BY:	H.D. ZSCHACH	DATE:	JAN. 82
		DRAWING No.	10



LEGEND

- **Q** — *QUATERNARY*
  Glacial deposits & alluvium
- **KCm** — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- **Kmb** — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- **Kbs** — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- **Kgt** — *GETHING FORMATION*
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- **Kdr** — *DRESSER FORMATION*
  Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- **JKb** — *BRENOT FORMATION*
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- **JKmc** — *MONACH FORMATION*
  Marine lithic and quartzose sandstones, with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates.
- **JKbp** — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- **JKmt** — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- **Jf** — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones. siltstones. marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS
BEAUDETTE GROUP — CRASSIER GROUP

APPENDIX A PART 1

2 COAL SEAM (line represents seam top).

532

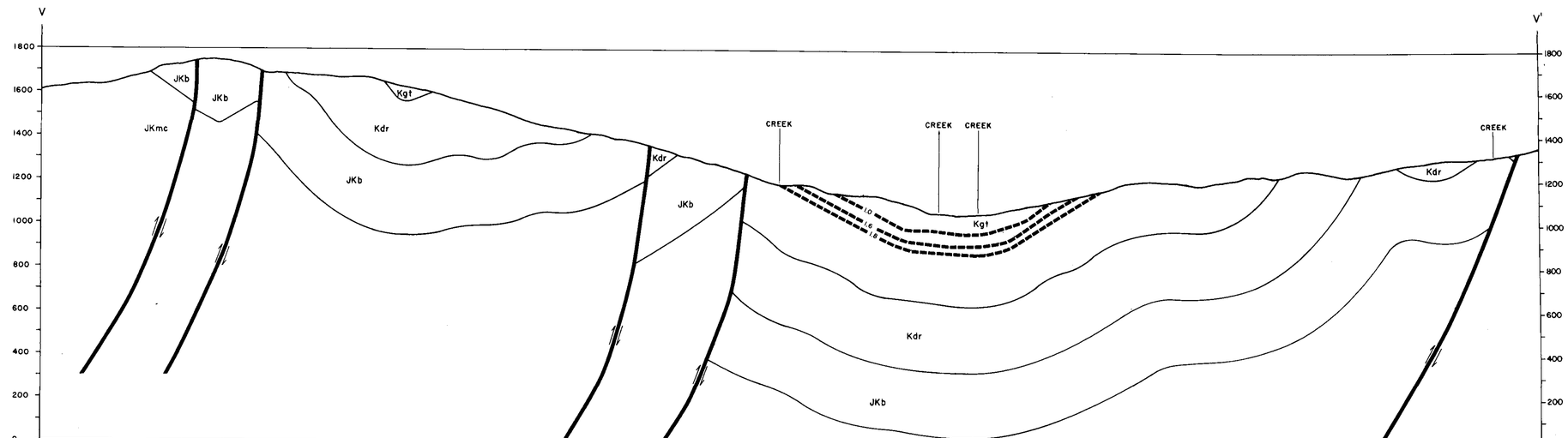
SCALE 1:10,000
0 500 1000 METRES

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

PR Geodesy Ltd.

GOODRICH PROJECT 1981
WHITERABBIT
STRUCTURE PROFILE U-U'

PREPARED BY	J. LaMarre / I. Delos	SCALE	1:10,000
APPROVED BY	H.O. ZSCHACH	DATE	JAN. 82
		DRAWING No	11



LEGEND

- Q — *QUATERNARY*
  Glacial deposits & alluvium
- KCm — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- Kbs — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — *GETHING FORMATION*
  Cyclothems ; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones ; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit ; COAL
- Kdr — *DRESSER FORMATION*
  Incomplete cyclothems ; discontinuous coal measures in varying thicknesses ; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — *BRENOT FORMATION*
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — *MONACH FORMATION*
  Marine lithic and quartzose sandstones, with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates.
- JKbp — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained ; thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- JKmt — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained ; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones. siltstones. marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS
BEAUDETTE GROUP — CRASSIER GROUP

(2) COAL SEAM (line represents seam top)

APPENDIX A PART 1

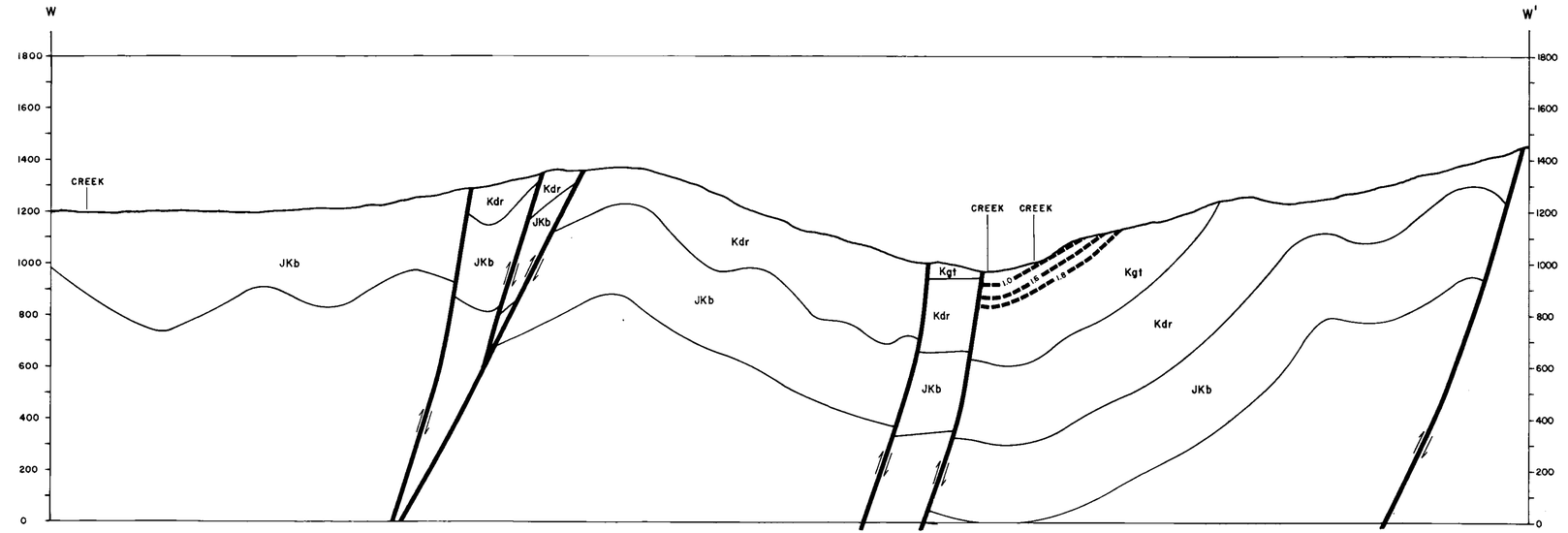
SCALE 1:10,000
0 500 1000
METRES

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH PROJECT 1981
WHITERABBIT
STRUCTURE PROFILE V-V'

PREPARED BY J. LaMarre I. Delas
APPROVED BY H.D. ZSCHACH DATE JAN. 82
SCALE 1:10,000
DRAWING No. 12

532



LEGEND

	Q	QUATERNARY Glacial deposits & alluvium
LOWER CRETACEOUS — CRASSIER GROUP	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	Kmb	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
	Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
	Kdr	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
JURASSIC — TRANSITIONAL — BEAUDETTE GROUP	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones, with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates.
	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones. siltstones. marine

2 COAL SEAM (line represents seam top).

APPENDIX A PART 1

SCALE 1:10,000

0 500 1000

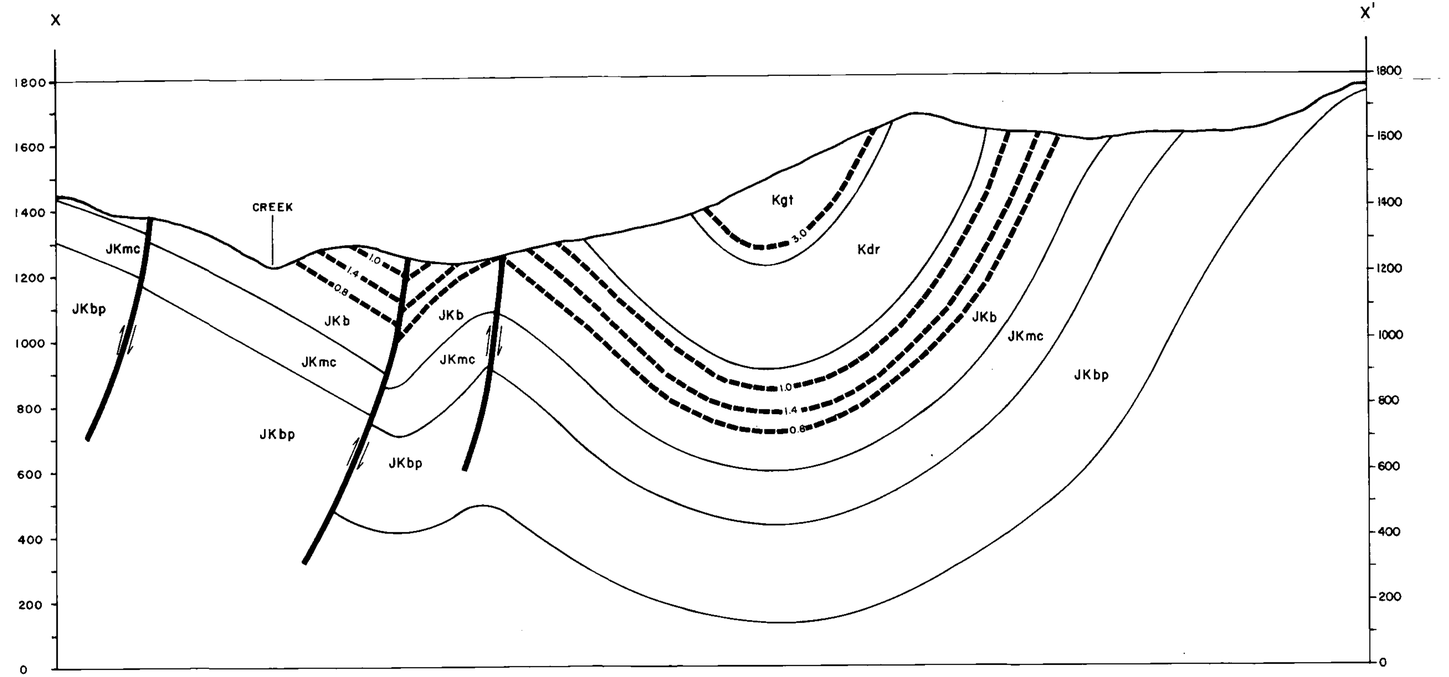
METRES

532

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH PROJECT 1981
WHITERABBIT
STRUCTURE PROFILE W-W'

PREPARED BY J. LaMarre I. Delas SCALE 1:10,000
APPROVED BY H.D. ZSCHACH DATE JAN.82 DRAWING No 12



LEGEND

- **Q** — *QUATERNARY*
  Glacial deposits & alluvium
- **KCm** — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- **Kmb** — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- **Kbs** — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- **Kgt** — *GETHING FORMATION*
  Cyclothems ; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones ; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit ; COAL
- **Kdr** — *DRESSER FORMATION*
  Incomplete cyclothems ; discontinuous coal measures in varying thicknesses ; medium to very coarse grained sandstones, grits, and conglomerates
- **JKb** — *BRENOT FORMATION*
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- **JKmc** — *MONACH FORMATION*
  Marine lithic and quartzose sandstones, with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates.
- **JKbp** — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained ; thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- **JKmt** — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained ; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- **Jf** — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones. siltstones. marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS
BEAUDETTE GROUP — CRASSIER GROUP

2 COAL SEAM (line represents seam top).

APPENDIX A PART 1

SCALE 1 : 10,000
0 500 1000
METRES

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

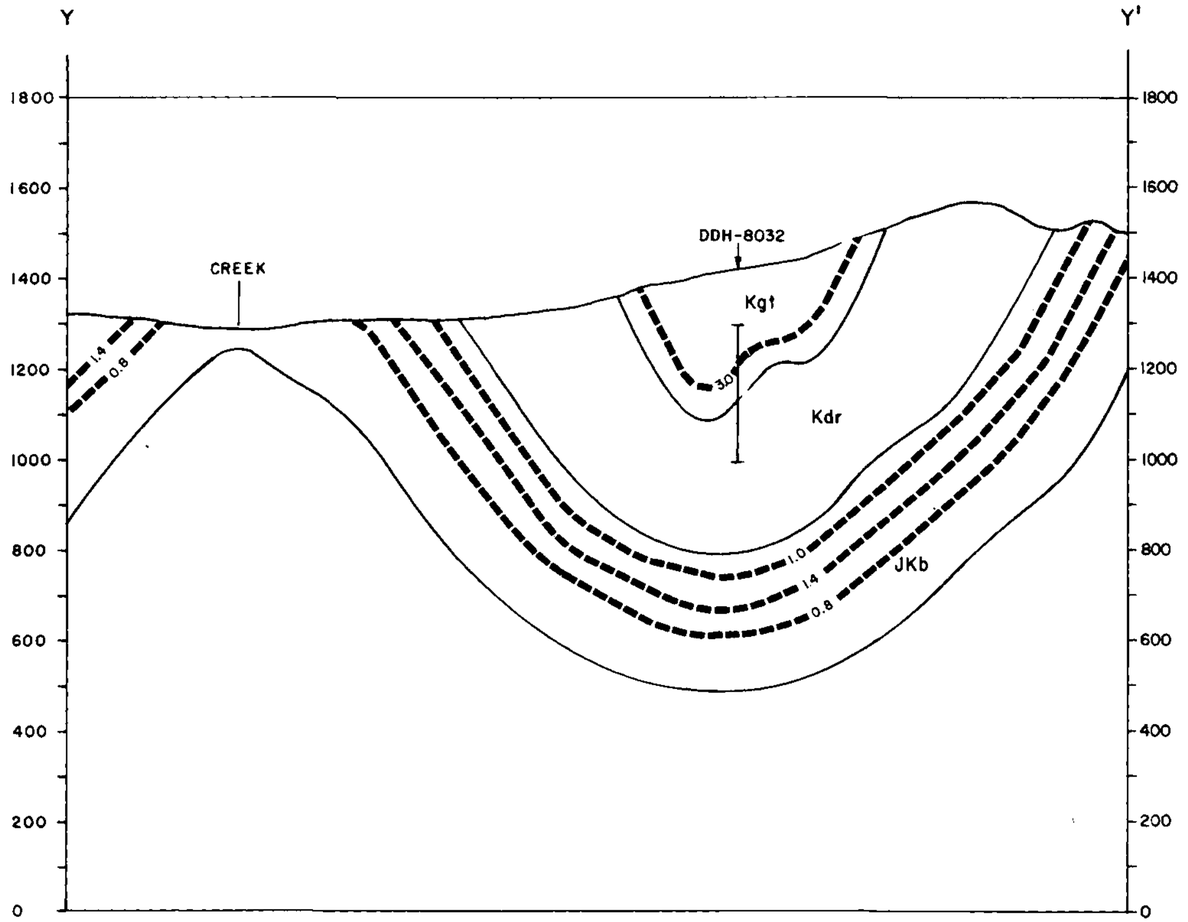
AR Goodrich 81-01A

GOODRICH PROJECT 1981
WHITERABBIT
STRUCTURE PROFILE X - X'

PREPARED BY J. LaMarre I. Delas SCALE : 1:10,000
APPROVED BY H.D. ZSCHACH DATE JAN. 82 DRAWING No

532

14



LEGEND

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS

BEAUDETTE GROUP — CRASSIER GROUP

Q	*QUATERNARY* — Glacial deposits & alluvium
KCm	*COMMOTION FORMATION* — Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
Kmb	*MOOSEBAR FORMATION* — Mudstones, minor siltstones, marine
Kbs	*BLUESKY* — Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
Kgt	*GETHING FORMATION* — Cyclothems ; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones ; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit ; COAL
Kdr	*DRESSER FORMATION* — Incomplete cyclothems ; discontinuous coal measures in varying thicknesses ; medium to very coarse grained sandstones, grits, and conglomerates
JKb	*BRENOT FORMATION* — Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
JKmc	*MONACH FORMATION* — Marine lithic and quartzose sandstones, with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates.
JKbp	*BEATTIE PEAKS FORMATION* — Buff to brownish sandstones, fine to medium grained ; thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
JKmt	*MONTIETH FORMATION* — Grey and brown sandstones, fine to medium grained ; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
Jf	*FERNIE FORMATION* — Dark grey and black shales, mudstones, sandstones. siltstones. marine

(2) COAL SEAM (line represents seam top).

APPENDIX A PART 1

SCALE 1:10,000

0 500 1000

METRES

532

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

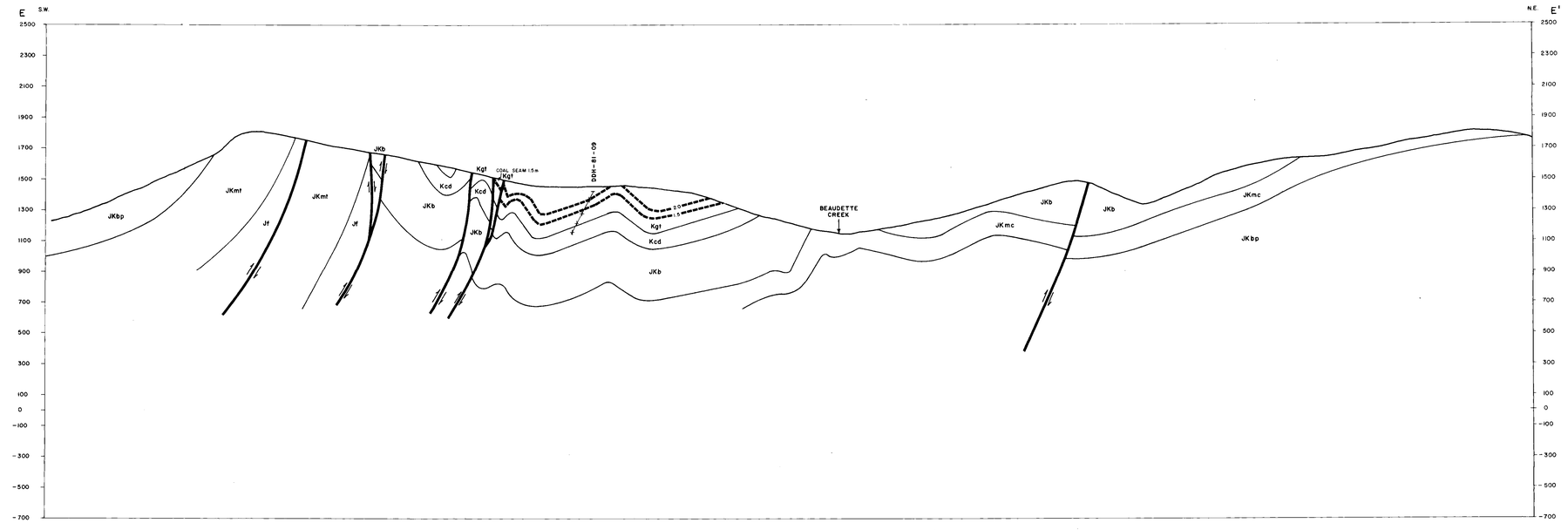
Gulf

PC Goodrich 2/12/19

GOODRICH PROJECT 1981
WHITERABBIT
STRUCTURE PROFILE Y-Y'

PREPARED BY J. LaMarre I. Delas SCALE 1:10,000
APPROVED BY H.D. ZSCHACH DATE JAN.82 DRAWING No

12



LEGEND

- **Q** — *QUATERNARY*
  Glacial deposits and alluvium
- **KCm** — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- **Kmb** — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- **Kbs** — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- **Kgt** — *GETHING FORMATION*
  Cyclothems, dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- **Kdr** — *DRESSER FORMATION*
  Incomplete cyclothems, discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- **JKb** — *BRENOT FORMATION*
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- **JKmc** — *MONACH FORMATION*
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- **JKbp** — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained, thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- **JKmt** — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- **Jf** — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS

BEAUDETTE GROUP | CRASSIER GROUP

COAL SEAM (line represents seam top)

0 200 400 600 800 1000

scale in metres

APPENDIX A PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY

1981

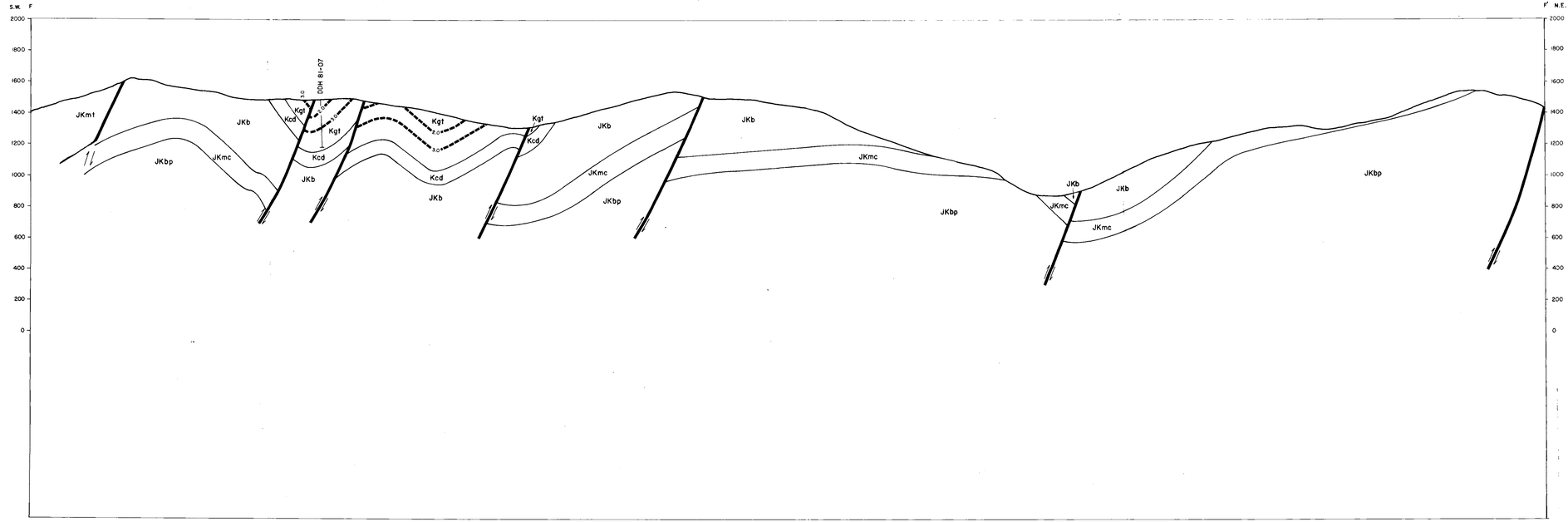
GOODRICH CENTRAL

GEOLOGICAL CROSS SECTION E-E'

PREPARED BY: A. PETZOLD — SCALE 1:10,000

APPROVED BY: H. ZSCHACH — DATE: JAN. 82 — DRAWING No. 532

532



LEGEND

JURASSIC — TRANSITIONAL — BEAUDETTE GROUP | CRASSIER GROUP | LOWER CRETACEOUS

- Q — QUATERNARY
  Glacial deposits and alluvium
- KCm — COMMOTION FORMATION
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — MOOSEBAR FORMATION
  Mudstones, minor siltstones, marine
- Kbs — BLUESKY
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — GETHING FORMATION
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit, COAL
- Kdr — DRESSER FORMATION
  Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — BRENOT FORMATION
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — MONACH FORMATION
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — BEATTIE PEAKS FORMATION
  Buff to brownish sandstones, fine to medium grained, thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- JKmt — MONTIETH FORMATION
  Grey and brown sandstones, fine to medium grained, fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates
- Jf — FERNIE FORMATION
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

COAL SEAM (line represents seam top)

0 200 400 600 800 1000

scale in metres

APPENDIX A PART 1

Rejected Plate

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY

1981

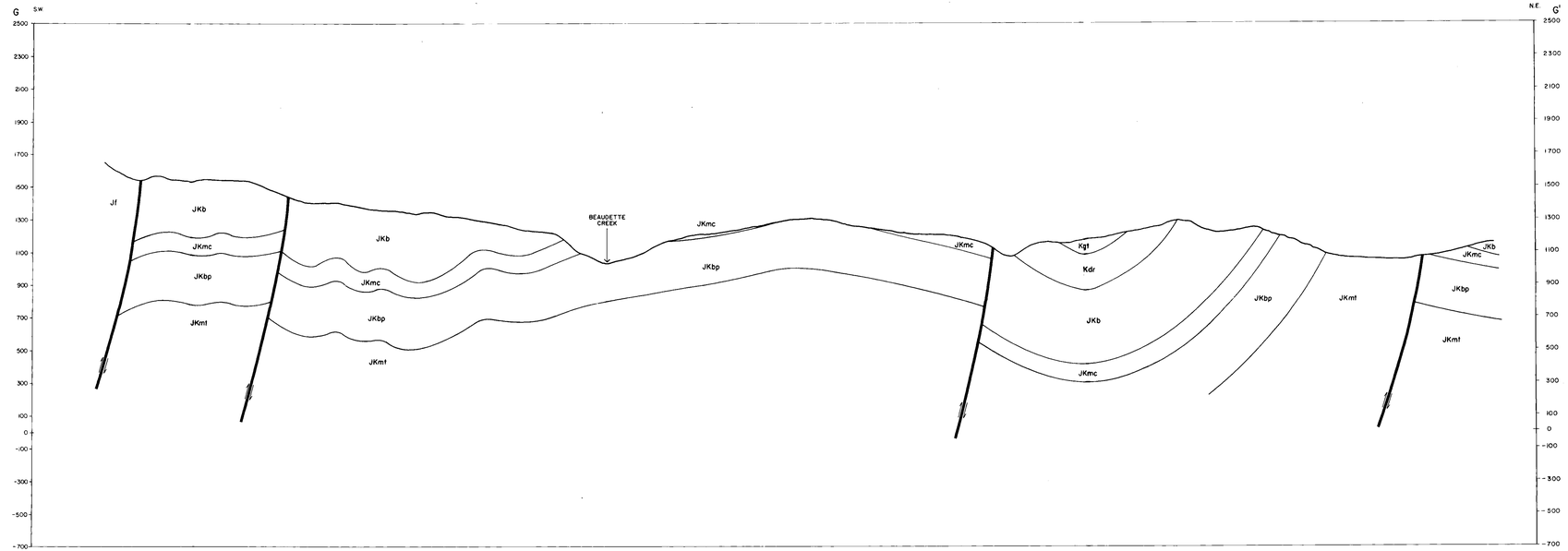
GOODRICH CENTRAL

GEOLOGICAL CROSS SECTION F-F'

PREPARED BY A. PETZOLD SCALE 1:10000

APPROVED BY H. ZSCHACH DATE JAN. 82 DRAWING No. 22

532



LEGEND

- Q — QUATERNARY
  Glacial deposits and alluvium
- KCm — COMMOTION FORMATION
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — MOOSEBAR FORMATION
  Mudstones, minor siltstones, marine
- Kbs — BLUESKY
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — GETHING FORMATION
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — DRESSER FORMATION
  Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — BRENOT FORMATION
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones; COAL
- JKmc — MONACH FORMATION
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — BEATTIE PEAKS FORMATION
  Buff to brownish sandstones, fine to medium grained, thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- JKmt — MONTIETH FORMATION
  Grey and brown sandstones, fine to medium grained, fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — FERNIE FORMATION
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS
BEAUDETTE GROUP | CRASSIER GROUP

2 COAL SEAM (2 represents seam top)

0 200 400 600 800 1000
scale in metres

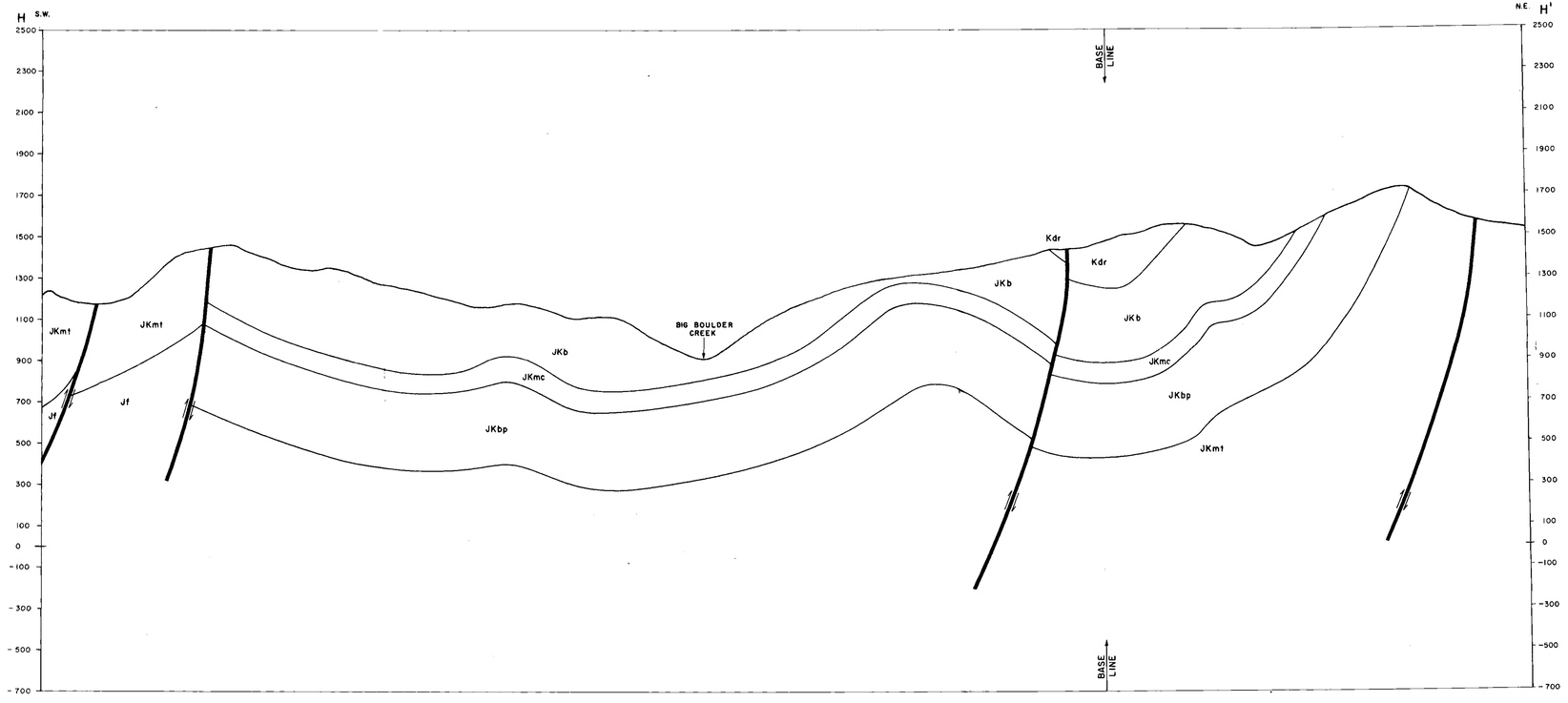
APPENDIX A PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
1981
GOODRICH CENTRAL
GEOLOGICAL CROSS SECTION G-G'

PREPARED BY: A. PETZOLD — SCALE: 1:10,000
APPROVED BY: H. ZSCHACH — DATE: JAN. 82 — DRAWING No.

532



LEGEND

- Q — *QUATERNARY* — Glacial deposits and alluvium
- KCm — *COMMOTION FORMATION* — Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — *MOOSEBAR FORMATION* — Mudstones, minor siltstones, marine
- Kbs — *BLUESKY* — Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — *GETHING FORMATION* — Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — *DRESSER FORMATION* — Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — *BRENOT FORMATION* — Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — *MONACH FORMATION* — Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — *BEATTIE PEAKS FORMATION* — Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- JKmt — *MONTIETH FORMATION* — Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — *FERNIE FORMATION* — Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS | BEAUSETTE GROUP | CRASSIER GROUP

COAL SEAM (line represents seam top)

0 200 400 600 800 1000

scale in metres

APPENDIX A PART 1

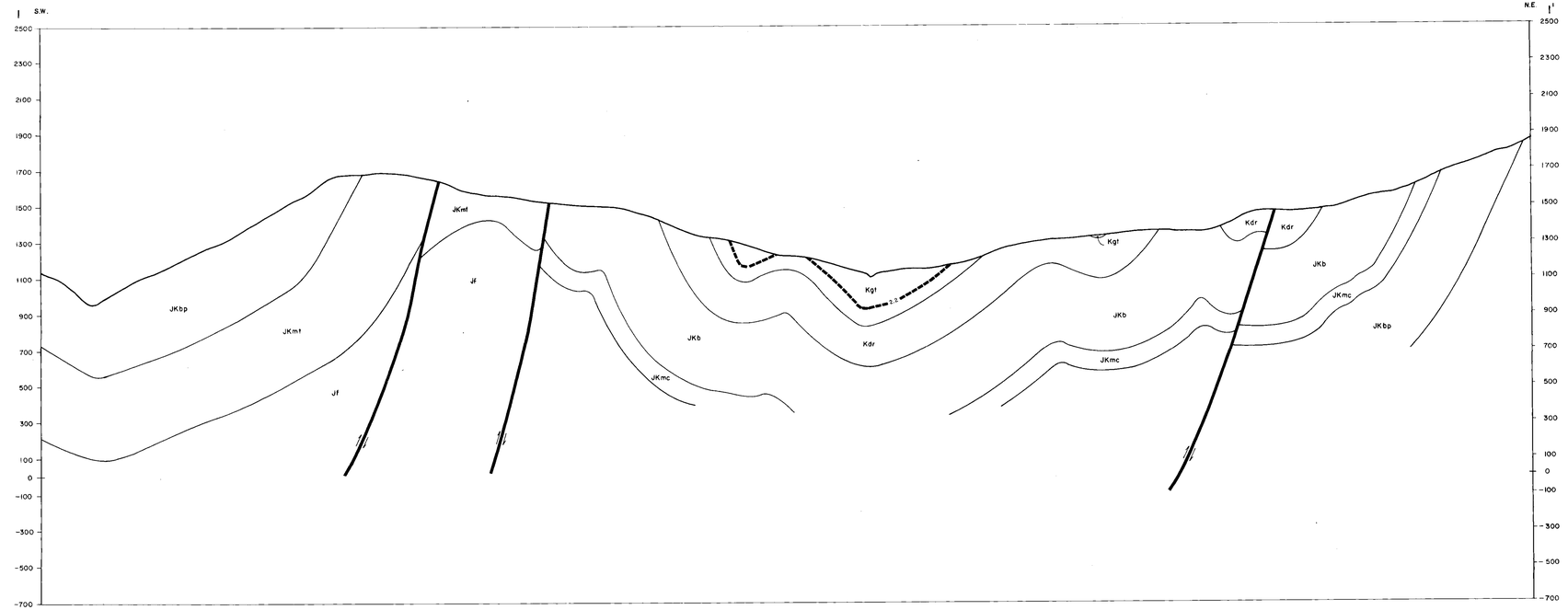
PR Permission 2617.P

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
1981
GOODRICH CENTRAL
GEOLOGICAL CROSS SECTION H-H'

PREPARED BY: I. Oelas B. A. Petzold — SCALE 1:10,000
APPROVED BY: H. Zechsch — DATE NOV. 81 — DRAWING No. 23

532



LEGEND

- Q — *QUATERNARY* — Glacial deposits and alluvium
- KCm — *COMMOTION FORMATION* — Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — *MOOSEBAR FORMATION* — Mudstones, minor siltstones, marine
- Kbs — *BLUESKY* — Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — *GETHING FORMATION* — Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — *DRESSER FORMATION* — Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — *BRENOT FORMATION* — Lithic 'salt and pepper' sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — *MONACH FORMATION* — Marine lithic and quartrose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — *BEATTIE PEAKS FORMATION* — Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- JKmt — *MONTIETH FORMATION* — Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — *FERNIE FORMATION* — Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS | BEAUDETTE GROUP | CRASSIER GROUP

2 COAL SEAM (line represents seam top)

0 200 400 600 800 1000

scale in metres

APPENDIX A PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY

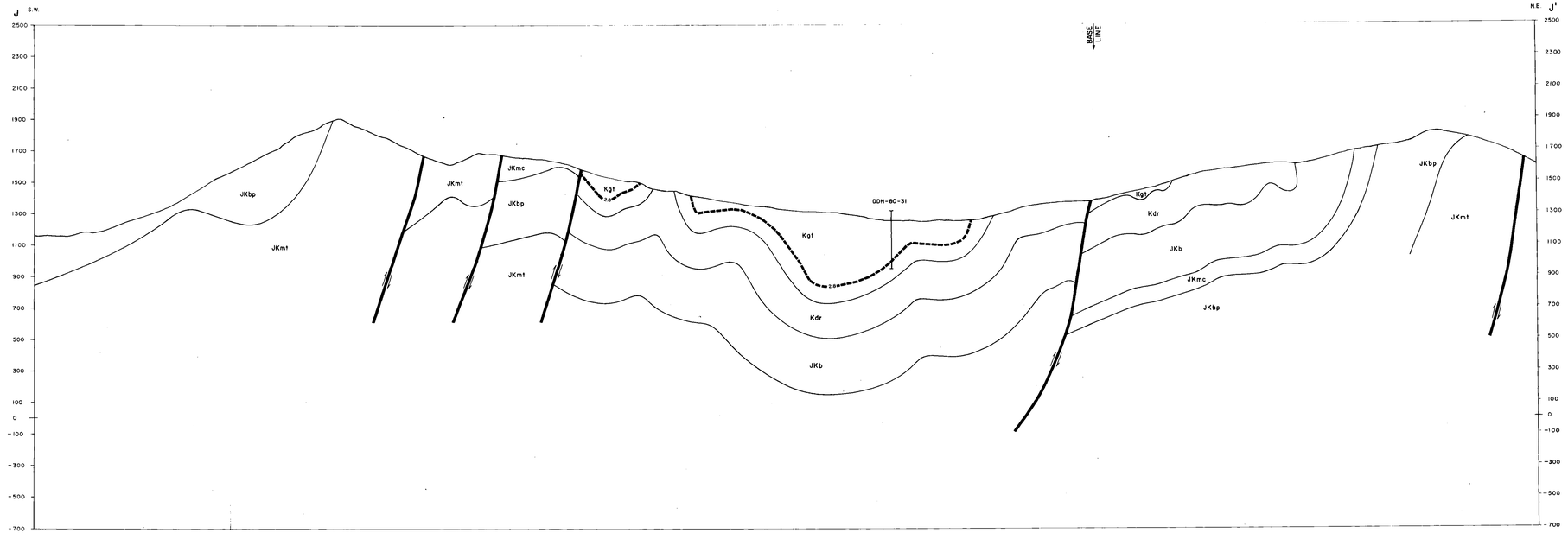
1981

GOODRICH CENTRAL

GEOLOGICAL CROSS SECTION I-I'

PREPARED BY: I. DELAS, A. PETZOLD	SCALE 1:10,000
APPROVED BY: H. ZSCHACH	DATE: JAN. 82 DRAWING No.

532



LEGEND

- Q — QUATERNARY
  Glacial deposits and alluvium
- KCm — COMMOTION FORMATION
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — MOOSEBAR FORMATION
  Mudstones, minor siltstones, marine
- Kbs — BLUESKY
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — GETHING FORMATION
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — DRESSER FORMATION
  Incomplete cyclothems; discontinuous coal measures in varying thicknesses, medium to very coarse grained sandstones, grits, and conglomerates
- JKb — BRENOT FORMATION
  Lithic 'salt and pepper' sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKnc — MONACH FORMATION
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — BEATTIE PEAKS FORMATION
  Bluff to brownish sandstones, fine to medium grained, thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- JKmt — MONTEITH FORMATION
  Grey and brown sandstones, fine to medium grained, fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — FERNIE FORMATION
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS
BEAUDETTE GROUP | CRASSIER GROUP

COAL SEAM (line represents seam top)

0 200 400 600 800 1000
scale in metres

APPENDIX A PART 1

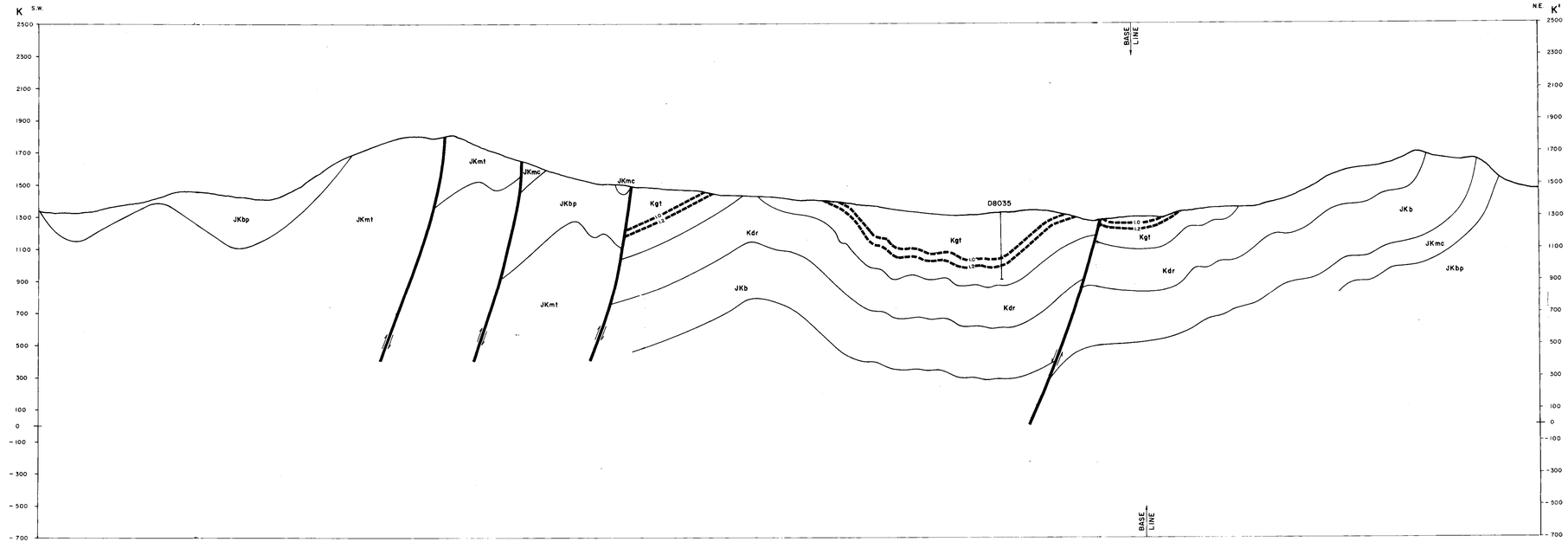
For Assessment Report

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
1981
GOODRICH CENTRAL
GEOLOGICAL CROSS SECTION J-J'

PREPARED BY: T. Dolan, A. Petzold — SCALE 1:10,000
APPROVED BY: H. Zaback — DATE: NOV. 81 — DRAWING No. 37

532



LEGEND

- Q — *QUATERNARY*
  Glacial deposits and alluvium
- KCm — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Knb — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- Kbs — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — *GETHING FORMATION*
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — *DRESSER FORMATION*
  Incomplete cyclothems, discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — *BRENOT FORMATION*
  Little "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — *MONACH FORMATION*
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained, thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- JKmt — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained, fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS — BEAUDETTE GROUP — CRASSIER GROUP

(2) COAL SEAM (line represents seam top)

0 200 400 600 800 1000

scale in metres

APPENDIX A PART 1

INCLOSURE 31 OF 31

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY

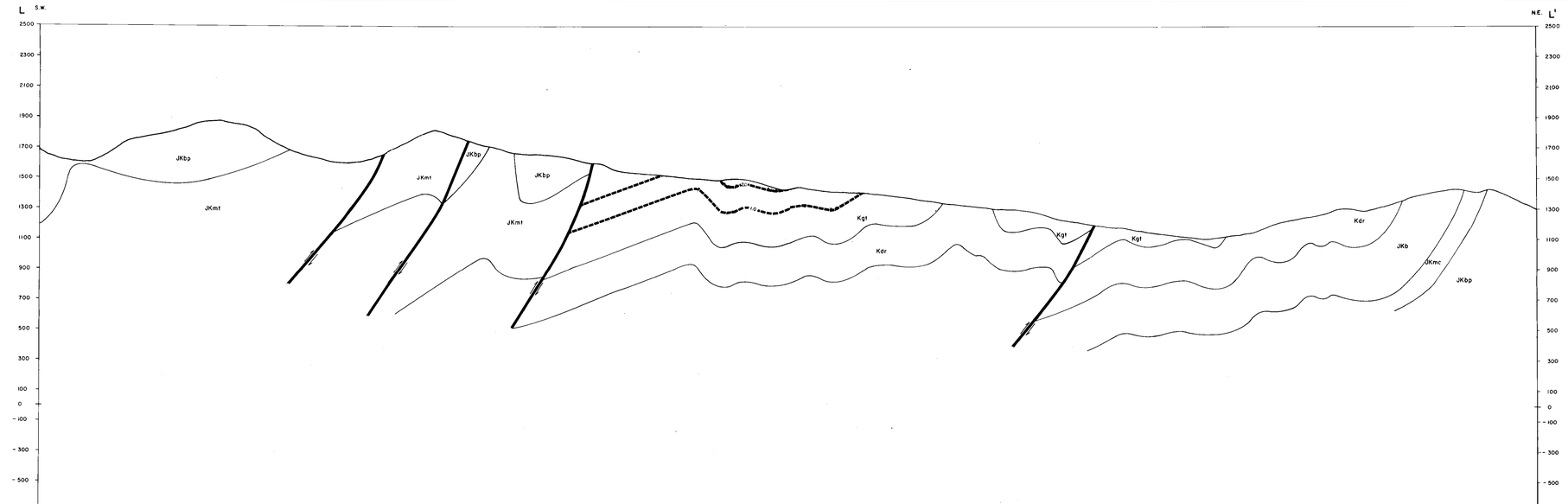
1981

GOODRICH CENTRAL

GEOLOGICAL CROSS SECTION K-K'

PREPARED BY: T. Dates & A. Petzold — SCALE 1:10,000
APPROVED BY: W. Zachach — DATE: NOV. 81 — DRAWING No. 38

532



LEGEND

- Q — QUATERNARY — Glacial deposits and alluvium
- KCm — COMMOTION FORMATION — Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Knb — MOOSEBAR FORMATION — Mudstones, minor siltstones, marine
- Kbs — BLUESKY — Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — GETHING FORMATION — Cyclothems, dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — DRESSER FORMATION — Incomplete cyclothems, discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — BRENOT FORMATION — Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — MONACH FORMATION — Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — BEATTIE PEAKS FORMATION — Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- JKmt — MONTIETH FORMATION — Grey and brown sandstones, fine to medium grained, fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates
- Jf — FERNIE FORMATION — Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS
BEAUDETTE GROUP | CRASSIER GROUP

COAL SEAM (line represents seam top)

0 200 400 600 800 1000
scale in metres

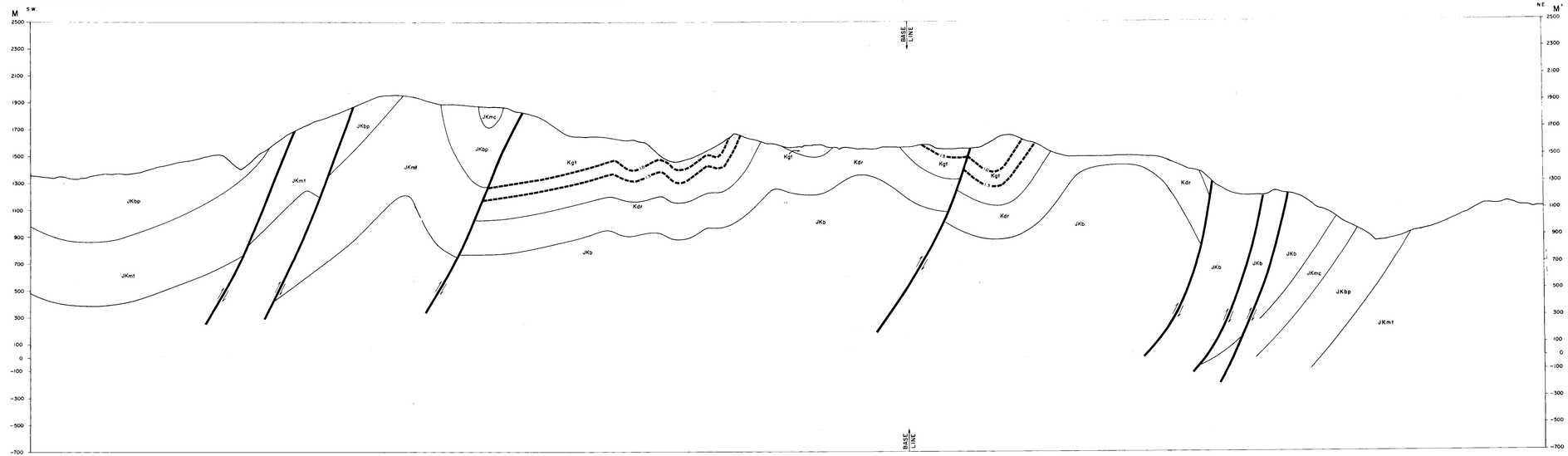
APPENDIX A PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
1981
GOODRICH CENTRAL
GEOLOGICAL CROSS SECTION L-L'

PREPARED BY: I. Delas & A. Patzelt — SCALE: 1:10,000
APPROVED BY: H. Zeiheh — DATE: JAN 82 — DRAWING No. 24

532



LEGEND

- Q — QUATERNARY
  Glacial deposits and alluvium
- KCm — COMMOTION FORMATION
  Siltstones, sandstones interbedded, claystones of marine origin.
  COAL at the top member, and conglomerates
- Kmb — MOOSEBAR FORMATION
  Mudstones, minor siltstones, marine
- Kbs — BLUESKY
  Fine to medium grained sandstones, mudstones, thin conglomerate at base at top with or without glauconite
- Kgt — GETHING FORMATION
  Cyclothems, dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones, coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit, COAL
- Kdr — DRESSER FORMATION
  Incoherent cyclothems, discontinuous coal measures in varying thicknesses, medium to very coarse grained sandstones, grits, and conglomerates
- JKb — BRENOT FORMATION
  Lithic, salt and pepper sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — MONACH FORMATION
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — BEATTIE PEAKS FORMATION
  Buff to brownish sandstones, fine to medium grained, thinly bedded black and dark grey shales, silty shales, siltstones, thin sandstones with ironstone banding
- JKmt — MONTIETH FORMATION
  Grey and brown sandstones, fine to medium grained, fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates
- JT — FERNIE FORMATION
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL (BEAUDETTE GROUP) — LOWER CRETACEOUS (CRASSIER GROUP)

COAL SEAM (the represents seam top)

0 200 400 600 800 1000
scale in metres

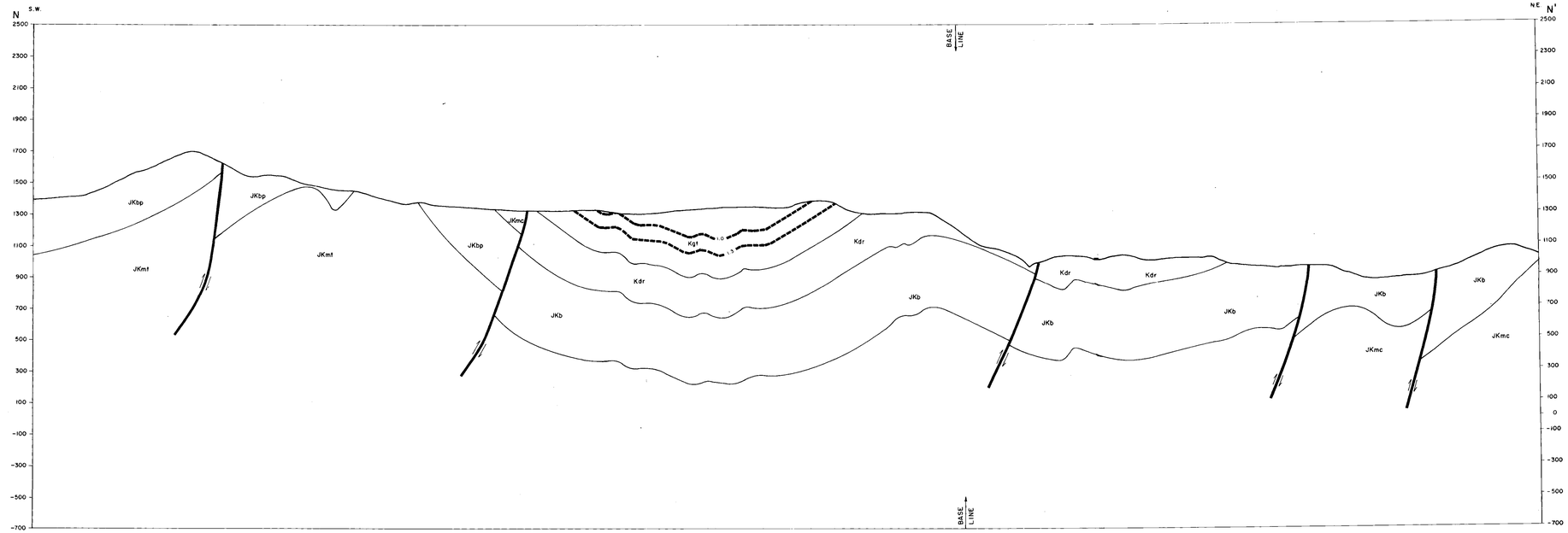
APPENDIX A PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
1981
GOODRICH CENTRAL
GEOLOGICAL CROSS SECTION M-M'

PREPARED BY DELAS, A. PETZOLD | SCALE 1 : 10,000
APPROVED BY W. ZSCHACH | DATE NOV. 81 | DRAWING No.

532



LEGEND

- Q — *QUATERNARY*
  Glacial deposits and alluvium
- KCm — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- Kbs — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — *GETHING FORMATION*
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — *DRESSER FORMATION*
  Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — *BRENOT FORMATION*
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — *MONACH FORMATION*
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- JKmt — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — LOWER CRETACEOUS | BEAUDETTE GROUP | CRASSIER GROUP

COAL SEAM (line represents seam top)

0 200 400 600 800 1000
scale in metres

APPENDIX A PART 1

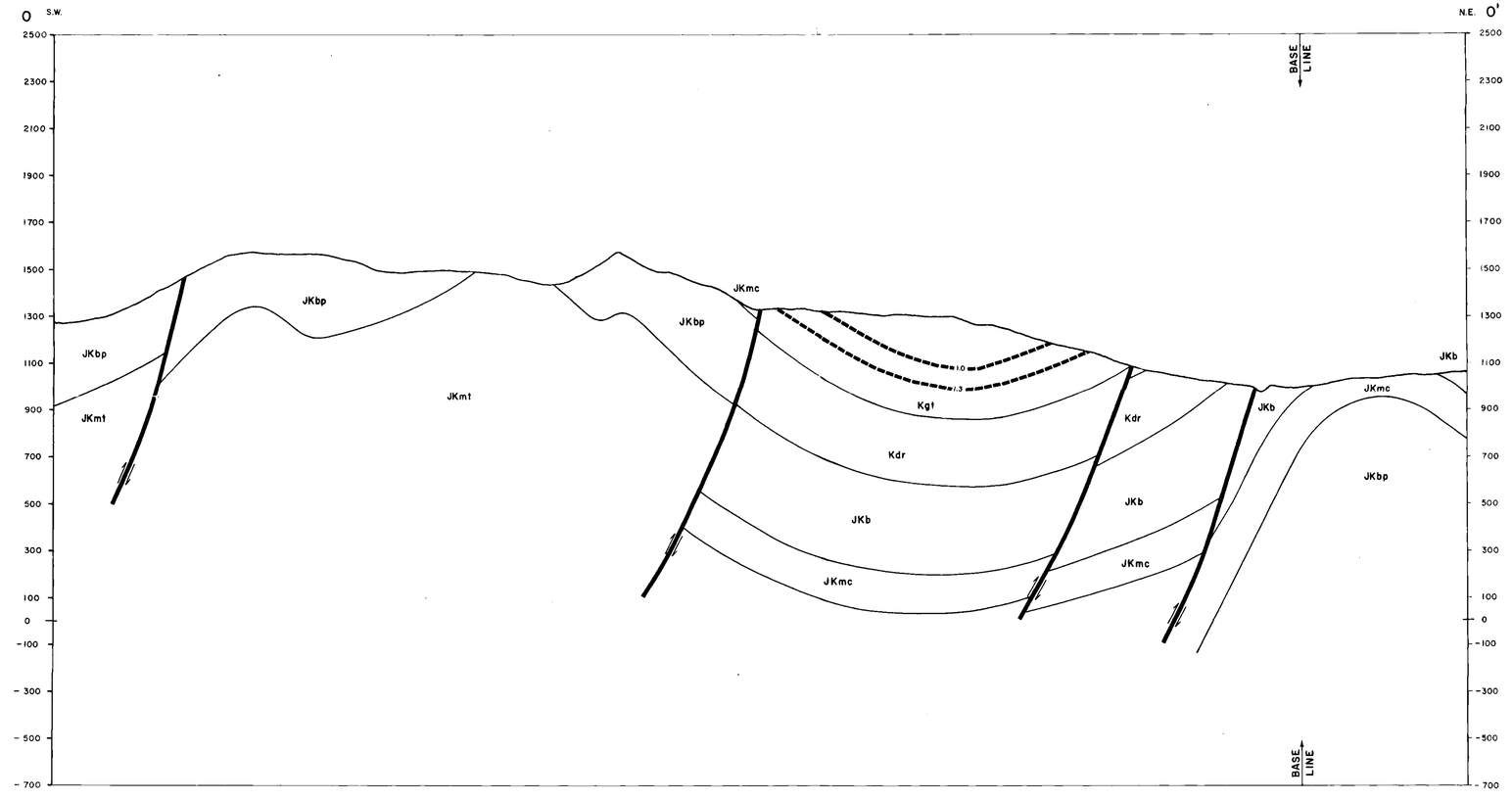
ff Continuation

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
1981
GOODRICH CENTRAL
GEOLOGICAL CROSS SECTION N-N'

PREPARED BY: I. DELAS, A. PETZOLD — SCALE 1:10,000
APPROVED BY: H. ZSCHACH — DATE JAN. 82 — DRAWING No. 21

532



LEGEND

- Q — *QUATERNARY*
  Glacial deposits and alluvium
- KCm — *COMMOTION FORMATION*
  Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
- Kmb — *MOOSEBAR FORMATION*
  Mudstones, minor siltstones, marine
- Kbs — *BLUESKY*
  Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
- Kgt — *GETHING FORMATION*
  Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tuffs in upper unit; COAL
- Kdr — *DRESSER FORMATION*
  Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates
- JKb — *BRENOT FORMATION*
  Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
- JKmc — *MONACH FORMATION*
  Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
- JKbp — *BEATTIE PEAKS FORMATION*
  Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
- JKmt — *MONTIETH FORMATION*
  Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings, occasional thin conglomerates.
- Jf — *FERNIE FORMATION*
  Dark grey and black shales, mudstones, sandstones, siltstones, marine

JURASSIC — TRANSITIONAL — BEAUDETTE GROUP — CRASSIER GROUP — LOWER CRETACEOUS

2 COAL SEAM (line represents seam top)

0 200 400 600 800 1000
scale in metres

APPENDIX A PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

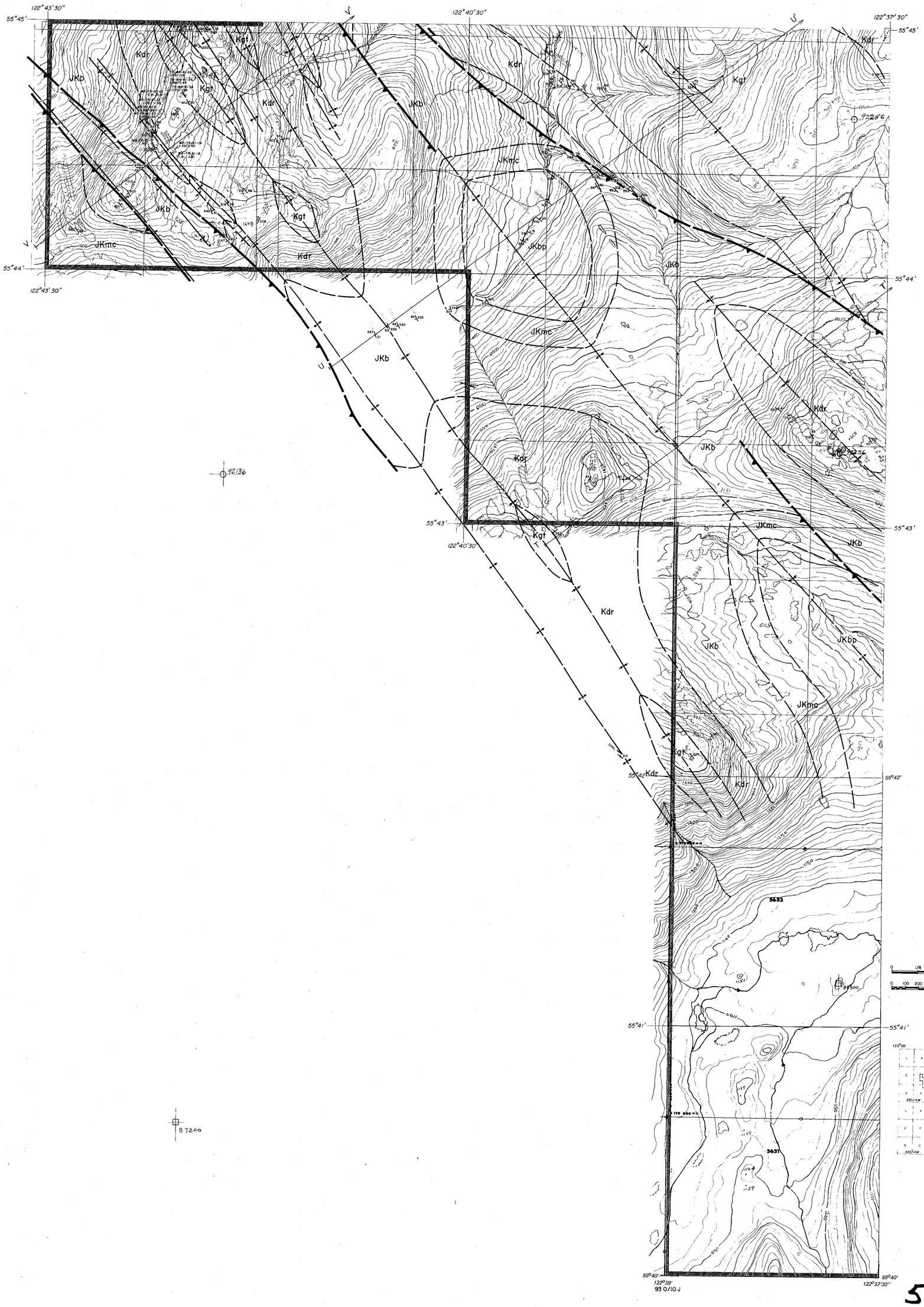
GOODRICH COAL PROPERTY

1981

GOODRICH CENTRAL

GEOLOGICAL CROSS SECTION O-O'

PREPARED BY: I. Oates & A. Petzold — SCALE 1:6,000
APPROVED BY: H. Zachach — DATE: NOV. 81 — DRAWING No. 532



532

PR-Goodrich 81(3)9

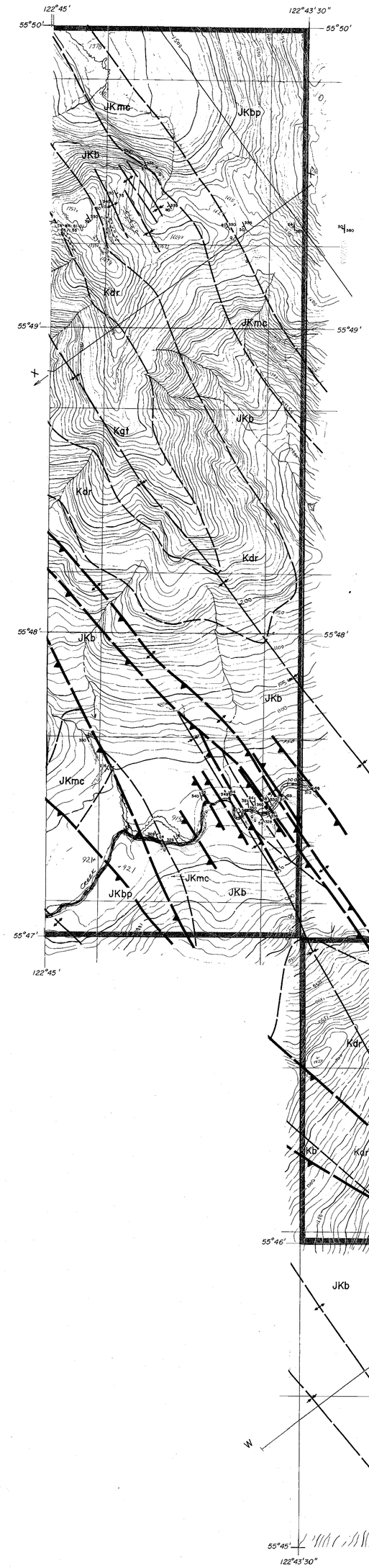
APPENDIX A PART 1

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

93 O/10 J

GOODRICH COAL PROJECT
WHITE RABBIT BLOCK
1981 GOELOGY MAP

PREPARED BY: J. LaMarre	SCALE 1:10,000
APPROVED BY: H. Zschoch DATE: JAN. 82	DRAWING No. 6



LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5534

FORM LINE INTERVAL 10 METRES

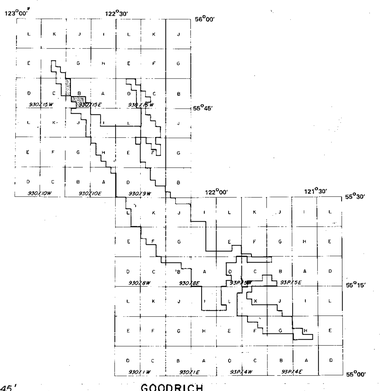
SURVEY NOTE

SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

0 1/8 1/4 1/2 3/4 MILE

0 100 200 400 600 800 1000 METERS

SCALE 1:10,000



GOODRICH INDEX MAP

APPENDIX A PART 1

532

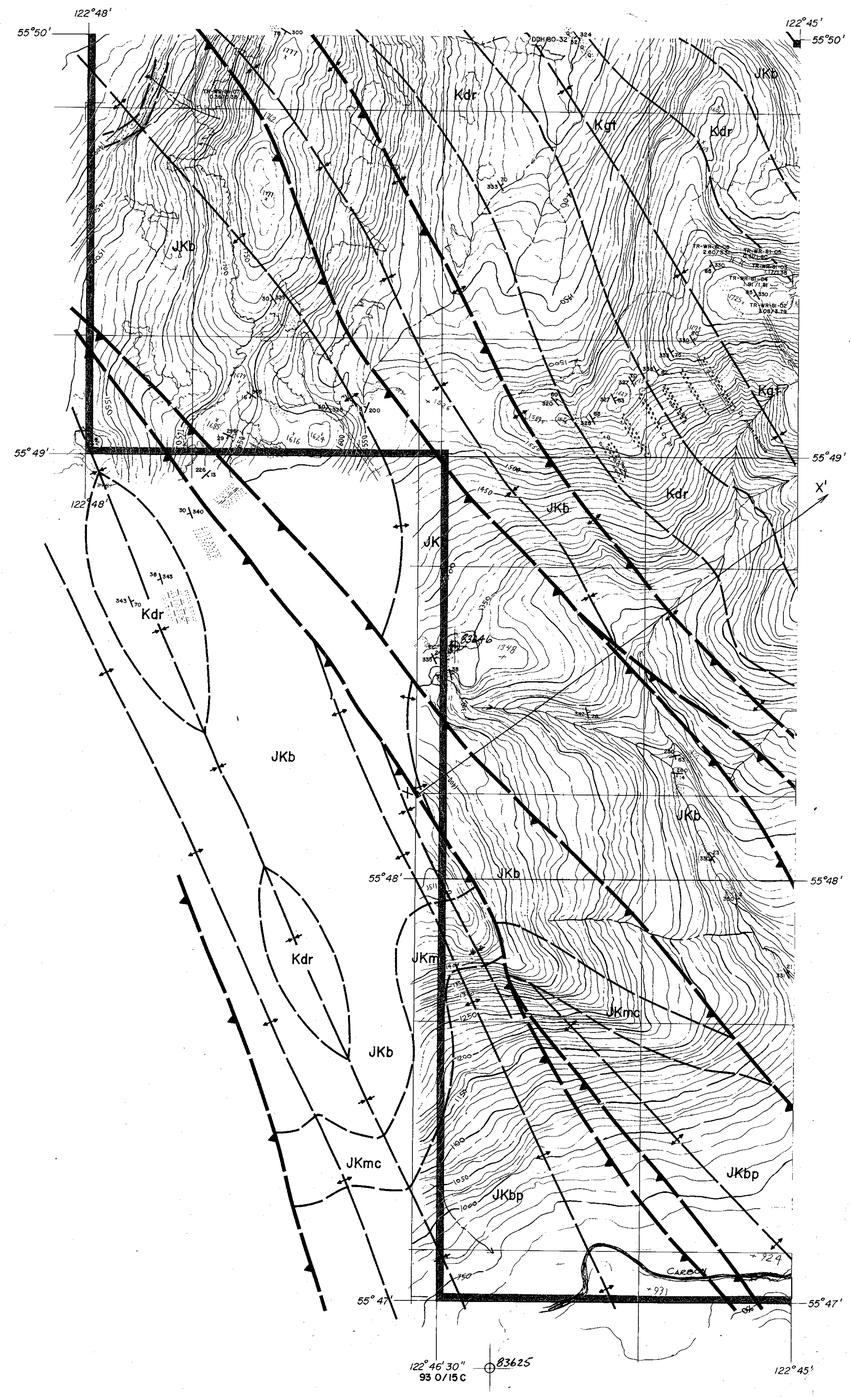
PR-Goodrich 21(a)(v)

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/15B

GOODRICH COAL PROJECT
WHITE RABBIT BLOCK
1981 GEOLOGY MAP

PREPARED BY: J. La Marre	SCALE 1:10,000
APPROVED BY: H. Zschach DATE: JAN. 82	DRAWING No.



LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT ×1134
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5534

FORM LINE INTERVAL 10 METRES

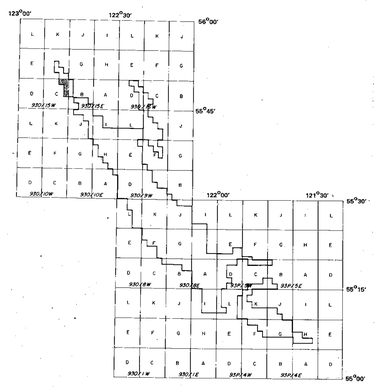
SURVEY NOTE

SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

0 1/8 1/4 1/2 3/4 MILE

0 100 200 400 600 800 1000 METERS

SCALE : 1:10,000



GOODRICH
INDEX MAP

APPENDIX A PART 1

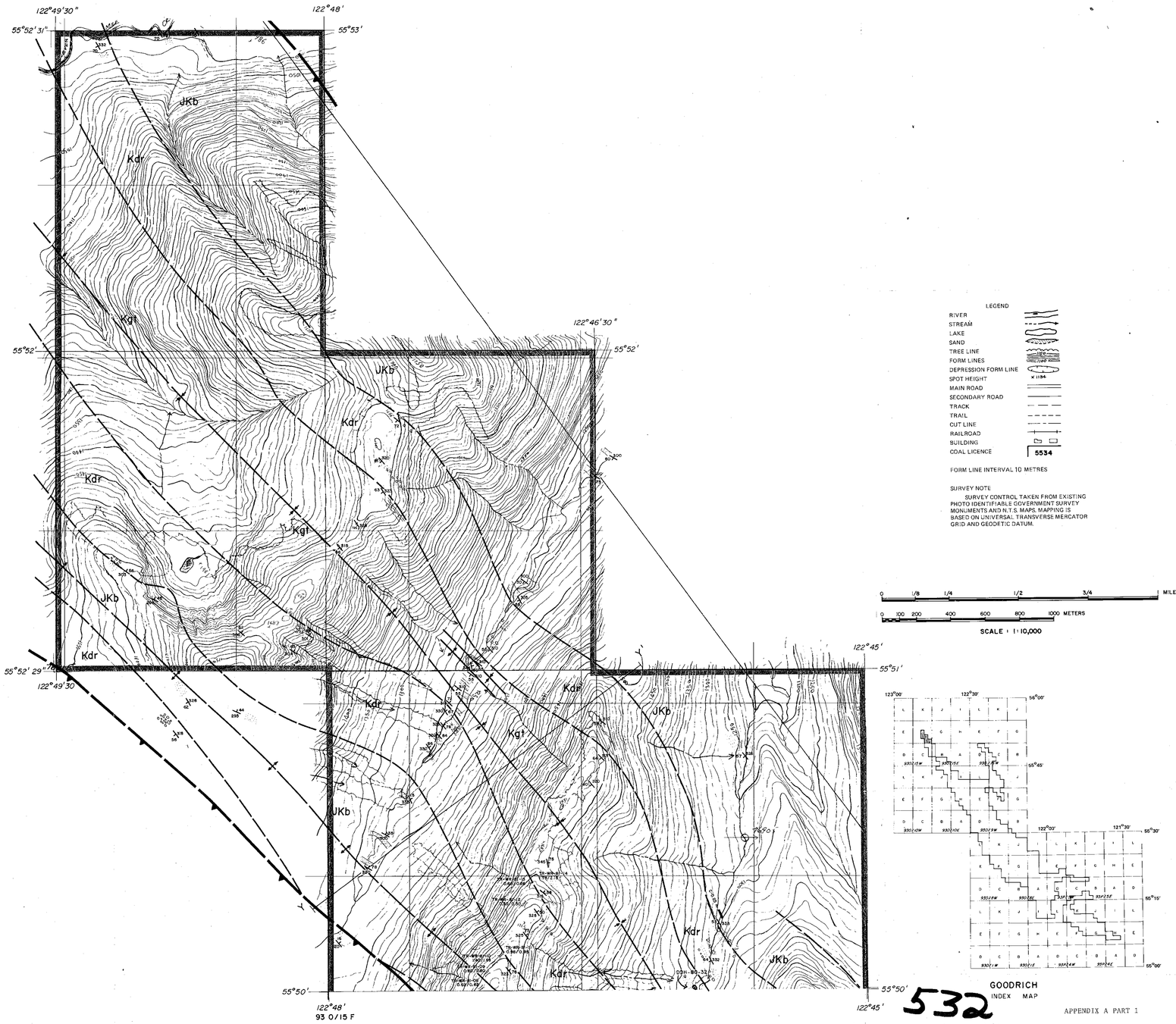
532 Pt Goodrich 81(9)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/15C

GOODRICH COAL PROJECT
WHITE RABBIT BLOCK
1981 GEOLOGY MAP

PREPARED BY:	J. La Marre	SCALE	1:10,000
APPROVED BY:	H. Zschach	DATE: JAN 82	DRAWING No. 9



532

APPENDIX A PART 1

AR Goodrich WB(1)A

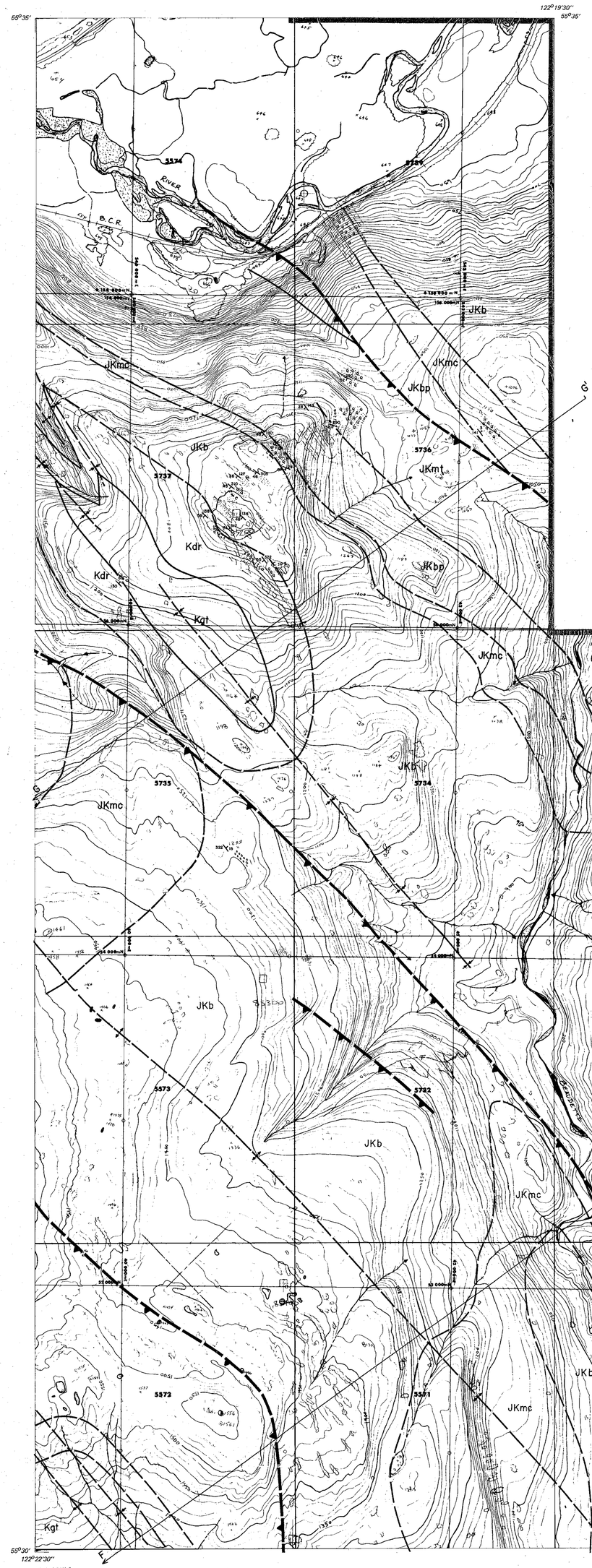
GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

Gulf

930/15F

GOODRICH COAL PROJECT
WHITE RABBIT BLOCK
1981 GEOLOGY MAP

PREPARED BY: J. LaMarre	SCALE 1:10,000
APPROVED BY: H. Zschoch DATE JAN. 82	DRAWING No. 9



LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT ×1134
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5534

FORM LINE INTERVAL 10 METRES

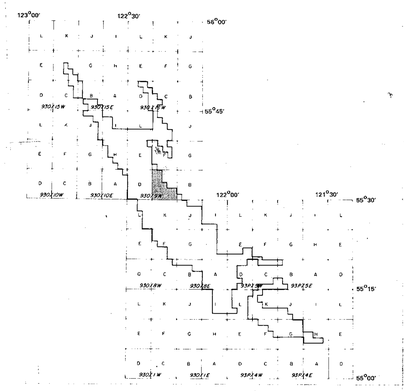
SURVEY NOTE

SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

0 1/8 1/4 1/2 3/4 MILE

0 100 200 400 600 800 1000 METERS

SCALE 1 : 10,000



GOODRICH
INDEX MAP

532

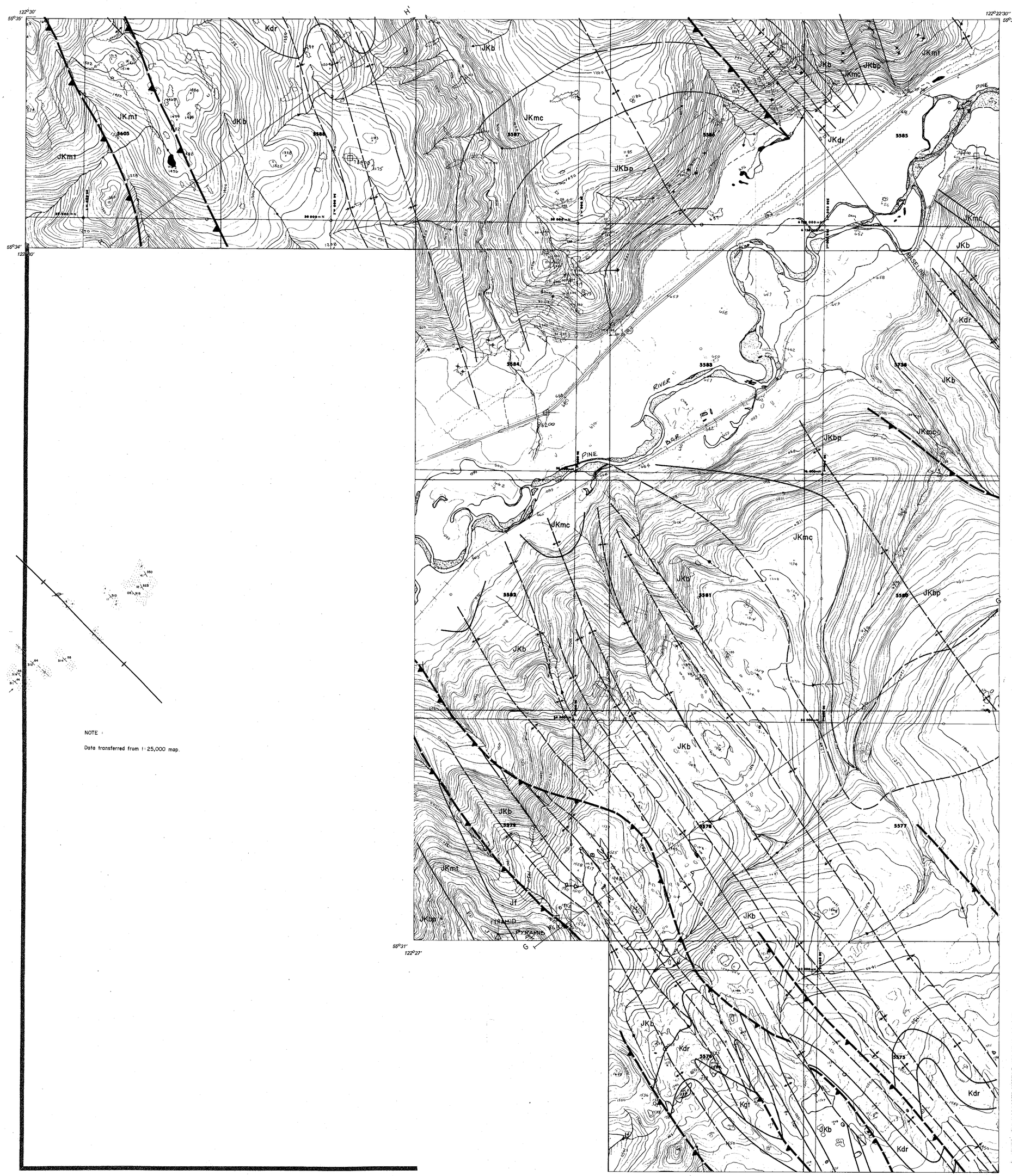
PR-Goodrich B(D)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/9WC

GOODRICH COAL PROPERTY
Northeast British Columbia
1981 GEOLOGY MAP
GOODRICH CENTRAL

PREPARED BY: G. SEVE , D. DAUPHINEE
APPROVED BY: H. ZSCHACH DATE: JAN 1982
SCALE 1:10,000
DRAWING No. 16



NOTE :

Data transferred from 1:25,000 map.

LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT (× 1134)
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5534

FORM LINE INTERVAL 10 METRES

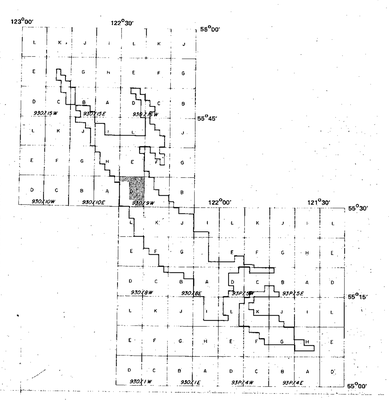
SURVEY NOTE

SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

0 1/8 1/4 1/2 3/4 MILE

0 100 200 400 600 800 1000 METERS

SCALE 1:10,000



GOODRICH
INDEX MAP

532 PR-Goodrich 81(2)A

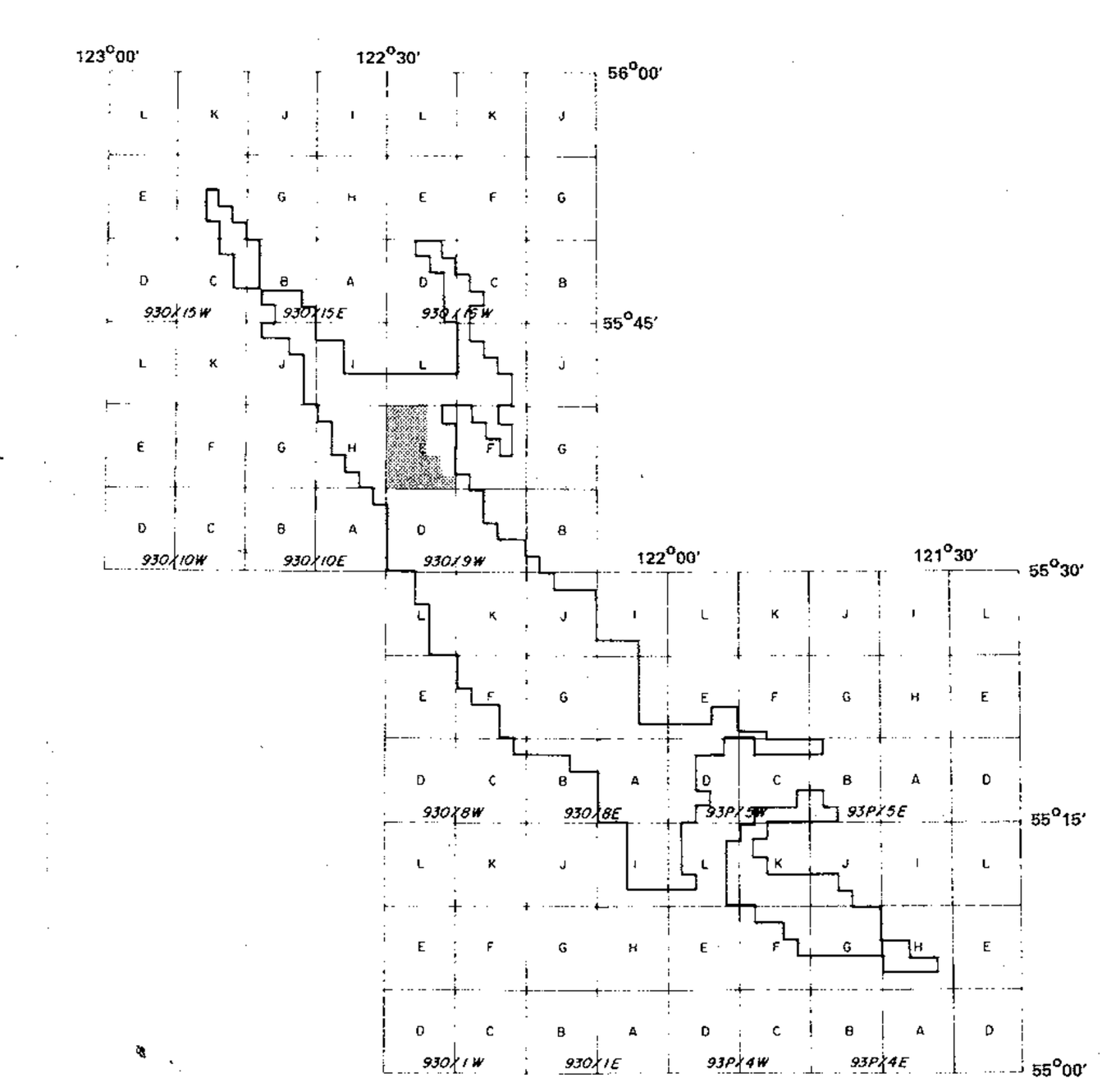
GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/9W D

GOODRICH COAL PROPERTY
NORTHEAST BRITISH COLUMBIA

GEOLOGY MAP 1981
GOODRICH CENTRAL

PREPARED BY: G. SERE , D. DAUPHINEE	SCALE 1:10 000
APPROVED BY: H. ZSCHACH DATE: JAN., '82	DRAWING No. 1 of 1



GOODRICH
INDEX MAP

532

PR-Goodrich 81(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

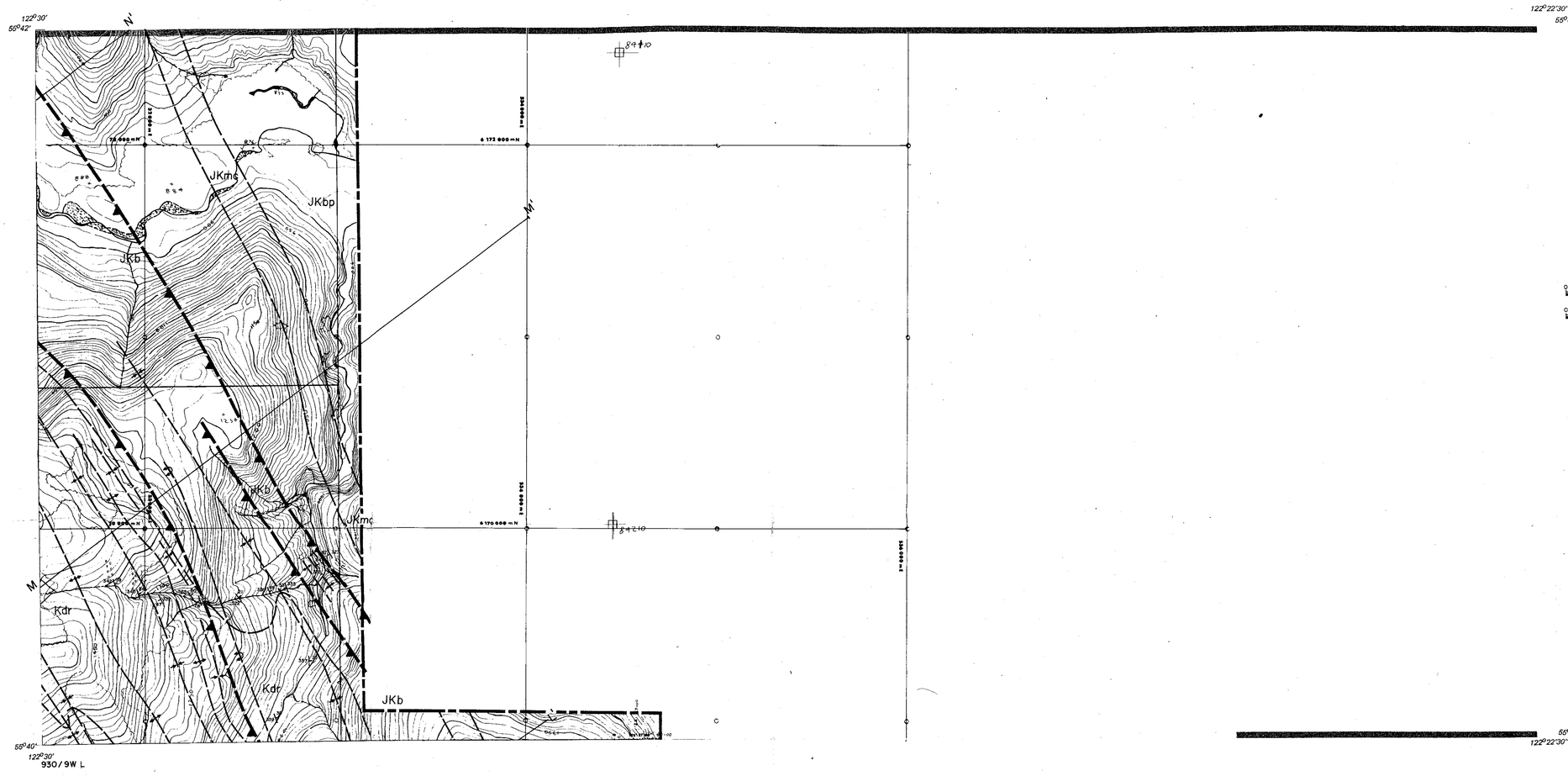
930/9WE

GOODRICH COAL PROPERTY
Northeast British Columbia

1981 GEOLOGY MAP
GOODRICH CENTRAL

PREPARED BY: DAUPHINEE , SEVE	SCALE 1 : 10,000
APPROVED BY: H.G. ZSCHACH DATE: JAN. 1982	DRAWING No. 18

APPENDIX A PART 1



LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT ×1134
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5534

FORM LINE INTERVAL 10 METRES

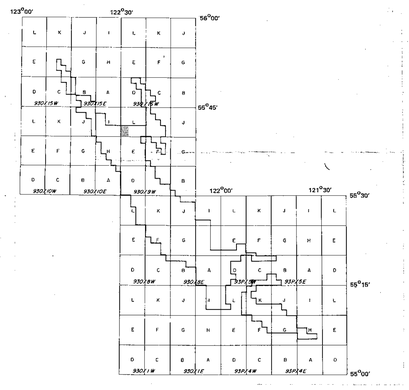
SURVEY NOTE

SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

0 1/8 1/4 1/2 3/4 MILE

0 100 200 400 600 800 1000 METERS

SCALE 1 : 10,000



GOODRICH
INDEX MAP

55°40'
122°22'30"

532 Pt Goodrich 30/2/9

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/9WL

GOODRICH COAL PROPERTY
Northeast British Columbia
1981 GEOLOGY MAP
GOODRICH CENTRAL

PREPARED BY: DAUPHINEE	SCALE 1 : 10,000
APPROVED BY: H.D. ZSCHACH DATE: JAN. 1982	DRAWING No. 19

122° 37' 30"

55°40'

122° 30'

55°40'

55°35'

122°30'

930/10 E H

55°35'

122°33'

LEGEND

RIVER
STREAM
LAKE
SAND
TREE LINE
FORM LINES
DEPRESSION FORM LINE
SPOT HEIGHT x 1134
MAIN ROAD
SECONDARY ROAD
TRACK
TRAIL
CUT LINE
RAILROAD
BUILDING
COAL LICENCE 5534

FORM LINE INTERVAL 10 METRES

SURVEY NOTE

SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

0 1/8 1/4 1/2 3/4 MILE

0 100 200 400 600 800 1000 METERS

SCALE 1 : 10,000

123°00' 122°30' 58°00' 59°45' 123°00' 121°30' 55°30' 55°15' 55°00'

GOODRICH
INDEX MAP

532 PR Goodrich 1(3)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/10E H

GOODRICH COAL PROPERTY
Northeast British Columbia
1981 GEOLOGY MAP
GOODRICH CENTRAL

PREPARED BY: RAHMANI, PETZOLD	SCALE 1 : 10,000
APPROVED BY: H.D. ZSCHACH DATE: JAN. 82	DRAWING No. 20

APPENDIX A PART 1

122°37'30"
55°45'
122°34'30"
55°44'
55°43'
55°42'
122°31'30"
122°30'
55°41'
55°40'
122°37'30"
930/10E 1
122°34'30"
122°31'30"
122°30'

JKb
JKbp
JKmc
JKmq
JKmf
Kdr
Kgt
Kct
Kgts
Q

LEGEND

- RIVER
- STREAM
- LAKE
- SAND
- TREE LINE
- FORM LINES
- DEPRESSION FORM LINE
- SPOT HEIGHT
- MAIN ROAD
- SECONDARY ROAD
- TRACK
- TRAIL
- CUT LINE
- RAILROAD
- BUILDING
- COAL LICENCE 5534

FORM LINE INTERVAL 10 METRES

SURVEY NOTE

SURVEY CONTROL TAKEN FROM EXISTING PHOTO IDENTIFIABLE GOVERNMENT SURVEY MONUMENTS AND N.T.S. MAPS. MAPPING IS BASED ON UNIVERSAL TRANSVERSE MERCATOR GRID AND GEODETIC DATUM.

0 1/8 1/4 1/2 3/4 MILE

0 100 200 400 600 800 1000 METERS

SCALE 1:10,000

123°00' 122°30' 56°00' 55°45' 122°00' 121°30' 55°30' 55°15' 55°00'

GOODRICH
INDEX MAP

APPENDIX A PART 1

PR Goodrich 11(2)10

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

930/10E1

GOODRICH COAL PROPERTY
Northeast British Columbia

1981 GEOLOGY MAP
GOODRICH CENTRAL

PREPARED BY: RAHMANI, DAUPHINEE	SCALE 1:10,000
APPROVED BY: H.D. ZSCHACH DATE: JAN. 1982	DRAWING No.

532 21

217-IU44

TABLE OF FORMATIONS

	Q	QUATERNARY Glacial deposits and alluvium
	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
Lower Cretaceous / CRASSIER GROUP	Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
	Kdr	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. (Kcd mostly conglomerates)
	Kcd	
	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
Jurassic / Transitional / BEAUDETTE GROUP	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

LEGEND

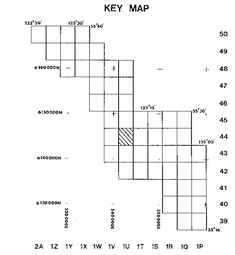
GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location (A — A')
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

KEY MAP



532

APPENDIX A PART 1

Re-Goodrich 8.(a)A

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours
- Horizontal control
- Vertical control
- Spot elevation

SCALE 1:5,000

METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
Northeast British Columbia

1981 GEOLOGY MAP
GOODRICH CENTRAL

DRAWN BY: DATE:	SCALE 1:5,000
PREPARED BY: D.D. & G.S.	DRAWING No. 217-IU44
APPROVED BY: H. ZSCHACH DATE: JAN. 1982	

FILE No. 32

TABLE OF FORMATIONS

	Q	QUATERNARY Glacial deposits and alluvium
Lower Cretaceous	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
CRASSIER GROUP	Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
CRASSIER GROUP	Kdr Kcd	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses, medium to very coarse grained sandstones, grits, and conglomerates. (Kcd mostly conglomerates)
CRASSIER GROUP	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
Jurassic Transitional	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
BEAUDETTE GROUP	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
BEAUDETTE GROUP	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

LEGEND

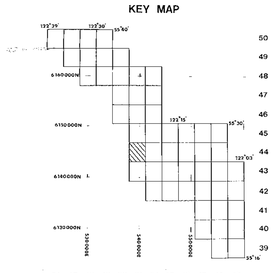
GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location (A — A')
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

KEY MAP



532

APPENDIX A PART 1

PR-Goodrich 81(a)A

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours (2100)
- Horizontal control (H-12)
- Vertical control (V-6, 1234.6)
- Spot elevation (2634.5)

SCALE 1:5,000

METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
Northeast British Columbia
1981 GEOLOGY MAP
GOODRICH CENTRAL

DRAWN BY: DATE: OCT., 1981	SCALE 1:5,000
PREPARED BY: G.SEVE, D.DAUPHINEE	DRAWING No. 218-IV44
APPROVED BY: H. ZSCHACH DATE: OCT., 1981	

FILE No. 30

218-IV44

TABLE OF FORMATIONS

	Q	QUATERNARY	Glacial deposits and alluvium
Lower Cretaceous	KCm	COMMOTION FORMATION	Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION	Mudstones, minor siltstones, marine
	Kbs	BLUESKY	Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
CRASSIER GROUP	Kgt	GETHING FORMATION	Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
	Kdr Kcd	DRESSER FORMATION	Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. (**Kcd mostly conglomerates**)
	JKb	BRENOT FORMATION	Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
Transitional	JKmc	MONACH FORMATION	Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
BEAUDETTE GROUP	JKbp	BEATTIE PEAKS FORMATION	Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION	Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
Jurassic	Jf	FERNIE FORMATION	Dark grey and black shales, mudstones, sandstones, siltstones, marine

LEGEND

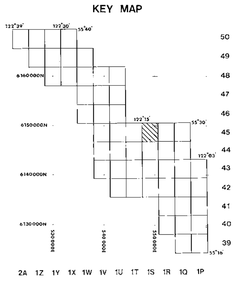
GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- A — A' Cross Section Location
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

KEY MAP



APPENDIX A PART 1

Pt-Goodrich 81(2)A

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours 2:00
- Horizontal control H-12
- Vertical control V-6 2346
- Spot elevation 2634.5

SCALE 1:5,000

METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

226 - IS45

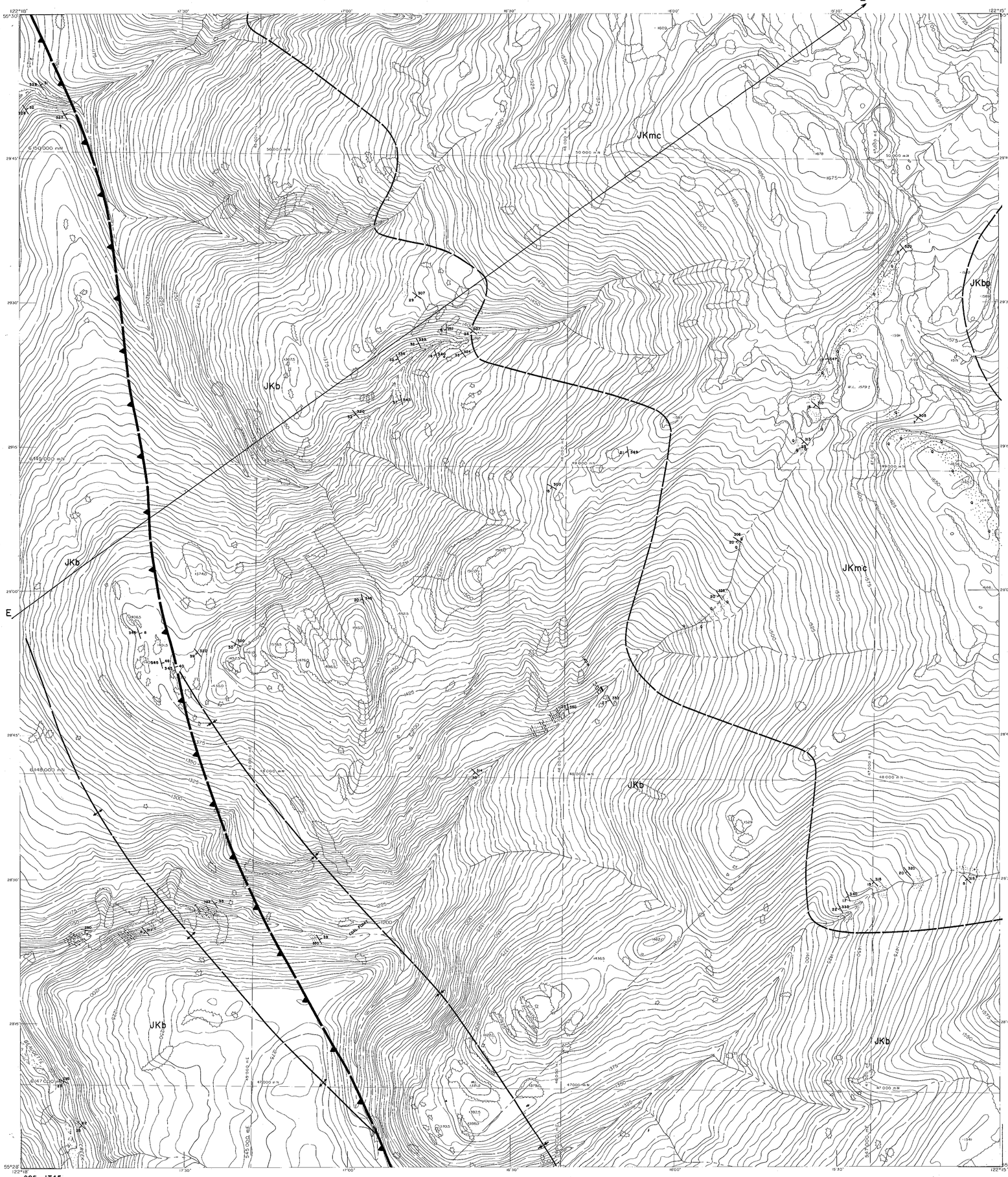
GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
Northeast British Columbia
1981 GEOLOGY MAP
GOODRICH CENTRAL

DRAWN BY: DATE: OCT., 1981	SCALE 1:5,000
PREPARED BY: G.SEVE, D.DAUPHINEE	DRAWING No. 226 - IS45
APPROVED BY: H. ZSCHACH DATE: OCT., 1981	FILE No.

37

532



225 - IT45

TABLE OF FORMATIONS

	Q	QUATERNARY	Glacial deposits and alluvium
Jurassic – Lower Cretaceous Transitional	KCm	COMMOTION FORMATION	Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION	Mudstones, minor siltstones, marine
	Kbs	BLUESKY	Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
CRASSIER GROUP	Kgt	GETHING FORMATION	Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
	Kdr / Kcd	DRESSER FORMATION	Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. **(Kcd mostly conglomerates)**
	JKb	BRENOT FORMATION	Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
BEAUDETTE GROUP	JKmc	MONACH FORMATION	Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
	JKbp	BEATTIE PEAKS FORMATION	Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION	Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
	Jf	FERNIE FORMATION	Dark grey and black shales, mudstones, sandstones, siltstones, marine

LEGEND

GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, aporox. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours (2100)
- Horizontal control (O H-12)
- Vertical control (V-6 / 2346)
- Spot elevation (2634·5)

SCALE 1:5,000

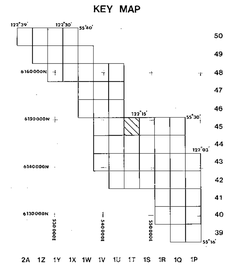
METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

KEY MAP



532

APPENDIX A PART 1

Re-Goodrich 5.1(a)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
Northeast British Columbia

1981 GEOLOGY MAP
GOODRICH CENTRAL

DRAWN BY: DATE: OCT., 1981	SCALE 1:5,000
PREPARED BY: G.SEVE , D.DAUPHINEE	DRAWING No. 225 - IT45
APPROVED BY: H. ZSCHACH DATE: OCT., 1981	FILE No. 38

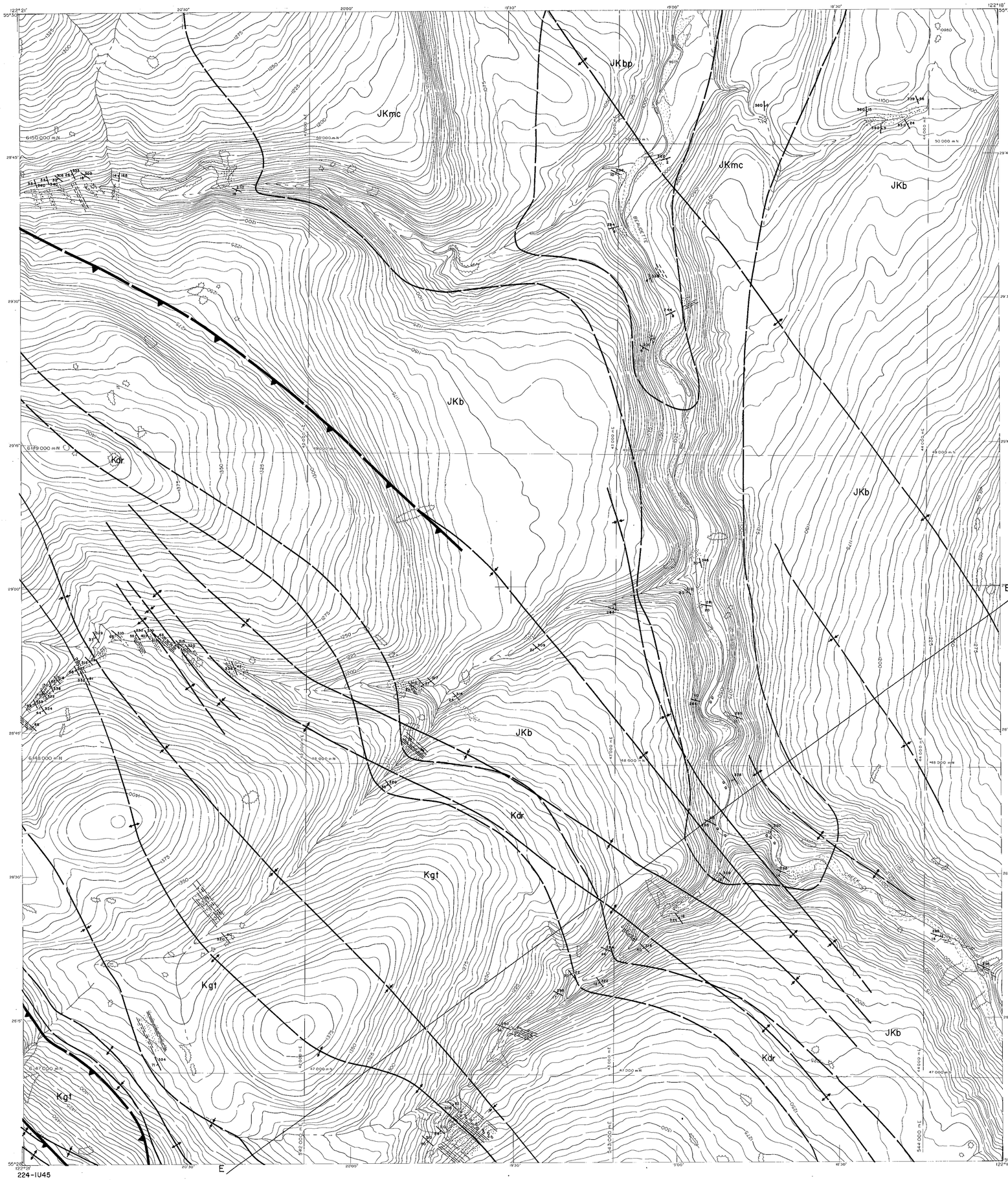


TABLE OF FORMATIONS

	Q	QUATERNARY Glacial deposits and alluvium
	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
CRASSIER GROUP	Kgt	GETHING FORMATION Cyclothems, dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
	Kdr	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. (Kcd mostly conglomerates)
	Kcd	
	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
BEAUDETTE GROUP	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

Lower Cretaceous — Transitional — Jurassic

LEGEND

GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location (A — A')
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours — 2100
- Horizontal control — △M-12
- Vertical control — V-6 / 2346
- Spot elevation — 2634.5

SCALE 1:5,000

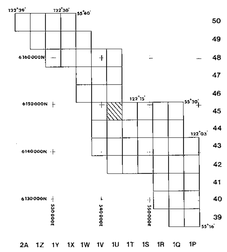
METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transveree Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

KEY MAP



532

APPENDIX A PART 1

Pt Goodrich 21(3)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
Northeast British Columbia

GEOLOGY MAP 1981
GOODRICH CENTRAL

DRAWN BY:	DATE: JAN. 1982	SCALE 1:5,000
PREPARED BY: G.SEVE , D. DAUPHINEE		DRAWING No. 224 - IU45
APPROVED BY: H.ZSCHACH	DATE: JAN. 1982	

FILE No. 39

224-IU45

TABLE OF FORMATIONS

	Q	QUATERNARY Glacial deposits and alluvium
Lower Cretaceous — CRASSIER GROUP	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
	Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones, coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
	Kdr	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. (Kcd mostly conglomerates)
	Kcd	
	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
Transitional — BEAUDETTE GROUP	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
Jurassic	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

LEGEND

GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours
- Horizontal control (H-12)
- Vertical control (V-6 2346)
- Spot elevation 2634.5

SCALE 1:5,000

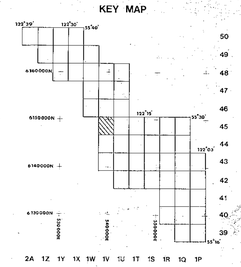
METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

KEY MAP



532

APPENDIX A PART 1

P.R. Goodrich 81/12/10

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
Northeast British Columbia
GEOLOGY MAP 1981
GOODRICH CENTRAL

DRAWN BY:	DATE: JAN 1982	SCALE	1:5,000
PREPARED BY: D.D. & G.S.		DRAWING No.	
APPROVED BY: H. ZSCHACH	DATE: JAN 1982		223 - IV45
		FILE No.	

223 - IV45

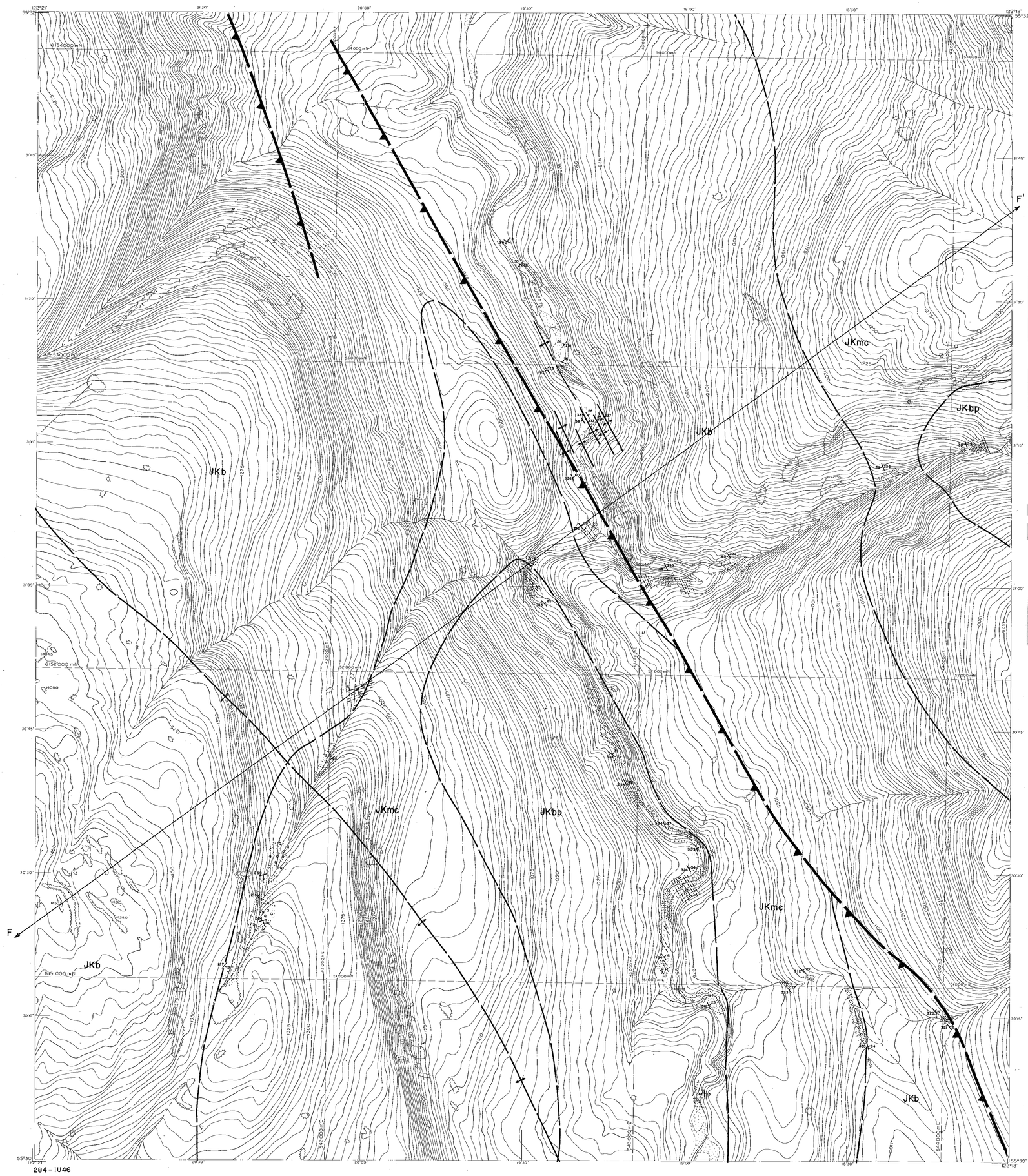


TABLE OF FORMATIONS

	Q	QUATERNARY Glacial deposits and alluvium
Lower Cretaceous	KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
	KmB	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
	Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
CRASSIER GROUP	Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
CRASSIER GROUP	Kdr Kcd	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. (Kcd mostly conglomerates)
	JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
Transitional	JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
BEAUDETTE GROUP	JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
BEAUDETTE GROUP	JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
Jurassic	Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

LEGEND

GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours — 2100 —
- Horizontal control — △ H-12
- Vertical control — ▽ V-6, 7345
- Spot elevation — 7634.5

SCALE 1:5,000

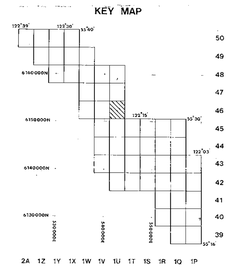
METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

KEY MAP



284 - IU46

532

APPENDIX A PART 1

M-Goodrich 81(2)A

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

GOODRICH COAL PROPERTY
Northeast British Columbia
1981 GEOLOGY MAP
GOODRICH CENTRAL

DRAWN BY: DATE: OCT., 1981	SCALE 1:5,000
PREPARED BY: G.SEVE , D.DAUPHINEE	DRAWING No.
APPROVED BY: H.ZSCHACH DATE: OCT., 1981	284 - IU46
	FILE No.

41

TABLE OF FORMATIONS

Symbol	Formation
Q	QUATERNARY Glacial deposits and alluvium
KCm	COMMOTION FORMATION Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
KmB	MOOSEBAR FORMATION Mudstones, minor siltstones, marine
Kbs	BLUESKY Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
Kgt	GETHING FORMATION Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
Kdr / Kcd	DRESSER FORMATION Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. (Kcd mostly conglomerates)
JKb	BRENOT FORMATION Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
JKmc	MONACH FORMATION Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
JKbp	BEATTIE PEAKS FORMATION Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
JKmt	MONTIETH FORMATION Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
Jf	FERNIE FORMATION Dark grey and black shales, mudstones, sandstones, siltstones, marine

Lower Cretaceous — Transitional — Jurassic
CRASSIER GROUP (Kgt – JKb); BEAUDETTE GROUP (JKmc – JKmt)

LEGEND

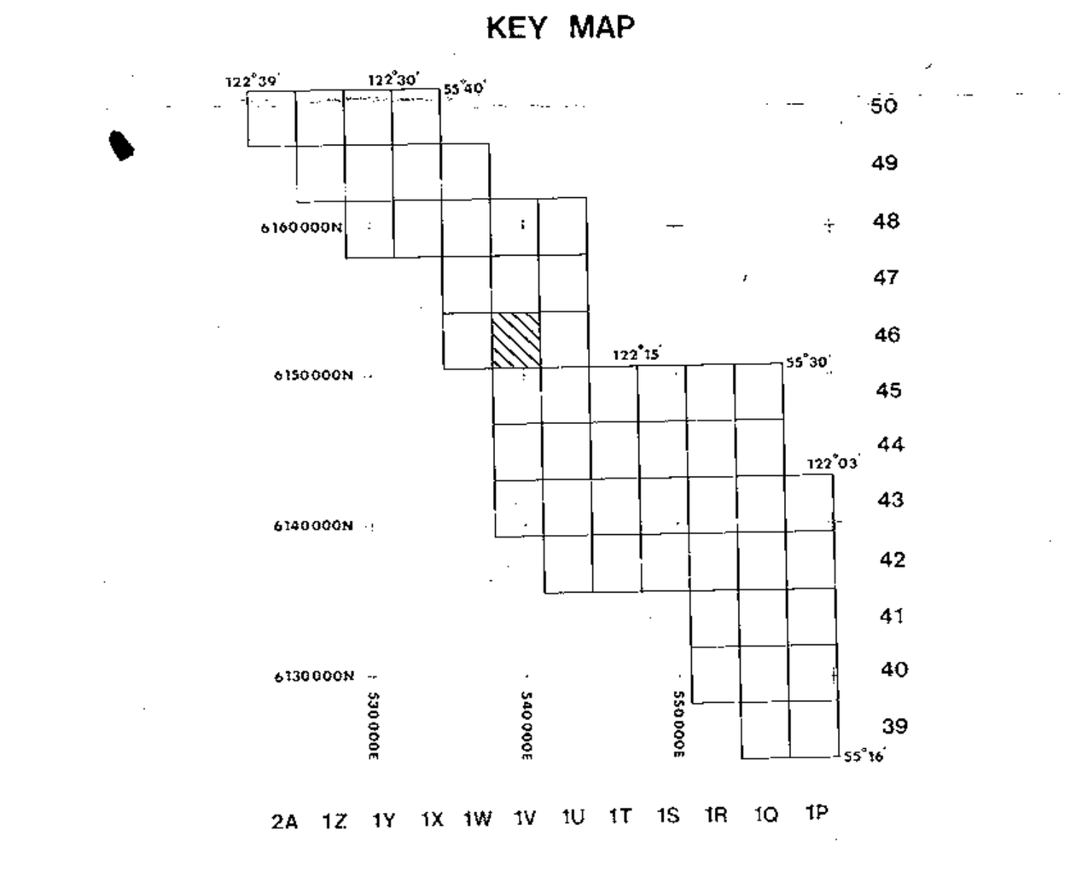
GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- A — A' Cross Section Location
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

Conglomerate	Claystone/Mudstone
Sandstone	Coal
Siltstone	Silty Claystone
Quartzite	Carbonaceous Claystone

KEY MAP



285-IV46

LEGEND

Improved road		River	
Secondary road		Stream	
Track or trail		Intermittent stream	
Railway		Swamp	
Fence		Contours	2100
Wall		Horizontal control	△ H-12
Cut line		Vertical control	V-6 23146
Tree area		Spot elevation	2634.5

SCALE 1:5,000

METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

532

APPENDIX A PART 1

PR-Goodrich 82(2)A

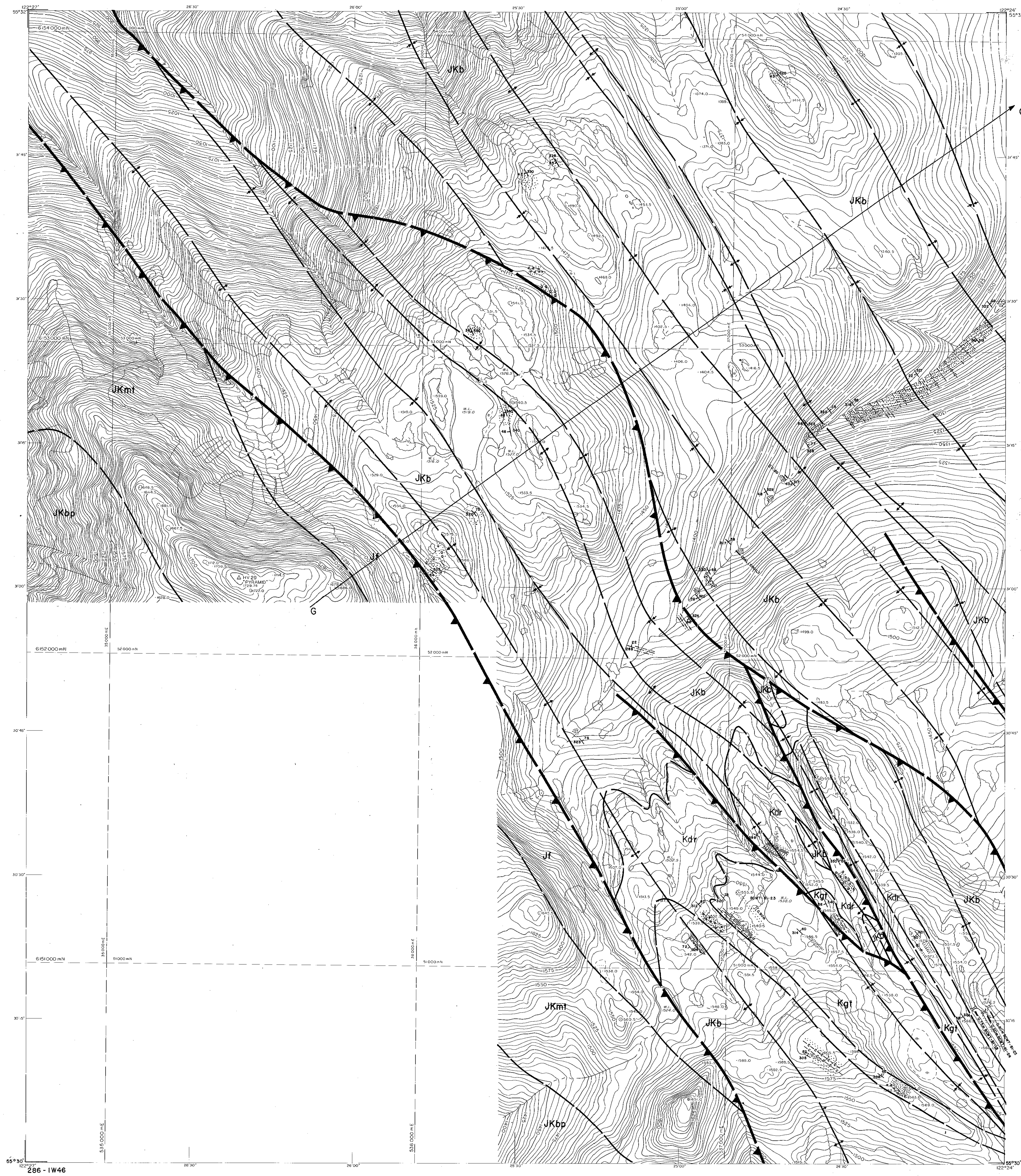
GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA
Gulf

GOODRICH COAL PROPERTY
Northeast British Columbia

1981 GEOLOGY MAP
GOODRICH CENTRAL

DRAWN BY:	DATE:	SCALE 1:5,000
PREPARED BY: G. SEVE, D. DAUPHINEE		DRAWING No.
APPROVED BY: H. ZSCHACH	DATE: JAN. 1982	285-IV46
		FILE No.

42



286 - IW46

TABLE OF FORMATIONS

Period	Group	Symbol	Formation
		Q	**QUATERNARY** Glacial deposits and alluvium
Lower Cretaceous		KCm	**COMMOTION FORMATION** Siltstones, sandstones interbedded, claystones of marine origin, COAL at the top member, and conglomerates
Lower Cretaceous		KmB	**MOOSEBAR FORMATION** Mudstones, minor siltstones, marine
Lower Cretaceous		Kbs	**BLUESKY** Fine to medium grained sandstones, mudstones, thin conglomerate unit at top with or without glauconite
Lower Cretaceous	CRASSIER GROUP	Kgt	**GETHING FORMATION** Cyclothems; dark grey mudstones, siltstones, carbonaceous, silty, sandy mudstones; coalified plant debris, minor bentonite, black shales, and occasional minor tufts in upper unit; COAL
Lower Cretaceous	CRASSIER GROUP	Kdr / Kcd	**DRESSER FORMATION** Incomplete cyclothems; discontinuous coal measures in varying thicknesses; medium to very coarse grained sandstones, grits, and conglomerates. (Kcd mostly conglomerates)
Lower Cretaceous	CRASSIER GROUP	JKb	**BRENOT FORMATION** Lithic "salt and pepper" sandstones, siltstones, mudstones, carbonaceous mudstones, COAL
Transitional	BEAUDETTE GROUP	JKmc	**MONACH FORMATION** Marine lithic and quartzose sandstones with thick beds of clean, coarse grained white quartzites at top. Minor shales, siltstones and sandstones with occasional thin conglomerates
Transitional	BEAUDETTE GROUP	JKbp	**BEATTIE PEAKS FORMATION** Buff to brownish sandstones, fine to medium grained; thinly bedded black and dark grey shales, silty shales, siltstones; thin sandstones with ironstone banding
Transitional	BEAUDETTE GROUP	JKmt	**MONTIETH FORMATION** Grey and brown sandstones, fine to medium grained; fine to very coarse grained quartzite. Minor beds of shales, and shales with siltstone and sandstone partings; occasional thin conglomerates
Jurassic		Jf	**FERNIE FORMATION** Dark grey and black shales, mudstones, sandstones, siltstones, marine

LEGEND

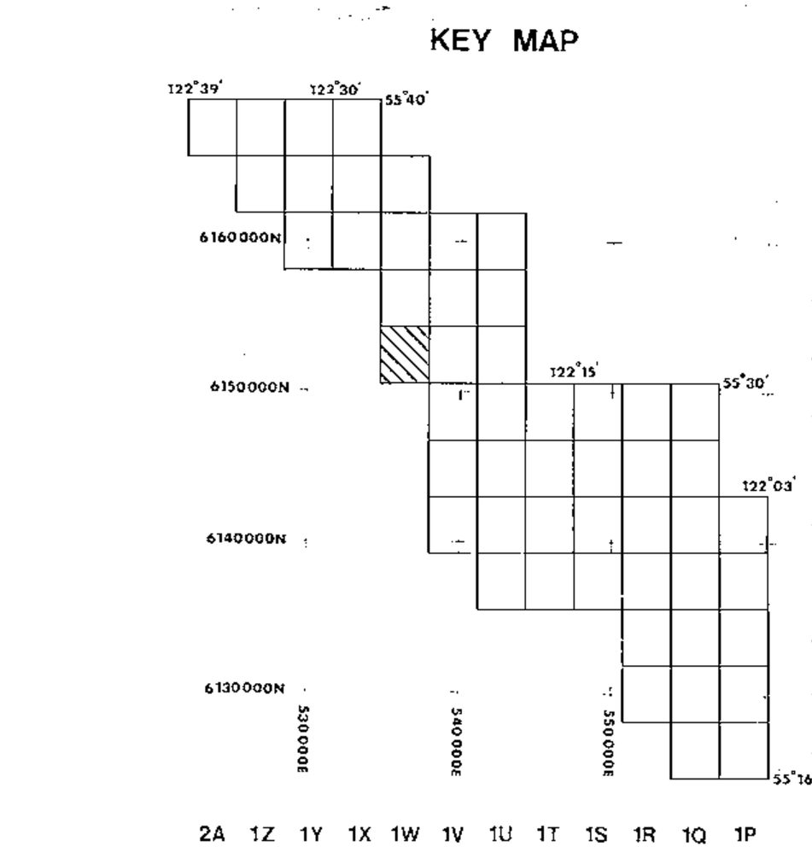
GEOLOGICAL SYMBOLS

- Coal Seam Subcrop
- Geological Boundary, (defined, approximate)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Anticline and Syncline (overturned)
- Fault (defined showing dip, approx. position of fault)
- Normal Fault
- Strike and Dip (bedding, overturned bedding)
- Cross Section Location
- Monocline
- Bedding (vertical, horizontal)
- Trench Location

LITHOLOGICAL SYMBOLS

- Conglomerate
- Sandstone
- Siltstone
- Quartzite
- Claystone/Mudstone
- Coal
- Silty Claystone
- Carbonaceous Claystone

KEY MAP



532

APPENDIX A PART 1

PR-Goodrich 81(2)A

LEGEND

- Improved road
- Secondary road
- Track or trail
- Railway
- Fence
- Wall
- Cut line
- Tree area
- River
- Stream
- Intermittent stream
- Swamp
- Contours 2100
- Horizontal control △ H-12
- Vertical control V-6 23146
- Spot elevation 2634.5

SCALE 1:5,000

METRES 100 0 200 400 600 800 METRES

CONTOUR INTERVAL 5 metres
DATE OF PHOTOGRAPHY 1980
DATE OF MAPPING 1981 by HARDY ASSOC. (1978) LTD.

SURVEY NOTE

The horizontal and vertical coordinates were established by Donald E. Watson Surveys Ltd. and are derived from government trig. stations Bickford West, Bickford East, Nipple, Pyramid, Wolf, Tat, Smokey, Herd, Early, and Bird. All coordinates are on the Universal Transverse Mercator grid, Zone 10. Datum is geodetic and derived from the above trig. stations.

GULF CANADA RESOURCES INC.
Coal Division
CALGARY ALBERTA

Gulf

GOODRICH COAL PROPERTY
Northeast British Columbia

1981 GEOLOGY MAP
GOODRICH CENTRAL

✓

DRAWN BY:	DATE: OCT., 1981	SCALE 1:5,000
PREPARED BY: G.SEVE , D.DAUPHINEE		DRAWING No.
APPROVED BY: H.ZSCHACH	DATE: OCT., 1981	286 - IW46
		FILE No. 43