Canada Oil and Gas Lands Administration / Administration du pétrole et du gaz des terres du Canada

D.A. 1379

Nova Scotia	☐	West Coast	☐	Exploratory	☒
Newfoundland	☐	Northern	☒	Development	☐
Gulf of St. Lawrence	☐	Hudson Bay	☐	Delineation	☐
				Service	☐

AUTHORITY TO DRILL A WELL

APPLICATION

This application is submitted with Section 82 of the Canada Oil and Gas Drilling Regulations When approved under Section 83 of the Regulations, it is the requisite authority for the commencement of drilling operations.

Well Name in Full: Conoco et al North Little Bear L-21

Operator: Conoco Canada Limited — Drilling Program No.: N/A

Contractor: Atco/Equtak Drilling — Permit or Lease No.: EL 319

Drilling Rig or Unit: 76 — Estimated Well Cost: $2,304,000

Location-Unit: L Section: 21 Grid Area: 64°50', 125° 45'

Coordinates: Lat North 64°40'39.499" Long West 125°50'25.234"

Area: Ft. Norman, N.W.T. — Field/Pool: Wildcat

Elevation-RT/KB: KB-237m GR-232.77m (ASL) — Seafloor: N/A (BRT)

Approx Spud Date: February 22, 1988 — Estimated Days on Location: 32

Anticipated Total Depth: 2156 mKB — Target Horizon(s): Jungle Ridge (Devonian)

UWI: 300L216450125450

EVALUATION PROGRAM

Ten-metre sample intervals: None

Five-metre sample intervals: 35m to Total Depth

Canned sample intervals: All

Conventional cores at: Geologist's discretion

Logs and Tests: DIFL-Sonic-SP-GR, CNL-LDT-GR-CAL TD to 550m
DST's may be run after logging.

CASING AND CEMENTING PROGRAM

O.D	Weight	Grade	Setting Depth (mKB) ~~Below Section~~	Cementing Program (Volumes)
508mm	139.9 kg/m	H40, STC	0 - 35m	cement to surface - 5.5 tonnes
244.5mm	53.6 kg/m	K55, STC	0 - 550m	cement to surface - 22 tonnes
139.7mm	23.1 kg/m	K55, LTC	0 - 2156m	as required

BOP Equipment: Diverter on conducter while drilling surface hole. 1 annular preventer - 21 mPa. 1 single gate preventer - 21 mPa, 2 single gate preventers - 34 mPa, 1 choke manifold - 21 mPa.

Other Information

Signed: [signature] Title: Sr. Production Engineer

Date: January 21, 1988 Company: Conoco Canada Limited

APPROVAL

An approved copy of this notice is to be posted at each wellsite

Signed: [signature]
Engineering Branch

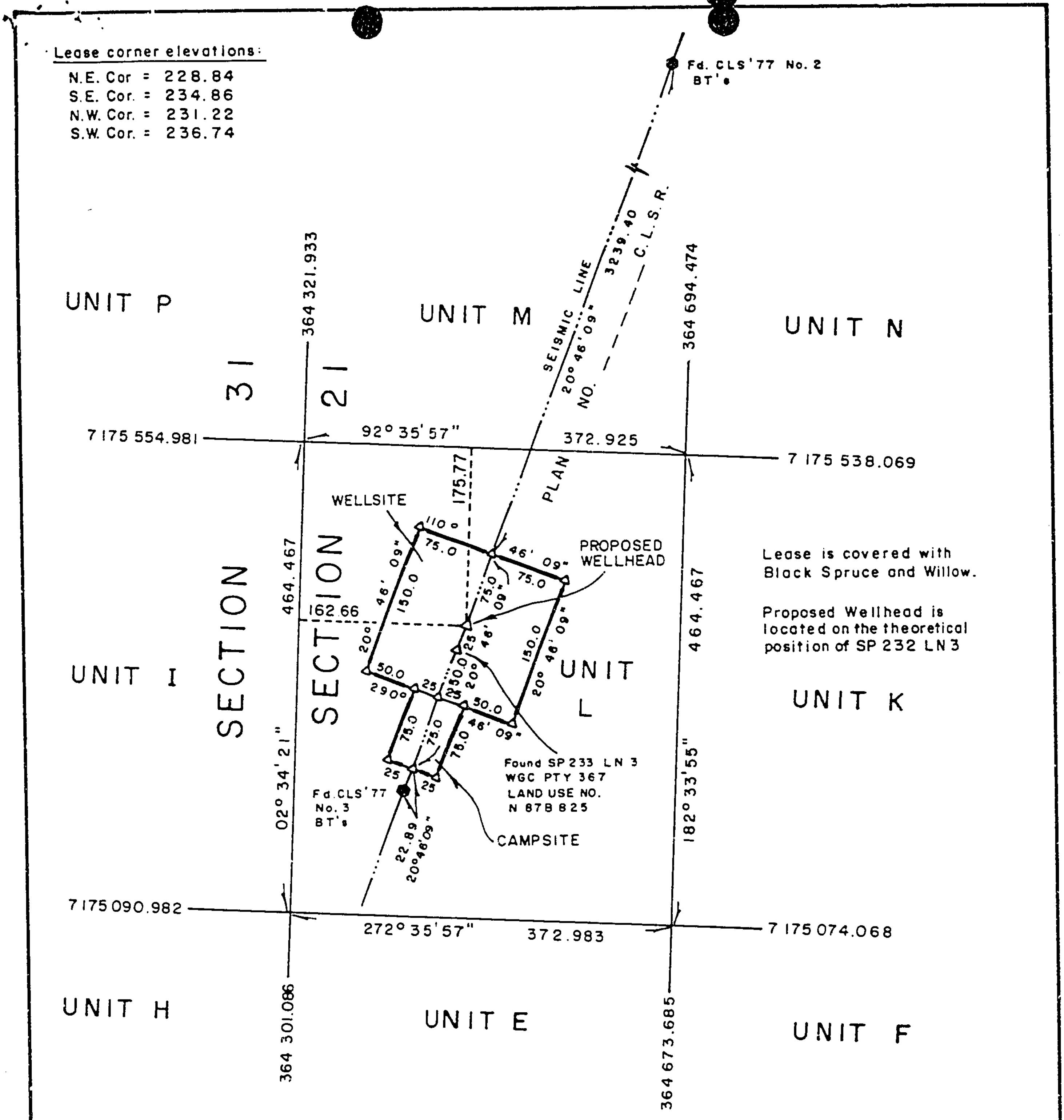
Date: February 10, 1988

File: 9211-C90-1-2

Department of Energy, Mines and Resources
Ministère de l'Énergie des Mines et des Ressources

Department of Indian Affairs and Northern Development
Ministère des Affaires indiennes et du Nord canadien

Canada



N.T.S. MAP SHEET: 96 C/12	METRIC	NORTHWEST TERRITORIES

CONOCO CANADA LIMITED

PRELIMINARY SKETCH SHOWING WELL LOCATION

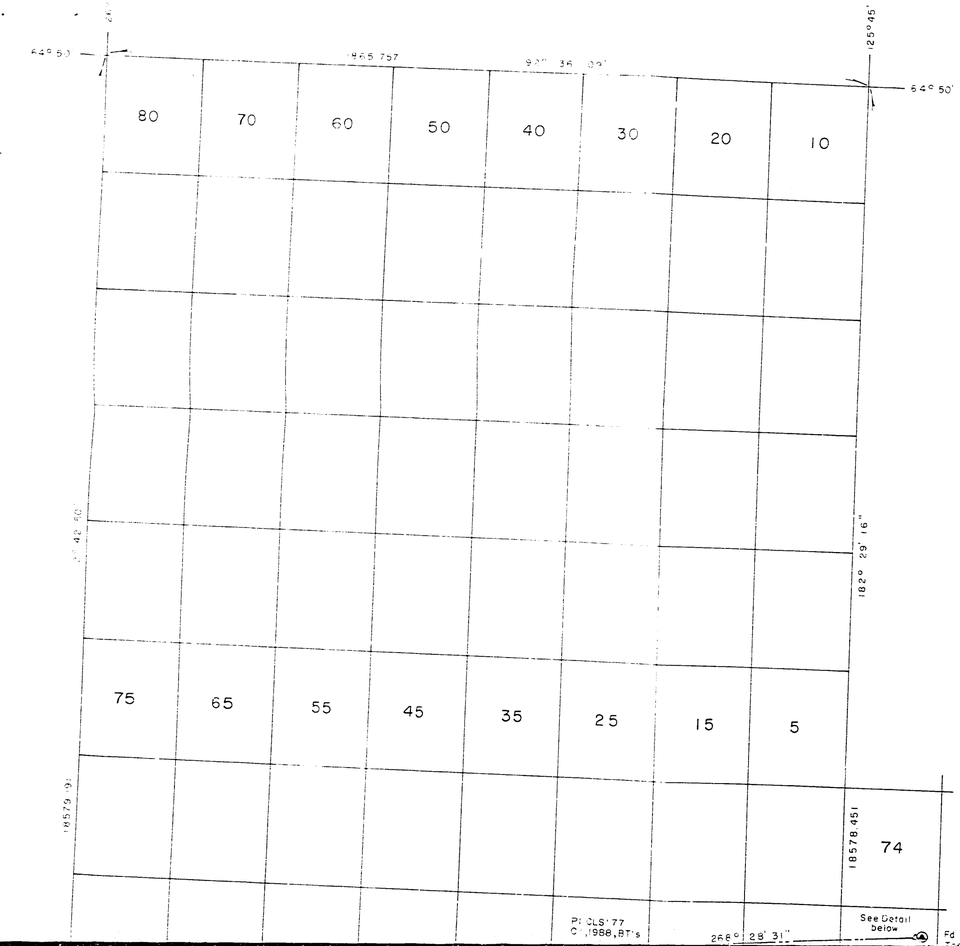
CONOCO ET AL ~~EAST~~ NORTH LITTLE BEAR L-21

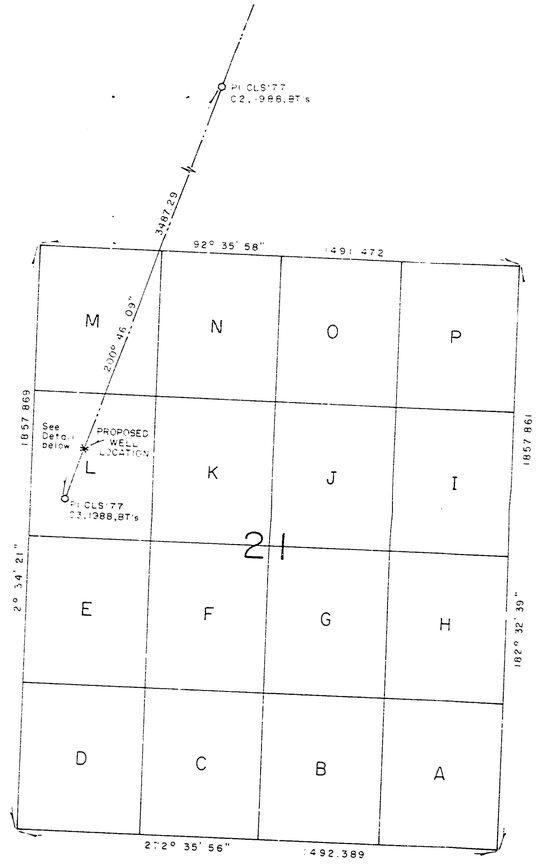
UNIT L, SECTION 21, GRID AREA 64° 50', 125° 45'

CONOCO CANADA LIMITED	CERTIFIED CORRECT:
[signatures]	THIS 11th. DAY OF JANUARY, A.D. 1988.
	[signature] CANADA LANDS SURVEYOR

ELEVATION	GEOGRAPHIC CO-ORD'S.	U.T.M. CO-ORDS (NAD 1927)
ON GROUND AT WELLHEAD : 232.77	NORTH LATITUDE: 64°40'39.499" (64.6776386°)	NORTHING 7 175 372.02
	WEST LONGITUDE: 125°50'25.234" (125.8403428°)	EASTING: 364 476.54
		CO-ORDINATES ARE COMPUTED FOR ZONE 10, CENTRAL MERIDIAN 123°W.

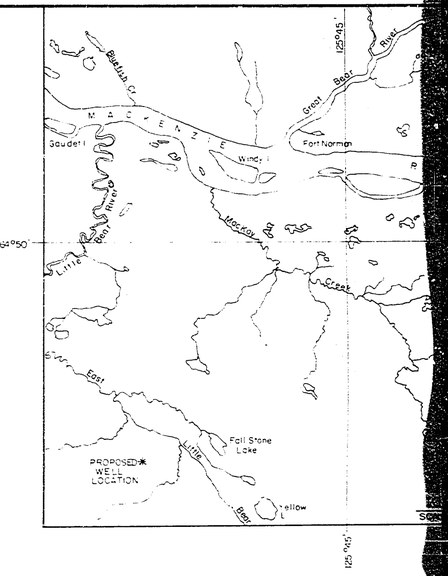
LEGEND	AREAS REQUIRED	HOSFORD, IMPEY, WELTER AND ASSOCIATES LTD.
Survey Monument found .... ●	WELLSITE : 5.56 Acres 2.250 ha.	P.O. BOX 1409, YELLOWKNIFE, X1A 2P1
Survey Monument placed .... ○	CAMPSITE : 0.93 Acres 0.375 ha.	NORTHWEST TERRITORIES
Traverse Station .... △	FUEL SITE : —— Acres —— ha.	
SCALE 1:5000	TOTAL : 6.49 Acres 2.625 ha	FILE NO. Y88001 / DATE: Jan. 11/88 k. / ck'd





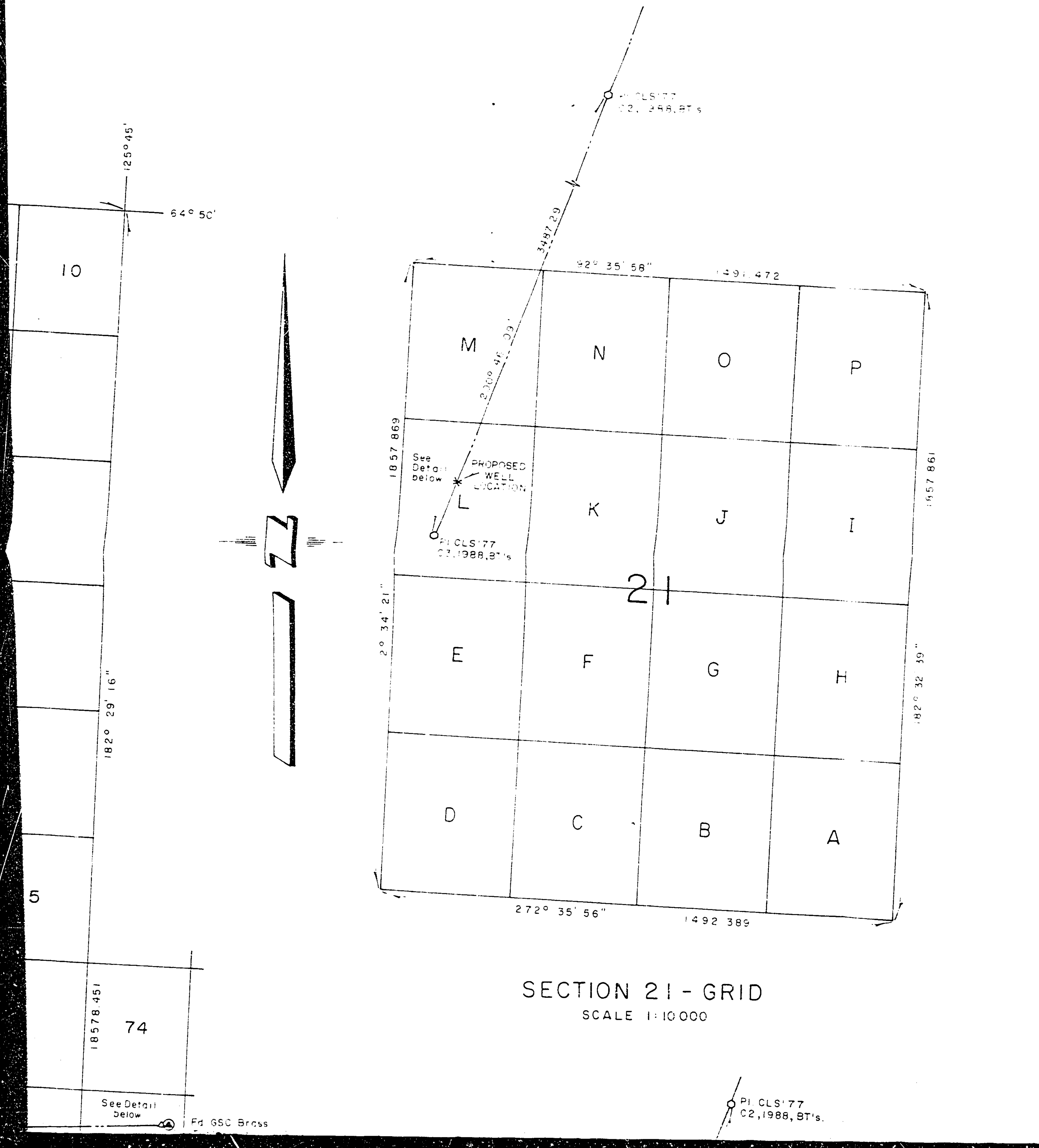
SECTION 21 - GRID
SCALE 1:10000

PI CLS'77
C2,1988,BT's

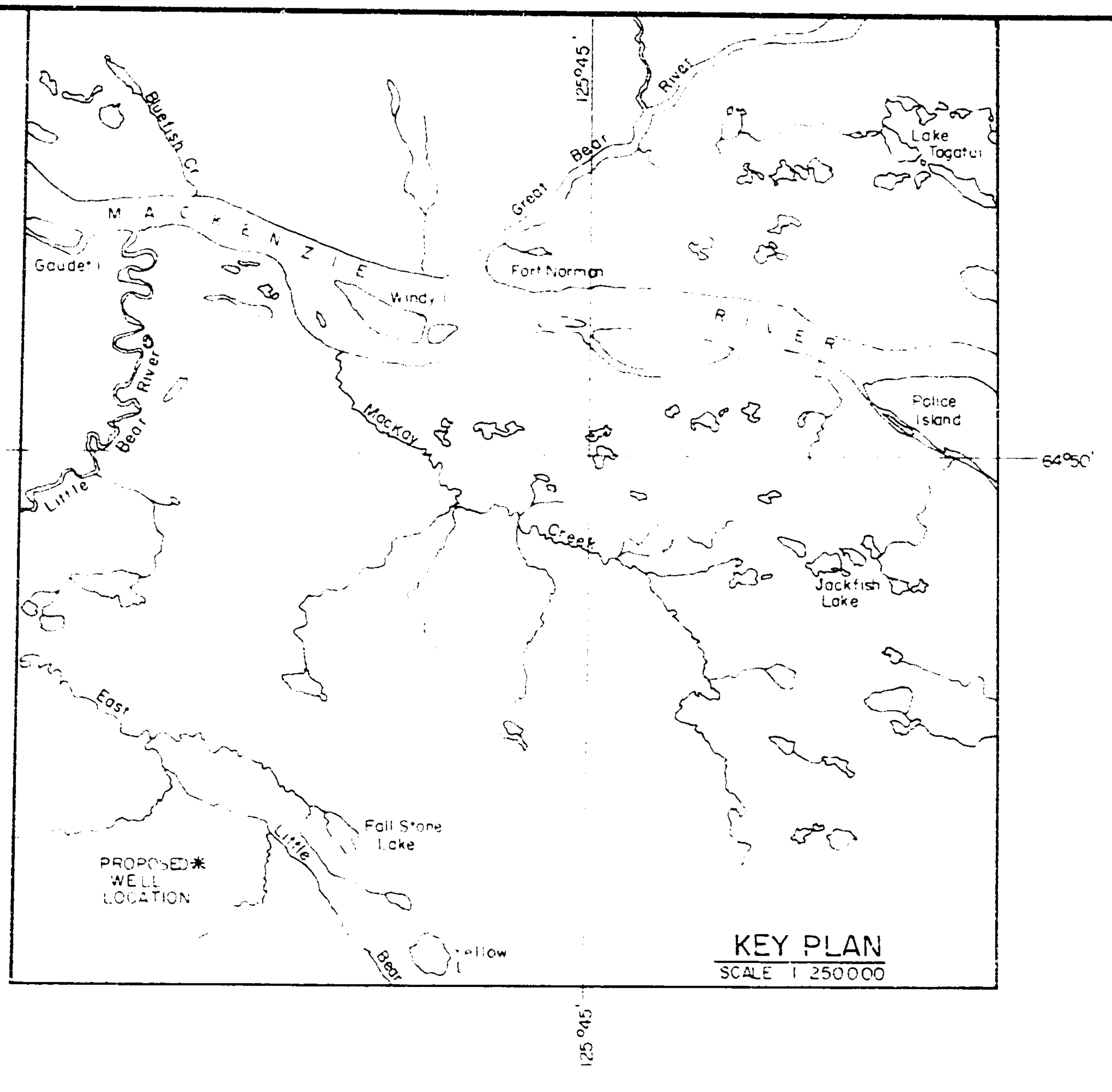


GEOGRAPHIC CO-ORDINATES ZONE 10 (123° W. LONG.)		
STATION	LATITUDE	LONGITUDE
789026	64° 42' 44.559"	125° 43' 27.597"
W/S	64° 40' 39.499"	125° 50' 25.234"

U.T.M. CO-ORDINATES ZONE 10 (123° W)			
STATION	NORTHING	EASTING	ELEVATION
789026	7 178 997.710	370 175.557	680.88
C1	7 178 875.091	365 805.935	167.69
C2	7 178 470.387	365 651.593	182.05
C3	7 175 210.400	364 415.247	240.87
W/S	7 175 372.015	364 476.540	232.77



SECTION 21 - GRID
SCALE 1:10 000



KEY PLAN
SCALE 1:250 000

PLAN AND FIELD NOTES
OF SURVEY OF

PROPOSED EXPLORATORY WELL

CONOCO ET AL NORTH LITTLE BEAR L-21

EXPLORATION LICENCE NO. 319

GRID AREA 64° 50', 125° 45' (QUAD 96 C/12)

NORTHWEST TERRITORIES

CANADA OIL AND GAS LAND REGULATIONS.

SCALE 1:50 000 — 0 500 1000 2000 3000 4000 5000 METRES

THIS SURVEY WAS EXECUTED DURING THE PERIOD OF
JANUARY 6th. TO JANUARY 9th., A.D. 1988
BY AMBROSE J. WRZOSEK, C.L.S.
FOR CONOCO CANADA LIMITED

GEOGRAPHIC CO-ORDINATES ZONE 10 (123° W. LONG.)

STATION	LATITUDE	LONGITUDE
789026	64° 42' 44.559"	125° 43' 27.597"
W/S	64° 40' 39.429"	125° 50' 25.234"

U.T.M. CO-ORDINATES ZONE 10 (123° W) (NAD 1927)

STATION	NORTHING	EASTING	ELEVATION	COMBINED FACTOR
789026	7 178 997.710	370175.557	680.88	0.9996997
C1	7 178 875.091	365 805.935	167.69	0.9997941
C2	7 178 470.387	365 651.593	182.05	0.9997923
C3	7 175 210.400	364 415.247	240.87	0.9997872
W/S	7 175 372.015	364 476.540	232.77	0.9997883

LEGEND:

U.T.M. Co-ordinates are computed for Zone 10 (123° W. Longitude)
Bearings are Grid, derived from Solar Observation, bearing of 268°28'31" on the line between Traverse Station No. 1 and placed Control Monument C1 and were confirmed by the bearing of 20°46'30" on the line between placed Control Monuments C3 and C2, derived from Observation on Arcturus (α Boo) and are referred to 123° W. Longitude.

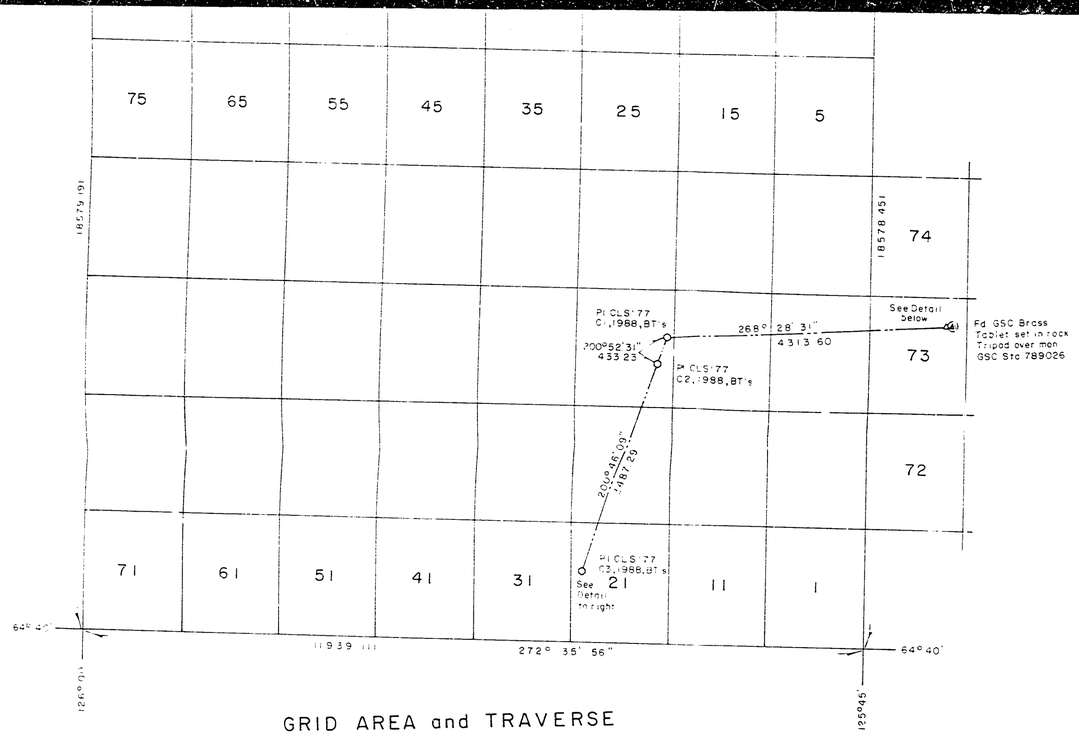
Distances shown in the traverse are measured distances, reduced to the horizontal at general ground level and are in metres and decimals thereof.
All distances are check measured, in two independent operations.

For the computation of co-ordinates, measured distances have been reduced to the U.T.M. plane by multiplying them by an averaged Combined Factor.
Co-ordinates for Station 789026 were retrieved from the Geodetic Surveys of Canada Data Bank on January 5th., 1988.

Elevations were derived from GSC Monument 789026 and are Trigonometric.

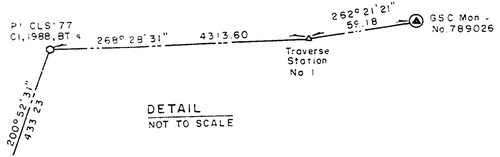
CLS'77 Posts placed are marked with the appropriate Station numbers and the year, 1988.

Geodetic Surveys of Canada (GSC) Control Monument found is shown thus: ⓐ
C.L.S.'77 Post placed is shown thus: ○
Traverse line and Station is shown thus: —o—
Bearings and distances of the Grid Area, Section and Unit are U.T.M. Plane, referred to Zone 10, Central Meridian 123° W.



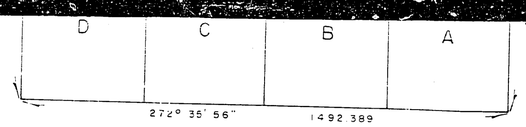
GRID AREA and TRAVERSE

SCALE 1:50000



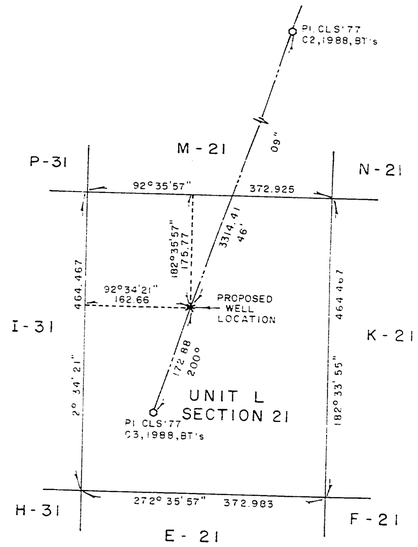
DETAIL

NOT TO SCALE



SECTION 21 - GRID

SCALE 1:10000



DETAIL

UNIT L SECTION 21

SCALE 1:5000

U.T.M. CO-ORDINATES ZONE 10 (123° W			
STATION	NORTHING	EASTING	ELEVATION
789026	7 178 997.710	370 175.557	680.88
C1	7 178 675.091	365 805.935	167.69
C2	7 178 470.387	365 651.593	182.05
C3	7 175 210.400	364 415.247	240.87
W/S	7 175 372.015	364 476.540	232.77

OIL AND GAS GRID CO-ORDINATES,				
	CORNER	GEOGRAPHIC		UTM ZONE
		LATITUDE, N	LONGITUDE, W	NORTHING
GRID AREA	N E	64° 50'	125° 45'	7 192 520.9
	N W	64° 50'	126° 00'	7 193 059.6
	S E	64° 40'	125° 45'	7 173 959.9
	S W	64° 40'	126° 00'	7 174 501.3
UNIT L SECTION 21	N E			7 175 538.0
	N W			7 175 554.9
	S E			7 175 074.0
	S W			7 175 090.9

BEARING TREES

C1

0.10	BLACK SPRUCE	4.75	118° 22'
0.10	BLACK SPRUCE	6.60	158° 11'
0.10	BLACK SPRUCE	4.36	291° 39'

C2

0.10	BLACK SPRUCE	9.14	86° 24'
0.06	TAMARACK	4.64	265° 52'
0.10	BLACK SPRUCE	8.19	308° 03'

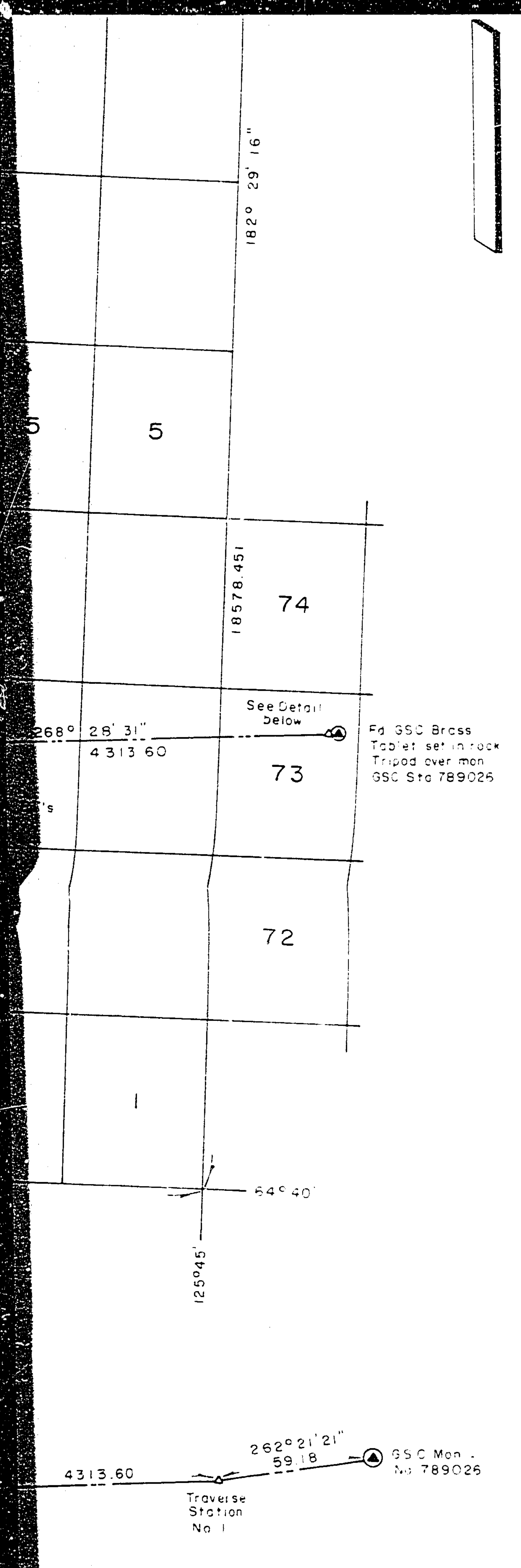
C3

0.10	SPRUCE		
0.15	SPRUCE		
0.10	SPRUCE		

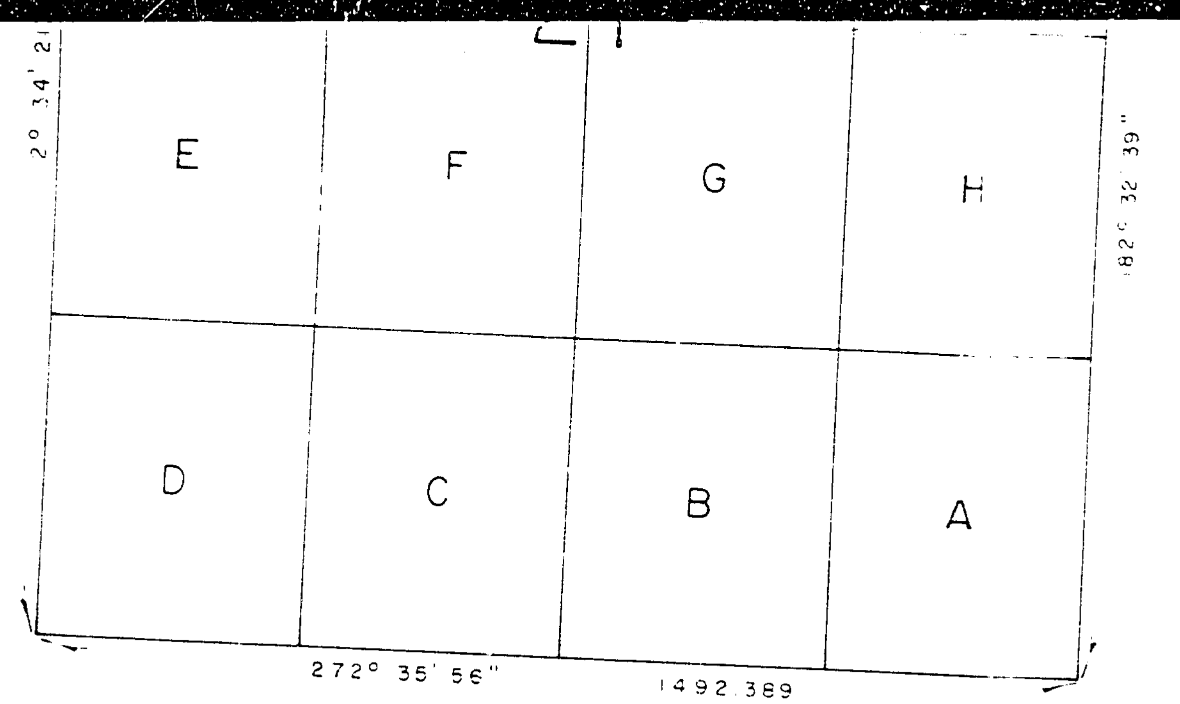
HOSFORD IMPEY WELTER & ASSOCIATES LTD.
P.O. BOX 1409 YELLOWKNIFE
NORTHWEST TERRITORIES

Drawn by: kgm 14/01/88	FILE NO.
Checked by:	Y88001

JANUARY 6th. TO JANUARY 9th., A.D.1988
BY AMBROSE J. WRZOSEK, C.L.S.
FOR CONOCO CANADA LIMITED



DETAIL
TO SCALE



SECTION 21 - GRID
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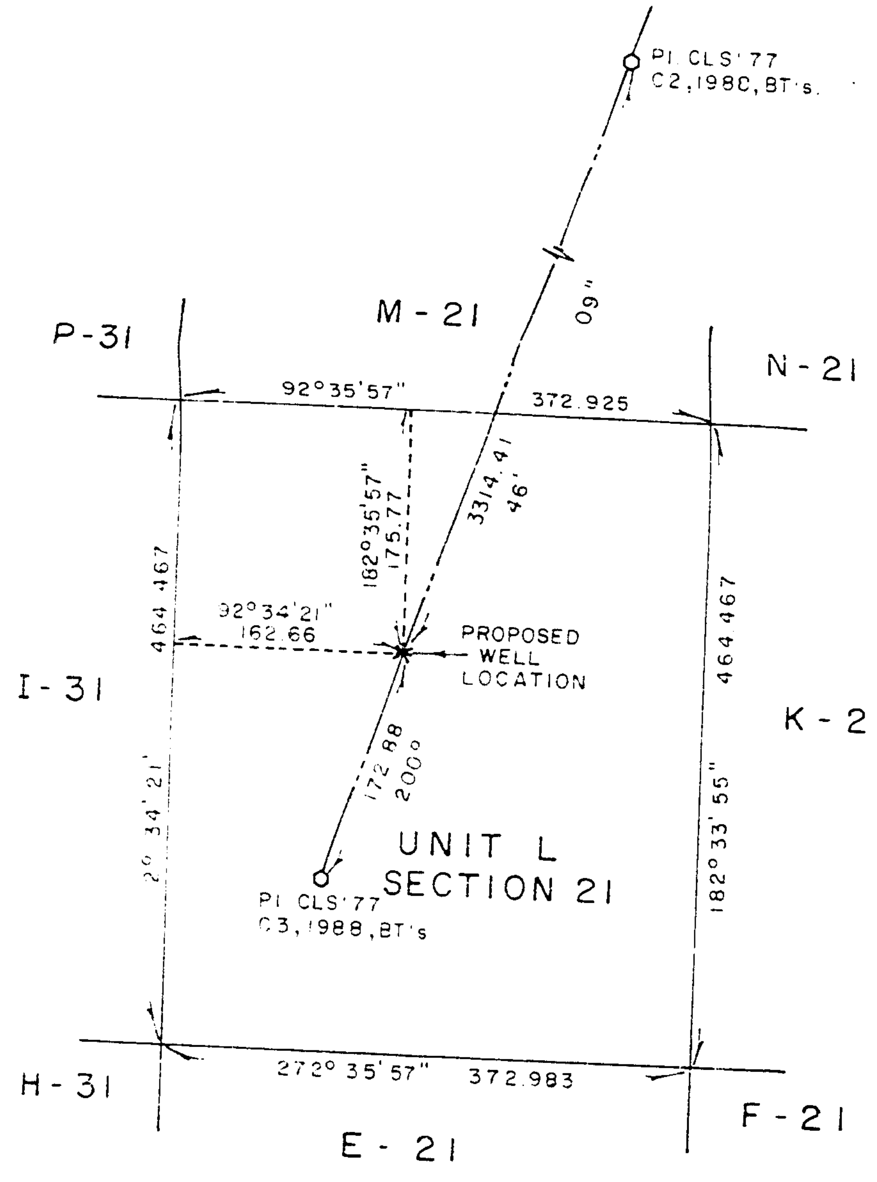

DETAIL
UNIT L SECTION 21
SCALE 1:5000

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C2	7 178 470.387	365 651.593	182.05	0.9997923
C3	7 175 210.400	364 415.247	240.87	0.9997872
W/S	7 175 372.015	364 476.540	232.77	0.9997883

OIL AND GAS GRID CO-ORDINATES, NAD 1927					
	CORNER	GEOGRAPHIC		UTM ZONE 10, CM 123° W.	
		LATITUDE, N	LONGITUDE, W	NORTHING (m)	EASTING (m)
GRID AREA	N E	64° 50'	125° 45'	7 192 520.913	369 538.318
	N W	64° 50'	126° 00'	7 193 059.694	357 684.800
	S E	64° 40'	125° 45'	7 173 959.969	368 731.955
	S W	64° 40'	126° 00'	7 174 501.339	356 805.124
UNIT L SECTION 21	N E			7 175 538.068	364 694 474
	N W			7 175 554.979	364 321.933
	S E			7 175 074.066	364 673.685
	S W			7 175 090.980	364 301 086

BEARING TREES

C1

0.10	BLACK SPRUCE	4.75	118° 22'
0.10	BLACK SPRUCE	6.60	158° 11'
0.10	BLACK SPRUCE	4.36	291° 39'

C2

0.10	BLACK SPRUCE	9.14	86° 24'
0.06	TAMARACK	4.64	265° 52'
0.10	BLACK SPRUCE	8.19	308° 03'

C3

0.10	SPRUCE	6.96	84° 22'
0.15	SPRUCE	6.87	233° 40'
0.10	SPRUCE	6.24	299° 03'

LEGEND:

U.T.M. Co-ordinates are computed for Zone 10 (123° W. Longitude)
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Traverse line and Station is shown thus: —△—
Bearings and distances of the Grid Area, Section and Unit are U.T.M. Plane, referred to Zone 10, Central Meridian 123° W.

I, Ambrose J. Wrzosek, of the City of Grande Prairie, in the Province of Alberta, Canada Lands Surveyor, make oath and say that I have, in my own proper person, according to law and the instructions of the Surveyor General of Canada Lands, faithfully and correctly executed the survey shown by this plan and field notes and that the said plan and field notes are correct and true to the best of my knowledge and belief.
SO HELP ME GOD.

SWORN before me at the City of Grande Prairie, in the Province of Alberta, this 14th day of January, A.D. 1988.

[signature]
Canada Lands Surveyor.

[signature] A.J. Wrzosek
Canada Lands Surveyor.

Examined by RWM

FINAL WELL REPORT

CONOCO ET AL NORTH LITTLE BEAR L-21

Prepared by John Schneider

March, 1988

A. INTRODUCTION

1. Summary

The well Conoco et al North Little Bear L-21 was spudded February 24, 1988 and reached a total depth of 2030m on March 10, 1988 1988. This was an exploratory well to evaluate the Cretaceous and Devonian aged formations. The rig Atco/Equatak 76, a conventional land rig, was used to drill this well.

No problems encountered during the drilling operations. The wireline logs showed no evidence of oil or gas so no DST's were run and the well was plugged and abandoned. The rig was released on March 13, 1988. A map showing the location of the well is attached.

B. GENERAL DATA

1. Well Name: Conoco et al North Little Bear L-21
   Unit L, Section 21, Grid Area 64°50', 125°40'

   Exploration Agreement: EL 319

2. Location: Geographic Coordinates - North 64°40' 39.499"
   - West 125°50' 25.234"

3. Unique Well Identifier: 300L216450125450

4. Operator and Drilling Contractor:

Operator	Drilling Contractor
Conoco Canada Limited 3900, 205 - 5th Avenue S.W. Calgary, Alberta T2P 2V7	Atco/Equatak Drilling Ltd. 700, 800 - 6th Avenue S.W. Calgary, Alberta T2P 3G3

5. Drilling Unit: Atco/Equatak rig 76

6. Difficulties and Delays: None

C. SUMMARY OF DRILLING OPERATIONS

1. Elevations: KB - 240.4 m GR - 234.2 m
2. Total Depth: Driller - 2030 mKB Logger 2026 mKB
3. Date and Hour Spudded: 88-02-24 at 0530 hours
4. Date Drilling Completed: 88-03-10 at 0800 hours
5. Date of Rig Release: 88-03-13 at 1200 hours
6. Well Status: Abandoned
7. Hole Sizes and Depths:

Bit Size	Interval
311 mm	0 - 554 m
222 mm	555 - 2030 m

8. Casing and Cementation Record: See Table 1
9. Sidetracked Hole: None
10. Drilling Fluid: See Table 2
11. Fishing Operations: None
12. Well Kicks: None
13. Formation Leakoff Tests:

Depth	Fluid Density (kg/m^3)	Applied Pressure (kPa)	EMW (kg/m^3)	Last Casing Depth
564m	1060	3160	1632	553m

14. Time Distribution

Drilling	250.5
Reaming	1
Condition Mud, Circulate	12
Trips	60
Repair Rig	15.75
Deviation Survey	20.5
Wireline Logs	24.75
Run and Cement Casing	24.5
Nipple Up and Test BOP's	27.5
Drill Cement	2
TOTAL	438.5

15. Deviation Survey: None

16. Abandonment Plugs:

Type	Depth	Fluid Between Plugs
7 tonnes 0:1:0 class G	2030 - 1930 m	Drilling Mud - 1130 kg/m^3
13 tonnes 0:1:0 class G	720 - 630 m	Drilling Mud - 1130 kg/m^3
7.8 tonnes 0:1:0 class G	580 - 520 m	Drilling Mud - 1130 kg/m^3
1.2 tonnes 0:1:0 class G	surface	

17. Composite Well Record: Submitted earlier.

D. GEOLOGY

1. Drill Cuttings, Cores, Lithology, Stratigraphic Column, Bio stratigraphic Column: Submitted earlier.

E. WELL EVALUATION

1. Downhole logs:

Date	Run Number	Type	Interval	Company
88-03-11	1	MSFL-DIL-Sonic-GR	2026 - 553 m	Schlumberger
88-03-11	2	CNL-LDT-GR	2026 - 553 m	Schlumberger
		CNL-GR	553 - 0 m	Schlumberger
88-03-11	3	Velocity Survey	2026 - 553 m	Schlumberger

2. Other Logs: None.

3. Velocity Surveys: Submitted earlier.

4. Formation Stimulation: None

5. Formation and Production Test Results: None

TABLE 1 - CASING AND CEMENTATION RECORD

Casing Type	Interval	Size	Weight	Grade	Make	# of Jts	Thread	Date Set	Cement	Cement Top
Conductor	0 - 19 mm	508 mm	139.9	H40	USS	2	BTC		Driven in place	
Surface	0 - 553mm	244.5mm	53.6	K55	NKK	46	STC	88-02-27	~~15.5~~ tonnes permafrost ~~18~~ tonnes class G	surface

Table 2 - Drilling Fluid

Date	Depth (m)	Mud Type	Density (kg/m^3)	Viscosity (sec)	Water Loss (cc)
88-02-24	23	Gel/lime	1140	40	-
88-02-25	292	Gel/lime	1100	35	-
88-02-26	510	Gel/lime	1230	43	-
88-02-27	554	Gel/lime	1240	63	-
88-02-29	732	Gel chem	1070	32	-
88-03-01	923	Gel chem	1135	33	16
88-03-02	1178	Gel chem	1120	33	16
88-03-03	1338	Gel chem	1125	36	14
88-03-04	1449	Gel chem	1160	38	9.5
88-03-05	1553	Gel chem	1170	41	11.5
88-03-06	1666	Gel chem	1155	41	8.5
88-03-07	1736	Gel chem	1150	41	8.5
88-03-08	1843	Gel chem	1135	43	9.5
88-03-09	1907	Gel chem	1130	41	9.5
88-03-10	2021	Gel chem	1110	41	9.5
88-03-11	2030	Gel chem	1130	65	9

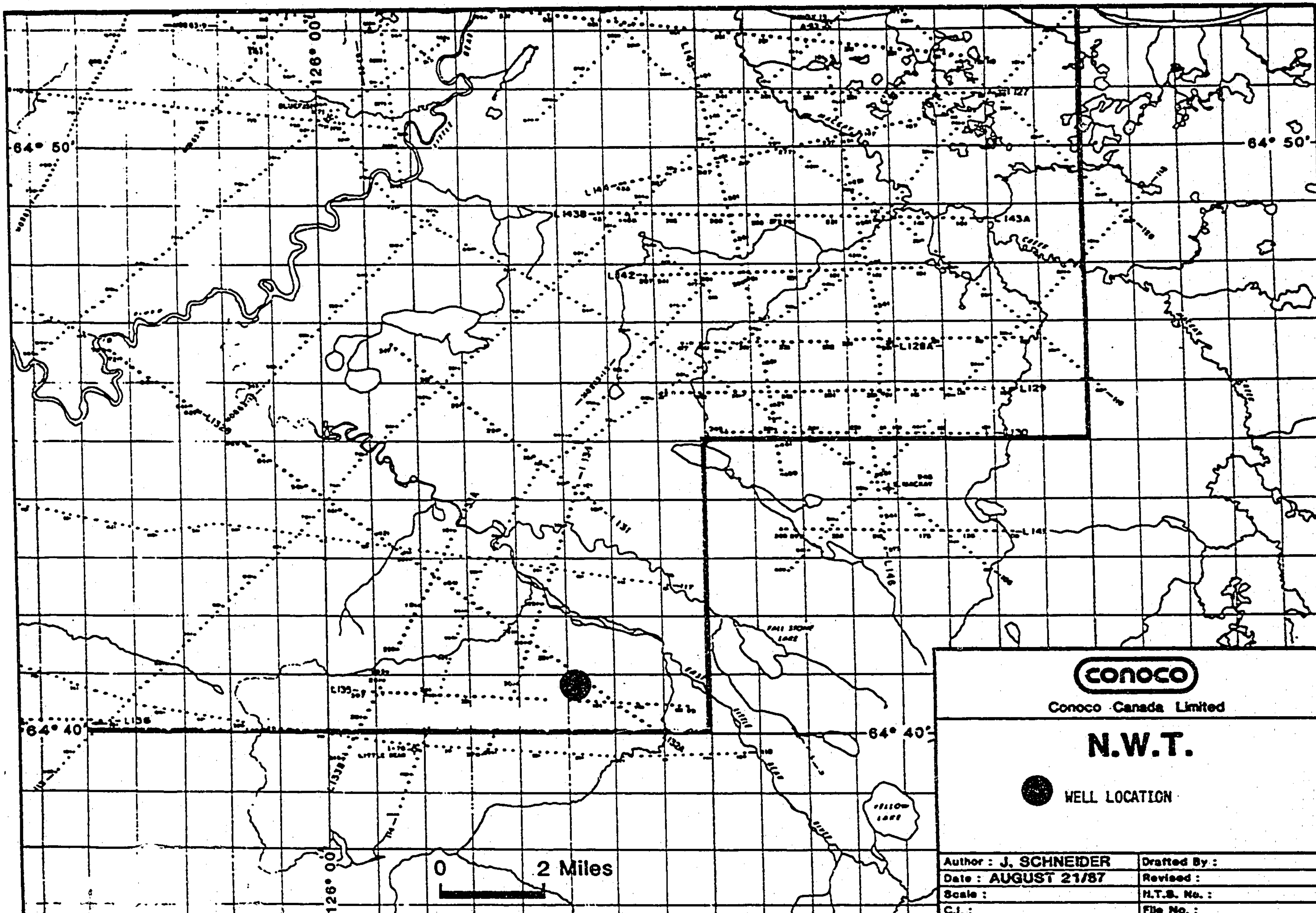
Table 3 - Deviation Surveys

Depth (m)	Deviation (°)	Depth (m)	Deviation (°)
31	1	1694	2 1/4
59	3/4	1722	3 3/4
96	1/2	1732	3 1/2
124	1/4	1742	3 3/4
159	1/2	1751	3
303	1	1767	3
332	1/2	1780	2 1/2
361	1/4	1809	1 3/4
389	1/2	1838	1 3/4
418	1/2	1866	1 3/4
544	1/4	1885	1 3/4
617	1/4	1913	1 1/4
675	1/4	1952	1
715	1 3/4	1970	1 1/2
740	1 1/2		
788	1 1/4		
836	2		
873	1 3/4		
920	1 1/2		
981	1 1/4		
1038	1		
1095	1		
1125	1		
1160	1		
1207	1		
1255	1 1/2		
1292	1 3/4		
1320	1 1/2		
1381	2		
1419	2 1/4		
1437	2 1/2		
1465	2		
1499	1 3/4		
1541	1/4		
1563	1/8		
1618	3/4		

Table 4 - Bit Record

Bit No.	Size(mm)	Make	Type	Jets	In	Out	Metres	Hrs	Mph	(daN) WOB	RPM	Condition
1	311	ST	SDT	3 x 16	15	287	272	19	14.3	12	140/160	5-3-I
2	311	ST	SDT	3 x 16	287	554	267	29 1/4	9.1	18	170	7-3-I
3	222	ST	SDGH	3 x 11	554	725	171	13	13.2	17	120	7-2-I
4	222	DBS	PD2	3 x 14	725	1438	713	75	9.5	4-6	100	Good
5	222	SEC	S82F	3 x 12	1438	1666	228	45	5.1	16	180	
6	222	DBS	PD2	3 x 14	1666	1872	206	38 1/4	5.4	1-4	100	
7	222	ST	F2	3 x 12	1872	2030	158	31 1/2	5	15	90	2-2-I

Ft. Norman


64° 50'
64° 50'
126° 00'
L143B
143A
L142
L128A
L129
L130
L141
L135
L136
64° 40'
64° 40'
126° 00'
0
2 Miles
conoco
Conoco Canada Limited
N.W.T.
WELL LOCATION
Author : J. SCHNEIDER
Date : AUGUST 21/87
Scale :
C.I. :
Drafted By :
Revised :
N.T.S. No. :
File No. :

Stratech Services Ltd.

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CONOCO CANADA LIMITED

GEOLOGICAL REPORT

CONOCO ET AL NORTH LITTLE BEAR L-21

L-21-64-50-125-45 (NWT)

9211-C90-1-2

OTTAWA COPY

Kory Koke, M. Sc., P. Geol.

CONOCO ET AL NORTH LITTLE BEAR L-21

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CONOCO ET AL NORTH LITTLE BEAR L-21
WELL DATA SUMMARY

OPERATOR:	CONOCO CANADA LIMITED
WELL NAME:	Conoco et al North Little Bear L-21
WELL LOCATION:	L-21-64-50-125-45 (Northwest Territorites, Canada)
COORDINATES:	64^{o} 40' 39.499" North Latitude 125^{o} 50' 25.234" West Longitude
ELEVATIONS:	Ground: 234.2m Kelly Bushing: 240.4m
TOTAL DEPTH:	Drillers: 2030m Loggers: 2026.4m
SPUD DATE:	05:30 hrs, 24 February, 1988
RIG RELEASE:	
CONTRACTOR:	Atco Equtak Drilling Division, Rig #76 (2800m)
SUPERVISION:	Drilling: R. Jones/H. Desaulniers Geological: K. Koke
LICENCE NUMBER:	D.A. 1379 (Lease # EL 319)
AFE NUMBER:	5B-26-0235 (3.2MM SCAN)
SAMPLE STUDY:	5m samples from 25m to TD
MUDLOGGING:	Continental Labs 25m to TD Total Gas and Chromatograph
HOLE SIZE:	Surface: 311mm Main: 222mm
CASING RECORD:	Conductor: 508mm 139.9 kg/m H-40 Driven to 19.0m KB
	Surface: 244.5mm 53.7 kg/m K-55 landed at 553.0m KB and cemented with: Lead: 15.5T permafrost Tail: 18.1T OW Class G/2% $CaCl_2$ Good returns

(CONTINUED ON NEXT PAGE)

CONOCO ET AL NORTH LITTLE BEAR L-21

WELL DATA SUMMARY

OPEN HOLE LOGS: Schlumberger

#1. DLL-SP-BHCS-GR 2026.4m to 552.5m
1:600 and 1:240 scales

#2. CNL-LDT-GR-XYCAL 2026.0m to 552.5m
1:240 scale on bulk density and Ø overlay

#3. Velocity Survey 1 shot per100m TD to Casing.

DRILLING FLUIDS:

19-554m	Gel Lime	WT	1040-1240 kg/m^3
		VIS	35-63 sec/liter
		pH	9.5
554-2030m	Gel Chem	WT	1070-1170 kg/m^3
		VIS	32-65 sec/liter
		WL	9-16 mils
		pH	8.0-9.5
		YP	1.5-6
		SOLIDS	2.5-10.5%

Note: essentially "dirty water" above 1350m as very little gel added above this point.

CONOCO ET AL NORTH LITTLE BEAR L-21

FORMATION TOPS

KB: 240.4m

FORMATION	SAMPLE DEPTH	SAMPLE SUBSEA	LOG DEPTH	LOG SUBSEA
LITTLE BEAR	631m	- 391m	633.5m	- 393.1m
SLATER RIVER			1110	- 869.6
BITUMINOUS ZONE	1343	-1103	1341.5	-1101.1
"SANS SAULT"	1437	-1197	1437	-1196.6
DETRITAL SHALES	1472	-1232	1471	-1230.6
IMPERIAL	1517	-1277	1492.5	-1252.1
CANOL	1858	-1618	1853	-1612.6
HUME	1986	-1746	1978.5	-1738.1
TOTAL DEPTH	2030	-1790	2026.4	-1786.0

CONOCO ET AL NORTH LITTLE BEAR L-21

DEVIATION SURVEYS

DEPTH	INCLINATION	DEPTH	INCLINATION
31m	1 degrees	1160m	1 degrees (N11W)
59	3/4	1207	1(N36W)
96	1/2	1255	1&1/2(N60W)
124	1/4	1292	1&3/4(N79W)
159	1/2	1381	2(N83W)
190	1	1419	2&1/4(N78W)
218	3/4	1437	2&1/2(S88W)
247	1/2	1465	2(S79W)
275	1	1494	1&3/4(S83W)
303	1	1541	1/4(N69W)
332	1/2	1563	1/8(N31W)
361	1/4	1618	3/4(N9W)
389	1/2	1694	2&1/4
418	1/2	1722	3&3/4
447	1	1732	3&1/2
475	1/4	1742	3&3/4
544	1/4	1751	3
617	1/4(N19E)	1761	3
675	1/4(N24E)	1780	2&1/2
715	1&3/4(N29E)	1809	1&3/4
740	1&1/2(N44E)	1838	1&3/4
788	1&1/4(N30E)	1866	1&3/4
836	2(N44E)	1885	1&3/4
873	1&3/4(N28E)	1913	1&1/4
920	1&1/2(N33E)	1952	1
981	1&1/4(N36E)	1990	1&1/2
1038	1(N34E)		
1095	1(N14E)		
1125	1(N14E)		

CONOCO ET AL NORTH LITTLE BEAR L-21

BIT RECORD

BIT NO.	SIZE	TYPE	SERIAL NO.	DEPTH IN	DEPTH OUT	PROGRESS	HOURS	FOB (1000 daN)	RPM	PP (1000 kPa)	CONDITION T/B/G
1	311mm	SDT	XF8992RR	15m	287m	272m	19	2-12	70-160	2-4	5-3-I
2	311	SDT	XF8994	287	554	267	29&1/2	12-18	140-170	5	7-3-I
3	222	SDGH	K24528	554	725	171	13	17	120	4.2	7-2-I
4	222	PD2	107B08	725	1438	713	75	3-6	100-120	4.2-9.6	good
5	222	S82F	361305	1438	1666	228	45	12-16	90-100	8.5-10.0	3-5-I
6	222	PD2	107B05	1666	1872	206	28&3/4	1-5	100	9.0-10.5	10% wear
7	222	F2	XF7774	1872	2030	158	31&1/2	10-15	90	10.5	2-2-I

CONOCO ET AL NORTH LITTLE BEAR L-21

DAILY WELL HISTORY

DATE	DAY NO.	DEPTH @06:00	MUD PROPERTIES WEIGHT kg/m^3	VIS sec.	W.L. ml.	pH	DAILY OPERATIONS
Spud 24 February, 1988, 05:30 hrs							
25 Feb	1	292m	1100	35		9.5	Drill 311mm surf. hole & trip for bit.
26	2	510	1230	43		9.5	Drill 311mm surf. hole
27	3	554	1240	63		9.5	Drill 311mm hole, run & cement csg @ 553m KB.
28	4	554					WOC, rig repairs, and nipple up BOP'S.
29	5	732	1070	32		9.5	Drill 222mm hole, trip for bit, leak-off test.
1 Mar	6	923	1135	33	16.0	9.0	Drill 222mm hole, trip for wash out, rig repairs.
2	7	1178	1120	33	16.0	8.5	Drill 222mm hole.
3	8	1338	1125	36	14.0	8.0	Drill 222mm hole.
4	9	1449	1160	38	9.5	9.0	Drill 222mm hole and trip for bit.
5	10	1553	1170	41	11.5	10.0	Drill 222mm hole.
6	11	1666	1155	41	8.5	9.0	Drill 222mm hole.
7	12	1736	1150	41	8.5	8.5	Drill 222mm hole and trip for bit.
8	13	1843	1135	43	9.0	9.5	Drill 222mm hole.
9	14	1907	1130	41	9.0	9.5	Drill 222mm hole and trip for bit.
10	15	2021	1110	41	9.0	9.5	Drill 222mm hole.
11	16	2030	1130	65	9.0	9.5	Drill 222mm hole and hoist to log.

CONOCO ET AL NORTH LITTLE BEAR L-21
GEOLOGICAL SUMMARY

The Conoco et al North Little Bear L-21 well was drilled in early 1988 to evaluate a Devonian seismic rollover co-incident with a fade-out of the Jungle Ridge reflector. It was hoped that reefing at the Jungle Ridge level or Kee Scarp level was related to this anomaly. Unfortunately, however, the Jungle Ridge was removed by erosion at L-21, causing the discontinuity on this reflector. No reefing was present in any of the Devonian rocks penetrated.

Evidence for a structural rollover in the Devonian was reinforced by the presence of liquid hydrocarbons present in the interval from 1700 to 1775m. Good C_2 to C_5 chromatograph response as well as poor to fair cut and streaming in solvent was evident in the tight Imperial siltstones of this interval. It thus appears that structural closure may be present on deeper Devonian rocks. The Bear Rock Formation (not penetrated in L-21) is known to be porous in the region, and may be prospective, especially for gas.

The only other potential reservoirs penetrated in the L-21 were the numerous sands of the Little Bear Formation. They are generally unconsolidated and grade up to conglomerate size in some intervals. No hydrocarbon shows were observed, however, and logs indicate that they are charged with relatively fresh water.

SUMMARY OF FORMATIONS

EAST FORK Surface

In the North Little Bear L-21 well, the East Fork in composed primarily of light to medium grey or grey-brown unconsolidated muds and shales. These sediments disperse completely into the drilling mud system, making it impossible to wash and dry some samples, and biasing others with high concentrations of consolidated elements

present. Thin interbeds of medium grey-brown siltstone are present, along with sideritic nodules, pyrite, and arenaceous forams. The top 50m or so (just below the surface) contains abundant mixed gravel and unconsolidated sand, representing surficial fluvial or glacial deposits, or partly reworked arenaceous sediments of the Summit Creek. No hydrocarbon shows were observed in this interval.

LITTLE BEAR 631m

The Little Bear at the L-21 location is a non-marine sequence of interbedded sandstone, siltstone, shale, and minor conglomerate and coal. The sands are light to medium grey, fine to coarse grained, subangular to subrounded, and may contain significant beds of chert pebbles. They are all unconsolidated in samples and appear to exhibit good porosity, but no hydrocarbon shows are present. The shales range from light to dark grey, are silty and carbonaceous in part, and are in part nearly unconsolidated. Light to medium grey siltstone stringers are common. Many of the sandstone and conglomerate beds within the Little Bear are undoubtedly of reservoir quality, but the total lack of hydrocarbon shows indicates that the formation may be breached updip.

DETRITAL SHALES 1472m

A sequence of red, green, tan and grey waxy shales interbedded with black to dark grey micromicaceous shale overlies the Devonian Imperial Formation in the L-21 well. There are interbeds of light to medium grey-brown or grey-green micaceous siltstone within this unit, and small sideritic or siliceous spherules are common. Some of these "pellets" look like altered Chara sp. There were no hydrocarbon shows in this package, which is interpreted to represent partially reworked Devonian sediments.

CONOCO ET AL NORTH LITTLE BEAR L-21
GEOLOGICAL SUMMARY

IMPERIAL 1517m

In the L-21 well, the Imperial is mostly composed of medium grey micromicaceous shales interbedded with minor medium grey-green calcareous and micaceous siltstone stringers. The interval from about 1700-1775m has up to 75% light grey-brown calcareous and micaceous siltstone interbedded with minor medium grey shale. This silty unit shows anomalously high gas detector readings, and the samples show poor to fair cut and streaming in solvent. The hydrocarbon saturation indicated in this siltstone may be a result of structural closure on the Devonian part of the section. If this is the case, porous beds below may also contain hydrocarbons. The Jungle Ridge and Canyon Creek limestone lentils were eroded from the top of the Devonian in this well.

CANOL 1858m

The Canol Formation in the L-21 well consists of dark brown to black bituminous ahd siliceous shale with waxy to brittle textures. There are a few interbeds of dark brown chert and dark brown calcareous marl. The Formation is rich in heavy hydrocarbons and shows total gas responses of up to several hundred units. It thus has the potential to serve as source rock to adjacent closed reservoirs in the region.

HUME 1986m

The Hume Formation in the L-21 well is conposed of buff to dark brown mottled clean bioclastic limestone. There is evidence of stromatoporoids and crinoid fragments forming an average framework

of about 40%, matrix supported. There are stylolites and coarse crystalline calcite vein fillings, but no porosity was seen or indicated by drilling times or logs. No significant gas readings or oil stain was noted. The indicated environment is a tight carbonate bank or platform. There is no evidence of significant dolomitization in samples.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

0-25m		No samples; 508mm conductor pipe set at 19m KB.
25-30	60%	Sand: medium grey, medium to very coarse grained, subrounded to subangular, well sorted, clear quartz with varicolored chert, good porosity, unconsolidated, no shows.
	35	Shale: dark grey to black, occasionally dark brown, silty in part, carbonaceous in part.
	5	Siltstone: medium to dark grey, argillaceous, sandy in part.
30-35	70	Sand: as above, including some pebbles of grey-green siltstone and brown limestone.
	20	Shale: as above.
	10	Siltstone: as above.
35-40	80	Sand: as above, common limestone and siltstone pebbles or boulders.
	15	Shale: as above.
	5	Siltstone: as above.
40-45	50	Gravel: pebbles, grains, and boulders of metamorphic and igneous rock fragments, grey-brown to brown siltstone, tight white sandstone, brown limestone and dolomite in a matrix of very fine to coarse quartz/chert sand.
	40	Shale: light to dark grey. light to dark brown, micromicaceous in part, silty in part, trace pelecypods and forams, carbonaceous in part.
	10	Siltstone: light to dark grey, grey-green to brown, micaceous in part, argillaceous in part.
45-50	65	Gravel: as above, grading to very coarse grained unconsolidated sand, no shows.
	25	Shale: as above.
	10	Siltstone: as above.
50-75		No samples; unconsolidated mud washed away completely during sample preparation.
75-80	50	Shale: light to medium grey-brown, unconsolidated, grading to mud, rare silty stringers, rare forams.
	50	Sand and Gravel: unconsolidated as above, may be cavings.
80-135		Unconsolidated light to medium grey-brown mud, washed away completely during sample preparation.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

135-140m	70%	Shale: medium to light grey-brown, some slightly calcareous, common medium brown sideritic stringers, common floating coarse subrounded black chert grains.
	15	Siltstone: light grey, argillaceous to clean, some grading to very fine grained sandstone, tight, no shows, thin stringers.
	5	Bentonitic shale: light blue-grey, micaceous.
	10	Cavings: mostly unconsolidated fine grained quartz/ chert sand.
140-150		Unconsolidated medium to light grey-brown mud, washed away completely during sample preparation.
150-155	55	Shale: as above, abundant floating black chert grains.
	15	Siltstone: as above.
	30	Cavings: as above.
155-160		Unconsolidated mud, washed away completely during sample preparation.
160-165	75	Shale: light to medium grey to grey-brown, most unconsolidated, grading to mud, some slightly silty, trace pyrite, minor floating black chert grains.
	20	Siltstone: medium grey-brown, argillaceous, sandy.
	5	Bentonitic shale: light blue-grey, waxy, micaceous.
165-245		Unconsolidated meidum to light grey-brown mud, washed away completely during sample preparation.
245-250	65	Shale: medium to light grey-brown, most unconsolidated clay, some silty, a few medium brown sideritic stringers or nodules, possible floating very coarse grained black chert grains, common forams (Haplophragmoides sp.)
	25	Siltstone: medium to light grey-brown, argillaceous, calcareous in part, sandy, thin stringers.
	10	Cavings: light blue-grey bentonitic shale, light grey sandstone, grey chert pebbles.
250-260		Unconsolidated mud, washed away completely during sample preparation.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

260-265m	70%	Shale: as above.
	15	Siltstone: as above, grading in part to thin tight sandstone stringers.
	15	Cavings: as above.
265-270	80	Shale: as above, abundant floating chert grains.
	10	siltstone: as above, thin stringers.
	10	Cavings: as bove.
270-275	70	Shale: light to medium grey-brown, earthy, grading to unconsolidated clay, silty in part, commonly pyritic, a few medium brown sideritic stringers, floating black chert grains?
	15	Siltstone: medium grey, argillaceous, sandy in part, carbonaceous in part, commonly calcareous, thin stringers.
	15	Cavings: very coarse grained quartz/chert sand, limestone fragments, etc., from unconsolidated surficial deposits.
275-280	70	Shale: as above.
	10	Siltstone: as above.
	20	Cavings: as above.
280-285	60	Shale: as above.
	25	Siltstone: as above.
	15	Cavings: as above.
285-290	70	Shale: as above, sideritic stringers.
	20	Siltstone: as above.
	10	Cavings: as above.
290-295	35	Shale: light to medium grey-brown, earthy, grading to clay, minor medium brown sideritic nodules, carbonaceous in part, silty in part, commonly pyritic, a few forams.
	35	Sandstone: light grey-brown, very fine to fine grained, well sorted, subangular, mostly clear quartz with minor meidum grey chert, most unconsolidated, some stringers with calcareous cement, poor to good? porosity, no shows.
	15	Siltstone: light grey-brown, argillaceous, sandy, calcareous in part, thin stringers.
	15	Cavings: coarse grained black chert sand, light grey bentonitic shale, light grey sandstone, etc.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

295-300m	50%	Shale: as above.
	30	Siltstone: as above, thin stringers.
	20	Cavings: as above.
300-305	70	Shale: as above.
	15	Siltstone: as above.
	15	Cavings: as above.
305-310		Unconsolidated mud; sample completely washed away during sample preparation.
310-315	50	Shale: light to medium grey-brown, earthy to micro-micaceous, commonly sideritic, siderite nodules, some silty or carbonaceous, commonly pyrite, a few floating black chert grains.
	20	Sandstone: light grey-brown, very fine to fine grained, meidum sorting, subangular, clear quartz with dark chert, calcareous and silica cement, tight to rare fair porosity, no shows.
	20	Siltstone: light grey-brown, argillaceous, carbonaceous, sandy, thin stringers.
	10	Cavings: light grey bentonitic shale, some grey to black chert pebbles, tan limestone.
315-320	50	Sandstone: meidum to light grey, fine to medium grained, medium sorting, subangular, clear quartz with light grey to black chert, unconsolidated in sample, commonly pyritic, no shows.
	20	Shale: as above.
	20	Siltstone: as above.
	10	Cavings: as above.
320-325	60	Sandstone: as above, common chert pebbles.
	20	Siltstone: as above.
	20	Shale: as above, foraminifera.
325-330	80	Shale: light to medium grey-brown, earthy, soft, slightly carbonaceous, some silty.
	10	Siltstone: light grey-brown, argillaceous, sandy, carbonaceous, trace pyrite, slightly calcareous, thin stringers.
	10	Cavings: very coarse grained subrounded light to dark grey chert grains.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

330-335m	55%	Shale: as above.
	35	Siltstone: as abovea, grading in part to very fine grained sandstone, tight, no shows.
	10	Cavings: as above, mostly chert grains.
335-340	70	Shale: as above, commonly sideritic.
	20	Siltstone: as above.
	10	Cavings: as above.
340-345	60	Shale: as above.
	30	Siltstone: as above, grading in part to sandstone, tight, no shows.
	10	Cavings: as above.
345-350	80	Shale: light to medium grey-brown, earthy, carbonaceous in part, common sideritic nodules, slightly silty in part, forams, mostly Haplophragmoides sp.
	10	Siltstone: light grey-brown, argillaceous, carbonaceous, pyritic.
	10	Cavings: very coarse chert grains and small pebbles, limestone fragments.
350-355	45	Shale: as above, a few floating chert grains?
	20	Siltstone: as above.
	15	Sandstone: light grey-brown, very fine grained, medium sorted, frosted quartz with grey chert, silica and clay cement, poor porosity, no shows.
	20	Cavings: as above.
355-360	55	Shale: as above.
	25	Siltstone: as above.
	10	Sandstone: as above, tight, no shows, thin stringers.
	10	Cavings: as above.
360-365	60	Shale: as above, commonly pyritic.
	25	Siltstone: as above.
	5	Sandstone: as above, tight, no shows.
	10	Cavings: as above.
365-370	70	Shale: light to medium grey-brown, earthy, carbonaceous in part, commonly silty, common sideritic nodules and stringers, abundant pyrite.
	20	Siltstone: light grey-brown, argillaceous, sandy, pyritic, thin stringers.
	10	Cavings: coarse chert grains and small pebbles, limestone fragments, light grey bentonite, etc.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

370-375m	80%	Shale: as above.
	15	Siltstone: as above.
	5	Cavings: as above.
375-380	70	Shale: as above, abundant pyrite, sideritic nodules.
	20	Siltstone: as above.
	10	Cavings: as above.
380-385	70	Shale: as above, forams.
	15	Siltstone: thin stringers.
	15	Cavings: as above.
385-390	80	Shale: medium to light grey-brown, earthy, soft, carbonaceous in part, some silty, commonly pyritic, sideritic nodules.
	10	Siltstone: light grey-brown, argillaceous, sandy, thin stringers.
	10	Cavings: light to dark grey chert grains and small pebbles.
390-395	50	Shale: as above, most washed away.
	40	Siltstone: as above.
	10	Cavings: as above.
395-400	70	Shale: as above, common sideritic nodules.
	20	Siltstone: as above, thin stringers.
	10	Cavings: as above.
400-405	70	Shale: as above, commonly silty.
	15	Siltstone: as above.
	15	Cavings: as above.
405-410	70	Shale: medium to light grey-brown, earthy, carbonaceous in part, silty in part, common tan sideritic nodules, pyrite.
	15	Siltstone: light grey-brown, sandy, argillaceous, carbonaceous.
	10	Sandstone: light grey-brown, fine to medium grained, poor sorting, subangular, frosted quartz with light to dark grey chert, trace glauconite and carbonaceous flakes, argillaceous matrix, tight to poor porosity, no shows, thin stringers.
	5	Cavings: very coarse chert grains and small pebbles, may be floating in shales?

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

410-415m	60%	Siltstone: as above.
	30	Shale: as above, most washed away.
	10	Cavings: as above.
415-420	50	Shale: as above, most washed away, common arenaceous forams.
	45	Siltstone: as above, some grading to very fine grained sandstone, tight, no shows.
	5	Cavings: as above.
420-425	60	Shale: as above, abundant forams (Haplophragmoides sp.)
	35	Siltstone: as above.
	5	Cavings: as above.
425-430	60	Shale: medium to light grey-brown, earthy, silty, carbonaceous in part, tan sideritic nodules, commonly pyritic.
	30	Siltstone: light grey-brown, argillaceous, sandy, carbonaceous.
	10	Cavings: light grey bentonite, coarse grained chert grains and pebbles, limestone fragments.
430-435	50	Shale: as above.
	45	Siltstone: as above.
	5	Cavings: as above.
435-440	50	Siltstone: as above.
	30	Shale: as above, abundant Haplophragmoides sp.
	15	Sandstone: light grey-brown, very fine grained to some medium grained, poor sorting, subangular, silty in part, argillaceous matrix, tight to unconsolidated, no shows.
	5	Cavings: as above.
440-445	80	Sandstone: medium grey, fine to coarse grained, medium sorted, subangular, clear to frosted quartz with light to dark grey chert, minor silica cement, most unconsolidated, good porosity, no shows.
	10	Siltstone: as above.
	10	Shale: as above.
445-450	70	Sandstone: as above, good porosity, no shows.
	15	Shale: medium to light grey-brown, earthy, silty, carbonaceous.
	15	Siltstone: light grey-brown, argillaceous, sandy, carbonaceous.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

450-455m	70%	Sandstone: generally as above but most very fine to fine grained, fair to good porosity, no shows.
	20	Siltstone: as above.
	10	Shale: as above.
455-460	55	Shale: as above, abundant sideritic stringers and nodules.
	20	Siltstone: as above.
	15	Sandstone: as above, most very fine grained, poor porosity to tight, no shows.
	10	Cavings: very coarse rock fragments from surface deposits.
460-465	50	Sandstone: light grey, very fine grained, poor sorting, subangular, argillaceous, silty, carbonaceous, tight, no shows.
	25	Shale: meidum to light grey-brown, earthy, silty, carbonaceous, tan sideritic nodules.
	20	Siltstone: light grey-brown, argillaceous, sandy, carbonaceous.
	5	Cavings: very coarse grained chert and small pebbles.
465-470	60	Siltstone: as above.
	20	Sandstone: as above, tight, no shows.
	15	Shale: as above.
	5	Cavings: as above.
470-475	50	Shale: as above, areanceous forams.
	45	Siltstone: as above, very sandy.
	5	Cavings: as above.
475-480	70	Shale: as above.
	25	Siltstone: as above.
	5	Cavings: as above.
480-485	70	Shale: medium grey-brown, earthy, silty, carbonaceous, commonly pyritic.
	25	Siltstone: light to medium grey-brown, argillaceous, sandy, carbonaceous.
	5	Cavings: light grey bentonitic shale, varicolored rock fragments.
485-490	70	Shale: as above.
	20	Siltstone: as above.
	10	Cavings: as above,mostly small chert pebbles.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

490-495m	80%	Shale: as above, and some dark to medium grey to grey-green, waxy to micromicaceous, bentonitic in part.
	15	Siltstone: as above.
	5	Cavings: as above.
495-500	65	Shale: medium to light grey, earthy, soft, silty in part, carbonaceous.
	25	Siltstone: light grey, argillaceous, sandy, carbonaceous.
	5	Bentonitic shale: light blue-grey, waxy,micaceous.
	5	Cavings: very coarse chert grains and pebbles.
500-505	60	Shale: as above, abundant pyrite.
	30	Siltstone: as above.
	10	Cavings: as above, including light blue-grey bentonitic shale.
505-510	80	Shale: as above.
	10	Siltstone: as above.
	10	Cavings: as above.
510-515	60	Shale: as above, abundant pyrite.
	20	Siltstone: as above.
	20	Conglomerate: medium grey, light to dark grey, black subrounded chert pebbles, minor subrounded frosted quartz, matrix of very coarse grained chert/quartz sand, unconsolidated, no shows.
515-520	55	Shale: as above.
	35	Conglomerate: as above, grading in part to very coarse grained unconsolidated sand, no shows.
	10	Siltstone: as above.
520-525	80	Shale: light to medium grey-brown, earthy, soft, carbonaceous, silty in part, commonly pyritic.
	10	Conglomerate: as above, may be cavings.
	10	Siltstone: light grey-brown, argillaceous, sandy, carbonaceous.
525-530	35	Shale: as above, commonly pyritic, common Haplophragmoides sp.
	30	Sandstone: medium grey, very coarse grained, abundant small pebbles, medium sorted, subrounded, light to dark grey, yellow to brown chert, minor frosted quartz, unconsolidated, no shows.
	30	Siltstone: as above.
	5	Bentonitic shale: light grey-green, waxy.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

530-535m	65%	Shale: as above, commonly pyritic, common forams.
	20	Sandstone: as above, grading in part to conglomerate, may be cavings in part, unconsolidated, no shows.
	15	Siltstone: as above.
535-540	60	Shale: as above.
	30	Sandstone: generally as above buf grading to fine grained, unconsolidated sand, no shows.
	10	Siltstone: as above.
540-545	70	Shale: as above, most washed away.
	20	Sandstone: as above, mostly cavings?, unconsolidated, no shows.
	10	Siltstone: as above.
545-550	75	Shale: medium to light grey-brown, earthy, soft, grading to clay, some silty, trace pyrite, sideritic nodules, most washes away.
	15	Siltstone: light grey-brown, argillaceous, sandy, carbonaceous.
	10	Cavings: unconsolidated chert sand and pebbles, varicolored rock fragments.
550-555		Sample missed; not circulated up. 244.5mm surface casing set at 553.0m KB.
555-560	10	Shale: medium grey, earthy to micromicaceous, carbonaceous.
	10	Cavings: varicolored rock fragments.
	80	Casing cement.
560-565	90	Shale: as above. blocky, some silty.
	10	Casing cement.
565-570	90	Shale: as above.
	10	Casing cement.
570-575		Unconsolidated medium grey mud; sample completely washed away during preparation.
575-580	95	Shale: light to medium grey, micromicaceous to earthy, soft, carbonaceous in part, trace pyrite.
	5	Casing cement.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

580-585m		Unconsolidated medium grey mud; washed away completely during sample preparation.
585-590	99%	Shale: as above.
	1	Casing cement.
590-595	100	Shale: as above, some silty.
595-600	95	Shale: medium to light grey, micromicaceous to earthy, blocky, carbonaceous in part, trace pyrite.
	5	Cavings: loose fine grained sand.
600-605	100	Shale: as above, soft.
605-610	98	Shale: as above.
	2	Cavings: as above.
610-615	95	Shale: as above, trace pyrite.
	5	Shale: light grey, waxy, bentonitic.
615-620	90	Shale: medium to light grey, micromicaceous to earthy, soft, carbonaceous in part.
	5	Shale: light grey-green, waxy, bentonitic.
	5	Cavings: loose very fine to medium grained sand.
620-625	90	Shale: as above, trace sideritic nodules.
	5	Bentonitic shale: as above, trace sideritic nodules.
	5	Cavings: as above.
625-630		Unconsolidated medium grey mud; washed away completely during sample preparation.

LITTLE BEAR 631m

630-635	90	Shale: medium to light grey, some mottled with white, micromicaceous to earthy, flaky, trace glauconite.
	10	Shale: light grey, waxy, bentonitic, thin stringers.
635-640	60	Shale: as above.
	35	Sandstone: light grey, very fine to medium grained, scattered small pebbles, medium sorted, subangular, frosted quartz with minor light to dark grey chert, unconsolidated in sample, good porosity, no shows.
	5	Bentonitic shale: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

640-645m	60%	Sandstone: generally as above, abundant chert pebbles, unconsolidated, good? porosity, no shows.
	35	Shale: as above.
	5	Bentonitic shale: as above.
645-650	70	Sandstone: as above, most very fine to fine grained, unconsolidated, good? porosity, no shows.
	30	Shale: as above.
650-655	60	Sandstone: light grey, fine to medium grained, mostly fine, well sorted, subangular, frosted quartz with light to dark grey chert, unconsolidated in sample, no shows.
	40	Shale: meidum to light grey, micromicaceous, most soft, some sandy to silty.
655-660	50	Shale: as above.
	25	Sandstone: as above, most medium grained, some chert pebbles, unconsolidated, no shows.
	25	Siltstone: light grey, argillaceous, thin stringers.
660-665	55	Shale: as above.
	25	Siltstone: as above.
	15	Conglomeratic sandstone: light grey, fine to very coarse grained quartz/chert sand with abundant light to dark grey or brown chert pebbles, unconsolidated in samples, no shows.
	5	Bentonitic shale: light grey, wasy, micaceous.
665-670	80	Shale: as above, some silty to sandy.
	10	Siltstone: as above.
	10	Bentonitic shale: as above.
670-675	80	Conglomerate: light to dark grey, yellow to brown subrounded chert pebbles, unconsolidated, no shows.
	10	Siltstone: light grey, clean, quartz silt, thin stringers.
	10	Shale: medium to dark grey, micromicaceous to waxy, some bituminous.
675-680	55	Shale: medium grey, micromicaceous to earthy, carbonaceous in part, silty in part.
	35	Siltstone: as above, some sandy.
	10	Conglomerate: as above, no shows.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

680-685m	50%	Siltstone: as above.
	40	Shale: as above.
	10	Conglomerate: as above, no shows.
685-690	70	Siltstone: as above.
	20	Shale: as above.
	10	Conglomerate: as above, no shows.
690-695	50	Sandstone: light to medium grey, fine to medium grained, medium sorting, subangular, frosted quartz with minor light to dark grey chert, minor silica overgrowth cement, most unconsolidated, no shows.
	40	Shale: medium to light grey, earthy, soft, some carbonaceous, some silty or sandy, some light grey, waxy, bentonitic.
	10	Siltstone: medium to light grey, argillaceous in part, sandy in part.
695-700	50	Sandstone: generally as above, abundant small chert pebbles, unconsolidated, no shows.
	30	Shale: as above.
	20	Siltstone: as above.
700-705	60	Shale: as above, most flaky, carbonaceous.
	30	Sandstone: as above, common small pebbles, unconsolidated, no shows.
	10	Siltstone: as above.
705-710	85	Shale: most dark grey, micromicaceous, flaky, carbonaceous, some light grey, waxy, bentonitic.
	15	Conglomeratic sandstone: medium grey, very fine to very coarse grained, abundant pebbles, subrounded, poor sorting, light todark grey and brown chert with minor frosted quartz, unconsolidated, good? porosity, no shows, thin stringers?
710-715	70	Shale: as above.
	30	Conglomeratic sandstone: as above, no shows.
	tr	Coal.
715-720	75	Shale: as above, commonly very carbonaceous.
	15	Coal: clean to very argillaceous.
	10	Conglomeratic sandstone: as above, cavings?, no shows.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

720-725m	95%	Shale: medium grey-brown, earthy, soft, some medium grey, micromicaceous, flaky, rarely light grey waxy, bentonitic.
	tr	Coal.
	5	Cavings: chert shards and sand grains.
725-730	70	Shale: medium to dark grey, micromicaceous, flaky, some light grey, waxy, bentonitic.
	25	Sandstone: light grey, very fine to fine grained, poor sorting, subangular, silty, mostly pure quartz, silica and clay cement, grading to siltstone, tight, no shows.
	5	Coal: clean to argillaceous.
730-735	60	Coal: mostly clean to rarely argillaceous.
	30	Shale: as above, very carbonaceous in part.
	10	Sandstone: as above, grading in part to siltstone, floating chert pebbles, poor porosity, no shows.
735-740	60	Shale: as above.
	20	Sandstone: light grey, medium to very coarse grained, common small pebbles, poor sorting, subangular to subrounded, light to medium grey chert with frosted to clear quartz, some silty matrix, poor to good? porosity, no shows.
	10	Siltstone: light grey, clean, quartz silt, sandy.
	10	Coal: as above, cavings in part.
740-745	60	Shale: as above.
	15	Sandstone: as above, poor? porosity, no shows.
	15	Siltstone: as above.
	10	Coal: clean to argillaceous.
745-750	70	Shale: medium grey, micromicaceous, flaky, about 10% is light grey, waxy, bentonitic, micaceous.
	20	Siltstone: light grey, most clean, pure quartz, thin stringers.
	10	Sandstone: light grey, very fine to very coarse grained, scattered small pebbles, poor sorting, subangular to subrounded, silty, frosted quartz with minor dark chert, silica cement, poor porosity to tight, no shows.
750-755	70	Shale: as above, 5% is bentonitic, tan sideritic nodules are common.
	15	Sandstone: as above, pebbles, mostly tight, no shows.
		Siltstone: as above, trace thin coaly stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

755-760m	90%	Shale: as above, trace bentonitic.
	5	Sandstone: as above, tight, no shows, cavings?
	5	Siltstone: as above.
760-765	90	Shale: as above, 5% is bentonitic.
	5	Sandstone: as above, no shows.
	5	Siltstone: as above, thin stringers.
765-770	90	Shale: medium grey, micromicaceous, most flaky, 5% is light grey, waxy, bentonitic (cavings?).
	10	Siltstone: medium to light grey, argillaceous, carbonaceous, sandy.
770-775	50	Sandstone: medium grey, fine to medium grained, subangular, well sorted, frosted quartz with abundant glauconite, minor dark chert, unconsolidated in sample, good porosity, no shows.
	40	Shale: as above.
	10	Siltstone: as above.
775-780	60	Sandstone: generally as above buf no glauconite, common small chert pebbles, good to poor porosity, no shows.
	25	Shale: as above, most silty.
	15	Siltstone: as above.
780-785	60	Sandstone: as above, most medium grained with abundant small pebbles, unconsolidated in sample, good porosity, no shows.
	20	Siltstone: as above.
	20	Shale: as above.
785-790	60	Shale: medium grey, micromicaceous, most flaky, some carbonaceous, silty in part, 5% is bentonitic, likely cavings in part.
	25	Siltstone: light to medium grey, argillaceous, sandy, carbonaceous in part, thin bedded.
	15	Sandstone: as above, abundant chert pebbles, poor to good porosity, no shows.
790-795	60	Shale: as above.
	20	Sandstone: light grey, fine to medium grained, medium sorting, subangular, frosted quartz with yellow to brown, grey to black chert, common small pebbles, unconsolidated in sample, good porosity, no shows.
	20	Siltstone: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

795-800m	40%	Sandstone: as above, good porosity, no shows.
	40	Shale: as above.
	20	Siltstone: as above.
800-805	50	Sandstone: as above, most fine grained, unconsolidated, fair to good porosity, no shows.
	30	Shale: as above.
	20	Siltstone: as above.
805-810	40	Sandstone: as above, good to poor porosity, no shows.
	40	Shale: as above, becoming very carbonaceous.
	20	Siltstone: as above.
	tr	Coal: thin stringers.
810-815	60	Shale: medium grey, micromicaceous, flaky rarely carbonaceous or silty.
	25	Sandstone: light grey, fine to medium grained, common small pebbles, medium sorting, subangular, frosted quartz with light to dark grey or brown chert, some silty matrix, unconsolidated in sample, good? porosity, no shows.
	15	Siltstone: light to medium grey, argillaceous, sandy, carbonaceous, thin stringers.
	tr	Coal: thin stringers.
815-820	80	Shale: as above, most soft, grading to clay.
	10	Sandstone: as above, common chert pebbles, poor to good? porosity, no shows, thin stringers or cavings?
	10	Siltstone: as above, thin stringers.
	tr	Coal.
820-825	85	Sandstone: light grey salt and pepper, fine to medium grained, well sorted, subangular, clear to frosted quartz with white, light grey to black chert, minor silica overgrowth cement, unconsolidated in sample, good porosity, no shows.
	10	Siltstone: as above.
	5	Shale: as above.
	tr	Coal.
825-830	50	Sandstone: generally as above but most fine grained, good porosity, no shows.
	40	Siltstone: as above.
	10	shale: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

830-835m	60%	Siltstone: light grey, clean to argillaceous, sandy, carbonaceous in part.
	25	Sandstone: light grey, fine to medium grained, rare small pebbles, medium sorting, subangular, frosted quartz withlight to dark grey chert, some silty?, unconsolidated, good? porosity, no shows.
	15	Shale: medium grey, micromicaceous, carbonaceous in part, some silty.
	tr	Coal: thin stringers or cavings.
835-840	50	Siltstone: as above.
	30	Shale: as above, most silty.
	20	Sandstone: as above, good to poor porosity, no shows.
840-845	50	Sandstone: generally as above, fine to medium grained, unconsolidated, good porosity, no shows.
	25	Shale: as above, commonly carbonaceous.
	15	Siltstone: as above.
	10	Coal: clean to argillaceous, thin stringers.
845-850	95	Sandstone: light grey, most fine to minor medium grained, well sorted, subangular, frosted quartz with minor white, light to dark grey chert, unconsolidated, good porosity, no shows.
	5	Shale, siltstone, and coal: as above, cavings?
850-855	90	Sandstone: as above, good porosity, no shows.
	10	Siltstone, shale, and coal: as above, cavings in part or thin stringers.
855-860	80	Sandstone: generally as above, but abundant silty matrix and clay cement, poor to fair porosity, no shows.
	10	Shale: medium grey, micromicaceous, carbonaceous in part.
	5	Siltstone: light grey, argillaceous, sandy, carbonaceous in part.
	5	Coal: argillaceous to clean, thin stringers.
860-865	60	Sandstone: medium grey, very fine to fine grained, poor sorting, subangular, very silty, argillaceous, frosted quartz with dark chert, carbonaceous in part, clay cement, poor porosity to tight, no shows.
	20	Shale: medium grey, micromicaceous, flaky, silty.
	20	Siltstone: light grey, sandy, argillaceous, carbonaceous in part.
	tr	Coal: argillaceous to clean, thin stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21
SAMPLE DESCRIPTIONS

865-870m	50%	Sandstone: as above, poor porosity to tight, no shows.
	30	Shale: as above.
	20	Siltstone: as above.
	tr	Coal.
870-875	50	Sandstone: as above, fair porosity to tight, no shows.
	30	Siltstone: as above.
	20	Shale: as above.
	tr	Coal.
875-880	90	Sandstone: light grey, very fine to fine grained, medium sorting, subangular, frosted quartz with minor dark chert, some silty, minor clay and silica overgrowth cement, fair porosity to tight, no shows.
	10	Shale, siltstone, and coal: as above, cavings in part?
880-885	90	Sandstone: as above, becoming siltier and better indurated, fair porosity to tight, no shows.
	10	Shale, siltstone, and coal: as above, thin stringers or cavings.
885-890	70	Shale: medium grey, micromicaceous to earthy, flaky to blocky, commonly silty, rarely carbonaceous.
	25	Siltstone: light to medium grey, argillaceous, carbonaceous.
	5	Sandstone: as above, tight, no shows, cavings.
890-895	50	Siltstone: as above, some very sandy, carbonaceous.
	30	shale: as above, most very silty.
	20	Sandstone: light to medium grey, very fine to medium grained, poor sorting, subangular, frosted quartz with white to dark grey chert, some silty, clay cement, poor porosity to tight, no shows.
895-900	60	Siltstone: as above, carbonaceous.
	30	Shale: as abo , most very silty.
	10	Sandstone: as above, becoming very silty, tight, no shows.
900-905	60	Siltstone: meidum to light grey, sandy, carbonaceous, argillaceous in part.
	25	Sandstone: light grey, very fine grained, poor sorting, subangular, very silty, carbonaceous, tight, no shows.
	15	Shale: as above, very carbonaceous in part.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

905-910m	60%	Siltstone: as above.
	20	Sandstone: as above, grading to siltstone, tight, no shows.
	20	Shale: medium grey, micromicaceous, flaky, commonly very silty.
910-915	65	Siltstone: as above.
	35	Shale: as above.
915-920	70	Shale: as above, most very silty.
	30	Siltstone: as above, most very argillaceous.
920-925	60	Shale: medium grey, micromicaceous in part, commonly very silty, carbonaceous in part.
	40	Siltstone: medium to light grey, sandy, argillaceous, carbonaceous in part.
925-930	50	Siltstone: as above, very sandy, grading to very fine grained sandstone, tight, no shows.
	50	Shale: as above.
930-935	70	Siltstone: as above, grading to very fine grained sandstone, tight, no shows.
	30	Shale: as above.
935-940	70	Sandstone: light grey, very fine grained, medium sorting, subangular, silty, clear quartz with minor dark chert, carbonaceous, silica and clay cement, tight, no shows.
	30	Shale: medium grey, blocky, commonly silty.
940-945	60	Shale: as above, becoming micromicaceous in part, a few tan sideritic nodules.
	40	Sandstone: as above, grading to siltstone, tight, no shows.
945-950	75	Shale: medium grey, micromicaceous in part, most blocky, silty, rare tan sideritic nodules.
	25	Siltstone: medium to light grey, argillaceous, carbonaceous, sandy, thin stringers.
950-955	50	Shale: as above, silty, tan sideritic nodules.
	30	Sandstone: light grey, fine to medium grained, minor small pebbles, poor sorting, subangular, frosted quartz, light grey to light brown chert, silty matrix, poor porosity to tight, no shows.
	20	Siltstone: as above.

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SAMPLE DESCRIPTIONS

955-960m	75%	Siltstone: as above.
	25	Shale: as above.
960-965	50	Shale: as above, very silty.
	50	Siltstone: as above, very argillaceous.
965-970	70	Siltstone: medium to light grey, argillaceous, sandy, carbonaceous, thin bedded.
	30	Shale: medium grey, blocky, most silty, some micromicaceous, thin bedded.
970-975	65	Siltstone: as above, some thin carbonaceous stringers.
	35	Shale: as above, very silty.
975-980	60	Shale: as above, very silty.
	40	Siltstone: as above.
980-985	85	Shale: medium grey, micromicaceous in part, most blocky, silty in part.
	15	Siltstone: medium to light grey, argillaceous, carbonaceous, thin stringers.
985-990	70	Shale: as above, tan sideritic nodules.
	30	Siltstone: as above.
990-995	60	Shale: as above, most very silty, minor tan sideritic nodules.
	40	Siltstone: as above, very argillaceous.
995-1000	50	Siltstone: as above.
	50	Shale: as above, abundant tan sider nodules.
1000-1005	70	Siltstone: light grey, sandy, argillaceous to clean, carbonaceous in part.
	30	Shale: medium grey, micromicaceous in part, commonly silty, blocky, hard tan sideritic stringers.
1005-1010	65	Siltstone: as above.
	35	Shale: as above.
1010-1015	60	Siltstone: as above.
	40	Shale: as above, very silty.
1015-1020	75	Siltstone: as above.
	25	Shale: as above, very silty.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1020-1025m	75%	Siltstone: light to medium grey, argillaceous to clean, sandy in part, carbonaceous.
	25	Shale: medium to light grey, blocky, silty, thin bedded, micromicaceous in part.
1025-1030	70	Shale: as above.
	30	Siltstone: as above, thin bedded.
1030-1035	50	Siltstone: as above, grading in part to very fine grained sandstone, tight, no shows.
	50	Shale: as above.
1035-1040	40	Siltstone: light to medium grey, argillaceous, sandy, carbonaceous in part.
	30	Shale: medium to light grey, micromicaceous in part, commonly sil y, blocky, carbonaceous, thin bedded.
	30	Sandstone: light grey, very fine grained, poor sorting, subangular, very silty, grading to siltstone, carbonaceous and argillaceous in part, tight, no shows.
1040-1045	60	Shale: as above, very silty.
	40	Siltstone: as above.
1045-1050	80	Shale: as above, very silty, blocky.
	20	Siltstone: as above.
1050-1055	85	Shale: as above, very silty.
	15	Siltstone: as above, thin bedded.
1055-1060	85	Shale: medium grey, blocky, silty, carbonaceous.
	15	Siltstone: medium to light grey, argillaceous, carbonaceous, blocky, grading to silty shale, thin bedded.
1060-1065	90	Shale: as above, becoming micromicaceous in part
	10	Siltstone: as above.
1065-1070	95	Shale: as above, becoming less silty.
	5	Siltstone: as above.
1070-1075	85	Shale: medium to dark grey, micromicaceous in part, flaky to blocky, most silty.
	15	Siltstone: medium grey, argillaceous, sandy, rarely carbonaceous, thin stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1075-1080m	80%	Sandstone: light grey, medium to coarse grained, medium sorting, subangular to angular, white to light grey chert with frosted quartz, clay cement, poor porosity, no shows.
	15	Shale: as above.
	5	Siltstone: as above.
1080-1085	90	Sandstone: medium grey salt and pepper, medium to fine grained, well sorted, subangular, clear to frosted quartz with white, light to dark grey and black chert, clay? cement, poor porosity, unconsolidated in sample, no shows.
	10	Siltstone and Shale: as above, likely cavings.
1085-1090	50	Siltstone: light grey, sandy, clean to rarely argillaceous, carbonaceous in part.
	30	Sandstone: as above, poor porosity, no shows.
	20	shale: medium to dark grey, micromicaceous in part, most silty, blocky, carbonaceous, thin bedded.
1090-1095	40	Sandstone: light grey, very fine grained, medium sorting, subangular, silty, clear quartz with minor dark chert, carbonaceous, clay cement, tight, no shows.
	40	Siltstone: as above, grading to very fine grained sandstone, tight, no shows.
	20	Shale: as above.
1095-1100	60	Siltstone: as above.
	20	Sandstone: as above, tight, no shows.
	20	Shale: as above.
1100-1105	50	Shale: as above.
	35	Siltstone: as above.
	15	Sandstone: as above, minor small chert pebbles, tight, no shows.
1105-1110	70	Shale: medium to dark grey, micromicaceous in part, commonly silty, blocky, carbonaceous in part.
	30	Siltstone: light to medium grey, argillaceous to clean, sandy in part, trace chert pebbles, carbonaceous in part.
1110-1115	80	Shale: as above.
	20	Siltstone: as above, abundant fine to medium grained floating sand grains.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1115-1120	90%	Shale: as above, commonly silty.
	10	Siltstone: as above, most very sandy, thin stringers.
1120-1125	85	Shale: dark grey, micromicaceous, trace Inoceramus prisms.
	10	Siltstone: medium grey, argillaceous, sandy, carbonaceous in part, thin stringers.
	5	Cavings: fine grained sand, coal.
1125-1130	70	Shale: as above.
	20	Siltstone: as above.
	10	Sandstone: light grey, very fine grained, medium sorted, subangular, silty, carbonaceous, grading to argillaceous siltstone, clay cement, tight, no shows, thin stringers.
1130-1135	60	Shale: as above.
	30	Siltstone: as above, very carbonaceous.
	10	Sandstone: as above, becoming fine grained, tight, no shows, thin stringers.
	tr	Coal: thin argillaceous stringers.
1135-1140	50	Siltstone: as above.
	35	Shale: as above, very silty.
	15	Sandstone: as above, tight, no shows, thin stringers.
1140-1145	60	Siltstone: medium grey, argillaceous, sandy, carbonaceous.
	40	Shale: dark grey to black, micromicaceous, carbonaceous, rarely silty.
1145-1150	70	Shale: as above.
	15	Sandstone: light grey, very fine to fine grained, medium sorting, subangular, silty, grading to sandy siltstone, clay cement, tight, no shows, thin stringers.
	15	Siltstone: as above, thin stringers.
1150-1155	[illegible]	Shale: as above.
	20	Sandstone: as above, tight, no shows, thin stringers.
	10	Siltstone: as above.
	5	Coal: thin argillaceous stringers.
1155-1160	70	Shale: as above.
	15	Sandstone: as above, tight, no shows, thin stringers.
	15	Siltstone: as above, thin argillaceous coal stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1160-1165m	60%	Shale: as above, dark colored, carbonaceous stringers.
	20	Sandstone: as above, unconsolidated, tight, no shows, thin stringers or cavings?
	20	Siltstone: as above.
	tr	Coal: as above.
1165-1170	70	Shale: dark grey to black, micromicaceous, sandy to silty, rare pelecypod fragments.
	30	Siltstone: medium to light grey, argillaceous, sandy (up to coarse grained), carbonaceous, thin stringers.
1170-1175	75	Shale: as above.
	25	Siltstone: as above, very sandy.
1175-1180	75	Shale: as above.
	20	Siltstone: as above, very sandy.
	5	Coal: thin stringers or cavings?
1180-1185	70	Shale: dark grey to black, micromicaceous, flaky.
	30	Siltstone: medium grey, argillaceous, sandy (up to coarse grained sand), rare embedded small chert pebbles, carbonaceous in part, thin bedded.
1185-1190	80	Shale: as above.
	20	Siltstone: as above, common coarse grained sand, coal stringers, may be cavings in part.
1190-1195	80	Shale: as above, rare pelecypod fragments.
	10	Sandstone: medium to light grey, very fine grained, subangular, poor sorting, silty, clear quartz with trace glauconite and carbonaceous flakes, silica and clay cement, tight, no shows, thin stringers.
	10	Siltstone: as above.
1195-1200	75	Shale: as above.
	15	Siltstone: as above.
	5	Sandstone: as above, thin stringers.
	5	Coal: thin argillaceous stringers or cavings?
1200-1205	80	Shale: as above, most black.
	15	Siltstone: as above.
	5	Sandstone: as above, tight, no shows, thin stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1205-1210m	75%	Shale: as above, trace pelecypod fragments.
	20	Siltstone: as above.
	5	Sandstone: as above, tight, no shows, thin stringers.
1210-1215	85	Shale: dark grey to black, micromicaceous, flaky, rarely silty, carbonaceous.
	15	Siltstone: medium to light grey, sandy, argillaceous, carbonaceous in part, grading in part to very fine grained sandstone, tight, no shows, thin stringers.
1215-1220	85	Shale: as above.
	10	Siltstone: as above.
	5	Sandstone: light grey, very fine to medium grained, subangular, poor sorting, frosted quartz with minor dark chert, silica and clay cement, tight, no shows, thin stringers in shale.
1220-1225	85	Shale: as above.
	10	Siltstone: as above.
	5	Sandstone: as above, tight, no shows, thin stringers.
1225-1230	80	Shale: as above.
	15	Sandstone: as above, unconsolidated in sample tight, no shows, thin stringers in shale or cavings?
	5	Siltstone: as above.
1230-1235	80	Shale: dark grey to black, micromicaceous, most flaky, some silty.
	10	Sandstone: medium to light grey, very fine to fine grained, poor sorting, subangular, frosted quartz with dark chert, silica and clay cement, tight, no shows, thin stringers.
	10	Siltstone: medium grey, argillaceous, sandy, carbonaceous in part, thin stringers.
1235-1240	85	Shale: as above.
	10	Siltstone: as above.
	5	Sandstone: as above, trace glauconite, tight, no shows, thin stringers.
1240-1245	85	Shale: as above, some light grey, waxy, bentonitic, may be cavings in part.
	10	Siltstone: as above.
	5	Sandstone: as above, tight, no shows, thin stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1245-1250m	80%	Shale: dark grey to black, micromicaceous, most flaky, some blocky and silty.
	10	Sandstone: light to medium grey, very fine to fine grained, poor sorting, subangular, trace glauconite, argillaceous to silty, tight, no shows, thin stringers in shale.
	10	Siltstone: medium to light grey, argillaceous, sandy, thin stringers.
1250-1255	85	Shale: as above.
	15	Siltstone: as above, grading to very fine tight sand.
1255-1260	80	Shale: as above, trace sideritic nodules.
	10	Sandstone: as above, tight, no shows, thin stringers.
	10	Siltstone: as above.
1260-1265	75	Shale: dark grey to black, micromicaceous in part, some sandy to silty.
	15	Siltstone: medium to dark grey, argillaceous,sandy, carbonaceous in part, thin stringers.
	10	Sandstone: medium to light grey, very fine to fine grained, poor sorting, subangular, silty, argillaceous, carbonaceous, trace glauconitic, tight, no shows, thin stringers or cavings.
1265-1270	70	Shale: as above.
	20	Siltstone: as above, very argillaceous.
	10	Sandstone: as above, tight, no shows, thin stringers.
1270-1275	75	Shale: as above.
	15	Sandstone: as above, tight, no shows, thin stringers or cavings.
	10	Siltstone: as above.
1275-1280	80	Shale: dark grey to black, micromicaceous in part, flaky to blocky, some silty.
	20	Siltstone: medium to light grey, sandy, argillaceous, carbonaceous, thin stringers.
1280-1285	85	Shale: as above.
	15	Siltstone: as above, very sandy with fine grained quartz/chert sand.
1285-1290	85	Shale: as above.
	15	Siltstone: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1290-1295	90%	Shale: as above, common pyrite.
	10	Siltstone: as above.
1295-1300	90	Shale: dark grey to black, micromicaceous, flaky to blocky, some silty.
	10	Siltstone: medium grey, sandy, argillaceous, carbonaceous stringers, thin interbeds in shale.
1300-1305	90	Shale: as above, some carbonaceous.
	10	Siltstone: as above, rare thin lenses of coal.
1305-1310	85	Shale: as above.
	15	Siltstone: as above.
1310-1315	85	Shale: dark grey to black, micromicaceous, flaky to blocky, some silty, some brown sideritic nodules.
	15	siltstone: light to medium grey, sandy, argillaceous, carbonaceous, thin stringers.
1315-1320	90	Shale: as above, carbonaceous in part.
	10	Siltstone: as above, rare thin coal stringers.
1320-1325	90	Shale: as above, minor brown sideritic nodules.
	10	Siltstone: as above, rare thin coal stringers.
1325-1330	80	Shale: dark grey to black, micromicaceous, flaky to blocky, some silty, carbonaceous in part.
	20	Siltstone: medium to light grey, argillaceous, sandy, carbonaceous, rare floating small chert pebbles, trace thin coal stringers.
1330-1335	85	Shale: as above.
	15	Siltstone: as above, thin sandy stringers.
1335-1340	90	Shale: as above, becoming more fissile, scattered tan sideritic nodules.
	10	Siltstone: as above.

SLATER RIVER BITUMINOUS SHALE 1343m

1340-1345	50	Shale: black, micromicaceous, fissile.
	40	Shale: dark grey type as above, common tan siderite nodules.
	10	Siltstone: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1345-1350m	90%	Shale: black, micromicaceous, fissile, very flaky.
	10	Cavings: dark grey siltyshale, coal, grey siltstone, light grey waxy bentonite, etc.
1350-1355	95	Shale: as above.
	5	Cavings: as above.
1355-1360	95	Shale: as above.
	5	Cavings: as above.
1360-1365	95	Shale: as above.
	5	Cavings: as above.
1365-1370	95	Shale: black, micromicaceous, flaky, trace fish remains.
	5	Cavings: light grey sandstone and siltstone, grey silty shale, coal, etc.
1370-1375	98	Shale: as above, trace dark to light grey-brown calcareous nodules, rare black bituminous stringers.
	2	Cavings: as above.
1375-1380	98	Shale: as above, rare calcareous nodules as above, some becoming slightly calcareous.
	2	Cavings: as above.
1380-1385	98	Shale: black, micromicaceous, flaky, slightly calcareous, a few medium to dark grey-brown calcareous stringers or nodules.
	2	Cavings: light grey sandstone and siltstone, bentonitic shale, grey silty shale, etc.
1385-1390	99	Shale: as above, distinctly calcareous, rare fish remains, slightly bituminous in part.
	1	Cavings: as above.
1390-1395	98	Shale: as above.
	2	Cavings: as above.
1395-1400	98	Shale: black, micromicaceous, flaky, slightly calcareous, trace fish remains, pelecypod fragments.
	2	Cavings: light grey bentonitic shale, grey silty shale, light grey siltstone.
1400-1405	100	Shale: as above, trace pyrite.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1405-1410m	98%	Shale: as above, very slightly calcareous.
	2	Cavings: as above.
1410-1415	98	Shale: as above.
	2	Cavings: as above.
1415-1420	98	Shale: dark grey to black, micromicaceous, flaky, non-calcareous.
	2	Cavings: light grey siltstone, coal, waxy bentonitic shale.
1420-1425	96	Shale: as above.
	4	Cavings: as above, most light grey siltstone.
1425-1430	98	Shale: as above.
	2	Cavings: as above.
1430-1435	98	Shale: black to dark grey-brown, micromicaceous, flaky.
	2	Cavings: light grey siltstone and sandstone, light grey waxy bentonitic shale.

"SANS SAULT" SILTY SHALES 1437m

1435-1440	75	Shale: as above, and some dark grey, blocky, carbonaceous.
	15	Siltstone: light to medium grey, sandy, clean to argillaceous, carbonaceous, thin hard stringers.
	10	Sandstone: light grey, very fine grained, subangular, poor sorting, silty, carbonaceous, siliceous, tight, no shows.
1440-1445	90	Shale: as above, most black, 5% is waxy, bentonitic, possible cavings.
	10	Siltstone: as above.
1445-1450	90	Shale: as aove, abundant Inoceramus fragments.
	10	Siltstone: as above.
1450-1455	90	Shale: black to dark grey, micromicaceous, most flaky, common Inoceramus fragments.
	10	Siltstone: light grey, sandy, argillaceous in part, calcareous in part, thin stringers.
1455-1460	95	Shale: as above, Inoceramus fragments.
	5	Siltstone: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1460-1465m	95%	Shale: as above.
	5	Siltstone: as above, thin stringers.
1465-1470	90	Shale: black to dark grey, micromicaceous, flaky, common pelecypod fragments, rarely light grey, waxy, bentonitic.
	10	Siltstone: medium grey-brown, argillaceous to clean, slightly calcareous, sandy with fine grained quartz/ chert sand, thin stringers.
		DETRITAL SHALE ZONE 1472m
1470-1475	85	Shale: as above, some light grey to blue-grey, waxy, bentonitic.
	10	Siltstone: as above, thin stringers.
	5	Coal: argillaceous, one thin bed.
1475-1480	80	Shale: as above.
	15	Siltstone: as above, grading in part to very fine grained sandstone, tight, no shows, thin stringers.
	5	Shale: tan, light grey to blue-grey, waxy, micaceous, rare sideritic or siliceous? pellets.
1480-1485	70	Shale: black type as above, tan sideritic nodules.
	15	Siltstone: as above.
	15	Shale: light grey to blue-grey, red to grey-green mottled, waxy, bentonitic? in part, common brown sideritic or siliceous spherules.
1485-1490	60	Shale: dark grey to black, micromicaceous, flaky, some silty, trace glauconitic.
	30	Shale: light green and red mottled, tan, grey-green, waxy, soft, common silicified Chara? or siliceous or sideritic pellets embedded.
	10	Siltstone: light to medium grey-brown, argillaceous, micaceous.
1490-1495	65	Shale: dark grey type as above, trace Inoceramus.
	20	Shale: varicolored type as abcve.
	15	Siltstone: as above.
1495-1500	40	Shale: dark grey type as above, cavings in part?
	35	Shale: colored type as above, rare siliceous spherules.
	25	Siltstone: light to medium grey-brown, light grey-green, micaceous, argillaceousl, slightly calcareous in part.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1500-1505m	60%	Shale: black to dark grey, micromicaceous, flaky, cavings? in part, trace pelecypod fragments.
	30	Shale: green with red mottling, tan, light grey-green, waxy, micaceous, rare tan spherules.
	10	Siltstone: as above, some very sandy.
1505-1510	50	Shale: black type as above.
	35	Shale: varicolored type as above, trace sideritic or siliceous spherules.
	15	Siltstone: as above, very sandy in part.
1510-1515	70	Shale: black type as above.
	20	Shale: varicolored type as above.
	10	Siltstone: as above, thin stringers, grading to very fine to medium grained poorly sorted sandstone, tight, no shows.

CLEAN IMPERIAL SHALE 1517m

1515-1520	50	Shale: light to dark grey, black, micromicaceous, flaky.
	35	Shale: red to grey-green mottled, tan to grey-brown, waxy, thin bedded.
	15	Siltstone: light to dark grey or grey-brown, sandy, argillaceous in part, calcareous, grading to poorly sorted very fine to medium grained sandstone, tight, no shows, thin stringers.
1520-1525	70	Shale: light to medium grey, micromicaceous, silty in part, most slightly calcareous.
	15	Shale: varicolored type as above, cavings?
	15	siltstone: as above.
1525-1530	80	Shale: light to medium grey type as above.
	10	Siltstone: as above.
	10	Shale: varicolored type as above, cavings in part?
1530-1535	90	Shale: medium grey, trace red to green mottled, colored types likely cavings, micromicaceous, slightly calcareous.
	10	Siltstone: medium to light grey, micaceous, argillaceous, calcareous, thin stringers.
1535-1540	90	Shale: as above, slightly calcareous, some silty.
	10	Siltstone: as above, thin stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1540-1545m	90%	Shale: as above, most medium grey.
	10	Siltstone: as above.
1545-1550	90	Shale: medium grey, micromicaceous, flaky, soft, rarely slightly calcareous, most non-calcareous, common pelecypod fragments, trace red to green waxy shale, likely cavings.
	10	Siltstone: medium to light grey, argillaceous, slightly calcareous, plant remains, thin stringers.
1550-1555	90	Shale: as above, most becoming slightly calcareous and medium grey-green, minor varicolored shales are likely cavings.
	10	Siltstone: as above, thin stringers.
1555-1560	95	Shale: as above, most becoming slightly calcareous and grey-green in color.
	5	Siltstone: as above.
1560-1565	95	Shale: medium grey-green to medium grey, micromicaceous, slightly calcareous, flaky, some silty.
	5	Siltstone: medium grey-green, micaceous, calcareous, argillaceous, sandy in part, thin stringers.
1565-1570	95	Shale: as above, trace pelecypod fragments, possible crinoid? fragments.
	5	Siltstone: as above.
1570-1575	95	Shale: as above.
	5	Siltstone: as above, thin stringers or cavings.
1575-1580	95	Shale: medium grey-green to medium grey, micromicaceous, slightly calcareous, flaky, minor possible plant remains, some slightly silty.
	5	Siltstone: medium grey-green, micaceous, calcareous, argillaceous, thin stringers, some grading to fossiliferous marl with pelecypod and possible crinoid fragments.
1580-1585	95	Shale: as above.
	5	Siltstone: as above.
1585-1590	95	Shale: as above, plant remains, trace tan siderite? nodules.
	5	Siltstone: as above, thin stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1590-1595m	98%	Shale: medium grey-green to medium grey, micromicaceous, flaky, slightly calcareous, rarely silty.
	2	Siltstone: medium grey, argillaceous, calcareous, sandy, thin stringers.
	tr	Marl: buff, calcareous, rare cinoids? and brachiopod? fragments.
1595-1600	98	Shale: as above.
	2	Siltstone: as above.
	tr	Marl: as above.
1600-1605	100	Shale: as above, trace tan sideritic? nodules.
	tr	Siltstone: as above, thin stringers.
	tr	Marl: as above, thin stringers.
1605-1610	98	Shale: medium grey to medium grey-green, micromicaceous, slightly calcareous, rarely silty.
	2	Siltstone: medium grey, sandy, calcareous, argillaceous, thin stringers, some grading to silty marl.
1610-1615	98	Shale: as above, trace tan dolomitic nodules.
	2	Siltstone: as above.
1615-1620	95	Shale: as above.
	5	Siltstone: as above, thin stringers.
1620-1625	98	Shale: medium grey, micromicaceous, fissile, slightly calcareous , rare medium brown sideritic nodules, some silty.
	2	Siltstone: medium grey-brown, argillaceous, calcareous, grading in part to silty marl, thin stringers.
1625-1630	98	Shale: as above, some silty.
	2	Siltstone: as above.
1630-1635	100	Shale: as above, trace sideritic nodules.
	tr	Siltstone: as above.
1635-1640	95	Shale: as above.
	5	Siltstone: as above, thin stringers.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1640-1645m	95%	Shale: medium grey, micromicaceous, slightly calcareous, flaky, rare silty.
	5	Siltstone: medium grey, argillaceous, calcareous, thin stringers.
1645-1650	98	Shale: as above, some silty and slightly calcareous.
	2	Siltstone: as above.
1650-1655	95	Shale: as above.
	5	Siltstone: as above.
1655-1660	98	Shale: as above, rare sideritic nodules.
	2	Siltstone: as above, thin calcareous stringers.
1660-1665	95	Shale: medium to dark grey, micromicaceous, fissile and flaky, some silty and slightly calcareous.
	5	Siltstone: medium grey, argillaceous, calcareous, grading in part to tan silty marl, thin stringers.
1665-1670	Sample missed.	
1670-1675	90	Shale: as above, some very silty.
	10	Siltstone: as above, thin stringers.
1675-1680	95	Shale: as above.
	5	Siltstone: as above, micaceous.
1680-1685	85	Shale: medium grey, micromicaceous, flaky, fissile, some slightly calcareous, rarely silty.
	15	Siltstone: medium grey to medium grey-brown, argillaceous, calcareous, plant remains.
1685-1690	90	Shale: generally as above, becoming silty and micaceous in part.
	10	Siltstone: as above, thin stringers.
1690-1695	65	Shale: as above, most slightly calcareous, very silty.
	35	Siltstone: as above, very argillaceous, plant remains, calcareous.
1695-1700	85	Shale: medium grey, micromicaceous, silty in part, plant remains, calcareous.
	15	Siltstone: medium grey, argillaceous, micaceous, calcareous, plant remains.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1700-1705m	75%	Shale: as above.
	25	Siltstone: as above, very argillaceous.
1705-1710	85	Shale: as above.
	15	Siltstone: as above.
1710-1715	80	Shale: as above.
	20	Siltstone: as above, very argillaceous, thin stringers.
1715-1720	60	Shale: medium grey, micromicaceous, slightly calcareous, silty in part, plant remains.
	40	Siltstone: medium to light grey, argillaceous, micaceous, plant remains, calcareous.
1720-1725	70	Shale: as above.
	30	Siltstone: as above, very argillaceous.
1725-1730	80	Shale: as above.
	20	Siltstone: as above.
1730-1735	80	Shale: as above.
	20	Siltstone: as above, becoming slightly cleaner.
1735-1740	75	Shale: medium grey, micromicaceous, flaky, plant remains, very slightly calcareous, some silty.
	25	Siltstone: light to medium grey-brown to grey-green, clean to argillaceous, calcareous, micaceous.
1740-1745	70	Shale: as above.
	30	Siltstone: as above.
1745-1750	60	Shale: as above, trace thin stringers of pyrobitumen.
	40	Siltstone: as above, tight, poor cut and streaming.
1750-1755	50	Siltstone: as above, most clean, tight, poor cut with streaming.
	50	Shale: as above.
1755-1760	60	Siltstone: light grey-brown, most clean to minor argillaceous, micaceous, calcareous, tight, poor cut with streaming.
	40	Shale: medium to dark grey or grey-green, micromicaceous, flaky to splintery, rarely silty.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1760-1765m	75%	Siltstone: as above, tight, poor cut with streaming.
	25	Shale: as above, cavings in part.
1765-1770	65	Shale: as above.
	35	Siltstone: as above, poor cut with streaming.
1770-1775	75	Shale: as above.
	25	Siltstone: as above, poor cut with streaming.
1775-1780	90	Shale: medium grey to grey-brown, micromicaceous, silty in part.
	10	Siltstone: medium to light grey, slightly calcareous, argillaceous, micaceous, plant remains, thin stringers.
1780-1785	95	Shale: as above.
	5	Siltstone: as above, cavings in part.
1785-1790	98	Shale: as above, becoming darker and generally non-calcareous.
	2	Siltstone: as above, cavings?
1790-1795	98	Shale: medium grey to grey-brown or grey-green, micromicaceous in part, earthy to flaky.
	2	Cavings: light grey siltstone.
1795-1800	100	Shale: as above.
1800-1805	100	Shale: as above.
1805-1810	100	Shale: medium to dark grey, some grey-brown to grey-green, micromicaceous in part, flaky to earthy, trace pyritized spicules.
1810-1815	100	Shale: as above.
1815-1820	100	Shale: generally as above but becoming dark grey-brown, slightly bituminous, slightly calcareous.
1820-1825	100	Shale: dark grey-brown, micromicaceous to earthy, rarely slightly calcareous, rarely bituminous.
1825-1830	100	Shale: dark grey -brown to black, micromicaceous to earthy, rarely slightly calcareous, most appears bituminous, pyritic.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1830-1835m	100%	Shale: most as above buf 35% becoming medium grey, micromicaceous, flaky.
1835-1840	100	Shale: medium to dark grey or grey-green, micro-micaceous, flaky.
1840-1845	100	Shale: as above, trace pyrite.
1845-1850	100	Shale: as above, some beccming dark grey mottled.
1850-1855	95	Shale: as above.
	5	Cavings: light grey siltstone.
		CANOL SHALE 1858m
1855-1860	95	Shale: dark grey -brown to black, micromicaceous to earthy, bituminous, slightly calcareous, trace pyrite.
	5	Cavings: medium grey shale, light grey siltstone, etc.
1860-1865	100	Shale: as above, abundant pyrite.
1865-1870	100	Shale: as above, abundant pyrite, slightly calcareous to fairly calcareous, rare stringers of dark brown marl with calcareous white specks.
1870-1875	70	Shale: as above, becoming very bituminous.
	30	Cavings: light grey shale and siltstone, trip sample.
1875-1880	65	Shale: dark grey-brown to black, earthy to waxy, very bituminous, commonly pyritic, some very siliceous.
	tr	Chert: dark brown to black, silicified shale.
	35	Cavings: as above.
1880-1885	75	Shale: as above, most bituminous, very siliceous.
	10	Chert: as above.
	5	Marl: dark grey-brown, mottled with white specks, calcareous, bituminous, thin stringers.
	10	Cavings: as above.
1885-1890	90	Shale: as above.
	5	Chert: as above.
	5	Marl: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

1890-1895m	90%	Shale: dark brown to black, non-calcareous to very calcareous, very bituminous, siliceous in part, trace pyrite.
	10	Marl: dark brown, calcareous, bituminous, some calcareous white specks, thin stringers.
1895-1900	95	Shale: as above.
	5	Cavings: light grey shale and siltstone.
1900-1905	95	Shale: as above.
	5	Cavings: as above.
1905-1910	100	Shale: dark brown to black, slightly calcareous, siliceous in part, trace pyrite.
1910-1915	95	Shale: as above, trace pyritized bone? fragments, siliceous in part.
	5	Marl: dark brown, calcareous, bituminous, thin stringers.
1915-1920	65	Shale: as above, becoming very calcareous, grading to marl.
	30	Marl: as above.
	5	Cavings: light grey siltstone and shale.
1920-1925	80	Shale: dark brown to black, blocky, most very calcareous, very bituminous, trace pyrite, grading in part to marl, thin stringers of pyrobitumen.
	20	Marl: dark brown, calcareous, bituminous, pyritic, thin bedded.
1925-1930	90	Shale: as above, some slightly siliceous.
	10	Marl: as above, thin stringers.
1930-1935	90	Shale: as above, abundant pyrite.
	10	Marl: as above.
1935-1940	100	Shale: dark brown to black, blocky, calcareous, rarely slightly siliceous, pyritic, a few thin marly stringers.
1940-1945	90	Shale: as above.
	10	Marl: dark brown, calcareous, common calcareous white specks, very bituminous, thin stringers.
1945-1950	95	Shale: as above.
	5	Marl: as above.

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SAMPLE DESCRIPTIONS

1950-1955m	100%	Shale: some dark grey, micromicaceous, flaky, some dark brown to black, blocky, calcareous, pyritic, very bituminous.
1955-1960	100	Shale: as above, mostly bituminous but some non-bituminous.
1960-1965	95	Shale: bituminous to non-bituminous, some becoming waxy, very flaky.
	5	Cavings: light to dark grey shale and siltstone.
1965-1970	70	Shale: dark brown to black, blocky, very calcareous, pyritic, white specks, very bituminous.
	30	Marl: dark brown with white mottling, calcareous, very bituminous, white specks and white elongate hollow microfossils.
1970-1975	75	Shale: as above, very calcareous.
	25	Marl: as above.
1975-1980	80	Shale: as above, abundant white microfossils, very calcareous.
	20	Marl: as above.
1980-1985	90	Shale: as above, very calcareous.
	10	Marl: as above.
		HUME LIMESTONE 1986m
1985-1990	70	Limestone: buff to dark brown mottled, microcrystalline matrix, clean, very fossiliferous with stromatoporoids and crinoid fragments, framework 70%, stylolites, common white coarse crystalline calcite vein fillings, tight, no shows.
	30	Shale: as above, cavings in part.
1990-1995	90	Limestone: generally as above, some microcrystalline, friable, becoming chalky, tight, no shows.
	10	Cavings: brown to grey bituminous or micromicaceous shales.
1995-2000	95	Limestone: generally as above but becoming cryptocrystalline, clean, tight, no shows.
	5	Cavings: as above.

CONOCO ET AL NORTH LITTLE BEAR L-21

SAMPLE DESCRIPTIONS

2000-2005m	95%	Limestone: buff to dark brown mottled, cryptocrystalline to microcrystalline, clean, some stromatoporoids and crinoids, framework 40%, stylolites, tight, no shows.
	5	Cavings: brown to black shales.
2005-2010	50	Limestone: as above, tight, no shows.
	50	Cavings: as above.
2010-2015	90	Limestone: as above, framework 50%, calcite vein fillings, tight, no shows.
	10	Cavings: as above.
2015-2020	95	Limestone: buff to dark brown mottled, cryptocrystalline to microcrystalline matrix, clean, bioclastic with stromatoporoids and crinoids, framework 40%, stylolites, white calcite vein fillings, tight, no shows.
	5	Cavings: grey shale and siltstone, brown to black bituminous shale.
2020-2025	Sample missed.	
2025-2030	98	Limestone: as above, trace pyrobitumen, tight, no shows.
	2	Cavings: as above.

TOTAL DEPTH 2030m (HUME) 07:55 hrs. 10 March. 1988

Canada Oil and Gas Lands Administration | Administration du pétrole et du gaz des terres du Canada

D.A. 1379

				Well Status	
Nova Scotia	☐	West Coast	☐	Suspended	☐
Newfoundland	☐	Northern	☒	Completed	☐
Gulf of St. Lawrence	☐	Hudson Bay	☐	Abandoned	☒

WELL TERMINATION RECORD

This record is submitted in triplicate in compliance with Section 184 of the Canada Oil and Gas Drilling Regulations.

WELL DATA

Well Name: Conoco et al North Little Bear L-21 Area: Fort Norman

Grid Area: 64-50-125-45 Field/Pool: Wildcat

Permit or Lease No.: EL 319 Final Coordinates: Lat.: North 64°40'39.499 Long: West 125°50'25.234

Drilling Unit: Atco/Equatak 76 Elevations-RT/KB: 240.8m SF/GL: 234.2

Spud Date: 88-02-24 Rig Released: 88-03-13 Total Depth: 2030 mKB

CASING AND CEMENTING

O.D.:	Weight:	Grade:	Depth Set:	Cement and Additives:
508 mm	139.9kg/m	H-40	19m	Driven
244.5mm	53.6kg/m	K-55	553m	15.5 tonnes permafrost 18.1 tonnes 0:1:0 cla.. G + 2% CaCl2

PLUGGING PROGRAM

Approval of the following program was obtained by (person) Gary Lushington from (person) Kem Singh of the Canada Oil and Gas Lands Administration by means of verbal approval on March 12 19 88.

Type of Plug:	Interval:	Felt:	Cement and Additives:
#1	2030 - 1930 m	no	7 tonnes class G
#2	720 - 630 m	9000 daN	13 tonnes class G
#3	580 - 520 m	9000 daN	7.8 tonnes class G
#4	surface	no	1.2 tonnes class G

Lost Circulation/Overpressure Zones: None

Equipment left on Seafloor (Describe): None

Provision for Re-entry (Describe and attach sketch): None

Cores: Type: None Intervals:

Other Downhole Completion/Suspension Equipment: None

CERTIFICATION

I certify on the basis of personal knowledge of operations undertaken at the above named well that the above information is accurate.

Signed: J.C. Schneider P. Eng.

Name: John Schneider

Title: Sr. Production Engineer

Date: 88-3-17

Acknowledged by: Engineering Branch

Date: 88-04-05

File: 9211-C90-1-2

Department of Energy, Mines and Resources | Ministère de l'Énergie, des Mines et des Ressources

Department of Indian Affairs and Northern Development | Ministère des Affaires indiennes et du Nord canadien

Canada