

GEOLOGICAL, DRILLING AND COMPLETION REPORT

ON

CANADA SOUTHERN CARNWATH RIVER #1

Located in the Northwest Territories

Co-ordinates:  $67^{\circ} 44' 40''$  North,  $128^{\circ} 47' 53''$  West.

PERMIT #2267 - Northwest Territories

FROM

11 March 1961 to 8 April, 1961

Wellsite Geologist: P. Antonenko

Drilling Supervisor: A. Moi.

Report Compiled By: P. Antonenko

Certified by:

M. A. Reasoner

M. A. Reasoner

Vice President & General Manager.

This report is submitted in compliance with  
the Department of Northern Affairs regulations.

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Plat of Well Location (see attached pocket)

LOGS ACCOMPANYING THIS REPORT (See attached pocket)

1. Sample Log.

GEOLOGICAL REPORTA. PERTINENT DATA

Operator: Canada Southern Petroleum Ltd.  
Well: Canada Southern Carnwath River #1  
Location: Co-ordinates:  $67^{\circ} 44' 40''$  North Latitude  
 $128^{\circ} 47' 53''$  West Longitude  
Elevation: Ground (estimated) 600'  
K. B. (estimated) 608'  
  
Permit No. 2267 Northwest Territories  
Contractor: Tri-City Drilling  
Spudded: 2:45 p.m. March 11, 1961  
Completed Drilling: April 7, 1961  
Total Depth: 2308'  
Surface Casing: 175.20' of 9-5/8", 36# Range 2 casing  
with 108 sacks of Halliburton cement,  
plus 4%  $\text{CaCl}_2$   
Abandonment Plugs: Plug #1 2000-2308' with 60 sacks cement  
Plug #2 1000-1200' with 40 sacks cement  
Plug #3 930-830' with 20 sacks cement  
Plug #4 400-125' with 55 sacks cement  
  
Rig Released: 1 p.m. April 8, 1961  
  
Status: Dry and Abandoned

B. SUB-SURFACE DATA

<u>Formation</u>	<u>Sample Depth</u>	<u>E-Log Depth</u>	<u>Sub-Sea</u>
Glacial Drift	Surface		
Mid Ramparts Shale	28'		
Lower Ramparts	126'		
Bear Rock	335'		
Siluro-Ordovician	1154'		
TOTAL DEPTH:	2308'		
ELEVATION:	Ground (est.) 600'		
	K. B. (est.) 608'		

C. LOGGING DATA

Electrical Logs were not run.

D. SUMMARY OF DRILLSTEM TESTS (Open Hole)

<u>No.</u>	<u>Interval</u>	<u>Formation</u>	<u>Results</u>
1	865 - 890'	Bear Rock	V.O. 45 minutes. Good initial puff, Strong air blow, decreasing slowly becoming weak in 1/2 hour, dead in 40 minutes. Shut In 30 minutes and 30 minutes. Recovered 610' muddy sulphurous fresh water. HP 410 - 400; FP 110 - 260; SIP 270 - 270.
2	1168 - 1193	Siluro-Ordovician	V. O. 60 minutes, Fair initial puff, weak to moderate air blow, decreasing slightly to end of test. Shut In 30 minutes and 30 minutes. Recovered 550'; 520' sulphurous fresh water 30' mud HP 555 - 555; FP 45 - 235; SIP 390 - 390.
3	2045 - 2070	Siluro-Ordovician	V. O. 60 minutes. Weak initial puff, weak air blow throughout test. Recovered 200' fresh sulphurous water cut mud. HP 1025 - 1025; FP 35 - 120; SIP 780-780.

E. SAMPLE DESCRIPTIONS - by P. Antonenko

<u>From</u>	<u>To</u>	<u>Description</u>
0	10'	Glacial drift; sand, fine medium grained quartzose, varicolored, rounded quartz and shale grains, some greenish grey waxy shale, calcareous and dark grey argillaceous limestone grains - intermixed with clay.
10'	20'	As above
20'	30'	As above - some greenish grey waxy calcareous shale and argillaceous limestone grains.
<u>TOP MIDDLE RAMPARTS SHALE (HARE INDIAN SHALE) 28'</u>		
30'	40'	Shale; Grey to olive green, occasionally maroon, calcareous in part, silty, interbedded lenses of buff to grey limestone, in part micaceous, occasional black spores, some round quartz grains (from above)
40'	50'	Shale; grey to green grey, occasionally maroon, silty, calcareous, in part micaceous, interbedded with limestone, grey to dark green to buff, in part argillaceous, in part finely crystalline - some black spores, occasionally brown weathered.
50'	60'	Shale and Limestone; as above, black spores in fair abundance.
60'	70'	As above; trace pyrite, some white mottling
70'	80'	Shale; grey to greenish grey to slightly maroon, calcareous in part, slightly silty, trace pyrite, some black spores, in part micaceous, some lenses of grey to brown, fine crystalline, argillaceous limestone.
80'	90'	As above; also some dark grey to dark brown shale, some pyrite, black spores in fair abundance.
90'	100'	As above; pyritic, trace fossils in shale becoming slightly darker.
100'	110'	Shale; As above, some cavings (poor sample) trace fossils.
110'	120'	As above; darker brownish shales increasing.
120'	130'	Limestone; grey, in part light brown, fine-micro-crystalline, dense, argillaceous fossils in parts, some micro fossils, brackish and coral fragments.
<u>TOP LOWER RAMPARTS LIMESTONE: 126'</u>		
130'	140'	As above, trace pyrite, calcite crystals, trace spores, some grey micaceous, slightly calcareous shale.
140'	150'	As above, some fossil fragments trace spores, interbedded with grey very slightly calcareous shale.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
150'	160'	<u>Limestone</u> ; as above, interbedded with 50% grey silty very slightly calcareous shale, some fossil fragments (brachiopods) some pyrite.
160'	170'	As above
170'	180'	As above
180'	190'	<u>Shale</u> ; grey, slightly calcareous, hackly, micro-micaceous, some interbedded limestone, argillaceous, grey, trace fossils, dense, micro-crystalline.
190'	200'	<u>Shale</u> ; as above, interbedded with light brown fine crystalline limestone, trace fossils, dense, argillaceous, 70% shale, 30% limestone.
200'	210'	<u>Limestone</u> and <u>Shale</u> ; as above 50-50
210'	220'	<u>Limestone</u> ; light brown, fine micro-crystalline, argillaceous in part, dense, occasional fossil fragments, occasional calcite crystals, interbedded with grey, slightly silty, micro-micaceous shale, occasional quartz crystals (some contamination from shoe)
220'	230'	<u>Limestone</u> ; as above, trace fossil fragments, trace pyrite, 15% shale as above.
230'	240'	<u>Limestone</u> ; as above, up to 25% shale as above
240'	250'	As above
250'	260'	<u>Limestone</u> ; light brown to buff, fine to micro-crystalline, in part argillaceous, dense, occasional fossil fragments, dense, interbedded with grey to greenish grey micro-micaceous, slightly calcareous shale, trace pyrite, Shale 20-30%.
260'	270'	As above - Shale 30-40%
270'	280'	As above.
280'	290'	<u>Limestone</u> ; light brown to buff, fine micro-crystalline, argillaceous in part, trace fossils, occasional calcite crystals no visible porosity, interbedded with grey to slightly greenish grey in part, micro-micaceous, slightly calcareous shale - 20%.
290'	300'	As above, in part pyritic.
300'	310'	As above, Shale about 50%
310'	320'	As above, Shale 30-40% slightly pyritic, trace fossil fragments.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
320'	330'	As above
330'	340'	<u>Limestone</u> ; brown to light brown, fine, crypto-crystalline, in part argillaceous, flaky cleavage, dense, minor amounts of shale as above.
340'	350'	As above; 10% grey shale
		<u>TOP BEAR ROCK: 335'</u>
350'	360'	<u>Limestone</u> ; brown to light brown, very fine crystalline, slightly argillaceous, no visible porosity, part dolomitic, minor grey shale, rare trace fossil fragments, occasional calcite crystals, trace pyrite.
360'	370'	As above
370'	380'	<u>Limestone</u> ; light brown to brown to some dark brown, fine crystalline, argillaceous in part, no visible porosity, some grey shale as above, also some dark brown to black slightly calcareous shale, trace pyrite, rare trace fossil fragments, occasional calcite crystals.
380'	390'	As above
390'	400'	<u>Limestone</u> ; as above, very minor amounts grey shale.
400'	410'	As above; occasional calcite crystals, no visible porosity.
410'	420'	As above.
420'	430'	As above.
430'	440'	<u>Limestone</u> ; light brown to buff, fine to micro-crystalline, dense, in part argillaceous, in part dolomitic, trace pyrite, minor grey shale.
440'	450'	<u>Limestone</u> ; as above, light brown to brown, trace stylolite.
450'	460'	As above - trace grey shale.
460'	470'	As above, some grey to dark grey waxy shale partings.
470'	480'	<u>Limestone</u> ; light brown to brown, fine to micro-crystalline, argillaceous in part, dense, appears to be non fossiliferous as above, in part dolomitic, some minor grey shale partings.
480'	490'	As above.

E. Sample Descriptions - By P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
490'	500'	As above, mainly light brown to buff.
500	510'	As above
510'	520'	As above
520'	530'	As above, trace greenish grey shale.
530'	540'	As above
540'	550'	As above, trace pellets.
550'	560'	<u>Limestone</u> : as above, in part crypto-crystalline, in part dolomitic, trace of grey shale.
560'	570'	As above, some greenish grey shale partings
570'	580'	As above
580'	590'	As above
590'	600'	As above, trace pyrite.
600'	610'	As above, minor grey-green to dark grey, slightly calcareous shale.
610'	620'	As above
620'	630'	As above
630'	640'	As above (Lost circulation at 635' for 12 hours).
640'	650'	<u>Limestone</u> : brown to grey brown, fine micro-crystalline, in part dolomitic, argillaceous, dense, some dark grey argillaceous partings, non fossiliferous trace grey shale (poor sample - lost circulation material).
650'	660'	As above, in part crypto-crystalline.
660'	670'	As above, some florescence, but assume contamination from surface.
670'	680'	<u>Limestone</u> ; as above, dense argillaceous (some rough drilling indicating broken formation)
680'	690'	As above, occasional stylolite.
690'	700'	<u>Limestone</u> ; as above, dense, trace grey green waxy shale.
700'	710'	As above
710'	720'	As above, trace pyritic grey green shale.

## E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
720'	730'	<u>Limestone</u> : as above, trace calcite crystals (calcite lined fracture)
730'	740'	<u>Limestone</u> : as above, some green grey shale partings, also traces of dark grey to grey micaceous shale.
740'	750'	<u>Limestone</u> : brown to grey, fine micro crypto-crystalline argillaceous in parts, dense, in part dolomitic, trace pyrite and occasional dark grey to black shale partings (stylolite?)
750'	760'	As above
760'	770'	As above, trace grey green shale.
770'	780'	As above, trace brown granular dolomite, some calcareous black shale (stylolites?) partings, also some greenish grey shale.
780'	790'	<u>Limestone</u> : as above
790'	800'	<u>Limestone</u> : light brown to grey, fine micro-crystalline, in part argillaceous, dense, in part dolomitic, some argillaceous partings.
800'	810'	<u>Limestone</u> : as above, more argillaceous, some green grey shale partings
810'	820'	As above
820'	830'	As above
830'	840'	As above, in part crypto-crystalline.
840'	850'	As above, some light brown granular dolomite.
850'	860'	As above.
860'	870'	<u>Limestone</u> : as above, dense.
870'	880'	<u>Dolomite</u> : grey to light brown, fine crystalline in part, dense, also light brown, granular dolomite with poor to fair inter granular porosity in parts. (Drilling break at 880-885 from 12-4 minutes per foot.)
885' (Circ. Sample)		<u>Dolomite</u> : light brown fine crystalline, some fair to poor, inter-crystalline and micro vuggy porosity, some dense.
885'	890'	<u>Dolomite</u> : as above, some pyrobitumen, occasional vugular and some poor porosity, inter-crystalline and micro vugular.

## E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
890'	900'	<u>Limestone</u> : light brown, fine micro-crystalline, dense, trace grey granular shale partings, in part dolomitic, interbedded with some dolomite as above.
900'	910'	As above, pyritic in part.
910'	920'	As above.
920'	930'	<u>Mainly Limestone</u> : as above.
930'	940'	<u>Limestone</u> : light brown to buff, fine micro-crystalline, dense, occasional trace of pin-point porosity, some pyrobitumen, some green grey shale partings, some trace granular dolomite.
940'	950'	<u>Limestone</u> : light brown to buff, very fine crystalline, rare trace porosity and pyrobitumen, trace shale, grey green, slightly calcareous.
950'	960'	<u>Limestone</u> : light brown to grey, fine micro-crystalline, dense, argillaceous in part, trace pyrite, trace greenish calcareous shale partings.
960'	970'	<u>Limestone</u> : as above, also abundant calcareous pellets or pebbly material imbedded in greenish grey calcareous shale matrix.
970'	980'	<u>Limestone</u> : as above, trace pellets as above.
980'	990'	<u>Limestone</u> : as above, somewhat chalky, some greenish grey calcareous shale, with calcareous pebbly material imbedded.
990'	1000'	<u>Limestone</u> : light brown to buff, fine micro-crystalline, appears chalky in part, dense, trace stylolite, trace grey green calcareous shale.
1000'	1010'	As above.
1010'	1020'	As above.
1020'	1030'	<u>Limestone</u> : light brown to light grey, fine crystalline, dense, trace pyrobitumen.
1030'	1040'	As above, in part chalky, trace calcite crystals, minor grey green calcite shale partings.
1040'	1050'	As above, Limestone.
1050'	1060'	<u>Dolomite</u> : grey brown, fine to medium crystalline, some scattered poor pin point porosity, some pyrobitumen, some limestone as above.
1060'	1070'	<u>Limestone</u> : grey brown, dolomitic, fine medium crystalline, dense, trace poor pin point porosity.

## E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1070'	1080'	<u>Dolomite and Limestone</u> : light brown fine micro-crystalline, dense, rare trace pin point porosity, trace calcareous grey green shale, trace calcite filled fractures.
1080'	1090'	<u>Limestone</u> : light brown and dolomitic as above, rare traces of poor pin point porosity, traces of grey green calcareous shale, some light granular dolomite.
1090'	1100'	<u>Limestone</u> : grey brown, fine micro-crystalline, argillaceous, dense, trace bituminous material.
1100'	1110'	As above.
1110'	1120'	<u>Limestone</u> : grey brown, fine crystalline, in part dolomitic, argillaceous in part dense.
1120'	1130'	As above.
1130'	1140'	As above, in part micro-crystalline.
1140'	1150'	<u>Limestone</u> : as above, trace coarsely crystalline dolomite, light brown, some fractures.
<u>SILURO-ORDOVICIAN: 1154'</u>		
1150'	1160'	<u>Dolomite</u> : grey to dark grey in part, finely crystalline, rare trace pin point poor porosity, some idiomorphic dolomite crystals infilled vugs or fractures, argillaceous.
1160'	1170'	<u>Dolomite</u> : grey brown, in part light brown, fine crystalline, in part micro-granular, slightly argillaceous, scattered poor pin point inter-crystalline and micro vugular porosity, traces fair porosity, some dolomite crystals as above.
1170'	1180'	<u>Dolomite</u> : light grey to buff, fine crystalline to micro granular, scattered poor pin point porosity, trace fair inter-crystalline porosity.
1180'	1190'	<u>Dolomite</u> : grey brown, argillaceous, slightly silty, micro-granular, some calcite lines fractures, occasional scattered poor pin point porosity.
1190'	1200'	<u>Dolomite</u> : light grey to off white, finely crystalline to micro granular, occasional calcite crystals, scattered inter-crystalline and micro vugular porosity, poor, traces fair.
1200'	1210'	<u>Dolomite</u> : medium grey to grey brown, fine crystalline to micro granular, argillaceous trace poor pin point porosity, trace white dolomite as above.
1210'	1220'	<u>Dolomite</u> : light brown to grey - otherwise as above.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1220'	1230'	<u>Dolomite</u> : light brown to buff, fine crystalline, trace poor micro-vuggy porosity, some calcite lining, trace disseminated pyrite.
1230'	1240'	<u>Dolomite</u> : grey to dark grey, fine crystalline to micro-granular, argillaceous, some calcite lined fractures, trace calcite veining, slightly limey in part, dense.
1240'	1250'	<u>Dolomite</u> : grey to brown, fine to medium crystalline, some scattered poor micro-vugular porosity, some calcite inclusions, slightly argillaceous, some micro-granular dolomite.
1250'	1260'	<u>Dolomite</u> : grey brown, mottled, coarsely crystalline, calcitic in part, scattered poor inter-crystalline porosity, trace fair porosity, also limestone as above.
1260'	1270'	As above, fine to coarsely crystalline, traces of fair inter-crystalline porosity.
1270'	1280'	<u>Dolomite</u> : grey brown to medium grey, finely crystalline to medium crystalline, scattered poor to fair inter-crystalline porosity, some calcite crystals (Red stain due to overheating sample), slightly silty, very slightly argillaceous.
1280'	1290'	<u>Dolomite</u> : as above, occasional poor inter-crystalline porosity
1290'	1300'	As above.
1300'	1310'	<u>Dolomite</u> : grey to grey brown, fine to medium crystalline, slightly argillaceous, some calcite lined fractures, occasional calcite crystals, rare trace poor inter-crystalline porosity.
1310'	1320'	As above.
1320'	1330'	As above, scattered poor porosity.
1330'	1340'	<u>Dolomite</u> : as above, finely crystalline, mainly dense.
1340'	1350'	As above, trace calcite vugs.
1350'	1360'	<u>Dolomite</u> : light brown to grey, finely crystalline, in part micro granular, traces of inter-crystalline porosity, some calcite lined vugs.
1360'	1370'	As above, poor to fair inter-crystalline porosity, mostly medium grey.
1370'	1380'	As above - mainly dense.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1380'	1390'	As above, in part sucrose, abundant calcite crystals, occasional poor inter-crystalline porosity, argillaceous in part.
1390'	1400'	As above, calcite filled vugs and fractures.
1400'	1410'	As above, mainly dense.
1410'	1420'	<u>Dolomite</u> : light brown to buff, fine to micro-crystalline, traces poor inter-crystalline porosity, occasional micro vugular scattered calcite crystals.
1420'	1430'	As above: in part medium grey, fine to medium crystalline, scattered poor porosity.
1430'	1440'	As above, trace poor porosity.
1440'	1450'	<u>Dolomite</u> : light grey to buff, finely crystalline, trace poor inter-crystalline porosity, minor medium grey, slightly argillaceous, medium crystalline dolomite.
1450'	1460'	As above, becoming darker.
1460'	1470'	<u>Dolomite</u> : medium grey, in part dark grey, medium crystalline, slightly argillaceous, trace poor inter-crystalline porosity, occasionally micro-vugular, trace calcite crystals.
1470'	1480'	As above.
1480'	1490'	<u>Dolomite</u> : grey-brown, finely crystalline, calcite veining and calcite infilled vugs, trace porosity.
1490'	1500'	<u>Dolomite</u> : grey to light brown, finely crystalline, trace calcite, trace micro-vugs.
1500'	1510'	<u>Dolomite</u> : grey brown, slightly argillaceous, fine to medium crystalline, occasional trace poor micro-vugular porosity.
1510'	1520'	As above.
1520'	1530'	<u>Dolomite</u> : grey, fine to medium crystalline, abundant calcite crystals, some poor inter-crystalline porosity.
1530'	1540'	<u>Dolomite</u> : light brown to grey, finely crystalline, dense, occasional calcite crystals, rare trace poor pin point porosity.
1540'	1550'	As above.
1550'	1560'	<u>Dolomite</u> : brown grey, fine to coarsely crystalline, slightly argillaceous, scattered poor inter-crystalline porosity, numerous calcite crystals.

E. Sample Descriptions - by P.Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1560'	1570'	<u>Dolomite</u> : brown-grey to dark grey - as above.
1570'	1580'	<u>Dolomite</u> : light brown to buff, fine to micro-crystalline, rare trace poor inter-crystalline porosity.
1580'	1590'	<u>Dolomite</u> : light grey to dark grey, fine crystalline, hard dense, slightly argillaceous, occasionally micro-vugular.
1590'	1600'	As above, (This sample is contaminated with pipe dope).
1600'	1610'	<u>Dolomite</u> : light grey, finely crystalline, dense, in part micro-granular.
1610'	1620'	As above.
1620'	1630'	As above; trace calcite lined fractures.
1630'	1640'	As above; dense.
1640'	1650'	As above.
1650'	1660'	As above, trace disseminated pyrite.
1660'	1670'	<u>Dolomite</u> : as above
1670'	1680'	<u>Dolomite</u> : as above, in part micro granular, slightly pyritic, slightly argillaceous, dense.
1690'	1690'	As above.
1690'	1700'	As above.
1700'	1710'	As above, trace calcite crystals, in part limey.
1710'	1720'	<u>Dolomite</u> : light grey to grey fine crystalline, in part limey, some calcite veining, dense.
1720'	1730'	As above.
1730'	1740'	As above, slightly argillaceous, trace pyrite.
1740'	1750'	As above, in part pyritic.
1750'	1760'	<u>Dolomite</u> : light grey micro-granular, in part fine crystalline, dense, some disseminated pyrite.
1760'	1770'	<u>Dolomite</u> : light grey, fine crystalline to micro-granular, dense, trace calcite.
1770'	1780'	As above, trace pyrite.



E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1780'	1790'	As above, in part light brown.
1790'	1800'	As above.
1800'	1810'	<u>Dolomite</u> : light grey, finely crystalline, dense, in part limey, trace calcite.
1810'	1820'	As above.
1820'	1830'	As above, trace pyrite, slightly silty.
1830'	1840'	As above.
1840'	1850'	<u>Dolomite</u> : light grey to medium grey, fine to micro-crystalline, dense, trace calcite.
1850'	1860'	As above.
1860'	1870'	<u>Dolomite</u> : grey to brown grey, finely crystalline to micro-crystalline, dense slightly silty, slightly argillaceous.
1870'	1880'	As above.
1880'	1890'	Grey and brown, dolomite, as above, in part micro-granular, dense, some disseminated pyrite.
1890'	1900'	<u>Dolomite</u> : grey to brown, fine crystalline, dense, some calcite veining, slightly argillaceous, trace pyrite.
1900'	1910'	As above.
1910'	1920'	<u>Dolomite</u> : as above, fine crystalline to micro-crystalline, slightly silty in part argillaceous.
1920'	1930'	<u>Dolomite</u> : as above, also some dark brown dolomitic shale, slightly silty, trace of green calcareous shale, waxy, occasional pyrite, some calcite veins and calcite lined fractures.
1930'	1940'	<u>Dolomite</u> : grey-brown, finely crystalline, dense, some calcite veining, trace green shale, occasional calcite crystals.
1940'	1950'	<u>Dolomite</u> : as above, slightly argillaceous.
1950'	1960'	As above, in part micro-granular.
1960'	1970'	<u>Dolomite</u> : brown, finely crystalline, trace micro-granular, dense, trace micro-vugular, calcite veining common, some grey dolomite as above.
1970'	1980'	As above, some grey green calcite waxy shale partings.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1980'	1990'	<u>Dolomite</u> : grey-brown, fine to micro-crystalline, slightly argillaceous, slightly silty, dense, trace pyrite, minor dark brown, dolomitic shale.
1990'	2000'	<u>Dolomite</u> : brown, finely crystalline, dense, some pyrite, traces of grey green dolomitic shale.
2000'	2010'	As above (this sample badly contaminated with pipe dope after trip).
2010'	2020'	<u>Dolomite</u> : grey to grey brown, fine-medium crystalline, dense, some calcite veining, trace pyrite, traces of grey green shale as above.
2020'	2030'	<u>Dolomite</u> : grey-brown, finely crystalline, dense, slightly argillaceous.
2030'	2040'	As above: some light brown dolomite, occasional calcite crystals, some calcite veining.
2040'	2050'	As above, some pyrite.
2050'	2060'	<u>Dolomite</u> : light brown, coarsely crystalline, calcite crystals common, some scattered poor inter-crystalline porosity.
2060'	2070'	<u>Dolomite</u> : as above, trace pyrite, scattered trace poor inter-crystalline porosity.
2070'	2080'	<u>Dolomite</u> : coarsely crystalline, light brown, as above - rare trace of poor inter-crystalline porosity, some calcite.
2080'	2090'	<u>Dolomite</u> : grey to light brown, medium coarsely crystalline, in part slightly argillaceous, some calcite veining and calcite infilled fractures, occasional dolomite crystal, rare trace poor inter-crystalline porosity.
2090'	2100'	As above, some scattered clear quartz crystals, trace green dolomitic shale.
2100'	2110'	<u>Dolomite</u> : light brown to brown, coarsely crystalline, trace poor inter-crystalline porosity, abundant coarse grained clear quartz crystals and white dolomite crystals, in part dolomitic quartz sandstone, trace pyrite. <span style="float: right;">X</span>
2110'	2120'	<u>Dolomite</u> : as above, in part silicious, scattered quartz crystals, also clusters of quartz with inter-crystalline porosity, poor; traces of white chert nodules and fragments, scattered poor inter-crystalline porosity, some disseminated pyrite, numerous white dolomite crystals, some calcite.

E. Sample Descriptions - by P. Antonenko (Cont'd)

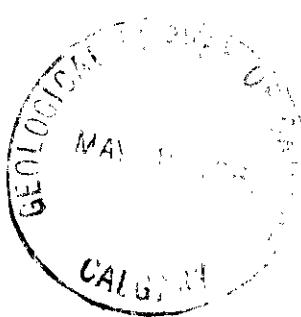
<u>From</u>	<u>To</u>	<u>Description</u>
2120'	2130'	<u>Dolomite</u> : light grey to light brown, coarsely crystalline, silicious, some calcite and abundant white dolomite crystals, trace chert and pyrite, scattered poor inter-crystalline porosity.
2130'	2140'	<u>Dolomite</u> : light brown, medium to coarse crystalline, silicious in part, scattered poor inter-crystalline porosity, well formed white dolomite crystals abundant, some clear quartz crystals, trace pyrite.
2140'	2150'	As above.
2150'	2160'	<u>Dolomite</u> : grey to light brown to white crystals, silicious, numerous intermixed well developed quartz crystals, some acicular quartz; scattered poor inter-crystalline porosity, some pieces fair porosity.
2160'	2170'	<u>Dolomite</u> : light grey to buff, fine crystalline, in small part coarsely crystalline as above, dense, trace calcite and calcite lined fractures.
2170'	2180'	<u>Dolomite</u> : light grey to light brown, fine to medium crystalline, silicious in part, abundant rhombic dolomite crystals intermixed with some clear quartz crystals, some scattered traces of poor porosity. Large crystals appear to be part of infilled vugulars or fractures.
2180'	2190'	As above.
2190'	2200'	<u>Dolomite</u> : light grey to grey to dark grey, fine to medium crystalline, slightly silicious, hard, in part argillaceous, some light brown coarse crystalline, dense, some quartz crystals and white dolomite crystals, trace calcite.
2200'	2210'	As above: trace soft green dolomite shale.
2210'	2220'	<u>Dolomite</u> : grey to dark grey, fine crystalline, slightly silicious, hard, argillaceous in part, dense, some white dolomite crystals, trace pyrite.
2220'	2230'	As above: some calcite veining, in part brown, medium to coarse crystalline.
2230'	2240'	As above: trace green shale partings.
2240'	2250'	<u>Dolomite</u> : light grey to buff, medium to coarsely crystalline, dense, occasional isolated vugular scattered white dolomite crystals, occasional quartz crystals, trace pyrite.
2250'	2260'	As above.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
2260'	2270'	As above, in part white dolomite, micro-granular occasional isolated vugular.
2270'	2280'	As above.
2280'	2290'	As above, dense, also some grey to dark grey dolomite, fine to medium crystalline, slightly argillaceous, siliceous in parts, some intermixed quartz crystals.
2290'	2300'	<u>Dolomite</u> : light grey to brown to dark grey, fine to medium crystalline, slightly siliceous, some calcite veining and infilling, some isolated vugulars infilled with dolomite crystals, some intermixed quartz crystals.
2300'	2308'	As above.

TOTAL DEPTH: 2308'





Your . . . . .

*Formation Testing Service Report*

Initial Closed In Time 30 Minutes			Date March 21, 1961		
Tool Open 1st 4 2nd 45 Minutes			Ticket No. T4418		
Final Closed In Time 30 Minutes			HOWCO DISTRICT Edmonton		
Depth Top Gauge	847 Ft.	Blanked Off No	Kind of Job Dual bottom hole		
BT. P.R.D. No	788	12 Hr. Clock	CONTRACTOR Tri City Drilling		
Pressure Readings	Field	Office Corrected	HOLE & TOOL DATA		
Initial Hydro Mud Pressure	375	379	Elevation	600' (EST.)	Top Packer Depth 850'
Initial Closed in Pres.	270	252	Total Depth	890'	Bottom Packer Depth 865'
Initial Flow Pres.	95	77	Casing or Hole Size	6 1/2"	Size & Type Wall Packer 5 1/2" SWP
Final Flow Pres.	250	247	Liner or Rathole Size	-	Size Bottom Choke 5/8"
Final Closed in Pres.	270	252	Casing Perforations	Top Bottom	Size Surface Choke nil
Final Hydro Mud Pressure	375	376	Interval Tested	365' - 890'	ID & Length Air Chamber -
Depth Center Gauge	Ft.	Blanked Off	Formation Tested	Bear Rock	ID & Length Drill Collars 2" x 455'
BT. P.R.D. No		Hr. Clock	Est. Gauge Depth Temp.	F°	Size Drill Pipe 3 1/2" I.F.
Pressure Readings	Field	Office Corrected	MUD DATA		
Initial Hydro Mud Pressure			Weight	9.0	Viscosity 55
Initial Closed in Pres.			All depths measured from	Kelly Bushing	No. Folders Reproduced 5
Initial Flow Pres.			REMARKS: Open tool on bottom at 12:28 with		
Final Flow Pres.			good initial blow. Closed tool for initial		
Final Closed in Pres.			CIP at 12:32. Open for test at 1:02 with good		
Final Hydro Mud Pressure			air blow, dying off in 40 minutes. Shut in		
Depth Bottom Gauge	887 Ft.	Blanked Off Yes	for final CIP at 1:47. Pull loose at 2:17		
BT. P.R.D. No	867	12 Hr. Clock	with 5000 pounds.		
Pressure Readings	Field	Office Corrected			
Initial Hydro Mud Pressure	410	357			
Initial Closed in Pres.	270	260	Recovered	610	Feet of Muddy sulphurous
Initial Flow Pres.	110	92	Recovered	Feet of	water
Final Flow Pres.	260	255	Recovered	Feet of	
Final Closed in Pres.	270	260	Recovered	Feet of	
Final Hydro Mud Pressure	400	334	Witnessed By	A Moi	
Amount-Type of Cushion	nil	Tester	L. Jewitt		

CANADA SOUTHERN GULF COAST FIELDS #1  
 LEASE NAME 67-44-4C N  
 WELL NO. #1  
 TESTING NO. #1  
 OWNER CANADA SOUTHERN PETROLEUM LIMITED  
 LEASE OWNER  
 STATEMENT OF OWNERSHIP DISTRICT  
 OWNERS DISTRICT CANADA

Company CANADA SOUTHERN PETROLEUM LIMITED Date March 21, 1961

		Time	PSI		
	<b>Initial Hydro Mud Pressure</b>	-	379		
<b>1st</b>	<b>Initial Flow</b>	-	11		
	<b>Final Flow</b>	4 minutes	66		
	<b>Initial Closed In Pressure</b>	30 minutes	252		
<b>2nd</b>	<b>Initial Flow</b>	-	77		
	<b>Final Flow</b>	45 minutes	247		
	<b>Final Closed In Pressure</b>	30 minutes	252		
	<b>Final Hydro Mud Pressure</b>		376		
1st Flow Pressure		Initial CIP	2nd Flow Pressure		Final CIP
Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.
P0	.000	11	.0000	66	.000
P1	.006	11	.0215	252	.102
P2	.012	25	.0430	252	.204
P3	.018	44	.0645	252	.306
P4	.024	66	.0860	252	
P5			.1075	252	
P6			.1290	252	
P7			.1505	252	
P8			.1720	252	
P9			.1935	252	
P10			.2150	252	
	1	Minute Intervals	3	Minute Intervals	15
				Minute Intervals	3
					Minute Intervals

Ticket No. 4418

Canada Southern  
Lease Carnwath River

Well No. 1 Test No. 1

BT No. 738 Depth 847'

12 Hr. Clock No. 3322

Temperature Corrected to 100 ° F

Remarks:

Company CANADA SOUTHERN PETROLEUM LIMITED Date March 21, 1961

	Time	PSI		
Initial Hydro Mud Pressure	-	387	Ticket No.	4418
Initial Flow	-	30		
Final Flow	4 minutes	80	Canada Southern Carwath River Lease	
Initial Closed In Pressure	30 minutes	260	Well No.	1 Test No. 1
2nd Initial Flow	-	92	BT No.	867 Depth 3871
Final Flow	45 minutes	255		12 Hr. Clock No. 2997
Final Closed In Pressure	30 minutes	260	Temperature Corrected to	100 ° F
Final Hydro Mud Pressure		384		
	1st Flow Pressure	Initial CIP	2nd Flow Pressure	Final CIP
	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.
P0	.000	30	.000	80
P1	.004	46	.020	260
P2	.008	59	.040	260
P3	.012	69	.060	260
P4	.016	80	.080	260
P5			.100	260
P6			.120	260
P7			.140	260
P8			.160	260
P9			.180	260
P10			.200	260
	1 Minute Intervals	3 Minute Intervals	15 Minute Intervals	3 Minute Intervals

Remarks:

4418-788

PRESSURE

TIME

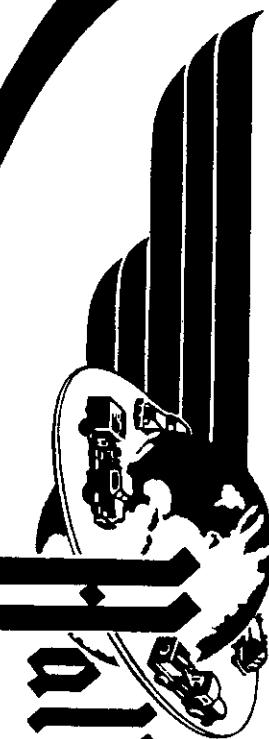
4418-867

Each Horizontal Line Equal to 1000 p.s.i.

Your.....

*Formation Testing Service Report*

**alliburton**  
COMPANY



Initial Closed In Time	30	Minutes			Date	March 23, 1961
Tool Open Flow Period	1st 3	2nd 60 Minutes			Ticket No.	T4419
Final Closed In Time	30	Minutes			HOWCO DISTRICT	Edmonton
Depth Top Gauge	1150 Ft.	Blanked Off No			Kind of Job	Dual bottom hole
BT. P.R.D. No.	867	12 Hr. Clock	CONTRACTOR		Tri City	
Pressure Readings	Field	Office Corrected	HOLE & TOOL DATA			
Initial Hydro Mud Pressure	555	545	Elevation	600' Est.	Top Packer Depth	1160'
Initial Closed in Pres.	390	372	Total Depth	1193'	Bottom Packer Depth	1168'
Initial Flow Pres.	45	35	Casing or Hole Size	6 1/4"	Size & Type Wall Packer	5 1/2" SEWP
Final Flow Pres.	235	236	Liner or Rathole Size	-	Size Bottom Choke	5/8"
Final Closed in Pres.	390	372	Casing Perforations	Top Bottom	Size Surface Choke	nil
Final Hydro Mud Pressure	555	542	Interval Tested	1168' - 1193'	ID & Length Air Chamber	-
Depth Center Gauge	Ft.	Blanked Off	Formation Tested	Silurian (?)	ID & Length Drill Collars	2" x 45'
BT. P.R.D. No.		Hr. Clock	Est. Gauge Depth Temp.	-	Size Drill Pipe	3 1/2" I.F.
Pressure Readings	Field	Office Corrected	MUD DATA Weight	9.2	Viscosity	45
Initial Hydro Mud Pressure			All depths measured from Kelly Bushing		No. Folders Reproduced	5
Initial Closed in Pres.			REMARKS: Open tool at 11:51 with fair			
Initial Flow Pres.			initial blow. Closed for initial shut in at			
Final Flow Pres.			11:54. Open tool for test at 12:24 with			
Final Closed in Pres.			moderate air blow decreasing towards end of			
Final Hydro Mud Pressure			test. Close in at 1:24. Pull loose with 5000			
Depth Bottom Gauge	1190 Ft.	Blanked Off Yes	pounds at 1:54.			
BT. P.R.D. No.	788	12 Hr. Clock				
Pressure Readings	Field	Office Corrected				
Initial Hydro Mud Pressure	590	574				
Initial Closed in Pres.	410	399	Recovered	30	Feet of Mud	
Initial Flow Pres.	65	57	Recovered	520	Feet of Sulphurous water	
Final Flow Pres.	270	261	Recovered		Feet of	
Final Closed in Pres.	410	399	Recovered		Feet of	
Final Hydro Mud Pressure	590	571	Witnessed By	A. Moi		
Amount-Type of Cushion	nil	Tester	D. Jewitt			

CANADA SOUTHERN  
COPPER RIVER #1  
LEASE NAME  
67-44-40 N  
128-47-53 W

WELL NO. #1  
TEST NO. #2  
FIELD Wilcut

CANADA SOUTHERN PETROLEUM LIMITED  
LEASE OWNER

COUNTY N.W.M.  
STATE CALGARY  
COUNTRY Canada  
OWNER'S DISTRICT

## Company CANADA SOUTHERN PETROLEUM LIMITED Date March 23, 1961

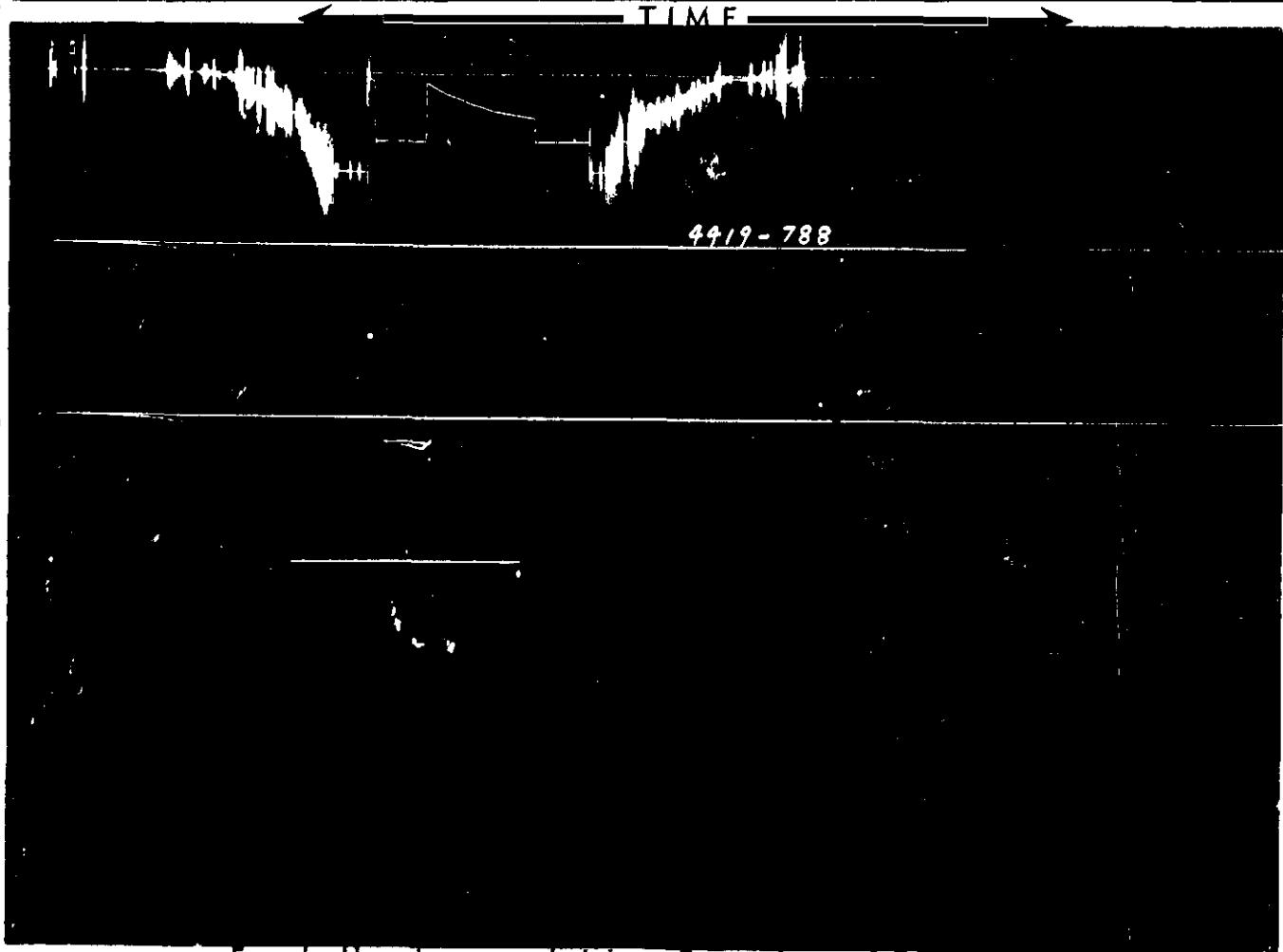
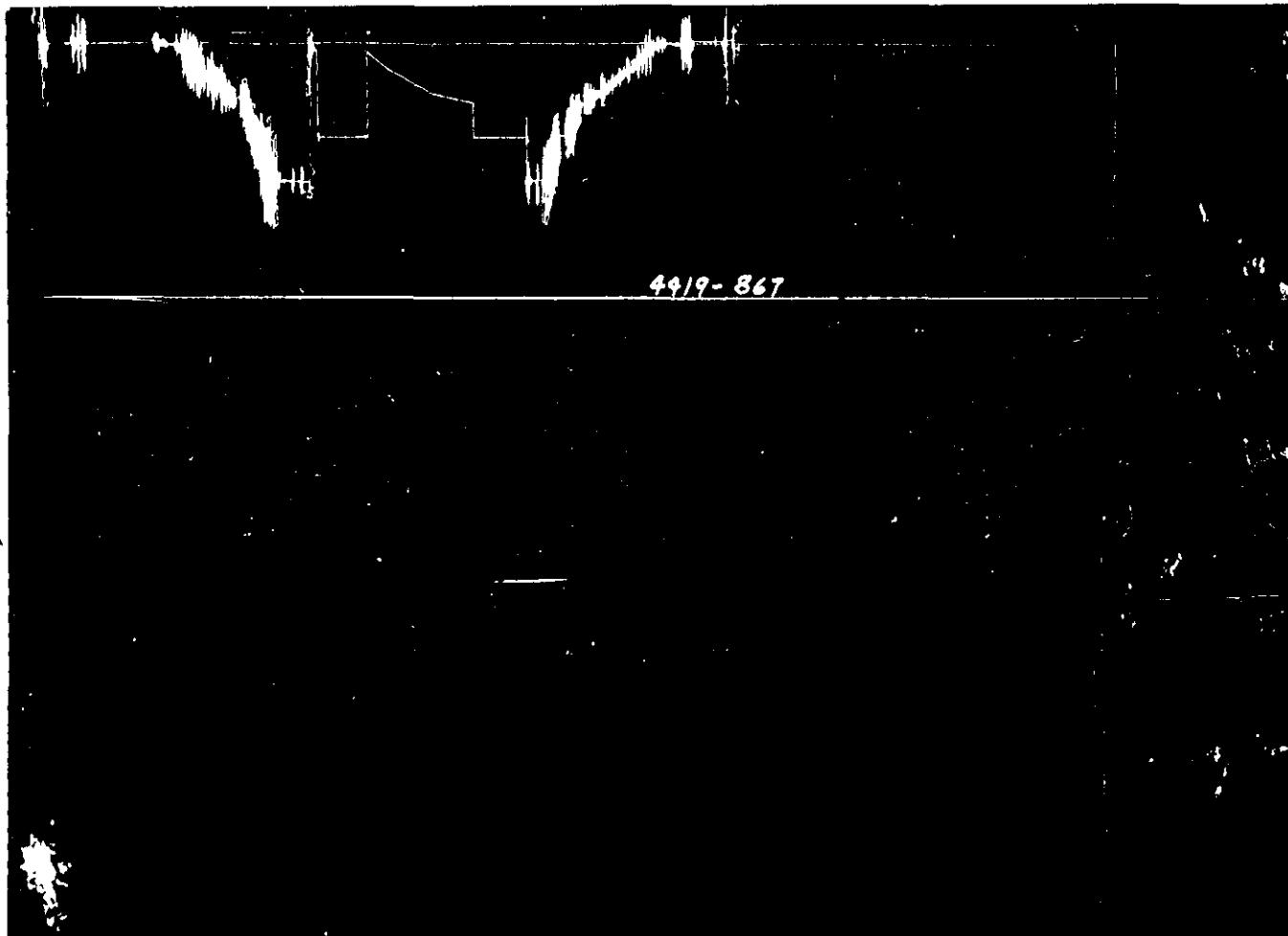
			Time	PSI				
Initial Hydro Mud Pressure			-	545				
1	Initial Flow		-	18				
	Final Flow	3 minutes		34				
2	Initial Closed In Pressure	30 minutes		372				
	Initial Flow	-		35				
Final Closed In Pressure			60 minutes	236				
Final Hydro Mud Pressure				542				
1st Flow Pressure			Initial CIP		2nd Flow Pressure		Final CIP	
	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.
P0	.000	18	.000	34	.000	35	.0000	236
P1	.006	21	.019	372	.101	113	.0205	372
P2	.012	27	.038	372	.202	169	.0410	372
P3	.018	34	.057	372	.303	210	.0615	372
P4			.076	372	.404	236	.0820	372
P5				.095	372		.1025	372
P6				.114	372		.1230	372
P7				.133	372		.1435	372
P8				.152	372		.1640	372
P9				.171	372		.1845	372
P10				.190	372		.2050	372
	1	Minute Intervals	3	Minute Intervals	15	Minute Intervals	3	Minute Intervals

Remarks:

Company CANADA SOUTHERN PETROLEUM LIMITED Date March 23, 1961

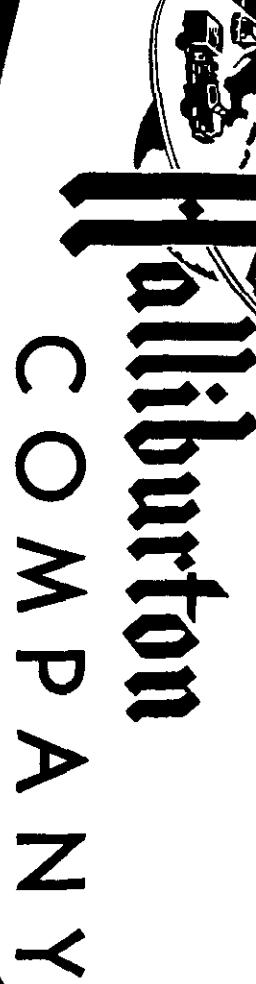
	Time	PSI		
Initial Hydro Mud Pressure	-	574	Ticket No. 4419  Canada Southern Caronwath River  Lease  Well No. 1 Test No. 2  BT No. 788 Depth 1190'  12 Hr. Clock No. 3322  Temperature Corrected to 100 ° F	
1st Initial Flow	-	26		
Final Flow	3 minutes	49		
Initial Closed In Pressure	30 minutes	399		
2nd Initial Flow	-	57		
Final Flow	60 minutes	261		
Final Closed In Pressure	30 minutes	399		
Final Hydro Mud Pressure		571		
	1st Flow Pressure	Initial CIP	2nd Flow Pressure	Final CIP
	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.
P0	.000	26	.000	49
P1	.008	34	.019	399
P2	.016	41	.038	399
P3	.024	49	.057	399
P4			.076	399
P5			.095	399
P6			.114	399
P7			.133	399
P8			.152	399
P9			.171	399
P10			.190	399
	1 Minute Intervals	3 Minute Intervals	15 Minute Intervals	3 Minute Intervals

Remarks:



YOUR.....

*Formation Testing Service Report*

 **Allison**  
COMPANY



								
Initial Closed In Time		30	Minutes	Date		April 3, 1961		
Tool Open Flow Period		1st 4	2nd 60 Minutes	Ticket No.		T4420		
Final Closed In Time		30	Minutes	HOWCO DISTRICT		Edmonton		
Depth Top Gauge	2025 Ft.	Blanked Off No		Kind of Job Dual bottom hole				
BT. P.R.D. No	788	12 Hr. Clock	CONTRACTOR Tri City Drilling					
Pressure Readings	Field	Office Corrected	HOLE & TOOL DATA					
Initial Hydro Mud Pressure	995	997	Elevation	600'	Top Packer Depth	2035'		
Initial Closed in Pres.	755	759	Total Depth	2070'	Bottom Packer Depth	2045'		
Initial Flow Pres.	17	12	Casing or Hole Size	6 1/4"	Size & Type Wall Packer	5 1/2" SEWP		
Final Flow Pres.	110	104	Liner or Rathole Size	-	Size Bottom Choke	5/8"		
Final Closed in Pres.	755	761	Casing Perforations	Top Bottom	Size Surface Choke	nil		
Final Hydro Mud Pressure	995	994	Interval Tested	2045' - 2070'	ID & Length Air Chamber	nil		
Depth Center Gauge	Ft.	Blanked Off	Formation Tested	Silurian	ID & Length Drill Collars	2" x 508'		
BT. P.R.D. No		Hr. Clock	Est. Gauge Depth Temp.	100 F°	Size Drill Pipe	3 1/2" I.F.		
Pressure Readings	Field	Office Corrected	MUD DATA Weight	9.5	Viscosity	55		
Initial Hydro Mud Pressure			All depths measured from	Kelly Bushing	No. Folders Reproduced	5		
Initial Closed in Pres.			REMARKS: Open tool with weak air blow.					
Initial Flow Pres.			Close valve for initial CIP. Open for flow					
Final Flow Pres.			with weak air blow throughout test. Close					
Final Closed in Pres.			valve for final CIP. Pull loose at 12:58 with					
Final Hydro Mud Pressure			5000 pounds.					
Depth Bottom Gauge	2066 Ft.	Blanked Off Yes						
BT. P.R.D. No	867	12 Hr. Clock						
Pressure Readings	Field	Office Corrected						
Initial Hydro Mud Pressure	1025	1017						
Initial Closed in Pres.	730	773	Recovered	200	Feet of	Mud water mixture		
Initial Flow Pres.	35	35	Recovered		Feet of			
Final Flow Pres.	120	121	Recovered		Feet of			
Final Closed in Pres.	780	773	Recovered		Feet of			
Final Hydro Mud Pressure	1015	1010	Witnessed By	A. Moi				
Amount-Type of Cushion	nil	Tester	L. Jewitt					

CANADA SOUTHERN CARRIAGE RIVER #1 #3

WELL NO.

TEST NO.

CANADA SOUTHERN PETROLEUMS LIMITED

LEASE OWNER

CALGARY

LOCATION

Carmarth River #1

FIELD

Wildcat

COUNTY

N.W.T.

Country

Canada

OWNER'S DISTRICT

30 Minutes

4 60 Minutes

30 Minutes

2025 Ft.

Blanked Off No

788 12 Hr. Clock

Field Office Corrected

995 997

755 759

17 12

110 104

755 761

995 994

Blanked Off Hr. Clock

Office Corrected

995 997

755 759

17 12

110 104

755 761

995 994

Blanked Off Yes

867 12 Hr. Clock

Office Corrected

1025 1017

730 773

35 35

120 121

780 773

1015 1010

nil

CANADA  
SOUTHERN PETROLEUMS LIMITED  
Company

Date April 3, 1961

	Time	PSI		
Initial Hydro Mud Pressure	-	997		
1st	Initial Flow	-	5	Ticket No. 4420
	Final Flow	4 minutes	11	Canada Southern Lease Carnwath River
Initial Closed In Pressure	30 minutes	759	Well No. 1	Test No. 3
2nd	Initial Flow	-	12	BT No. 788 Depth 2028'
	Final Flow	60 minutes	104	12 Hr. Clock No. 3322
Final Closed In Pressure	30 minutes	761	Temperature Corrected to 100	° F
Final Hydro Mud Pressure		994		
	1st Flow Pressure	Initial CIP	2nd Flow Pressure	Final CIP
	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.
P0	.000	5	.0000	11
P1	.006	8	.0205	759
P2	.012	3	.0410	759
P3	.018	9	.0615	759
P4	.024	11	.0820	759
P5			.1025	759
P6			.1230	759
P7			.1435	759
P8			.1640	759
P9			.1845	759
P10			.2050	759
	1	Minute Intervals	3	Minute Intervals
			15	3
				Minute Intervals

Remarks:

**CANADA**  
**SOUTHERN PETROLEUMS LIMITED**

Date April 3, 1961

Company

		Time	PSI		
<b>Initial Hydro Mud Pressure</b>		-	1017		
<b>1st</b>	<b>Initial Flow</b>	-	29		
	<b>Final Flow</b>	4 minutes	31		
<b>Initial Closed In Pressure</b>		30 minutes	773		
<b>2nd</b>	<b>Initial Flow</b>	-	35		
	<b>Final Flow</b>	60 minutes	121		
<b>Final Closed In Pressure</b>		30 minutes	773		
<b>Final Hydro Mud Pressure</b>			1010		
<b>1st Flow Pressure</b>		<b>Initial CIP</b>	<b>2nd Flow Pressure</b>	<b>Final CIP</b>	
	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Temp. Corr.	Time Defl. .000"
<b>P0</b>	.000	29	.000	31	.000
<b>P1</b>	.005	30	.020	773	.100
<b>P2</b>	.010	30	.040	773	.200
<b>P3</b>	.015	31	.060	773	.300
<b>P4</b>	.020	31	.080	773	.400
<b>P5</b>			.100	773	
<b>P6</b>			.120	773	
<b>P7</b>			.140	773	
<b>P8</b>			.160	773	
<b>P9</b>			.180	773	
<b>P10</b>			.200	773	
]	Minute Intervals	3	Minute Intervals	15	Minute Intervals
]	Minute Intervals	3	Minute Intervals	15	Minute Intervals

Ticket No. 4420

Canada Southern  
Lease Carnwath River

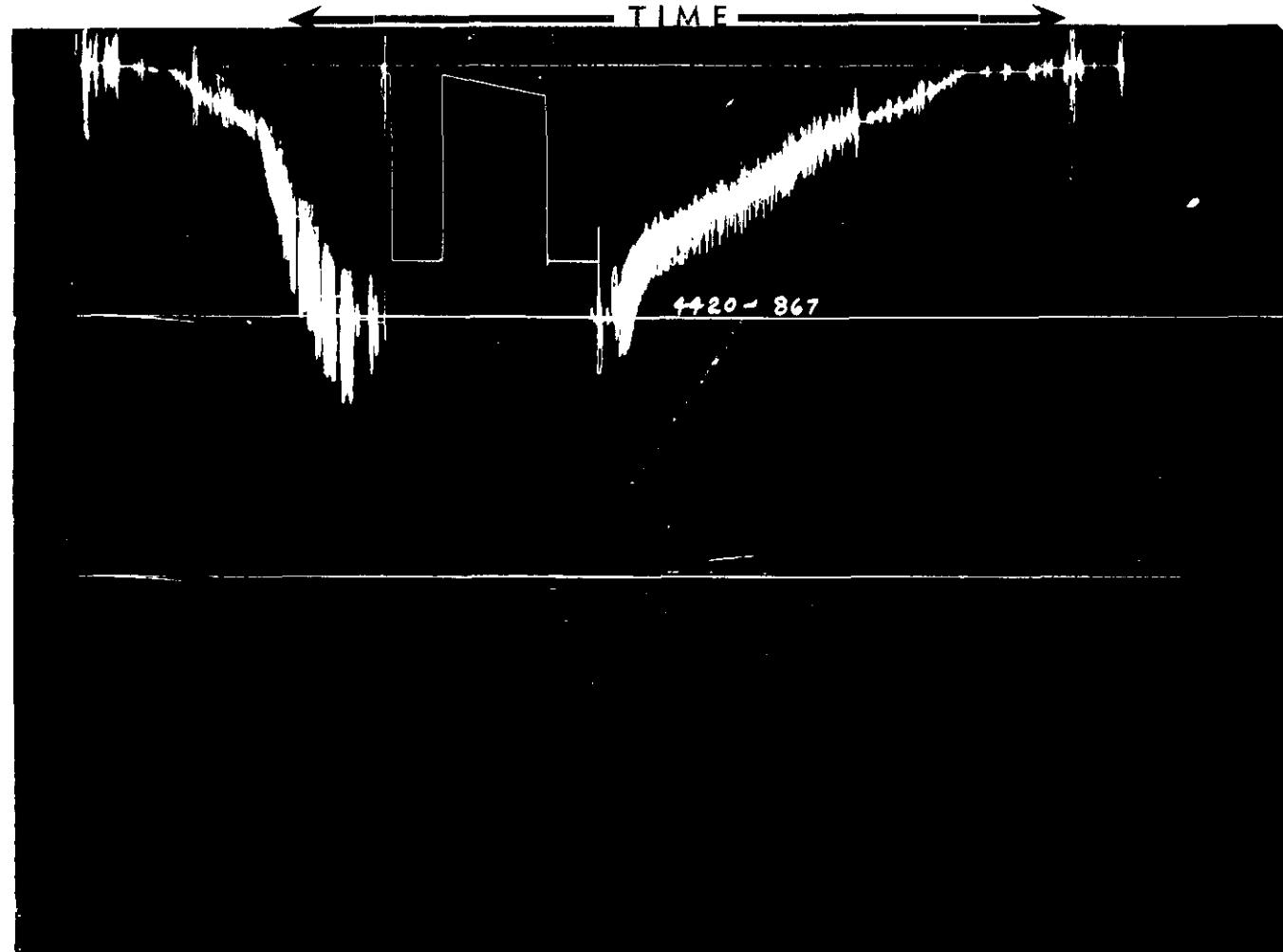
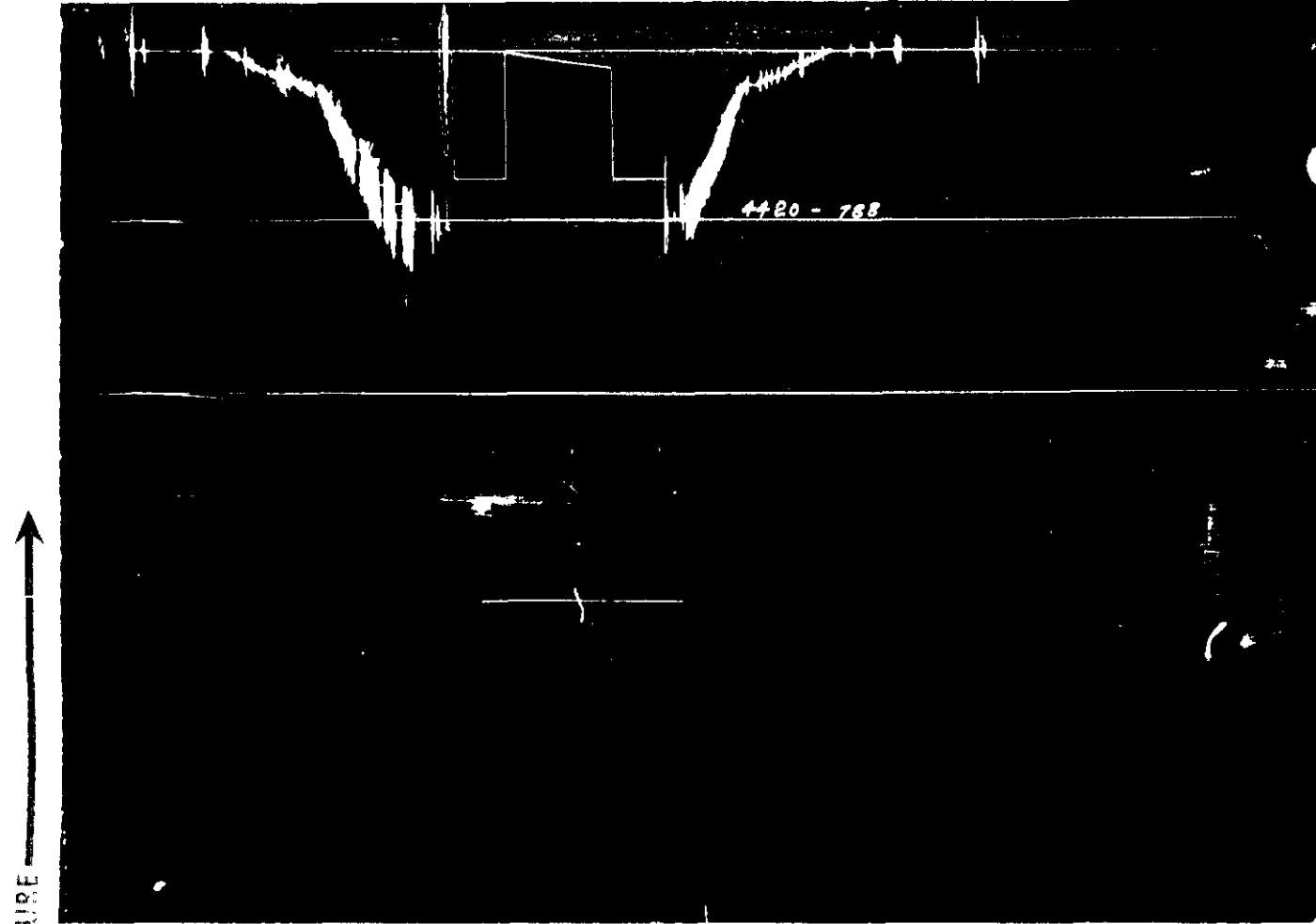
Well No. 1 Test No. 3

BT No. 867 Depth 2066

12 Hr. Clock No. 2903

Temperature Corrected to 100 ° F

Remarks:



## CHEMICAL &amp; GEOLOGICAL LABORATORIES LTD.

Edmonton

Fort St. John

Calgary

## WATER ANALYSIS REPORT

Field **N.W.T.** Well No. **Canada Southern Carnwath River #1**  
 Operator **Canada Southern Petroleum Limited** Date Received **March 24, 1961**  
 Formation **Depths 865' - 890'**  
 Other pertinent data **Location: 67° 44' 40" N. ; 128° 47' 53" W. D.S.T. #1**  
**Recovered 610 feet salt water.**

Date **April 11, 1961** Lab. No. **C3714**

## PARTS PER MILLION (MILLIGRAMS PER LITER)

Na + K	Ca	Mg	Fe	SO <sub>4</sub>	Cl	CO <sub>3</sub>	HCO <sub>3</sub>	OH	H <sub>2</sub> S
1,289	82	59	Present	174	1,615		965		

## MILLIGRAM EQUIVALENTS

56.05	4.09	4.85		3.62	45.54		15.83		
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## MILLIGRAM EQUIVALENTS IN PERCENT

43.12	3.15	3.73		2.78	35.04		12.18		
-------	------	------	--	------	-------	--	-------	--	--

## Total Solids in Parts per Million

By evaporation **4,600**  
 After ignition **2,070**  
 Calculated **3,694**  
 Specific Gravity **1.006**  
 Observed pH **7.4**  
 Resistivity **1.67** ohm meters @ 68° F.

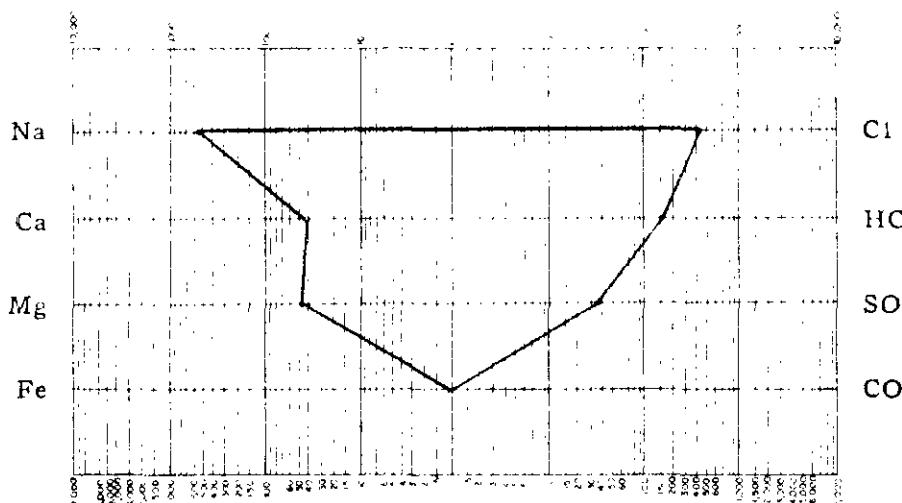
## Properties of Reaction in Percent

Primary salinity **75.64**  
 Secondary salinity **—**  
 Primary alkalinity **10.60**  
 Secondary alkalinity **13.76**  
 Chloride salinity **92.65**  
 Sulfate salinity **7.35**

Remarks and conclusions **We have no reports on file with which to compare this sample.**

Milligram Equivalents Multiplied by 10 on the graph.

LOGARITHMIC PATTERN  
MEQ per unit

HCO<sub>3</sub>SO<sub>4</sub>CO<sub>3</sub>

Cl

## CHEMICAL &amp; GEOLOGICAL LABORATORIES LTD.

Edmonton

Fort St. John

Calgary

## WATER ANALYSIS REPORT

Field N.W.T. Well No. Canada Southern Cornwall River #1.

Operator Canada Southern Petroleum Limited Date Received April 12, 1961

Formation Depths 1168° - 1193°

Other pertinent data Locations 67° 44' 40" N., 128° 47' 53" W., D.S.T. #2. Recovered 550 feet, 520 feet sulph. fresh water and 30 feet mud.

Date April 14, 1961

Lab. No. C3746

PARTS PER MILLION (MILLIGRAMS PER LITER)

Na & K	Ca	Mg	Fe	SO <sub>4</sub>	Cl	CO <sub>3</sub>	HCO <sub>3</sub>	OH	H <sub>2</sub> S
1,621	109	83		431	2,245		640		

## MILLIGRAM EQUIVALENTS

70.51	5.44	6.82		8.96	63.31		10.50		
-------	------	------	--	------	-------	--	-------	--	--

## MILLIGRAM EQUIVALENTS IN PERCENT

42.59	3.29	4.12		5.41	38.25		6.34		
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## Total Solids in Parts per Million

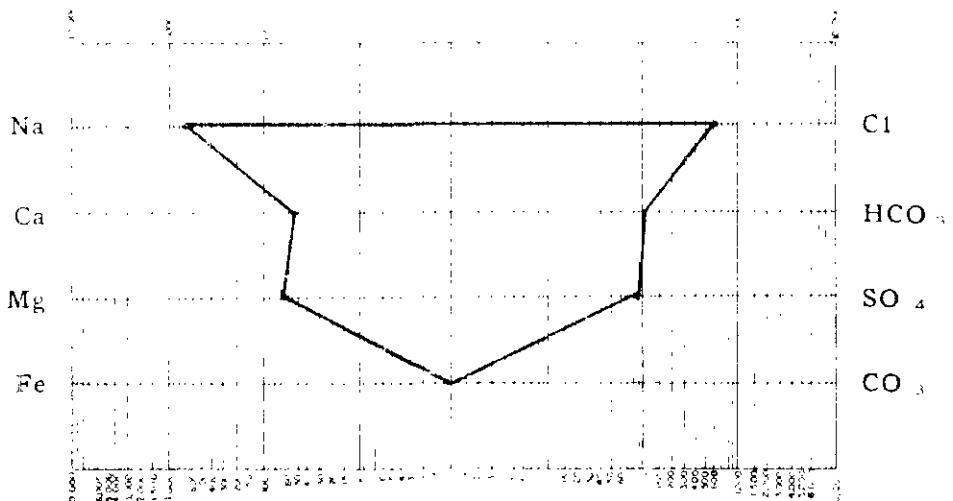
By evaporation	5,530
After ignition	3,740
Calculated	4,804
Specific Gravity	1.006
Observed pH	7.5
Resistivity	1.30 ohm meters @ 68° F.

## Properties of Reaction in Percent

Primary salinity	85.18
Secondary salinity	2.14
Primary alkalinity	---
Secondary alkalinity	12.68
Chloride salinity	87.61
Sulfate salinity	12.39

Remarks and conclusions We have no analysis in our records from this area with which to compare this sample.

## Milligram Equivalents Multiplied by 10 on the pattern.

LOGARITHMIC PATTERN  
MEO per unit

## CHEMICAL &amp; GEOLOGICAL LABORATORIES LTD.

Edmonton — Fort St. John — Calgary

## WATER ANALYSIS REPORT

Field Wildcat Area, N.W.T. Well No. Canada Southern Cornwall River #1  
 Operator Canada Southern Petroleum Limited Date Received April 17, 1961  
 Formation Depths 2045' - 2070'  
 Other pertinent data D.S.T. #3. Recovered 200 feet fresh water cut mud.

Date April 20, 1961 Lab. No. C3756

## PARTS PER MILLION (MILLIGRAMS PER LITER)

Na & K	Ca	Mg	Fe	SO <sub>4</sub>	Cl	CO <sub>3</sub>	HCO <sub>3</sub>	OH	H <sub>2</sub> S
1,438	21	38		461	1,590	37	675		

## MILLIGRAM EQUIVALENTS

62.56	1.05	3.12		9.59	44.84	1.23	11.07		
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## MILLIGRAM EQUIVALENTS IN PERCENT

46.87	0.79	2.34		7.19	33.60	0.92	8.29		
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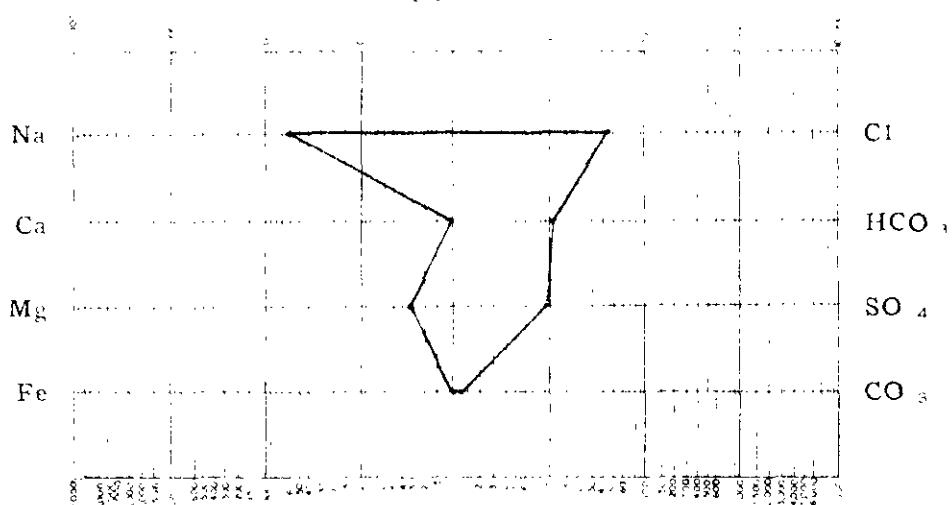
## Total Solids in Parts per Million

By evaporation	4,090
After ignition	3,040
Calculated	3,917
Specific Gravity	1.007
Observed pH	8.4
Resistivity 1.62	ohm meters @ 68° F.

## Properties of Reaction in Percent

Primary salinity	81.58
Secondary salinity	---
Primary alkalinity	12.16
Secondary alkalinity	6.26
Chloride salinity	82.37
Sulfate salinity	17.63

Remarks and conclusions No water analysis to compare with on file.

LOGARITHMIC PATTERN  
MEQ per unit

ENGINEERING & DRILLING REPORTA. SURFACE CASING REPORT

March 11, 1961 to March 14, 1961 - Drilled to 188' with 13 3/4" HT OSC Bit.

March 14, 1961

- Ran 175.20' of 9-5/8" 36# Range 2 casing. Cemented with 108 sacks of Halliburton cement with 4% calcium chloride.

PLUG DOWN - 10 a.m.

Description of Casing String - 9-5/8", 36# Range 2

Halliburton guide shoe	1.20
9-5/8" nipple	3.37
1st Joint	27.30
2nd Joint	30.00
3rd Joint	27.35
4th Joint	27.08
5th Joint	27.42
6th Joint	<u>31.48</u>

175.20'

Landing Joint in 8.50'

Pipe Landed at 183.70' K.B.



B. BIT RECORD

<u>Bit #</u>	<u>Size</u>	<u>Make</u>	<u>Type</u>	<u>Serial</u>	<u>Depth Out</u>	<u>Feet</u>	<u>Hours</u>	<u>R.P.M.</u>	<u>Pump Pressure</u>	<u>Weight</u>	<u>Viscosity</u>	<u>Remarks</u>
					Weight 1000 Pounds					Mid		Used Bit
1	13-3/4"	H.T.	OSC-3	188	188	48	6	80	100	45		
2	6-1/4"	H.T.	OSCIG	60397	442	24	6	80	150	34		
3	6-1/4"	H.T.	IG	60394	660	218	26-3/4	18	100	200		
4	6-1/4"	H.T.	OSC	69146	815	155	26-1/4	18	100	200		
5	6-1/4"	H.T.	OSC	72657	890	75	9-1/4	18	100	200		55
6	6-1/4"	H.T.	OWV	23620	1073	183	24	18	100	225		
7	6-1/4"	H.T.	OWV	37219	1193	120	22-1/4	17	100	225		
8	6-1/4"	H.T.	OWV	23612	1273	80	17-1/4	17	100	250		
9	6-1/4"	H.T.	OWS	72181	1357	84	20	17	90	250		
10	6-1/4"	H.T.	OWS	72189	1448	91	24	18	80	250		50
11	6-1/4"	H.T.	OWS	72177	1533	85	22-1/4	18	60	275		55
12	6-1/4"	H.T.	OWS	72180	1599	66	22-1/4	18	60	200		
13	6-1/4"	H.T.	OWV	75104	1672	73	24	18	60	150		
14	6-1/4"	H.T.	OWV	37235	1749	77	24-1/2	18	60	100		
15	6-1/4"	H.T.	OWV	37195	1824	75	21-1/4	18	60	150		9.3
16	6-1/4"	H.T.	OWS	72166	1921	97	21-3/4	18	80	150		9.3
17	6-1/4"	H.T.	OWS	72157	2009	88	19-1/2	18	80	150		68
18	6-1/4"	H.T.	OWS	51348	2070	61	11-1/4	18	80	150		66
19	6-1/4"	H.T.	OWV	37272	2146	76	22-3/4	12	70	200		55
20	6-1/4"	H.T.	OWS	33610	2198	52	16	12	70	200		
21	6-1/4"	H.T.	OWS	72159	2236	38	17	8	70	200		
22	6-1/4"	H.T.	OWS	72175	2308	72	16	8	70	200		

C. DEVIATION RECORD

<u>Depth</u>	<u>Degrees</u>
130'	1/2
400'	0
890'	1/4
1070'	1/2
1600'	1-3/4
2240'	1-1/2



D. MUD RECORD

<u>Date</u>	<u>Depth</u>	<u>Mud Properties</u>			<u>Filter Cake</u>	<u>Ph</u>	<u>Mud and Chemicals Used</u>
		<u>Wt.</u>	<u>Vis</u>	<u>W.L.</u>			
Mar. 11/61	381'						950# Aquage1
Mar. 12/61	141'	10.5	48				-
Mar. 13/61	186'	10.8	42				-
Mar. 14/61	188'		42				-
Mar. 15/61	272'	8.7	31				1000# Aquage1 100# Bicarb 50# Caustic
Mar. 16/61	401'	9.1	36				1000# Aquage1 25# Caustic
Mar. 17/61	568'	9.4	38				200# Magcogel 250# Poly Gel
Mar. 18/61	638' )						2700# Aquage1 16 bags Fibreseal 9 bags Bran
	) (Lost Circulation)						
Mar. 18/61	660' )						8 bags Mil Fibre 7 bags Bran 1 bag Poly Gel 50# Caustic
Mar. 19/61	-						-
Mar. 20/61	890'	9.1					2300# Magcogel 50# Caustic
Mar. 21/61	976'	8.9	48				900# Aquage1 25# Caustic
Mar. 22/61	1125'	9	46				400# Aquage1
Mar. 23/61	1228'	9.2	46				-
Mar. 24/61	1282'	9.4	42				400# Aquage1 50# Quebracho
Mar. 25/61	1401'	9.3	47				900# Aquage1
Mar. 26/61	1450'	9.5	60				600# Aquage1 15# Caustic 50# Quebracho 600# Aquage1 10# Caustic
Mar. 27/61	1554'	9.3	55				-

D. MUD RECORD (Cont'd)

<u>Date</u>	<u>Depth</u>	<u>Mud Properties</u>			<u>Filter Cake</u>	<u>Ph</u>	<u>Mud and Chemicals Used</u>
		<u>Wt.</u>	<u>Via</u>	<u>W.L.</u>			
Mar. 28/61	1581'	9.4	75				400# Gel 10# Caustic 50# Quebracho 15# Caustic 50# Quebracho 1000# Gel
Mar. 29/61	1675'	9.2	57				500# Gel
Mar. 30/61	1748'	9.2	64				600# Gel
Mar. 31/61	1882'	9.3	55				-
April 1/61	1848'	9.4	57				200# Gel
April 2/61	2000'	9.4	60				1000# Gel 100# Quebracho 50# Caustic 500# Gel
April 3/61	2070'	9.5	55				-
April 4/61	2105'	9.5	53	10	2/32	8	300# Gel
April 5/61	2174'	9.5	55				400# Gel
April 6/61	2228'	9.5	47				300# Gel
April 7/61	2308'	9.6	60				300# Gel
April 8/61		Rig Released: 1 p.m. April 8, 1961					

E. CHRONOLOGICAL DAILY DRILLING REPORT

<u>Date</u>	<u>Days</u>	<u>Depth</u>	<u>Footage</u>	<u>Hours on Bottom</u>	<u>Remarks</u>
11 Mar. 61	1	38'	38'	1 3/4	Spudded 2:45 p.m. Mixing mud and drilling rate hole. Bit #1 13-3/4" OSC
12 Mar. 61	2	141'	103'	22	Drilling and running survey bit #1.
13 Mar. 61	3	186'	83'	22 3/4	Drilling, Bit #1
14 Mar. 61	4	188'	2'	1 3/4	Ran 175.20' of 9-5/8" 36# Range 2 Casing. Shoe at 183.70'. Cemented with 108 bags of Halliburton cement. Plug down 10 a.m. with 4% CaCl2. Waiting on cement and nipping up.
15 Mar. 61	5	272'	84'	14 3/4	Waiting on cement and nipping up. Pressured up, drilled out cement, welded casing bowl, pressured up to 500#, drilled out shoe with bit #2, 6 1/4" OSC IG; Drilling
16 Mar. 61	6	441'	169'	20 1/4	Drilling, Ran survey, Check B.O.P. Tripping for Bit #3
17 Mar. 61	7	632'	463'	22 1/2	Ran in with Bit #3 OSC-IG Drilling, Check B.O.P.s
18 Mar. 61	8	687'	55'	8 1/2	Drilling, lost circulation at 635'. Mixed mud and fibreseal and bran. Waiting on water. Tripped for Bit #4 @ 660'.
19 Mar. 61	9	815'	128'	22	Drilling with Bit #4 OSC 6 1/4". Checked B.O.P.s. Tripped for new bit.
20 Mar. 61	10	890'	75'	9 1/4	Drilling with Bit #5 OSC, dumped mud tanks to clean lost circulation material and mixed mud; ran survey and ran in to drillstem test.
21 Mar. 61	11	1034'	144'	13 3/4	DST #1 from 865 - 890'. Recovered 610' fresh sulphurous water. Drilled with Bit No. 6 H.T. OWV.
22 Mar. 61	12	1163'	129'	21 1/4	Drilling, survey, Ran in with Bit #7 H.T. OWV, Drilling.

## E. CHRONOLOGICAL DAILY DRILLING REPORT (Cont'd)

<u>Date</u>	<u>Days</u>	<u>Depth</u>	<u>Footage</u>	<u>Hours on Bottom</u>	<u>Remarks</u>
23 Mar. 61	13	1228'	65'	13 3/4	Drilling, pulled out to run DST #2 from 1168-1193'. Recovered 520' sulphurous fresh water and 30' mud. Ran in with Bit #8 H.T. OWS, Drilling.
24 Mar. 61	14	1317'	99'	21 1/2	Drilling, Tripped for Bit #9, H.T. OWS, Drilling.
25 Mar. 61	15	1401'	84'	21 1/4	Drilling, Tripped for Bit #10 H.T. OWS, Checked B.O.P.s. Drilling.
26 Mar. 61	16	1482'	81'	20 1/2	Drilling, Checked B.O.P.s. Tripped for Bit #11 H.T. OWS, Drilling.
27 Mar. 61	17	1554'	72'	17 3/4	Drilling, pulled out of hole to change transmission. Ran in with Bit #12 H.T. OWS, Drilling.
28 Mar. 61	18	1609'	55'	20 1/2	Drilling, Check B.O.P.s. Tripped for Bit #13 H.T. OWS, Survey, Drilling.
29 Mar. 61	19	1675'	66'	20 1/2	Drilling, Tripped for Bit #14 H.T. OWS, Drilling.
30 Mar. 61	20	1748'	73'	23 1/2	Drilling.
31 Mar. 61	21	1822'	74'	20 1/3	Drilling, Tripped for Bit #15 H.T. OWS, Drilling.
1 April 61	22	1903'	81'	18 3/4	Drilling, Tripped for Bit #16, H.T. OWS, Drilling. Work on pump, Drilling.
2 April 61	23	1966'	63'	19 1/2	Drilling, Tripped for Bit #17 H.T. OWS, Drilling.
3 April 61	24	2070'	104'	14 3/4	Drilling, Tripped for Bit #18, H.T. OWS, Drilling, Tripped for DST #3 @ 2070'. Testing
4 April 61	25	2130'	60'	17 3/4	DST #3 2045 - 2070. Recovered 200' fresh water cut mud, drilling with Bit #19 H.T. OWS.
5 April 61	26	2198'	68'	21	Drilling, Tripped for Bit #20 H.T. OWS, Checked B.O.P.s, Drilling.

E. CHRONOLOGICAL DAILY DRILLING REPORT

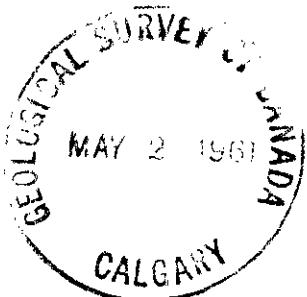
<u>Date</u>	<u>Days</u>	<u>Depth</u>	<u>Footage</u>	<u>Hours on Bottom</u>	<u>Remarks</u>
6 April 61	27	2239'	41'	17 3/4	Drilling, Tripped for Bit #21 H.T. OWS, and laid down 3 drill collars. Drilling, Tripped for Bit #22 H.T. OWS.
7 April 61	28	2308'	69	15 1/4	Drilling, survey, Tripping. Laid down Drill collars. Ran in to cement plugs. <u>Ran plug #1</u> from 2000-2308 - 60 sacks cement, displaced 13 bbls. water, plug down 7:30 p.m. <u>Ran plug #2</u> from 1000 - 1200' with 40 sacks cement. Displaced with 7 bbls. water. Plug down 8:45 p.m. Waiting on cement.
8 April 61	29	2308'	Total Depth		Waiting on Cement. Felt plug #2 at 1015'. <u>Ran plug #3</u> from 930'-830' with 20 sacks cement. Plug down 3:30 a.m. <u>Ran plug #4</u> from 400' - 125' with 55 sacks. Displaced with 1 bbl. water. Plug down 4:30 a.m. Waiting on cement. Felt plug #4 at 132'. Put 10 sacks cement in casing near surface. Welded top on casing with 4 feet 2" stand pipe as marker.  <u>Rig Released</u> 1 p.m. 4:00 - 12:00 p.m. Rigging Down.

**FORM "B"**

DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES

**NORTHERN ADMINISTRATION BRANCH**

## RESOURCES DIVISION



For the period from . . . . . March 1, 1961

to, April 15, 1961

REPORT of COMPLETION—  
REINFORCING—  
RECOMPLETION—  
DISPOSITION  
ABANDONMENT of a Well

Permit No. 2267

Location  $67^{\circ} 44' 40''$  . . . . . N. Lat.  $128^{\circ} 47' 53''$  W. Long.

Elevation: Ground 600' (est). Last previous depth . . . . .  
608' (est) 2308' T.D.

Spudded March 11th, 1961 Present depth . . . . .  
Finished drilling Apr. 7/61 Big Release

April 8, 1961.

Deviations from vertical  $130^\circ - 1\frac{1}{2}^\circ$ ;  $400^\circ - 0^\circ$ ;  $890^\circ - 1\frac{1}{4}^\circ$ ;  $1070^\circ - 1\frac{1}{2}^\circ$ ;  
 $1600^\circ - 1\frac{3}{4}^\circ$ ;  $2240^\circ - 1\frac{1}{2}^\circ$ ;

**CASING RECORD**

<u>Date</u>	<u>Size O.D.</u>	<u>Weight lbs/ft</u>	<u>Grade</u>	<u>Set at feet</u>	<u>Sacks Cement</u>	<u>Top of Cement</u>
1 Mar. 14/61	9-5/8"	36 <sup>4</sup> 55	Range 2	183.70 KB	108	Surface
2...	...	...	...	...	...	...
3...	...	...	...	...	...	...
4...	...	...	...	...	...	...

**TUBING RECORD**

Size	Wt.Lbs/foot	Grade	Amount	Landed Depth	Remarks
... . . .	... . . . .	... . . .	... . . .	... . . .	... . . .
... . . .	... . . . .	... . . .	... . . .	... . . .	... . . .

Status of well on completion of drilling . **DRY & ABANDONED**

Producing Injection Zone . . . . . None . . . . . and formation . . . . . SURVEY . .

Cord intervals . . . . . Mil

1960 MAY 2 1960

..... 1961. 11. 11. 35

.....

Electrical Logs were not run

Interval logged: E-log . . . . . Other logs . . . . .

The above logs (are)

(will be) submitted in accordance with Section 65 of the Regulations.

## DRILL STEM TESTS

(If space insufficient, attach further sheet)

(Strike out the non-applicable) (Completion) (Rework) (Recompletion)

## Shootings

## Hydraulic functioning

### Chemical treatment . . . . .

Date initial production tests . . . . .

Pumping or flowing . . . . .  
Plug back . . . . .  
Other . . . . .  
.



**CEMENT PLUGS SET**

<u>Date</u>	<u>Plug set at</u>	<u>Sacks cement</u>	<u>Method</u>	<u>Top found at</u>
Apr. 7/61	2008-2308	60 sacks	Milliburton Cementing	.....
Apr. 7/61	1002-1200	40 sacks	"	1015°
Apr. 8/61	930-830°	20 sacks	"	.....
Apr. 8/61	100-125°	55 sacks	"	132°
Apr. 8/61		10 sacks	set at surface	.....

Washed well samples have been sent to Geological Survey of Canada, Calgary  
will be

ADDITIONAL DETAILS AND COMMENTS

Signed . . . . . Address . . . . .  
Date . . . . .

(To be submitted in triplicate in accordance with Sections 68, 69, 70 and 71, of the Territorial Oil and Gas Regulations to the Oil Conservation Engineer at Calgary, Alberta.)

NAME CANADA SOUTHERN CARNWATH RIVER #1  
LOCATION N 67° 44' 40" W 128° 47' 53"  
ELEV. K B 608 GRN. 600 TD 2308  
STARTED 11-3-61 COMPL. 8-4-61  
STATUS Abn - Dry FILE NO. N 67° 44' 40" W 128° 47'  
OIL OCC.  GAS CCC.   
SAMPLES-CORE:  DRILL:  LOGS

CONFIDENTIAL

Page 1

GEOLOGICAL REPORT

**A. PERTINENT DATA**

Operator: Canada Southern Petroleum Ltd.  
Well: Canada Southern Carnwath River #1  
Location: Co-ordinates:  $67^{\circ} 44' 40''$  North Latitude  
 $128^{\circ} 47' 53''$  West Longitude  
Elevation: Ground (estimated) 600'  
K. B. (estimated) 608'  
Permit No. 2267 Northwest Territories  
Contractor: Tri-City Drilling  
Spudded: 2:45 p.m. March 11, 1961  
Completed Drilling: April 7, 1961  
Total Depth: 2308'  
Surface Casing: 175.20' of 9-5/8", 36# Range 2 casing  
with 108 sacks of Halliburton cement,  
plus 4%  $\text{CaCl}_2$   
Abandonment Plugs: Plug #1 2000-2308' with 60 sacks cement  
Plug #2 1000-1200' with 40 sacks cement  
Plug #3 930-830' with 20 sacks cement  
Plug #4 400-125' with 55 sacks cement  
Rig Released: 1 p.m. April 8, 1961  
Status: Dry and Abandoned

**B. SUB-SURFACE DATA**

<u>Formation</u>	<u>Sample Depth</u>	<u>E-Log Depth</u>	<u>Sub-Sea</u>
Glacial Drift	Surface		
Mid Ramparts Shale	28'		
Lower Ramparts	126'		
Bear Rock	335'		
Siluro-Ordovician	1154'		
TOTAL DEPTH:	2308'		
ELEVATION:	Ground (est.) 600'		
	K. B. (est.) 608'		

**C. LOGGING DATA**

Electrical Logs were not run.

D. SUMMARY OF DRILLSTEM TESTS (Open Hole)

<u>No.</u>	<u>Interval</u>	<u>Formation</u>	<u>Results</u>
1	865 - 890'	Bear Rock	V.O. 45 minutes. Good initial puff, Strong air blow, decreasing slowly becoming weak in 1/2 hour, dead in 40 minutes. Shut In 30 minutes and 30 minutes. Recovered 610' muddy sulphurous fresh water. HP 410 - 400; FP 110 - 260; SIP 270 - 270.
2	1168 - 1193	Siluro-Ordovician	V. O. 60 minutes, Fair initial puff, weak to moderate air blow, decreasing slightly to end of test. Shut In 30 minutes and 30 minutes. Recovered 550'; 520' sulphurous fresh water 30' mud HP 555 - 555; FP 45 - 235; SIP 390 - 390.
3	2045 - 2070	Siluro-Ordovician	V. O. 60 minutes. Weak initial puff, weak air blow throughout test. Recovered 200' fresh sulphurous water cut mud. HP 1025 - 1025; FP 35 - 120; SIP 780-780.



E. SAMPLE DESCRIPTIONS - by P. Antonenko

<u>From</u>	<u>To</u>	<u>Description</u>
0	10'	Glacial drift; sand, fine medium grained quartzose, varicolored, rounded quartz and shale grains, some greenish grey waxy shale, calcareous and dark grey argillaceous limestone grains - intermixed with clay.
10'	20'	As above
20'	30'	As above - some greenish grey waxy calcareous shale and argillaceous limestone grains.
<u>TOP MIDDLE RAMPARTS SHALE (HARE INDIAN SHALE) 28'</u>		
30'	40'	Shale; Grey to olive green, occasionally maroon, calcareous in part, silty, interbedded lenses of buff to grey limestone, in part micaceous, occasional black spores, some round quartz grains (from above)
40'	50'	Shale; grey to green grey, occasionally maroon, silty, calcareous, in part micaceous, interbedded with limestone, grey to dark green to buff, in part argillaceous, in part finely crystalline - some black spores, occasionally brown weathered.
50'	60'	Shale and Limestone; as above, black spores in fair abundance.
60'	70'	As above; trace pyrite, some white mottling
70'	80'	Shale; grey to greenish grey to slightly maroon, calcareous in part, slightly silty, trace pyrite, some black spores, in part micaceous, some lenses of grey to brown, fine crystalline, argillaceous limestone.
80'	90'	As above; also some dark grey to dark brown shale, some pyrite, black spores in fair abundance.
90'	100'	As above; pyritic, trace fossils in shale becoming slightly darker.
100'	110'	Shale; As above, some cavings (poor sample) trace fossils.
110'	120'	As above; darker brownish shales increasing.
120'	130'	Limestone; grey, in part light brown, fine-micro-crystalline, dense, argillaceous fossils in parts, some micro fossils, brackish and coral fragments.
<u>TOP LOWER RAMPARTS LIMESTONE: 126'</u>		
130'	140'	As above, trace pyrite, calcite crystals, trace spores, some grey micaceous, slightly calcareous shale.
140'	150'	As above, some fossil fragments trace spores, interbedded with grey very slightly calcareous shale.

E. Sample Descriptions - by P. Antchenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
150'	160'	<u>Limestone</u> ; as above, interbedded with 50% grey silty very slightly calcareous <u>shale</u> , some fossil fragments (brachiopods) some pyrite.
160'	170'	As above
170'	180'	As above
180'	190'	<u>Shale</u> ; grey, slightly calcareous, hackly, micro-micaceous, some interbedded limestone, argillaceous, grey, trace fossils, dense, micro-crystalline.
190'	200'	<u>Shale</u> ; as above, interbedded with light brown fine crystalline limestone, trace fossils, dense, argillaceous, 70% shale, 30% limestone.
200'	210'	<u>Limestone and Shale</u> ; as above 50-50
210'	220'	<u>Limestone</u> ; light brown, fine micro-crystalline, argillaceous in part, dense, occasional fossil fragments, occasional calcite crystals, interbedded with grey, slightly silty, micro-micaceous <u>shale</u> , occasional quartz crystals (some contamination from shoe)
220'	230'	<u>Limestone</u> ; as above, trace fossil fragments, trace pyrite, 15% shale as above.
230'	240'	<u>Limestone</u> ; as above, up to 25% shale as above
240'	250'	As above
250'	260'	<u>Limestone</u> ; light brown to buff, fine to micro-crystalline, in part argillaceous, dense, occasional fossil fragments, dense, interbedded with grey to greenish grey micro-micaceous, slightly calcareous <u>shale</u> , trace pyrite, Shale 20-30%.
260'	270'	As above ~ Shale 30-40%
270'	280'	As above.
280'	290'	<u>Limestone</u> ; light brown to buff, fine micro-crystalline, argillaceous in part, trace fossils, occasional calcite crystals no visible porosity, interbedded with grey to slightly greenish grey in part, micro-micaceous, slightly calcareous <u>shale</u> - 20%.
290'	300'	As above, in part pyritic.
300'	310'	As above, <u>Shale</u> about 50%
310'	320'	As above, Shale 30-40% slightly pyritic, trace fossil fragments.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
320'	330'	As above
330'	340'	<u>Limestone</u> ; brown to light brown, fine, crypto-crystalline. In part argillaceous, flaky cleavage, dense, minor amounts of shale as above.
340'	350'	As above; 10% grey shale
		<u>TOP BEAR ROCK: 335'</u>
350'	360'	<u>Limestone</u> ; brown to light brown, very fine crystalline, slightly argillaceous, no visible porosity, <u>part dolomitic</u> , minor grey shale, rare trace fossil fragments, occasional calcite crystals, trace pyrite.
360'	370'	As above
370'	380'	<u>Limestone</u> ; light brown to brown to some dark brown, fine crystalline, argillaceous in part, no visible porosity, some grey shale as above, also some dark brown to black slightly calcareous shale, trace pyrite, rare trace fossil fragments, occasional calcite crystals.
380'	390'	As above
390'	400'	<u>Limestone</u> ; as above, very minor amounts grey shale.
400'	410'	As above; occasional calcite crystals, no visible porosity.
410'	420'	As above.
420'	430'	As above.
430'	440'	<u>Limestone</u> ; light brown to buff, fine to micro-crystalline, dense, in part argillaceous, in part dolomitic, trace pyrite, minor grey shale.
440'	450'	<u>Limestone</u> ; as above, light brown to brown, trace stylolite.
450'	460'	As above - trace grey shale.
460'	470'	As above, some grey to dark grey waxy shale partings.
470'	480'	<u>Limestone</u> ; light brown to brown, fine to micro-crystalline, argillaceous in part, dense, appears to be non fossiliferous as above, in part dolomitic, some minor grey shale partings.
480'	490'	As above.

5. Sample Descriptions - By P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
490'	500'	As above, mainly light brown to buff.
500	510'	As above
510'	520'	As above
520'	530'	As above, trace greenish grey shale.
530'	540'	As above
540'	550'	As above, <u>trace pellets</u> .
550'	560'	<u>Limestone</u> : as above, in part crypto-crystalline, <u>in part dolomitic</u> , trace of grey shale.
560'	570'	As above, some greenish grey shale partings
570'	580'	As above
580'	590'	As above
590'	600'	As above, trace pyrite.
600'	610'	As above, minor grey-green to dark grey, slightly calcareous shale.
610'	620'	As above
620'	630'	As above
630'	640'	As above (Lost circulation at 635' for 12 hours).
640'	650'	<u>Limestone</u> : brown to grey brown, fine micro-crystalline, <u>In part dolomitic</u> , argillaceous, dense, some dark grey argillaceous partings, non fossiliferous trace grey shale (poor sample - lost circulation material).
650'	660'	As above, in part crypto-crystalline.
660'	670'	As above, some florescence, but assume contamination from surface.
670'	680'	<u>Limestone</u> ; as above, dense argillaceous (some rough drilling indicating broken formation)
680'	690'	As above, occasional stylolite.
690'	700'	<u>Limestone</u> ; as above, dense, trace grey green waxy shale.
700'	710'	As above
710'	720'	As above, trace pyritic grey green shale.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
720'	730'	<u>Limestone</u> : as above, trace calcite crystals (calcite lined fracture)
730'	740'	<u>Limestone</u> : as above, some green grey shale partings, also traces of dark grey to grey micaceous shale.
740'	750'	<u>Limestone</u> : brown to grey, fine micro crypto-crystalline argillaceous in parts, dense, in part dolomitic, trace pyrite and occasional dark grey to black shale partings (stylolite?)
750'	760'	As above
760'	770'	As above, trace grey green shale.
770'	780'	As above, trace brown granular dolomite, some calcareous black shale (stylolites?) partings, also some greenish grey shale.
780'	790'	<u>Limestone</u> : as above
790'	800'	<u>Limestone</u> : light brown to grey, fine micro-crystalline, in part argillaceous, dense, in part dolomitic, some argillaceous partings.
800'	810'	<u>Limestone</u> : as above, more argillaceous, some green grey shale partings
810'	820'	As above
820'	830'	As above
830'	840'	As above, in part crypto-crystalline.
840'	850'	As above, some light brown granular dolomite.
850'	860'	As above.
860'	870'	<u>Limestone</u> : as above, dense.
870'	880'	<u>Dolomite</u> : grey to light brown, fine crystalline in part, dense, also light brown, granular dolomite with poor to fair inter granular porosity in parts. (Drilling break at 880-885 from 12-4 minutes per foot.)
885' (Circ. Sample)		<u>Dolomite</u> : light brown fine crystalline, some fair to poor, inter-crystalline and micro vuggy porosity, some dense.
885'	890'	<u>Dolomite</u> : as above, some pyrobitumen, occasional vugular and some poor porosity, inter-crystalline and micro vugular.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
890'	900'	<u>Limestone</u> : light brown, fine micro-crystalline, dense, trace grey granular shale partings, in part dolomitic, interbedded with some dolomite as above.
900'	910'	As above, pyritic in part.
910'	920'	As above.
920'	930'	<u>Mainly Limestone</u> : as above.
930'	940'	<u>Limestone</u> : light brown to buff, fine micro-crystalline, dense, occasional trace of pin-point porosity, some pyrobitumen, some green grey shale partings, some trace granular dolomite.
940'	950'	<u>Limestone</u> : light brown to buff, very fine crystalline, rare trace porosity and pyrobitumen, trace shale, grey green, slightly calcareous.
950'	960'	<u>Limestone</u> : light brown to grey, fine micro-crystalline, dense, argillaceous in part, trace pyrite, trace greenish calcareous shale partings.
960'	970'	<u>Limestone</u> : as above, also abundant calcareous pellets or pebbly material imbedded in greenish grey calcareous shale matrix.
970'	980'	<u>Limestone</u> : as above, trace pellets as above.
980'	990'	<u>Limestone</u> : as above, somewhat chalky, some greenish grey calcareous shale, with calcareous pebbly material imbedded.
990'	1000'	<u>Limestone</u> : light brown to buff, fine micro-crystalline, appears chalky in part, dense, trace stylolite, trace grey green calcareous shale.
1000'	1010'	As above.
1010'	1020'	As above.
1020'	1030'	<u>Limestone</u> : light brown to light grey, fine crystalline, dense, trace pyrobitumen.
1030'	1040'	As above, in part chalky, trace calcite crystals, minor grey green calcite shale partings.
1040'	1050'	As above, Limestone.
1050'	1060'	<u>Dolomite</u> : grey brown, fine to medium crystalline, some scattered poor pin point porosity, some pyrobitumen, some limestone as above.
1060'	1070'	<u>Limestone</u> : grey brown, dolomitic, fine medium crystalline, dense, trace poor pin point porosity.

## E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1070'	1080'	<u>Dolomite and Limestone</u> : light brown fine micro-crystalline, dense, rare trace pin point porosity, trace calcareous grey green shale, trace calcite filled fractures.
1080'	1090'	<u>Limestone</u> : light brown and dolomitic as above, rare traces of poor pin point porosity, traces of grey green calcareous shale, some light granular dolomite.
1090'	1100'	<u>Limestone</u> : grey brown, fine micro-crystalline, argillaceous, dense, trace bituminous material.
1100'	1110'	As above.
1110'	1120'	<u>Limestone</u> : grey brown, fine crystalline, in part dolomitic, argillaceous in part dense.
1120'	1130'	As above.
1130'	1140'	As above, in part micro-crystalline.
1140'	1150'	<u>Limestone</u> : as above, trace coarsely crystalline dolomite, light brown, some fractures.
<u>SILURO-ORDOVICIAN</u>		<u>SILURO-ORDOVICIAN</u> : 1154'
1150'	1160'	<u>Dolomite</u> : grey to dark grey in part, finely crystalline, rare trace pin point poor porosity, some idiomorphic dolomite crystals infilled vugs or fractures, argillaceous.
1160'	1170'	<u>Dolomite</u> : grey brown, in part light brown, fine crystalline, in part micro-granular, slightly argillaceous, scattered poor pin point inter-crystalline and micro vugular porosity, traces fair porosity, some dolomite crystals as above.
1170'	1180'	<u>Dolomite</u> : light grey to buff, fine crystalline to micro granular, scattered poor pin point porosity, trace fair inter-crystalline porosity.
1180'	1190'	<u>Dolomite</u> : grey brown, argillaceous, slightly silty, micro-granular, some calcite lines fractures, occasional scattered poor pin point porosity.
1190'	1200'	<u>Dolomite</u> : light grey to off white, finely crystalline to micro granular, occasional calcite crystals, scattered inter-crystalline and micro vugular porosity, poor, traces fair.
1200'	1210'	<u>Dolomite</u> : medium grey to grey brown, fine crystalline to micro granular, argillaceous trace poor pin point porosity, trace white dolomite as above.
1210'	1220'	<u>Dolomite</u> : light brown to grey - otherwise as above.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1220'	1230'	<u>Dolomite</u> : light brown to buff, fine crystalline, trace poor micro-vuggy porosity, some calcite lining, trace disseminated pyrite.
1230'	1240'	<u>Dolomite</u> : grey to dark grey, fine crystalline to micro-granular, argillaceous, some calcite lined fractures, trace calcite veining, slightly limey in part, dense.
1240'	1250'	<u>Dolomite</u> : grey to brown, fine to medium crystalline, some scattered poor micro-vugular porosity, some calcite inclusions, slightly argillaceous, some micro-granular dolomite.
1250'	1260'	<u>Dolomite</u> : grey brown, mottled, coarsely crystalline, calcitic in part, scattered poor inter-crystalline porosity, trace fair porosity, also limestone as above.
1260'	1270'	As above, fine to coarsely crystalline, traces of fair inter-crystalline porosity.
1270'	1280'	<u>Dolomite</u> : grey brown to medium grey, finely crystalline to medium crystalline, scattered poor to fair inter-crystalline porosity, some calcite crystals (Red stain due to overheating sample), slightly silty, very slightly argillaceous.
1280'	1290'	<u>Dolomite</u> : as above, occasional poor inter-crystalline porosity
1290'	1300'	As above.
1300'	1310'	<u>Dolomite</u> : grey to grey brown, fine to medium crystalline, slightly argillaceous, some calcite lined fractures, occasional calcite crystals, rare trace poor inter-crystalline porosity.
1310'	1320'	As above.
1320'	1330'	As above, scattered poor porosity.
1330'	1340'	<u>Dolomite</u> : as above, finely crystalline, mainly dense.
1340'	1350'	As above, trace calcite vugs.
1350'	1360'	<u>Dolomite</u> : light brown to grey, finely crystalline, in part micro granular, traces of inter-crystalline porosity, some calcite lined vugs.
1360'	1370'	As above, poor to fair inter-crystalline porosity, mostly medium grey.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1380'	1390'	As above, in part sucrose, abundant calcite crystals, occasional poor inter-crystalline porosity, argillaceous in part.
1390'	1400'	As above, calcite filled vugs and fractures.
1400'	1410'	As above, mainly dense.
1410'	1420'	<u>Dolomite</u> : light brown to buff, fine to micro-crystalline, traces poor inter-crystalline porosity, occasional micro vugular scattered calcite crystals.
1420'	1430'	As above: in part medium grey, fine to medium crystalline, scattered poor porosity.
1430'	1440'	As above, trace poor porosity.
1440'	1450'	<u>Dolomite</u> : light grey to buff, finely crystalline, trace poor inter-crystalline porosity, minor medium grey, slightly argillaceous, medium crystalline dolomite.
1450'	1460'	As above, becoming darker.
1460'	1470'	<u>Dolomite</u> : medium grey, in part dark grey, medium crystalline, slightly argillaceous, trace poor inter-crystalline porosity, occasionally micro-vugular, trace calcite crystals.
1470'	1480'	As above.
1480'	1490'	<u>Dolomite</u> : grey-brown, finely crystalline, calcite veining and calcite infilled vugs, trace porosity.
1490'	1500'	<u>Dolomite</u> : grey to light brown, finely crystalline, trace calcite, trace micro-vugs.
1500'	1510'	<u>Dolomite</u> : grey brown, slightly argillaceous, fine to medium crystalline, occasional trace poor micro-vugular porosity.
1510'	1520'	As above.
1520'	1530'	<u>Dolomite</u> : grey, fine to medium crystalline, abundant calcite crystals, some poor inter-crystalline porosity.
1530'	1540'	<u>Dolomite</u> : light brown to grey, finely crystalline, dense, occasional calcite crystals, rare trace poor pin point porosity.
1540'	1550'	As above.
1550'	1560'	<u>Dolomite</u> : brown grey, fine to coarsely crystalline, slightly argillaceous, scattered poor inter-crystalline porosity, numerous calcite crystals.

E. Sample Descriptions - by P.Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1560'	1570'	<u>Dolomite</u> : brown-grey to dark grey - as above.
1570'	1580'	<u>Dolomite</u> : light brown to buff, fine to micro-crystalline, rare trace poor inter-crystalline porosity.
1580'	1590'	<u>Dolomite</u> : light grey to dark grey, fine crystalline, hard dense, slightly argillaceous, occasionally micro-vugular.
1590'	1600'	As above, (This sample is contaminated with pipe dope).
1600'	1610'	<u>Dolomite</u> : light grey, finely crystalline, dense, in part micro-granular.
1610'	1620'	As above.
1620'	1630'	As above; trace calcite lined fractures.
1630'	1640'	As above; dense.
1640'	1650'	As above.
1650'	1660'	As above, trace disseminated pyrite.
1660'	1670'	<u>Dolomite</u> : as above
1670'	1680'	<u>Dolomite</u> : as above, in part micro granular, slightly pyritic, slightly argillaceous, dense.
1690'	1690'	As above.
1690'	1700'	As above.
1700'	1710'	As above, trace calcite crystals, in part limey.
1710'	1720'	<u>Dolomite</u> : light grey to grey fine crystalline, in part limey, some calcite veining, dense.
1720'	1730'	As above.
1730'	1740'	As above, slightly argillaceous, trace pyrite.
1740'	1750'	As above, in part pyritic.
1750'	1760'	<u>Dolomite</u> : light grey micro-granular, in part fine crystalline, dense, some disseminated pyrite.
1760'	1770'	<u>Dolomite</u> : light grey, fine crystalline to micro-granular, dense, trace calcite.
1770'	1780'	As above, trace pyrite.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1780'	1790'	As above, in part light brown.
1790'	1800'	As above.
1800'	1810'	<u>Dolomite</u> : light grey, finely crystalline, dense, in part limy, trace calcite.
1810'	1820'	As above.
1820'	1830'	As above, trace pyrite, slightly silty.
1830'	1840'	As above.
1840'	1850'	<u>Dolomite</u> : light grey to medium grey, fine to micro-crystalline, dense, trace calcite.
1850'	1860'	As above.
1860'	1870'	<u>Dolomite</u> : grey to brown grey, finely crystalline to micro-crystalline, dense slightly silty, slightly argillaceous.
1870'	1880'	As above.
1880'	1890'	Grey and brown, dolomite, as above, in part micro-granular, dense, some disseminated pyrite.
1890'	1900'	<u>Dolomite</u> : grey to brown, fine crystalline, dense, some calcite veining, slightly argillaceous, trace pyrite.
1900'	1910'	As above.
1910'	1920'	<u>Dolomite</u> : as above, fine crystalline to micro-crystalline, slightly silty in part argillaceous.
1920'	1930'	<u>Dolomite</u> : as above, also some dark brown dolomitic shale, slightly silty, trace of green calcareous shale, waxy, occasional pyrite, some calcite veins and calcite lined fractures.
1930'	1940'	<u>Dolomite</u> : grey-brown, finely crystalline, dense, some calcite veining, trace green shale occasional calcite crystals.
1940'	1950'	<u>Dolomite</u> : as above, slightly argillaceous.
1950'	1960'	As above, in part micro-granular.
1960'	1970'	<u>Dolomite</u> : brown, finely crystalline, trace micro-granular, dense, trace micro-vugular, calcite veining common, some grey dolomite as above.
1970'	1980'	As above, some grey green calcite wavy shale partings.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
1980'	1990'	<u>Dolomite</u> : grey-brown, fine to micro-crystalline, slightly argillaceous, slightly silty, dense, trace pyrite, minor dark brown, dolomitic shale.
1990'	2000'	<u>Dolomite</u> : brown, finely crystalline, dense, some pyrite, traces of grey green dolomitic shale.
2000'	2010'	As above (this sample badly contaminated with pipe dope after trip).
2010'	2020'	<u>Dolomite</u> : grey to grey brown, fine-medium crystalline, dense, some calcite veining, trace pyrite, traces of grey green shale as above.
2020'	2030'	<u>Dolomite</u> : grey-brown, finely crystalline, dense, slightly argillaceous.
2030'	2040'	As above: some light brown dolomite, occasional calcite crystals, some calcite veining.
2040'	2050'	As above, some pyrite.
2050'	2060'	<u>Dolomites</u> : light brown, coarsely crystalline, calcite crystals common, some scattered poor inter-crystalline porosity.
2060'	2070'	<u>Dolomite</u> : as above, trace pyrite, scattered trace poor inter-crystalline porosity.
2070'	2080'	<u>Dolomite</u> : coarsely crystalline, light brown, as above - rare trace of poor inter-crystalline porosity, some calcite.
2080'	2090'	<u>Dolomite</u> : grey to light brown, medium coarsely crystalline, in part slightly argillaceous, some calcite veining and calcite infilled fractures, occasional dolomite crystal, rare trace poor inter-crystalline porosity.
2090'	2100'	As above, some scattered clear quartz crystals, trace green dolomitic shale.
2100'	2110'	<u>Dolomite</u> : light brown to brown, coarsely crystalline, trace poor inter-crystalline porosity, abundant coarse grained clear quartz crystals and white dolomite crystals, in part dolomitic quartz sandstone, trace pyrite.
2110'	2120'	<u>Dolomite</u> : as above, in part silicious, scattered quartz crystals, also clusters of quartz with inter-crystalline porosity, poor; traces of white chert nodules and fragments, scattered poor inter-crystalline porosity, some disseminated pyrite, numerous <sup>ite</sup> dolomite crystals, some calcite.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
2120'	2130'	<u>Dolomite</u> : light grey to light brown, coarsely crystalline, silicious, some calcite and abundant white dolomite crystals, trace chert and pyrite, scattered poor inter-crystalline porosity.
2130'	2140'	<u>Dolomite</u> : light brown, medium to coarse crystalline, silicious in part, scattered poor inter-crystalline porosity, well formed white dolomite crystals abundant, some clear quartz crystals, trace pyrite.
2140'	2150'	As above.
2150'	2160'	<u>Dolomite</u> : grey to light brown to white crystals, silicious, numerous intermixed well developed quartz crystals, some acicular quartz; scattered poor inter-crystalline porosity, some pieces fair porosity.
2160'	2170'	<u>Dolomite</u> : light grey to buff, fine crystalline, in small part coarsely crystalline as above, dense, trace calcite and calcite lined fractures.
2170'	2180'	<u>Dolomite</u> : light grey to light brown, fine to medium crystalline, silicious in part, abundant rhombic dolomite crystals intermixed with some clear quartz crystals, some scattered traces of poor porosity. Large crystals appear to be part of infilled vugulars or fractures.
2180'	2190'	As above.
2190'	2200'	<u>Dolomite</u> : light grey to grey to dark grey, fine to medium crystalline, slightly silicious, hard, in part argillaceous, some light brown coarse crystalline, dense, some quartz crystals and white dolomite crystals, trace calcite.
2200'	2210'	As above: trace soft green dolomite shale.
2210'	2220'	<u>Dolomite</u> : grey to dark grey, fine crystalline, slightly silicious, hard, argillaceous in part, dense, some white dolomite crystals, trace pyrite.
2220'	2230'	As above: some calcite veining, in part brown, medium to coarse crystalline.
2230'	2240'	As above: trace green shale partings.
2240'	2250'	<u>Dolomite</u> : light grey to buff, medium to coarsely crystalline, dense, occasional isolated vugular scattered white dolomite crystals, occasional quartz crystals, trace pyrite.
2250'	2260'	As above.

E. Sample Descriptions - by P. Antonenko (Cont'd)

<u>From</u>	<u>To</u>	<u>Description</u>
2260'	2270'	As above, in part white dolomite, micro-granular occasional isolated vugular.
2270'	2280'	As above.
2280'	2290'	As above, dense, also some grey to dark grey dolomite, fine to medium crystalline, slightly argillaceous, silicious in parts, some intermixed quartz crystals.
2290'	2300'	<u>Dolomite</u> : light grey to brown to dark grey, fine to medium crystalline, slightly silicious, some calcite veining and infilling, some isolated vugulars infilled with dolomite crystals, some intermixed quartz crystals.
2300'	2308'	As above.

TOTAL DEPTH: 2308'