WELL HISTORY REPORT

on

UNION et al MOBIL COLVILLE D-45

NORTHWEST TERRITORIES

CANADA

Submitted by

John K. Ontko
Professional Geologist

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SUMMARY OF PERTINENT WELL DATA

NAME OF WELL:	Union et al Mobil Colville D-45
UNIQUE WELL IDENTIFIER:	300D456720125000
LOCATION:	Unit D, Section 45, Grid 67 deg.20', 125deg.00'. Latitude 67 deg. 14' 08.57"N Longitude 125 deg. 09' 20.87"W
UNIVERSAL WELL LOC. REF:	67.23571 deg.N 125.15539 deg.W
PERMITTEE:	Mobil Oil Canada Ltd., Permit #5499
EXPLORATORY LICENSE NO.:	1471
OPERATOR:	Union Oil Company of Canada, 335 - 8th Avenue S.W., Calgary, Alberta.
DRILLING CONTRACTOR:	Nabors Drilling Ltd. Rig #8
DRILLING AUTHORITY:	Issued Feb. 28th, 1973. No. 685.
CLASSIFICATION:	New Field Wildcat
ELEVATION:	2080' Ground K.B. 2099'
SPUDDED:	12:00 Noon, March 2nd, 1973
DRILLING COMPLETED:	4:20 PM, May 29th, 1973
TOTAL DEPTH:	3850'
WELL STATUS:	D & A
RIG RELEASED:	8:00 AM, May 7th, 1973
HOLE SIZES:	0 - 60' 17½" 60 - 600' 12¼" 600 - 2704 8-3/4" 2704 - TD 6-1/8"
CASING:	15 jts. 9-5/8", 36#, K-55, 8 rd. - 611.97' + Howco shoe, float collar and D.V. tool (4.60'). Cemented with 180 sax + 1% $CaCl_2$. Plug down 3:30 PM, April 5th. Displaced with water. Circulated D.V. tool. Cemented 2nd stage with 125 sax oilwell cement + 1% $CaCl_2$. Plug down @ 4:30 PM, April 5th. Cement returns visable. D.V. tool @ 160'.
NO. OF DST's:	5
NO. OF CORES:	8
LOGS:	Dresser Atlas - DIL, BHCSG, G-N & Dipmeter
TOOLPUSHERS:	Al Thoma, Jack Smale

SUMMARY OF PERTINENT WELL DATA CONT'D.

WELLSITE SUPERVISORS:	Engineers - Tom Ramsay, Carl Jasinski Geologist - John Ontko
HEADQUARTER SUPERVISION:	Engineer - J. Sullivan
	Geology - D. Connolly
HELICOPTER SUPPORT:	Trans North Turbo Air Pilots - B. Robertson, D. Plaster, G. Stringer & G. Howell
FIXED WING SUPPORT:	Nabor's Navajo & T.N.T.A. Twin Otter
DISTRIBUTION OF DATA:	1 set bags - G.S.C. 1 set can 2790 - TD - G.S.C. 1 set lined bags - Mobil 1 set vials - Mobil 1 set vials - Union 1 set envelopes - Union All logs - original & prints - Union

SUMMARY OF SUB-SURFACE DATA

KB 2099

FORMATION	E-Log DEPTH	ELEVATION
Lower Ordovician surface		+ 2099
Cambrian		
Saline River	1863	+ 236
Saline River Salt (equiv.)	2206	- 107
Mount Cap	2680	- 581
Mount Clark Old Fort Sand Mbr.	3160	- 1061
Proterozoic	3275	- 1176
T.D.	3850	- 1751

CORE DESCRIPTIONS

Core #1 3018 - 32'. Recovered 12'9".
Times 35,34,23,32,-26,27,23,30,25,-25,28,33,33,38.
Core badly shattered in part. Jammed on connection.

7'3"	Shale - dark grey, with slight greenish tinge. Massive, slightly silty in part with two thin ($\frac{1}{4}$" to $\frac{1}{2}$") irregular siltstone beds with near flat bedding planes.
6"	Shale - as above with thin siltstone interbeds indicating 45 degree bedding dip. Basal 1" dark green with an irregular abrupt contact with the underlying section.
5'3"	Shale - greenish dark grey with numerous thin beds of light grey, silty shale. Bedding is horizontal.

Core #2 3032 - 62'. Recovered 30'.
Times 5,10,5,7,8,-8,8,10,10,10,-10,10,10,12,12,-10,10,10,
13,13,14,13,15,14,15,-17,16,10,10,15.

7'3"	Sandstone - light grey, silt size to fine grained, angular, predominantly well packed with minor black green and green glauconite grains. Sand grains are easily dislodged by scratching with blade. Thin clear, flakes (medium size) are common and dispersed throughout section (a secondary silica, not mica.) Porosity not apparent. Core bleeds light brown oil and has gassy odor. Under fluoroscope appears patchy in small to large blebs as well as linear along micro fractures. The latter are not noticeable to the eye or under the microscope. The sandstone is much like the lower Cardium of the Pembina Field.

CORE DESCRIPTIONS

Core #2 Cont'd.

12'4"	Shale - dark grey, sandy to silty with the coarse clusters expressed as very small blebs and occasional thin beds up to 1½" thick. The sand & siltstone content decrease gradually towards base of section. Shale to sand ratio approx. 60 - 40. No bleeding oil, stain, minor weak patchy fluorescence.
10'9"	Shale - dark grey, massive with noticeable thin interbeds and blebs of light grey, siltstone, decreasing towards base. Siltstone less than 10% of section. No stain or oil bleeding.

Core #3 3062 - 92'. Recovered 30'.

Times 22,22,26,26,27,-23,26,21,22,18,-17,24,36,21,23,-28,29,31,26,9,-7,8,10,8,8,-6,6,7,6,7.

19'	Shale - dark grey, massive, hard, featureless.
6'8"	Sandstone - grey, argillaceous, very fine grained, angular, slightly salt and peppered, hard, dense. Has blebbed appearance, ¼" max. size, caused by cleaner sand. These blebs have medium fluorescence (faint white color.) No stain, faint gas odor on breaking. Tight. Both contacts transitional.
0'4"	Sandstone - light grey, dolomitic, silt to very fine grained size, hard. Basal contact abrupt and irregular with underlying dolomite.
4'0"	Dolomite - brown, fine crystalline, hard, dense, with numerous thin irregular dark shale laminal, giving section a fragmental appearance.

CORE DESCRIPTIONS

Core #4 3092 - 3122'. Recovered 30'.

Times 6,6,8,5,5,-6,10,9,10,20,-25,26,24,12,15,-10,15,28,30, 30,-28,22,15,15,16,-9,5,7,6,7.

3'0"	Shale - dark grey, massive, with light grey siltstone patches. Slightly dolomitic.
4'10"	Sandstone - light brown, dolomitic, very fine grained, tightly packed, angular, clear quartz, with few dark grey shale interbeds (up to 2" thick) and numerous thin shale partings. Trace pyrite. Oil bleeding. Porosity poor, not obvious.
1'0"	Shale & Siltstone - 50 - 50. Shale dark grey, interspersed with blebs and interbeds of light grey, dolomitic siltstone. Tight. No oil bleeding.
1'1"	Sandstone & Shale - 70 - 30. Sandstone is light brown, very fine grained as above in bands up to 3" (oil bleeding) interbedded with thin beds of dark grey shale.
4'9"	Shale - dark grey, massive.
2'9"	Shale - dark grey with minor blebs and patches of dark brown, fine to medium crystalline, tight dolomite.
2'1"	Shale - dark grey with numerous blebs and patches of tightly packed fine to medium crystalline dolomite. Tight.
5'0"	Shale - greenish grey, massive.
4'5"	Sandstone - dark grey green, salt and peppered, consisting of 50 - 50 coarse sub-rounded grains of dark green shale (glauconite?) interspersed with finer textured, angular, poorly sorted, tightly packed clear quartz. (grain size from very fine to coarse, but predominantly less than medium.) Section tight.

CORE DESCRIPTIONS

Core #4 Cont'd.

2'1"	Sandstone - light brown, very fine grained, tightly packed, quartzose, with green shale parting and grains, slightly dolomitic. Oil stained with bleeding light brown oil. Basal 1'3" is saturated. Porosity not apparent under microscope.

Core #5 3122 - 52'. Recovered 30'.

Times 4,4,6,5,5,-14,21,22,22,27,-23,24,26,11,12,-12,17,20, 18,19,-11,12,10,13,11,-16,13,12,15,16.

6'2"	Sandstone - light brown, very fine grained. tightly packed, oil saturated. Bleeds oil. No obvious porosity.
8'6"	Shale - dark grey, massive, slightly sandy toward base.
2'6"	Shale - dark grey, silty with numerous small silty blebs.
2'6"	Shale - dark grey, clean.
1'4"	Siltstone - light grey grading to very fine grained sandstone, shaly with shale intermixed as thin interbeds (partings) and as host rock toward base.
9'0"	Shale - dark grey with varying minor amount of light grey siltstone (very fine grained sandstone) interspersed throughout as blebs and irregular thin interbeds.

CORE DESCRIPTIONS

Core #6 3152 - 73'. Recovered 21'.

Times 18,10,7,11,20,-20,15,7,8,17,-9,7,8,17,11,-10,7,8,9,8,-11 -core barrel jammed.

2'0" Shale - dark grey green, with upper 8" slightly blebbed with light grey siltstone.

2'0" Sandstone - light grey, very fine to occasional coarse grained, rounded clear quartz grains in a argillaceous matrix. Framework 80%. Tight. No oil stain, or fluoresence. The unit has occasional dark grey, argillaceous beds cutting across core without any parallel pattern.

3'6" Shale - dark grey, massive. Basal 6" contains rounded vugs (½" diameter) infilled with dark brown crystalline dolomite, (as well as few paper-thin, light grey, interbeds of dolomite.)

13'6" Dolomite - light grey to brownish grey, very fine to finely crystalline, in part sandy, hard, tight. The zone has numerous thin irregular shale partings giving the zone a fragmental appearance. Not a rubble zone, as fragments have not been transported. No movement.

Core #7 3173 - 3203' Recovered 30'.

Times 13,9,7,5,4,-6,3,3,4,7,-8,4,4,4,4,6,4,3,3,10,-5,3,3,3,5,-5,6,8,2,2.

0'6" Sandstone - light grey, fine to medium grained, sub-rounded, poorly sorted, well packed, dolomitic. Tight. No stain.

0'3" Shale - dark grey, massive.

1'0" Sandstone - light brown, fine to medium grained, sub-rounded to rounded, with occasional coarse grain size fragment of green shale. Few thin interbeds of dark grey, and sandy green

CORE DESCRIPTIONS

Core #7 Cont'd.

	shale blebs are present. Zone appears depositionally fragmented. Oil stain. No visual porosity.
1'0"	Shale - green, sandy in part.
1'3"	Sandstone - as above, light grey, fine to medium grained with few thin green shale interbeds at base. No stain. Tight.
2'3"	Sandstone - as above, in part light brown stain, grading to very fine to fine grained, sub-angular, quartzose. Hard. Occasional thin shale interbed. Two vugs $\frac{1}{4}$" in size present 1' below top. Tight visually.
1'10"	Sandstone - as above with thin green and dark grey shale interbeds more common, giving section a fragmental (depositional) appearance in part.
3'9"	Sandstone - very fine grained, quartzose, massive, with green shale interbeds more common. Hard. Well packed appears tight. Stained.
6'0"	Sandstone - as above, in part heavily stained (approx. 1' located $1\frac{1}{2}$' from top of unit.) Remainder light brown stained.
1'2"	Sandstone - as above interbedded with thin dark grey shale. Stained.
3'7"	Shale - green to pale green becoming sandy in basal 6".
1'6"	Sandstone - very fine grained as above with green shale matrix in part. Stained.
3'0"	Shale & Sandstone - shale is green with abundant light grey sandstone blebs. No stain.
0'4"	Shale - dark grey green.
1'6"	Sandstone - light grey, very fine grained, quartzose, sub-angular with minor amount of green shale intermixed.

CORE DESCRIPTIONS

Core #7 Cont'd.

1'0"	Sandstone - very fine grained, sub-angular intermixed with medium sized sub-rounded grains, poorly sorted, slightly friable. Oil stained.

Core #8 3203 - 33'. Recovered 29'.

Times 2,2,2,2,2,-3,2,2,2,2,-2,2,2,2,2,-
2,2,2,3,3,-2,2,2,2,11,-8,4,1,1,1,-

5'6"	Sandstone - brown stained, gassy odor, fine grained, sub-angular, quartzose. good sorting, well packed, friable. Oil stained.
0'3"	Shale - pale green, soft.
13'0"	Sandstone - as above. Oil stained.
1'3"	Sandstone - black, fine to medium, sub-rounded, quartzose grains, friable. Bitumen infill interstial spaces. No physical barrier at contacts responsible for difference in stain.
5'0"	Sandstone- light brown stained as before, predominantly fine grained, sub-rounded, with occasional coarse rounded to sub-rounded clear quartz grains. Well packed. Friable.
1'0"	Sandstone - black, fine grained, bituminous as before with no noticeable rock change at contacts.
0'6"	Shale - green, soft.
1'0"	Sandstone & Shale - broken core, shale is pale green, soft, sandstone is as above, oil stained.

SAMPLE DESCRIPTIONS

Sample interval 30'.

30	Chert - light grey, massive.
60	Chert - light grey to white, massive to micro-crystalline, in part tripolitic. Occasional chip has honeycomb structure.
90	Chert - as above with minor clear angular coarse quartz grains (5%).
120	Chert - as above with trace of quartz.
150	as above, with porous honeycomb, (porous) structured chert common (20%).
180	Chert - light grey brown and white, massive, trace of tripolite. Occasional quartz grain. No porous chert.
210	predominantly light grey and white as above with minor tripolitic and porous chert. Iron stain obvious.
240	Dolomite - light brown to light grey, micro and finely granular (the fine grained has white matrix.) Light grey chert common. Occasional light greenish yellow chert present. Trace of clear quartz. (Sample quality poor, only coarse chips.)
270	as above, without the granular white matrixed dolomite and the pale greenish yellow chert. (Poor sample.)
300	as above with chert occasionally vuggy. (poor sample)
330	as above, without vuggy type chert. (Very poor sample.)
360	Dolomite - light brown, crypto to micro-crystalline with minor chert (one piece has pesolitic structure.) Iron stain spotty.
390	as above, grading to finely crystalline in part, occasionally light grey in color. Light grey, massive chert common to abundant. (30%)

420	Dolomite - as above with abundant light grey, massive, crypto to micro-crystalline dolomite. Decrease in chert to trace.
450	as above, chert approx. 10%.
480	Dolomite - with occasional chip of pale green and green shale.
510	Dolomite - light brown, hard, dense, micro-crystalline (60%), light grey, chalky textured, limy dolomite abundant (40%). Trace chert.
540	predominantly light brown micro-crystalline dolomite - 70% - with light grey, micro-crystalline dolomite common (20%). Chalky textured dolomite minor (less than 10%.) Trace of chert.
570	as above. Slightly more chert - 5%. Occasional greenish dolomite chip.
600	as above, with minor amount of chalky textured dolomite (20%.)
630	Dolomite - light brown, micro to very finely crystalline with trace (less than 5%) white and light grey chert.
660 - 90	in part - 10% - light grey, very fine to finely crystalline, poorly sorted, tight dolomite. Occasional pale green shale chip.
720	Dolomite - predominantly light brown, micro to very finely crystalline dolomite.
750	with occasional white, soft, chalky textured dolomite chip. Few white chert, and clear quartz chips also present.
780	with ferruginous stain and rust. No primary porosity. Iron indicates fracture, some water in hole at 759 - went to mist.
810	with abundant fine to medium crystalline dolomite. Occasional trace of solution vugs. Much of the cuttings are reddish due to iron stain.

840 Dolomite - the prevalent light brown, micro to very finely crystalline dolomite has occasional solitary vug. The light grey, micro to finely crystalline dolomite is approx. 15%. The light grey sucrosic, very finely crystalline, silty dolomite is approx. 5%. White chert and white chalky texture makes up approx. 5%. No iron stain present.

870 as above - the light brown dolomite is becoming abundantly very fine crystalline (sucrosic.) Occasional small chip of green sandstone. Few yellowish green, cryptocrystalline dolomite chips.

900 as above with minor amount of sandy dolomite, Occasional coarse, clear quartz grain.

930 as above with only occasional white chert chip, no coarse quartz observed. Sample is predominantly light brown, micro to very finely crystalline dolomite (70%), light brown to light grey, sucrosic, very finely crystalline dolomite 20%, and very minor amount of light grey, very fine to fine crystalline, poorly sorted dolomite. Occasional chip has yellowish green tint.

990 same lithology as above, but becoming increasingly more light grey in color.

1020 - 50 Dolomite - lighter brown than above, consistently micro-crystalline, with minor light brown to light grey to white, chalky appearing dolomite 20%. Trace white chert.

1080 as above with occasional rust parting.

1140 as above. Occasional reddish speckled and light pinkish colored chip.

1170	as above, increase in amount of the light grey to white (chalky textured) sucrosic dolomite to approx. 50%.
1200	decrease in sucrosic to minor - less than 20%.
1230	with abundant light to medium to dark grey crypto to micro-crystalline dolomite (30%). The dark grey is micro-crystalline. Trace of light grey shale.
1260	Dolomite - as above, predominantly light brown (50%) and light grey (40%) hard, dense, crypto to micro-crystalline. Occasional pale greenish yellow dolomite chip. Minor green, blocky, slightly dolomitic shale (10%).
1290	Dolomite - predominantly light brown in part light grey, crypto to micro-crystalline, hard, dense. Occasional green shale chip.
1320	as above with occasional coarse crystalline calcite lump and odd medium grey, micro-crystalline dolomite chip.
1350	as above with minor light grey, chalky dolomite (10%).
1380	the above chalky (in part sucrosic) dolomite becoming predominant (60%.) Light grey and light brown, micro-crystalline, dense dolomite of the above is abundant (40%.)
1410	Limestone - light grey to medium grey, micro- to finely crystalline, slightly silty and argillaceous.
1440	Dolomite - light grey to medium grey, micro-crystalline, hard, dense - 70% with light brown, crypto to micro-crystalline, dense dolomite common.
1470	as above with trace of green shale.
1500	Dolomite - as above, light brown 70% and light to medium grey 30%.

1530 Dolomite - predominantly light to medium grey, argillaceous, crypto to micro-crystalline, dense (70%) with light to medium brown, dense, crypto to micro-crystalline dolomite common 25%. Trace of medium grey, blocky, dolic shale.

1560 as above with minor 10% light grey and light brown, soft, chalky textured dolomite.

1590 as above with minor dark grey, blocky dolomitic shale.

1620 increase in shale amount (approx. 20%) with greenish grey, slightly fissile shale obvious. The light brown, chalky dolomite approx. 20%. The light to medium grey and light brown dolomite of above is predominant (60%.)

1650 as above with green, blocky shale common (15%). Trace of disseminated pyrite.

1680 as above, becoming predominantly the light grey, dense, hard, micro-crystalline type (50%), the light brown to greyish brown type is approx. 30%. The grey shale and green shale comprises approx. 20%. Trace of pin point solitary vugs in both dolomite color types.

1710 Dolomite - brown, hard, dense, crypto-crystalline in part appear greyish brown (30%) with green, blocky to slightly fissile shale (with occasional disseminated pyrite) 20%.

1740 as above with the dolomite occasionally earthy (softer) appearing. Increase in green shale to approx. 30%.

1770 as above with minor amount of light grey, slightly argillaceous, massive dolomite with occasional trace of fossil detrital. Decrease in amount of green shale (10%.)

1800 as above. Dolomite 70% - increase in green fissile to slightly waxy in part shale.

1830	as above. Dolomite remains light grey and light brown, massive, crypto to micro-crystalline. Trace of brown, micro-crystalline dolomite. Green, fissile to blocky shale approx. 20%.
1860	as above, decrease in shale to trace - less than 5%.
Saline River 1870	
1890	Shale (50%) rusty to dark brown in part interbedded with light grey, light brown, and pinkish crypto to micro-crystalline dolomite with spotty good vuggy porosity (no stain.) Green waxy to dull shale present as a trace.
1920	Shale - as above reddish to brown, light green to dark green in part waxy (60%), with abundant pinkish, reddish, yellowish, grey, dolomitic siltstone (20%), minor pink and white anhydrite (10%), and light grey to light brown, dense, crypto-crystalline dolomite. (Variegated.)
1950 - 1990	as above with anhydrite only a trace (less than 5%.)

Start 10' interval samples at 2000'.

2000	Shale - variegated as above with siltstone and anhydrite and dolomite as above with green shale predominant (approx. 40%.)
2010 - 60	as above with trace of white mineral with columnar habit (gypsum?). Occasional clear, needle-shaped, gypsum crystal present.
2070 - 90	as above, yellowish and light grey shale more obvious than above. Dolomite present as trace. Very minor anhydrite and siltstone.
2100 - 2110	variegated section as above with green shale very predominant. Trace dolomite, anhydrite and siltstone.

2120 - 60 as above, with anhydrite obvious.

2170 trace vuggy porous dolomite.

2180 as above with further increase in anhydrite approx. 10%.

2190 as above with increase to obvious in pale yellowish shale.

2200 as above, green, reddish and light grey shale (order of predominance) with trace of yellow shale. Anhydrite common.

2210 as above with considerable light brown, massive, crypto-crystalline dolomite 30%, slightly silty in part; pink anhydrite (sylvite) minor 10%. Trace light grey, dolomitic, fine grained sandstone.

2220 no dolomite. Sample predominantly red shale with abundant green, in part light green, waxy shale. Minor amount of brown, yellowish brown and grey shale. Anhydrite - white and pink (sylvite) present in minor amount approx. 5%.

Pipe Correction -32'.

2230 Salt? at 2228 - 37 with shale as above. Trace light brown dolomite. Anhydrite minor.

2250 Shale as above with trace of white chert, also light grey, fine grained sandstone with medium to coarse quartz crystal inclusions.

2260 - 90 as above with minor amount of pink anhydrite (sylvite) 10%. Trace of pyrite in a dark background, pale green, lithographic shale with conchoidal fracture, occasional chip of light grey, fine to medium grained, angular, poorly sorted.

2300 as above. Variegated shale and minor anhydrite. Occasional chip of light grey, poorly sorted, angular, very fine to medium grained sandstone. Pyrite "dark" as before.

2310 - 20	as above, with odd white chert and white lithographic mineral (appears like chalk.)
2330 - 40	as above with white, soft, chalky textured, limy shale common (10%.) Light grey shale obvious, contains sandstone grain interbeds. predominantly green and red shale of above.
2350	as above, decrease in anhydrite to trace.
2360	as above, predominantly green shale.
2370	as above. Minor to trace of anhydrite (Pink) occasional chip of white chert and siltstone.
2380 - 2400	as above with increase in reddish colored shale to approx. 2/3 of the green. Yellowish brown and brown shale obvious. Occasional shale chip is pitted suggesting salt inclusions.
2410	Shale - predominantly green and reddish with minor grey; trace amount of anhydrite.
2420	Decrease in amount of rusty shale with light grey, soft, slightly dolomitic shale obvious. Trace of light brown, crypto-crystalline dolomite.
2440	as above with light brown, soft, chalky appearing, slightly limy dolomite common 10%.
2450	variegated shales as above, abundant green, rust (red) and light grey common, with trace of pink and white anhydrite and light brown, crypto-crystalline dolomite (containing disseminated pyrite in part.) Difficult to dry clean sample because of grey dust.
2460	Decrease in rusty shale with minor light brown dolomite with excellent honeycomb porosity (tight fragments have pelletoidal - granular - texture.)
2470	Dolomite - light brown, earthy, tight (50%) with abundant green shale. No rusty shale. Trace of anhydrite. One coarse mica flake. Few black shale fragments. Difficult to dry sample clean, as it becomes dusty and covers colored cuttings.

2480	Shale - pale green (45%) with abundant very dolomitic light grey shale (shaly dolomite) 45%. Minor to trace of pink and white anhydrite, as well as trace of dolomite. When dried covers colored chips with grey dust. Sticks to pan.
2490	Shale - as above, green to light greenish grey to grey dolomitic (80%) with minor light brown dolomite (10%) and white and orange (pink) anhydrite 10%.
2500	Dolomite - grey to slightly brownish grey, in part light grey, dense, silty, tight (60%) with abundant (30%) above grey, grey green and green shale with minor light grey shale. Occasional anhydrite as well as the odd porous grain cluster. Red (rusty) shale appears as trace, but considered caving. Mud has been in poor condition for last 100' because of salt contamination. Sample dries without grey dusty coating of above samples.
2510	Shale - green and grey, dolomitic in part, as above with minor light brown, dolomite and trace of anhydrite.
2520	as above. Trace of pale yellow green and bright green shale. Occasional chip of anhydrite.
2530 - 60	Shale - as above, green and grey green, dolomitic with abundant grey shale. Minor to trace of light brown, earthy dolomite. Occasional piece of anhydrite. Red (rusty) shale is obvious. Bedding obvious with samples often having micro-flakestone appearance.
2570 - 80	as above with trace dark grey shale, slight increase in dolomite (10%). No anhydrite.

2590	Shale - as above with slightly increased light brown, slightly silty dolomite approx. 15% - light grey, finely crystalline dolomite present as trace amount of less than 5%.
2600	as above. No grey, micro-crystalline dolomite. Increase in light brown dolomite to approx. 25%.
2610 - 30	as above. Light brown to light grey to medium brown, in part crypto-crystalline, argillaceous dolomite approx. 20%.
2640 - 50	becoming predominantly shale. Dolomite approx. 15% with medium brown dolomite as trace.
2660	Shale - as above approx. 40% with abundant dolomite, light brown, earthy to very finely crystalline (granular) 30%, with minor amount of good pin point vug fluorescence with light grey to light brownish grey, argillaceous dolomite 20%. Minor brown chert speckled (inclusions) in part 5%. Trace of darl grey shale, occasional pink (orange) anhydrite chip. Fluorescence less than 5% of sample in brown, very finely crystalline dolomite with occasional pin point vug.
2670	Shale - 60% predominantly bright green, blocky with light green and grey green in minor amount. Dolomite 40$ - light brown to medium brown, (fluorescence with occasional pin point vug) to grey brown, crypto-crystalline, in part finely crystalline, granular, silty. Fluorescence less than 5%.
2680	as above - the green shale looks dark greenish grey when dry. Dolomite remains approx. 40% and is similar to above silty, crypto to fine grained, light grey brown to occasionally medium brown in part. Odd chip fluoresces.

2690	Dolomite - 50% as above with occasional brown (oil stained fragment less than 10% of dolomite portion) with occasional pin point vug. Shale 50% - predominantly bright green, slightly fissile and in part pale green, blocky.
2700	Shale - as above 60% with dolomite 40% light grey to light brown, crypto to micro-crystalline with occasional brown, very finely granular, crystalline (oil stain - white - fluorescence.) Less than 1%. Occasional brown chert chip.
2704 circulated	Shale 80% Dolomite 20%. Occasional (less than 1% of dolomite portion) oil stained (white fluorescence), finely granular dolomite.
2710	Shale - dark greenish grey to dark grey, blocky to platy to fissile. Trace of reddish, and pale green shale. Occasional chip of light grey, crypto-crystalline dolomite, light grey dolomitic siltstone and fine grained, slightly porous, spotty rust stained sandstone (probably the trace and occasional chips are cuttings from the mud tanks that are circulated through the mud system.)
2715	as above with minor amount 5% of grey, slightly dolomitic, salt and peppered, angular, very fine to fine grained sand-stone. The black grains are shale frag-ments (similar to shale being drilled), and are larger than the quartz grain com-plementary component. Tight. Trace of light brown to brown crypto-crystalline dolomite 1%. Occasional chip of reddish shale and light grey, fine grained dolomitic sandstone (contaminants?)

2720 Shale as above. Occasional chip of above salt and peppered sandstone, reddish, and pale green shale.

2730 Shale as above - dark greenish grey to dark grey - blocky, platy to fissile.

2740 as above with occasional chip of light brown, crypto to finely crystalline dolomite and white chert, and white tripolite with quartz grain inclusions.

2750 Shale - as above, however, not greenish as before. Habit same. Color dark grey.

2760 as above with minor (less than 5%) light grey, dolomitic, very silty to very fine grained, predominantly quartz with occasional very fine grained shale grains, sandstone (siltstone.) Tight.

2770 Shale & Limestone - Shale 50% - dark grey to black and dark green, blocky to fissile to finely bedded as above with Limestone 50% - light grey to light brown to brown, crypto to micro-crystalline, slightly silty, dense with trace of light grey, soft, chalky limestone. Occasional chip grades to fine granular with odd fragment containing coarse grained inclusions (fossil fragments?)

2780 as above with decrease in above limestone to approx. 30%. Occasional chip of vuggy dolomite with slight cut. Less than 1%. Shale remains grey green in part.

2790 increase in limestone to approx. 80%, and becoming brown, micro to very finely crystalline with occasional chip containing fair inter-crystalline porosity with fluorescence (at most 10% of limestone portion), limestone is also slightly dolomitic. Shale 20%, predominantly green, platy to blocky as above. Evidence of occasional micro fractures infilled with calcite.

2800 Shale - dark grey, blocky, limy, very silty 90% with minor light grey, limy, very argillaceous siltstone 10%. Trace of limestone as above.

2810 as above, grading more to the grey, slightly dolomitic very argillaceous siltstone (silty shale.)

2820 Limestone (80%) brown to buff in part, crypto-crystalline, dense, in part buff, soft, chalky textured limestone. Shale 20% - greenish grey as above. Calcite present in trace amount as fracture infill.

2830 Shale - dark grey, blocky, slightly limy with 10% limestone as above.

2840 Limestone - 80% medium brown, crypto to micro-crystalline in part grading to buff, soft, chalky textured limestone. Occasional fracture infilled with calcite. Shale 20% - green grey, blocky.

2850 Shale - dark grey, fissile to blocky with minor 20% limestone of above.

2860 as above, shale shows platy texture, some minor slickensiding, occasional fossil mold (Trilobite parts.)

2870 Limestone 60% - light to medium brown, slightly dolomitic, crypto-crystalline grading to very finely granular in part, buff colored, softer limestone is common. Shale 40% - predominantly green and dark grey in color, blocky with trace amount of dark brown, fissile shale, and dark brown silty shale.

2880 Siltstone 50% - light grey, very dolomitic in part medium grey, argillaceous, as well as greyish brown. Shale 45% - predominantly dark grey and green with minor black and dark brown. Dolomite 5% - as above, light brown to buff.

2890 Dolomite 90% - light to medium brown, micro to finely crystalline, dense with occasional white calcite chip (fracture infill.) Shale 10% - green, dark grey and brown as above.

2900 Dolomite 60% - becoming light brown to light grey, to medium grey, predominantly crypto-crystalline, slightly silty with Shale 40% - dark grey, in part brown and trace of black fissile, bituminous.

2910 Dolomite - predominantly medium brown, micro-crystalline to tightly packed, finely granular in texture, slightly limy, occasional chip with inter-crystalline porosity; with hard, blocky, dolomitic pale green, silty shale. Trace of green shale.

2920 Dolomite 90% - light grey, silty, very fine granular, massive, dense with rounded glauconite inclusions abundant in numerous chips. Shale 10% - dark grey present in minor amounts.

2930 Dolomite - brown, finely crystalline, slightly silty, tight. Trace of green shale and light grey, very finely crystalline, glauconitic dolomite.

2940 Siltstone - light grey, slightly dolomitic. Trace of green shale.

2950 as above in part brownish in color, with considerable sericite(?) flakes. Thin shale partings also present. Minor black shale present in part sericitic.

2960 Shale 60% - green, blocky, in part platy, with siltstone 40$ light brown to light grey in part. Occasional chip fluoresceses, no cut.

2970 as above with trace of brown shale. Decrease in siltstone to approx. 10%.

2980 Shale - green and brown shale, blocky to fissile. Approx. 40 - 60 green to brown shale.

2990 Shale - becoming predominantly brownish grey, with abundant green fissile. Minor amount (5%) of light grey chert. Very odd (occasional) angular, fine to coarse, clear quartz grain and clusters. Trace of light brown to reddish, very finely to finely crystalline dolomite.

2995 Shale - green, blocky to fissile.

3000 Shale 90% - predominantly green with brown common and minor amount of grey. Trace of white to light grey chert, light brown dolomite and occasional angular, coarse, clear quartz grain.

3010 Shale - green as above with trace of brown.

3015 Sandstone - light brown, fine grained, angular, quartzose sand. Tightly packed, trace of inter-granular, poor porosity with good oil stain and cut. Not dolomitic, has minor silica cement. Mostly framework, porosity may be good but not noticeable under microscope.

Cored 3018 - 3233 - 8 cores 95% recovery.

3240 Shale - green, fissile to blocky with abundant light grey, very fine grained, quartzose sandstone, in part grading to medium sized, sub-angular to sub-rounded. Porous. Partly stained with faint fluorescence.

3250 Sandstone - light grey to light brown, stained fine to medium, sub-angular to sub-rounded, clear, quartz grains. Good porosity.

3260 - 70	Sandstone - light brown, stained, very fine grained as above with abundant loose coarse, angular to sub-rounded, predominantly translucent quartz with trace of clear, and yellowish quartz. Minor amount 15% of green fissile to blocky shale.
3280 - 90	Shale - green, fissile and blocky with abundant maroon, rusty, and brown colored shale.
3300	Shale - as above with much fine grained, porous sandstone and loose, coarse, rounded sand grains - cavings. (Shale continues very reddish and soft - much is washed out when cleaning.)
3320	Shale - reddish, dark green, trace of pale green, grey and dark grey common. In part silty and sandy grading to siltstone and dolomite, occasional slightly glauconitic sandstone. Numerous lighter shales and siltstone are micaceous (sericite.)
3330	Sandstone - light grey, very argillaceous, with occasional pale green speck inclusions, reddish stained with shales of above common, the brownish grey color being the most prevalent. Mica (sericite) flakes abundant and present in brownish and green shales as well as the sandstone.
3340 - 50	Shale - decrease in sandstone to approx. 20%, predominantly variegated shales as above.
3360	Shale - green to grey green, 80% with grey shale 20% common. Habits are blocky to fissile in part.
3370	Shale - as above with increase in grey type to approx. 40%.
3380	as above with grey shale predominant.
3390	Shale - as above 60% green 40% grey.

3400	as above 50 - 50 with trace light brown, micro-crystalline dolomite, few chips of white bentonite.
3410	Siltstone - light grey to greenish grey, argillaceous, slightly glauconitic grading to very fine grained sandstone with green and grey shale common 30%.
3420	Sandstone - as above decrease in shale to less than 20%.
3430 - 70	Shale - green and grey, fissile, micro-micaceous in part, with minor grey, argillaceous, very fine grained sandstone 10%.
3480	as above, increase in light greenish grey sandstone to approx. 20%.
3490	Sandstone & Shale - 60 - 40 - as above with the glauconitic portion becoming more obvious.
3500	Sandstone - as above with decrease in shale to less than 10%.
3510	as above, shale approx. 25%.
3520	as above, shale 40%.
3530	decrease in shale to 20%. Few dark grey to black to brown chips of shale. Trace of bituminous sandstone.
3540	Sandstone - light grey, silt to fine grained, angular, clear quartz, fair sorting, slightly micaceous, silica cement. Occasional glauconite grain, and green shale grain. Trace of inter-granular porosity.
3550	as above with a few coarse, angular, clear quartz chips occasionally encrusted with quartz crystals suggesting fractures. Occasional rust staining.
3560	Shale 90% - grey green, blocky to fissile with minor amount of above sandstone.
3570	Shale - green 40%, grey 20%, maroon 10%, and sandstone light grey, quartzitic as above 30%.

3580	Shale - green, fissile to blocky with minor amount of dark grey shale. Trace of maroon and pale green shale. Sandstone of above minor in amount.
3590	Shale - green and dark grey as above with minor sandstone 15%.
3600 - 10	as above with dark grey shale abundant. Brown shale common. Sandstone argillaceous to quartzitic approx. 20%.
3630	Sandstone - light grey, very fine grained, quartzitic, slightly glauconitic, tight. Minor dark grey and brown shale 10%.
3640	Sandstone is very argillaceous in part, increase in above shale to approx. 50%. * Sample is brown due to being burned when drying.
3650 - 90	as above. Dark grey shale approx. 10%.
3700 - 10	as above with texture grading down to silt size. Noticeably quartzitic. Slight increase in shale varying from 10 - 25%.
3720 - 30	as above, becoming more noticeably micaceous; both sandstone and shale.
3740	Shale 60% - grey to dark grey, fissile to blocky, slightly micaceous in part. Minor brown shale. Sandstone 40% - grey and brown, grading to siltstone, quartzitic, argillaceous, slightly micaceous in part.
3750	Shale - dark grey, blocky to fissile with minor amount of green and brown shale. Sandstone - light grey and brown, silty, quartzitic present as trace.
3760 - 70	Shale - as above with brown shale and siltstone and silty shale becoming obvious.

3780	Shale - dark grey with minor green grey, and green, fissile to blocky. Minor light grey, slightly glauconitic, very fine grained quartzitic sandstone - less than 10%.
3790 - 3800	as above, increase in sandstone to approx. 30%.
3810 - 30	Sandstone 60% - as above in part grey, very quartzitic with shale 40%.
3840	decrease in sandstone to less than 40%.
3850	Shale - grey, green with trace of brown, fissile to blocky. Occasional pyrite crystal cluster. Few sandstone grains of above.

TD 3850

May 2nd, 4:20 PM, 1973.

E N G I N E E R I N G

BIT RECORD

BIT NO.	SIZE	MAKE & KIND	SERIAL	DEPTH	TOTAL FEET	TOTAL HOURS	REMARKS
1A	17½	H7J	394440	30	30	8½	8-1-1
2A	12¼	M4NGJ	913351	32	2	6	5-1-1
3A	12¼	H7UJ					Drill 21' rat hole.
4A	12¼	H7UJ		53	21	4	5-3-1 stiff foam
3A RR	12¼	H7UJ		151	98	12½	8-4-1 stiff foam
5A	12¼	H10J		180	29	8	2-7-1 stiff foam
6A	12¼	H77U		211	31	4¼	2-1-1 stiff foam
7A	12¼	M4NG		226	15	1½	3-3-1 mud.
8A	12¼	3JS		610	384	44½	2-2-1
1	8-3/4	WDR-RR	28639	615	5	3/4	Drill out - air
2	8-3/4	SS8	N4779	1900	1285	87½	8-8-1 foam
3	8-3/4	TC8 RR	FS005R	2242	342	29½	5-7-1
4	8-3/4	4JS	MS282				Clean out to bottom
5 RR	8-3/4	WDR	28639	2326	84	11½	5-2-1 mud
6 RR	8-3/4	4JS	MS282	2513	187	34	1-1-1
7	8-3/4	H77	369204	2704	191	42½	3-2-1
8	6-1/8	S88	435437	2930	226	38½	1-2-1
9	6-1/8	M88	913695	3018	88	21	1-1-1
1D	6-3/32	diamond	EC127112	3032	14	7-3/4	New
2D	6-3/32	diamond	EC117235	3233	201	39	Good
10 RR	6-1/8	S88	435437	3315	82	18¼	1-5-1
11	6-1/8	S88	435555	3850	535	38¼	1-3-1
					Total	457-3/4 hours	

DAILY MUD RECORD (PROPERTIES & ADDITIVES)

DATE	DEPTH	WT. GAL.	VIS. SECS.	W.L.	PH	KELZON	GEL	SAW DUST	CAUSTIC	BENEX	SPER SENE	SALT GEL	SALT	CMC	BI-CARB
			Drilling with air												
Apr. 3	267	3.4	110			4	50	100							
4	410	3.5	200				70		4	20					
5	607	9.0	185			4	17		2						
			Drill with air												
15	2242	8.5	200+			6	80	100							
16	2326	8.5	150	11.2		8	70								
17	2434	9.0	90	15.2			15		3		1				
18	2513	9.5	65	11.8		1						16	156	4	
19	2634	10.0	80	14.0		1								1	
20	2704	10.0	88	15.2			End of Salt Mud System								
21	2704		W.O.C.												
22	2745	8.4	38			1									4
23	2876	8.8	47	12.4	9.5	4									
24	2941	8.8	53	9.0	9.0	3	19								
25	3020	8.8	52	9.5	9.5	2	15								
26	3062	8.8	52	10.2	8.0		12								
27	3105	8.9	50	11.0	8.0										
28	3169	8.9	60	11.4	8.0										
29	3233	9.0	58	12.0	9.0										
30	3279	9.0	62	12.0	9.0										
May 1	3415	8.8	57	12.0	9.0										
2	3726	8.8	55	16.4	8.0										
3	3850	8.8	58	15	8.0										
4	3850	8.8	48	15	8.0		8								

DAILY PROGRESS REPORT

8:00 AM

DATE	DEPTH	FOOTAGE	HRS.ON BOTTOM	BIT NO.	8;00AM WEATHER	REMARKS
Mar.26/73	15	15	4	1A	+10	Drill with air - rat hole
27	15	ream	10	1A&2A		Ream to 17½"
28	34	19	10	2A&3A	+8	Ran & cemented conductor. W.O.C.
29	34				+12	W.O.C. Headed up air drill equipment.
30	123	89	13½	3A&4A	+10 wdy.	Spudded noon March 29.
31	177	47	12	3A&5A	+15	Drill
Apr. 1	210	33	5¼	5A&6A	+5	Drill. Hole sloughing badly.
2	210			7A	+10	Change to mud. Losing circulation.
3	267	57	8	7A&8A	-5	Drill. No mud loss.
4	410	136	17½	8A	-10	Drill.
5	607	197	19½	8A	+5	Drill.
6	610	3	½	8A	+6	Ran 9-5/8" surface casing.
7	610				+5	Nippling up.
8	615	5	3/4	1	+12	Pressured up OK. Drill out.
9	794	179	17¼	2	+25	Drill with air.
10	1120	326	23¼	2	+26	Drill.
11	1471	351	23¼	2	+15 snow	Drill.
12	1876	405	23	2	+10 clr.	Drill.
13	2208	332	18½	2&3	+15 clr.	Drill.
14	2242	34	12½	3&4	-10 clr.	Hole slough, water in hole. Reaming.
15	2242	0	0	RR5	-10 clr.	Unable to fill hole w/water, mixed mud w/lost circulation material, got returns.

Pipe Correction -32'.

DAILY PROGRESS REPORT Cont'd.

8:00 AM

DATE	DEPTH	FOOTAGE	HRS, ON BOTTOM	BIT NO.	8:00AM WEATHER	REMARKS
Apr. 16/73	2326	84	11½	RR5	0 clr.	Clean out 8 hrs. - drill with mud.
17	2434	108	12-3/4	RR6	-5 clr.	Laid down air rotary bed.
18	2513	79	21¼	RR6	0 clr.	Change to salt mud.
19	2634	121	22½	7	+5 wdy.	Drill.
20	2704	70	20	7	+18 wdy.	Drill - prepare to run casing.
21	2704				+10 cldy.	Ran 7" casing. W.O.C.
22	2745	41	4	8	+20 wdy.	Test B.O.P.'s, drill.
23	2876	131	21-3/4	8	+10 cldy.	Drill.
24	2941	65	18-3/4	8&9	+5	Drill. Pipe correction 7'.
25	3020	79	15	9&D1	-2 clr.	Drill and core.
26	3062	42	11-3/4	D2	+4 wdy.	Core, DST #1.
27	3105	43	12½	D2	+12 wdy.	Core.
28	3169	64	15½	D2	+28 fgy.	Core.
29	3233	64	5-3/4	D2	+18	Core, DST #2 = misrun.
30	3279	46	3-3/4	10RR	+30 clr.	Drill.
May 1	3415	136	21½	10RR	+32 clr.	Drill.
2	3726	311	23¼	11	+25 clr.	Drill.
3	3850	124	8	11	+30	Waiting on parts for logger.
4	3850					Logging.
5	3850					Ran DST #4.
6	3850					Ran DST #4 and #5.
7						Ran abandonment plugs.
						Rig released 8:00 AM, May 7th, 1973.

DEVIATION RECORD

DEPTH	DEVIATION (DEGREES)
80	¼
146	0
224	1-3/4
295	2
390	2
490	2
605	2¼
695	2
910	1-3/4
1200	1
1500	3/4
1798	¼
2110	¼
2320	2
2350	1-3/4
2420	2¼
2643	1½
2700	1-7/8
2815	2
2930	2
3018	1
3850	6-7/8

DRILL STEM TESTS

TEST #1

Date	April 26th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3002 - 62	
Flow Periods	Preflow	15 mins.
	Initial Shut-In	60 mins.
	Flow	90 mins.
	Final Shut-In	90 mins.
Pressures	IHP 1550	
	FHP 1370	
	Preflow	
	IFP 50	
	FFP 50	
	ISIP 240	
	FSIP 60	
Recovery	40' drilling mud, slightly oil flecked & gas cut. Tool open - Fair air blow to faint in 3 minutes.	

TEST #2

Date	April 29th, 1973
Operator	C. Martineau - B.J. Services
Formation	Old Fort Sand
Interval	3186 - 3233
Misrun	Spline in Shut-In tool damaged

DRILL STEM TESTS Cont'd.

TEST #3

Date	April 29th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3186 - 3233	
Flow Periods	Preflow	5 mins.
	Initial Shut-In	60 mins.
	Flow	140 mins.
	Final Shut-In	120 mins.
Pressures	IHP 1500	
	FHP 1440	
	Preflow	
	IFP 310	
	FFP 990	
	ISIP 1040	
	FSIP 1040	
Recovery	2300' of water 40,000 ppm. NaCl.	
	Temp. cool - est. 50 deg. F - no therm.	

TEST #4

Date	May 5th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3207 - 3224	
Flow Periods	Preflow	5 mins.
	Initial Shut-In	120 mins.
	Flow	120 mins.
	Final Shut-In	140 mins.
Pressures	IHP 1550	
	FHP 1400	
	IFP 240	
	FFP 900	
	ISIP 1050	
	FSIP 1030	
B.H.T.	95 degrees F	
Recovery	2200' slightly gassy, salt water (45,000 ppm. NaCl) Upper 500' slightly oil flecked	

DRILL STEM TESTS Cont'd.

TEST #5

Date	May 6th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3253 - 78	
Flow Periods	Preflow	10 mins.
	Initial Shut-In	60 mins
	Flow	120 mins.
	Final Shut-In	120 mins.
Pressures	IHP	1590
	FHP	1450
	IFP	380
	FFP	1030
	ISIP	1110
	FSIP	1110
B.H.T.	95 degrees F	
Recovery	2200' salt water (45,000 ppm. NaCl.)	

ABANDONMENT PLUGS

PLUG #1

1st Stage - 3850 - 3250
Ran 150 sax oilwell cement. Displaced with 24 barrels drilling mud.

2nd Stage - 3250 - 2650
Ran 150 sax oilwell cement. Displaced with 18 barrels drilling mud.
Felt Plug at 11:00 PM, May 6th. Top at 2590.

Cut off casing. Placed 5 sax cement at top. Welded on plate and installed well sign.

Rig released 8:00 AM, May 7th, 1973.

confidential

~~23/11/90~~
21/12/90 eys

SHELL CANADA RESOURCES
CONTROLLED PYROLYSIS ANALYSES

WELL NAME AND LOCATION	DEPTH THK (FEET)	PYROLYSIS TEMP (C)	HYDROCARBON YIELD WT. PERCENT	DEPTH THK (METRES)
UNION ET AL MOBIL COLVILLE D-45	3098.0 0	0-50	0.000	944.27 0.0
300/D45 67-20 125-00/ 0		50-100	0.000	
		100-150	0.033	
		150-200	0.109	
		200-250	0.117	
		250-300	0.097	
		300-350	0.072	
		350-400	0.087	
		400-450	0.097	
		450-500	0.034	
		500-550	0.006	
		550-600	0.004	
		600-650	0.003	
		650-700	0.002	
		700-750	0.002	
		TOTAL YIELD	0.672	TOC (wt %) - 0.63

WELL NAME AND LOCATION	DEPTH THK (FEET)	PYROLYSIS TEMP (C)	HYDROCARBON YIELD WT. PERCENT	DEPTH THK (METRES)
UNION ET AL MOBIL COLVILLE D-45	3101.0 0	0-50	0.000	945.18 0.0
300/D45 67-20 125-00/ 0		50-100	0.000	
		100-150	0.000	
		150-200	0.007	
		200-250	0.023	
		250-300	0.020	
		300-350	0.007	
		350-400	0.007	
		400-450	0.013	
		450-500	0.013	
		500-550	0.002	
		550-600	0.001	
		600-650	0.001	
		650-700	0.001	
		700-750	0.002	
		TOTAL YIELD	0.103	TOC (wt %) - 0.36

SHELL CANADA RESOURCES
CONTROLLED PYROLYSIS ANALYSES

WELL NAME AND LOCATION	DEPTH THK (FEET)	PYROLYSIS TEMP (C)	HYDROCARBON YIELD WT. PERCENT	DEPTH THK (METRES)
UNION ET AL MOBIL COLVILLE D-45	3104.0 0	0-50	0.000	946.10 0.0
300/D45 67-20 125-00/ 0		50-100	0.000	
		100-150	0.000	
		150-200	0.000	
		200-250	0.000	
		250-300	0.000	
		300-350	0.000	
		350-400	0.000	
		400-450	0.001	
		450-500	0.001	
		500-550	0.001	
		550-600	0.001	
		600-650	0.001	
		650-700	0.001	
		700-750	0.001	
		TOTAL YIELD	0.007	TOC (wt %) - 0.10

WELL NAME AND LOCATION	DEPTH THK (FEET)	PYROLYSIS TEMP (C)	HYDROCARBON YIELD WT. PERCENT	DEPTH THK (METRES)
UNION ET AL MOBIL COLVILLE D-45	3112.0 0	0-50	0.000	948.54 0.0
300/D45 67-20 125-00/ 0		50-100	0.000	
		100-150	0.000	
		150-200	0.000	
		200-250	0.000	
		250-300	0.000	
		300-350	0.000	
		350-400	0.000	
		400-450	0.001	
		450-500	0.002	
		500-550	0.001	
		550-600	0.001	
		600-650	0.001	
		650-700	0.001	
		700-750	0.001	
		TOTAL YIELD	0.008	TOC (wt %) - 0.13

250-4-11

Indian and Northern Affairs / Affaires indiennes et du Nord

Box 2020
Inuvik, N. W. T.
XOE OTO

June 1, 1973

Your file Votre référence

Our file Notre référence

Dr. H. J. Berry
Chief Petroleum Engineer
Ottawa, Ontario

Dr. D. H. McLaren, Director
Institute of Sedimentary &
Petroleum Geology
Calgary, Alberta

Gentlemen:

RE: Union Mobil Colville D-45
D. A. 685 - 67-20-125-00

Enclosed is one copy each of DST #1, #3, #4 & #5.

Please sign the attached sheet acknowledging receipt.

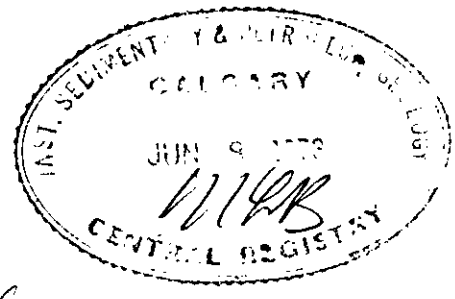
Yours truly,

John J. Kirk
Conservation Engineer

A. F. Halcrow
District Conservation Engineer
District 3

JJK/jt
Enclosure

cc: Mr. M. D. Thomas
Regional Conservation Engineer



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150-4-11

Indian and Northern Affairs / Affaires indiennes et du Nord

Box 2020
Inuvik, N. W. T.
XOE OTO

June 1, 1973

Your file *Votre référence*

Our file *Notre référence*

Dr. H. J. Berry
Chief Petroleum Engineer
Ottawa, Ontario

Dr. D. H. McLaren, Director
Institute of Sedimentary &
Petroleum Geology
Calgary, Alberta

Gentlemen:

RE: Union Mobil Colville D-45
Union Aklavik F-38

Enclosed is one copy of DST #2 for Union Mobil Colville D-45 and one copy of DST #1 for Union Aklavik F-38.

Please sign the attached sheet acknowledging receipt.

Yours very truly,

John J. Kirk
Conservation Engineer

(for) A. F. Halcrow
District Conservation Engineer
District 3

JJK/jt
Enclosure

cc: Mr. M. D. Thomas
Regional Conservation Engineer

1 Copy to Geos

Petro-Canada

1979-10-29

Dr. D. Stott,
Institute of Sedimentary and Petroleum Geology,
3303 - 33 Street N.W.,
CALGARY, Alberta
T2L 2A7

Dear Don:

Please find enclosed 22 samples which were analyzed for geochemical information. Twelve samples were examined in detail and therefore pulverized rock, paraffin-naphthene extract, aromatic extract, asphaltene extract and N.S.O. extract are included for these samples. Only five of the extraction thimbles were returned to Petro-Canada from the analytical laboratory and they are included.

The wells examined and sampled intervals are as follows:

Tedji K-24	3760-3850
	3860-3980
Colville E-15	5018-5200
	5200-5400
	5400-5600
	5600-5700
	5700-5850
	5850-5996
Belot Hills M-63	3480-3700
	3710-3850
	3860-4050
	4060-4400
Colville Lake D-45	3270-3430
	3440-3620
	3630-3850
Maunoir M-48	1660-2830
Iroquois D-40	7710-7850
	7860-7990
	8000-8100
	8100-8300
	8310-8500

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Whitefish H-34 5411-5428

Also, enclosed are the technical memoranda on the proterozoic samples and a copy of the presentation on the "Cambrian Hydrocarbon Potential of the Northern Interior Plains".

Yours truly,

D. G. Wilson,
Regional Geologist,
Frontier Division.

DGW:bv

Encls.

Petro-Canada

CC:

SUBJECT: GEOCHEMISTRY OF PRECAMBRIAN SAMPLES FROM SELECTED NORTHWEST TERRITORIES WELLS

Twenty-two Precambrian samples from seven Northwest Territories wells will and have been subjected to various geochemical analyses. The wells in question are: Tedji K-24, Colville E-15, Belot Hills M-63, Colville D-45, Maunoir M-48, Iroquois D-40 and Whitefish H-34. To date, total organic carbon (T.O.C.) data and dispersed organic material (D.O.M.) data are available. The former data is from Geochem Laboratories (Canada) Ltd. and the latter is from our own laboratory. The attached chart summarizes the data, but it should be noted that the samples are of Precambrian age. At that time in the geologic past, land plants had not evolved and therefore the commonly used D.O.M. terminology is inappropriate. Abbreviations found in the chart are as follows: V = very, Lt = light, Dk = dark, yel = yellow, brn = brown, blk = black, Am = amorphous, str = structured, mem = membranous, f = fine, med = medium and crs = coarse.

To interpret the data, certain criteria can be followed. T.O.C. values greater than 0.5 are normally considered necessary in order to predict liquid hydrocarbon occurences but in this situation values between 0.1 and 0.5 are probably compatible with gas occurrences if maturation is approaching the optimum. D.O.M. data provides us with maturation and richness indicators. Yellow colors and light browns are compatible with liquid hydrocarbons while browns and blacks are found in the mature gas zones. Amorphous material is oil prone to the greatest degree while membranous and structured materials to lesser degrees, all dependant on maturation. All will produce gas.

WELL & DEPTH (feet)	T.O.C. (%)	D.O.M. ANALYSES Amount	Color	Types	Size	Preservation	Comments
K-24, 3760	0.42	Thin	Lt.yel-brn	40% v. fine Am; 60% Str	f-med	poor-fair	
3860	0.37	Normal	Lt.brn-brn	80% Am; 20% Str	med-f	fair	lumpy Am
E-15, 5018	0.13	Abundant	Brn-dk.brn	10% Am; 90% Str&Mem	med-crs	poor	consistent color
5200	0.01	Abundant	Brn-dk.brn	50% Am; 50% Str&Mem	med-crs	poor	dull hues
5400	0.01	Abundant	Brn-dk.brn	10% Am; 90% Str&Mem	med-crs	fair	consistent color
5600	0.01	Abundant	Brn-dk.brn	50% Am; 50% Str&Mem	f-med	fair-poor	rare spores?
5700	0.00	V. Thin	Dk.brn-blk	100% Str	f	poor	
5850	0.01	Thin	Dk.brn-blk	80% Am; 20% Str	med	poor	Am is fine
M-63, 3480	0.01	Thin	Yel-Lt.brn	50% Am; 50% Str	f-med	fair	rare spores?
3710	0.00	V. Thin	Yel-Lt.brn	50% Am; 50% Str	f-med	fair	bright colors
3860	0.53	Normal	Brn	30% Am; 70% Str	fine	poor	
4060	1.10	Abundant	Brn-dk.brn	30% Am; 70% Str	f-crs	poor	degraded O.M.
D-45, 3270	0.25	Thin	Lt.yel-brn	40% Am; 60% Str	med-f	fair-good	spores
3440	0.16	Abundant	Yel-brn	20% Am; 80% Str&Mem	med-crs	poor	spores
3630	0.13	Abundant	Yel-Lt.brn	60% Am; 40% Mem&Str	f-med	fair	spores
M-48, 2660	0.11	Thin	Dk.yel-brn	50% Am; 50% Mem	f	poor	lumpy Am
D-40, 7710	0.12	Normal	Lt. brn	20% Am; 80% Str&Mem	med-crs	poor	rare spores
7860	0.13	Thin	Dk.brn-blk	20% Am; 80% Mem	f-med	poor	dull hues
8000	0.00	V. Thin	Dk.brn	5% Am; 95% Mem	med-f	poor	fungal, dull
8100	0.12	Thin	Brn-dk.brn	20% Am; 80% Mem&Str	f	poor	
8310	0.13	Thin	Dk.brn	50% Mem; 50% Str	f-med	poor	
H-34, 5411	0.17	Abundant	Lt.yel-blk	60% Str&Mem, 40% Str	f-crs	good	contamination

The individual wells are interpreted as follows:

Tedji K-24:	low T.O.C. values, mature colors, reasonable Am material. Therefore, gas prone, with minor potential for oil because of maturation state and favourable D.O.M.
Colville E-15:	very low T.O.C. values, over mature colors, mediocre D.O.M. Therefore, gas in minor quantities if at all.
Belot Hills M-63:	good T.O.C. in deeper part of well, mature colors, fair D.O.M. Therefore, oil potential around 3900' and good gas potential.
Colville D-45:	low T.O.C. values, mature colors, fair to good D.O.M. Therefore, gas prone, with minor oil potential because of maturation and favourable D.O.M.
Maunoir M-48:	low T.O.C., mature, reasonable D.O.M. type. Therefore, gas, minor oil potential.
Iroquois D-40:	low T.O.C., over mature, poorer D.O.M. type. Therefore, gas in minor quantities if at all.
Whitefish H-34:	low T.O.C., but sample appears strongly contaminated. Therefore, no comment.

To summarize, T.O.C. values are generally low and this is often confirmed by the D.O.M. analyses. For this reason it becomes difficult to envision large liquid hydrocarbon deposits. Gas occurrences have more potential because of ease of migration from much larger volumes. Maturation in all wells is not excessive for gas occurrences. D.O.M. type tends to be rather favourable because at that age only primitive algae plants had evolved.

Petro-Canada

T CC:

SUBJECT: Additional Geochemistry for Selected Precambrian Samples from Various Northwest Territories Wells

A preliminary memorandum dated May 4, 1979, discussed total organic carbon and dispersed organic material analyses. This report will discuss extraction, composition of the extract, C_{15+} paraffin distribution and the C_{15+} chromatograms for 12 of the original 22 samples examined. With the new information the specific sample interpretations can be re-evaluated and therefore revised well interpretations can be provided. Tables I and II contain the raw data upon which the more comprehensive interpretations can be made. The Appendix contains the 12 chromatograms and the organic carbon-dispersed organic material analyses from the preliminary report.

Total extracts range from fair to very good, total hydrocarbons range from fair to excellent. Percent hydrocarbon and HC/Non-HC ratios indicate marginally mature, mature and stained (containing excessive HC's) samples. The hydrocarbon to total organic carbon percent and percent relative "lights" (using $\Sigma \leq C_{24}$/total paraffins x 100%) are as follows:

Well and Depth	GeoC. #	HC/T.O.C.% (ppm/(%x100)	Relative "lights" ($\Sigma \leq C_{24}$/Total)
K-24, 3760	1	424/100/.42 = 10.0%, excellent	86%
3860	2	356/100/.37 = 9.6%, excellent	92%
E-15, 5018	3	661/100/.13 = 50.8%, stain	84%
5850	8	158/100/.01 =158.0%, stain	87%
M-63, 3860	11	641/100/.53 = 12.1%, excellent	93%
4060	12	728/100/1.1 = 6.6%, excellent	95%
D-45, 3270	13	805/100/.25 = 32.2%, stain	95%
3630	15	478/100/.13 = 36.8%, stain	98%
M-48, 2260	16	346/100/.11 = 31.5%, stain	98%
D-40, 7710	17	287/100/.12 = 23.9%, stain-excellent	99%
8310	21	444/100/.13 = 34.2%, stain	99%
H-34, 5411	22	116/100/.17 = 6.8%, excellent	98%

.../2

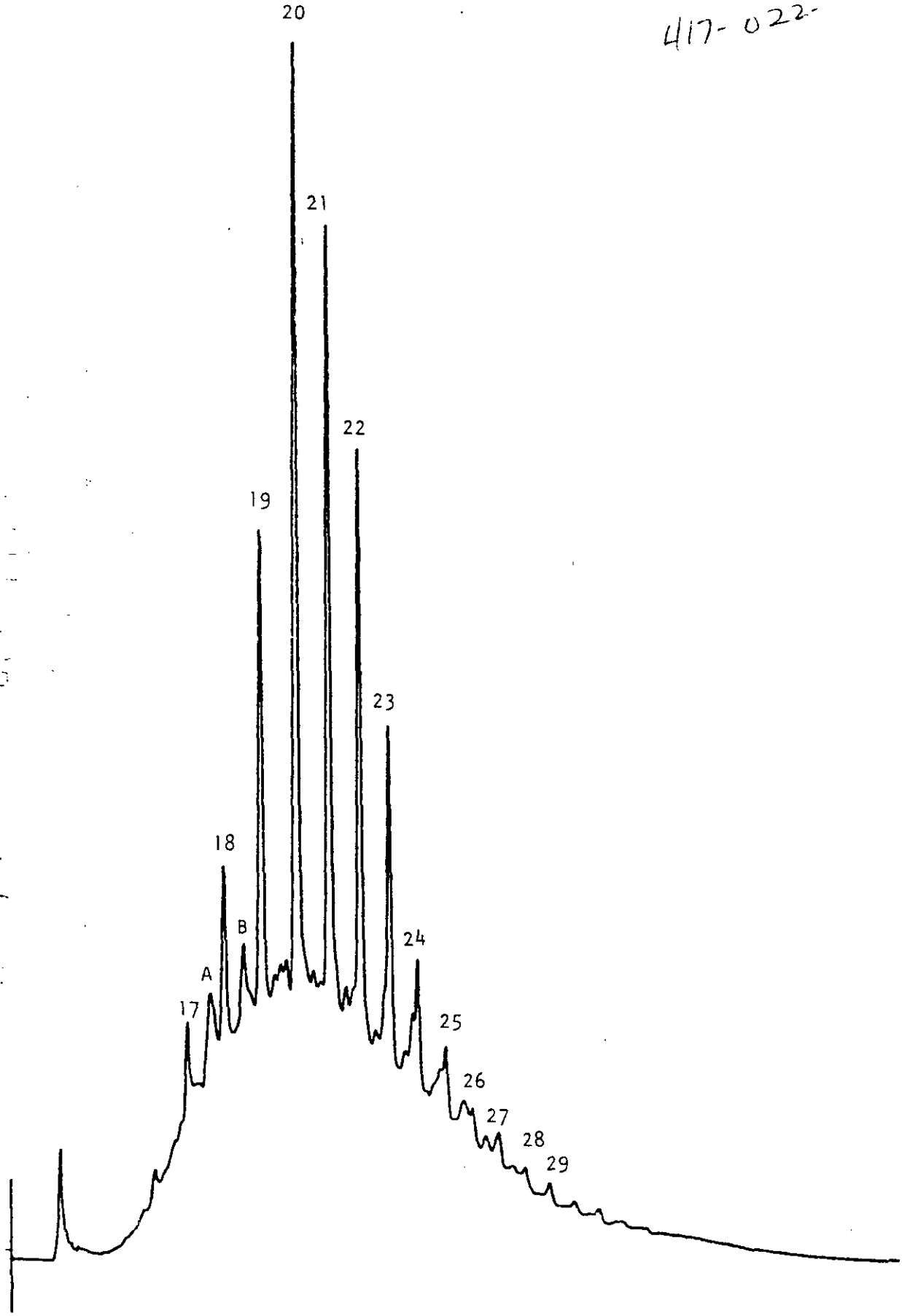
WELL & DEPTH (feet)	T.O.C. (%)	D.O.M. ANALYSES Amount	Color	Types	Size	Preservation	Comments
K-24, 3760	0.42	Thin	Lt.yel-brn	40% v. fine Am; 60% Str	f-med	poor-fair	
3860	0.37	Normal	Lt.brn-brn	80% Am; 20% Str	med-f	fair	lumpy Am
E-15, 5018	0.13	Abundant	Brn-dk.brn	10% Am; 90% Str&Mem	med-crs	poor	consistent color
5200	0.01	Abundant	Brn-dk.brn	50% Am; 50% Str&Mem	med-crs	poor	dull hues
5400	0.01	Abundant	Brn-dk.brn	10% Am; 90% Str&Mem	med-crs	fair	consistent color
5600	0.01	Abundant	Brn-dk.brn	50% Am; 50% Str&Mem	f-med	fair-poor	rare spores?
5700	0.00	V. Thin	Dk.brn-blk	100% Str	f	poor	
5850	0.01	Thin	Dk.brn-blk	80% Am; 20% Str	med	poor	Am is fine
M-63, 3480	0.01	Thin	Yel-Lt.brn	50% Am; 50% Str	f-med	fair	rare spores?
3710	0.00	V. Thin	Yel-Lt.brn	50% Am; 50% Str	f-med	fair	bright colors
3860	0.53	Normal	Brn	30% Am; 70% Str	fine	poor	
4060	1.10	Abundant	Brn-dk.brn	30% Am; 70% Str	f-crs	poor	degraded O.M.
D-45, 3270	0.25	Thin	Lt.yel-brn	40% Am; 60% Str	med-f	fair-good	spores
3440	0.16	Abundant	Yel-brn	20% Am; 80% Str&Mem	med-crs	poor	spores
3630	0.13	Abundant	Yel-Lt.brn	60% Am; 40% Mem&Str	f-med	fair	spores
M-48, 2660	0.11	Thin	Dk.yel-brn	50% Am; 50% Mem	f	poor	lumpy Am
D-40, 7710	0.12	Normal	Lt. brn	20% Am; 80% Str&Mem	med-crs	poor	rare spores
7860	0.13	Thin	Dk.brn-blk	20% Am; 80% Mem	f-med	poor	dull hues
8000	0.00	V. Thin	Dk.brn	5% Am; 95% Mem	med-f	poor	fungal, dull
8100	0.12	Thin	Brn-dk.brn	20% Am; 80% Mem&Str	f	poor	
8310	0.13	Thin	Dk.brn	50% Mem; 50% Str	f-med	poor	
H-34, 5411	0.17	Abundant	Lt.yel-blk	60% Str&Mem, 40% Str	f-crs	good	contamination

TOTAL ORGANIC CARBON ANALYSES

GeoChem Sample Number	Interval		Total Organic Carbon (% of Rock)	
C417-001	3760-3850	Tedji K-24	0.42	*
C417-002	3860-3980		0.37	*
C417-003	5018-5200		0.13	*
C417-004	5200-5400	Colville E-15	0.01	
C417-005	5400-5600		0.01	
C417-006	5600-5700		0.01	
C417-007	5700-5850		0.00	
C417-008	5850-5996		0.01	*
C417-009	3480-3700		0.01	
C417-010	3710-3850	Delet Hills Mbs	0.00, 0.00 R	
C417-011	3860-4050		0.53	*
C417-012	4060-4400		1.10	*
C417-013	3270-3430		0.25	*
C417-014	3440-3620	Colville D-45	0.16	
C417-015	3630-3850		0.13	*
C417-016	2660-2830	Maunoir M-48	0.11	*
C417-017	7710-7850		0.12	*
C417-018	7860-7990		0.13	
C417-019	8000-8700	Iroquois D-40	0.00	
C417-020	8100-8300		0.11, 0.13 R	
C417-021	8310-8500		0.13	*
C417-022	5411-5428	Whitefish H-34	0.17	*

Note: * = samples to continue with.

417-022-



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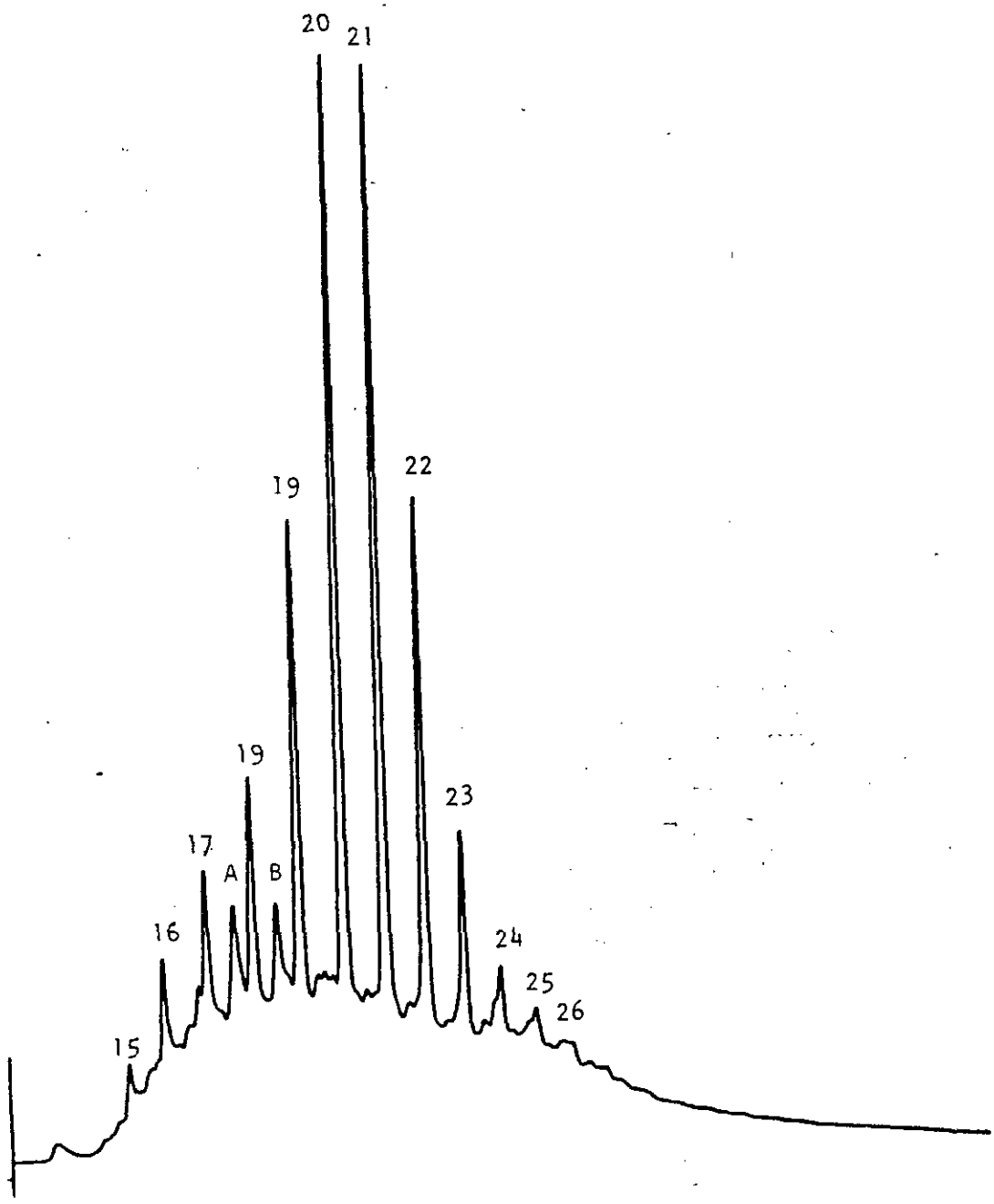

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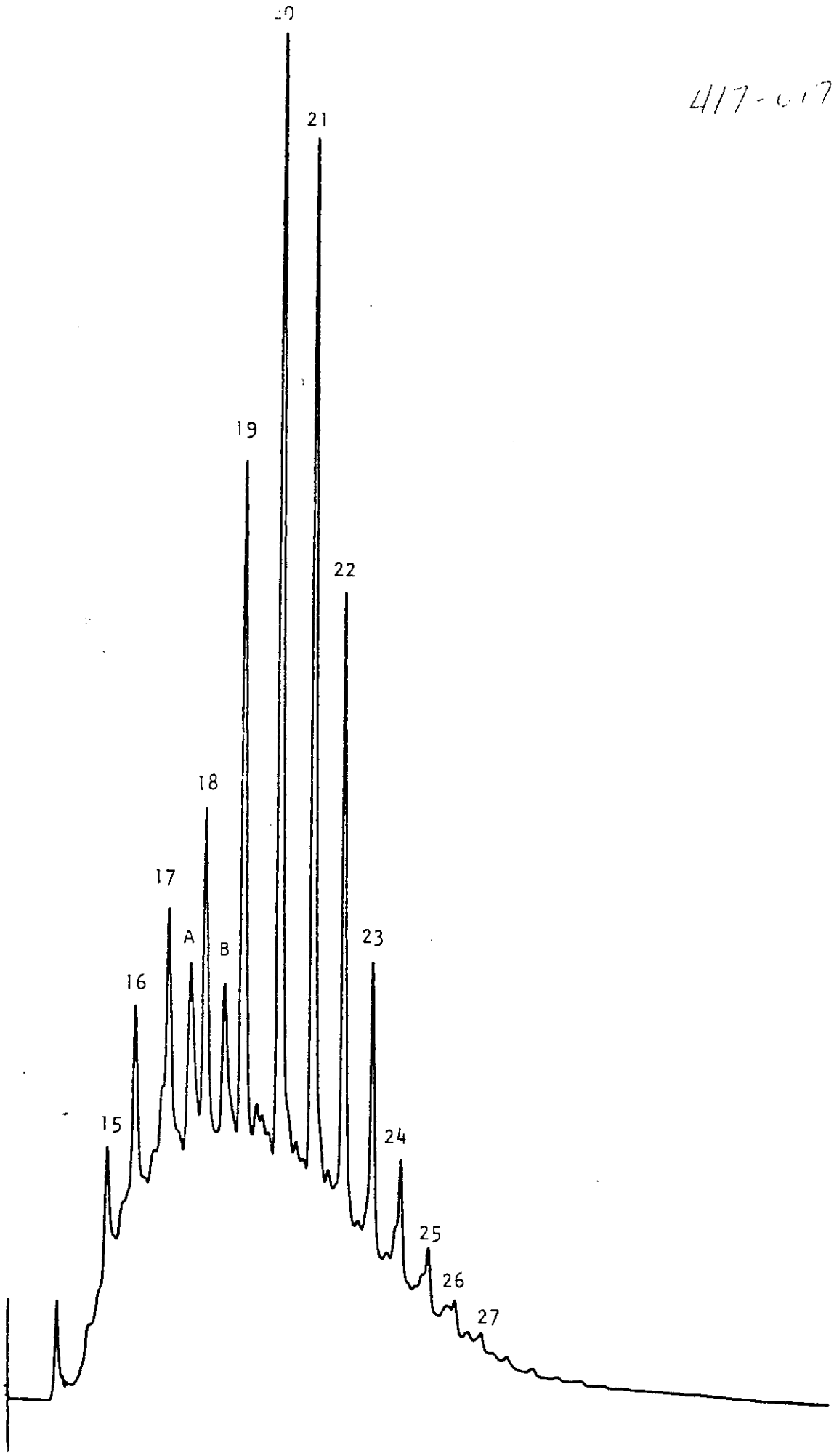

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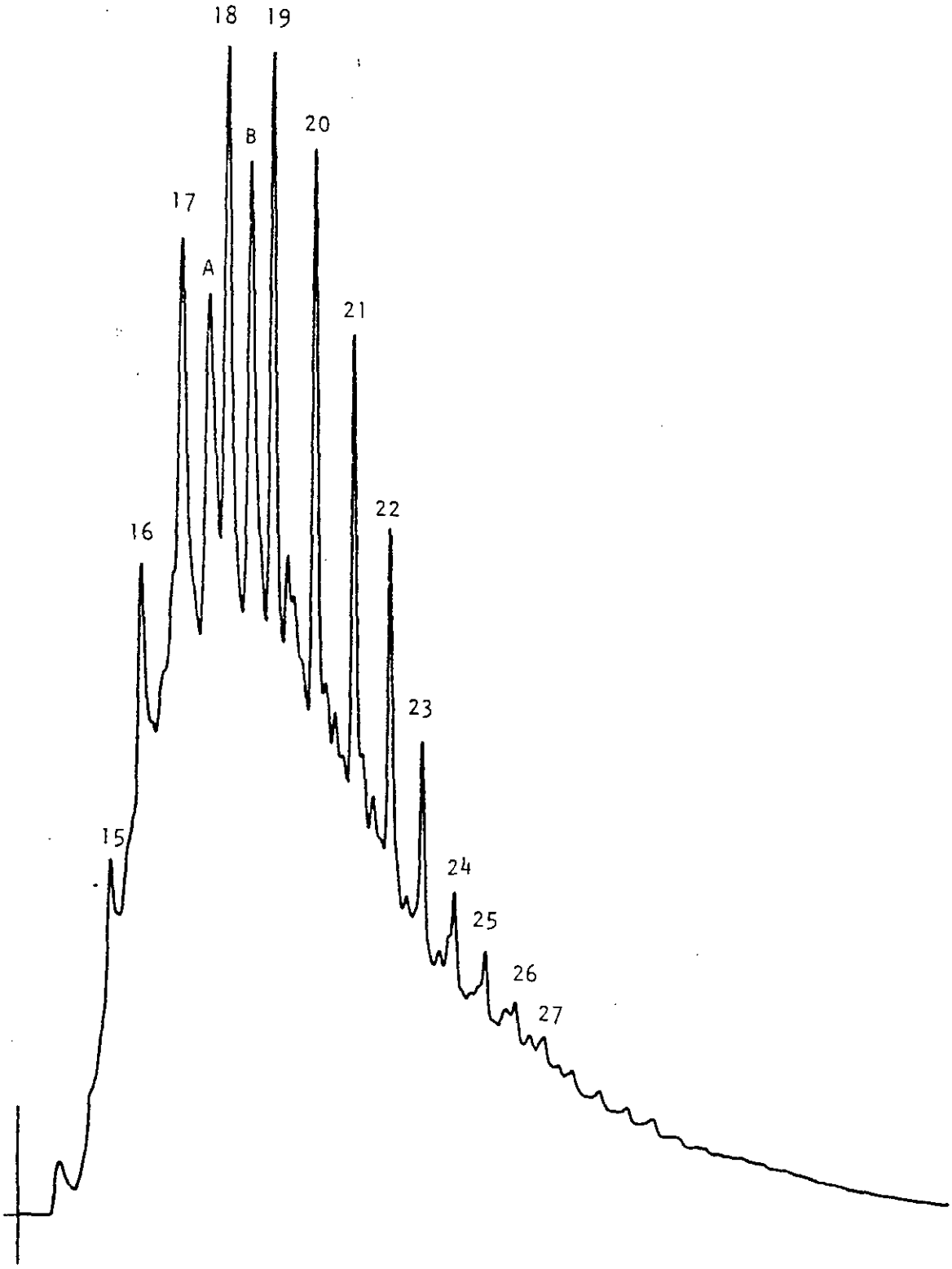

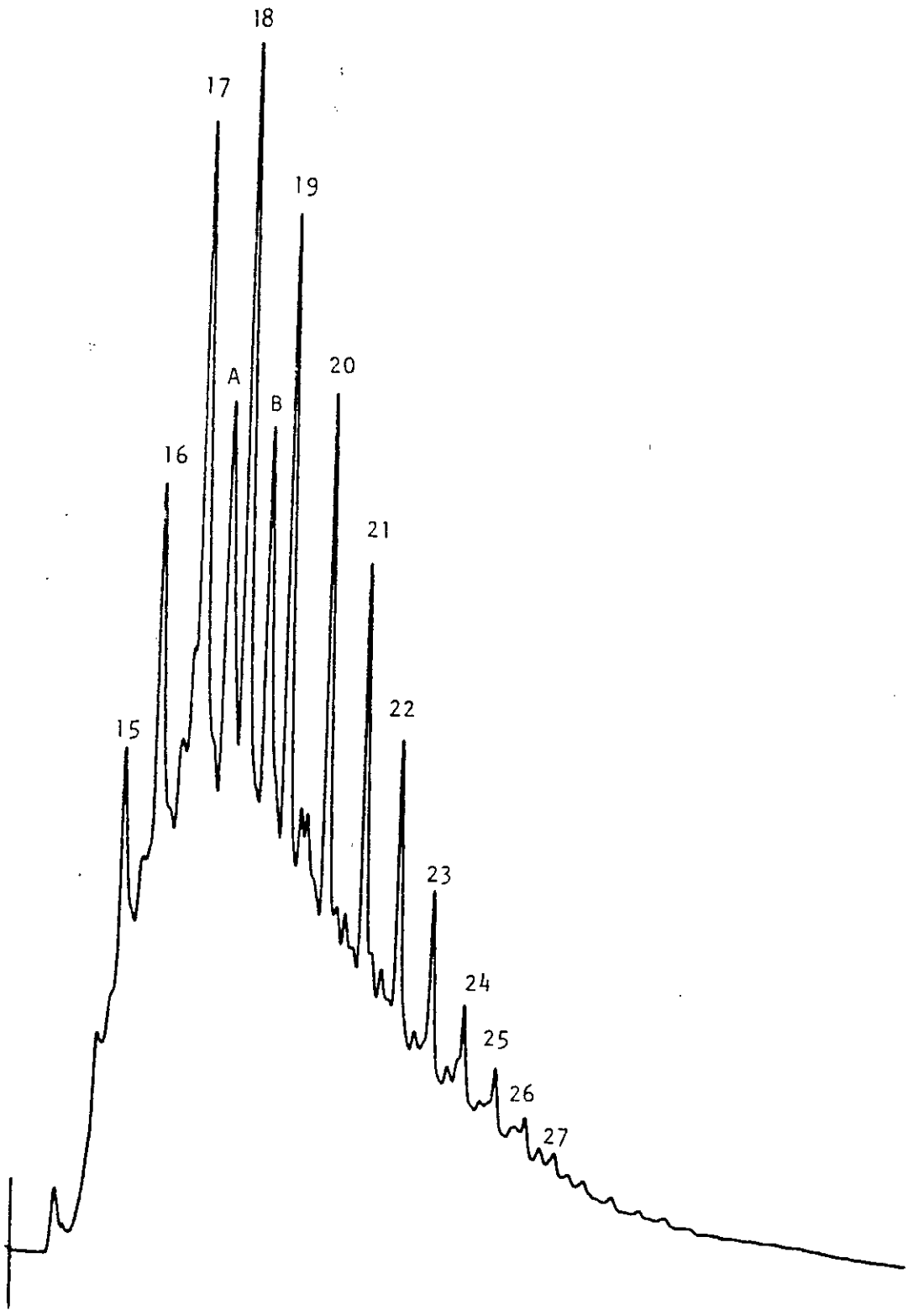
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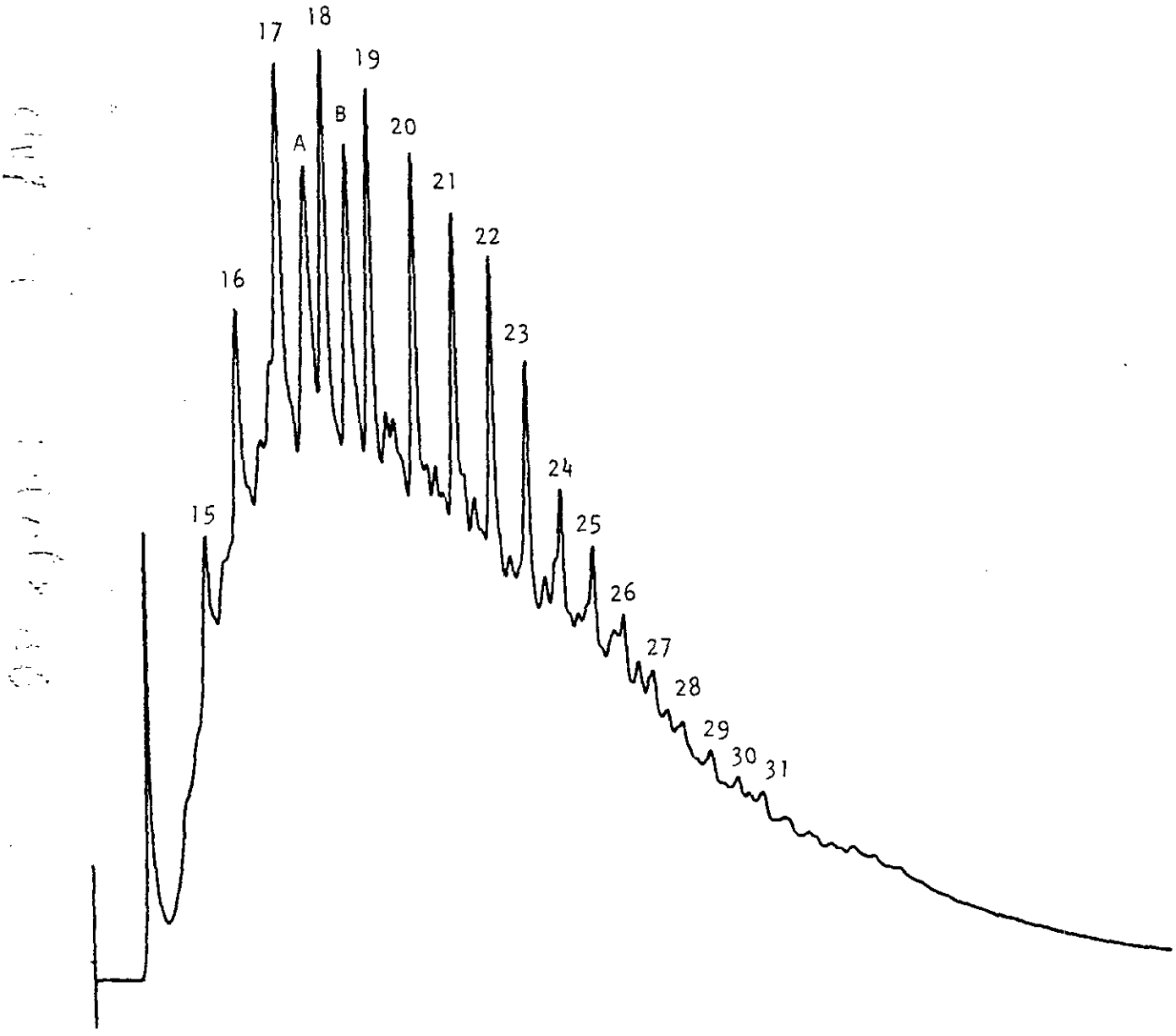

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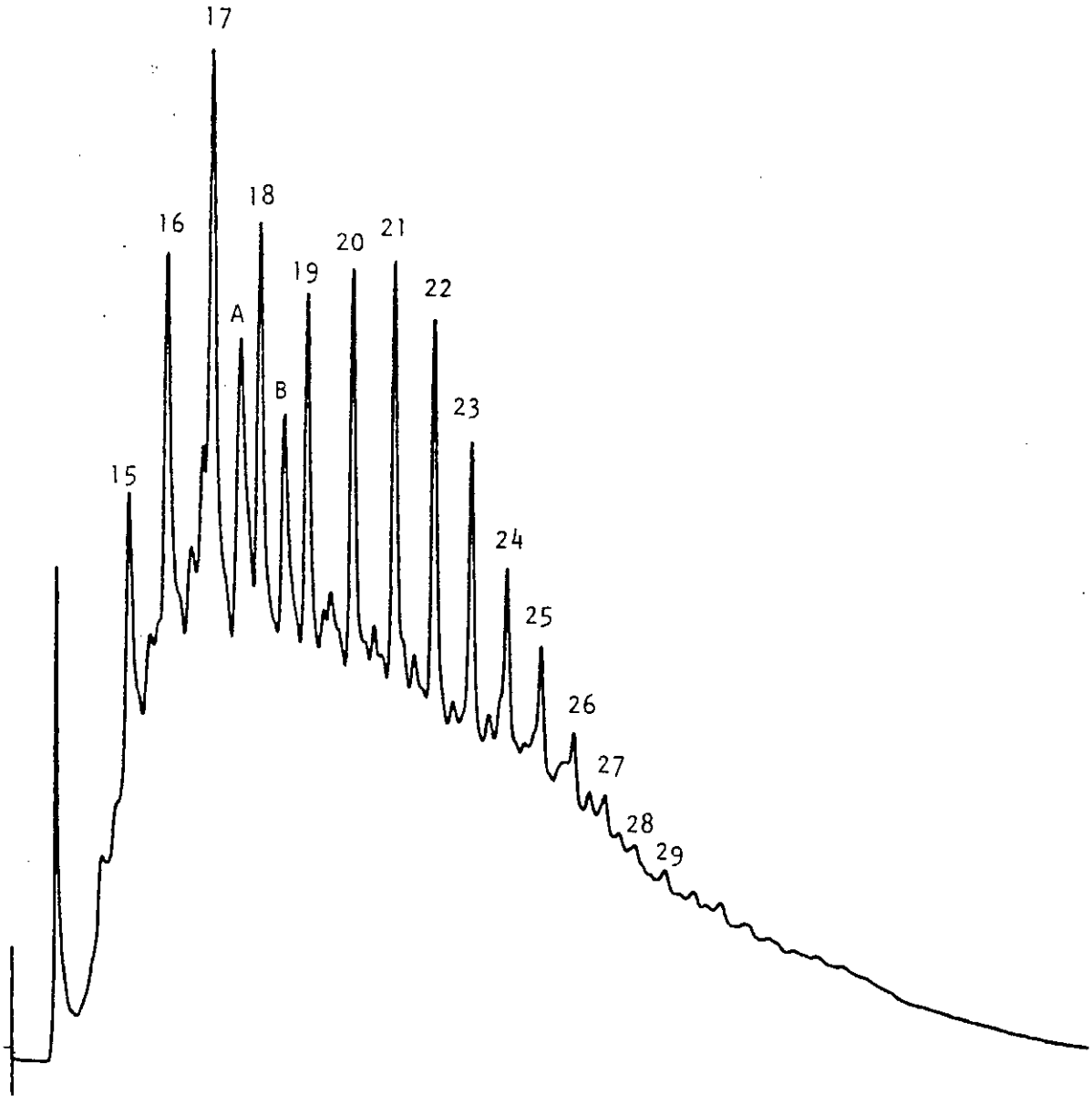

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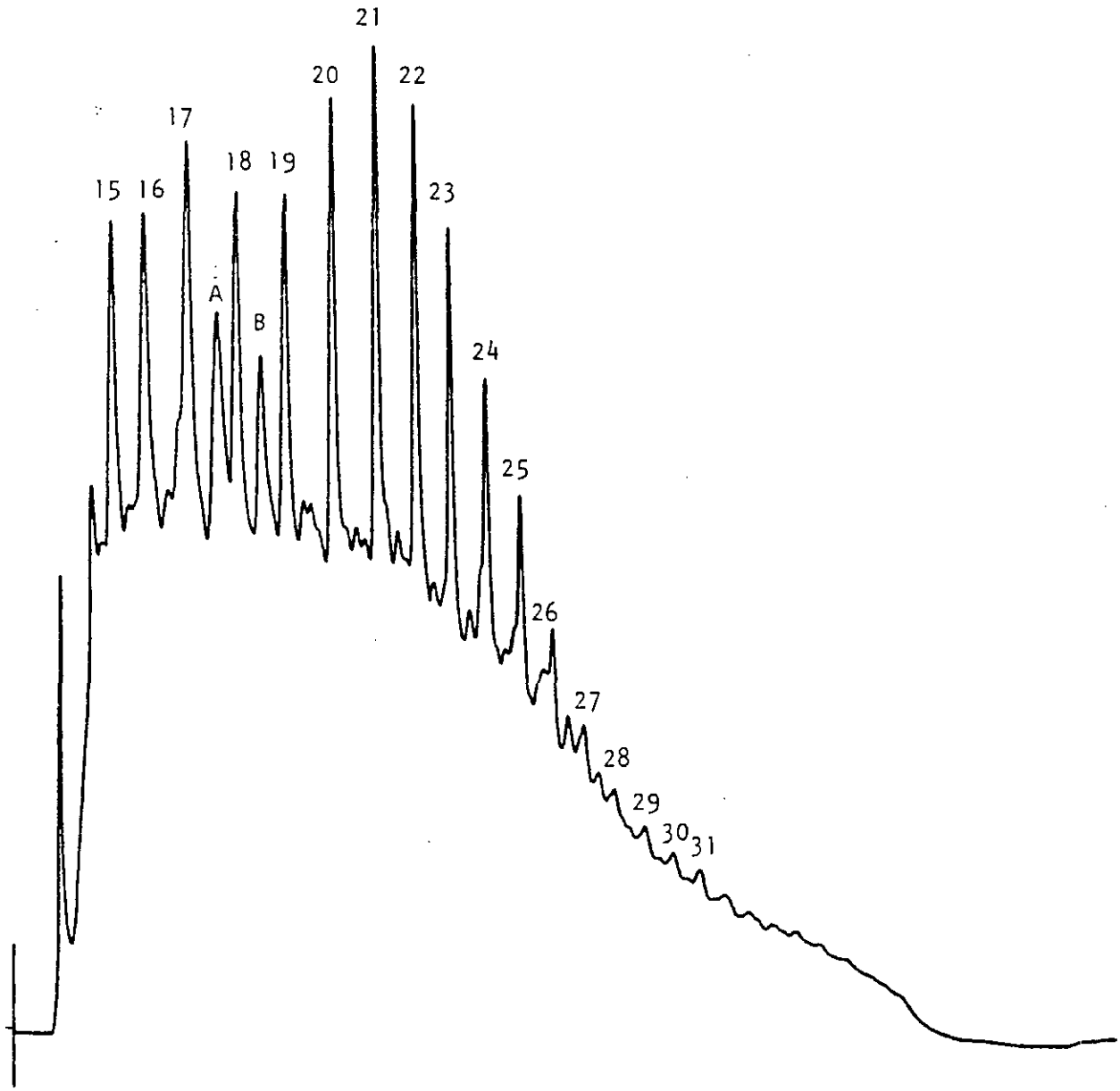

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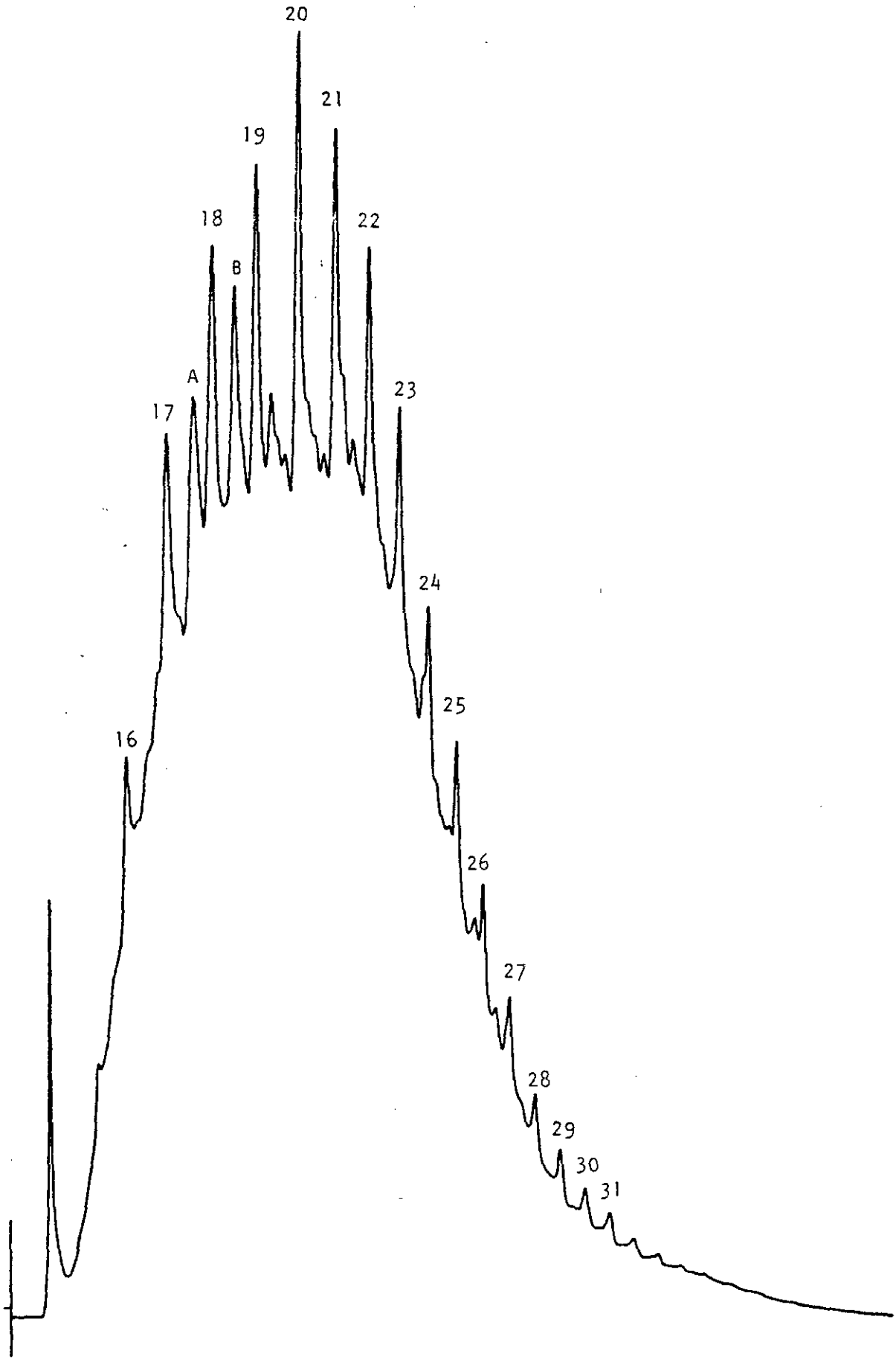

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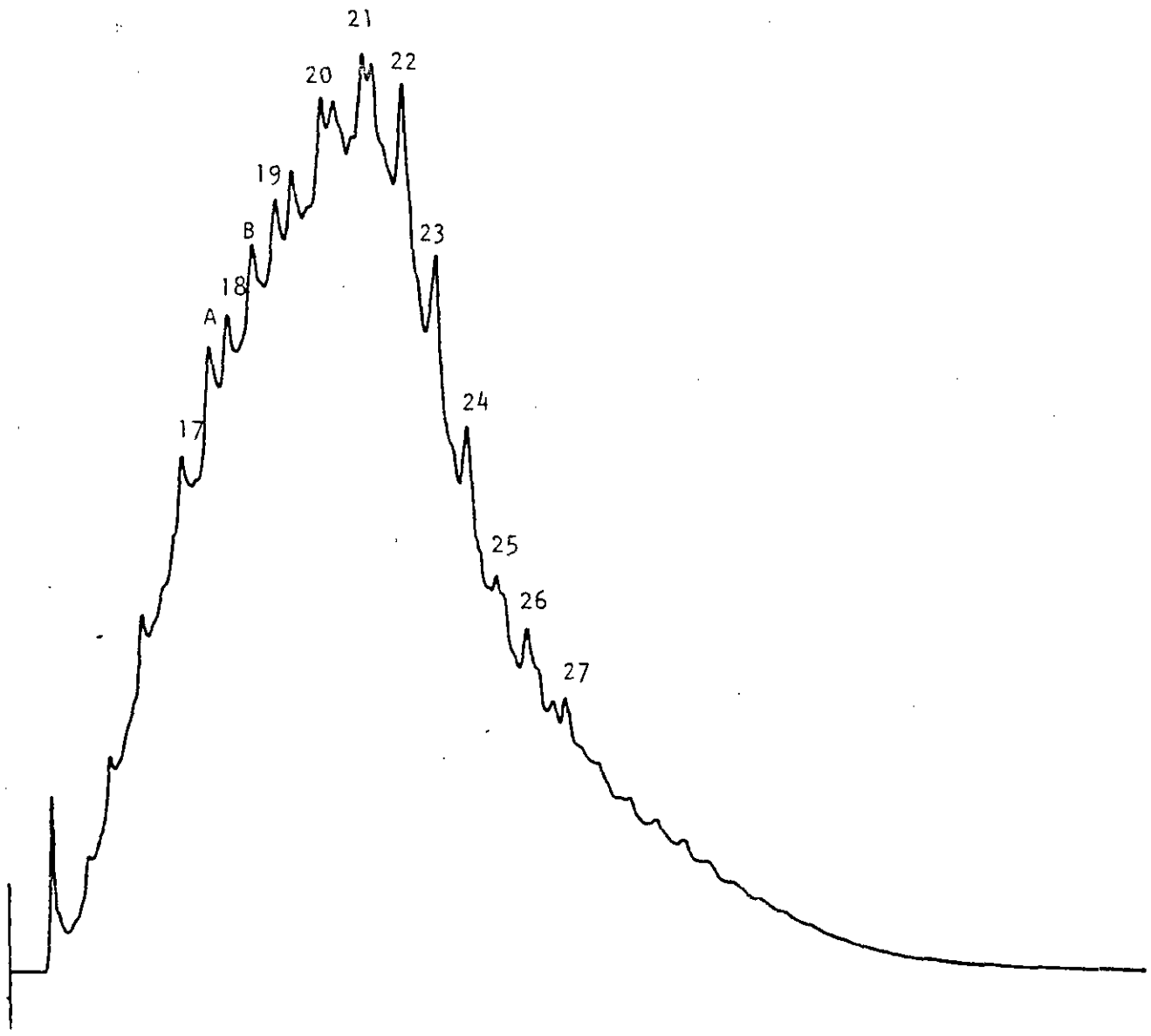

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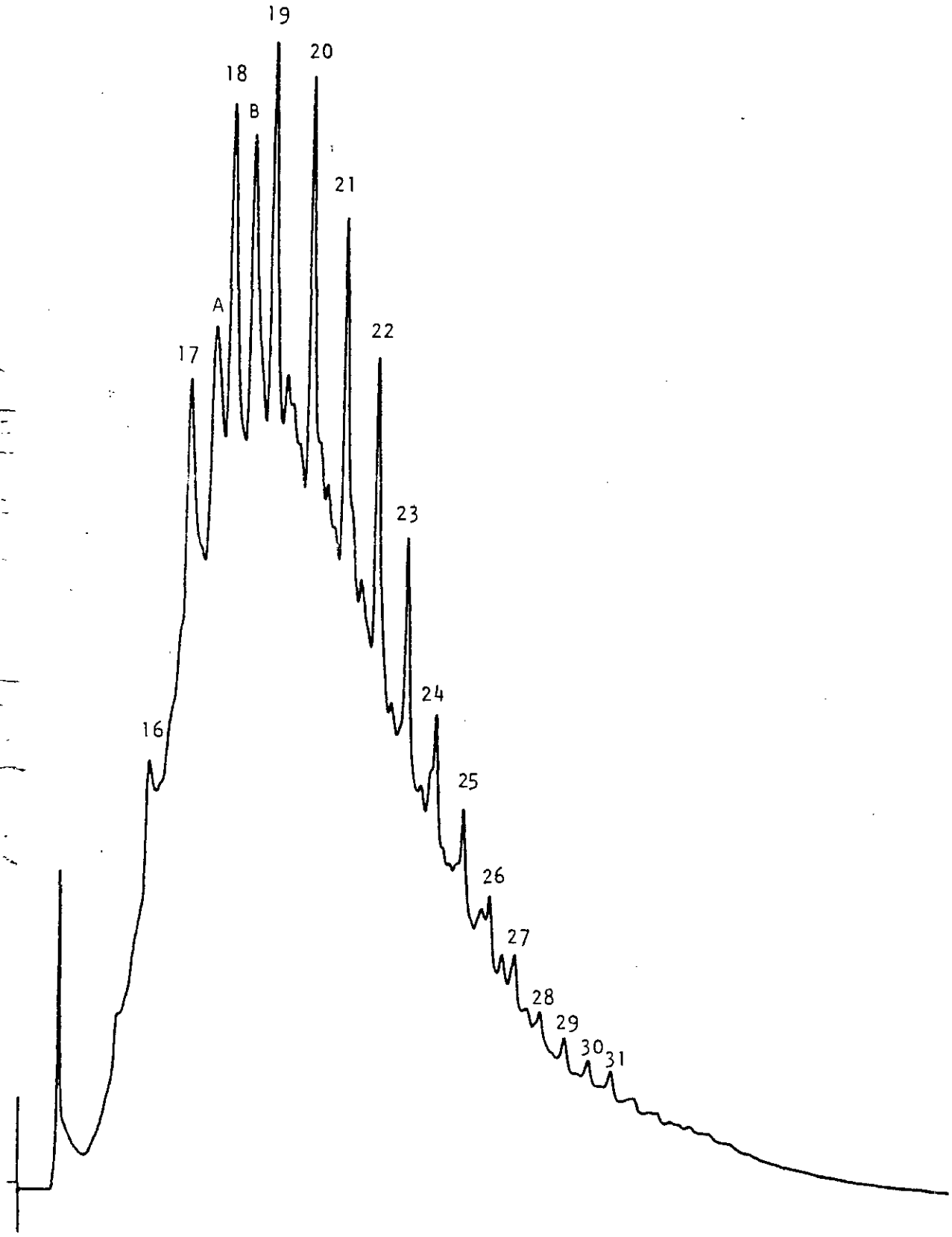

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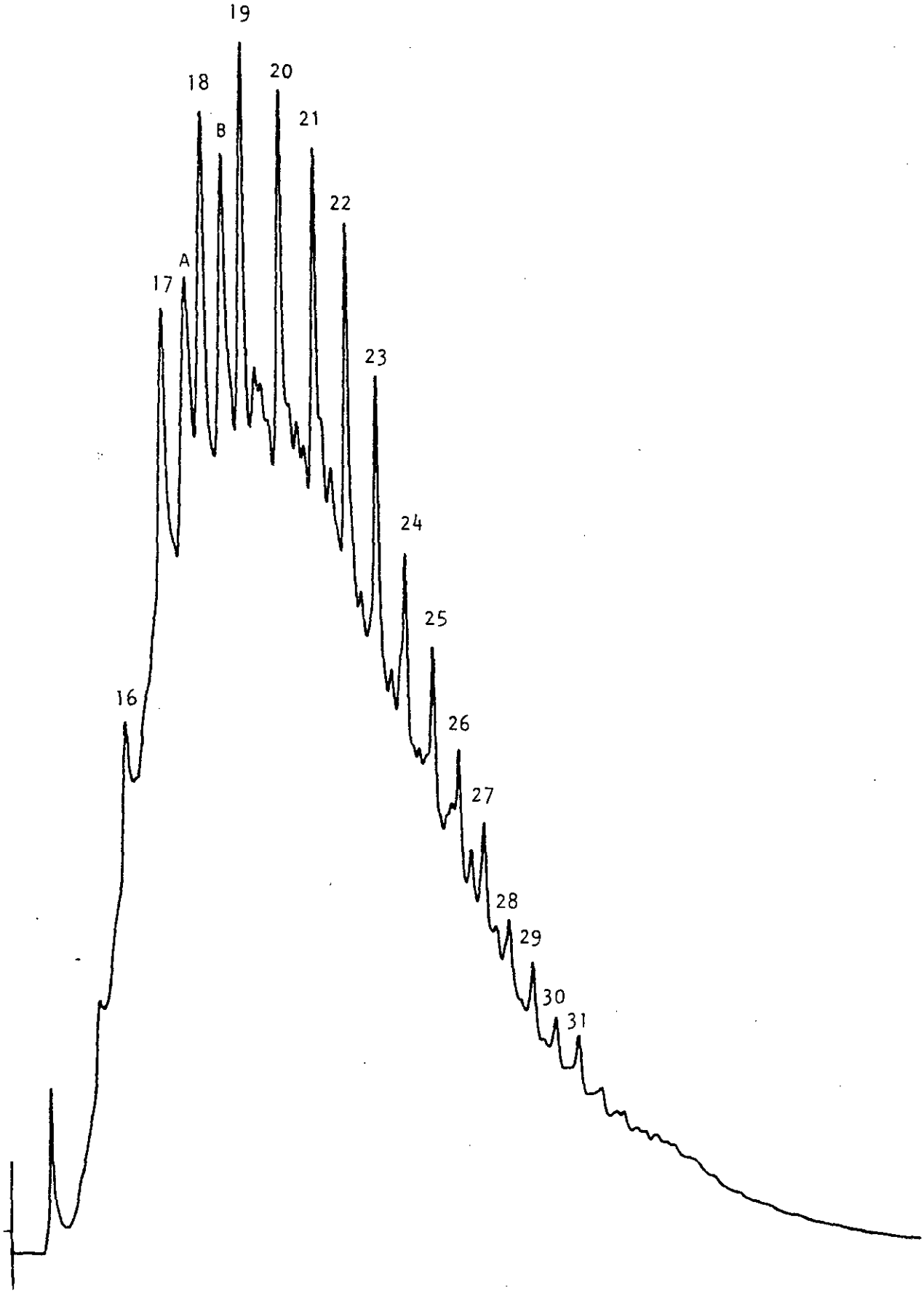


APPENDIX

The hydrocarbon to total organic carbon suggests excellent generation and stain, indicating very good source and migrated hydrocarbons. The paraffin distribution shows a distinctive enrichment in light C_{15+} components indicating mature samples and/or algal marine source material. The C.P. index confirms the maturation level and high naphthene contents also agree with the algal marine source, as suggested.

The revised well interpretations are based on all of the available data to date. Some changes from the original report will be noted.

Tedji, K24: Mature to slightly over-mature, excellent generation from in situ organic source material, low T.O.C. Therefore, if we have a large volume of source rock, liquid hydrocarbon should accumulate. Significant gas could accompany.

Colville, E-15; Over-mature, stain, very low T.O.C., therefore the liquids have probably migrated into the samples examined. There is some indication of associated evaporites. The samples would be considered very poor source rocks, slightly more marine.

Belot Hills, M-63: Mature to slightly over-mature, excellent generation from in situ organic source material, and there is good T.O.C. which appears mainly marine. The source rocks have good oil generating potential and would be expected to have excellent gas association.

Colville, D-45: Mature (immature?), stain, low T.O.C., therefore it appears a mature oil has migrated into slightly immature rocks. There is some non-marine influence in the lower sample. Some gas potential is present.

Maunoir, M-48: Mature to slightly over-mature, possible staining, low T.O.C., therefore if we have a large volume of source rock, liquid hydrocarbons could accumulate. Could have significant gas.

Iroquois, D-40: Over-mature, lower hydrocarbon content, very low T.O.C., some possibility of staining in lower sample, therefore there is some gas potential from non-marine-like source material.

Whitefish, H-34: Suggested contamination, but possibly mature, only fair generation and low T.O.C., therefore some gas potential is present.

In conclusion, Belot Hills area appears the most promising while Tedji is not far behind. Iroquois suggests the most non-marine example. Oil accumulations are possible because of the very favourable D.O.M. types in the first two mentioned wells. Gas accumulations are more likely because of the generally low total organic carbon values and mature to over-mature regimes in the general area.

Paul R. Gunther

P.Gunther

PG:wm

SATURATE HYDROCARBON ANALYSES

NORMALIZED PARAFFIN DISTRIBUTION

Sample Interval	C417-001 3760-3850	C417-002 3860-3980	C417-003 5018-5200	C417-008 5850-5996	C417-011 3860-4050	C417-012 4060-4400	C417-013 3270-3430	C417-015 3630-3850	C417-016 2660-2830	C417-017 7[illegible]0-7850	C417-021 8310-8500	C417-022 5411-5428
nC15	0.0	0.0	0.0	0.0	7.7	5.2	2.8	4.0	1.5	1.9	0.9	0.0
nC16	1.8	1.2	0.0	2.8	7.2	9.0	5.8	7.4	4.2	3.6	2.5	0.0
nC17	7.2	6.2	5.0	7.2	7.0	11.0	9.7	9.6	8.5	3.7	3.5	1.9
ip-C19	4.9	4.1	7.9	5.2	4.1	6.5	7.4	7.8	6.4	3.2	2.4	1.3
nC18	9.9	12.2	6.9	10.3	7.2	9.4	11.1	15.9	12.7	6.3	5.8	4.8
ip-C20	14.1	10.8	6.9	8.3	4.3	5.6	9.7	8.4	11.6	3.1	1.9	1.3
nC19	11.7	14.0	6.9	11.8	8.4	9.0	11.8	14.1	14.7	13.8	12.6	13.4
nC20	9.6	13.7	5.9	14.4	10.7	9.7	10.2	11.7	14.1	23.0	25.0	26.7
nC21	8.3	11.0	5.0	9.6	11.6	10.2	8.5	8.9	11.0	21.3	25.0	21.8
nC22	9.9	10.6	17.8	9.4	11.4	9.7	9.2	6.0	8.3	12.2	13.8	15.4
nC23	7.7	7.3	13.9	6.8	9.2	7.0	6.7	3.4	4.3	5.6	5.2	9.0
nC[illegible]	3.1	2.1	9.9	2.8	4.7	3.7	2.3	1.3	1.1	1.3	0.9	1.7
nC[illegible]	3.2	2.0	3.0	3.5	3.3	2.3	1.9	0.9	0.8	0.6	0.5	0.7
nC26	1.8	0.9	6.9	2.0	1.1	0.8	0.7	0.4	0.4	0.2	0.2	0.3
nC27	2.4	1.1	4.0	2.0	0.7	0.5	0.7	0.2	0.4	0.2	0.0	0.7
nC28	1.1	0.5	0.0	1.3	0.3	0.2	0.4	0.0	0.0	0.0	0.0	0.3
nC29	1.4	0.9	0.0	1.1	0.3	0.3	0.4	0.0	0.0	0.0	0.0	0.4
nC30	0.8	0.7	0.0	0.7	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0
nC31	1.0	0.7	0.0	0.7	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.0
nC32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
nC33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
nC34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
nC35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Paraffin	6.64	7.35	1.02	5.76	10.74	12.87	9.10	18.23	11.62	3.97	35.40	24.68
% Isoprenoid	1.56	1.29	0.18	0.90	0.99	1.78	1.88	3.52	2.55	2.26	1.57	0.68
% Naphthene	91.80	91.36	98.80	93.34	88.27	85.35	89.02	78.25	85.83	3.77	63.03	74.64
CPI Index A	1.13 *	1.14 *	0.69 *	1.09 *	1.14 *	1.11 *	1.11 *	1.22 *	1.19 *	1.38 *	1.41 *	1.27 *
CPI Index B	1.64	1.63 *	0.71 *	1.45	1.74 *	2.00 *	1.64	1.82	1.91 *	2.25 *	1.72 *	2.01 *
ip-C19/ip-C20	0.35	0.38	1.14	0.62	0.97	1.16	0.76	0.93	0.55	1.03	1.25	1.00

TABLE II

Summary of C15+ Soxhlet Extraction, Deasphaltening

and Liquid Chromatography

Well name: N.W.T.

A. Weights of Extracts and Chromatographic Fractions

GeoChem Sample Number	Interval	Rock Extd (grams)	Total Extract (grams)	Precip. Asphn (grams)	nC5 Soluble (grams)	Paraffin Naph (grams)	Arom (grams)	Eluted NSO's (grams)	Non-Elut NSO's (grams)
C417-001	3760-3850	33.94	0.0651	0.0431	0.0220	0.0087	0.0057	0.0038	0.0038
C417-002	3860-3980	41.84	0.0653	0.0415	0.0238	0.0091	0.0058	0.0042	0.0047
C417-003	5018-5200	50.33	0.0619	0.0240	0.0379	0.0272	0.0061	0.0025	0.0021
C417-008	5850-5996	68.28	0.0397	0.0233	0.0164	0.0056	0.0052	0.0021	0.0035
C417-011	3860-4050	50.43	0.1261	0.0584	0.0677	0.0198	0.0125	0.0122	0.0232
C417-012	4060-4400	51.79	0.0732	0.0240	0.0492	0.0285	0.0092	0.0075	0.0040
C417-013	3270-3430	55.52	0.1116	0.0508	0.0608	0.0280	0.0167	0.0134	0.0027
C417-015	3630-3850	52.87	0.0495	0.0124	0.0371	0.0164	0.0089	0.0082	0.0036
C417-016	2660-2830	58.99	0.0661	0.0375	0.0286	0.0121	0.0083	0.0058	0.0024
C417-017	7710-7850	59.26	0.0642	0.0198	0.0444	0.0110	0.0060	0.0117	0.0157
C417-021	8310-8500	51.79	0.0514	0.0199	0.0315	0.0170	0.0060	0.0056	0.0029
C417-022	5411-5428	51.57	0.0581	0.0497	0.0084	0.0035	0.0025	0.0016	0.0008

B. Concentration of extracted Materials in Rock

			Hydrocarbons			Non-Hydrocarbons			
Geochem Sample Number	Interval	Total Extract (ppm)	Paraff. Naphth. (ppm)	Aromatic (ppm)	Total (ppm)	Precip. Asphtn. (ppm)	Eluted NSO's (ppm)	Non-Elut NSO's (ppm)	Total (ppm)
C417-001	3760-3850	1918	256	168	424	1270	112	112	1494
C417-002	3860-3980	1560	217	139	356	992	100	112	1204
C417-003	5018-5200	1230	540	121	661	477	50	42	569
C417-008	5850-5996	581	82	76	158	341	31	51	423
C417-011	3860-4050	2501	393	248	641	1158	242	460	1860
C417-012	4060-4400	1413	550	178	728	463	145	77	685
C417-013	3270-3430	2010	504	301	805	915	241	49	1205
C417-015	3630-3850	936	310	168	478	235	155	68	458
C417-016	2660-2830	1121	205	141	346	636	98	41	775
C417-017	7710-7850	1083	186	101	287	334	197	265	796
C417-021	8310-8500	992	328	116	444	384	108	56	548
C417-022	5411-5428	1127	68	48	116	964	31	16	1011

C. Composition of Extracts

		Hydrocarbons			Non-Hydrocarbons					
Geochem Sample Number	Interval	Paraffin Naphth. %	Arom. %	PN/Arom	Eluted NSO's %	Non-Elut NSO's %	Precip. Asphtn. %	Asph/NSO	HC's %	HC/Non-HC
C417-001	3760-3850	13.4	8.8	1.52	5.8	5.8	66.2	5.71	22.2	0.29
C417-002	3860-3980	13.9	8.9	1.56	6.4	7.2	63.6	4.68	22.8	0.30
C417-003	5018-5200	43.9	9.9	4.43	4.0	3.4	38.8	5.24	53.8	1.16
C417-008	5850-5996	14.1	13.1	1.08	5.3	8.8	58.7	4.16	27.2	0.37
C417-011	3860-4050	15.7	9.9	1.59	9.7	18.4	46.3	1.65	25.6	0.34
C417-012	4060-4400	38.9	12.6	3.09	10.2	5.5	32.8	2.09	51.5	1.06
C417-013	3270-3430	25.1	15.0	1.67	12.0	2.4	45.5	3.16	40.1	0.67
C417-015	3630-3850	33.1	18.0	1.84	16.6	7.3	25.0	1.05	51.1	1.04
C417-016	2660-2830	18.3	12.6	1.45	8.8	3.6	56.7	4.57	30.9	0.45
C417-017	7710-7850	17.1	9.3	1.84	18.2	24.5	30.9	0.72	26.4	0.36
C417-021	8310-8500	33.1	11.7	2.83	10.9	5.6	38.7	2.35	44.8	0.81
C417-022	5411-5428	6.0	4.3	1.40	2.8	1.4	85.3	20.36	10.3	0.11

TABLE I

BJ

BORG WARNER

BJ SERVICE DIVISION

BORG-WARNER (CANADA) LIMITED

UNION MOBIL COVILLE LAKE

D-45

TEST NO. 1

BJ BORG WARNER

TESTING REPORT

DRILL-STEM TEST DATA

Well Name	UNION MOBIL COVILLE LAKE	Test No.	1
Well Number	D-45	Zone Tested	CAMBRIAN
Company	UNION OIL COMPANY OF CANADA LTD.	Interval	3002 - 3062
Comp. Rep.	K. JASINSKI	Tester C. MARTINEAU	Date APRIL 26, 1973

Type of Test: DUAL BOTTOM HOLE RFS Tool No.

Preflow 15 mins. ISI 63 mins. Flow 92 mins. FSI 88 mins.

	IN REC No. 2015 5750 RANGE 12 HR. CLOCK	OUT REC. No. 3852 5800 RANGE 12 HR. CLOCK	REC. No. RANGE HR. CLOCK
DEPTH	2985	3004	
Initial Hydro Mud Press	1335	1352	
Initial Shut-In Press	213	222	
Initial Flow Press	28	42	
Final Flow Press	32	48	
Final Shut-In Press	232	245	
Final Hydro Mud Press	1334	1343	

Mud Drop 6 FEET Fluid Loss Mud Weight 8.9

Viscosity 52 Temperature °F 95 Net Pay Tested 60.0

Top Packer Depth 2996 Bottom Packer Depth 3002 Total Depth 3062

Drill Pipe Size 3.50 Wt. 13.3 Drill Collar I.D. Ft. Run 472

Surface Choke Size 0.75 Bottom Choke Size 0.50 Main Hole Size 6.125

Anchor Size 4.75 Rat Hole Size 6 3/32 Feet of Rat Hole 45

Cushion Amount Type Rubber Size

Fluid Recovery Total Feet 40

Recovered 40 Feet of OIL AND GAS CUT DRILLING MUD

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Gas Recovery How Measured Riser size:

mins.	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins.	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins.	Temp. °F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day

Bleed Off Time for Drill Pipe

REMARKS: FAIR AIR BLOW, DEAD IN 20 MINUTES.

A Core Lab Gas Cont. No Chem - Geo. Lab Gas Cont. No.

BJ
BORG WARNER

TESTING REPORT

	ID	OD	LENGTH	
4S LANDING SUB				
4S CHAMBER				
4S TOOL OR P.O. SUB			1.00	
CO SUB				
SHUT IN TOOL		4¾	5.20	
R.F.S. No.	2¼	4¾		
R.F.S. No.	2¼	4¾		
HYDRAULIC TOOL		4¾	7.20	
JARS	1	4¾		
RECORDER No. 2015	2¼	4¾	5.00	DEPTH 2985
RECORDER No.	2¼	4¾		DEPTH
SAFETY JOINT	2 11/16	4¾	2.00	
BY PASS SUB	1 5/32	4¾		
PACKER	1 OR ⅞	5¾	6.00	
PACKER	1 or ⅞	5½		TOOL ABOVE INTERVAL 31.40
ANCHOR—SPECIFY S.D.	2½		1.00	
BLANK OFF OR BY PASS SUB	1 5/32	4¾		
RECORDER No. 3852	2¼	4¾	5.00	DEPTH 3004
PACKER	1 OR ⅞			TOTAL INTERVAL 60
PACKER	1 OR ⅞			
ANCHOR—SPECIFY	2½			
PERFS			22.00	
RECORDER No	2¼	4¾		DEPTH
D.C.			29.00	
BULLNOSE	2¾	4¾	3.00	TOTAL TAIL PIPE 60.00
				TOTAL TEST TOOL 62.40

WEIGHT INDICATER READING

PRIOR TO SETTING PACKERS

AFTER PULL PACKERS LOOSE

1. PACKER DEPTH 2996

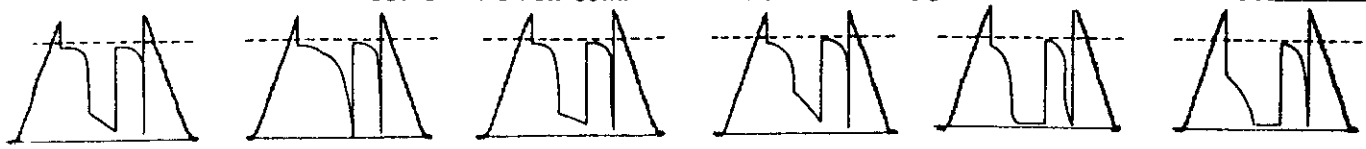
2. PACKER DEPTH 3002

3. PACKER DEPTH

4. PACKER DEPTH

TOTAL DEPTH 3062

DST CHARTS FOR COMPARATIVE VISUAL ANALYSIS



B HIGH PERMEABILITY STRONG DAMAGE EFFECT | HIGH PERMEABILITY NO DAMAGE EFFECT | MEDIUM PERMEABILITY STRONG DAMAGE EFFECT | MEDIUM PERMEABILITY NO DAMAGE EFFECT | LOW PERMEABILITY STRONG DAMAGE EFFECT | LOW PERMEABILITY NO DAMAGE EFFECT

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: CAMBRIAN

REC NO. 2015
DST NO. 1
DEPTH 2985

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
RUN IN HOLE	0.	0.	
	83.0	1335.3	
INITIAL HYDRO PRESSURE	125.0	1335.3	
INITIAL PREFLOW PRESSURE	0.	33.7	
FINAL PREFLOW PRESSURE	15.0	33.7	
START INITIAL SHUT-IN	0.	33.7	
	5.0	71.8	4.00
	10.0	98.2	2.50
	15.0	117.3	2.00
	20.0	133.4	1.75
	25.0	148.1	1.60
	30.0	158.4	1.50
	35.0	168.6	1.43
	40.0	180.4	1.37
	45.0	187.7	1.33
	50.0	196.5	1.30
	55.0	203.8	1.27
INITIAL SHUT-IN PRESSURE	63.0	212.6	1.24
START FLOW PERIOD	0.	212.6	
INITIAL FLOW PRESSURE	1.0	27.9	
	10.0	29.3	
	20.0	29.3	
	30.0	29.3	
	40.0	29.3	
	50.0	29.3	
	60.0	29.3	
	70.0	30.8	
	80.0	30.8	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: CAMBRIAN

REC NO. 2015
DST NO. 1
DEPTH 2985

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
FINAL FLOW PRESSURE	92.0	32.3	
START FINAL SHUT-IN	0.	32.3	
	5.0	82.1	22.40
	10.0	104.1	11.70
	15.0	120.2	8.13
	20.0	133.4	6.35
	25.0	143.7	5.28
	30.0	155.4	4.57
	35.0	165.7	4.06
	40.0	174.5	3.68
	45.0	181.8	3.38
	50.0	190.6	3.14
	55.0	196.5	2.95
	60.0	202.3	2.78
	65.0	209.7	2.65
	70.0	214.1	2.53
	75.0	219.9	2.43
	80.0	225.8	2.34
FINAL SHUT-IN PRESSURE	88.0	231.7	2.22
RUN OUT OF HOLE	0.	231.7	
FINAL HYDRO PRESSURE	1.0	1333.8	
	15.0	1333.8	
OUT OF HOLE	85.0	0.	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: CAMBRIAN
RECOVERY TYPE USED IN CALCULATIONS: MUD

REC NO. 2015
DST NO. 1
DEPTH 2985
INTERVAL 3002-3062

SUMMARY OF CALCULATIONS

1 FIRST SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	284.8 PSIG
SLOPE OF EXTRAPOLATED LINE	775.80 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.20 PSI
NUMBER OF POINTS IN SHUT-IN	13
NUMBER OF POINTS USED FOR EXTRAPOLATION	4

2 SECOND SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	339.2 PSIG
SLOPE OF EXTRAPOLATED LINE	309.71 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.51 PSI
NUMBER OF POINTS IN SHUT-IN	18
NUMBER OF POINTS USED FOR EXTRAPOLATION	4
DIFFERENCE (2ND-1ST EXTRAPOLATION)	54.4 PSI

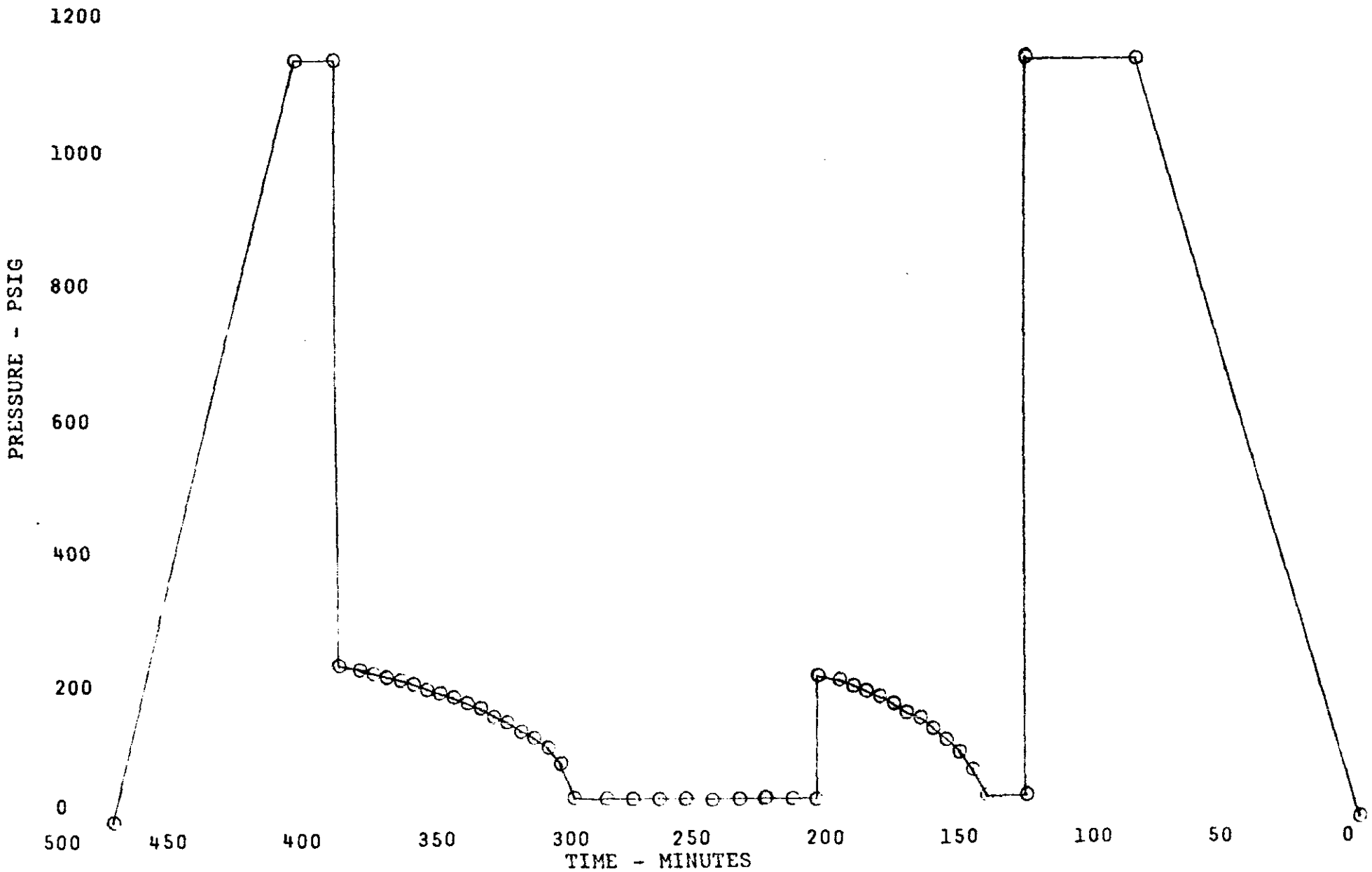
3 RESERVOIR AND FLUID PROPERTIES

NET PAY	60.00 FT
RESERVOIR POROSITY	15.00 PERCENT
PRODUCTION RATE	4.3 BPD
FORMATION VOLUME FACTOR	1.000 RB/STB
FLUID VISCOSITY	0.760 C.P.
TOTAL COMPRESSIBILITY X 10-6	7.200 /PSI
RESERVOIR TEMPERATURE	95.0 F
FINAL FLOWING PRESSURE	32.3 PSIG
TOTAL FLOW TIME	107.0 MIN

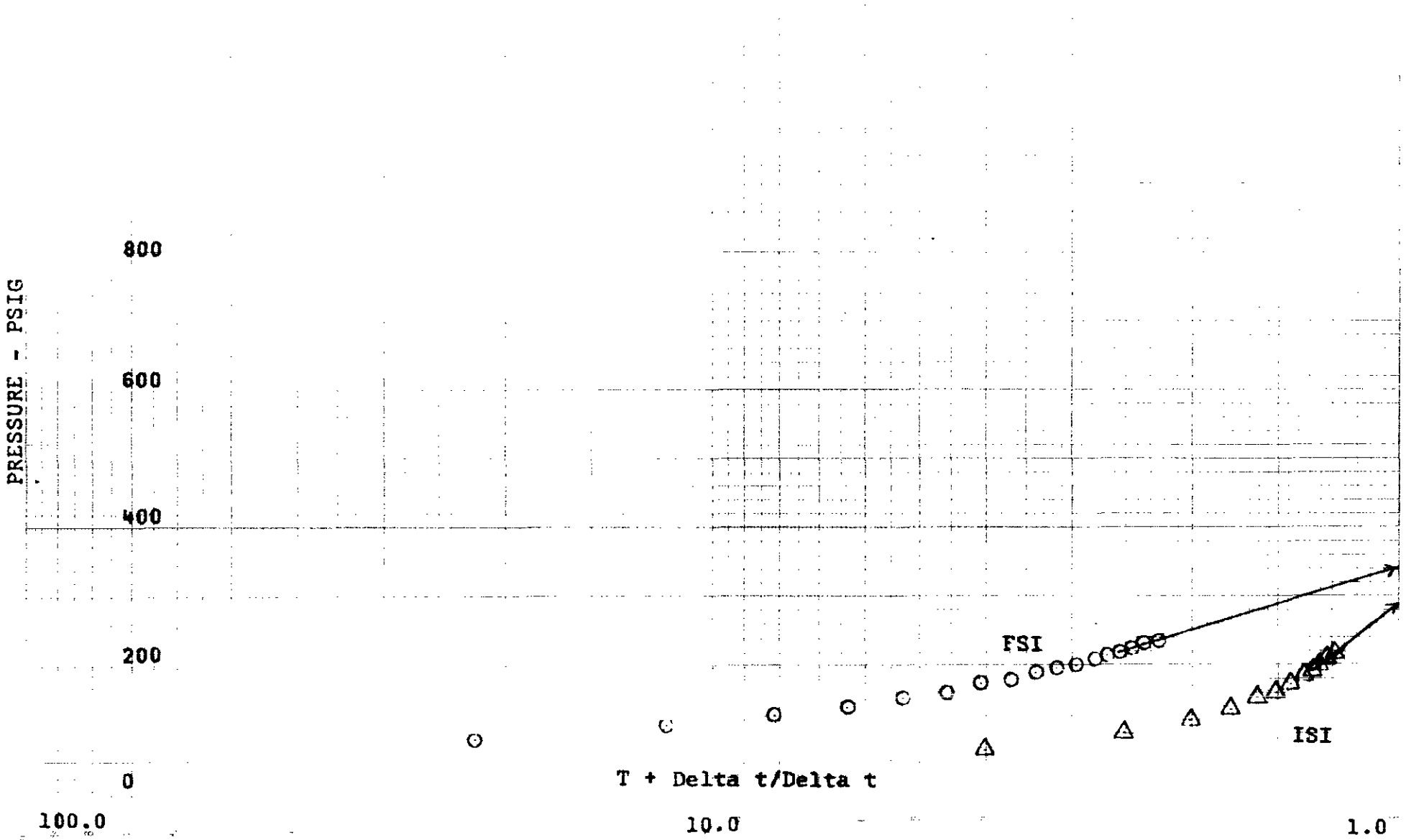
4 CALCULATION RESULTS

ESTIMATED DAMAGE RATIO	0.36
PERMEABILITY THICKNESS	1.7 MD FT
PERMEABILITY	0.03 MD
SKIN FACTOR	-2.03
APPROXIMATE DRAINAGE RADIUS	8.1 FT
PRODUCTIVITY INDEX	0.014 BPD/PSI

UNION MOBIL COVILLE LAKE D-45 DST NO. 1 REC. NO. 2015

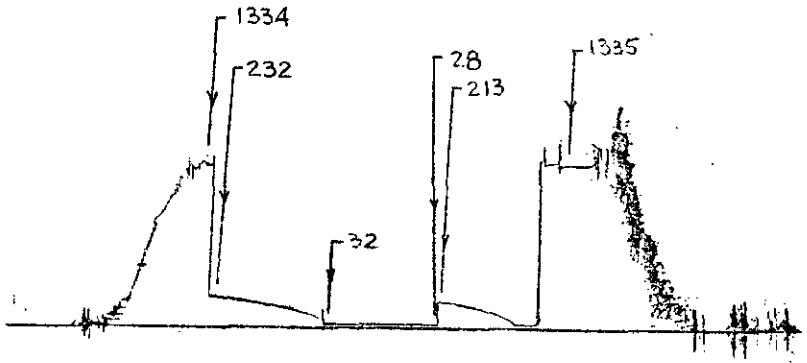


UNION MOBIL COVILLE LAKE D-45 DST NO. 1 P* = 339.2 PSIG

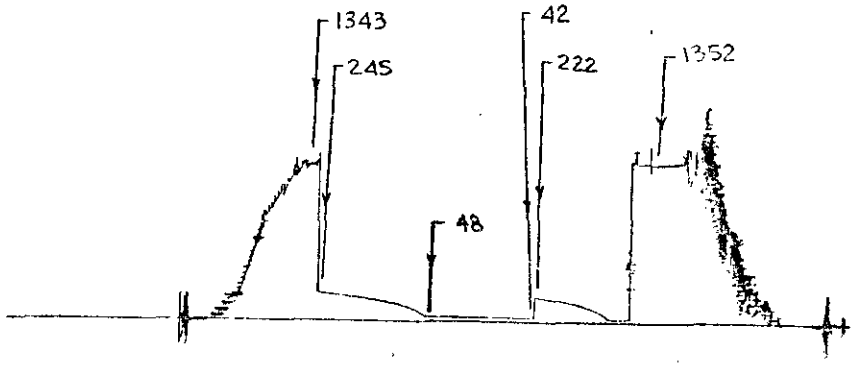


DST RECORDER CHARTS

UNION MOBIL COVILLE LAKE D-45
DST NO. 1
INSIDE REC. NO. 2015



UNION MOBIL COVILLE LAKE D-45
DST NO. 1
OUTSIDE REC. NO. 3852



BJ

BORG WARNER

BJ SERVICE DIVISION
BORG-WARNER (CANADA) LIMITED

COLVILLE
UNION D - 45

TEST NO. 2

BJ BORG WARNER

TESTING REPORT

DRILL-STEM TEST DATA

Well Name	UNION D-45	Test No.	2
Well Number	D-45	Zone Tested	
Company	UNION OIL OF CANADA LTD.	Interval	3186 - 3233
Comp. Rep.	Tester	Date	APRIL 29, 1973

Type of Test

R F S Tool No.

Preflow mins. ISI mins. Flow mins. FSI mins.

	IN REC No. 2015 5720 RANGE 12 HR CLOCK	BTM REC. No. 3852 5800 RANGE 12 HR. CLOCK	REC. No. RANGE HR. CLOCK
DEPTH			
Initial Hydro Mud Press	1454	1467	
Initial Shut-In Press			
Initial Flow Press			
Final Flow Press			
Final Shut-In Press			
Final Hydro Mud Press	1454	1467	

Mud Drop | Fluid Loss | Mud Weight

Viscosity | Temperature °F | Net Pay Tested

Top Packer Depth | Bottom Packer Depth | Total Depth

Drill Pipe Size | Wt. | Drill Collar I.D. | Ft. Run

Surface Choke Size | Bottom Choke Size | Main Hole Size

Anchor Size | Rat Hole Size | Feet of Rat Hole

Cushion Amount | Type | Rubber Size

Fluid Recovery Total Feet

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Gas Recovery How Measured Riser size:

mins	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins.	Temp. °F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins.	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins.	Temp °F	Press Rdg	psi	Orifice Size	=	MCF/Day

Bleed Off Time for Drill Pipe

REMARKS:

MISRUN.

A Core Lab Gas Cont. No

Chem Geo. Lab Gas Cont. No.

BJ BORG WARNER

TESTING REPORT

	ID	OD	LENGTH
4S LANDING SUB			
4S CHAMBER			
4S TOOL OR P.O. SUB			1.00
~~SUB~~ JARS			6.00
SHUT IN TOOL		4¾	
R.F.S. No. 2015	2¼	4¾	2.50
R.F.S. No.	2¼	4¾	
HYDRAULIC TOOL		4¾	7.20
JARS	1	4¾	
RECORDER No.	2¼	4¾	5.00 DEPTH 3175
RECORDER No.	2¼	4¾	DEPTH
SAFETY JOINT	2 11/16	4¾	2.00
BY PASS SUB	1 5/32	4¾	
PACKER	1 OR ⅞		
PACKER	1 or ⅞		5.00 TOOL ABOVE INTERVAL 34.90
ANCHOR—SPECIFY S.D.	2½		1.00
BLANK OFF OR BY PASS SUB	1 5/32	4¾	
RECORDER No. 3852	2¼	4¾	5.00 DEPTH 3188
PACKER	1 OR ⅞		TOTAL INTERVAL
PACKER	1 OR ⅞		
ANCHOR—SPECIFY	2½		
PERFS			10.00
RECORDER No	2¼	4¾	DEPTH
D.C.			28.00
BULLNOSE	2¾	4¾	3.00 TOTAL TAIL PIPE 47.00

WEIGHT INDICATER READING

PRIOR TO SETTING PACKERS

AFTER PULL PACKERS LOOSE

1. PACKER DEPTH

2. PACKER DEPTH 3186

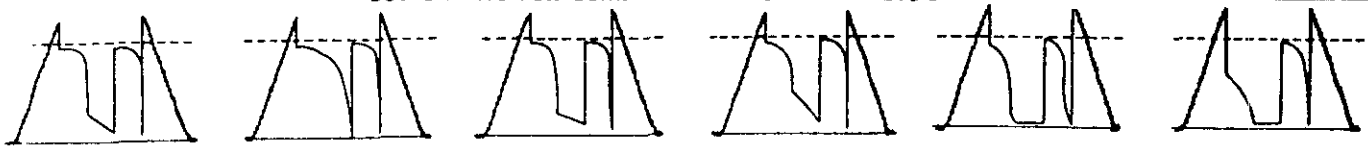
3. PACKER DEPTH

4. PACKER DEPTH

TOTAL DEPTH 3233

TOTAL TEST TOOL 53.90

DST CHARTS FOR COMPARATIVE VISUAL ANALYSIS

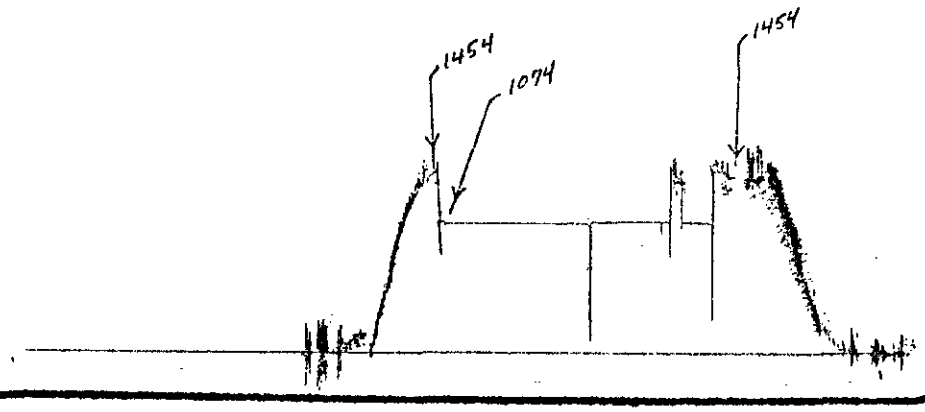


HIGH PERMEABILITY HIGH PERMEABILITY MEDIUM PERMEABILITY MEDIUM PERMEABILITY LOW PERMEABILITY LOW PERMEABILITY

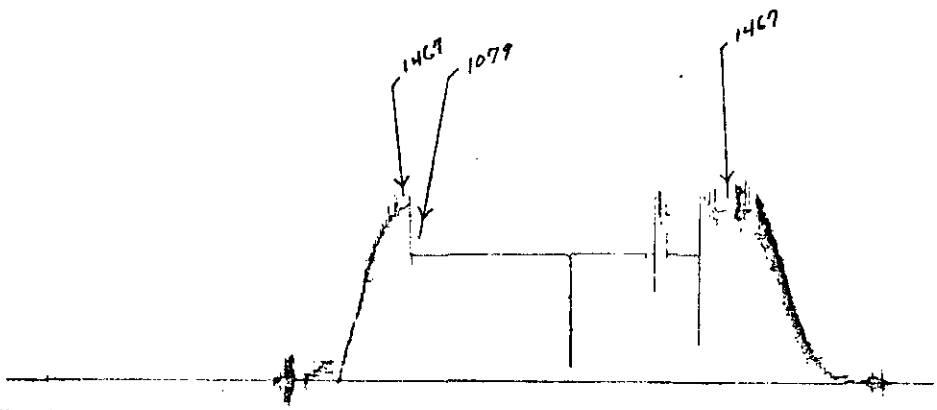
P STRONG DAMAGE EFFECT NO DAMAGE EFFECT STRONG DAMAGE EFFECT NO DAMAGE EFFECT STRONG DAMAGE EFFECT NO DAMAGE EFFECT

DST RECORDER CHARTS

UNION D-45
DST NO. 2
INSIDE REC. NO. 2015



UNION D-45
DST NO. 2
BTM REC. NO. 3852



BJ

BORG WARNER

BJ SERVICE DIVISION

BORG-WARNER (CANADA) LIMITED

UNION MOBIL COVILLE LAKE

D-45

TEST NO. 3

BJ BORG WARNER

TESTING REPORT

DRILL-STEM TEST DATA

Well Name	UNION MOBIL COVILLE LAKE	Test No.	3
Well Number	D-45	Zone Tested	CAMBRIAN
Company	UNION OIL COMPANY OF CANADA LTD.	Interval	3186 - 3233
Comp. Rep.	T. RAMSEY	Tester C. MARTINEAU	Date APRIL 29, 1973

Type of Test: BOTTOM HOLE — RFS Tool No.

Preflow 5 mins. ISI 54 mins. Flow 142 mins. FSI 111 mins.

	IN REC No. 2015 5750 RANGE 12 HR CLOCK	OUT REC. No. 3852 5800 RANGE 12 HR CLOCK	REC. No. RANGE HR. CLOCK
DEPTH	3176	3188	
Initial Hydro Mud Press	1484	1468	
Initial Shut-In Press	1080	1084	
Initial Flow Press	309	325	
Final Flow Press	1049	1062	
Final Shut-In Press	1085	1094	
Final Hydro Mud Press	1484	1478	

Mud Drop: NIL — Fluid Loss — Mud Weight: 8.9

Viscosity: 52 — Temperature °F — Net Pay Tested: 47

Top Packer Depth: 3186 — Bottom Packer Depth: NIL — Total Depth: 3233

Drill Pipe Size: 3.5 — Wt: 13.3 — Drill Collar I.D — Ft. Run: 472

Surface Choke Size — Bottom Choke Size: 0.50 — Main Hole Size: 6.125

Anchor Size: 4.75 — Rat Hole Size: 6 2/32 — Feet of Rat Hole

Cushion Amount — Type — Rubber Size

Fluid Recovery Total Feet: 2300

Recovered 2300 Feet of SALT WATER (40,000 PPM)

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Gas Recovery — How Measured — Riser size:

mins	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins.	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins.	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day

Bleed Off Time for Drill Pipe

REMARKS: GOOD AIR BLOW DECREASING TO VERY WEAK IN 140 MINUTES.

A Core Lab Gas Cont No — Chem Geo Lab Gas Cont. No.

BJ BORG WARNER

TESTING REPORT

	ID	OD	LENGTH	
4S LANDING SUB				
4S CHAMBER				
4S TOOL OR P.O. SUB			1.00	
CO SUB				
WEIGHT INDICATER READING				
SHUT IN TOOL		4¾	6.20	
PRIOR TO SETTING PACKERS				
R.F.S. No.	2¼	4¾	2.50	
AFTER PULL PACKERS LOOSE				
R.F.S. No.	2¼	4¾		
HYDRAULIC TOOL		4¾	7.20	
JARS	1	4¾		
RECORDER No. 2015	2¼	4¾	5.00	DEPTH 3176
RECORDER No.	2¼	4¾		DEPTH
SAFETY JOINT	2 11/16	4¾	2.00	
BY PASS SUB	1 5/32	4¾		
1. PACKER DEPTH — PACKER	1 OR ⅞			
2. PACKER DEPTH 3186 — PACKER	1 or ⅞		5.00	TOOL ABOVE INTERVAL 28.90
ANCHOR—SPECIFY S.D.	2½		1.00	
BLANK OFF OR BY PASS SUB	1 5/32	4¾		
RECORDER No. 3852	2¼	4¾	5.00	DEPTH 3188
3. PACKER DEPTH — PACKER	1 OR ⅞			TOTAL INTERVAL 47
4. PACKER DEPTH — PACKER	1 OR ⅞			
ANCHOR—SPECIFY	2½			
PERFS			10.00	
RECORDER No	2¼	4¾		DEPTH
D.C.			28.00	
TOTAL DEPTH 3233 — BULLNOSE	2¾	4¾	3.00	TOTAL TAIL PIPE 47.00
				TOTAL TEST TOOL 47.90

DST CHARTS FOR COMPARATIVE VISUAL ANALYSIS

HIGH PERMEABILITY STRONG DAMAGE EFFECT | HIGH PERMEABILITY NO DAMAGE EFFECT | MEDIUM PERMEABILITY STRONG DAMAGE EFFECT | MEDIUM PERMEABILITY NO DAMAGE EFFECT | LOW PERMEABILITY STRONG DAMAGE EFFECT | LOW PERMEABILITY NO DAMAGE EFFECT

B

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: CAMBRIAN

REC NO. 2015
DST NO. 3
DEPTH 3176

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
RUN IN HOLE	0.	0.	
	63.0	1484.1	
INITIAL HYDRO PRESSURE	80.0	1484.1	
INITIAL PREFLOW PRESSURE	0.	102.6	
FINAL PREFLOW PRESSURE	5.0	258.1	
START INITIAL SHUT-IN	0.	258.1	
	5.0	997.1	2.00
	10.0	1041.9	1.50
	15.0	1057.8	1.33
	20.0	1063.6	1.25
	25.0	1069.4	1.20
	30.0	1072.3	1.17
	35.0	1073.7	1.14
	40.0	1075.1	1.12
	45.0	1076.6	1.11
	50.0	1078.0	1.10
INITIAL SHUT-IN PRESSURE	54.0	1079.5	1.09
START FLOW PERIOD	0.	1079.5	
INITIAL FLOW PRESSURE	1.0	309.4	
	10.0	451.6	
	20.0	582.1	
	30.0	686.2	
	40.0	768.3	
	50.0	832.8	
	60.0	884.2	
	70.0	923.8	
	80.0	956.0	
	90.0	980.9	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: CAMBRIAN

REC NO. 2015
DST NO. 3
DEPTH 3176

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
	100.0	1000.0	
	110.0	1017.3	
	120.0	1028.9	
	130.0	1041.9	
FINAL FLOW PRESSURE	142.0	1049.1	
START FINAL SHUT-IN	0.	1049.1	
	2.0	1069.4	74.50
	5.0	1072.3	30.40
	10.0	1075.1	15.70
	20.0	1078.0	8.35
	30.0	1079.5	5.90
	40.0	1080.9	4.68
	50.0	1081.6	3.94
	60.0	1082.4	3.45
	70.0	1083.1	3.10
	80.0	1083.1	2.84
	90.0	1083.8	2.63
	100.0	1084.5	2.47
FINAL SHUT-IN PRESSURE	111.0	1085.3	2.32
RUN OUT OF HOLE	0.	1085.3	
FINAL HYDRO PRESSURE	1.0	1484.1	
	10.0	1484.1	
OUT OF HOLE	85.0	0.	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: CAMBRIAN
RECOVERY TYPE USED IN CALCULATIONS: WATER

REC NO. 2015
DST NO. 3
DEPTH 3176
INTERVAL 3186-3233

SUMMARY OF CALCULATIONS

1 FIRST SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	1092.1 PSIG
SLOPE OF EXTRAPOLATED LINE	334.79 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.21 PSI
NUMBER OF POINTS IN SHUT-IN	12
NUMBER OF POINTS USED FOR EXTRAPOLATION	4

2 SECOND SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	1094.4 PSIG
SLOPE OF EXTRAPOLATED LINE	25.05 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.04 PSI
NUMBER OF POINTS IN SHUT-IN	14
NUMBER OF POINTS USED FOR EXTRAPOLATION	4
DIFFERENCE (2ND-1ST EXTRAPOLATION)	2.3 PSI

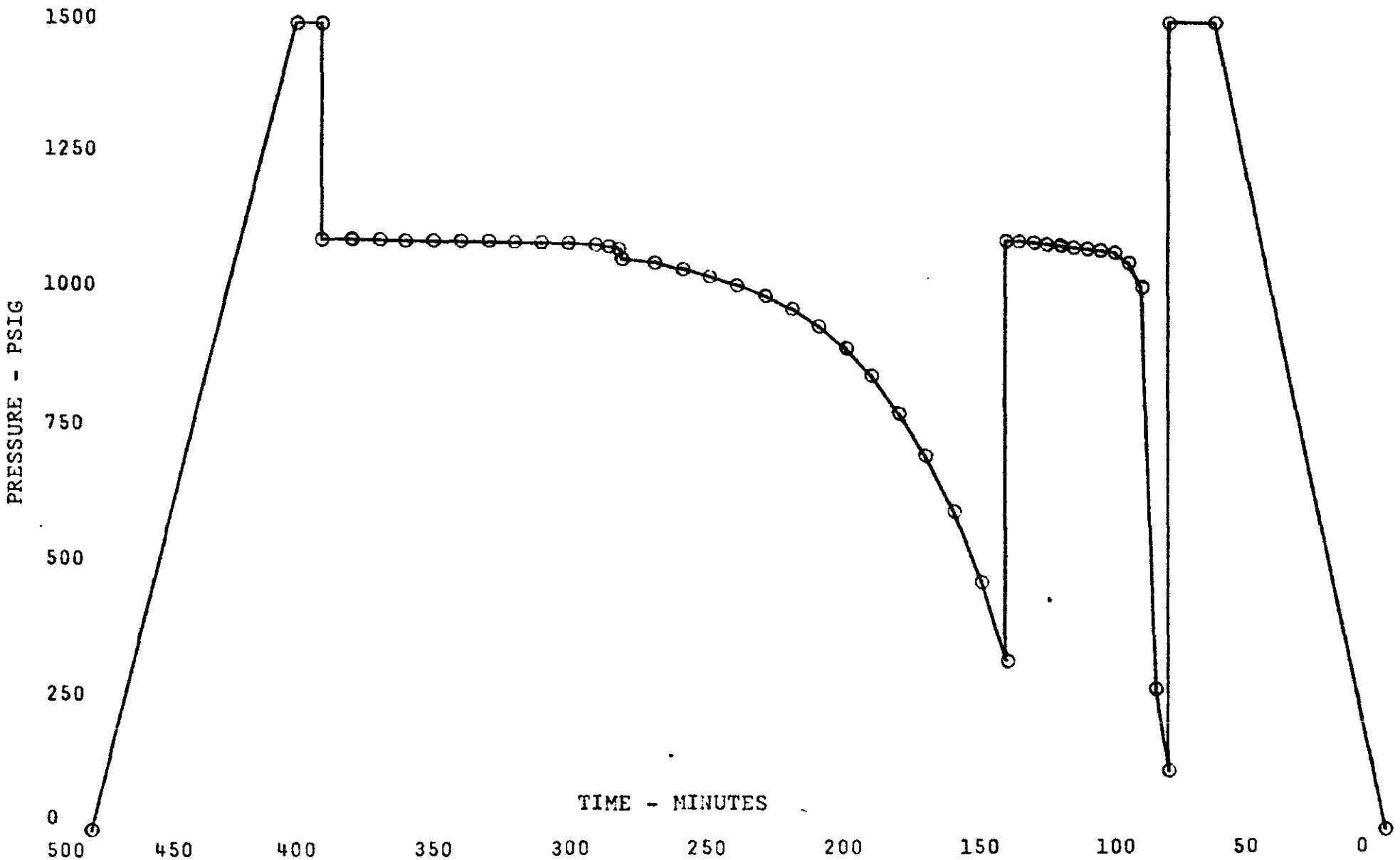
3 RESERVOIR AND FLUID PROPERTIES

NET PAY	47.00 FT
RESERVOIR POROSITY	15.00 PERCENT
PRODUCTION RATE	170.0 BPD
FORMATION VOLUME FACTOR	1.000 RB/STB
FLUID VISCOSITY	0.760 C.P.
TOTAL COMPRESSIBILITY X 10-6	7.200 /PSI
RESERVOIR TEMPERATURE	95.0 F
FINAL FLOWING PRESSURE	1049.1 PSIG
TOTAL FLOW TIME	147.0 MIN

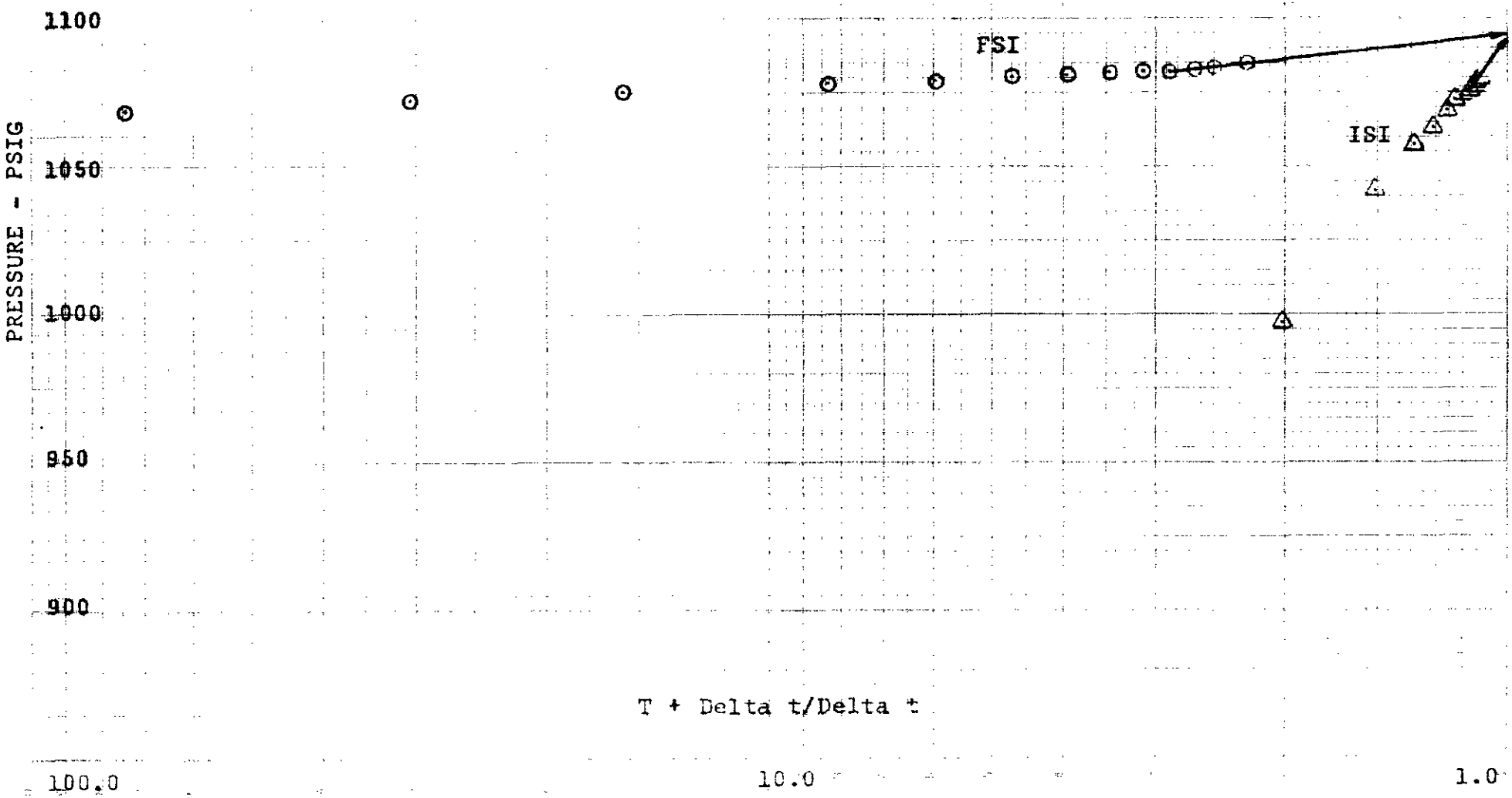
4 CALCULATION RESULTS

ESTIMATED DAMAGE RATIO	0.32
PERMEABILITY THICKNESS	838.2 MD FT
PERMEABILITY	17.83 MD
SKIN FACTOR	-4.46
APPROXIMATE DRAINAGE RADIUS	236.2 FT
PRODUCTIVITY INDEX	3.756 BPD/PSI

UNION MOBIL COVILLE LAKE D-45 DST NO. 3 REC. NO. 2015

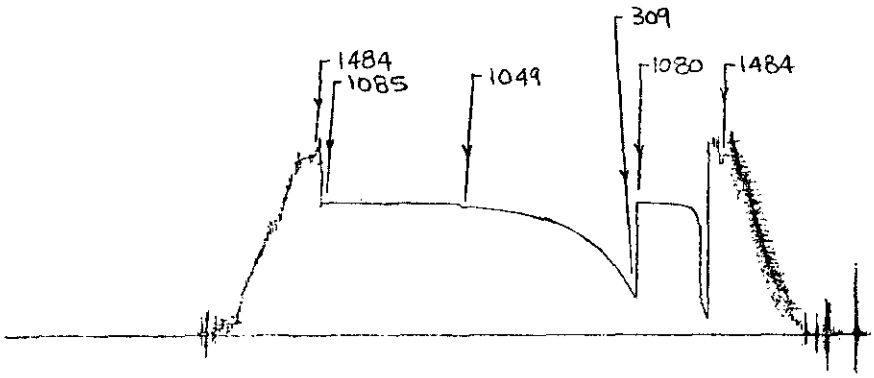


UNION MOBIL COVILLE LAKE D-45 DST NO. 3 P* = 1094.4 PSIG

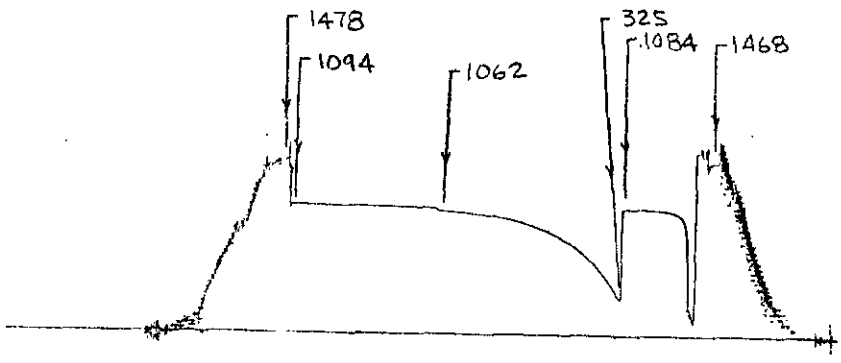


DST RECORDER CHARTS

UNION MOBIL COVILLE LAKE D-45
DST NO. 3
INSIDE REC. NO. 2015



UNION MOBIL COVILLE LAKE D-45
DST NO. 3
OUTSIDE REC. NO. 3852



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BJ SERVICE DIVISION

BORG-WARNER (CANADA) LIMITED

UNION MOBIL COVILLE LAKE

D-45

TEST NO. 4

BJ BORG WARNER

TESTING REPORT

DRILL-STEM TEST DATA

Well Name	UNION MOBIL COVILLE LAKE	Test No.	4
Well Number	D-45	Zone Tested	OLD FORT SAND
Company	UNION OIL COMPANY OF CANADA LTD.	Interval	3207 - 3224
Comp. Rep.	T. RAMSEY	Tester C. MARTINEAU	Date MAY 5, 1973

Type of Test SINGLE STRADDLE RFS Tool No.

Preflow 5 mins. ISI 115 mins. Flow 111 mins. FSI 139 mins.

	IN REC No. 3852 5800 RANGE 12 HR CLOCK	IN REC No. 2015 5750 RANGE 12 HR. CLOCK	BTM REC. No. 3687 5750 RANGE 24 HR. CLOCK
DEPTH	3196	3199	3245
Initial Hydro Mud Press	1453	1454	1480
Initial Shut In Press	1081	1081	
Initial Flow Press	262	265	
Final Flow Press	961	956	
Final Shut-In Press	1081	1083	
Final Hydro Mud Press	1447	1447	1460

Mud Drop NIL | Fluid Loss | Mud Weight 8.9

Viscosity 60 | Temperature °F | Net Pay Tested 18.0

Top Packer Depth 3207 | Bottom Packer Depth 3224 | Total Depth 3850

Drill Pipe Size 3.5 IF | Wt. 13.3 | Drill Collar I.D. | Ft. Run

Surface Choke Size 0.75 | Bottom Choke Size 0.50 | Main Hole Size 6.125

Anchor Size 4.50 | Rat Hole Size | Feet of Rat Hole

Cushion Amount | Type | Rubber Size

Fluid Recovery Total Feet 2200

Recovered	500	Feet of	SLIGHTLY OIL CUT SALT WATER
Recovered	1700	Feet of	SLIGHTLY GASSIFIED SALT WATER
Recovered		Feet of	
Recovered		Feet of	
Recovered		Feet of	

Gas Recovery How Measured Riser size

mins.	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp. °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp. °F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day
mins	Temp °F	Press Rdg.	psi	Orifice Size	=	MCF/Day

Bleed Off Time for Drill Pipe

REMARKS:

A Core Lab Gas Cont No Chem Geo. Lab Gas Cont No.

BJ BORG WARNER

TESTING REPORT

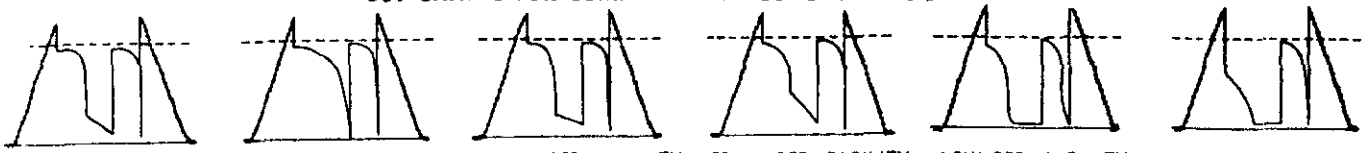
WEIGHT INDICATER READING

PRIOR TO SETTING PACKERS

AFTER PULL PACKERS LOOSE

	ID	OD	LENGTH	
4S LANDING SUB				
4S CHAMBER				
4S TOOL OR P.O. SUB			1.00	
CO SUB				
SHUT IN TOOL		4¾	5.20	
R.F.S. No.	2¼	4¾		
R.F.S. No.	2¼	4¾		
HYDRAULIC TOOL		4¾	7.20	
JARS	1	4¾		
RECORDER No. 3852	2¼	4¾	4.00	DEPTH 3196
RECORDER No. 2015	2¼	4¾	4.00	DEPTH 3194
SAFETY JOINT	2 11/16	4¾		
BY PASS SUB	1 5/32	4¾		
1. PACKER DEPTH — PACKER	1 OR ⅞			
2. PACKER DEPTH 3207 — PACKER	1 or ⅞		5.00	TOOL ABOVE INTERVAL 27.40
ANCHOR—SPECIFY S.D.	2½		1.00	
PERFS			10.00	
PERFS			3.00	
BLANK OFF OR BY PASS SUB	1 5/32	4¾		
RECORDER No.	2¼	4¾		DEPTH
3. PACKER DEPTH 3224 — PACKER	1 OR ⅞		4.00	TOTAL INTERVAL 18.00
			2.00	
4. PACKER DEPTH — PACKER	1 OR ⅞			
ANCHOR—SPECIFY PERFS	2½		15.00	
PERFS			3.00	
RECORDER No 3687	2¼	4¾	5.00	DEPTH 3245
D.P.			598.00	
TOTAL DEPTH 3850 — BULLNOSE	2¾	4¾	3.00	TOTAL TAIL PIPE 626.00
				TOTAL TEST TOOL 68.00

DST CHARTS FOR COMPARATIVE VISUAL ANALYSIS



HIGH PERMEABILITY STRONG DAMAGE EFFECT | HIGH PERMEABILITY NO DAMAGE EFFECT | MEDIUM PERMEABILITY STRONG DAMAGE EFFECT | MEDIUM PERMEABILITY NO DAMAGE EFFECT | LOW PERMEABILITY STRONG DAMAGE EFFECT | LOW PERMEABILITY NO DAMAGE EFFECT

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: OLD FORT SAND

REC NO. 2015
DST NO. 4
DEPTH 3199

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
RUN IN HOLE	0.	0.	
	75.0	1453.8	
INITIAL HYDRO PRESSURE	110.0	1453.8	
INITIAL PREFLOW PRESSURE	0.	107.0	
FINAL PREFLOW PRESSURE	5.0	200.9	
START INITIAL SHUT-IN	0.	200.9	
	5.0	998.5	2.00
	10.0	1039.0	1.50
	15.0	1053.5	1.33
	20.0	1063.6	1.25
	25.0	1067.9	1.20
	30.0	1070.8	1.17
	35.0	1072.3	1.14
	40.0	1075.1	1.12
	45.0	1075.9	1.11
	50.0	1076.6	1.10
	55.0	1076.6	1.09
	60.0	1077.3	1.08
	65.0	1078.0	1.08
	70.0	1078.0	1.07
	75.0	1078.8	1.07
	80.0	1079.5	1.06
	85.0	1080.2	1.06
	90.0	1080.2	1.06
	95.0	1080.2	1.05
	100.0	1080.2	1.05
	105.0	1080.9	1.05
	110.0	1080.9	1.05
INITIAL SHUT-IN PRESSURE	115.0	1080.9	1.04
START FLOW PERIOD	0.	1080.9	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: OLD FORT SAND

REC NO. 2015
DST NO. 4
DEPTH 3199

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
INITIAL FLOW PRESSURE	1.0	265.4	
	10.0	387.1	
	20.0	495.6	
	30.0	588.0	
	40.0	665.7	
	50.0	733.1	
	60.0	787.4	
	70.0	831.4	
	80.0	871.0	
	90.0	904.7	
	100.0	932.6	
FINAL FLOW PRESSURE	111.0	956.0	
START FINAL SHUT-IN	0.	956.0	
	2.0	1041.9	61.00
	5.0	1050.6	25.00
	10.0	1059.2	13.00
	15.0	1063.6	9.00
	20.0	1066.5	7.00
	25.0	1067.9	5.80
	30.0	1070.1	5.00
	35.0	1072.3	4.43
	40.0	1073.7	4.00
	45.0	1075.1	3.67
	50.0	1076.6	3.40
	55.0	1078.0	3.18
	60.0	1078.0	3.00
	65.0	1078.8	2.85
	70.0	1079.5	2.71
	75.0	1079.5	2.60
	80.0	1079.5	2.50
	85.0	1080.2	2.41
	90.0	1080.2	2.33
	95.0	1080.9	2.26
	100.0	1080.9	2.20
	105.0	1081.6	2.14
	110.0	1081.6	2.09
	115.0	1081.6	2.04
	120.0	1082.4	2.00

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: OLD FORT SAND

REC NO. 2015
DST NO. 4
DEPTH 3199

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
	125.0	1082.4	1.96
	130.0	1083.1	1.92
	135.0	1083.1	1.89
FINAL SHUT-IN PRESSURE	139.0	1083.1	1.86
RUN OUT OF HOLE	0.	1083.1	
FINAL HYDRO PRESSURE	1.0	1446.5	
	5.0	1446.5	
OUT OF HOLE	94.0	0.	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: OLD FORT SAND
RECOVERY TYPE USED IN CALCULATIONS: WATER

REC NO. 2015
DST NO. 4
DEPTH 3199
INTERVAL 3207-3224

SUMMARY OF CALCULATIONS

1 FIRST SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	1085.2 PSIG
SLOPE OF EXTRAPOLATED LINE	217.26 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.41 PSI
NUMBER OF POINTS IN SHUT-IN	24
NUMBER OF POINTS USED FOR EXTRAPOLATION	20

2 SECOND SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	1091.3 PSIG
SLOPE OF EXTRAPOLATED LINE	29.25 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.54 PSI
NUMBER OF POINTS IN SHUT-IN	30
NUMBER OF POINTS USED FOR EXTRAPOLATION	26
DIFFERENCE (2ND-1ST EXTRAPOLATION)	6.2 PSI

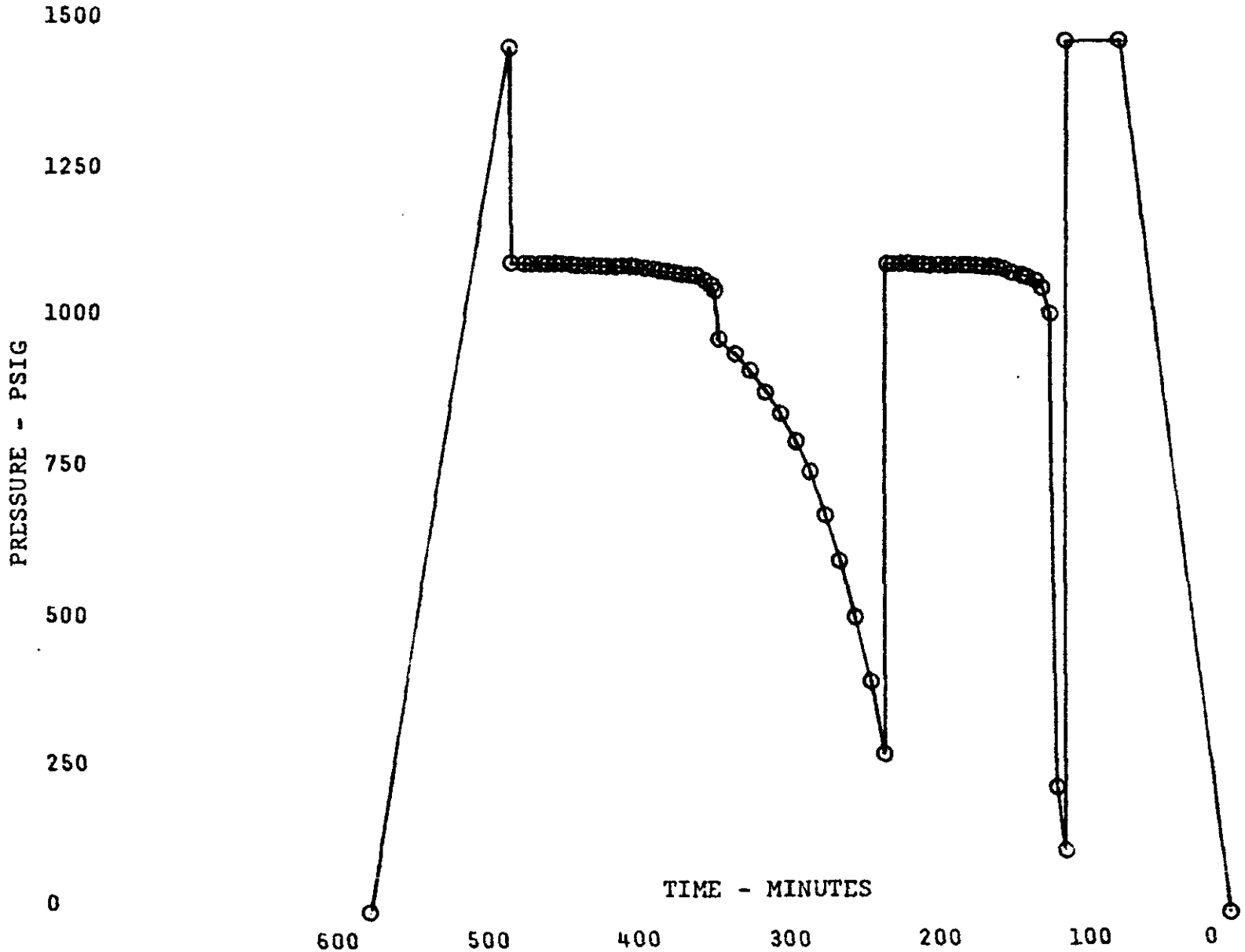
3 RESERVOIR AND FLUID PROPERTIES

NET PAY	18.00 FT
RESERVOIR POROSITY	15.00 PERCENT
PRODUCTION RATE	199.4 BPD
FORMATION VOLUME FACTOR	1.000 RB/STB
FLUID VISCOSITY	0.760 C.P.
TOTAL COMPRESSIBILITY X 10-6	7.200 /PSI
RESERVOIR TEMPERATURE	95.0 F
FINAL FLOWING PRESSURE	956.0 PSIG
TOTAL FLOW TIME	120.0 MIN

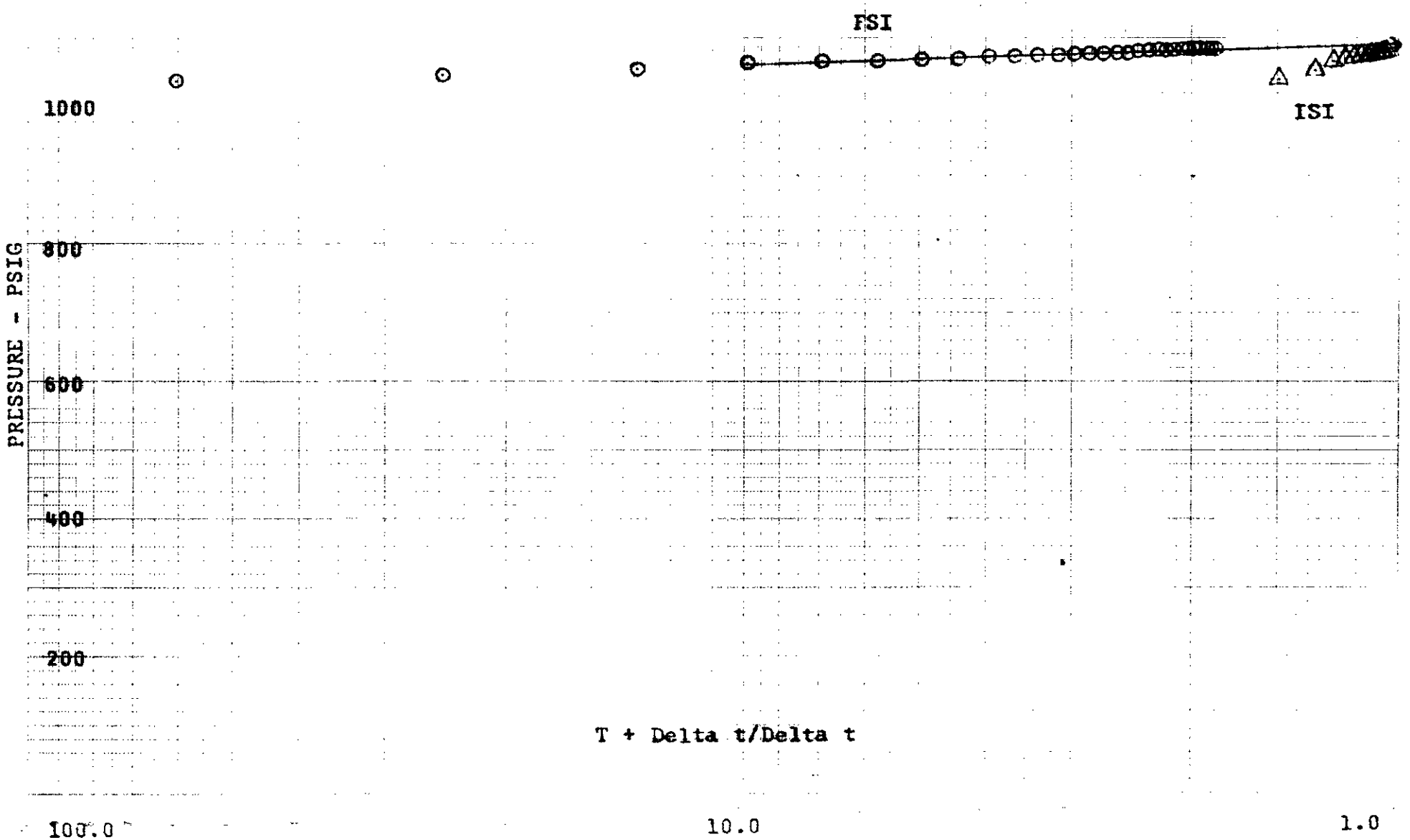
4 CALCULATION RESULTS

ESTIMATED DAMAGE RATIO	0.77
PERMEABILITY THICKNESS	841.8 MD FT
PERMEABILITY	46.76 MD
SKIN FACTOR	-1.60
APPROXIMATE DRAINAGE RADIUS	345.6 FT
PRODUCTIVITY INDEX	1.473 BPD/PSI

UNION MOBIL COVILLE LAKE D-45 DST NO. 4 REC. NO. 2015

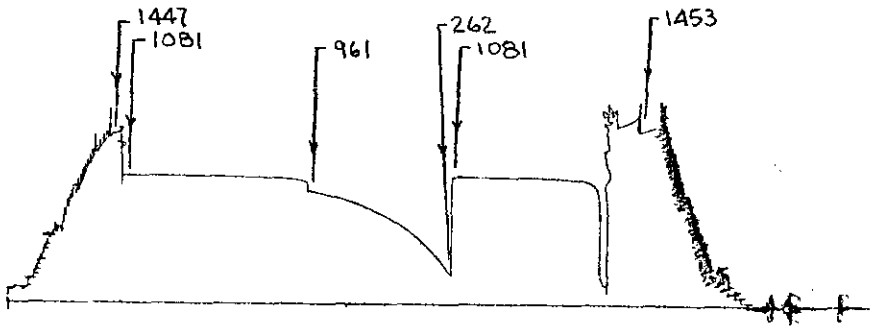


UNION MOBIL COVILLE LAKE D-45 DST NO. 4 P* = 1091.3 PSIG

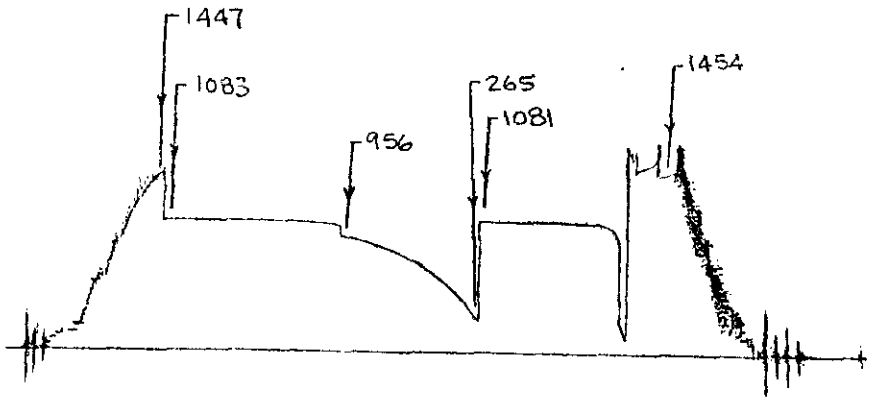


DST RECORDER CHARTS

UNION MOBIL COVILLE LAKE D-45
DST NO. 4
INSIDE REC. NO. 3852

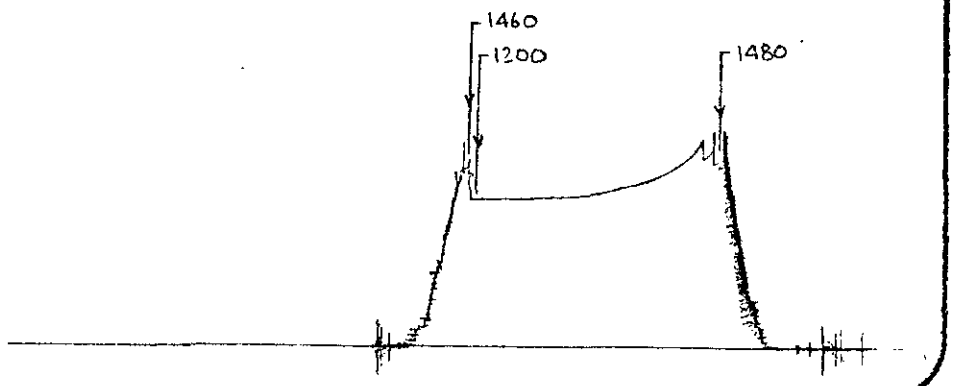


UNION MOBIL COVILLE LAKE D-45
DST NO. 4
INSIDE REC. NO. 2015



DST RECORDER CHARTS

UNION MOBIL COVILLE LAKE D-45
DST NO. 4
BTM REC. NO. 3687



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BORG WARNER

BJ SERVICE DIVISION

BORG-WARNER (CANADA) LIMITED

UNION MOBIL COVILLE LAKE

D-45

TEST NO. 5

BJ BORG WARNER

TESTING REPORT

DRILL-STEM TEST DATA

Well Name UNION MOBIL COVILLE LAKE — Test No. 5

Well Number D-45 — Zone Tested OLD FORT SAND

Company UNION OIL COMPANY OF CANADA LTD. — Interval 3253 - 3278

Comp. Rep. T. RAMSEY — Tester C. MARTINEAU — Date MAY 6, 1973

Type of Test SINGLE STRADDLE — RFS Tool No

Preflow 10 mins ISI 61 mins. Flow 116 mins. FSI 112 mins.

	IN REC. No. 2015	OUT REC. No. 3852	BTM REC. No. 3687
	5750 RANGE 12 HR. CLOCK	5800 RANGE 12 HR. CLOCK	5750 RANGE 24 HR. CLOCK
DEPTH	3244	3257	3281
Initial Hydro Mud Press	1561	1570	1587
Initial Shut In Press	1098	1098	
Initial Flow Press	367	375	
Final Flow Press	1023	1032	
Final Shut In Press	1087	1099	
Final Hydro Mud Press	1471	1467	1449

Mud Drop NIL — Fluid Loss — Mud Weight 8.9

Viscosity 50 — Temperature F 95 — Net Pay Tested 25.0

Top Packer Depth 3253 — Bottom Packer Depth 3278 — Total Depth 3850

Drill Pipe Size 3.5 IF — Wt 13.3 — Drill Collar I.D. — Ft Run

Surface Choke Size 0.75 — Bottom Choke Size 0.50 — Main Hole Size 6.50

Anchor Size 4.75 — Rat Hole Size — Feet of Rat Hole

Cushion Amount — Type — Rubber Size 5.25

Fluid Recovery Total Feet 2200

Recovered 2200 Feet of SALT WATER (40,000 PPM)

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Gas Recover, How Measured Riser size

mins	Temp F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp F	Press Rdg	psi	Orifice Size	=	MCF/Day
mins	Temp F	Press Rdg	psi	Orifice Size	=	MCF/Day

Bleed Off Time for Drill Pipe

REMARKS.

A Core Lab Gas Cont No Chem - Geo. Lab Gas Cont No

BJ BORG WARNER

TESTING REPORT

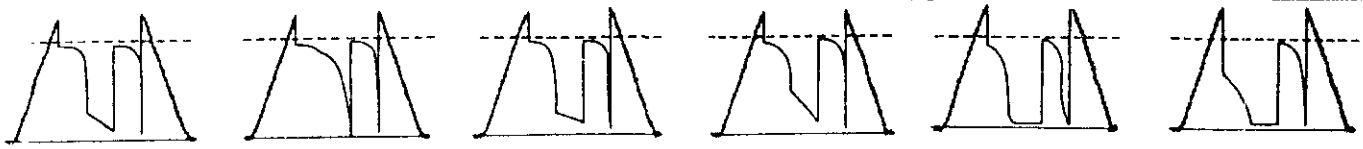
WEIGHT INDICATER READING

PRIOR TO SETTING PACKERS

AFTER PULL PACKERS LOOSE

	ID	OD	LENGTH	
4S LANDING SUB				
4S CHAMBER				
4S TOOL OR P.O. SUB			1.00	
CO SUB				
SHUT IN TOOL		4¾	5.20	
R.F.S. No.	2¼	4¾		
R.F.S. No.	2¼	4¾		
HYDRAULIC TOOL		4¾	7.20	
JARS	1	4¾		
RECORDER No. 2015	2¼	4¾	5.00	DEPTH 3244
RECORDER No.	2¼	4¾		DEPTH
SAFETY JOINT	2 11/16	4¾		
BY PASS SUB	1 5/32	4¾		
1. PACKER DEPTH — PACKER	1 OR ⅞			
2. PACKER DEPTH 3253 — PACKER	1 or ⅞		5.00	TOOL ABOVE INTERVAL 24.00
ANCHOR—SPECIFY S.D.	2½		1.00	
BLANK OFF OR BY PASS SUB	1 5/32	4¾		
RECORDER No. 3852	2¼	4¾	5.00	DEPTH 3257
PERFS			15.00	
3. PACKER DEPTH 3278 — PACKER	1 OR ⅞		4.00	TOTAL INTERVAL 25.00
			2.00	
4. PACKER DEPTH — PACKER	1 OR ⅞			
ANCHOR—SPECIFY	2½			
RECORDER No 3687	2¼	4¾	1.00	DEPTH 3281
D.P.			566.00	
TOTAL DEPTH 3850 — BULLNOSE	2¾	4¾	3.00	TOTAL TAIL PIPE 572.00
				TOTAL TEST TOOL 54.00

DST CHARTS FOR COMPARATIVE VISUAL ANALYSIS



HIGH PERMEABILITY STRONG DAMAGE EFFECT | HIGH PERMEABILITY NO DAMAGE EFFECT | MEDIUM PERMEABILITY STRONG DAMAGE EFFECT | MEDIUM PERMEABILITY NO DAMAGE EFFECT | LOW PERMEABILITY STRONG DAMAGE EFFECT | LOW PERMEABILITY NO DAMAGE EFFECT

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: OLD FORT SAND

REC NO. 2015
DST NO. 5
DEPTH 3244

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
RUN IN HOLE	0.	0.	
	63.0	1560.7	
INITIAL HYDRO PRESSURE	80.0	1560.7	
INITIAL PREFLOW PRESSURE	0.	145.2	
FINAL PREFLOW PRESSURE	10.0	334.3	
START INITIAL SHUT-IN	0.	334.3	
	5.0	1020.2	3.00
	10.0	1054.9	2.00
	15.0	1069.4	1.67
	20.0	1076.6	1.50
	25.0	1082.4	1.40
	30.0	1086.7	1.33
	35.0	1089.6	1.29
	40.0	1092.5	1.25
	45.0	1094.7	1.22
	50.0	1096.1	1.20
	55.0	1096.8	1.18
INITIAL SHUT-IN PRESSURE	61.0	1098.3	1.16
START FLOW PERIOD	0.	1098.3	
INITIAL FLOW PRESSURE	1.0	366.6	
	10.0	519.1	
	20.0	648.1	
	30.0	741.9	
	40.0	813.8	
	50.0	865.1	
	60.0	909.1	
	70.0	942.8	
	80.0	967.7	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: OLD FORT SAND

REC NO. 2015
DST NO. 5
DEPTH 3244

TIME - PRESSURE INCREMENTS

REMARKS	TIME MIN.	PRESSURE PSIG	T+DELTA(T)/ DELTA(T)
	90.0	988.3	
	100.0	1005.8	
FINAL FLOW PRESSURE	116.0	1023.1	
START FINAL SHUT-IN	0.	1023.1	
	2.0	1052.0	64.00
	10.0	1059.2	13.60
	20.0	1065.0	7.30
	30.0	1069.4	5.20
	40.0	1072.3	4.15
	50.0	1075.1	3.52
	60.0	1078.0	3.10
	70.0	1079.5	2.80
	80.0	1081.6	2.57
	90.0	1083.8	2.40
	100.0	1085.3	2.26
FINAL SHUT-IN PRESSURE	112.0	1086.7	2.12
RUN OUT OF HOLE	0.	1086.7	
FINAL HYDRO PRESSURE	1.0	1471.1	
	7.0	1471.1	
OUT OF HOLE	81.0	0.	

WELL NAME: UNION MOBIL COVILLE LAKE
WELL LOCATION: D-45
FORMATION: OLD FORT SAND
RECOVERY TYPE USED IN CALCULATIONS: WATER

REC NO. 2015
DST NO. 5
DEPTH 3244
INTERVAL 3253-3278

SUMMARY OF CALCULATIONS

1 FIRST SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	1110.2 PSIG
SLOPE OF EXTRAPOLATED LINE	180.41 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.20 PSI
NUMBER OF POINTS IN SHUT-IN	13
NUMBER OF POINTS USED FOR EXTRAPOLATION	5

2 SECOND SHUT-IN

EXTRAPOLATED FORMATION PRESSURE	1106.8 PSIG
SLOPE OF EXTRAPOLATED LINE	61.09 PSI/CYCLE
ROOT MEAN SQUARE DEVIATION OF FITTED LINE	0.12 PSI
NUMBER OF POINTS IN SHUT-IN	13
NUMBER OF POINTS USED FOR EXTRAPOLATION	5
DIFFERENCE (2ND-1ST EXTRAPOLATION)	-3.3 PSI

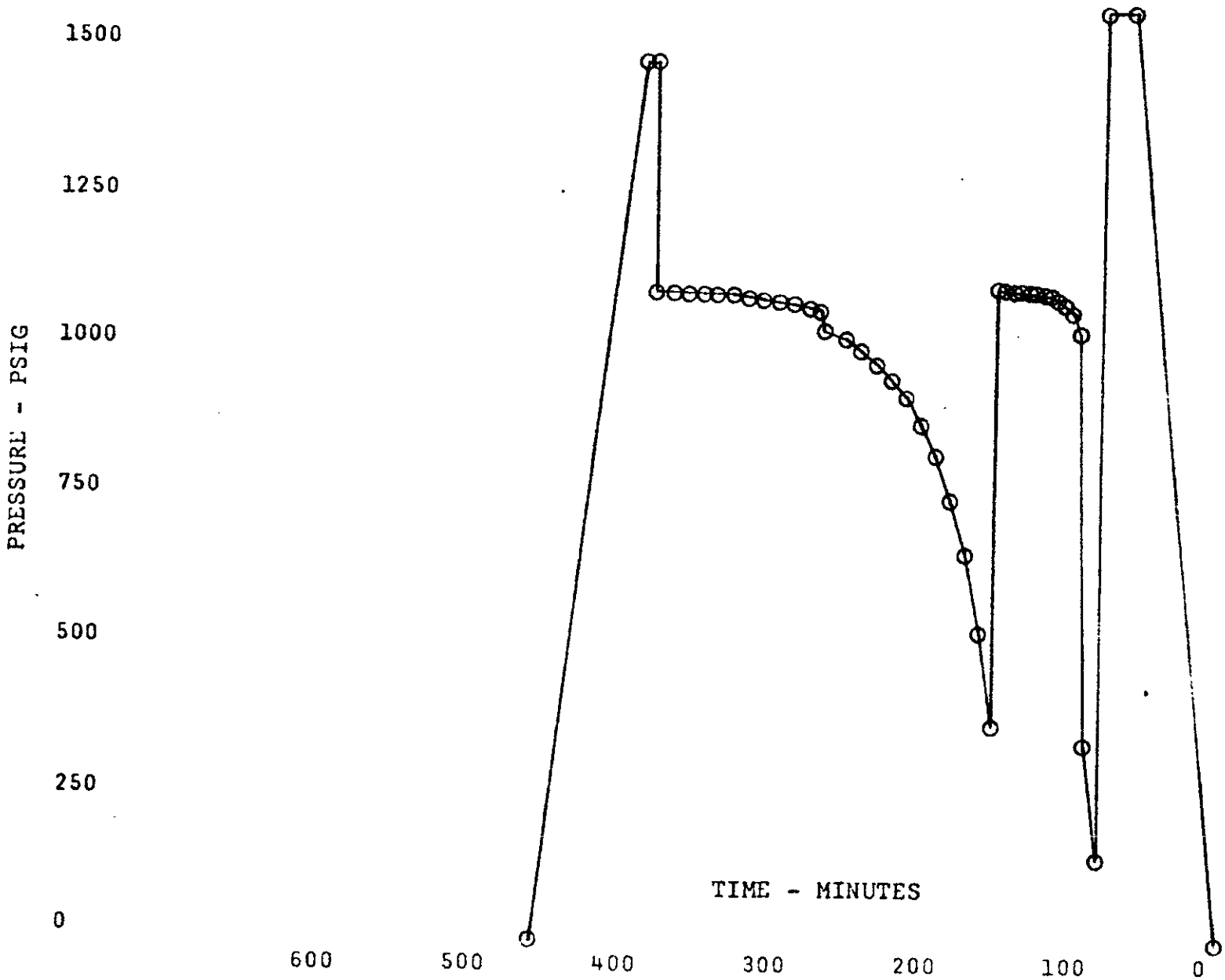
3 RESERVOIR AND FLUID PROPERTIES

NET PAY	25.00 FT
RESERVOIR POROSITY	15.00 PERCENT
PRODUCTION RATE	186.6 BPD
FORMATION VOLUME FACTOR	1.000 RB/STB
FLUID VISCOSITY	0.760 C.P.
TOTAL COMPRESSIBILITY X 10-6	7.200 /PSI
RESERVOIR TEMPERATURE	95.0 F
FINAL FLOWING PRESSURE	1023.1 PSIG
TOTAL FLOW TIME	126.0 MIN

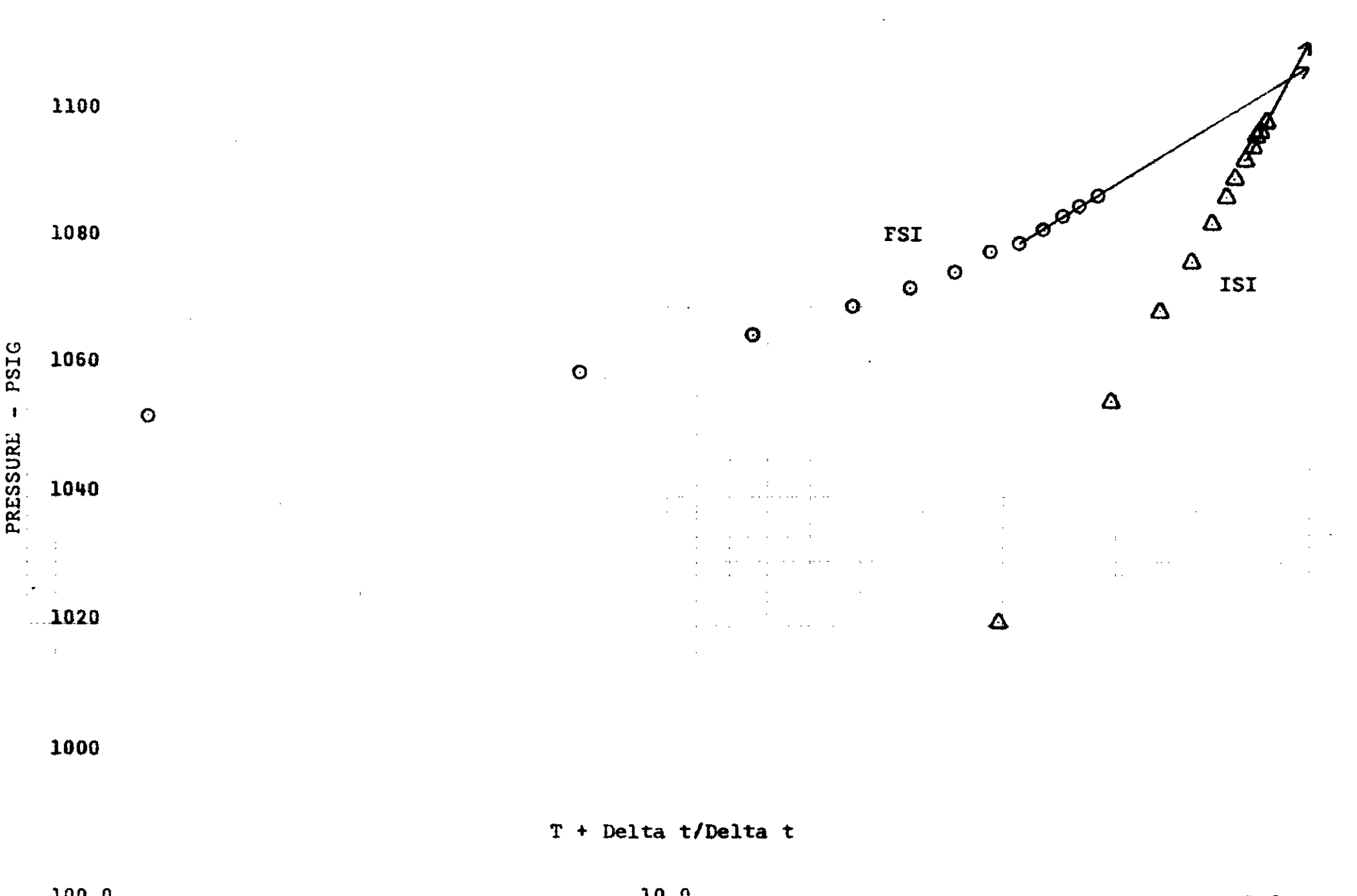
4 CALCULATION RESULTS

ESTIMATED DAMAGE RATIO	0.25
PERMEABILITY THICKNESS	377.3 MD FT
PERMEABILITY	15.09 MD
SKIN FACTOR	-4.75
APPROXIMATE DRAINAGE RADIUS	201.2 FT
PRODUCTIVITY INDEX	2.229 BPD/PSI

UNION MOBIL COVILLE LAKE D-45 DST NO. 5 REC. NO. 2015

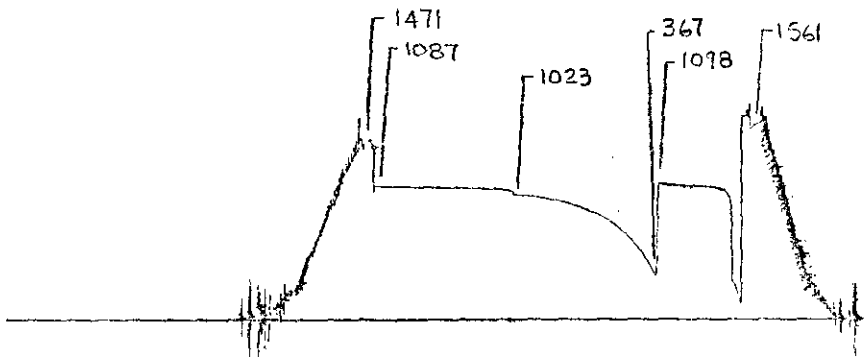


UNION MOBIL COVILLE LAKE D-45 DST NO. 5 P* = 1106.8 PSIG

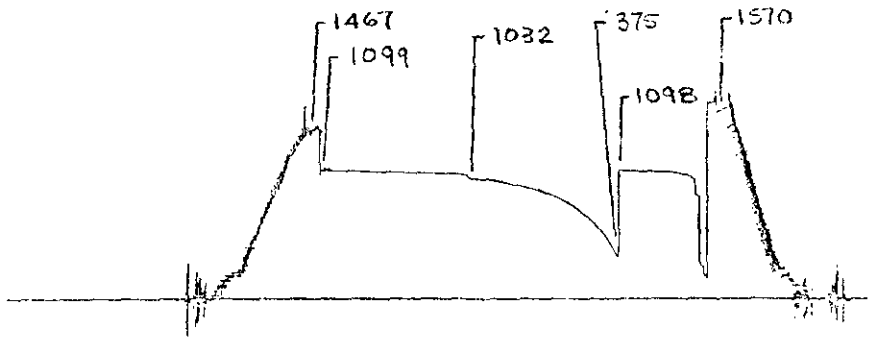


DST RECORDER CHARTS

UNION MOBIL COVILLE LAKE D-45
DST NO. 5
INSIDE REC. NO. 2015

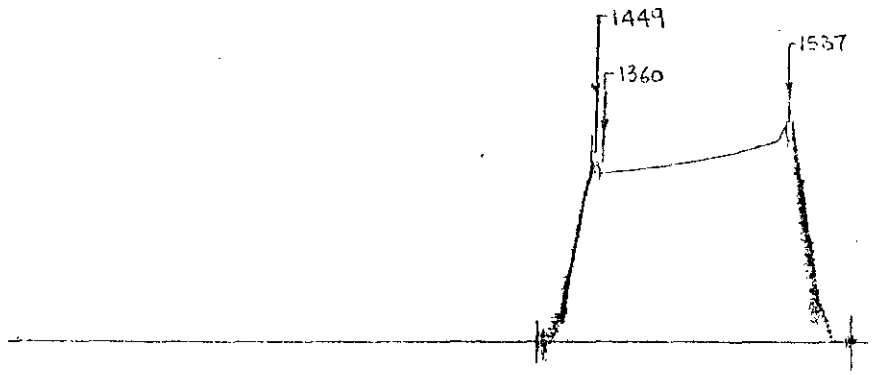


UNION MOBIL COVILLE LAKE D-45
DST NO. 5
OUTSIDE REC. NO. 3852



DST RECORDER CHARTS

UNION MOBIL COVILLE LAKE D-45
DST NO. 5
BTM REC. NO. 3687



Special Core Analysis Study

for

UNION OIL COMPANY OF CANADA LIMITE

Stopover K-44 and Colville D-45 Wells

MEMORANDUM

October 22, 1987 87295ACC0062

D.B. GRASS
A-348

Visual Source Rock Report on Five Wells, Central Mackenzie Valley, NWT.

1. Gulf Fina N. Colville L-21 3685-3706 ft (Cambrian) Non-source. ?Colonial algal cells 3730-3742 ft (Cambrian) Non-source.

2. Atlantic Arctic Circle Ontaratue K-04 7966-8006 ft (Pe) Non-source. Rare ?colonial algal cells 8008-8024 ft (Pe) Non-source. Rare ?colonial algal cells 8761-8782 ft (Pe) Non-source. Kerogen fragments present black, TAI 7 very rare ?colonial algal cells

3. Candell et al Police Island L-66 4287-4313 ft (Cambrian) Non-source

4. Imperial Windflower G-77 1350-1370 ft (Devonian) Non-source

5. **Union Mobil Colville D-45** 3018-3030 ft (Cambrian) Poor source for hydrocarbons Amorphous, blob-like, medium brown coloured kerogen abundant ?colonial algal cells (some in tetrads) 3057-3081 ft Non-source. As above but less amorphous material and very abundant algal cells. Medium brown colour on usual TAI scale would be 5, or "past peak" oil, pre-peak gas. 3102-3116 ft Non-source. ?Colonial lagal cells in decreased numbers, no kerogen material as in two samples above. 3128-3136 ft (Cambrian) Non-source. Barren.

Comment: Normally, all samples which test non-source (less than 0.05 kerogen ml/15 gm sample) are deemed as unsuitable for further source-rock evaluation. However, samples at 3057-81 ft in the Colville D-45 well and 3685-3706 ft in the Colville L-21 well were recommended for study. This was in order to see if something could be learned of the nature of the kerogen material in these samples. A subsequent report was not enlightening on the matter. However, another sample with similar ?algal material at 3018-3030 ft in Mobil Colville D-45 indicated presence of liquid hydro- carbon generating material at early peak oil generating stage. Hence the visual reading indicated a slightly higher

generating stage than rock-eval. (Geochemistry Services Group, Tulsa Research Center, Technical Service 879169CI by R. J. Harwood, October, 1987).

WWBRIDEAUX
Geological Associate

WWB/WWB

A M O C O P R O D U C T I O N C O M P A N Y
R E S E A R C H C E N T E R

AUTHORIZED BY D. B. GRASS
TECHNICAL SERVICE NUMBER 879169

TABLE 1: ROCKEVAL PYROLYSIS DATA
DATE 05/07/90

SAMPLE NUMBER	TOP OF INTERVAL FEET	FORMATION	TOTAL ORGANIC CARBON WT% ROCKEVAL TOC	PPM VOLATILE HYDROCARBONS (S1 X 1000)	VOL/ TOC	PPM GENERATED HYDROCARBONS (S2 X 1000)	GEN/ TOC	TEMP OF MAX GEN	VOL/ VOL + GEN
UNION MOBIL COLVILLE D-45		D45 6720 12500					45		
I-500	3018.0	MT. CAP	.4	110	.03	1060	.27	447	.09
I-501	3057.0	MT. CAP	< .1	30	.15	120	.60	NR	.20
PEX FINA N COLVILLE L-21		L21 6750 12600							
I-502	3685.0	MT. CAP	.1	10	.01	120	.11	NR	.08

NR indicates 'not reliable'

TABLE 2: BITUMEN DATA

SAMPLE NUMBER	FIELD NO. OR DEPTH FEET TOP***BOTTOM	FORMATION	TOTAL ORG C WT%	BITUMEN BBL/AF	BITUMEN PPM	SAT HC BBL/AF	SAT HC PPM	SAT HC/ BITUMEN	BIT/ TOC	NC17/ PR	NC18/ PH	CPI BITUMEN	PR/ PH
UNION MOBIL COLVILLE D-45		D45 6720 12500						45					
I-500	3018.0 - 3030.0	MT. CAP	.4	9	511				.13	2.37	2.44	.97	1.65

TABLE 3: VISUAL AND VITRINITE REFLECTANCE

SAMPLE NUMBER	FIELD NO. OR DEPTH FEET TOP***BOTTOM	FORMATION	VIT REFLECTANCE %RO	VIT REFLECTANCE COUNTS	VISUAL SCALE	KEROGEN DESCRIPTION
UNION MOBIL COLVILLE D-45		D45 6720 12500				45
I-500	3018.0 - 3030.0	MT. CAP	.32	65		AMORPHOUS

TABLE 4: ELEMENTAL ANALYSIS DATA

SAMPLE NUMBER	FIELD NO. OR DEPTH FEET TOP***BOTTOM	FORMATION	NORM. ELEMENTAL ANALYSIS, WT. % CARBON	HYDROGEN	OXYGEN	NITROGEN	% REC	SULFUR WT. %	ASH WT. %	ATOMIC RATIO O/C	ATOMIC RATIO H/C	CARBON ISOTOPE KEROGEN
UNION MOBIL COLVILLE D-45		D45 6720 12500					45					
I-500	3018.0 - 3030.0	MT. CAP	84	7.0	8.0	1.1	79			.07	1.00	

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

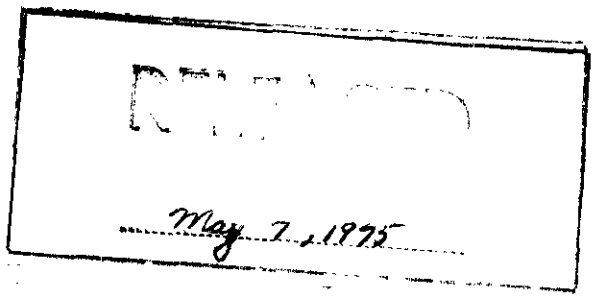
Special Core Analysis Study

for

UNION OIL COMPANY OF CANADA LIMITED

Stopover K-44 and Colville D-45 Wells

Northwest Territories, Canada



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

March 25, 1976

Union Oil Company of Canada Limited
P. O. Box 999
Calgary, Alberta T2P 2K6
Canada

Attention: Mr. Lorne D. McCluskey

Subject: Special Core Analysis Study
Stopover K-44 and Colville D-45 Wells
Northwest Territories, Canada
File Number: SCAL-75150

Gentlemen:

In letters dated April 25, 1975, June 2, 1975, and June 16, 1975 from Lorne D. McClusky, Core Laboratories, Inc., was requested to perform: (1) Water-Oil Relative Permeability Tests, (2) Mercury Injection Tests, (3) Capillary Pressure Tests, (4) Formation Resistivity Factor Measurements, and (5) Formation Resistivity Index Measurements on sandstone core plugs from the subject wells. The results of the water-oil relative permeability tests are presented herein. The remaining tests are in progress and test results will be submitted as the data becomes available. The core plugs used in this study are identified as to well, sample number, and depth interval on Page 1 and are lithologically described on Page 2.

Fifteen core plugs and nine slabbed well cores were submitted for use in this study. Core plugs, 1-inch in diameter, were drilled from the nine slabbed cores using a diamond core bit with water as the bit coolant and lubricant. All core plugs were extracted of hydrocarbons with toluene, leached of salt with methyl alcohol, and then dried. Air permeabilities and Boyle's law porosities were determined on the cleaned and dried core plugs. The results of the permeability and porosity determinations were submitted to a representative of Union Oil Company of

Canada Limited. Based on the permeability and porosity determinations, core plugs were selected for further testing.

Eleven core plugs, six from the Stopover well and five from the Colville well, were evacuated and saturated with either a simulated Stopover formation water or a simulated Colville formation water. Initial (pseudo-connate) water saturations which averaged 13.0 per cent pore space for the Colville D-45 well and 21.5 per cent pore space for the Stopover K-44 well were established using a centrifugal technique. Effective permeabilities to oil were measured in the presence of the initial water saturations. One core plug from each well contained insufficient permeability for further testing and was deleted from the testing program. Water-oil relative permeability tests were performed using the proper injection water. The results of the water-oil relative permeability tests are summarized by well on Page 3, presented in tabular form on Pages 4 through 11, and in graphical form on Pages 12 through 27.

Because of the limited oil production following water breakthrough for Sample 115, insufficient data was available to calculate the relative permeability characteristics. The results of this test are summarized on Page 3 with the water-oil relative permeability data; however, only end-point data is presented.

The properties of the fluids used in the water-oil relative permeability tests are listed below for your convenience.

Fluid	Temperature, °F.	Density, gm/cc.	Viscosity, Centipoises
Refined Mineral Oil	70	0.8348	20.6
	90	0.8272	12.9
	110	0.8196	8.61
Simulated Colville Water	70	1.038	1.067
	90	1.035	0.845
	110	1.032	0.687
Simulated Stopover Water	70	1.023	1.026
	90	1.019	0.810
	110	1.014	0.653

The results of the tests on Samples 50A and 98 from the Stopover K-44 well indicate both channeling and plugging. The channeling is indicated by the rapid increase in the relative permeability-to-water curves (Pages 21 and 25) at the low water saturations and the plugging is indicated by the suppressed relative permeability-to-water curves at the high water saturations.

Should you have any questions pertaining to these test results, or if we can be of any assistance, please do not hesitate to contact us.

Very truly yours,

Core Laboratories, Inc.

Duane L. Archer (DB)

Duane L. Archer, Manager
Special Core Analysis

DLA:JWW:tl
10 cc. - Addressee

Company Union Oil Company of Canada Limited
Formation Old Fort Sand
Number of Wells Two
County Northwest Territories
Field As Noted
State Canada

Identification of Samples

Sample Number	Company	Well	Depth, Feet
		Stopover Field	
50A	Union Oil Co. of Canada Ltd.	Union Oil Stopover K-44	2784.1-85.0
88			2813.2-13.5
98			2820.8-21.9
103			2825.6-26.2
115			2834.3-34.9
		Colville Field	
1	Union Oil Co. of Canada Ltd.	Union Mobile Colville D-45	3183.2-83.7
11			3218.0-18.7
15			3223.0-23.4
18			3225.9-26.4

Lithological Description

Sample Number	Description
	Colville D-45
1	Ss, lt gry, v/fn-silt grn, apparent SiO_2 cement, well indurated, tr musc,pyrite
11	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminar, tr musc
15	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae, tr musc
18	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae
	Stopover K-44
50A	Ss, red-brn, cse-v/fn grn, apparent SiO_2 cement, well indurated, cse grn concentrations
88	Ss, buff-white, med-fn grn, apparent SiO_2 cement, mod indurated, red-brn staining an upper portion
98	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color staining, grns uniform
103	Ss, red-brn, cse-fn grn, apparent SiO_2 cement, mod-poor indurated, blotchy color appearance
115	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color appearance

Summary of Waterflood Test Results

Sample Number	Depth, Feet	Air Permeability, Millidarcys	Porosity, Per Cent	Initial Conditions: Water Saturation, Per Cent Pore Space	Initial Conditions: Oil Permeability, Millidarcys	Terminal Conditions: Oil Saturation, Per Cent Pore Space	Terminal Conditions: Water Permeability, Millidarcys	Oil Recovered, Per Cent Pore Space	Oil Recovered, Per Cent Oil in Place
				Colville D-45					
1	3183.2-83.7	0.35	11.7	14.6	0.065	39.2	0.028	46.2	54.0
11	3218.0-18.7	12	14.0	13.8	8.5	49.3	6.4	36.9	42.8
15	3223.0-23.4	7.3	13.2	11.6	4.8	52.4	4.1	36.0	40.8
18	3225.9-26.4	20	15.1	11.9	10.5	38.8	8.8	49.3	55.9
				Stopover K-44					
50A	2784.1-85.0	1.2	8.3	28.7	0.67	52.4	0.001	18.9	26.6
88	2813.2-13.5	130	12.8	12.6	117	48.6	27	38.8	44.4
98	2820.8-21.9	12	10.1	25.8	9.0	55.3	0.15	18.9	25.5
103	2825.6-26.2	118	14.7	18.1	100	42.0	7.5	39.9	48.7
115*	2834.3-34.9	1.7	10.8	22.2	8.7	49.0	0.29	28.8	37.0

* Insufficient data for relative permeability calculation.

Water-Oil Relative Permeability Data

Sample Number 1
Air Permeability, Md. 0.35
Oil Permeability at Initial Water Saturation, Md. 0.065
Initial Water Saturation, Per Cent Pore Space 14.6
Porosity, Per Cent 11.7

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
14.6		.000	1.000
35.5	.070	.027	.388
43.2	.687	.103	.150
49.4	4.66	.205	.044
54.3	25.3	.304	.012
56.3	59.5	.345	.0058
58.6	216	.389	.0018
59.6	540	.405	.00075
60.8		.431	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 11

Air Permeability, Md. 12

Oil Permeability at
Initial Water Saturation, Md. 8.5

Initial Water Saturation,
Per Cent Pore Space 13.8

Porosity, Per Cent 14.0

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
13.8		.000	1.000
19.7	.098	.035	.355
23.4	.973	.178	.183
25.0	1.74	.240	.138
29.1	5.72	.389	.068
35.2	22.4	.538	.024
39.8	57.3	.617	.011
43.5	124	.661	.0053
45.5	188	.690	.0037
50.7		.746	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 15
Air Permeability, Md. 7.3
Oil Permeability at
Initial Water Saturation, Md. 4.8

Initial Water Saturation,
Per Cent Pore Space 11.6
Porosity, Per Cent 13.2

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
11.6		.000	1.000
16.6	.511	.225	.440
20.7	2.07	.420	.203
22.1	2.93	.468	.160
23.5	4.12	.515	.125
27.8	10.4	.617	.059
31.7	22.7	.680	.030
39.0	97.5	.780	.0080
41.3	162	.805	.0050
47.6		.850	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 18

Air Permeability, Md. 20

Oil Permeability at
Initial Water Saturation, Md. 10.5

Initial Water Saturation,
Per Cent Pore Space 11.9

Porosity, Per Cent 15.1

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
11.9		.000	1.000
24.2	.108	.038	.350
29.4	.723	.141	.195
32.0	1.43	.209	.146
36.3	4.00	.332	.083
42.5	15.0	.540	.036
44.9	23.0	.621	.027
47.3	36.5	.693	.019
50.0	58.4	.759	.013
53.1	87.9	.800	.0091
55.0	120	.825	.0069
61.2		.839	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 50A
Air Permeability, Md. 1.2
Oil Permeability at
Initial Water Saturation, Md. 0.67

Initial Water Saturation,
Per Cent Pore Space 28.7
Porosity, Per Cent 8.3

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
28.7		.000	1.000
30.4	.050	.0049	.098
32.5	1.00	.010	.010
34.5	4.33	.013	.0030
35.9	7.78	.014	.0018
38.4	17.2	.016	.00093
40.6	33.8	.017	.00051
43.0	59.8	.018	.00030
47.6		.019	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 88
Air Permeability, Md. 130
Oil Permeability at Initial Water Saturation, Md. 117
Initial Water Saturation, Per Cent Pore Space 12.6
Porosity, Per Cent 12.8

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
12.6		.000	1.000
19.1	.0080	.0049	.610
24.3	.068	.027	.399
28.5	.199	.055	.277
31.3	.369	.076	.206
35.5	.835	.106	.127
39.4	1.94	.132	.068
42.4	4.62	.157	.034
44.4	9.10	.173	.019
45.8	14.8	.183	.012
46.7	21.6	.190	.0088
48.5	53.9	.205	.0038
49.3	92.2	.211	.0023
51.4		.231	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 98

Air Permeability, Md. 12

Oil Permeability at Initial Water Saturation, Md. 9.0

Initial Water Saturation, Per Cent Pore Space 25.8

Porosity, Per Cent 10.1

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
25.8		.000	1.000
30.3	.040	.0078	.195
33.7	.214	.012	.056
38.3	1.52	.014	.0092
41.1	4.41	.015	.0034
43.1	16.7	.015	.0009
44.3	533	.016	.00003
44.7		.016	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

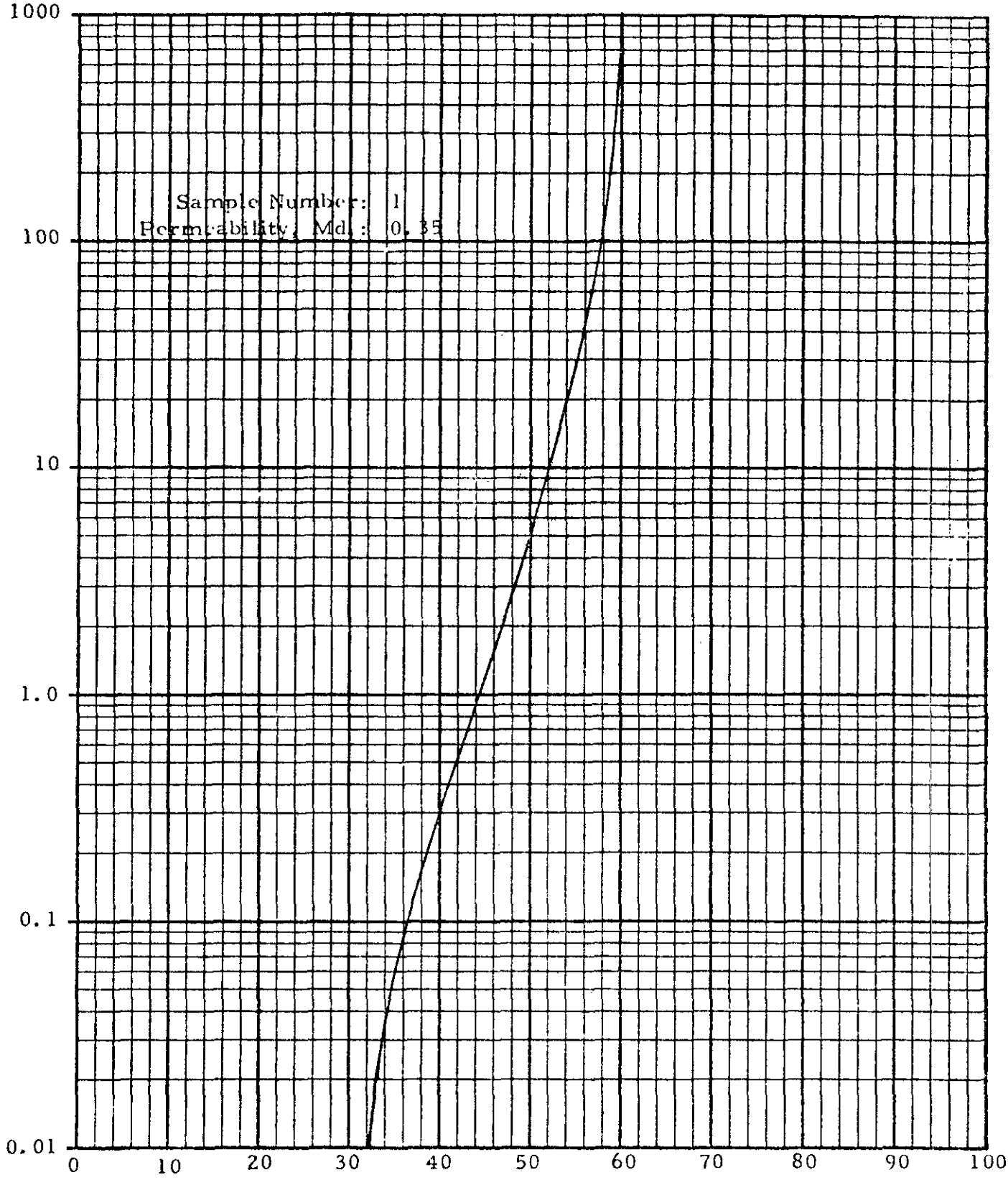
Sample Number 103
Air Permeability, Md. 118
Oil Permeability at Initial Water Saturation, Md. 100

Initial Water Saturation, Per Cent Pore Space 18.1
Porosity, Per Cent 14.7

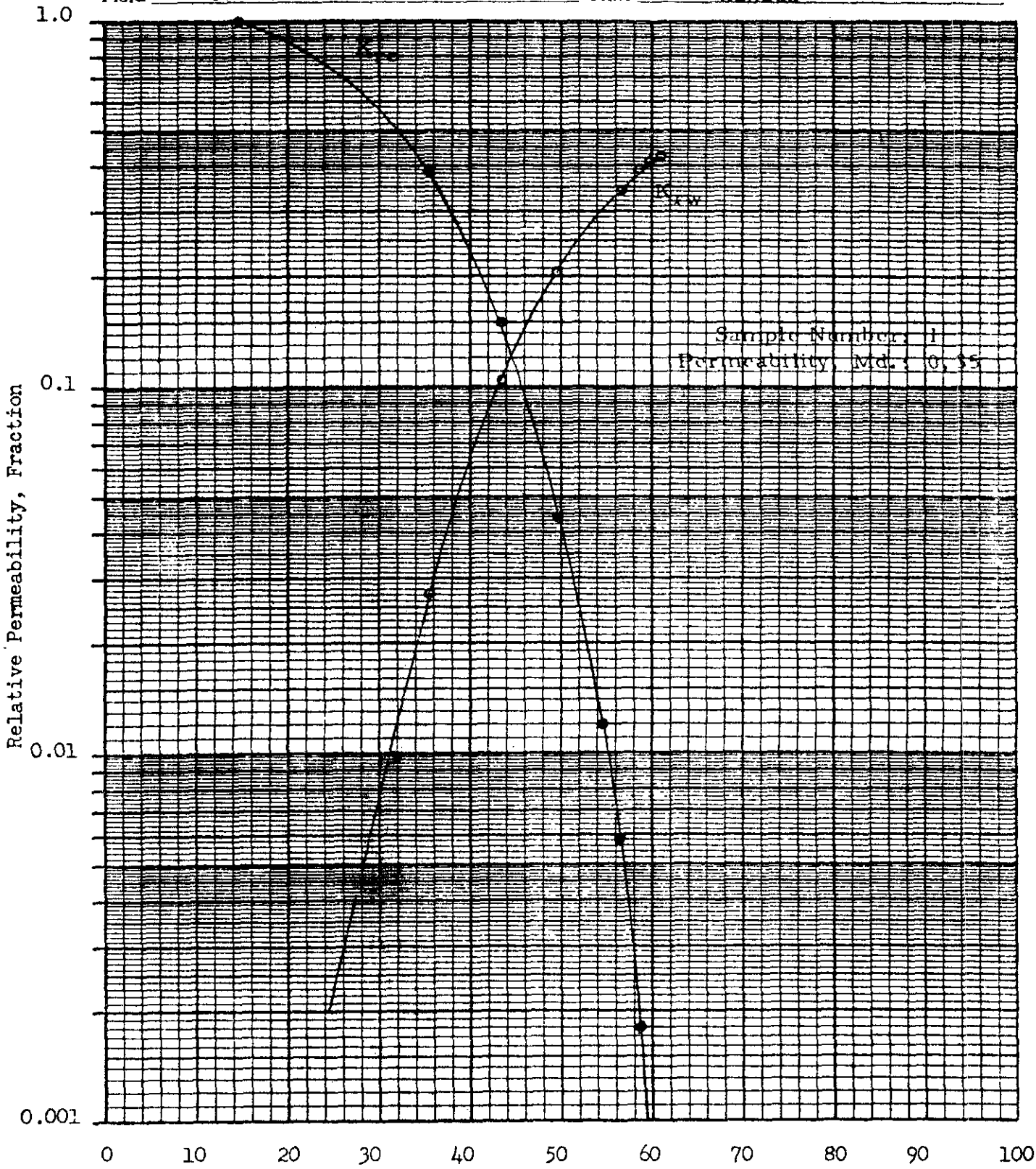
Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
18.1		.000	1.000
35.3	.0063	.0014	.221
41.2	.058	.0070	.121
47.3	.444	.024	.054
52.3	2.68	.045	.017
54.9	11.4	.057	.0050
55.9	35.8	.061	.0017
56.8	112	.067	.00060
57.3	260	.069	.00027
58.1		.075	

* Relative to oil permeability.

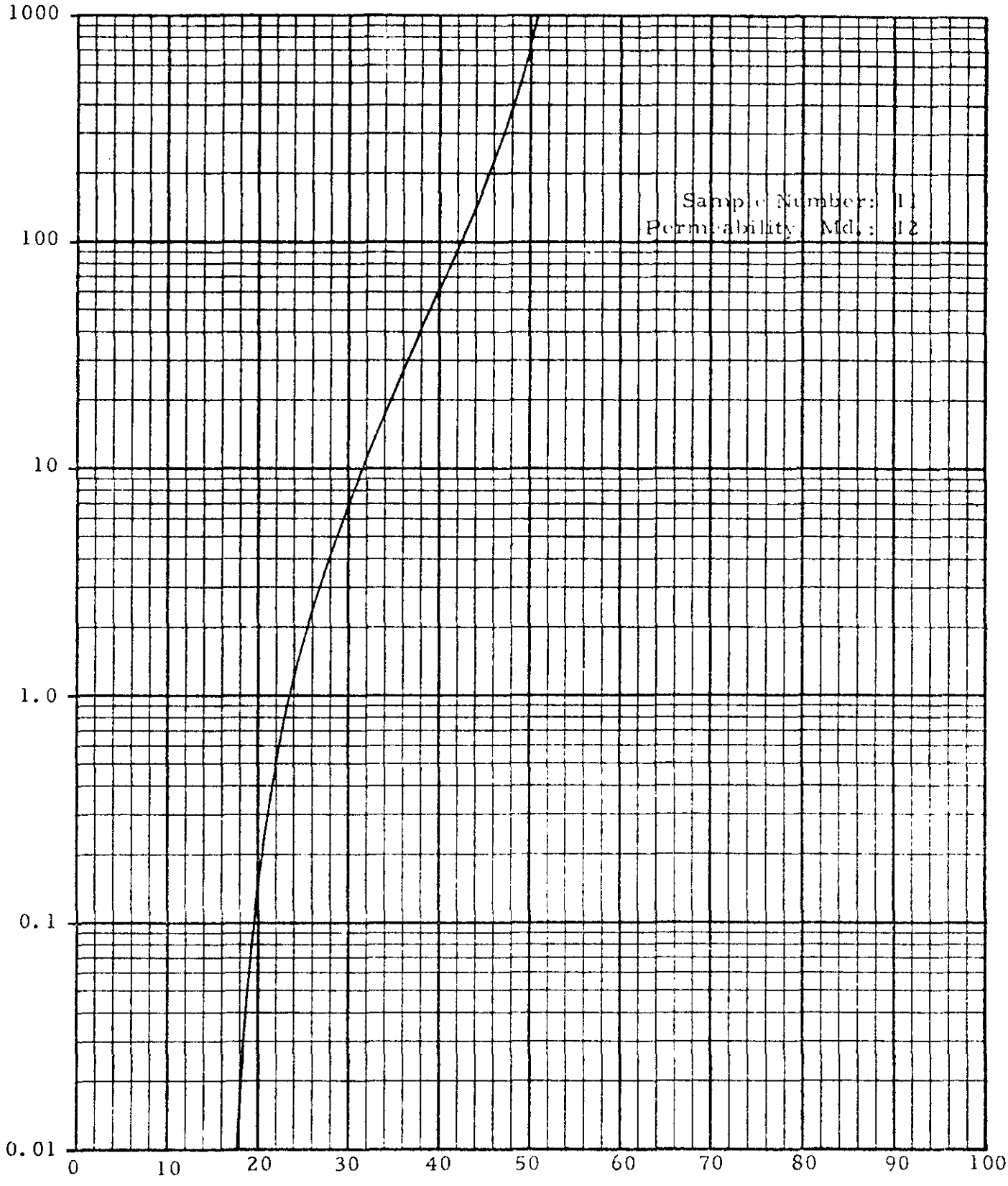
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



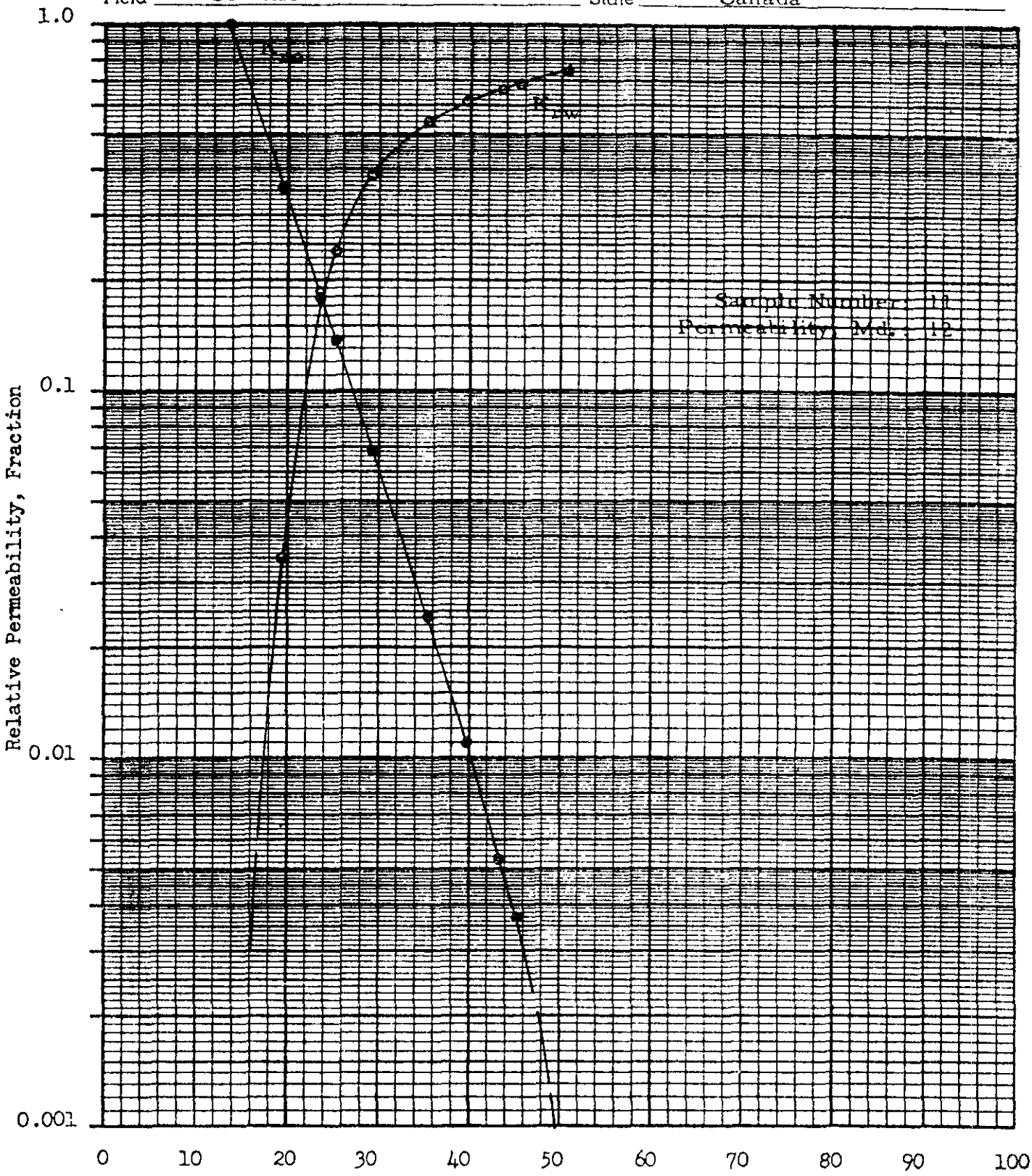
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



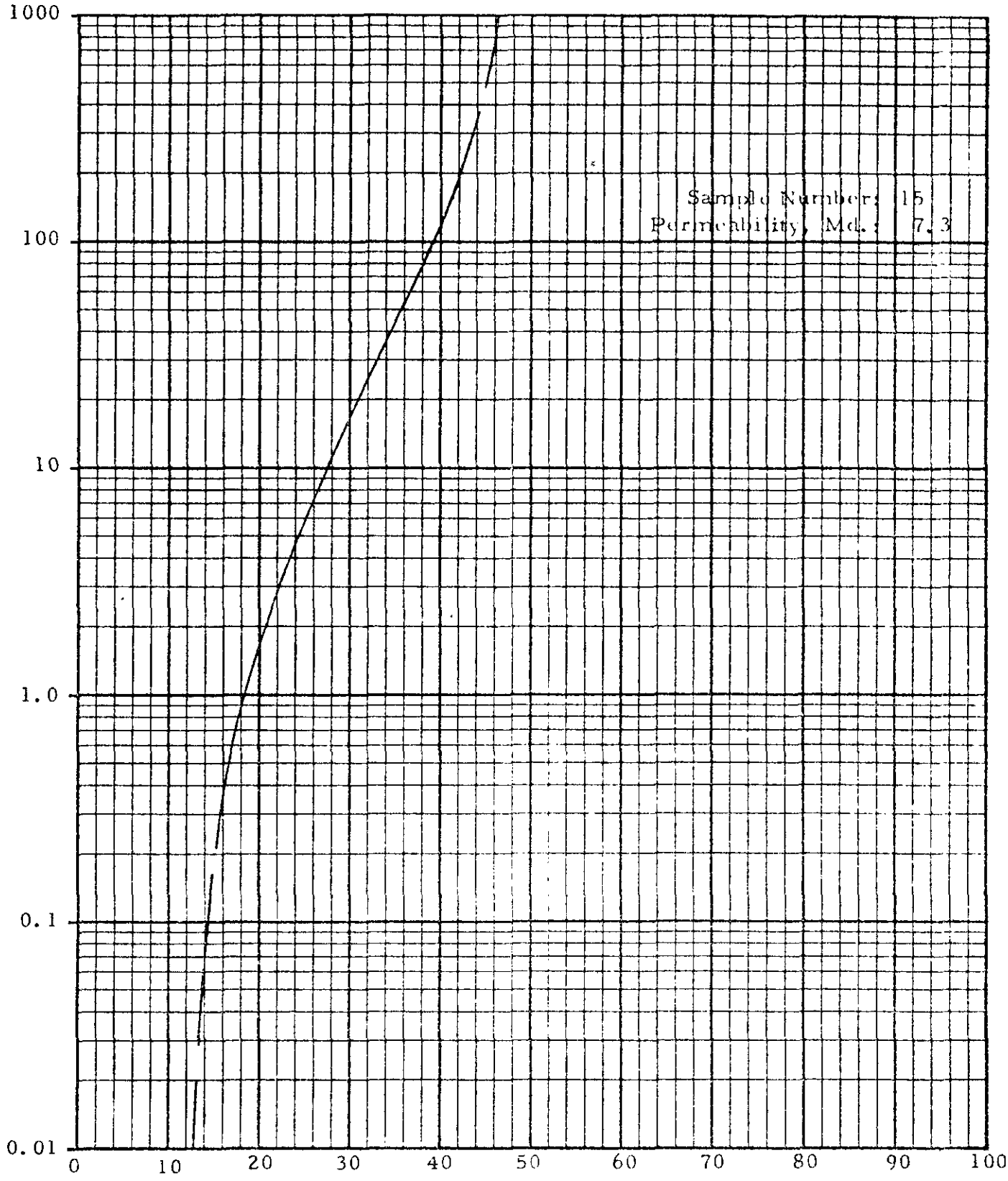
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



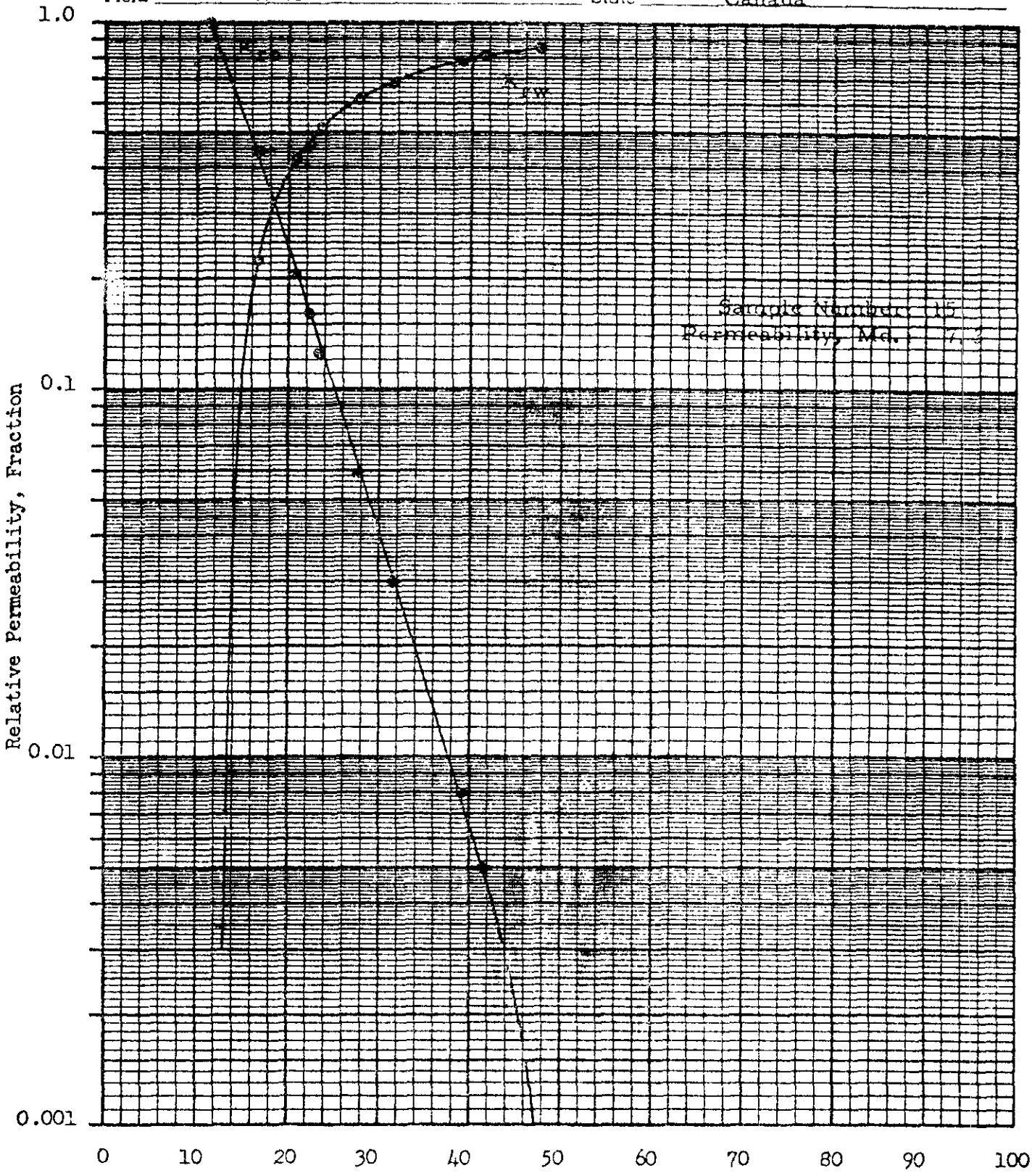
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



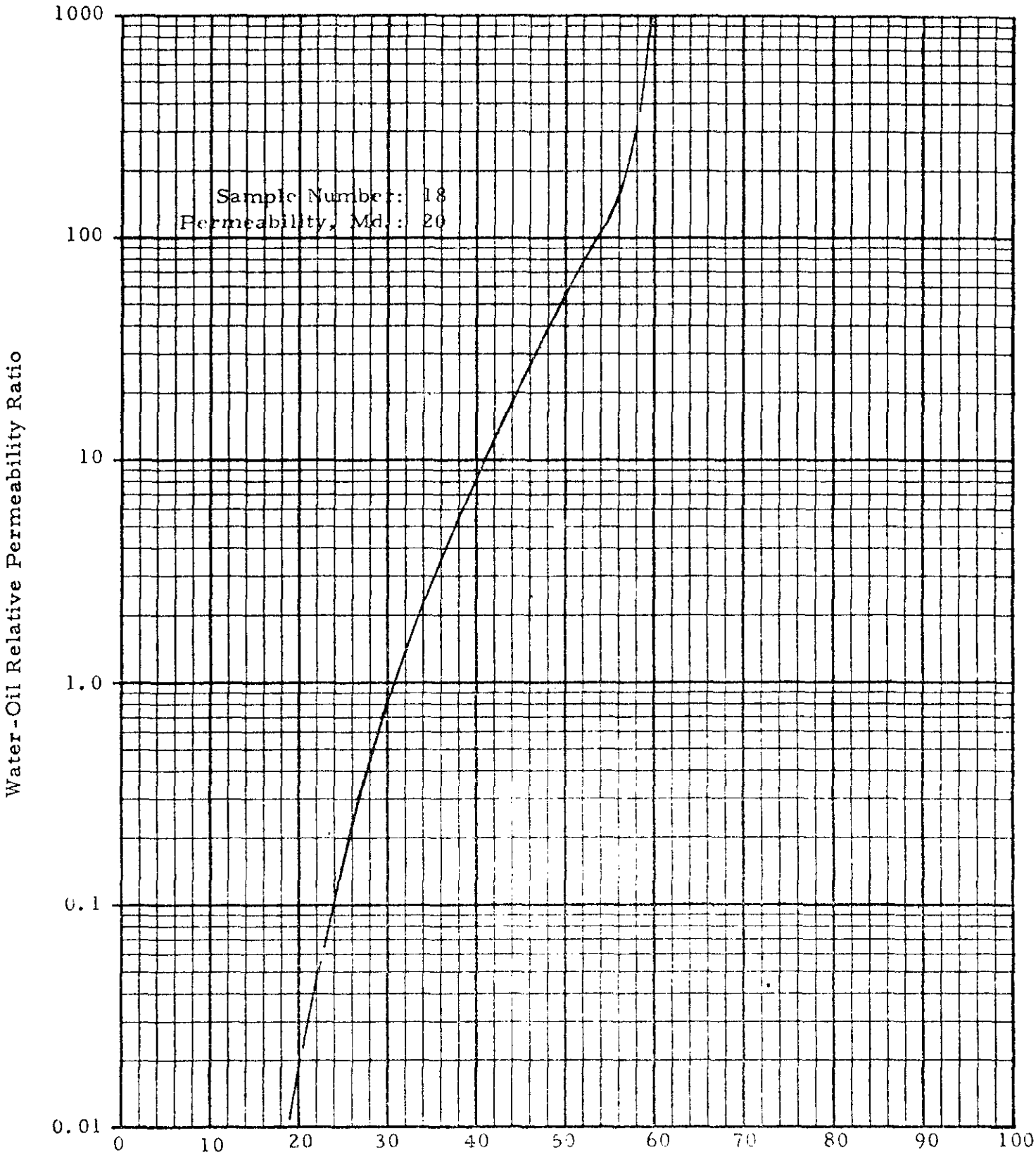
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



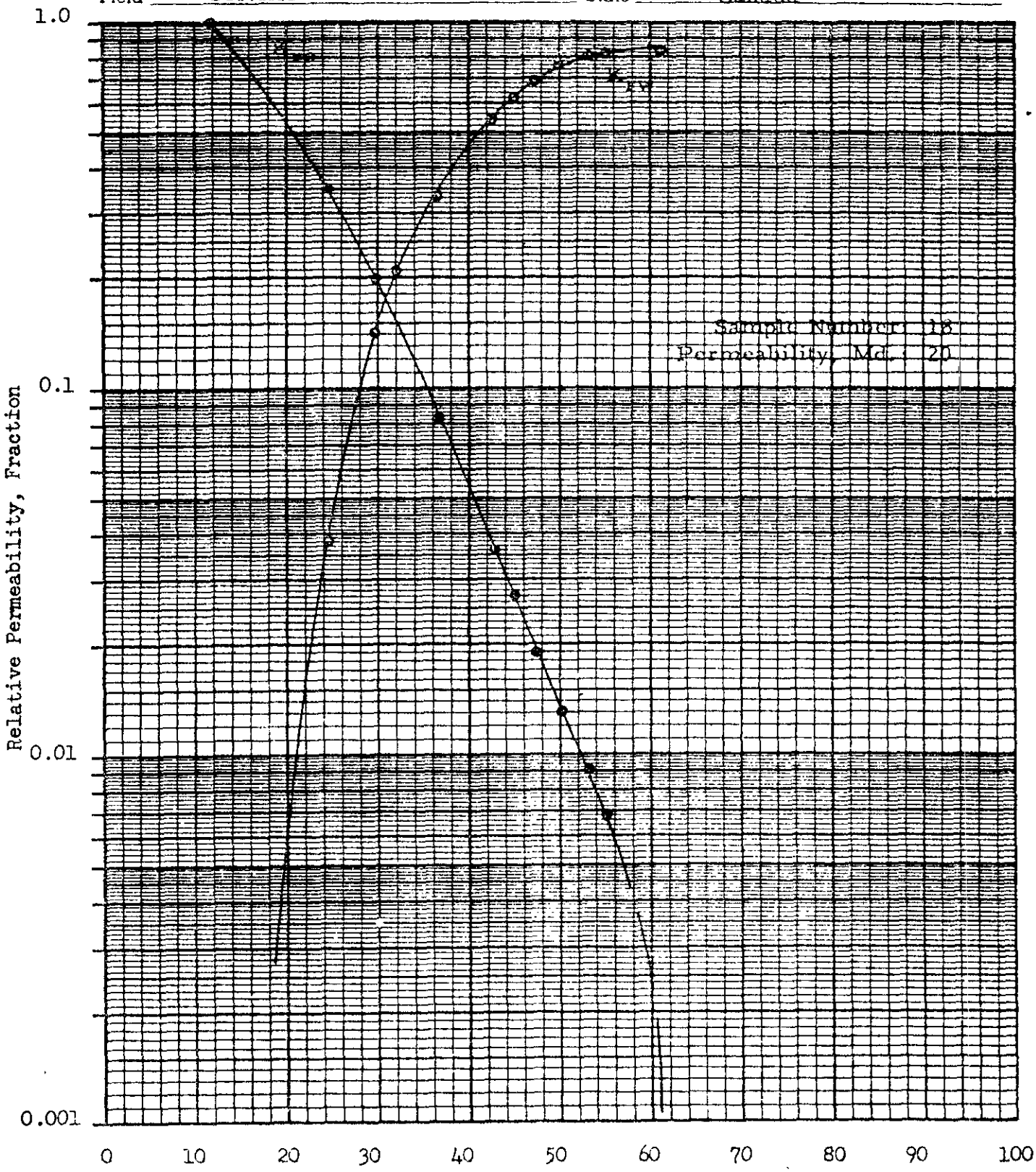
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



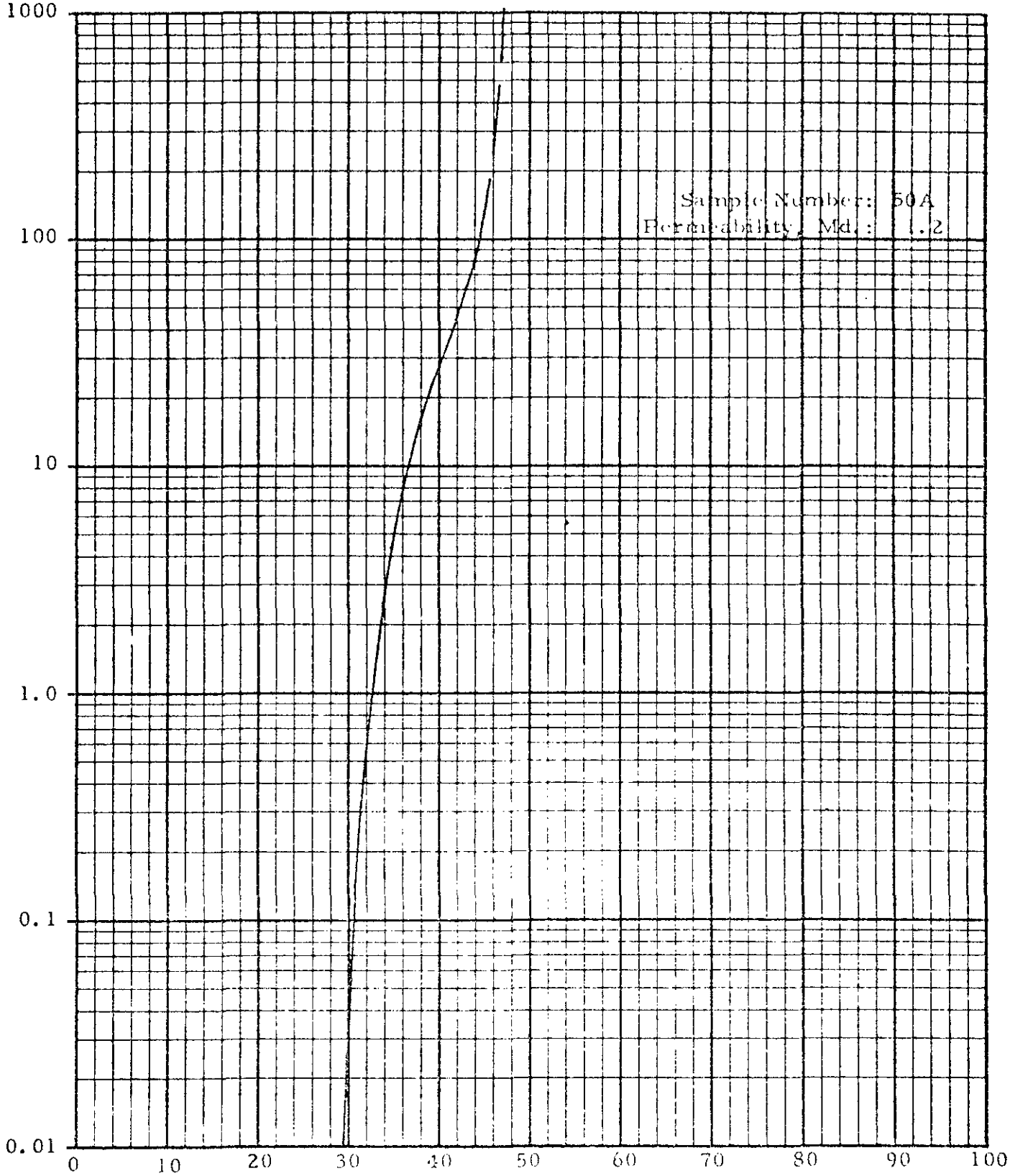
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



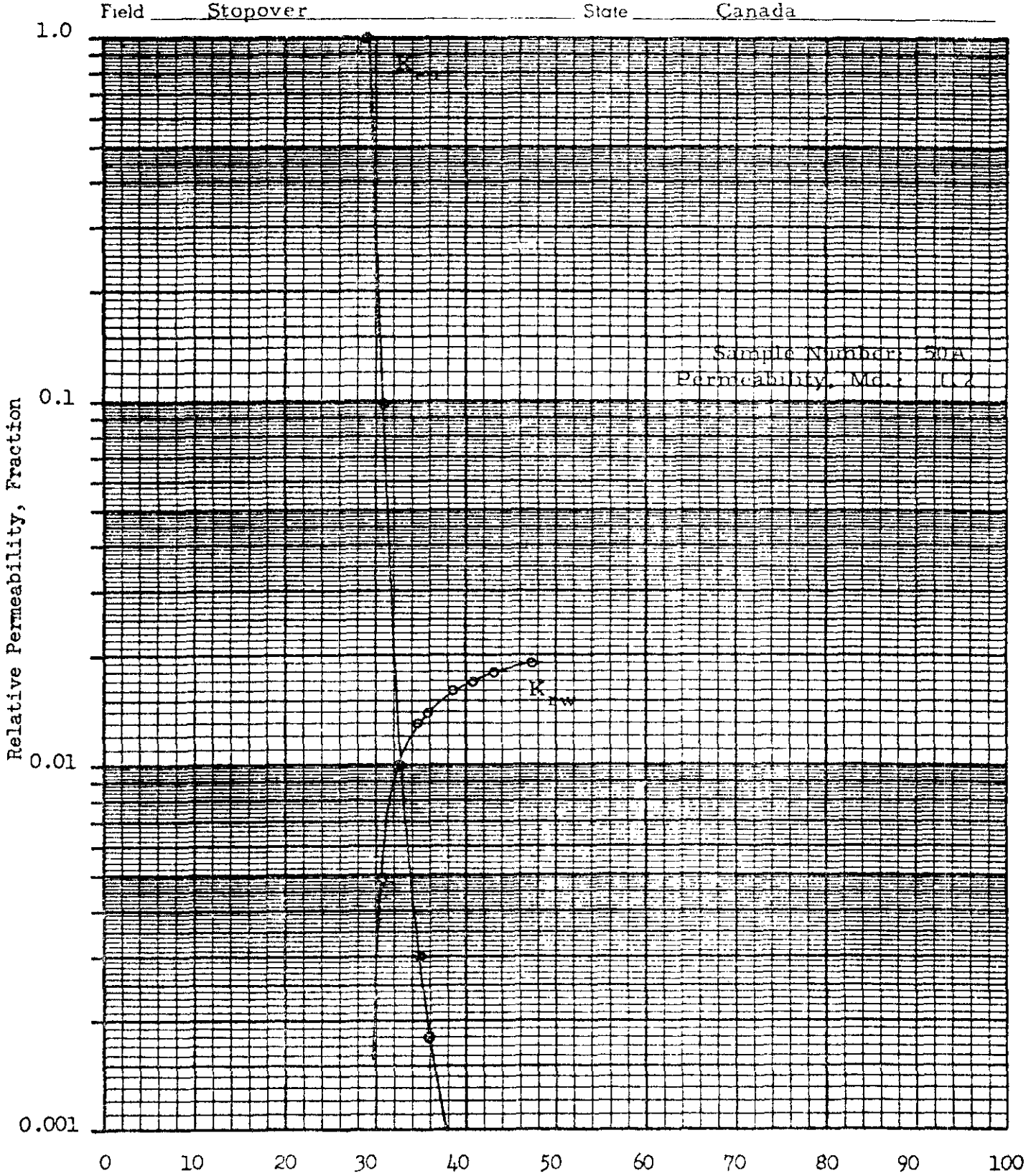
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



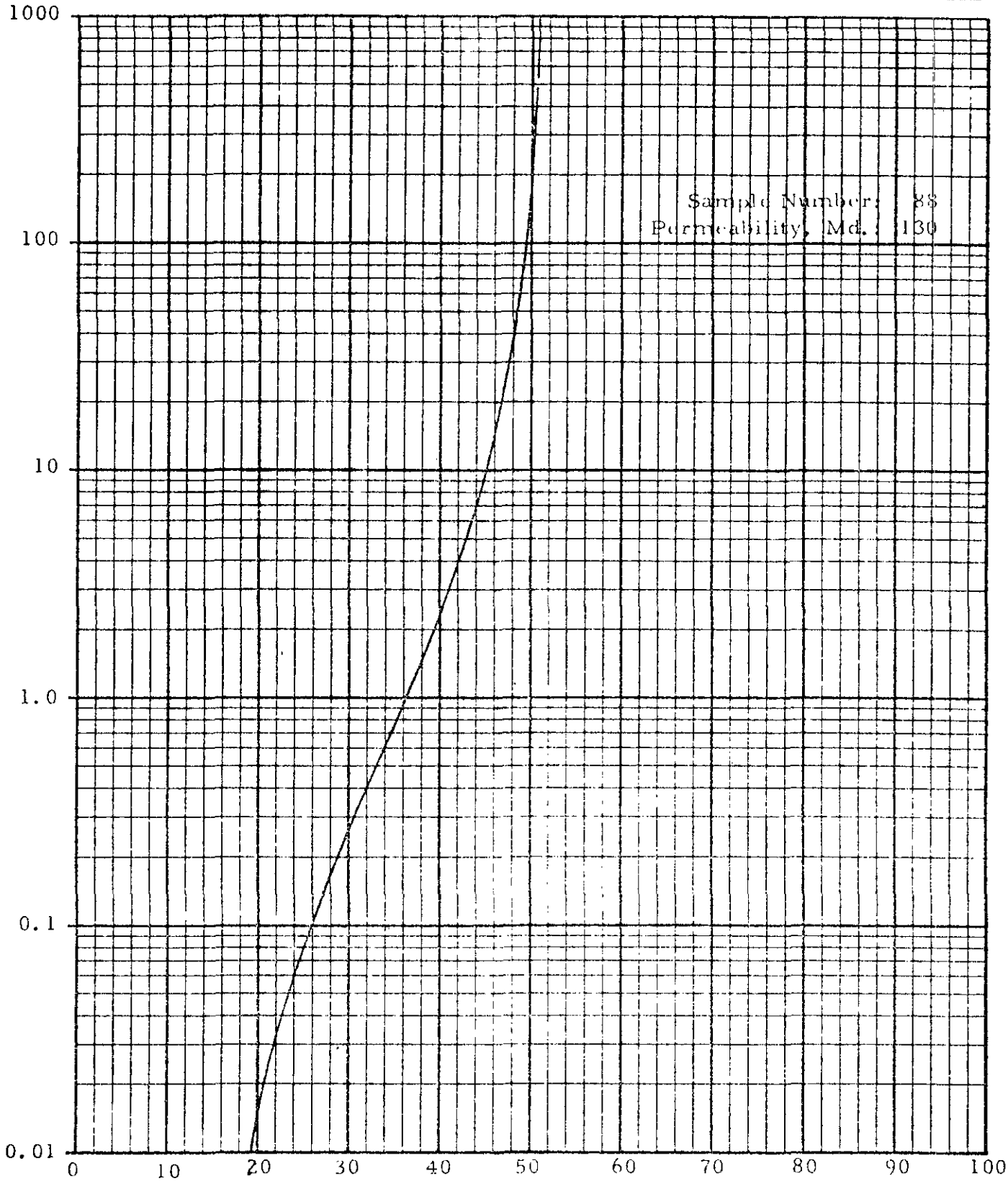
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



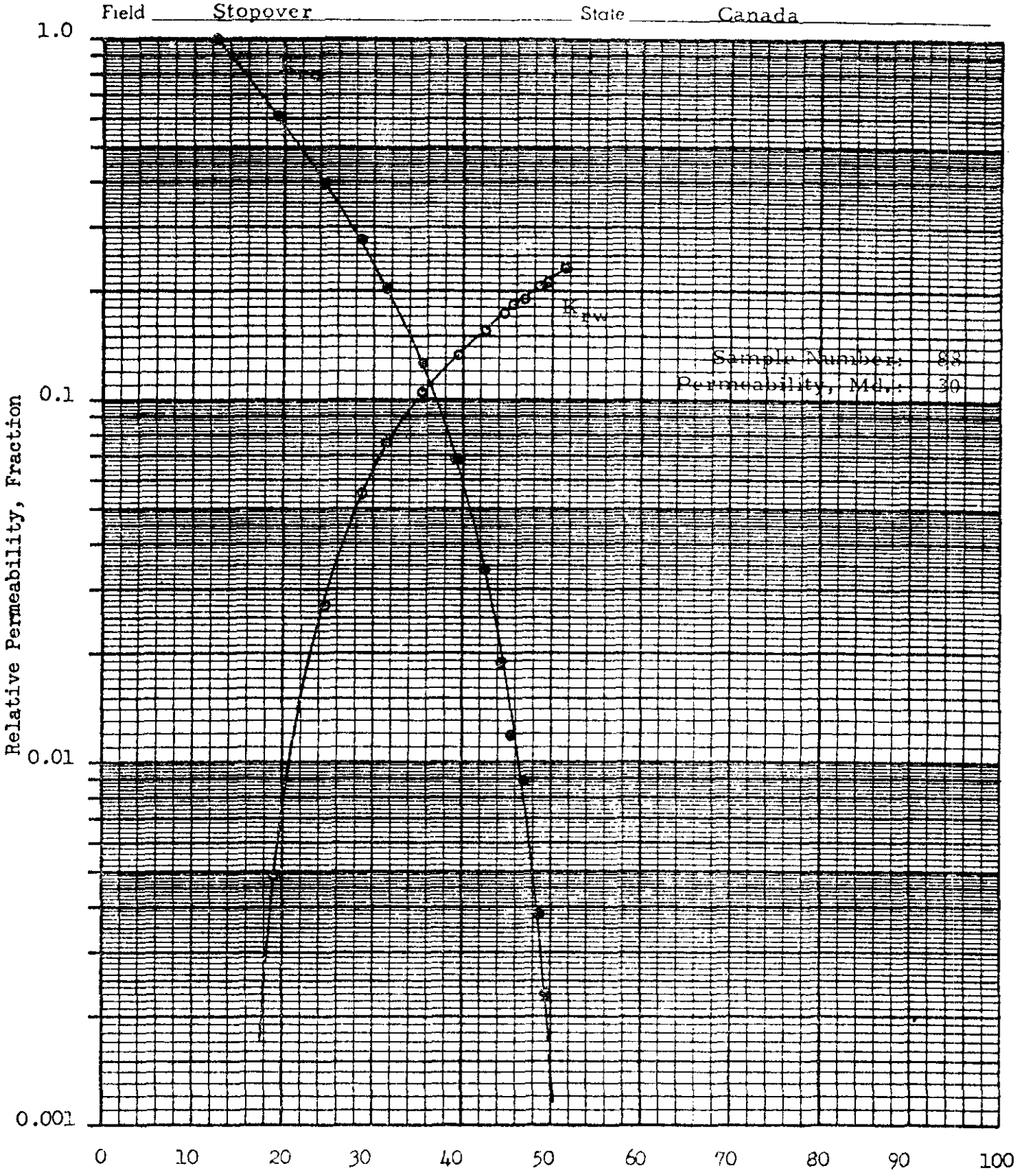
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



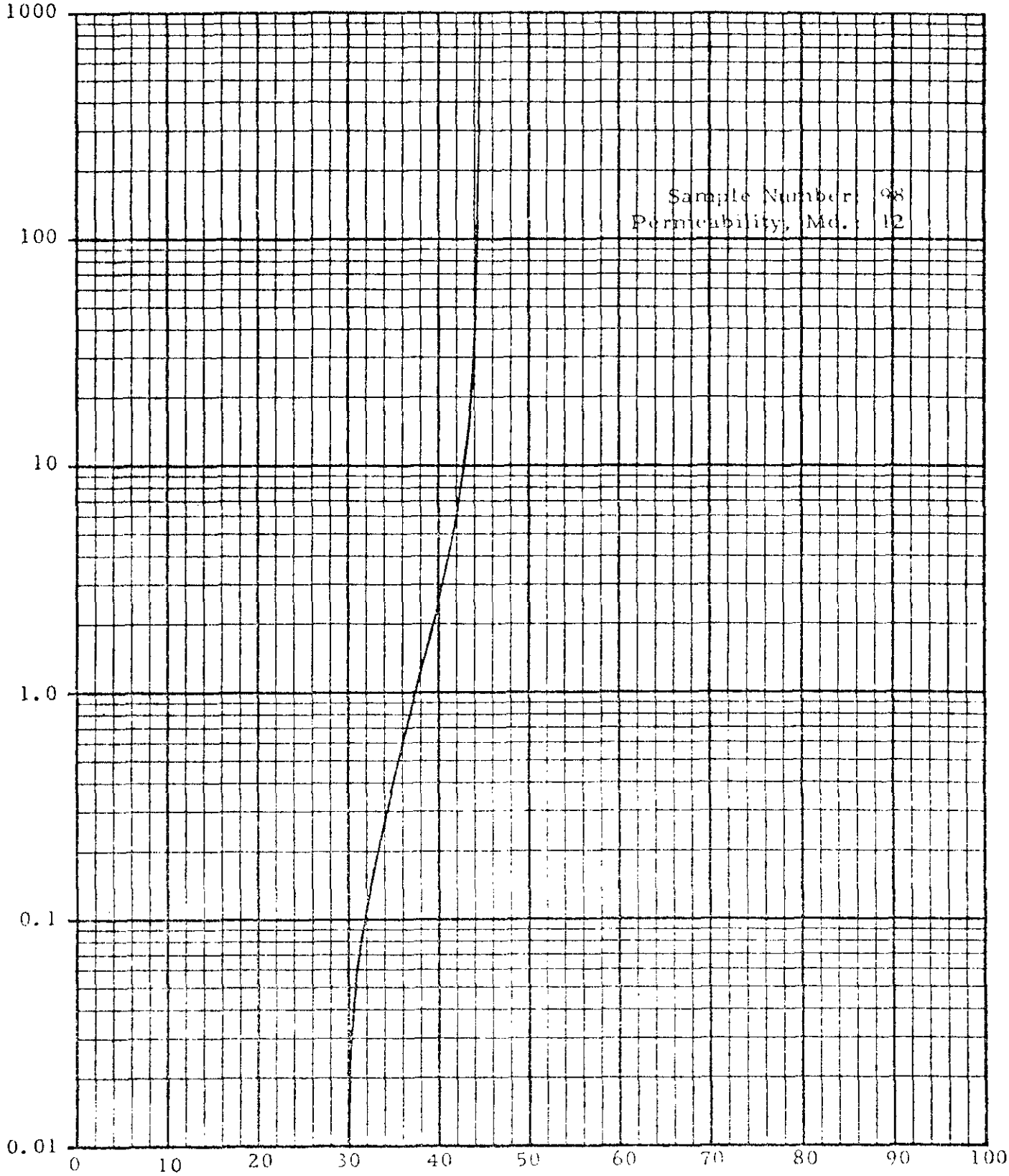
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



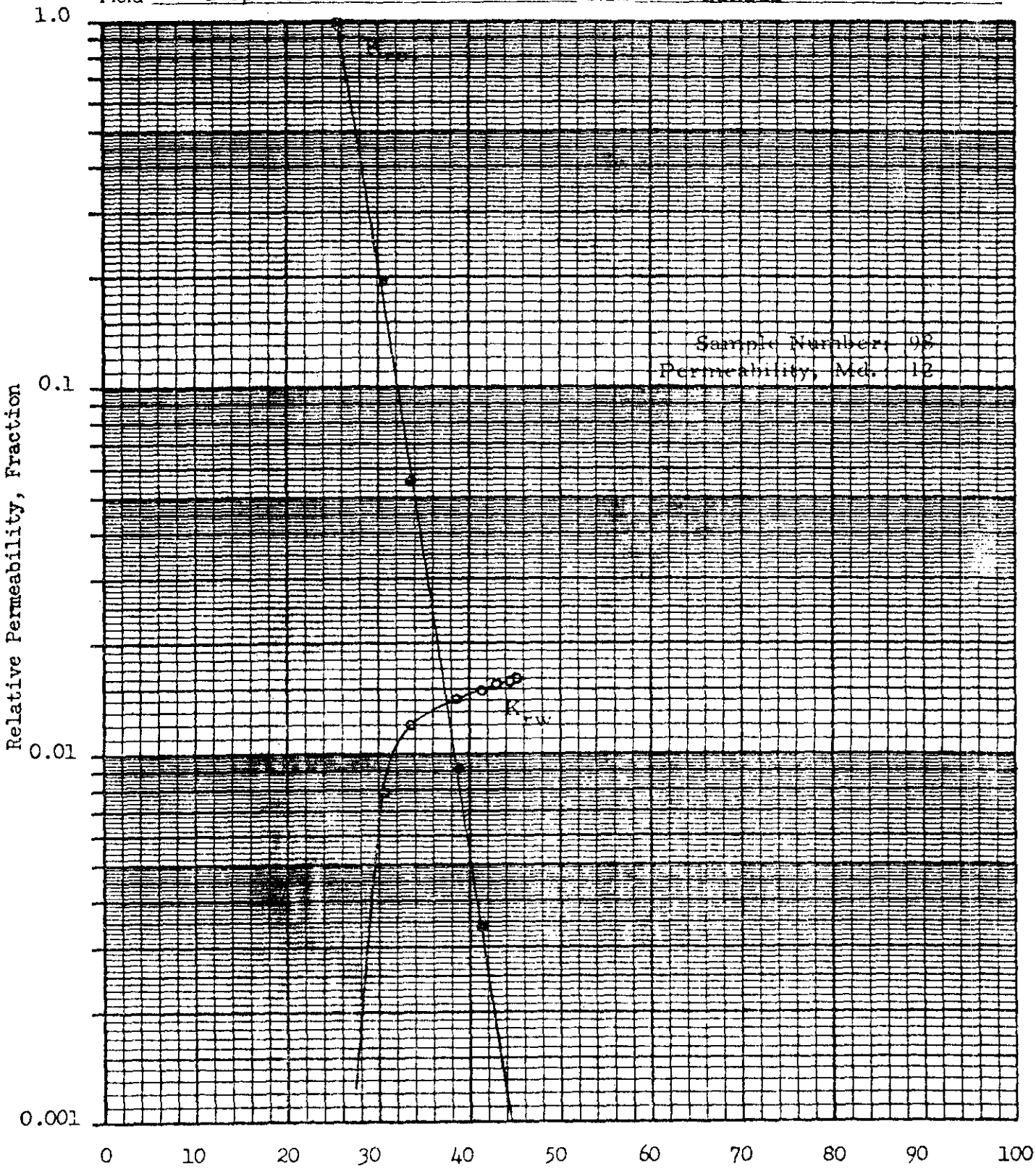
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



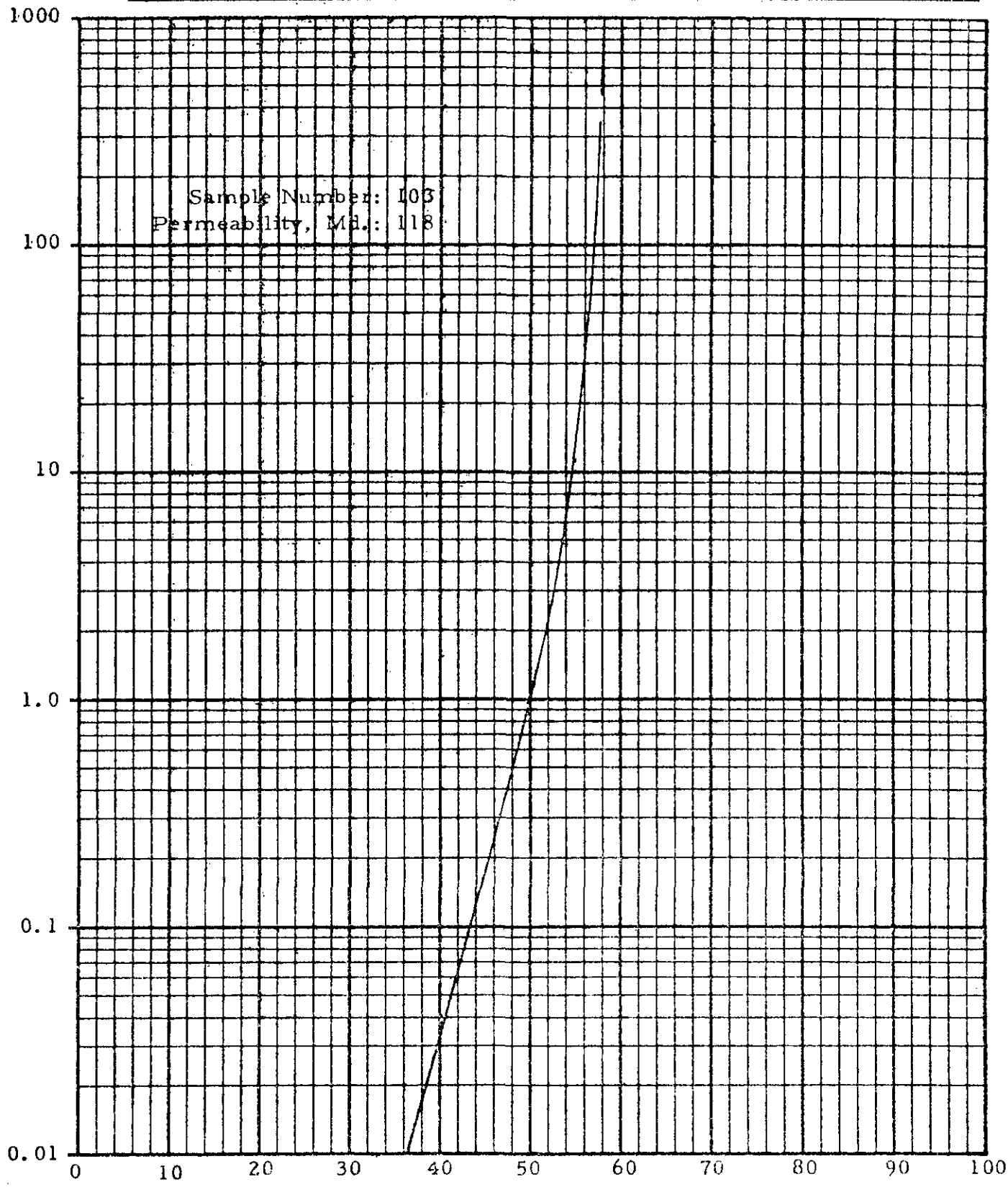
Company Union Oil Co. of Canada Ltd. Formation Old Fort Saud
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



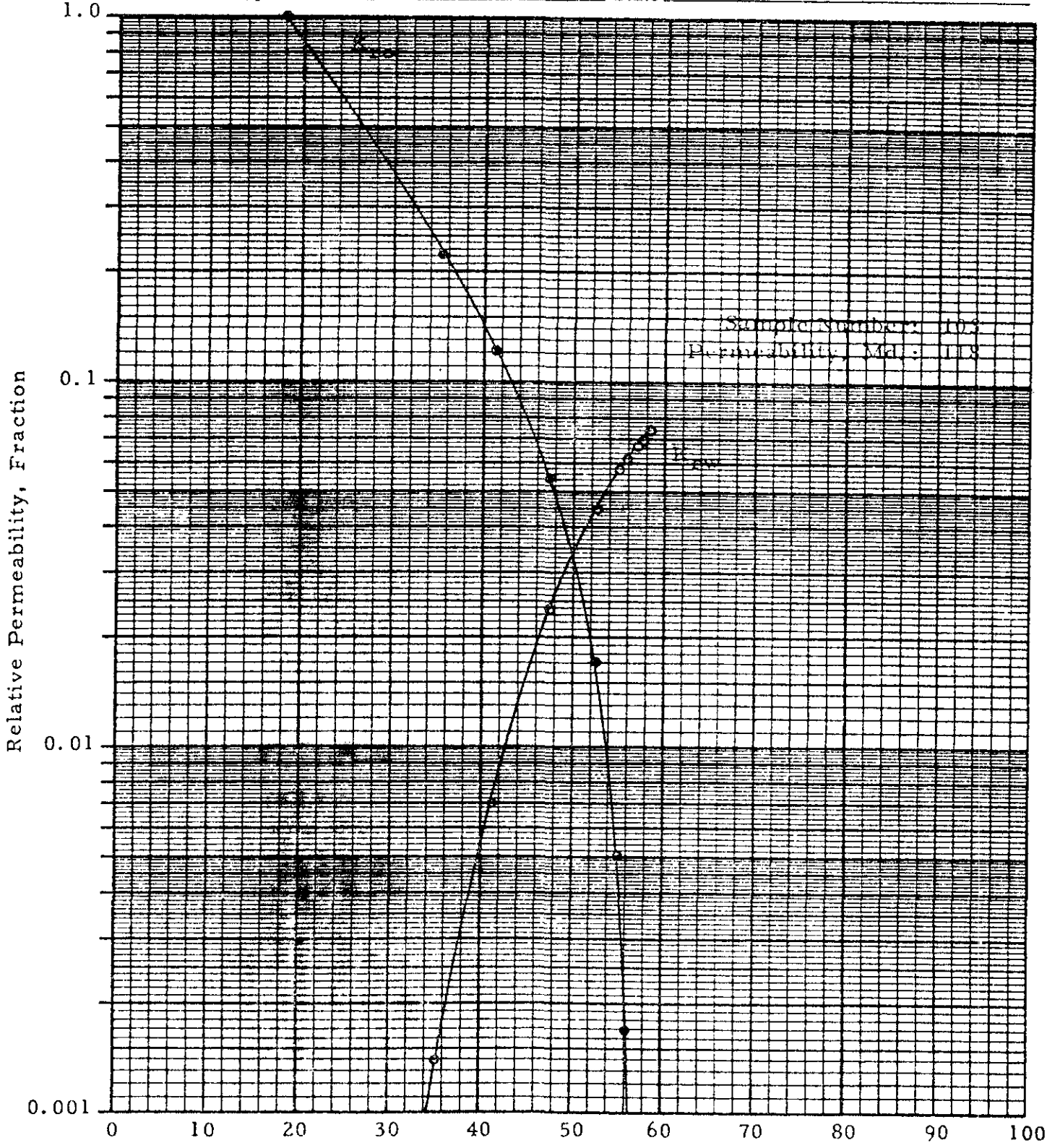
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Special Core Analysis Study

for

UNION OIL COMPANY OF CANADA LIMITED

Stopover K-44 and Colville D-45 Wells

Northwest Territories Canada

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

May 18, 1976

Union Oil Company of Canada Limited
P. O. Box 999
Calgary, Alberta T2P 2K6
Canada

Attention: Mr. Lorne D. McCluskey

Subject: Special Core Analysis Study
Stopover K-44 and Colville D-45 Wells
Northwest Territories
Canada
File Number: SCAL-75150

Gentlemen:

In letters dated April 25, 1975, June 2, 1975, and June 16, 1975, from Lorne D. McCluskey, Core Laboratories, Inc., was requested to perform: (1) Water-Oil Relative Permeability Tests, (2) Mercury Injection Tests, (3) Capillary Pressure Tests, (4) Formation Resistivity Factor Measurements, and (5) Formation Resistivity Index Measurements on sandstone core plugs from the subject wells. The results of the water-oil relative permeability tests were submitted in final form on March 25, 1976. The remaining tests are presented herein. The core plugs used in this study are identified as to well, sample number, and depth interval on Page 1 and are lithologically described on Page 2.

Fifteen core plugs and nine slabbed well cores were submitted for use in this study. Core plugs 1 inch in diameter were drilled from the nine slabbed cores with a diamond core bit using water as the bit coolant and lubricant. All core plugs were extracted of hydrocarbons with toluene, leached of salt with methyl alcohol, and then dried. Air permeabilities and porosities were determined on the cleaned and dried core plugs. The results of the permeability and porosity determinations were submitted to a representative of Union Oil Company of Canada Limited. Based on

the permeability and porosity determinations, core plugs were selected for further testing.

Eight core plugs, five from the Stopover well and three from the Colville well, were evacuated and saturated with appropriate simulated formation water. Six-point capillary pressure tests were performed using a porous-plate cell and an air-brine system. The results of the capillary pressure tests are presented by well in tabular form on Page 3 and in graphical form on Pages 4 through 8. The measured capillary pressure-saturation relationships correlate with both permeability and porosity for the Stopover and Colville wells.

Prior to performing the air-brine capillary pressure tests, the electrical resistivities of the brines and the brine saturated core plugs were measured. These measurements were repeated over a period of several days until the electrical resistivities stabilized indicating that ionic equilibrium within the core plugs had been attained. Formation resistivity factors were calculated from the electrical resistivity measurements and their relationships with porosity are presented in tabular form on Page 9 and in graphical form on Pages 10 and 11. Using Archie's equation, a cementation exponent "m" of 1.71 was calculated for the Stopover well. Using Archie's generalized equation, a cementation exponent "m" of 1.83 at an "a" intercept of 1.10 was calculated for the Colville well.

Electrical resistivities were measured at one equilibrium desaturation point on three core plugs from each the Stopover and the Colville wells. The formation resistivity-saturation relationships yield calculated saturation exponents "n" of 1.47 and 1.68 for the Stopover and Colville wells respectively.

Multi-point mercury injection tests were performed on eleven core plugs, six from the Stopover well and five from the Colville well, using injection pressures ranging from 3 psia to 1500 psia. The multi-point mercury injection tests are presented by well in tabular form on Pages 14 and 15, and in graphical form on Pages 16 through 21. The results of the wetting phase saturation injection pressure relationships correlate

with permeability and porosity for both wells. The inflections exhibited by the test results for Samples 89, 103A, 12, and 9 (Pages 18, 19 and 20) indicate the presence of multi-modal pore size distribution. The heterogeneous porosity systems present in the core plugs tested is not unusual for poorly sorted sandstone core material.

Should you have any questions pertaining to these test results or if we can be of any assistance, please do not hesitate to contact us.

Very truly yours,

Core Laboratiories, Inc.

Duane L. Archer (mf)

Duane L. Archer, Manager
Special Core Analysis

DLA:JWW:gb
10 cc. - Addressee

Company Union Oil Co. of Canada Limited
Number of Wells Two
Field Stopover and Colville
Formation Old Fort Sand
County Northwest Territories
State Canada

Identification of Samples

Sample Number	Company	Well	Depth, Feet
		Stopover Field	
45	Union Oil Company of Canada Ltd.	Union Oil Stopover K-44	2780.0-80.7
50			2784.1-85.0
50A			2784.1-85.0
70			2798.2-99.0
88			2813.2-13.5
89			2813.5-14.3
98			2820.8-21.9
98A			2820.8-21.9
103			2825.6-26.2
103A			2825.6-26.2
113			2832.4-33.1
115			2834.3-34.9
		Colville Field	
1	Union Oil Company of Canada Ltd.	Union Mobile Colville D-45	3183.2-83.7
4			3185.6-86.0
9			3190.8-91.8
10			3190.8-91.8
11			3218.0-18.7
12			3218.0-18.7
15			3223.0-23.4
18			3225.9-26.4

Lithological Description

Sample Number	Description
	Stopover Field
45	Ss, reddish brn, v/fn grn, well indurated, w/sh inclusions
50	Ss, gry-red, fn-v/fn grn, well indurated, w/sh
50A	Ss, red-brn, cse-v/fn grn, apparent SiO_2 cement, well indurated, cse grn concentrations
70	Ss, red & gry, fn grn, v/sl/calc, mod indurated, w/clay pockets
88	Ss, buff-white, med-fn grn, apparent SiO_2 cement, mod indurated, red-brn staining an upper portion
89	Ss, gry, med-fn grn, v/sl/calc, mod indurated, w/fn grn lams, red stks
98	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color staining, grns uniform
98A	Ss, red & gry, fn-med grn, well indurated, w/clay pockets
103	Ss, red-brn, cse-fn grn, apparent SiO_2 cement, mod-poor in-indurated, blotchy color appearance
103A	Ss, red, fn-med grn, v/sl/calc, mod indurated
113	Ss, red, fn grn, well indurated, w/sh stks
115	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color appearance
	Colville Field
1	Ss, lt gry, v/fn-silt grn, apparent SiO_2 cement, well indurated, tr musc, pyrite
4	Ss, gry, v/fn grn, sl/calc, well indurated
9	Ss, gry, v/fn grn, sl/calc, well indurated
10	Ss, tan, v/fn grn, sl/calc, mod indurated,
11	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminar, tr musc
12	Ss, gry, fn grn, mod indurated
15	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae, tr musc
18	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae

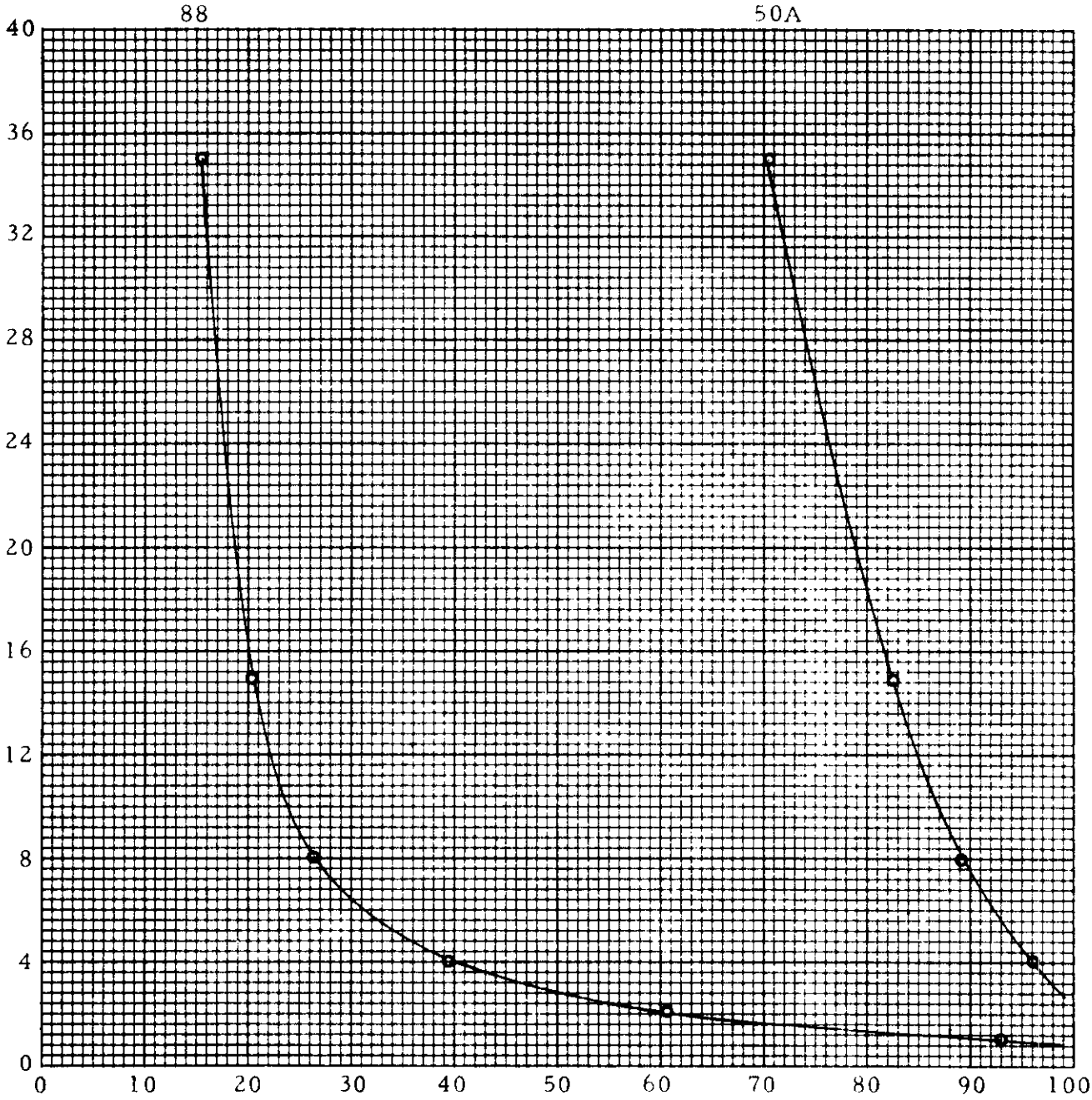
Air-Brine Capillary Pressure Data

Pressure, PSI:	1	2	4	8	15	35

Sample Number	Permeability, Millidarcys	Porosity, Per Cent	Brine Saturation, Per Cent Pore Space					
					Stopover Field			
50A	1.2	8.3	100.0	100.0	96.0	89.0	82.6	70.3
88	130	12.8	92.9	60.8	39.5	26.3	20.3	15.6
98	12	10.1	100.0	100.0	89.4	64.0	42.0	31.9
103	118	14.4	100.0	69.4	44.8	31.5	25.6	21.3
115	1.7	10.8	100.0	100.0	91.6	63.9	41.7	31.9
					Colville Field			
11	12	14.0	100.0	95.4	75.3	50.6	31.2	16.9
15	7.3	13.2	100.0	100.0	93.2	63.2	34.6	18.0
18	20	15.1	100.0	100.0	83.0	39.6	26.4	15.9

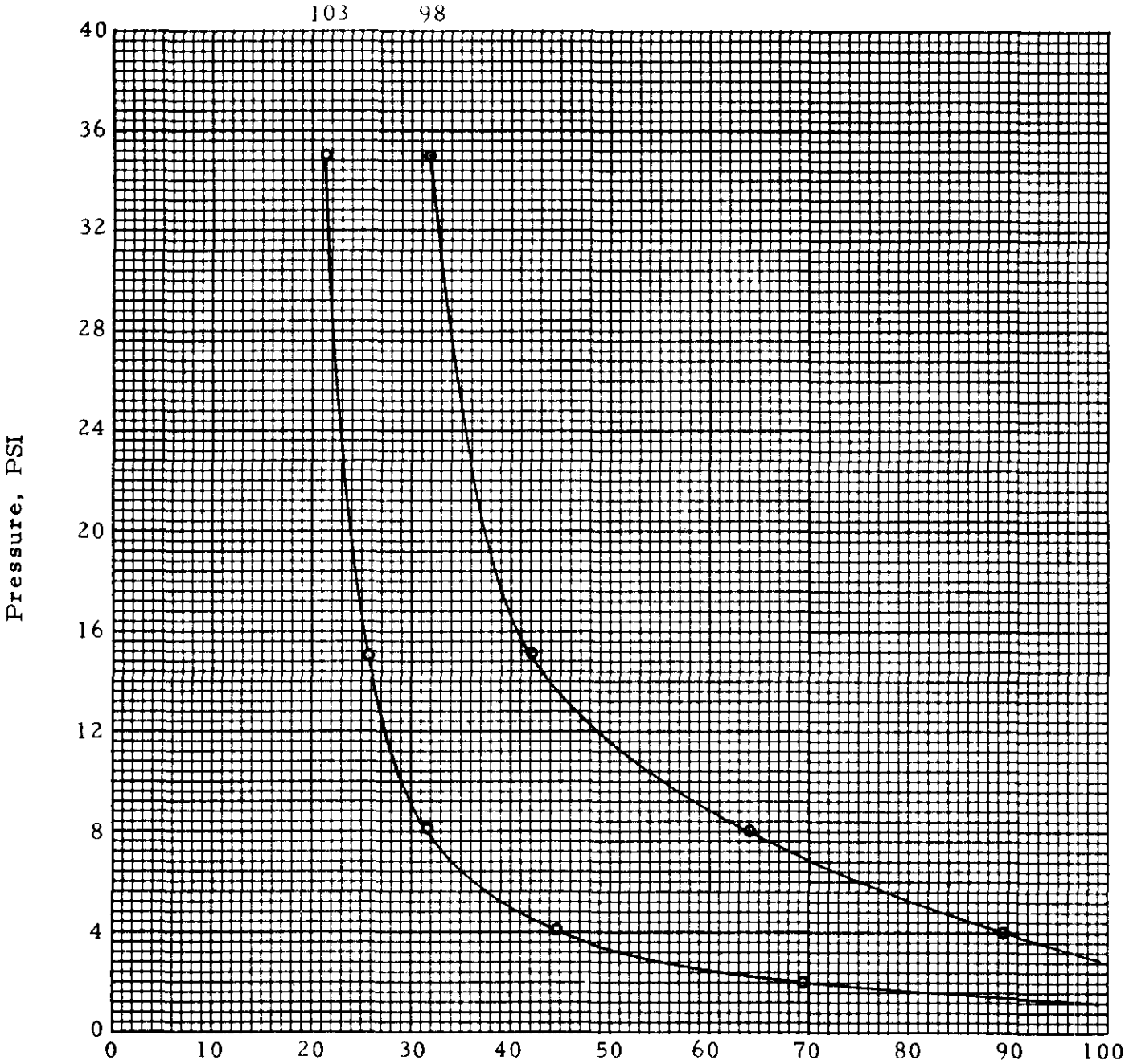
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number:	88	50A
Permeability, Md.:	130	1.2



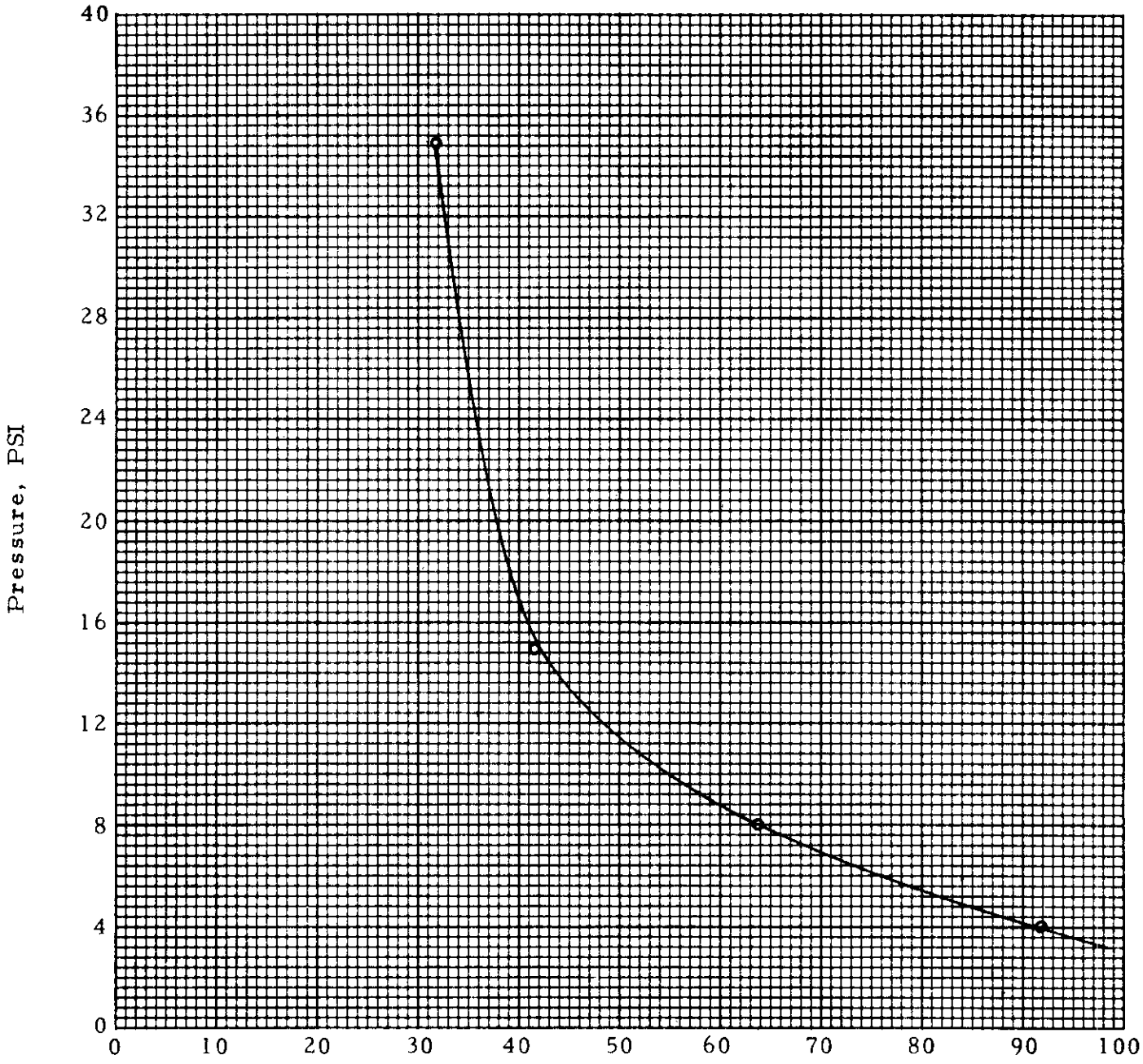
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number:	103	98
Permeability, Md.:	118	12



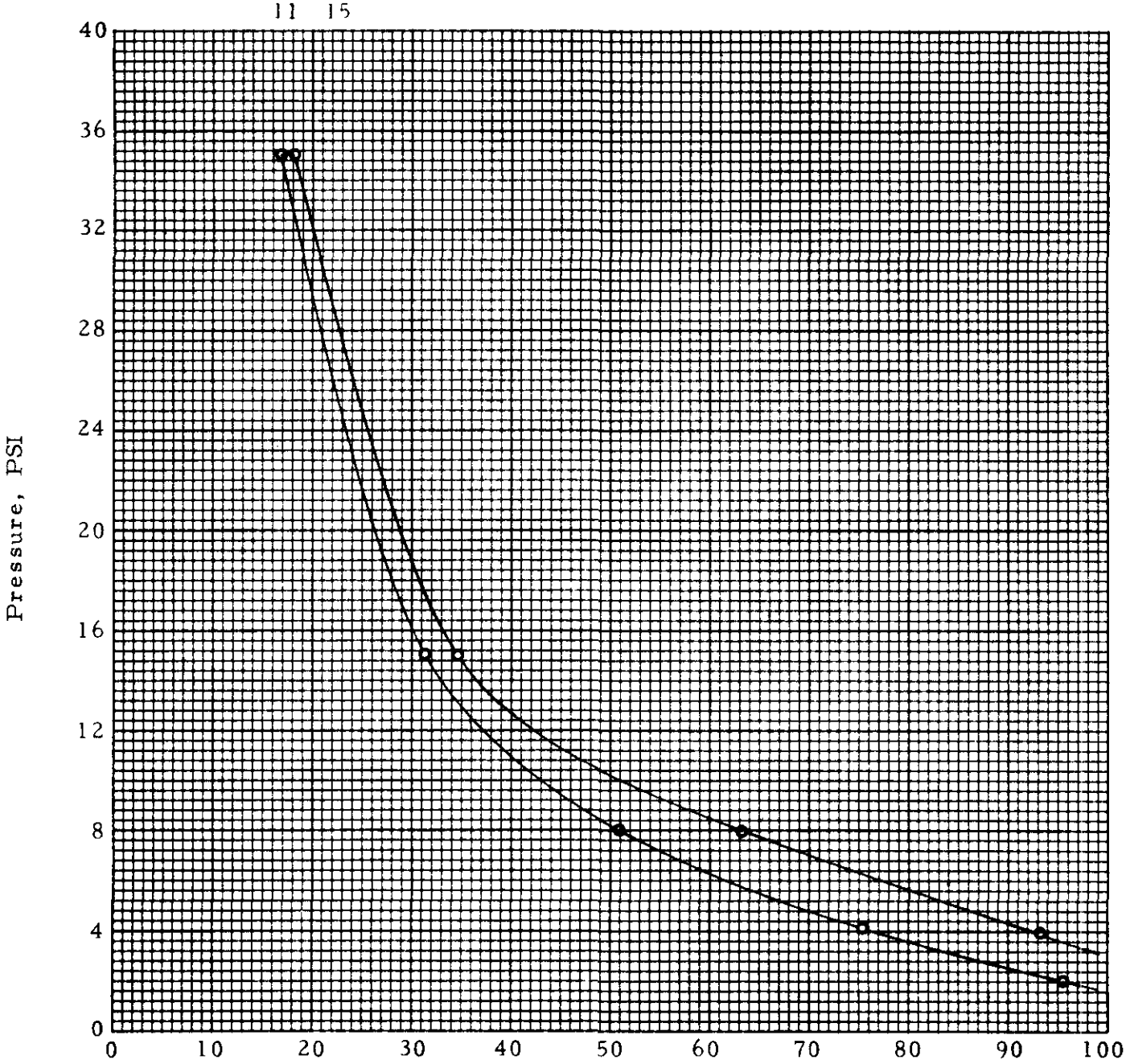
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number: 115
Permeability, Md.: 1.7



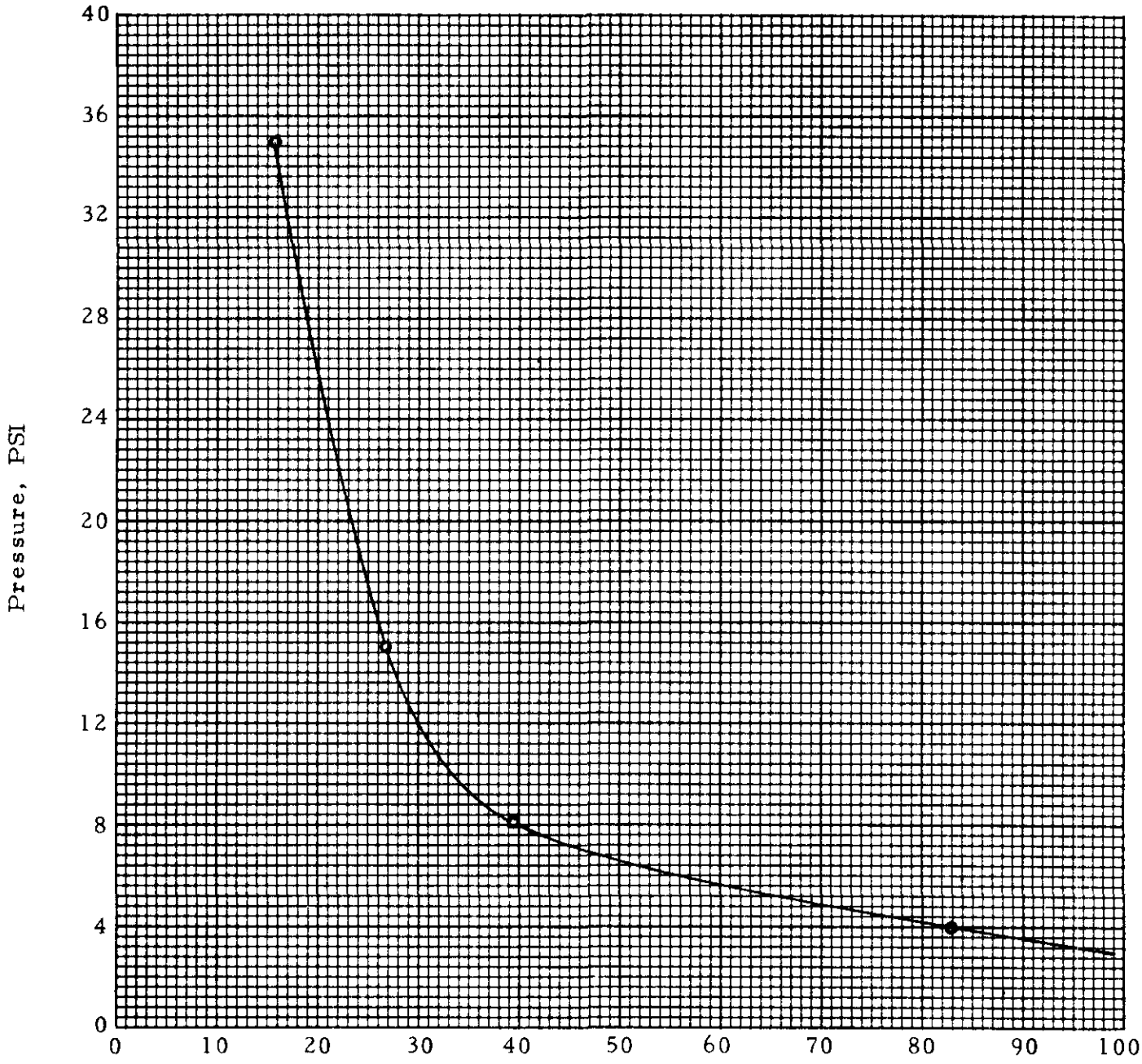
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D45 County Northwest Territories
Field Colville State Canada

Sample Number:	11	15
Permeability, Md.:	12	7.3



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 18
Permeability, Md.: 20



Formation Factor and Resistivity Index Data

Stopover Field

Resistivity of Saturating Brine, Ohm-Meters: 0.253 @ 71°F.

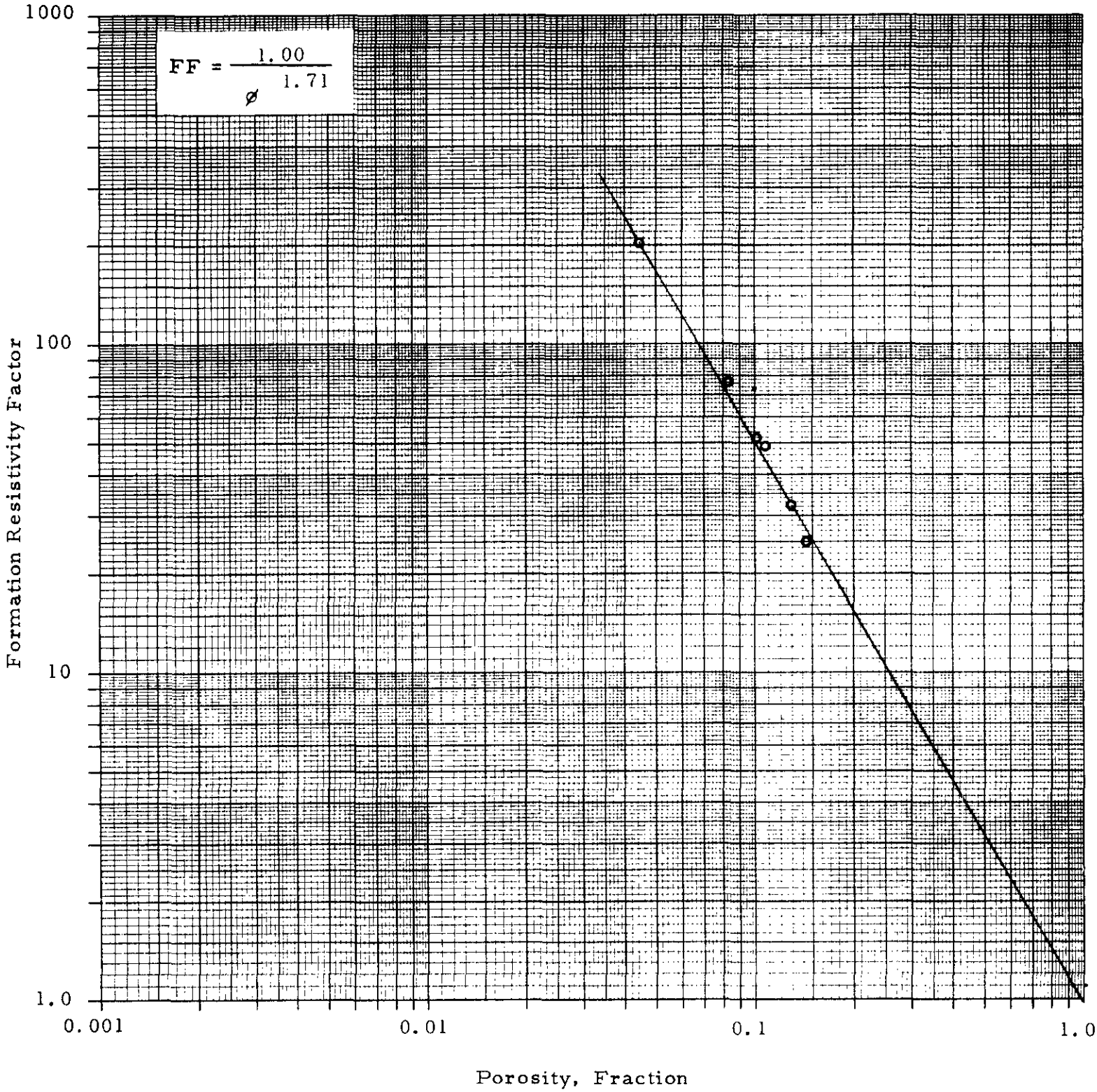
Sample Number	Porosity, Per Cent	Formation Factor	Brine Saturation, Per Cent Pore Space	Resistivity Index
50A	8.3	76.1	100.0	1.00
			70.3	2.13
88	12.8	32.1	100.0	1.00
			15.6	9.29
98	10.1	51.8	100.0	1.00
			31.9	5.98
103	14.4	24.8	100.0	1.00
113	4.5	201	100.0	1.00
115	10.8	49.7	100.0	1.00

Colville Field

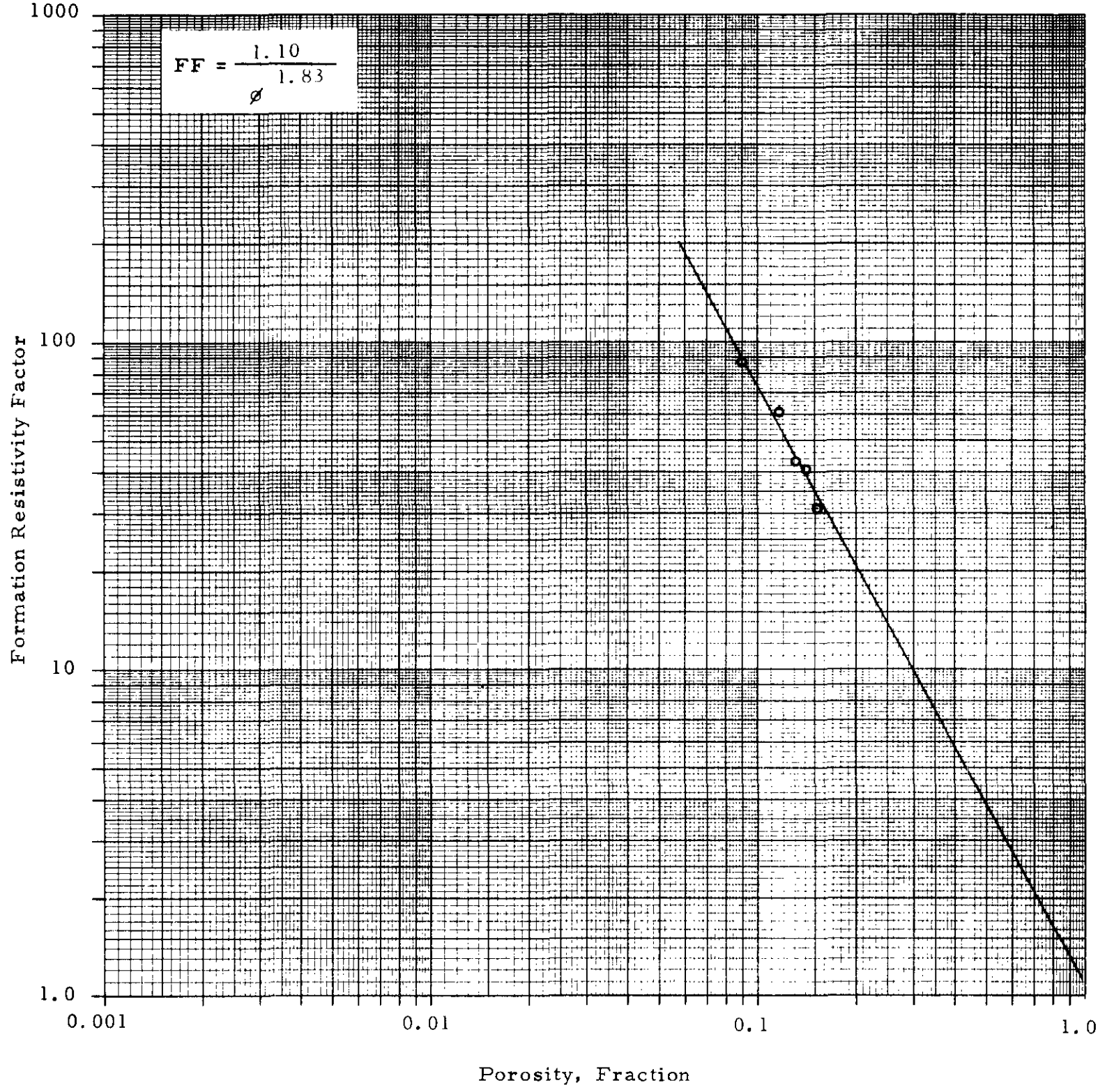
Resistivity of Saturating Brine, Ohm-Meters: 0.120 @ 74°F.

1	11.7	60.8	100.0	1.00
			80.5	1.89
10	9.0	87.0	100.0	1.00
11	14.0	41.2	100.0	1.00
15	13.2	43.2	100.0	1.00
			18.0	12.0
18	15.1	31.1	100.0	1.00
			15.9	23.3

Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

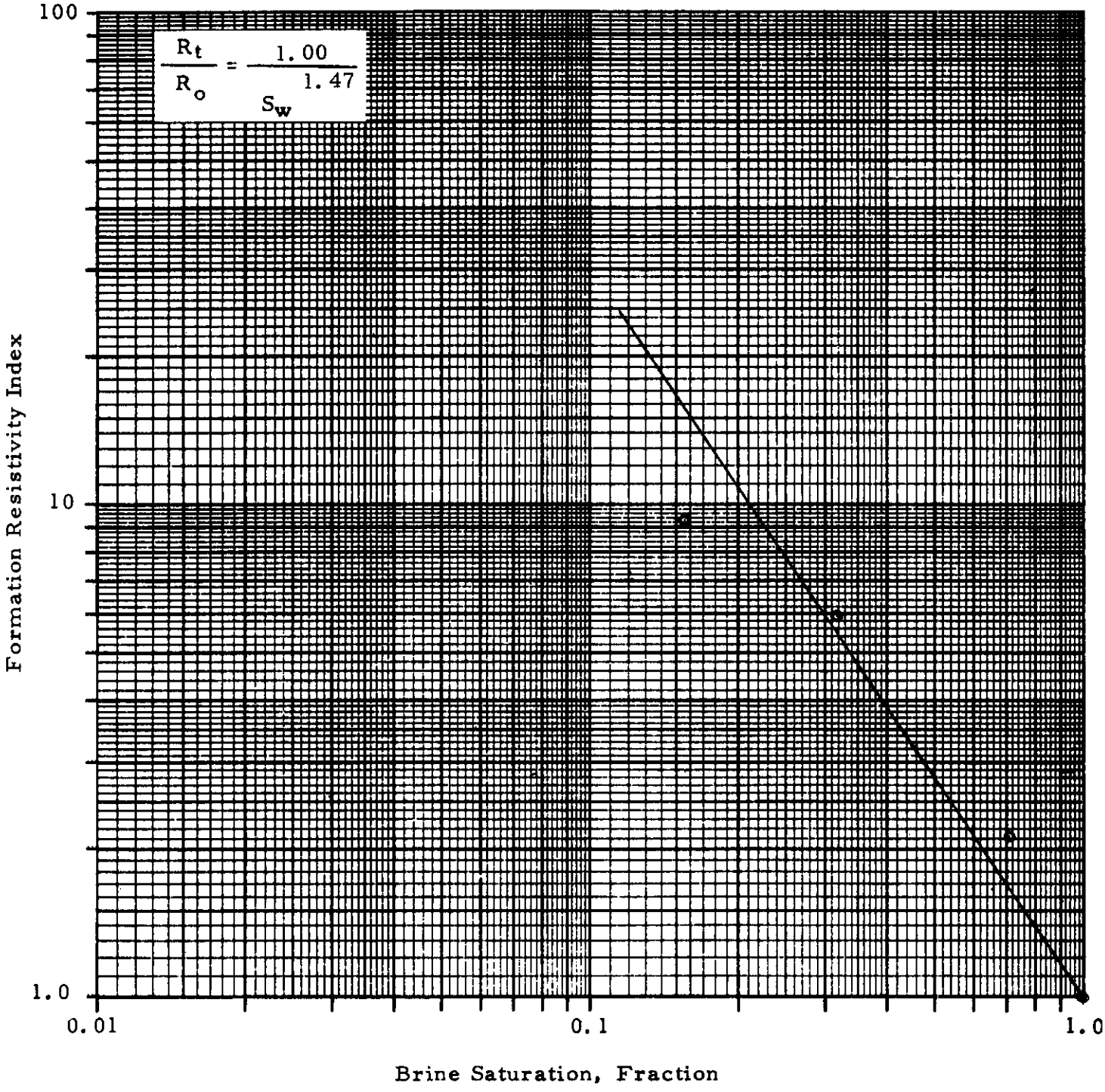


Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada



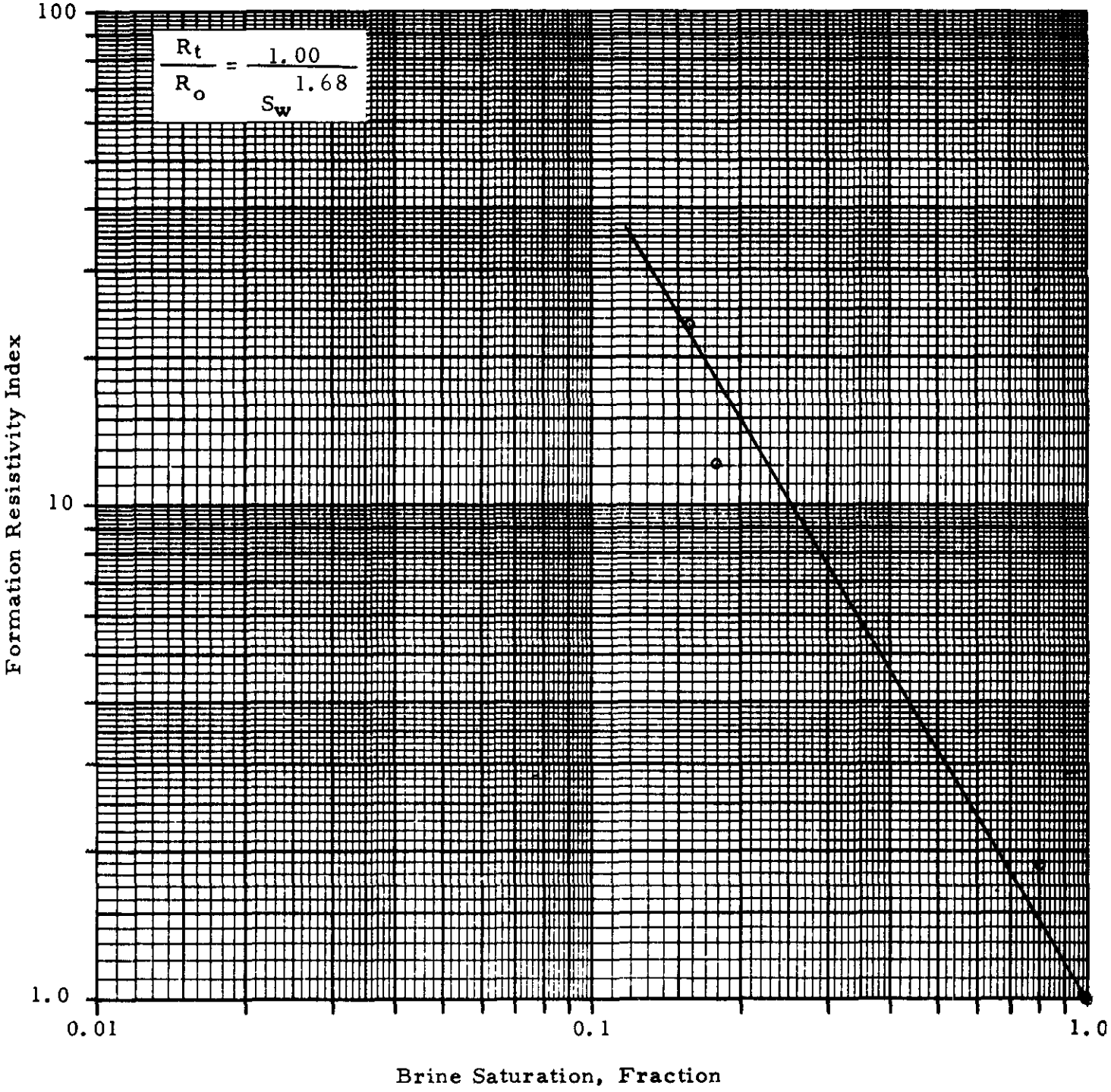
Company Union Oil Co. of Canda — Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 — County Northwest Territories
Field Stopover — State Canada

Composite



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Composite



Stopover Field

Mercury Injection Capillary Pressure Data

Sample Number:	45	50	70	89	98A	103A
Permeability, Md.:	0.033	0.28	1.3	233	5.5	60
Porosity, Per Cent:	5.6	6.6	13.7	13.2	9.7	14.6
Injection Pressure, PSIA	Wetting Phase Saturation, Per Cent Pore Space					
3	100.0	100.0	100.0	93.0	100.0	100.0
6	100.0	100.0	100.0	71.9	100.0	100.0
9	100.0	100.0	100.0	55.8	100.0	96.9
12	100.0	100.0	100.0	44.1	100.0	85.6
15	100.0	100.0	100.0	38.3	100.0	74.4
18	100.0	100.0	100.0	32.8	100.0	62.9
21	100.0	100.0	100.0	30.1	100.0	57.2
24	100.0	100.0	100.0	27.6	100.0	52.4
27	100.0	100.0	100.0	25.7	100.0	48.9
30	100.0	100.0	100.0	24.5	98.2	46.4
40	100.0	100.0	98.6	21.4	88.0	39.5
60	100.0	100.0	94.0	17.8	67.7	32.7
80	100.0	100.0	89.9	15.8	57.4	30.0
100	100.0	96.6	84.9	14.4	51.0	28.2
200	100.0	73.2	63.5	10.7	39.8	24.2
300	100.0	62.6	54.0	8.7	34.1	22.4
500	91.7	45.5	44.0	6.3	27.7	19.6
750	72.0	34.2	35.6	4.5	23.2	17.2
1000	55.6	28.3	29.3	4.2	20.8	15.0
1250	44.5	23.5	24.9	2.8	19.1	14.5
1500	34.5	21.4	21.9	2.7	18.1	12.2

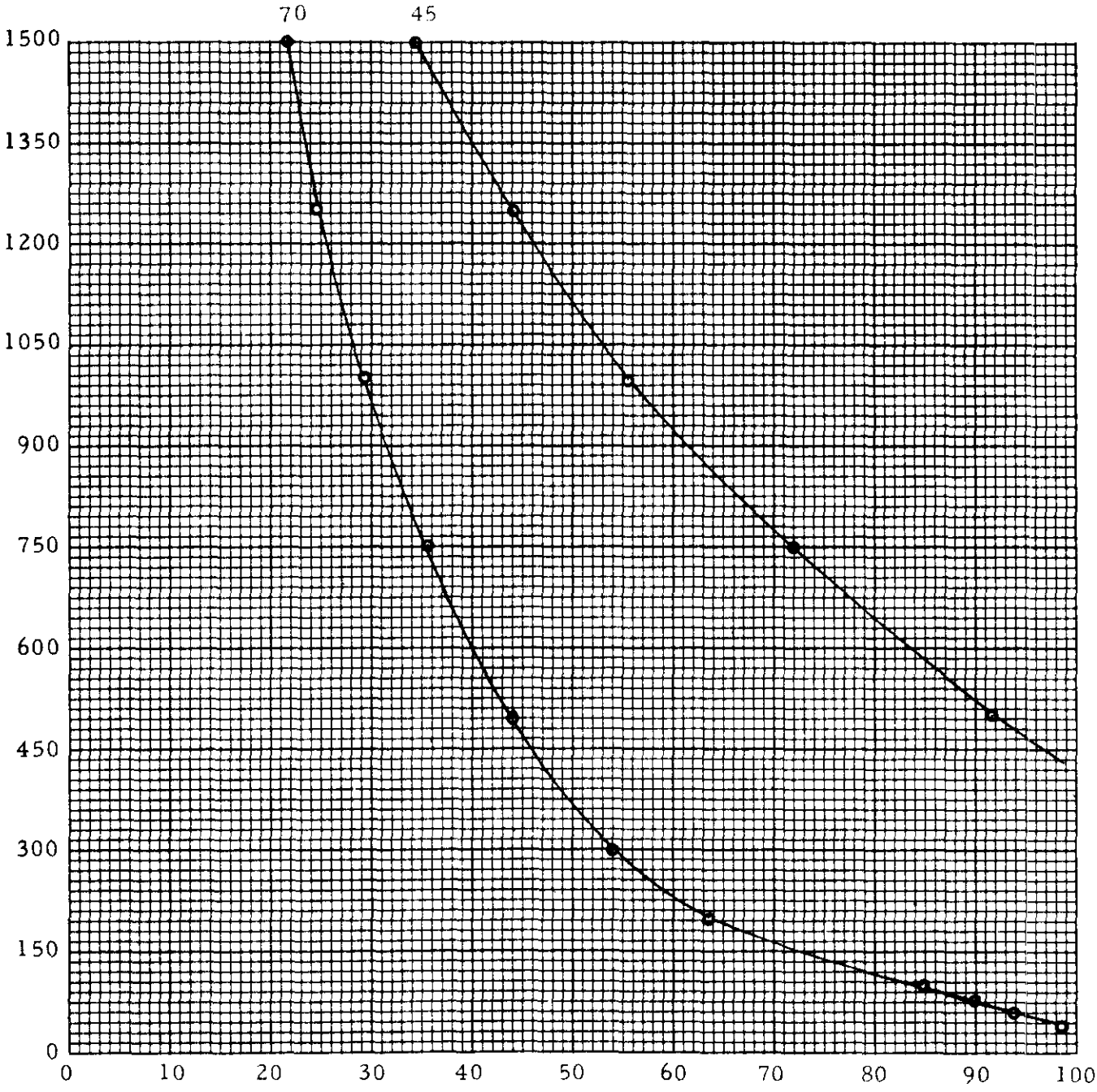
Colville Field

Mercury Injection Capillary Pressure Data

Sample Number:	4	9	11	12	18
Permeability, Md.:	0.56	0.035	18	82	25
Porosity, Per Cent:	11.8	7.9	13.9	12.6	14.6
Injection Pressure, PSIA	Wetting Phase Saturation, Per Cent Pore Space				
3	100.0	100.0	100.0	100.0	100.0
6	100.0	100.0	100.0	100.0	100.0
9	100.0	100.0	100.0	100.0	100.0
12	100.0	100.0	100.0	100.0	100.0
15	100.0	100.0	95.4	100.0	100.0
18	100.0	100.0	89.0	98.5	100.0
21	100.0	100.0	83.9	96.1	95.8
24	100.0	100.0	79.9	92.1	85.1
27	100.0	100.0	76.1	90.4	75.9
30	100.0	100.0	73.5	87.6	67.8
40	100.0	100.0	64.7	77.7	51.3
60	100.0	100.0	55.1	65.6	42.0
80	100.0	100.0	48.1	57.3	36.0
100	100.0	100.0	43.2	51.8	31.8
200	73.7	100.0	30.3	38.6	23.2
300	63.7	100.0	24.0	31.3	18.8
500	54.3	100.0	16.8	24.1	13.5
750	46.6	100.0	14.1	20.3	10.9
1000	40.7	78.2	12.2	17.5	9.8
1250	35.5	69.9	10.6	14.5	8.8
1500	31.4	60.5	10.2	13.8	8.7

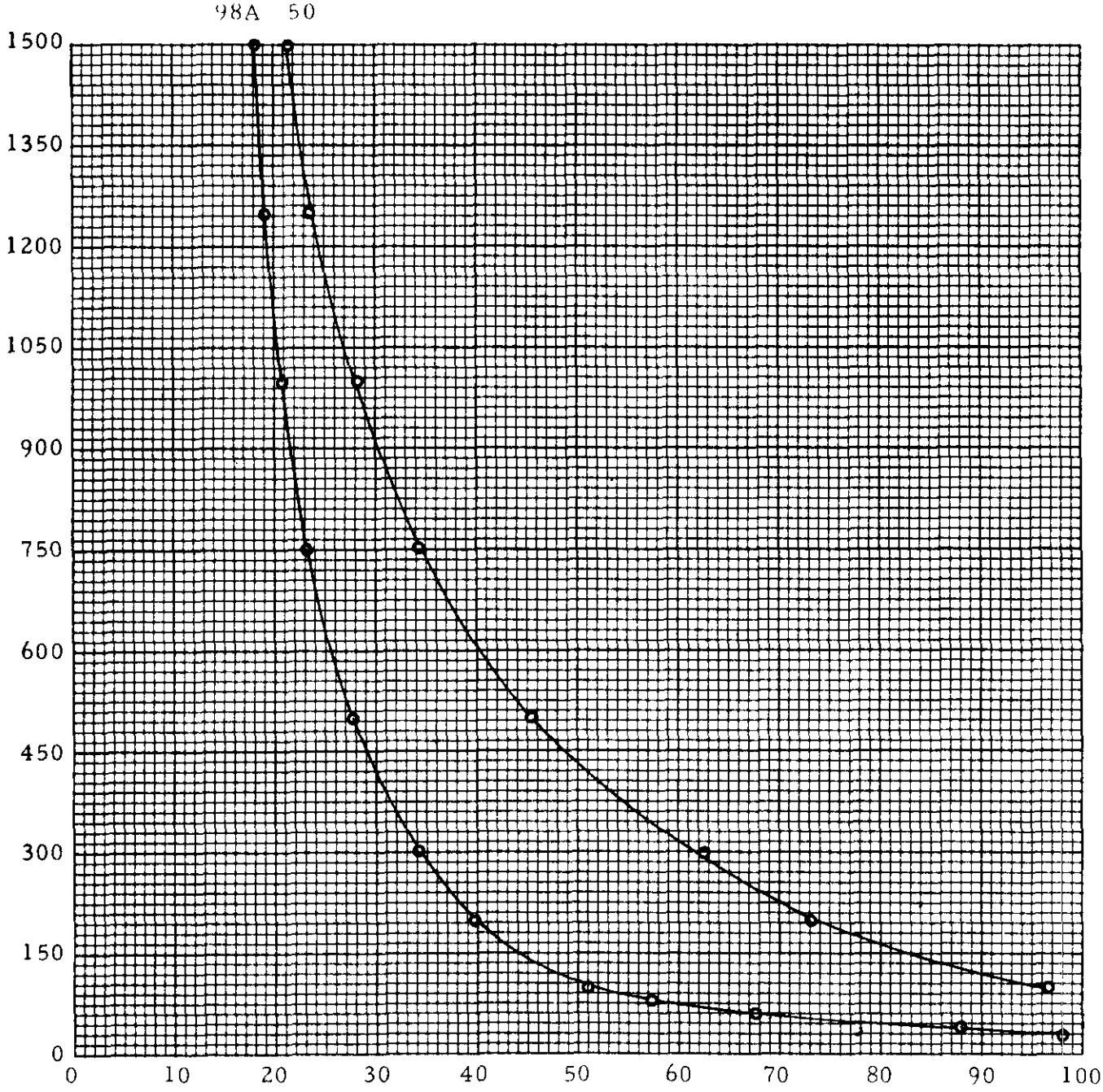
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number:	70	45
Permeability, Md.:	1.3	0.033



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

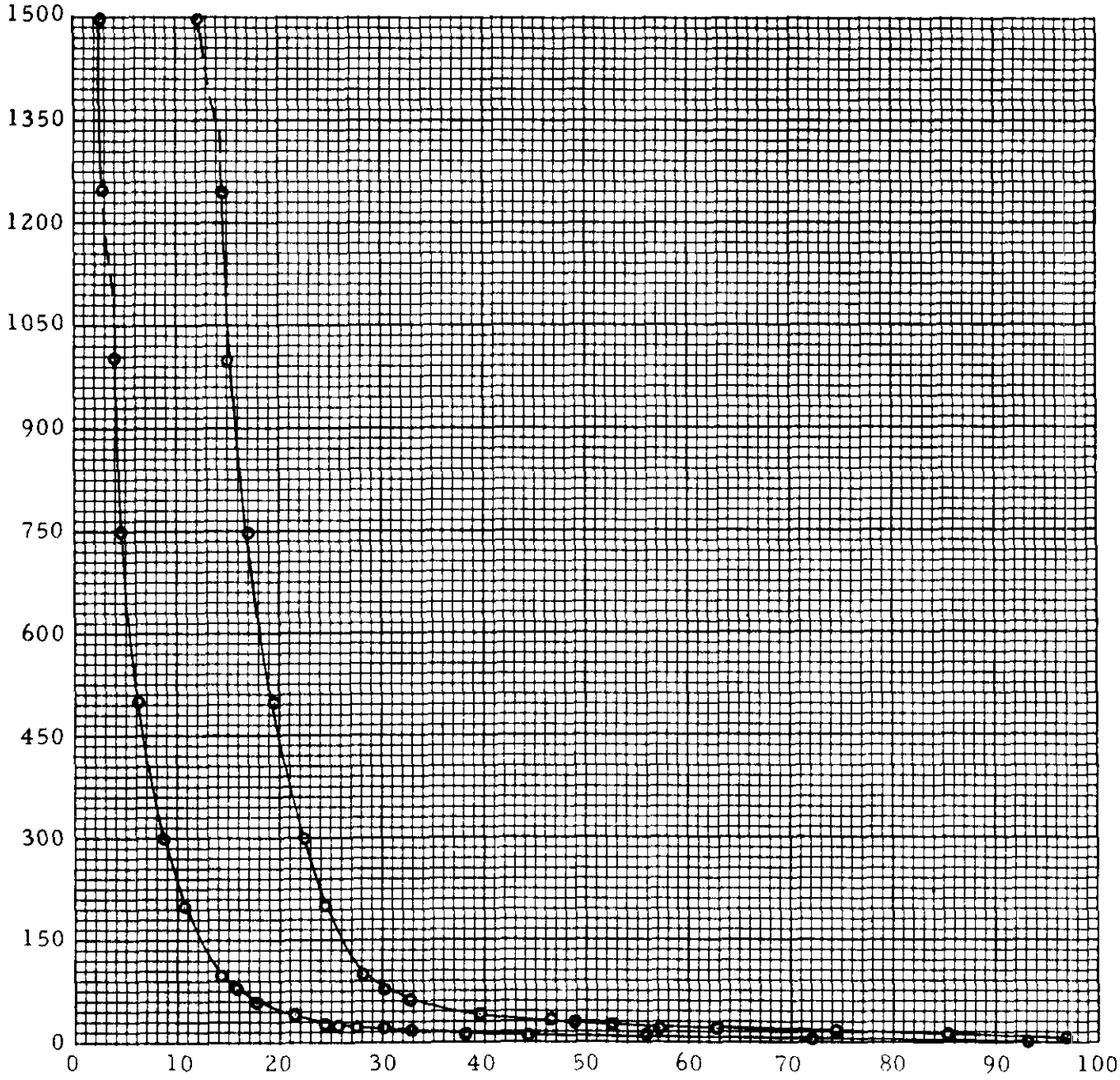
Sample Number:	98A	50
Permeability, Md.:	5.5	0.28



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

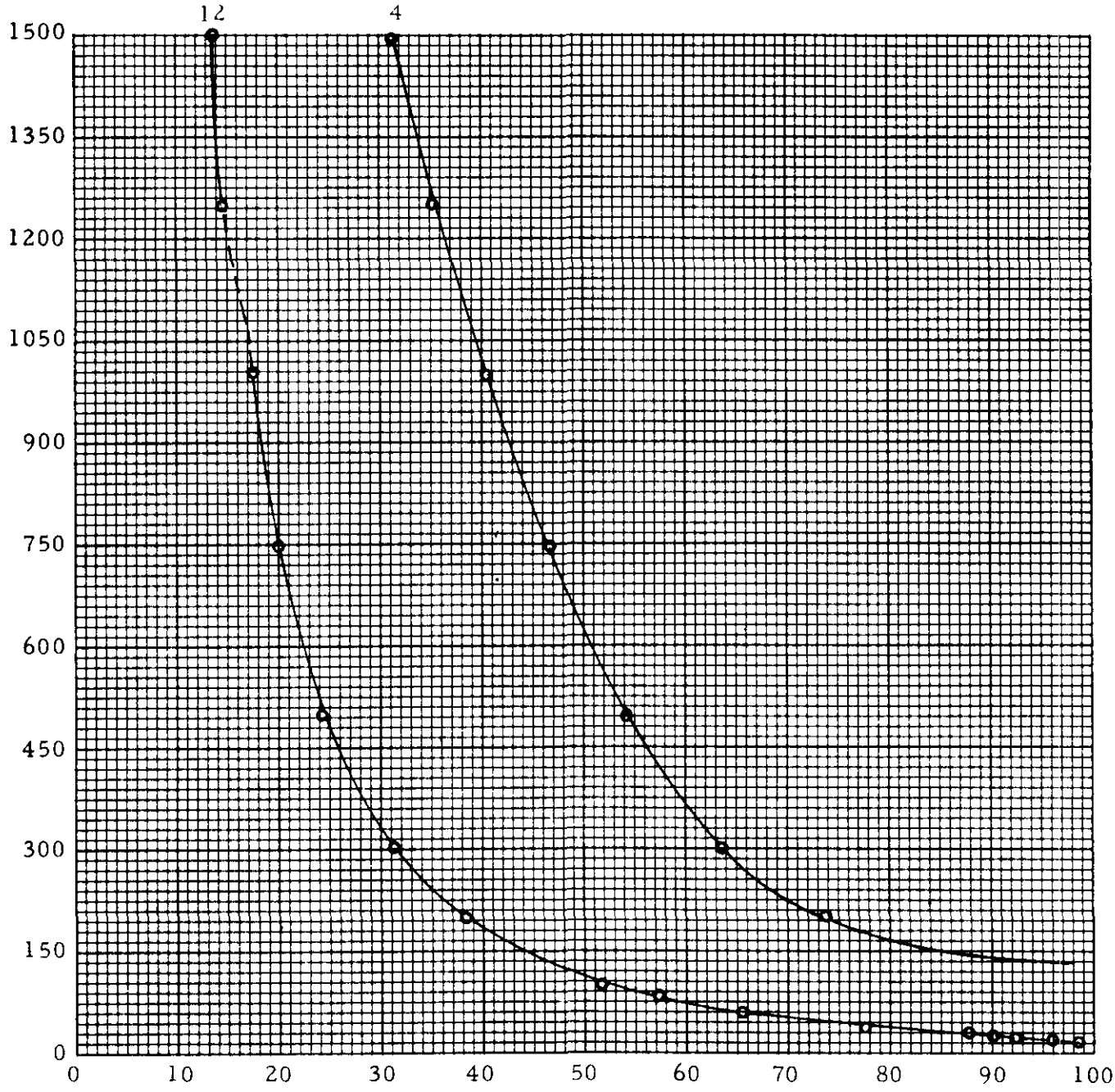
Sample Number:	89	103A
Permeability, Md.:	233	60

89 103A



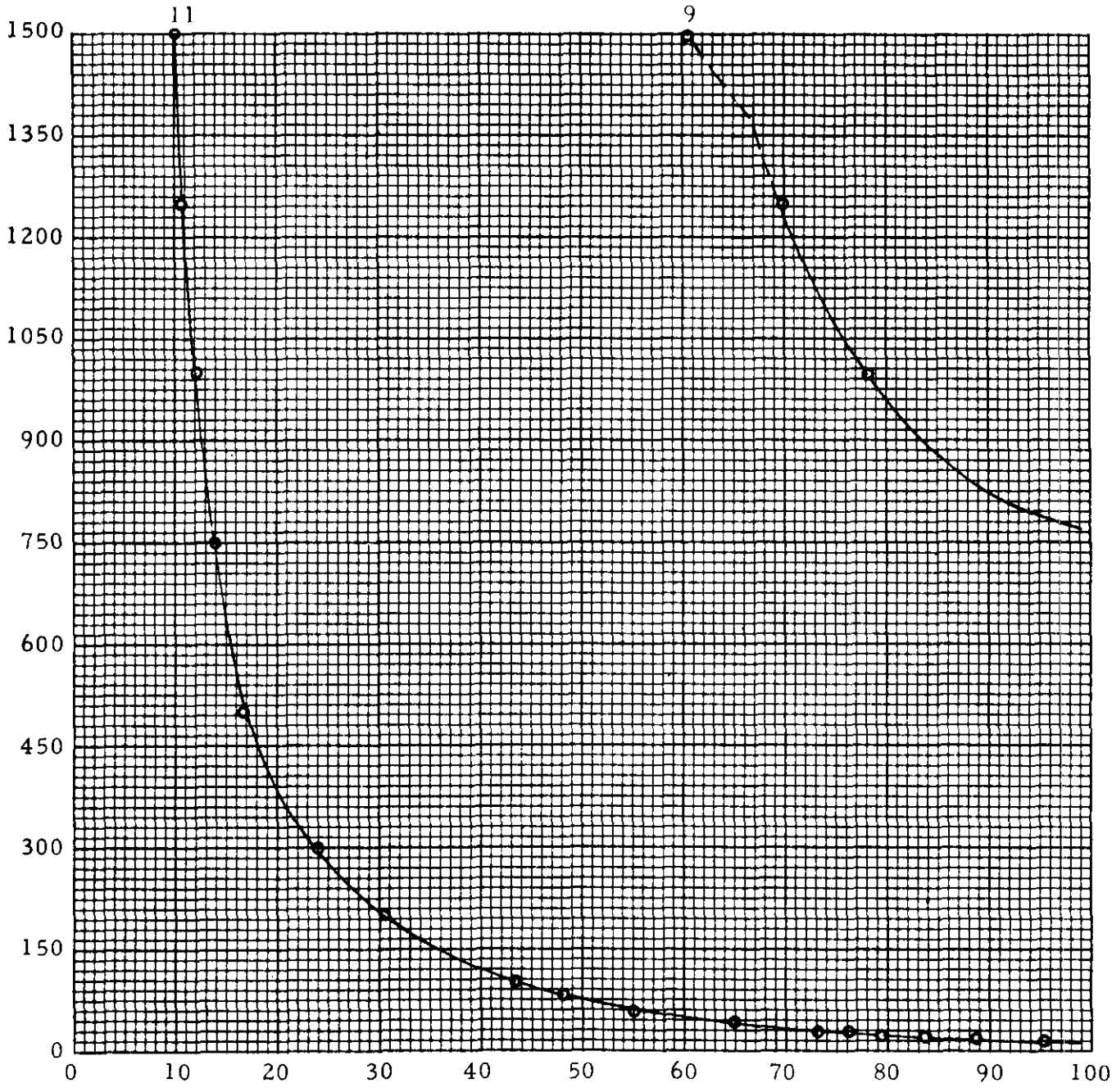
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number:	12	4
Permeability, Md.:	8.2	0.56



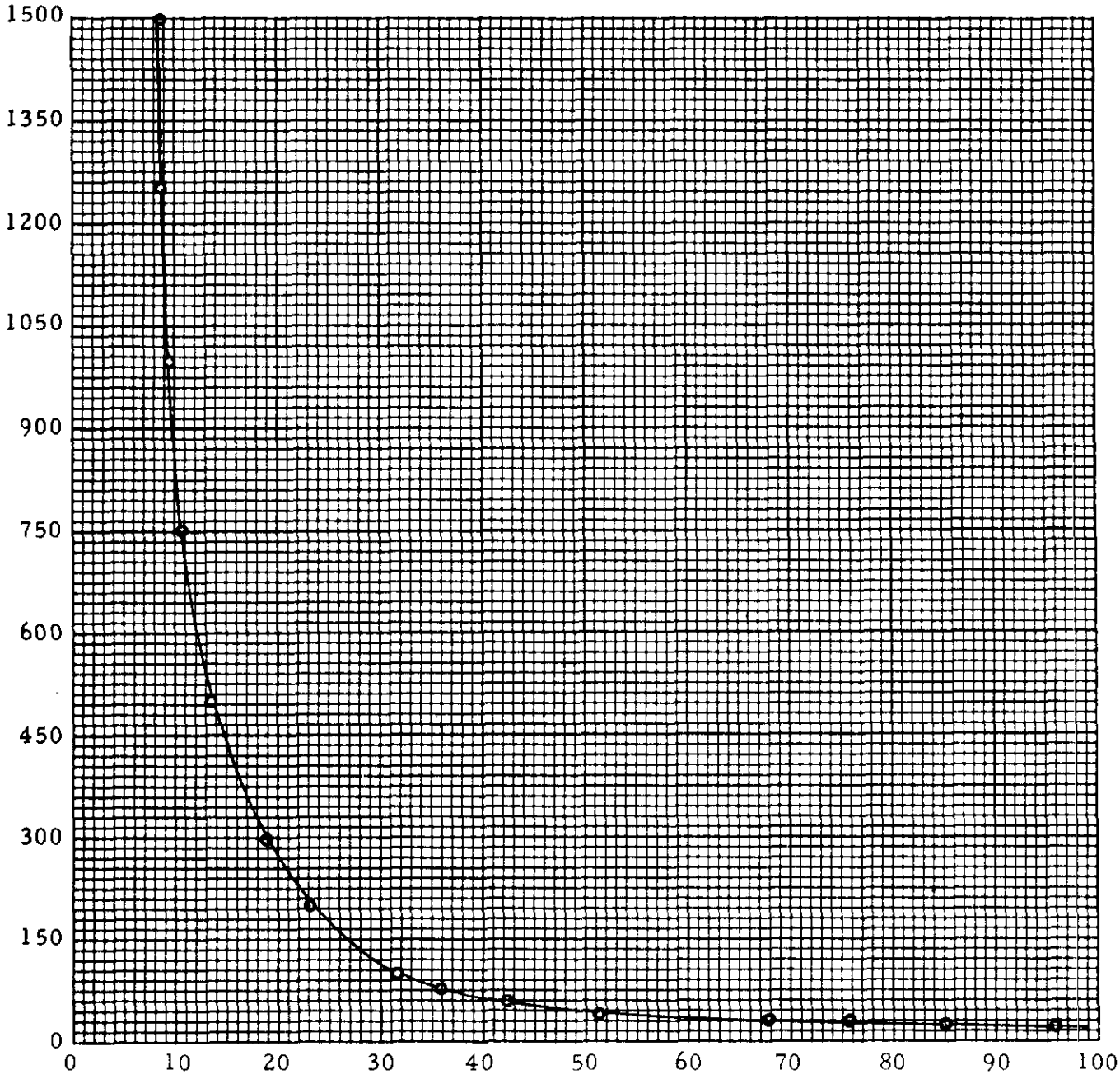
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number:	11	9
Permeability, Md.:	18	0.035



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 18
Permeability, Md.: 25



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Special Core Analysis Study

for

UNION OIL COMPANY OF CANADA LIMITED

Stopover K-44 and Colville D-45 Wells

Northwest Territories Canada

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

May 18, 1976

Union Oil Company of Canada Limited
P. O. Box 999
Calgary, Alberta T2P 2K6
Canada

Attention: Mr. Lorne D. McCluskey

Subject: Special Core Analysis Study
Stopover K-44 and Colville D-45 Wells
Northwest Territories
Canada
File Number: SCAL-75150

Gentlemen:

In letters dated April 25, 1975, June 2, 1975, and June 16, 1975, from Lorne D. McCluskey, Core Laboratories, Inc., was requested to perform: (1) Water-Oil Relative Permeability Tests, (2) Mercury Injection Tests, (3) Capillary Pressure Tests, (4) Formation Resistivity Factor Measurements, and (5) Formation Resistivity Index Measurements on sandstone core plugs from the subject wells. The results of the water-oil relative permeability tests were submitted in final form on March 25, 1976. The remaining tests are presented herein. The core plugs used in this study are identified as to well, sample number, and depth interval on Page 1 and are lithologically described on Page 2.

Fifteen core plugs and nine slabbed well cores were submitted for use in this study. Core plugs 1 inch in diameter were drilled from the nine slabbed cores with a diamond core bit using water as the bit coolant and lubricant. All core plugs were extracted of hydrocarbons with toluene, leached of salt with methyl alcohol, and then dried. Air permeabilities and porosities were determined on the cleaned and dried core plugs. The results of the permeability and porosity determinations were submitted to a representative of Union Oil Company of Canada Limited. Based on

the permeability and porosity determinations, core plugs were selected for further testing.

Eight core plugs, five from the Stopover well and three from the Colville well, were evacuated and saturated with appropriate simulated formation water. Six-point capillary pressure tests were performed using a porous-plate cell and an air-brine system. The results of the capillary pressure tests are presented by well in tabular form on Page 3 and in graphical form on Pages 4 through 8. The measured capillary pressure-saturation relationships correlate with both permeability and porosity for the Stopover and Colville wells.

Prior to performing the air-brine capillary pressure tests, the electrical resistivities of the brines and the brine saturated core plugs were measured. These measurements were repeated over a period of several days until the electrical resistivities stabilized indicating that ionic equilibrium within the core plugs had been attained. Formation resistivity factors were calculated from the electrical resistivity measurements and their relationships with porosity are presented in tabular form on Page 9 and in graphical form on Pages 10 and 11. Using Archie's equation, a cementation exponent "m" of 1.71 was calculated for the Stopover well. Using Archie's generalized equation, a cementation exponent "m" of 1.83 at an "a" intercept of 1.10 was calculated for the Colville well.

Electrical resistivities were measured at one equilibrium desaturation point on three core plugs from each the Stopover and the Colville wells. The formation resistivity-saturation relationships yield calculated saturation exponents "n" of 1.47 and 1.68 for the Stopover and Colville wells respectively.

Multi-point mercury injection tests were performed on eleven core plugs, six from the Stopover well and five from the Colville well, using injection pressures ranging from 3 psia to 1500 psia. The multi-point mercury injection tests are presented by well in tabular form on Pages 14 and 15, and in graphical form on Pages 16 through 21. The results of the wetting phase saturation injection pressure relationships correlate

with permeability and porosity for both wells. The inflections exhibited by the test results for Samples 89, 103A, 12, and 9 (Pages 18, 19 and 20) indicate the presence of multi-modal pore size distribution. The heterogeneous porosity systems present in the core plugs tested is not unusual for poorly sorted sandstone core material.

Should you have any questions pertaining to these test results or if we can be of any assistance, please do not hesitate to contact us.

Very truly yours,

Core Laboratiories, Inc.

Duane L. Archer (mf)

Duane L. Archer, Manager
Special Core Analysis

DLA:JWW:gb
10 cc. - Addressee

Company Union Oil Co. of Canada Limited
Number of Wells Two
Field Stopover and Colville
Formation Old Fort Sand
County Northwest Territories
State Canada

Identification of Samples

Sample Number	Company	Well	Depth, Feet
		Stopover Field	
45	Union Oil Company of Canada Ltd.	Union Oil Stopover K-44	2780.0-80.7
50			2784.1-85.0
50A			2784.1-85.0
70			2798.2-99.0
88			2813.2-13.5
89			2813.5-14.3
98			2820.8-21.9
98A			2820.8-21.9
103			2825.6-26.2
103A			2825.6-26.2
113			2832.4-33.1
115			2834.3-34.9
		Colville Field	
1	Union Oil Company of Canada Ltd.	Union Mobile Colville D-45	3183.2-83.7
4			3185.6-86.0
9			3190.8-91.8
10			3190.8-91.8
11			3218.0-18.7
12			3218.0-18.7
15			3223.0-23.4
18			3225.9-26.4

Lithological Description

Sample Number	Description
	Stopover Field
45	Ss, reddish brn, v/fn grn, well indurated, w/sh inclusions
50	Ss, gry-red, fn-v/fn grn, well indurated, w/sh
50A	Ss, red-brn, cse-v/fn grn, apparent SiO_2 cement, well indurated, cse grn concentrations
70	Ss, red & gry, fn grn, v/sl/calc, mod indurated, w/clay pockets
88	Ss, buff-white, med-fn grn, apparent SiO_2 cement, mod indurated, red-brn staining an upper portion
89	Ss, gry, med-fn grn, v/sl/calc, mod indurated, w/fn grn lams, red stks
98	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color staining, grns uniform
98A	Ss, red & gry, fn-med grn, well indurated, w/clay pockets
103	Ss, red-brn, cse-fn grn, apparent SiO_2 cement, mod-poor in-indurated, blotchy color appearance
103A	Ss, red, fn-med grn, v/sl/calc, mod indurated
113	Ss, red, fn grn, well indurated, w/sh stks
115	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color appearance
	Colville Field
1	Ss, lt gry, v/fn-silt grn, apparent SiO_2 cement, well indurated, tr musc, pyrite
4	Ss, gry, v/fn grn, sl/calc, well indurated
9	Ss, gry, v/fn grn, sl/calc, well indurated
10	Ss, tan, v/fn grn, sl/calc, mod indurated,
11	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminar, tr musc
12	Ss, gry, fn grn, mod indurated
15	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae, tr musc
18	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae

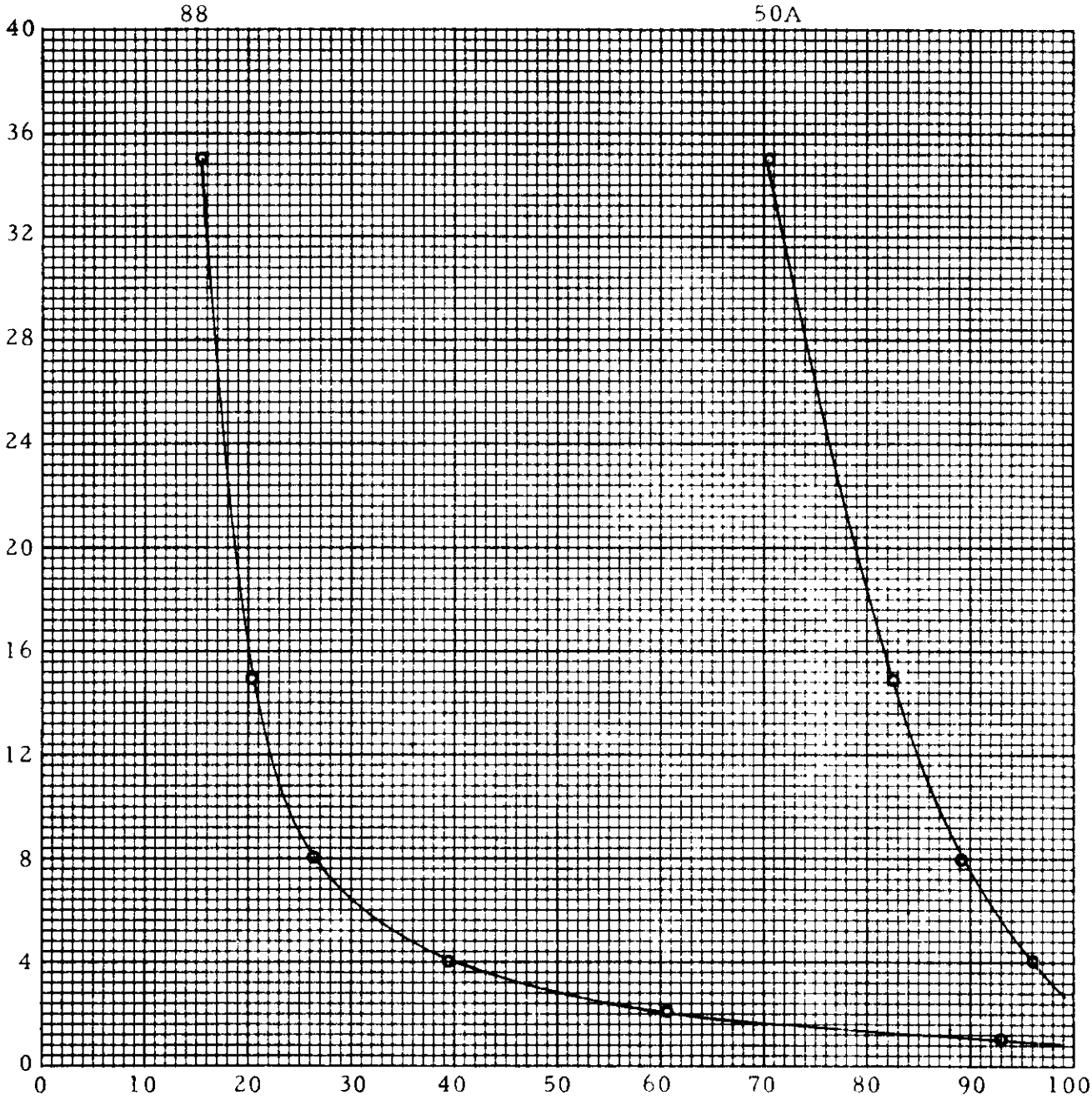
Air-Brine Capillary Pressure Data

Pressure, PSI:	1	2	4	8	15	35

Sample Number	Permeability, Millidarcys	Porosity, Per Cent	Brine Saturation, Per Cent Pore Space					
					Stopover Field			
50A	1.2	8.3	100.0	100.0	96.0	89.0	82.6	70.3
88	130	12.8	92.9	60.8	39.5	26.3	20.3	15.6
98	12	10.1	100.0	100.0	89.4	64.0	42.0	31.9
103	118	14.4	100.0	69.4	44.8	31.5	25.6	21.3
115	1.7	10.8	100.0	100.0	91.6	63.9	41.7	31.9
					Colville Field			
11	12	14.0	100.0	95.4	75.3	50.6	31.2	16.9
15	7.3	13.2	100.0	100.0	93.2	63.2	34.6	18.0
18	20	15.1	100.0	100.0	83.0	39.6	26.4	15.9

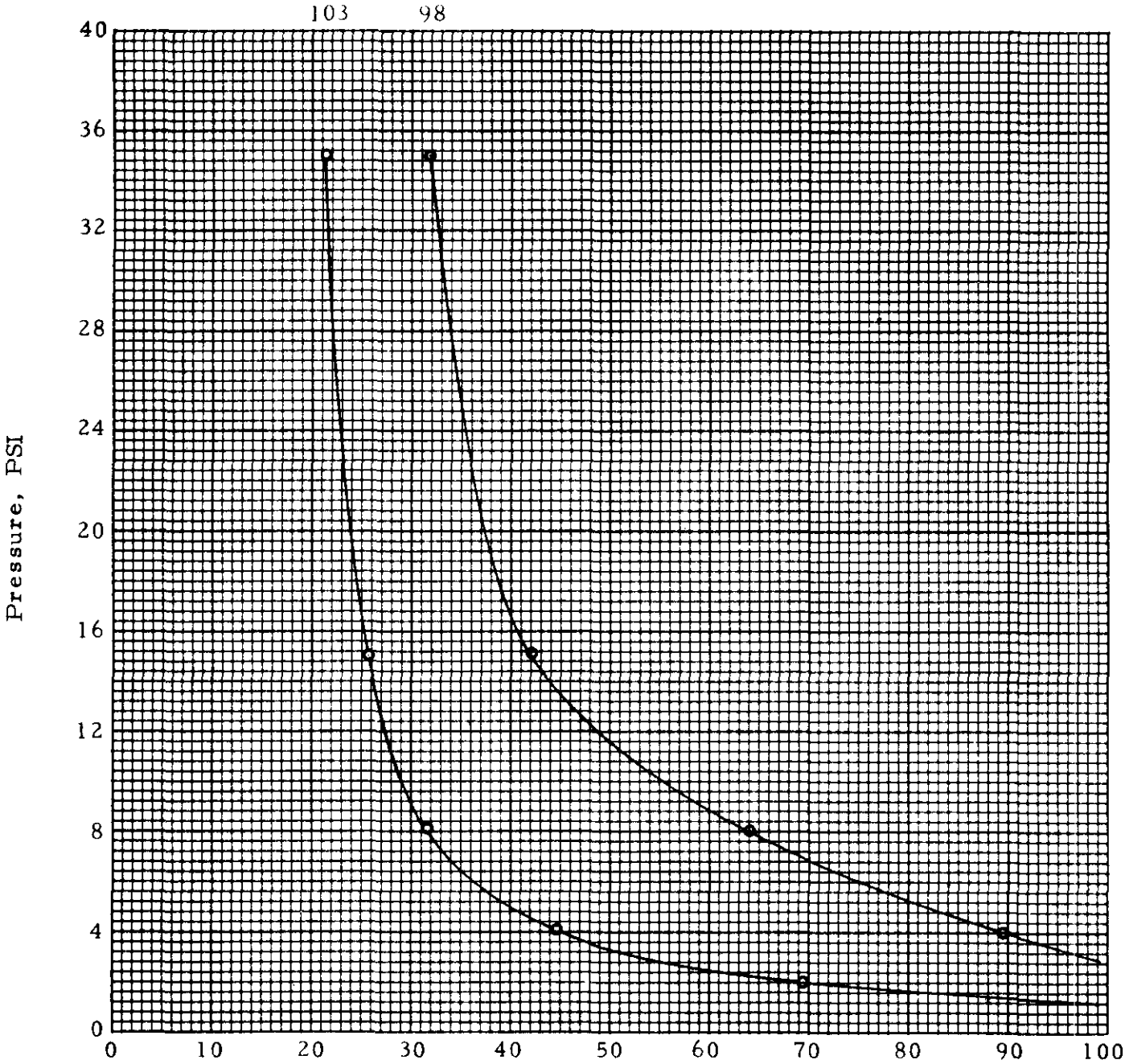
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number:	88	50A
Permeability, Md.:	130	1.2



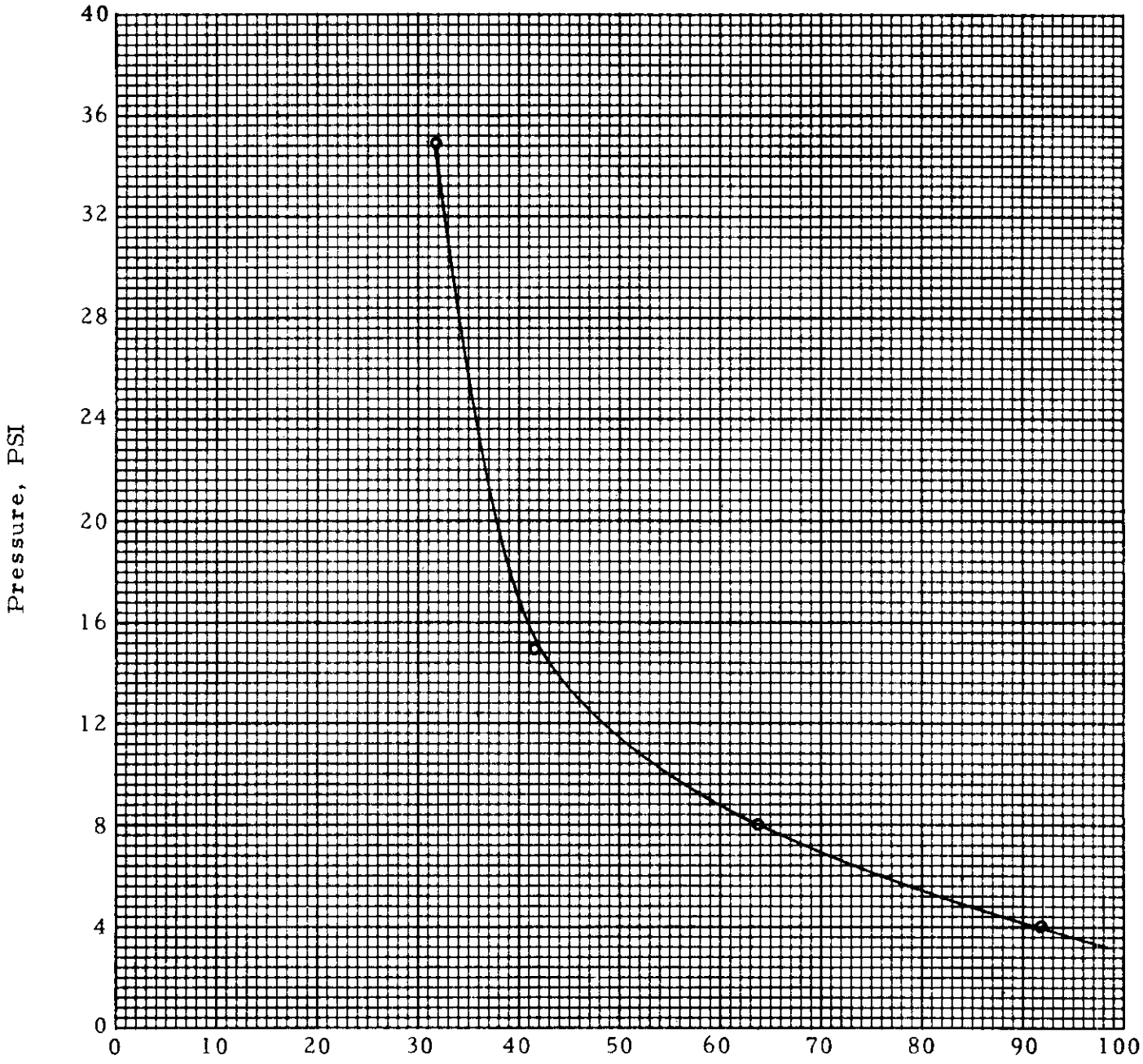
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number:	103	98
Permeability, Md.:	118	12



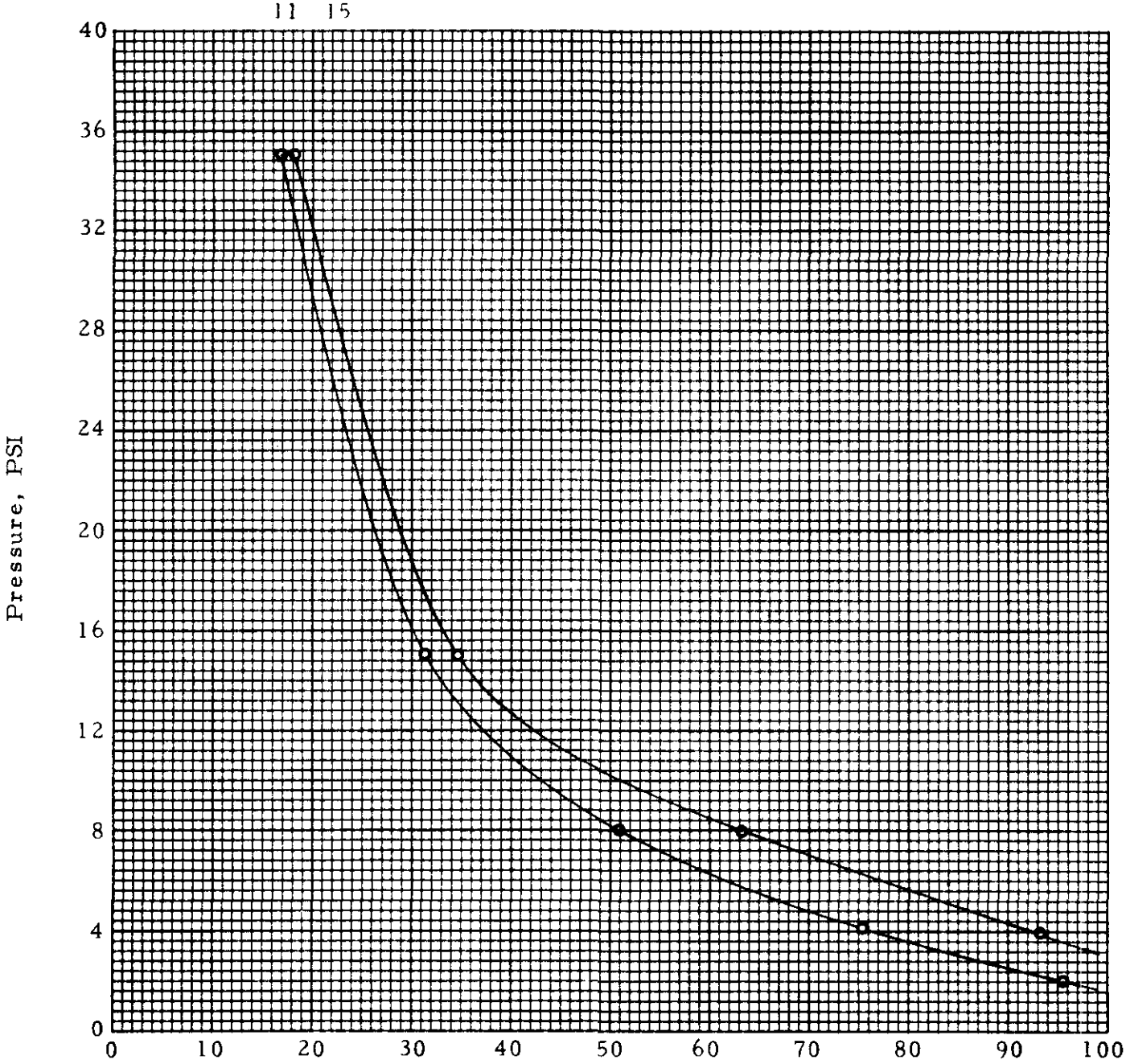
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number: 115
Permeability, Md.: 1.7



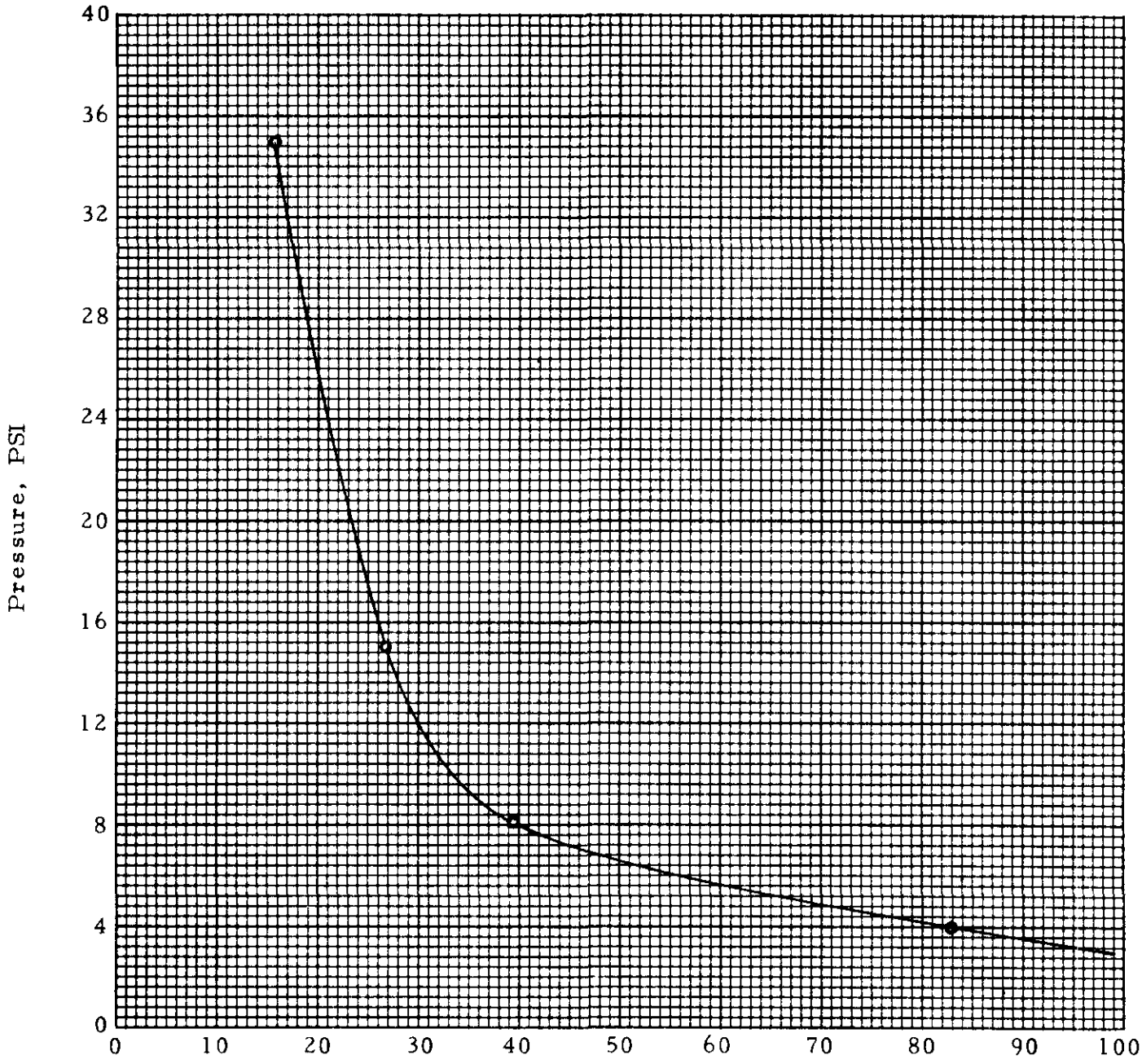
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D45 County Northwest Territories
Field Colville State Canada

Sample Number:	11	15
Permeability, Md.:	12	7.3



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 18
Permeability, Md.: 20



Formation Factor and Resistivity Index Data

Stopover Field

Resistivity of Saturating Brine, Ohm-Meters: 0.253 @ 71°F.

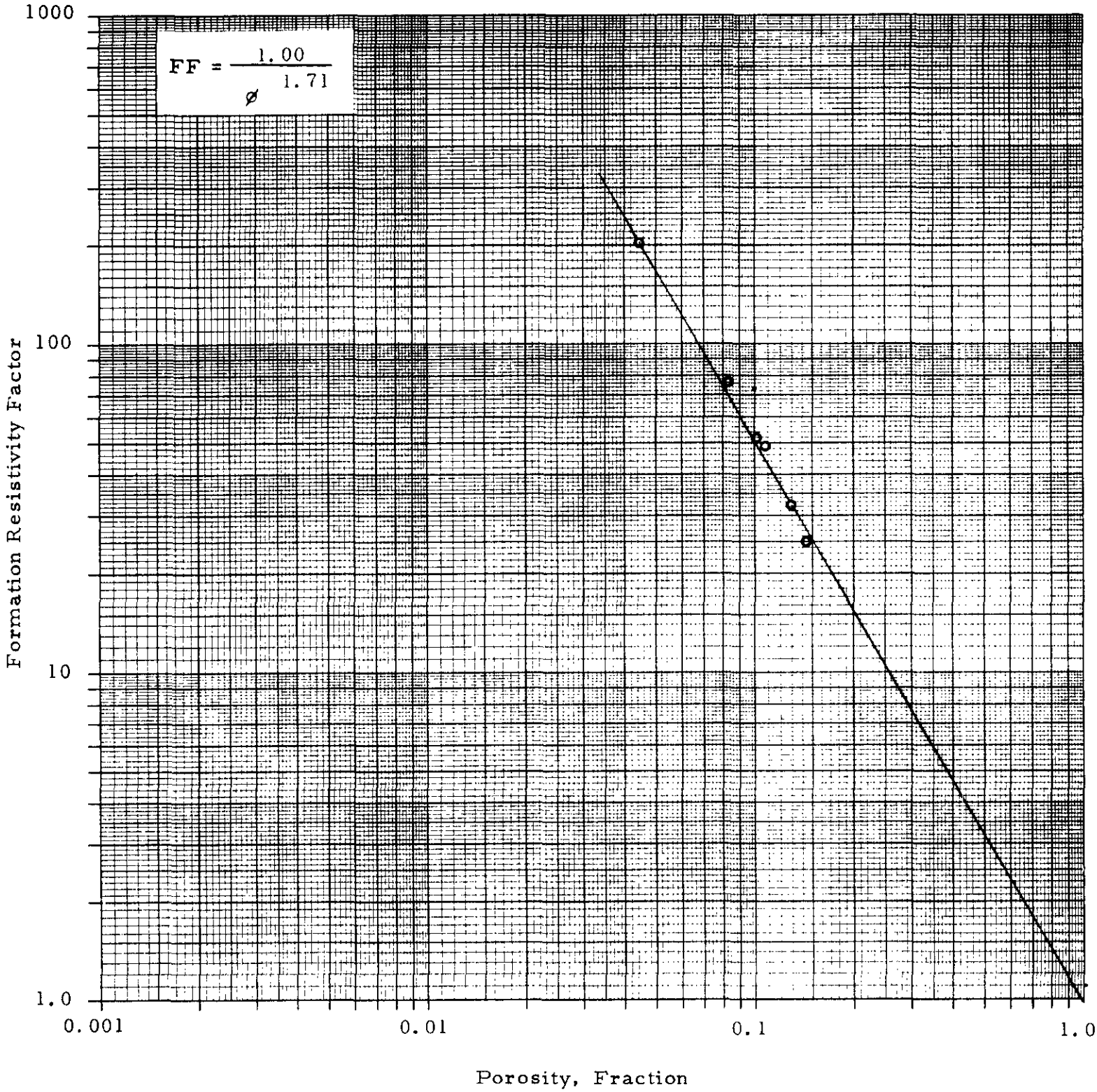
Sample Number	Porosity, Per Cent	Formation Factor	Brine Saturation, Per Cent Pore Space	Resistivity Index
50A	8.3	76.1	100.0	1.00
			70.3	2.13
88	12.8	32.1	100.0	1.00
			15.6	9.29
98	10.1	51.8	100.0	1.00
			31.9	5.98
103	14.4	24.8	100.0	1.00
113	4.5	201	100.0	1.00
115	10.8	49.7	100.0	1.00

Colville Field

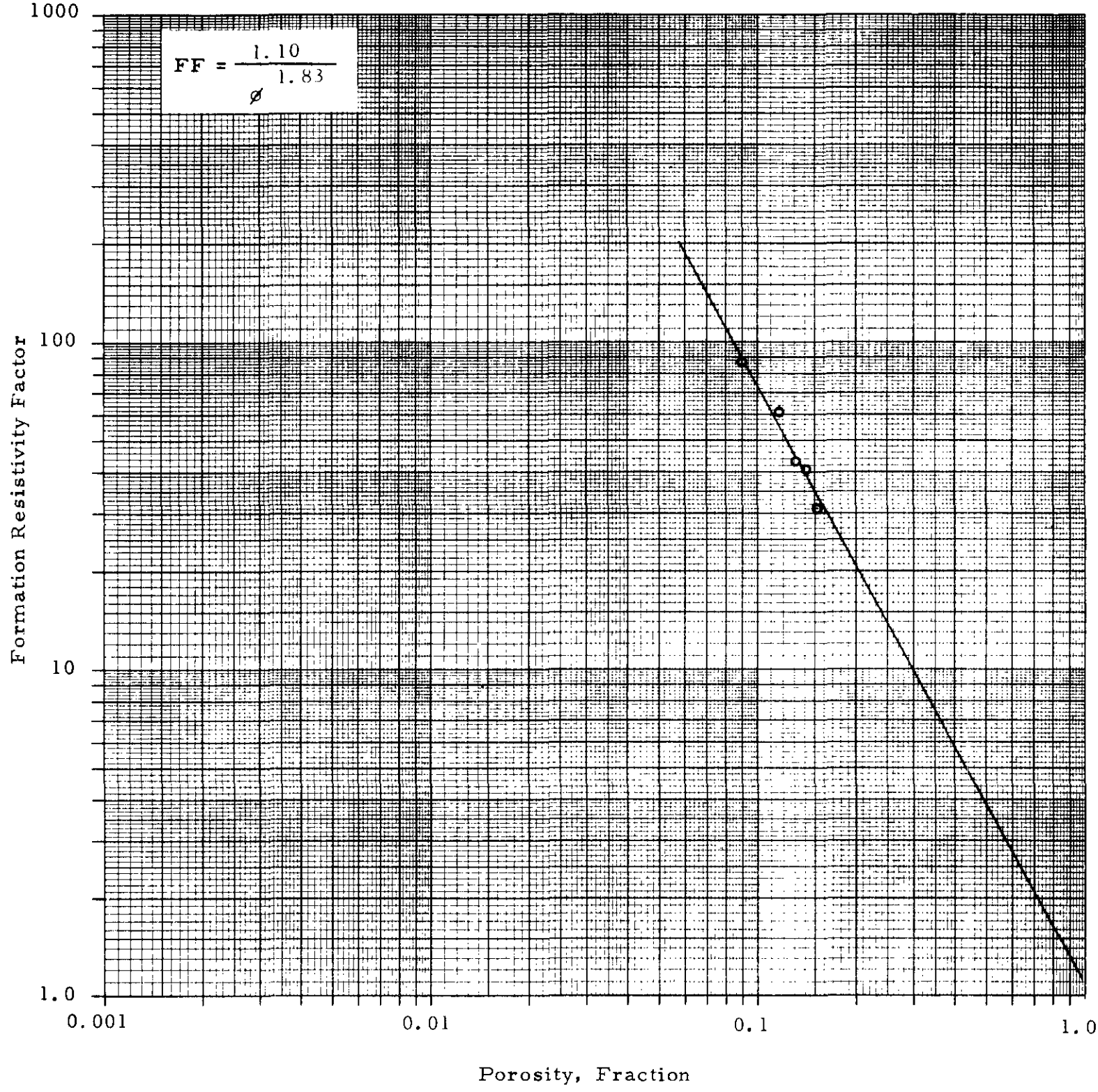
Resistivity of Saturating Brine, Ohm-Meters: 0.120 @ 74°F.

1	11.7	60.8	100.0	1.00
			80.5	1.89
10	9.0	87.0	100.0	1.00
11	14.0	41.2	100.0	1.00
15	13.2	43.2	100.0	1.00
			18.0	12.0
18	15.1	31.1	100.0	1.00
			15.9	23.3

Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

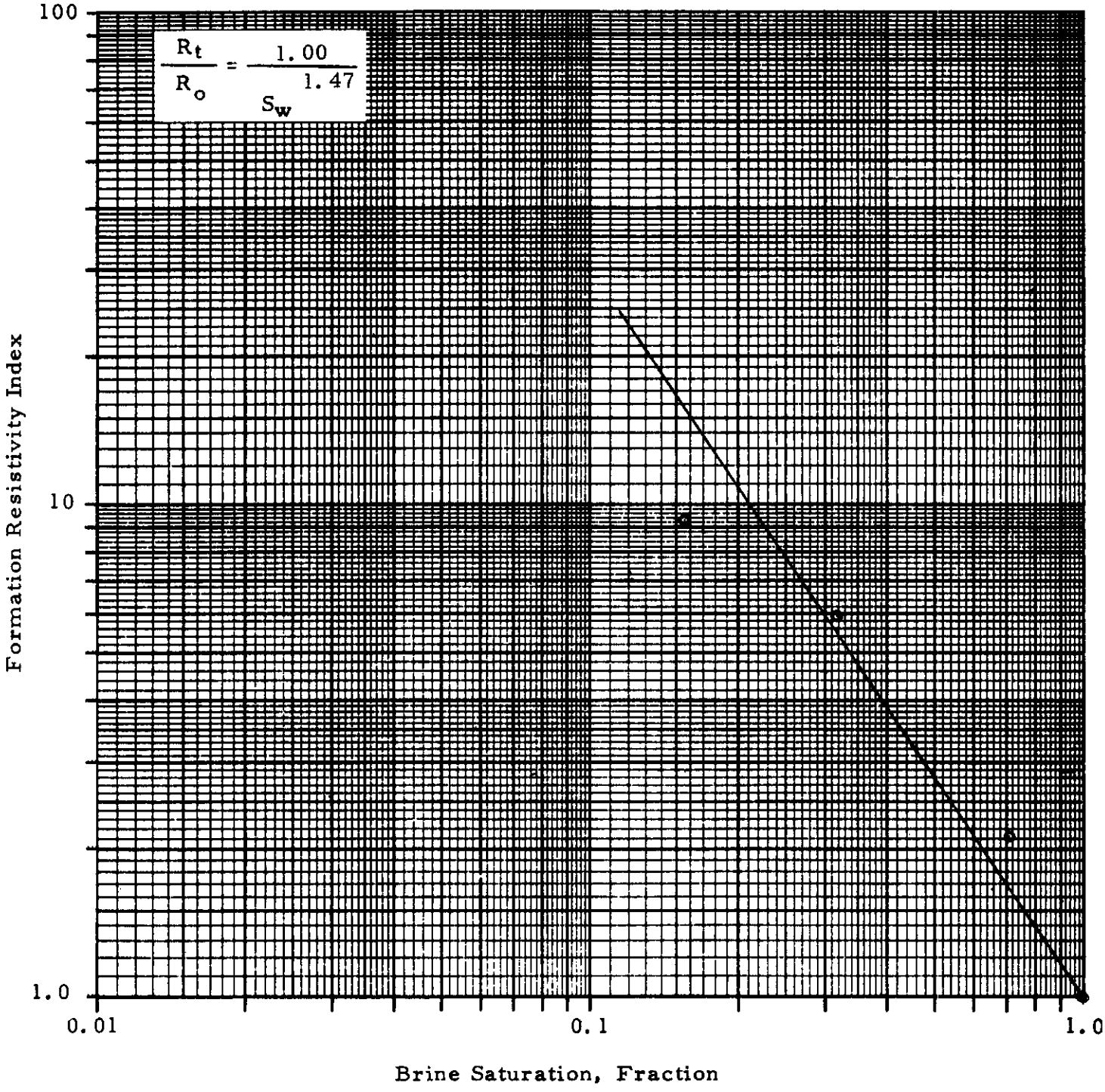


Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada



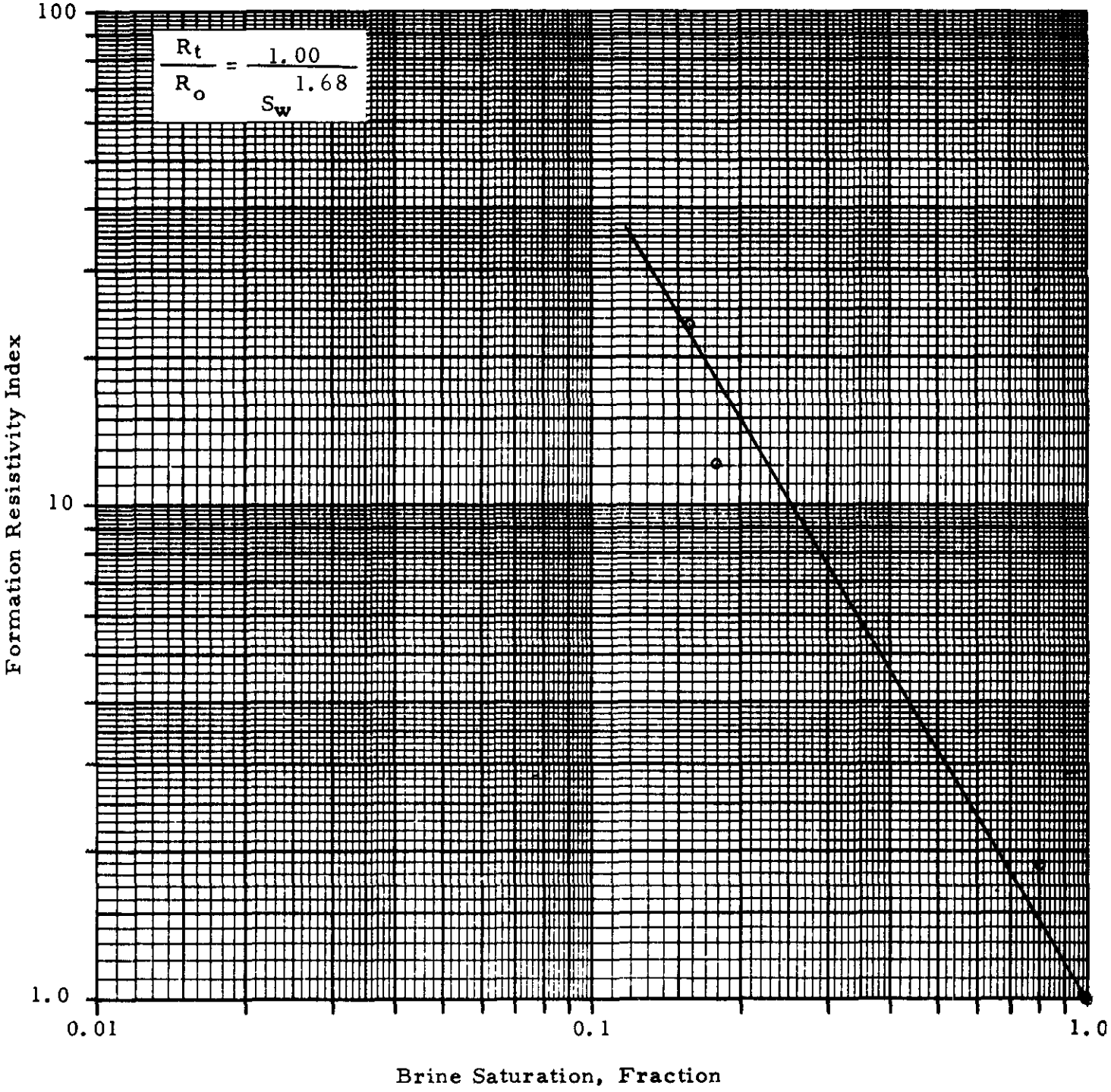
Company Union Oil Co. of Canda — Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 — County Northwest Territories
Field Stopover — State Canada

Composite



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Composite



Stopover Field

Mercury Injection Capillary Pressure Data

Sample Number:	45	50	70	89	98A	103A
Permeability, Md.:	0.033	0.28	1.3	233	5.5	60
Porosity, Per Cent:	5.6	6.6	13.7	13.2	9.7	14.6
Injection Pressure, PSIA	Wetting Phase Saturation, Per Cent Pore Space					
3	100.0	100.0	100.0	93.0	100.0	100.0
6	100.0	100.0	100.0	71.9	100.0	100.0
9	100.0	100.0	100.0	55.8	100.0	96.9
12	100.0	100.0	100.0	44.1	100.0	85.6
15	100.0	100.0	100.0	38.3	100.0	74.4
18	100.0	100.0	100.0	32.8	100.0	62.9
21	100.0	100.0	100.0	30.1	100.0	57.2
24	100.0	100.0	100.0	27.6	100.0	52.4
27	100.0	100.0	100.0	25.7	100.0	48.9
30	100.0	100.0	100.0	24.5	98.2	46.4
40	100.0	100.0	98.6	21.4	88.0	39.5
60	100.0	100.0	94.0	17.8	67.7	32.7
80	100.0	100.0	89.9	15.8	57.4	30.0
100	100.0	96.6	84.9	14.4	51.0	28.2
200	100.0	73.2	63.5	10.7	39.8	24.2
300	100.0	62.6	54.0	8.7	34.1	22.4
500	91.7	45.5	44.0	6.3	27.7	19.6
750	72.0	34.2	35.6	4.5	23.2	17.2
1000	55.6	28.3	29.3	4.2	20.8	15.0
1250	44.5	23.5	24.9	2.8	19.1	14.5
1500	34.5	21.4	21.9	2.7	18.1	12.2

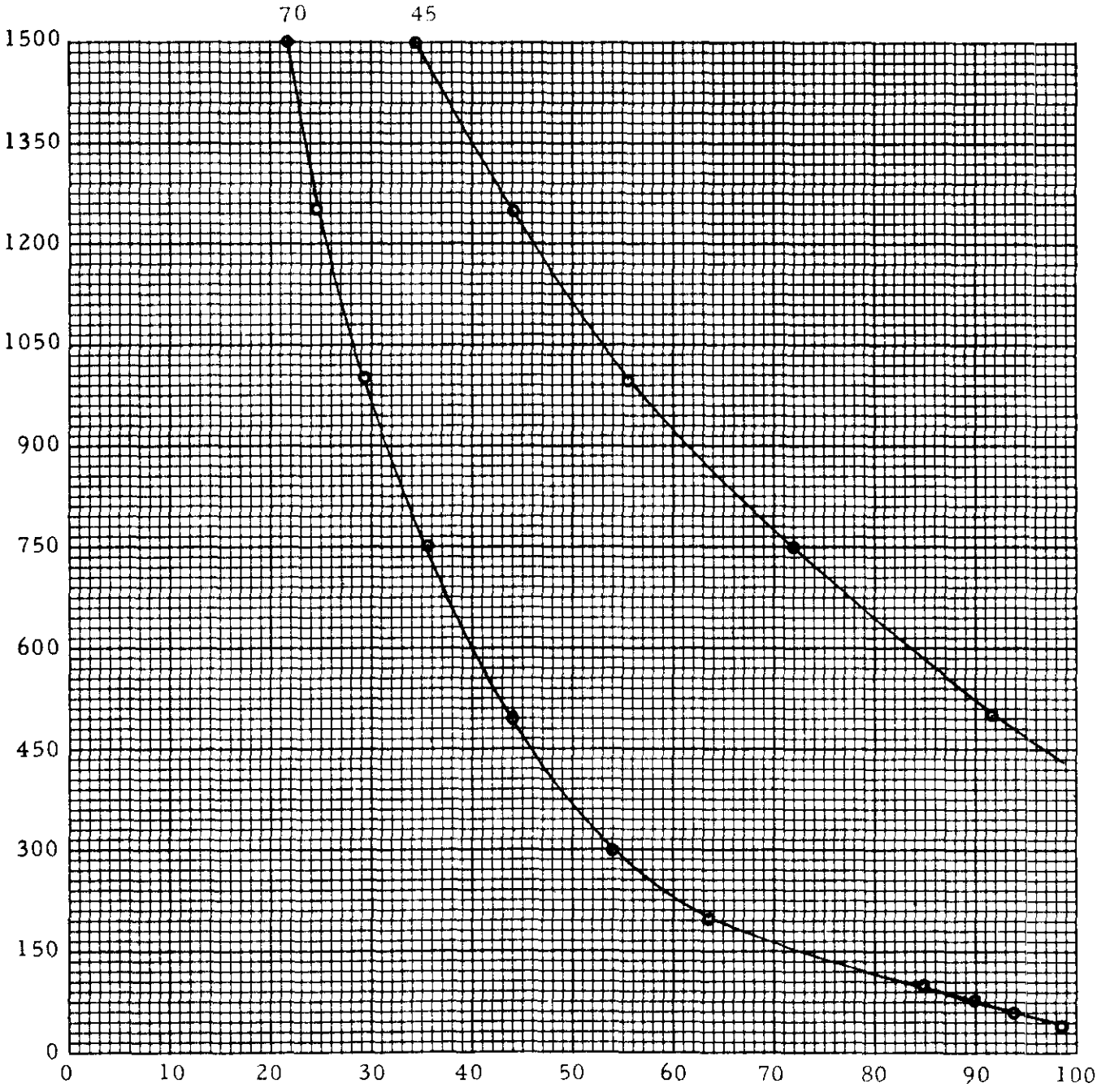
Colville Field

Mercury Injection Capillary Pressure Data

Sample Number:	4	9	11	12	18
Permeability, Md.:	0.56	0.035	18	82	25
Porosity, Per Cent:	11.8	7.9	13.9	12.6	14.6
Injection Pressure, PSIA	Wetting Phase Saturation, Per Cent Pore Space				
3	100.0	100.0	100.0	100.0	100.0
6	100.0	100.0	100.0	100.0	100.0
9	100.0	100.0	100.0	100.0	100.0
12	100.0	100.0	100.0	100.0	100.0
15	100.0	100.0	95.4	100.0	100.0
18	100.0	100.0	89.0	98.5	100.0
21	100.0	100.0	83.9	96.1	95.8
24	100.0	100.0	79.9	92.1	85.1
27	100.0	100.0	76.1	90.4	75.9
30	100.0	100.0	73.5	87.6	67.8
40	100.0	100.0	64.7	77.7	51.3
60	100.0	100.0	55.1	65.6	42.0
80	100.0	100.0	48.1	57.3	36.0
100	100.0	100.0	43.2	51.8	31.8
200	73.7	100.0	30.3	38.6	23.2
300	63.7	100.0	24.0	31.3	18.8
500	54.3	100.0	16.8	24.1	13.5
750	46.6	100.0	14.1	20.3	10.9
1000	40.7	78.2	12.2	17.5	9.8
1250	35.5	69.9	10.6	14.5	8.8
1500	31.4	60.5	10.2	13.8	8.7

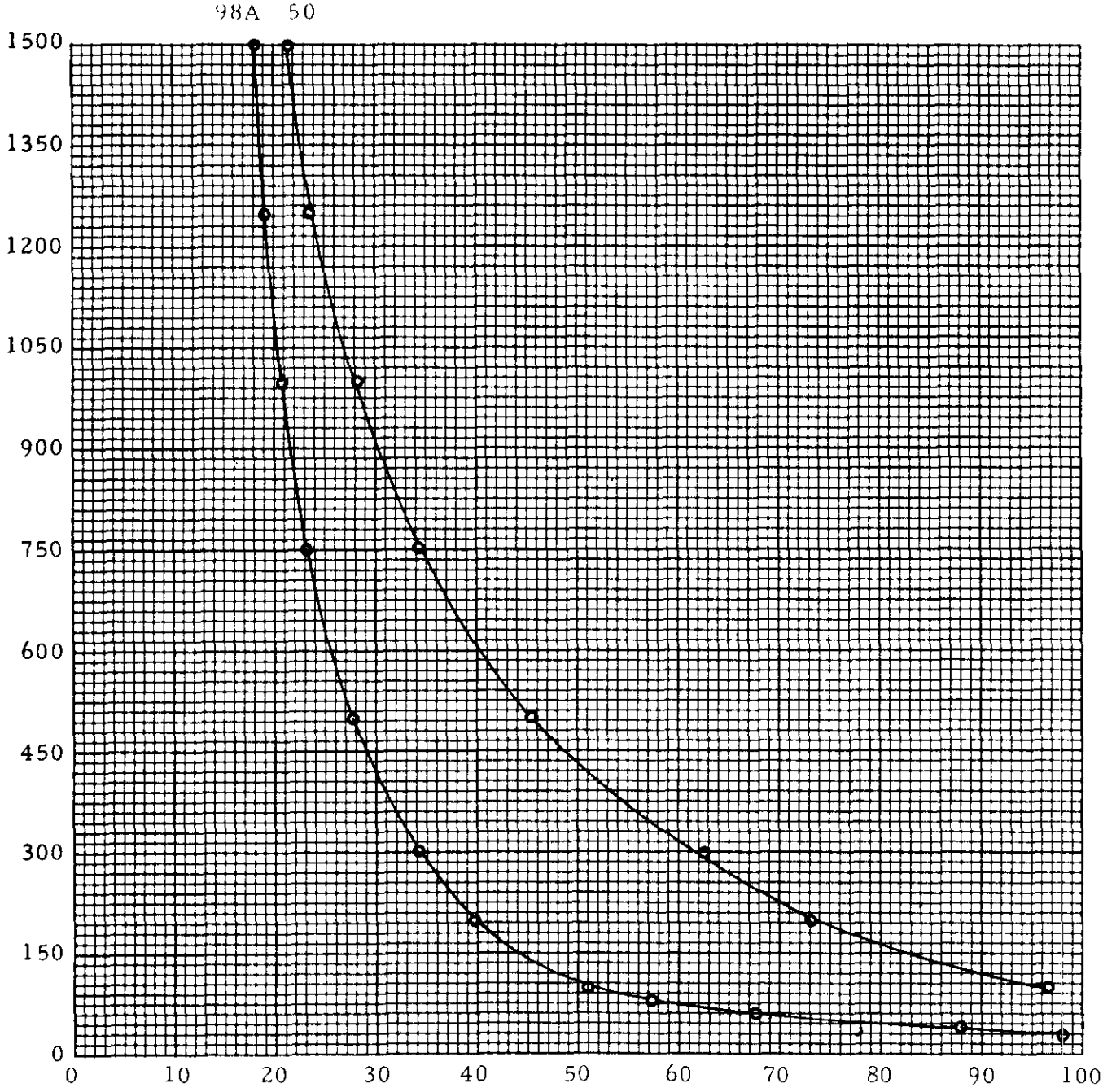
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

Sample Number:	70	45
Permeability, Md.:	1.3	0.033



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

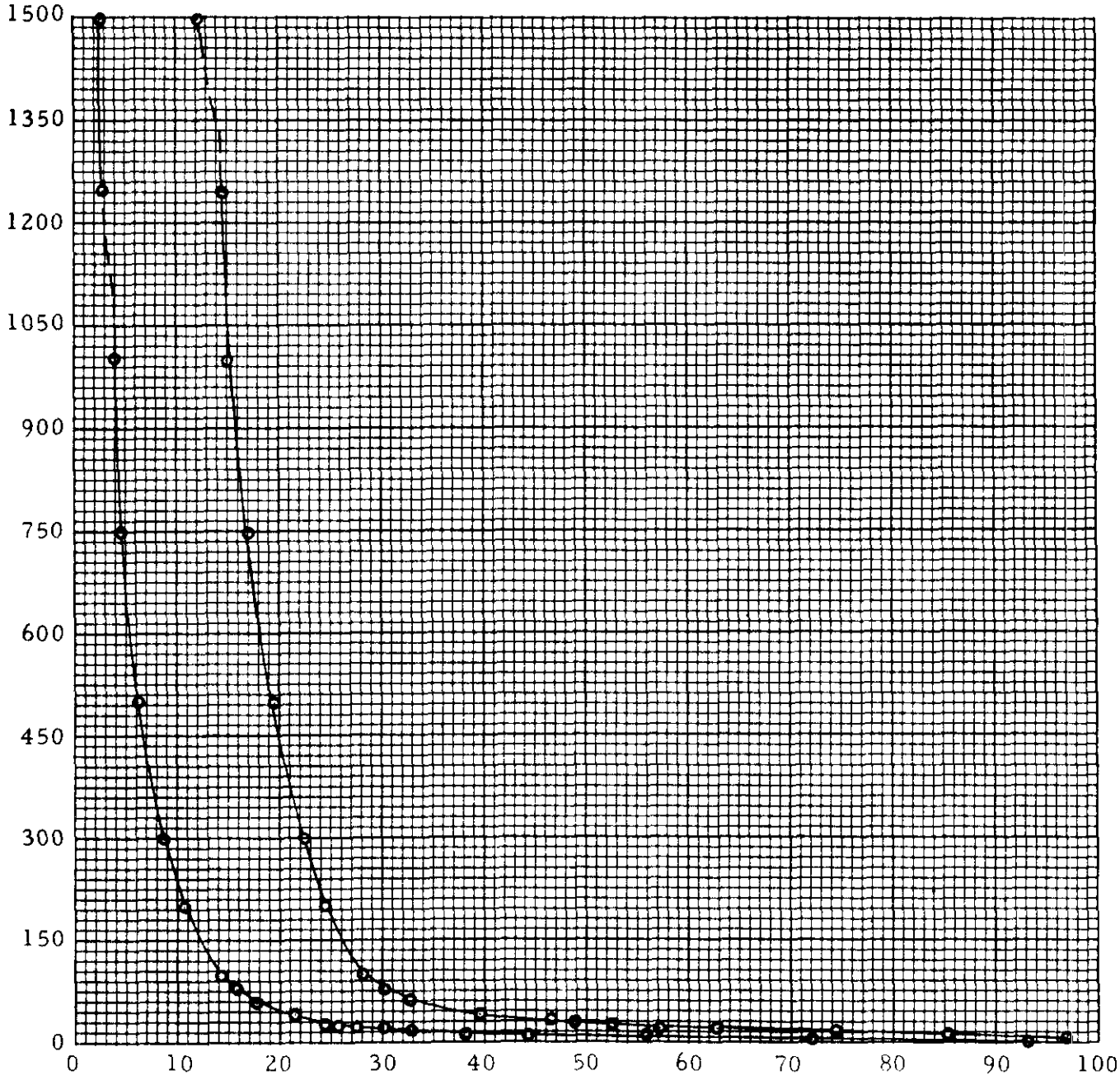
Sample Number:	98A	50
Permeability, Md.:	5.5	0.28



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Stopover State Canada

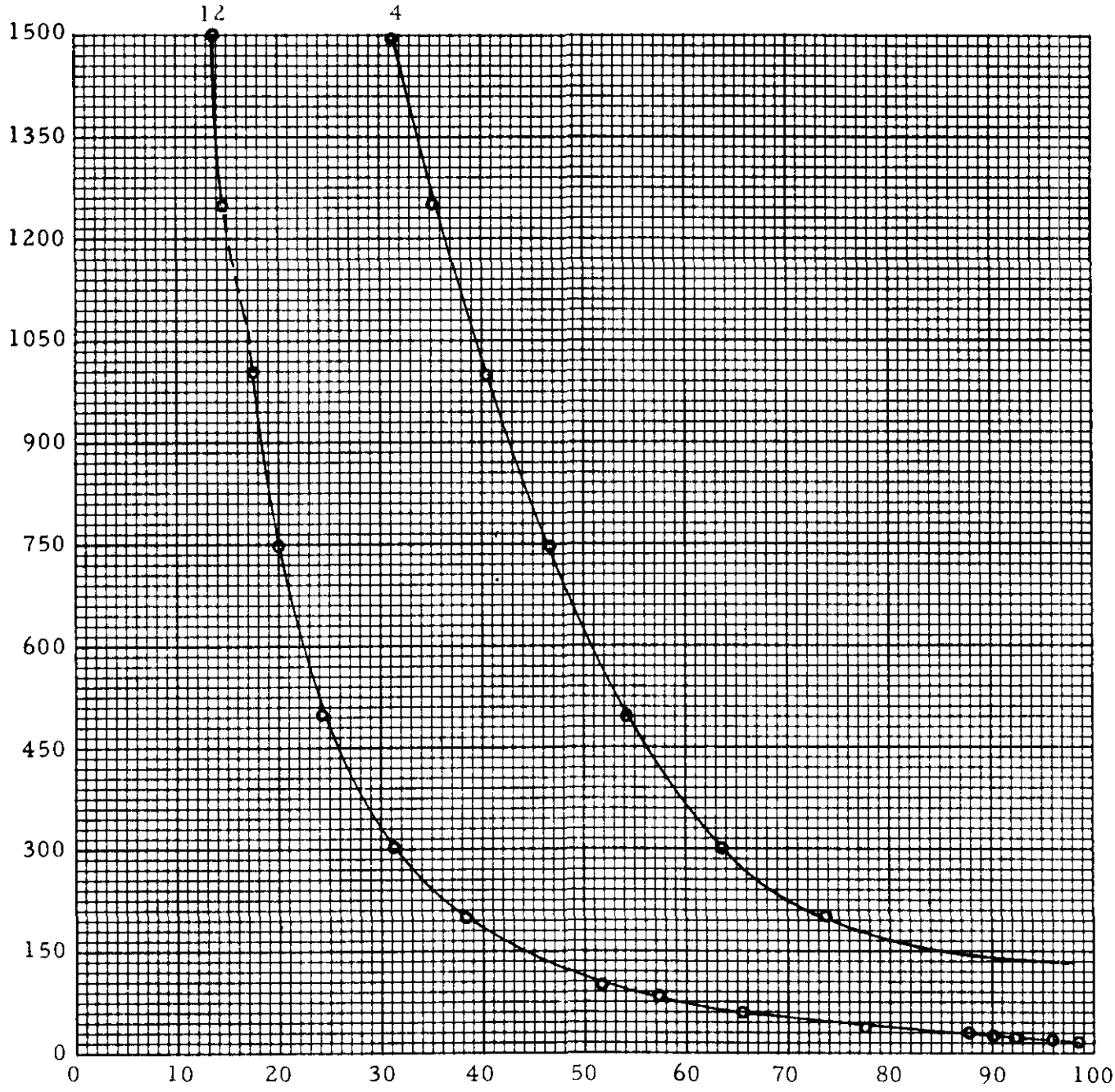
Sample Number:	89	103A
Permeability, Md.:	233	60

89 103A



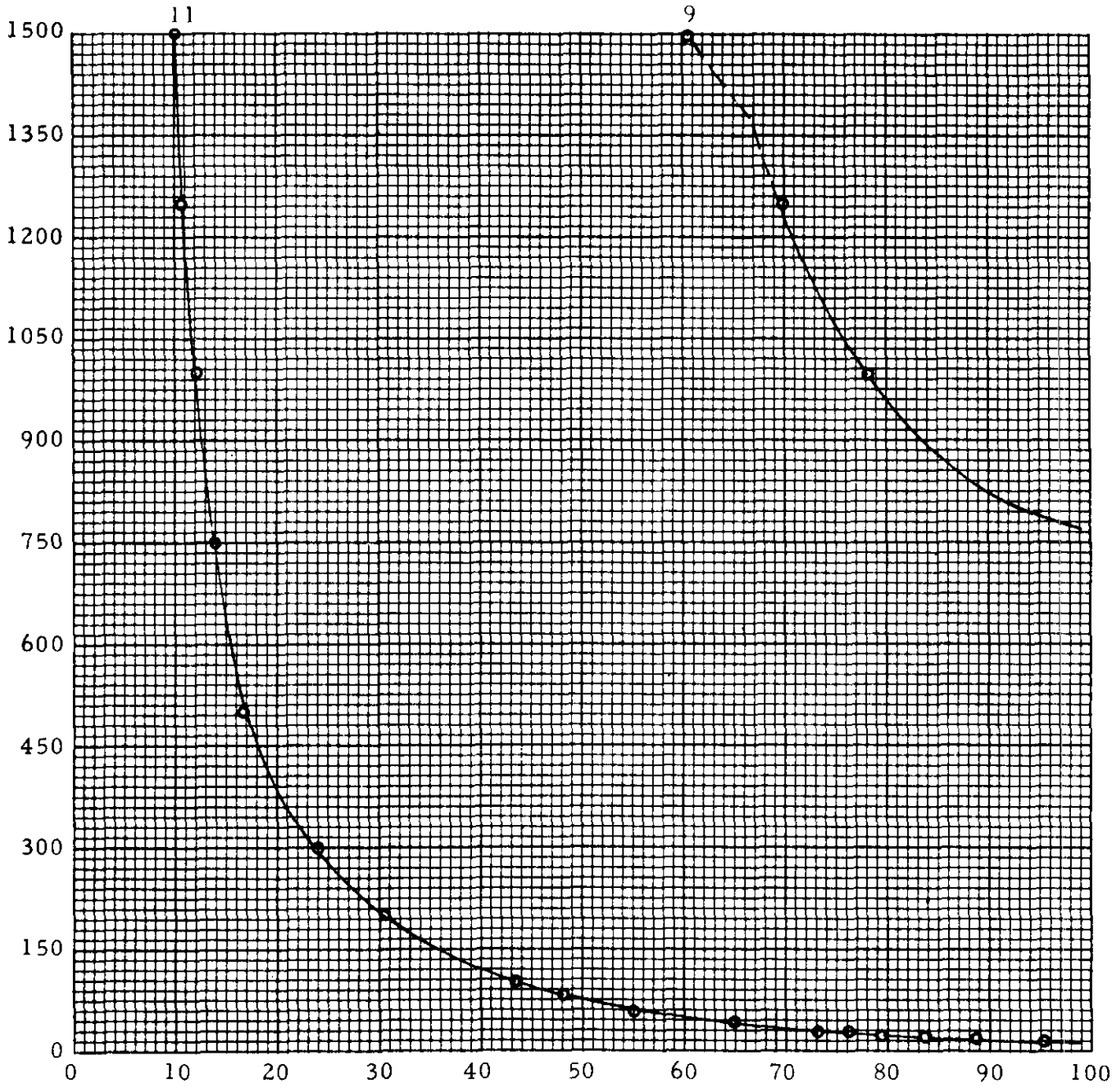
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number:	12	4
Permeability, Md.:	8.2	0.56



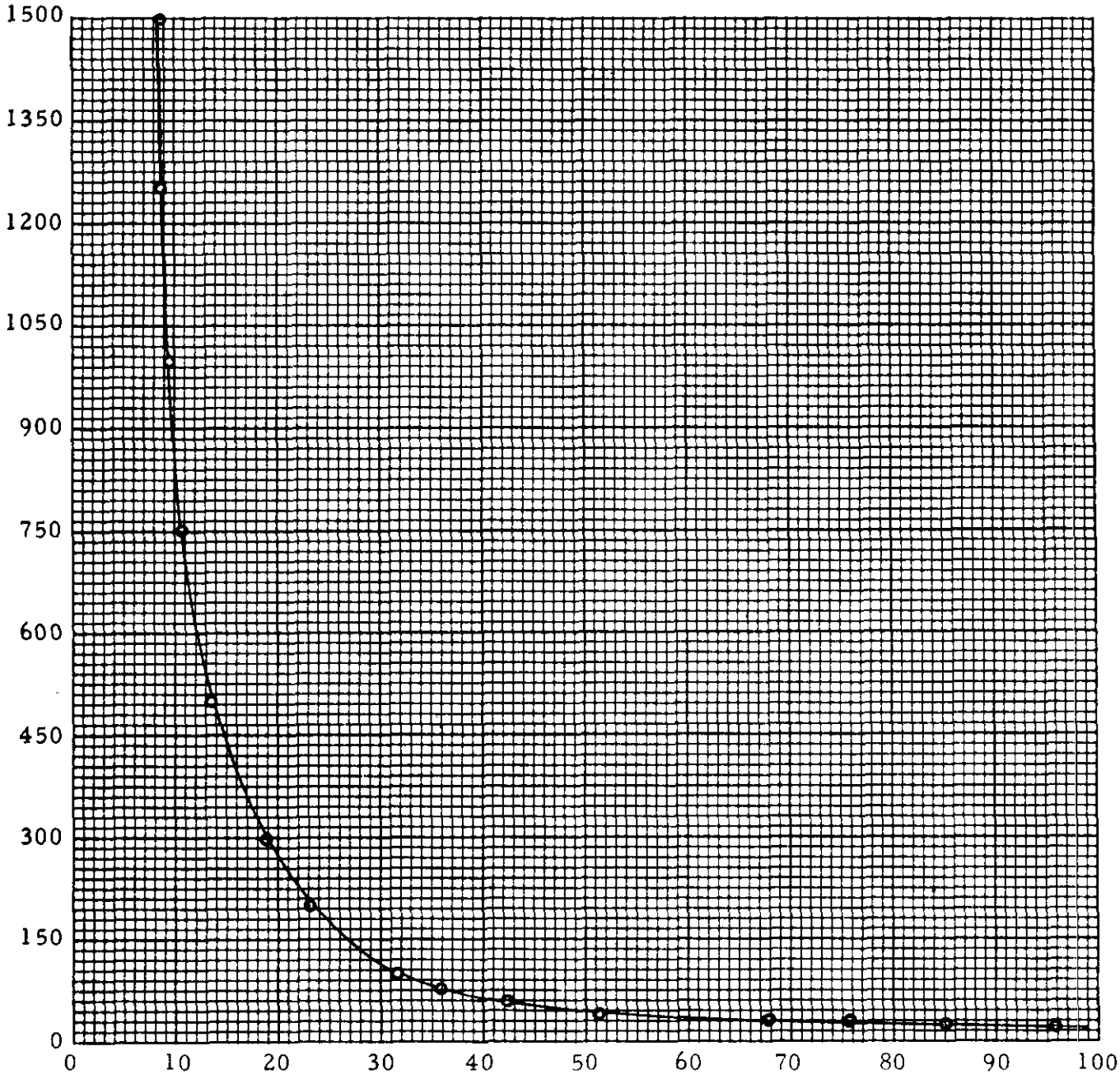
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number:	11	9
Permeability, Md.:	18	0.035



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 & Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 18
Permeability, Md.: 25



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Special Core Analysis Study

for

UNION OIL COMPANY OF CANADA LIMITED

Stopover K-44 and Colville D-45 Wells

Northwest Territories, Canada

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

March 25, 1976

Union Oil Company of Canada Limited
P. O. Box 999
Calgary, Alberta T2P 2K6
Canada

Attention: Mr. Lorne D. McCluskey

Subject: Special Core Analysis Study
Stopover K-44 and Colville D-45 Wells
Northwest Territories, Canada
File Number: SCAL-75150

Gentlemen:

In letters dated April 25, 1975, June 2, 1975, and June 16, 1975 from Lorne D. McClusky, Core Laboratories, Inc., was requested to perform: (1) Water-Oil Relative Permeability Tests, (2) Mercury Injection Tests, (3) Capillary Pressure Tests, (4) Formation Resistivity Factor Measurements, and (5) Formation Resistivity Index Measurements on sandstone core plugs from the subject wells. The results of the water-oil relative permeability tests are presented herein. The remaining tests are in progress and test results will be submitted as the data becomes available. The core plugs used in this study are identified as to well, sample number, and depth interval on Page 1 and are lithologically described on Page 2.

Fifteen core plugs and nine slabbed well cores were submitted for use in this study. Core plugs, 1-inch in diameter, were drilled from the nine slabbed cores using a diamond core bit with water as the bit coolant and lubricant. All core plugs were extracted of hydrocarbons with toluene, leached of salt with methyl alcohol, and then dried. Air permeabilities and Boyle's law porosities were determined on the cleaned and dried core plugs. The results of the permeability and porosity determinations were submitted to a representative of Union Oil Company of

Canada Limited. Based on the permeability and porosity determinations, core plugs were selected for further testing.

Eleven core plugs, six from the Stopover well and five from the Colville well, were evacuated and saturated with either a simulated Stopover formation water or a simulated Colville formation water. Initial (pseudo-connate) water saturations which averaged 13.0 per cent pore space for the Colville D-45 well and 21.5 per cent pore space for the Stopover K-44 well were established using a centrifugal technique. Effective permeabilities to oil were measured in the presence of the initial water saturations. One core plug from each well contained insufficient permeability for further testing and was deleted from the testing program. Water-oil relative permeability tests were performed using the proper injection water. The results of the water-oil relative permeability tests are summarized by well on Page 3, presented in tabular form on Pages 4 through 11, and in graphical form on Pages 12 through 27.

Because of the limited oil production following water breakthrough for Sample 115, insufficient data was available to calculate the relative permeability characteristics. The results of this test are summarized on Page 3 with the water-oil relative permeability data; however, only end-point data is presented.

The properties of the fluids used in the water-oil relative permeability tests are listed below for your convenience.

Fluid	Temperature, °F.	Density, gm/cc.	Viscosity, Centipoises
Refined Mineral Oil	70	0.8348	20.6
	90	0.8272	12.9
	110	0.8196	8.61
Simulated Colville Water	70	1.038	1.067
	90	1.035	0.845
	110	1.032	0.687
Simulated Stopover Water	70	1.023	1.026
	90	1.019	0.810
	110	1.014	0.653

The results of the tests on Samples 50A and 98 from the Stopover K-44 well indicate both channeling and plugging. The channeling is indicated by the rapid increase in the relative permeability-to-water curves (Pages 21 and 25) at the low water saturations and the plugging is indicated by the suppressed relative permeability-to-water curves at the high water saturations.

Should you have any questions pertaining to these test results, or if we can be of any assistance, please do not hesitate to contact us.

Very truly yours,

Core Laboratories, Inc.

Duane L. Archer (DB)

Duane L. Archer, Manager
Special Core Analysis

DLA:JWW:tl
10 cc. - Addressee

Company Union Oil Company of Canada Limited
Formation Old Fort Sand
Number of Wells Two
County Northwest Territories
Field As Noted
State Canada

Identification of Samples

Sample Number	Company	Well	Depth, Feet
		Stopover Field	
50A	Union Oil Co. of Canada Ltd.	Union Oil Stopover K-44	2784.1-85.0
88			2813.2-13.5
98			2820.8-21.9
103			2825.6-26.2
115			2834.3-34.9
		Colville Field	
1	Union Oil Co. of Canada Ltd.	Union Mobile Colville D-45	3183.2-83.7
11			3218.0-18.7
15			3223.0-23.4
18			3225.9-26.4

Lithological Description

Sample Number	Description
	Colville D-45
1	Ss, lt gry, v/fn-silt grn, apparent SiO_2 cement, well indurated, tr musc,pyrite
11	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminar, tr musc
15	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae, tr musc
18	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae
	Stopover K-44
50A	Ss, red-brn, cse-v/fn grn, apparent SiO_2 cement, well indurated, cse grn concentrations
88	Ss, buff-white, med-fn grn, apparent SiO_2 cement, mod indurated, red-brn staining an upper portion
98	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color staining, grns uniform
103	Ss, red-brn, cse-fn grn, apparent SiO_2 cement, mod-poor indurated, blotchy color appearance
115	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color appearance

Summary of Waterflood Test Results

Sample Number	Depth, Feet	Air Permeability, Millidarcys	Porosity, Per Cent	Initial Conditions: Water Saturation, Per Cent Pore Space	Initial Conditions: Oil Permeability, Millidarcys	Terminal Conditions: Oil Saturation, Per Cent Pore Space	Terminal Conditions: Water Permeability, Millidarcys	Oil Recovered, Per Cent Pore Space	Oil Recovered, Per Cent Oil in Place
				Colville D-45					
1	3183.2-83.7	0.35	11.7	14.6	0.065	39.2	0.028	46.2	54.0
11	3218.0-18.7	12	14.0	13.8	8.5	49.3	6.4	36.9	42.8
15	3223.0-23.4	7.3	13.2	11.6	4.8	52.4	4.1	36.0	40.8
18	3225.9-26.4	20	15.1	11.9	10.5	38.8	8.8	49.3	55.9
				Stopover K-44					
50A	2784.1-85.0	1.2	8.3	28.7	0.67	52.4	0.001	18.9	26.6
88	2813.2-13.5	130	12.8	12.6	117	48.6	27	38.8	44.4
98	2820.8-21.9	12	10.1	25.8	9.0	55.3	0.15	18.9	25.5
103	2825.6-26.2	118	14.7	18.1	100	42.0	7.5	39.9	48.7
115*	2834.3-34.9	1.7	10.8	22.2	8.7	49.0	0.29	28.8	37.0

* Insufficient data for relative permeability calculation.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File SCAL-75150

Water-Oil Relative Permeability Data

Sample Number 1

Air Permeability, Md. 0.35

Oil Permeability at Initial Water Saturation, Md. 0.065

Initial Water Saturation, Per Cent Pore Space 14.6

Porosity, Per Cent 11.7

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
14.6		.000	1.000
35.5	.070	.027	.388
43.2	.687	.103	.150
49.4	4.66	.205	.044
54.3	25.3	.304	.012
56.3	59.5	.345	.0058
58.6	216	.389	.0018
59.6	540	.405	.00075
60.8		.431	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 11
Air Permeability, Md. 12
Oil Permeability at
Initial Water Saturation, Md. 8.5

Initial Water Saturation,
Per Cent Pore Space 13.8
Porosity, Per Cent 14.0

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
13.8		.000	1.000
19.7	.098	.035	.355
23.4	.973	.178	.183
25.0	1.74	.240	.138
29.1	5.72	.389	.068
35.2	22.4	.538	.024
39.8	57.3	.617	.011
43.5	124	.661	.0053
45.5	188	.690	.0037
50.7		.746	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 15
Air Permeability, Md. 7.3
Oil Permeability at
Initial Water Saturation, Md. 4.8

Initial Water Saturation,
Per Cent Pore Space 11.6
Porosity, Per Cent 13.2

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
11.6		.000	1.000
16.6	.511	.225	.440
20.7	2.07	.420	.203
22.1	2.93	.468	.160
23.5	4.12	.515	.125
27.8	10.4	.617	.059
31.7	22.7	.680	.030
39.0	97.5	.780	.0080
41.3	162	.805	.0050
47.6		.850	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 18
Air Permeability, Md. 20
Oil Permeability at Initial Water Saturation, Md. 10.5

Initial Water Saturation, Per Cent Pore Space 11.9
Porosity, Per Cent 15.1

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
11.9		.000	1.000
24.2	.108	.038	.350
29.4	.723	.141	.195
32.0	1.43	.209	.146
36.3	4.00	.332	.083
42.5	15.0	.540	.036
44.9	23.0	.621	.027
47.3	36.5	.693	.019
50.0	58.4	.759	.013
53.1	87.9	.800	.0091
55.0	120	.825	.0069
61.2		.839	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 50A
Air Permeability, Md. 1.2
Oil Permeability at
Initial Water Saturation, Md. 0.67

Initial Water Saturation,
Per Cent Pore Space 28.7
Porosity, Per Cent 8.3

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
28.7		.000	1.000
30.4	.050	.0049	.098
32.5	1.00	.010	.010
34.5	4.33	.013	.0030
35.9	7.78	.014	.0018
38.4	17.2	.016	.00093
40.6	33.8	.017	.00051
43.0	59.8	.018	.00030
47.6		.019	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

Sample Number 88
Air Permeability, Md. 130
Oil Permeability at Initial Water Saturation, Md. 117
Initial Water Saturation, Per Cent Pore Space 12.6
Porosity, Per Cent 12.8

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
12.6		.000	1.000
19.1	.0080	.0049	.610
24.3	.068	.027	.399
28.5	.199	.055	.277
31.3	.369	.076	.206
35.5	.835	.106	.127
39.4	1.94	.132	.068
42.4	4.62	.157	.034
44.4	9.10	.173	.019
45.8	14.8	.183	.012
46.7	21.6	.190	.0088
48.5	53.9	.205	.0038
49.3	92.2	.211	.0023
51.4		.231	

* Relative to oil permeability.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File SCAL-75150

Water-Oil Relative Permeability Data

Sample Number 98

Air Permeability, Md. 12

Oil Permeability at
Initial Water Saturation, Md. 9.0

Initial Water Saturation,
Per Cent Pore Space 25.8

Porosity, Per Cent 10.1

Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
25.8		.000	1.000
30.3	.040	.0078	.195
33.7	.214	.012	.056
38.3	1.52	.014	.0092
41.1	4.41	.015	.0034
43.1	16.7	.015	.0009
44.3	533	.016	.00003
44.7		.016	

* Relative to oil permeability.

Water-Oil Relative Permeability Data

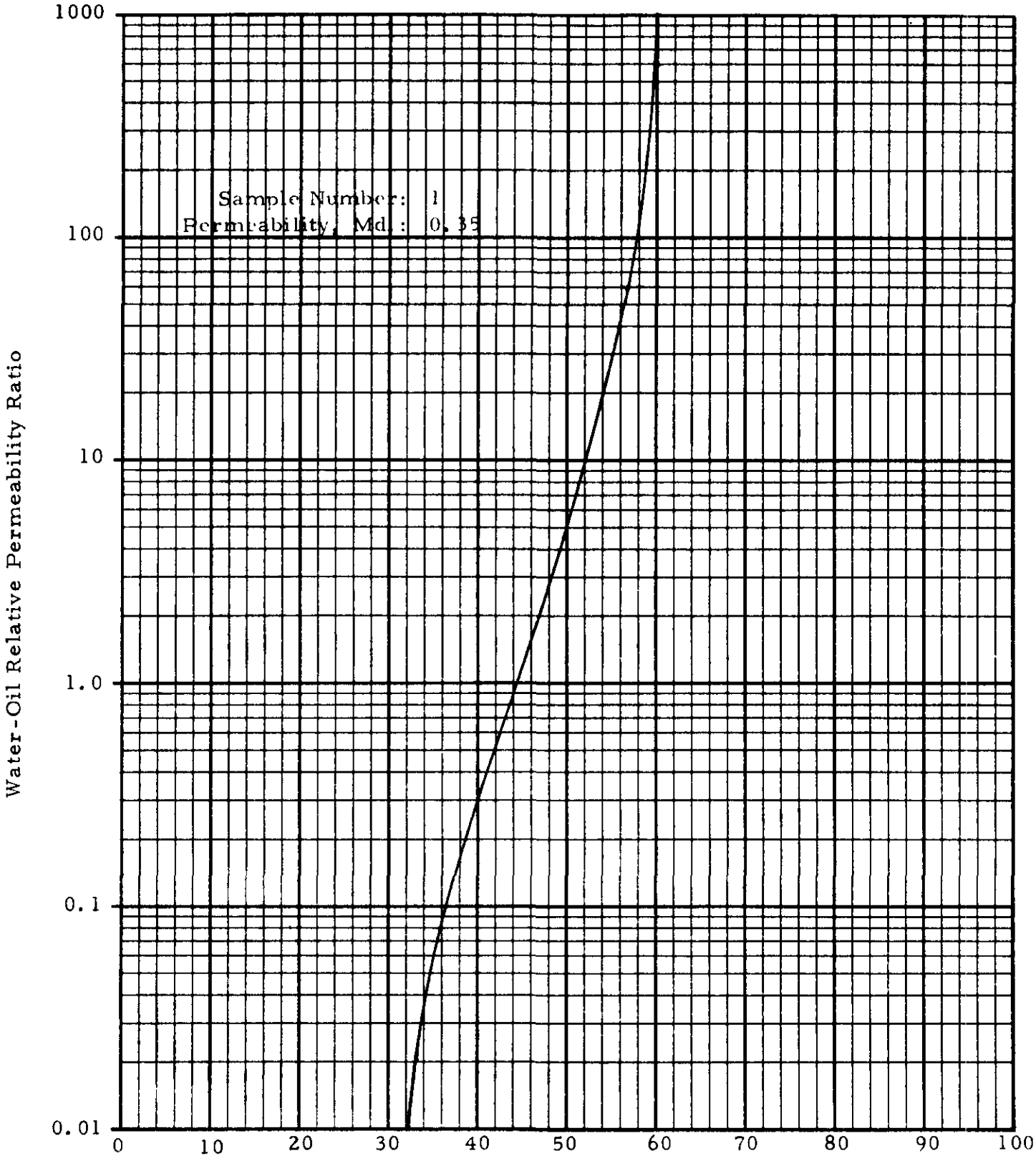
Sample Number 103
Air Permeability, Md. 118
Oil Permeability at Initial Water Saturation, Md. 100

Initial Water Saturation, Per Cent Pore Space 18.1
Porosity, Per Cent 14.7

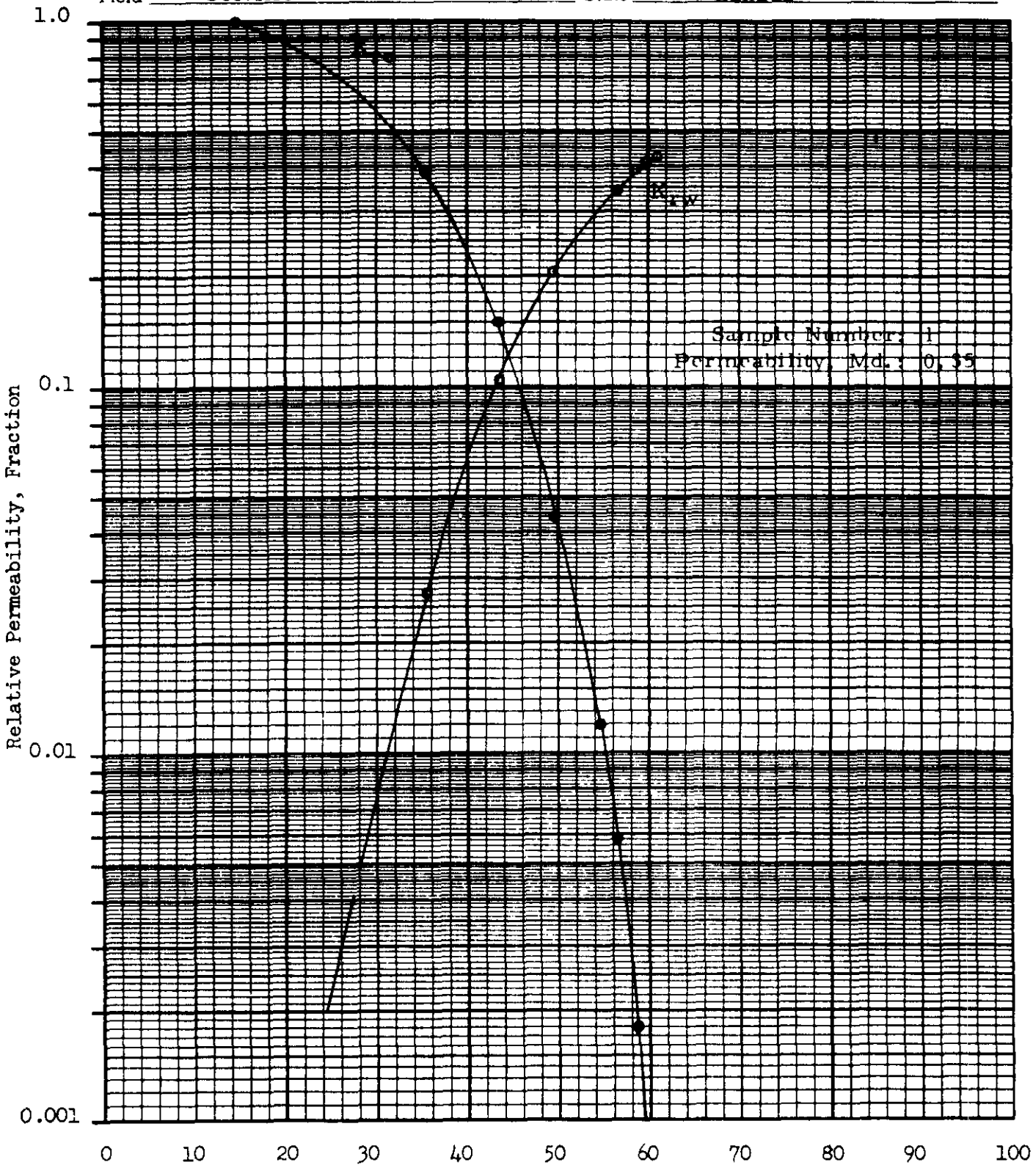
Water Saturation, Per Cent Pore Space	Water-Oil Relative Permeability Ratio	Relative Permeability To Water*, Fraction	Relative Permeability to Oil*, Fraction
18.1		.000	1.000
35.3	.0063	.0014	.221
41.2	.058	.0070	.121
47.3	.444	.024	.054
52.3	2.68	.045	.017
54.9	11.4	.057	.0050
55.9	35.8	.061	.0017
56.8	112	.067	.00060
57.3	260	.069	.00027
58.1		.075	

* Relative to oil permeability.

Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



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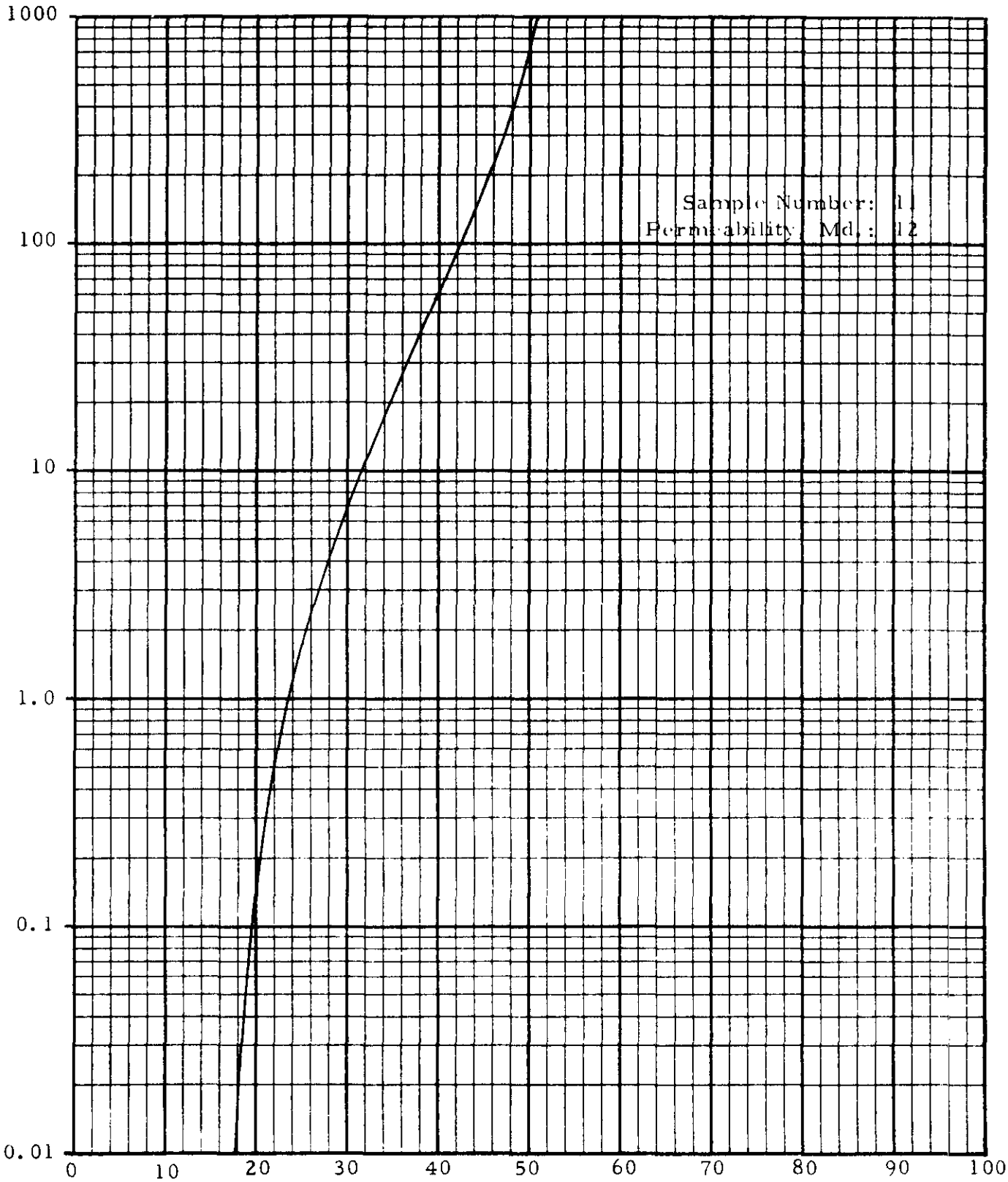
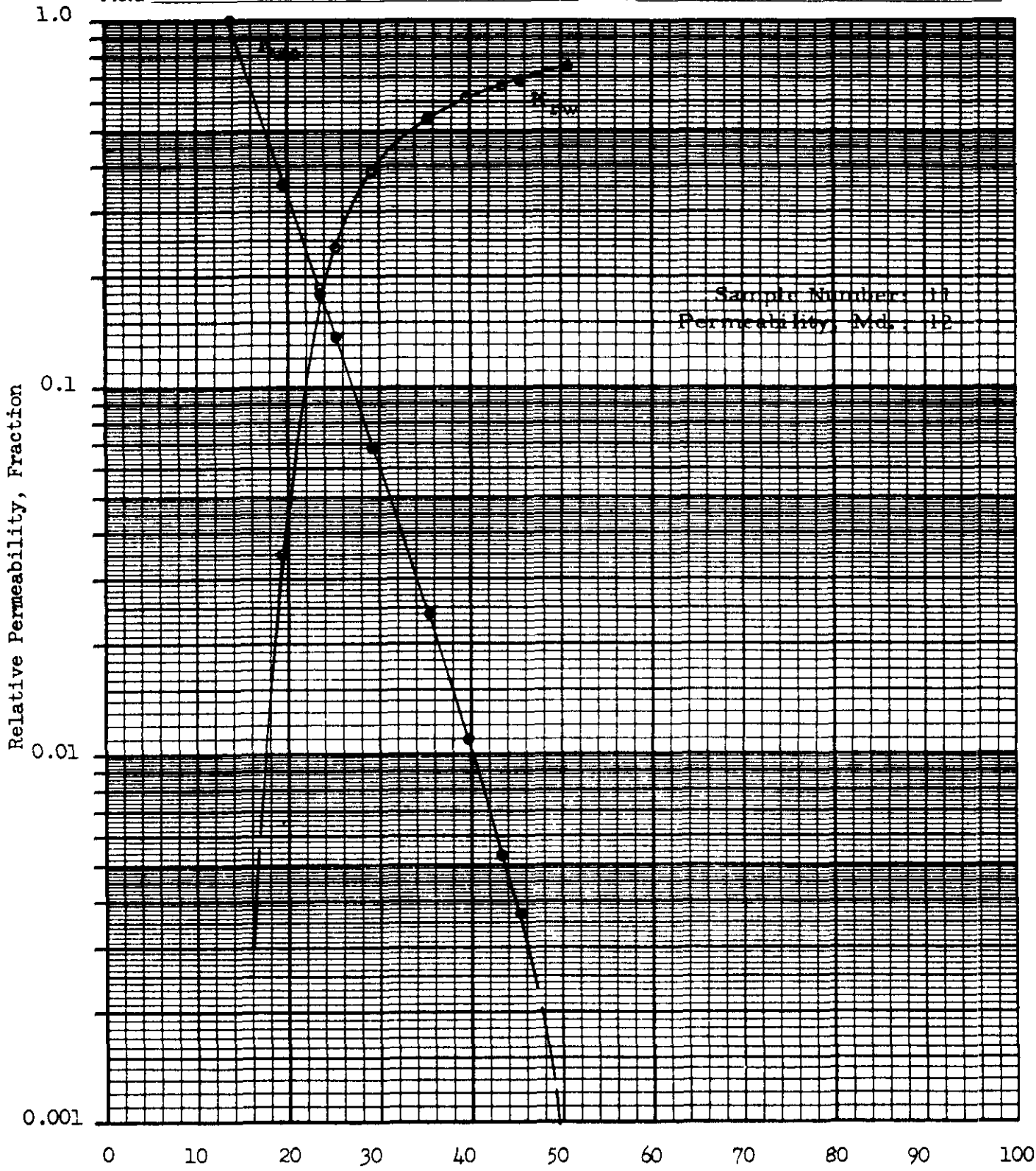
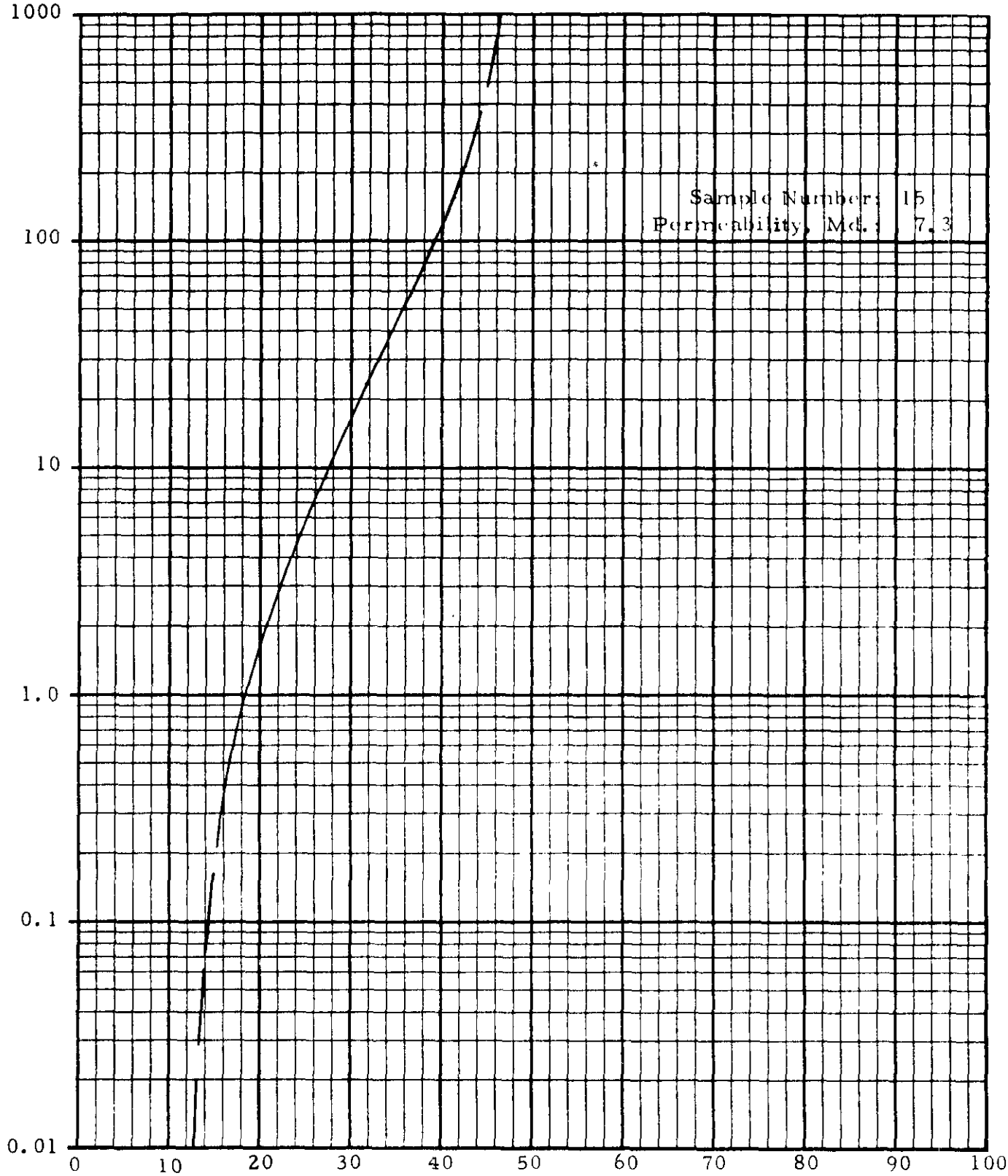
Field Colville State Canada



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



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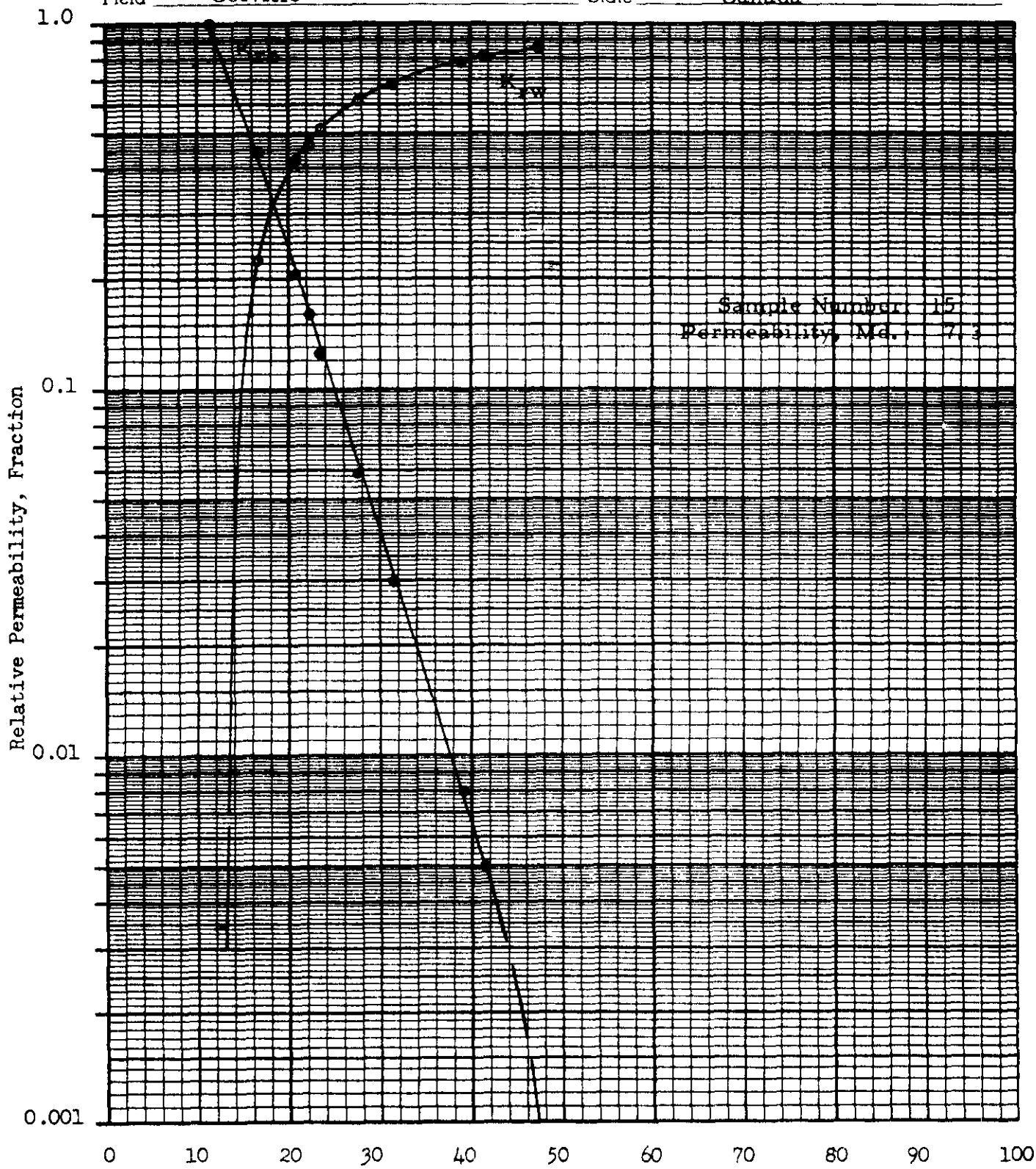
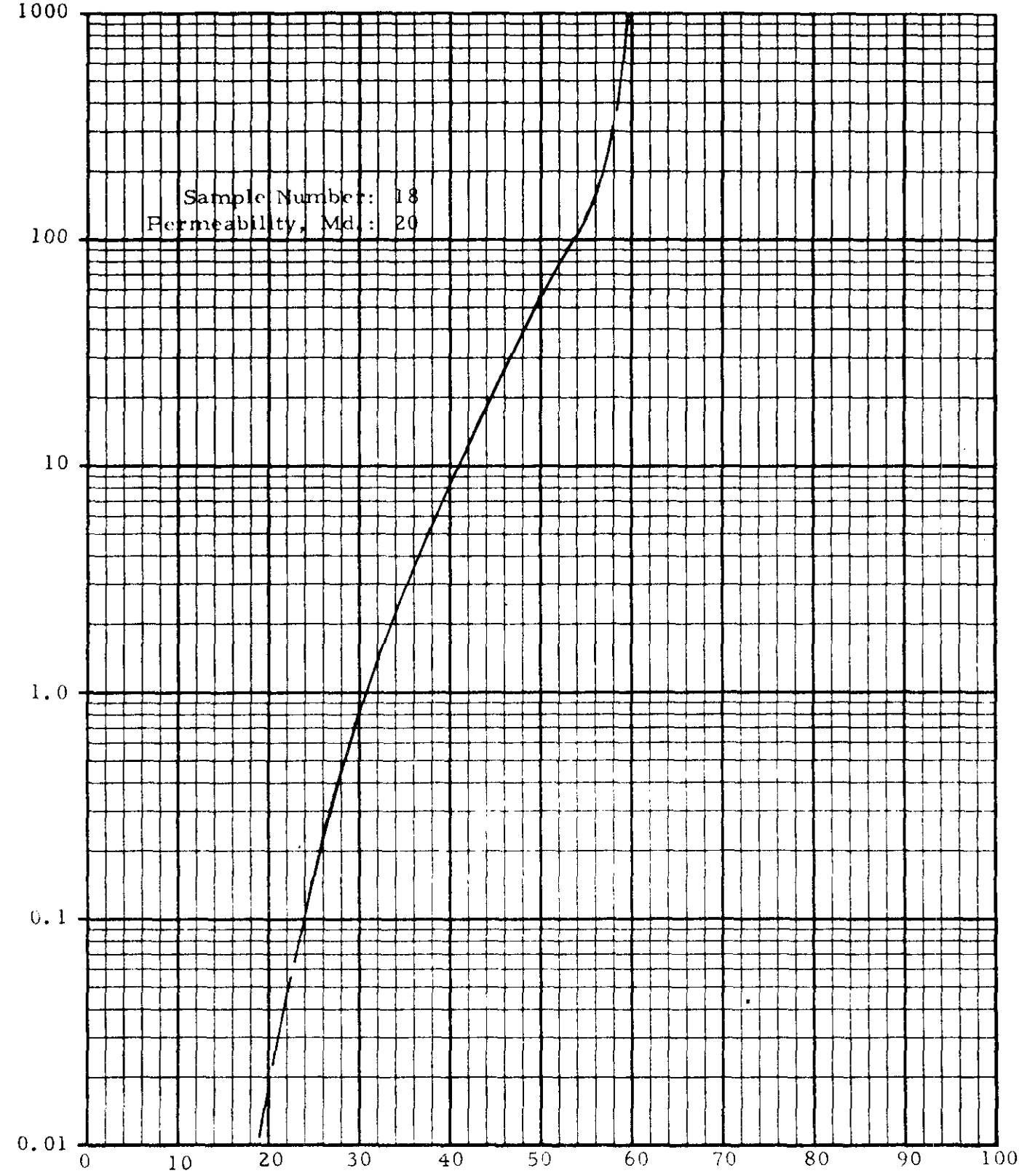
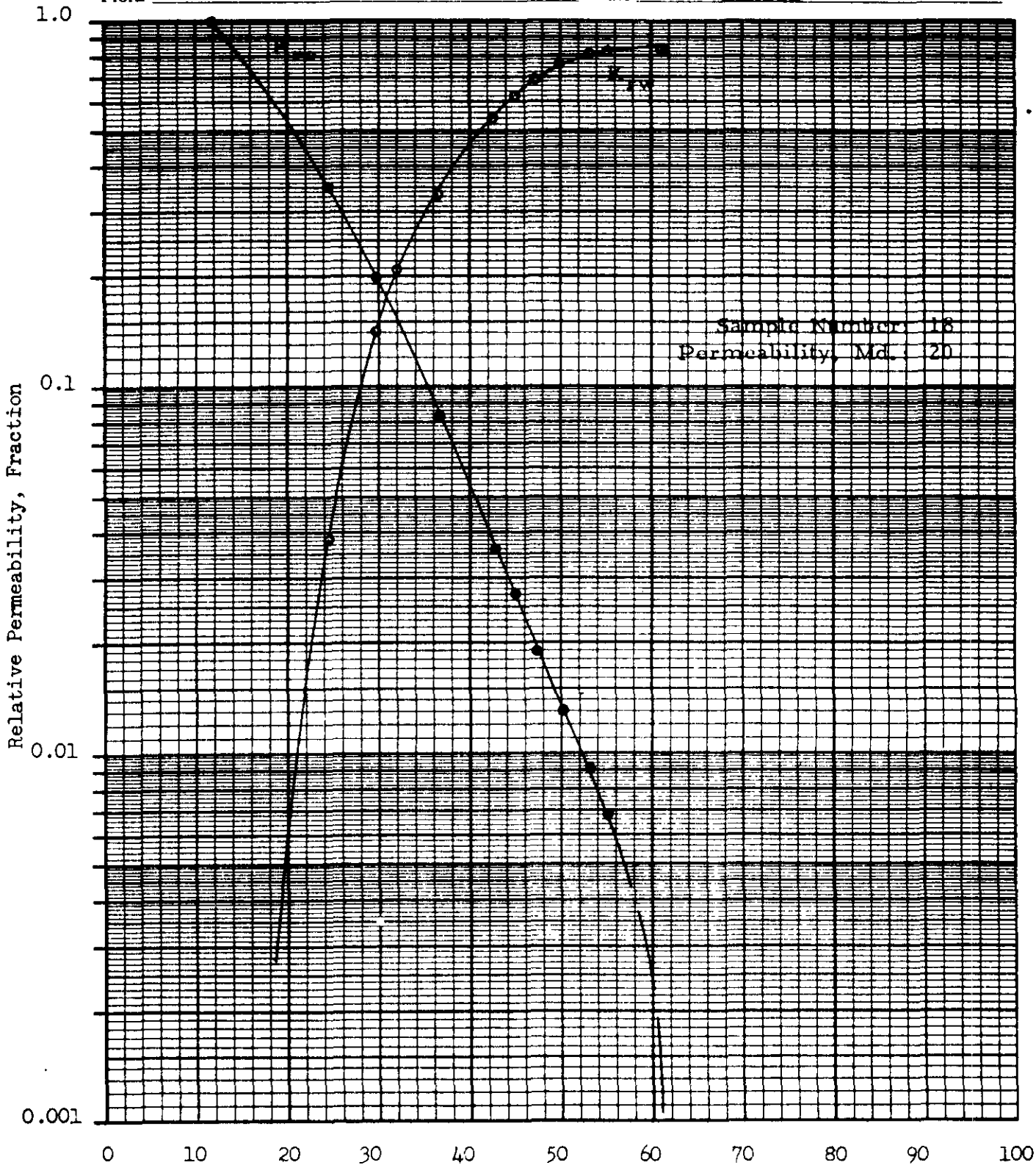
Field Colville State Canada



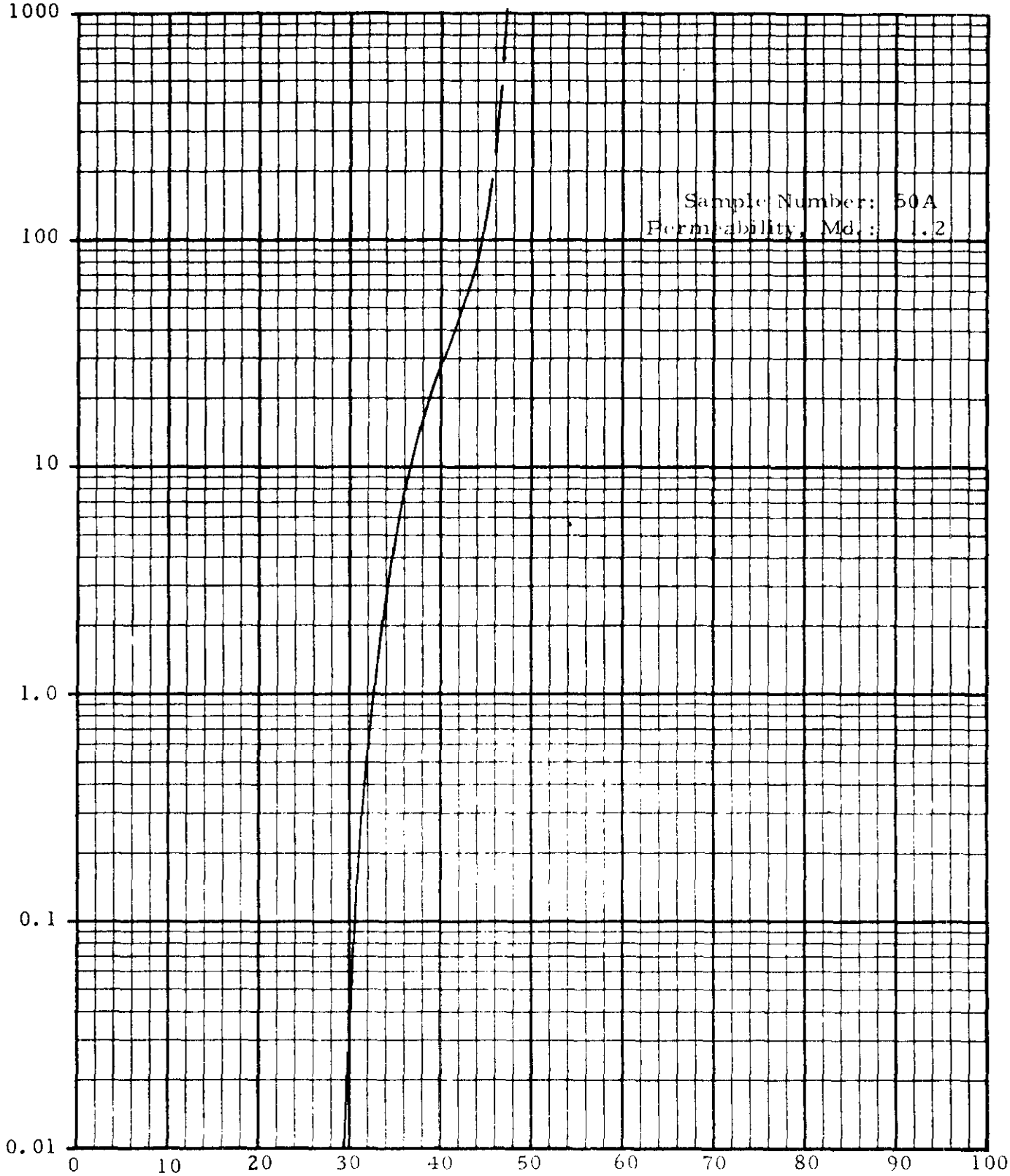
Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Mobile Colville D-45 County Northwest Territories
Field Colville State Canada



Company Union Oil Co. of Canada Ltd. Formation Old Fort Sand
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



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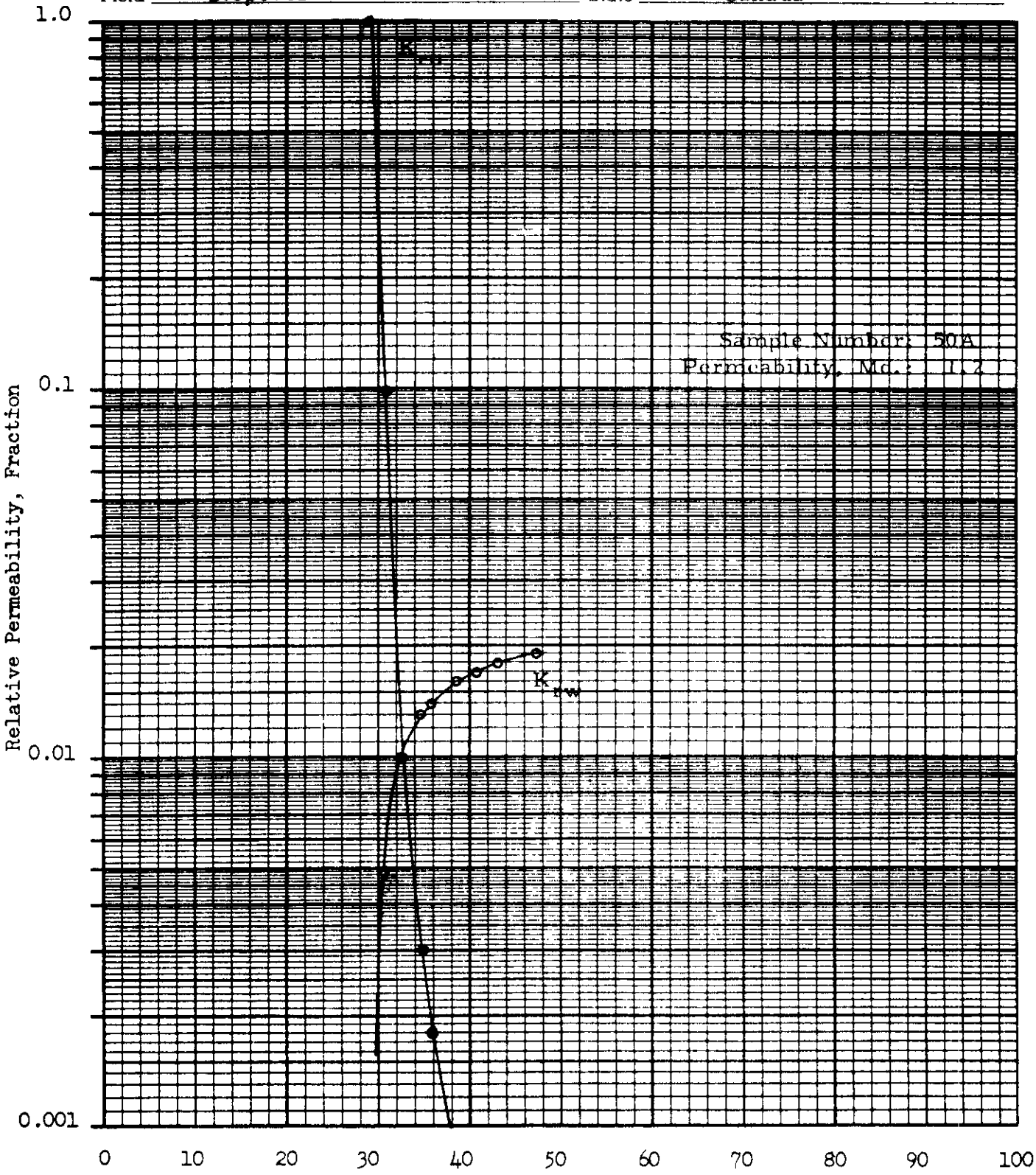
Field Stopover State Canada



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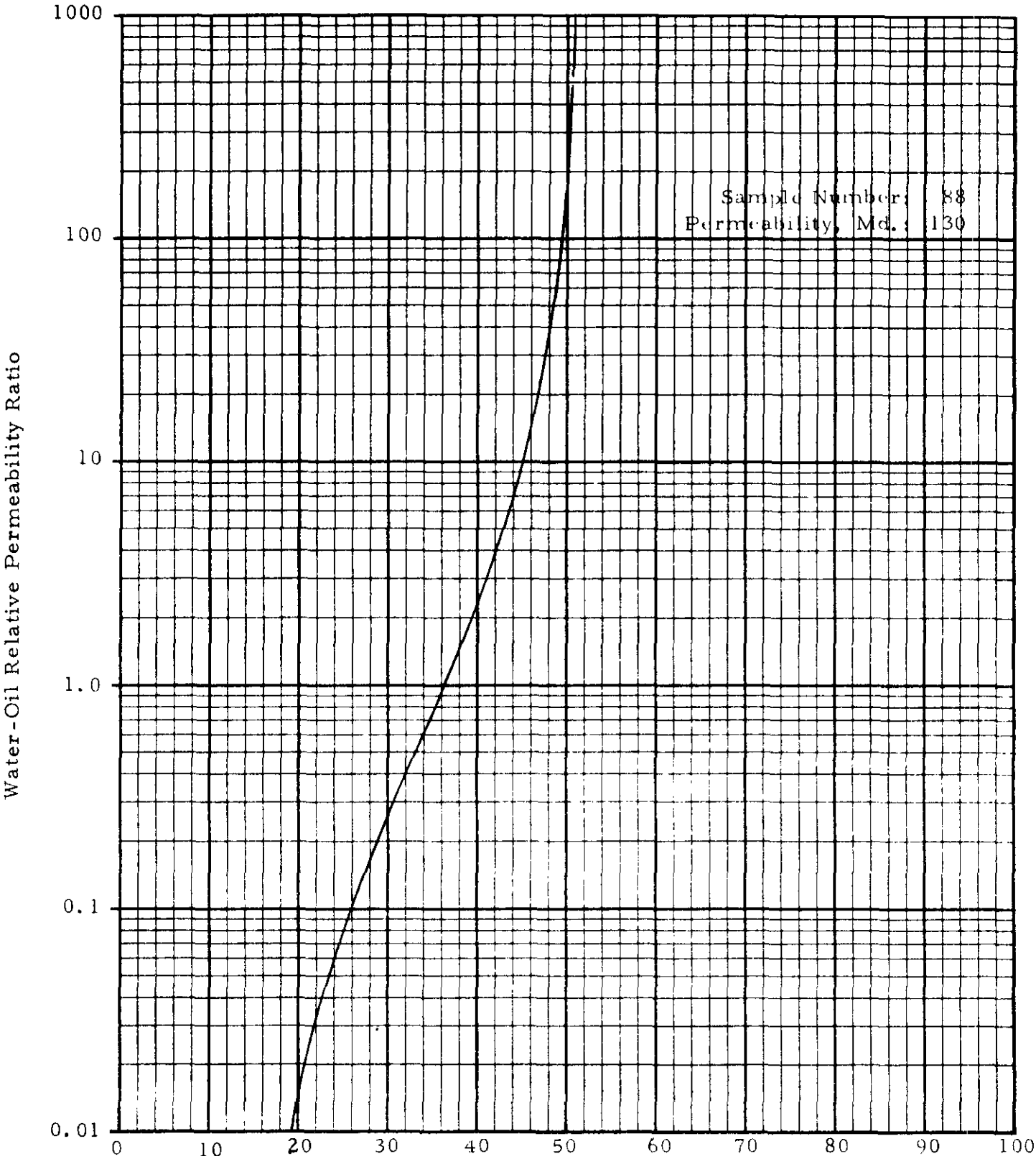
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



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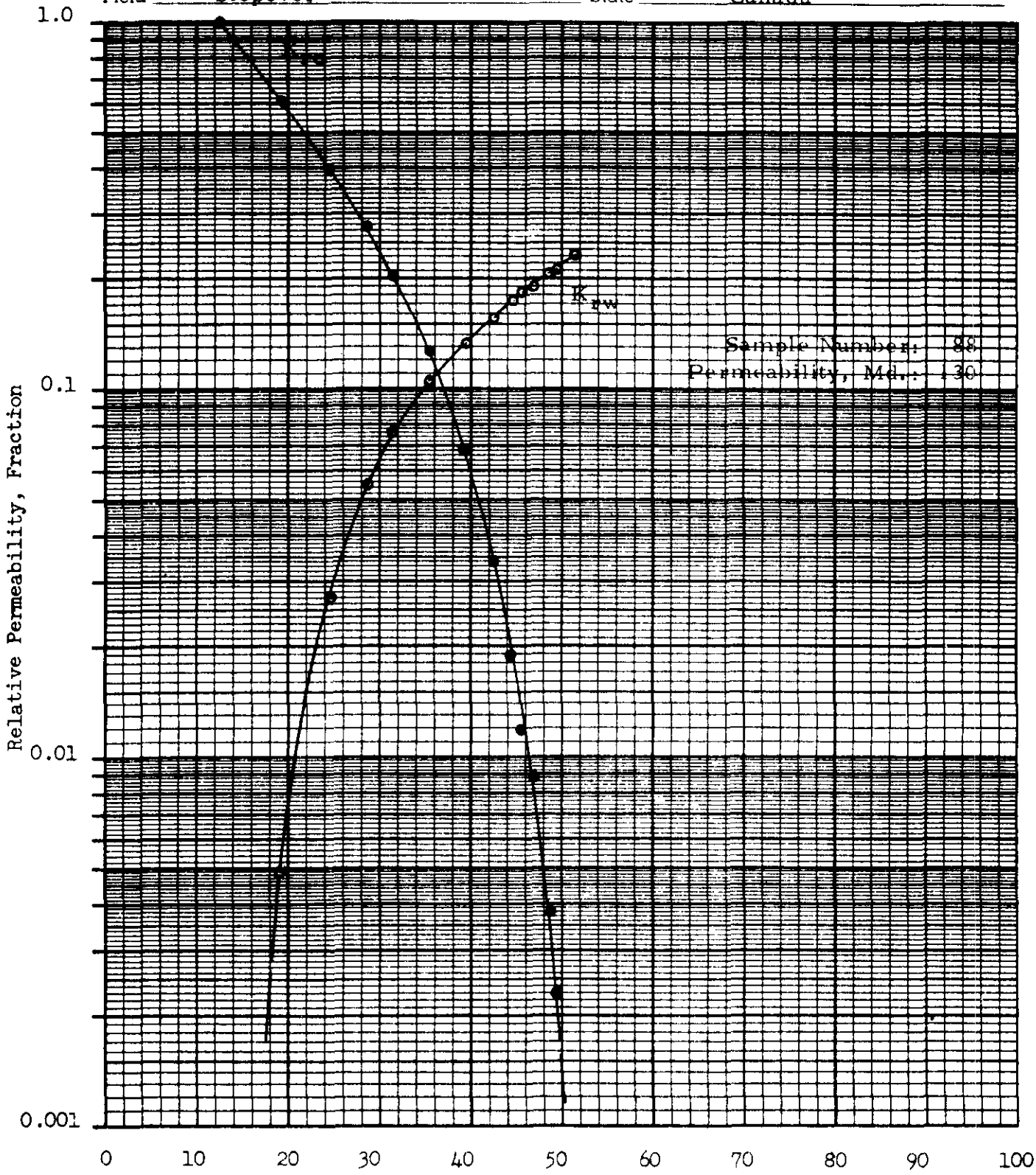
Well Union Oil Stopover K-44 County Northwest Territories
Field Stopover State Canada



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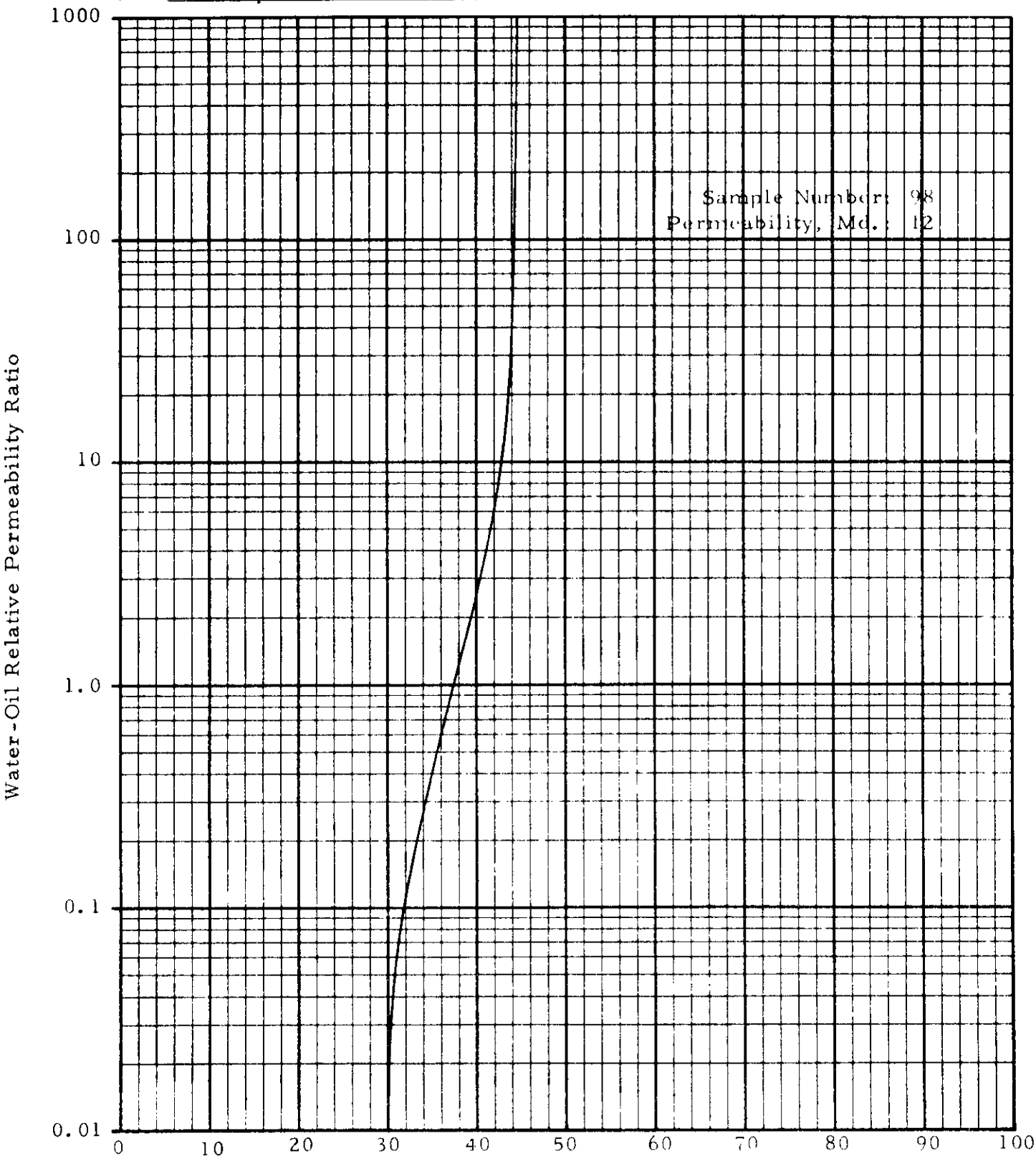
Field Stopover State Canada



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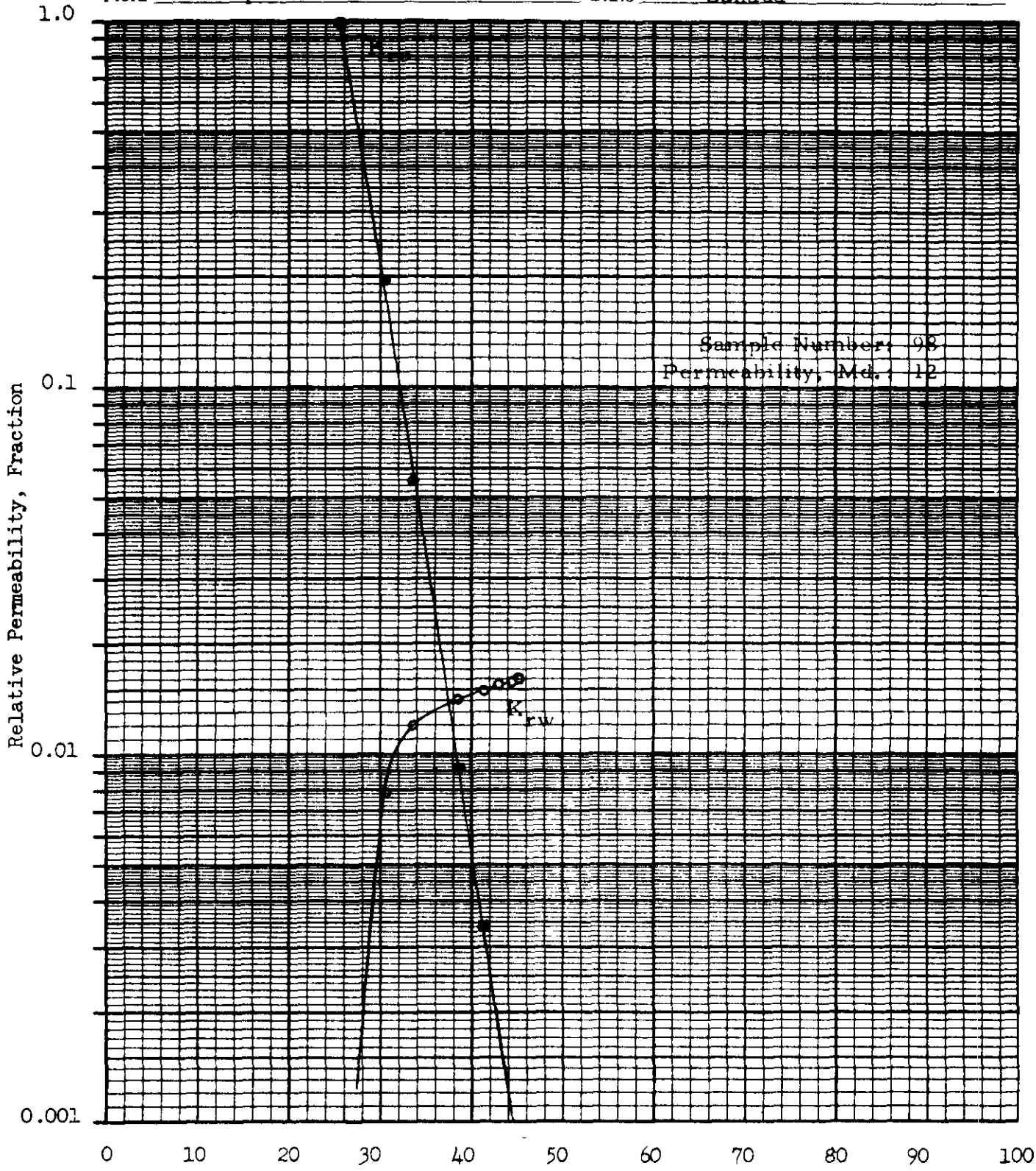
Field Stopover State Canada



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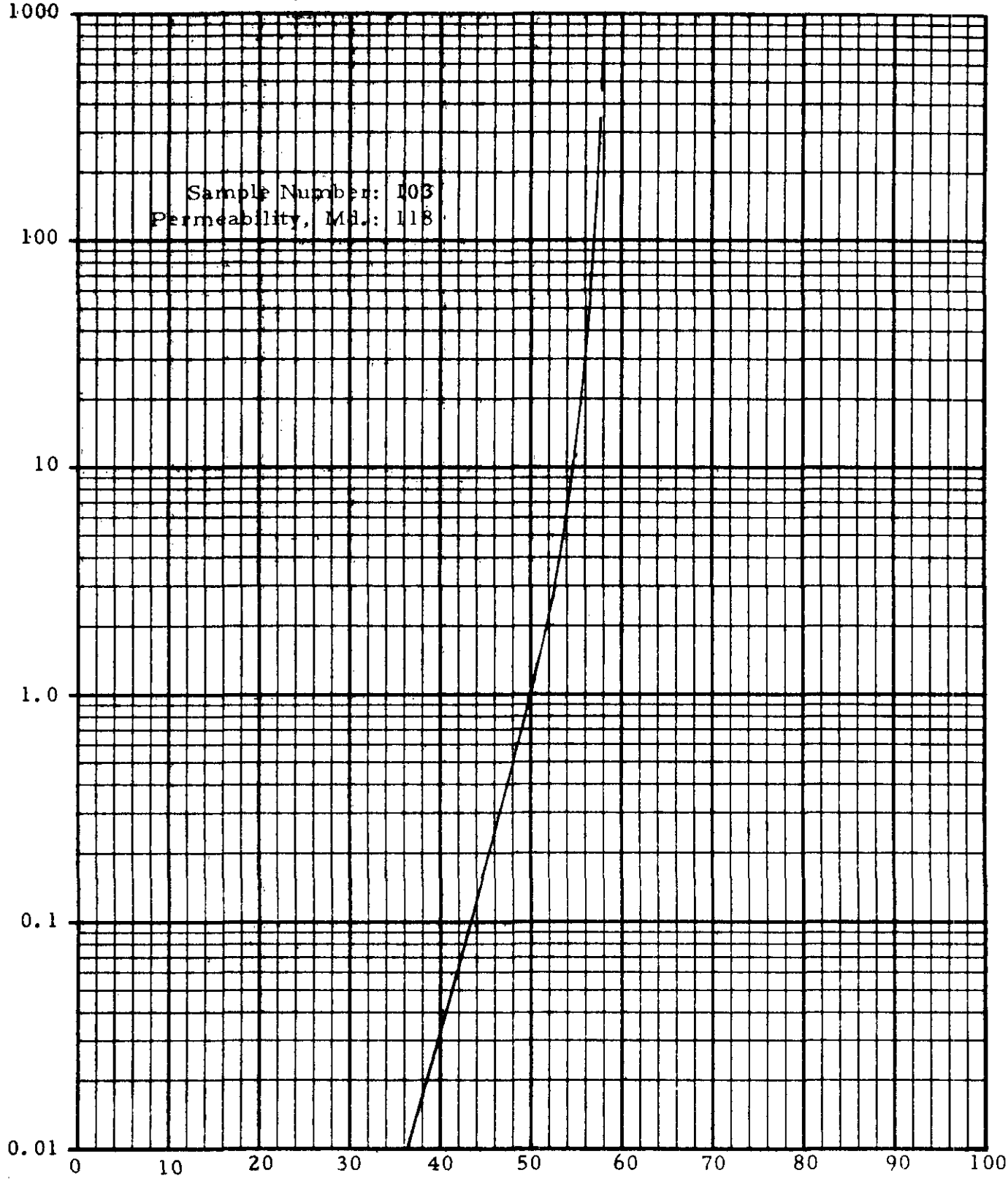

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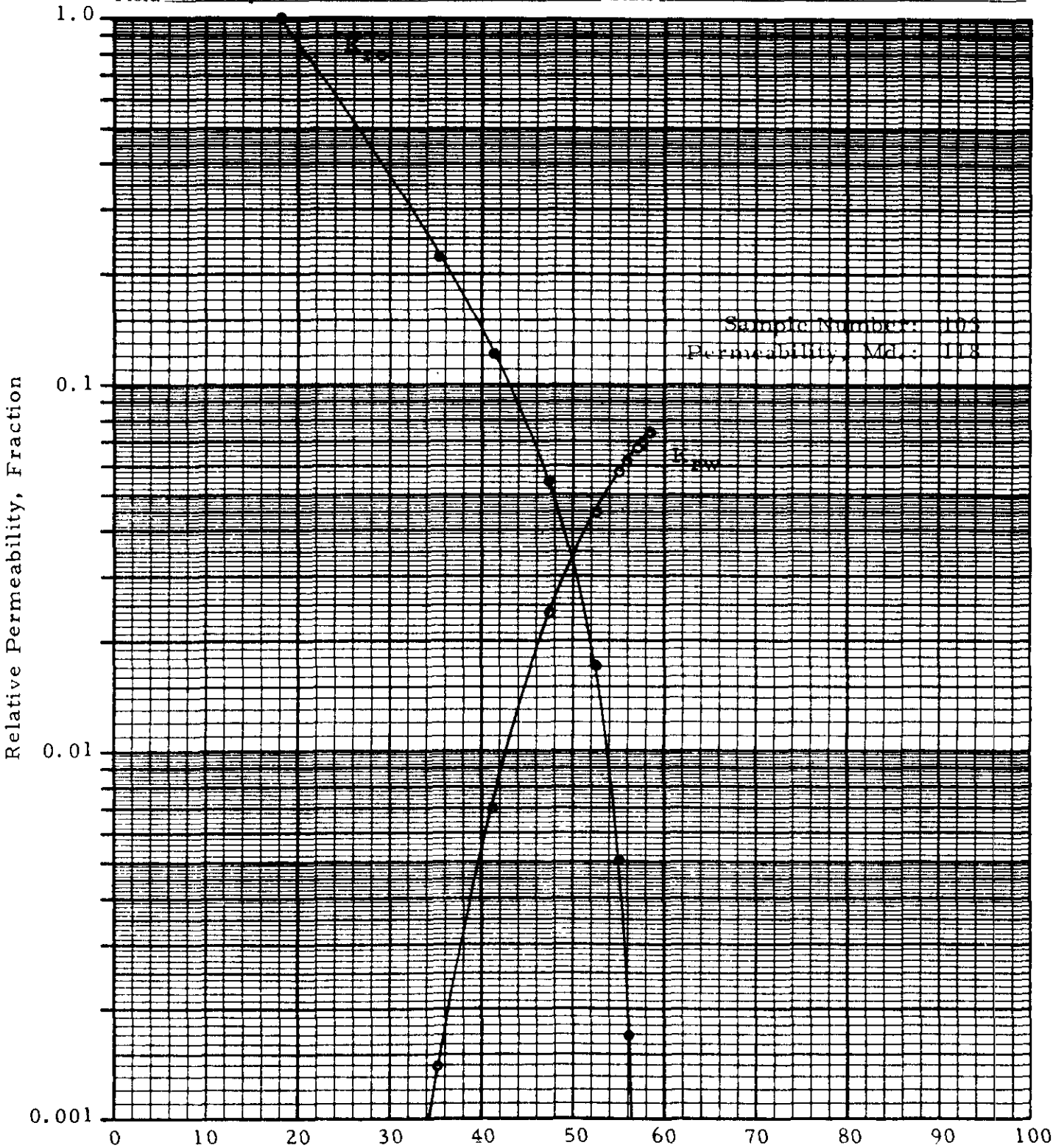
Field Stopover State Canada



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Special Core Analysis Study

for

UNION OIL COMPANY OF CANADA LIMITED

Stopover No. K-44 and
Colville D-45 Wells
Canada

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

February 24, 1978

Union Oil Company of Canada Limited
P.O. Box 999
Calgary, Alberta 2TP 2K6
Canada

Attention: Mr. Lorne D. McCluskey

Subject: Special Core Analysis Study
Stopover No. K-44 and
Colville D-45 Wells
Northwest Territories
Canada
File Number: SCAL-75150A

Gentlemen:

On May 18, 1976, a Special Core Analysis Study identified as SCAL-75150 was submitted in final form. In subsequent communications and conversations between representatives of Union Oil Company of Canada Limited and Core Laboratories, Inc., it was noted that there was a difference in the results of the multi-point mercury injection tests as compared to the porous-plate capillary pressure tests. It was decided that Core Laboratories, Inc., would attempt to resolve these differences by performing additional tests. Presented in this report are the results of the following: (1) Porous-Plate Capillary Pressure Tests with a final high-speed centrifugal point performed in an air-brine system, and (2) Multi-Point Mercury Injection Tests on sandstone core plugs from the subject wells. There will be no charges incurred by Union Oil Company of Canada Limited for this study. The core plugs used in this study are identified as to well, sample number, and depth interval on Page 1, and are lithologically described on Page 2.

The nine core plugs used in this study were previously prepared for use in the study identified as SCAL-75150. Each core plug was extracted of hydrocarbons with alternate injections of toluene and acetone, leached of salt with methyl alcohol, and then dried. Air permeabilities and Boyle's law porosities were determined on each cleaned and dried core plug.

Three core plugs (Numbers 65A, 88A, and 115A) from the Stopover K-44 Well, and two core plugs (Numbers 16 and 17) from the Colville D-45 Well were evacuated and saturated with the appropriate simulated formation water, synthesized from water analyses submitted for use in this study. With the exception of a final high-speed centrifuge point, a porous-plate cell and an air-brine system were used in performing these 7-point capillary pressure tests. The results of these data are presented by well in tabular form on Page 3, and in graphical form on Pages 4 through 7.

The five core plugs used for the capillary pressure tests were leached of salt with methyl alcohol, and dried. Air permeabilities and Boyle's law porosities were again determined on the cleaned and dried core plugs. Multi-point mercury injection tests were performed on six core plugs from the Stopover K-44 Well and three core plugs from the Colville D-45 Well using injection pressures ranging from 3 psia to 2000 psia. The results of these multi-point mercury injection test data are presented by well in tabular form on Pages 8 and 9, and in graphical form on Pages 10 through 18.

The air-brine capillary pressure data were converted to an air-mercury system by multiplying the air-brine capillary pressure by 5.11. A comparison was then made to the average mercury injection plot. These comparisons are valid only when comparing tests performed on the same core plug. The multi-point mercury injection data and the converted air-brine data for the three core plugs (Numbers 65A, 88A, and 115A) from the Stopover K-44 Well correlate extremely well. The two core plugs (Numbers 16 and 17) from the Colville D-45 Well exhibit differences in capillary pressure-saturation relationships that correlate generally at the low pressures (approximately 50 psi air-mercury) but deviate considerably beyond this point.

In the study which was submitted on May 18, 1976, and identified by our file number SCAL-75150, air-brine capillary pressure tests and multi-point mercury injection tests were performed on two core plugs (Numbers 11 and 18) from the Colville D-45 Well. The capillary pressure-saturation relationships for these two core plugs correlate generally at the low pressures (approximately 50 psi air-mercury) and deviate considerably beyond this point. There is no readily apparent reason to explain why the air-mercury and air-brine data do not correlate for the Colville Well.

In summary, it is believed that either the air-brine capillary pressure data or the multi-point mercury injection data would be applicable for reservoir calculations for the Stopover K-44 Well. It is extremely difficult to access the air-brine capillary pressure and multi-point mercury injection data from the Colville D-45 Well, but based on all of the test results it appears that the multi-point mercury injection data from the Colville D-45 Well would be the most applicable for reservoir calculations.

It has been a pleasure working for you on this study. Should you have any questions pertaining to these test results, please do not hesitate to contact us.

Very truly yours,

Core Laboratories, Inc.

John W. White (BB)

John W. White
for Duane L. Archer, Manager
Special Core Analysis

JWW:fm
10 cc. - Addresee

Company Union Oil Company of Canada Limited
Number of Wells Two
Field As Noted

Formation Old Fort Sand
County Northwest Territories
State Canada

Identification of Samples

Sample Number	Company	Well	Depth, Feet
		Stopover Field	
50B	Union Oil Co. of Canada Ltd.	Union Oil Stopover K-44	2784.1 - 85.0
65A			2794.9 - 95.4
88A			2813.2 - 13.5
98B			2820.8 - 21.9
103B			2825.6 - 26.2
115A			2834.3 - 34.9
		Colville Field	
15	Union Oil Co. of Canada Ltd.	Union Mobile Colville D-45	3223.0 - 23.4
16			3223.0 - 23.4
17			3225.9 - 26.4

Lithological Description

Sample Number	Description
	Stopover K-44
50B	Ss, red-brn, cse-v/fn grn, apparent SiO_2 cement, well indurated, cse grn concentrations
65A	Ss, red-brn, med-fn grn, apparent SiO_2 cement, well indurated
88A	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, well indurated
98B	Ss, red-brn-buff white, med-fn grn, apparent SiO_2 cement, well indurated, blotchy color staining, grns uniform
103B	Ss, red-brn, cse-fn grn, apparent SiO_2 cement, mod-poor indurated, blotchy color appearance
115A	Ss, red-brn, fn grn, apparent SiO_2 cement, well indurated, blotchy color appearance
	Colville D-45
15	Ss, lt gry-white, fn-v/fn grn, apparent SiO_2 cement, mod-poor indurated, med grn laminae, tr mosc
16	Ss, lt gry-white, fn-med grn, apparent SiO_2 cement, well indurated
17	Ss, lt gry, v/fn-fn grn, apparent SiO_2 cement, well indurated

Air-Brine Capillary Pressure Data

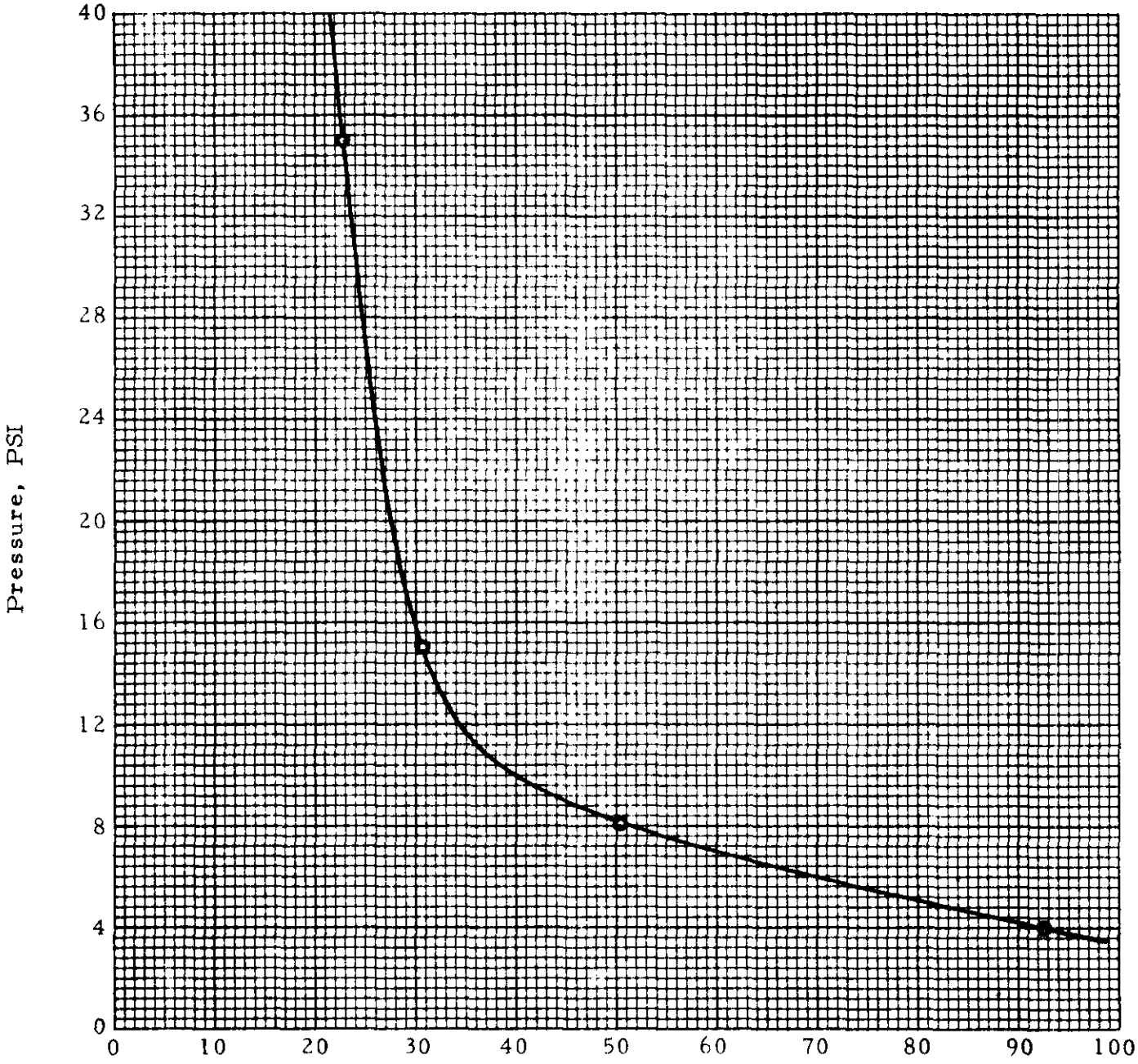
Pressure, PSI:	1	2	4	8	15	35	300*

Sample Number	Permeability, Millidarcys	Porosity, Per Cent	Brine Saturation, Per Cent Pore Space						
					Stopover K-44				
65A	22	10.8	100.0	100.0	92.6	50.3	30.7	22.7	12.9
88A	172	13.0	80.9	50.0	27.9	20.6	15.2	11.8	5.9
115A	20	11.1	100.0	100.0	86.0	53.6	36.3	28.5	18.4
					Colville D-45				
16	5.1	11.7	100.0	100.0	98.4	68.3	43.9	26.0	14.6
17	7.2	16.8	100.0	100.0	100.0	78.1	39.9	21.8	13.7

*Equivalent Pressure from Centrifuge (Air-Brine System)

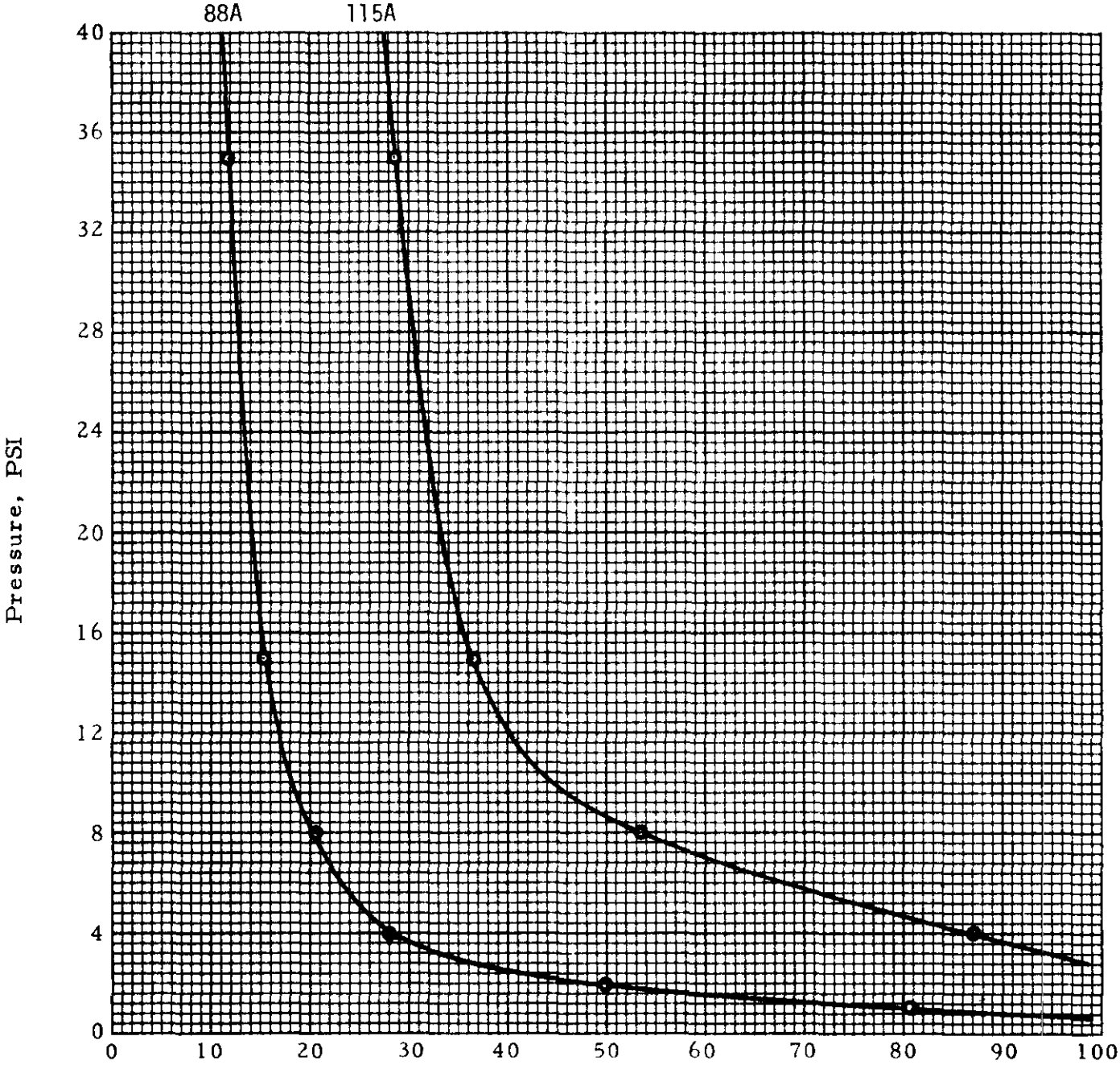
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 County Northwest Territories
Field Stopover State Canada

Sample Number: 65A
Permeability, Md.: 22



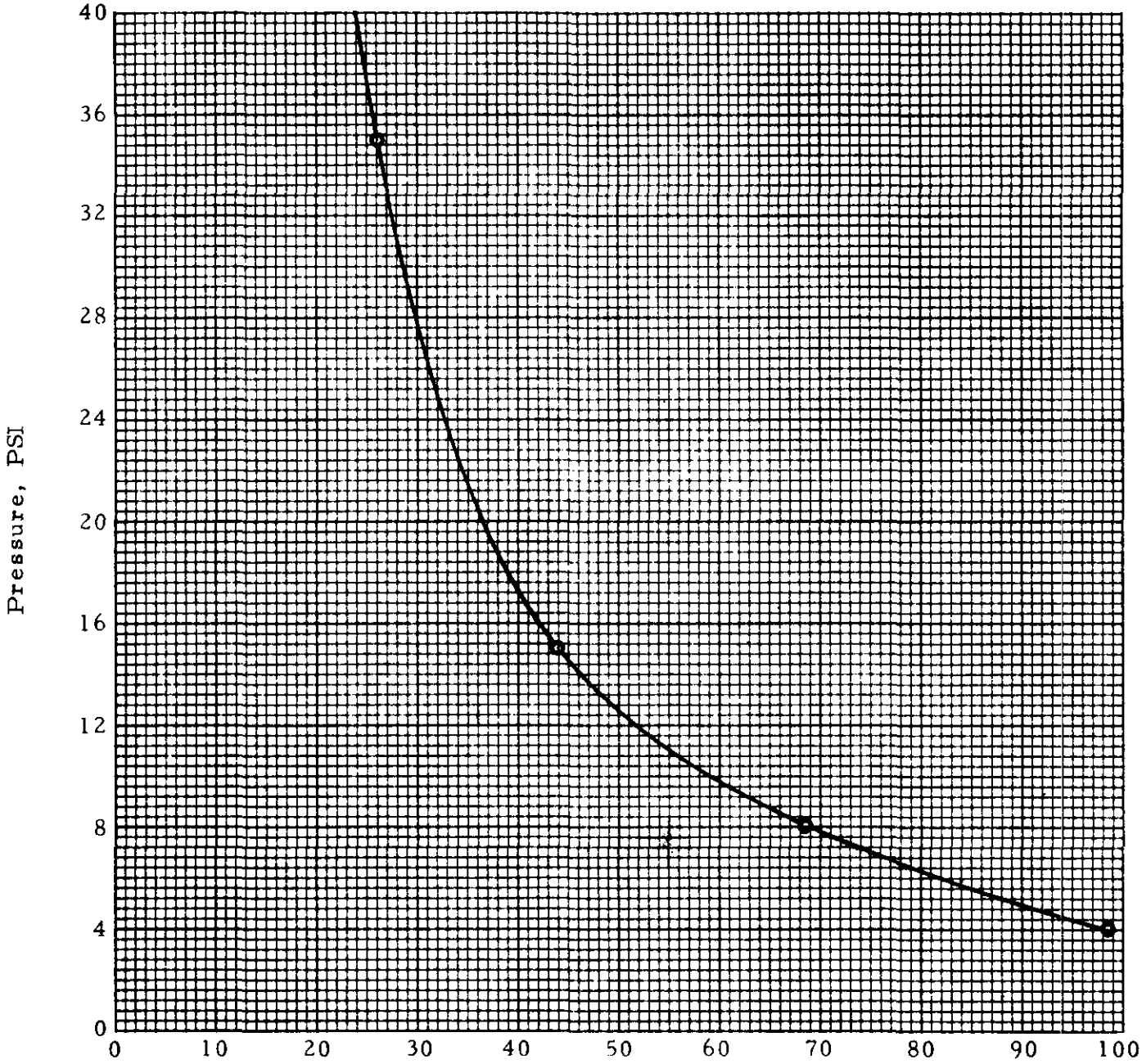
Company Union Oil Company of Canada — Formation Old Fort Sand
Well Stopover K-44 — County Northwest Territories
Field Stopover — State Canada

Sample Number: 88A 115A
Permeability, Md.: 172 20



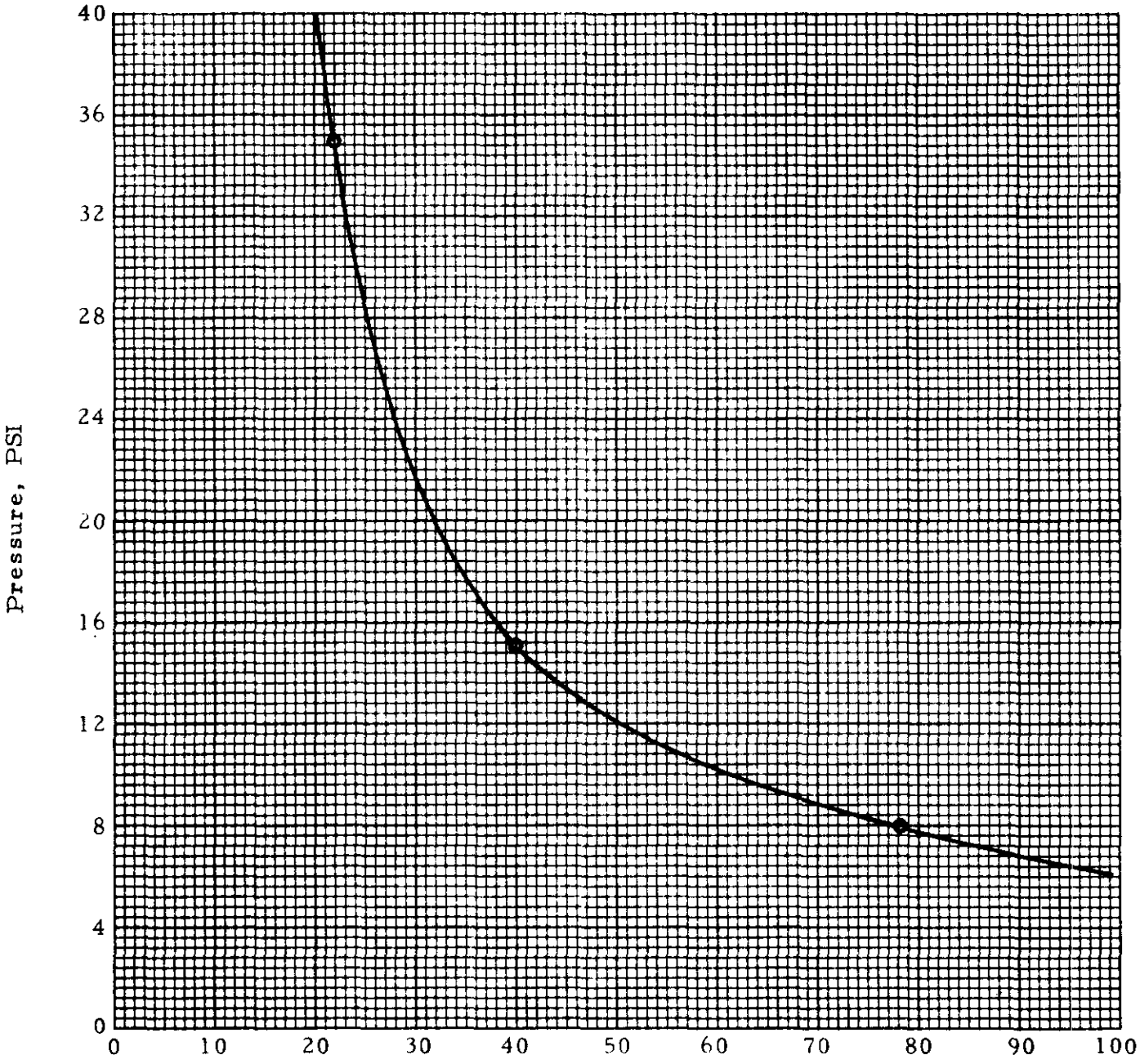
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 16
Permeability, Md.: 5.1



Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 17
Permeability, Md.: 7.2



Mercury Injection Capillary Pressure Data

Stopover K-44

Sample Number:	50B	65A	88A	98B	103B	115B
Permeability, Md.:	0.86	28	218	122	9.9	22
Porosity, Per Cent:	8.3	11.0	13.0	14.8	10.4	13.0

Injection Pressure, PSIA	Wetting Phase Saturation, Per Cent Pore Space					
3	100.0	100.0	100.0	100.0	100.0	100.0
6	100.0	100.0	85.0	100.0	100.0	100.0
9	100.0	100.0	55.7	94.6	100.0	100.0
12	100.0	100.0	42.5	75.1	100.0	93.3
15	100.0	100.0	37.2	60.8	98.0	85.0
18	100.0	94.3	32.2	52.0	93.3	77.7
21	100.0	80.4	27.5	46.0	89.1	71.2
24	100.0	72.7	25.7	42.7	85.1	64.8
27	100.0	61.9	23.7	38.4	81.3	60.1
30	100.0	55.7	23.7	37.3	77.8	56.0
40	98.6	40.9	19.7	32.3	67.8	45.9
60	95.4	31.2	16.2	28.6	50.4	37.8
80	92.3	27.8	15.2	27.0	43.2	34.2
100	88.7	25.6	13.7	25.3	39.6	33.2
200	75.2	22.2	10.7	23.3	30.6	29.5
300	66.2	21.0	10.2	22.4	25.4	27.5
500	52.4	18.7	9.2	21.0	21.0	24.4
750	41.8	16.8	7.7	19.2	18.2	22.3
1000	33.2	14.8	6.7	17.5	18.0	19.7
1250	27.6	14.5	5.7	16.8	16.4	18.1
1500	24.3	13.9	5.7	16.8	15.0	16.8
1750	21.9	13.4	5.7	16.7	14.9	16.6
2000	21.4	13.1	5.7	16.4	13.8	16.1

Mercury Injection Capillary Pressure Data

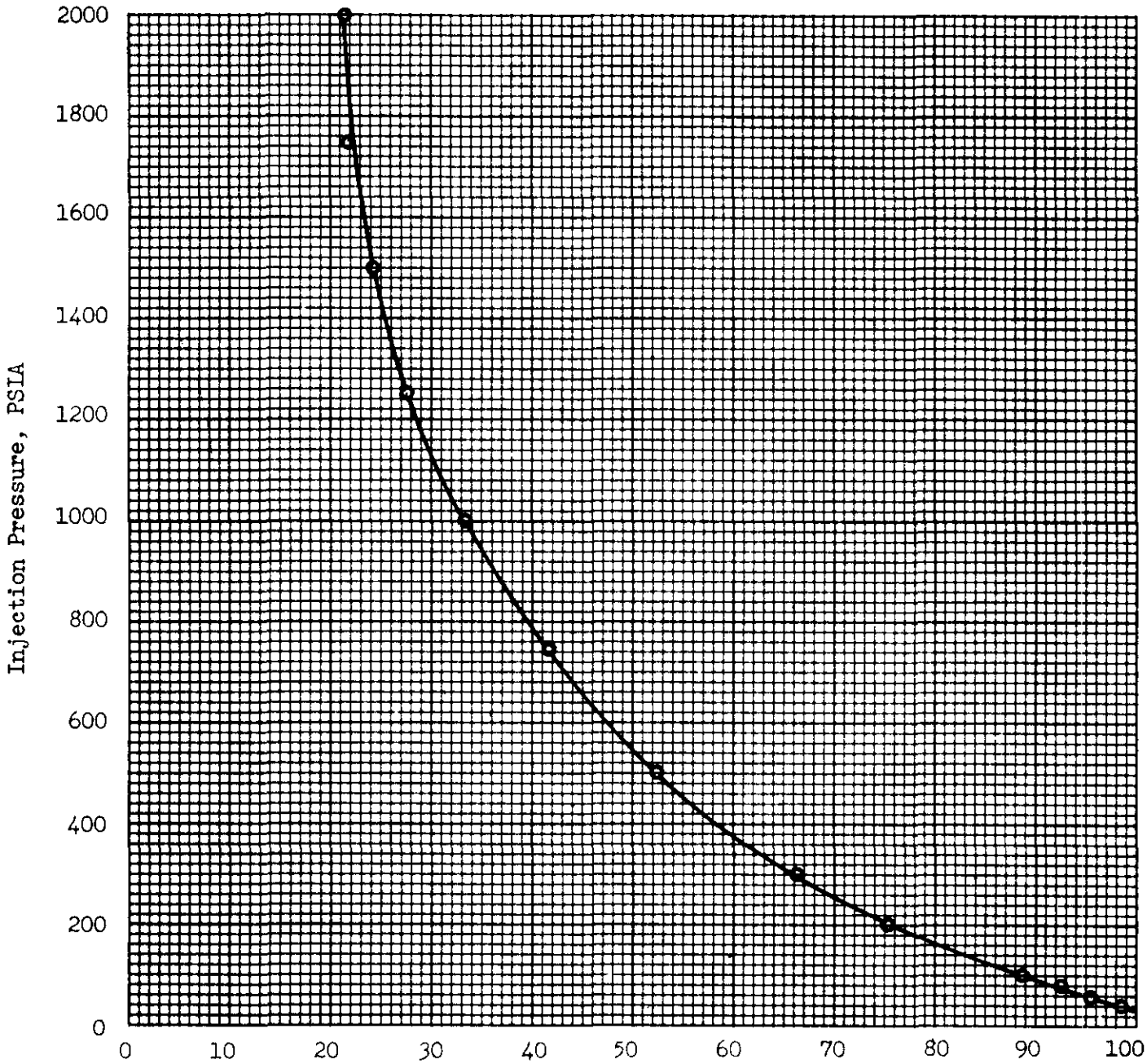
Colville D-45

Sample Number:	15	15	17
Permeability, Md.:	10	5.1	7.2
Porosity, Per Cent:	13.1	10.9	16.2

Injection Pressure, PSIA	Wetting Phase Saturation, Per Cent Pore Space		
3	100.0	100.0	100.0
6	100.0	100.0	100.0
9	100.0	100.0	100.0
12	100.0	100.0	100.0
15	100.0	100.0	100.0
18	100.0	100.0	100.0
21	100.0	100.0	100.0
24	99.1	100.0	100.0
27	90.6	100.0	100.0
30	86.7	96.7	100.0
40	77.4	84.0	91.3
60	65.4	61.5	60.7
80	57.3	50.8	49.7
100	47.8	48.4	43.2
200	35.1	35.2	28.4
300	27.6	27.9	22.4
500	20.8	21.3	16.4
750	17.1	17.2	12.6
1000	15.1	15.6	10.4
1250	13.7	13.9	8.7
1500	12.8	13.9	8.5
1750	11.6	13.9	7.1
2000	11.3	13.9	7.1

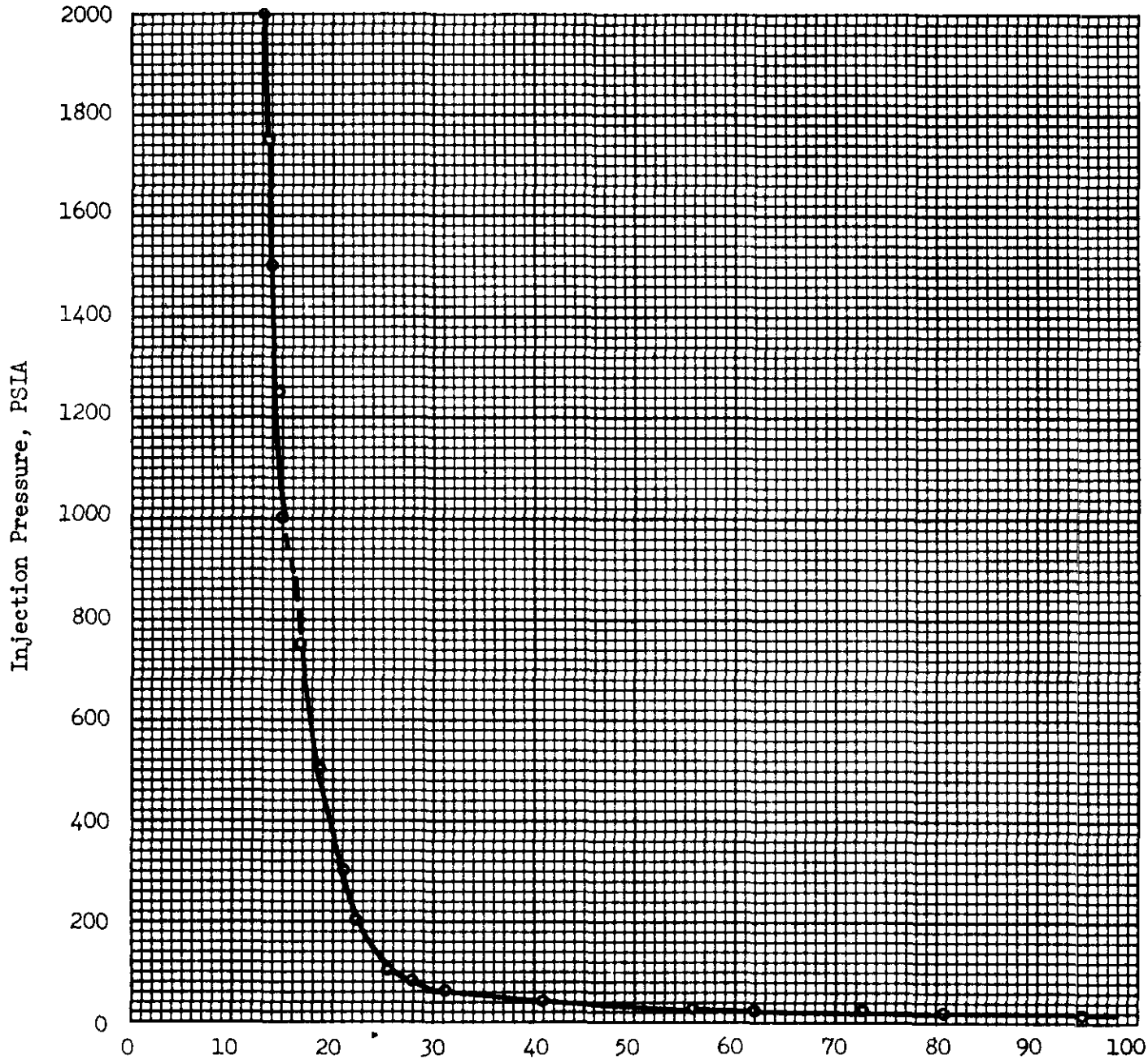
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 County Northwest Territories
Field Stopover State Canada

Sample Number: 50B
Permeability, Md.: 0.86



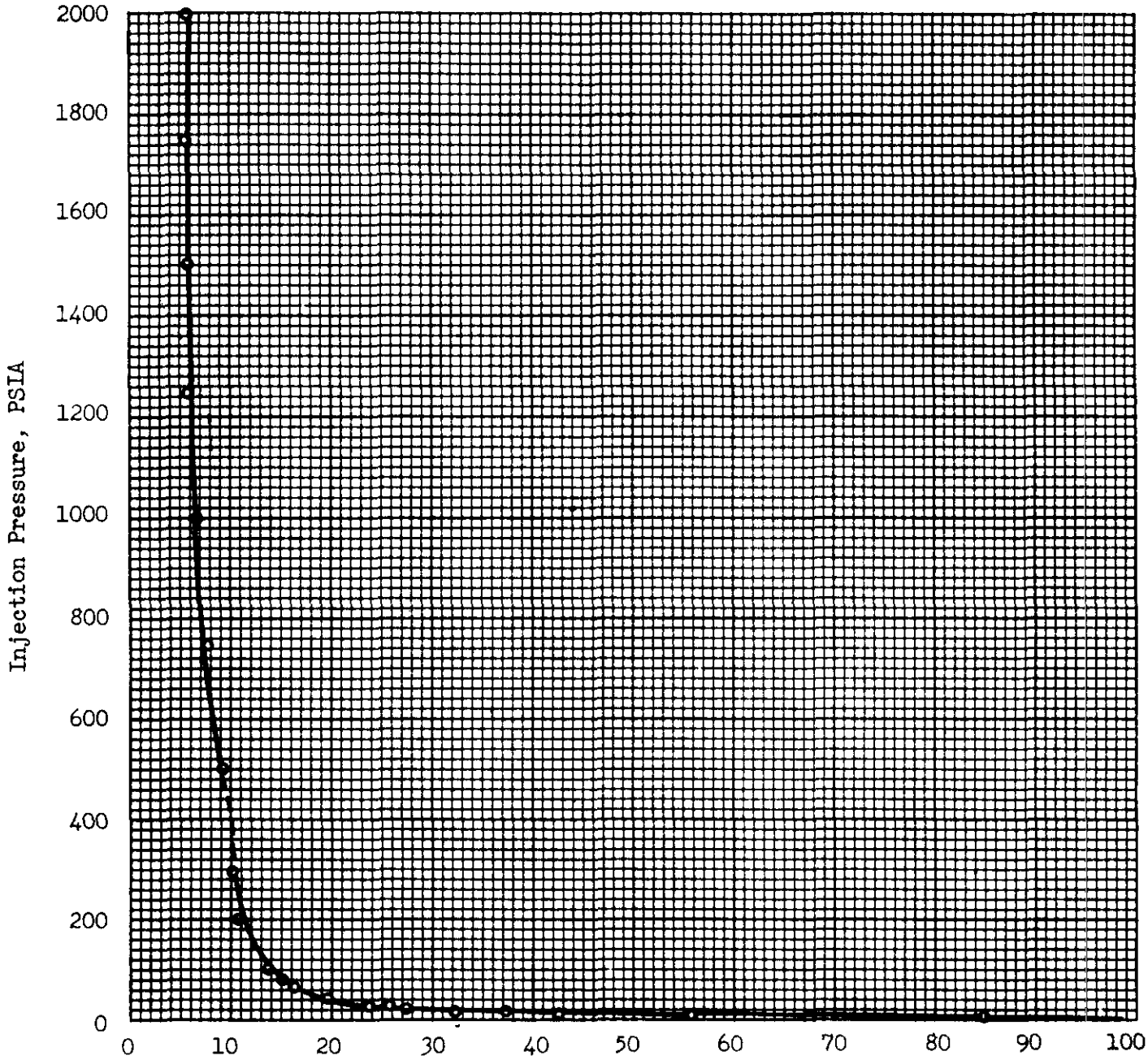
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 County Northwest Territories
Field Stopover State Canada

Sample Number: 65A
Permeability, Md.: 28



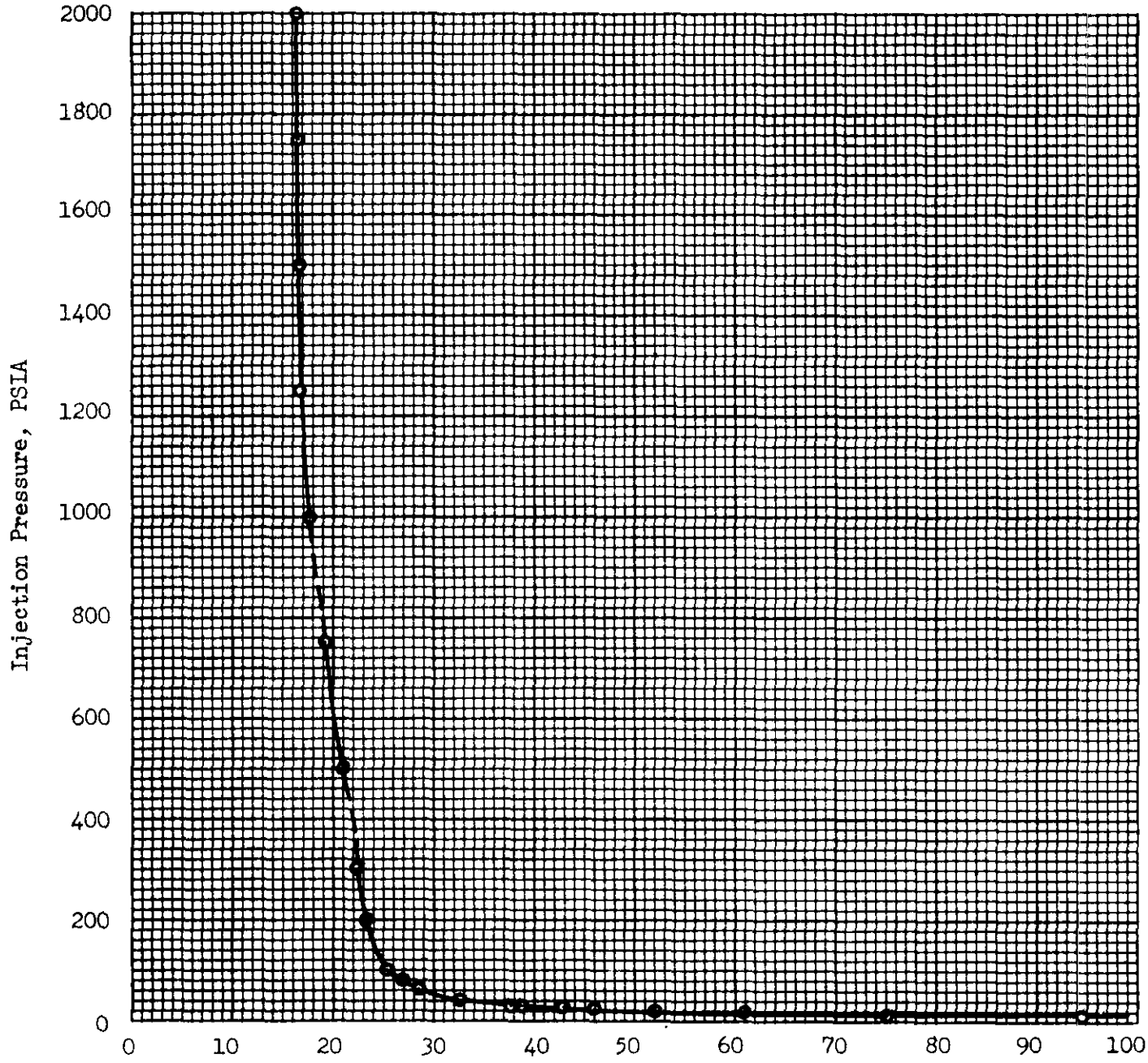
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 County Northwest Territories
Field Stopover State Canada

Sample Number: 88A
Permeability, Md.: 218



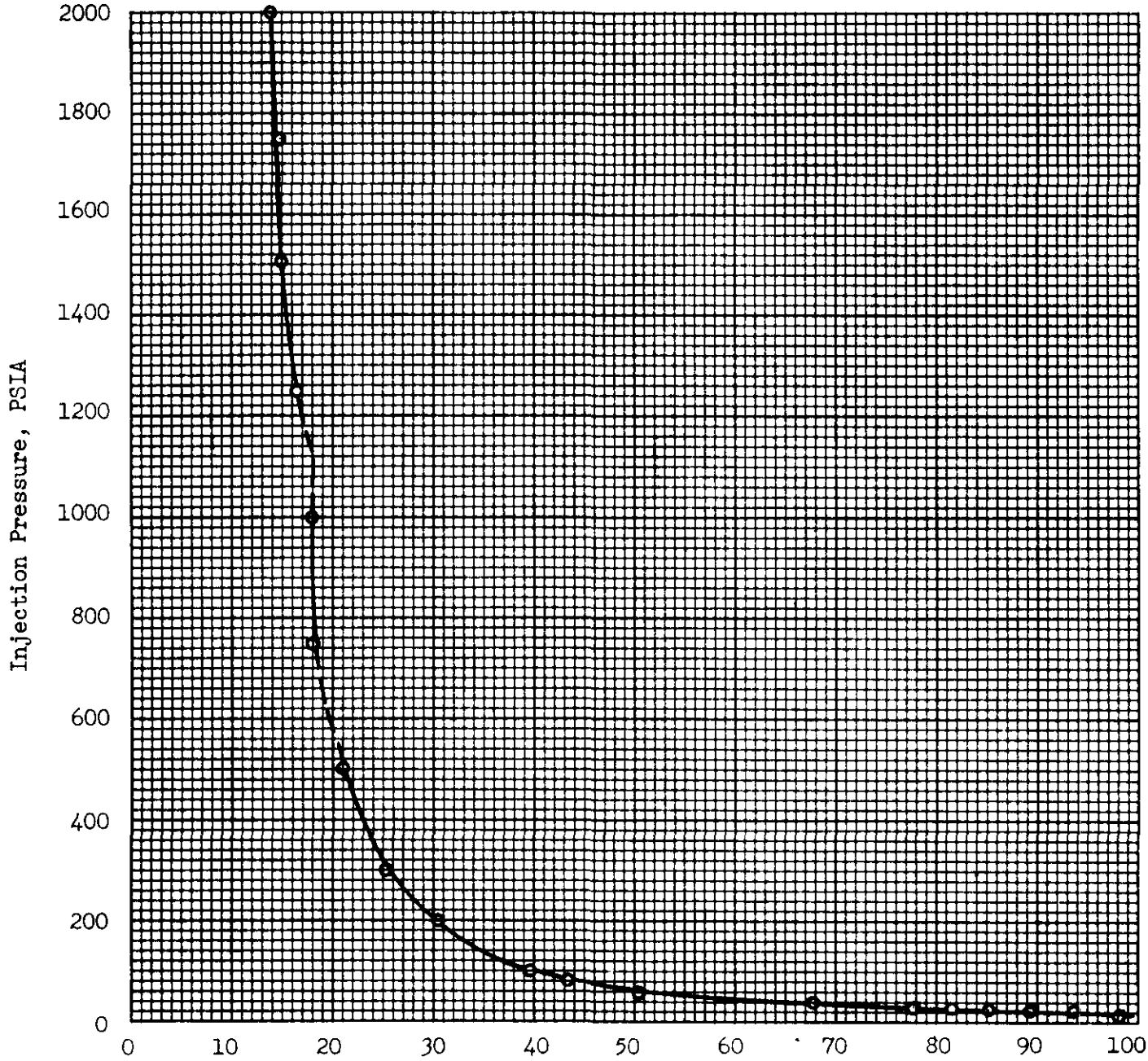
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 County Northwest Territories
Field Stopover State Canada

Sample Number: 98B
Permeability, Md.: 122



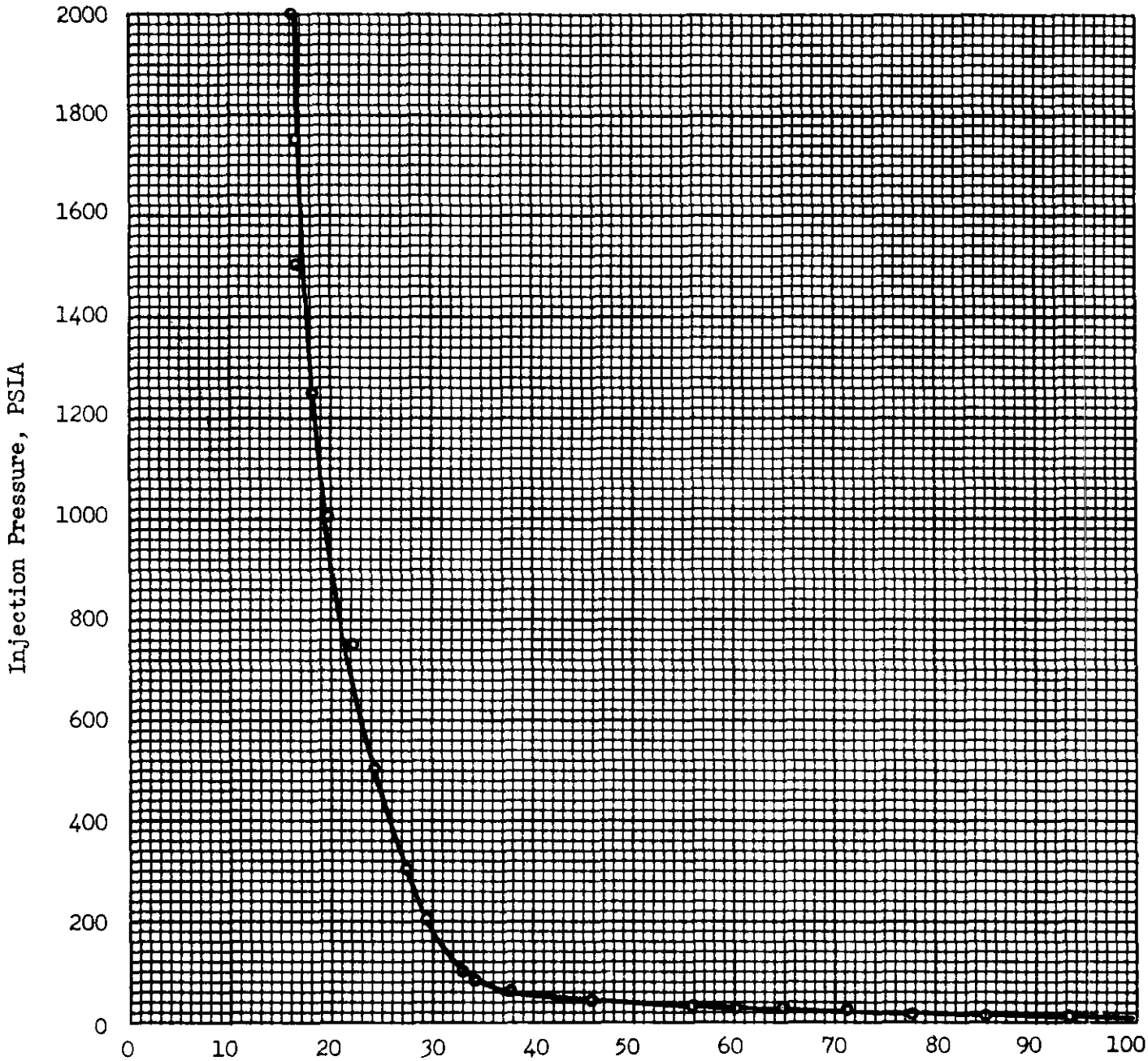
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 County Northwest Territories
Field Stopover State Canada

Sample Number: 103B
Permeability, Md.: 9.9



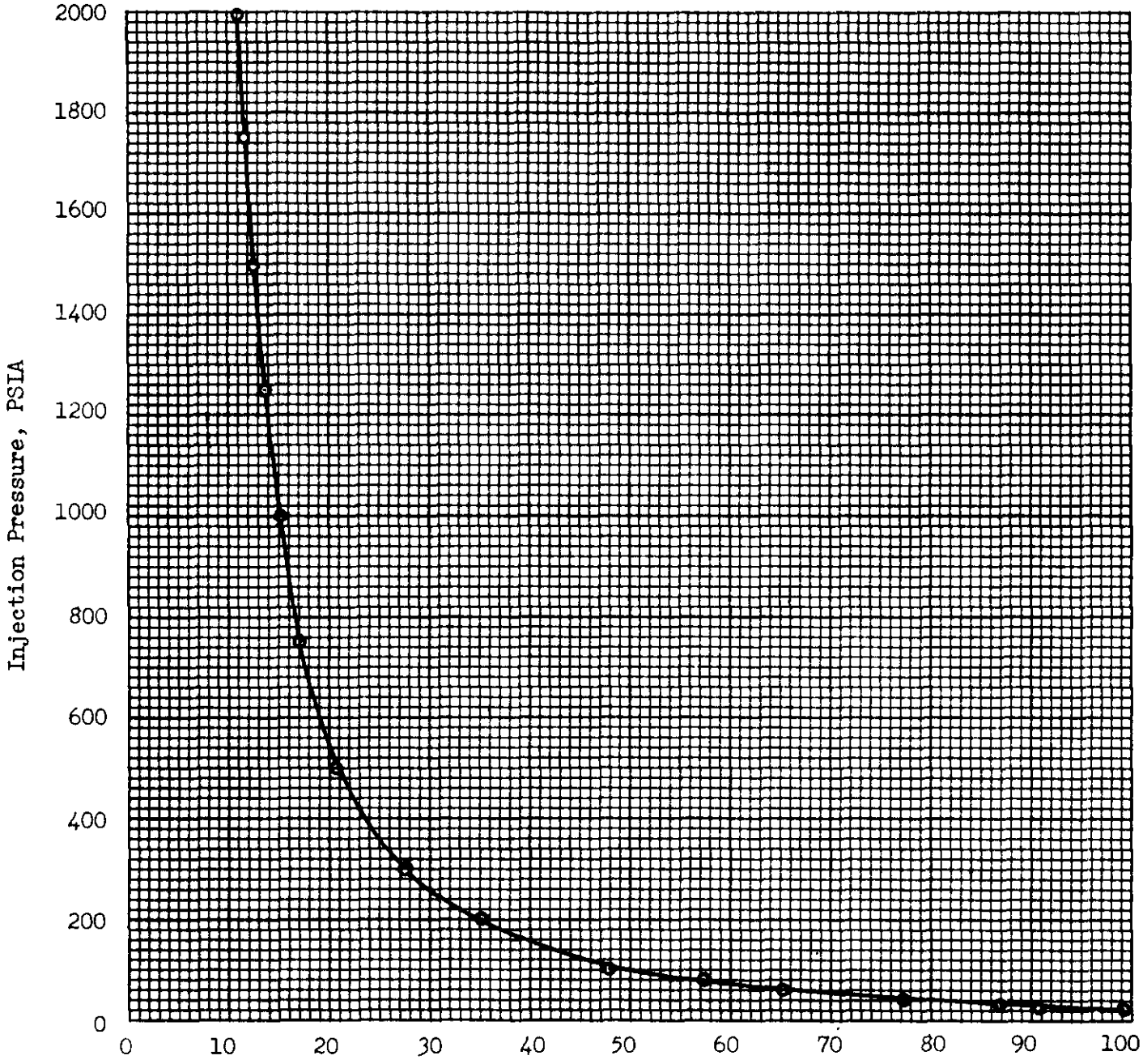
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Stopover K-44 County Northwest Territories
Field Stopover State Canada

Sample Number: 115A
Permeability, Md.: 22



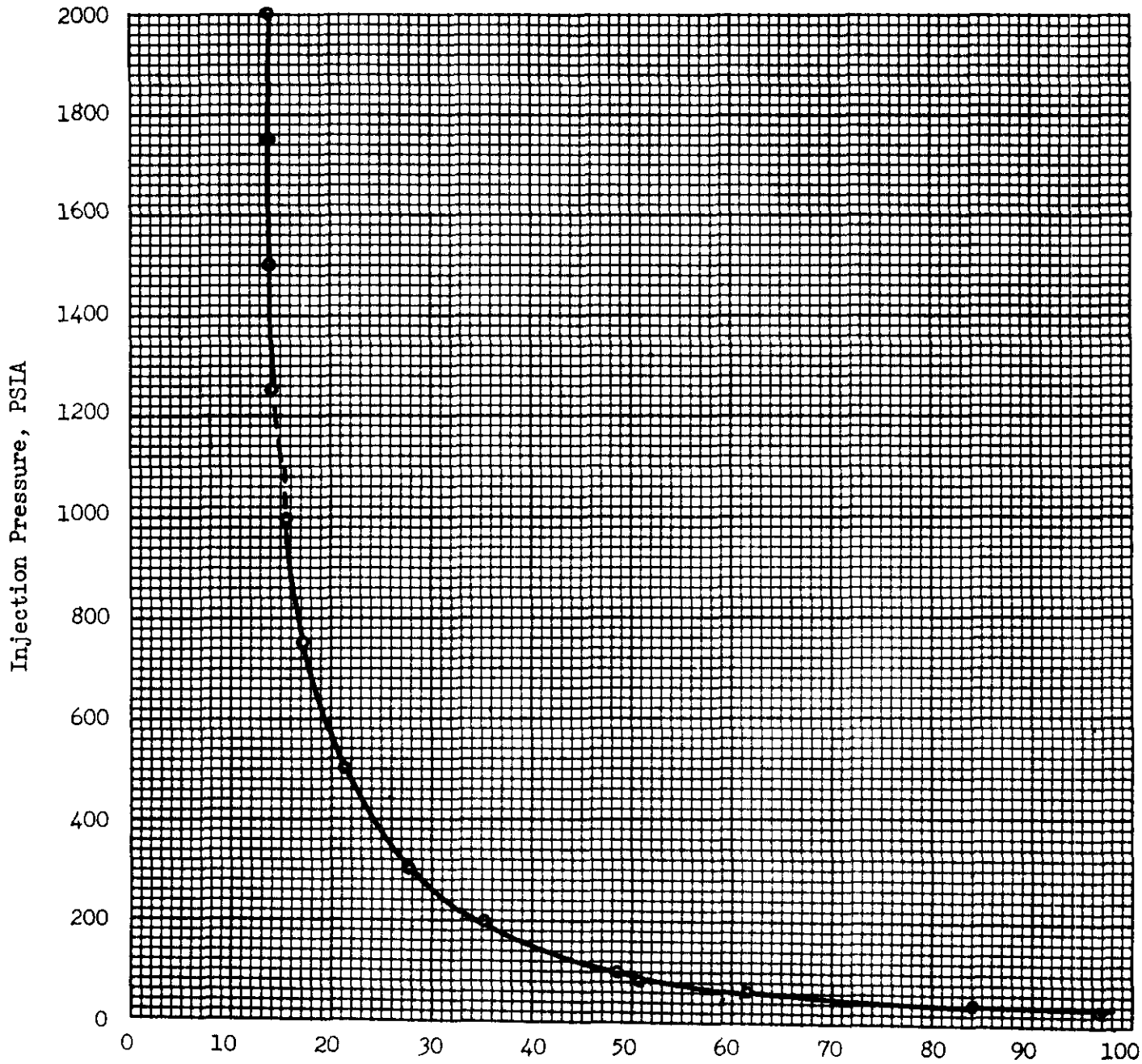
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 15
Permeability, Md.: 10



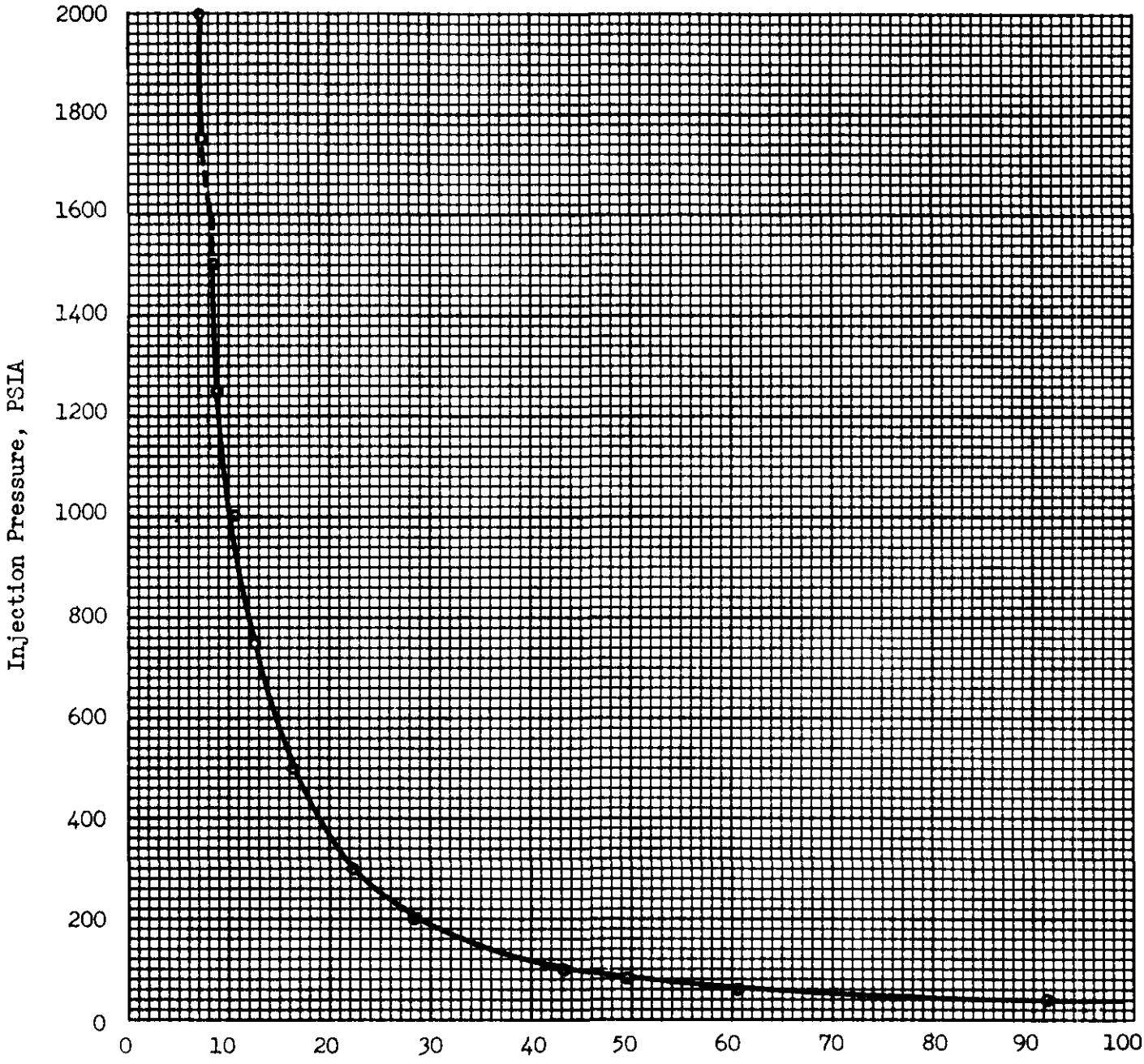
Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 16
Permeability, Md.: 5.1



Company Union Oil Company of Canada Ltd. Formation Old Fort Sand
Well Colville D-45 County Northwest Territories
Field Colville State Canada

Sample Number: 17
Permeability, Md.: 7.2



WATER ANALYSES

FOR

UNION OIL COMPANY OF CANADA LIMITED

UNION MOBIL COLVILLE D-45
COLVILLE LAKE

CORE LABORATORIES - CANADA LTD.

Petroleum Reservoir Engineering

CALGARY - EDMONTON - REGINA

CORE LABORATORIES – CANADA LTD.

PETROLEUM RESERVOIR ENGINEERING

WATER ANALYSIS

File 7021-3645 PAGE 1 of 4

Company Union Oil Company of Canada Limited

Well Union Mobil Colville D-45 K.B. 2080' Grd. ____

Location 67° 14'08.57 N.L. 125° 09'20.87 W.L. Field Colville Lake Province ____

Formation ____ Interval ____

Sampled from DST #1 (Make up Water) by ____

Date sampled ____ Date analysed May 4/3m Analyst L. Kinsella

Recovery ____

____ Mud type ____ Water cushion ____

Resistivity 48.4 Ohm-meters @ 60 °F

Specific gravity 1.0001 @ 60°F

pH 6.5 H_2S Absent

Refractive Index 1.3318 @ 74°F

Total Solids:

Calculated 68 mg/liter

By evaporation @ 110°C ____ mg/liter

By evaporation @ 180°C ____ mg/liter

At ignition ____ mg/liter

MILLIGRAMS PER LITER

Na + K	Ca	Mg	Fe	Ba	Br	I	Cl	HCO_3	SO_4	CO_3	OH
2	9	5	Pres.	-	-	-	8	44	0	0	0

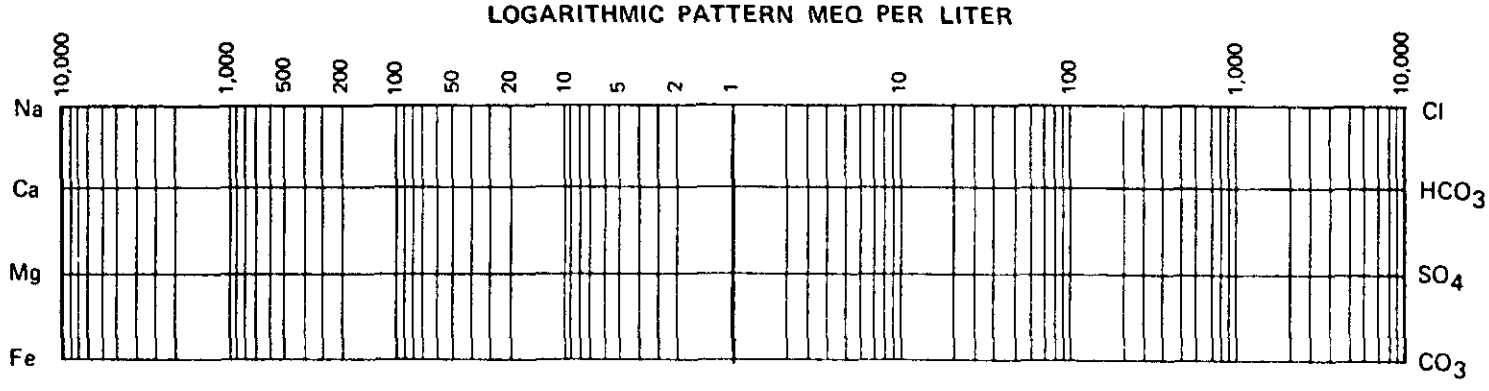
PER CENT CALCULATED SOLIDS

2.9	13.2	7.4	Pres.	-	-	-	11.8	64.7	.0	.0	.0

MEQ PER LITER

.1	.4	.4	Pres.	-	-	-	.2	.7	.0	.0	.0

LOGARITHMIC PATTERN MEQ PER LITER



41. 2.0

CORE LABORATORIES – CANADA LTD.

PETROLEUM RESERVOIR ENGINEERING

WATER ANALYSIS

Company: Union Oil Company of Canada Limited

Well: Union Mobil Colville D-45 K.B. 2080' Grd. ____

Location: 67° 14'08.57 N.L. 125° 09'20.87 W.L. Field: Colville Lake Province: ____

Formation: Cambrian Interval: 3186' - 3233'

Sampled from: DST #3 (Top of Tool) by: ____

Date sampled: April 29/73 Date analysed: May 4/73 Analyst: L. Kinsella

Recovery: 2300' Liquid

____ Mud type: ____ Water cushion: ____

Resistivity: 0.134 Ohm-meters @ 70 °F

Specific gravity: 1.0401 @ 60°F

pH: 7.0 H_2S: Absent

Refractive Index: 1.3420 @ 74°F

Total Solids:

Calculated: 58,986 mg/liter

By evaporation @ 110°C: ____ mg/liter

By evaporation @ 180°C: ____ mg/liter

At ignition: ____ mg/liter

MILLIGRAMS PER LITER

Na + K	Ca	Mg	Fe	Ba	Br	I	Cl	HCO_3	SO_4	CO_3	OH
21551	903	405	Trace	-	-	-	35844	283	0	0	0

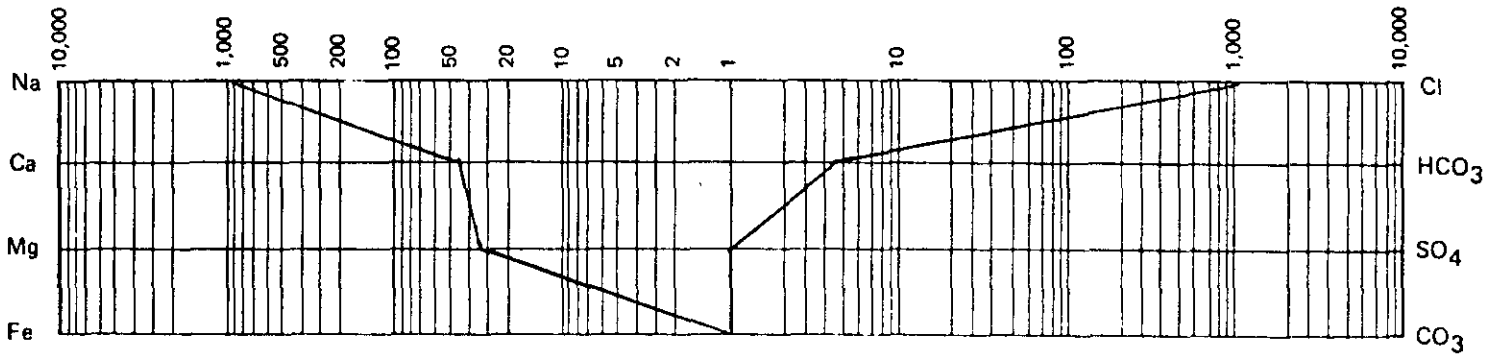
PER CENT CALCULATED SOLIDS

36.5	1.5	.7	Trace	-	-	-	60.8	.5	.0	.0	.0

MEQ PER LITER

937.0	45.1	33.3	Trace	-	-	-	1010.8	4.6	.0	.0	.0

LOGARITHMIC PATTERN MEQ PER LITER



56335 21551.0

CORE LABORATORIES—CANADA LTD.

— SAMPLE ANALYSIS —

SAMPLE TYPE: FORMATION WATER

☐ GROUP SAMPLE

☒ TEST SAMPLE

OPERATOR NAME AND ADDRESS: Union Oil Company of Canada Limited

CODE:

SAMPLE CONTAINER I.D.

CONTAINER OWNER:

CONTAINER MATERIAL: Plastic

CONTAINER NUMBER:

UNIQUE I.D. OR SAMPLE LOCATION								WELL OR SAMPLE LOCATION NAME	ELEVATIONS KB	ELEVATIONS GRD	DATE SAMPLED DAY	DATE SAMPLED MO	DATE SAMPLED YR
	LE	LSD	SEC	TWP	RGE	W	M	E							
									Colville Lake D-45	2080'		29	4	73

FIELD OR AREA	CODE	POOL OR ZONE	CODE	NAME OF SAMPLER
Colville Lake		Cambrian		

DST NO	FT OF H2O CUSH	MUD TYPE	MUD RESISTIVITY @ °F	DST RECOVERY
3			@ °F	2300' Liquid

SAMPLE INTERVAL		SAMPLE DEPTH ABOVE TOOL	OR PRODUCTION SAMPLE POINT	PRODUCTION TYPE PUMP	FLOW	G.L.	SWAB	WATER BBL/D	PRODUCTION RATE OIL BBL/D	GAS MCF/D
3186'	3233'		Top of Recovery							

PRESSURES - PSIG

SEPARATOR	TREATER	LINE	RESERVOIR	CONTAINER WHEN SAMPLED	CONTAINER WHEN RECEIVED

TEMPERATURES (°F)

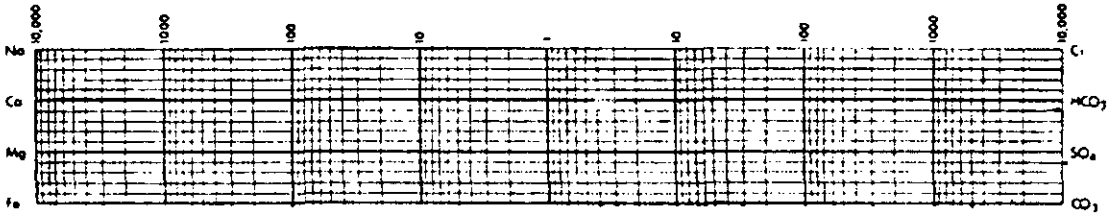
SEPARATOR	TREATER	LINE

LABORATORY NAME	LABORATORY NO.	NAME OF ANALYZER	DATES RECEIVED DAY	RECEIVED MO.	RECEIVED YR	ANALYZED DAY	ANALYZED MO	ANALYZED YR
Core Laboratories Canada Ltd.	7021-3645	L. Kinsella	2	5	73	4	5	73

ION	MG/L	MG %
Na		
K		
Ca		
Mg		
Ba		
Sr		
Fe		
SO_4		
Cl	19,282	
Br		
I		
HCO_3		
CO_3		
OH		
H_2S		
TOTAL CALC		
TOTAL BY EVAP		
TOTAL @ °F CONDITION		
TOTAL FROM RES		

SPECIFIC GRAVITY @ °F	REFRACTIVE INDEX @ °F	OBSERVED PH @ °F	RESISTIVITY (Ohm/meters) @ °F

LOGARITHMIC PATTERN MEQ PER LITRE



CORE LABORATORIES—CANADA LTD.

— SAMPLE ANALYSIS —

SAMPLE TYPE

FORMATION WATER

☐ GROUP SAMPLE

☒ TEST SAMPLE

OPERATOR NAME AND ADDRESS: Union Oil Company of Canada Limited

CODE:

PAGE: 4 of 4

SAMPLE CONTAINER I.D.

CONTAINER OWNER:

CONTAINER MATERIAL: Plastic

CONTAINER NUMBER:

UNIQUE I.D. OR SAMPLE LOCATION: LE | LSD | SEC | TWP | RGE | W | E

WELL OR SAMPLE LOCATION NAME: Colville Lake D-45

ELEVATIONS: KB | GRD: 2080'

DATE SAMPLED: DAY | MO | YR

FIELD OR AREA: Colville Lake | CODE

POOL OR ZONE | CODE

NAME OF SAMPLER

DST NO | FT OF H2O CUSH | MUD TYPE | MUD RESISTIVITY @ °F | DST RECOVERY

SAMPLE | INTERVAL | SAMPLE DEPTH ABOVE TOOL | OR | PRODUCTION SAMPLE POINT: Flowline (Drilling Mud) | PRODUCTION TYPE: PUMP, FLOW, G.L., SWAB | WATER BBL/D | PRODUCTION RATE OIL BBL/D | GAS MCF/D

PRESSURES - PSIG: SEPARATOR | TREATER | LINE | RESERVOIR | CONTAINER: WHEN SAMPLED | WHEN RECEIVED

TEMPERATURES (°F): SEPARATOR | TREATER | LINE

LABORATORY NAME: Core Laboratories-Canada Ltd.

LABORATORY NO.: 7021-3645

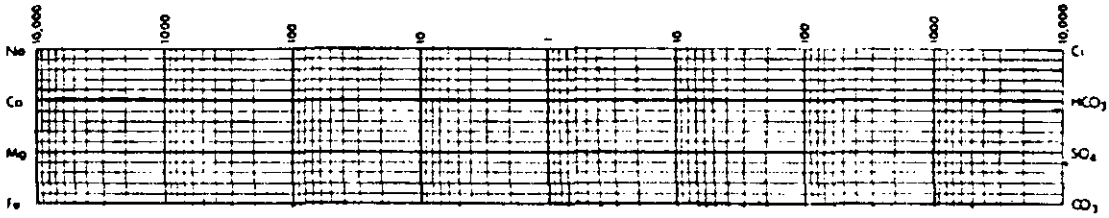
NAME OF ANALYZER: L. Kinsella

DATES: RECEIVED: DAY 2 | MO 5 | YR 73; ANALYZED: DAY 4 | MO 5 | YR 73

ION	MG/L	MG %
Na		
K		
Ca		
Mg		
Ba		
Sr		
Fe		
SO_4		
Cl	1,814	
Br		
I		
HCO_3		
CO_3		
OH		
H_2S		
TOTAL CALC		
TOTAL BY EVAP		
TOTAL @ °F/°C ION		
TOTAL FROM RES		

SPECIFIC GRAVITY @ °F | REFRACTIVE INDEX @ °F | OBSERVED PH @ °F | RESISTIVITY (Ohm/meters) @ °F

LOGARITHMIC PATTERN MEQ PER LITRE



CORE LABORATORIES – CANADA LTD.

PETROLEUM RESERVOIR ENGINEERING

WATER ANALYSIS

File 7021-3674 PAGE 1 of 2

Company Union Oil Company of Canada Limited

Well Union Mobil Colville D-45 K.B. 2099' Grd. 2080'

Location 67° 14'08.57 N.L. 125° 09'20.87 W.L. Field Colville Lake Province

Formation Interval 3207' - 3224'

Sampled from DST #4 (Top of Tool) by B.J. Service

Date sampled May 5/73 Date analysed May 10/73 Analyst L. Kinsella

Recovery 2200' Salt water

Mud type Water cushion

Resistivity 0.124 Ohm-meters @ 73 °F

Specific gravity 1.0383 @ 60°F

pH 6.9 H_2S Absent

Refractive Index 1.3415 @ 73°F

Total Solids:

Calculated 57,371 mg/liter

By evaporation @ 110°C mg/liter

By evaporation @ 180°C mg/liter

At ignition mg/liter

MILLIGRAMS PER LITER

Na + K	Ca	Mg	Fe	Ba	Br	I	Cl	HCO_3	SO_4	CO_3	OH
20971	778	457	Pres.	"	"	"	34875	288	2	0	0

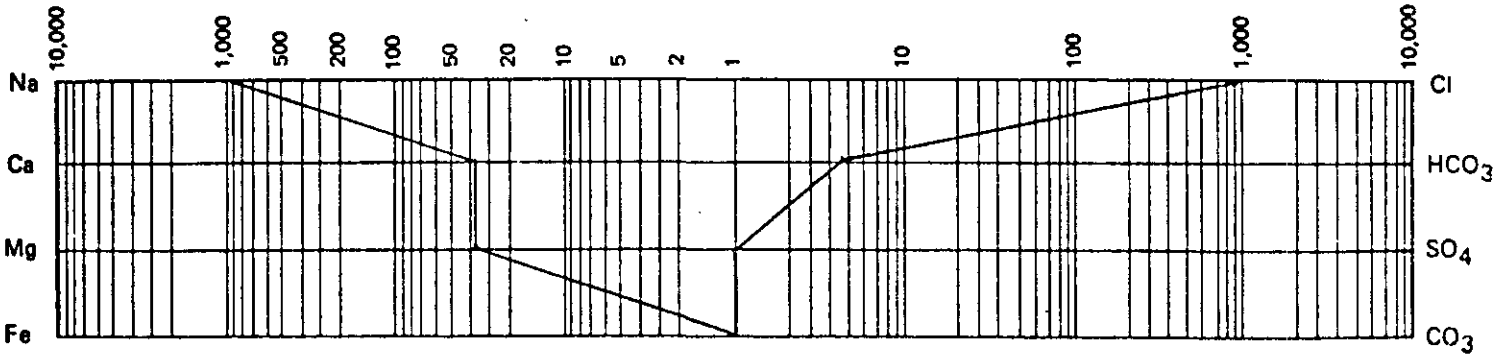
PER CENT CALCULATED SOLIDS

36.6	1.4	.8	Pres.	"	"	"	60.8	.5	.0	.0	.0

MEQ PER LITER

911.8	38.8	37.6	Pres.	"	"	"	983.5	4.7	.0	.0	.0

LOGARITHMIC PATTERN MEQ PER LITER



57578. 20971.0

CORE LABORATORIES – CANADA LTD.

PETROLEUM RESERVOIR ENGINEERING

WATER ANALYSIS

File 7021-3674 PAGE 2 of 2

Company Union Oil Company of Canada Limited

Well Union Mobil Colville D-45 K.B. ____ Grd. ____

Location 67° 14'08.57 N.L. 125° 09'20.87 W.L. Field Colville Lake Province ____

Formation ____ Interval 3253' - 3278'

Sampled from DST #5 (Top of Tool) by B.J. Service

Date sampled May 6/73 Date analysed May 10/73 Analyst L. Kinsella

Recovery 2200' Salt water

____ Mud type ____ Water cushion ____

Resistivity 0.130 Ohm-meters @ 73 °F

Specific gravity 1.0358 @ 60°F

pH 6.9 H_2S Absent

Refractive Index 1.3411 @ 73°F

Total Solids:

Calculated 54,267 mg/liter

By evaporation @ 110°C ____ mg/liter

By evaporation @ 180°C ____ mg/liter

At ignition ____ mg/liter

MILLIGRAMS PER LITER

Na + K	Ca	Mg	Fe	Ba	Br	I	Cl	HCO_3	SO_4	CO_3	OH
19902	746	381	Pres.	-	-	-	32938	298	2	0	0

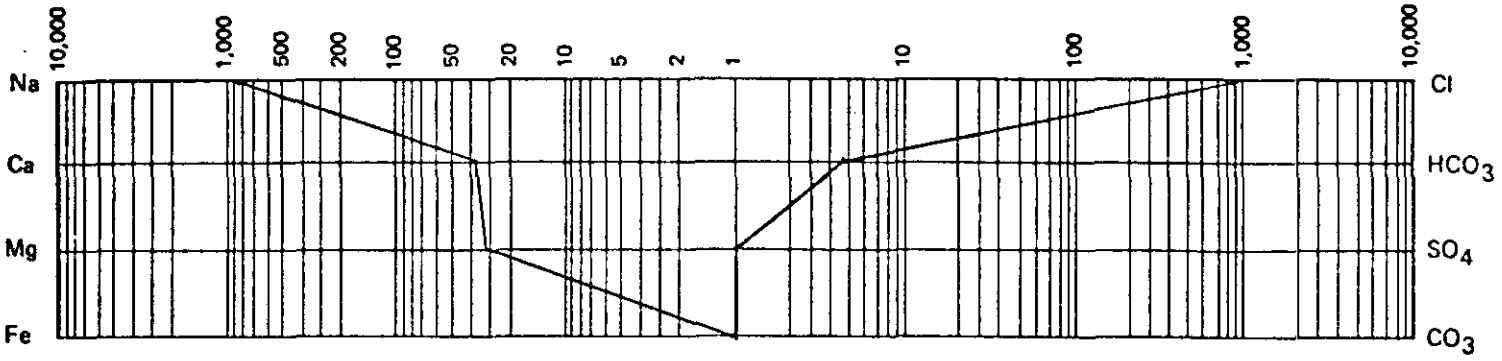
PER CENT CALCULATED SOLIDS

36.7	1.4	.7	Pres.	-	-	-	60.7	.5	.0	.0	.0

MEQ PER LITER

865.3	37.2	31.3	Pres.	-	-	-	928.9	4.9	.0	.0	.0

LOGARITHMIC PATTERN MEQ PER LITER



54392. 19902.0

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

WATER ANALYSIS

Lab No. C73-6392

Received: April 18,1973 Reported: April 19,1973

Well: Location: Union Mobil Colville D-45 N.W.T. 67° 14' 08 57" N 125° 09' 20 87" W

Operator: UNION OIL COMPANY OF CANADA LIMITED Field or Area: N.W.T.

Elev.: K.B. 2098' Grd. 2080' Zone/Formation: Saline River Sample Interval: 2220' T.D.

Method of Production: Flow into Bore Hole Sampled from: Blooie Line Sampled by: T. Ramsey Date: April 11, 1973

OTHER PERTINENT DATA

(Signed)

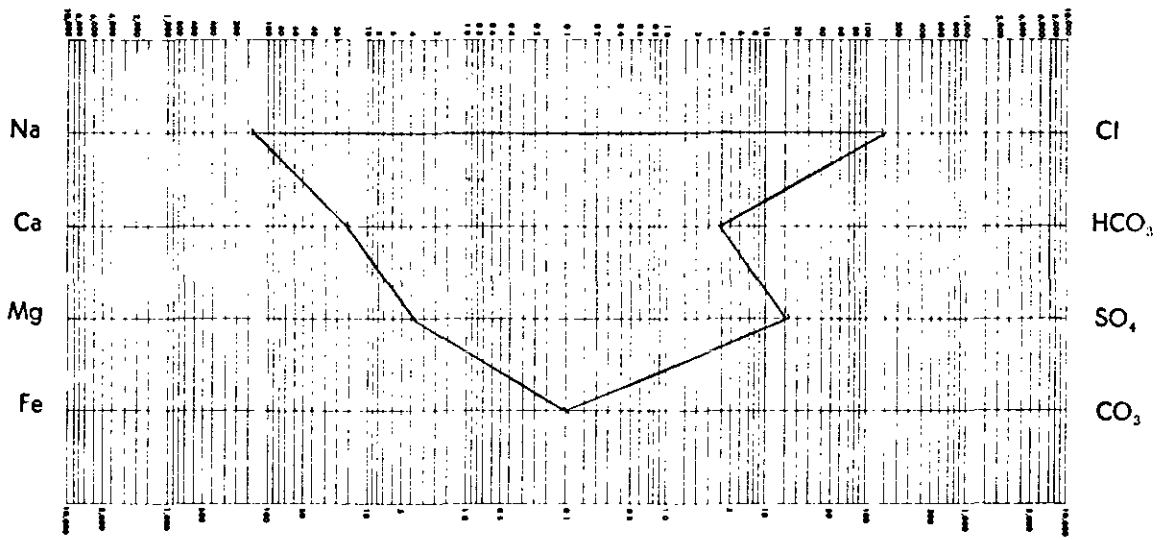
	Na & K		Ca	Mg					SO_4	Cl			CO_3	HCO_3		
Mg./L	3290		310	46					805	5020			---	249		
Meq./L	143.13		15.47	3.78					16.74	141.56			---	4.08		
Meq. %	44.07		4.76	1.16					5.15	43.59			---	1.26		

Total Solids Mg/L: By Evaporation 9700 Fe Present Specific Gravity 1.012 @60°F Observed pH 7.7 @75 °F

Calculated 9720 After Ignition 9088 H_2S Nil Refractive Index 1.3348 @25°C Resistivity 0.652 ohm meters @68 °F

Organic matter - Trace

Pattern Unit Meq./L



Remarks and Conclusions

Analysis determined on a clear colorless filtrate recovered from muddy water.

WELL HISTORY REPORT

on

UNION et al MOBIL COLVILLE D-45

NORTHWEST TERRITORIES

CANADA

Submitted by

John K. Ontko
Professional Geologist

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SUMMARY OF PERTINENT WELL DATA

NAME OF WELL:	Union et al Mobil Colville D-45
UNIQUE WELL IDENTIFIER:	300D456720125000
LOCATION:	Unit D, Section 45, Grid 67 deg.20', 125deg.00'. Latitude 67 deg. 14' 08.57"N Longitude 125 deg. 09' 20.87"W
UNIVERSAL WELL LOC. REF:	67.23571 deg.N 125.15539 deg.W
PERMITTEE:	Mobil Oil Canada Ltd., Permit #5499
EXPLORATORY LICENSE NO.:	1471
OPERATOR:	Union Oil Company of Canada, 335 - 8th Avenue S.W., Calgary, Alberta.
DRILLING CONTRACTOR:	Nabors Drilling Ltd. Rig #8
DRILLING AUTHORITY:	Issued Feb. 28th, 1973. No. 685.
CLASSIFICATION:	New Field Wildcat
ELEVATION:	2080' Ground K.B. 2099'
SPUDDED:	12:00 Noon, March 2nd, 1973
DRILLING COMPLETED:	4:20 PM, May 2nd, 1973
TOTAL DEPTH:	3850'
WELL STATUS:	D & A
RIG RELEASED:	8:00 AM, May 7th, 1973
HOLE SIZES:	0 - 60' 17½" 60 - 600' 12¼" 600 - 2704 8-3/4" 2704 - TD 6-1/8"
CASING:	15 jts. 9-5/8", 36#, K-55, 8 rd. - 611.97' + Howco shoe, float collar and D.V. tool (4.60'). Cemented with 180 sax + 1% $CaCl_2$. Plug down 3:30 PM, April 5th. Displaced with water. Circulated D.V. tool. Cemented 2nd stage with 125 sax oilwell cement + 1% $CaCl_2$. Plug down @ 4:30 PM, April 5th. Cement returns visable. D.V. tool @ 160'.
NO. OF DST's:	5
NO. OF CORES:	8
LOGS:	Dresser Atlas - DIL, BHCSG, G-N & Dipmeter
TOOLPUSHERS:	Al Thoma, Jack Smale

SUMMARY OF PERTINENT WELL DATA CONT'D.

WELLSITE SUPERVISORS:	Engineers - Tom Ramsay, Carl Jasinski Geologist - John Ontko
HEADQUARTER SUPERVISION:	Engineer - J. Sullivan
	Geology - D. Connolly
HELICOPTER SUPPORT:	Trans North Turbo Air Pilots - B. Robertson, D. Plaster, G. Stringer & G. Howell
FIXED WING SUPPORT:	Nabor's Navajo & T.N.T.A. Twin Otter
DISTRIBUTION OF DATA:	1 set bags - G.S.C. 1 set can 2790 - TD - G.S.C. 1 set lined bags - Mobil 1 set vials - Mobil 1 set vials - Union 1 set envelopes - Union All logs - original & prints - Union

SUMMARY OF SUB-SURFACE DATA

KB 2099

FORMATION	E-Log DEPTH	ELEVATION
Lower Ordovician surface		+ 2099
Cambrian		
Saline River	1863	+ 236
Saline River Salt (equiv.)	2206	- 107
Mount Cap	2680	- 581
Mount Clark Old Fort Sand Mbr.	3160	- 1061
Proterozoic	3275	- 1176
T.D.	3850	- 1751

CORE DESCRIPTIONS

Core #1 3018 - 32'. Recovered 12'9".
Times 35,34,23,32,-26,27,23,30,25,-25,28,33,33,38.
Core badly shattered in part. Jammed on connection.

7'3"	Shale - dark grey, with slight greenish tinge. Massive, slightly silty in part with two thin ($\frac{1}{4}$" to $\frac{1}{2}$") irregular siltstone beds with near flat bedding planes.
6"	Shale - as above with thin siltstone interbeds indicating 45 degree bedding dip. Basal 1" dark green with an irregular abrupt contact with the underlying section.
5'3"	Shale - greenish dark grey with numerous thin beds of light grey, silty shale. Bedding is horizontal.

Core #2 3032 - 62'. Recovered 30'.
Times 5,10,5,7,8,-8,8,10,10,10,-10,10,10,12,12,-10,10,10,
13,13,14,13,15,14,15,-17,16,10,10,15.

7'3"	Sandstone - light grey, silt size to fine grained, angular, predominantly well packed with minor black green and green glauconite grains. Sand grains are easily dislodged by scratching with blade. Thin clear, flakes (medium size) are common and dispersed throughout section (a secondary silica, not mica.) Porosity not apparent. Core bleeds light brown oil and has gassy odor. Under fluoroscope appears patchy in small to large blebs as well as linear along micro fractures. The latter are not noticeable to the eye or under the microscope. The sandstone is much like the lower Cardium of the Pembina Field.

CORE DESCRIPTIONS

Core #2 Cont'd.

12'4"	Shale - dark grey, sandy to silty with the coarse clusters expressed as very small blebs and occasional thin beds up to 1½" thick. The sand & siltstone content decrease gradually towards base of section. Shale to sand ratio approx. 60 - 40. No bleeding oil, stain, minor weak patchy fluorescence.
10'9"	Shale - dark grey, massive with noticeable thin interbeds and blebs of light grey, siltstone, decreasing towards base. Siltstone less than 10% of section. No stain or oil bleeding.

Core #3 3062 - 92'. Recovered 30'.

Times 22,22,26,26,27,-23,26,21,22,18,-17,24,36,21,23,-28,29,31,26,9,-7,8,10,8,8,-6,6,7,6,7.

19'	Shale - dark grey, massive, hard, featureless.
6'8"	Sandstone - grey, argillaceous, very fine grained, angular, slightly salt and peppered, hard, dense. Has blebbed appearance, ¼" max. size, caused by cleaner sand. These blebs have medium fluorescence (faint white color.) No stain, faint gas odor on breaking. Tight. Both contacts transitional.
0'4"	Sandstone - light grey, dolomitic, silt to very fine grained size, hard. Basal contact abrupt and irregular with underlying dolomite.
4'0"	Dolomite - brown, fine crystalline, hard, dense, with numerous thin irregular dark shale laminal, giving section a fragmental appearance.

CORE DESCRIPTIONS

Core #4 3092 - 3122'. Recovered 30'.

Times 6,6,8,5,5,-6,10,9,10,20,-25,26,24,12,15,-10,15,28,30, 30,-28,22,15,15,16,-9,5,7,6,7.

3'0"	Shale - dark grey, massive, with light grey siltstone patches. Slightly dolomitic.
4'10"	Sandstone - light brown, dolomitic, very fine grained, tightly packed, angular, clear quartz, with few dark grey shale interbeds (up to 2" thick) and numerous thin shale partings. Trace pyrite. Oil bleeding. Porosity poor, not obvious.
1'0"	Shale & Siltstone - 50 - 50. Shale dark grey, interspersed with blebs and interbeds of light grey, dolomitic siltstone. Tight. No oil bleeding.
1'1"	Sandstone & Shale - 70 - 30. Sandstone is light brown, very fine grained as above in bands up to 3" (oil bleeding) interbedded with thin beds of dark grey shale.
4'9"	Shale - dark grey, massive.
2'9"	Shale - dark grey with minor blebs and patches of dark brown, fine to medium crystalline, tight dolomite.
2'1"	Shale - dark grey with numerous blebs and patches of tightly packed fine to medium crystalline dolomite. Tight.
5'0"	Shale - greenish grey, massive.
4'5"	Sandstone - dark grey green, salt and peppered, consisting of 50 - 50 coarse sub-rounded grains of dark green shale (glauconite?) interspersed with finer textured, angular, poorly sorted, tightly packed clear quartz. (grain size from very fine to coarse, but predominantly less than medium.) Section tight.

CORE DESCRIPTIONS

Core #4 Cont'd.

2'1"	Sandstone - light brown, very fine grained, tightly packed, quartzose, with green shale parting and grains, slightly dolomitic. Oil stained with bleeding light brown oil. Basal 1'3" is saturated. Porosity not apparent under microscope.

Core #5 3122 - 52'. Recovered 30'.

Times 4,4,6,5,5,-14,21,22,22,27,-23,24,26,11,12,-12,17,20, 18,19,-11,12,10,13,11,-16,13,12,15,16.

6'2"	Sandstone - light brown, very fine grained. tightly packed, oil saturated. Bleeds oil. No obvious porosity.
8'6"	Shale - dark grey, massive, slightly sandy toward base.
2'6"	Shale - dark grey, silty with numerous small silty blebs.
2'6"	Shale - dark grey, clean.
1'4"	Siltstone - light grey grading to very fine grained sandstone, shaly with shale intermixed as thin interbeds (partings) and as host rock toward base.
9'0"	Shale - dark grey with varying minor amount of light grey siltstone (very fine grained sandstone) interspersed throughout as blebs and irregular thin interbeds.

CORE DESCRIPTIONS

Core #6 3152 - 73'. Recovered 21'.

Times 18,10,7,11,20,-20,15,7,8,17,-9,7,8,17,11,-10,7,8,9,8,-11 -core barrel jammed.

2'0" Shale - dark grey green, with upper 8" slightly blebbed with light grey siltstone.

2'0" Sandstone - light grey, very fine to occasional coarse grained, rounded clear quartz grains in a argillaceous matrix. Framework 80%. Tight. No oil stain, or fluoresence. The unit has occasional dark grey, argillaceous beds cutting across core without any parallel pattern.

3'6" Shale - dark grey, massive. Basal 6" contains rounded vugs ($\frac{1}{2}$" diameter) infilled with dark brown crystalline dolomite, (as well as few paper-thin, light grey, interbeds of dolomite.)

13'6" Dolomite - light grey to brownish grey, very fine to finely crystalline, in part sandy, hard, tight. The zone has numerous thin irregular shale partings giving the zone a fragmental appearance. Not a rubble zone, as fragments have not been transported. No movement.

Core #7 3173 - 3203' Recovered 30'.

Times 13,9,7,5,4,-6,3,3,4,7,-8,4,4,4,4,6,4,3,3,10,-5,3,3,3,5,-5,6,8,2,2.

0'6" Sandstone - light grey, fine to medium grained, sub-rounded, poorly sorted, well packed, dolomitic. Tight. No stain.

0'3" Shale - dark grey, massive.

1'0" Sandstone - light brown, fine to medium grained, sub-rounded to rounded, with occasional coarse grain size fragment of green shale. Few thin interbeds of dark grey, and sandy green

CORE DESCRIPTIONS

Core #7 Cont'd.

	shale blebs are present. Zone appears depositionally fragmented. Oil stain. No visual porosity.
1'0"	Shale - green, sandy in part.
1'3"	Sandstone - as above, light grey, fine to medium grained with few thin green shale interbeds at base. No stain. Tight.
2'3"	Sandstone - as above, in part light brown stain, grading to very fine to fine grained, sub-angular, quartzose. Hard. Occasional thin shale interbed. Two vugs $\frac{1}{4}$" in size present 1' below top. Tight visually.
1'10"	Sandstone - as above with thin green and dark grey shale interbeds more common, giving section a fragmental (depositional) appearance in part.
3'9"	Sandstone - very fine grained, quartzose, massive, with green shale interbeds more common. Hard. Well packed appears tight. Stained.
6'0"	Sandstone - as above, in part heavily stained (approx. 1' located $1\frac{1}{2}$' from top of unit.) Remainder light brown stained.
1'2"	Sandstone - as above interbedded with thin dark grey shale. Stained.
3'7"	Shale - green to pale green becoming sandy in basal 6".
1'6"	Sandstone - very fine grained as above with green shale matrix in part. Stained.
3'0"	Shale & Sandstone - shale is green with abundant light grey sandstone blebs. No stain.
0'4"	Shale - dark grey green.
1'6"	Sandstone - light grey, very fine grained, quartzose, sub-angular with minor amount of green shale intermixed.

CORE DESCRIPTIONS

Core #7 Cont'd.

1'0"	Sandstone - very fine grained, sub-angular intermixed with medium sized sub-rounded grains, poorly sorted, slightly friable. Oil stained.

Core #8 3203 - 33'. Recovered 29'.

Times 2,2,2,2,2,-3,2,2,2,2,-2,2,2,2,2,-
2,2,2,3,3,-2,2,2,2,11,-8,4,1,1,1,-

5'6"	Sandstone - brown stained, gassy odor, fine grained, sub-angular, quartzose. good sorting, well packed, friable. Oil stained.
0'3"	Shale - pale green, soft.
13'0"	Sandstone - as above. Oil stained.
1'3"	Sandstone - black, fine to medium, sub-rounded, quartzose grains, friable. Bitumen infill interstial spaces. No physical barrier at contacts responsible for difference in stain.
5'0"	Sandstone- light brown stained as before, predominantly fine grained, sub-rounded, with occasional coarse rounded to sub-rounded clear quartz grains. Well packed. Friable.
1'0"	Sandstone - black, fine grained, bituminous as before with no noticeable rock change at contacts.
0'6"	Shale - green, soft.
1'0"	Sandstone & Shale - broken core, shale is pale green, soft, sandstone is as above, oil stained.

SAMPLE DESCRIPTIONS

Sample interval 30'.

30	Chert - light grey, massive.
60	Chert - light grey to white, massive to micro-crystalline, in part tripolitic. Occasional chip has honeycomb structure.
90	Chert - as above with minor clear angular coarse quartz grains (5%).
120	Chert - as above with trace of quartz.
150	as above, with porous honeycomb, (porous) structured chert common (20%).
180	Chert - light grey brown and white, massive, trace of tripolite. Occasional quartz grain. No porous chert.
210	predominantly light grey and white as above with minor tripolitic and porous chert. Iron stain obvious.
240	Dolomite - light brown to light grey, micro and finely granular (the fine grained has white matrix.) Light grey chert common. Occasional light greenish yellow chert present. Trace of clear quartz. (Sample quality poor, only coarse chips.)
270	as above, without the granular white matrixed dolomite and the pale greenish yellow chert. (Poor sample.)
300	as above with chert occasionally vuggy. (poor sample)
330	as above, without vuggy type chert. (Very poor sample.)
360	Dolomite - light brown, crypto to micro-crystalline with minor chert (one piece has pesolitic structure.) Iron stain spotty.
390	as above, grading to finely crystalline in part, occasionally light grey in color. Light grey, massive chert common to abundant. (30%)

420	Dolomite - as above with abundant light grey, massive, crypto to micro-crystalline dolomite. Decrease in chert to trace.
450	as above, chert approx. 10%.
480	Dolomite - with occasional chip of pale green and green shale.
510	Dolomite - light brown, hard, dense, micro-crystalline (60%), light grey, chalky textured, limy dolomite abundant (40%). Trace chert.
540	predominantly light brown micro-crystalline dolomite - 70% - with light grey, micro-crystalline dolomite common (20%). Chalky textured dolomite minor (less than 10%.) Trace of chert.
570	as above. Slightly more chert - 5%. Occasional greenish dolomite chip.
600	as above, with minor amount of chalky textured dolomite (20%.)
630	Dolomite - light brown, micro to very finely crystalline with trace (less than 5%) white and light grey chert.
660 - 90	in part - 10% - light grey, very fine to finely crystalline, poorly sorted, tight dolomite. Occasional pale green shale chip.
720	Dolomite - predominantly light brown, micro to very finely crystalline dolomite.
750	with occasional white, soft, chalky textured dolomite chip. Few white chert, and clear quartz chips also present.
780	with ferruginous stain and rust. No primary porosity. Iron indicates fracture, some water in hole at 759 - went to mist.
810	with abundant fine to medium crystalline dolomite. Occasional trace of solution vugs. Much of the cuttings are reddish due to iron stain.

840 Dolomite - the prevalent light brown, micro to very finely crystalline dolomite has occasional solitary vug. The light grey, micro to finely crystalline dolomite is approx. 15%. The light grey sucrosic, very finely crystalline, silty dolomite is approx. 5%. White chert and white chalky texture makes up approx. 5%. No iron stain present.

870 as above - the light brown dolomite is becoming abundantly very fine crystalline (sucrosic.) Occasional small chip of green sandstone. Few yellowish green, cryptocrystalline dolomite chips.

900 as above with minor amount of sandy dolomite, Occasional coarse, clear quartz grain.

930 as above with only occasional white chert chip, no coarse quartz observed. Sample is predominantly light brown, micro to very finely crystalline dolomite (70%), light brown to light grey, sucrosic, very finely crystalline dolomite 20%, and very minor amount of light grey, very fine to fine crystalline, poorly sorted dolomite. Occasional chip has yellowish green tint.

990 same lithology as above, but becoming increasingly more light grey in color.

1020 - 50 Dolomite - lighter brown than above, consistently micro-crystalline, with minor light brown to light grey to white, chalky appearing dolomite 20%. Trace white chert.

1080 as above with occasional rust parting.

1140 as above. Occasional reddish speckled and light pinkish colored chip.

1170	as above, increase in amount of the light grey to white (chalky textured) sucrosic dolomite to approx. 50%.
1200	decrease in sucrosic to minor - less than 20%.
1230	with abundant light to medium to dark grey crypto to micro-crystalline dolomite (30%). The dark grey is micro-crystalline. Trace of light grey shale.
1260	Dolomite - as above, predominantly light brown (50%) and light grey (40%) hard, dense, crypto to micro-crystalline. Occasional pale greenish yellow dolomite chip. Minor green, blocky, slightly dolomitic shale (10%).
1290	Dolomite - predominantly light brown in part light grey, crypto to micro-crystalline, hard, dense. Occasional green shale chip.
1320	as above with occasional coarse crystalline calcite lump and odd medium grey, micro-crystalline dolomite chip.
1350	as above with minor light grey, chalky dolomite (10%).
1380	the above chalky (in part sucrosic) dolomite becoming predominant (60%.) Light grey and light brown, micro-crystalline, dense dolomite of the above is abundant (40%.)
1410	Limestone - light grey to medium grey, micro- to finely crystalline, slightly silty and argillaceous.
1440	Dolomite - light grey to medium grey, micro-crystalline, hard, dense - 70% with light brown, crypto to micro-crystalline, dense dolomite common.
1470	as above with trace of green shale.
1500	Dolomite - as above, light brown 70% and light to medium grey 30%.

1530 Dolomite - predominantly light to medium grey, argillaceous, crypto to micro-crystalline, dense (70%) with light to medium brown, dense, crypto to micro-crystalline dolomite common 25%. Trace of medium grey, blocky, dolic shale.

1560 as above with minor 10% light grey and light brown, soft, chalky textured dolomite.

1590 as above with minor dark grey, blocky dolomitic shale.

1620 increase in shale amount (approx. 20%) with greenish grey, slightly fissile shale obvious. The light brown, chalky dolomite approx. 20%. The light to medium grey and light brown dolomite of above is predominant (60%.)

1650 as above with green, blocky shale common (15%). Trace of disseminated pyrite.

1680 as above, becoming predominantly the light grey, dense, hard, micro-crystalline type (50%), the light brown to greyish brown type is approx. 30%. The grey shale and green shale comprises approx. 20%. Trace of pin point solitary vugs in both dolomite color types.

1710 Dolomite - brown, hard, dense, crypto-crystalline in part appear greyish brown (80%) with green, blocky to slightly fissile shale (with occasional disseminated pyrite) 20%.

1740 as above with the dolomite occasionally earthy (softer) appearing. Increase in green shale to approx. 30%.

1770 as above with minor amount of light grey, slightly argillaceous, massive dolomite with occasional trace of fossil detrital. Decrease in amount of green shale (10%.)

1800 as above. Dolomite 70% - increase in green fissile to slightly waxy in part shale.

1830	as above. Dolomite remains light grey and light brown, massive, crypto to micro-crystalline. Trace of brown, micro-crystalline dolomite. Green, fissile to blocky shale approx. 20%.
1860	as above, decrease in shale to trace - less than 5%.
Saline River 1870	
1890	Shale (50%) rusty to dark brown in part interbedded with light grey, light brown, and pinkish crypto to micro-crystalline dolomite with spotty good vuggy porosity (no stain.) Green waxy to dull shale present as a trace.
1920	Shale - as above reddish to brown, light green to dark green in part waxy (60%), with abundant pinkish, reddish, yellowish, grey, dolomitic siltstone (20%), minor pink and white anhydrite (10%), and light grey to light brown, dense, crypto-crystalline dolomite. (Variegated.)
1950 - 1990	as above with anhydrite only a trace (less than 5%.)

Start 10' interval samples at 2000'.

2000	Shale - variegated as above with siltstone and anhydrite and dolomite as above with green shale predominant (approx. 40%.)
2010 - 60	as above with trace of white mineral with columnar habit (gypsum?). Occasional clear, needle-shaped, gypsum crystal present.
2070 - 90	as above, yellowish and light grey shale more obvious than above. Dolomite present as trace. Very minor anhydrite and siltstone.
2100 - 2110	variegated section as above with green shale very predominant. Trace dolomite, anhydrite and siltstone.

2120 - 60 as above, with anhydrite obvious.

2170 trace vuggy porous dolomite.

2180 as above with further increase in anhydrite approx. 10%.

2190 as above with increase to obvious in pale yellowish shale.

2200 as above, green, reddish and light grey shale (order of predominance) with trace of yellow shale. Anhydrite common.

2210 as above with considerable light brown, massive, crypto-crystalline dolomite 30%, slightly silty in part; pink anhydrite (sylvite) minor 10%. Trace light grey, dolomitic, fine grained sandstone.

2220 no dolomite. Sample predominantly red shale with abundant green, in part light green, waxy shale. Minor amount of brown, yellowish brown and grey shale. Anhydrite - white and pink (sylvite) present in minor amount approx. 5%.

Pipe Correction -32'.

2230 Salt? at 2228 - 37 with shale as above. Trace light brown dolomite. Anhydrite minor.

2250 Shale as above with trace of white chert, also light grey, fine grained sandstone with medium to coarse quartz crystal inclusions.

2260 - 90 as above with minor amount of pink anhydrite (sylvite) 10%. Trace of pyrite in a dark background, pale green, lithographic shale with conchoidal fracture, occasional chip of light grey, fine to medium grained, angular, poorly sorted.

2300 as above. Variegated shale and minor anhydrite. Occasional chip of light grey, poorly sorted, angular, very fine to medium grained sandstone. Pyrite "dark" as before.

2310 - 20	as above, with odd white chert and white lithographic mineral (appears like chalk.)
2330 - 40	as above with white, soft, chalky textured, limy shale common (10%.) Light grey shale obvious, contains sandstone grain interbeds. predominantly green and red shale of above.
2350	as above, decrease in anhydrite to trace.
2360	as above, predominantly green shale.
2370	as above. Minor to trace of anhydrite (Pink) occasional chip of white chert and siltstone.
2380 - 2400	as above with increase in reddish colored shale to approx. 2/3 of the green. Yellowish brown and brown shale obvious. Occasional shale chip is pitted suggesting salt inclusions.
2410	Shale - predominantly green and reddish with minor grey; trace amount of anhydrite.
2420	Decrease in amount of rusty shale with light grey, soft, slightly dolomitic shale obvious. Trace of light brown, crypto-crystalline dolomite.
2440	as above with light brown, soft, chalky appearing, slightly limy dolomite common 10%.
2450	variegated shales as above, abundant green, rust (red) and light grey common, with trace of pink and white anhydrite and light brown, crypto-crystalline dolomite (containing disseminated pyrite in part.) Difficult to dry clean sample because of grey dust.
2460	Decrease in rusty shale with minor light brown dolomite with excellent honeycomb porosity (tight fragments have pelletoidal - granular - texture.)
2470	Dolomite - light brown, earthy, tight (50%) with abundant green shale. No rusty shale. Trace of anhydrite. One coarse mica flake. Few black shale fragments. Difficult to dry sample clean, as it becomes dusty and covers colored cuttings.

2480	Shale - pale green (45%) with abundant very dolomitic light grey shale (shaly dolomite) 45%. Minor to trace of pink and white anhydrite, as well as trace of dolomite. When dried covers colored chips with grey dust. Sticks to pan.
2490	Shale - as above, green to light greenish grey to grey dolomitic (80%) with minor light brown dolomite (10%) and white and orange (pink) anhydrite 10%.
2500	Dolomite - grey to slightly brownish grey, in part light grey, dense, silty, tight (60%) with abundant (30%) above grey, grey green and green shale with minor light grey shale. Occasional anhydrite as well as the odd porous grain cluster. Red (rusty) shale appears as trace, but considered caving. Mud has been in poor condition for last 100' because of salt contamination. Sample dries without grey dusty coating of above samples.
2510	Shale - green and grey, dolomitic in part, as above with minor light brown, dolomite and trace of anhydrite.
2520	as above. Trace of pale yellow green and bright green shale. Occasional chip of anhydrite.
2530 - 60	Shale - as above, green and grey green, dolomitic with abundant grey shale. Minor to trace of light brown, earthy dolomite. Occasional piece of anhydrite. Red (rusty) shale is obvious. Bedding obvious with samples often having micro-flakestone appearance.
2570 - 80	as above with trace dark grey shale, slight increase in dolomite (10%). No anhydrite.

2590	Shale - as above with slightly increased light brown, slightly silty dolomite approx. 15% - light grey, finely crystalline dolomite present as trace amount of less than 5%.
2600	as above. No grey, micro-crystalline dolomite. Increase in light brown dolomite to approx. 25%.
2610 - 30	as above. Light brown to light grey to medium brown, in part crypto-crystalline, argillaceous dolomite approx. 20%.
2640 - 50	becoming predominantly shale. Dolomite approx. 15% with medium brown dolomite as trace.
2660	Shale - as above approx. 40% with abundant dolomite, light brown, earthy to very finely crystalline (granular) 30%, with minor amount of good pin point vug fluorescence with light grey to light brownish grey, argillaceous dolomite 20%. Minor brown chert speckled (inclusions) in part 5%. Trace of darl grey shale, occasional pink (orange) anhydrite chip. Fluorescence less than 5% of sample in brown, very finely crystalline dolomite with occasional pin point vug.
2670	Shale - 60% predominantly bright green, blocky with light green and grey green in minor amount. Dolomite 40$ - light brown to medium brown, (fluorescence with occasional pin point vug) to grey brown, crypto-crystalline, in part finely crystalline, granular, silty. Fluorescence less than 5%.
2630	as above - the green shale looks dark greenish grey when dry. Dolomite remains approx. 40% and is similar to above silty, crypto to fine grained, light grey brown to occasionally medium brown in part. Odd chip fluoresces.

2690	Dolomite - 50% as above with occasional brown (oil stained fragment less than 10% of dolomite portion) with occasional pin point vug. Shale 50% - predominantly bright green, slightly fissile and in part pale green, blocky.
2700	Shale - as above 60% with dolomite 40% light grey to light brown, crypto to micro-crystalline with occasional brown, very finely granular, crystalline (oil stain - white - fluorescence.) Less than 1%. Occasional brown chert chip.
2704 circulated	Shale 80% Dolomite 20%. Occasional (less than 1% of dolomite portion) oil stained (white fluorescence), finely granular dolomite.
2710	Shale - dark greenish grey to dark grey, blocky to platy to fissile. Trace of reddish, and pale green shale. Occasional chip of light grey, crypto-crystalline dolomite, light grey dolomitic siltstone and fine grained, slightly porous, spotty rust stained sandstone (probably the trace and occasional chips are cuttings from the mud tanks that are circulated through the mud system.)
2715	as above with minor amount 5% of grey, slightly dolomitic, salt and peppered, angular, very fine to fine grained sand-stone. The black grains are shale frag-ments (similar to shale being drilled), and are larger than the quartz grain com-plementary component. Tight. Trace of light brown to brown crypto-crystalline dolomite 1%. Occasional chip of reddish shale and light grey, fine grained dolomitic sandstone (contaminants?)

2720 Shale as above. Occasional chip of above salt and peppered sandstone, reddish, and pale green shale.

2730 Shale as above - dark greenish grey to dark grey - blocky, platy to fissile.

2740 as above with occasional chip of light brown, crypto to finely crystalline dolomite and white chert, and white tripolite with quartz grain inclusions.

2750 Shale - as above, however, not greenish as before. Habit same. Color dark grey.

2760 as above with minor (less than 5%) light grey, dolomitic, very silty to very fine grained, predominantly quartz with occasional very fine grained shale grains, sandstone (siltstone.) Tight.

2770 Shale & Limestone - Shale 50% - dark grey to black and dark green, blocky to fissile to finely bedded as above with Limestone 50% - light grey to light brown to brown, crypto to micro-crystalline, slightly silty, dense with trace of light grey, soft, chalky limestone. Occasional chip grades to fine granular with odd fragment containing coarse grained inclusions (fossil fragments?)

2780 as above with decrease in above limestone to approx. 30%. Occasional chip of vuggy dolomite with slight cut. Less than 1%. Shale remains grey green in part.

2790 increase in limestone to approx. 80%, and becoming brown, micro to very finely crystalline with occasional chip containing fair inter-crystalline porosity with fluorescence (at most 10% of limestone portion), limestone is also slightly dolomitic. Shale 20%, predominantly green, platy to blocky as above. Evidence of occasional micro fractures infilled with calcite.

2800 Shale - dark grey, blocky, limy, very silty 90% with minor light grey, limy, very argillaceous siltstone 10%. Trace of limestone as above.

2810 as above, grading more to the grey, slightly dolomitic very argillaceous siltstone (silty shale.)

2820 Limestone (80%) brown to buff in part, crypto-crystalline, dense, in part buff, soft, chalky textured limestone. Shale 20% - greenish grey as above. Calcite present in trace amount as fracture infill.

2830 Shale - dark grey, blocky, slightly limy with 10% limestone as above.

2840 Limestone - 80% medium brown, crypto to micro-crystalline in part grading to buff, soft, chalky textured limestone. Occasional fracture infilled with calcite. Shale 20% - green grey, blocky.

2850 Shale - dark grey, fissile to blocky with minor 20% limestone of above.

2860 as above, shale shows platy texture, some minor slickensiding, occasional fossil mold (Trilobite parts.)

2870 Limestone 60% - light to medium brown, slightly dolomitic, crypto-crystalline grading to very finely granular in part, buff colored, softer limestone is common. Shale 40% - predominantly green and dark grey in color, blocky with trace amount of dark brown, fissile shale, and dark brown silty shale.

2880 Siltstone 50% - light grey, very dolomitic in part medium grey, argillaceous, as well as greyish brown. Shale 45% - predominantly dark grey and green with minor black and dark brown. Dolomite 5% - as above, light brown to buff.

2890 Dolomite 90% - light to medium brown, micro to finely crystalline, dense with occasional white calcite chip (fracture infill.) Shale 10% - green, dark grey and brown as above.

2900 Dolomite 60% - becoming light brown to light grey, to medium grey, predominantly crypto-crystalline, slightly silty with Shale 40% - dark grey, in part brown and trace of black fissile, bituminous.

2910 Dolomite - predominantly medium brown, micro-crystalline to tightly packed, finely granular in texture, slightly limy, occasional chip with inter-crystalline porosity; with hard, blocky, dolomitic pale green, silty shale. Trace of green shale.

2920 Dolomite 90% - light grey, silty, very fine granular, massive, dense with rounded glauconite inclusions abundant in numerous chips. Shale 10% - dark grey present in minor amounts.

2930 Dolomite - brown, finely crystalline, slightly silty, tight. Trace of green shale and light grey, very finely crystalline, glauconitic dolomite.

2940 Siltstone - light grey, slightly dolomitic. Trace of green shale.

2950 as above in part brownish in color, with considerable sericite(?) flakes. Thin shale partings also present. Minor black shale present in part sericitic.

2960 Shale 60% - green, blocky, in part platy, with siltstone 40$ light brown to light grey in part. Occasional chip fluoresceses, no cut.

2970 as above with trace of brown shale. Decrease in siltstone to approx. 10%.

2980 Shale - green and brown shale, blocky to fissile. Approx. 40 - 60 green to brown shale.

2990 Shale - becoming predominantly brownish grey, with abundant green fissile. Minor amount (5%) of light grey chert. Very odd (occasional) angular, fine to coarse, clear quartz grain and clusters. Trace of light brown to reddish, very finely to finely crystalline dolomite.

2995 Shale - green, blocky to fissile.

3000 Shale 90% - predominantly green with brown common and minor amount of grey. Trace of white to light grey chert, light brown dolomite and occasional angular, coarse, clear quartz grain.

3010 Shale - green as above with trace of brown.

3015 Sandstone - light brown, fine grained, angular, quartzose sand. Tightly packed, trace of inter-granular, poor porosity with good oil stain and cut. Not dolomitic, has minor silica cement. Mostly framework, porosity may be good but not noticeable under microscope.

Cored 3018 - 3233 - 8 cores 95% recovery.

3240 Shale - green, fissile to blocky with abundant light grey, very fine grained, quartzose sandstone, in part grading to medium sized, sub-angular to sub-rounded. Porous. Partly stained with faint fluorescence.

3250 Sandstone - light grey to light brown, stained fine to medium, sub-angular to sub-rounded, clear, quartz grains. Good porosity.

3260 - 70	Sandstone - light brown, stained, very fine grained as above with abundant loose coarse, angular to sub-rounded, predominantly translucent quartz with trace of clear, and yellowish quartz. Minor amount 15% of green fissile to blocky shale.
3280 - 90	Shale - green, fissile and blocky with abundant maroon, rusty, and brown colored shale.
3300	Shale - as above with much fine grained, porous sandstone and loose, coarse, rounded sand grains - cavings. (Shale continues very reddish and soft - much is washed out when cleaning.)
3320	Shale - reddish, dark green, trace of pale green, grey and dark grey common. In part silty and sandy grading to siltstone and dolomite, occasional slightly glauconitic sandstone. Numerous lighter shales and siltstone are micaceous (sericite.)
3330	Sandstone - light grey, very argillaceous, with occasional pale green speck inclusions, reddish stained with shales of above common, the brownish grey color being the most prevalent. Mica (sericite) flakes abundant and present in brownish and green shales as well as the sandstone.
3340 - 50	Shale - decrease in sandstone to approx. 20%, predominantly variegated shales as above.
3360	Shale - green to grey green, 80% with grey shale 20% common. Habits are blocky to fissile in part.
3370	Shale - as above with increase in grey type to approx. 40%.
3380	as above with grey shale predominant.
3390	Shale - as above 60% green 40% grey.

3400	as above 50 - 50 with trace light brown, micro-crystalline dolomite, few chips of white bentonite.
3410	Siltstone - light grey to greenish grey, argillaceous, slightly glauconitic grading to very fine grained sandstone with green and grey shale common 30%.
3420	Sandstone - as above decrease in shale to less than 20%.
3430 - 70	Shale - green and grey, fissile, micro-micaceous in part, with minor grey, argillaceous, very fine grained sandstone 10%.
3480	as above, increase in light greenish grey sandstone to approx. 20%.
3490	Sandstone & Shale - 60 - 40 - as above with the glauconitic portion becoming more obvious.
3500	Sandstone - as above with decrease in shale to less than 10%.
3510	as above, shale approx. 25%.
3520	as above, shale 40%.
3530	decrease in shale to 20%. Few dark grey to black to brown chips of shale. Trace of bituminous sandstone.
3540	Sandstone - light grey, silt to fine grained, angular, clear quartz, fair sorting, slightly micaceous, silica cement. Occasional glauconite grain, and green shale grain. Trace of inter-granular porosity.
3550	as above with a few coarse, angular, clear quartz chips occasionally encrusted with quartz crystals suggesting fractures. Occasional rust staining.
3560	Shale 90% - grey green, blocky to fissile with minor amount of above sandstone.
3570	Shale - green 40%, grey 20%, maroon 10%, and sandstone light grey, quartzitic as above 30%.

3580	Shale - green, fissile to blocky with minor amount of dark grey shale. Trace of maroon and pale green shale. Sandstone of above minor in amount.
3590	Shale - green and dark grey as above with minor sandstone 15%.
3600 - 10	as above with dark grey shale abundant. Brown shale common. Sandstone argillaceous to quartzitic approx. 20%.
3630	Sandstone - light grey, very fine grained, quartzitic, slightly glauconitic, tight. Minor dark grey and brown shale 10%.
3640	Sandstone is very argillaceous in part, increase in above shale to approx. 50%. * Sample is brown due to being burned when drying.
3650 - 90	as above. Dark grey shale approx. 10%.
3700 - 10	as above with texture grading down to silt size. Noticeably quartzitic. Slight increase in shale varying from 10 - 25%.
3720 - 30	as above, becoming more noticeably micaceous; both sandstone and shale.
3740	Shale 60% - grey to dark grey, fissile to blocky, slightly micaceous in part. Minor brown shale. Sandstone 40% - grey and brown, grading to siltstone, quartzitic, argillaceous, slightly micaceous in part.
3750	Shale - dark grey, blocky to fissile with minor amount of green and brown shale. Sandstone - light grey and brown, silty, quartzitic present as trace.
3760 - 70	Shale - as above with brown shale and siltstone and silty shale becoming obvious.

3780	Shale - dark grey with minor green grey, and green, fissile to blocky. Minor light grey, slightly glauconitic, very fine grained quartzitic sandstone - less than 10%.
3790 - 3800	as above, increase in sandstone to approx. 30%.
3810 - 30	Sandstone 60% - as above in part grey, very quartzitic with shale 40%.
3840	decrease in sandstone to less than 40%.
3850	Shale - grey, green with trace of brown, fissile to blocky. Occasional pyrite crystal cluster. Few sandstone grains of above.

TD 3850

May 2nd, 4:20 PM, 1973.

E N G I N E E R I N G

BIT RECORD

BIT NO.	SIZE	MAKE & KIND	SERIAL	DEPTH	TOTAL FEET	TOTAL HOURS	REMARKS
1A	17½	H7J	394440	30	30	8½	8-1-1
2A	12¼	M4NGJ	913351	32	2	6	5-1-1
3A	12¼	H7UJ					Drill 21' rat hole.
4A	12¼	H7UJ		53	21	4	5-3-1 stiff foam
3A RR	12¼	H7UJ		151	98	12½	8-4-1 stiff foam
5A	12¼	H10J		180	29	8	2-7-1 stiff foam
6A	12¼	H77U		211	31	4¼	2-1-1 stiff foam
7A	12¼	M4NG		226	15	1½	3-3-1 mud.
8A	12¼	3JS		610	384	44½	2-2-1
1	8-3/4	WDR-RR	28639	615	5	3/4	Drill out - air
2	8-3/4	SS8	N4779	1900	1285	87½	8-8-1 foam
3	8-3/4	TC8 RR	FS005R	2242	342	29½	5-7-1
4	8-3/4	4JS	MS282				Clean out to bottom
5 RR	8-3/4	WDR	28639	2326	84	11½	5-2-1 mud
6 RR	8-3/4	4JS	MS282	2513	187	34	1-1-1
7	8-3/4	H77	369204	2704	191	42½	3-2-1
8	6-1/8	S88	435437	2930	226	38½	1-2-1
9	6-1/8	M88	913695	3018	88	21	1-1-1
1D	6-3/32	diamond	EC127112	3032	14	7-3/4	New
2D	6-3/32	diamond	EC117235	3233	201	39	Good
10 RR	6-1/8	S88	435437	3315	82	18¼	1-5-1
11	6-1/8	S88	435555	3850	535	38¼	1-3-1
					Total	457-3/4 hours	

DAILY MUD RECORD (PROPERTIES & ADDITIVES)

DATE	DEPTH	WT. GAL.	VIS. SECS.	W.L.	PH	KELZON	GEL	SAW DUST	CAUSTIC	BENEX	SPER SENE	SALT GEL	SALT	CMC	BI-CARB
			Drilling with air												
Apr. 3	267	3.4	110			4	50	100							
4	410	3.5	200				70		4	20					
5	607	9.0	185			4	17		2						
			Drill with air												
15	2242	8.5	200+			6	80	100							
16	2326	8.5	150	11.2		8	70								
17	2434	9.0	90	15.2			15		3		1				
18	2513	9.5	65	11.8		1						16	156	4	
19	2634	10.0	80	14.0		1								1	
20	2704	10.0	88	15.2			End of Salt Mud System								
21	2704		W.O.C.												
22	2745	8.4	38			1									4
23	2876	8.8	47	12.4	9.5	4									
24	2941	8.8	53	9.0	9.0	3	19								
25	3020	8.8	52	9.5	9.5	2	15								
26	3062	8.8	52	10.2	8.0		12								
27	3105	8.9	50	11.0	8.0										
28	3169	8.9	60	11.4	8.0										
29	3233	9.0	58	12.0	9.0										
30	3279	9.0	62	12.0	9.0										
May 1	3415	8.8	57	12.0	9.0										
2	3726	8.8	55	16.4	8.0										
3	3850	8.8	58	15	8.0										
4	3850	8.8	48	15	8.0		8								

DAILY PROGRESS REPORT

8:00 AM

DATE	DEPTH	FOOTAGE	HRS.ON BOTTOM	BIT NO.	8;00AM WEATHER	REMARKS
Mar.26/73	15	15	4	1A	+10	Drill with air - rat hole
27	15	ream	10	1A&2A		Ream to 17½"
28	34	19	10	2A&3A	+8	Ran & cemented conductor. W.O.C.
29	34				+12	W.O.C. Headed up air drill equipment.
30	123	89	13½	3A&4A	+10 wdy.	Spudded noon March 29.
31	177	47	12	3A&5A	+15	Drill
Apr. 1	210	33	5¼	5A&6A	+5	Drill. Hole sloughing badly.
2	210			7A	+10	Change to mud. Losing circulation.
3	267	57	8	7A&8A	-5	Drill. No mud loss.
4	410	136	17½	8A	-10	Drill.
5	607	197	19½	8A	+5	Drill.
6	610	3	½	8A	+6	Ran 9-5/8" surface casing.
7	610				+5	Nippling up.
8	615	5	3/4	1	+12	Pressured up OK. Drill out.
9	794	179	17¼	2	+25	Drill with air.
10	1120	326	23¼	2	+26	Drill.
11	1471	351	23¼	2	+15 snow	Drill.
12	1876	405	23	2	+10 clr.	Drill.
13	2208	332	18½	2&3	+15 clr.	Drill.
14	2242	34	12½	3&4	-10 clr.	Hole slough, water in hole. Reaming.
15	2242	0	0	RR5	-10 clr.	Unable to fill hole w/water, mixed mud w/lost circulation material, got returns.

Pipe Correction -32'.

DAILY PROGRESS REPORT Cont'd.

8:00 AM

DATE	DEPTH	FOOTAGE	HRS, ON BOTTOM	BIT NO.	8:00AM WEATHER	REMARKS
Apr. 16/73	2326	84	11½	RR5	0 clr.	Clean out 8 hrs. - drill with mud.
17	2434	108	12-3/4	RR6	-5 clr.	Laid down air rotary bed.
18	2513	79	21¼	RR6	0 clr.	Change to salt mud.
19	2634	121	22½	7	+5 wdy.	Drill.
20	2704	70	20	7	+18 wdy.	Drill - prepare to run casing.
21	2704				+10 cldy.	Ran 7" casing. W.O.C.
22	2745	41	4	8	+20 wdy.	Test B.O.P.'s, drill.
23	2876	131	21-3/4	8	+10 cldy.	Drill.
24	2941	65	18-3/4	8&9	+5	Drill. Pipe correction 7'.
25	3020	79	15	9&D1	-2 clr.	Drill and core.
26	3062	42	11-3/4	D2	+4 wdy.	Core, DST #1.
27	3105	43	12½	D2	+12 wdy.	Core.
28	3169	64	15½	D2	+28 fgy.	Core.
29	3233	64	5-3/4	D2	+18	Core, DST #2 = misrun.
30	3279	46	3-3/4	10RR	+30 clr.	Drill.
May 1	3415	136	21½	10RR	+32 clr.	Drill.
2	3726	311	23¼	11	+25 clr.	Drill.
3	3850	124	8	11	+30	Waiting on parts for logger.
4	3850					Logging.
5	3850					Ran DST #4.
6	3850					Ran DST #4 and #5.
7						Ran abandonment plugs.
						Rig released 8:00 AM, May 7th, 1973.

DEVIATION RECORD

DEPTH	DEVIATION (DEGREES)
80	¼
146	0
224	1-3/4
295	2
390	2
490	2
605	2¼
695	2
910	1-3/4
1200	1
1500	3/4
1798	¼
2110	¼
2320	2
2350	1-3/4
2420	2¼
2643	1½
2700	1-7/8
2815	2
2930	2
3018	1
3850	6-7/8

DRILL STEM TESTS

TEST #1

Date	April 26th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3002 - 62	
Flow Periods	Preflow	15 mins.
	Initial Shut-In	60 mins.
	Flow	90 mins.
	Final Shut-In	90 mins.
Pressures	IHP 1550	
	FHP 1370	
	Preflow	
	IFP 50	
	FFP 50	
	ISIP 240	
	FSIP 60	
Recovery	40' drilling mud, slightly oil flecked & gas cut. Tool open - Fair air blow to faint in 3 minutes.	

TEST #2

Date	April 29th, 1973
Operator	C. Martineau - B.J. Services
Formation	Old Fort Sand
Interval	3186 - 3233
Misrun	Spline in Shut-In tool damaged

DRILL STEM TESTS Cont'd.

TEST #3

Date	April 29th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3186 - 3233	
Flow Periods	Preflow	5 mins.
	Initial Shut-In	60 mins.
	Flow	140 mins.
	Final Shut-In	120 mins.
Pressures	IHP 1500	
	FHP 1440	
	Preflow	
	IFP 310	
	FFP 990	
	ISIP 1040	
	FSIP 1040	
Recovery	2300' of water 40,000 ppm. NaCl.	
	Temp. cool - est. 50 deg. F - no therm.	

TEST #4

Date	May 5th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3207 - 3224	
Flow Periods	Preflow	5 mins.
	Initial Shut-In	120 mins.
	Flow	120 mins.
	Final Shut-In	140 mins.
Pressures	IHP 1550	
	FHP 1400	
	IFP 240	
	FFP 900	
	ISIP 1050	
	FSIP 1030	
B.H.T.	95 degrees F	
Recovery	2200' slightly gassy, salt water (45,000 ppm. NaCl) Upper 500' slightly oil flecked	

DRILL STEM TESTS Cont'd.

TEST #5

Date	May 6th, 1973	
Operator	C. Martineau - B.J. Services	
Formation	Old Fort Sand	
Interval	3253 - 78	
Flow Periods	Preflow	10 mins.
	Initial Shut-In	60 mins
	Flow	120 mins.
	Final Shut-In	120 mins.
Pressures	IHP	1590
	FHP	1450
	IFP	380
	FFP	1030
	ISIP	1110
	FSIP	1110
B.H.T.	95 degrees F	
Recovery	2200' salt water (45,000 ppm. NaCl.)	

ABANDONMENT PLUGS

PLUG #1

1st Stage - 3850 - 3250
Ran 150 sax oilwell cement. Displaced with 24 barrels drilling mud.

2nd Stage - 3250 - 2650
Ran 150 sax oilwell cement. Displaced with 18 barrels drilling mud.
Felt Plug at 11:00 PM, May 6th. Top at 2590.

Cut off casing. Placed 5 sax cement at top. Welded on plate and installed well sign.

Rig released 8:00 AM, May 7th, 1973.