NATIONAL PETROLEUM RESERVE IN ALASKA

GEOLOGICAL REPORT

WEST DEASE TEST WELL NO. 1

HUSKY OIL NPR OPERATIONS, INC.
Prepared by: Harry Haywood & R. G. Brockway
Edited by: Gordon W. Legg

For the

U. S. GEOLOGICAL SURVEY
Office of the National Petroleum Reserve in Alaska
Department of the Interior
AUGUST 1983

TABLE OF CONTENTS

PERTINENT DATA AND APPENDICES (Continued)

COMPOSITE LITHOLOGY LOG (In Pocket)

GEOLOGIC SUMMARY

INTRODUCTION

The West Dease Test Well No. 1 is located in the northern part of the National Petroleum Reserve in Alaska in the NE 1/4 of protracted Section 21, Township 21 North, Range 14 West, Umiat Meridian, Alaska (Figure 1). The well is located on the coastal plain near the western shore of Dease Inlet approximately 27 miles east-southeast of Barrow, Alaska (Figure 2).

The well was drilled by Husky Oil NPR Operations, Inc. under contract to the U. S. Geological Survey. Drilling of the well commenced on February 19, 1980. The well was plugged and abandoned and the rig released on March 26, 1980, after drilling to a total depth (BKB) of 4,170 feet. Hydrocarbon shows were present in equivalents of the Jurassic Barrow sandstones as well as the Triassic Sag River Sandstone and Shublik Formation. A drill-stem test in the equivalent of the Lower Barrow sand at 3699-3730' recovered drilling mud with traces of oil.

PRE-DRILLING PROGNOSIS

The primary objective of the West Dease test was the updip pinchout of the Sag River Sandstone.

Trapping mechanisms for hydrocarbons were: (1) southeast regional dip; (2) truncation of the Sag River to the north and northeast of the prospect by the lower Cretaceous unconformity and subsequent deposition of the "Pebble Shale"; and (3) a facies change to shale of the Sag River sandstones to the northwest of the prospect. These conditions would provide stratigraphic closure in the updip directions. This facies change of the Sag River Sandstone was inferred from log correlation with the Iko Bay No. 1, Section 16, T21N, R16W, Umiat Meridian, and the change or absence of the typical Sag River seismic characteristics. The pinchout edge was expected to be just east and downdip from the Iko Bay well.

At the West Dease test location, up to 50 feet of Sag River sandstone was expected with porosities ranging from 10% to 20%.

Potential hydrocarbon source rocks would have been the overlying "Pebble Shale" and the underlying Shublik Formation.

The well was forecast to penetrate the top of the Sag River at 3,650 feet and the argillite basement at 3,950 feet.

POST-DRILLING SUMMARY

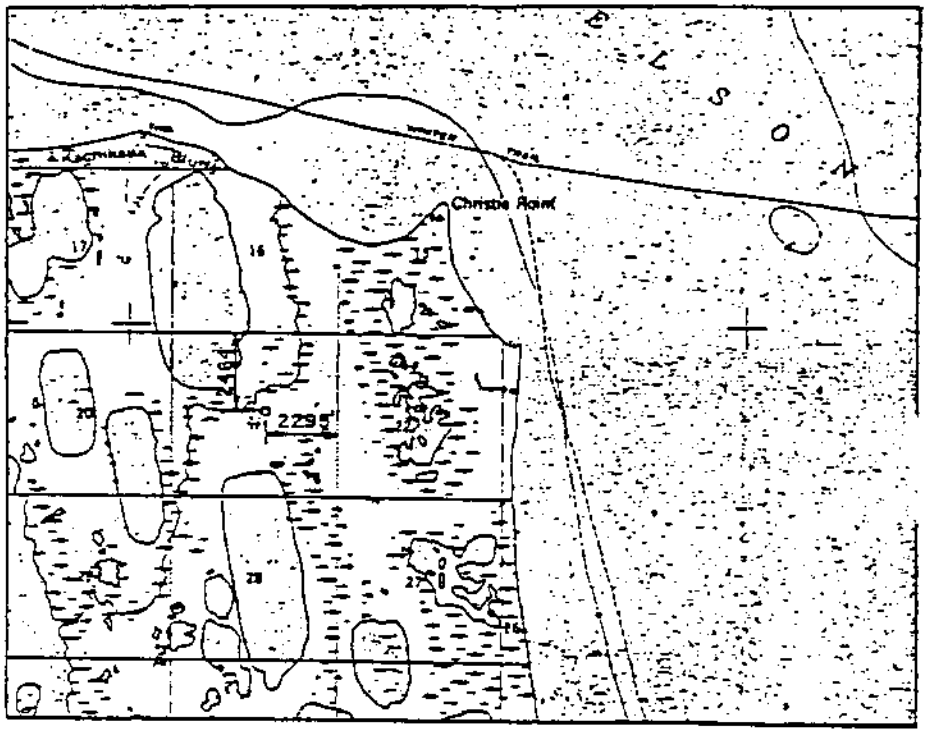
The well was drilled to a total depth of 4,170 feet into the argillite basement. The top of the argillite was picked from the wireline logs at 4,006 feet, or 56 feet lower than forecast. The top of the Sag River Sandstone is selected on the logs at 3,802 feet, or 152 feet lower than forecast.

The main zones of interest penetrated in the well were the sandstones considered to be equivalents of the Lower Barrow sandstones present in the Barrow gas fields to the west. The Lower Barrow sandstones (3694-3732') exhibited poor to fair reservoir potential. The underlying Sag River Sandstone, however, in the interval 3802' to 3826' had porosities of 11.2% to 23% as measured and calculated from logs and cores. Permeabilities from the same interval are less than 1.0 to 201 millidarcies. Analysis indicates the zone is water wet (Appendices C & D).

A drill-stem test of part of the Lower Barrow sandstone (3700-3730') recovered only drilling mud with traces of oil (Appendix E). Core and log analysis of the test interval indicate an average of 11.5-13% porosity, high water saturations, and an average permeability of less than 1 millidarcy.

One other zone of possible potential interest was a 28 foot thick conglomeratic sandstone in the interval 3330-3358', which was interpreted to be equivalent to the "Pebble Shale" sandstones developed at the base of the lower Cretaceous. This sandstone had only a trace of dead oil stain on rare individual grains and computed to have very low porosity.

The projected top of the Sag River Sandstone, estimated at 3650', was in reality the top of the Lower Barrow sandstone picked at 3694'.



Computed location based on data from Barr Automated Surveys, Inc. to Husky Oil NPR Operations, Inc. dated Aug. 11, 1979, a copy of which is on file with Tectonics, Inc., Anchorage, AK.

WEST DEASE 1-80

LAT. = 71° 09' 32.65"
LONG. = 155° 37' 45.19"
Y = 6,276,319.45
X = 307,294.09
ZONE 5

CERTIFICATE OF SURVEYOR

I hereby certify that I am properly registered and licensed to practice land surveying in the State of Alaska and that this plat represents a location survey made by me or under my supervision, and that all dimensions and other details are correct.

0 1/2 1 2
SCALE IN MILES

AS STAKED

WEST DEASE TEST WELL No. 1

LOCATED IN

NE 1/4 PROTRACTED SEC. 21, T2N., R.14W. UMIAT MERIDIAN, AK.

SURVEYED FOR

HUSKY OIL

N.P.R. OPERATIONS, INC.

TECTONICS INC.

P.O. BOX 4-2265, ANCHORAGE, AK 99509

FIGURE 1 - SURVEYOR'S PLAT - WEST DEASE TEST WELL NO. 1

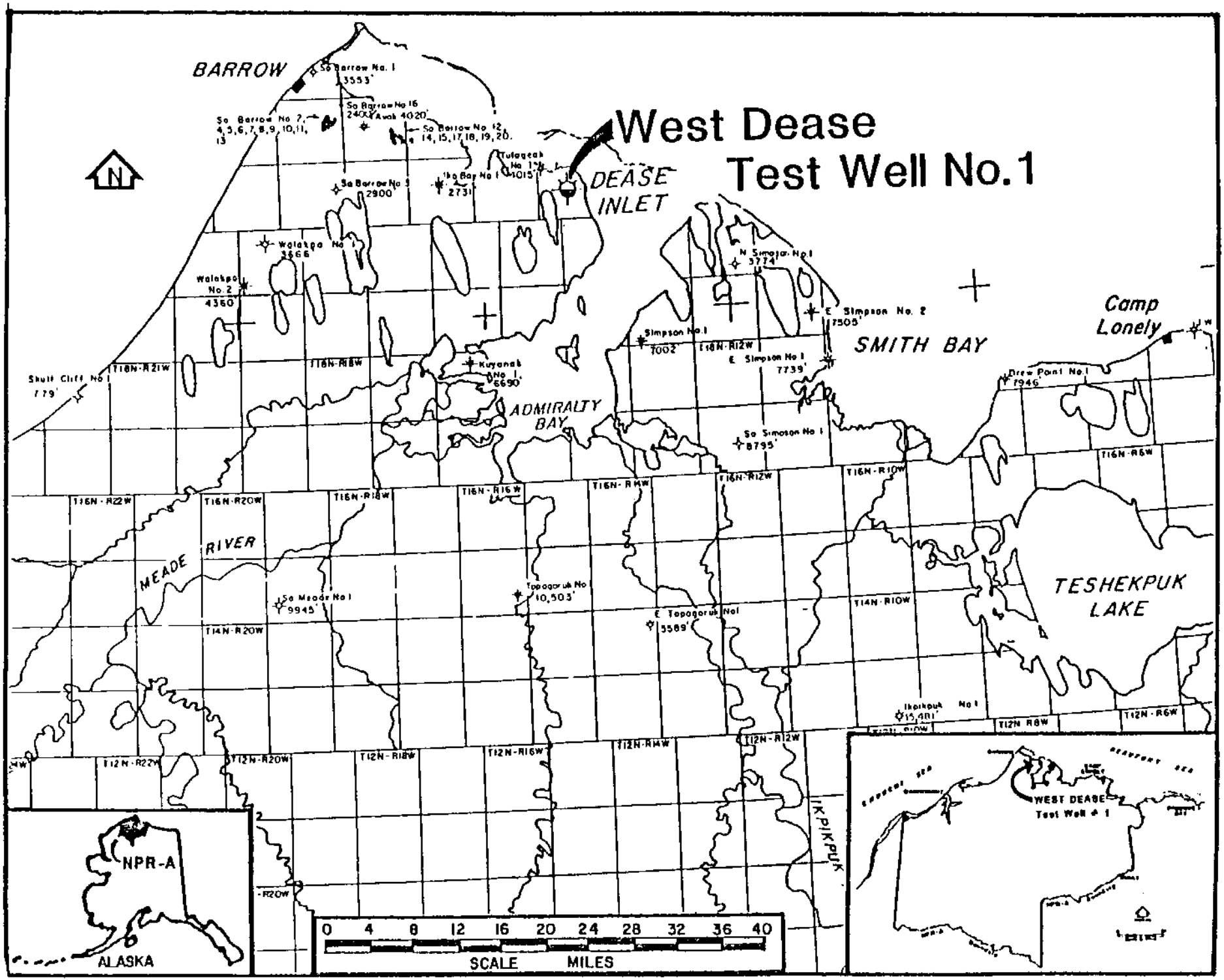


FIGURE 2 - LOCATION MAP - WEST DEASE TEST WELL NO. 1

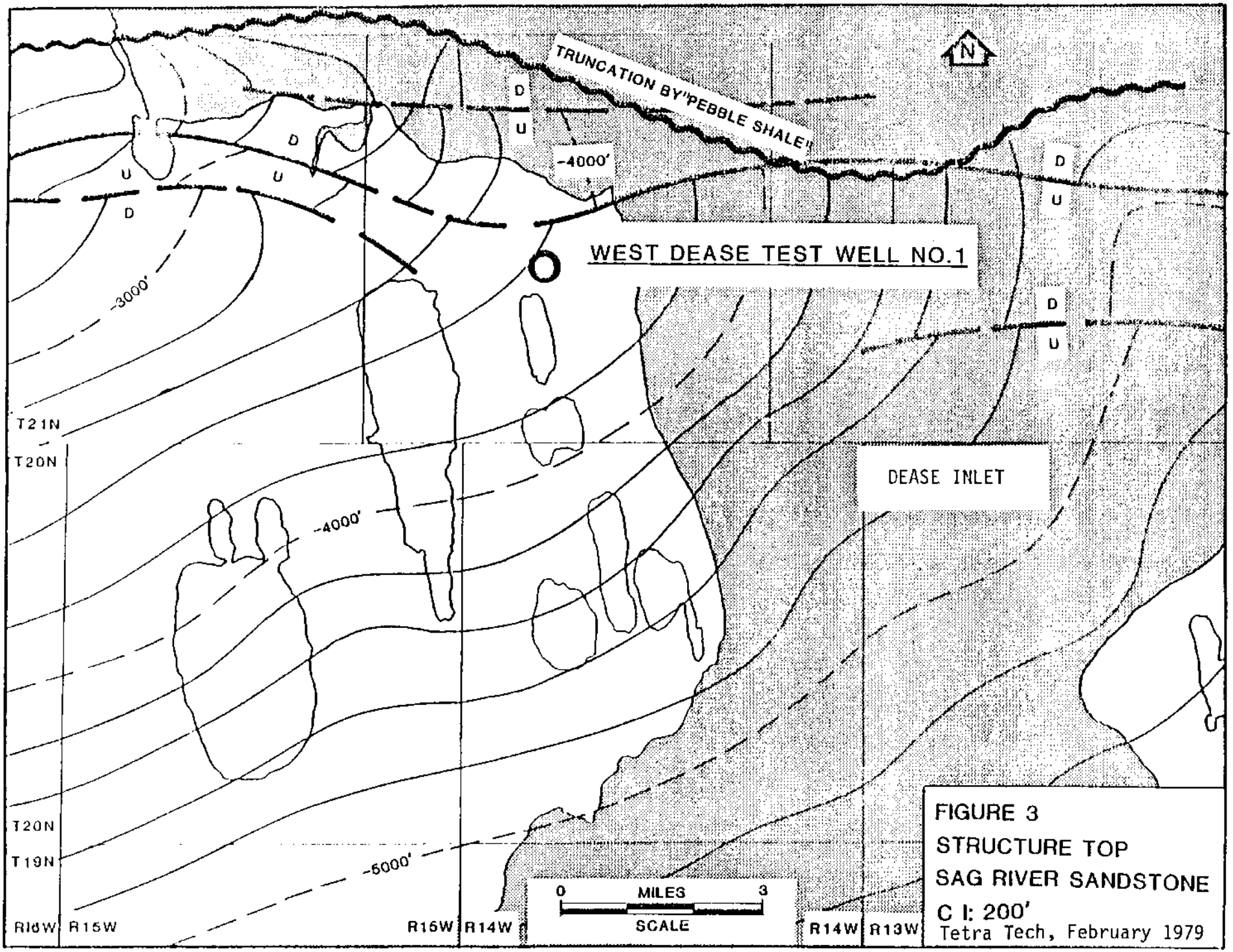


FIGURE 3
STRUCTURE TOP
SAG RIVER SANDSTONE
C I: 200'
Tetra Tech, February 1979

WELLSITE GEOLOGIST REPORT
BY
R. V. NELSON, JR.

INTRODUCTION

The West Dease Test Well No. 1 was spudded at 0600 hours on February 19, 1980 using Brinkerhoff Rig 31. Twenty-inch conductor had been set at 101' (below the Kelly Bushing) during construction operations. Nanushuk Group sediments of Lower Cretaceous age were found starting with the first samples collected below the conductor.

The well was drilled in order to test the possibility of a stratigraphic trap being developed in the Sag River Sandstone, as interpreted by seismic.

The West Dease Test Well No. 1 reached total depth on March 22, 1980 after penetrating a stratigraphic section similar to many of the Barrow gas field wells. The postulated truncation and facies changes which were to have created a stratigraphic trap were unconfirmed at this location.

The well was plugged and abandoned on March 26, 1980 after testing the Lower Barrow sandstone with a recovery of only drilling mud with a trace of oil. No other zones were judged to warrant additional evaluation.

STRATIGRAPHY

WIRELINE TOPS

	Drilled Depth (BKB)	Subsea Depth
CRETACEOUS		
Nanushuk Group (undifferentiated)	101' samples start	-77'
Torok Formation	595'	-571'
"Pebble Shale"	2919'	-2895'
JURASSIC		
Kingak Formation	3358'	-3334'
Lower Barrow sandstone equivalent	3694'	-3670'
TRIASSIC		
Sag River Sandstone	3802'	-3778'
Shublik Formation	3912'	-3888'
INDETERMINATE		
Argillite	4006'	-3982'
Total Depth	4170'	-4146'

CRETACEOUS

Nanushuk Group (undifferentiated): 101' to 595'

From 101' to approximately 595', the section is characterized by interbedded light gray-brown claystones and siltstones, gravel, and gray, partly conglomeratic sandstones with scattered gray shales. Carbonaceous material and coal stringers are common.

Torok Formation: 595-2919'

Below 595' to a depth of approximately 1845', claystones are the main constituent of the formation. Thin interbedded siltstones and scattered sandstones make up a small part of the Torok. The claystones are light gray-brown, soft, partly silty, and grade in part to gray-brown siltstones to approximately 1550'. Below this point there is a color change to medium and dark gray for the claystones and gray for the siltstones. The randomly scattered sandstones in the formation are medium to light gray, generally fine to very fine grained, subangular to subrounded, carbonaceous and clay filled. Rare beds are calcite cemented and exhibit poor porosity. Sandstone beds are more numerous and slightly thicker in the interval 1785-1900'. No shows were recorded.

Medium dark gray to gray-brown, carbonaceous, micaceous shales occupy the majority of the lower Torok Formation (1845-2919'). The shales are silty in part and grade to siltstones.

Palynological studies by Anderson, Warren & Associates, Inc. (AWA) classified the interval from 110' to 2945' as Aptian-Early Albian (AWA Zonule P-M18). From foraminiferal determinations, a slightly different zonation was made in which the upper portion, from 101' to 690', was called Middle to Late Albian (AWA Zone F-9). From 690' to 1850', the assemblage was indicative of Late Aptian to Early Albian (AWA Zone F-10), and 1850' to 2930' was assigned to the Aptian (AWA Zone F-11).

There is a shallowing of marine depositional environments with time through the Torok Formation and Nanushuk Group. The lower thousand feet represent open marine conditions grading upward to middle to outer neritic above 1850' and middle to inner neritic above 690'. This is shown by the change in foraminiferal assemblages and the basic sediment deposition with a general coarsening in an upward direction of the sandstones and deposition of lignitic material above 690'.

No potential reservoir zones or hydrocarbon shows were observed.

"Pebble Shale": 2919-3358'

At 2919', the top of the Early Cretaceous "Pebble Shale" was encountered. At this point there is also a marked change in the appearance of the shales from those of the Torok above. The "Pebble Shale" is very dark gray to brown and appears almost black in contrast to the lower portion of the Torok Formation which is medium to dark gray-brown. The "Pebble

Shale" contains very fine detrital mica like the Torok above, but the shale appears harder, has finely laminated to disseminated pyrite, and is characterized by well rounded, polished to frosted quartz grains "floating" throughout.

At the base of the "Pebble Shale", the "Pebble Shale" sand (possible equivalent to the Kuparuk Sandstone) is present in the interval 3330' to 3358'. The sandstone is represented in the sample by poorly consolidated medium to coarse, subangular to subrounded, varicolored quartz grains and pebbles, abundant large fragments of black, smoky gray and blue-gray chert and a trace of red jasper. Pyrite nodules are common. A trace of dead oil stain was observed on rare grains. There was no fluorescence or cut and no indication of gas. This varicolored conglomeratic unit probably represents the transgressive basal unit deposited on the regional unconformity which truncates pre-Cretaceous formations.

Interpretation of electric logs indicate the sandstone to be water wet.

Paleontological evidence supports the sample and electric-log identification of the "Pebble Shale". Foraminifera represent the Hauterivian to Barremian and Valanginian (AWA Zones F-12 to F13) and palynological forms indicated a Neocomian age (AWA Zonule P-M19).

JURASSIC

Kingak Formation: 3358-3885'

The Jurassic in the West Dease Test Well No. 1 is represented by the Kingak Formation. The lower part of the formation includes the Upper and Lower Barrow sandstones that are the producing zones in the Barrow gas fields to the west.

Based on paleontological evidence, the upper part of the Kingak is absent. The foraminiferal assemblage shows Lower Jurassic to Upper Triassic (AWA Zones F-18 to F-19) (to a depth of 3732') directly below the Lower Cretaceous (AWA Zones F-12 to F-13) of the "Pebble Shale". The ages indicated by palynology differ only slightly from this. A Neocomian age (AWA Zonule P-M19) was indicated by samples from sidewall cores in the "Pebble Shale" sand with the next defined interval (3356-3800') dated as Early Jurassic (AWA Zonule P-M24). Reworked specimens are common in this interval.

The Kingak Formation is composed primarily of light gray-brown silty claystones, medium dark gray-brown micaceous silty shales, and light to medium gray soft clayey siltstones. All have lignite and pyrite inclusions. Sandstones are scattered but become more common toward the bottom of the Kingak, finally culminating in the Lower Barrow sandstone from 3694-3732'. They are light gray, partly "salt and pepper", very fine grained, subrounded and subangular, clay filled, rarely calcareous and have poor porosity. The Lower Barrow sandstone is discussed separately.

Lower Barrow sandstone: 3694-3732'

The Lower Barrow (3694-3732') is light to dark brown, very fine grained, subrounded to subangular, poor to fair sorted, sideritic, and has some shale laminations. This unit has poor to fair porosity and poor to good hydrocarbon shows. An average of 13% porosity was computed from the electric logs, with core analysis showing 6.5-16.7% porosity and mostly high water saturations (Appendices C & D). A drill-stem test was taken over the interval 3699-3730' which recovered 0.69 barrels of rat hole mud with 1% oil (Appendix E).

Glauconite pellets are scattered throughout the Lower Barrow.

TRIASSIC

Sag River Sandstone: 3802-3912'

The top of the Sag River Sandstone has been picked on the basis of a marked reduction in the gamma-ray reading on the electric log. At this point there is also a color change from the dark grays above to medium gray and gray-brown. Although the neutron density porosity log indicates a zone of approximately 24 feet (3802-3826') of sandstone with fair to good porosity, very little sandstone was described in the core taken through this zone (see Core No. 7). Electric-log analysis indicates a water-wet sandstone with 13-22% porosity, which is confirmed by core analysis (Appendices C & D).

Core and sample descriptions show that the unit is primarily a siltstone with interbedded sandstones and shales. The siltstones are medium to dark gray-brown. They are sandy, argillaceous, glauconitic, and contain dark gray shale laminae. Hydrocarbon staining was present throughout.

Interbedded with the siltstones in the upper part are thin medium gray to brown, very fine grained, silty, argillaceous non-porous sandstones with oil staining. Dark gray, hard, silty shales are scattered throughout the unit.

The section (3826-3912') has been designated as the lower, shaly portion of the Sag River Sandstone and is characterized by a light to medium gray, very fine grained, glauconitic, clayey, friable to firmly cemented sandstone with shell fragments. Green, glauconitic, sandy siltstone was also observed in the samples.

Shublik Formation: 3912-4006'

The upper 28 feet of the Shublik Formation as picked from the electrical logs and described in Core No. 8 (3912-3973') is primarily sandstone with interbedded siltstone and minor shale and limestones. The sandstones vary in color from dark gray and green to medium gray-brown. They are very fine grained to partly fine grained, clay filled, slightly calcareous, and fossiliferous. The sandstones contain shale laminations and have a slight hydrocarbon show. Thin interbedded dark gray to dark gray-green siltstones were observed. A thin very finely crystalline limestone is present from 3926.4-3927.4' in Core No. 8.

Below 3940.5', the rocks are mainly siltstones that are medium to dark green with some very dark gray. The siltstones are hard, calcareous, argillaceous, have shale laminae and scattered fossils. A siltstone from 3986.3-3996.5' also contains occasional small chert pebbles, pyrite nodules and limy concretions at 3989'. Interbedded with the siltstones are dark green, very fine to fine grained, glauconitic clay-filled sandstones and very dark gray hard shales.

At 3999-4000.5', a conglomerate with buff to dark gray, subrounded to rounded, chert pebbles and granules and a black mudstone matrix was logged (Core No. 9). This may be the base of the Shublik Formation although the base of the Shublik/top of the Argillite (4006') has been picked on a log break below a dark gray siltstone. The bottom portion of Core No. 9 (4003-4033') was not recovered. It is not known what type rock was present there.

Biostratigraphic studies by Anderson, Warren & Associates, Inc. have placed the interval 3732-4012' into a foraminiferal zone of Triassic age (AWA Zone F-19) and a Late Triassic, Norian age (AWA Zonule P-M26) for 3850-4003' by palynology. Below this point data was indeterminate.

INDETERMINATE

Argillite: 4006-4170' Total Depth

The top of the argillite has been picked from the electrical logs at 4006' where there is a distinct change in both the gamma-ray and the resistivity. Log characteristics below this point are typical of those found in the argillite sections drilled in other wells in this area.

The top of the argillite occurred in the unrecovered portion (4003-4033') of Core No. 9. From 4033-4100' medium to dark gray and gray-brown shales with some gray and gray-brown siltstones were observed in the samples. Possibly some of these may have been cavings. A trace of black claystone was seen in the 4040-4070' samples and may be from the argillite zone. Argillite was described below 4100' in the samples, and Core No. 10 (4150-4160') recovered 1.5 feet of argillite. Sidewall cores obtained at 4012' and 4061' described argillitic shale, which was dark gray, slightly micaceous and contained nearly vertical bedding.

CONCLUSIONS

After full evaluation of all available data, it was deemed that the West Dease Test Well No. 1 contained no commercial hydrocarbon accumulations. The well was plugged and abandoned.

The seismically interpreted top of the Sag River Sandstone at 3650' was in reality the top of the Lower Barrow sand which has been picked at 3694'. The Sag River Sandstone (3802-3912') in the West Dease well, has thinned to 110' from 190' at the South Simpson No. 1, Section 22, T17N, R12W, Umiat Meridian.

PERTINENT DATA AND APPENDICES

SUMMARY PERTINENT DATA, OPERATIONS & ANALYSIS*

Summary Pertinent Data

WELL NAME:	West Dease Test Well No. 1
API NO.:	50-023-20014
OPERATOR:	Husky Oil NPR Operations, Inc.
LOCATION:	Latitude: 71°09'32.65" North Longitude: 155°37'45.19" West X = 307,294.09; Y = 6,276,319.45 Zone 5
COORDINATES:	2295' FEL, 2464' FNL, protracted Section 21, T21N, R14W Umiat Meridian North Slope Borough, Alaska
ELEVATION:	Ground Level 7'; Kelly Bushing 24'
DATE SPUDDED:	February 19, 1980
TOTAL DEPTH:	4170' Driller; 4166' Wireline
DATE TOTAL DEPTH REACHED:	March 22, 1980
RIG RELEASED:	March 26, 1980
CASING:	20" at 101' (Driller) 13-3/8" at 288' (Driller) 9-5/8" at 2970' (Driller)
HYDROCARBON SHOWS:	No significant shows except minor gas, fluorescence and cuts in Barrow sandstone
TESTS:	Drill-Stem Test No. 1 @ 3700-3730'
STATUS:	Plugged and abandoned.

Summary Operations and Analysis

LOGGING RECORD:

Open hole:	DLL/MSFL/GR/SP/CAL	288-4164'
	BHCS/TTI/GR	288-4165'
	FDC/CNL/GR/CAL	288-4165'
	ML/MLL/CAL	2965-4165'
	HDT Dipmeter	288-4165'
	HRT Temp (Run 1)	50-4170'
	HRT Temp (Run 2)	50-4160'
	Velocity Survey	304-4150'
	Mud Log	110-4170'
Computed Logs:	Dipmeter Arrow Plot	1850-4086'
	SARABAND	2970-4143'

SIDEWALL CORES: Run No. 1 745-2912', Shot 16, Recovered 16.
Run No. 2 2991-4061', Shot 24, Recovered 24.
(Some depths double shot)

CONVENTIONAL CORES:

No.	Interval	Recovery	Unit
1	600- 630'	27'	Torok Formation
2	1099-1129'	14'	Torok Formation
3	1900-1930'	30'	Torok Formation
4	2945-2975'	30'	"Pebble Shale"
5	3700-3732'	32'	Upper Barrow sandstone
6	3732-3790'	58'	Upper Barrow sandstone
7	3790-3850'	60'	Upper & Lower Barrow sandstone
8	3912-3973'	57'	Shublik Formation
9	3973-4033'	30'	Shublik Formation & argillite?
10	4150-4160'	1.5'	Argillite

CORE ANALYSIS PERFORMED: **

Date	Interval	Core No.	Sample No.
3/13/80	3700-3731'	5	1- 32
3/13/80	3730-3787'	6	33- 60
3/13/80	3790-3850'	7	61-105
3/13/80	3912-3969'	8	106-135
3/13/80	3973-4003'	9	136-152

TESTS (Summary): ***

Interval	Description
Test No. 1	
3700-3730'	Open hole DST with 500' of glycol cushion, IHP 2,074 psi. Gauge Depth: 3726' 1st FP (30 min.): Opened tool through 1/4" choke with weak blow air and continued throughout flow period. IFP 282-300? psi, shut in for 60 minutes, ISIP 1,368 psi. 2nd FP (240 min.): Opened tool through 1/4" choke with weak blow air, decreased to very weak blow in 2 hours, increased to weak blow air in 3 hours, continued to end of flow period (no gas), FFP 318-371 psi, shut in for 480 minutes, FSIP 1,597 psi. Recovered 0.69 barrels rat-hole mud with approximately 1% oil.

FLUID ANALYSIS: ****

1. Water Analysis (2); Recovery fluid Drill Stem Test No. 1.
2. Gas Analysis (2); Recovery from Drill Stem Test No. 1.

Miscellaneous Pertinent Data

WELLSITE GEOLOGIST:	W. D. Fenex R. V. Nelson, Jr.
WELL LOG ANALYST:	A. Kane
DRILLING CONTRACTOR:	Brinkerhoff Signal Inc., Rig 31
MUD LOGGERS:	The Analysts
BIOSTRATIGRAPHIC ANALYSIS:	Anderson, Warren & Associates, Inc.

* Copies and/or reproducibles of all geological data are available from:

National Oceanic and Atmospheric Administration
EDIS/NGSDC (D62)
325 Broadway
Boulder, CO 80303

** Includes correlation coregraph with core gamma ray.

*** See Appendix E for report.

**** See Appendix F for report.

WEST DEASE TEST WELL NO. 1
DRILL CUTTINGS AND CORE DESCRIPTIONS
BY
D. FENEX - 101-3769'
R. V. NELSON - 3769-4170'

DRILLED DEPTH (FEET BELOW KELLY BUSHING)

Set 20" Conductor at 101'

0 - 101 No samples collected.

101 - 128 Claystone: light gray-brown, soft, gummy, disperses in water, with very fine black carbonaceous specks, silty in part, grades to siltstone; abundant fossil prisms.

128 - 158 Gravel: unconsolidated, consists of pebbles of rounded, clear to frosted quartz, and black to brown chert, very poorly sorted.

158 - 295 Claystone: light gray-brown, as above, with interbedded Conglomerate: as above; grades to Sandstone: conglomeratic, coarse grained, "salt and pepper", very poorly sorted, subangular to subrounded, abundant pyrite nodules, becomes less conglomeratic towards base, thin beds of Lignite: black, shiny, partly subbituminous, woody texture in part; abundant loose fossil prisms.

295 - 390 Claystone: light gray-brown, soft, gummy, as above, with abundant loose, clear, rounded quartz pebbles; trace of lignite, black, shiny.

390 - 455 Claystone: as above, grades to Shale: gray, smooth, blocky, noncalcareous, moderately indurated, thin beds of Sandstone at 390-397' and 425-432', gray, medium to coarse grained, subangular to subrounded, fair sorting, soft, friable, fair to poor porosity; traces of lignite and quartz pebbles.

455 - 600 Claystone: as above, becomes more shaly; thin sandstone beds at 512-515' and 545-550'; same as above, becomes fine grained to silty; rare lignite.

600 - 630 Core No. 1: Cut 30', Recovered 27'

600.0-627.0' (27.0') Claystone: light gray-brown, soft, gummy, smooth, micromicaceous, silty laminae in part, grades to Siltstone:

gray, sandy in part, micaceous, carbonaceous, moderately to poorly indurated.

627.0-630.0' (3.0') No recovery.

630 - 730 Claystone: as above.

730 - 750 Claystone: as above, with common loose clear rounded quartz pebbles.

750 - 840 Claystone: as above, becomes very silty towards base, grades to Siltstone: gray-brown, poorly indurated, minute carbonaceous inclusions.

840 - 875 Siltstone: as above, with interbedded Claystone: as above.

875 - 975 Claystone: as above.

975 - 1099 Siltstone: gray-brown, moderately indurated, calcareous, minute carbonaceous inclusions, pyrite inclusions, with interbedded Claystone: as above, rare quartz pebbles.

1099 - 1129 Core No. 2: Cut 30', Recovered 14'

1099.0-1113.0' (14.0') Claystone: gray-brown, soft, gummy, disperses in water, micaceous, silty in part.

1113.0-1129.0' (16.0') No recovery.

1129 - 1250 Claystone: as above, with thin beds of Siltstone: gray, sandy, "salt and pepper", micaceous, calcareous, carbonaceous.

1250 - 1465 Sandstone: gray, fine grained, subrounded to subangular, fair sorting, "salt and pepper", common medium to coarse carbonaceous inclusions, white clay filling and calcite cement, soft, friable, grades to siltstone in part, with interbedded Claystone: as above, rare pyrite inclusions.

1465 - 1740 Claystone: as above, becomes darker gray in color, more firm, blocky in part, rare fossil fragments, with Sandstone: as above, from 1500-1510'.

1740 - 1900 Sandstone: as above, no odor, stain, cut, or fluorescence; grades to siltstone in part, minute carbonaceous inclusions; with interbedded Claystone: as above.

1900 - 1930 Core No. 3: Cut 30', Recovered 30'

1900.0-1913.0' (13.0')	Shale: medium dark gray-brown, subfissile, micromicaceous, rare to common lignitic inclusions with woody texture, silty, moderately indurated.
1913.0-1921.0' (8.0')	Siltstone: gray, sandy, "salt and pepper", micaceous, carbonaceous, rare coarse kaolinite inclusions, very argillaceous in part, grades to shale.
1921.0-1930.0' (9.0')	Shale: dark gray, micromicaceous, as above, becomes smooth, moderately indurated, coarse lignitic inclusions with woody texture at 1927', grades to siltstone at base.

1930 - 2078 Shale: medium dark gray, subfissile, micromicaceous, silty, rare to common lignitic inclusions, moderately indurated, grades to siltstone in part.

2078 - 2095 Sandstone: thinly bedded, light gray, slightly "salt and pepper", very fine grained, subrounded to subangular, fair sorting, calcite cement, moderately friable, very poor porosity, no odor, stain, cut, or fluorescence; with Shale: as above.

2095 - 2238 Shale: as above, silty, grades to siltstone in part.

2238 - 2272 Sandstone: as above, thinly bedded, with Shale: as above, becomes very silty, grades to siltstone in part.

2272 - 2510 Shale: gray-brown, silty, grades to Siltstone in part: as above, rare to common carbonaceous inclusions, sandstone stringers and thin beds.

2510 - 2805 Shale: as above, splintery to lumpy, becomes siltier and darker, interbedded siltstone and sandstone.

2805 - 2862 Sandstone: light gray to gray, very fine grained, slightly argillaceous, "salt and pepper", subangular and subrounded, indurated, very poor porosity, some white clay filling towards base, no show, thinly bedded with Shale: as above, pyrite inclusions, dark gray-brown.

2862 - 2926 Shale: dark gray-brown, as above, with trace of white kaolinitic material.

2926 - 2945 Shale: as above, with common chlorite(?) green, loose, and Limestone: tan, with bright green mottling, dense, glauconite pellets, and rare Sandstone: gray, with some

pink grains, fine to medium grained, subrounded and subangular, poor sorting, white clay and calcite cement, very poor porosity, no odor, stain, cut, or fluorescence.

2945 - 2975 Core No. 4: Cut and Recovered 30'

2945.0-2975.0' (30.0') Shale: very dark gray, organic, silty in part, fissile, moderately indurated, spicules filled with pyrite and clay, rare bioturbation, burrows filled with Sandstone: green-gray, very fine grained, some clear to pink to tan grains, glauconite pellets, calcite and white clay cement, thin scattered laminae of chlorite(?), green, grades to light gray, very pyritic, abundant biotite.

2975 - 2980 Shale: as above.

2980 - 3092 Shale: black, organic, subfissile, silty, firm, rare pyrite nodules, rare to common subrounded, polished quartz pebbles "floating" in matrix.

3092 - 3097 Sandstone: composed of unconsolidated quartz grains, fine to medium grained, subrounded to subangular, poor to fair sorting.

3097 - 3198 Shale: dark gray-brown, silty, micromicaceous, rare carbonaceous inclusions with woody texture, pyrite nodules, rare quartz pebbles, moderately indurated, subfissile to platy, becomes very silty, grades to Siltstone: dark gray, very argillaceous, moderately indurated, silty, calcareous, Limestone concretions: tan.

3198 - 3295 Shale: dark gray-brown, platy to blocky, micromicaceous, rare carbonaceous inclusions, pyrite nodules, rare quartz pebbles, moderately to well indurated, becomes very clayey in part, Limestone concretions: brown, as above.

3295 - 3347 Shale: as above, with interbedded zones, 3293-3298', 3312-3318', and 3324-3328' of Sandstone: gray-brown, "salt and pepper" (coarse black material), fine to medium grained, rarely coarse grained, subrounded to subangular, poorly sorted, calcite cement, poor to moderately indurated, very poor porosity, very dull gold fluorescence, slow milky cut.

3347 - 3376 Sandstone: conglomeratic, composed of unconsolidated quartz, clear, rare pink and amber, medium to coarse grains and pebbles, subrounded to subangular, very poorly sorted, common pyrite nodules and abundant large

	fragments of Chert: black, smoky gray, blue-gray, trace of red jasper, trace of dead oil stain on rare individual grains, no fluorescence, cut, or gas; thin Clay zone: brown, silty, lignitic inclusions from 3352-3359'.
3376 - 3408	Clay: as above, grades to light gray in color, bentonitic.
3408 - 3440	Siltstone: light gray, very clayey, grades to clay in part, soft, gummy, with abundant lignitic inclusions.
3440 - 3468	Clay, as above.
3468 - 3497	Sandstone: light gray, "salt and pepper", very fine grained to silty, subrounded to subangular, fair sorting, calcite and white clay cement, moderately indurated, very poor to nil porosity, no odor, stain, cut, or fluorescence; with interbedded Clay: as above, light gray, silty, lignite inclusions.
3497 - 3515	Siltstone: gray, very clayey, soft, gummy, micromicaceous, lignite inclusions, pyrite nodules, grades to clay.
3515 - 3539	Clay: as above, grades to Shale: light gray-brown, silty, micromicaceous, platy to blocky, minute lignite inclusions, common pyrite and chert nodules, moderately indurated.
3539 - 3588	Siltstone: gray-brown, very argillaceous, pyrite inclusions, well indurated, with interbedded Shale: light to dark gray-brown, silty, micromicaceous, platy to blocky, moderate to well indurated, common chert inclusions.
3588 - 3596	Sandstone: light gray-brown, very fine grained to silty, "salt and pepper", subrounded to subangular, fair sorting, siderite cement, rare green glauconite pellets, nil to very poor porosity, no odor, stain, cut, or fluorescence.
3596 - 3633	Shale: medium dark gray-brown, silty, as above, with rare quartz pebbles, pyrite inclusions.
3633 - 3642	Sandstone: light gray-brown, as above.
3642 - 3678	Shale: as above, with interbedded Sandstone: as above, grades to siltstone in part.
3678 - 3695	Sandstone: dark gray-brown, very argillaceous, very fine grained to silty, "salt and pepper", subangular to subrounded, poor sorting, siderite and clay cement, rare glauconite pellets, well indurated, nil porosity, grades to shale at base.

3695 - 3700 Sandstone: gray-brown, slightly "salt and pepper", very fine to fine grained, rarely coarse, subrounded to subangular, poor to fair sorting, rare to common green glauconite pellets, rare lignitic inclusions, rare large fossil fragment, siderite and clay cement, very poor porosity, no odor, stain, cut, or fluorescence.

3700 - 3732 Core No. 5: Cut 32', Recovered 32'

3700.0-3703.0' (3.0')	Sandstone: gray-brown, slightly "salt and pepper", very fine to fine grained, fair sorting, subrounded to subangular, siderite cement, micromicaceous, some minute lignite inclusions, bright green glauconite pellets, scattered small to rare large argillaceous inclusions, poor to fair intergranular porosity, good odor, even to slightly scattered bright pale gold fluorescence, immediate milky cut.
3703.0-3704.0' (1.0')	Sandstone: dark gray-brown, very fine grained to silty, very argillaceous, micromicaceous, well indurated, rare glauconite, very poor porosity, scattered pale gold fluorescence, immediate milky cut.
3704.0-3705.0' (1.0')	Sandstone: gray-brown, as above, very fine grained, common shale laminations, poor porosity, scattered (50-75%) pale gold fluorescence, immediate milky cut.
3705.0-3706.0' (1.0')	Sandstone: gray-brown, as above, less shale laminations, poor to fair porosity, even bright pale gold fluorescence, immediate milky cut.
3706.0-3709.0' (3.0')	Sandstone: as above, becomes argillaceous, poor porosity, scattered (50-75%) pale gold fluorescence, immediate milky cut.
3709.0-3710.0' (1.0')	Sandstone: dark gray-brown, silty, very argillaceous, very poor porosity, scattered (25%) pale gold fluorescence, immediate milky cut.
3710.0-3712.0' (2.0')	Sandstone: gray-brown, as above, rare argillaceous inclusions and laminations, poor to fair porosity, even pale gold fluorescence, immediate milky cut.

	3712.0-3714.0' (2.0')	Sandstone: as above, increase in shale laminations, scattered (50%) pale gold fluorescence, immediate milky cut, poor porosity.
	3714.0-3716.0' (2.0')	Sandstone: dark gray-brown, becomes very argillaceous, abundant shale laminations, very poor porosity, scattered (25%) pale gold fluorescence, immediate milky cut.
	3716.0-3719.0' (3.0')	Sandstone: light gray-brown, as above, poor to fair porosity, scattered (25%) pale gold fluorescence, immediate milky cut, rare shale laminae.
	3719.0-3720.0' (1.0')	Sandstone: as above, grades to poor porosity, increase in shale laminations, scattered (50%) pale gold fluorescence with immediate milky cut.
	3720.0-3723.0' (3.0')	Sandstone: dark gray-brown, very silty and argillaceous, well indurated, very poor porosity, scattered (25%) pale gold fluorescence, immediate cut.
	3723.0-3726.0' (3.0')	Sandstone: light gray-brown, as above, very fine grained, poor to fair porosity, scattered (75%) pale gold fluorescence, immediate milky cut, scattered shale laminae.
	3726.0-3727.0' (1.0')	Sandstone: dark gray-brown, as above, very silty and argillaceous, abundant shale laminae, scattered (25%) pale gold fluorescence, immediate milky cut.
	3727.0-3732.0' (5.0')	Sandstone: light gray-brown, as above, scattered (50-75%) pale gold fluorescence, immediate milky cut, generally very poor to rare, fair porosity, becoming dark gray-brown and very silty 3730-3731'.
3730 - 3790	Core No. 6: Cut 60', Recovered 58.3'	
	3730.0-3733.0' (3.0')	Sandstone: dark gray, very fine grained, firm to hard, silty and argillaceous, fossiliferous (ammonites and brachiopods), fair porosity, apparent poor permeability, fair petroleum odor, light stain, gold fluorescence, bright blue-gold cut, medium to dark straw cut residue.

3733.0-3734.0' (1.0')	Sandstone: as above, scattered thin irregular dark gray shale laminations, minor crossbedding, good fluorescence in sandstone, apparent low permeability.
3734.0-3735.4' (1.4')	Sandstone: medium gray, very fine to fine grained, firm, silty, slightly argillaceous and calcareous, fossiliferous, tight, fair oil fluorescence.
3735.4-3741.0' (5.6')	Sandstone: medium to dark gray, very fine to fine grained, argillaceous, silty, fine irregular shale laminae, oil staining in cleaner sandstone, good fluorescence, carbonized and pyritized woody material at 3739.8'.
3741.0-3745.5' (4.5')	Siltstone: dark gray, sandy, argillaceous, fossiliferous, streaks with carbonized and pyritized woody material.
3745.5-3747.9' (2.4')	Sandstone: medium to dark gray, very fine grained, silty, argillaceous, hard, very fine, irregular shale laminae, fossiliferous (brachiopods and ammonites), poor porosity, fair oil show.
3747.9-3748.5' (0.6')	Limestone, coquina? ammonite hash, fine to medium sand matrix, shale clasts and laminae, open vugs or burrows, fair to good show, fair porosity.
3748.5-3751.0' (2.5')	Sandstone: very fine to fine grained, fossiliferous, very fine dark gray shale laminae, fair bright yellow-gold fluorescence, yellow to milky blue cut.
3751.0-3753.1' (2.1')	Siltstone: dark gray, argillaceous, thin irregular sandstone laminae, hard, slightly calcareous, poor oil shows in sandstone laminations.
3753.1-3754.5' (1.4')	Sandstone: medium gray, firm to hard, very fine grained, carbonized wood material, fair porosity, possible fair permeability, fair oil fluorescence, flushed appearance.
3754.5-3756.6' (2.1')	Siltstone: as above, with irregular sandstone laminae, as above, fine crossbedding and clasts, fossiliferous, oil stain and fluorescence in sandstones and fossils.

	3756.6-3757.2' (0.6')	Sandstone: medium to dark gray, very fine grained, silty, tight, hard, slightly calcareous, very fine shale laminae, oil fluorescence throughout.
	3757.2-3762.0' (4.8')	Siltstone: dark gray, sandy, argillaceous, hard, tight, fossiliferous, some woody material, interlaminated fine grained sandstone with oil fluorescence, poor show.
	3762.0-3764.5' (2.5')	Sandstone: medium gray, very fine grained, hard, silty, argillaceous, tight, streaky oil fluorescence, siltstone bed 3762.9-3763.5', sandstone slightly cleaner and better stained below siltstone.
	3764.5-3787.5' (23.0')	Siltstone: dark gray, sandy, argillaceous, thin interbedded and interlaminated sandstones, casts and crossbeds, scattered fossils and woody material, rare spots bleeding light brown oil, shows of oil in sandstones above 3780'.
	3787.5-3790.0' (2.5')	Sandstone: medium gray, very fine grained, silty, slightly argillaceous, fossiliferous, fair porosity, strong odor, yellow fluorescence with good bright blue-gold cut.
3790 - 3850	<u>Core No. 7: Cut 60', Recovered 60'</u>	
	3790.0-3792.0' (2.0')	Sandstone: medium gray, gray-brown very fine grained, hard, argillaceous, no porosity, good odor, oil stain throughout, bleeding brown oil from pinpoint porosity, strong gold fluorescence, straw visible cut, milky blue cut fluorescence.
	3792.0-3800.2' (8.2')	Shale: black to light brown, firm to hard, silty, apparent bedding dip at 15° with some complex soft sediment deformation with clasts of very fine grained sandstone, scattered brachiopods(?) and black chert pebbles, trace of pinpoint porosity bleeding some oil.
	3800.2-3801.2' (1.0')	Siltstone: medium gray-brown, argillaceous, sandy, hard, oil stained, slight bleeding of brown oil, good fluorescence.

	3801.2-3803.5' (2.3')	Sandstone: medium gray to brown, very fine to fine grained, silty, argillaceous, hard, nil porosity, oil stained, slight patchy fluorescence in lower portion.
	3803.5-3806.0' (2.5')	Shale: dark gray to green, hard, slightly silty.
	3806.0-3809.5' (3.5')	Siltstone: medium to dark gray-brown, sandy, argillaceous, fine dark gray shale laminae, no porosity, lightly oil stained throughout, live oil fluorescence.
	3809.5-3810.5' (1.0')	Shale: dark gray, hard, slightly silty.
	3810.5-3839.0' (28.5')	Siltstone: medium gray-brown, sandy, relatively even textured mix of sand in argillaceous silt with rare to common thin (1 mm) dark irregular shale laminae, appears generally saturated with live oil with good yellow fluorescence, straw colored white light cut, bright blue-green cut fluorescence, lacks apparent permeability, grades to medium to dark gray, hard, tight silicified siltstone at 3822.2-3823'.
	3839.0-3850.0' (11.0')	Siltstone: medium to dark green, hard, sand grains and glauconite pellets throughout, scattered dark shaly laminations, 1-3 mm thick, no shows.
3850 - 3885		Siltstone: green, glauconitic, sandy as above, with occasional very fine grained glauconitic sandstone, no odor, stain, cut, or fluorescence.
3885 - 3912		Sandstone: light to medium gray, very fine grained, glauconitic, clayey, friable to firmly cemented, shell fragments common; with minor Siltstone: as above; no odor, stain, cut, or fluorescence.
3912 - 3973		Core No. 8: Cut 61', Recovered 57'
	3912.0-3915.0' (3.0')	Sandstone: dark gray to green, very fine to fine grained with scattered medium grains, poorly sorted, argillaceous, hard, slightly calcareous, no porosity, no shows, brachiopods common, deformed bedding with scattered shale inclusions.

3915.0-3919.0' (4.0')	Siltstone: medium to dark green, hard, sandy, argillaceous, rare dark gray chert pebbles, thin laminae of sandstone and shale, brachiopod shells abundant.
3919.0-3921.5' (2.5')	Sandstone: medium to dark gray-green, glauconitic, argillaceous, hard, slightly calcareous, irregular 1 mm shale laminae, brachiopods common, no porosity, very slight yellow fluorescence, milky blue weak cut fluorescence.
3921.5-3923.0' (1.5')	Shale: dark gray to medium brown, firm to hard, laminated, rare fossils.
3923.0-3926.4' (3.4')	Sandstone: medium to dark gray, very fine grained, very silty near top, clay filled, glauconitic, very poor permeability, shows exhibit irregular pattern related to porous-nonporous zoning, weak fluorescence, milky blue-green cut fluorescence, no white light cut.
3926.4-3927.4' (1.0')	Limestone: medium to dark gray-brown, very finely crystalline, hard, brachiopods(?) common.
3927.4-3932.0' (4.6')	Sandstone: medium gray-brown, very fine to fine grained, argillaceous, mostly clay filled, lightly to moderately calcareous, firm to hard, low permeability, spotty bleeding brown oil, moderate live oil fluorescence throughout, good blue-green cut fluorescence, no white light cut.
3932.0-3932.6' (0.6')	Siltstone: medium dark gray, hard, very calcareous, no porosity, no shows.
3932.6-3940.5' (7.9')	Sandstone: medium gray-brown, very fine grained, glauconitic, firm to hard, slightly calcareous, argillaceous, complex bedding with very fine shale laminae (irregular), low permeability, spotty bleeding brown oil, faint yellow to bright yellow-gold fluorescence, milky blue-green cut fluorescence.
3940.5-3945.0' (4.5')	Siltstone: dark green, calcareous, glauconite pellets common, thinly interbedded and interlaminated dark gray

		shale and fine grained green sandstone, no shows, brachiopods common, scattered calcite-filled fractures.
	3945.0-3945.8' (0.8')	Shale: very dark gray, hard, slightly silty.
	3945.8-3952.0' (6.2')	Siltstone: very dark gray to dark green, hard, argillaceous, slightly calcareous, partly sandy, irregular shale laminae, no shows.
	3952.0-3952.5' (0.5')	Shale: very dark gray, hard, silty.
	3952.5-3963.0' (10.5')	Siltstone: medium to dark green, very glauconitic, argillaceous (clay filled), fossiliferous, irregular shale laminae, grades to sandstone, no porosity.
	3963.0-3969.0' (6.0')	Sandstone: medium to dark green, fine grained, glauconitic, clay filled, medium sorted, appears to have quartz overgrowths, no porosity, no shows.
	3969.0-3973.0' (4.0')	No recovery.
3973 - 4033	Core No. 9: Cut 60', Recovered 30'	
	3973.0-3983.0' (10.0')	Sandstone: dark green, firm to hard, glauconitic, moderately calcareous, clay filled, nil porosity, no shows, shale streaks and black shale filling in burrows at 3981'.
	3983.0-3985.0' (2.0')	Shale: very dark gray, silty, hard, slightly calcareous.
	3985.0-3986.3' (1.3')	Sandstone: dark green, very fine grained, argillaceous, 1-10 mm thick dark shale laminae, no porosity, no shows.
	3986.3-3996.5' (10.2')	Siltstone: medium to dark green interlaminated with Shale: black to very dark green, 1-4 mm laminae (approximately 50-50% ratio), scattered small chert pebbles, pyrite nodules and limy concretions at 3989', fossiliferous at 3991'.

	3996.5-3999.0' (2.5')	Shale: very dark gray, hard, slightly silty.
	3999.0-4000.5' (1.5')	Conglomerate: buff to dark gray, primarily chert pebbles and granules, subrounded to rounded, black mudstone matrix.
	4000.5-4001.3' (0.8')	Siltstone: medium to dark gray, dark shale burrow filling.
	4001.3-4003.0' (1.7')	Siltstone: as above, laminated, highly mechanically fractured to rubble in bottom 2' when core jammed.
	4003.0-4033.0' (30.0')	No recovery.
4033 - 4040	Siltstone: brown-green, as above, with interbedded Shale: brown-gray.	
4040 - 4070	Shale: medium to dark gray to gray-brown, firm, very slightly calcareous, with minor Siltstone: medium gray, very argillaceous; trace of Claystone: black, with minor sandstone interlaminations.	
4070 - 4100	Shale: medium gray to dark gray, and brown, firm, very slightly calcareous, scattered pyrite; with minor medium gray-brown siltstone.	
4100 - 4150	Argillite: grades downward from a hard highly compacted very dark sandstone with trace of interlaminated silver phyllitic argillite to 100% argillite at 4140', silver gray, with phyllitic sheen.	
4150 - 4160	Core No. 10: Cut 10', Recovered 1.5'	
	4150.0-4151.5' (1.5')	Argillite: very dark gray, silver gray micaceous sheen, highly fractured, quartz veining, some fractures exhibit vugs, slickensides on some fractures, near vertical bedding.
	4151.5-4160.0' (8.5')	No recovery.
4160 - 4170	Argillite: black to silver gray with scattered vein quartz.	

4,170 Feet Total Depth.

NOTE: Formation tops picked in this section were correlated at the wellsite and may or may not agree with final correlations.

HUSKY OIL NPR OPERATIONS, INC.
U.S. GEOLOGICAL SURVEY/ONPRA

LOGGING REPORT

WELL NAME WEST DEASE #1

Date March 2, 1980 Driller Depth 2980'

Elevation 24' KB Logger Depth 2978'

Logs Ran and Intervals

DLL/MSFL	288-2973'
BHCS/GR/TTI	288-2970' (Ran out of film @ 1450' on 2")
FDC/CNL/GR/CAL	288-2973'
HDT Dipmeter	288-2974'
CST-Sidewall Sampler	shot 16, recovered 16

Additional Logs to Run

Zones of Interest

Depth	Gross Thickness	Net Feet of Porosity	Lith	Porosity	Probable Fluid Content
NO ZONES OF INTEREST					

Discussion:

Ran in hole w/DLL/MSFL, hit bridge at 2450'. POH to cond w/bit. No bridges on second run. Memorizer failed intermittently on second run on DLL/MSFL. Began logging at 2100 hrs March 2, 1980. Completed at 0830 hrs March 4, 1980

Log Tops & Correlations:

Torok	298 (-274')
"Pebble Sh"	2908' (-2884')

Additional Evaluation Plans:

NONE

DAVE FENEX
Wellsite Geologist

Log Analyst

12/77

HUSKY OIL NPR OPERATIONS, INC.
U.S. GEOLOGICAL SURVEY/ONPRA

LOGGING REPORT

WELL NAME WEST DEASE #1

Date March 23-24, 1980 Driller Depth 4170'

Elevation K.B. 24' Logger Depth 4166'

Logs Ran and Intervals

Temperature Survey (2)	50-4120'	Velocity Survey	Top 400' - Bottom 4150'
GR/SP/Cal/DLL	2977-4164'	CST	Top 2991' - Bottom 4061'
GR/Cal/CNL/FDC	2968-4165'		
GR/BHC	2965-4160'		
Cal/MLL/ML	2965-4165'		
HDT-Dipmeter	2966-4165'		

Additional Logs to Run

None

Zones of Interest

Depth	Gross Thickness	Net Feet of Porosity	Lith	Average Porosity	Probable Fluid Content
3690-3730'	40	24	Shaly Ss	13%	water
3802-3826'	24	20	" "	13-22%	water
4000-4004'	4	4	" "	18%	water
3930-3938'	8	8	" "	12%	water

Discussion:

Sands appear Shaly and tight with little or no evidence of invasion.

Log Tops & Correlations:

Basal Cretaceous Uncon.	3315'
1st Barrow Sand	3692'
2nd Barrow Sand	3800'
Sag River Sand	3923'
Argillite	4020'

Additional Evaluation Plans:

P & A

R. Nelson
Wellsite Geologist

A. Kane
Log Analyst

12/77

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

USGS/HUSKY OIL CO., OPR.
WEST DEASE NO. 1
DEASE INLET
NORTH SLOPE, ALASKA

DATE : 13-MAR-80
FORMATION :
DRLG. FLUID: WBM
LOCATION : SEC. 21-T21N/R14W

FILE NO : BP-3-578
ANALYSTS : TLS,WBP
LABORATORY: ANCHORAGE

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID OIL	SATS. WTR	API OIL	DESCRIPTION
	core #5									
1	3700.0	0.63			13.3	2.66	6.3	68.6	--	ss!vfgr
2	3701.0	0.54			13.1	2.65	9.0	46.2	--	same
3	3702.0	2.15			15.7	2.67	9.0	55.7	--	same
4	3703.0	0.05		0.09	6.5	2.67	12.0	60.2	26	same
5	3704.0	1.05			13.6	2.66	8.5	56.9	--	same
6	3705.0	3.47			15.4	2.66	11.4	64.9	--	same
7	3706.0	7.45			16.7	2.67	8.4	57.6	--	same
8	3707.0	1.28			14.3	2.66	9.9	62.9	28	same
9	3708.0	0.10			9.3	2.68	9.5	46.2	--	same
10	3709.0	0.47		0.05	10.6	2.66	10.7	59.6	--	same
11	3710.0	1.76			14.6	2.66	9.4	62.9	--	same
12	3711.0	0.35			12.0	2.66	13.5	42.4	28	same
13	3712.0	5.56			16.3	2.66	9.9	62.4	--	same
14	3713.0	0.69			12.6	2.66	11.0	66.3	--	same
15	3714.0	0.37		0.08	11.9	2.64	13.6	42.8	--	same
16	3715.0	0.42			11.2	2.70	13.3	47.4	--	same
17	3716.0	0.87			13.5	2.66	9.3	44.8	--	same
18	3717.0	0.57			11.1	2.67	12.1	42.3	--	same
19	3718.0	<0.01			12.1	2.66	14.0	59.9	30	same
20	3719.0	0.91		0.73	14.2	2.65	12.0	60.0	--	same
21	3720.0	0.02			1.5	3.28	29.3	41.8	--	ss!vfgr,sid
22	3721.0	0.73			12.8	2.65	7.7	68.4	--	ss!vfgr
23	3722.0	0.71			11.5	2.68	10.2	70.0	--	same
24	3723.0	3.33			16.0	2.66	10.9	59.1	--	same
25	3724.0	0.57		0.27	12.0	2.66	9.0	82.0	33	same

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

USGS/HUSKY OIL CO., OPR.
WEST DEASE NO. 1

DATE : 13-MAR-80
FORMATION :

FILE NO : BP-3-578
ANALYSTS : TLS,WSP

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID OIL	SATS. WTR	API OIL	DESCRIPTION
26	3725.0	0.15			10.3	2.66	11.6	53.9	--	same
27	3726.0	0.12			9.5	2.66	13.2	57.4	--	same
28	3727.0	0.27			10.5	2.66	9.3	78.8	--	same
29	3728.0	2.86			16.5	2.65	12.4	62.2	--	same
30	3729.0	1.78		0.50	14.4	2.65	7.6	67.2	--	same
31	3730.0	0.05			8.5	2.66	19.0	54.8	33	same
32	3731.0	0.23			11.7	2.66	11.3	62.3	--	same
	core #6									
33	3730.0	0.05			10.5	2.65	8.8	68.0	--	ssivfgr,slty
34	3731.0	0.32			15.0	2.67	5.9	66.9	--	same
35	3733.0	0.18			8.2	2.68			--	same
36	3735.0	50.			16.5	2.66	6.7	57.8	--	same *horiz. frac.*
37	3737.0	0.07			10.2	2.65	16.2	55.8	--	same
38	3739.0	0.02			6.2	2.64			--	same
39	3741.0	0.07			9.3	2.64			--	same
40	3744.0	<0.01			7.7	2.92			--	ssivfgr,slty,pyr
41	3746.0	0.07			13.1	2.78	15.2	64.3	--	same
42	3748.0	0.02			11.3	3.23	11.3	67.7	--	same,pyr
43	3749.0	1.46			14.0	2.64	10.7	56.5	--	ssivfgr,slty
44	3751.0	0.02			8.4	2.67			--	same
45	3753.0	0.14			11.9	2.66	7.5	60.0	--	same
46	3755.0	0.05			8.6	2.65			--	same
47	3757.0	0.02			6.6	2.65			--	same
48	3759.0	0.02			7.8	2.65			--	same
49	3761.0	0.02			6.9	2.65			--	same
50	3763.0	0.05			8.0	2.65			--	same
51	3765.0	0.02			8.0	2.64			--	same
52	3767.0	0.05			9.7	2.65			--	same

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

USGS/HUSKY OIL CO., OFR.
WEST DEASE NO. 1

DATE : 13-MAR-80
FORMATION :

FILE NO : BP-3-578
ANALYSTS : TLS,WSP

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID OIL	SATS, WTR	API OIL	DESCRIPTION
53	3770.0	<0.01			8.2	2.65			--	same
54	3773.0	<0.01			8.8	2.65	7.1	80.7	--	same
55	3775.0	0.05			10.1	2.66			--	same
56	3777.0	<0.01			8.3	2.65			--	same
57	3782.0	<0.01			7.2	3.02			--	ss|vf-fgr,sid
58	3784.0	<0.01			10.7	2.79			--	same
59	3786.0	<0.01			11.3	2.81			--	same
60	3787.0	0.02			16.0	2.85	5.6	81.5	--	same
	core #7									
61	3790.0	<0.01			13.5	2.94	0.2	86.9	--	same
62	3791.0	<0.01			14.8	2.78	14.4	70.2	33	same
63	3800.0	<0.01			4.7	2.81			--	slts|sid
64	3801.0	2.07			16.4	2.65	21.7	41.9	--	ss|vfgr,slty
65	3802.0	0.36			15.6	2.66	14.0	69.8	--	same
66	3803.0	0.12			14.0	2.68	12.7	80.0	--	same
67	3806.0	0.02			11.2	2.74	7.4	59.6	--	same
68	3807.0	21.			19.6	2.65	9.0	65.2	33	ss|vf-fgr,sl slty
69	3808.0	77.			22.7	2.64	8.3	69.6	--	same
70	3809.0	141.			23.3	2.64	8.6	70.0	--	same
71	3810.0	201.			23.4	2.64	6.6	73.4	33	same
72	3811.0	76.			21.8	2.65	6.4	68.0	--	same
73	3812.0	31.			20.6	2.65	5.6	64.0	--	same
74	3813.0	5.08			17.8	2.68	7.4	65.6	--	same|sl calc
75	3814.0	51.			23.5	2.64	4.2	67.4	27	ss|vf-fgr,sl slty
76	3815.0	0.07			11.5	2.68	4.9	58.9	--	ss|vfgr,slty
77	3816.0	<0.01			18.4	2.66	8.9	52.3	--	ss|vfgr,slty,fos
78	3817.0	43.			23.1	2.64	10.7	56.0	31	ss|vf-fgr,sl slty
79	3818.0	48.			19.6	2.66	8.6	56.3	--	same|sl calc

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

USGS/HUSKY OIL CO., OPR. | DATE : 13-MAR-80 | FILE NO : BP-3-578
WEST DEASE NO. 1 | FORMATION : | ANALYSTS : TLS,WSP

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID SATS. OIL	WTR	API OIL	DESCRIPTION
80	3819.0	40.			21.7	2.65	7.6	66.8	--	same;sl calc
81	3820.0	8.75			20.6	2.65	8.0	67.8	33	ss;vfgr,sltw
82	3821.0	6.63			15.2	2.67	28.4	34.1	31	ss;vfgr,sltw,calc
83	3822.0	1.30			16.4	2.66	9.5	57.3	--	ss;vfgr,sltw
84	3823.0	<0.01			3.2	2.70			--	ls;vsltw,shw
85	3824.0	29.			23.0	2.66	8.6	63.4	--	ss;vf-fgr,sl sltw
86	3825.0	32.			22.2	2.66	5.0	57.3	--	same
87	3826.0	13.			22.1	2.67	7.5	66.1	31	same
88	3827.0	25.			23.2	2.67	5.3	63.8	--	same
89	3828.0	0.44			15.7	2.69	5.2	68.1	--	ss;vfgr,sltw,sl calc
90	3829.0	2.25			19.7	2.66	7.4	58.5	--	same
91	3830.0	4.24			21.3	2.67	8.6	65.0	--	same
92	3831.0	3.27			19.3	2.66	7.9	64.2	31	same
93	3832.0	0.43			13.5	2.67	6.3	66.1	--	same
94	3833.0	3.27			20.9	2.66	6.4	60.1	30	same
95	3834.0	5.84			21.5	2.66	7.6	47.2	--	same
96	3835.0	0.29			18.8	2.67	9.5	60.1	--	same
97	3836.0	0.14			19.0	2.68	6.4	53.3	--	same
98	3837.0	0.53			18.5	2.67	7.2	49.4	34	same
99	3838.0	0.02			12.8	2.74	0.9	86.5	--	sltst;pyr,sdy,slauc
100	3840.0	0.02			18.1	2.77			--	ss;vfgr,pyr,slauc
101	3842.0	<0.01			7.9	2.84			--	same;ls inbd
102	3844.0	<0.01			12.0	2.77			--	ss;vfgr,pyr,slauc;sl calc
103	3846.0	<0.01			12.1	2.72			--	same
104	3848.0	<0.01			13.6	2.72			--	same
105	3850.0	<0.01			7.5	2.87			--	same;ls inbd
	core #8									
106	3912.0	0.10			17.2	2.71			--	ss;vfgr,pyr,slauc;sl calc

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

USGS/HUSKY OIL CO., OPR.
WEST DEASE NO. 1

DATE : 13-MAR-80
FORMATION :

FILE NO : BP-3-578
ANALYSTS : TLS,WSP

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID SATS. OIL	WTR	API OIL	DESCRIPTION
107	3916.0	0.03			17.0	2.73			--	same
108	3924.0	0.39			16.2	2.69	7.2	65.3	--	ss|vf|gr,slty,sl calc
109	3925.0	0.65			18.0	2.68	8.6	63.3	35	same
110	3926.0	0.52			17.5	2.69	6.8	65.5	--	same
111	3927.0	0.20			14.7	2.72	5.8	69.7	--	same
112	3928.0	<0.01			3.8	2.70	9.1	56.6	--	ls|vslty
113	3929.0	0.15			14.6	2.70	9.6	57.5	33	ss|vf-fgr,slw,sl calc
114	3930.0	0.03			10.6	2.68	12.1	65.4	--	same
115	3931.0	0.03			8.9	2.69	9.2	63.6	--	same
116	3932.0	0.26			15.4	2.68	8.6	60.8	--	same
117	3933.0	0.13			13.5	2.68	8.7	74.9	--	same
118	3934.0	0.16			13.9	2.69	5.4	77.6	--	same
119	3935.0	0.03			12.3	2.71	0.0	66.2	--	same
120	3936.0	0.02			7.0	2.68	2.8	71.1	--	same
121	3937.0	0.03			11.8	2.68	3.0	59.3	--	same
122	3938.0	0.02			6.9	2.68	10.1	72.4	--	ss|vf-fgr,slty,slauc,sl calc
123	3939.0	0.21			13.7	2.69	6.3	69.9	--	same
124	3940.0	0.08			11.8	2.68	2.9	64.3	--	same
125	3942.0	0.02			13.7	2.80			--	ss|vf-fgr,slty,slauc,sid,sl c
126	3944.0	0.10			14.8	2.78			--	same
127	3948.0	0.02			9.1	2.74			--	same
128	3952.0	0.05			15.4	2.74			--	same
129	3954.0	0.02			17.6	2.82			--	same
130	3956.0	0.22			20.3	2.78			--	same
131	3957.0	0.17			20.5	2.80			--	same
132	3961.0	0.12			19.4	2.72			--	same
133	3964.0	0.07			18.2	2.86			--	same
134	3966.0	0.17			22.8	2.64			--	same
135	3969.0	1.31			22.9	2.92			--	ss|vf|gr,slty,pyr

core #9

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

USGS/HUSKY OIL CO., OPR. | DATE : 13-MAR-80 | FILE NO : BP-3-578
WEST DEASE NO. 1 | FORMATION : | ANALYSTS : TLS,WSP

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID SATS. OIL	WTR	API OIL	DESCRIPTION
136	3973.0	0.81			22.6	2.75			--	ss|vfgr,vslty,slauc
137	3974.0	0.02			13.9	2.81			--	ss|vfgr,vslty,calc
138	3975.0	0.02			12.5	2.76			--	same
139	3976.0	0.02			14.6	2.78			--	ss|vfgr,vslty,slauc
140	3977.0	0.05			18.4	2.80			--	same
141	3978.0	0.27			19.3	2.74			--	same
142	3979.0	0.24			17.9	2.70			--	same
143	3980.0	0.02			11.8	2.71			--	same|calc
144	3981.0	0.05			15.2	2.70			--	same|calc
145	3982.0	0.10			15.3	2.69			--	ss|vfgr,vslty
146	3986.0	0.02			11.3	2.77			--	same
147	3991.0	0.05			12.0	2.69			--	same
148	3999.0	1.37			15.3	2.81			--	cons|sdy
149	4000.0	0.49			11.4	2.76			--	same
150	4001.0	1.62			19.3	2.80			--	ss|vfgr,vslty
151	4002.0	1.73			19.7	2.71			--	same
152	4003.0	0.15			11.6	2.69			--	same

HUSKY

U.S. GEOLOGICAL SURVEY/ONPRA

DRILL STEM TEST REPORT FORM

WELL NAME WEST DEASE #1 DST. NO. 1 DATE 3-12-80

Formation Tested UPPER BARROW SD (?)

Test Interval 3699-3730'

Total Depth 3730'

Choke Size: Surface 1/4" Bottom Hole 5/8"

Hole Size 8-1/2"

Drill Collar Length 435 I.D. 2.25

Drill Pipe Length 3220' I.D. 2.6

Packer Depth(s) Top 3691'; Bottom 3699'

Depth Tester Valve 3672' Ft.

Cushion Type Glycol Amount 500' (2 bbls.)

TEST DATA

Tool open at 0710 hrs. 3-12-80 XX.

Initial flow period 30 min.

Initial shut-in period 60 min.

Final flow period 240 min.

Final shut-in period 480 min.

Unseated packer at 2040 hrs. 3-12-80 XX.

RESISTIVITY CHLORIDE DATA

	Resistivity			Chloride Content
Recovery Water	-	@ -	°F.	- ppm
Recovery Mud	-	@ -	°F.	52000 ppm
Recovery Mud Filtrate	-	@ -	°F.	- ppm
Mud Pit Sample	-	@ -	°F.	- ppm
Mud Pit Sample Filtrate	-	@ -	°F.	- ppm

Mud Weight 10.3 vis 45 cp

Description of initial flow period: Opened tool w/immediate weak blow air & continuing throughout initial open, no gas, shut in for 1 hr.

Description of final flow period: Opened tool w/weak blow (in 3-4" wtr) decreasing to faint blow in 1 hr. 25 min., increased to weak blow in 2 hrs. 5 min., decreasing again to faint blow in 2 hrs. 20 min., increasing again to weak blow in 3 hrs. and continuing through remainder of test, no gas to surface, shut in for 8 hrs.

PRESSURE DATA

TEMPERATURE	Gauge No. 3675 Depth: ft.		Gauge No. 3722 Depth: ft.		Gauge No. 3726 Depth: ft.		TIME	
	24 Hour Clock		24 Hour Clock		24 Hour Clock		Tool	A.M.
Est. °F.	Blanked Off No		Blanked Off Yes		Blanked Off Yes		Opened	P.M.
Actual 120 °F.	Pressures		Pressures		Pressures		Opened Bypass	A.M. P.M.
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	2059		2070		2074			
Initial Flow Period FLOW Initial	239		269		282		—	—
Initial Flow Period FLOW Final	283		301		300?			
Initial Flow Period Closed In	1356		1364		1368			
Second Flow Period FLOW Initial	316		317		318		—	—
Second Flow Period FLOW Final	359		364		371			
Second Flow Period Closed In	1583		1583		1597			
Third Flow Period FLOW Initial							—	—
Third Flow Period FLOW Final								
Third Flow Period Closed In								
Final Hydrostatic	2038		2038		2074		—	—

RECOVERY DATA

			Depth Back Pres. Valve	Surface Choke	Bottom Choke
Cushion Glycol	Type 500	Amount			
Recovered 0.69 bbl.		Feet/bbl of Rat hole mud at 52000 ppm w/1% oil.			
Recovered		Feet/bbl of			
Recovered		Feet/bbl of			
Recovered		Feet/bbl of			

Remarks: Sample chamber to be opened in Anchorage.

Unseated packer at 2040 hrs. w/no fluid drop.

Prepared by: DAVE FENEX

57

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA,

P.O. BOX 4-1276
Anchorage, Alaska 99509

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL (
5633 B Street

WATER ANALYSIS REPORT

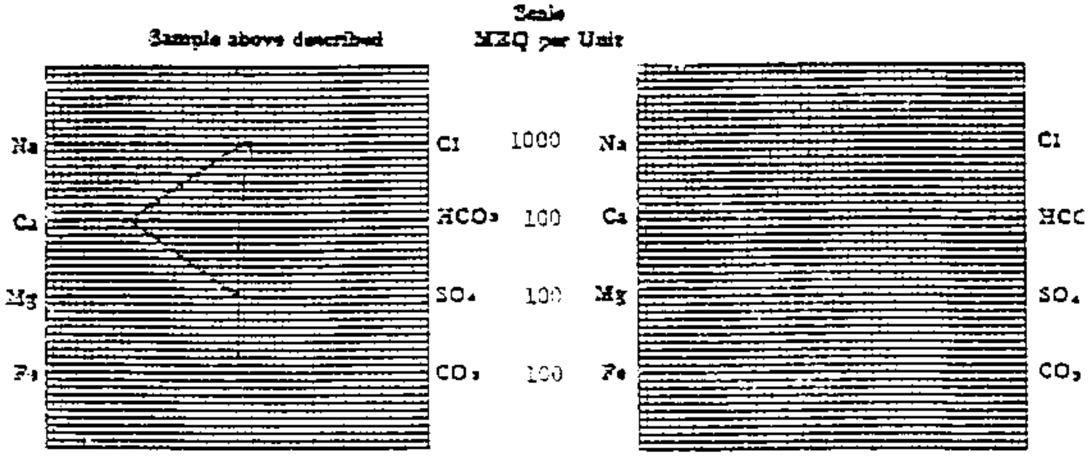
OPERATOR	Husky Oil Company	DATE	April 1, 1980
LAB NO.	3191-1		
WELL NO.	W. Dease T. W. No. 1	LOCATION	
FIELD	NPRA	FORMATION	
COUNTY		INTERVAL	DST No. 1
STATE	Alaska	SAMPLE FROM	Top of Hydrospring

REMARKS & CONCLUSIONS: OIL & GREASE, mg/1————3.8

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	3577	155.58	Sulfate	1190	24.75
Potassium	1240	31.74	Chloride	57500	1621.50
Calcium	29500	1472.05	Carbonate	0	—
Magnesium	20	1.64	Bicarbonate	900	14.76
Iron	—	—	Hydroxide	—	—
Total Cations		1661.01	Total Anions		1661.01

Total dissolved solids, mg/l	93474	Specific resistance @ 68°F.:		
NaCl equivalent, mg/l	91205	Observed	0.10	ohm-meter
Observed pH	7.3	Calculated	0.09	ohm-meter

WATER ANALYSIS PATTERN



(Na value in above graph includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milliequivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

CHEMICAL & GEOLOGICAL LABORATORIES of ALASKA, INC.

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

GAS ANALYSIS REPORT

Company Husky Oil Company Date April 1, 1980 Lab No. 3191-2

Well No. W. Dease T. W. No. 1 Location

Field NPRA Formation Upper Barrow Sands

County Depth DST No. 1 (3700-30)

State Alaska Sampling Point Bubble Hose-Start of Reverse Cut

Line pressure ____ psig; Sample pressure ____ psig; Temperature ____ °F; Container number

Remarks

Component	Mole % or Volume %	Gallons per MCF
Oxygen	0	
Nitrogen	0.73	
Carbon dioxide	0.05	
Hydrogen sulfide	—	
Methane	99.21	
Ethane	0.01	
Propane & Higher	TRACE	
Total	100.00	—
GPM of pentanes & higher fraction		
Gross btu cu. ft. @ 60° F. & 14.7 psia (dry gas)	1002	
Specific gravity (calculated from analysis)	0.557	
Specific gravity (measured)	0.555	

Remarks:

6.

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA,

P.O. BOX 4-1276
Anchorage, Alaska 99509

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL
5633 B Street

WATER ANALYSIS REPORT

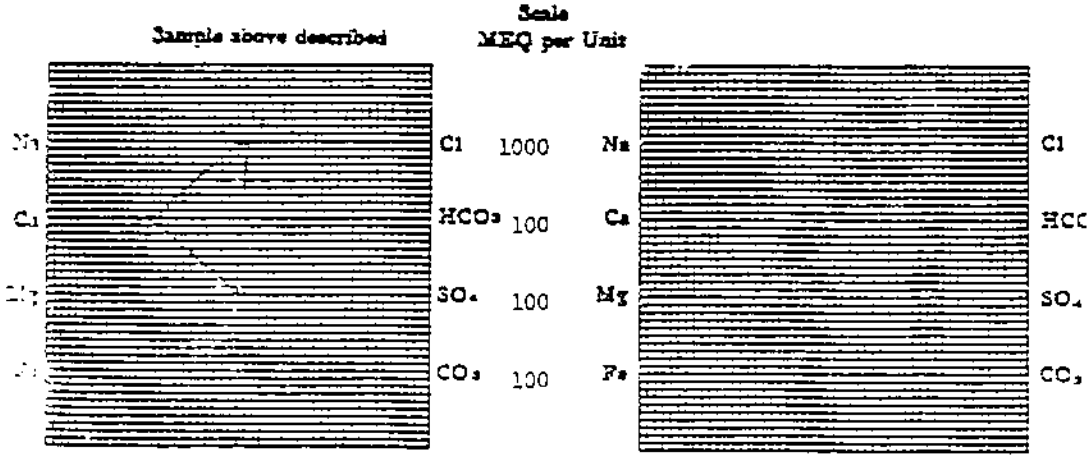
OPERATOR	Husky Oil Company	DATE	April 1, 1980 — LAB NO. 3191-3
WELL NO.	W. Dease T. W. No. 1	LOCATION	
FIELD	NPRA	FORMATION	
COUNTY		INTERVAL	DST No. 1
STATE	Alaska	SAMPLE FROM	Sample from Tool

REMARKS & CONCLUSIONS: OIL & GREASE, mg/1 ——————— 3.0

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	4472	194.53	Sulfate	800	16.64
Potassium	990	25.34	Chloride	47500	1339.50
Calcium	22922	1143.80	Carbonate	0	—
Magnesium	45	3.70	Bicarbonate	685	11.22
Iron	–	—	Hydroxide	–	—
Total Cations		1367.37	Total Anions		1367.37

Total dissolved solids, mg/l	77069	Specific resistance @ 68°F.: Observed	0.13	ohm-meters
NaCl equivalent, mg/l	75413	Calculated	0.11	ohm-meters
Observed pH	7.1			

WATER ANALYSIS PATTERN



(Na value in above graph includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne [illegible] from components

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907)-279-4014
274-3384

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

GAS ANALYSIS REPORT

Company Husky Oil Company Date April 1, 1980 Lab No. 3191-4

Well No. W. Dease T. W. No. 1 Location

Field NPRA Formation Upper Barrow Sands

County Depth DST No. 1 (3700-30)

State Alaska Sampling Point Tool Chamber

Line pressure ____ psig; Sample pressure 350 psig; Temperature ____ °F; Container number

Remarks Water Recovered 1700 ml, gas volume 50 ml

Component	Mole % or Volume %	Gallons per MCF
Oxygen	0	
Nitrogen	0.70	
Carbon dioxide	0.05	
Hydrogen sulfide	—	
Methane	99.23	
Ethane	0.02	
Propane & Higher	TRACE	—
Total	100.00	—

GPM of pentanes & higher fraction

Gross btu cu. ft. @ 60° F. & 14.7 psia (dry basis) = 1002

Specific gravity (calculated from analysis) = 0.557

Specific gravity (measured) 0.555

Remarks:

LIST OF OTHER GEOLOGICAL AND WELL DATA & SOURCE

I. List of Other Available Geological and Related Well Data:

A. Final Micropaleontology Reports by Anderson, Warren & Associates, Inc.

1. Final Foraminifera Report

2. Final Palynology Report

B. Halliburton Drill-Stem Test Report (DST No. 1)

C. Birdwell Velocity Survey

D. Drilling History Report, prepared by Husky Oil NPR Operations, Inc.

E. Daily Geological Reports, Husky Oil NPR Operations, Inc., U. S. Geological Survey, ONPRA

II. Source of Other Geological and Well Data:

Copies and some reproducibles of information referenced in this report which was generated as part of the USGS/NPRA exploration effort, can be obtained by contacting:

National Oceanic and Atmospheric Administration
EDIS/NGSDC (D62)
325 Broadway
Boulder, CO 80303