NATIONAL PETROLEUM RESERVE IN ALASKA

GEOLOGICAL REPORT

WALAKPA TEST WELL NO. 1

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

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)

GEOLOGIC SUMMARY

INTRODUCTION

The Walakpa Test Well No. 1 is located in the SE 1/4, protracted Section 9, T20N, R19W, Umiat Meridian, approximately 15 miles south of Barrow, Alaska (see Figure 1 and 2). Drilling of the well commenced on December 25, 1979. The well reached a total depth of 3,666 feet on January 23, 1980. After testing a thin sandstone at approximately 2,075 feet, the well was plugged and abandoned and the rig released on February 8, 1980. Significant indications of hydrocarbons were restricted to approximately 15 net feet of Lower Cretaceous sandstone which tested gas at a calculated rate of 325,000 cubic feet per day.

PRE-DRILLING PROGNOSIS

The primary objective in drilling the Walakpa well was to evaluate the potential of an interpreted Upper Jurassic sandstone predicted to occur at approximately 2,075 feet. The objective horizon was seismically correlated with Jurassic sandstones in South Barrow No. 3 and was also thought to be correlative with the Jurassic Kingak sandstones penetrated in the South Simpson Test Well No. 1 and the Kugrua Test Well No. 1. The top of this sandstone was forecast at 2,075 feet measured depth. Oil and/or gas shows had been noted from this correlative sandstone in the above wells where porosities averaged approximately 16%. Seismic interpretation and isopach mapping of the Jurassic sandstone indicated truncation of the sandstone by the basal Cretaceous unconformity to the north of the Walakpa location. Seismic interpretations also indicated a phase reversal anomaly occurred to the south of the location. This phase reversal occurred in a south to north direction and was interpreted to be related to changes in fluid saturation from water-wet sandstone noted in the Kugrua and South Simpson wells to hydrocarbon saturated sandstone in the South Barrow area. Closure on the south and southwest was provided by regional dip.

Secondary objectives of the test were the Sag River Sandstone and sandstones of the Shublik Formation. The Shublik Formation was expected to directly overlie the argillite basement at this location. The top of the argillite was forecast at 3,550 feet measured depth.

Geochemical data in the area indicated potential source rocks in the Kingak Formation and overlying "Pebble Shale". Maturation studies indicated both oil and gas could be expected at the target objectives.

POST-DRILLING SUMMARY

The well penetrated the top of the argillite at a driller's depth of 3,633 feet and was drilled and cored to a total depth of 3,666 feet.

The primary objective sandstone was penetrated at a depth of 2,070-2,090 feet, or nearly as forecast. This sandstone is now informally referred to as the Walakpa sandstone. The entire sandstone was cored (No. 6). Core analysis indicated an average porosity through the 20-foot interval of approximately 18% and an average permeability of approximately 50 millidarcies. Average water saturation from core and log calculations are 50% and 40%, respectively. The zone was initially tested open hole but mechanical problems associated with this test resulted in the interval eventually being retested through perforations after running and cementing 7" casing. The well flowed dry gas at approximately 325 MCFPD on a 14/64" choke. Flowing tubing pressure was 260 psi with 1,026 psi FSIP. Additional details of the testing are in Appendix E. A special water-damage analysis performed on the core from this sandstone indicates fresh-water drilling fluid may have damaged the formation and resulted in lower flow rates (see Appendix G).

The age of the sandstone in the interval 2,070-2,090 feet is now considered to be Neocomian*. Current interpretation, as supported by more recent drilling and paleontological data, strongly indicates this Walakpa sandstone is approximately equivalent to other Lower Cretaceous sandstones such as the Kuparuk River.

No additional hydrocarbon reservoirs were noted in the well. The Sag River Sandstone and Shublik Formation sandstones did contain some porous intervals but all were interpreted to be water wet from log calculations.

More recent drilling in the area (Walakpa Test Well No. 2; Kuyanak Test Well No. 1) have served to better define the limits of the Walakpa sandstone. This data now indicates the unit pinches out depositionally to the north and that the southern productive limit lies somewhere between Walakpa No. 1 and the water-saturated sandstone present in Kuyanak No. 1. The potential lateral limits of this sandstone are still undetermined but appear to be large enough to provide a significant local source of gas.

* Biostratigraphic studies found Neocomian age foraminifera in the Walakpa sandstone of the Walakpa Well No. 2, drilled in early 1981.

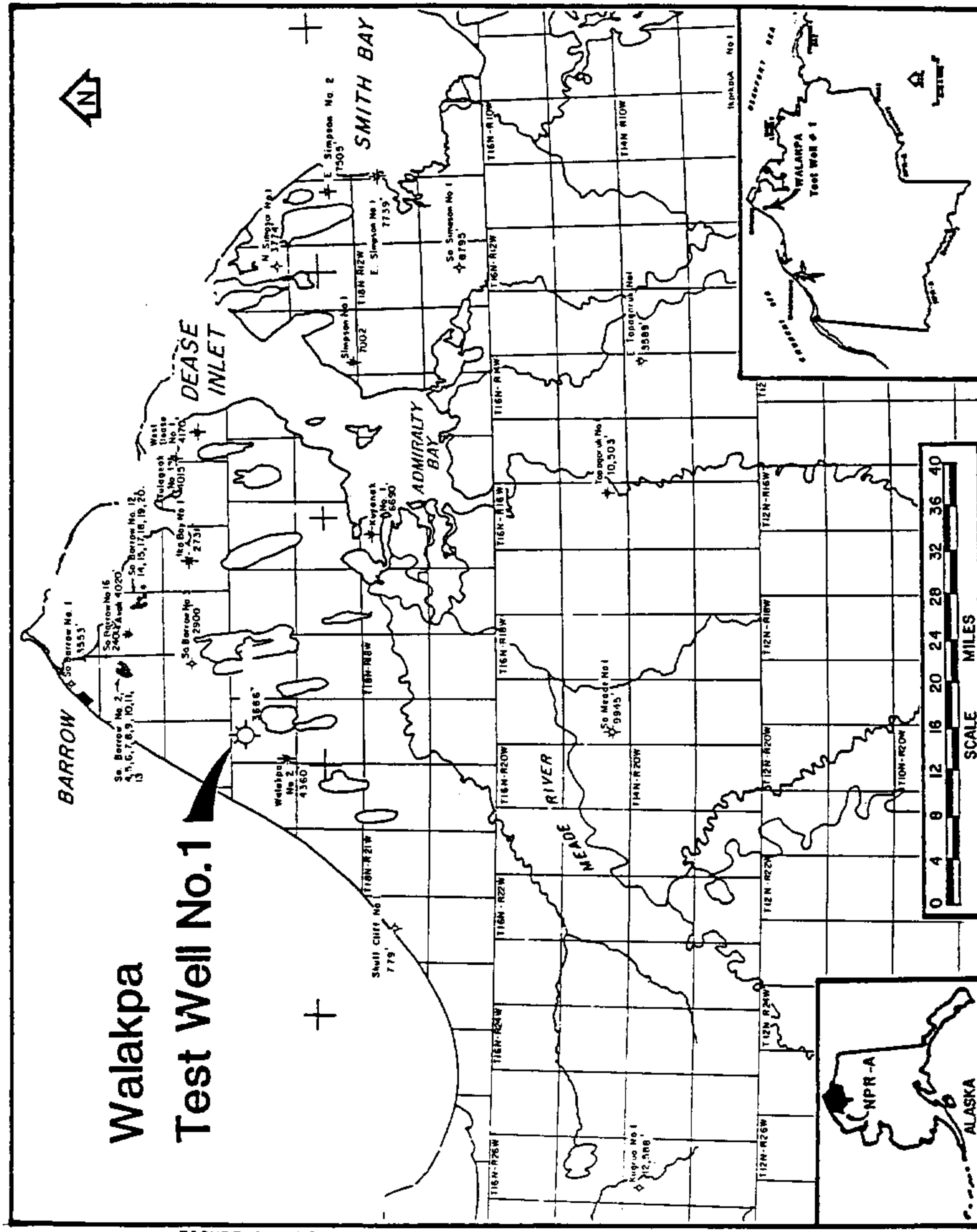
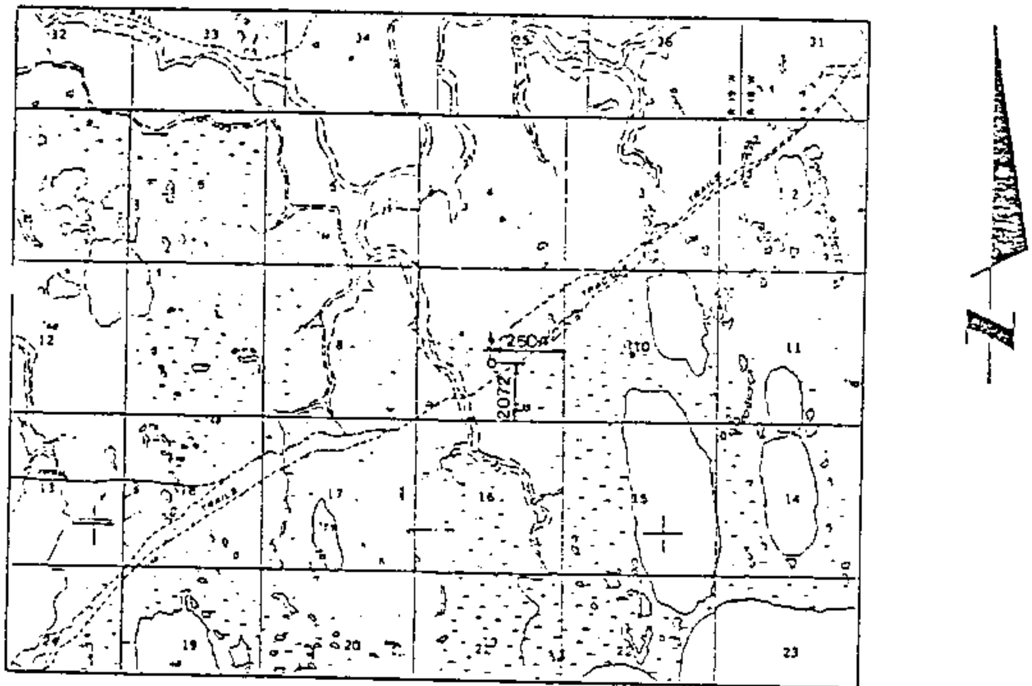


FIGURE 1 - LOCATION MAP - WALAKPA TEST WELL NO. 1



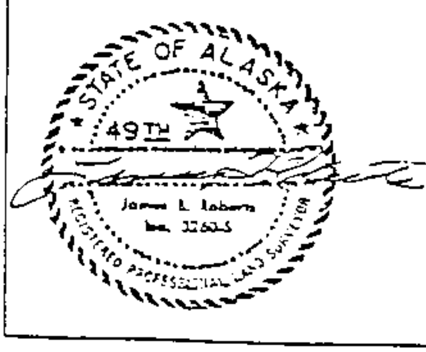
Computed location based on data from Barr Automated Surveys, Inc. to Husky Oil NPR Operations, Inc. dated Aug. 11, 1979, a copy of which is on file with Tectonics, Inc., Anchorage, AK.

WALAKPA 6-80
LAT. = 71°05'57.63"
LONG. = 156°53'03.79"
Y = 6,253,083.18
X = 632,366.26
ZONE 6

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
WALAKPA TEST WELL No.1
LOCATED IN
SE 1/4 PROTRACTED SEC. 9, T20N, R19W. UMIAT MERIDIAN, AK.

SURVEYED FOR
HUSKY OIL
N.P.R. OPERATIONS, INC.

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

FIGURE 2 - SURVEYOR'S CERTIFICATE - WALAKPA TEST WELL NO. 1

WELLSITE GEOLOGIST'S REPORT
by
Gordon W. Legg

INTRODUCTION

The Walakpa Test Well No. 1 is located approximately 13 miles south-southwest of the South Barrow Gas Field and 8 miles southwest of the South Barrow Test Well No. 3, a dry hole with a total depth of 2,900 feet. The Walakpa well was drilled to test the so-called Simpson or Mid-Jurassic sandstone which is absent in the South Barrow Gas Field and is poorly developed and shaly in the South Barrow Test Well No. 3. Seismic interpretations indicated a possibility of a gas reservoir at the approximate expected level of the sandstone at Walakpa No. 1.

STRATIGRAPHY

WIRELINE TOPS

	DRILLED DEPTH	SUBSEA DEPTH
CRETACEOUS		
Torok Formation	100'	-50'
"Pebble Shale"	1701'	-1651'
Walakpa sandstone	2070'	-2020'
JURASSIC		
Kingak Formation	2087'	-2040'
TRIASSIC		
Sag River Sandstone	3224'	-3174'
Shublik Formation	3314'	-3264'
INDETERMINATE		
Argillite	3633'	-3583'

CRETACEOUS

Torok Formation: 100-1701'

The sediments of the Torok Formation for the most part are a sequence of clays and claystones with a few siltstones and sandstones down to 900' then has an increase in the thinly bedded siltstones and sandstones from 900' to 1701'. All of the sandstones are carbonaceous with flakes of black carbonaceous material and are extremely shaly and silty. They are very fine grained, and exhibit poor to very poor porosity, consequently must be considered as having very poor reservoir potential due to both low porosity and insufficient bed thickness. There is an observable gradational character from clays and claystones through siltstones to the very shaly, silty sandstones.

Only one minor show of oil in the ditch samples was observed in the Torok, occurring at 250'. A core was obtained just below this point at 257-287'. Of the 23' recovered, most was clay and claystone with three thin sandstones (1-2' thick) which were shaly and silty and exhibited no oil or gas shows.

Sediments from a depth of 390' to 900' are Early Cretaceous (Aptian-Albian) undifferentiated from paleontological (Forminiferal) studies and from 900' to 1690' they are Early Cretaceous (Aptian-Early Albian). Paleontological studies based on palynology give ages of Early Cretaceous (Aptian-Albian) from 100' (conductor pipe) to 1690'. Electric logs revealed the top of the "Pebble Shale" (base of Aptian-Albian-top of Neocomian) at 1701', which is very close agreement with paleontological determinations.

"Pebble Shale": 1701-2070'

The dominant lithology of the "Pebble Shale" is a charcoal gray to black very organic shale. The shale contains "floating" rounded, clear, polished, greasy-appearing medium to coarse quartz grains. Occasionally, some of the grains are composed of chert. Toward the bottom of the formation and approaching the sandstone, the shale becomes highly carbonaceous, partly silty, and the color becomes more generally dark gray and gray-brown. Pyrite is common, and frequent large wood fragments were observed in Core No. 5 from 1981-2041'.

Ditch samples define the Neocomian "Pebble Shale" from 1690' to 2064' on the basis of forminifera and from 1650' to 2064' on the basis of palynology. Both foraminifera and palynological determinations were able to define the base of the Neocomian at approximately 2064' by examining a core which was obtained from 2060' to 2120'. A more convenient marker would be that obtained at the base of the Walakpa sandstone which occurred at 2087' on the electric log. The zone from 2064' to 2080' appears to be a reworked zone, paleontologically, and it is impossible to assign a definite age to it. This is typical of so-called "unconformity sands" which, in this well, are most likely early Cretaceous in age, but contain some reworked Jurassic fossils.

Walakpa sandstone: 2071-2087'

The interval 2071-2087' is a sandstone with fair to good reservoir qualities. Some equivalent of this sandstone is present in most of the wells drilled in the National Petroleum Reserve and is variously known as the "Pebble Shale", "Unconformity sandstone", and "Kuparuk sandstone".

Lithologically, the sandstone is very fine to fine grained, carbonaceous, and glauconitic; occasional pyrite was observed. Two thin conglomerates are present in the upper 5' of Core No. 6 (2060-2120'). Both are composed of black chert and quartz pebbles and cobbles, large clay blebs and scattered to common glauconite pellets. One (2062.5-2063.25') has a very shaly matrix; the other (2064.5-2065.25') has a sandstone matrix with scattered hydrocarbon staining. Light oil staining was observed in the core from 2063.5' to 2080', accompanied by good petroleum odor and varying degrees of fluorescence from dull gold to straw colored. Most of the shows yielded good cuts with a fair to good gold residue. Shows of gas were detected with the chromatograph. This sandstone was cored and then was tested both open hole and later through casing.

JURASSIC

Kingak Formation: 2087-3224'

The sediments representing the upper 963' of the Kingak Formation are alternating sequences of silty gray and brown shales with very argillaceous, light gray to gray-brown siltstones, and a few thin, rather argillaceous and silty sandstones. All sediments contain glauconite inclusions and pellets, and are somewhat carbonaceous. The shales are the dominant lithology above 2660' with the siltstones most prominent below this point.

At 3049' (electric log), a 55' Lower Barrow sandstone equivalent was entered. Fifty-three feet were recovered from a core at 3051' to 3111' (3058-3118' electric log). This sandstone, which is a gas producer in the Barrow gas fields, was fairly well developed in the Walakpa well but had marginal porosities in the range of 12-18% and did not contain hydrocarbon shows. The sandstone was generally light gray to brown, very fine to fine grained, carbonaceous and somewhat shaly and calcareous.

There were no shows of oil or gas in the Kingak and, with the exception of the Lower Barrow, none of the rock units had potential reservoir qualifications at this location.

From 3104' to 3224', the rocks are predominantly medium to light gray siltstones which grade downward to shales at the base. A few thin gray, very fine grained sandstones are present.

Rocks of Late to Early Jurassic are represented in the Walakpa No. 1 well. Foraminiferal and palynological determinations pick the top of the Late Jurassic at 2080' (2087' electric log). The base of the Late to Middle Jurassic is somewhat indistinct, but a depth of 3087' is chosen as a probable pick. A Late Triassic to Early Jurassic age has been assigned to the interval 3087-3360'. The electric log pick of 3224', which represents the top of the Sag River Sandstone, is preferred for the base of the Jurassic.

TRIASSIC

Sag River Sandstone: 3224-3314'

Rocks of the Sag River are primarily sandstones and siltstones with some thin shales and limestones. The sandstones are tan, medium gray and off-white, fine to very fine grained, glauconitic and have some carbonaceous material. They are siliceous and generally tight at the top of the interval but become increasingly calcareous with depth. No hydrocarbon shows were observed.

Interbedded with the sandstones are thin gray to dark gray, argillaceous and calcareous siltstones and gray to dark gray shales. Some reddish-brown shale was noted in the samples. Tan, microcrystalline, dolomitic limestone was observed in the 3230-3270' samples.

Although Anderson, Warren & Associates, Inc. do not pick a definite Triassic top in the Walakpa No. 1, the Sag River Sandstone has been given a Triassic age in other wells drilled in the National Petroleum Reserve in Alaska. For the purpose of this report, it is also placed in the Triassic.

Shublik Formation: 3220-3633'

The Shublik consists of limestones and generally calcareous sandstones, siltstones and shales. There is an alternating sequence of sediments of the above rock types which appear to be gradational with each other. These rocks are typically glauconitic, occasionally carbonaceous, and become increasingly fossiliferous with depth; most of the fossils are in limestones. Light gray, very fine to fine grained, calcareous, glauconitic sandstones and light to dark gray siltstones are the prominent lithology down to 3505'. Below this point, limestones become the major component, although sandstones and siltstones are common. The limestones vary in color from dark gray to white. Thin gray and gray-brown shales are scattered throughout the formation.

Foraminiferal determinations choose the zone from 3087' to 3360' as Late Triassic to Early Jurassic without committing a definite Triassic pick. Palynological determinations assigned the zone 3090' to 3360' as indeterminate. Foraminiferal determinations choose 3620' as the base of the Triassic while palynological determinations are more indistinct with definite Triassic extending only to 3420' followed by an apparent "data gap" from 3420-3545' and a final classification of indeterminate for rocks from 3545' to 3666'.

None of the rock units of the Triassic are considered to be a potential reservoir rock because they are generally quite well indurated and have low porosities. No shows of hydrocarbons were observed.

INDETERMINATE

Argillite: 3633-3666'

The low-grade metamorphics, which are collectively called argillite on the North Slope, were encountered at 3633' (electric log) and persisted to a total depth of 3666' (3672' electric log).

The argillite was charcoal gray in color and had a microgranular texture. It was micromicaceous, blocky, and dense. A core at 3656-3666' (Core No. 12) exhibited no apparent bedding, fissility, or schistosity.

OIL AND GAS SHOWS

All shows of oil and gas have been covered under the various stratigraphic headings; however, the gas show in the Walakpa sandstone at 2071-2087' (driller's depth) will be covered in greater detail.

Analysis of the cored interval 2062-2081' had porosities ranging from a low of 9.1% to a high of 25.1%. The average porosity value for the entire 19' interval was 18.2%. Permeabilities ranged from a low of 0.05 millidarcies to a high of 157 millidarcies, and with an average for the interval of 49 millidarcies. Oil saturations averaged around 3%, which is typical for a gas sand. Water saturations were also typical for gas sandstones with an average of around 50% (Appendix D).

Log calculations revealed an average porosity of approximately 21% and a water saturation of approximately 40% (these values compare favorably with core analysis).

Interpretation of the log calculations and core analysis would predict water-free gas production with some question about volume of production because of generally low permeability and probably low pressure due to the shallow depth.

An open-hole drill-stem test from 2063-2120' had gas-to-surface in 13 minutes, but freezing of water cushion and possibly hydrate water in the flow line precluded determinations of flow rates or pressures.

A decision was made to run 7" casing, cement, and perforate the Walakpa sandstone interval and place the zone on a 4-point production test. Perforations were made from 2071-2086', and the well was tested with varying choke sizes and with several flow periods. A flow of 325,000 CFGPD was obtained on a 14/64" choke with a flowing tubing pressure of 260 psi. Based on the flow rates, a calculated absolute open flow rate of 370,000 CFGPD was obtained.

CONCLUSION

The gas-producing sandstone (2071-2087') that was tested in Walakpa is considered only of fair reservoir quality on the bases of low to moderate permeability and porosity and limited reservoir thickness. The trapping mechanism is most likely controlled by updip pinchout of the sandstone to the north against the Barrow Arch. The producing limits of the sandstone could be quite extensive since it is almost certainly stratigraphically controlled.

The area in the vicinity of Walakpa could ultimately prove to be of interest as a future supply of gas for the village of Barrow.

PERTINENT DATA AND APPENDICES

SUMMARY PERTINENT DATA, OPERATIONS & ANALYSIS*

WELL NAME:	Walakpa Test Well No. 1
API NO.:	50-023-20013
OPERATOR:	Husky Oil NPR Operations, Inc.
LOCATION:	2604' FEL, 2072' FSL Protracted Section 9, T20N, R19W Umiat Meridian North Slope Borough, Alaska
COORDINATES:	Latitude: 71°05'57.63" North Longitude: 156°53'03.79" West X = 632,366.26 Y = 6,253,083.18 Zone 6
ELEVATION:	50' Kelly Bushing; 31' Ground; 33' Pad
DATE SPUDDED:	December 25, 1979
TOTAL DEPTH:	3666' Driller; 3672' Wireline
DATE REACHED TOTAL DEPTH:	January 23, 1980
FORMATION AT TOTAL DEPTH:	Argillite
DATE RIG RELEASED:	February 7, 1980
CASING:	13-3/8" @ 100' 9-5/8" @ 1786' 7" @ 3644'

SIGNIFICANT HYDROCARBON SHOWS:

Interval	Description
2073-2088' (Perfs)	Tested 325 MCFD of dry gas

STATUS: Plugged and abandoned.

LOGGING RECORD:

Open Hole:	DIL/GR/SP	106-3666'
	BHCS/GR/TTI	106-3666'
	CNL/FDC/GR/CAL-0	106-3660'
	FDC/GR/CAL/RR	106-3660'
	HDT Dipmeter	106-1780'
		1786-3655'
	HRT Temp.	200-3672'
	Mud Log	100-3666'
	Dc Exponent	700-3666'
	Velocity Survey	345-3670'
Cased Hole:	CBL/VDL/CR/CAL	1200-3567'
		1700-2197'
Computed Logs:	Geogram Survey	100-3620'
	Saraband	1800-3660'

SIDEWALL CORES**

Run 1 1840-3615'; 30 shot, 25 recovered.

CONVENTIONAL CORES:

No.	Interval	Recovery	Formation
1	257- 287'	23'	Torok
2	1590-1613'	No recovery	Torok
3	1743-1760'	No recovery	"Pebble Shale"
4	1837-1897'	51'	"Pebble Shale"
5	1981-2041'	58'	"Pebble Shale"
6	2060-2120'	54'	Walakpa sandstone
7	2808-2825'	3.8'	Kingak
8	2930-2990'	60'	Kingak
9	2990-3020'	30'	Kingak
10	3051-3111'	60'	Sag River Sandstone
11	3360-3420'	60'	Shublik
12	3656-3666'	10'	Argillite

CORE ANALYSIS:

Date	Interval	Core No.	Sample Nos.
1-14-80	2062-2081'	6	1-20
1-14-80	3051-3096'	10	21-66

TESTS (DRILL-STEM TESTS):

No.	Interval	Summary Description
1	2063-2120'	Open-hole drill-stem test, gas to surface in 13 minutes, flow line froze, test aborted.
2	2073-2088'	Perforated 7" casing, four shots/foot, well flowed dry gas at approximately 325 MCFGPD.

FLUID ANALYSIS:

Source	Type Analysis
Drill-Stem Test No. 1	Gas and recovery fluid analysis (see Appendix F).
Drill-Stem Test No. 2	Gas, drill fluid, water cushion and sample-chamber fluid (see Appendix F).

SPECIAL ANALYSIS: Fresh-water susceptibility analysis interval 2066-2078' (Core No. 6) (see Appendix G).

Miscellaneous Pertinent Data

WELLSITE GEOLOGIST: G. Legg
W. D. Fenex

DRILLING CONTRACTOR: Brinkerhoff Signal, Inc., Rig 31

MUDLOGGERS: 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

** Sidewall cores were utilized for various analyses including: lithology, paleontology, and geochemistry.

WALAKPA NO. 1
DRILL CUTTINGS AND CORE DESCRIPTION
BY

G. LEGG	-	100-1800'
	-	3051-3666'
D. FENEX	-	1800-3051'

NOTE: Sample descriptions and depths are from wellsite and are not adjusted to mechanical control.

DRILLED DEPTH (FEET BELOW KELLY BUSHING)	
0 - 100	No samples caught.
100 - 140	Clay: gray, soft, sticky to gummy with occasional very fine grained flecks of carbonaceous material.
140 - 200	Clay: as above, with trace of Sandstone: gray, fine grained, carbonaceous flakes.
200 - 240	Clay: as above, with increase in silt to very fine grained sand particles and with 10% carbonaceous flecks.
240 - 257	Clay: as above, with Sandstone: gray, very silty, heavy clay matrix; very fine grained to silt, some carbonaceous flecks, bright yellow fluorescence in part, very slow cut, nonstreaming.
257 - 287	Core No. 1: Cut 30', Recovered 23'

257.0-258.0' (1.0')	Clay and Claystone: medium gray, soft to poorly indurated, gummy to sticky, noncalcareous, nonswelling.
258.0-258.5' (0.5')	Sandstone: medium gray, very argillaceous and silty, grading to siltstone and clay, very fine grained to silt, soft to friable with heavy clay matrix, poor to nil porosity, grading to silty clay toward bottom.
258.5-268.0' (9.5')	Clay and Claystone: as above, but slightly silty and very slightly micromicaceous in part, varying between micromicaceous and silty to sandy to nonmicaceous and nonsandy.

	268.0-269.0' (1.0')	Sandstone: medium gray, very argillaceous as above, no show.
	269.0-274.5' (5.5')	Claystone: as above.
	274.5-275.0' (0.5')	Sandstone: as above, but even more clayey, completely gradational with claystone.
	275.0-278.0' (3.0')	Claystone: as above.
	278.0-278.2'' (0.2')	Sandstone: mostly as above, but slightly more porous, some evidence of very slight permeability, no show.
	278.2-280.0' (1.8')	Claystone: as above.
	280.0-287.0' (7.0')	No recovery.

287 - 380	Clay and Claystone: as in Core No. 1.
380 - 410	Clay: as above, but with increase in floating sand and silt grains.
410 - 650	Clay: as above, but with rare sand to silt grains.
650 - 770	Clay: as above, with trace of Sandstone: gray, very fine grained to silt, very argillaceous with heavy clay cement, some very fine grained carbonaceous material, poor porosity, no show.
770 - 950	Clay: as above, with minor Sandstone: gray to brown, very fine grained to silt, argillaceous, poor to moderately indurated, poor porosity, no show.
950 - 1070	Clay: as above, with trace to 10% Sandstone: gray, silty, clay matrix, poor porosity.
1070 - 1100	Clay: as above, with Sandstone and Siltstone: white to gray, very fine grained to silt, some very thin carbonaceous flakes, very argillaceous, grading to clay, some poor to fair porosity, some bright yellow fluorescence, very slight to nil cut from gel-like emulsion, possible free oil, probably contamination.
1100 - 1160	Clay: as above, with Sandstone and Siltstone: as above, but no fluorescence.

1160 - 1250	Clay: very silty to sandy with sandstone becoming mostly siltstone.
1250 - 1460	Clay: becoming very silty, nearly unconsolidated, becoming a very clayey siltstone, with Sandstone: dark gray to brown, very silty, essentially siltstone, poor porosity, no show.
1460 - 1490	Clay: mostly as above, but with large increase in silt and very fine grained sand residue when clay is washed out, with Siltstone: dirty gray, sandy, very argillaceous, carbonaceous.
1490 - 1520	Clay: as above, with Siltstone: as above with abundant free pyrite.
1520 - 1550	Sample contaminated with diesel oil from unknown source.
1550 - 1580	Clay: as above, with Siltstone and Sandstone: light gray to off white, very fine grained to silt, extremely carbonaceous with flakes and inclusions, poor porosity, no show, with rounded black chert pebbles and one rounded smoky quartz pebble.
1580 - 1590	Clay, Siltstone, and Sandstone: as above, but no pebbles.
1590 - 1613	Core No. 2: Cut 23', No recovery.
1613 - 1700	Clay: as above, with Siltstone: dirty gray, very argillaceous, grading to silty claystone with Sandstone: gray, very fine grained to silt, some fine grained, abundant feldspar grains, very argillaceous, grading to siltstone and claystone, poor porosity, no show.
1700 - 1730	Shale: dark gray, very organic and carbonaceous, subfissile to fissile, poor to moderately indurated, with Clay and Siltstone: as above.
1730 - 1743	Shale: as above, with occasional free rounded, clear, coarse grained quartz and some broken pebbles of quartz and gray chert.
1743 - 1760	Core No. 3: Cut 17', No recovery.
1760 - 1790	Shale: as above, but becoming more light gray, very silty, occasionally grading to siltstone; less organic.
1790 - 1800	Shale: as above, with occasional rounded grains as above.
1800 - 1837	Shale: as above.

1837 - 1897	Core No. 4: Cut 60', Recovered 51'	
	1837.0-1859.5' (22.5')	Shale: black to dark gray, subfissile, micromicaceous, rare pyrite inclusions, rare floating quartz pebbles, well rounded; minute carbonaceous inclusions.
	1859.5-1860.0' (0.5')	Siltstone: medium dark gray, very argillaceous, sandy in part (floating well rounded, medium grained quartz), minutely micaceous, common carbonaceous debris, very slightly calcareous, well indurated.
	1860.0-1861.0' (1.0')	Shale: as above.
	1861.0-1861.5' (0.5')	Siltstone: as above.
	1861.5-1864.0' (2.5')	Shale: as above.
	1864.0-1864.75' (0.75')	Marlstone (Concretion?): medium gray brown, smooth, very well indurated, with coarse calcite-filled veins and pelecypod(?) cast; some minute carbonaceous inclusions.
	1864.75-1888.0' (23.25')	Shale: as above, with pyrite nodules, rare rounded quartz pebbles, rare wood fragments, carbonized, and grading to coal, black and shiny, partially replaced by pyrite, rare microfossils and spicules; rare fossil prisms.
	1888.0-1897.0' (9.0')	Not recovered.
1897 - 1945	Shale: as above.	
1945 - 1981	Probably Sandstone as interpreted by drilling time; only minor amounts of unconsolidated quartz grains, very fine to fine grained, clear, with loose pyrite, subrounded to subangular, well to fair sorted, occur in the largely Shale sample.	

1981 - 2041	<u>Core No. 5: Cut 60', Recovered 58'</u>	
	1981.0-2030.0' (49.0')	Shale: dark gray-brown, subfissile to fissile, coarsely micaceous grading to micromicaceous towards base with scattered rounded quartz pebbles, pyrite inclusions, scattered large wood fragments, carbonaceous, grading to black, shiny coal (pyrite replacement occurs in part); abundant spicules filled with olive-green clay; occasional microfossils; generally silty to very silty; carbonaceous debris.
	2030.0-2031.0' (1.0')	Siltstone: medium gray brown, argillaceous, abundant carbonaceous debris and fine tan fossil debris.
	2031.0-2039.0' (8.0')	Shale: as above, with some pyritized worm tubes.
	2039.0-2041.0' (2.0')	No recovery.
2041 - 2060	Essentially Shale: as above.	
2060 - 2120	<u>Core No. 6: Cut 60', Recovered 54'</u>	
	2060.0-2061.5' (1.5')	Shale: dark gray brown, as above.
	2061.5-2062.5' (1.0')	Shale: as above, becomes very conglomeratic with large floating black subrounded chert and quartz cobbles and pebbles; abundant quartz grains, varying from fine to coarse grained, very poorly sorted; largely dark brown clay matrix, becomes sandier towards base; large wood fragment.
	2062.5-2063.25' (0.75')	Conglomerate: very shaly matrix with cobbles and pebbles, as above; some large clay blebs; scattered bright green glauconite pellets.
	2063.25-2064.5' (1.25')	Sandstone: light gray brown, "salt and pepper", fine to medium grained, subrounded and subangular, fair sorting, moderately indurated, slightly calcareous (appears to be siderite cement), common bright green

	glauconite pellets, some milk-white tripolitic chert, poor to fair intergranular porosity, light oil stain, good petroleum odor, varying degree of fluorescence from dull gold to straw, light straw milky cut, leaves gold residual cut on spot plate.
2064.5-2065.25' (0.75')	Conglomerate: dark gray brown, composed of large rounded pebble- to cobble-sized quartz and black, smoky gray chert, rare dark gray rounded clay blebs, rare milk-white tripolitic chert, some fossil debris and plant remains, in a matrix of Sandstone: as above, common green glauconite pellets, siderite cement, petroleum odor, scattered stain, dull gold fluorescence, slow cut leaving a residual cut on spot plate; generally poor intergranular porosity.
2065.25-2068.25' (3.0')	Sandstone: as above, with generally better porosity, dull to bright gold fluorescence, slow blossoming cut, well cemented with siderite.
2068.25-2068.75' (0.5')	Sandstone: as above, very fine to fine grained, very poor porosity; no odor, stain, cut, or fluorescence.
2068.75-2079.5' (10.75')	Sandstone: as above at 2068.25', with show as above, general increase in porosity.
2079.5-2080.0' (0.5')	Sandstone: as above, with abundant pebbles and cobbles, some white tripolitic chert and carbonized plant remains; vertical fractures.
2080.0-2080.5' (0.5')	Sandstone: as above, very silty, hard and tight, argillaceous, black-brown clay cement; no odor, stain, cut, or fluorescence.
2080.5-2086.0' (5.5')	Shale: dark gray-brown, very silty, grades to siltstone in part, some spicules, becomes shalier towards base.
2086.0-2092.0' (6.0')	Siltstone: dark gray-brown, argillaceous, micromicaceous, with coarse green glauconite pellets.

2092.0-2100.0' (8.0')	Interbedded Shale: dark brown, smooth, subfissile, micromicaceous, slightly silty, some clay-filled spicules and Siltstone: as above.
2100.0-2113.0' (13.0')	Shale: as above, with spicules and pyritized worm burrows, some carbonized wood debris, rare microfossils.
2113.0-2114.0' (1.0')	Siltstone: as above.
2114.0-2120.0' (6.0')	Not recovered.

2120 - 2172	Shale: as above, grades to siltstone in part, with large green glauconite pellets.
2172 - 2178	Sandstone: unconsolidated, composed of quartz grains, coarse, subrounded. (Interpretation based mainly upon drilling time.)
2178 - 2194	Shale: as above.
2194 - 2200	Sandstone: as above, unconsolidated.
2200 - 2335	Claystone: brown, lumpy, moderate to poorly indurated, with coarse glauconite pellets, pyrite inclusions, some pyritized worm tubes; rare ironstone concretions, tan, hard, brittle.
2335 - 2465	Siltstone: light gray, clean, moderately indurated, with minute green glauconite pellets, very slightly calcareous, grades to sandstone, composed of unconsolidated quartz grains, with some loose pyrite and glauconite, from 2345-2352'; trace fossil prisms.
2465 - 2550	Alternating Shale and Siltstone: as above, with some concretions.
2550 - 2570	Shale: light medium gray, very minutely micaceous, smooth to silty in part; some minute carbonaceous material, blocky.
2570 - 2580	Siltstone: as above, argillaceous, some loose rounded quartz grains.
2580 - 2655	Shale: gray, as above, with abundant bentonite streaks, minute carbonaceous debris, some pyrite inclusions, silty in part.

2655 - 2745 Siltstone: light gray to tan, clean, blocky, well indurated, rare minute glauconite pellets, becomes sandy in part, noncalcareous, grades to very argillaceous in part; with interbedded Shale: gray, as above, some pyrite inclusions.

2745 - 2767 Siltstone: light gray, sandy in part, grades to sandstone in part, clean, noncalcareous, moderately indurated, grades to gray siltstone, argillaceous in part, with some concretions, as above.

2767 - 2775 Shale: light medium gray, as above.

2775 - 2790 Siltstone: as above, very argillaceous.

2790 - 2808 Shale: as above.

2808 - 2825 Core No. 7: Cut 17', Recovered 3.8'

2808.0-2811.8' (3.8') Siltstone: medium to light gray-brown, very argillaceous, sandy in part, grades to shale in part, micromicaceous, abundant coarse carbonaceous debris, moderately indurated.

2811.8-2825.0' (13.2') No recovery.

2825 - 2880 Siltstone: as above, becomes slightly "salt and pepper", abundant coarse carbonaceous debris, micaceous, rare glauconite pellets, with thin interbedded shale, as above.

2880 - 2930 Shale: medium gray-brown, subfissile, micromicaceous, some minute carbonaceous debris, very bentonitic, some fossil fragments, pyrite inclusions.

2930 - 2990 Core No. 8: Cut 60', Recovered 60'

2930.0-2958.0' (28.0') Shale: medium gray-brown, subfissile, micromicaceous, minute carbonaceous debris, moderately well indurated, noncalcareous, with abundant blebs of bentonite, scattered rare worm tubes replaced by pyrite, rare concretions and spicules filled with gray clay; rare large wood fragments, coalified; and with one small intact pelecypod replaced by pyrite.

2958.0-2966.0' (8.0') Shale: as above, becomes very silty, grades to siltstone, with pyritized worm tubes.

26

2966.0-2972.0' (6.0') Shale: as above.

2972.0-2988.0' (16.0') Siltstone: gray-brown, very argillaceous, well indurated, common carbonaceous debris, micromicaceous, rare green glauconite pellets, noncalcareous.

2988.0-2990.0' (2.0') Siltstone: as above, grades to sandstone in part.

2990 - 3020 Core No. 9: Cut 30', Recovered 30'

2990.0-3020.0' (30.0') Siltstone: dark gray-brown, very argillaceous, sandy, micromicaceous, common carbonaceous debris and green glauconite pellets, bioturbated, thinly laminated, rare bentonite blebs; grades to light gray Sandstone clasts; occasional wood fragments, no porosity, no shows.

3020 - 3042 Siltstone: as above.

3042 - 3051 Sandstone: light gray brown, very fine to fine grained, subrounded and subangular, well sorted, clean, slightly "salt and pepper", calcareous, poor to fair intergranular porosity; no odor, stain, cut, or fluorescence.

3051 - 3111 Core No. 10: Cut 60', Recovered 60'

3051.0-3056.0' (5.0') Sandstone: light to medium gray, very fine grained to silt, grading to siltstone, slightly bioturbated with marbling of darker gray argillaceous material, occasionally finely micaceous, and with rare fragments of partly carbonized wood, occasionally pyritized, very slightly carbonaceous, well cemented with silica and clay, moderate to well indurated, generally poor to nil porosity, occasional thin lenses of poor to fair porosity, no show; some rare snow white talc-like mineral on occasional closed fracture, probably kaolin; sandstone appears to be very well indurated and silicified in vicinity of fracture.

3056.0-3065.0' (9.0') Sandstone: light gray to tan, very fine grained to fine grained, slightly less argillaceous and bioturbated than above, occasionally slightly friable to moderately indurated, very slightly calcareous, poor to fair porosity, no show.

3065.0-3066.0' (1.0')	Sandstone: light to medium gray, very fine grained to silt, argillaceous, well indurated, very slightly calcareous, poor to nil porosity, no show.
3066.0-3069.0' (3.0')	Sandstone: light gray to tan, very fine grained to fine grained as interval 3056.0' to 3065.0' above.
3069.0-3076.0' (7.0')	Sandstone: light to medium gray, very fine grained to silt, argillaceous, with occasional very finely micaceous argillaceous material, very slightly calcareous as above, generally poor porosity, occasional thin zones of poor to fair porosity, no show.
3076.0-3098.0' (22.0')	Sandstone: light to medium gray, very fine grained to silt, with some fine grained, varies between moderate to well indurated and moderate to well cemented, very slightly calcareous as above; porosity varies from poor to nil to poor to fair, no show; generally more silty and argillaceous than above, becoming more argillaceous and slightly carbonaceous below 3086', with occasional thin very finely micaceous and carbonaceous shale partings; one large wood fragment approximately 3-4 centimeters in diameter at 3093', high specific gravity, very heavily pyritized, but with original wood texture and grain.
3098.0-3100.0' (2.0')	Sandstone: light to medium gray, as above, very fine grained to silt, very slightly calcareous, argillaceous and slightly carbonaceous, but with occasional grains of green glauconite, poor to nil porosity.
3100.0-3109.0' (9.0')	Siltstone: gray to dark gray, argillaceous and sandy, grading to

		very silty sandstone; carbonaceous, very slightly calcareous, moderate to well indurated.
	3109.0-3111.0' (2.0')	Siltstone: as above, but slightly more sandy, and with occasional lenses and partially rounded inclusions of spar calcite, appears to be detrital, but probably is replacement (no recognizable fossil form).
3111 - 3120	Shale: medium gray, grading to siltstone, calcareous, with Siltstone: gray, very argillaceous, grading to shale.	
3120 - 3140	Siltstone: as above, grades in part to very silty sandstone, gray, argillaceous, very fine grained, well indurated, poor to nil porosity.	
3140 - 3160	Siltstone: as above, but becoming more sandy, grading to sandstone, with Sandstone: mostly as above, but with some finely disseminated glauconite and with minor Shale: as above.	
3160 - 3170	Siltstone: as above, with minor Sandstone: light gray, very fine to fine grained, black carbonaceous and coal flakes, very slightly calcareous, siliceous, very well indurated.	
3170 - 3190	Siltstone: light gray, very argillaceous and sandy, very carbonaceous, with very fine grained coal flakes with Sandstone: white to light gray, mottled with black carbonaceous flakes, very fine grained to silt, grades to siltstone, very slightly calcareous, siliceous cement, very well indurated, with minor Shale: as above.	
3190 - 3210	Siltstone and Sandstone: as above, with Shale: as above and with some Shale: red brown, very finely micaceous in part, poor to moderately indurated.	
3210 - 3220	Sandstone: tan to pale gray; mostly fine grained, mottled with black carbonaceous material and shale particles, occasional glauconite, dense, tight and siliceous, some friable with fair porosity, no show, with Shale: as above, with minor Siltstone: as above.	
3220 - 3230	Shale: as above, with some Shale: dark gray to black, very organic and carbonaceous, earthy, with Sandstone and Siltstone: as above.	

3230 - 3240	Shale and Sandstone: as above, with Limestone: very dolomitic or sideritic, tan, occasionally earthy, microcrystalline, well indurated, occasional inclusions of sand and glauconite pellets.
3240 - 3250	Shale and Sandstone: as above, with Limestone: as above, but becoming very silty in part, grading to siltstone, with Siltstone: gray, very calcareous, argillaceous, well indurated.
3250 - 3260	Sandstone: gray to off white, very fine grained to fine grained, very silty, grading to Siltstone: argillaceous, occasional black carbonaceous flakes, occasional glauconite grains and pellets, moderate to well indurated, poor porosity, no show, with Siltstone, Shale and Limestone: as above.
3260 - 3270	Sandstone: as above, but becoming more calcareous, grading in part to limestone.
3270 - 3280	Sandstone: as above, with heavy calcareous matrix and occasional white clay in matrix.
3280 - 3290	Sandstone: as above, with Siltstone: gray to dark gray, very sandy, occasional glauconite and carbonaceous particles, and with trace of Shale: pale gray, waxy, nearly claystone.
3290 - 3310	Shale: as above, with Shale: dark gray to black, organic, earthy, occasional floating rounded quartz grains, with Siltstone and Sandstone: as above.
3310 - 3320	Shale: as above, but becoming more silty, grading to siltstone, occasional glauconite pellets, with sandstone, becoming more silty - grading to siltstone, and with Siltstone: grading to shale, occasional glauconite pellets.
3320 - 3330	Siltstone and Sandstone: gradational, frequent pellets and inclusions of glauconite, with Shale: as above, and with some limonite and limonitic clay, rust-brown with occasional oolites and trace of Limestone: tan to brown, microcrystalline, dense.
3330 - 3340	Siltstone and Sandstone: as above, becoming well indurated, with Shale: as above, with increase in limonite, and with trace of Limestone: as above.
3340 - 3350	Siltstone and Sandstone: as above, grading in part to limestone, with increase in Limestone: some dark gray, white to tan in part, fossil pelecypod shells, occasional glauconite, frequently silty, with Shale: as above.

3350 - 3360	Predominantly Shale: pale gray, smooth, fissile, micromicaceous, very fine carbonaceous flakes, rare glauconite pellets, with Limestone: as above, and with minor Siltstone and Sandstone: as above.
3360 - 3420	<u>Core No. 11: Cut 60', Recovered 60'</u>

3360.0-3372.0' (12.0')	Siltstone: very sandy, argillaceous and calcareous, grading to silty sandy Limestone: gray to gray-brown, mostly silt with some very fine grained sand zones, very heavy calcareous matrix, very well indurated and dense, occasional zones of pelecypod accumulations, occasional glauconite grains, poor to nil porosity, grading from essentially sandstone at top to siltstone and then to limestone near bottom.
3372.0-3375.0' (3.0')	Limestone: gray and gray-brown, very argillaceous, silty and occasionally sandy, grading to very calcareous siltstone.
3375.0-3377.0' (2.0')	Siltstone: as above.
3377.0-3393.0' (16.0')	Sandstone: gray to gray-brown, very silty, grading in part to siltstone, very argillaceous and calcareous, very fine grained, occasional glauconite, poor to nil porosity; very shaly in bottom one foot.
3393.0-3396.0' (3.0')	Shale: gray, smooth, micromicaceous, fissile, carbonaceous flakes, noncalcareous except for occasional fossil pods.
3396.0-3419.5' (23.5')	Siltstone: as above, but increase in glauconite, and with occasional carbonaceous inclusions; dark green translucent mineral 3405-3410', waxy, soft, appears to be chlorite; no glauconite or chlorite below 3410', but occasional pyrite.
3419.5-3420.0' (0.5')	Shale: pale gray, noncalcareous, as above.

3420 - 3430	Shale: as in Core No. 11, with Siltstone: as in Core No. 11.
3430 - 3460	Sandstone: off white to light gray, mottled green with abundant glauconite pellets and grains, very fine grained, very calcareous with heavy matrix, argillaceous and silty, poor porosity, no show, with Shale and Siltstone: as above.
3460 - 3470	Sandstone: as above, occasional calcite replaced pelecypods.
3470 - 3480	Sandstone: becoming very fine grained to fine grained, friable in part, heavy clay and calcite matrix, poor porosity, no show.
3480 - 3490	Sandstone: as above, but more firmly indurated, with Siltstone: dark gray, sandy, very calcareous, with inclusions of yellow-brown limonitic claystone, frequent loose coarse grained rounded quartz, abundant pelecypod fragments.
3490 - 3510	Sandstone and Siltstone: as above, becoming more calcareous, grading to limestone, with Shale: brown, micromicaceous, subfissile to fissile.
3510 - 3530	Limestone: dark gray to brown, very silty and sandy, grading to siltstone and sandstone, very well indurated, occasional glauconite, occasional pelecypod fragments, with Sandstone and Siltstone: as above.
3530 - 3560	Limestone: as above, but becoming more dense, appears to be siliceous, with some Sandstone and Siltstone: as above.
3560 - 3570	Limestone: becoming more sandy, grading to Sandstone and Siltstone: as above.
3570 - 3590	Limestone: as above, with some Limestone: white, soft, very chalky, with Shale: gray and gray-brown, smooth, fissile, with Sandstone and Siltstone: as above.
3590 - 3600	Limestone: white to light tan, very chalky, abundant fossil fragments, soft to very well indurated, nil porosity, no show, with minor Shale, Siltstone and Sandstone: as above.
3600 - 3610	Limestone: as above, but becoming sandy in part, with sand grains and very fine grained inclusions of black mineral, could possibly be argillite, dense, with minor Sandstone: very calcareous, and minor Shale: as above.

3610 - 3620	Limestone: as above, but becoming even more silty, sandy, grading to sandstone, and with increase in very fine grained black inclusions.
3620 - 3656	Argillite: charcoal gray, microgranular texture, micromicaceous, blocky, dense.
3656 - 3666	Core No. 12: Cut 10', Recovered 10'

3656.0-3666.0' (10.0')	Argillite: charcoal gray, microgranular, micromicaceous, with scattered mica; breaks at 30° and 60° with slate-like cleavage, occasional hairline discontinuous lenses filled with calcite (seldom exceeding 1-2 centimeters and with random orientation).

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

LOGGING REPORT

WELL NAME WALAKPA #1

Date December 30, 1979 Driller Depth 1800'

Elevation 50' KB - 31' GL Logger Depth 1799'

Logs Run and Intervals

DIL/GR/SP	106-1793'
BHCS/GR (Caliper failed)	106-1788'
FDC/CNL/GR/CAL	106-1790'
HDT Dipmeter	106-1780'

Additional Logs to Run

Zones of Interest

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

Discussion:

Schlumberger TD: 1799' Csg: 106' (13 3/8")
Driller TD: 1800'

Log Tops & Correlations:

Top - Pebble Shale: 1701' (-1651') = 6472' (-6412') on So. Meade - 4761' high.

Additional Evaluation Plans:

NONE

DAVE FENEX
Wellsite Geologist

Log Analyst

12/77

HUSKY

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

LOGGING REPORT

WELL NAME WALAKPA #1

Date January 24, 1980 Driller Depth 3666'

Elevation 50' KB - 31' GL Logger Depth 3672'

Logs Run and Intervals

HRT Temp Log (#1)	200-3672'
DIL/GR/SP	1786-3666'
~~BHCS/GR~~	~~1786-3660'~~
FDC/CNL/GR/CAL	1786-3660'
HDT Dipmeter	1786-3655'
~~Velocity Survey~~	~~345-3670'~~
HRT Temp Log (#2)	200-3672'

Additional Logs to Run

CST Sidewall Cores, shot 30, recovered 25

Zones of Interest

Depth	Gross Thickness	Net Feet of Porosity	Lith	Porosity	Probable Fluid Content
2071-2087'	16'	16'	SS	22%	Gas

Discussion:

SS @ 2071-2086', net pay 16', aver. density porosity 22.5%, aver. neutron porosity 22.0%, max. porosity 25%, minimum porosity 18%, Sw estimate @ 40-50%.

Log Tops & Correlations:

"Basal Cret" SS @ 2071'
Sag River? @ 3224'
Shublik @ 3264'
Argillite @ 3631'

Additional ... Plans

Cased hole DST after running 7" casing.

G. Legg
... Geologist

... Analyst

12/77

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

U.S. GEOLOGICAL SURVEY
HUSKY OIL CO., NPR OPERATOR
WALAKPA #1
NORTH SLOPE, ALASKA

DATE : 14-JAN-80
FORMATION :
DRLG. FLUID: WBM
LOCATION :

FILE NO : BP-3-563
ANALYSTS : WSP,TLS
LABORATORY: ANCHORAGE

BOYLES LAW POROSITY

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID SATS. OIL	WTR	DESCRIPTION
1	2062.0	0.84			9.7	2.64	6.4	51.4	ss;f-cgr carb
2	2063.0	6.46			12.7	2.67	0.0	22.0	ss;vf-fgr
3	2064.0	83.			17.2	2.66	0.0	50.8	same
4	2065.0	123.			22.0	2.66	0.5	51.9	same
5	2066.0	68.			21.3	2.66	1.1	52.4	same
6	2067.0	10.			17.3	2.67	4.1	49.8	same
7	2068.0	0.11			9.1	2.73	0.0	72.4	same
8	2069.0	92.			21.2	2.66	4.9	56.6	same
9	2070.0	31.			20.1	2.66	0.6	61.9	same
10	2071.0	38.			20.3	2.66	5.1	59.9	same
11	2072.0	55.			20.8	2.67	3.5	51.7	same
12	2073.0	43.			20.3	2.66	1.1	55.0	same
13	2074.0	25.			19.9	2.78	2.9	44.5	same
14	2075.0	157.			25.1	2.68	3.5	52.3	same
15	2076.0	95.			22.5	2.67	3.8	45.2	same
16	2077.0	71.			21.3	2.66	3.7	48.6	same
17	2078.0	64.			21.1	2.67	2.6	52.2	same
18	2079.0	12.			19.2	2.70	3.2	47.8	ss;vf-mgr
19	2080.0	0.05			12.7	2.67	1.0	81.7	sltst;sdy
20	2081.0	0.80			11.2	2.69	1.1	89.9	same
21	3051.0	2.26			17.2	2.67			ss;vf-fgr
22	3052.0	0.53			2.3	3.17			same;sid
23	3053.0	0.19			13.0	2.68			ss;vf-fgr
24	3054.0	0.87			14.9	2.66			same
25	3055.0	3.67			17.5	2.66			same
26	3056.0	0.69			14.1	2.67			same
27	3057.0	4.19			16.4	2.68			same
28	3058.0	13.			18.9	2.66			same

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

U.S. GEOLOGICAL SURVEY
HUSKY OIL CO., NPR OPERATOR

DATE : 14-JAN-80
FORMATION :

FILE NO : BP-3-563
ANALYSTS : WSP,TLS

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID SATS. OIL	WTR	DESCRIPTION
29	3059.0	6.69			17.8	2.67			same
30	3060.0	20.			19.5	2.66			same
31	3061.0	8.66			17.1	2.67			same
32	3062.0	25.			19.8	2.66			same
33	3063.0	8.94			18.3	2.65			same
34	3064.0	1.42			14.8	2.67			same
35	3065.0	0.40			11.9	2.72			same
36	3066.0	4.95			17.2	2.65			same
37	3067.0	6.53			16.4	2.89			same;sid
38	3068.0	13.			18.3	2.69			ss;vf-fgr
39	3069.0	20.			19.1	2.65			same
40	3070.0	0.63			15.8	2.67			same
41	3071.0	0.60			16.0	2.66			same
42	3072.0	0.57			15.6	2.67			same
43	3073.0	0.33			14.0	2.69			same
44	3074.0	0.28			14.0	2.67			same
45	3075.0	0.07			9.2	2.68			ss;vf-fgr slty
46	3076.0	8.09			19.6	2.66			same
47	3077.0	1.41			16.6	2.67			same
48	3078.0	1.53			16.0	2.74			same
49	3079.0	1.19			17.1	2.66			same
50	3080.0	0.75			17.0	2.67			same
51	3081.0	1.11			17.4	2.67			same
52	3082.0	0.33			14.7	2.67			same
53	3083.0	0.07			12.4	2.77			same
54	3084.0	0.17			12.9	2.67			same
55	3085.0	0.14			13.5	2.68			same
56	3086.0	0.19			13.5	2.68			same
57	3087.0	<0.01			4.8	3.12			same;sid
58	3088.0	0.09			11.5	2.67			ss;vf-fgr slty

U.S. GEOLOGICAL SURVEY
HUSKY OIL CO., NPR OPERATOR

DATE : 14-JAN-80
FORMATION :

FILE NO : BP-3-563
ANALYSTS : WSP,TLS

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY (MD) MAXIMUM	90 DEG	VERTICAL	POR %	GRAIN DEN.	FLUID SATS. OIL	WTR	DESCRIPTION
59	3089.0	0.28			15.5	2.68			same
60	3090.0	0.31			15.7	2.67			same
61	3091.0	0.16			13.5	2.68			same
62	3092.0	0.24			15.2	2.69			same
63	3093.0	0.09			11.5	2.67			same
64	3094.0	0.07			10.5	2.67			same
65	3095.0	0.14			11.5	2.67			same
66	3096.0	0.09			11.9	2.67			same

HALLIBURTON DST REPORT

FLUID SAMPLE DATA

Sampler Pressure ______ P.S.I.G. at Surface
Recovery: Cu. Ft. Gas ______
cc. Oil ______
cc. Water ______
cc. Mud ______
Tot. Liquid cc. ______
Gravity ______ ° API @ ______ °F.
Gas/Oil Ratio ______ cu. ft./bbl.

	Resistivity		Chloride Content
Recovery Water	@	°F.	3800 ppm
Recovery Mud	@	°F.	900 ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	800 ppm
Mud Pit Sample Filtrate	@	°F.	800 ppm

Mud Weight 10.5 vis 41 SEC CP

Date 1-9-80 Ticket Number 642692
Kind of Job OPEN HOLE PACKER DST Halliburton District ANCHORAGE
Tester L.D. PHILLIPS Witness D. REED
Drilling Contractor BRINKERHOFF DR

EQUIPMENT & HOLE DATA

Formation Tested Kugrua-South Simpson
Elevation 50' Ft.
Net Productive Interval 15' Ft.
All Depths Measured From Kelly Bushing
Total Depth 2120' Ft.
Main Hole/Casing Size 8 1/2"
Drill Collar Length 433.90' I.D. 2.25"
Drill Pipe Length 1596' I.D. 2.602"
Packer Depth(s) 2057-2063' Ft.
Depth Tester Valve 2034' Ft.

Cushion Type 500' Amount Water Ft. Depth Back Pres. Valve ______ Surface Choke 1/8-1/4" 3/8" Bottom Choke 3/4"

Recovered 306 Feet of water
Recovered 153 Feet of cut drilling mud-gas and water cut
Recovered ______ Feet of
Recovered ______ Feet of
Recovered ______ Feet of

Meas. from Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET

Legal Location Sec. - Twp. - Rng. 9-20N-19W
Lease Name WALAKPA
Well No. 1
Test No. 1
Tested Interval 2063-2120'
Field Area WILDCAT
County NORTH SLOPE
State ALASKA
Lease Owner/Company Name HUSKY OIL NPR 4 OPERATIONS

TEMPERATURE	Gauge No. 2781 Depth: 2039 Ft.		Gauge No. 2137 Depth: 2043 Ft.		Gauge No. 7581 Depth: 2111 Ft.		TIME	
	24 Hour Clock		24 Hour Clock		24 Hour Clock		Tool Opened 21:53	
Est. °F.	Blanked Off No		Blanked Off No		Blanked Off Yes		Opened Bypass 07:48	
2116' Actual 68 °F.	Pressures		Pressures		Pressures			
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	1131	1127.9	1133	1131.9	1141	1164.9		
First Period Flow Initial	237	255.2	238	259.2	276	298.7	—	—
First Period Flow Final	789	804.4	791	805.7	811	826.1	23	30
First Period Closed in	1025	1017.1	1029	1018.4	1039	1036.8	67	61
Second Period Flow Initial	736	828.0	739	757.2	760	855.3	—	—
Second Period Flow Final	920	927.8	923	927.8	938	945.4	207	208
Second Period Closed in	999	1018.4	1001	1018.4	1014	1035.5	298	296
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	1183	1168.8	1186	1170.1	1217	1205.5	—	—

FORM 181-R6-PRINTED IN U.S.A. **FORMATION TEST DATA** LITTLE'S

HALLIBURTON DST REPORT

FLUID SAMPLE DATA	
Sampler Pressure ____ P.S.I.G. at Surface	Date 1-9-80 · Ticket Number 642692
Recovery: Cu. Ft. Gas ____	Kind of Job OPEN HOLE PACKER DST · Halliburton District ANCHORAGE
cc. Oil ____	
cc. Water ____	Tester L.D. PHILLIPS · Witness D. REED
cc. Mud ____	Drilling Contractor BRINKERHOFF DR
Tot. Liquid cc. ____	
Gravity ____ ° API @ ____ °F.	EQUIPMENT & HOLE DATA
Gas/Oil Ratio ____ cu. ft./bbl.	Formation Tested ____
RESISTIVITY · CHLORIDE CONTENT	Elevation ____ Ft.
	Net Productive Interval ____ Ft.
Recovery Water ____ @ ____ °F. ____ ppm	All Depths Measured From ____
Recovery Mud ____ @ ____ °F. ____ ppm	Total Depth ____ Ft.
Recovery Mud Filtrate ____ @ ____ °F. ____ ppm	Main Hole/Casing Size ____
Mud Pit Sample ____ @ ____ °F. ____ ppm	Drill Collar Length ____ I.D. ____
Mud Pit Sample Filtrate ____ @ ____ °F. ____ ppm	Drill Pipe Length ____ I.D. ____
	Packer Depth(s) ____ Ft.
Mud Weight ____ vis ____ cp	Depth Tester Valve ____ Ft.

Cushion TYPE ____ AMOUNT ____ Ft. · Depth Back Pres. Valve ____ · Surface Choke ____ · Bottom Choke ____

Recovered ____ Feet of ____

Recovered ____ Feet of ____

Recovered ____ Feet of ____

Recovered ____ Feet of ____

Recovered ____ Feet of ____

Mea. From Tester Valve

Remarks

TEMPERATURE	Gauge No. 7582 (FOURTH) Depth: 2117 Ft.		Gauge No. Depth: Ft.		Gauge No. Depth: Ft.		TIME	
	24 Hour Clock		Hour Clock		Hour Clock		Tool Opened	A.M. P.M.
Est. °F.	Blanked Off Yes		Blanked Off		Blanked Off		Opened Bypass	A.M. P.M.
Actual °F.	Pressures		Pressures		Pressures		Reported	Computed
	Field	Office	Field	Office	Field	Office	Minutes	Minutes
Initial Hydrostatic	1144	1169.6						
First Period Flow Initial	281	304.3					—	—
First Period Flow Final	814	833.3						
First Period Closed in	1042	1040.8						
Second Period Flow Initial	764	862.3					—	—
Second Period Flow Final	941	953.2						
Second Period Closed in	1017	1042.0						
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	1221	1211.7					—	—

Legal Location Sec. - Twp. - Rng.	9-20N-19W
Lease Name	WALAKPA
Well No.	1
Test No.	1
Field Area	WILDCAT
Tested Interval	2063-2120'
County	NORTH SLOPE
State	ALASKA
Lease Owner/Company Name	HUSKY OIL NPR 4 OPERATIONS

FORM 101-R1—PRINTED IN U.S.A.

FORMATION TEST DATA

LITTLE'S PRTT 100 5/74

HALLIBURTON DST REPORT

Casing perfs ______ Bottom choke 3/4" Surf. temp. -30 °F Ticket No. 642692
Gas gravity ______ Oil gravity ______ GOR ______
Spec. gravity ______ Chlorides ______ ppm Res. ______ @ ______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED ______

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
21:53					Opened tool with a fair blow
22:00	1/8	400			
22:06	1/8	700			
22:07	1/4	600			
22:08	"	600			Fluid and gas to surface
22:16	"	565			Closed tool
23:23	"	600			Opened tool
23:28	"	520			
23:38	"	740			
23:51	3/8"				
23:53	"	700			Closed at surface to thaw flow line
1-10-80 00:49	"	780			Opened surface valve
00:52	1/4"	400			
01:00	"	650			Closed at surface to thaw flow line
01:05	"				Opened surface valve
01:06	"	730			Pressure fluctuating from 670
02:48	"	750			to 750 PSI
02:50	"	720			Closed tool
06:58					Dropped shear bar and reversed out fluid
07:48					Pulled packer loose and reverse again
09:00					Broke surface equipment off, pulled
					up into casing and circulate
13:30					Out of hole.

FORM 163-R1—PRINTED IN U.S.A. PRODUCTION TEST DATA LITTLE'S 60672 5M74

Gauge No. 7581			Depth 2111'					Clock No. 13743			24 hour	Ticket No. 642692			
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp. Corr.
0	.000	298.7	.000	-----	826.1	000	855.3	.000	-----	866.7					
1	.0165	429.1	.0033	1.490	1020.3	.044	841.3BS	.0033	2.206	1017.7					
2	.0330	851.5	.0066	1.204	1025.3	1095**	1030.4	.0067	1.905	1021.5					
3	.0495	851.5	.0099	1.041	1037.9	2256	1038.0	.0099	1.738	1024.1					
4	.0660	833.7	.0132	.929	1030.4	.286	1038.0ES	0133	1.613	1025.3					
5	.0825	824.8	.0166	.843	1031.7	.323	866.7BS	.0167	1.517	1025.3					
6	.0990	826.1	.0199	.776	1031.7	.338	1040.6ES	0200	1.441	1026.6					
7			.0232	.722	1031.7	3417	980.9	.0233	1.377	1026.6					
8			.0265	.675	1031.7	4578	947.9	.0267	1.321	1027.9					
9			.0298	.636	1032.9	5739	933.9	.0300	1.273	1027.9					
10			.0331	.601	1032.9	6900	945.4	.0333	1.230	1029.1					
11			.0364	.571	1032.9			.2232	.529	1034.2					
12			.0695	.385	1035.5			.4130	.359	1034.2					
13			.1026	.293	1036.8			.6029	.275	1035.5					
14			.1358	.238	1036.8			.7928	.223	1035.5					
15			.1689	.200	1036.8			.9860	.187	1035.5					
			.2020	.173	1036.8										
Gauge No. 7582					Depth	2117'		Clock No. 7031			hour	24			
0	.000	304.3	.000	-----	833.3	.000	862.3	.000	-----	953.2					
1	.0165	391.3	.0033	1.486	1026.7	(.045	874.2BS)	.0034	2.206	1025.5					
2	.0330	852.2	.0067	1.198	1030.6	.1106**	1034.4	.0067	1.909	1028.0					
3	.0495	858.5	.0100	1.037	1033.1	.2279	1044.6	.0101	1.733	1030.6					
4	.0660	839.6	.0134	.924	1034.4	(.289	1044.6ES)	.0134	1.613	1031.8					
5	.0825	832.0	.0167	.841	1035.7	(.327	848.4BS)	.0168	1.517	1033.1					
6	.0990	833.3	.0201	.773	1036.9	(.343	1047.1ES)	.0201	1.442	1034.4					
7			.0234	.719	1038.2	.3452	1075.3	.0235	1.377	1035.7					
8			.0268	.672	1039.5	.4624	955.7	.0268	1.322	1036.9					
9			.0301	.632	1040.8	.5797	940.6	.0302	1.273	1038.2					
10			.0334	.598	1040.8	.6970	953.2	.0335	1.230	1039.5					
11			.0368	.567	1040.8			.2247	.530	1040.8					
12			.0702	.382	1040.8			.4159	.360	1040.8					
13			.1037	.291	1040.8			.6072	.275	1040.0					
14			.1371	.236	1040.8			.7984	.223	1040.8					
15			.1705	.199	1040.8			.9930	.107	1042.0					
Reading Interval	5		2040	.172	1040.8	35		***							Minutes

REMARKS: * *-First 11 intervals equal to 1 minute each; last 5 intervals equal to 10 minutes each.
BS-Beginning of surface closure ES-End of surface closure **-33 minutes ***-First 10 intervals equal to 1 minute each; next 4 intervals equal to 57 minutes each; last interval equal to 58 minutes.

FORM 183 R1—PRINTED IN U.S.A.

SPECIAL PRESSURE DATA

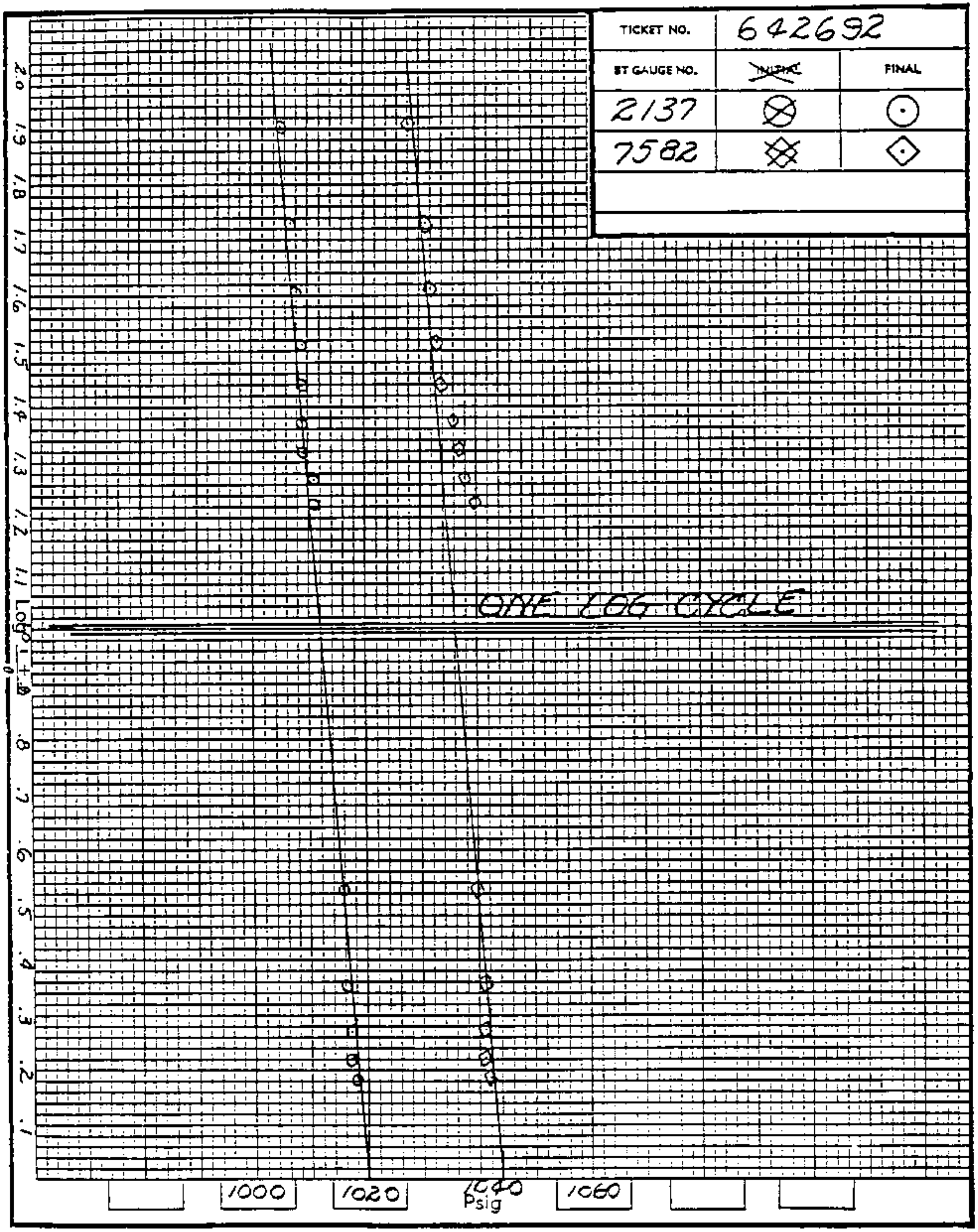
Gauge No. 2781			Depth 2039'					Clock No. 16033			24 hour		Ticket No. 642692		
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\log\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\log\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\log\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	255.2	.000	----	804.4	.000	828.0	.000	-----	927.8					
1	.016	398.6	.0033	1.485	1005.2	(.044	820.2BS)	.0033	2.206	1001.3					
2	.032	838.5	.0065	1.198	1007.9	.1077**	1010.5	.0066	1.905	1003.9					
3	.048	828.0	.0098	1.033	1010.5	.2220	1019.7	.0098	1.336	1005.2					
4	.064	812.3	.0130	.923	1010.5	(.281	1019.7ES)	.0131	1.613	1006.5					
5	.080	804.4	.0163	.838	1011.8	(.319	849.0BS)	.0164	1.518	1007.9					
6	.096	804.4	.0195	.773	1011.8	(.333	1023.7ES)	.0197	1.441	1007.9					
7			.0228	.717	1011.8	.3362	960.6	.0230	1.376	1007.9					
8			.0260	.671	1011.8	.4505	931.7	.0262	1.322	1009.2					
9			.0293	.631	1013.1	.5647	912.0	.0295	1.273	1010.5					
10			.0325	.597	1013.1	.6790	927.8	.0328	1.230	1010.5					
11			.0358	.566	1013.1			.2199	.529	1014.5					
12			.0682	.382	1015.8			.4071	.359	1015.8					
13			.1007	.291	1017.1			.5943	.375	1015.8					
14			.1331	.236	1017.1			.7815	.223	1017.1					
15			.1656	.199	1017.1			.9720	.187	1018.4					
			.1980	.172	1017.1										
Gauge No. 2137			Depth 2043'					Clock No. 13836			24 hour				
0	.000	259.2	.000	------	805.7	.000	757.2	.000	-----	927.8					
1	.016	380.9	.0033	1.475	1003.9	(.046	821.5BS)	.0033	2.202	1001.3					
2	.032	807.0	.0067	1.186	1007.9	.1096**	1009.2	.0067	1.903	1005.2					
3	.048	830.6	.0099	1.029	1010.5	.2255	1019.7	.0100	1.732	1006.5					
4	.064	813.6	.0133	.915	1011.8	(.287	1019.7ES)	.0134	1.607	1007.9					
5	.080	805.7	.0166	.831	1013.1	(.324	849.0BS)	.0167	1.514	1009.2					
6	.096	805.7	.0199	.765	1013.1	(.341	1023.7ES)	.0200	1.439	1009.2					
7			.0233	.709	1013.1	.3417	985.5	.0234	1.373	1009.2					
8			.0266	.664	1014.5	.4580	927.8	.0267	1.318	1009.2					
9			.0299	.624	1014.5	.5743	913.3	.0301	1.269	1010.5					
10			.0333	.589	1014.5	.6910	927.8	.0334	1.226	1010.5					
11			.0366	.559	1014.5			.2240	.527	1015.8					
12			.0699	.375	1017.1			.4147	.357	1015.8					
13			.1032	.286	1018.4			.6053	.273	1017.1					
14			.1364	.231	1018.4			.7960	.221	1017.1					
15			.1697	.195	1018.4			.9900	.186	1018.4					
Reading Interval	5		.2030	.168 *	1018.4	35			***						Minutes

REMARKS:
BS- Beginning of surface closure ES-End of surface closure *-First 11 intervals equal to 1 minute each; last 5 intervals equal to 10 minutes each. **-33 minutes ***-First 10 intervals equal to 1 minute each; next 4 intervals equal to 57 minutes each; last interval equal to 58 minutes

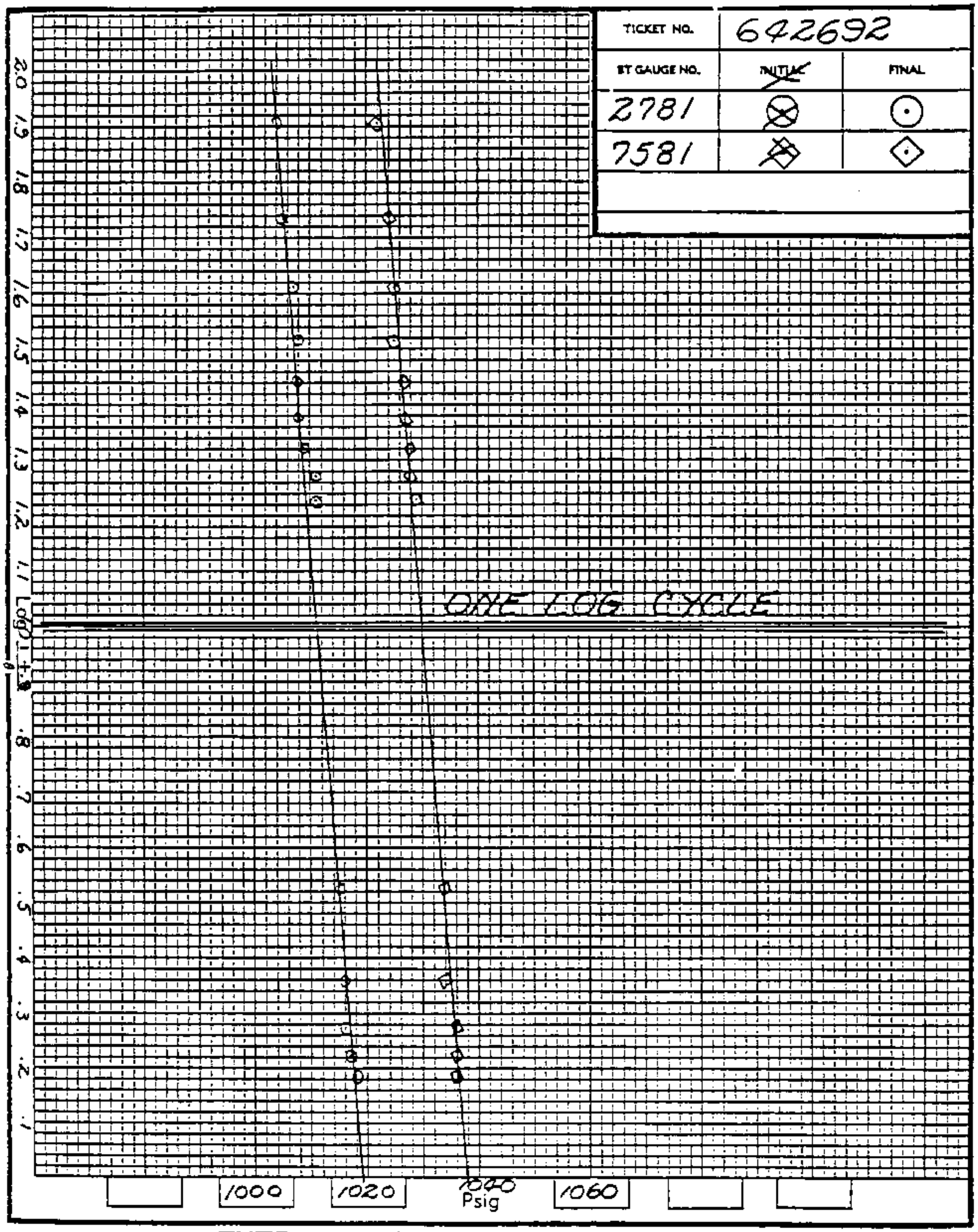
FORM 183 R1—PRINTED IN U.S.A.

SPECIAL PRESSURE DATA

TICKET NO.	642692	
BT GAUGE NO.	~~INITIAL~~	FINAL
2137	⊗	⊙
7582	⟐	◇



EXTRAPOLATED PRESSURE GRAPH



EXTRAPOLATED PRESSURE GRAPH

Gas Production HALLIBURTON DST REPORT

B.T. Gauge Numbers			2137	7582	Ticket Number	642692
			PRESSURE	PRESSURE		
Initial Hydrostatic			1132	1170	Elevation	50 ft.
Final Hydrostatic			1170	1212	Production Rate * 1st Flow	854 MCF
1st Flow	Initial	Time	259	304	Production Rate ** 2nd Flow	200 MCF
	Final	23	806	833	Production Rate 3rd Flow	MCF
	Closed In Pressure	67	1018	1041	Hole Size	8 1/2 in.
2nd Flow	Initial	Time	757	862	Footage Tested	15 ft.
	Final	207	928	953	Mud Weight	10.5 lbs./gal.
	Closed In Pressure	298	1018	1042	Gas Viscosity	.014 cp
3rd Flow	Initial	Time			Gas Gravity assumed	.60 —
	Final				Gas Compressibility	.84 —
	Closed In Pressure				Temperature	68 °F
Extrapolated Static Pressure		1st				
		2nd	1020	1044		
		3rd				
Slope P/10		1st				
		2nd	1012	1036		
		3rd				

Remarks: *-First rate is based on final pressure of initial flow period.
**-Second rate is based on observation of company personnel. First rate is questionable due to fluid being produced in gas and no separator was utilized. Calculations reported below are for each rate for the final closed in period only.

SUMMARY

PRODUCT	EQUATION	B.T. Gauge No. 2137, Depth 2043' — * FIRST	** SECOND	THIRD	B.T. Gauge No. 7582, Depth 2117 — * FIRST	** SECOND	THIRD	UNITS
Transmissibility	$\frac{Kh}{\mu} = \frac{1637\, Q_g ZT}{m}$	38142.2	8932.60		37262.00	8726.47		$\frac{md. ft.}{cp}$
Theoretical Flow Capacity	$Kh = \frac{Kh}{\mu}\ \mu$	533.91	125.06		521.67	122.17		md. ft.
Average Effective	$K = \frac{Kh}{h}$	35.60	8.34		34.778	8.15		md.
Permeability	$K_1 = \frac{Kh}{h_1}$							md.
Indicated Flow Capacity	$(Kh)_e = \frac{3200\, Q_g\, \mu ZT \log(0.472\, b/r_w)}{P_s^2 - P_f^2}$	192.86	38.08		189.71	37.44		md. ft.
Damage Ratio	$DR = \frac{\text{Theo. Flow Cap}}{\text{Indicated Flow Cap}}\ \frac{Kh}{(Kh)_e}$	2.77	3.29		2.75	3.26		—
Indicated	$OF_1 = \frac{Q_g\, P_s^2}{P_s^2 - P_f^2}$ Max.	4957.71	1161.06		5122.00	1199.53		MCFD
Flow Rate	$OF_2 = \frac{Q_g\, P_s}{\sqrt{P_s^2 - P_f^2}}$ Min.	2057.64	481.88		2091.46	489.80		MCFD
Theoretical	$OF_3 = OF_1\ DR$ Max.	13727.07	3813.06		14084.41	3914.11		MCFD
Potential Rate	$OF_4 = OF_2\ DR$ Min.	5697.26	1582.57		5751.06	1598.24		MCFD
Approx. Radius of Investigation	$b \cong \sqrt{Kt}$ or $\sqrt{Kt_o}$	74.16	36.07		73.30	35.66		ft.
	$b_1 \cong \sqrt{K_1 t}$ or $\sqrt{K_1 t_o}$							ft.
Potentiometric Surface *	$Pot. = (El - CD) + (2.319\, Ps)$	372.38	372.38		354.04	354.04		ft.

FORM 155-R1—PRINTED IN U.S.A. INTERPRETATIONS AND CALCULATIONS LITTLE'S 90674 2M 2/7

HALLIBURTON DST REPORT

FLUID SAMPLE DATA

Sampler Pressure 340 P.S.I.G. at Surface

Recovery: Cu. Ft. Gas ______

cc. Oil ______

cc. Water ______

cc. Mud ______

Tot. Liquid cc. ______

Gravity ______ ° API @ ______ °F.

Gas/Oil Ratio ______ cu. ft./bbl.

	Resistivity		Chloride Content
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F.	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	ppm
Mud Pit Sample Filtrate	@	°F.	475 ppm

Mud Weight 10.2 vis 44 sec

Date 1-31-80 Ticket-Number 488798

Kind of Job CASING PACKER DST Halliburton District ANCHORAGE

Tester K.C. MC WILLIAMS Witness DON MOORE

Drilling Contractor BRINKERHOFF DRILLING COMPANY BC S

EQUIPMENT & HOLE DATA TJH

Formation Tested S. Simpson Sand

Elevation 50' KB Ft.

Net Productive Interval 2071' - 2086' Ft.

All Depths Measured From Kelly Bushing

Total Depth 2231' PB Ft.

Main Hole/Casing Size 7"

Drill Collar Length 291' I.D. 2.125"

Drill Pipe Length 1700' I.D. 2.764"

Packer Depth(s) 2042' Ft.

Depth Tester Valve 2010' Ft.

Cushion Type Water Amount 500 Ft. Depth Back Pres. Valve ______ Surface Choke ______ Bottom Choke .75"

Recovered ______ Feet of ______

Recovered ______ Feet of ______

Recovered ______ Feet of ______

Recovered ______ Feet of ______

Recovered ______ Feet of ______

Meas. From Tester Valve

MAILED FEB 15 1980 HALLIBURTON SERVICES DUNCAN, OKLAHOMA

Remarks SEE PRODUCTION TEST DATA SHEET . . . .

Q = Questionable CS = Clock stopped CTE = Chart time expired

Temperature	Gauge No. 82, Depth: 2024 Ft., 144 Hour Clock, Blanked Off NO		Gauge No. 32, Depth: 2028 Ft., 48 Hour Clock, Blanked Off NO		Gauge No. 13, Depth: 2095 Ft., 144 Hour Clock, Blanked Off YES		Time	
Est. °F. 2103 Actual 65 °F.	Pressures		Pressures		Pressures		Tool 1-31-80 A.M. Opened 0710 P.M. Opened 2-5-80 A.M. Bypass 0800 P.M.	
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic		1124.1	1086	1093.9	1094	1147.2		
First Period Flow Initial		255.9	238	253.5	239	283.5	—	—
First Period Flow Final		156.8	143	148.1	141	156.3	410	410
First Period Closed in		1026.9	1014	1017.5	1024	1026.4	240?	297
Second Period Flow Initial		210.2	143	202.0	159	234.1	—	—
Second Period Flow Final		86.0	79	81.6	88	90.1	285	283
Second Period Closed in		1011.8	999	1002.3	1015	1016.7	400	401
Third Period Flow Initial		646.4-Q	143	805.0-Q	141	689.5-Q	—	—
Third Period Flow Final		334.4	-	407.2-CTE	327	340.1	2870	2873
Third Period Closed in		1021.5	-	-	1015	1025.5	2880	2879
Final Hydrostatic		1124.1	-	CTE	1147	1147.2	—	—

Legal Location Sec. - Twp. - Rng.

Lease Name WALAKPA

Well No. 1

Test No. 2

Field Area

Tested Interval 2042' - 2231'

County NORTH SLOPE

State ALASKA

Lease Owner/Company Name HUSKY OIL NPR-4 OPERATIONS

FORM 181-R1—PRINTED IN U.S.A.

FORMATION TEST DATA

LITTLE'S

FLUID SAMPLE DATA

Sampler Pressure ______ P.S.I.G. at Surface
Recovery: Cu. Ft. Gas ______
cc. Oil ______
cc. Water ______
cc. Mud ______
Tot. Liquid cc. ______
Gravity ______ ° API @ ______ °F.
Gas/Oil Ratio ______ cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F.	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	ppm
Mud Pit Sample Filtrate	@	°F.	ppm

Mud Weight ______ vis ______ cp

Date 1-31-80 Ticket Number 488798
Kind of Job CASING PACKER DST Halliburton District ANCHORAGE
Tester MR. MC WILLIAMS Witness MR. MOORE
Drilling Contractor BRINKERHOFF DRILLING COMPANY BC

EQUIPMENT & HOLE DATA

Formation Tested ______
Elevation ______ Ft.
Net Productive Interval ______ Ft.
All Depths Measured From ______
Total Depth ______ Ft.
Main Hole/Casing Size ______
Drill Collar Length ______ I.D. ______
Drill Pipe Length ______ I.D. ______
Packer Depth(s) ______ Ft.
Depth Tester Valve ______ Ft.

Cushion TYPE ______ AMOUNT ______ Ft. Depth Back Pres. Valve ______ Surface Choke ______ Bottom Choke ______

Recovered ______ Feet of ______
Recovered ______ Feet of ______
Recovered ______ Feet of ______
Recovered ______ Feet of ______
Recovered ______ Feet of ______

Meas. From Tester Valve

Remarks

Q = Questionable CS = Clock stopped

FOURTH GAUGE:

Legal Location Sec. - Twp. - Rng.: ______
Lease Name: WALAKPA
Well No.: 1
Test No.: 2
Tested Interval: 2042' - 2231' PB
Field Area: ______
County: NORTH SLOPE
Lease Owner/Company Name: HUSKY OIL NPR-4 OPERATIONS
State: ALASKA

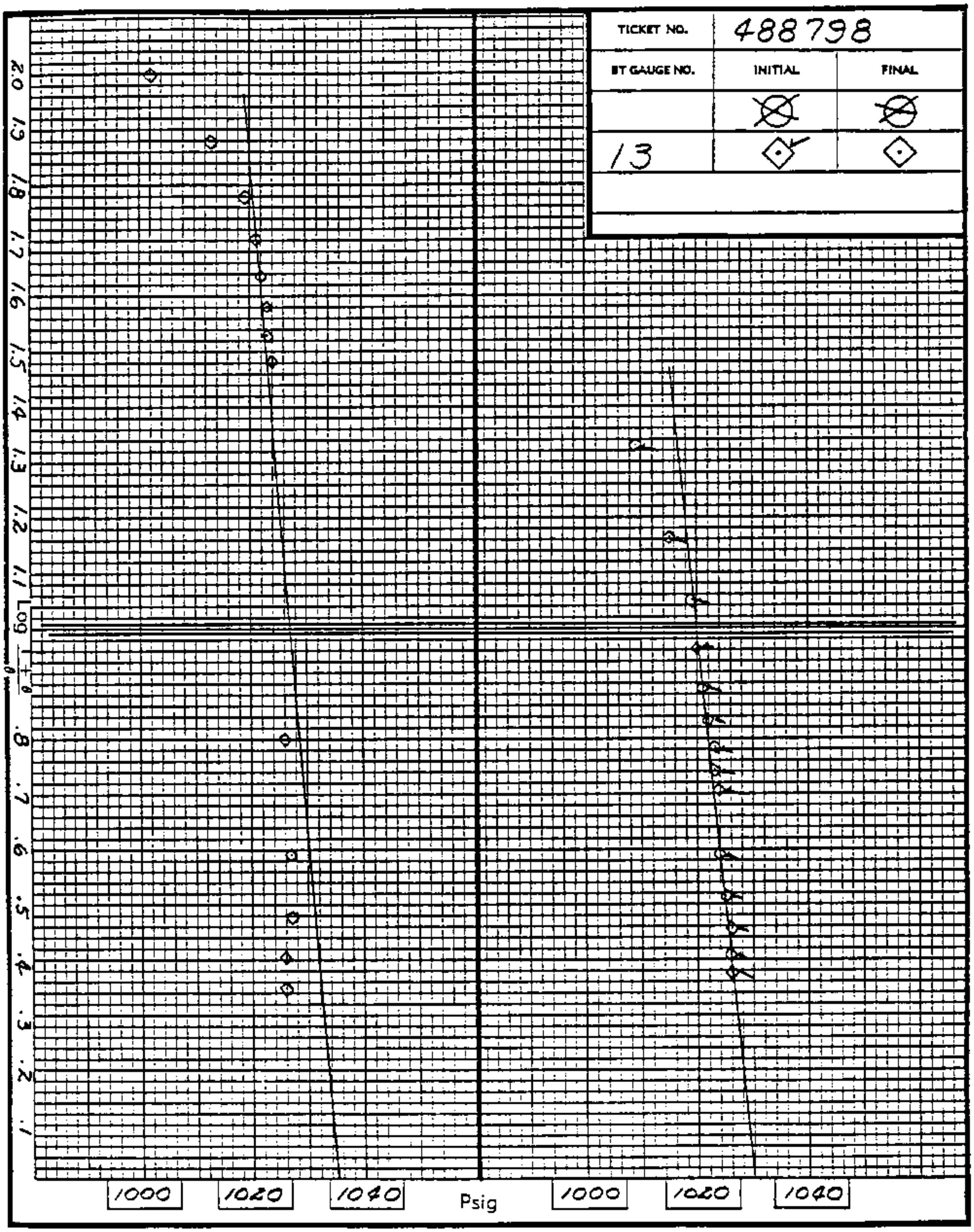
TEMPERATURE	Gauge No. 74 Depth: 2099' Ft.		Gauge No. Depth: Ft.		Gauge No. Depth: Ft.		TIME	
	48 Hour Clock		Hour Clock		Hour Clock		Tool Opened	A.M. P.M.
Est. °F.	Blanked Off Yes		Blanked Off		Blanked Off		Opened Bypass	A.M. P.M.
Actual °F.	Pressures		Pressures		Pressures		Reported	Computed
	Field	Office	Field	Office	Field	Office	Minutes	Minutes
Initial Hydrostatic		1138.5						
First Period Flow Initial		295.3					—	—
First Period Flow Final		156.7						
First Period Closed in		1029.8						
Second Period Flow Initial		234.5					—	—
Second Period Flow Final		91.6						
Second Period Closed in		1020.2						
Third Period Flow Initial		789.1-Q					—	—
Third Period Flow Final		416.8-CS						
Third Period Closed in		-						
Final Hydrostatic		1138.5					—	—

FORM 181-R1—PRINTED IN U.S.A.

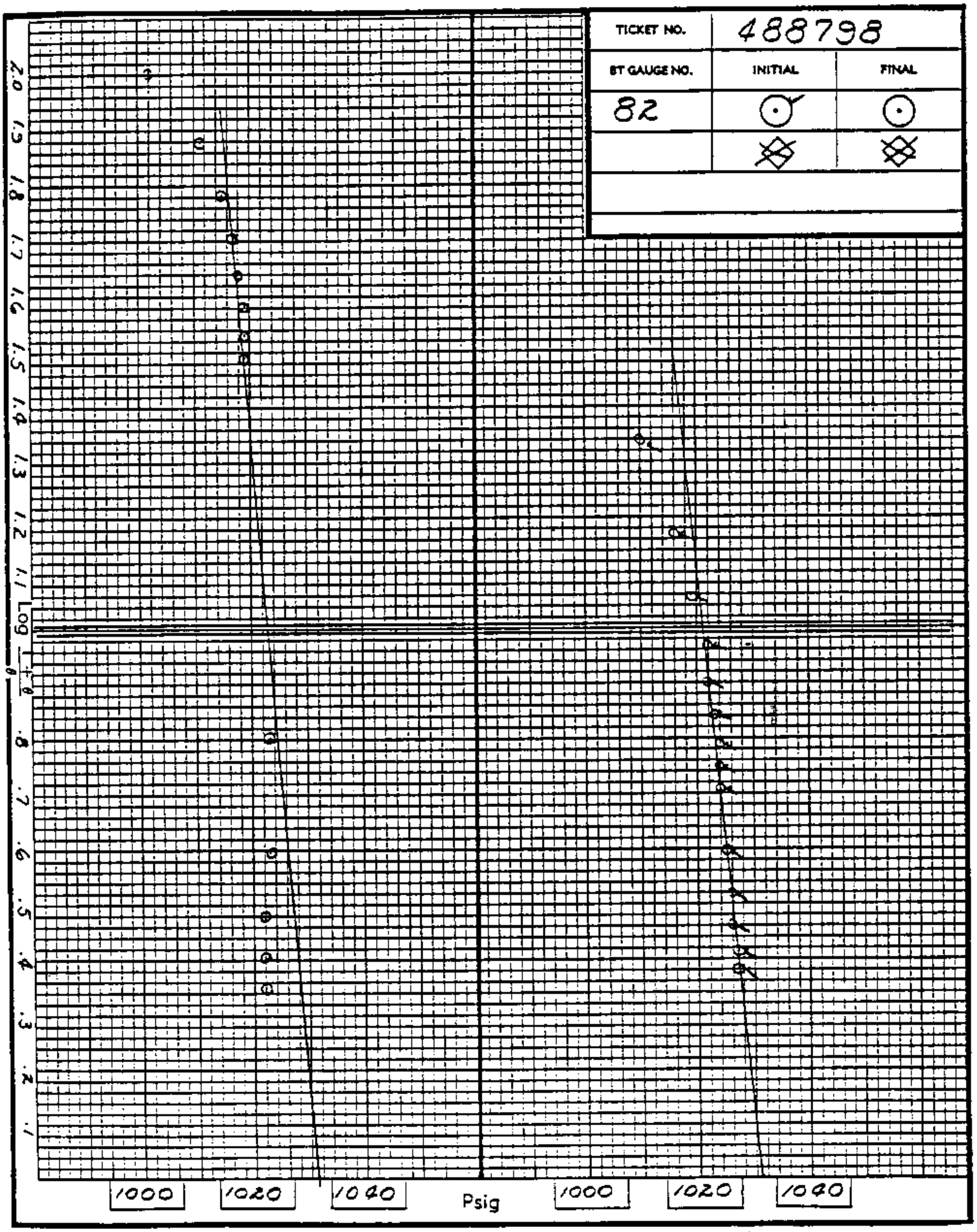
FORMATION TEST DATA

LITTLE'S 86871 10M 8/74

HALLIBURTON DST REPORT



EXTRAPOLATED PRESSURE GRAPH



EXTRAPOLATED PRESSURE GRAPH

Gauge No. 82			Depth 2024'					Clock No. 20040			144 hour		Ticket No. 488798		
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp. Corr.
0	.0000	255.9	.0000	-----	156.8	.0000	210.2	.0000	-----	86.0	.0000	646.4-Q	.0000	------	334.4
1	(.0060	260.3)LF	.0055	1.632	945.7	(.0130	157.9)C	.0061	1.812***	429.1	(.0380	201.5)C	.0067	2.476	906.7
2	.0337	980.4*	.0110	1.341	1009.7	.0226	159.0	.0229	1.256	792.8	(.0560	312.6)C	.0134	2.176	986.9
3	(.0360	983.7)LO	.0166	1.172	1016.1	(.0270	161.2)C	.0397	1.034	906.7	(.0650	394.3)C	.0201	2.002	1002.1
4	.0617	169.9	.0221	1.057	1019.4	.0452	162.3	.0564	.898	954.4	(.0780	513.0)C	.0268	1.878	1010.7
5	(.0640	169.9)C	.0276	.970	1021.5	.0678	135.0	.0732	.801	979.3	.2015	396.5**	**.0335	1.783	1015.1
6	.0898	110.0	.0331	.900	1021.5	.0905	106.7	.0899	.727	990.2	.4024	413.9	.0402	1.705	1017.2
7	(.0960	107.8)C	.0387	.842	1022.6	(.1030	100.2)C	.1067	.668	996.7	.6034	415.0	.0469	1.640	1018.3
8	(.1090	503.2)C	.0442	.793	1023.7	.1131	96.9	.1235	.619	1002.1	.8043	412.8	.0536	1.583	1019.4
9	.1178	185.1	.0497	.750	1023.7	.1357	91.5	.1402	.578	1006.4	1.0052	403.0	.0603	1.533	1019.4
10	.1459	202.6	.0552	.713	1023.7	.1600	86.0***	.1570	.542	1008.6	(1.1140	401.9)C	.0670	1.489	1019.4
11	.1739	196.0 C	.0773	.599	1024.8			.1737	.511	1009.7	1.2062	366.0	.3742	.802	1022.6
12	.2020	166.6	.0994	.520	1025.9			.1905	.484	1010.7	1.4071	368.1	.6814	.595	1022.6
13	(.2120	167.7)P	.1215	.461	1025.9			.2072	.460	1010.7	(1.4740	361.6)C	.9885	.480	1021.5
14	.2300	156.8	.1436	.415	1026.9			.2240	.438	1011.8	1.6080	334.4	1.2957	.405	1021.5
15			.1640	.381	1026.9								1.6080	.351	1021.5

Gauge No. 32			Depth 2028					Clock No. 13866			48 hour				
0	.0000	253.5	.0000	-----	148.1	.0000	202.0	.0000	-----	81.6	.0000	805.0-Q	LF	= LINE	FROZE
1	(.0130	251.1)LF	.0167	1.628	979.4	(.0380	148.9)C	.0185	1.807***	472.2	(.1130	198.1)C	LO	= LINE	OPEN
2	.1013	974.6*	.0334	1.337	1003.9	.0671	152.1	.0691	1.253	805.8	(.1640	308.2)C	C	= CHOKE	CHANGE
3	(.1030	975.4)LO	.0501	1.171	1008.7	(.0780	154.5)C	.1197	1.031	904.1	(.1910	390.6)C	P	= POSSIBLE	CHOKE
4	.1857	161.6	.0668	1.055	1010.3	.1343	154.5	.1703	.895	949.2	(.2290	507.1)C		CHANGE	
5	(.1930	160.8)C	.0835	.968	1011.1	.2014	126.7	.2208	.798	971.4	.6053	388.2****	Q	= QUESTIONABLE	
6	.2700	100.6	.1002	.898	1011.9	.2685	99.8	.2714	.724	980.9	1.2090	406.5			
7	(.2870	99.0)C	.1169	.840	1012.7	(.2980	94.2)C	.3220	.665	987.3	1.8127	408.0			
8	(.3250	496.8)C	.1336	.791	1013.5	.3357	90.3	.3726	.616	993.6	1.9930	407.2)			
9	.3544	178.2	.1503	.749	1013.5	.4028	86.3	.4231	.575	997.6					
10	.4308	194.1	.1670	.711	1013.5	.4750	81.6**	.4737	.540	999.2	CHART TIME EXPIRED				
11	.5232	188.5-Q	.2338	.598	1015.1			.5243	.509	1000.7	AFTER 1185 MINUTES.				
12	.6076	158.4	.3006	.519	1015.9			.5740	.482	1001.5	LAST INTERVAL				
13	(.6340	158.4)P	.3674	.460	1015.9			.6254	.457	1001.5	107 MINUTES.				
14	.6920	148.1	.4342	.414	1016.7			.6760	.436	1002.3					
15			.4960	.379	1017.5										
Reading Interval	50		**			40		30			359		******		Minutes

REMARKS: *Int. = 60 min. **First 10 int. = 10 min. each; next 4 int. = 40 min. each; last int. = 37 min. ***Int. = 43 min ****Int. = 11 min. *****Int. = 360 min. ******First 10 int. = 12 min. each; next 4 int. = 550 min. each; last int. = 559 minutes.

SPECIAL PRESSURE DATA

	Gauge No. 13					Depth 2095'		Clock No. 20039			144 hour	Ticket No. 488798			
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.0000	283.5	.0000	-----	156.3	.0000	234.1	.0000	----	90.1	.0000	689.5-Q	.0000	-----	340.1
1	(.0040	284.4)L	.0056	1.624	957.6	(.0130	170.4)C	.0062	1.804****	*477.0	(.0370	207.5)C	.0067	2.477	861.5
2	.0337	998.2*	.0112	1.333	1008.8	.0225	170.4	.0230	1.253	813.0	(.0550	319.7)C	.0135	2.174	986.7
3	(.0360	1000.8)	LO.0169	1.165	1014.9	(.0270	172.2)C	.0398	1.032	910.0	(.0640	401.9)C	.0202	2.000	1001.7
4	.0617	179.3	.0225	1.050	1018.5	.0449	172.2	.0567	.895	955.8	(.0770	518.5)C	.0269	1.878	1013.2
5	(.0650	172.2)C	.0281	.963	1020.2	.0674	136.9	.0735	.799	979.6	.2021	401.0***	**.0337	1.781	1019.3
6	.0898	112.1	.0337	.893	1021.1	.0899	107.7	.0903	.725	992.9	.4036	418.7	.0404	1.704	1021.1
7	(.0960	109.5)C	.0394	.835	1022.0	(.1010	101.5)C	.1072	.665	999.0	.6052	421.3	.0471	1.639	1022.0
8	(.1090	506.1)C	.0450	.786	1022.9	.1124	97.1	.1240	.617	1005.2	.8067	418.7	.0539	1.581	1022.9
9	.1178	189.9	.0506	.744	1022.9	.1348	91.8	.1408	.576	1009.6	1.0083	410.7	.0606	1.532	1022.9
10	.1459	204.0	.0562	.707	1023.8	.1590	90.1***	.1577	.540	1012.3	(1.1140	410.7)C	.0674	1.487	1023.8
11	.1739	198.7-C	.0787	.594	1023.8			.1745	.509	1014.1	1.2098	372.7	.3761	.801	1026.4
12	.2020	166.9	.1012	.515	1024.6			.1913	.482	1014.9	1.4114	372.7	.6848	.594	1027.3
13	(.2100	167.8)P	.1237	.456	1025.5			.2082	.458	1015.8	(1.4740	368.3)C	.9935	.479	1027.3
14	.2300	156.3	.1462	.410	1026.4			.2250	.436	1016.7	1.6130	340.1	1.3022	.404	1026.4
15			.1670	.376	1026.4								1.6160	.350	1025.5

	Gauge No. 74					Depth 2099'		Clock No. 9397			48 hour				
0	.0000	295.3	.0000	------	156.7	.0000	234.5	.0000	------	91.6	.0000	789.1-Q	LF	= LINE FROZE	
1	(.0110	283.5)	F .0167	1.630	994.6	(.0420	168.4)C	.0186	1.807***	*523.3	(.1130	216.4)C	LO	= LINE OPEN	
2	.1017	1005.3	.0334	1.339	1017.0	.0678	174.8	.0692	1.255	824.1	(.1650	327.2)C	C	= CHOKE CHANGE	
3	(.1050	1006.3	LO.0501	1.172	1021.3	(.0820	176.9)C	.1199	1.033	919.4	(.1920	410.4)C	P	= POSSIBLE CHOKE	
4	.1865	172.7	.0668	1.057	1022.3	.1357	174.8	.1705	.897	963.9	(.2280	526.6)C		CHANGE	
5	(.1950	173.7)	.0835	.970	1023.4	.2035	136.4	.2212	.800	986.2	.6077	406.1*****	Q	= QUESTIONABLE	
6	.2712	109.8	.1002	.900	1024.5	.2714	108.7	.2718	.726	997.8	(1.0160	416.8)			
7	(.2900	108.7)	.1169	.842	1024.5	(.2990	102.3)C	.3225	.667	1004.2					
8	(.3260	511.6)	.1336	.793	1025.5	.3392	99.1	.3731	.618	1010.6	CLOCK STOPPED AFTER				
9	.3560	192.9	.1503	.750	1025.5	.4071	94.8	.4238	.577	1014.9	602 MINUTES.				
10	.4407	206.8	.1670	.713	1025.5	.4800	91.6***	.4744	.541	1015.9	LAST INT. =				
11	.5255	200.4-	.2338	.599	1026.6			.5251	.510	1017.0	242 MINUTES...				
12	.6102	168.4	.3006	.520	1027.7			.5757	.483	1018.1					
13	(.6360	169.5)	.3674	.461	1027.7			.6264	.459	1019.1					
14	.6950	156.7	.4342	.415	1028.7			.6770	.437	1020.2					
15			.4960	.380	1029.8										
Reading Interval		50		**			40		30			359		******	Minutes

REMARKS: *Int. = 60 min. **First 10 int. = 10 min. each; next 4 int. = 40 min. each; last int. = 37 min. ***Int. = 43 min.
****Int. = 11 min. *****Int. = 360 min. ******First 10 int. = 12 min. each; next 4 int. = 550 min. each; last int. = 559 minutes.

FORM 183 R? PRINTED IN U.S.A.

SPECIAL PRESSURE DATA

LITTLE & ??? ??? ???

Gas Production HALLIBURTON DST REPORT

B.T. Gauge Numbers			82	13	Ticket Number	488798
			PRESSURE	PRESSURE		
Initial Hydrostatic			1124.1	1147.2	Elevation	50 ft.
Final Hydrostatic			1124.1	1147.2	Production Rate 1st Flow	335 MCF
1st Flow	Initial	Time	255.9	283.5	Production Rate 2nd Flow	- MCF
	Final	410	156.8	156.3	Production Rate 3rd Flow	330 MCF
	Closed In Pressure	297	1026.9	1026.4	Hole Size	7 in.
2nd Flow	Initial	Time	210.2	234.1	Footage Tested	15 ft.
	Final	283	86.0	90.1	Mud Weight	10.2 lbs./gal.
	Closed In Pressure	401	1011.8	1016.7	Gas Viscosity	0.014 cp
3rd Flow	Initial	Time	646.4-Q	689.5-Q	Gas Gravity	0.65 Estimated
	Final	2873	334.4	340.1	Gas Compressibility	0.815 —
	Closed In Pressure	2879	1021.5	1025.5	Temperature	65 °F
Extrapolated Static Pressure		1st	1031	1030		
		2nd	-	-		
		3rd	1031	1035		
Slope P/10		1st	1021	1020		
		2nd	-	-		
		3rd	1023	1027		

Remarks: Q = Questionable

SUMMARY

		B.T. Gauge No. 82, Depth 2024'			B.T. Gauge No. 13, Depth 2095'			
PRODUCT	EQUATION	FIRST	SECOND	THIRD	FIRST	SECOND	THIRD	UNITS
Transmissibility	$\frac{Kh}{\mu} = \frac{1637\ Q_g\ ZT}{m}$	11434.9		14066.6	11446.1		14012.0	md. ft./cp
Theoretical Flow Capacity	$Kh = \frac{Kh}{\mu}\ \mu$	160.089		196.933	160.245		196.169	md. ft.
Average Effective	$K = \frac{Kh}{h}$	-		-	-		-	md.
Permeability	$K_1 = \frac{Kh}{h_1}$	10.673		13.129	10.683		13.078	md.
Indicated Flow Capacity	$(Kh)_e = \frac{3200\ Q_g\ \mu\ ZT\ Log(0.472\ b/r_w)}{P_s^2 - P_f^2}$	12.829		17.277	12.852		17.195	md. ft.
Damage Ratio	$DR = \frac{\text{Theo. Flow Cap}}{\text{Indicated Flow Cap}}\ \frac{Kh}{(Kh)_e}$	12.480		11.399	12.470		11.409	—
Indicated	$OF_1 = \frac{Q_g\ P_s^2}{P_s^2 - P_f^2}$ Max.	343		369	343		370	MCFD
Flow Rate	$OF_2 = \frac{Q_g\ P_s}{\sqrt{P_s^2 - P_f^2}}$ Min.	339		349	339		349	MCFD
Theoretical	$OF_3 = OF_1\ DR$ Max.	4280		4203	4275		4220	MCFD
Potential Rate	$OF_4 = OF_2\ DR$ Min.	4230		3976	4226		3986	MCFD
Approx. Radius of	$b \approx \sqrt{Kt}$ or $\sqrt{Kt_o}$	-		-	-		-	ft.
Investigation	$b_1 \approx \sqrt{K_1 t}$ or $\sqrt{K_1 t_o}$	66		217	66		216	ft.
Potentiometric Surface *	$Pot. = (El - GD) + (2.319\ Ps)$	417		417	344		355	ft.

NOTICE: These calculations are based upon information furnished by you and taken from Drill Stem Test pressure charts, and are furnished you for your information. In furnishing such calculations and evaluations based thereon Halliburton is merely expressing its opinion. You agree that Halliburton makes no warranty express or implied as to the accuracy of such calculations or opinions, and that Halliburton shall not be liable for any loss or damage, whether due to negligence or otherwise, in connection with such calculations and opinions.

FORM 185-R1—PRINTED IN U.S.A. INTERPRETATIONS AND CALCULATIONS LITTLE'S

CHEMICAL & [illegible]OLOGICAL LABORATORIE[illegible] OF ALASKA, INC.

TELEPHONE (907) 279-4014 274-3364

ANCHORAGE INDUSTRIAL CENTER 5633 B Street

GAS ANALYSIS REPORT

Company Husky Oil Company Date January 30, 1980 Lab No. 2664-5

Well No. Walakpa No. 1 Location

Field NPRA Formation

County Depth DST No. 1 (2066-2120)

State Alaska Sampling Point Final Flow (#3)

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

Remarks

Component	Mole % or Volume %	Gallons per MCF
Oxygen	0	
Nitrogen	0.28	
Carbon dioxide	TRACE	
Hydrogen sulfide	—	
Methane	99.72	
Ethane & Higher	TRACE	
Total	100.00	

GPM of pentanes & higher fraction ____

Gross btu/cu. ft. @ 60° F. & 14.7 psia (dry basis) 1007

Specific gravity (calculated from analysis) 0.555

Specific gravity (measured) 0.555

Remarks:

CHEMICAL & [illegible]OLOGICAL LABORATORIE[illegible] OF ALASKA, INC.

TELEPHONE (907)-279-4014 274-3364 ANCHORAGE INDUSTRIAL CENTER 5633 B Street

GAS ANALYSIS REPORT

Company Husky Oil Company Date January 30, 1980 Lab No. 2664-6

Well No. Walakpa No. 1 Location

Field NPRA Formation

County Alaska Depth DST No. 1 (2066-2120)

State Sampling Point Final Flow (#4)

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

Remarks

Component	Mole % or Volume %	Gallons per MCF
Oxygen	0	
Nitrogen	0.30	
Carbon dioxide	TRACE	
Hydrogen sulfide		
Helium	<0.01	
Methane	99.70	
Ethane & Higher	TRACE	
Total	100.00	

GPM of pentanes & higher fraction

Gross btu cu. ft @ 60° F. & 14.7 psia (dry basis) 1007

Specific gravity (calculated from analysis) 0.555

Specific gravity (measured) 0.555

Remarks:

CHEMICAL & GEOLOGICAL LABORATURIES OF ALASKA, INC.

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

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

From Husky Oil Company
Product Fluid Samples
Address Anchorage, Alaska
Date January 22, 1980
Other Pertinent Data

Analyzed by LMG
Date January 29, 1980 Lab No. 2664

REPORT OF ANALYSIS
FLUID SAMPLES
DST #1 (2066-2120)
WALAKPA NO. 1
NPRA, ALASKA

SAMPLE	.....Milligrams/liter........... CHLORIDE	OIL & GREASE (*)
Top of DCIP Valve	14800	386
Reverse Out Water	7600	86
Mud	660	—
Water Cushion	210	—

(*) Diesel Fuel

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: February 14, 1980 — Lab No. 2788-1

Well No.: Walakpa No. 1 — Location:

Field: NPRA — Formation:

County: — Depth: DST No. 2 (2073-88)

State: Alaska — Sampling Point: 30 Min. Open on 3rd Flow

Line pressure — psig; Sample pressure 147 psig; Temperature — °F; Container number

Remarks:

Sample No. 3

Component	Mole % or Volume %	Gallons per MCF
Oxygen	0	
Nitrogen	1.27	
Carbon dioxide	Trace	
Hydrogen sulfide	—	
Helium	<0.01	
Methane	98.72	
Ethane & Higher	0.01	
Total	100.00	—

GPM of pentanes & higher fraction: —

Gross btu cu. ft. @ 60° F. & 14.7 psia (dry basis): 997

Specific gravity (calculated from analysis): 0.559

Specific gravity (measured): 0.560

Remarks:

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

From Husky Oil Company Product Fluid

Address Anchorage, Alaska Date February 5, 1980

Other Pertinent Data

Analyzed by DB/IMG Date February 13, 1980 Lab No. 2788

REPORT OF ANALYSIS
FLUID SAMPLES
WALAKPA NO. 1
NPRA, ALASKA

Samples received February 5, 1980
Samples taken February 1, 1980 (DST #2 2073-88 feet)

SAMPLE	CHLORIDE, mg/l
Cushion Water	300
Drilling Mud	480

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

From Husky Oil Company

Product Water

Address Anchorage, Alaska

Date February 8, 1980

Other Pertinent Data

Analyzed by LMG

Date February 14, 1980 Lab No. 2844

REPORT OF ANALYSIS
WATER SAMPLES
WALAKPA NO. 1
NORTH SLOPE, ALASKA

Samples received February 8, 1980
Samples taken from DST No. 2

SAMPLE	RESISTIVITY, ohm-m @ 68°F	CHLORIDE, mg/l
Sample Chamber	0.32	15400
Test Tool Sub.	0.72	6300

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

WALAKPA #1

From: Husky Oil Company

Product: Cores - for fresh water susceptibility analysis.

Address: Anchorage, Alaska

Date: February 1980

Other Pertinent Data:

Analyzed by: PG

Date: March 4, 1980

Lab No. 3047

REPORT OF ANALYSIS
CORE SAMPLES
WALAKPA NO. 1
NPRA, ALASKA

PROCEDURE:

Selected core samples were analyzed to determine the susceptibility of existing materials to the exposure of various liquids.

LEGEND:

Fresh Water = (City of Anchorage) See Attached Analysis.
$CaCl_2$ = Calcium Chloride (36.11% Calcium, 63.39% Chloride)
$CaCl_2$ 25000 = 25000 ppm as $CaCl_2$ = 9027.5 ppm as Ca - 15972.5 ppm as Cl
NaCl = Sodium Chloride (39.34% Sodium, 60.66% Chloride)
KCl = Potassium Chloride (52.25% Potassium, 47.75% Chloride)
Filtrate = Drilling Mud Filtrate

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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

TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER: Husky Oil Company
SAMPLE LOCATION: City of Anchorage
DATE COLLECTED: —
TIME COLLECTED: —
SAMPLED BY: —
SOURCE: —
REMARKS: Potable Water

FOR LAB USE ONLY
RECVD.BY ______ LAB # CITY WATER
DATE RECEIVED —
DATE COMPLETED —
DATE REPORTED —
SIGNED (signature)

mg/l		mg/l		mg/l	
[ ]Ag,Silver		[ ]P,Phosphorous		[ ]Cyanide	
[ ]Al,Aluminum		[ ]Pb,Lead		[X]Sulfate	17
[ ]As,Arsenic		[ ]Pt,Platinum		[ ]Phenol	
[ ]Au,Gold		[ ]Sb,Antimony		[X]Total Dissolved Solids	36
[ ]B,Boron		[ ]Se,Selenium		[ ]Total Volatile Solids	
[ ]Ba,Barium		[ ]Si,Silicon		[ ]Suspended Solids	
[ ]Bi,Bismuth		[ ]Sn,Tin		[ ]Volatile Suspended Solids	
[X]Ca,Calcium	28	[ ]Sr,Strontium		[X]Hardness as $CaCO_3$	98
[ ]Cd,Cadmium		[ ]Ti,Titanium		[X]Alkalinity as $CaCO_3$	55
[ ]Co,Cobalt		[ ]W,Tungsten		[ ]	
[ ]Cr,Chromium		[ ]V,Vanadium		[ ]	
[ ]Cu,Copper		[ ]Zn,Zinc		[ ]	
[X]Fe,Iron	<0.1	[ ]Zr,Zirconium		[ ]	
[ ]Hg,Mercury		[ ]Ammonia Nitrogen-N		[X]mmhos Conductivity	140
[X]K,Potassium	0.8	[ ]Kjedahl Nitrogen-N		[X]pH Units	6.8
[X]Mg,Magnesium	4.5	[ ]Nitrate-N		[ ]Turbidity NTU	
[ ]Mn,Manganese		[ ]Nitrite-N		[ ]Color Units	
[ ]Mo,Molybdenum		[ ]Phosphorus (Ortho)-P		[ ]T.Coliform/100ml	
[X]Na,Sodium	2.5	[X]Chloride	2	[ ]	
[ ]Ni,Nickel		[ ]Fluoride		[ ]	

% PERMEABILITY REDUCTION

LAB NO. 3047-1

DEPTH = 2078 Feet

	TIME 15 Min.	TIME 30 Min.	TIME One Hour
Fresh Water	85.2	88.3	89.2
$CaCl_2$ 25000	49.0	59.3	68.8
$CaCl_2$ 50000	23.6	47.0	53.8
$CaCl_2$ 100000	20.9	44.6	50.6
NaCl 50000	22.2	46.6	51.5
KCl 50000	23.0	47.0	52.3
Filtrate	50.1	80.2	91.0

DEPTH = 2075 Feet

	15 Min.	30 Min.	One Hour
Fresh Water	58.7	85.0	90.1
$CaCl_2$ 25000	10.1	20.4	33.3
$CaCl_2$ 50000	7.0	17.1	27.7
$CaCl_2$ 100000	6.9	17.6	26.6
NaCl 50000	7.0	17.3	28.0
KCl 50000	6.9	17.3	27.3
Filtrate	47.6	79.1	90.6

% PERMEABILITY REDUCTION

LAB NO. 3047-2

DEPTH = 2072 Feet	15 Min.	30 Min.	One Hour
	TIME		
Fresh Water	60.3	86.4	89.6
$CaCl_2$ 25000	14.6	29.4	51.4
$CaCl_2$ 50000	10.4	20.6	33.8
$CaCl_2$ 100000	10.0	20.1	31.4
NaCl 50000	10.0	20.3	32.0
KCl 50000	10.1	20.0	31.6
Filtrate	50.6	79.7	90.2

DEPTH = 2069 Feet	15 Min.	30 Min.	One Hour
Fresh Water	90.6	96.4	98.2
$CaCl_2$ 25000	77.3	82.6	88.0
$CaCl_2$ 50000	68.0	80.3	82.1
$CaCl_2$ 100000	67.7	80.4	80.4
NaCl 50000	67.6	81.0	82.6
KCl 50000	68.1	81.4	82.6
Filtrate	80.6	92.4	96.8

% PERMEABILITY REDUCTION LAB NO. 3047-3

DEPTH = 2066 Feet	TIME 15 Min.	30 Min.	One Hour
Fresh Water	50.8	69.9	75.9
$CaCl_2$ 25000	14.0	30.6	49.6
$CaCl_2$ 50000	11.0	21.3	34.0
$CaCl_2$ 100000	10.6	20.0	33.2
NaCl 50000	11.0	20.9	34.3
KCl 50000	10.8	20.9	34.6
Filtrate	42.1	66.6	70.2

LISTING OF OTHER AVAILABLE GEOLOGIC & PERTINENT DATA

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

   a. Foraminifera Report, Walakpa No. 1, March 25, 1980.

   b. Palynology Report, Walakpa No. 1, March 25, 1980.

2. Drilling History Report, Walakpa Test Well No. 1 (prepared by Husky Oil NPR Operations, Inc.).

3. Halliburton Drill-Stem Test Reports with Charts for Drill-Stem Tests No. 1 and No. 2.

4. Analysis of Cased Hole Drill-Stem Test, Walakpa Test Well No. 1, NPRA, by Gruy Management Service Co., March 21, 1980, 5 pages with Appendices.

5. Source of Other Geological & Well Data:

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

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