

NATIONAL PETROLEUM RESERVE IN ALASKA

GEOLOGICAL REPORT

J. W. DALTON TEST WELL NO. 1

HUSKY OIL NPR OPERATIONS, INC.

Prepared by: Harry Haywood

Edited by: Gordon W. Legg

For the

U. S. GEOLOGICAL SURVEY

Office of the National Petroleum Reserve in Alaska

Department of the Interior

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## COMPOSITE LITHOLOGY LOG (In Pocket)

## GEOLOGIC SUMMARY

### INTRODUCTION

The J. W. Dalton Test Well No. 1 is located in the NW 1/4 of protracted Section 14, T18N, R5W, Umiat Meridian, approximately 3 miles east of Camp Lonely and approximately 85 miles east-southeast of Barrow, Alaska. The location was situated adjacent to the Beaufort Sea Coast on Pitt Point (see Figures 1 and 2).

Drilling operations commenced on May 7, 1979. The well was plugged and abandoned and the rig released on August 1, 1979, after reaching a total depth of 9,367 feet below kelly bushing. Indications of residual hydrocarbons were noted in the Shublik and Ivishak Formations and the Lisburne Group. Five drill-stem tests were performed, and all indicated no commercial hydrocarbons were present. No other zones exhibited any significant hydrocarbon shows.

### Pre-Drilling Prognosis:

The primary objective of drilling the J. W. Dalton well was to test the sandstones and coarser clastics of the Ivishak Formation at a location that was structurally isolated from surrounding wells (W. T. Foran No. 1 and Drew Point No. 1). Secondary objectives were the basal "Pebble Shale" sandstones (Kuparuk Sandstone equivalent), Sag River Sandstone, and the Lisburne Group carbonates and clastics.

Structural closure at the Ivishak seismic horizon was dependent upon truncation by the basal Cretaceous unconformity. Trapping of hydrocarbons in the "Pebble Shale" sandstones was dependent upon stratigraphic pinchout of permeable sandstone. The interpreted trapping mechanism for the Lisburne carbonates was dependent upon truncation to the north of the location by the basal Cretaceous unconformity, onlap of the unit onto the Barrow High to the northwest, and upon regional dip to the south and east. Permeability in the Lisburne was principally expected in the dolomite.

Maturation studies indicated that both oil and gas could be expected throughout the lower Cretaceous and Triassic-Permian rocks.

### Post-Drilling Analysis:

The well was drilled to a total depth of 9367' into the argillite basement rocks of Indeterminate age. The top of the argillite was penetrated nearly 700 feet lower than forecast.

The primary objective, the Ivishak Formation, was penetrated almost 270 feet lower than forecast and was found to contain water-saturated porous clastics with varying amounts of residual asphaltic oil. Permeability of the Ivishak clastics reached a high of 756 millidarcies, with the best average permeabilities and porosities being developed in the upper part of the formation (see Appendix E).

The "Pebble Shale" sandstones have low porosity and permeability in the well. A bed of tight silty sandstone, which exhibited traces of stain and dead oil, is present in the basal Torok Formation immediately above the "Pebble Shale".

The Sag River Sandstone is not present in the well. The Lisburne Group carbonates were penetrated almost 500 feet lower than originally forecast. The Lisburne rocks did exhibit some porosity, but permeabilities averaged less than 1.0 millidarcies. The unit contained heavy residual asphaltic oil and water.

Five drill-stem tests were run in the Ivishak and Lisburne strata combined, two of which recovered minor amounts of asphaltic oil along with formation water and drilling fluids.

The drilling of the J. W. Dalton No. 1 well again confirmed the presence of potential reservoir rocks in the area within the Ivishak Formation. The presence of dead oil in the Ivishak and Lisburne implies hydrocarbons have been generated, but have since migrated through the area to some structurally higher position.



# J. W. Dalton Test Well No.1

Camp  
Lonely

SMITH BAY

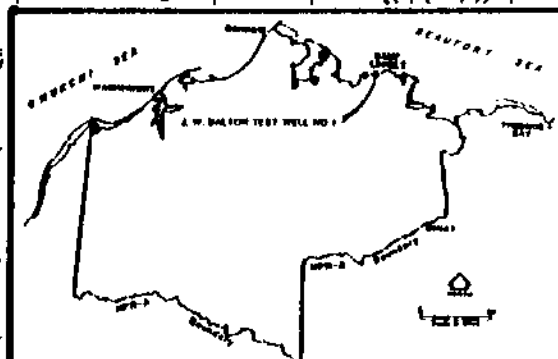
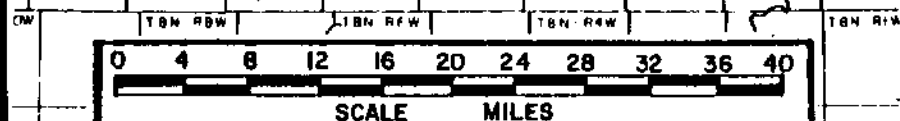
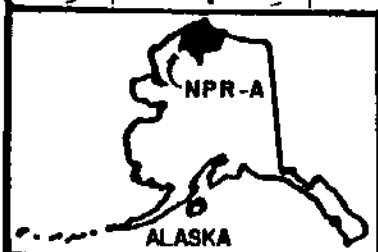
HARRISON BAY

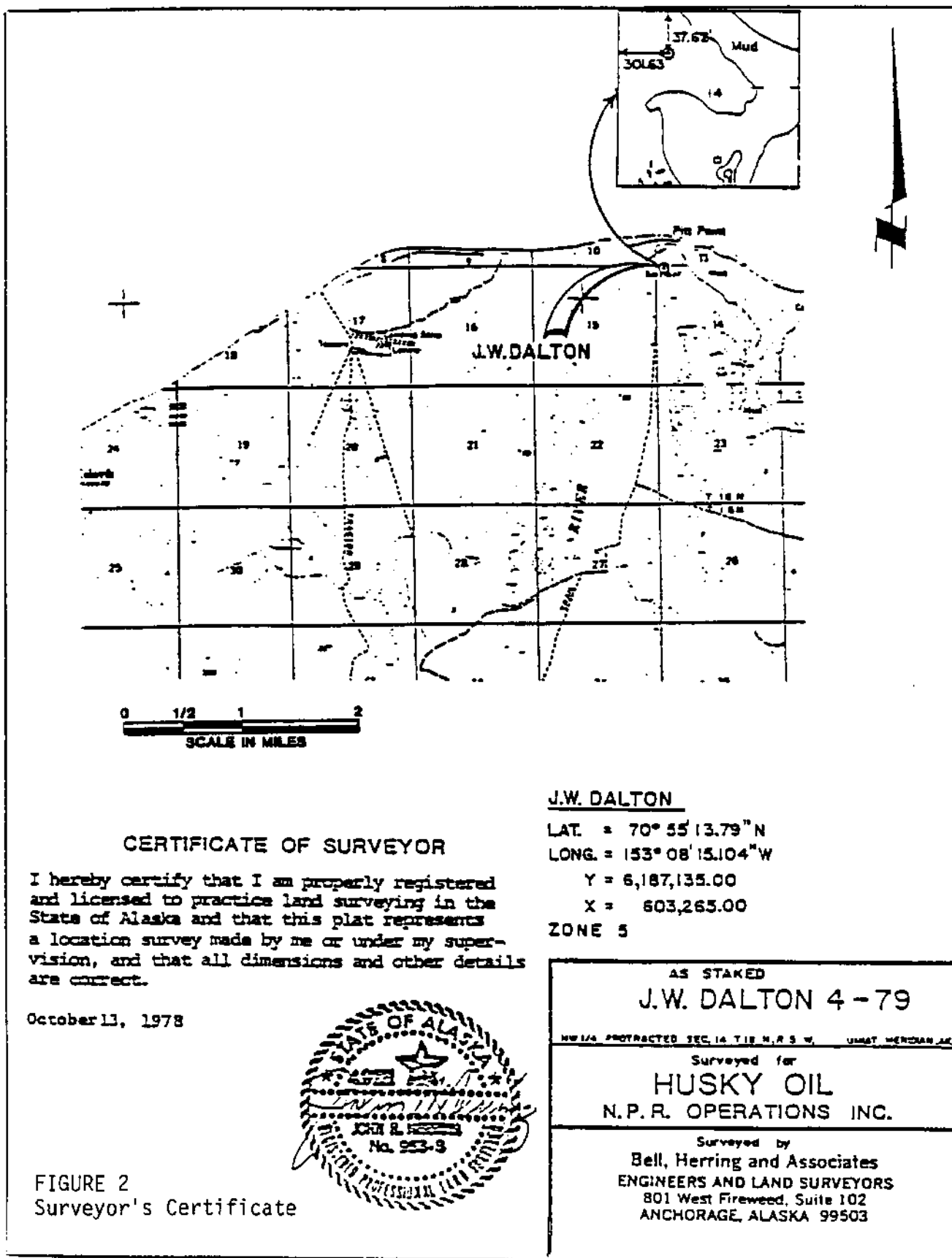
TESHEKPUK  
LAKE

COLVILLE

FIGURE 1 - LOCATION MAP - J. W. DALTON TEST WELL NO. 1

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WELLSITE GEOLOGIST REPORT  
BY: R. V. NELSON  
EDITED BY: GORDON W. LEGG

## INTRODUCTION

The J. W. Dalton Test Well No. 1 was drilled in 1979 as a follow-up to the W. T. Foran Test Well No. 1, and the Drew Point Test Well No. 1. The W. T. Foran was drilled in 1977 by Husky Oil NPRA/U. S. Navy, and the Drew Point was drilled in 1978 by Husky Oil NPRA/USGS. The W. T. Foran, although not productive, had good shows of oil in the Kuparuk Sandstone equivalent and in the Ivishak Formation of the Sadlerochit Group. These two intervals flowed water to the surface on drill-stem tests, thus demonstrating the presence of excellent potential reservoirs should a prospect be developed which would prove to have stratigraphic/structural closure on either of the two sandstones.

The basic play was dependent on stratigraphic trapping in the Ivishak Formation through erosional truncation by the basal Cretaceous unconformity. A secondary objective, the Lisburne Group of carbonates, was dependent on porosity development through possible "dolomitization" coupled with stratigraphic closure created through erosional truncation to the north by the basal Cretaceous unconformity, onlap pinchout to the northwest (as indicated in Drew Point), and regional dip to the south and east. The Sag River Sandstone was believed to have been removed by erosion, which proved to be the case.

The Ivishak Formation was present, as expected, and was fairly well-developed and porous. The Ivishak consisted of clastics ranging from very fine grained sand to conglomerate, and contained spotty dead oil and asphalt throughout. Lisburne carbonates were also present and had some porosity; heavy oil staining and asphalt were noted throughout. A clastic sequence was encountered below the limestone and also contained dead oil. This clastic facies is equivalent to the Lower Lisburne. Five drill-stem tests were run, one open-hole in the Ivishak and four cased hole tests, three of which were in the Lisburne and the final cased hole test being again in the Ivishak. Both of the Ivishak tests flowed water to the surface (see Appendix F for complete drill-stem test data).

The J. W. Dalton Test Well No. 1 was completely evaluated by sample analysis, mud-logging data, conventional coring, and, finally, drill-stem testing. Fair shows, dead oil, and asphalt were noted and probably indicate flushing and lack of closure. It is possible that additional work, primarily seismic, could identify a prospect having the necessary closure, but the prospect would most likely be to the north off the National Petroleum Reserve.



# STRATIGRAPHY

## WIRELINE TOPS

	<u>DRILLED DEPTH</u>	<u>SUBSEA DEPTH</u>
CRETACEOUS		
Nanushuk Group (undifferentiated)	907'	-870'
Torok Formation	4714'	-4677'
"Pebble Shale"	7483'	-7446'
TRIASSIC		
Shublik Formation	7755'	-7718'
TRIASSIC-PERMIAN		
Sadlerochit Group	7893'	-7856'
Ivishak Formation	7893'	-7856'
Kavik Shale Member	8233'	-8196'
PENNSYLVANIAN-MISSISSIPPIAN		
Lisburne Group	8318'	-8281'
INDETERMINATE		
Argillite	9270'	-9233'
Total Depth - Driller	9367'	-9330'
Total Depth - Wireline	9370'	-9333'

## QUATERNARY-TERTIARY

### 94-210'

From the surface casing at 94' to a depth of 210', the samples consist of unconsolidated clay, sand, and gravel with layers of soft peaty wood and plant material. Foraminifera, as well as other shell fragments, are common. Electric logs confirm the interbedded nature of the sediments. Pyrite replacements are common in the plant material.

Foraminiferal studies, by Anderson, Warren & Associates, Inc. (AWA), suggest a Pliocene to Pleistocene age and a shallow, probably inner neritic, depositional environment. Palynological studies yielded no data useful in determining the age of these beds.

## TERTIARY

### 210-907'

Below 210' there is no marked change in the nature of the sediments. Thin organic layers persisted through the interval with a slightly increasing degree of carbonization. The sediments are unconsolidated,

with clay clasts common in fresh cuttings. These clay cuttings broke down with washing or just with time in wet samples, so that sample descriptions tend to be biased toward the coarser fractions. Small pebbles are common throughout the sands. From 769-910' a chert gravel with thin layers of wood was logged.

Though barren of foraminifera, palynology placed the interval from 270-900' into zonules P-M11 and P-M12 (Paleogene). A marine to marginal marine environment is suggested.

## CRETACEOUS

### Nanushuk Group (undifferentiated): 907-4714'

The Upper Cretaceous sediments, as picked on palynology, are those in the interval 900-2970', and are classified into AWA zonules P-M13-P-M16. Late Cretaceous foraminifera of AWA zones F-5 through F-8 occur between 1050' and 2820'. The section consists primarily of soft gray claystones with thin sand and silt beds. The depositional environment seems to have cycled from marginal marine to outer neritic, to open marine, and then back to marginal marine.

The claystones broke down easily and the hole "made mud" while drilling through the Nanushuk. Fine carbonaceous material and mica flakes are common throughout. Silt and sand layers are present in the claystone in what appears to be a gradational sequence. In the lower portion of this section a few thin, coarse grained, reddish stained, varicolored sands were logged.

While drilling the Nanushuk, the total background gas in the mud rose from traces near the top to 40 units near the base. (As used in this area, 100 units are equal to 2% methane mixed with air. Levels of 50-100 units are common in fast drilling and soft sediments in the area.) In this well the Lower Cretaceous is represented by the section from 2970-7650', based on palynology, and from 2820-7730', based on foraminifera. Foraminifera zones F-9 and F-10 (Albian) are represented, and a neritic environment is indicated. Palynology for the interval 2970-7380' indicated an age of Middle to late Albian AWA zonule P-M17 and suggested a marine environment. This portion of the Nanushuk consisted almost entirely of medium gray claystones, with only occasional sands and silts. Plant material, pyrite, mica, and shell fragments are common in the samples.

Core No. 1 was cut from 3500-3530' and recovered mostly soft claystone, which is dark gray and silty, with pelecypod fragments common. Interbedded with the claystone is a zone of dark gray argillaceous siltstone with occasional small rounded pebbles and lighter gray, fine grained sandstone clasts and flat-lying sand laminations. Core No. 2 from 4667-4697' showed a change to interbedded and interlaminated fine grained sandstone, alternating with a firm claystone, which showed the beginnings of shaly fissility. Sands showed multidirectional crossbedding.

#### Torok Formation: 4714-7483'

The Torok can be broken down to the soft shale from 4714-7380' and the hard siltstone, sandstone and shale from 7380-7483'. The upper shale portion yielded assemblages from the AWA palynology zonules P-M17 and P-M18 (Middle and Upper Albian and Aptian to Early Aptian, respectively). Foraminifera from the interval 4740-7380' were classified into AWA zone F-11 (Aptian to Early Albian). Foraminifera types indicated open marine to possibly bathyal conditions. The section from 4740-7380' consists almost entirely of fine grained clastics grading from medium to dark gray claystone to medium dark gray and brown shale. Only occasional thin sands are present. Mica, pyrite and shell fragments are common. Portions of the shale are silty, grading to dark gray and brown siltstones. Occasional traces of siliceous, brittle, gray shale were seen in the samples. Core No. 3 was cut from 5603-5633' and recovered 27'. The core consists of thinly interlaminated soft shale and harder siliceous shaly bands each about 1" thick, with occasional zones of siltstone and sand up to a few inches thick. Core No. 4 was cut from 6585-6615' but recovered only 4.3'. The recovered core consists of dark gray to gray-brown, firm to hard, silty and sandy shale, with a 3" layer of fine to very fine grained sandstone showing complex crossbedding.

The basal portion of the Torok, from approximately 7380-7483', shows a marked change to hard, argillaceous siltstone and sandstone. Foraminifera from this interval yielded a Neocomian age (AWA zones F-12 - F-13), and suggested a probable middle to outer neritic environment.

#### "Pebble Shale": 7483-7755'

The "Pebble Shale" is distinctive both on logs and in samples. On electric logs the top is characterized by high gamma ray levels. Core No. 5 was cut from 7524-7534' and recovered 8.6'. The core is characteristic of the "Pebble Shale" and consists of finely laminated very dark gray or brown to black, hard, brittle shale. "Floating" throughout the shale are medium to coarse, well rounded, polished to frosted, quartz grains. Bedding planes have black, shiny carbonaceous material, which gave a very slow weak cut fluorescence, probably from asphaltic material. One thin, hard, pyritic siltstone layer about 2" thick was recovered in the middle of the core. Also seen in the core are fine pyrite laminations. The first lamination was encountered in the hard sandstone and siltstone just above the "Pebble Shale".

The Kuparuk Sandstone, or equivalent, is poorly developed at this location. It consists of thin, glauconitic, conglomeratic sandstones and siltstones interbedded with black shale. A slight increase in the background gas was noted through this zone, but did not constitute a show.

The base of the "Pebble Shale" was picked at 7755' from electric logs. Pre-Cretaceous erosion removed the Kingak Formation of Jurassic age and the Sag River Sandstone of Triassic age. The "Pebble Shale" rests unconformably on the Shublik Formation in the J. W. Dalton well.

## TRIASSIC

### Shublik Formation: 7755-7893'

The Shublik Formation consists of thin, hard, very calcareous sandstones which frequently grade to sandy limestones. Interbedded with the sandstones are hard calcareous siltstones and thin calcareous shales. Porosities in the sandstones are generally poor, estimated to be generally less than 5%. Occasionally, a slow, dull yellow cut fluorescence was obtained from selected sandstone cuttings through this interval.

No conventional cores were attempted in the Shublik because of a lack of either good shows or porous sandstones.

Foraminifera indicate a Middle to Late Triassic age (AWA zone F-19).

## TRIASSIC-PERMIAN

### Sadlerochit Group: 7893-8318'

The Sadlerochit Group is represented by rocks of the Ivishak Formation. Based on foraminiferal identification rocks of the underlying Echooka Formation are absent. The upper 340 feet of the Ivishak consists primarily of sandstone with some interbedded shales, and the lower 85 feet consists of shale belonging to the Kavik Shale Member.

Lithologically, the Ivishak is predominantly sandstone. The sandstones range from very fine grained (gradational to siltstone) to conglomeratic. The conglomerates contain mostly chert pebbles as the large fraction. The sandstones and conglomerates are interbedded with thin, relatively hard, gray to green, micaceous shales.

The Ivishak was continuously cored (Cores 6-10) from 7967-8200' (see Appendix E for core analysis). Slight scattered oil shows accompanied by slight to moderate gas shows (maximum of 150 units) were logged in the section from the top of the Ivishak to the first cored interval. The cores also contained spotty scattered oil staining as well as asphalt and dead oil. The spotted and scattered nature of the oil staining and the presence of asphalt and dead oil typically indicates a zone which has been "flushed" with water. Porosity and permeability in the cores are fair (see Appendix E).

An open-hole drill-stem test was run on the interval from 7812-8140' (Test No. 1). The test flowed water with small amounts of solution gas at the rate of 1,218 barrels per day on a 1/4" choke. The flowing surface pressure reached a maximum of 300 psi according to the drill-stem test report from the field. The formation was retested (Test No. 5) through casing (perfs 7971-7976'). This test flowed water at the rate of 258 barrels per day at a stabilized surface pressure of 110 psi as reported from the field (see Appendices F & G).

The Kavik Shale Member of the Ivishak Formation is represented by a gray, partly splintery, micaceous shale having thin silty beds. The depositional environment for the Kavik is interpreted as being nonmarine to marginal marine.

#### PENNSYLVANIAN-MISSISSIPPIAN

##### Lisburne Group: 8318-9270'

Only the upper part of the Lisburne carbonates appears to be present in this well. This upper limestone unit is interpreted as being deposited in a shoaling shelf and subtidal to tidal type environment. The interval 8318-9160' has been dated as Early to Middle Pennsylvanian. The foraminifera report from Anderson, Warren and Associates, Inc. states that the absence of the lower carbonate unit can be due either to an unconformity between the Lisburne Group and the underlying Endicott Group or to a facies change in the lower Lisburne. The facies change may have allowed clastics normally associated with the Endicott Group to have climbed in the section with respect to age. A possible Mississippian age was assigned to the clastic section from 9160-9270'.

Two conventional cores were cut, No. 11 from 8315-8345', and No. 12 from 8515-8543.5'. Cores and samples consist of finely to coarsely crystalline limestone that is medium to dark gray and brown. Porosity is generally low, and consists primarily of pinpoint vug porosity and fractures. The limestones throughout showed dead and heavy asphaltic oil staining, which was occasionally bleeding from fractures and pinpoint pores. Chert pebbles and occasional chert conglomerates were also logged, including one such conglomerate one-inch thick which was recovered at the top of Core No. 11. Traces of dead oil also were noted in drill cuttings. Interbedded with the limestones of Core No. 12 are calcareous sandstones which are brown, fine to medium grained, angular and containing dead oil stain and bleeding heavy black asphaltic oil. Some red and green claystones were present in the bottom 7.1' of the recovery from Core No. 12.

Two drill-stem tests were run in the Lisburne carbonates. Drill-Stem Test No. 3 through perforations in the intervals 8482-8509' and 8520-8538' recovered 22 barrels of oil-cut water and 5 barrels of water-cut heavy oil. Drill-Stem Test No. 4 through perforations in the interval 8392-8436' died after 28 minutes into the initial flow and recovered only water cushion, which was slightly mud cut, and an estimated 1.3 barrels of mud. Both the water cushion and the mud had a slight sheen of oil (see Appendix F for complete drill-stem test data).

The lower portion of the Pennsylvanian section in this well is represented by clastics consisting of red and green shales interbedded with green to red and varicolored sandstones, mostly very fine grained with some medium grained, silty and very calcareous, exhibiting mostly poor porosity. The sandstones become conglomeratic in the lower part, containing pebbles of chert. Scattered sandy limestones were also logged. The Pennsylvanian was picked as low as 9160', but below that point dating breaks down. The

rocks could be as old as Early Mississippian or as young as Early Pennsylvanian. The depositional environment was probably nonmarine to marginal marine.

One drill-stem test (Drill-Stem Test No. 2) was run in red clastics through perforations over the interval 8558-8665'. This test recovered 80 barrels of formation water and 5 barrels of asphalt when reversed out (see Appendix F for details).

## INDETERMINATE

### Argillite: 9270-9367'

Rocks of Indeterminate age, collectively called argillite in most areas of the North Slope, were encountered at a depth of 9270'. The lithology consists of dark gray to black, slickensided, quartz-veined shales, which have been subjected to low-grade metamorphism. The so-called argillite is considered to be economic basement throughout the area.

## STRUCTURE

Two runs were made with a 4-arm dipmeter tool from 2600' to total depth. Computed dips appear to be close to those seen in the cores.

From 2600' down to the top of the "Pebble Shale" computed dips are quite gentle with most being less than 5° and often nearly flat. The direction of dip varied, but was generally northeast to southeast.

From the "Pebble Shale" to total depth the dips increased slightly, but still held generally under 10°. The dip direction was very consistent to the southeast and did not show any marked changes in the lower section that might indicate an unconformity.

The presence of potential reservoir rocks in the lower part of this well and the general southerly dips would indicate that a trap could still exist updip from this well. Unfortunately, any likely play would exist north of the J. W. Dalton location and would, therefore, be situated off of the National Petroleum Reserve.

## PERTINENT DATA AND APPENDICES

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SUMMARY OF PERTINENT DATA  
AND OPERATIONS AND ANALYSIS

WELL NAME: J. W. Dalton Test Well No. 1

API NO.: 50-279-20006

OPERATOR: Husky Oil NPR Operations, Inc.

LOCATION: 38' FNL, 302' FWL, (NW 1/4),  
protracted Section 14, T18N, R5W,  
Umiat Meridian, North Slope, Alaska.

LOCATION COORDINATES: Latitude: 70°55'13.79"N  
Longitude: 153°08'15.104"W  
X = 603,265.00  
Y = 6,187,135.00  
Zone 5

ELEVATION: 37 feet Kelly Bushing;  
19 feet Pad; 15 feet Ground

DATE SPUDDED: May 7, 1979

TOTAL DEPTH: 9,367' Driller  
9,370' Logger

DATE TOTAL DEPTH  
REACHED: June 27, 1979

RIG RELEASED: August 1, 1979

CASING: 20" @ 94'  
13-3/8" @ 2633'  
9-5/8" @ 7524'  
7" liner @ 7204-8898'

STATUS: Plugged and abandoned.

WELLSITE GEOLOGIST: R. V. Nelson, Jr.  
John Greene

WELL LOG ANALYST: Armour Kane

DRILLING CONTRACTOR: Nabors Alaska Drilling, Inc., Rig 1

MUD LOGGERS: Borst & Giddens Logging Service, Inc.

BIOSTRATIGRAPHIC  
ANALYSIS: Anderson, Warren & Associates, Inc.



# OPERATIONS AND ANALYSIS PERFORMED

## LOGGING RECORD:

### Open Hole: (Dresser Atlas)

DILF/SP/GR/SP	60-9368'
BHC Acoustilog/GR/TTI	35-9356'
CN/CD/GR/Porosity	2300-9359'
Densilog/GR/CAL	2300-9359'
HR-Diplog	2600-9320'
Diff.-Temp. Log (6/27/79) Run No. 1	100-9370'
Diff.-Temp. Log (6/29/79) Run No. 2	100-9360'
Birdwell Velocity Survey	250-9300'
Mudlog (Petro Tech)	90-9367'
Dc Exponent Log (Petro Tech)	90-9367'

### Cased Hole:

CBL/VDL/GR/CCL (3 runs)	6858-8779' Gross
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### Computed Logs:

Synthetic Seismogram	2600-8200'
Epilog (Complex Reservoir)	7535-9360'
Integrated Velocity	2600-8200'

### Sidewall Cores:

Run No. 1	3105-7516', 21 shot, 19 recovered.
Run No. 2	7653-9116', 25 shot, 21 recovered.

### Conventional Cores:

<u>No.</u>	<u>Interval</u>	<u>Recovery</u>	<u>Rock Unit</u>
1	3500-3530'	27.0'	Nanushuk
2	4667-4697'	30.0'	Nanushuk
3	5603-5633'	27.0'	Torok
4	6585-6615'	4.3'	Torok
5	7524-7534'	8.6'	"Pebble Shale"
6	7967-8021'	54.0'	Ivishak
7	8021-8081'	55.0'	Ivishak
8	8081-8113'	13.5'	Ivishak
9	8113-8139.5'	26.5'	Ivishak
10	8140-8200'	59.0'	Ivishak
11	8317-8345'	24.9'	Lisburne
12	8515-8543.5'	28.1'	Lisburne
13	9357-9367'	8.8'	Argillite

### Hydrocarbon Shows:

- 7878-7921' Shublik and Ivishak Formations: sandstone; trace light brown spotted oil stain, trace yellow cut fluorescence, maximum ditch gas @ 7884', 150 units.
- 7955-8887' Sadlerochit and Lisburne Groups: sandstone, conglomerate, and limestone; scattered residual heavy oil show throughout, in part asphaltic; entire section water wet with occasional to common spotted black asphaltic stain, occasional gold speckled fluorescence common, dull to bright yellow cut fluorescence; better shows associated with tighter rocks.

### Core Analysis:

<u>Date</u>	<u>Interval</u>	<u>Core No.</u>	<u>Sample No.</u>
7-6-79	7967-8011'	6	1 thru 37
	8029-8081'	7	38 thru 70
	8081-8090'	8	70 thru 76
	8114-8139'	9	77 thru 101
	8140-8198'	10	102 thru 160
	8317-8341'	11	161 thru 173
	8515-8536'	12	174 thru 195

### Tests:

- Drill-Stem Test No. 1, 7812-8140': Sadlerochit (open hole), recovered fresh water then salt water. Flowed at rate of 1,218 BWPD.
- Drill-Stem Test No. 2, 8558-8665': Lisburne (perforations), recovered 3.31 barrels of water cushion, 5 barrels of asphalt, 2 barrels of rat-hole mud, and 29 barrels of rat-hole fluid and mud filtrate plus 80 barrels of formation water.
- Drill-Stem Test No. 3, 8482-8509' and 8520-8538': Lisburne (perforations), recovered 6.8 barrels of water cushion and rat-hole mud, 5 barrels of oil, and 22 barrels of formation water.
- Drill-Stem Test No. 4, 8392-8436': Lisburne (perforations), no hydrocarbon recovery. Recovered water cushion and 1.3 barrels of mud with a sheen of oil.
- Drill-Stem Test No. 5, 7971-7976': Sadlerochit (perforations), recovered 3.3 barrels of water cushion, 162 barrels of formation water. Flowed water at rate of 258 BWPD.

J. W. DALTON NO. 1  
 DRILL CUTTINGS AND CORE DESCRIPTIONS  
 BY  
 R. NELSON - 94-7534'  
 J. GREENE - 7534-9367'

DEPTH DRILLED  
 (FEET BELOW  
KELLY BUSHING)

0 - 94	No samples.
94 - 130	Clay: medium to light gray, soft, gummy, trace amounts of fine to medium grained sand, occasional pelecypod fragments and forams.
130 - 150	Peat: soft wood and plant material, partially pyritized and carbonized; small amounts of pyritic coal, with sand and fine gravel; pelecypod fragments common; well preserved forams were noted.
150 - 240	Sand/Gravel: varicolored, mostly orange with yellows, reds, greens, blues and grays; poorly sorted, coarse fractions rounded to subrounded, with surface textures from frosted to polished; sands subangular to rounded, some clear, very well rounded quartz, and with thin beds of soft, medium gray clay; occasional thin layers of peat and wood organic material; traces of shell fragments and pyrite.
240 - 310	Chert Pebble Conglomerate: dark gray, poorly sorted, subrounded to well rounded, mixture of frosted and well polished granules and pebbles; many pebbles show remains of pyrite on surfaces as well as traces of calcareous cement.
310 - 480	Clay: medium gray, soft, silty; carbonaceous and sandy in part; interbedded with dark gray chert pebble conglomerate, as above.
480 - 590	Sand: more finer sizes and fewer pebbles and granules; angular to subangular in sand sizes; predominantly quartz and chert, with clay and organic layers, as above.
590 - 780	Gravel: sandy at top; mostly dark gray and medium gray chert, upper portion has 5-10% varicolored rock fragments; moderately to well size graded, some small pebbles; rounded to subrounded, many well polished; some wood as thin, carbonized zones at 610'.

780 - 920	Gravel: dark gray chert pebbles, rounded to subrounded, many polished grains; some broken fragments of larger pebbles; occasional zones of carbonized wood material.
920 - 1075	Gravel: dark gray chert pebbles, and many broken fragments of larger chert pebbles.
1075 - 1290	Clay: medium gray, soft, plastic, slightly silty; occasional fine carbonaceous particles.
1290 - 1450	Clay: medium to light gray, soft to firm, silty; grading occasionally to argillaceous Siltstone: medium gray, soft, sandy; traces of pelecypod shell fragments; very fine carbonaceous grains and mica flakes in both clay and silt.
1450 - 1650	Sand: medium gray, very fine grained, silty and clayey; mostly quartz, but with trace amounts of bright, varicolored grains, which are probably very thinly interbedded in siltstones and clays.
1650 - 1750	Clay: as above; thinly interbedded with Sandstone: as above.
1750 - 1920	Siltstone, Clay and Claystone: as above.
1920 - 1930	Sand: coarse grained, well rounded, numerous clear quartz grains; some very fine grained, firm, gray sandstone.
1930 - 2010	Claystone and Clay: as above.
2010 - 2120	Clay: medium and light gray; becoming progressively more firm and grading to soft, plastic claystone, with light gray patches of bentonite?; silt content varies greatly; mica and fine carbonaceous material are common; traces of pelecypod shells and plant stems.
2120 - 2290	Claystone: medium to light gray, plastic; occasional slight fissility.
2290 - 2370	Claystone: medium gray, soft, less silty; mica common.
2370 - 2410	Siltstone: medium gray, argillaceous, micaceous, calcareous, firm to occasionally hard, with Claystone: as above.
2410 - 2500	Sand: red stained, coarse grained; mostly quartz; very well rounded; often clear or polished, with Siltstone and Claystone: as above.

2500 - 2530	Claystone: medium to light gray, soft, silty, grading to siltstone, micaceous, and with Siltstone: as above.
2530 - 2690	Siltstone: light gray with scattered dark grains, argillaceous, micaceous, calcareous, pyritic, with Claystone: as above.
2690 - 2800	Siltstone: medium gray, argillaceous, slightly calcareous to occasionally hard; abundant fine mica; minor amount of carbonaceous material; sandy, with occasional hard, calcareous, very fine grained sandstone and coarse grains of loose sand; interbedded with, and grading to, soft, medium gray, silty claystone; traces of gray to brown, crystalline calcite; pyrite clusters common.
2800 - 2950	Claystone: medium to dark gray, soft, silty, slightly carbonaceous; scattered fine mica; occasional light gray, firm, bentonitic clay.
2950 - 3070	Claystone: medium to dark gray, soft to firm, silty, carbonaceous.
3070 - 3220	Claystone: medium to dark gray, firm, slightly silty, carbonaceous, micaceous, pyritic; trace of amber; Sandstone: very fine grained, hard, calcareous; probably as very thin beds.
3220 - 3360	Claystone: medium to dark gray, soft to firm, only occasionally silty, and with thin, argillaceous siltstone interbedding; traces of chert and shell fragments.
3360 - 3500	Claystone: medium to dark gray, soft to firm, pyritic, occasional thin, soft, argillaceous, calcareous, gray siltstone; pyrite clusters; worm tubes and pelecypod shell fragments common.
3500 - 3530	<u>Core No. 1: Cut 30', Recovered 27'</u>
	3500.0-3503.0' No recovery. (3.0')
	3503.0-3508.0' Siltstone: dark gray, argillaceous, grading to silty claystone; firm, occasional small rounded pebbles throughout; lighter gray, hard, very fine grained sandstone in casts and relatively flat-lying laminations. (5.0')
	3508.0-3530.0' Claystone: dark gray, firm to soft, slightly silty, but less than above; no evidence of fissility, generally (22.0')

undercompacted; pelecypod shells (1-10 cm) and other shell fragments common; some thin-shelled types; prismatic shell layers often recrystallized to clear, amber colored crystalline calcite.

- 3530 - 3600 Siltstone: dark gray, argillaceous, sandy, with hard, fine grained sandstone clasts and laminations, with Claystone: dark gray, soft to firm, pelecypod shells common.
- 3600 - 3810 Claystone: medium to dark gray, soft to firm, silty, with Siltstone: medium to dark gray, soft, argillaceous, calcareous, carbonaceous, with occasional Sandstone: dark green, very fine grained, hard, calcareous; traces of Limestone: dark gray, hard, argillaceous, crystalline.
- 3810 - 3940 Claystone: medium gray, soft, micaceous; pelecypod shells and carbonized plant fragments common.
- 3940 - 4070 Claystone: medium gray, soft, slightly silty; minor Siltstone: dark gray, hard, calcareous; scattered small rounded pebbles; occasional carbonized wood.
- 4070 - 4240 Claystone: medium gray, soft, micaceous; scattered pebbles; occasional loose grains of coarse sand; trace of dark gray, finely crystalline, argillaceous limestone, containing abundant plant remains.
- 4240 - 4370 Claystone: medium gray, soft to firm, soluble, silty, carbonaceous, micaceous; pyrite, pelecypod shells and soft plant remains common.
- 4370 - 4470 Claystone: medium to dark gray, soft, silty, carbonaceous, micaceous; abundant shell fragments, many of which are weathered to a chalky texture.
- 4470 - 4600 Claystone: medium gray, soft to firm, silty, carbonaceous, micaceous; traces of coal, pyrite and shell fragments; abundant white, red, and brown weathered clayey material below 4530'.
- 4600 - 4667 Claystone: as above, with occasional chert and quartz pebbles and granules; minor very fine grained sand.
- 4667 - 4697 Core No. 2: Cut 30', Recovered 30'
- 4667.0-4670.5' (3.5') Claystone/Shale: finely laminated, dark gray to brown, firm, silty; Siltstone: dark gray to brown, argillaceous, and showing low angle crossbedding.

- 4670.5-4675.0'  
(4.5') Claystone/Shale: dark gray to dark brown in 2-25 mm thick laminations with 0.5-2 mm thick silt and sand laminations showing soft sediment distortion; interlayered with 2-10 mm thick sandy Siltstone: argillaceous, micaceous; and 5-10 mm thick sands, very fine grained, medium gray, soft to firm, noncalcareous, with dark carbonaceous streaks; mica and clay clasts; shows very multi-directional crossbedding, some small sand casts.
- 4675.0-4679.3'  
(4.3') Claystone/Shale: dark gray to gray-brown, firm, clean to silty with 1-3 mm silt laminations, and 15-30 mm irregular sands showing internal crossbedding at 4675.9' and 4677.2'.
- 4679.3-4681.3'  
(2.0') Sandstone: very fine grained, medium to light gray with black streaks of carbonaceous material, micaceous, argillaceous, with 1-10 mm silty shale laminations making up about 20%; some low angle crossbedding in sand and some small lenses of siltstone; interval is uniform in appearance.
- 4681.3-4683.7'  
(2.4') Claystone/Shale: dark gray to gray-brown, firm, clean to silty, occurs as 2-15 mm interlamination with 1-5 mm thick, fine grained sand; approximately 50% each; regularly laminated with occasional 2-4 mm thick, light gray silt and sand lenses.
- 4683.7-4685.7'  
(2.0') Sandstone: (approximately 60%) medium gray, very fine to fine grained; in 1-5 mm laminations with Claystone/Shale (40%): dark gray, firm, shows fine, fairly regular cross-bedding with fluting at the base of sandier portions.
- 4685.7-4686.9'  
(1.2') Claystone: dark gray, firm, with occasional thin (1-4 mm) sand laminations.
- 4686.9-4688.0'  
(1.1') Sandstone: medium gray, very fine grained, firm, argillaceous, moderately carbonaceous, micaceous; with 2-4 mm shale laminations; some internal crossbedding and flute casting.

4688.0-4688.4' (0.4')	5-10 mm shale and 1-5 mm sand laminations showing soft sediment folding.
4688.4-4689.0' (0.6')	Sandstone: light gray, fine to very fine grained, hard, calcareous, with carbonaceous partings 0.5-1 mm thick.
4689.0-4689.8' (0.8')	Sandstone: medium gray, fine grained, slightly argillaceous, firm, with carbonaceous layers 0.5-4 mm thick.
4689.8-4690.9' (1.1')	Thin laminations (1-5 mm) of medium gray sandstone and dark gray shale, regularly layered.
4690.9-4693.2' (2.3')	Sandstone: medium gray, slightly argillaceous; fairly uniform, with 1-3 mm carbonaceous layers approximately 20 mm apart, noncalcareous, very fine to fine grained.
4693.2-4693.8' (0.6')	Evenly laminated 3-10 mm sandstone and 13 mm shale layers.
4693.8-4694.8' (1.0')	Shale/Claystone: dark gray with 10% sandstone in 1-2 mm laminations; dip appears less than 10°.
4694.8-4695.5' (0.7')	Approximately 50/50 1-10 mm laminations of medium gray sandstone and dark gray Shale: firm, micaceous, carbonaceous; soft sediment slump and fold convoluted bedding and lensing.
4695.5-4696.5' (1.0')	Sandstone: fine to occasionally medium grained, carbonaceous, with 15% shale in 1-5 mm laminations; uniform.
4696.5-4697.0' (0.5')	Shale/Claystone: dark gray, firm, clean.
4697 - 4830	Claystone/Shale: medium to dark gray, soft to firm, occasionally silty, with thin Sandstone: very fine grained, soft to hard, some loose grains, rounded to subrounded, fine to coarse grained sand.
4830 - 5040	Siltstone: medium gray to brown, argillaceous, carbonaceous, micaceous, sandy; and Shale: dark gray to brown, soft to firm, occasionally hard and siliceous; traces of light brown, hard, siliceous claystone; traces of blue chert, pyrite, pelecypod shells.



- 5040 - 5190 Claystone/Shale: medium to dark gray, generally firm, but ranging from soft and soluble to siliceous and hard; pyritic; traces of forams; occasional sand grains.
- 5190 - 5310 Siltstone: medium to light gray and brown, firm to hard, sandy, carbonaceous, micaceous, occasionally siliceous, argillaceous; with Shale: as above and with loose grains of coarse, rounded, varicolored sand; small columnar echinoid fragments, worm tubes and pelecypods.
- 5310 - 5603 Shale: medium to dark gray, firm to hard, occasionally silty; occasional pyrite.
- 5603 - 5633 Core No. 3: Cut 30', Recovered 27'
- 5603.0-5630.0' Entire core consisted of rhythmically  
(27.0') bedded shale and siltstone; color shows distinct steps from black to dark gray, to dark brown to gray, to light gray to light brown; darkest layers 1-3 mm thick; lightest gray sandy silt layers are 0.1 to 1 mm; core washed out in regular alternations of relatively hard and soft layers approximately 20 mm thick, so that the surface showed pronounced relief; harder layers medium brown and gray, silty, siliceous shale; softer parts are black to brown shale with very fine laminations of lighter gray silt and occasional very fine grained sand; occasional sandy zones up to 50 mm occur, such as at 5605'; a 30 mm layer of siliceous and possibly dolomitic, hard claystone was cored at 5612.5'.
- 5630.0-5633.0' No recovery.  
(3.0')
- 5633 - 5700 Siltstone and Shale. Siltstone: medium gray, carbonaceous, argillaceous, micaceous, occasionally clean and friable; Shale: medium to dark gray and brown, some well developed shaly partings, firm to hard, but still probably a significant percentage dissolving into the mud; traces of light brown, hard, siliceous shale.
- 5700 - 6090 Shale: dark gray, firm, carbonaceous, micaceous, occasionally silty, grading to argillaceous siltstone; occasional large, well rounded, clear quartz grains; trace of blue chert.

- 6090 - 6480 Shale: as above, with Siltstone: medium to light gray, grading to Sandstone: micaceous and dark brown, argillaceous, pyritic; occasional forams.
- 6480 - 6585 Shale: dark gray, firm to hard, occasionally silty, with Siltstone: medium to light gray, argillaceous, carbonaceous, sandy, micaceous, and with occasional Sandstone: very fine grained, medium to light gray, argillaceous and silty.
- 6585 - 6615 Core No. 4: Cut 30', Recovered 4.3'
- 6585.0-6588.4' Shale: dark gray to gray brown, (3.4') firm to hard, silty and sandy, with Sand: light gray, very fine grained, siliceous, hard; laminations 0.5-5 mm thick and making up to 10% of interval; thicker sand layers show micro crossbedding and lensing.
- 6588.4-6588.7' Sandstone: medium to light gray, fine (0.3') to very fine grained, grading finer downward; shows complex crossbedding; poor porosity.
- 6588.7-6589.3' Shale: dark gray to brown, with a (0.6') 10 mm band of very fine grained sandstone.
- 6589.3-6615.0' No recovery. (25.7')
- 6615 - 6750 Shale: dark brown, firm, silty; dark gray, clean, firm to occasionally hard in more siliceous portions; 30% Siltstone: medium to dark gray, with black "peppery" grains, argillaceous, carbonaceous, sandy, firm to hard; 5% Sandstone: very fine to fine grained, medium to light gray, salt and pepper, occasionally micaceous, calcareous, friable to hard.
- 6750 - 7150 Shale: getting progressively harder and cleaner downward; bladed in part, dark gray and gray-brown with the gray-brown being slightly more silty; in part platy; first traces of Inoceramus fragments; occasional traces of fine grained sand; traces of dark gray chert.
- 7150 - 7290 Shale: dark gray and brown, as above, with thin laminations of very fine to fine grained, hard, calcareous, carbonaceous sandstone and 10% fine grained, salt and pepper, gray friable sandstone; occasional larger loose grains, 25% Siltstone: ranging from dark

gray, argillaceous and hard, to light gray and friable grading to sandstone; fine pyrite laminations; traces of inoceramus, chert grains and pebbles; glauconite filled forams; some papery shale fragments.

7290 - 7440 Shale with Sandstone and Siltstone: as above, with small amounts of dark gray-brown, hard lime mudstone; pyrite clusters common; chert pebbles; green rock fragments.

7440 - 7490 Sandstone: very fine grained, hard, light salt and pepper gray, occasionally friable with possibly fair porosity, micaceous, silty, grading to siltstone; fine pyrite streaks; minor Shale: dark silvery-gray, siliceous, hard, brittle; trace of red, dark gray and white chert.

7490 - 7524 Shale: very dark gray to black, carbonaceous, hard, siliceous, with medium to coarse grained, well rounded, clear quartz grains "floating" in the shale; with siltstone, sandstone and lighter colored shales probably still coming from above.

7524 - 7534 Core No. 5: Cut 10', Recovered 8.6'

7524.0-7532.6' Shale: very dark gray and brown, hard, brittle, very finely laminated (8.6') (less than 0.5 mm), black, shiny, carbonaceous material, which gives a very weak slow cut fluorescence, is common on bedding planes; very fine mica common, well rounded medium to coarse grained, frosted to polished, clear quartz grains are "floating" throughout the shale; pyrite occurs in seams less than 1 mm thick; Siltstone (approximately 50 mm thick): medium to dark gray, highly compacted, hard, pyritic, showing irregular beds or lenses at 7524.4' and 7528.3'.

7532.6-7534.0' No recovery.  
(1.4')

7534 - 7620 Shale: dark gray to black, slightly micaceous, rare floating sand grains; trace of pyrite; rare, very coarse grained sand grains.

7620 - 7623 Sandstone: gray to brown, slightly conglomeratic quartz, chert grains and pebbles; white to blue-gray opaque, siliceous; rare glauconite; oil staining, with yellow cut fluorescence.

- 7623 - 7715 Interbedded Siltstone: brown, gray, green-gray, partly friable, calcareous, sandy, glauconitic, with Sandstone: gray, gray-brown, silty, calcareous, subangular, well sorted, glauconitic; spotted stain, no odor, no fluorescence, yellow cut fluorescence; sandstone approximately 10% of cuttings; interbedded Shale: dark gray, black, micromicaceous, splintery.
- 7715 - 7777 Shale: very dark gray to black, with brown cast, trace brown streak, trace of floating, rounded sand grains, partly splintery; trace of Siderite: chocolate brown, dense, with rare, very finely disseminated pyrite; shell fragment, amber to resinous at 7749-7754'; at 7744' trace of interbedded Sandstone: brown, green, very fine grained, subangular, well sorted, silty, calcareous, glauconitic, sideritic, tight, and Siltstone: light gray, rare, scattered black grains, part very finely sandy.
- 7777 - 7810 Shale: very dark gray to black, trace of brown; interbedded Siltstone: light gray, trace of brown, calcareous; trace of Limestone: white, light gray, silty, sandy at 7781-7783'.
- 7810 - 7830 Sandstone: light gray, light brown, very fine grained, angular to subangular, well sorted, silty, calcareous to very calcareous, with shell fragments; grading to Limestone: brown, mottled, very sandy, shell fragments, slight dull yellow cut fluorescence.
- 7830 - 7878 Interbedded Siltstone: medium gray-brown, tight, calcareous; Shale: medium brown, very calcareous, silty; trace of Sandstone: light gray to brown, very fine grained, silty, calcareous; trace of shell fragments.
- 7878 - 7921 Sandstone: brown-gray, very fine grained, subangular, well sorted, friable, fair porosity; trace of glauconite; stained; trace of fine grained, friable; grades from no fluorescence to yellow cut fluorescence.
- 7921 - 7928 Shale: dark gray, splintery, trace of brown silty shale.
- 7928 - 7955 Shale: clayey, red, pink, cream, trace of mottled; interbedded Sandstone: white, very fine grained, siliceous, angular, well sorted, noncalcareous.
- 7955 - 7967 Sandstone: light gray, spotted oil staining, fine grained, angular, subangular, well sorted, gold fluorescence, slightly siliceous, slightly friable to friable, moderate porosity, scattered dead oil, trace of interstitial white clay, good streaming yellow cut fluorescence; bottom 4' white to very light gray, medium grained, friable, trace of loose grains, good porosity.

- 7967.0-7970.0'  
(3.0') Sandstone: brown-gray, fine grained, angular, subangular, well sorted, rare white siliceous cement, clayey, trace of white grains; trace of orange grains; medium porosity, oil stained, gold sample fluorescence, bright yellow cut fluorescence.
- 7970.0-7979.0'  
(9.0') Sandstone: gray, very fine grained, silty, slightly argillaceous, with white clay; trace of chert pebbles; spotted stain, no sample fluorescence except at 7974' and 7978', which is gold and has bright yellow cut fluorescence.
- 7979.0-7983.0'  
(4.0') Sandstone: black, medium gray to brown, light gray, fine to medium grained, subangular, medium sorted, slight dead oil stain, spotted brown oil stain, faint gold sample fluorescence at 7979', bright yellow cut fluorescence, trace of Shale: medium gray, micaceous; trace of thin coal, with pyrite lense, at 7980'.
- 7983.0-7986.0'  
(3.0') Sandstone: light gray to gray, conglomeratic, with metamorphic and chert pebbles; Shale lense: medium gray; spotted oil stain in sandstone, no sample fluorescence except at 7984'; bright yellow cut fluorescence, slightly porous.
- 7986.0-7997.0'  
(11.0') Sandstone: gray, black-brown, fine to medium grained, subangular, medium sorted, friable, porous, dead oil stain, spotted oil stain; becoming heavy and asphaltic at 7988'; scattered pebbles; trace of siliceous streaks; streak with disseminated pyrite; chert grains common.
- 7997.0-8003.0'  
(6.0') Shale: medium gray, gray to green, micaceous, with Siltstone lenses: light gray, siliceous; trace of Sandstone: mottled gray to brown, orange, and light gray.
- 8003.0-8011.0'  
(8.0') Sandstone: mottled white and black, tripolitic chert grains and pebbles, fine

grained, subangular, well sorted, spotted oil stain, dead oil stain; with Shale: gray-green, micaceous, siltstone lenses, siliceous.

8011.0-8021.0' Interbedded Shale, Siltstone and  
(10.0') Sandstone: green, light green, finely micaceous, siliceous.

8021 - 8081

Core No. 7, Cut 60', Recovered 55'

8021.0-8030.0' Siltstone: red, green, very light gray,  
(9.0') slightly micaceous, argillaceous, rare sandstone streaks, rare green shale streaks.

8030.0-8039.0' Sandstone: gray to brown, green, very  
(9.0') fine to fine grained, angular, subangular, well sorted, poor oil stain; rare silty and sandy streaks, very faint gold sample fluorescence, bright yellow cut fluorescence.

8039.0-8047.0' Siltstone: dark gray, dark gray to  
(8.0') brown-green, finely micaceous, trace of Shale: red, micaceous, conchoidal fracture, rare siltstone streaks, with dead oil stain.

8047.0-8050.0' Sandstone: gray, abundant black dead  
(3.0') oil stain, very fine to fine grained, well sorted, rare pebbles and coarse white chert grains, faint gold sample fluorescence, bright yellow cut fluorescence.

8050.0-8056.0' Shale: green, red, dark gray,  
(6.0') micaceous; trace of silt and sand grains.

8056.0-8058.0' Sandstone: gray, light gray to brown,  
(2.0') very fine grained, subangular, well sorted, poor oil stain; becoming silty.

8058.0-8060.0' Shale: green, micaceous, with silty and  
(2.0') sandy streaks, trace of dead oil stain.

8060.0-8064.0' Sandstone: black, brown, trace of  
(4.0') white, mottled, fine grained, subangular, well sorted, heavy oil stain, dead stain, rare pebbles, trace of

asphaltic oil, very faint gold sample fluorescence, bright yellow cut fluorescence; Siltstone: medium gray, slightly micaceous from 8061-8062'.

8064.0-8065.0' Shale: green, finely micaceous,  
(1.0') conchoidal fracture.

8065.0-8076.0' Sandstone: conglomeratic, gray to  
(11.0') brown chert grains and pebbles, white to gray, subangular to subrounded, poorly sorted, brown oil stain, very faint gold sample fluorescence, bright yellow cut fluorescence, trace of siliceous cement, trace of pebbles 1/2" to 1 1/2"; trace of quartzite pebbles; bottom part bleeding heavy oil, good porosity 8068-8071'; trace of Shale and Siltstone: green, orange; micaceous at 8072-8073'.

8076.0-8081.0' No recovery.  
(5.0')

8081 - 8113

Core No. 8, Cut 32', Recovered 13.5'

8081.0-8081.5' Shale: very dark gray, very fine to  
(0.5') finely micaceous, conchoidal fracture, trace of fish remains.

8081.5-8094.5' Chert conglomerate: pebbles of white to  
(13.0') medium gray, subangular to subrounded, poorly sorted; Sandstone matrix: medium to very coarse grained, spotted heavy oil stain with asphaltic oil, no sample fluorescence, bright yellow cut fluorescence; pebbles in various sizes up to 2", many with slightly rounded shape, but essentially angular; quartzite pebbles common; slight to medium porosity, locally siliceous cement.

8094.5-8113.0' No recovery.  
(18.5')

8113 - 8139.5

Core No. 9, Cut 26.5', Recovered 26.5'

8113.0-8122.0' Sandstone: conglomeratic, light gray  
(9.0') to gray, brown chert grains and white to gray pebbles, trace of quartzite

pebbles, subangular to subrounded; Sandstone: fine to very coarse grained, angular to subangular, poorly sorted, slight to medium porosity, horizontal bedding with crossbedding approximately 20°; no sample fluorescence, bright yellow cut fluorescence, heavy asphaltic oil, 2" nubbin of Shale: dark gray, finely micaceous, with floating rounded sand grains at top.

8122.0-8133.0' (11.0') Sandstone: gray to brown, medium to coarse grained, angular, subangular, medium sorted, medium porosity, trace of good porosity, white and black grains, trace of tripolitic chert grains, brown oil stain, gold sample fluorescence, bright yellow cut fluorescence; horizontal bedding with crossbedding, rare silty streaks; Shale (8127-8128'): light gray to gray, slightly micaceous, conchoidal fracture.

8133.0-8138.0' (5.0') Sandstone: brown-gray, fine, medium, and coarse grained, slightly conglomeratic, angular, subangular, medium sorted, slight to medium porosity, poor oil stain, no sample fluorescence, bright yellow cut fluorescence, slightly crossbedded.

8138.0-8139.5' (1.5') Sandstone: light gray to brown, fine grained, subangular, well sorted, slight porosity to medium porosity, poor oil stain, no sample fluorescence, bright yellow cut fluorescence; white grains common.

8139.5-8140 No sample. Made 0.5' on clean-out for Drill-Stem Test No. 1.

8140 - 8200 Core No. 10, Cut 60', Recovered 59'

8140.0-8182.0' (42.0') Sandstone: light gray, gray to brown, very fine to fine grained, trace of medium grained, angular to subangular, well sorted, slight to medium porosity, trace of siliceous cement in part, rare, faint argillaceous partings; poor oil stain; rare, black, dead oil; rare,



asphaltic oil; white grains common; scattered black coal-like grains; shiny, conchoidal fracture; none to faint gold sample fluorescence; bright yellow cut fluorescence.

8182.0-8199.0' Sandstone: gray to light gray, very  
(17.0') fine grained, silty, subangular, well sorted, slight to very slight porosity, trace of argillaceous partings; rare, black coal-like grains and pebbles; conglomeratic zone from 8193-8194' consisting of coal-like pebbles; faint oil stain, no sample fluorescence, bright yellow cut fluorescence.

8199.0-8200.0' No recovery.  
(1.0')

8200 - 8270 Sandstone: light gray, gray to brown, very fine grained; becoming silty, subangular, well sorted, slight to medium porosity, faint oil stain, dead oil; zones from 8220-8240' and 8255-8270' with black coal-like, very coarse grains and possible pebbles; no sample fluorescence, bright yellow cut fluorescence; interbedded Shale: dark gray, splintery, partly with brown cast.

8270 - 8297 Shale: gray, finely micaceous, trace of splintery shale; trace of Siltstone: gray to brown.

8297 - 8317 Sandstone: light brown, very fine grained, subangular, well sorted, friable, slight to medium porosity, scattered light green glauconite; oil stained; gold sample fluorescence, bright yellow cut fluorescence; becoming predominantly a chert conglomerate at 8302'; composed of blue to gray, white and light green, translucent chert pebbles; trace of opaque chert pebbles, mostly angular, broken grains and pebbles.

8317 - 8345 Core No. 11, Cut 28', Recovered 24.9'

8317.0-8335.0' Limestone (with imbedded top inch of  
(18.0') chert conglomerate, with dark gray pebbles): medium brown, fine crystalline, partly coarse crystalline, rare pelletoid, trace of light green glauconite, slightly sandy, scattered pebbles, very slightly dolomitic; oil stain; faint gold sample fluorescence, bright yellow cut fluorescence, streaming

cut; trace of crinoid stems; some brachiopods and bryozoans; bleeding very heavy oil from pinpoint porosity; vertical fractures; rare siltstone streak; very calcareous, sandy, glauconitic; pebble zones at top and at 8329'.

8335.0-8337.0' Claystone: green, conchoidal fracture, (2.0') slickensided; dark green to drab gray; conchoidal fracture; crumbly.

8337.0-8341.9' Limestone: medium brown-gray, tight (4.9') pelletoid, slightly crinoidal, rare brachiopods and bryozoans; trace of sparry calcite, rare sand grains, very slightly argillaceous, very slightly dolomitic; bottom 2' with very heavy oil on bedding planes and fractures; throughout core bedding planes are flat and fractures are vertical.

8341.9-8345.0' No recovery. (3.1')

8345 - 8372 Limestone: light brown to brown, trace of pelletoid, partly red, very slightly dolomitic, sandy.

8372 - 8385 Shale: red; trace of interbedded Limestone: red, chalky.

8385 - 8392 Sandstone: white, very fine grained, subangular, well sorted, friable, dead oil stain.

8392 - 8438 Limestone: tan, light brown, white, slightly mottled, very indistinct oolitic, trace of chert, which is white and opaque; faint gold sample fluorescence, bright yellow cut fluorescence.

8438 - 8462 Sandstone: white, gray, very fine grained, subangular, well sorted, friable, siliceous in part, very faint gold sample fluorescence, bright yellow cut fluorescence.

8462 - 8467 Shale: red.

8467 - 8484 Limestone: pink, white, trace of green; indistinct, very fine pellets.

8484 - 8492 Sandstone: pink to gray brown, very fine grained, well sorted, silty, calcareous.

8492 - 8502 Limestone: white, light brown, indistinct pelletoid; mottled trace of spotty heavy oil.

- 8502 - 8508      Chert: very light blue to gray, translucent, very coarse grained, angular; very rare, rounded edges; probable pebble conglomerate(?).
- 8508 - 8515      Limestone: white, brown; trace of very dark fine pelletoid; sandy, spotty heavy oil; bleeding oil; no sample fluorescence, bright yellow cut fluorescence, streaming cut.
- 8515 - 8543.5      Core No. 12, Cut 28.5', Recovered 28.1'
- 8515.0-8520.0'      Sandstone: brown, fine to medium  
(5.0')      grained, angular, medium sorted, very calcareous, dead oil stain, bleeding very heavy black asphaltic oil, chert grains common, no sample fluorescence, bright yellow cut fluorescence.
- 8520.0-8533.0'      Limestone: brown to light brown,  
(13.0')      fine pelletoid, very sandy to slightly sandy, in part crinoidal, trace of sparry calcite, dead to black asphaltic oil stain; bleeding oil on fractures and bedding planes.
- 8533.0-8536.0'      Limestone: medium gray to gray, fine to  
(3.0')      medium pelletoid, very sandy, sparry calcite; bottom foot with scattered quartzite and metamorphic pebbles.
- 8536.0-8543.1'      Claystone: medium gray to green,  
(7.1')      spotted red in top foot; grading to Claystone: brick red, slightly sandy; conchoidal fracture.
- 8543.1-8543.5'      No recovery.  
(0.4')
- 8543.5 - 8547      Claystone: red, green, shaly.
- 8547 - 8564      Sandstone: gray, brown, very fine grained, subangular, well sorted, slightly porous, dead and heavy asphaltic oil stain, calcareous to very calcareous, none to faint gold sample fluorescence, bright yellow cut fluorescence with Chert conglomerate (8552-8556'): light blue to gray; Limestone (8556-8558'): white to light brown, crystalline, trace of pelletoid; sandy; slight bleeding of heavy oil.
- 8564 - 8571      Shale: red.

- 8571 - 8578 Chert conglomerate: blue-gray, white, trace of black; loose, angular, broken pebbles.
- 8578 - 8585 Shale: red.
- 8585 - 8618 Limestone: white, light brown, pink, crystalline, slightly pelletoid, rare indistinct fossils, sandy, dark bleeding oil; shale partings.
- 8618 - 8633 Sandstone: gray, very fine grained, silty, angular, well sorted, scattered black dead oil, no sample fluorescence, dull yellow cut fluorescence.
- 8633 - 8657 Chert conglomerate:: white to gray, very coarse pebbles, rounded edges with dead oil; trace of black chert.
- 8657 - 8664 Shale: red, gray; trace of green shale.
- 8664 - 8677 Chert conglomerate: opaque white and translucent blue to gray; trace of black; trace of black dead oil residue and stain.
- 8677 - 8698 Shale: red, gray, green.
- 8698 - 8747 Interbedded Limestone, Shale and Sandstone, with Limestone: white, light brown, crystalline, slightly pelletoid, sandy, sparry calcite, brown stain, bleeding very heavy oil; Shale: red, gray, green; Sandstone: gray, very fine grained, subangular, well sorted, spotted with dead and very heavy oil; trace of coal-like grains; black, shiny, conchoidal fracture; no sample fluorescence, bright yellow cut fluorescence; trace of chert pebbles.
- 8747 - 8762 Chert conglomerate: blue to gray, trace of black, rare green, rare rounded pebbles, with trace of dead oil residue.
- 8762 - 8774 Shale: red, trace of light green, rare silt and limestone streaks.
- 8774 - 8786 Sandstone: light green, very fine grained, very silty, tight; trace with dead oil; interbedded Shale: red.
- 8786 - 8814 Interbedded Limestone and Shale, with Limestone: gray-brown, crystalline, sandy; trace of pelletoidal; rare glauconite, spotted heavy black asphaltic oil, faint gold sample fluorescence, bright yellow cut fluorescence; Shale: red.

- 8814 - 8824 Sandstone: light green, very fine grained, very silty, grading to sandy siltstone, very slightly dolomitic, tight.
- 8824 - 8876 Interbedded Shale, Limestone and Sandstone, with Shale: red; Limestone: white to gray, very heavy asphaltic oil, no sample fluorescence, bright yellow cut fluorescence; Sandstone: gray to brown, fine grained, angular, well sorted, friable, dead oil and trace of spotty black heavy oil.
- 8876 - 8883 Sandstone: light green, green and white to cream; very fine grained, angular, subangular, well sorted, trace of orange grains, silty, tight, slightly siliceous.
- 8883 - 8887 Sandstone: gray, very fine to fine grained, angular, subangular, friable, trace of dead oil and spotty, heavy black oil; no sample fluorescence, bright yellow cut fluorescence; trace of Limestone: white, gray, and brown crystalline, slightly pelletoidal, sandy, spotty, very heavy black asphaltic oil, no sample fluorescence, bright yellow cut fluorescence.
- 8887 - 8898 Chert conglomerate: light gray, green, and white, rare black, broken angular grains; trace of very coarse rounded pebbles, with rare black dead oil residue.
- 8898 - 8923 Sandstone: green to very light gray, and light orange, very fine to fine grained, silty, argillaceous; trace of orange grains.
- 8923 - 8934 Shale: red; trace of Limestone: pink, mottled, argillaceous, sandy.
- 8934 - 8992 Sandstone: pink to red, fine grained, trace of medium grained, angular, calcareous, varicolored grains; scattered rare chert pebbles; interbedded Shale: red, green.
- 8992 - 9000 Shale: red to maroon, trace of green shale, trace of sandy shale.
- 9000 - 9025 Sandstone: pink to red, very fine to fine grained, angular, well sorted, very calcareous; trace of calcareous veining, trace of glauconite; rare medium and coarse grains.
- 9025 - 9055 Sandstone: pink, green, very fine to coarse grained, subangular, subrounded, poorly sorted, slightly calcareous; trace of loose grains; trace of chert and varicolored grains; trace of interbedded Shale: red.

- 9055 - 9077 Chert conglomerate: varicolored grains and pebbles; trace of pink sandstone matrix; trace of varicolored limestone pebbles.
- 9077 - 9092 Shale: red-maroon, occasionally spotted green, trace of Siltstone: pink, calcareous.
- 9092 - 9165 Chert conglomerate: varicolored grains and pebbles; trace of pink sandstone matrix; trace of varicolored limestone pebbles; interbedded Shale: red-maroon, trace of green; Sandstone (9135-9140'): pink, varicolored, fine to coarse grained, slightly conglomeratic, with chert, limestone, shale, and quartz grains; sparry calcite; possible bedded Limestone (9144-9146'): light brown, dense.
- 9165 - 9188 Shale: maroon, trace of green; trace of light green-gray, clayey, soft; trace of conglomerate with chert, limestone and varicolored pebbles, angular, rarely subrounded.
- 9188 - 9226 Shale: light green, purple, yellow, mottled in part, micromicaceous, trace with micaceous sheen.
- 9226 - 9240 Chert conglomerate: varicolored, angular, coarse to very coarse grained, trace of pebbles, rounded; interbedded Shale: maroon.
- 9240 - 9246 Sandstone: pink to red, trace of green, mottled, very fine grained, trace of medium grained, silty, calcareous to very calcareous.
- 9246 - 9250 Shale: green, purple, varicolored, micromicaceous, with micaceous sheen.
- 9250 - 9256 Chert conglomerate: varicolored grains; trace of pebbles; trace of limestone pebbles.
- 9256 - 9276 Shale: green, purple, partly mottled, micromicaceous.
- 9276 - 9357 Shale: very dark gray-black, partly dark steel-blue to gray, micromicaceous, micaceous sheen; trace of Siltstone: dark gray, very rare calcite and quartz veining, tight; quartz veining becoming common; very rare schistose shale at 9320'; rare, very finely disseminated pyrite.
- 9357 - 9367 Core No. 13, Cut 10', Recovered 8.8'
- 9357.0-9365.8' (8.8') Argillite: very dark gray to black, micromicaceous, micaceous sheen, trace of slickensides; quartz veining common

in irregular and wavy stringers; trace of calcite veining; rare vertical fractures; low angle fractures fairly common; rare scattered very finely disseminated pyrite; wavy, shaly bedding; incipient schistosity.

9365.8-9367.0' No recovery.  
(1.2')

9,367 feet - Total Depth.



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

LOGGING REPORT

WELL NAME J.W. DALTON #1

Date May 28, 29, 30, 1979

Driller Depth 7534'

Elevation 37' KB

Logger Depth 7536'

Logs Ran and Intervals

GR/SP/DIL	2624-7534' (Neutron Recorded to 1850')
GR/CAL/CNL/FDC	2622-7534'
GR/BHC	2624-7534'
HRD-Dipmeter	2600-7534'
Birdwell Velocity Survey	250-7534'
CST-Sidewall Cores	3105-7516'
Additional Logs to Run	

Zones of Interest

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

Discussion:

A series of sands with a well developed SP from 2700 to 4100' appear wet with porosities in the 30-33% range. Resistivities range from 1.5 to 3.0 ohm-meters. There is some evidence of invasion in these sands.

Log Tops & Correlations:

	J.W. DALTON	W.T. FORAN	DREW POINT
TOROK	4714'	4385'	2956' (?)
PEBBLE SHALE	7483'	7335'	6700'

Additional Evaluation Plans:

RICH NELSON

Wellsite Geologist  
ARMOUR KANE

Log Analyst





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

LOGGING REPORT

WELL NAME J.W. DALTON #1

Date June 27, 28, 29, 30, 1979

Driller Depth 9367'

Elevation 37' KB

Logger Depth 9370'

Logs Ran and Intervals

GR/SP/DIL	7340-9368'	CST-Sidewall Cores	7653-9186'
GR/CAL/CNL/FDC	7150-9359'	Temperature Survey (2)	100-9370'
GR/BHC	7400-9356'		
HRD-Dipmeter	7550-9320'		
Birdwell Velocity Survey	4710-9370'		

Additional Logs to Run

None

Zones of Interest

Depth	Gross Thickness	Net Feet of Porosity	Lith	Porosity %	Probable Fluid Content
7970-7980'	10	10	Ss	17	Sw 60% Oil & Water
7980-7990'	10	10	Ss	17.5	84 " "
8082-8110'	28	28	Ss	11	83 " "
8120-8130'	10	10	Ss	15	86 " "
8150-8160'	10	10	Ss	16.5	93 " "
8160-8170'	10	10	Ss	18	100 " "
Above saturation figures based on $R_w = 0.15$					

Discussion:

Porosities in the Lisburne Limestone range from 6% to 13% based on CNL/FDC cross plots and well confirmed by BHC porosities. Some faint evidence of possible fracturing can be seen.

Log Tops & Correlations:

	DALTON	W.T. FORAN	DREW PT.
SAG RIVER	7735'	-	-
SHUBLIK	7756'	7542'	6972'
SADLEROGHIT	7893'	7624'	7616'
KAVIK	8230'	-	-
LISBURNE	8317'	8230'	-
ARGILLITE	9270'	8795'	7840'

Additional Evaluation Plans:

Drill Stem Tests

JOHN GREENE

Wellsite Geologist

ARMOUR KANE

Log Analyst

Log Analysis

## ARMOUR KANE

Formation Evaluation

Well Log Analyst  
18380-6 Cantara St.  
Reseda, Ca. 91335  
(213) 993-0586  
June 6, 1979

Mr. S. L. Hewitt  
Husky Oil/NPR Operations, Inc.  
2525 C Street  
Anchorage, Ak 99503

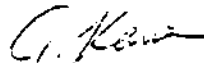
Dear Mr. Hewitt:

Dresser-Atlas began their first logging job on an NPRA well at J. W. Dalton No. 1 on May 28, 1979. The pipe was out of the hole at 1930 hours but the D-A crew found a damaged spot on their cable which should have been caught during their previous checks of the preceding two days. Repairs were made and the DIL began at 2130, but due to an SP drift it was necessary to re-log from 4200 to casing. Log was completed at 0400, May 29. CIL/FDC, BEC, HRD, Velocity Survey and side wall cores followed, and while all logs were of very good quality, in my opinion the elapsed time was excessive for a comparatively shallow well; 32.5 hours. For instance the dipmeter required 6 hours of logging time and it took over 4 hours to run one sidewall core gun shooting 18 shots. Four hours elapsed before field prints were delivered. Mr. Tony Lawrence, Dresser's log analyst, was most cooperative and eager to please, but seemed uncertain in regard to certain tool characteristics and was somewhat evasive in responding to other questions.

Correlative log tops were: Tomok at 4714 as compared to 4385 in the W. T. Foran well and Pebble Shale at 7483, 7335 in Foran and 6700 in Drew Point. Correlation was good with both Foran and Drew Point.

A series of sands from 2700 to 4100 exhibit well developed SP characteristics in the order of 40 to 70 millivolts and appear to be fairly permeable since the DIL indicates some invasion has taken place. However, due to low resistivity values in the range of 1.5 to 3.0 ohm-meters all these sands appear to be water bearing. Salinity from SP computations is about 25,000 PPM. While the porosities of 30-33% appear high they are confirmed by all three porosity logs. An unusually high level of gamma radiation is seen in this well with the shale line being in the order of 80 to 100 API Units as contrasted with the usual 50 to 70 API Units in other wells. No zones of interest were found.

Very truly yours,



A. Kane

Log Analyst

## ARMOUR KANE

Formation Evaluation

Well Log Analyst  
18380-6 Cantara St.  
Redwood, Ca. 91335  
(213) 983-0588  
JULY 9, 1979

Mr. S. L. Hewitt  
Husky Oil/NPR Operations, Inc.  
2525 C Street  
Anchorage, Ak 99503

Dear Mr. Hewitt:

Dresser-Atlas began the final logging run on J. W. Dalton #1 at 2300 hours on June 27, 1979, and by 0230 hours on June 30 had completed two temperature logs, DIL, CNL/FDC, BHC, HRD, Birdwell Velocity Survey and sidewall cores. Temperature tool failure occurred on the first run and necessitated re-logging from casing to TD. A drifting SP problem was encountered on the DIL and the log was run five times without good SP repeatability although the resistivity curves and the gamma ray repeated splendidly. The log required about 8 hours to run. On the CNL/FDC the neutron tool failed so the log was re-run twice. The BHC was satisfactory but the HRD exhibited a very erratic deviation curve due to hole conditions and in some intervals the correlation curves were dead. The dipmeter is therefore of little use. 21 of 24 sidewall cores were recovered. Dresser had five personnel at the well and their attitude and co-operation were above reproach but in my opinion an average of over 6 hours per log at 9500 feet is excessive logging time. The same excessive logging time was experienced on the previous run when it took 32.5 hours to complete 6 logs at only 7500 feet. Most of the personnel were inexperienced in North Slope operations and appeared a bit unsure of themselves. The logs, as finally obtained were of good quality with the exception of the dipmeter.

Log formation tops were: Sag River, 7635; Shublik, 7756; Sadlerochit, 7893; Kavik, 8230; Lisburne, 8317 and Argillite at 9270. The Kingak could not be definitely placed.

Two zones are seen on the logs: 7970-7990 and 8080-8170 which are of interest, the upper zone averaging 17% porosity and water saturation ranging from 57% to 86%, the lower zone averaging 14% porosity and water saturation from 73% to 100%. Neither of these zones would probably result in commercial production but are certainly worthy of a test. The Lisburne exhibited good porosities ranging from 6% to 13% and extremely high resistivities in excess of 2000 ohm-meters. These high resistivity values repeated on 5 runs and so must be considered valid. The Sw values on the attached tabulation were computed using  $R_w = 0.15$  which was confirmed by both SP and  $R_{wa}$  calculations and thus can be used with confidence.

Very truly yours,



A. Kane

HUSKY OIL/NPR OPERATIONS, INC.		WELL	J.W. DALTON TEST WELL #1
NPRA	COUNTY	STATE	
	NORTH SLOPE		ALASKA

D-3

*Log Analysis* by Armour Kane

COMPANY		WELL				
HUSKY OIL/NPR OPERATIONS, INC		L.W. DALTON TEST WELL #1				
FIELD	COUNTY	STATE				
NPRA	NORTH SLOPE	ALASKA				
DEPTH	$\phi_D$	$\phi_N$	$\phi_{PLAN}$	$\Delta T$	$\phi_S$	REMARKS
8346-60	6	8.5	7	56	6	COULD INDICATE POSSIBLE FRACTURING
8400-20	8	8	8	56	6	
8424-36	9	11	10	59	8.5	
8482-88	9	9	9	56	6	
8490-8510	12	10	11	60	9	
8558-64	13	13	13	65	12	
8642-60	14	13	13	70	15	
8760-70	10	12.5	11	67	13	
8940-60	4	8	6	57	7	

## CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Company USGS/HUSKY OIL CO., OPR. Formation \_\_\_\_\_ Page 1 of \_\_\_\_\_  
 Well DALTON #1 Cores DIAMOND File BP-3-536  
 Field WILDCAT Drilling Fluid WBM Date Report JULY 6, 1979  
 County NORTH SLOPE State ALASKA Elevation \_\_\_\_\_ Analysts WSP  
 Location \_\_\_\_\_ Remarks BOYLES LAW POROSITY

## CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS			POROSITY PERCENT	GRAIN DENSITY	RESIDUAL SATURATION		REMARKS
		Horizontal Maximum	Horizontal 90°	Vertical			Oil % Pore	Total Water % Pore	
1	7967	78.			15.7	2.65	24.1	30.6	ss,vf-fg
2	7968	22.			13.6	2.64	28.8	26.1	ss,vf-fg,slty
3	7969	152.			15.8	2.64	25.8	24.2	ss,fg,sc carb
4	7970	12.			13.8	2.65	20.0	26.6	ss,vfg
5	7971	5.2			12.6	2.66	31.9	25.5	same
6	7972	33.			14.6	2.67	34.2	32.1	ss,vf-fg,slty
7	7973	4.4			12.9	2.66	6.3	46.9	ss,vfg,slty
8	7974	102.			15.8	2.67	14.3	42.8	ss,f-mg
9	7975	551.			17.6	2.64	20.4	36.9	ss,mg,sc gilsonite
10	7976	523.			17.3	2.62	22.8	34.2	same
11	7977	69.			15.3	2.65	10.9	60.2	ss,fg
12	7978	447.			17.3	2.65	19.9	38.2	ss,m-cg
13	7979	756.			17.9	2.63	17.7	32.6	ss,m-cg,sc gilsonite
14	7980	2.8			10.8	2.79	27.8	38.1	ss,vf-fg,sid
15	7981	93.			15.1	2.68	12.6	50.5	ss,vf-fg
16	7982	169.			14.9	2.62	1.7	63.1	ss,f-mg,sc carb
17	7983	253.			16.1	2.64	1.5	58.1	ss,mg,sc carb
18	7984	4.8			12.7	2.91	10.1	54.9	ss,f-cg,sid
19	7985	30.			12.9	2.84	12.5	46.3	same
20	7986	145.			15.6	2.65	7.1	58.8	ss,f-mg
21	7987	3.7			11.3	2.71	10.4	52.2	ss,f-vcg,slty
22	7988	70.			14.8	2.82	18.7	45.8	ss,f-vcg,slty,sid
23	7989	474.			16.1	2.93	21.7	33.8	ss,m-vcg,sid
24	7990	295.			15.4	2.72	33.0	36.3	ss,m-vcg
25	7991	219.			15.2	2.65	29.7	29.7	ss,vf-fg
26	7992	266.			15.1	2.64	33.1	33.1	same
27	7993	371.			14.5	2.64	23.7	36.3	same
28	7994	178.			14.5	2.67	29.6	32.9	same
29	7995	114.			13.1	2.61	27.6	29.3	same
30	7996	362			17.2	2.66	30.7	32.0	same
31	7997	76.			16.1	2.67	24.7	40.1	same
32	7999	0.1			2.3	2.92	16.6	68.7	sltst,sid
33	8004	0.8			6.5	2.78	18.6	74.5	sltst,sid,sdy
34	8006	55.			13.0	2.87	12.6	55.4	ss,vfg,sid
35	8008	60.			15.1	2.69	25.5	30.6	ss,vfg
36	8010	8.9			14.1	2.73	28.9	36.1	same
37	8011	31.			14.6	2.70	28.9	34.0	same
38	8029	0.0			4.4	2.82	22.9	65.3	ss,vfg,sid
39	8030	0.0			3.6	2.78	4.1	82.6	sltst,sdy,sid

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. and its officers and employees, but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representation as to the production, proper operation, or profitability of any oil, gas or other mineral well, or land in connection with, which such report is used or relied upon.

**CORE LABORATORIES, INC.**  
Petroleum Reservoir Engineering  
DALLAS, TEXAS

Company USGS/HUSKY OIL CO., OPR. Formation \_\_\_\_\_ Page 2 of \_\_\_\_\_  
Well DALTON #1 Cores DIAMOND File BP-3-536  
Field WILDCAT Drilling Fluid WBM Date Report JULY 6, 1979  
County NORTH SLOPE State ALASKA Elevation \_\_\_\_\_ Analysts WSP  
Location \_\_\_\_\_ Remarks BOYLES LAW POROSITY

**CORE ANALYSIS RESULTS**

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYs			POROSITY PERCENT	GRAIN DENSITY	RESIDUAL SATURATION		REMARKS
		Horizontal Maximum	Horizontal 90°	Vertical			Oil % Pore	Total Water % Pore	
40	8031	0.1	---	---	7.3	2.70	26.0	48.2	ss,vfg,slty
41	8032	0.2	---	---	7.9	2.75	23.9	34.1	ss,vfg,slty,sid
42	8033	1.4	---	---	10.6	2.71	19.5	42.2	ss,vfg,slty
43	8034	0.3	---	---	8.6	2.68	21.1	39.1	same
44	8035	0.1	---	---	6.0	2.85	24.4	56.9	ss,vfg,slty,sid
45	8036	0.0	---	---	5.1	2.68	21.8	41.0	ss,vfg,slty
46	8037	82.	---	---	15.2	2.68	25.0	38.3	ss,fg
47	8038	140.	---	---	15.2	2.66	26.7	61.0	same
48	8039	6.1	---	---	7.7	2.79	14.9	19.9	ss,fg,sid
49	8046	15.	---	---	11.1	2.75	12.7	50.8	ss,fg,pyr
50	8047	56.	---	---	14.6	2.71	0.0	93.3	ss,vf-fg
51	8048	2.8	---	---	10.3	2.70	29.3	29.3	same
52	8049	28.	---	---	12.7	2.77	35.8	20.1	ss,vf-fg,sid
53	8050	0.0	---	---	5.1	2.76	32.3	41.6	same
54	8056	0.0	---	---	4.6	2.70	0.0	68.9	ss,vfg,sid
55	8057	0.0	---	---	5.3	2.70	17.6	62.7	same
56	8058	0.1	---	---	6.9	2.71	16.4	46.7	same
57	8059	0.1	---	---	4.9	2.68	20.3	20.3	ss,vfg,slty
58	8060	28.	---	---	13.4	2.72	27.4	35.0	same
59	8061	28.	---	---	13.6	2.71	26.6	33.2	same
60	8062	0.7	---	---	10.3	2.70	23.6	41.3	same
61	8063	0.8	---	---	10.5	2.70	28.8	32.4	same
62	8064	5.8	---	---	10.1	2.69	19.9	28.8	same
63	8065	1.6	---	---	10.3	2.75	14.2	40.6	ss,fg,slty,sid
64	8066	4.5	---	---	10.6	2.67	18.1	45.3	ss,f-cg,slty
65	8067	293.	---	---	16.6	2.66	5.2	48.0	same
66	8068	13.	---	---	12.4	2.81	12.3	41.0	ss,f-cg,slty,sid
67	8071	139.	---	---	16.0	2.66	19.1	54.6	ss,f-mg
68	8072	6.6	---	---	9.4	2.91	15.9	34.5	ss,fg,sid
69	8075	0.9	---	---	8.7	2.79	28.8	22.6	same
70	8081	47.	19.	---	8.2	2.68	2.1	49.4	cong
71	8082	18.	18.	---	8.6	2.69	3.1	37.0	same
72	8083	131.	80.	---	6.9	2.97	2.7	40.3	same
73	8085	34.	20.	---	7.2	2.66	2.5	40.1	same
74	8086	5.8	5.0	---	8.5	2.74	2.2	36.7	same
75	8087	54.	41.	---	12.0	2.68	2.0	53.3	same
76	8090	6.7	3.5	---	7.8	2.73	9.8	38.0	same
77	8114	46.	---	---	14.5	2.70	6.1	39.2	ss,fg
78	8115	11.	---	---	12.7	2.69	12.2	38.3	ss,f-mg

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CORE LABORATORIES, INC.  
Petroleum Reservoir Engineering  
DALLAS, TEXAS

Company USGS/HUSKY OIL CO. OPR. Formation \_\_\_\_\_ Page 3 of \_\_\_\_\_  
Well DALTON #1 Cores DIAMOND File BP-3-536  
Field WILDCAT Drilling Fluid WBM Date Report JULY 6, 1979  
County NORTH SLOPE State ALASKA Elevation \_\_\_\_\_ Analyst WSP  
Location \_\_\_\_\_ Remarks BOYLES LAW POROSITY

CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYs			POROSITY PERCENT	GRAIN DENSITY	RESIDUAL SATURATION		REMARKS
		Horizontal Maximum	Horizontal 90°	Vertical			Oil % Pore	Total Water % Pore	
79	8116	91.			14.5	2.72	7.5	40.1	ss, f-cg
80	8117	196.			14.6	2.67	6.7	37.3	same
81	8118	1.9			10.1	2.67	18.0	47.9	ss, f-mg
82	8119	255.			17.9	2.67	0.9	46.0	ss, mg
83	8120	130.			16.5	2.66	7.5	48.2	same
84	8121	7.6			13.7	2.71	9.9	33.2	ss, fg
85	8122	17.			14.7	2.72	12.4	37.2	ss, f-mg
86	8123	25.			14.9	2.70	15.3	40.7	same
87	8124	90.			16.4	2.75	11.0	42.2	same
88	8125	20.			14.4	2.76	12.8	33.6	same
89	8126	43.			15.6	2.73	10.8	41.3	same
90	8128	3.7			10.5	2.87	0.8	47.5	ss, vf-fg
91	8129	12.			14.0	2.71	1.6	50.4	ss, mg
92	8130	142.			17.4	2.72	1.5	58.5	same
93	8131	217.			18.1	2.69	0.7	58.7	same
94	8132	52.			15.4	2.78	2.0	57.2	same
95	8133	7.1			14.3	2.85	0.9	49.2	ss, mg, sc peb
96	8134	27.			16.0	2.76	1.9	65.7	ss, mg
97	8135	14.			14.3	2.73	1.2	80.9	ss, mg, sc peb
98	8136	44.			17.5	2.79	0.9	65.8	ss, mg
99	8137	45.			16.9	2.84	4.4	71.5	same
100	8138	13.			15.2	2.82	4.1	64.1	ss, vf-fg
101	8139	20.			16.0	2.74	1.5	50.1	same
102	8140	87.			18.6	2.71	4.9	42.1	same
103	8141	111.			19.0	2.71	13.3	58.9	same
104	8142	0.0			9.8	2.77	1.4	62.4	same
105	8143	12.			15.5	2.69	9.8	52.4	same
106	8144	17.			16.1	2.70	6.4	54.4	same
107	8145	13.			15.8	2.71	6.9	49.1	same
108	8146	9.7			14.9	2.70	1.7	57.5	same
109	8147	21.			16.2	2.73	1.2	49.6	same
110	8148	25.			16.1	2.69	1.4	62.0	same
111	8149	48.			17.3	2.74	5.8	43.9	same
112	8150	79.			16.5	2.78	6.9	53.6	same
113	8151	72.			18.4	2.77	6.0	57.2	same
114	8152	13.			15.1	2.73	6.4	51.5	same
115	8153	20.			15.1	2.66	6.5	51.9	ss, fg
116	8154	53.			17.0	2.72	0.7	65.1	same
117	8155	21.			15.9	2.71	0.7	57.7	same

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CORE LABORATORIES, INC.  
Petroleum Reservoir Engineering  
DALLAS, TEXAS

Company USGS/HUSKY OIL CO. OPR. Formation \_\_\_\_\_ Page 4 of \_\_\_\_\_  
Well DALTON #1 Cores DIAMOND File BP-3-536  
Field WILDCAT Drilling Fluid WBM Date Report JULY 6, 1979  
Country NORTH SLOPE State ALASKA Elevation \_\_\_\_\_ Analysts WSP  
Location \_\_\_\_\_ Remarks BOYLES LAW POROSITY

CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS			POROSITY PERCENT	GRAIN DENSITY	RESIDUAL SATURATION		REMARKS
		Horizontal Maximum	Horizontal 90°	Vertical			Oil % Pore	Total Water % Pore	
118	8156	37.			16.6	2.71	1.4	58.3	ss, fg
119	8157	46.			17.2	2.73	0.8	59.8	same
120	8158	35.			16.6	2.72	0.0	56.5	same
121	8159	22.			16.5	2.70	1.9	55.2	same
122	8160	12.			15.5	2.68	1.9	57.7	same
123	8161	30.			17.7	2.79	0.8	59.1	same
124	8162	34.			17.5	2.78	0.7	62.9	same
125	8163	40.			18.4	2.69	0.7	64.9	same
126	8164	39.			18.4	2.69	0.7	57.0	same
127	8165	18.			16.6	2.64	17.4	48.3	ss, vf-fg
128	8166	44.			16.2	2.67	0.7	54.6	ss, fg
129	8167	44.			17.5	2.70	0.7	56.3	same
130	8168	33.			17.7	2.73	0.7	52.6	same
131	8169	42.			17.6	2.65	3.1	56.9	ss, vf-fg
132	8170	43.			16.3	2.77	4.1	50.5	same
133	8171	6.9			15.2	2.64	1.6	53.0	same
134	8172	3.1			12.5	2.63	1.5	44.7	ss, fg
135	8173	20.			15.7	2.64	10.2	44.1	same
136	8174	31.			15.3	2.64	2.4	57.3	same
137	8175	6.3			13.0	2.63	5.1	49.7	same
138	8176	7.7			14.1	2.64	6.3	52.4	same
139	8177	26.			14.9	2.64	1.5	47.9	same
140	8178	8.3			13.8	2.64	9.5	40.9	same
141	8179	7.2			13.0	2.63	6.6	49.6	same
142	8180	4.6			12.8	2.63	11.7	55.2	same
143	8181	7.3			12.6	2.65	8.8	64.7	same
144	8182	1.3			11.6	2.64	9.2	59.1	same
145	8183	0.7			11.0	2.65	12.1	54.5	ss, vf-fg
146	8184	0.4			10.1	2.65	10.8	55.4	same
147	8185	1.7			11.1	2.73	15.7	49.2	same
148	8186	0.4			9.3	2.63	15.9	45.9	same
149	8187	0.5			10.6	2.63	23.2	59.5	same
150	8188	0.5			11.2	2.64	11.3	45.4	same
151	8189	0.4			11.2	2.64	22.7	56.8	same
152	8190	0.5			10.4	2.62	9.3	51.6	same
153	8191	1.3			11.1	2.70	6.7	51.4	same
154	8192	0.7			10.9	2.64	7.0	53.7	same
155	8193	0.2			----	----	31.6	33.7	ss, vf-fg, v carb
156	8194	0.0			7.7	2.73	47.2	28.7	same

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CORE LABORATORIES, INC.  
Petroleum Reservoir Engineering  
DALLAS, TEXAS

Company USGS/HUSKY OIL CO., OPR. Formation \_\_\_\_\_ Page 5 of \_\_\_\_\_  
Well DALTON #1 Cores DIAMOND File BP-3-536  
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County NORTH SLOPE State ALASKA Elevation \_\_\_\_\_ Analysts WSP  
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CORE ANALYSIS RESULTS

(Figures in parentheses refer to footnote remarks)

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS			POROSITY PERCENT	GRAIN DENSITY	RESIDUAL SATURATION		REMARKS
		Horizontal Maximum	Horizontal 90°	Vertical			Oil % Pore	Total Water % Pore	
157	8195	0.0			8.8	2.64	9.7	62.2	ss, vf-fg
158	8196	0.2			9.5	2.64	2.4	42.5	same
159	8197	1.3			11.1	2.63	13.6	62.1	same
160	8198	0.2			8.6	2.61	13.8	36.7	same
161	8317	0.6			10.7	2.71	25.6	24.6	ls, fx, pp vugs
162	8318	0.4			10.0	2.71	29.6	16.9	same
163	8319	0.3			5.7	2.69	48.7	21.7	ls, fx, peb incl
164	8320	0.1			3.2	2.70	46.9	20.1	ls, fx
165	8321	0.0			1.0	2.68	42.7	36.6	same
166	8322	0.6			5.8	2.70	46.7	31.2	same
167	8323	0.3			4.3	2.71	44.0	18.9	same
168	8324	0.3			4.1	2.72	47.9	27.3	same
169	8327	0.1			3.8	2.68	46.8	30.8	same
170	8331	0.0			1.2	2.67	42.7	36.6	same
171	8333	0.0			3.0	2.76	39.6	26.4	same
172	8334	0.1			3.4	2.65	57.1	24.5	same
173	8341	0.1			4.0	2.70	40.0	25.0	same
174	8515	32.			9.3	2.70	34.5	17.3	same
175	8516	1.5			8.8	2.70	15.2	51.3	same
176	8517	5.1			10.7	2.69	33.7	14.8	same
177	8518	23.			9.1	2.69	28.5	14.2	same
178	8519	0.9			7.8	2.69	27.8	14.8	same
179	8520	2.9			8.2	2.69	28.3	16.7	same
180	8521	1.3			10.1	2.69	30.0	12.4	same
181	8522	1.1			11.2	2.70	27.4	14.6	same
182	8523	0.9			11.5	2.70	32.3	15.3	same
183	8524	0.9			12.3	2.70	28.0	14.7	same
184	8525	0.9			11.9	2.70	26.6	17.7	same
185	8526	1.2			13.3	2.70	25.8	13.7	same
186	8527	0.8			11.1	2.70	20.8	9.9	same
187	8528	0.6			9.0	2.70	27.6	14.7	same
188	8529	0.1			9.8	2.70	21.0	14.0	same
189	8530	0.3			9.2	2.69	27.6	21.0	same
190	8531	0.1			6.5	2.67	18.7	16.0	same
191	8532	0.4			9.7	2.70	28.2	18.2	same
192	8533	0.1			10.1	2.69	19.4	14.6	same
193	8534	0.1			9.3	2.69	16.7	13.8	same
194	8535	0.0			4.4	2.62	32.8	21.0	same
195	8536	0.0			4.2	2.64	----	----	same

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PRELIMINARY



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

DRILL STEM TEST REPORT FORM

WELL NAME J.W. DALTON #1 DST. NO. 1 DATE 6-16-79

Formation Tested SADLITROCHIT/IVISHAK SS Hole Size 8 1/2"  
Test Interval 7812-8140 (328') Drill Collar Length 277.56' I.D. 2 1/8"  
Total Depth 8140' Drill Pipe Length 7767.33 I.D. 4.276"  
Choke Size: Surface 1/4" Bottom Hole 1/4" Packer Depth(s) 7812 Ft.  
Depth Tester Valve 7777 Ft.  
Cushion Type WATER Amount 4487'

TEST DATA

Tool open at 11:13 hrs.  
Initial flow period 11 min.  
Initial shut-in period 61 min.  
Final flow period 1 hrs. 01 min. 181 min.  
Final shut-in period 6 hrs. 01 min. 361 min.  
Unseal packer at 21:46 hrs.

RESISTIVITY/CHLORIDE DATA

BSM hole  
Sampler  
Recovery Water 0.32 Resistivity APPX 65 of 12500 ohm cm ph 7.2  
Recovery Mud 3.5 " 60 of 800 ohm cm  
Recovery Mud Filtrate 1.35 " 61 of 800 ohm cm  
Mud Pit Sample 1.35 " 56 of 950 ohm cm  
Mud Pit Sample Filtrate " " of 900 ohm cm  
Mud Weight 10.1 lbs/gal

Description of initial flow period Strong blow on initial open decreased to fair blow in 15 min.; fluid to surface (WTR cushion) in 21 min. & measured rate 1255 bbl/day.

Description of final flow period Opened cool w/flow of water cushion; muddy water in 14 min.; ratehole and 9.8 cps in 26 min.; filtrate to surface in 40 min.; in 1 hr. 24 min. filtrate w/minor solution gas breaking out; @ 2 hrs. 1 min. muddy water & measured rate of 1218 bbls/day w/Cl<sub>2</sub> 4600 ppm & WHP 300 psi & v. light sheen of oil (? pipe dope) on WTR. @ 2 hrs. 36 min.

PRESSURE DATA

(CONT'D. UNDER REMARKS BELOW)

TEMPERATURE	Gauge No. 6103		Gauge No. 6104		Gauge No. 6142		TIME
	Depth: 8136	ft.	Depth: 8131	ft.	Depth: 7742	ft.	
Est. 165	48	Hour Clock	48	Hour Clock	48	Hour Clock	11:13 A.M.
OF: Blanked ON	Yes		Blanked ON	Yes	Blanked ON	No	Opened 11:13 A.M.
Actual 185	OF: Pressure		Pressure		Pressure		Opened Bypass 21:46 P.M.
Initial Hydrostatic	Field	Office	Field	Office	Field	Office	Recorded Minutes
	4290		4268		4082		Compared Minutes
	Initial	3125	3095		2834		
	Final	3873	3856		3697		
First Period FLOW	Closed in	4067	4045		3922		SEE TEST DATA ABOVE
	Initial	3875	3856		3713		
	Final	3860	3887		3681		
	Closed in	4051	4030		3906		
Second Period FLOW	Initial						
	Final						
	Closed in						
	Initial						
Third Period FLOW	Initial						
	Final						
	Closed in						
	Initial						
Final Hydrostatic	4258		4435		4066		

GAUGE #6141 & 7786 DID NOT WORK

RECOVERY DATA

Cushion	Type	H <sub>2</sub> O	Amount	4487	Depth Back	Surface	Bottom
Recovered	7777'	Feet/bbl of	Salt water and muddy salt water		Pres. Valve	Choke	Choke
Recovered		Feet/bbl of					
Recovered		Feet/bbl of					
Recovered		Feet/bbl of					

Remarks 35' Perforated 17' below FTR

FFP CONTINUED:

Flowing slightly muddy water w/Cl<sub>2</sub> 11600 ppm & WHP 190 psi & v. light sheen oil; shut in well 1 1/2 hrs. 01 min.; reversed out slightly muddy water; drilling mud to surface after 1000 strokes.

JOHN GREENE/H. RAYWOOD



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

## DRILL STEM TEST REPORT FORM

WELL NAME J.W. DALTON #1 DST. NO. 2 DATE 7-16 - 7-18-79

Formation Tested LISBURN Hole Size 7" Liner  
Test Interval 8558-8665' (Perf @ 4 shots/ft.) Drill Collar Length 1320.44' - 3 1/2" I.D. 2.602"  
Total Depth 8780' PBTD Drill Pipe Length 7170.11' - 5" I.D. 4.276"  
Choke Size: 0.375" Packer Depth (ft.) 8520  
Surface 0.500" Bottom Hole 0.62" Depth Tester Valve 8493 Ft.  
Cushion Type 504' (3.3 bbls) Amount water

## TEST DATA

Tool open at 1011 hrs. 7-16-79 ~~AK~~  
Initial flow period 1011-1042 hrs. 31 min  
Initial shut-in period 1042-1142 hrs. 50 min  
Final flow period 1142-0012 hrs-7/17 750 min  
Final shut-in period 0012 (7/16)-0118 1506 min  
Unseated packer at 0118 hrs 7/18 (7/18) hrs.

## RESISTIVITY-CHLORIDE DATA

Recovery water cushion 1.2 @ 64° - 1000 ppm Cl<sub>2</sub>  
Resistivity Chloride Content  
Recovery Water 0.31 @ 64 OF 14000 ppm  
Recovery Mud 0.54 @ 64 OF 5450 ppm  
Recovery Mud Filtrate 0.90 @ 62 OF 2000 ppm  
Mud Pit Sample 0.80 @ 66 OF 41 ppm  
Mud Pit Sample Filtrate 10.1 vis 41 cd

Description of initial flow period Med blow at 9 min through 1/2" bubble hose, increase to strong at 25 min; remain strong to shut in.

Description of final flow period Open with strong blow through 1/2" bubble hose, gas to surface less than 2 psi at 2000 hrs (8 hrs. into final flow).

NOTE: 4 CLOCKS - CONTINUED ON  
NEXT PAGE

## PRESSURE DATA

	#1	#2	#3	
TEMPERATURE	Gauge No. 6141 Depth: 8499 ft.	Gauge No. 6103 Depth: 8504 ft.	Gauge No. 6104 Depth: 8553 ft.	TIME
Est.	48 Hour Clock OF. Blanked Off No	48 Hour Clock OF. Blanked Off No	48 Hour Clock OF. Blanked Off No	Tool Opened A.M. P.M.
Actual	220 OF. Pressures Field Office	Pressures Field Office	Pressures Field Office	Tool Opened A.M. Bydass P.M.
Initial Hydrostatic	4590	4593	4600	Reported Minutes
Initial FLOW	407	414	442	Computed Minutes
Final FLOW	813	860	852	
Closed in	4132	4131	4141	
Initial FLOW	852	860	915	
Final FLOW	3202	3205	3206	
Closed in	4018	4019	4030	
Initial FLOW				
Final FLOW				
Closed in				
Final Hydrostatic	4459	4433	4473	

## RECOVERY DATA

Cushion	Type	Amount	Depth Back Pres. Valve	Surface Choke	Bottom Choke
Recovered	4.92	xxx bbl of asphalt			0.62"
Recovered	3.30	xxx bbl of water cushion			0.62"
Recovered	29.00	xxx bbl of rathole fluid and mud filtrate			0.62"
Recovered	80.00	xxx bbl of formation fluid (salt water)			0.62"

Remarks Reversed out at 2141 hrs. 7-17-79; fluid to surface at 140 strokes (asphalt); water cushion at 179 strokes; rathole fluid at 210 strokes; formation fluid at 442 strokes; reversing mud at 941 strokes.

RON BROCKWAY  
Prepared by

11/78



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

PAGE 2 OF 2

WELL NAME J.M. DALTON #1 DST. NO. 2 DATE 7-16-7-18-79

Formation Tested \_\_\_\_\_ Hole Size \_\_\_\_\_  
Test Interval \_\_\_\_\_ Drill Collar Length \_\_\_\_\_ I.D. \_\_\_\_\_  
Total Depth \_\_\_\_\_ Drill Pipe Length \_\_\_\_\_ I.D. \_\_\_\_\_  
Choke Size: \_\_\_\_\_ Packer Depth(s) \_\_\_\_\_ Ft.  
Surface \_\_\_\_\_ Bottom Hole \_\_\_\_\_ Depth Tester Valve \_\_\_\_\_ Ft.  
Cushion Type \_\_\_\_\_ Amount \_\_\_\_\_

TEST DATA

RESISTIVITY/CHLORIDE DATA

Tool open at \_\_\_\_\_ hrs. Recovery Water \_\_\_\_\_ Resistivity \_\_\_\_\_ Chloride Content \_\_\_\_\_  
Initial flow period \_\_\_\_\_ min. Recovery Mud \_\_\_\_\_ OF \_\_\_\_\_ ppm  
Initial shut-in period \_\_\_\_\_ min. Recovery Mud Filtrate \_\_\_\_\_ OF \_\_\_\_\_ ppm  
Final flow period \_\_\_\_\_ min. Mud Pit Sample \_\_\_\_\_ OF \_\_\_\_\_ ppm  
Final shut-in period \_\_\_\_\_ min. Mud Pit Sample Filtrate \_\_\_\_\_ OF \_\_\_\_\_ ppm  
Unseated packer at \_\_\_\_\_ hrs. Mud Weight \_\_\_\_\_ vis \_\_\_\_\_ cp

Description of initial flow period \_\_\_\_\_  
Description of final flow period \_\_\_\_\_

(CONTINUED FROM PAGE 1)

PRESSURE DATA

#4

TEMPERATURE		Gauge No. 6142	Gauge No.	Gauge No.	TIME	
Depth: 8557		ft.	Depth:	ft.	Depth:	ft.
Est.	OF	Hour Clock	Hour Clock	Hour Clock	Tool	A. M.
	Blanked Off	Yes	Blanked Off	Blanked Off	Opened	P. M.
Actual	OF	Pressure	Pressure	Pressure	Opened	A. M.
	Field	Office	Field	Office	System	P. M.
Initial Hydrostatic	6609				Reported	Computed
First Pressure	Initial	648			Minutes	
	Final	891				
	Closed in	6129				
Second Pressure	Initial	306				
	Final	1201				
	Closed in	6036				
Third Pressure	Initial					
	Final					
	Closed in					
Final Hydrostatic	6481					



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

DRILL STEM TEST REPORT FORM

WELL NAME J.H. DALTON #1 DST. NO. 3 DATE 7-19 - 7-21-79

Formation Tested LTSBURNE Hole Size 7" Liner  
8520-8538'  
Test Interval 8482-8509' (Part at 4 SPT) Drill Collar Length 1399.59 I.O. 2.62  
Total Depth 8540 PSD Drill Pipe Length 5086 I.O. 4.276  
Choke Size: 3.75 Packer Depth(s) 8438' Ft.  
Surface 0.50 Bottom Hole 0.62 Depth Tester Valve 8415' Ft.  
Cushion Type water Amount 500'  
Res: 2.9 @ 64°F. 1000 ppm

TEST DATA

RESISTIVITY/CHLORIDE DATA

Tool case at 1031 hrs (7-19-79) Scks 885 Recovery Water 0.59 Resistivity 70 Chloride Content 3950 ppm  
Initial flow period 30 min. Recovery Mud - @ - OF - ppm  
Initial shut-in period 60 min. 791 Recovery Mud Filtrate 0.56 @ 70 OF 1400 ppm  
Final flow period 6 hrs min. Mud Pit Sample - @ - OF - ppm  
Final shut-in period 13 hrs 15 min. Mud Pit Sample Filtrate 0.87 @ 68 OF 1450 ppm  
Unseal packer at 1947 hrs 7-20-79 hrs. Mud Weight 10.1 lb/cu ft 17 lb/cu ft  
774 Sample 0.91 @ 64°F. 1200 ppm

Description of initial flow period Very weak blow increasing to weak blow. At shut in well bubbling in 1" water from bubble hose.

Description of final flow period Opened with moderate blow continuing to strong blow at 4 hrs. Moderate to strong blow remainder of open period. No gas to surface. At strongest point would bubble rapidly at the bottom of bubble bucket.

PRESSURE DATA

TEMPERATURE	Gauge No. 6104		Gauge No. 6142		Gauge No. 6103		Gauge No. 6141	
	Depth: 8417	ft.	Depth: 8422	ft.	Depth: 8471	ft.	Depth: 8475	ft.
Est.	Blanked ON	No	Blanked ON	NO	Blanked ON	Yes	Blanked ON	Yes
Actual:	225	OF						
	Pressure		Pressure		Pressure		Pressure	
	Field	Office	Field	Office	Field	Office	Field	Office
Initial Hydrostatic	4505		4593		4529		4525	
FLOW	Initial	521	541		573		570	
	Final	710	700		713		716	
	Closed in	3643	3521		3660		3663	
FLOW	Initial	710	700		729		728	
	Final	368	391		908		911	
	Closed in	3272	3233		3252		3267	
FLOW	Initial	-	-		-		-	
	Final	-	-		-		-	
	Closed in	-	-		-		-	
Final Hydrostatic	4473		4481		4497		4492	

RECOVERY DATA

Cushion	Type	Amount	Depth Back Pres. Valve	Surface Choke	Bottom Choke
Recovered	5 bbls	Feet/bbl of Oil		1"	0.62
Recovered	6.8 bbls	Feet/bbl of H <sub>2</sub> O cushion/rat hole mud		1"	0.62
Recovered	22 bbls	Feet/bbl of formation fluid oil/water		1"	0.62
Recovered		Feet/bbl of		1"	0.62

Remarks: Started reversing at 1630 hrs 7-20-79. Tool plugged. Filled drill pipe w/mud. Unplugged tool. Circulated cast fluid to surface w/ 94 bbl displacement; 3 bbl oil, 6.8 bbl cushion/rat hole mud/oil, 22 bbls water/oil.

Samples: Oil at 746 scks first to surface. 756 scks oil, 774 scks oil, 791 scks cushion/rat hole/oil, 885 scks water/oil, 1010 scks mud. Pretest cushion mud air reversing One sample from below dual GTP water/oil.

HENRY PETERSON, DRILLING ENGINEER

Prepared by

11/78

# PRELIMINARY REPORT



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

## DRILL STEM TEST REPORT FORM

WELL NAME J.W. DALTON #1 DST. NO. 4 DATE 7-24-79  
Formation Tested LISBURN Hole Size 7" Linder  
Test Interval 8392-8436' Drill Collar Length        I.D.         
Total Depth 78 8449' Drill Pipe Length 1599.95 I.D. 2.602  
12- 6730.67 4.276  
Choke Size:        Packer Depth(s) 8260.29 Ft.  
Surface 1/4 - 1/2 Bottom Hole 0.62  
Depth Tester Valve 8337 Ft.  
Cushion Type WEZ Amount 500'

### TEST DATA

### RESISTIVITY/CHLORIDE DATA

Tool open at 1947 hrs. 7-23-79 hrs. Recovery Water        Resistivity        Chloride Content         
Initial flow period 30 min. Recovery Mud See below                       
Initial shut-in period 60 min. Recovery Mud Filtrate                       
Final flow period 120 min. Mud Pit Sample 1.0 64 1100  
Final shut-in period 280 min. Mud Pit Sample Filtrate 1.0 64 1100  
Unseated packer at 0337 hrs. 7-24-79 hrs. Mud Weight 10.1 vis 37 cp

Description of initial flow period Weak blow after 10 min. in 1" of water, decreased to  
no blow at 38 min. (dead)  
Description of final flow period No blow (dead)

### PRESSURE DATA

TEMPERATURE	Gauge No. 6104		Gauge No. 6142		Gauge No. 6103/6141		TIME
	Depth: 8339	h.	Depth: 8344	h.	Depth: 8393/8397	h.	
Est.	oe	Blanked Off	No	Blanked Off	No	Blanked Off	Yes/Yes
Actual	212 of	Pressures	Pressures	Pressures	Pressures	Opened	A.M.
		Field	Office	Field	Office	Bypass	P.M.
Initial Hydrostatic	4410		4417		4449	4443	Reported
Flow	Initial:	383	369	398	391		Computed
	Final:	442	430	462	456		Minutes
	Closed in:	552	557	589	586		Minutes
Flow	Initial:	442	446	478	472		
	Final:	442	446	478	472		
	Closed in:	773	779	796	813		
Flow	Initial:						
	Final:						
	Closed in:						
Final Hydrostatic	4378		4369		4401	4443	

### RECOVERY DATA

Cushion water Type 500' Amount        Depth Back        Surface        Bottom         
Pres. Valve        Choke        Choke         
Recovered 1.8 bbl Feet bbl of water cushion/mud w/gas odor  
Recovered 1.1 bbl Feet bbl of water cushion w/sheen oil  
Recovered 1.1 bbl Feet bbl of water cushion/mud w/sheen oil  
Recovered 1.1 bbl Feet bbl of mud w/sheen oil

Remarks: Samples as follows: 2 ea. gas samples taken at 850 stks after compressing air/gas column at 883 stks first fluid to surface, contaminated cushion. Res. 1.01 at 64°F. at 910 stks. Water cushion Res. 1.51 at 62°F. 1000 ppm. 920 stks, water cushion, Res. 1.9 at 64°F. 950 ppm. 940 stks - mud Res. 1.1 at 64°F. 1100 ppm. Sample from BCIF. Oil/mud Res. 0.91 at 64°F. 1200 ppm.  
Pretest cushion Res. 2.9 at 62°F. 850 ppm.  
Predisp. mud Res. 1.0 at 64°F. 1100 ppm.  
Circulated recovery to surface w/119 bbl.

HENRY PETERSON

Prepared by



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

# DRILL STEM TEST REPORT FORM

WELL NAME J.W. DALTON #1 DST. NO. 5 DATE 7-28-79

Formation Tested SADLERCHIT/IVISHAK Hole Size 7" liner

Test Interval 7971-7976 (FDC Ditch) 6 perfs/ft. Drill Collar Length None I.O. 1599.95 - 3 1/2" 2.602"

Total Depth 8331' Drill Pipe Length 6295.88 - 5" I.O. 4.276"

Choke Size: Surface 1/2" and 1/4" Bottom Hole 0.62 Packer Depth (ft) 7924 Ft.

Depth Tester Valve 7901 Ft.

Cushion Type WATER Amount 506'  
(3.35 bbls)

## TEST DATA

Tool open at 1200 hrs, 7-26-79 hrs.  
Initial flow period 1200-1230 hrs, 30 min.  
Initial shut-in period 1230-1330 hrs, 60 min.  
Final flow period 1330-2103 hrs, 7 hrs 33 min.  
Final shut-in period 13 hrs, 28 min  
Unseated packer at 1227 hrs 7-27-79 hrs.

## RESISTIVITY/CHLORIDE DATA

Water cush: Res 3.2 ohms @ 57°F./900 ppm Cl<sub>2</sub>  
Resistivity Chloride Content  
Recovery Water 0.28 @ 70 °F. 12,000 ppm  
Recovery Mud 0 @ 0 °F. 0 ppm  
Recovery Mud Filtrate 0 @ 0 °F. 0 ppm  
Mud Pit Sample 0 @ 0 °F. 1100 ppm  
Mud Pit Sample Filtrate 0 @ 0 °F. 0 ppm  
Mud Weight 10.0 vis 36 cp

Description of initial flow period: Opened tool w/weak blow, increase to mod blow in 5 min. strong blow 15 min, continuous strong blow to SI of IFP at less than 2 psi WHP.

Description of final flow period: Opened tool w/strong blow; in 2 hrs WHP increased to 10 psi on 1/2" choke; gas to surface in 2 hrs 45 min, change to 1/4" choke, water cush to surf in 3 hrs 35 min @ 40 psi WHP; formation fluid to surface in 4 hrs 20 min; well stabilized last 1 hr of test at 110 psi WHP at approx rate of 258 BWPD.

## PRESSURE DATA

TEMPERATURE	Gauge No. 6142		Gauge No. 6104		Gauge No. 6141		Gauge No. 6103		
	Depth:	7903 ft.	Depth:	7908 ft.	Depth:	7957 ft.	Depth:	7961 ft.	
Est.	OF	Blanked ON	No	Blanked ON	No	Blanked Off	Yes	Blanked ON	Yes
Actual	220 OF	Pressure		Pressure		Pressure		Pressure	
		Field	Office	Field	Office	Field	Office	Field	Office
First FLOW	Initial Hydrostatic	4129		4140		4149		4163	
	Initial	303		300		358		350	
	Final	1273		1167		1251		1242	
Second FLOW	Closed in	1938		1935		1953		1971	
	Initial	1145		1120		1219		1242	
	Final	1489		1506		1528		1526	
Third FLOW	Closed in	1954		1935		1969		1971	
	Initial								
	Final								
Final Hydrostatic	Initial								
	Final								
Final Hydrostatic		4098		4124		4149		4163	

## RECOVERY DATA

Cushion	Type	Amount	Depth Back Pres. Valve	Surface Choke	Bottom Choke	Notes
Recovered	1.3	Over/bbl of WATER CUSHION		0.25"	0.62"	
Recovered	142	Water/bbl of FORMATION WATER, mud cut in part		0.25"	0.62"	
Recovered		Feet/bbl of				
Recovered		Feet/bbl of				

Remarks: Measured rate to stock tank 258 bbls per day; collected 3 gas samples, 2 at 2 hrs 30 min into final flow; 1 a compressed sample prior to reversing out.

DAVE YOUNG





# CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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

TELEPHONE (907)-279-4014  
274-3364

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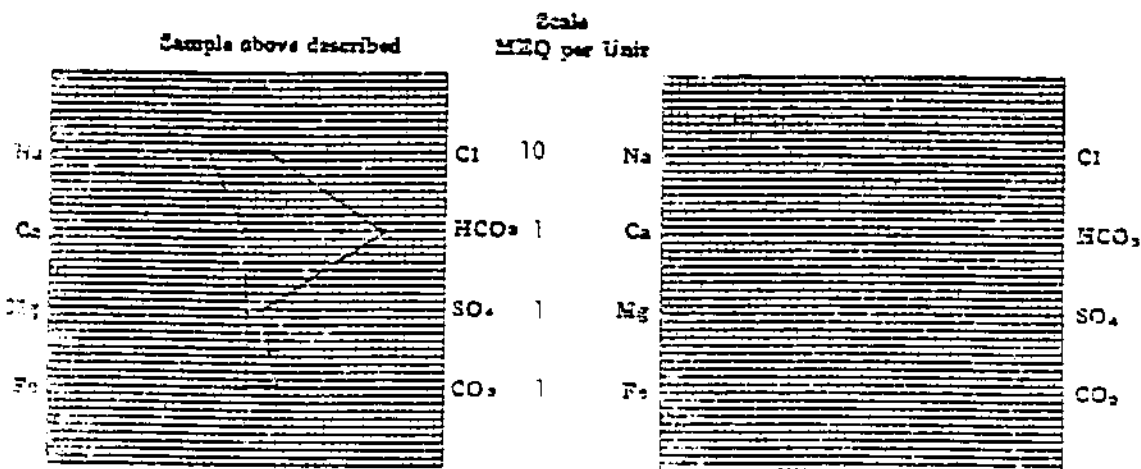
## WATER ANALYSIS REPORT

OPERATOR	Husky Oil Company	DATE	July 6, 1979	LAB NO.	0819-1
WELL NO.	Dalton No. 1	LOCATION			
FIELD	North Slope	FORMATION			
COUNTY		INTERVAL	DST No. 1		
STATE	Alaska	SAMPLE FROM	Mud pit		

REMARKS & CONCLUSIONS: Oil & Grease, mg/l----- 2.6  
Quebracho Filtrate

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	1085	47.20	Sulfate	87	1.81
Potassium	6.8	0.17	Chloride	900	25.38
Calcium	14.8	0.74	Carbonate	120	4.00
Magnesium	3.4	0.28	Silicate	1049	17.20
Iron	--	--	Hydroxide	--	--
Total Cations		48.39	Total Anions		48.39
Total dissolved solids, mg/l	2734		Specific resistance @ 25°C:		
NaCl equivalent, mg/l	2490		Observed	2.7	ohm-centimeters
Observed pH	9.2		Calculated	2.6	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value is shown greater than 10, 1, and 1)  
NOTE: Mg/l is 1/2000th of the NaCl equivalent per liter  
Sulfate chloride equivalent per liter is 1/1000th of the NaCl equivalent per liter



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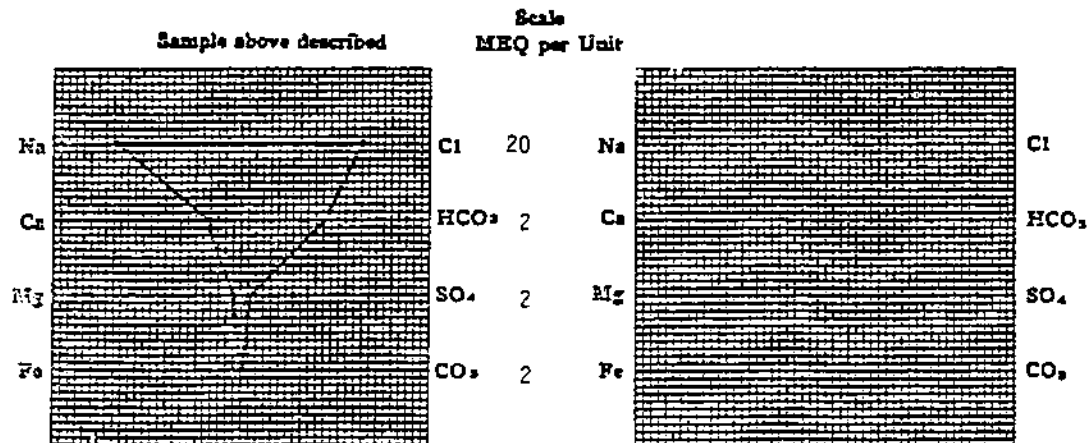
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE July 6, 1979 LAB NO. 0819-2  
WELL NO. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 1  
STATE Alaska SAMPLE FROM 1538 Hrs. (6 mins. before shut in of FFP)

REMARKS & CONCLUSIONS: Oil & Grease, mg/l-----11.4 (probably pipe dope)

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	7609	331.00	Sulfate	95	1.98
Potassium	33	0.84	Chloride	11300	318.66
Calcium	185	9.23	Carbonate	0	--
Magnesium	24	1.97	Bicarbonate	1366	22.40
Iron	-	--	Hydrosulfide	-	--
Total Cations		343.04	Total Anions		343.04
Total dissolved solids, mg/l		19918	Specific resistance @ 68°F.:		
NaCl equivalent, mg/l		19581	Observed	0.37	ohm-centimeters
Observed pH		7.1	Calculated	0.37	ohm-centimeters

## WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/l = milligrams per liter; Meq/l = milligram equivalent per liter  
Sulfate chloride equivalent = by Dougan & Hueston's minimization from composition



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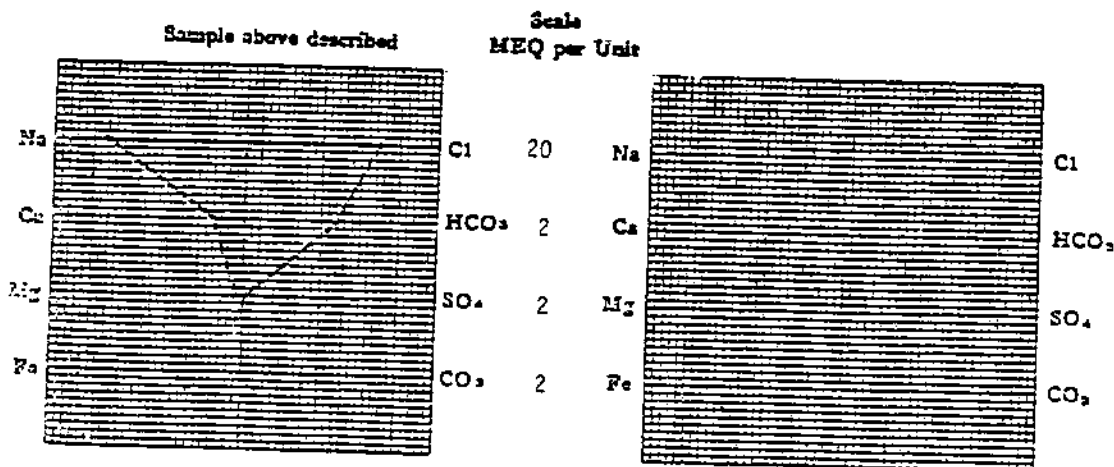
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE July 6, 1979 LAB NO. 0819-3  
WELL NO. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 1  
STATE Alaska SAMPLE FROM Sampled from flow line after  
FSI while reversing out drill  
pipe fluid.

REMARKS & CONCLUSIONS: Oil & Grease, mg/l-----26.2  
(contaminated w/pipe dope ?)

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	8339	362.73	Sulfate	15	0.31
Potassium	34	0.87	Chloride	12400	349.68
Calcium	169	8.43	Carbonate	0	--
Magnesium	24	1.97	Bicarbonate	1464	24.01
Iron	-	--	Hydroxide	-	--
Total Cations		374.00	Total Anions		374.00
Total dissolved solids, mg/l	21701		Specific resistance @ 68°F.:		
NaCl equivalent, mg/l	21383		Observed	0.35	ohm-centimeters
Observed pH	7.6		Calculated	0.34	ohm-centimeters

## WATZ ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: 16g/l = 1 meq/l. Diagrams per Unit: 1 meq/l = 1 meq/l. Diagrams per Unit:  
Sulfate chloride equivalent by Division of Hydrocarbon calculations from composition



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Anchorage, Alaska 99509

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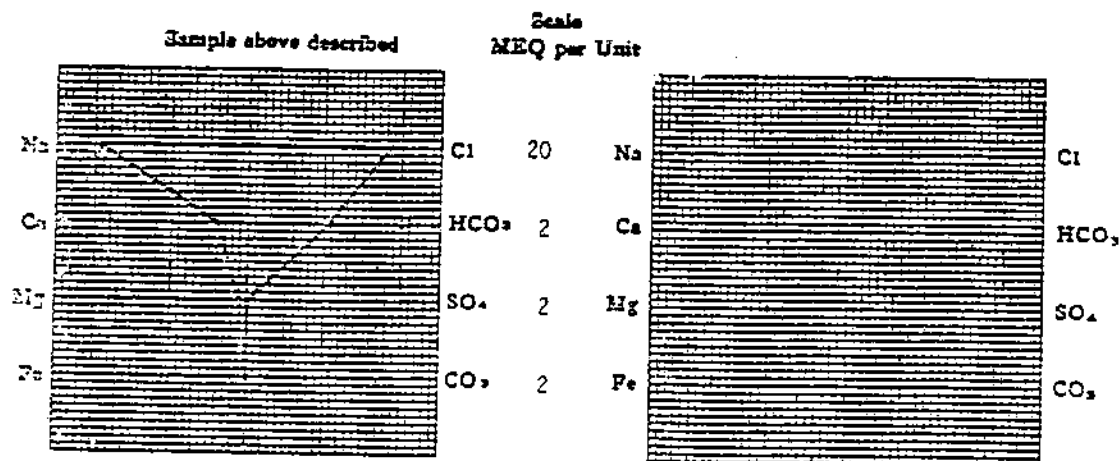
### WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE July 6, 1979 LAB NO. 0819-4  
WELL NO. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 1  
STATE Alaska SAMPLE FROM Btm Hole Sampler

REMARKS & CONCLUSIONS: Oil & Grease, mg/l-----11.5  
IDENTIFICATION TO FOLLOW

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	8753	380.77	Sulfate	18	0.37
Potassium	33	0.84	Chloride	13100	369.42
Calcium	163	8.13	Carbonate	0	--
Magnesium	25	2.06	Bicarbonate	1342	22.01
Iron	-	--	Hydroxide	-	--
Total Cations		391.80	Total Anions		391.80
Total Dissolved Solids, mg/l		22753	Specific resistance @ 68°F.:		
NaCl equivalent, mg/l		22462	Observed	0.35	ohm-centimeters
Observed pH		6.9	Calculated	0.33	ohm-centimeters

### WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/1000 = meq/liter per liter NaCl/1000 = meq/liter per liter  
Sodium chloride equivalent by Dumas & Hartmann calculation from components



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## GAS ANALYSIS REPORT

Company Husky Oil Company Date July 20, 1979 Lab. No. 1027-1  
Well No. No. 1 J. W. Dalton Location Lisburne  
Field NPR-A Formation 8568-8665  
County Alaska Depth DST #2  
State Alaska Sampling point DST #2  
Line pressure psig; Sample pressure 2 psig; Temperature ---° F; Container number ---  
Remarks Sample taken July 16, 1979 @ 2255 Hrs. by Mr. Ronald G. Brockway

Component	Mole % or Volume %	Gallons per MCF
Oxygen	0	
Nitrogen	4.57	
Carbon dioxide	TRACE	
Hydrogen sulfide	---	
Methane	95.43	
Ethane & Higher	TRACE	
Total	100.00	

GPM of pentanes & higher fraction ---  
Gross btu cu. ft. @ 60° F. & 14.7 psia (dry basis) 964  
Specific gravity (calculated from analysis) 0.573  
Specific gravity (measured) 0.575

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



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Anchorage, Alaska 99509

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### WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE July 20, 1979 LAB NO. 1027-3  
WELL NO. No. 1 J. W. Dalton LOCATION Lisburne  
FIELD NPR-A FORMATION DST #2 8568-8665  
COUNTY Alaska INTERVAL Mud-from pipe while going in hole  
STATE Alaska SAMPLE FROM Mud-from pipe while going in hole

REMARKS & CONCLUSIONS: Mud sample, dark quebracho filtrate.  
Sample taken by Mr. Ronald G. Brockway 7-16-79 @ 0930 Hrs.

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	3589	156.12	Sulfate	1955	40.66
Potassium	49	1.25	Chloride	200	5.64
Calcium	52	2.59	Carbonate	2800	93.24
Magnesium	2	0.16	Silicate	0	--
Iron			Hydroxide	350	20.58
Total Cations		160.12	Total Anions		160.12
Total dissolved solids, mg/l	8797		Specific resistance @ 68°F:		
NaCl equivalent, mg/l	8748		Observed	0.88	ohm-centimeters
Observed pH	11.2		Calculated	0.88	ohm-centimeters

### WATER ANALYSIS PATTERN

Sample above described		Scale MEQ per Unit		
Na	Cl	200	Na	Cl
Ca	HCO <sub>3</sub>	20	Ca	HCO <sub>3</sub>
Mg	SO <sub>4</sub>	20	Mg	SO <sub>4</sub>
Fe	CO <sub>3</sub>	20	Fe	CO <sub>3</sub>

(We value in above graphs includes Na, K, and Li)  
NOTE: Mg/l is Milligrams per liter; Meq/l is Milliequivalents per liter  
Sodium chloride equivalent by Dupont & Hawthorne calculation from composition



## CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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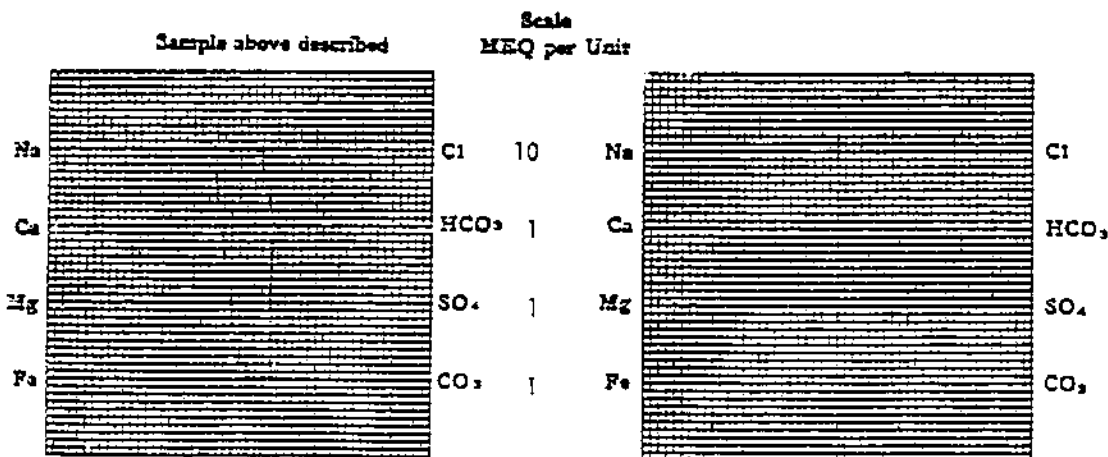
### WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE July 20, 1979 LAB NO. 1027-4  
WELL NO. No. 1 J. W. Dalton LOCATION \_\_\_\_\_  
FIELD NPR-A FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL OST No. 2 8568-8665  
STATE Alaska SAMPLE FROM Water Cushion

REMARKS & CONCLUSIONS: Muddy Water, light quebracho filtrate.  
Sample taken by Mr. Ronald G. Brockway 7-16-79

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	765	33.26	Sulfate	192	3.99
Potassium	23	0.59	Chloride	920	25.95
Calcium	64	3.19	Carbonate	128	4.26
Magnesium	20	1.64	Bicarbonate	273	4.48
Iron	-	--	Hydroxide	-	--
Total Cations		38.68	Total Anions		38.68
Total dissolved solids, mg/l	2245		Specific resistance @ 68°F.: _____		
NaCl equivalent, mg/l	2138		Observed _____	3.2	ohm-centimeters
Observed pH	9.0		Calculated _____	3.0	ohm-centimeters

### WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/l = milligrams per liter (Mm/l); HCO<sub>3</sub> = milligrams equivalent per liter  
Sulfate chloride equivalent by Dupont & Hachertman calculated from components



## CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA.

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

TELEPHONE (907)-279-4014  
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### ANALYTICAL REPORT

From Husky Oil Company Product Crude Oil  
Address Anchorage, Alaska Date 8-1-79  
Other Pertinent Data \_\_\_\_\_  
Analyzed by JP Date August 30, 1979 Lab No. 1154

REPORT OF ANALYSIS  
CRUDE OIL SAMPLES  
J.W. DALTON NO. 1  
NORTH SLOPE, ALASKA

<u>SAMPLE</u>	<u>SPECIFIC GRAVITY</u> <u>@60°F</u>	<u>POUR</u> <u>POINT-°F</u>	<u>TOTAL</u> <u>SULFUR-%</u>
First to surface (DST#2)	1.065	+80	0.96
Middle Fluid Recovery (DST#3)	0.980	+80	0.92
From CIP Valve (DST#4)	0.960	I.S.	0.92

REMARKS: I.S.=Insufficient Sample for analysis.





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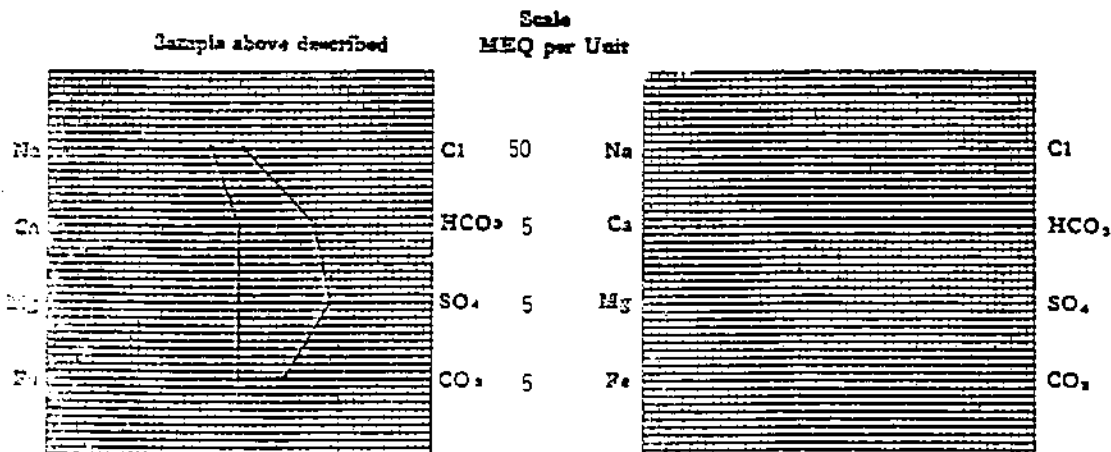
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-1  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8655)  
STATE Alaska SAMPLE FROM Drilling Fluid

REMARKS & CONCLUSIONS: Quebracho filtrate  
Oil & Grease content, mg/l----- <10

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	3910	170.12	Sulfate	2910	60.56
Potassium	46	1.18	Chloride	1200	33.84
Calcium	22	1.10	Carbonate	882	29.37
Magnesium	1	0.08	Bicarbonate	2972	48.71
Iron	-	--	Hydroxide	-	--
Total Cations		172.48	Total Anions		172.48
Total Dissolved Solids, mg/l	10436		Specific resistance @ 25°C:		
NaCl equivalent, mg/l	8547		Observed	0.90	ohm-centimeters
Observed pH	9.6		Calculated	0.81	ohm-centimeters

## WATER ANALYSIS PATTERN



(Na value in above pattern includes Na, K, and Li)  
NOTES: Meq/l = Milliequivalents per liter; Meq/l = Milliequivalents per liter  
Sulfate chloride equivalent by Dupont is based on assumption that all carbonate



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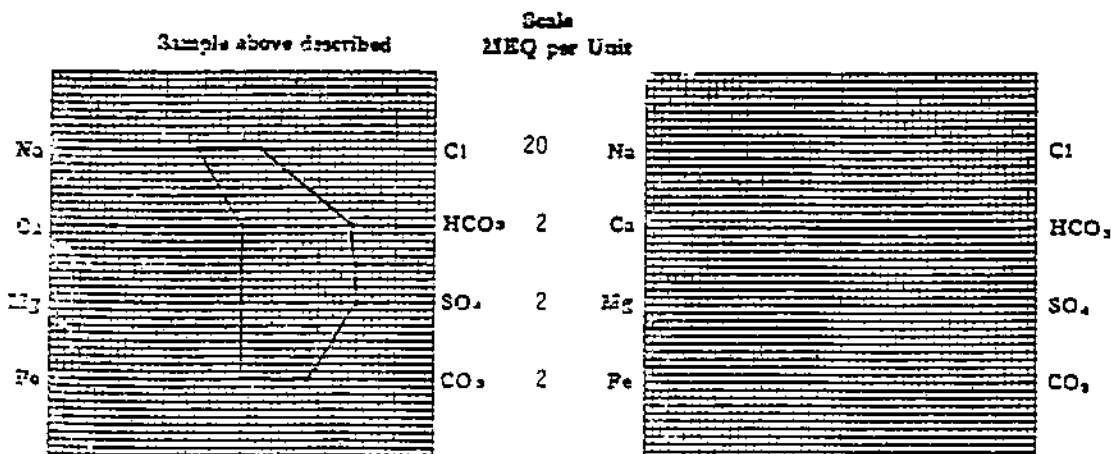
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-3  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8665)  
STATE Alaska SAMPLE FROM Water Cushion (TOP-179 Stks)

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----530

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	2636	114.68	Sulfate	1456	30.28
Potassium	39	1.00	Chloride	1400	39.48
Calcium	12	0.60	Carbonate	535	17.82
Magnesium	<1	--	Bicarbonate	1750	28.70
Iron	--	--	Hydrosulfide	--	--
Total Cations		116.28	Total Anions		116.28
Total dissolved solids, mg/l	8335		Specific resistance @ 68°F:		
NaCl equivalent, mg/l	8751		Observed	0.96	cm-cm-meters
Observed pH	9.4		Calculated	0.82	cm-cm-meters

## WATER ANALYSIS PATTERN



(Fe values in above graphs include Na, K, and Li)  
NOTE: Mg/l is MEQ/l times 2.0; Ca/l is MEQ/l times 2.0; Fe/l is MEQ/l times 2.0  
Sulfate values calculated by Dumas & Hachmann calculations from carbonate



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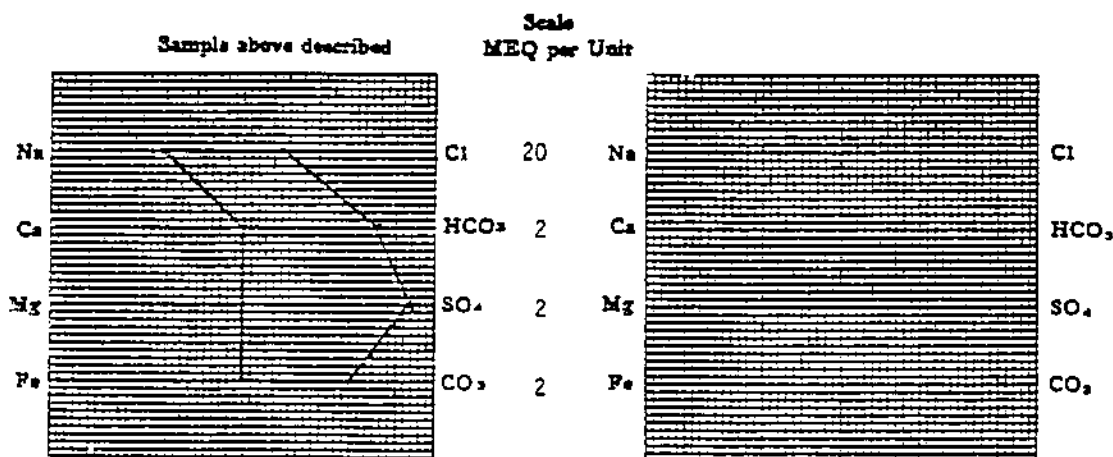
### WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-4  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8665)  
STATE Alaska SAMPLE FROM Water Cushion (BTM-210 stks)

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----360

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	4691	204.08	Sulfate	2110	43.89
Potassium	133	3.40	Chloride	3600	101.51
Calcium	11	0.55	Carbonate	835	27.81
Magnesium	<1	--	Bicarbonate	2123	34.82
Iron	--	--	Hydroxide	--	--
Total Cations		208.03	Total Anions		208.03
Total dissolved solids, mg/l		14908	Specific resistance @ 64°F.: Observed	0.45	ohm-centimeters
NaCl equivalent, mg/l		16078	Calculated	0.45	ohm-centimeters
Observed pH		9.4			

### WATER ANALYSIS PATTERN



(No value is shown if the concentration is less than 1 mg/l or 1 meq/l)  
NOTE: Mg/1000 meq/l is shown as 1000 mg/l or 1000 meq/l  
Sulfate chloride equivalent is shown as Sulfate & Chloride equivalent from analysis



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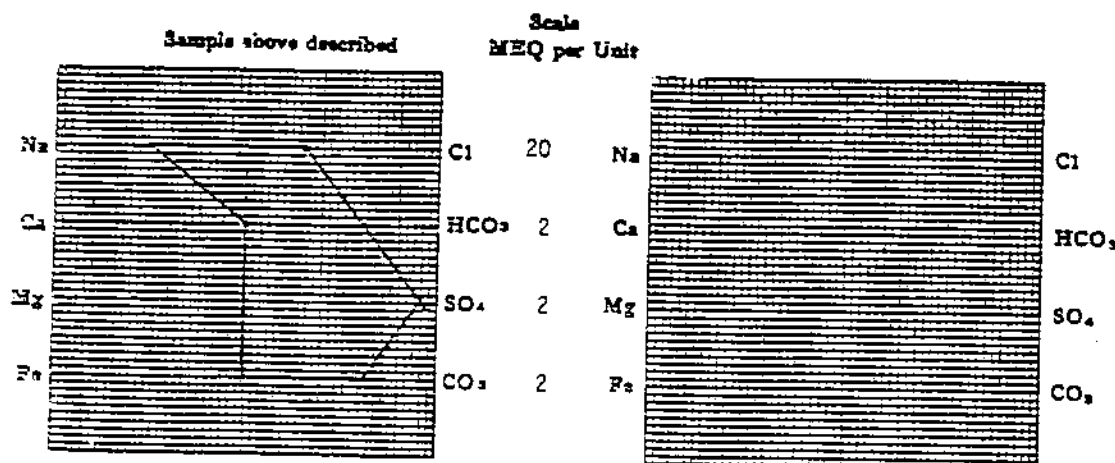
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-5  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8665)  
STATE Alaska SAMPLE FROM Rat hole mud (260 stks)

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----294

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	5899	256.63	Sulfate	2194	45.64
Potassium	197	5.04	Chloride	5400	152.28
Calcium	8	0.40	Carbonate	974	32.43
Magnesium	1	0.08	Bicarbonate	1939	31.80
Iron	-	--	Hydroxide	-	--
Total Cations		262.15	Total Anions		262.15
Total dissolved solids, mg/l	15628		Specific resistance @ 68°F:		
NaCl equivalent, mg/l	14353		Observed	0.55	ohm-centimeters
Observed pH	9.2		Calculated	0.54	ohm-centimeters

## WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Meq/l is Milliequivalents per liter. Meq/l is Milliequivalents per liter.  
Sulfate chloride contribution by Dumas & Henschel's calculation from composition



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## WATER ANALYSIS REPORT

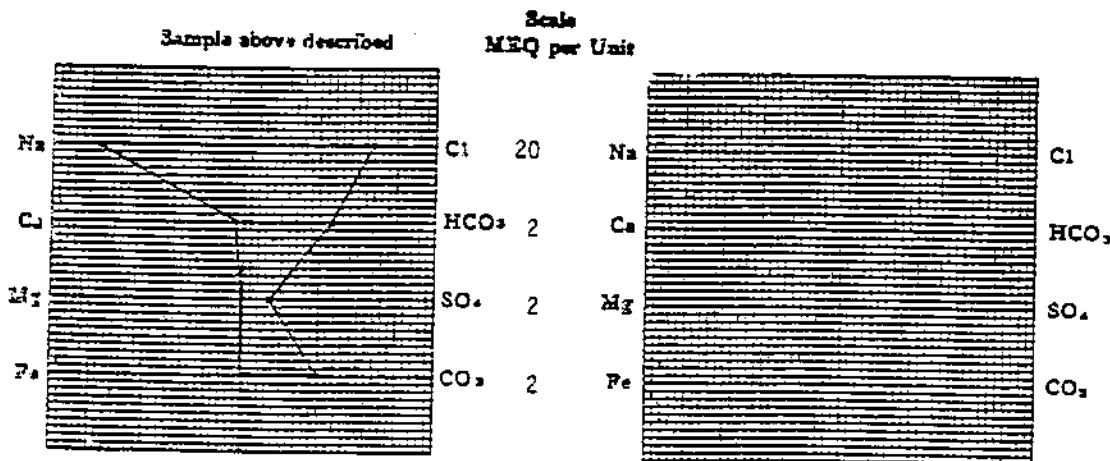
OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-6  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8565)  
STATE Alaska SAMPLE FROM Formation Water (500 stks)

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----428

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	8788	382.31	Sulfate	333	6.93
Potassium	134	3.43	Chloride	12000	338.40
Calcium	54	2.69	Carbonate	603	20.08
Magnesium	8	0.66	Bicarbonate	1444	23.68
Iron	-	--	Hydrosulfide	-	--
Total Cations		389.09	Total Anions		389.09

Total dissolved solids, mg/l 22631 Specific resistance @ 68°F.:  
NaCl equivalent, mg/l 22305 Observed 0.38 ohm-centimeters  
Observed pH 8.7 Calculated 0.33 ohm-centimeters

## WATER ANALYSIS PATTERN



(No value in above graphs indicates Na, K, and Li)  
NOTE: Mg/l = MEQ/l x 1.215; Ca/l = MEQ/l x 2.004; Fe/l = MEQ/l x 0.858  
Sodium chloride equivalent by Dumas & Mendenhall calculation from composition



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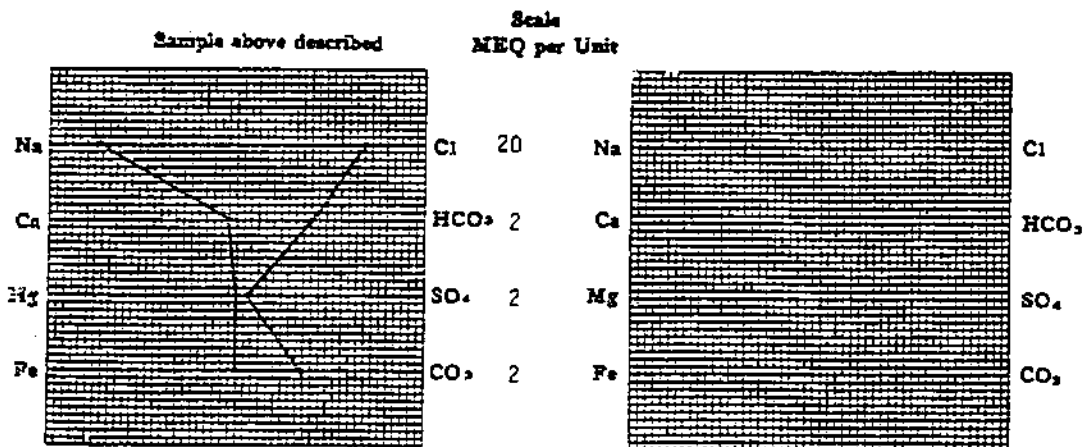
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-7  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8665)  
STATE Alaska SAMPLE FROM Formation Water (750 stks)

REMARKS & CONCLUSIONS: Oil & Grease content, mg/l-----345

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	8576	373.06	Sulfate	145	3.02
Potassium	79	2.02	Chloride	12000	338.40
Calcium	40	2.00	Carbonate	510	16.98
Magnesium	10	0.82	Bicarbonate	1189	19.50
Iron	-	--	Hydroxide	-	--
Total Cations		377.90	Total Anions		377.90
Total dissolved solids, mg/l		21946	Specific resistance @ 66°F:		
CaCl equivalent, mg/l		21749	Observed	0.35	ohm-centimeters
Observed pH		8.6	Calculated	0.34	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value in above graphs includes Na, K, and Li)  
NOTE: Mg/l = 2.498 meq/l; Ca/l = 2.5 meq/l; SO<sub>4</sub>/l = 2 meq/l; CO<sub>3</sub>/l = 2 meq/l  
Sodium chloride equivalent by Dumas & Marshburn calculation from composition



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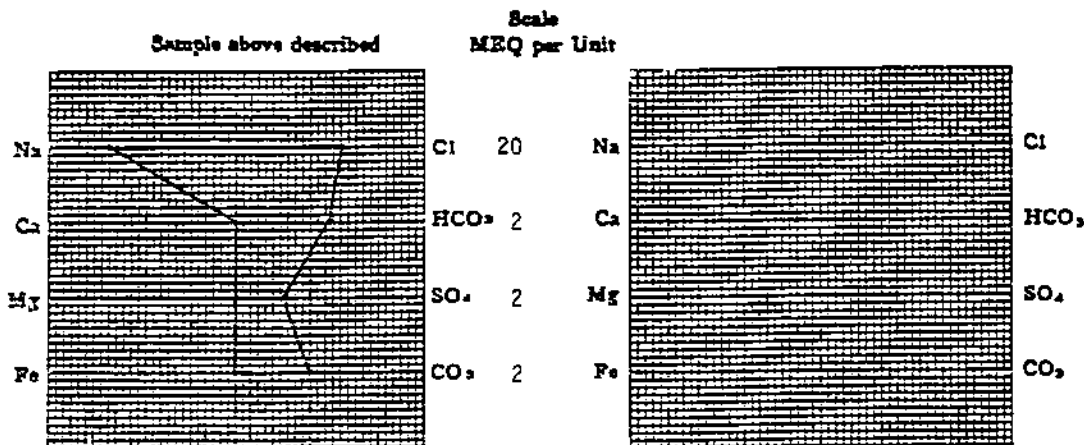
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-8  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8665)  
STATE Alaska SAMPLE FROM Top of tool

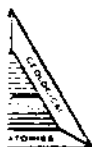
REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----12.7

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	7899	343.61	Sulfate	645	13.42
Potassium	82	2.10	Chloride	10200	287.63
Calcium	11	0.55	Carbonate	605	20.15
Magnesium	<1	--	Bicarbonate	1528	25.06
Iron	--	--	Hydroxide	--	--
Total Cations		346.26	Total Anions		346.26
Total dissolved solids, mg/l	20194		Specific resistance @ 68°F:		
NaCl equivalent, mg/l	19688		Observed	0.39	ohm-centimeters
Observed pH	9.0		Calculated	0.37	ohm-centimeters

## WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/l = Milligrams per liter; Meq/l = Milligram equivalent per liter  
Sodium chloride equivalent by Donnan & Henderson calculation from composition



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## WATER ANALYSIS REPORT

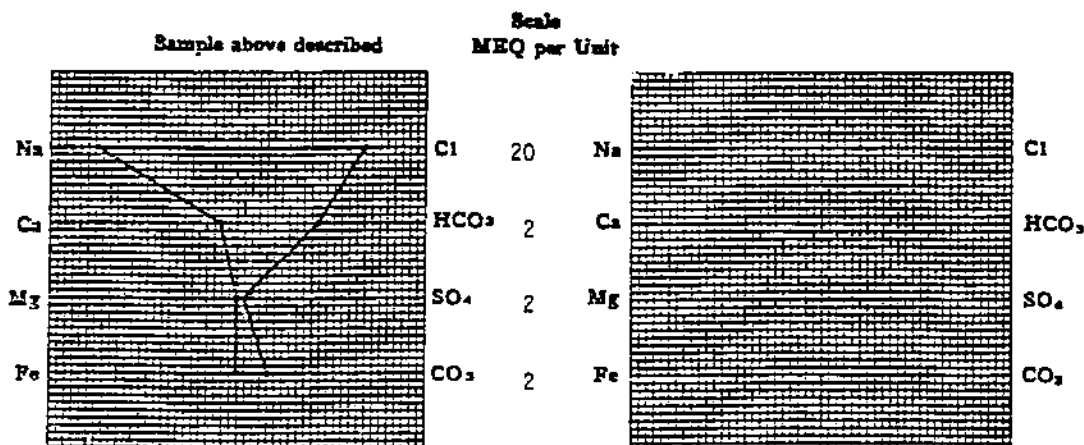
OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-9  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 2 (8568-8665)  
STATE Alaska SAMPLE FROM Between Dual CIP & hydrospring

### REMARKS & CONCLUSIONS:

Oil & Grease content, mg/l-----19.8

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	8596	373.95	Sulfate	114	2.37
Potassium	59	1.51	Chloride	12300	346.86
Calcium	81	4.04	Carbonate	255	8.49
Magnesium	9	0.74	Bicarbonate	1373	22.52
Iron	-	--	Hydrosulfide	-	--
Total Cations		380.24	Total Anions		380.24
Total dissolved solids, mg/l	22090		Specific resistance @ 68°F:		
NaCl equivalent, mg/l	21798		Observed	0.32	ohm-centimeters
Observed pH	8.4		Calculated	0.34	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value in above graphs indicates Na, K, and Li)  
NOTE: Mg/l in Milligrams per liter; Meq/l in Milligrams equivalent per liter  
Sodium chloride equivalent by Dumas & Bunsen's calculation from composition





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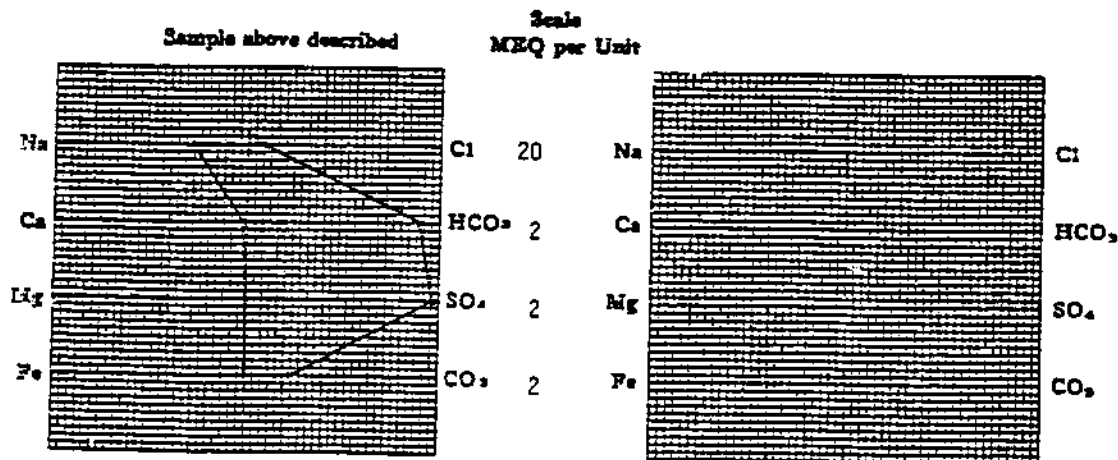
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-10  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL OST No. 3  
STATE Alaska SAMPLE FROM Suction Mud

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----<10

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	3260	141.81	Sulfate	2330	48.46
Potassium	47	1.20	Chloride	1400	39.48
Calcium	20	1.00	Carbonate	348	11.59
Magnesium	1	0.08	Bicarbonate	2717	44.56
Iron	-	--	Hydrosulfide	-	--
Total Cations		144.09	Total Anions		144.09
Total dissolved solids, mg/l	8745		Specific resistance @ 44°F.:		
NaCl equivalent, mg/l	7065		Observed	1.00	ohm-centimeters
Observed pH	9.3		Calculated	0.97	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value in above results includes Na, K, and Li)  
NOTE: Mg/l = Milligram per liter; Meq/l = Milligram equivalent per liter  
Sodium chloride equivalent by Dupont & Harbison calculation from components



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## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-11  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 3  
STATE Alaska SAMPLE FROM Pretest water cushion

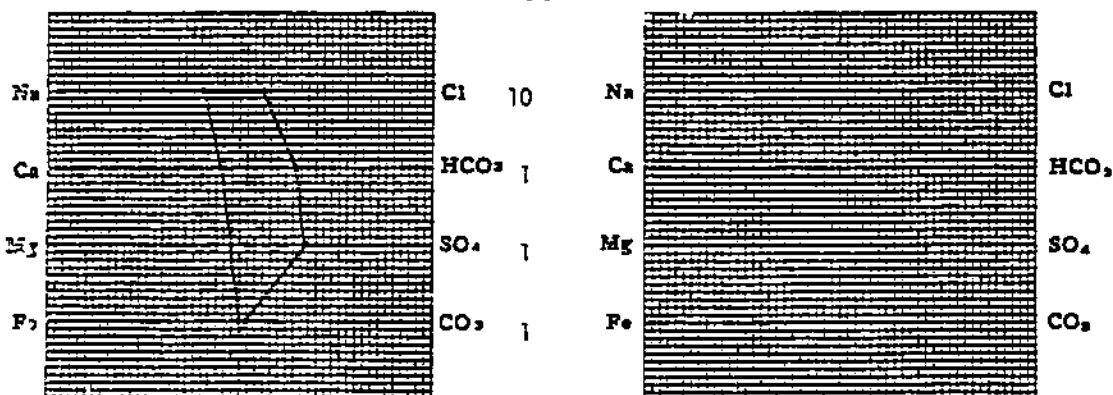
### REMARKS & CONCLUSIONS:

Oil & Grease content, mg/l----- <10

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	1064	46.29	Sulfate	411	8.55
Potassium	26	0.67	Chloride	1200	33.84
Calcium	48	2.40	Carbonate	23	0.77
Magnesium	15	1.23	Bicarbonate	453	7.43
Iron	-	--	Hydroxide	-	--
Total Cations		50.59	Total Anions		50.59
Total dissolved solids, mg/l	3010		Specific resistance @ 48°F:		
NaCl equivalent, mg/l	2722		Observed	2.5	ohm-cmeters
Observed pH	8.3		Calculated	2.44	ohm-cmeters

## WATER ANALYSIS PATTERN

Sample above described  
Scale  
MEQ per Unit



(No value in above graphs includes Na, K, and Li)  
NOTE: Mg/100MEqgrams per liter Mg/100 MEqgrams equivalent per liter  
Sodium chloride equivalent by Dupont & Associates calculated from composition



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## WATER ANALYSIS REPORT

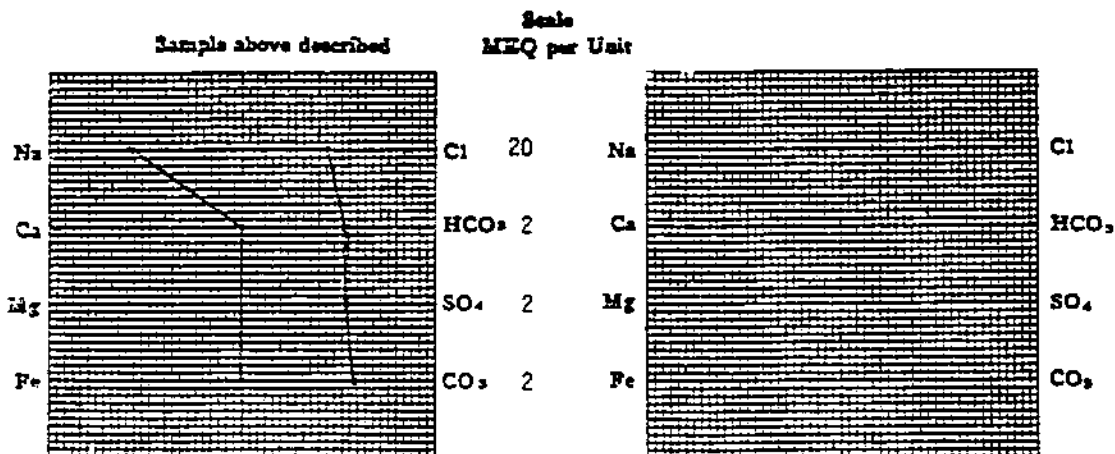
OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-12  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 3  
STATE Alaska SAMPLE FROM Formation fluid above CIP

### REMARKS & CONCLUSIONS:

Oil & Grease content, mg/l-----1514

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	6598	287.05	Sulfate	1310	27.25
Potassium	278	7.12	Chloride	7500	211.50
Calcium	11	0.55	Carbonate	882	29.37
Magnesium	1	0.08	Bicarbonate	1627	26.68
Iron	-	-	Hydroxide	-	-
Total Cations . . . . .			294.80	Total Anions . . . . .	
			294.80		
Total Dissolved Solids, mg/l . . . . .			17382	Specific resistance @ 44°F.: . . . .	
NaCl equivalent, mg/l . . . . .			16594	Observed . . . . .	
Observed pH . . . . .			8.9	Calculated . . . . .	
				0.41 ohm-centimeters	
				0.44 ohm-centimeters	

## WATER ANALYSIS PATTERN



(Na values in above graphs include Na, K, and Li)  
NOTE: Meq/l is Milliequivalents per liter Meq/l is Milliequivalents per liter  
Sodium chloride equivalent by Dumas & Haverstick calculation from composition



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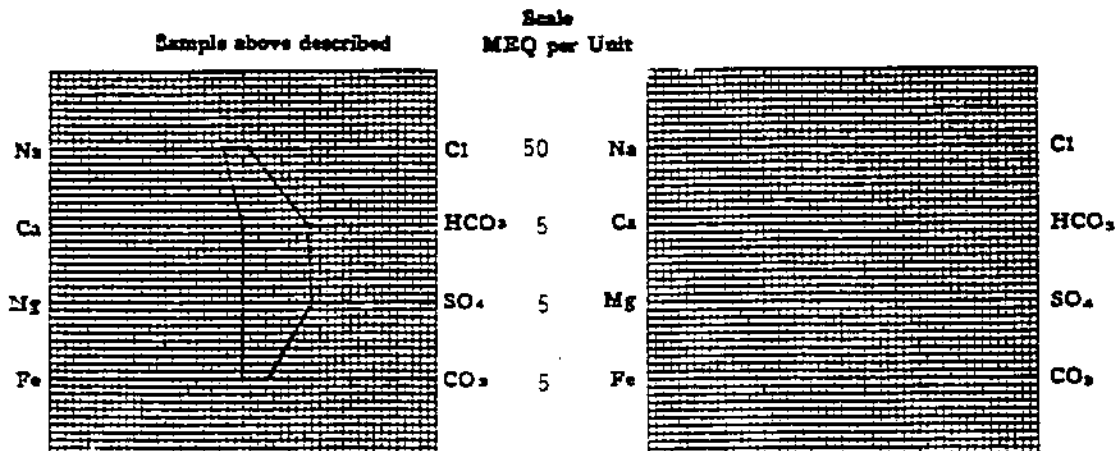
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-13  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 3  
STATE Alaska SAMPLE FROM Middle fluid recovery (756 stks)

REMARKS & CONCLUSIONS: Quebracho  
Oil & grease content-%-----85

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	3030	131.84	Sulfate	2236	46.51
Potassium	47	1.20	Chloride	1000	28.20
Calcium	16	0.80	Carbonate	510	16.98
Magnesium	1	0.08	Bicarbonate	2575	42.23
Iron	-	--	Hydroxide	-	--
Total Cations		133.92	Total Anions		133.92
Total dissolved solids, mg/l	8109		Specific resistance @ 40°F.: Observed 1.00 ohm-cm/cm Calculated 1.01 ohm-cm/cm		
NaCl equivalent, mg/l	6550				
Observed pH	9.3				

## WATER ANALYSIS PATTERN



(No value in above graphs includes Na, K, and Li)  
NOTE: Mg/1000mg/l is 1000 mg/l. Mg/1000mg/l is 1000 mg/l. Mg/1000mg/l is 1000 mg/l.  
Sodium chloride equivalent by Dougan & Henricsson calculation from composition



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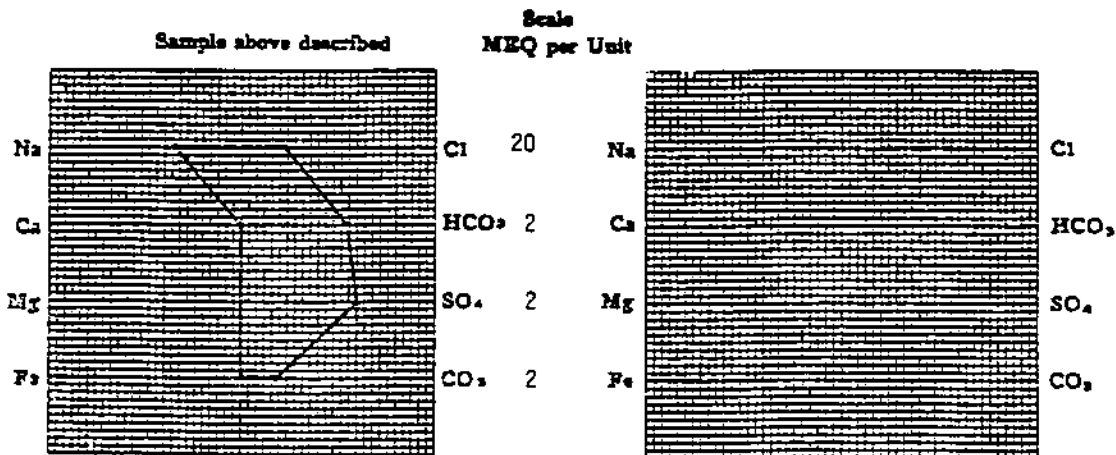
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-14  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 3  
STATE Alaska SAMPLE FROM Formation Fluid (885 stks)

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----2984

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	4075	177.30	Sulfate	1435	29.85
Potassium	173	4.43	Chloride	4100	115.61
Calcium	11	0.55	Carbonate	278	9.26
Magnesium	<1	0.06	Bicarbonate	1684	27.62
Iron	-	--	Hydrosulfide	-	--
Total Cations		182.34	Total Anions		182.34
Total dissolved solids, mg/l		10901	Specific resistance @ 25°C		
NaCl equivalent, mg/l		9882	Observed	0.80	ohm-cmeters
Observed pH		9.0	Calculated	0.71	ohm-cmeters

## WATER ANALYSIS PATTERN



(No values in above circles indicate Na, K, and Li)  
NOTE: Mg/l in Milligrams per liter Meq/l in Milligrams equivalent per liter  
Sodium chloride equivalent by Dupont & Hawthorne calculation from composition



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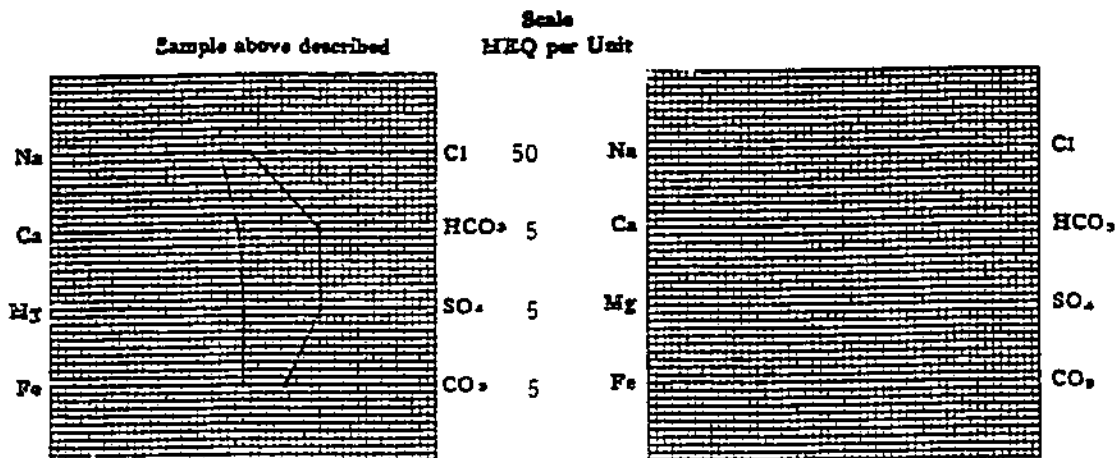
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-15  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 3  
STATE Alaska SAMPLE FROM Bottom fluid (975 stks)

REMARKS & CONCLUSIONS: Overbracho

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	3608	156.98	Sulfate	2496	51.91
Potassium	44	1.13	Chloride	1100	31.02
Calcium	43	2.15	Carbonate	835	27.81
Magnesium	2	0.16	Bicarbonate	3029	49.68
Iron	-	--	Hydrosulfide	-	--
Total Cations		160.42	Total Anions		160.42
Total dissolved solids, mg/l	9621		Specific resistance @ 46°F.:		
NaCl equivalent, mg/l	7914		Observed	1.10	ohm-centimeters
Observed pH	9.2		Calculated	0.87	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value is shown greater than 100, 50, and 10)  
NOTE: Mg/l is Milligrams per liter Meq/l is Milligrams equivalent per liter  
Sodium chloride equivalent by Dupont & Harwood calculation from components



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5633 8 Street

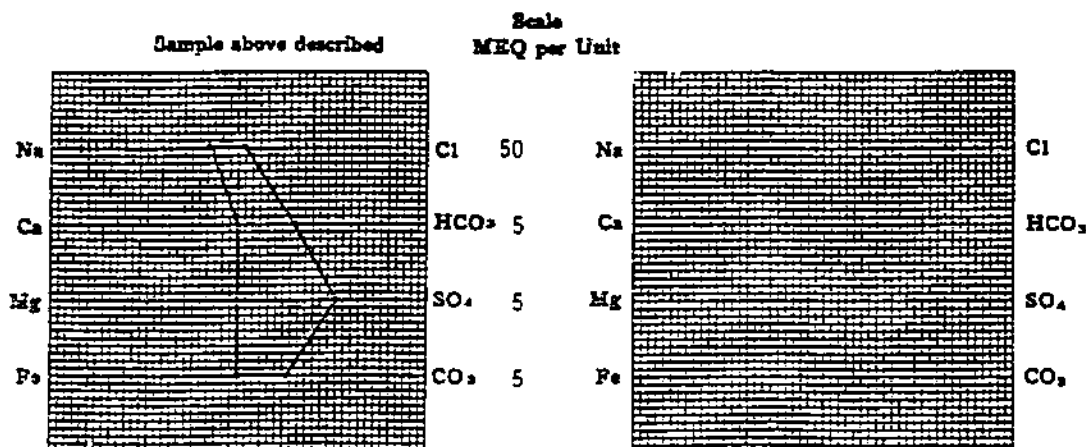
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-16  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 4  
STATE Alaska SAMPLE FROM Mud

REMARKS & CONCLUSIONS: Quebracho

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	4136	179.94	Sulfate	3120	64.90
Potassium	53	1.36	Chloride	1600	45.12
Calcium	13	0.65	Carbonate	1020	33.96
Magnesium	1	0.08	Bicarbonate	2320	38.05
Iron	-	-	Hydrosulfide	-	-
Total Cations		182.03	Total Anions		182.03
Total dissolved solids, mg/l		11086	Specific resistance @ 66°F:		
NaCl equivalent, mg/l		9274	Observed	0.80	ohm-centimeters
Observed pH		9.2	Calculated	0.75	ohm-centimeters

## WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/l = MEQ/l x 1.17; Ca/l = MEQ/l x 2.0; SO<sub>4</sub>/l = MEQ/l x 1.0; CO<sub>3</sub>/l = MEQ/l x 1.0  
Sodium chloride equivalent by Dupont & Harshbarger calculation from composition



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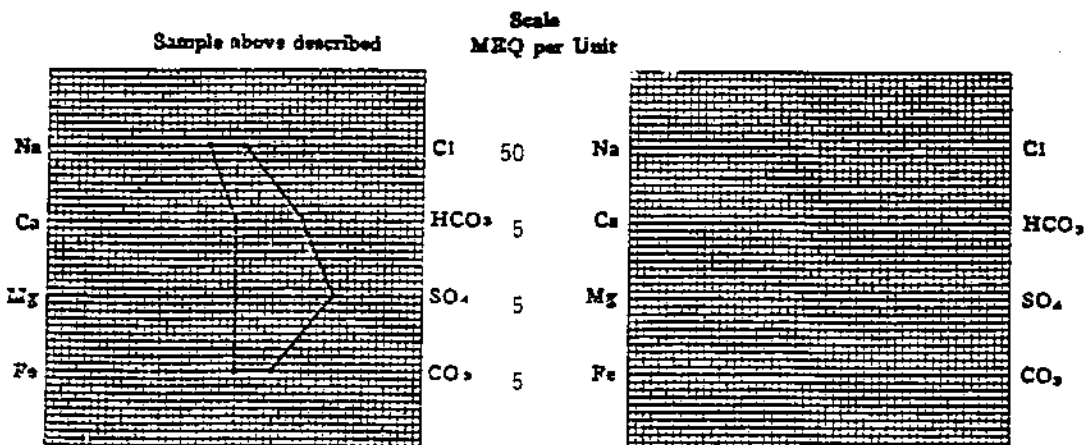
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-17  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 4  
STATE Alaska SAMPLE FROM First to surface (883 stks)

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----968

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	4045	175.96	Sulfate	3130	65.11
Potassium	28	0.72	Chloride	1500	42.30
Calcium	11	0.55	Carbonate	740	24.64
Magnesium	1	0.08	Bicarbonate	2760	45.26
Iron	-	-	Hydroxide	-	-
Total Cations		177.31	Total Anions		177.31
Total dissolved solids, mg/l	10815		Specific resistance @ 68°F.:		
NaCl equivalent, mg/l	8828		Observed	1.03	ohm-centimeters
Observed pH	9.1		Calculated	0.79	ohm-centimeters

## WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/l = MEQ/l x 1.17046  
Sulfate chloride equivalent: by Dumas & Marshburn calculation from composition





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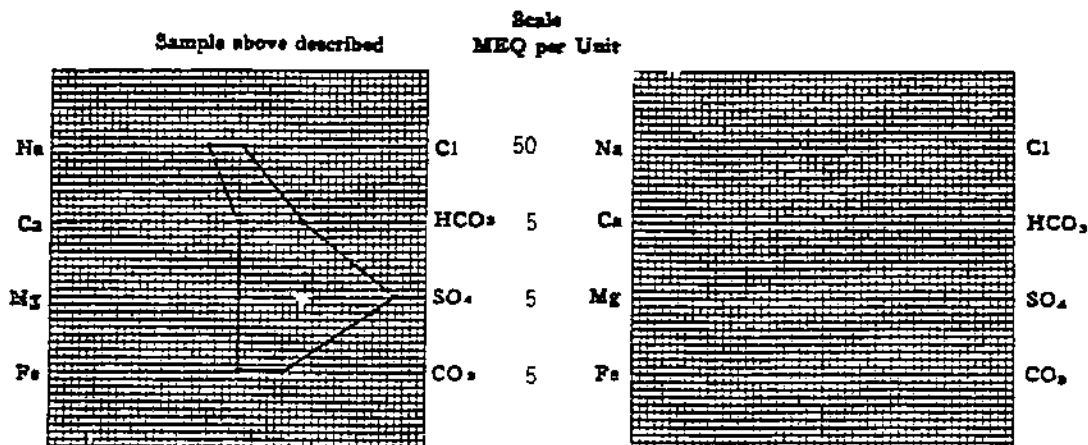
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-18  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 4  
STATE Alaska SAMPLE FROM From CIP Valve

REMARKS & CONCLUSIONS: Quebracho  
Oil & Grease content, mg/l-----2720

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	4710	204.91	Sulfate	5117	106.43
Potassium	77	1.97	Chloride	1000	28.20
Calcium	24	1.20	Carbonate	928	30.90
Magnesium	2	0.16	Bicarbonate	2604	42.71
Iron	-	--	Hydroxide	-	--
Total Cations		208.24	Total Anions		208.24
Total dissolved solids, mg/l	13141		Specific resistance @ 40°F:		
NaCl equivalent, mg/l	10244		Observed	1.06	ohm-centimeters
Observed pH	9.2		Calculated	0.69	ohm-centimeters

## WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/l = Milligrams per liter; Meq/l = Milliequivalents per liter  
Sodium chloride equivalent may be used for hardness calculations from components



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## GAS ANALYSIS REPORT

Company Husky Oil Company Date August 30, 1979 Lab. No. 1154-19  
Well No. J. W. Dalton No. 1 Location \_\_\_\_\_  
Field North Slope Formation \_\_\_\_\_  
County \_\_\_\_\_ Depth DST No. 4  
State Alaska Sampling point Gas from above water cushion  
Line pressure \_\_\_\_\_ psig; Sample pressure \_\_\_\_\_ psig; Temperature \_\_\_\_\_ ° F; Container number \_\_\_\_\_  
Remarks \_\_\_\_\_

Component	Mole % or Volume %	
Oxygen .....	0	
Nitrogen .....	0.87	
Carbon dioxide .....	TRACE	
Hydrogen sulfide .....	---	
Methane .....	87.10	Gallons
Ethane .....	4.06	per MCF
Propane .....	2.03	0.557
Iso-butane .....	0.71	0.232
N-butane .....	1.27	0.399
Iso-pentane .....	0.90	0.328
N-pentane .....	0.49	0.177
Hexanes .....	0.84	0.345
Heptanes & higher .....	1.73	0.797
Total .....	100.00	2.835

GPM of pentanes & higher fraction ..... 1.647  
Gross btu cu. ft. @60° F. & 14.7 psia (dry basis) ..... 1258  
Specific gravity (calculated from analysis) ..... 0.723  
Specific gravity (measured) ..... 0.725

Remarks: \_\_\_\_\_





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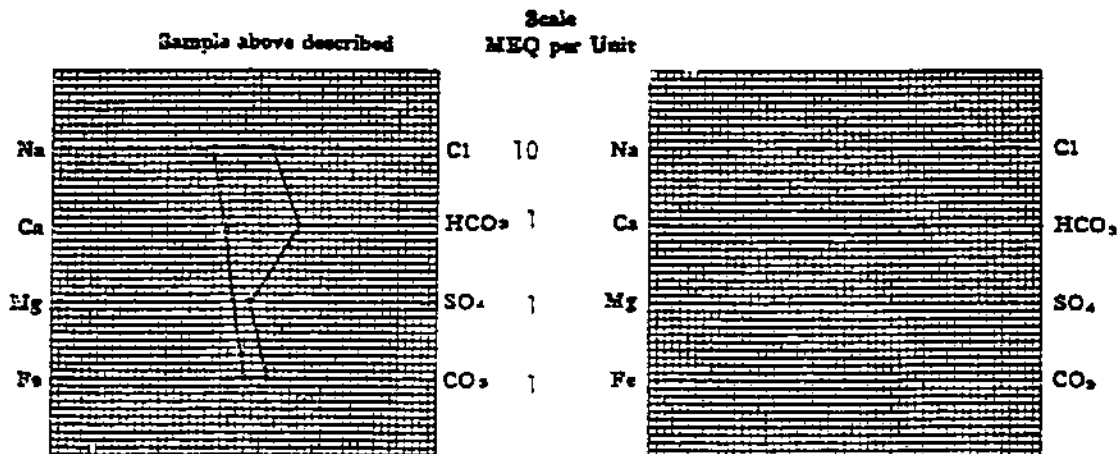
## WATER ANALYSIS REPORT

OPERATOR	Husky Oil Company	DATE	August 30, 1979	LAB NO.	1154-21
WELL NO.	J. W. Dalton No. 1	LOCATION			
FIELD	North Slope	FORMATION			
COUNTY		INTERVAL	DST No. 5		
STATE	Alaska	SAMPLE FROM	Water Cushion		

### REMARKS & CONCLUSIONS:

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	905	39.40	Sulfate	21	0.44
Potassium	28	0.72	Chloride	1200	33.83
Calcium	55	2.74	Carbonate	93	3.10
Magnesium	18	1.48	Bicarbonate	425	6.97
Iron	-	--	Hydrosulfide	-	--
Total Cations		44.34	Total Anions		44.34
Total dissolved solids, mg/l	2529		Specific resistance @ 68°F:		
NaCl equivalent, mg/l	2463		Observed	2.8	ohm-centimeters
Observed pH	8.5		Calculated	2.62	ohm-centimeters

## WATER ANALYSIS PATTERN



(Me values to above graphs include Na, K, and Li)  
NOTE: Mg/1000 Milligrams per liter Meq/1000 Milligrams equivalent per liter  
Sodium chloride equivalent may be determined by Doung & Mearns calculation from samplegrams



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## WATER ANALYSIS REPORT

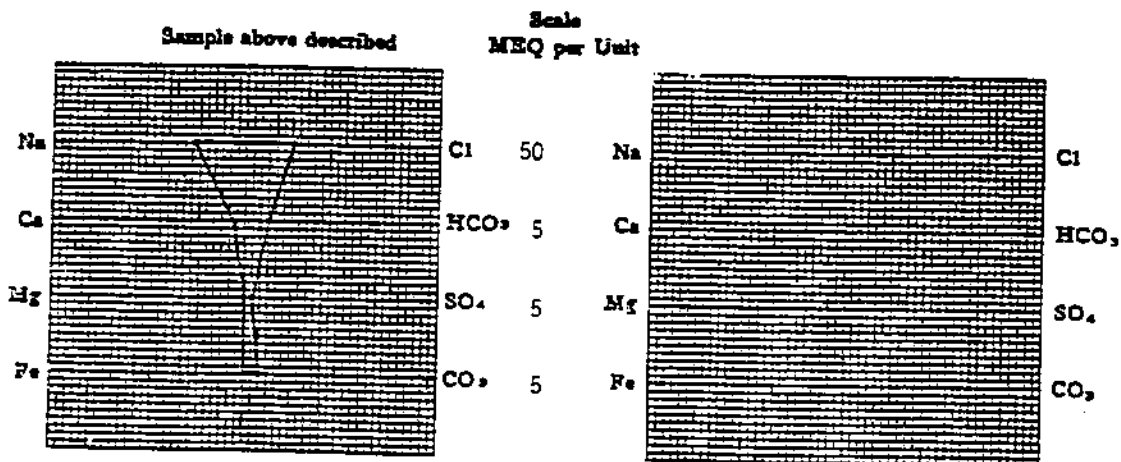
OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-22  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 5  
STATE Alaska SAMPLE FROM Top reverse out

### REMARKS & CONCLUSIONS:

Oil & Grease content, mg/l-----1660

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	7743	336.84	Sulfate	207	4.31
Potassium	90	2.30	Chloride	11200	315.84
Calcium	146	7.29	Carbonate	348	11.59
Magnesium	19	1.56	Bicarbonate	991	16.25
Iron	-	--	Hydroxide	-	--
Total Cations		347.99	Total Anions		347.99
Total dissolved solids, mg/l		20241	Specific resistance @ 68°F:		
NaCl equivalent, mg/l		20019	Observed	0.37	ohm-cm/cm
Observed pH		8.6	Calculated	0.36	ohm-cm/cm

## WATER ANALYSIS PATTERN



(No value to above graphs includes Na, K, and Li)  
NOTE: Mg/l = Milligram per liter Meq/l = Milligram equivalent per liter  
Sodium chloride equivalent: Drying & Moisture calculation from composition



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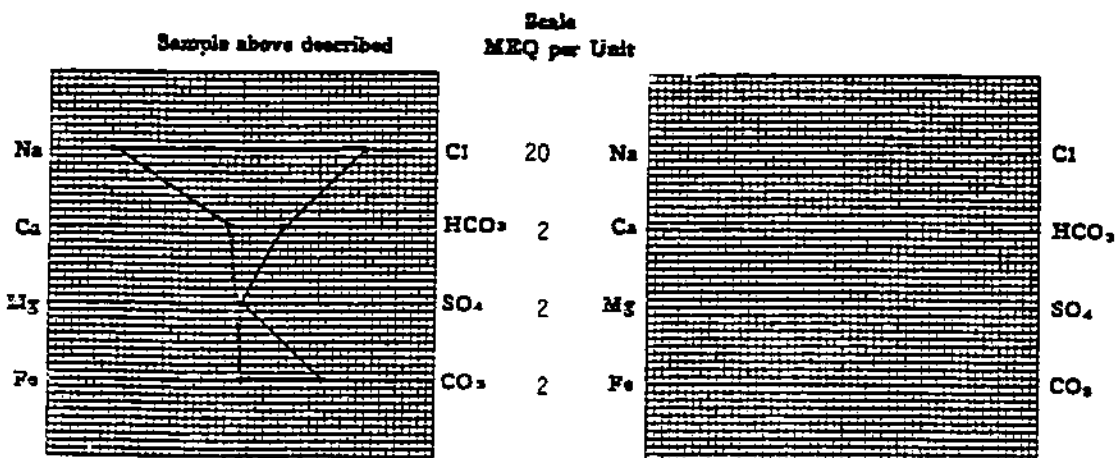
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-23  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 5  
STATE Alaska SAMPLE FROM Formation water below test valve.

### REMARKS & CONCLUSIONS:

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	7865	342.16	Sulfate	11	0.23
Potassium	77	1.97	Chloride	11200	315.83
Calcium	59	2.94	Carbonate	650	21.65
Magnesium	16	1.32	Bicarbonate	651	10.68
Iron	-	--	Hydroxide	-	--
Total Cations		348.39	Total Anions		348.39
Total dissolved solids, mg/l		20198	Specific resistance @ 68°F:		
NaCl equivalent, mg/l		20230	Observed	0.39	ohm-centimeters
Observed pH		8.6	Calculated	0.36	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value in above graphs includes Na, K, and Li)  
NOTE: Mg/l in Milligrams per liter; Meq/l in Milligrams equivalent per liter  
Sodium chloride equivalent may be used to determine salinity from composition



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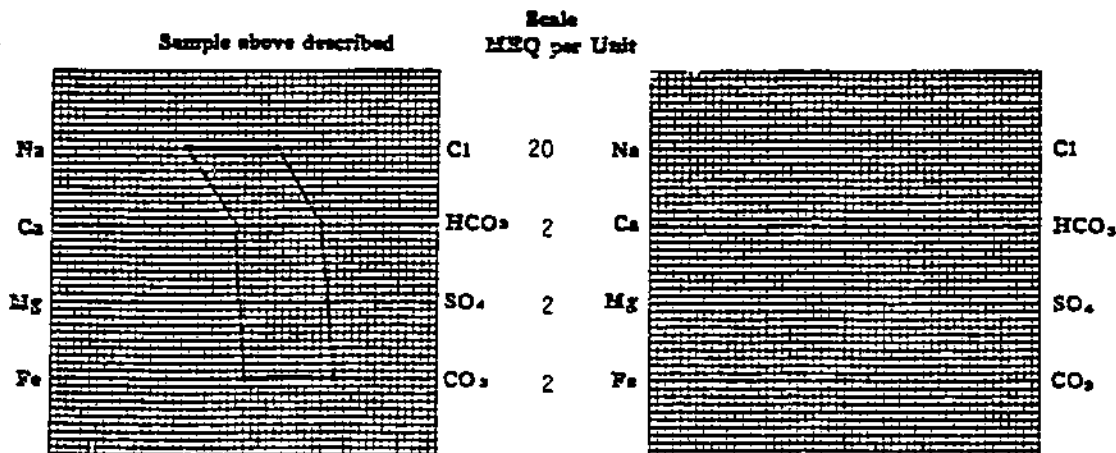
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-24  
WELL NO. J. W. Dalton #1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 5  
STATE Alaska SAMPLE FROM Formation Water (Time 4:21)

### REMARKS & CONCLUSIONS:

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	3311	143.85	Sulfate	1050	21.84
Potassium	173	4.43	Chloride	3100	87.24
Calcium	40	2.00	Carbonate	696	23.18
Magnesium	18	1.48	Bicarbonate	1189	19.50
Iron	-	--	Hydrosulfide	-	--
Total Cations		151.76	Total Anions		151.76
Total dissolved solids, mg/l		8974	Specific resistance @ 45°F.:		
NaCl equivalent, mg/l		8380	Observed	0.91	ohm-centimeters
Observed pH		9.1	Calculated	0.83	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value in above graphs includes Na, K, and Li)  
NOTE: Mg/l is MEQ/l times 1.2. Na/l is MEQ/l times 1.2.  
Sodium chloride equivalent may be used for hardness calculation from composition.



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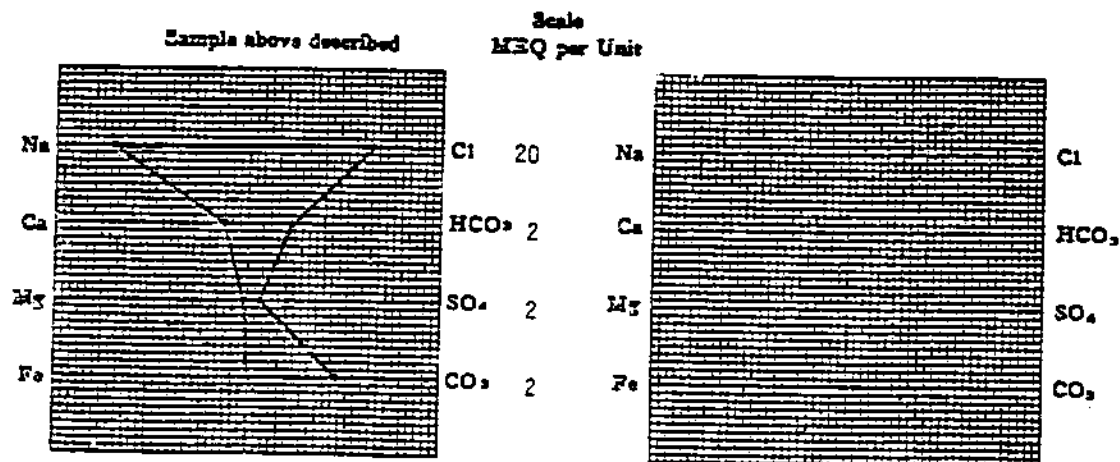
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-25  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 5  
STATE Alaska SAMPLE FROM Formation Water (7 hrs. 30 min.)

### REMARKS & CONCLUSIONS:

Cations			Anions		
	mg/l	meq/l		mg/l	meq/l
Sodium	8077	351.37	Sulfate	156	3.24
Potassium	78	2.00	Chloride	11500	324.30
Calcium	135	6.74	Carbonate	695	23.14
Magnesium	18	1.48	Bicarbonate	665	10.91
Iron	-	-	Hydroxide	-	-
Total Cations	-	361.59	Total Anions	-	361.59
Total dissolved solids, mg/l	-	20986	Specific resistance @ 68°F:	-	-
NaCl equivalent, mg/l	-	20952	Observed	0.35	ohm-cmeters
Observed pH	-	8.6	Calculated	0.35	ohm-cmeters

## WATER ANALYSIS PATTERN



(Na value in above graphs includes Na, K, and Li)  
NOTE: Mg/l is in parentheses per liter Meq/l is Milligram equivalent per liter  
Sodium chloride equivalent is the sum of the sodium and chloride ions in the sample





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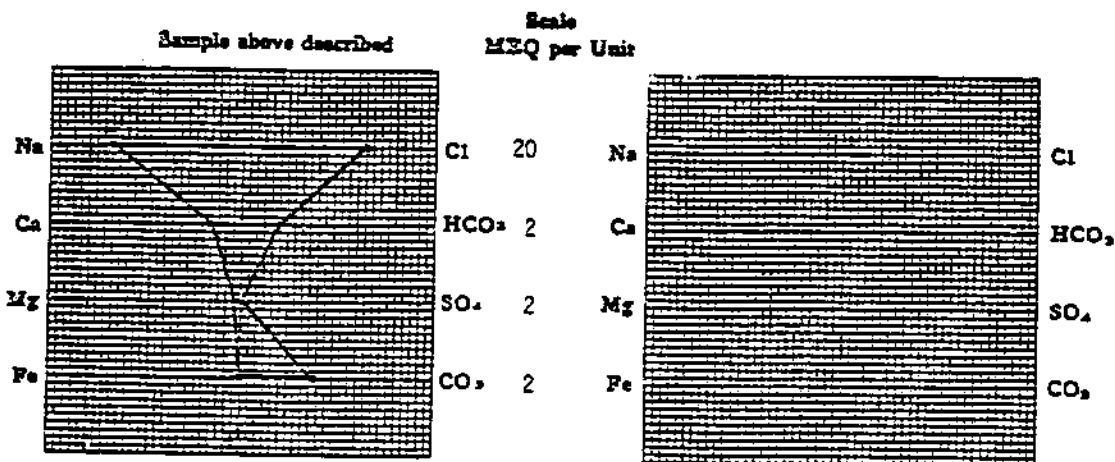
## WATER ANALYSIS REPORT

OPERATOR Husky Oil Company DATE August 30, 1979 LAB NO. 1154-26  
WELL NO. J. W. Dalton No. 1 LOCATION \_\_\_\_\_  
FIELD North Slope FORMATION \_\_\_\_\_  
COUNTY \_\_\_\_\_ INTERVAL DST No. 5  
STATE Alaska SAMPLE FROM Bottom reverse out

### REMARKS & CONCLUSIONS:

Cations	mg/l	mg/l	Anions	mg/l	mg/l
Sodium	7921	344.57	Sulfate	31	0.64
Potassium	80	2.05	Chloride	11600	327.13
Calcium	164	8.18	Carbonate	580	19.31
Magnesium	19	1.56	Bicarbonate	566	9.28
Iron	-	--	Hydrosulfide	-	--
Total Cations		356.36	Total Anions		356.36
Total dissolved solids, mg/l		20674	Specific resistance @ 25°F.:		
NaCl equivalent, mg/l		20693	Observed	0.35	ohm-centimeters
Observed pH		8.6	Calculated	0.35	ohm-centimeters

## WATER ANALYSIS PATTERN



(No value in above graphs includes Na, K, and Li)  
NOTE: Mg/l is Milligrams per liter; Meq/l is Milligram equivalent per liter  
Sodium chloride equivalent may be calculated from the following formula:



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## GAS ANALYSIS REPORT

Company Husky Oil Company Date August 30, 1979 Lab. No. 1154-27  
Well No. J. W. Dalton No. 1 Location \_\_\_\_\_  
Field North Slope Formation \_\_\_\_\_  
County \_\_\_\_\_ Depth DST No. 5  
State Alaska Sampling point Gas Sample under pump pres.  
Line pressure \_\_\_\_\_ psig; Sample pressure 300 psig; Temperature \_\_\_\_\_ ° F; Container number \_\_\_\_\_  
Remarks \_\_\_\_\_

Component	Mole % or Volume %	
Oxygen	0	
Nitrogen	0.68	
Carbon dioxide	TRACE	
Hydrogen sulfide	---	
Methane	97.30	Gallons
Ethane	1.00	per MCF
Propane	0.61	0.167
Iso-butane	0.32	0.104
N-butane	0.08	0.025
Iso-pentane, & Higher	0.01	0.004
Total	100.00	0.300
GPM of pentanes & higher fraction	0.004	
Gross bru cu. ft. @ 60° F. & 14.7 psia (dry basis)	1033	
Specific gravity (calculated from analysis)	0.576	
Specific gravity (measured)	0.575	

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

LE SUBJECT X-5020 SHEET NO. \_\_\_\_\_ DATE June 20 19 79



## LABORATORY REPORT

RECEIVING NO. \_\_\_\_\_ DATE REC'D \_\_\_\_\_ 19 \_\_\_\_\_

SAMPLE DESCRIPTION

Core sample from USGS/Husky N.P.R.

J.W. Dalton Well # 1 at 7515' (Sidewall core, analyzed from GR shale, courtesy Dresser-Atlas)

RECEIVED FROM

W.H. Fertl

SUBJECT OF TEST

Mineralogy

Analysis by x-ray diffraction gave the following components:

7515 Feet

20-25% Mica  
25-30% Chlorite  
10-15% Feldspar  
2-5 % Dolomite  
5-10% Pyrite  
10-15% Quartz

XC: Finis Turner  
Bob Lockhart  
Keith Wagner  
Walter Fertl

REMARKS:

BY Ray Clark

APPROVED BY [Signature]

PRINTED IN U.S.A.

LISTING OF OTHER AVAILABLE GEOLOGICAL DATA\*

1. FINAL MICROPALAEONTOLOGY REPORT  
(Anderson, Warren & Associates, Inc.)
2. FINAL PALYNOLOGY REPORT  
(Anderson, Warren & Associates, Inc.)
3. DRILLING HISTORY
4. HALLIBURTON DRILL STEM TEST REPORTS  
for Drill Stem Tests Nos. 1 through 5 with charts and reservoir analysis.
5. WIRELINE LOGS  
Open Hole and Cased Hole (Dresser Atlas)

\* Copies of above and all other well data are available from:

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