

A Digital Atlas of Hydrocarbon Accumulations Within and Adjacent to the National Petroleum Reserve–Alaska (NPRA)

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Oil and gas accumulation displays (listed below)

	Map	Seismic	Well Log	Porosity and Permeability
<i>Alpine Pool (Colville River Field)</i>	✓	✓	✓	✓
<i>Colville Delta (Kuukpik Unit)</i>	✓	✓	✓	✓
<i>East Barrow Pool (Barrow Field)</i>	✓	✓	✓	✓
<i>East Kurupa</i>	✓	✓	✓	
<i>East Umiat</i>	✓	✓	✓	✓
<i>Fiord (Colville River Unit)</i>	✓	✓	✓	✓
<i>Fish Creek</i>	✓	✓	✓	
<i>Gubik</i>	✓	✓	✓	✓
<i>Kalubik (Kuukpik Unit)</i>	✓	✓	✓	✓
<i>Meade</i>	✓	✓	✓	
<i>Sikulik Pool (Barrow Field)</i>	✓	✓	✓	
<i>Simpson</i>	✓	✓	✓	
<i>South Barrow Pool (Barrow Field)</i>	✓	✓	✓	✓
<i>Square Lake</i>	✓	✓	✓	✓
<i>Tabasco Pool (Kuparuk River Field)</i>	✓	✓	✓	✓
<i>Tarn Pool (Kuparuk River Field)</i>	✓	✓	✓	
<i>Umiat</i>	✓	✓	✓	✓
<i>Walakpa</i>	✓	✓	✓	✓
<i>Wolf Creek</i>	✓	✓	✓	

Introduction



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Introduction

The United States Geological Survey (USGS) has initiated a project to reassess the hydrocarbon potential of the NPRA. Although exploration for hydrocarbons in the NPRA was initiated in 1944, it has taken fifty years for the first commercial discovery to be made. That discovery, the Alpine field (projected recoverable reserves of 430 million barrels), was made in 1994 along the eastern boundary of the NPRA. This field produces from a formation heretofore considered to be mostly a source rock. The Alpine discovery made such a reassessment necessary. As part of this assessment, we have compiled stratigraphic, structural, petrophysical, and seismic data related to nineteen accumulations within and nearby the NPRA. The goal is to provide basic documentation and a set of analog accumulations for the new assessment.

The first two displays of this atlas consist of a [location map](#) and a [stratigraphic column](#) showing the stratigraphic settings for the primary reservoir and source rocks for these accumulations. The third display is a table listing each accumulation and providing the hydrocarbon fluid type, reservoir, operator, status, and discovery well and date for each. Compilation of basic information for each individual accumulation follows these displays. A typical compilation includes a structure-contour map on or near the reservoir horizon, a log display of the discovery well with reservoir characteristics along with figures for

recoverable volumes, and one or two seismic lines across or near the accumulation.

Data Sources

All the data has been derived from public sources: primarily Alaska state agencies and USGS files, and published literature. Appropriate credits have been made on each display throughout the atlas. The following list indicates the most significant sources for the compilation presented here.

Maps

Alaska Oil and Gas Conservation Commission, 1998, State of Alaska, Alaska Oil and Gas Conservation Commission Annual Report, 261p.
Alaska Oil and Gas Conservation Commission, 1999, State of Alaska, Alaska Oil and Gas Conservation Commission Field Rule files.
George Gryc (editor), 1988, Geology and Exploration of the National Petroleum Reserve in Alaska, 1974 to 1982, U.S. Geological Survey Professional Paper 1399, 940p.
Tetra Tech, 1982, Final Report on the Exploration of the National Petroleum Reserve in Alaska, Report 8200, 1974-1982, 3 folios.

(continued)



Field and Reservoir Data

Reserve numbers for a majority of the accumulations have been obtained from Kornbrath and others (1987). In addition, oil in place and recoverable reserve figures are available for some of the more recently discovered accumulations in Field and Pool Rule documents available through the Alaska Oil and Gas Conservation Commission. In addition to many of the maps, oil gravity and other reservoir information is also available through the Alaska Oil and Gas Conservation Commission Annual Reports.

Kornbrath, R.W. and others, 1997, Petroleum potential of the eastern National Petroleum Reserve–Alaska: Alaska Department of Natural Resources, Division of Oil and Gas, 30 p.

Seismic Data

Most seismic reflection records shown here are segments of data collected in the NPRA from 1974 through 1981 for the USGS. These data were reprocessed by the USGS using modern, post-stack processing techniques and displayed as color-amplitude records in almost all the examples shown here. For access to 22 of the reprocessed regional seismic lines (3,470 line-miles of data), see the following:

Miller, John J, Agena, Warren F., Lee, Myung W., Zihlman, Frederick N., Grow, John A., Taylor, David J., Killgore, Michele, and Oliver, Harold L., 2000, Regional Seismic Lines Reprocessed Using Post-Stack Processing Techniques: National Petroleum Reserve- Alaska, U.S.Geological Survey, Open-File Report 00-286 (Version 1.0).

Petrophysical Data

All log displays have been generated from USGS log files. Because some of the oldest wells did not have digital logs, those logs have been digitized from paper copies for displays in this atlas. The porosity and permeability data and test information is from original well files. Most of this data has been summarized by Bird (1988, in George Gryc, 1988).

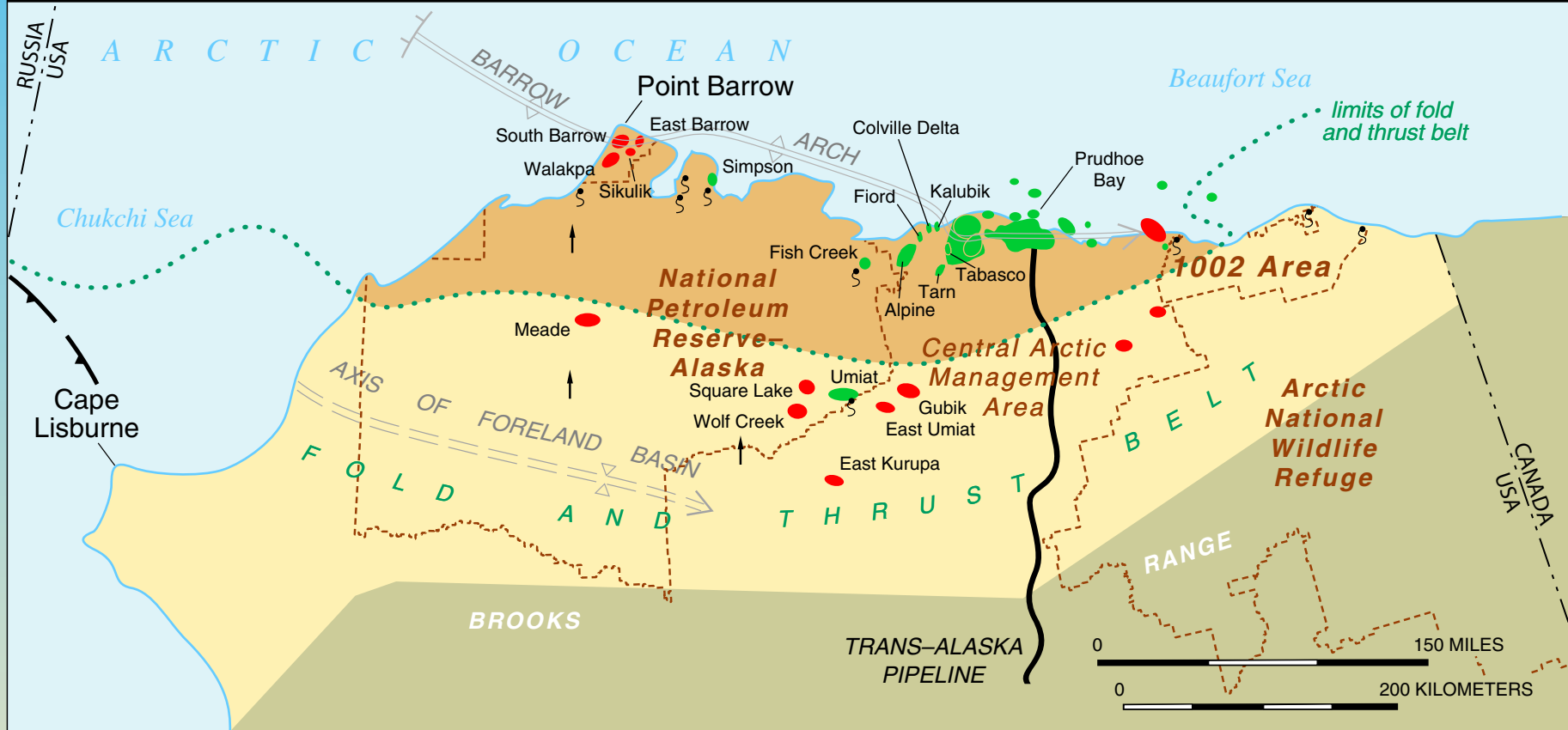
Summary

At this time, 71 displays describing 19 oil and gas accumulations are included in the digital atlas. Eventually, the remaining accumulations on the North Slope of Alaska, about 60 in all, will be added to the atlas.

Acknowledgements

We are grateful for the review and comments of Tim Ryherd and for the able assistance of Sandra Troutman and Megan Simpson in the final stages of document preparation.

Index map of oil and gas accumulations

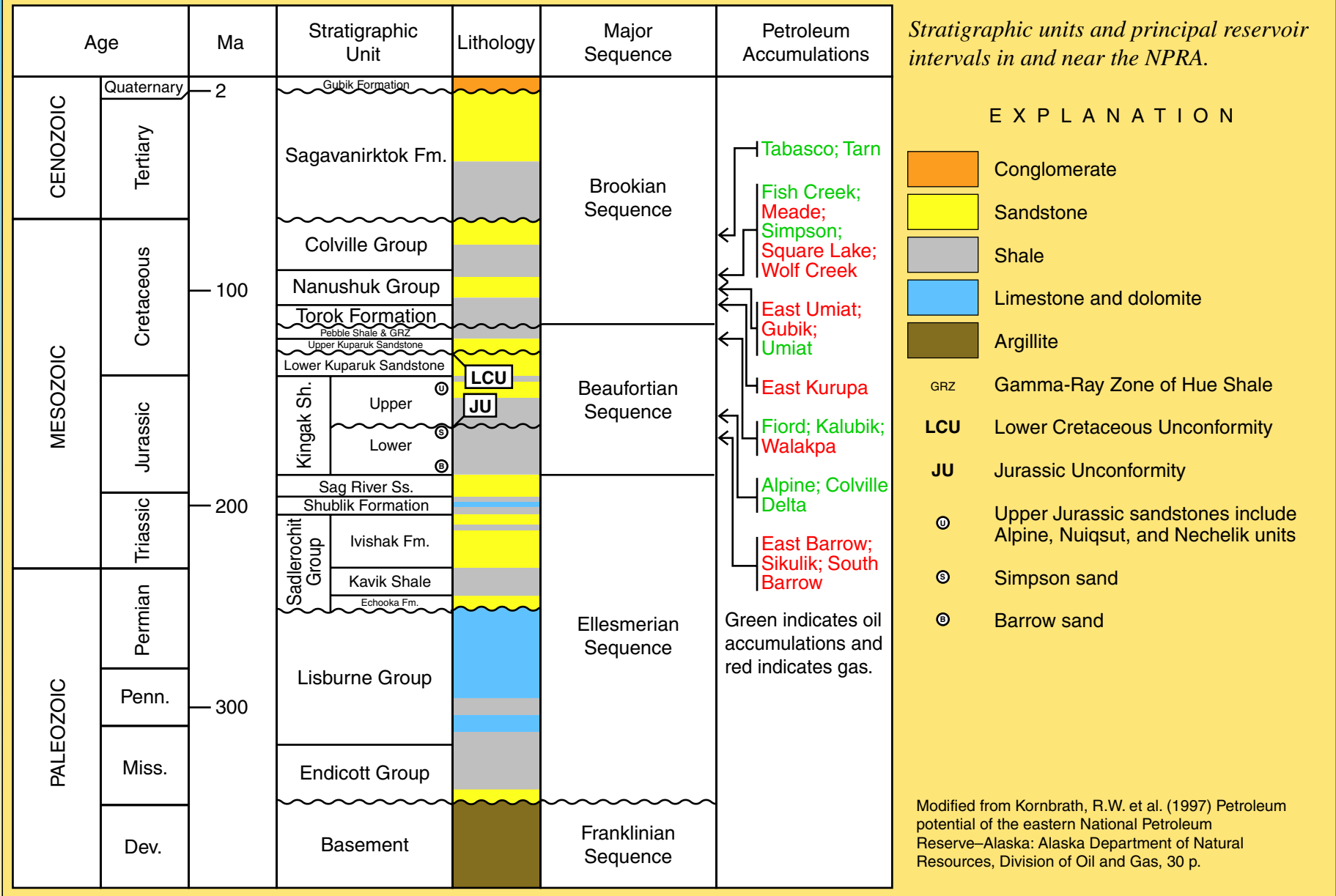
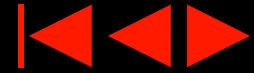


*Locations of oil and gas accumulations on the North Slope of Alaska. Boundaries of the NPRA, Alaska National Wildlife Refuge, and 1002 Area are indicated by broken brown line. **Named accumulations are linked to maps.***

EXPLANATION

- Arctic coastal plain
- Foreland basin rocks
- Gas field
- Oil field
- Gas seep
- Oil seep

Stratigraphy



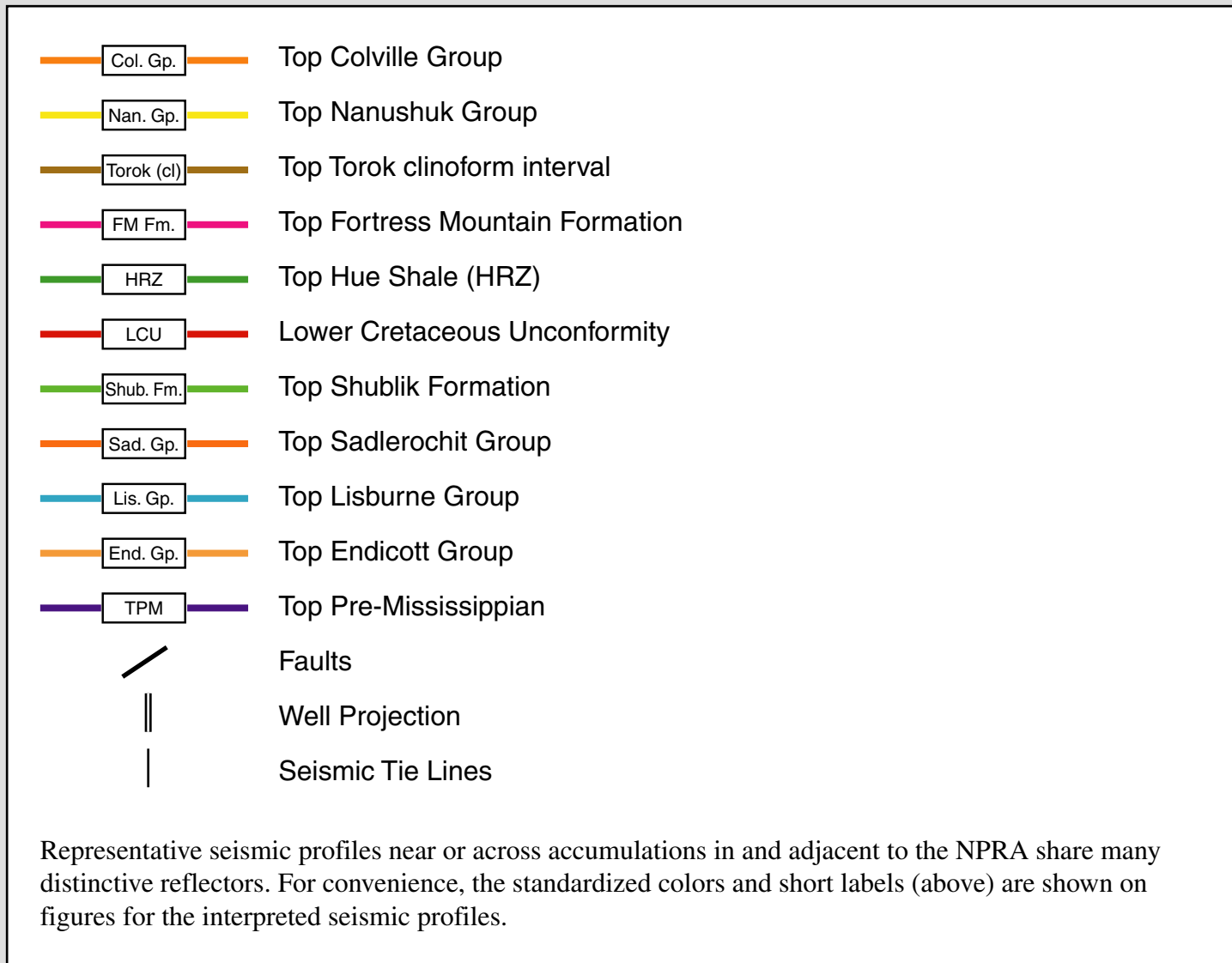
Summary of Oil and Gas Accumulations



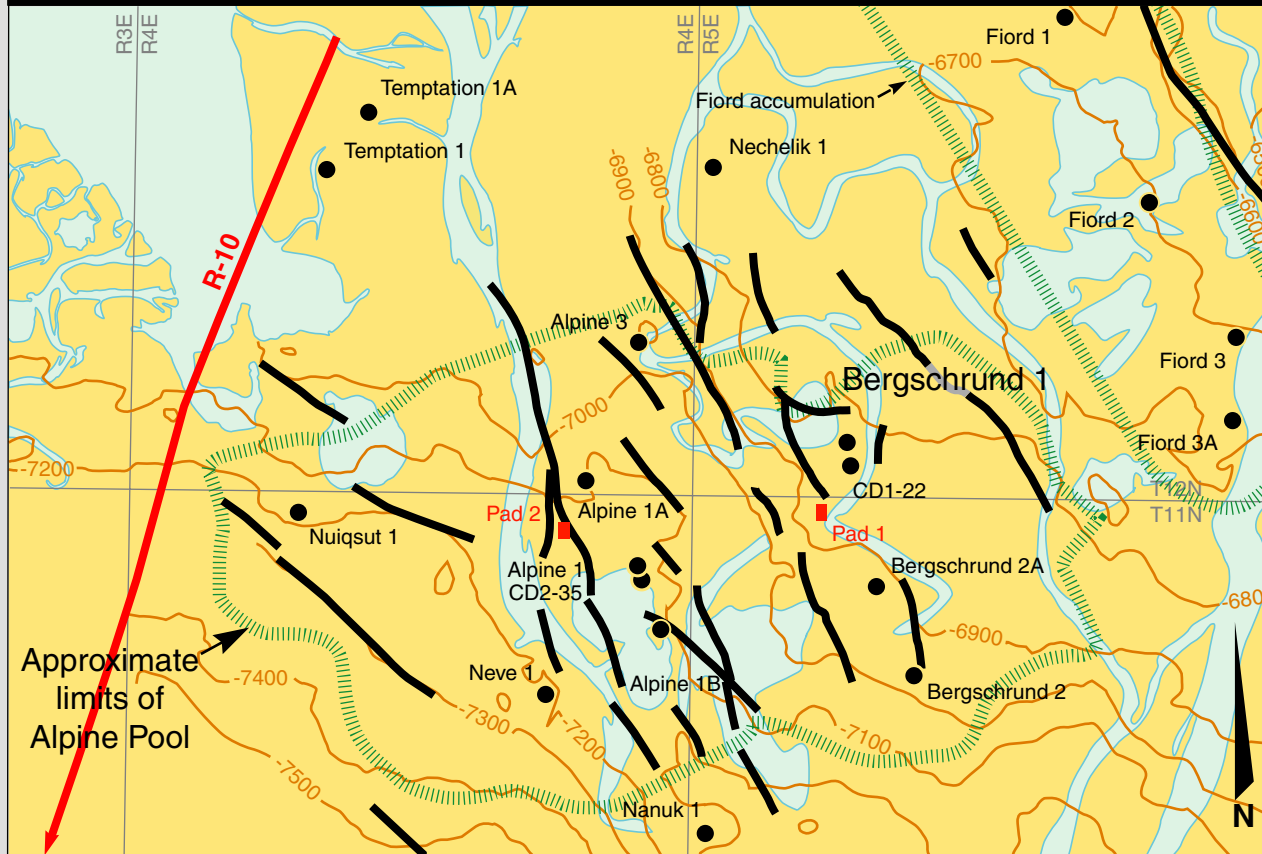
	Type	Reservoir	Field Operator	Status	Discovery Well	Date Completed
<i>Alpine Pool (Colville River Field)</i>	Oil	Alpine sand (Jurassic)	Phillips (ARCO)	production, 2000	ARCO Bergschrund 1	3/27/1994
<i>Colville Delta (Kuukpik Unit)</i>	Oil	Nuiqsut sand (Jurassic)	Phillips (ARCO)	undeveloped	Texaco Colville Delta 1A	4/26/1985
<i>East Barrow Pool (Barrow Field)</i>	Gas	Barrow sand (Jurassic)	NSB*	production, 1981	U.S. Navy South Barrow 12	5/04/1974
<i>East Kurupa</i>	Gas	Torok/Fortress Mtn Fm		undeveloped	Texaco East Kurupa Unit 1	3/01/1976
<i>East Umiat</i>	Gas	Nanushuk Group	UMC Petroleum	shut-in, no prod.	BP East Umiat 1	3/28/1964
<i>Fiord (Colville River Unit)</i>	Oil	Kuparuk & Nechilik ss	Phillips (ARCO)	undeveloped	ARCO Fiord 1	4/18/1992
<i>Fish Creek</i>	Oil	Nanushuk Group		undeveloped	U.S. Navy Fish Creek 1	9/04/1949
<i>Gubik</i>	Gas	Colville & Nanushuk Gp		undeveloped	U.S. Navy Gubik Test 1	8/11/1951
<i>Kalubik (Kuukpik Unit)</i>	Oil	Kuparuk & Nuiqsut ss	Phillips (ARCO)	undeveloped	ARCO Kalubik 1	5/01/1992
<i>Meade</i>	Gas	Nanushuk Group		undeveloped	U.S. Navy Meade 1	8/21/1950
<i>Sikulik Pool (Barrow Field)</i>	Gas	Barrow sand (Jurassic)	NSB*	undeveloped	South Barrow NSB-5	4/18/1988
<i>Simpson</i>	Oil	Nanushuk Group		undeveloped	U.S. Navy Simpson 26	10/23/1950
<i>South Barrow Pool (Barrow Field)</i>	Gas	Barrow sand (Jurassic)	NSB*	production, 1950	U.S. Navy South Barrow 2	4/15/1949
<i>Square Lake</i>	Gas	Nanushuk Group		undeveloped	U.S. Navy Square Lake 1	4/18/1952
<i>Tabasco Pool (Kuparuk River Field)</i>	Oil	Tabasco ss (Colville Gp)	Phillips (ARCO)	production, 1999	ARCO KRU 2T-201	1/01/1992
<i>Tarn Pool (Kuparuk River Field)</i>	Oil	Seabee Fm (Colville Gp)	Phillips (ARCO)	production, 1998	ARCO KRU Bermuda 1	2/02/1991
<i>Umiat</i>	Oil	Nanushuk Group		undeveloped	U.S. Navy Umiat 4	7/29/1950
<i>Walakpa</i>	Gas	Walakpa ss (Cretaceous)	NSB*	production, 1992	Husky Walakpa 1	2/07/1980
<i>Wolf Creek</i>	Gas	Nanushuk Group		undeveloped	U.S. Navy Wolf Creek 1	6/04/1951

NSB* is North Slope Burrough

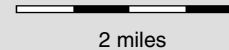
Explanation of Interpreted Seismic Reflectors



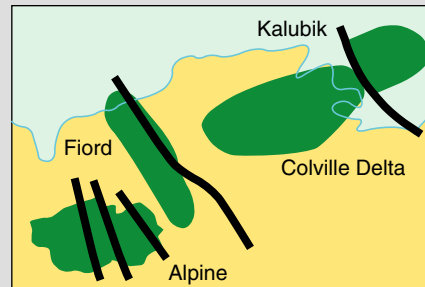
Alpine Pool (Colville River Field)



Source: Alaska Oil and Gas Conservation Commission, Field Rule Files, 1999 (Exhibit 5 of oral testimony)



- Bottom-hole well location
- Fault
- Depth to top of Alpine sand in feet below sea level
- Seismic line



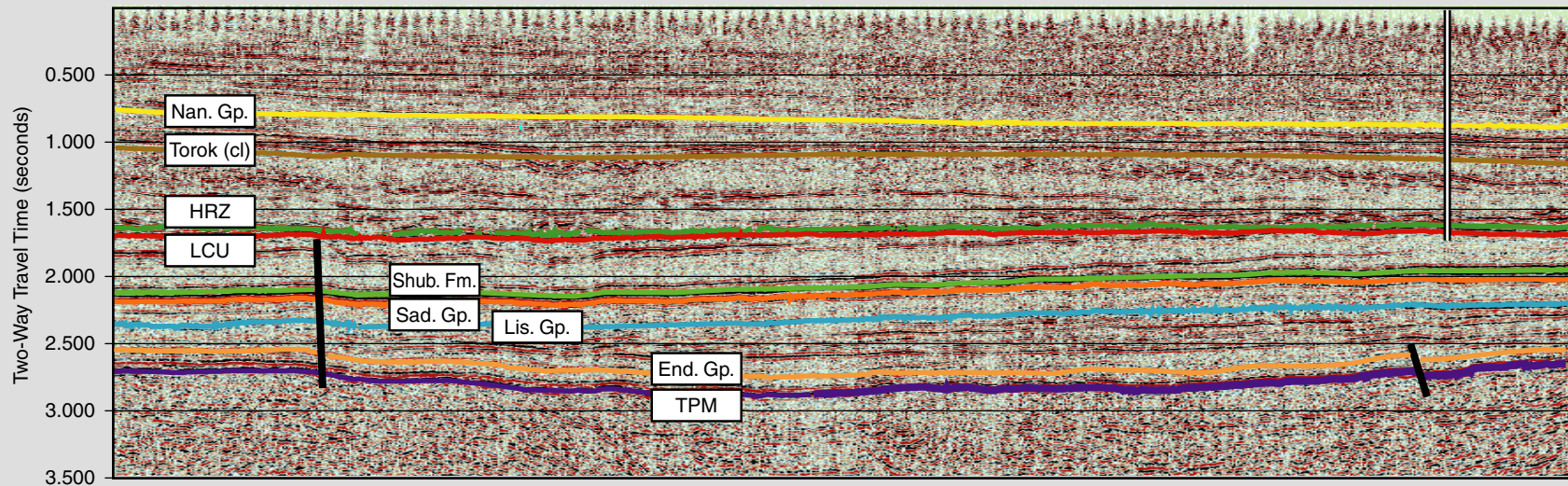
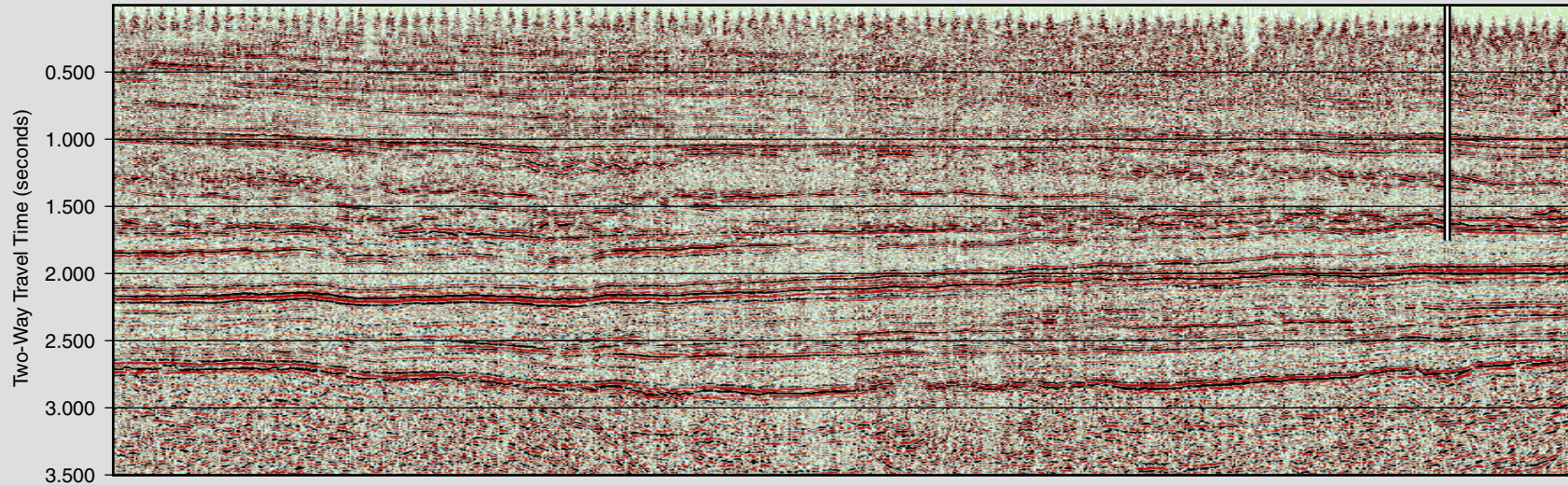
Alpine Pool (Colville River Field)
Discovery date: 1994
Discovery well: ARCO Bergschrund 1
Trap type: Stratigraphic truncation trap against Lower Cretaceous Unconformity (LCU)
Reservoir: Alpine sand (Kingak Shale)
Production date: 2000
Producing wells: 92 when fully developed (90,000 BOPD in mid-2001)
Area: 19,000 acres
Original oil in place: approximately 1 billion barrels
Oil gravity: 40° API
Total reserves: 430 MMBO

Alpine Pool (Colville River Field) R-10



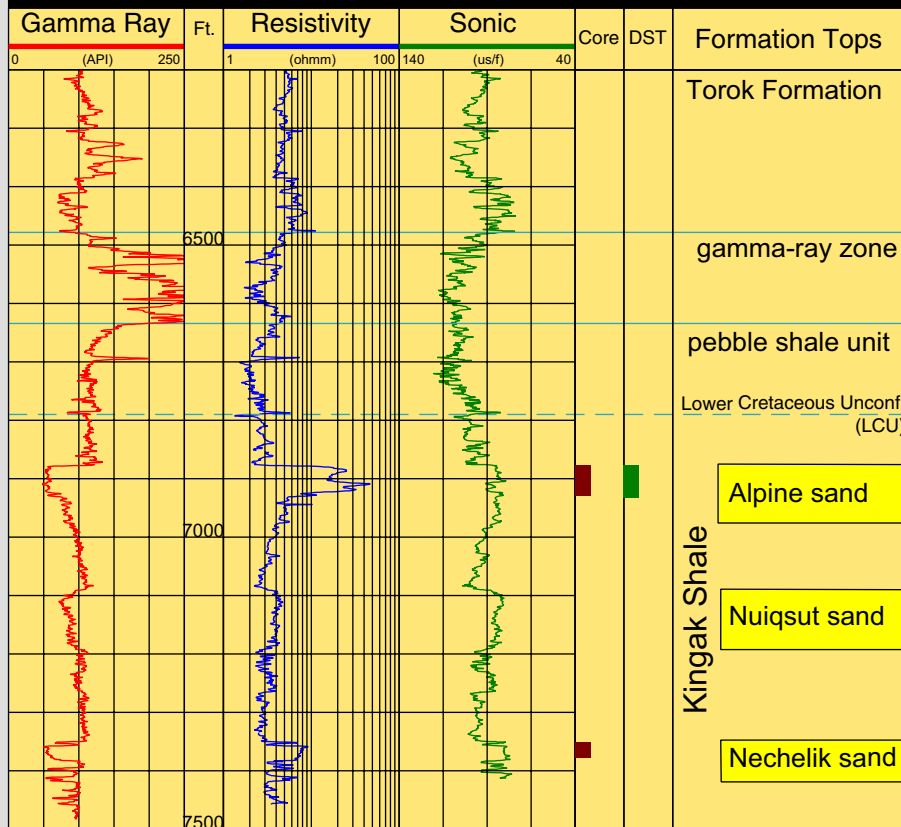
S

Bergschrund 1
(7 miles ESE) N



(Go to Explanation of Interpreted Seismic Reflectors)

Bergschrund 1



Alpine Pool (Colville River Field)–Bergschrund 1

API number: 50-103-20207

Operator: ARCO Alaska

Location: lat 70.35224° N., long 150.91630° W.

Kelly Bushing: 41 feet above sea level

Ground elevation: 11 feet above sea level

Total depth: 7502 feet measured depth

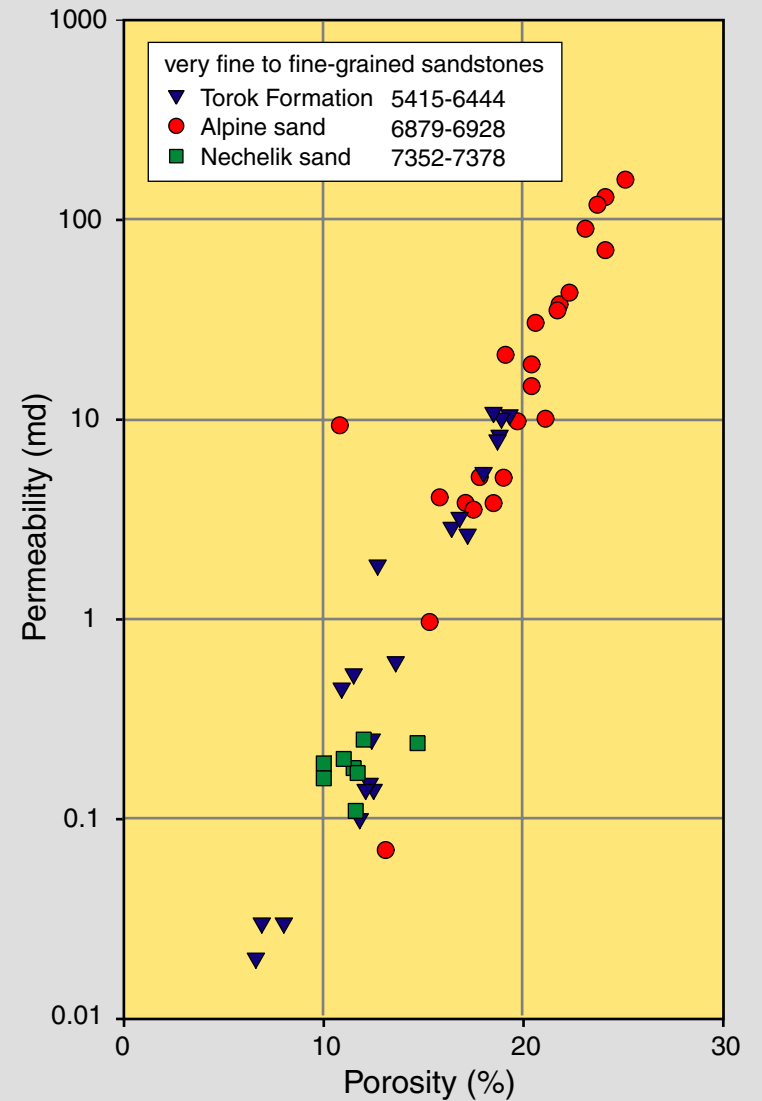
Completion date: 3/27/94

Drill Stem Tests:

DST 1: 6877-6932 ft, flowed 1115 barrels oil per day (37.8° API gravity) and 979 MCF gas per day.

DST 2: 6877-6932 ft, flowed 575 barrels oil per day (39.4° API gravity) and 428 MCF gas per day.

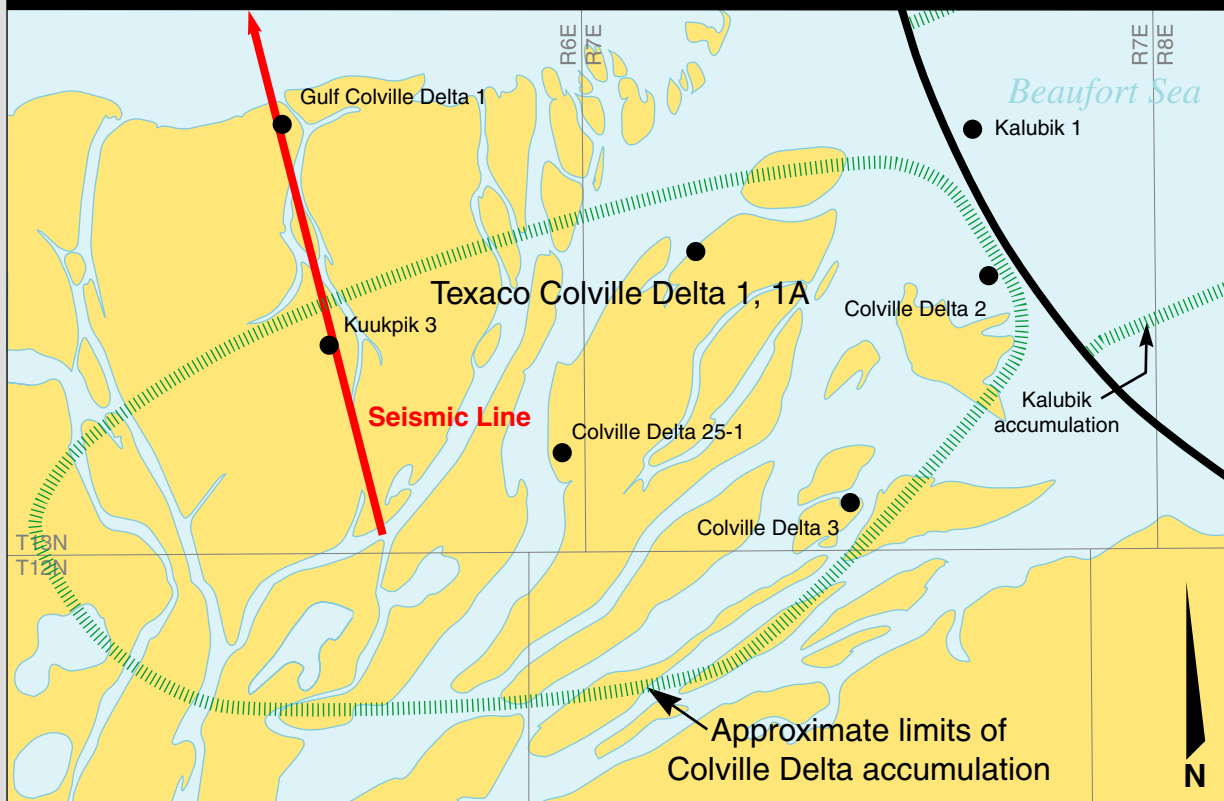
DST 3: 6877-6932 ft, flowed 2383 barrels oil per day (40° API gravity) and 1834 MCF gas per day.



Notes:

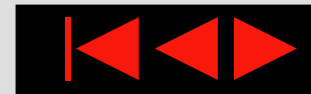
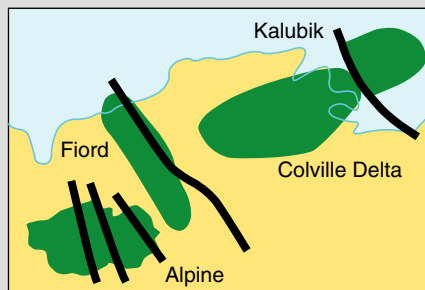
Porosity and permeability were measured from rotary sidewall cores in three intervals.

Colville Delta (Kuukpik Unit)



Colville Delta accumulation outline is based on distribution of successful wells and not necessarily the oil-water contact or actual limits of the field.

- Bottom-hole well location
- Fault
- Seismic line



Colville Delta (Kuukpik Unit)

Discovery date: 1985

Discovery well: Texaco Colville Delta 1A

Trap type: Stratigraphic truncation against Lower Cretaceous Unconformity (LCU)

Reservoir: Nuiqsut sand (Kingak Shale)

Production date: not available

Producing wells: not available

Production: not available

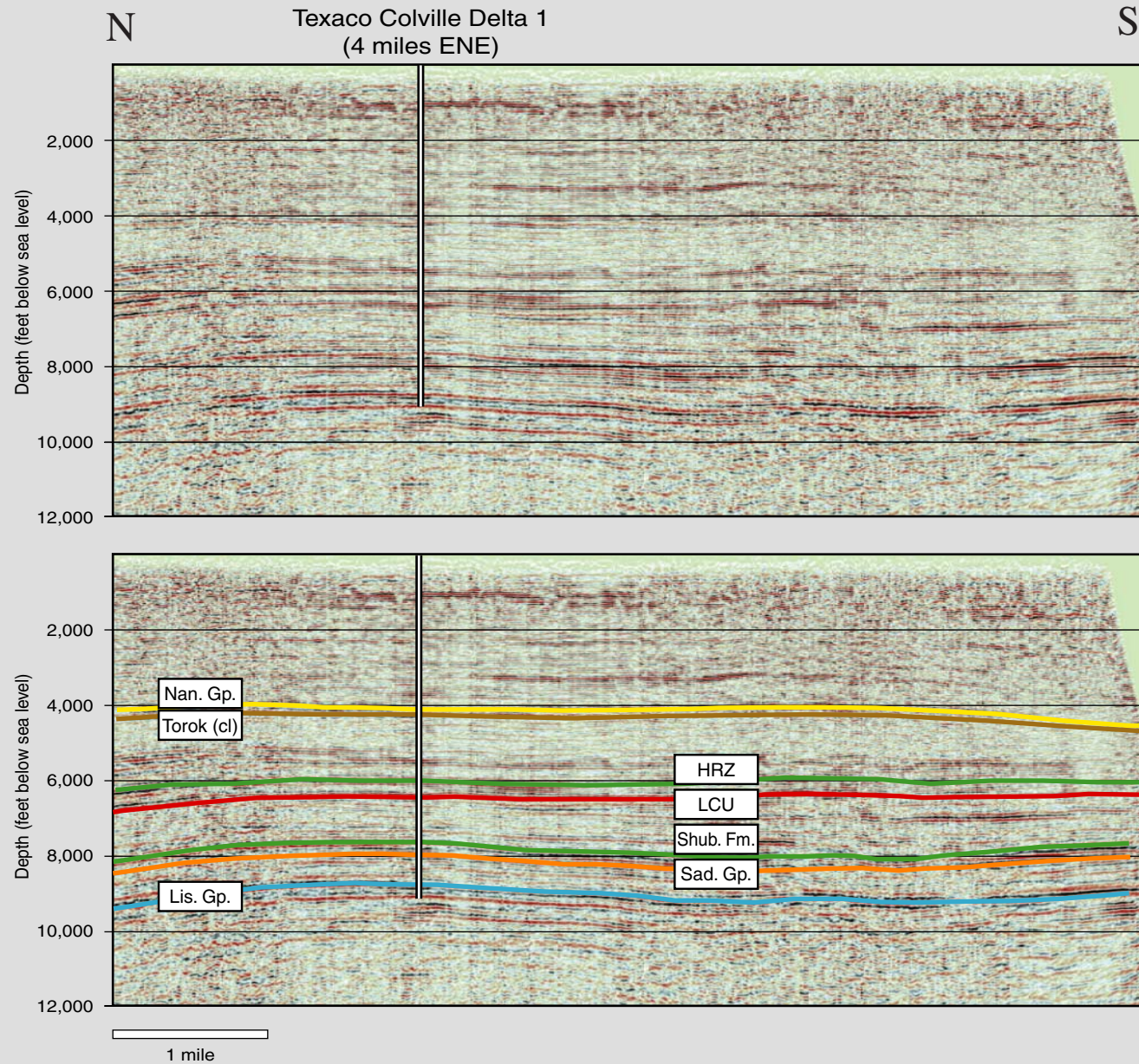
Area: 20,000 acres

Original oil in place: 100 million barrels (estimated)

Oil gravity: 17-25° API

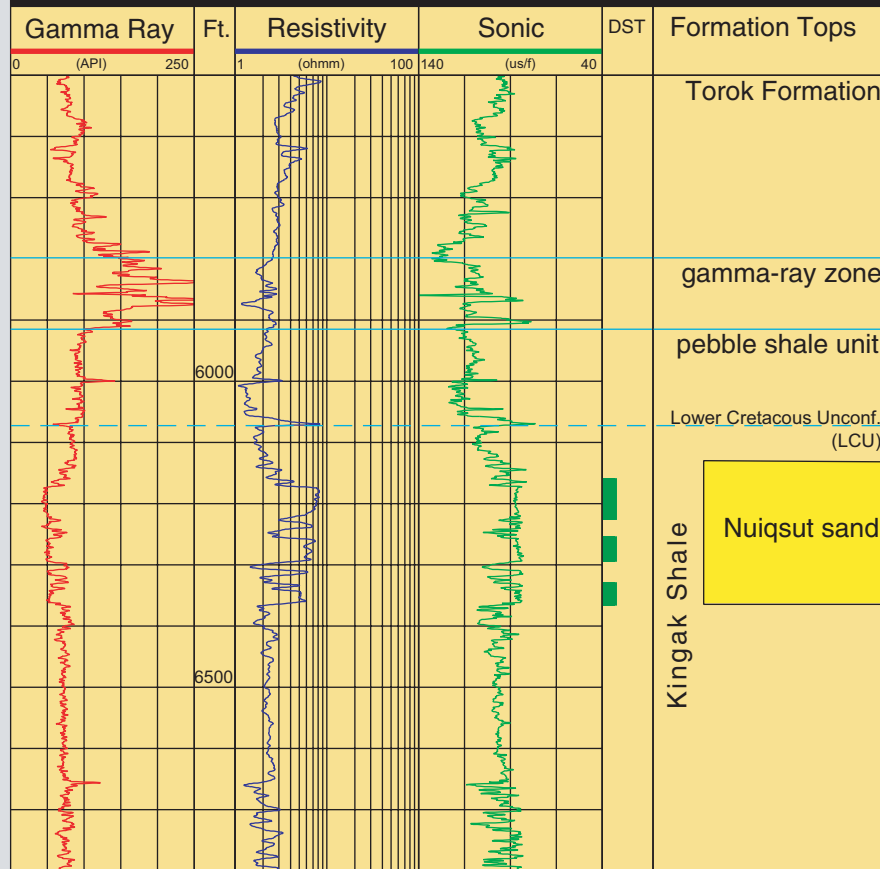
Total reserves: 25 MMBO

Colville Delta (Kuukpik Unit) Seismic Line



(Go to Explanation of Interpreted Seismic Reflectors)

Colville Delta 1 (Texaco)



Colville Delta (Kuukpik Unit) - Colville Delta #1

API number: 50-103-20038

Operator: Texaco

Location: lat 70.47552°N., long 150.39804°W.

Kelly Bushing: 35.5 feet above sea level

Ground elevation: 4.0 feet above sea level

Total depth: 9457 feet measured depth

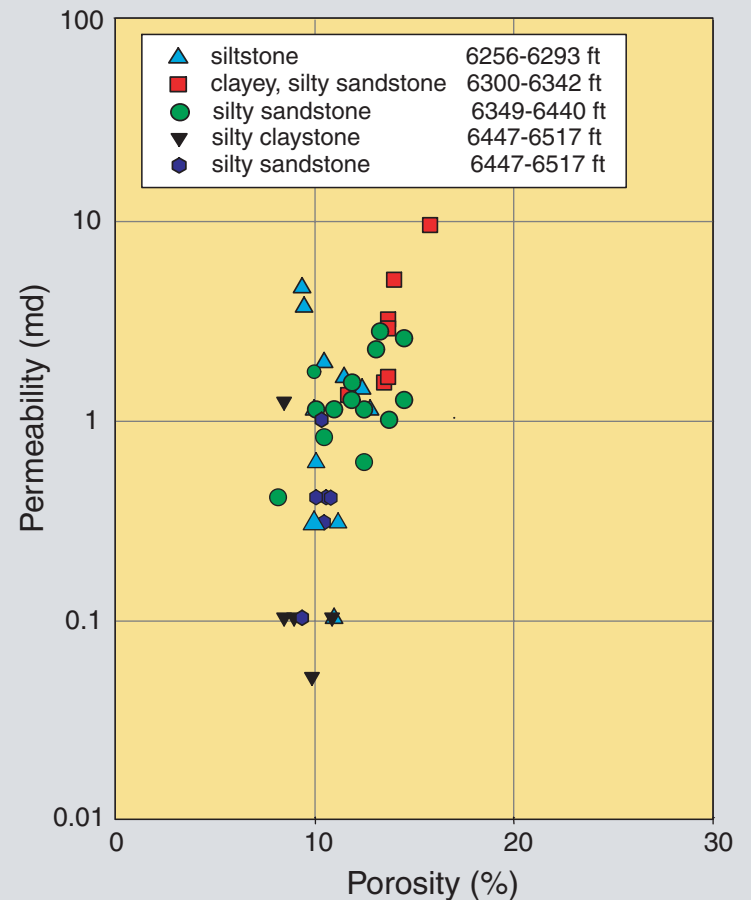
Completion date: 4/26/85

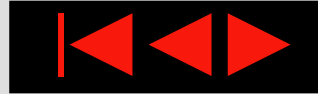
Notes:

Porosity and permeability core measurements were obtained on cores from sidetrack Colville Delta 1A (see plot). The Nuiqsut interval extends from 6243 to 6520 feet in Colville Delta 1A and was cored from 6255 to 6541 feet. Depths reported are measured depths.

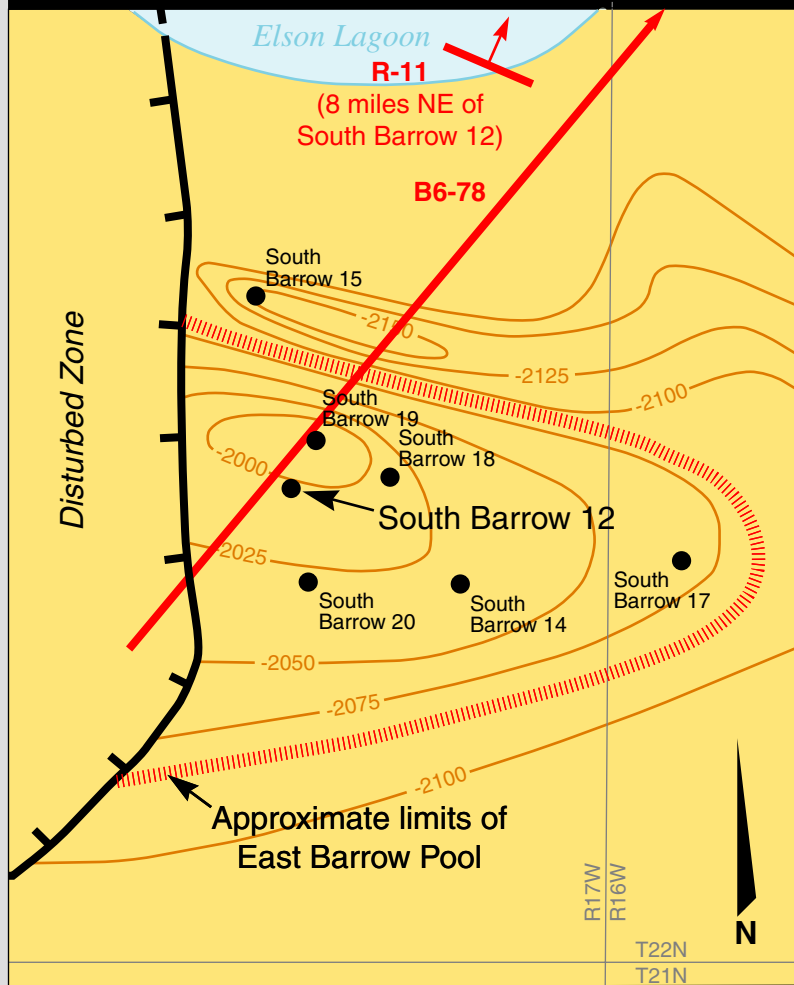
Drill Stem Tests:

- DST 5: 6328-6366 ft, produced 4.5 barrels of oil, API gravity 22.7°. Small amount of gas to surface.
- DST 5A: 6328-6366 ft, acidized, oil flowed at rates ranging from 25 to 100 barrels of oil per day.
- DST 6: 6253-6295 ft, gas flowed to surface. Flowed mud-cut oil at 30 to 40 barrels per day. API gravity 17.7°.
- DST 6A: 6253-6295 ft, acidized, gas flowed to surface at 25 to 50 MCF per day. 29.8 barrels of fluid recovered during the test period.
- DST 7: 6158-6226 ft, gas to surface in 51 minutes. Flowed 4.3 barrels of mud-cut oil at approximately 35 barrels per day. API gravity 20.4°.
- DST 7A: 6158-6226 ft, hydraulic fracture, produced 375 to 1075 barrels oil per day. API gravity 25°.

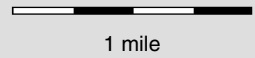




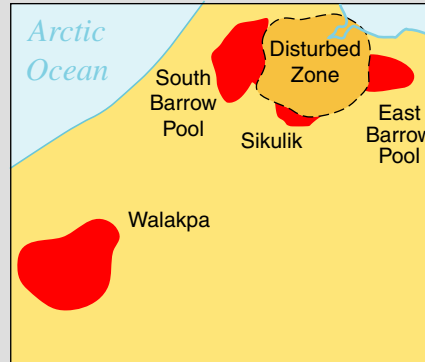
East Barrow Pool (Barrow Field)



Source: Alaska Oil and Gas Conservation Commission Annual Report, 1998



- Depth to top of Barrow Sands in feet below sea level
- Well location
- Fault, teeth on downthrown side
- Seismic lines



East Barrow Pool (Barrow Field)

Discovery date: 1974

Discovery well: South Barrow 12

Trap type: Structural closure on Barrow sand

Reservoir: Barrow sand (Kingak Shale)

Production date: 1981

Producing wells: 4

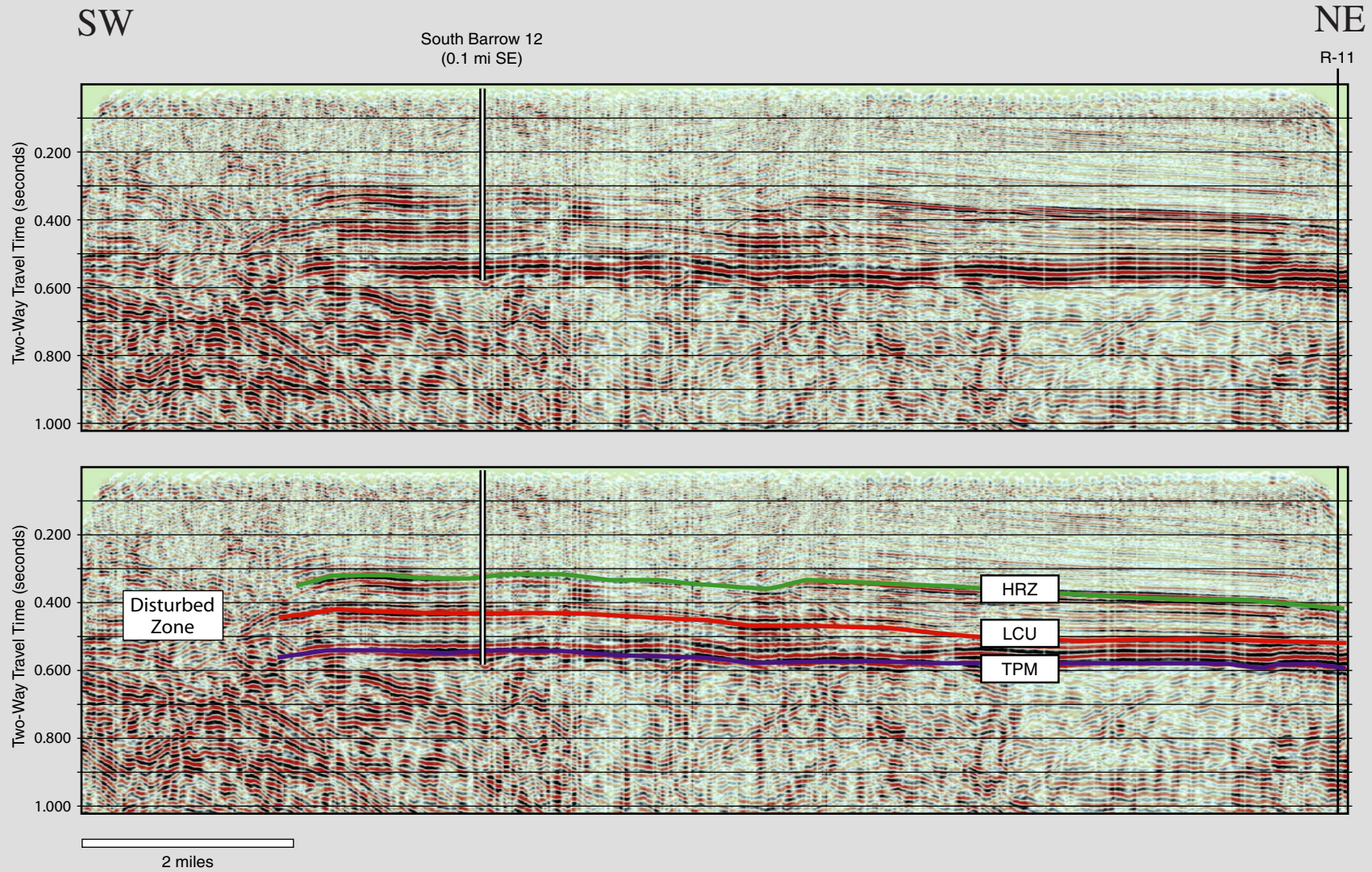
Production: 0.3 MMCFPD

Area: 4,000 acres

Original gas in place: Not available

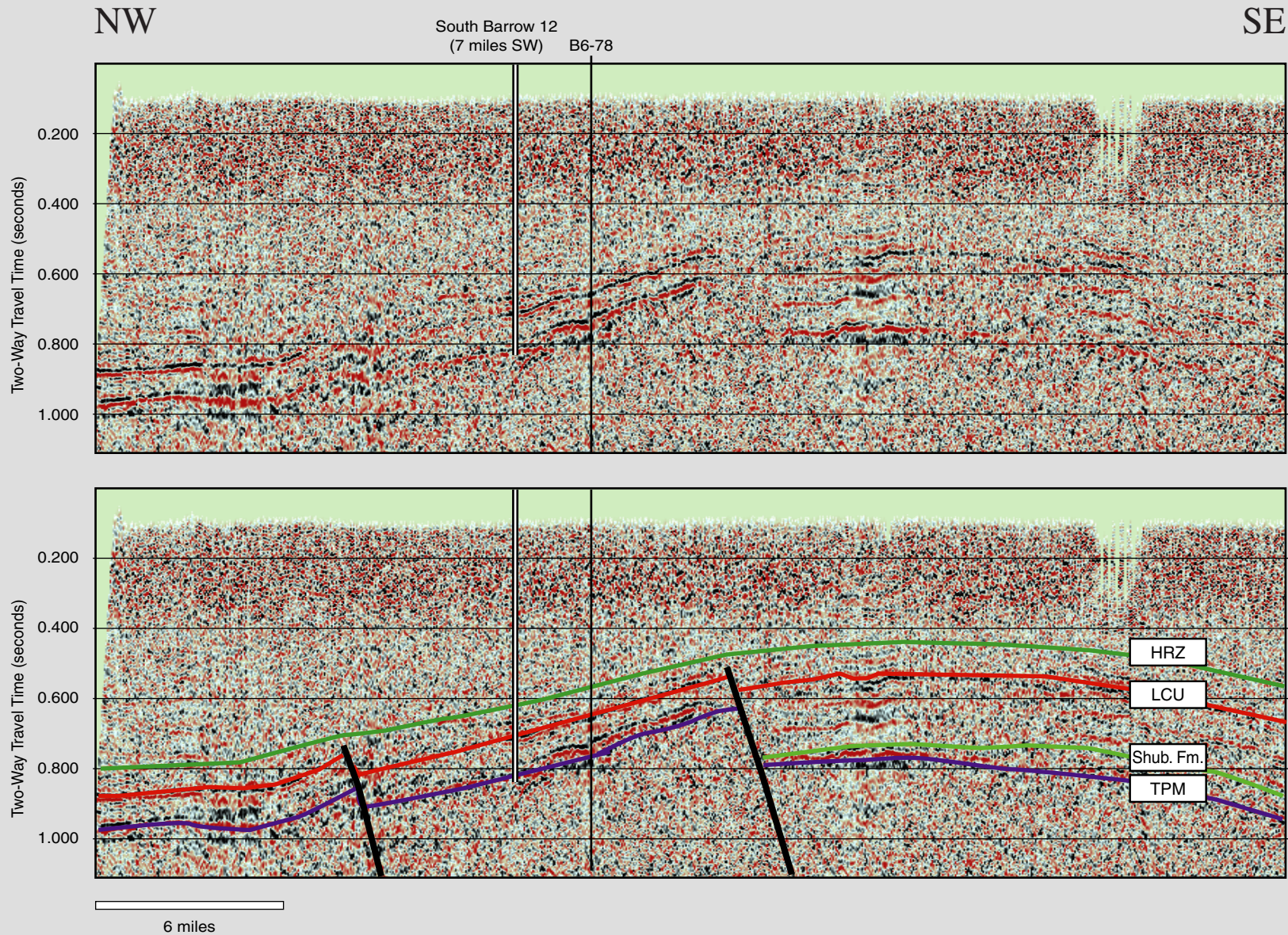
Total reserves: 12.5 BCF

East Barrow Pool (Barrow Field) B6-78



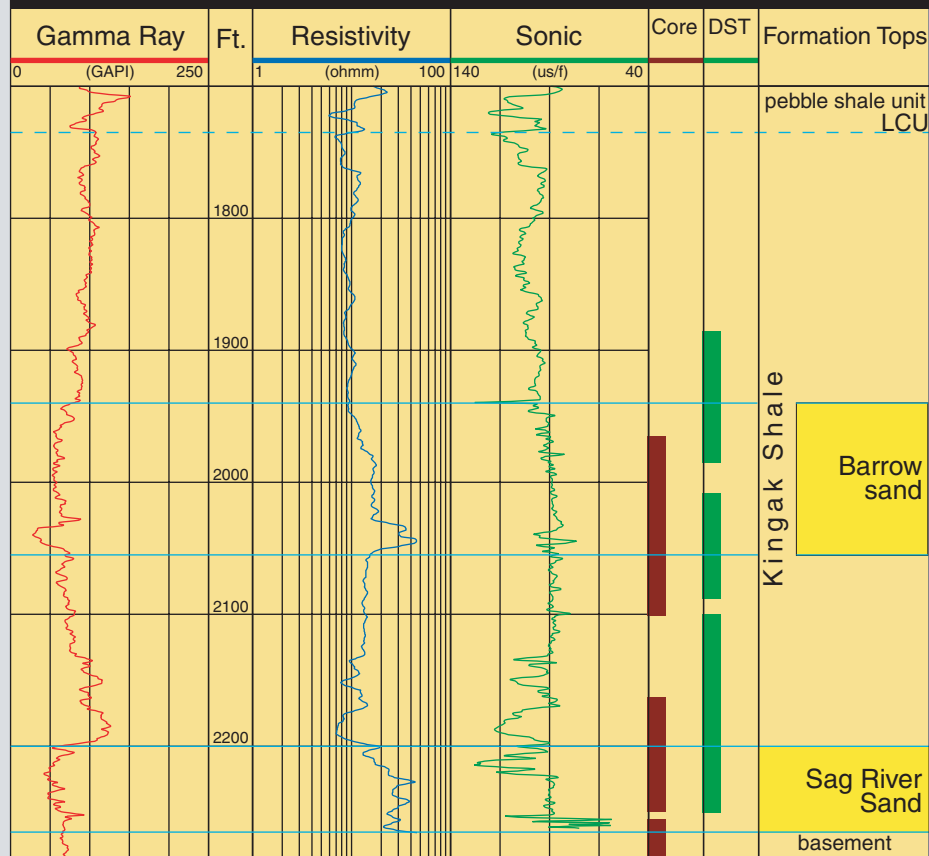
(Go to Explanation of Interpreted Seismic Reflectors)

East Barrow Pool (Barrow Field) R-11



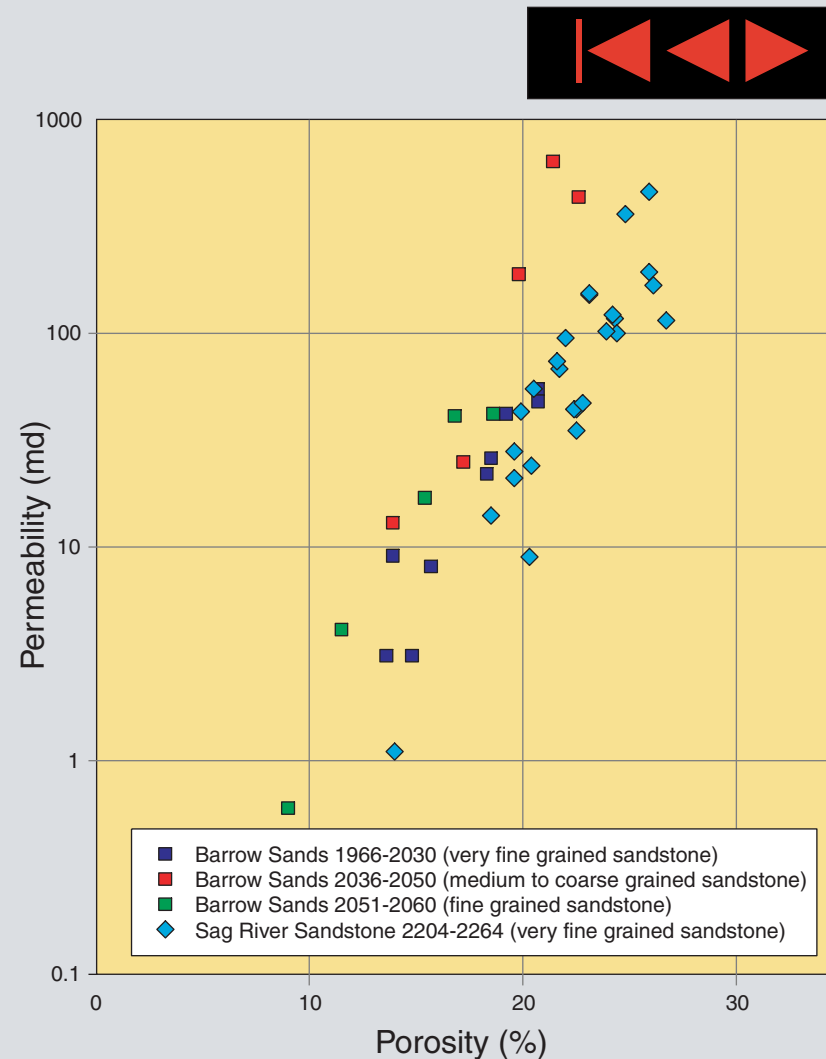
(Go to Explanation of Interpreted Seismic Reflectors)

South Barrow #12



East Barrow Pool (Barrow Field)–South Barrow #12

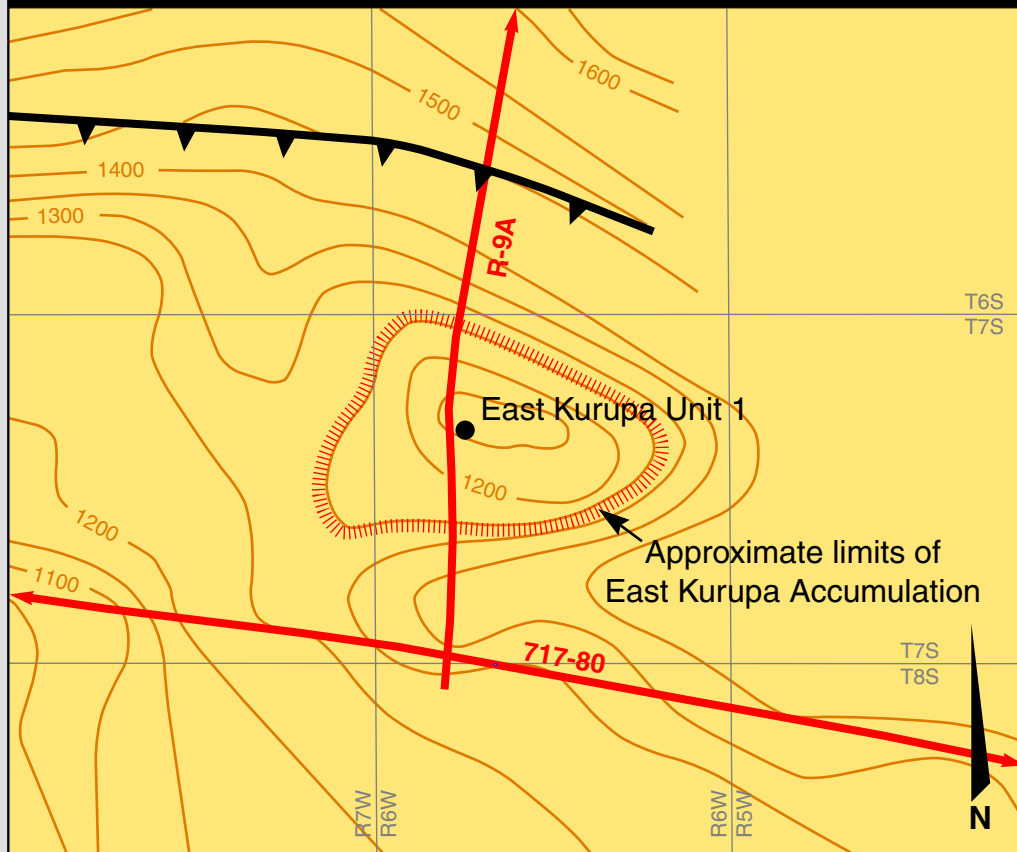
API number: 50-023-20006
 Operator: U.S. Navy
 Location: lat. 71.23722° N., long. 156.33778° W.
 Kelly Bushing: 39 feet above sea level
 Ground elevation: 26 feet above sea level
 Total depth: 2285 feet measured depth
 Completion date: 5/04/74



Drill Stem Tests:





- DST1 1885-1985 ft, Weak blow decreasing to very weak. Flowed gas to surface in 22 minutes. Recovery too small to measure.
- DST 2 1985-2101 ft, Packer failed.
- DST 3 1946-2101 ft, Packer failed.
- DST 4 2100-2250, Flowed gas to surface in 20 minutes. Recovered 950 ft of oil (API gravity 24°) and gas-cut mud/saltwater.
- DST 5 2192-2285 ft, No data.
- DST 6 2008-2088 ft, Flowed gas at rate too small to measure.

East Kurupa



Source: Shafi, H., and others, 1980, FM Horizon (time) Map, Plate III, in Bruynzeel, J.W., Summary Geophysical Report FY1980: Tetra Tech Report No. 8003. Unpublished report for ONPRA, Husky Oil NPR Operations, Inc.

2 miles

-  Bottom-hole well location
-  Thrust fault, teeth shown on upper plate
-  Depth to top of Lower Cretaceous reflector in two-way travel time (milliseconds)
-  Seismic lines



East Kurupa

Discovery date: 1976

Discovery well: East Kurupa
Unit 1

Trap type: Structural closure on
Fortress Mountain horizon

Reservoir: Fortress Mountain
(Torok Fm.)

Production date: Undeveloped

Producing wells: None

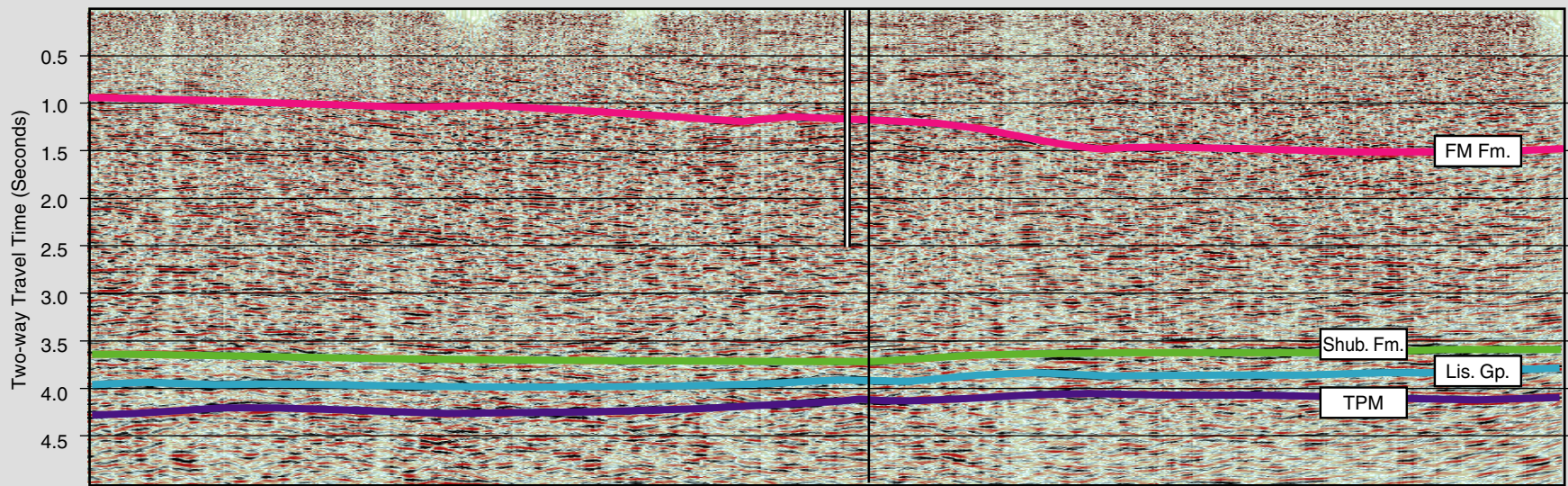
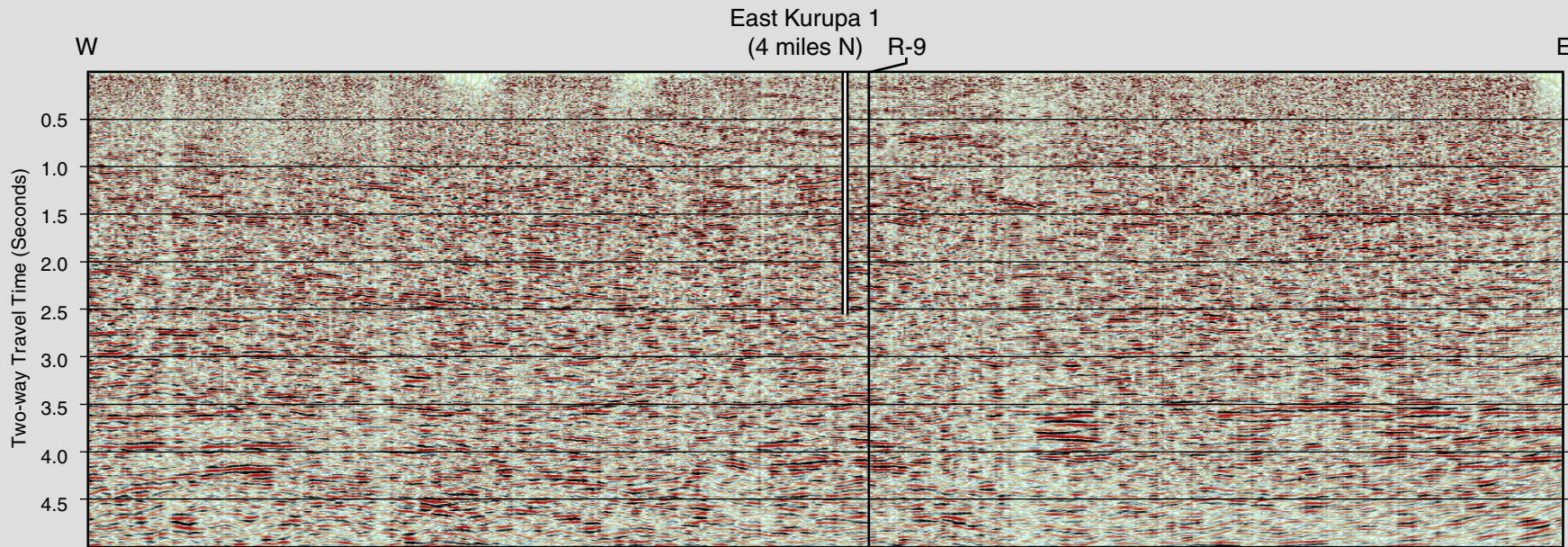
Production: None; tested up to 3.8
MMCFPD

Area: 7,500 acres

Original gas in place: Not available

Total reserves: Not available

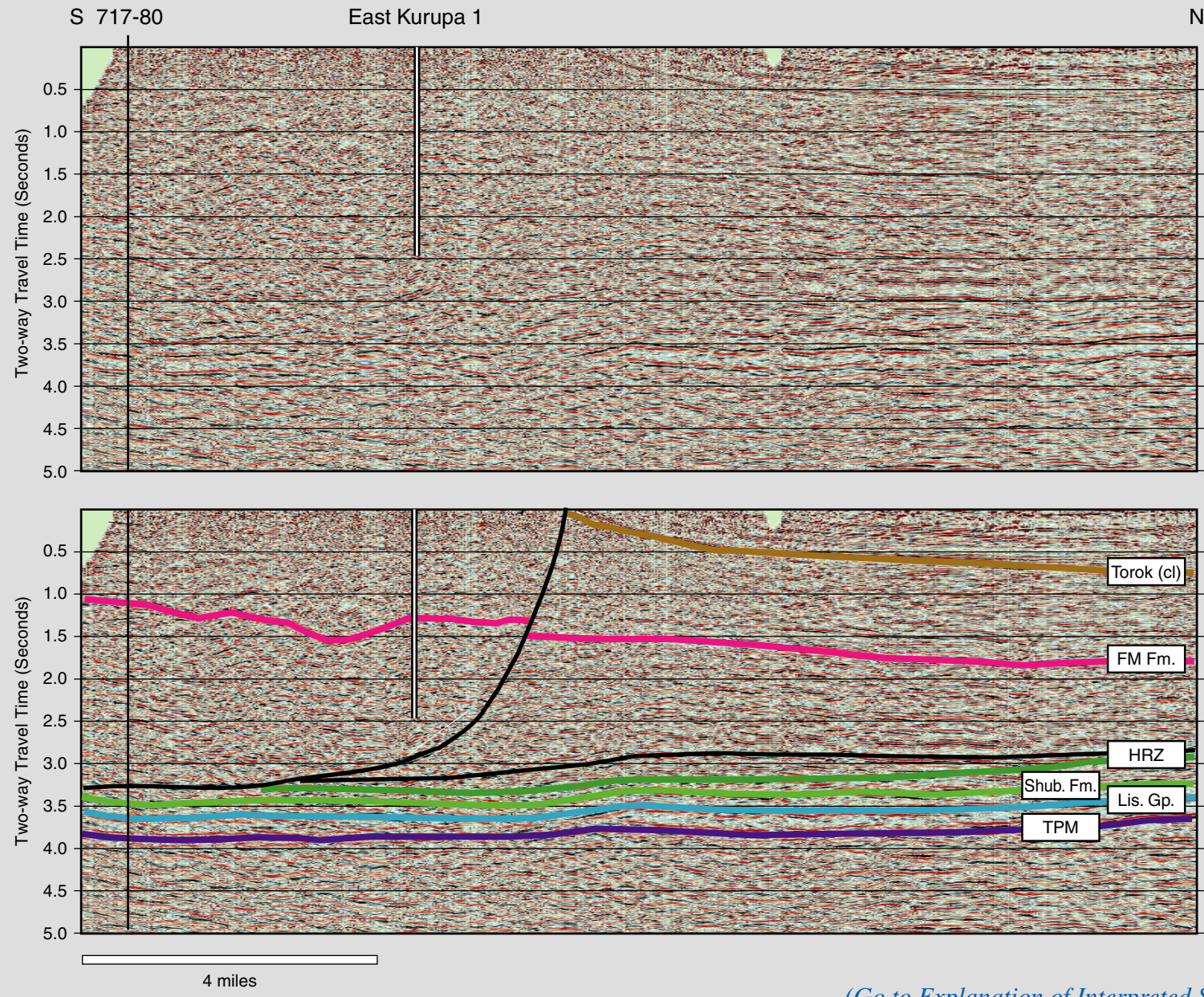
East Kurupa 717-80



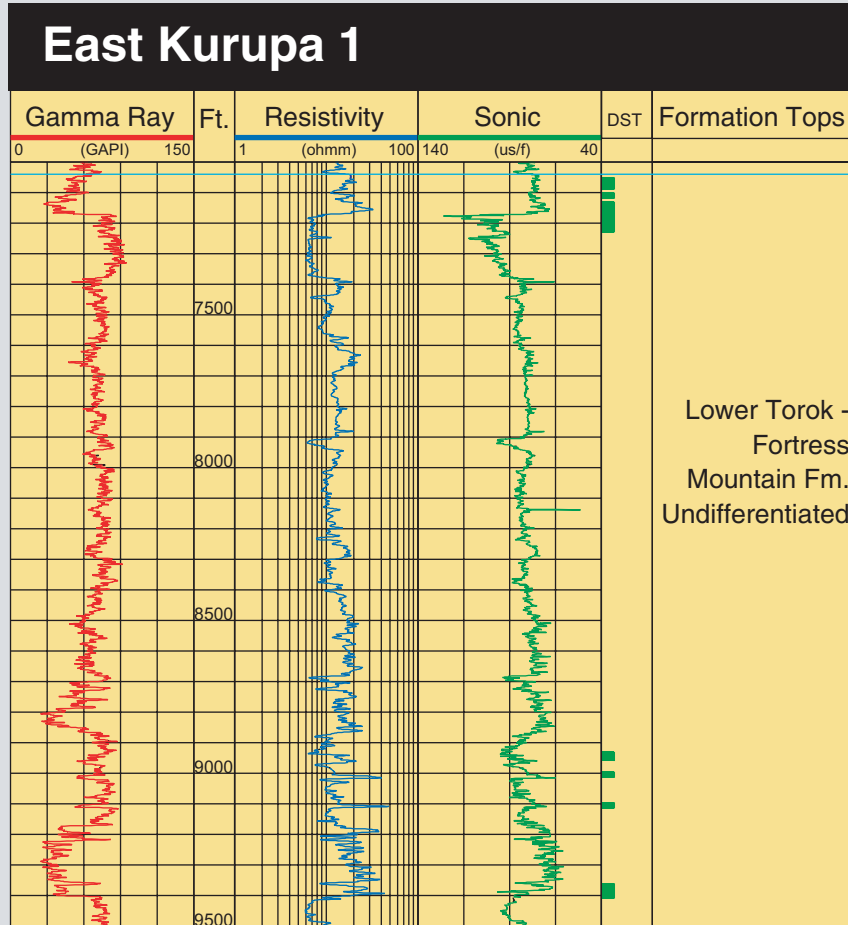
4 miles

(Go to Explanation of Interpreted Seismic Reflectors)

East Kurupa R-9A



(Go to Explanation of Interpreted Seismic Reflectors)



East Kurupa Gas Field - East Kurupa Unit #1

API number: 50-137-20002

Operator: Texaco

Location: lat 68.84016° N., long 153.30362° W.

Kelly Bushing: 1607 feet above sea level

Ground elevation: 1580 feet above sea level

Total depth: 12695 feet measured depth

Completion date: 3/01/76

Drill Stem Tests:

DST 4: 8930-8960, 8995-9015, 9095-9115, 9360-9410 ft. 6 hr 12 min test. Gas to surface in 11 min. Flowed at 1300 MCFPD rate through 20/64" choke.

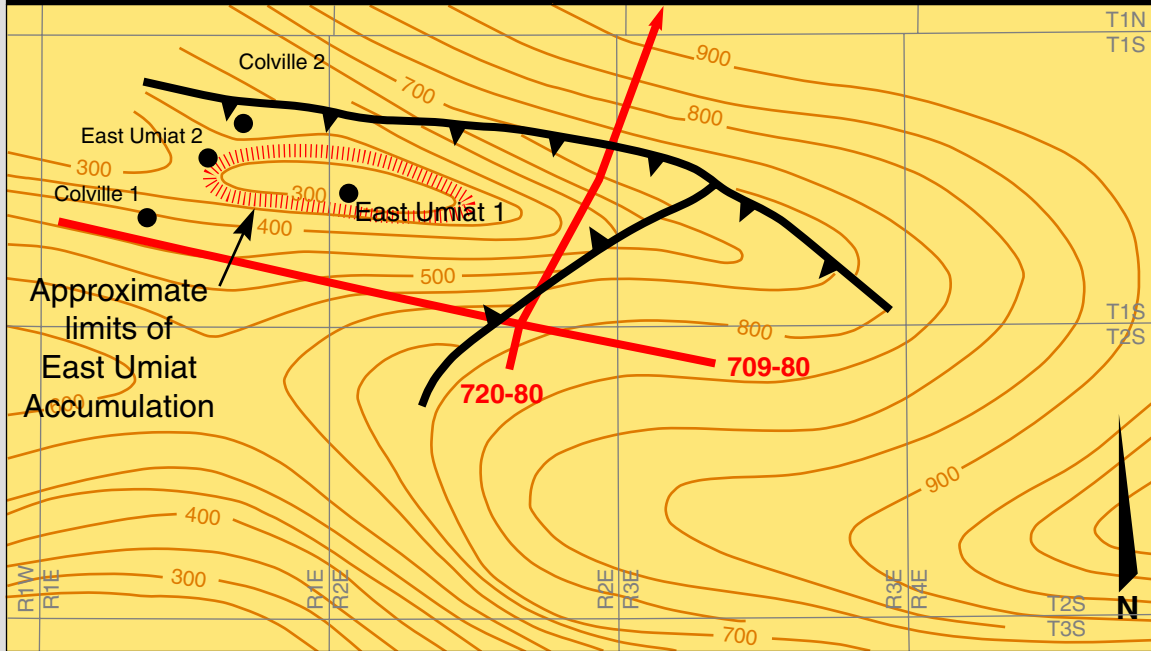
DST 5: 7150-7190 ft. 7 hr 57 min test. Gas to surface in 5 min. Flowed at 3500 MCFPD rate on 3/8" choke, 2700 MCFPD on 7/16" choke and 3800 MCFPD on 5/64" choke.

DST 6: 7050-7090, 7100-7120, 7130-7230 ft. 13 hr 42 min test. Gas to surface in 16 min. Flowed gas at rate of 1800 MCFPD on 11/64" choke, 3000 MCFPD on 28/64" choke, and 2660 MCFPD on 36/64" choke.





Notes:

A few sidewalls cores were cut, but data are sparse. No conventional core was taken.

East Umiat



Source: Chandler River Development Contract with Sinclair Oil and Gas Co., 1967, as displayed by Tailleux, I. L., and S. E. Engwicht, 1978, Seismic maps of shallow Cretaceous horizons, eastern North Slope petroleum province, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-928 G, 1 sheet, scale 1:500,000.

-  Bottom-hole well location
-  Thrust fault, teeth shown on upper side
-  Depth to top of Nanushuk Group in two-way travel time (milliseconds)
-  Seismic lines



East Umiat

Discovery date: 1984

Discovery well: East Umiat 1

Trap type: Structural closure on Nanushuk Group

Reservoir: Nanushuk Group

Production date: Shut-in; no production

Producing wells: None

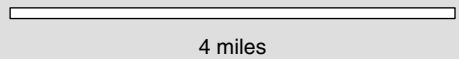
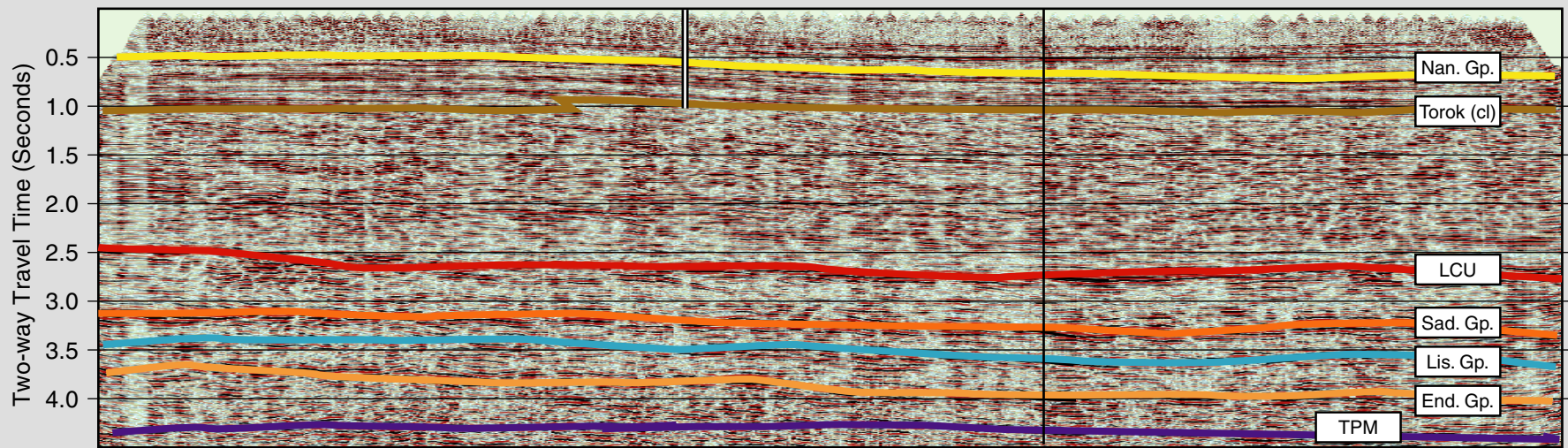
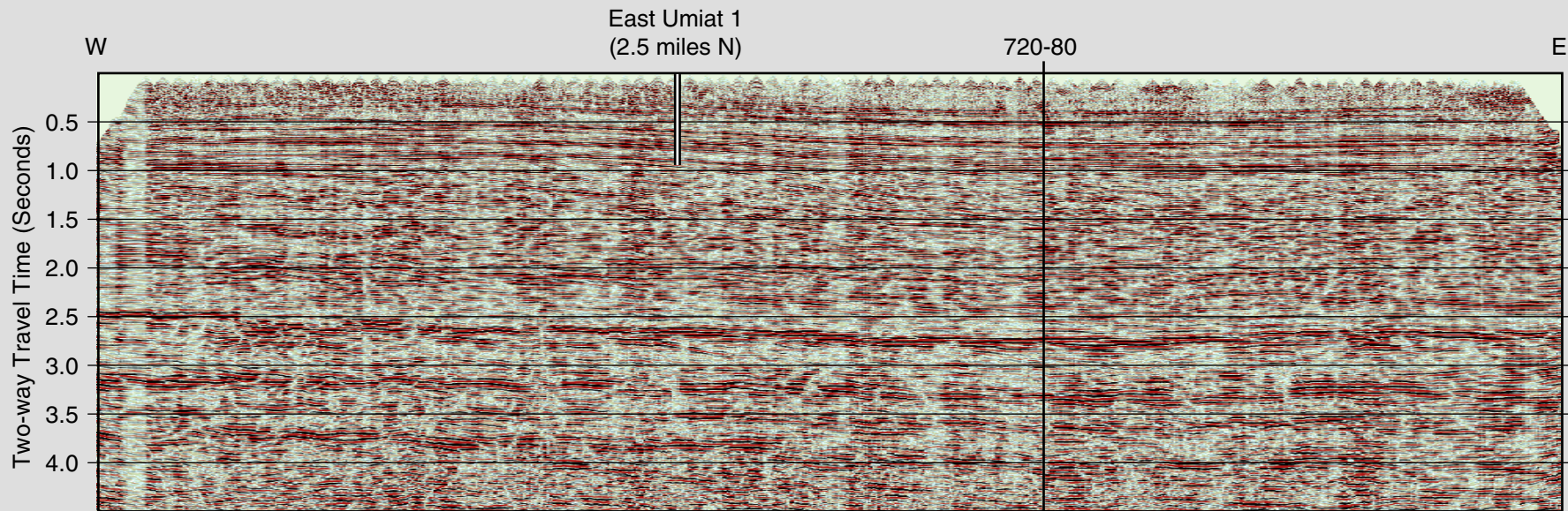
Production: None; tested up to 3-5 MMCFPD

Area: 5,000 acres

Original gas in place: Not available

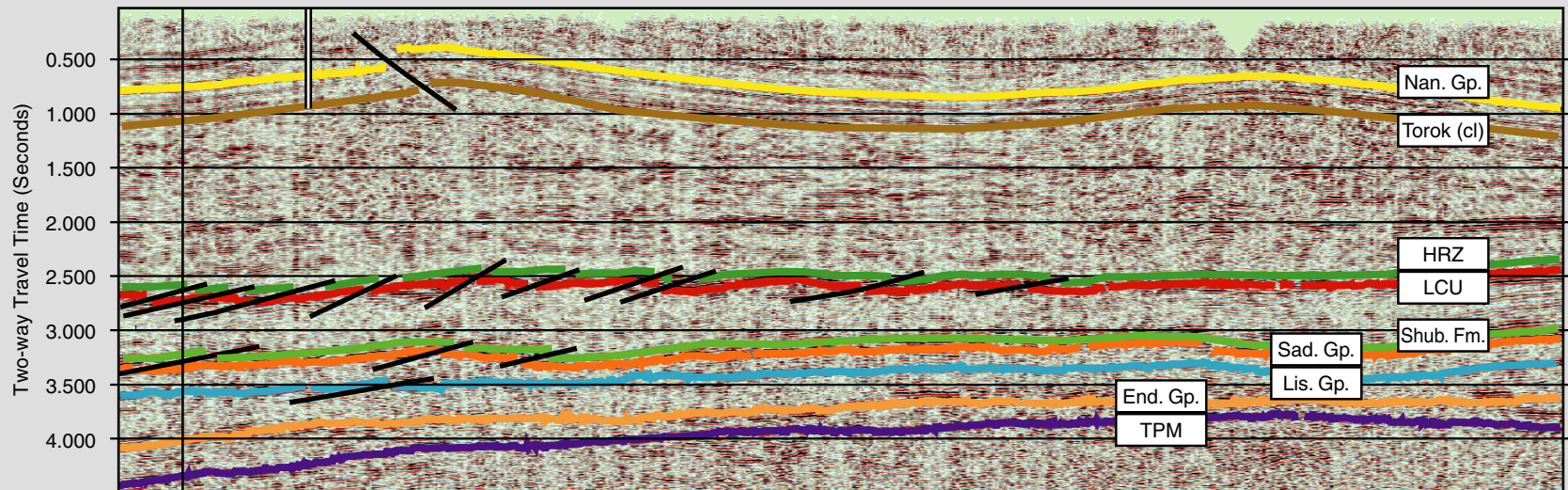
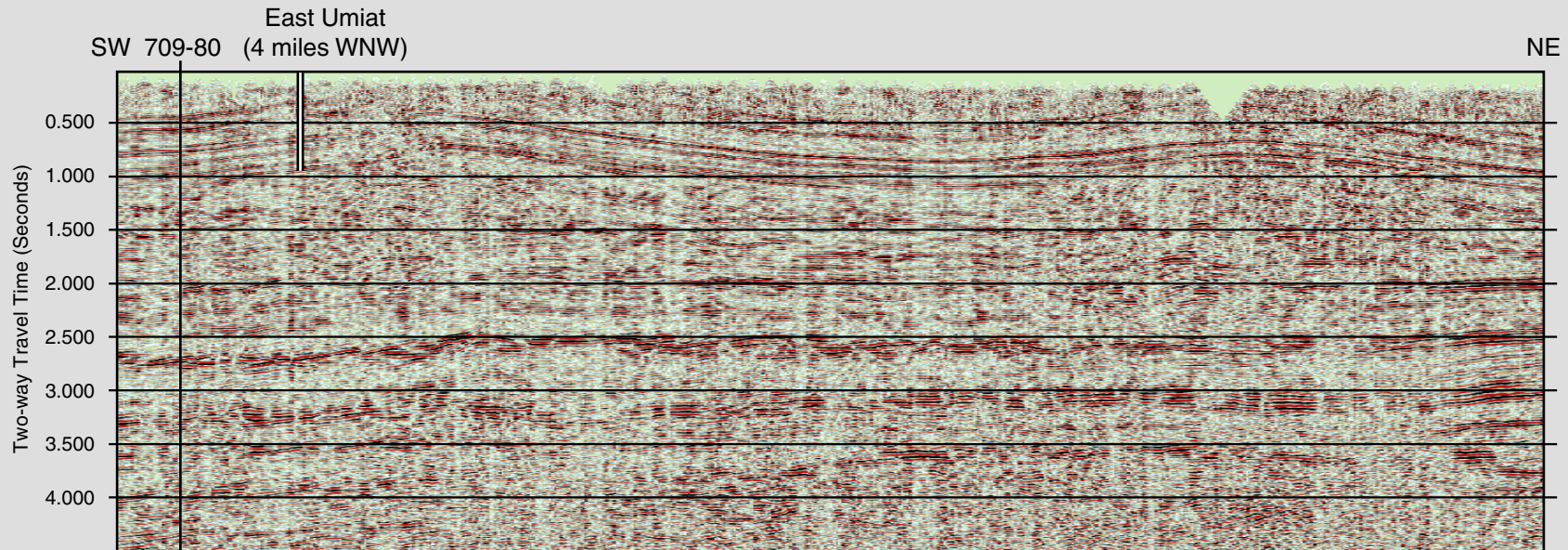
Total reserves: 4 BCF

East Umiat 709-80



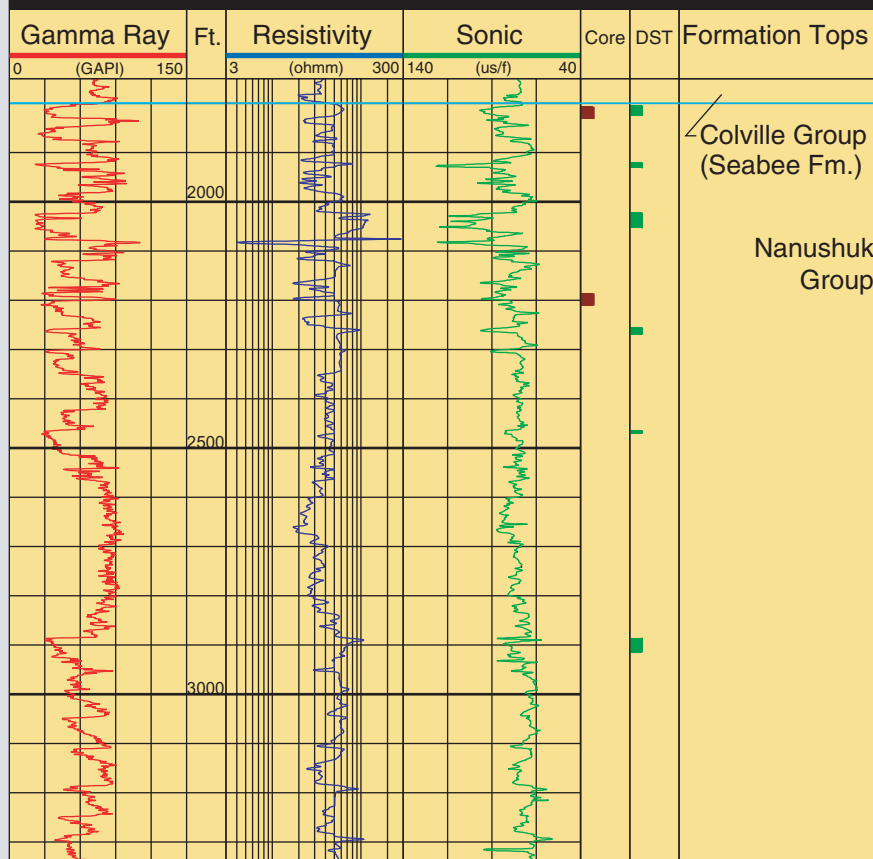
(Go to Explanation of Interpreted Seismic Reflectors)

East Umiat 720-80



(Go to Explanation of Interpreted Seismic Reflectors)

East Umiat 1



East Umiat Gas Field - East Umiat Unit #1

API number: 50-287-10016

Operator: BP Exploration

Location: lat 69.344548° N., long 151.74269° W.

Kelly Bushing: 555 feet above sea level

Ground elevation: 538 feet above sea level

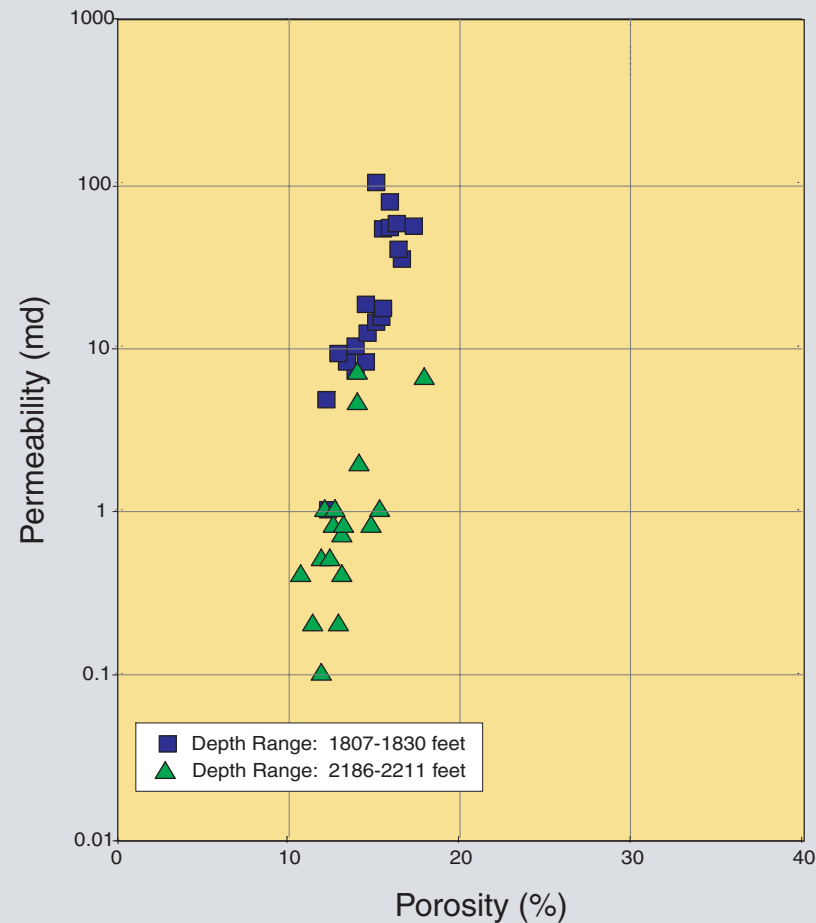
Total depth: 3347 feet measured depth

Completion date: 3/28/64

Drill Stem Tests:

DST 1: 2885-2915 ft, maximum rate of 5.3 MCF per day, final 2.5 MCF per day.

DST 2: 2464-2471 ft, maximum rate of 5.2 MCF per day, final 2.2 MCF per day.



Drill Stem Tests, continued:

DST 3: 2255-2270 ft, maximum rate of 190 MCF per day, final 160 MCF per day.

DST 4: 2039-2054 ft, average flow of 1900 MCF per day on 1-inch choke.

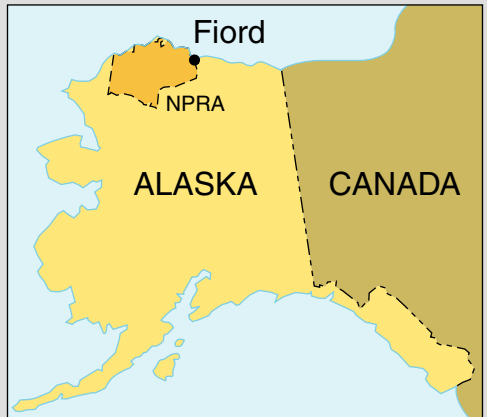
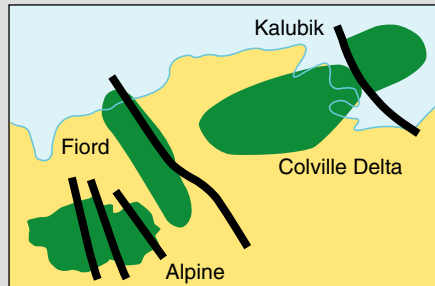
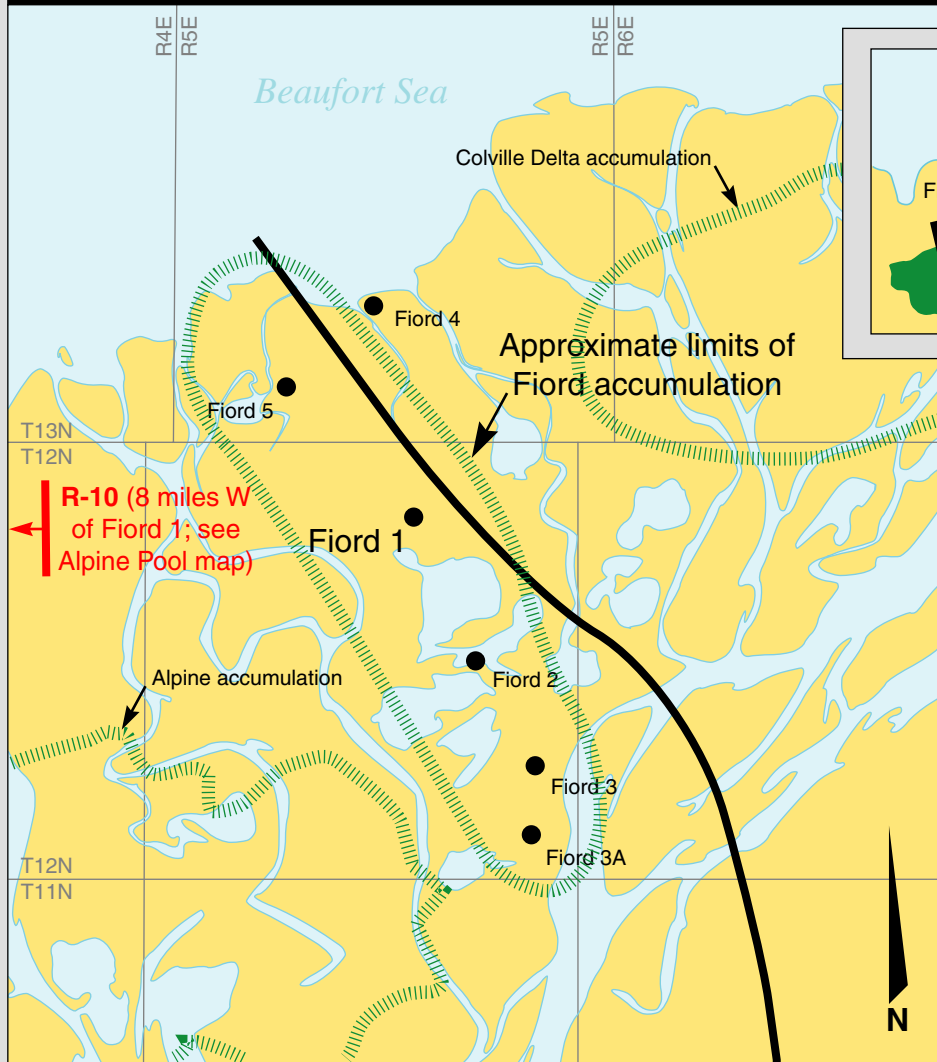
DST 5: 2022-2054 ft, 1600 MCF per day, open flow potential at 6,000 MCF per day.

DST 6: 1920-1932 ft, final rate of 1690 MCF per day.

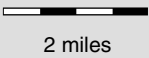
DST 7: 1817-1818 ft, produced gas on 1-inch choke.

DST 8: 1804-1826 ft, final rate of 1630 MCF per day at 32/64-inch choke; 2520 MCF per day at 48/64-inch choke, and 3100 MCF per day at 64/64-inch choke.

Fiord (Colville River Unit)



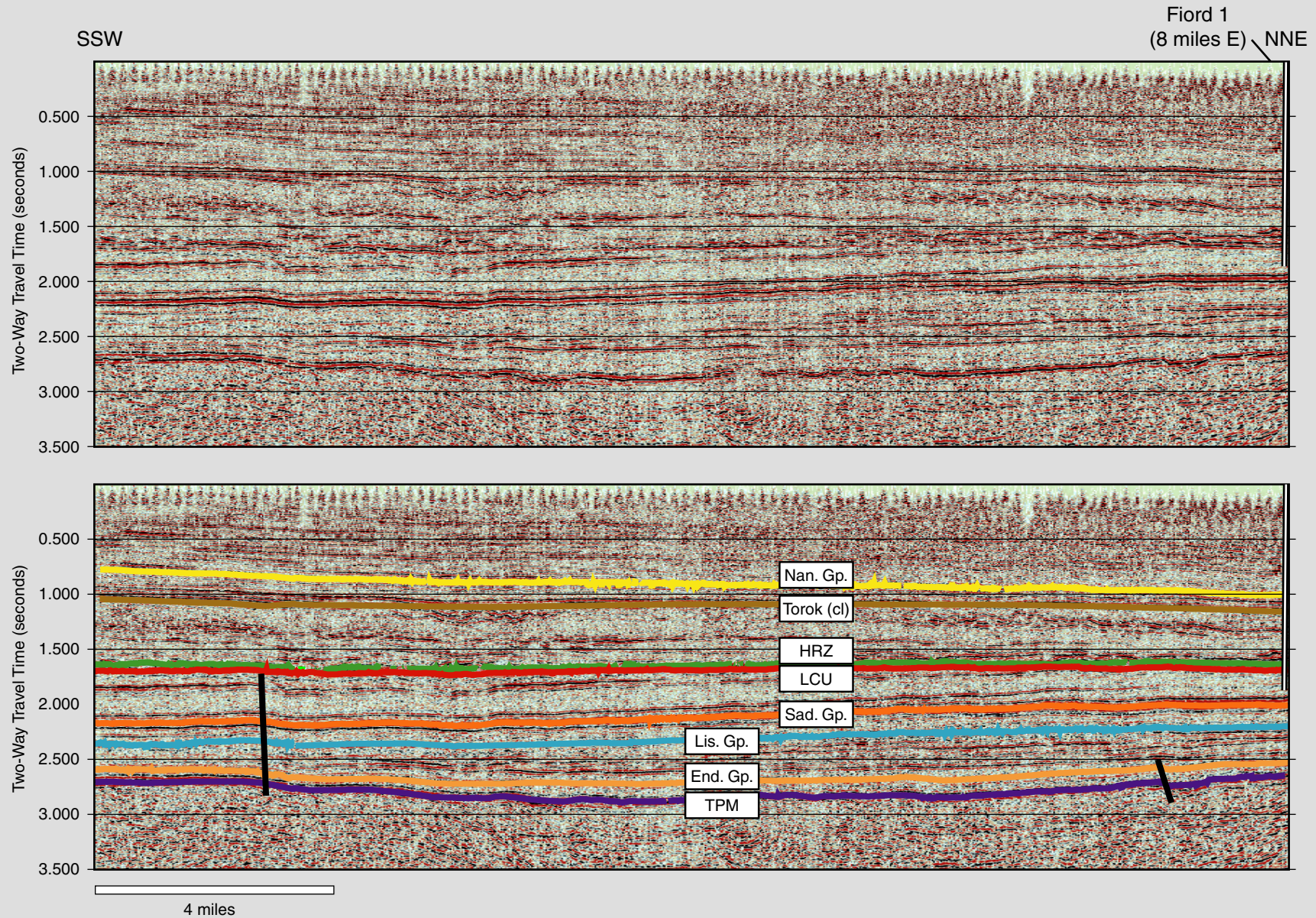
Fiord accumulation outline is based on distribution of successful wells and not necessarily the oil-water contact and the actual limits of the field.



- Bottom-hole well location
- Fault
- Seismic line

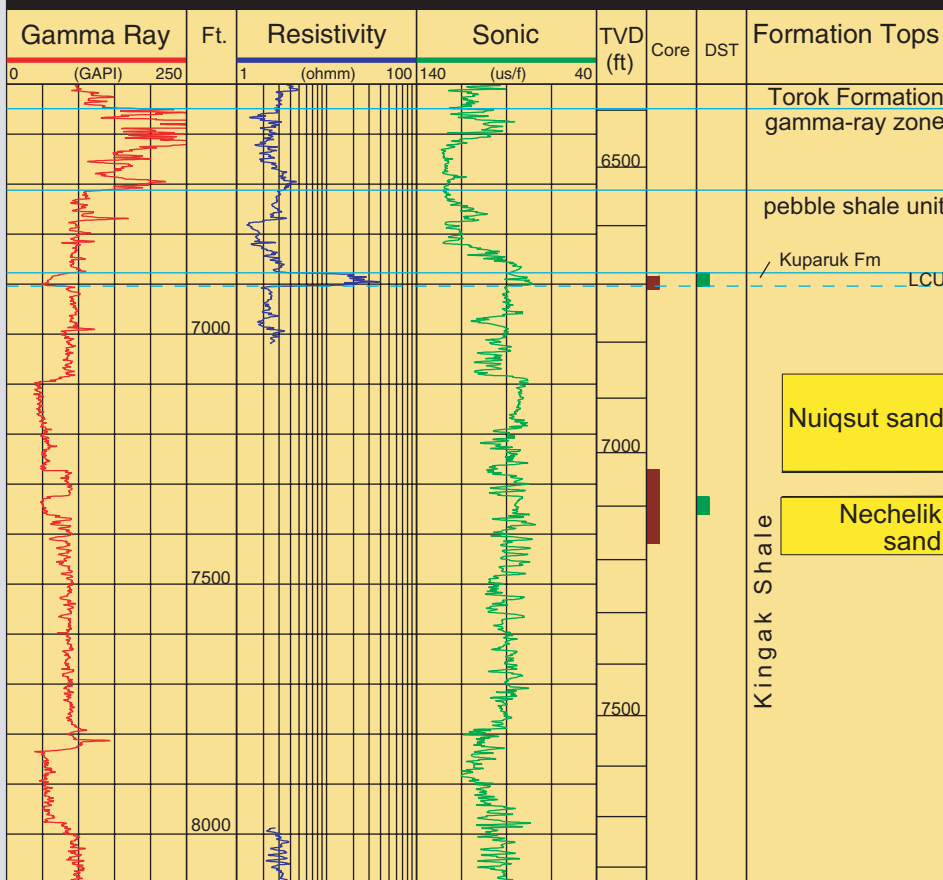
Fiord (Colville River Unit)
Discovery date: 1992
Discovery well: Fiord 1
Trap type: Stratigraphic/structural trap in Kuparuk and Nechelik sands
Reservoir: Kuparuk Ss and Nechelik sand (Kingak Shale)
Production date: Not available
Producing wells: None
Production: Tested 1,065 BOPD in Kuparuk and 180 BOPD in Nechelik
Area: 4,000 acres
Original oil in place: Not available
Oil gravity: 33° API in Kuparuk and 28° API in Nechelik
Total reserves: 50 MMBO

Fiord (Colville River Unit) Line R-10



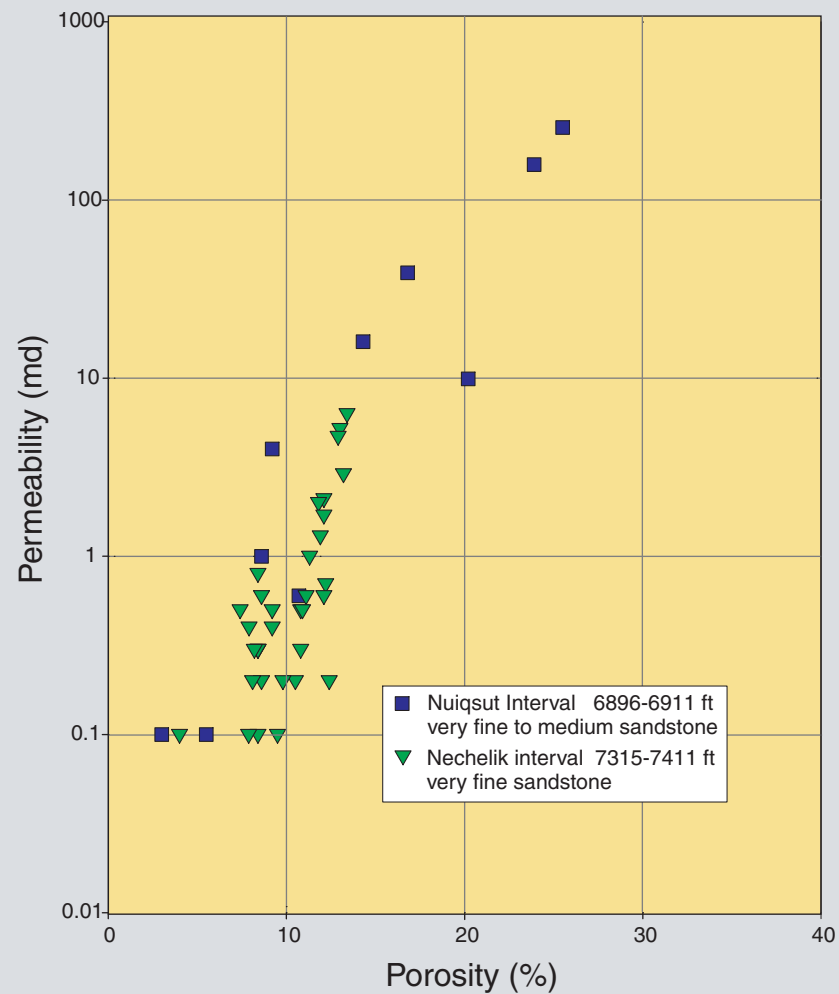
(Go to Explanation of Interpreted Seismic Reflectors)

Fiord 1



Fiord Pool (Colville River Field) - Fiord #1

API number: 50-103-20162
 Operator: ARCO Alaska
 Location: lat 70.41703° N., long 150.81365° W.
 Kelly Bushing: 38 feet above sea level
 Ground elevation: 8 feet above sea level
 Total depth: 10250 feet measured depth
 Completion date: 4/18/92

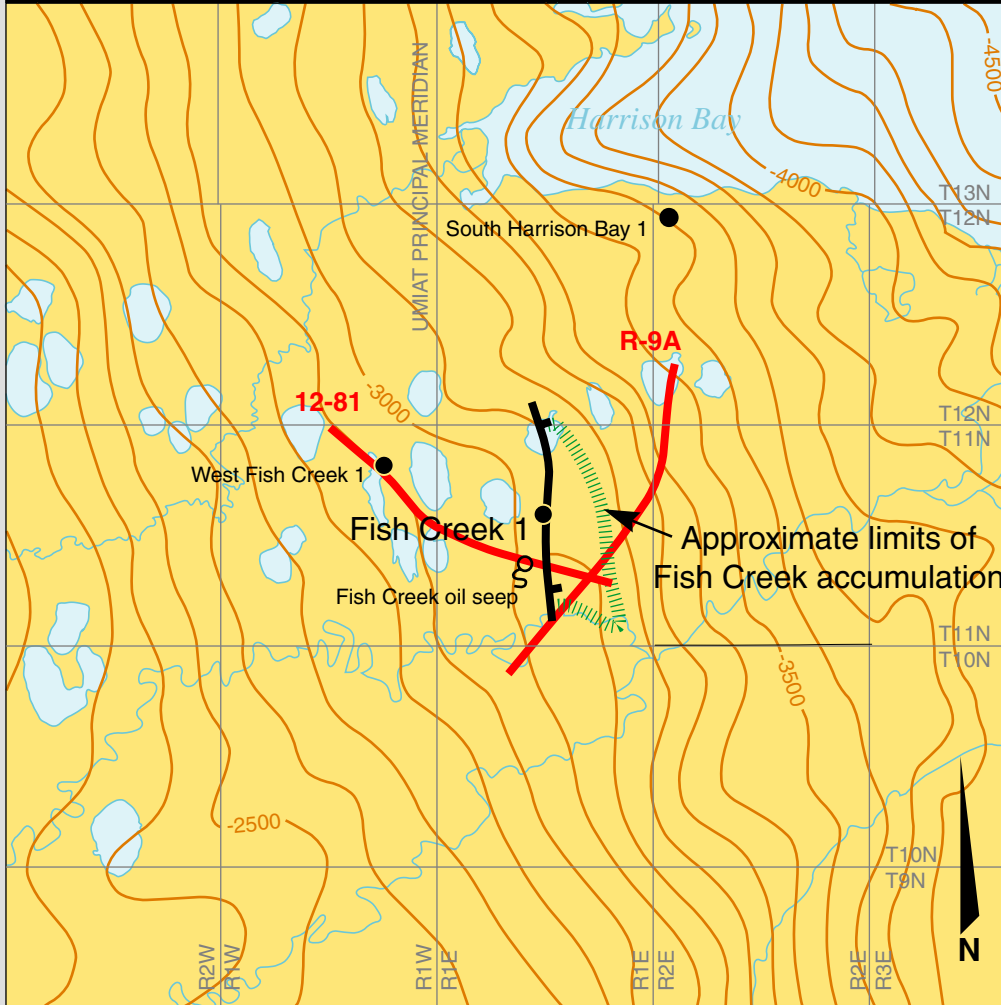


Drill Stem and Production Tests:

DST 1: 7325-7362 ft (MD), tested oil at 180 barrels per day, API gravity 28°.
 DST 2: 6876-6906 ft (MD), tested 1065 barrels oil per day, API gravity 33°.

Notes:
 Fiord 1 is a deviated well, see True Vertical Depth (TVD) track on well log plot.

Fish Creek



Source : Harris, Baxter, and Picard, 1978, Tetra Tech Plate IA/N (Shallow Cretaceous depth map) in Summary Report FY'78 prepared for Husky Oil NPR Operations, Inc.

2 miles

- Bottom-hole well location
- Depth to top of Nanushuk Group in feet below sea level
- ⤴ Fault, teeth on downthrown side
- Seismic lines



Fish Creek

Discovery date: 1949

Discovery well: Fish Creek 1

Trap type: Structural closure on Nanushuk Group

Reservoir: Nanushuk Group

Production date: Undeveloped

Producing wells: None

Production: None

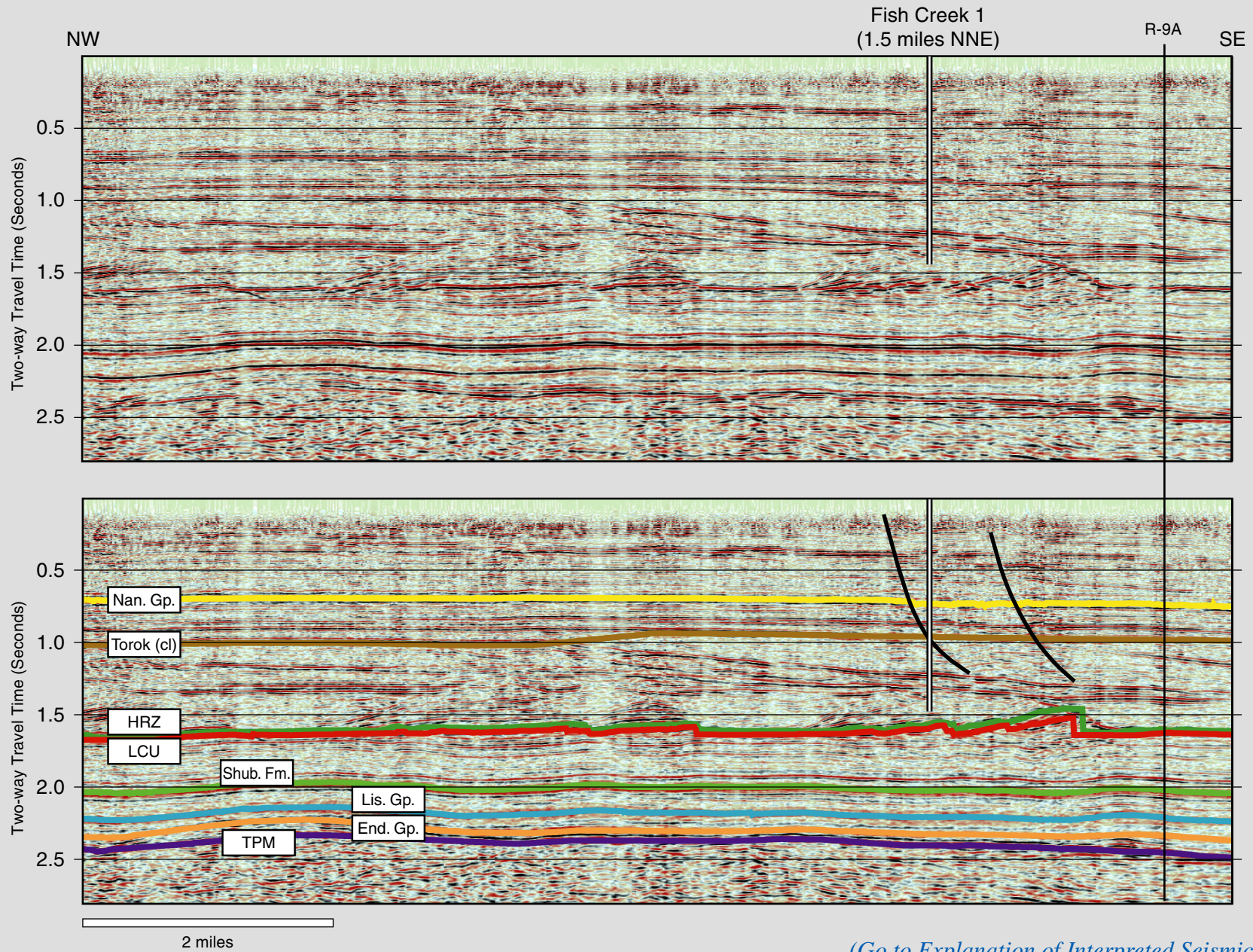
Area: 5,000 acres

Original oil in place: Not available

Oil gravity: 13.9° API

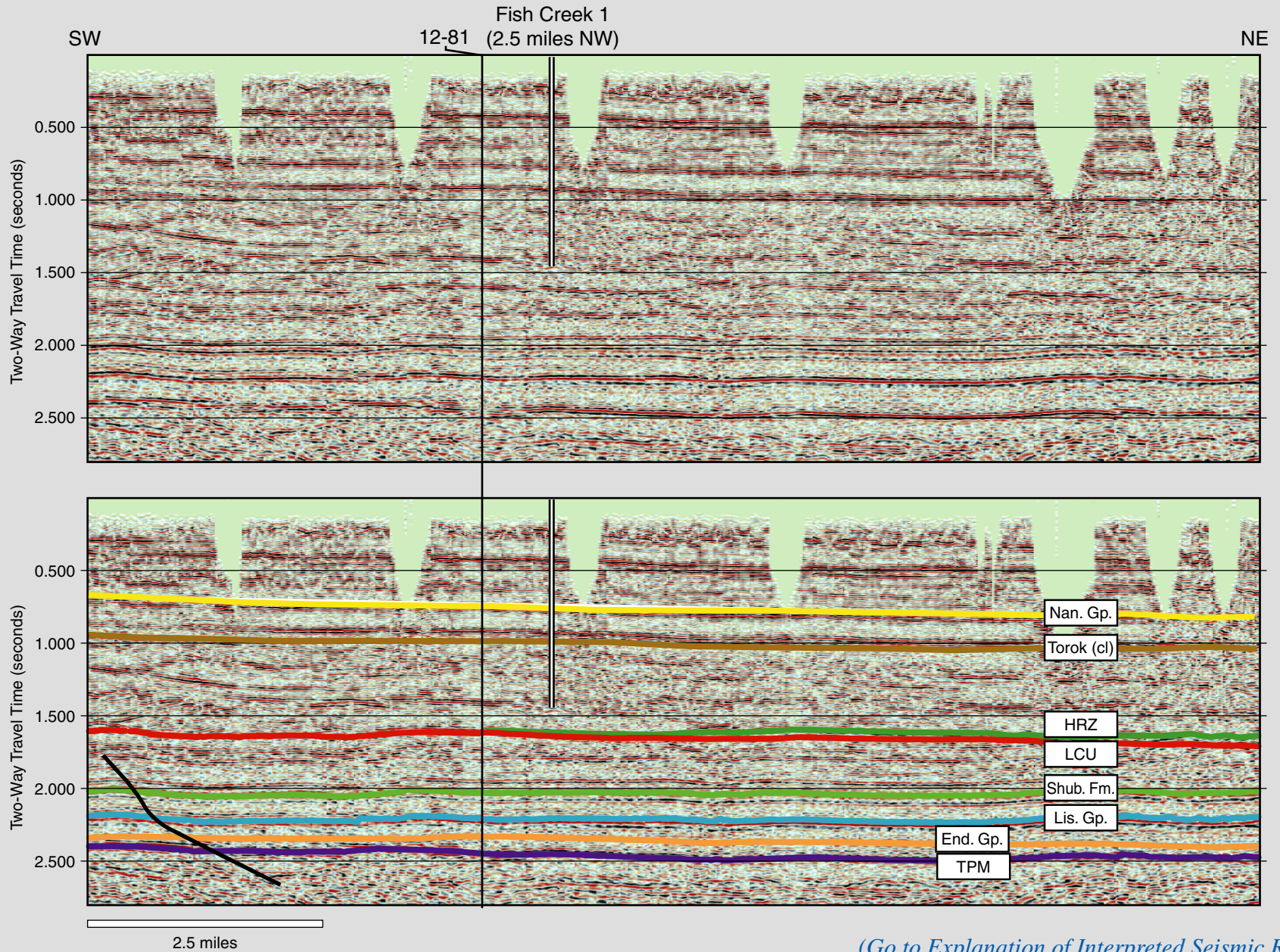
Total reserves: Tested 12 BOPD

Fish Creek 12-81

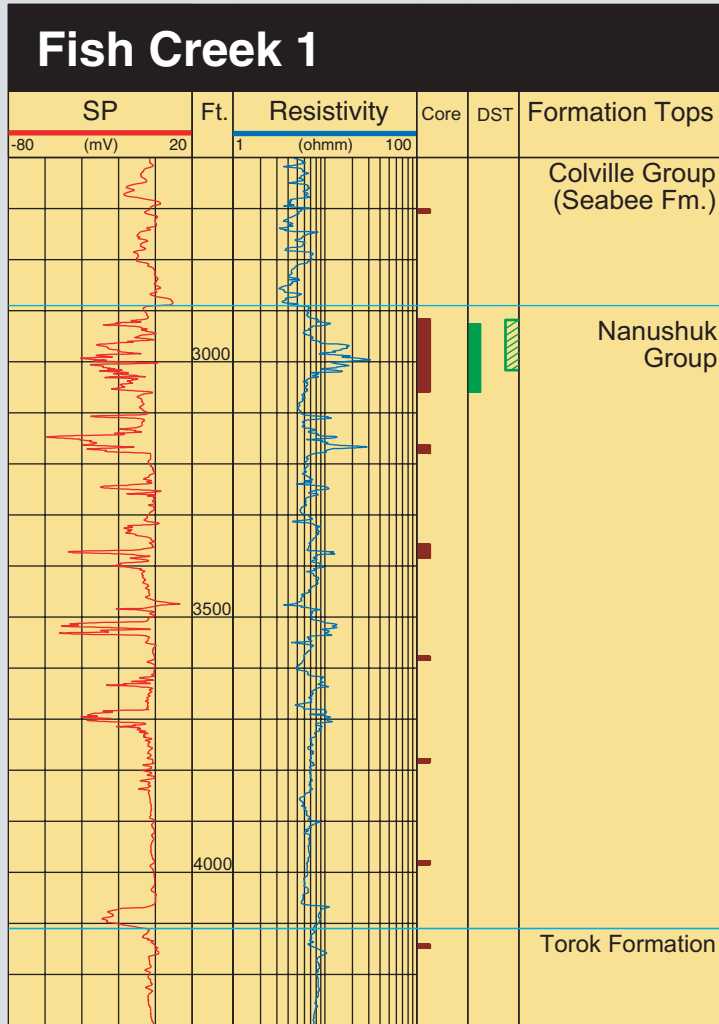


(Go to Explanation of Interpreted Seismic Reflectors)

Fish Creek R-9A



(Go to Explanation of Interpreted Seismic Reflectors)



Fish Creek Oil Field - Fish Creek #1

API number: 50-103-10001
 Operator: U.S. Navy
 Location: lat 70.31111° N., long 151.87000° W.
 Kelly Bushing: 32 feet above sea level
 Ground elevation: 17 feet above sea level
 Total depth: 7020 feet measured depth
 Completion date: 9/04/49

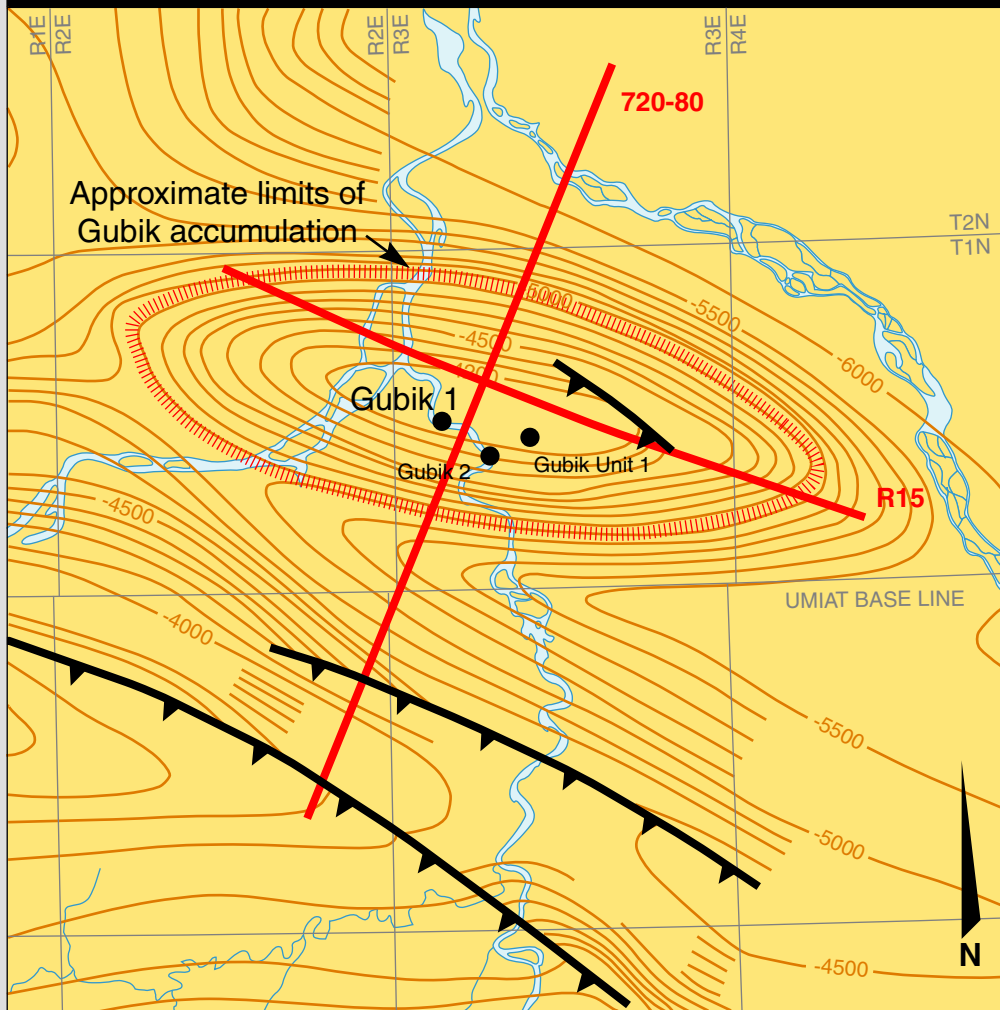
Drill Stem Tests:

DST 1: 2925-3060 ft, (solid green bar) flowed gas to surface in 15 minutes.
 Recovered 180 ft of slightly gas-cut oil and 380 ft of gas, oil, and mud.
 Test 1: 2918-3017 ft, (cross-hatched bar) 36-day pump test produced 12 barrels
 per day of 15° API gravity oil.

Notes:

Only a few scattered core measurements (not shown) were obtained from Fish Creek 1.

Gubik



Source: Miller, N., Presutti, V., and Sterr, A., 1978, Tetra Tech Plate IA/S (Shallow Cretaceous, depth map) in Summary Report FY'78 prepared for Husky Oil NPR Operations, Inc., scale: 1:250,000.

2 miles

- Well location
- ↖ Thrust fault, teeth shown on upper plate
- Seismic lines
- Depth to a horizon within the Nanushuk Group in feet below sea level



Gubik

Discovery date: 1951

Discovery well: Gubik 1

Trap type: Structural closure on Nanushuk Group

Reservoir: Colville and Nanushuk gps

Production date: Undeveloped

Producing wells: None

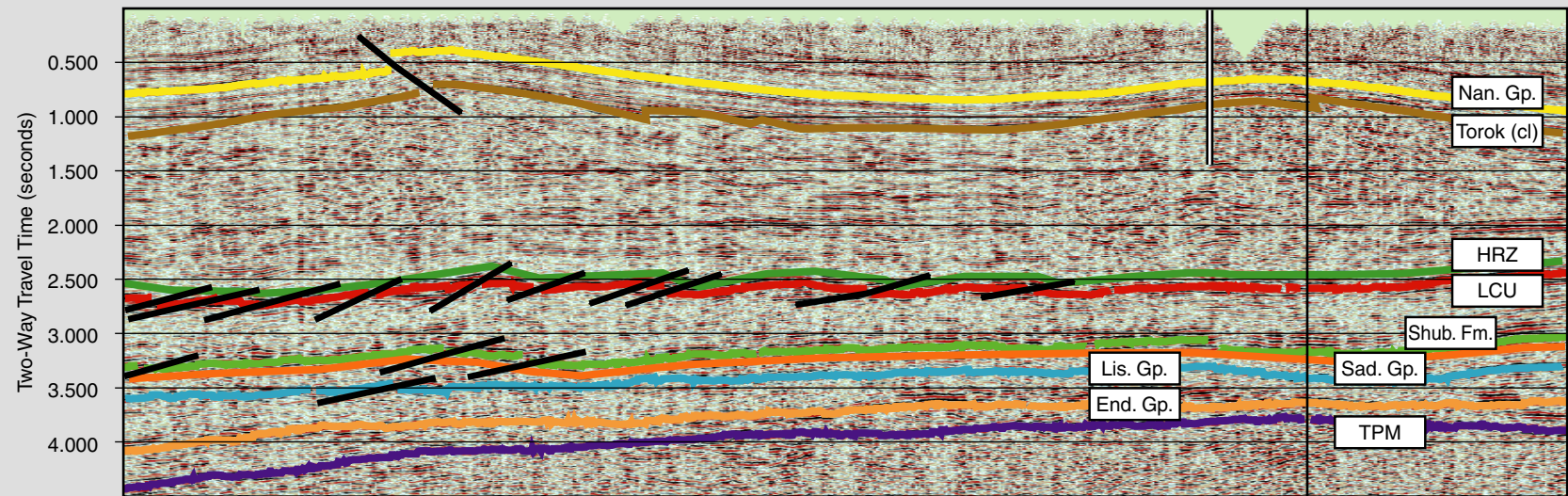
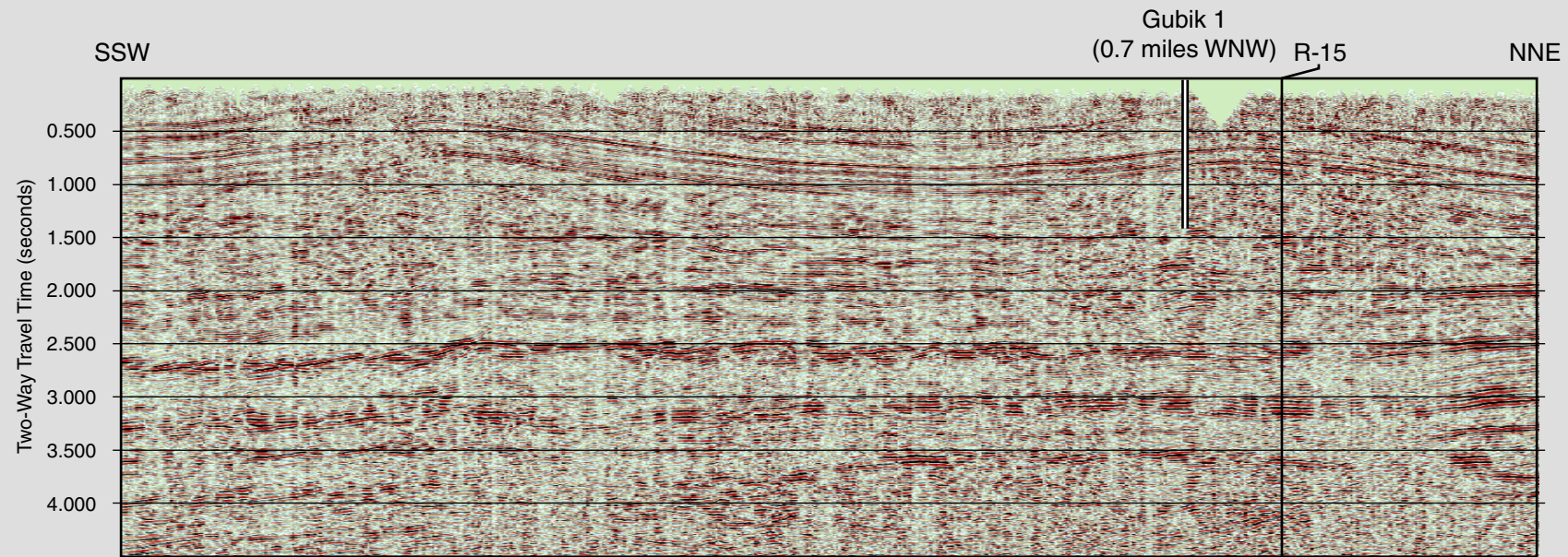
Production: None

Area: 20,000 acres

Original gas in place: Not available

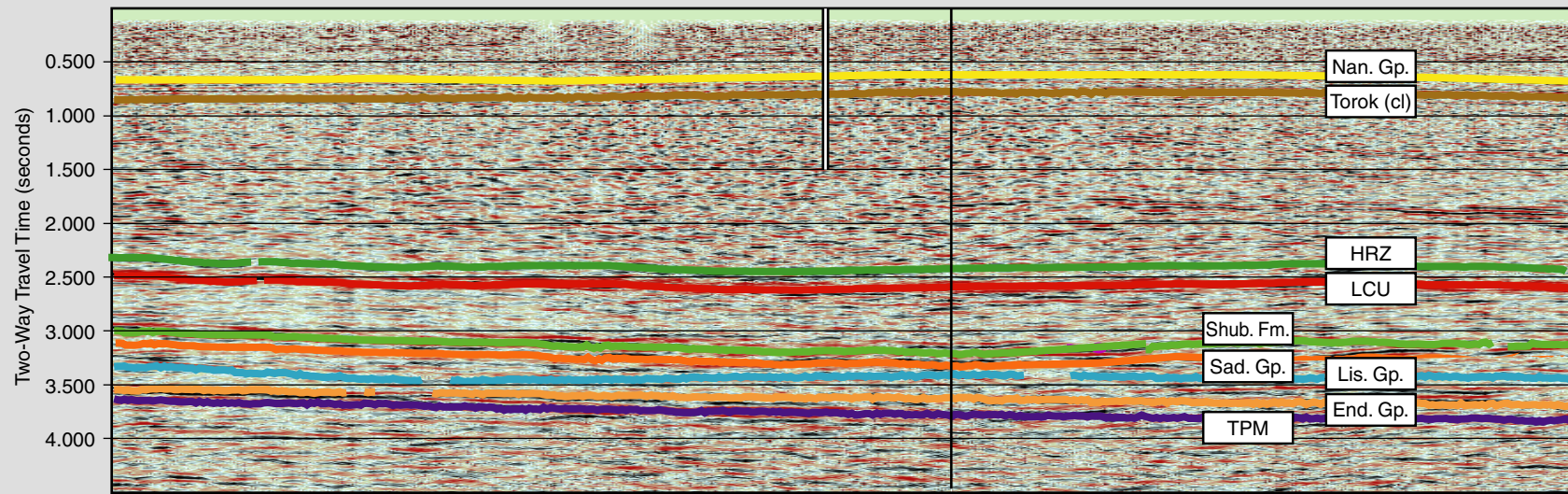
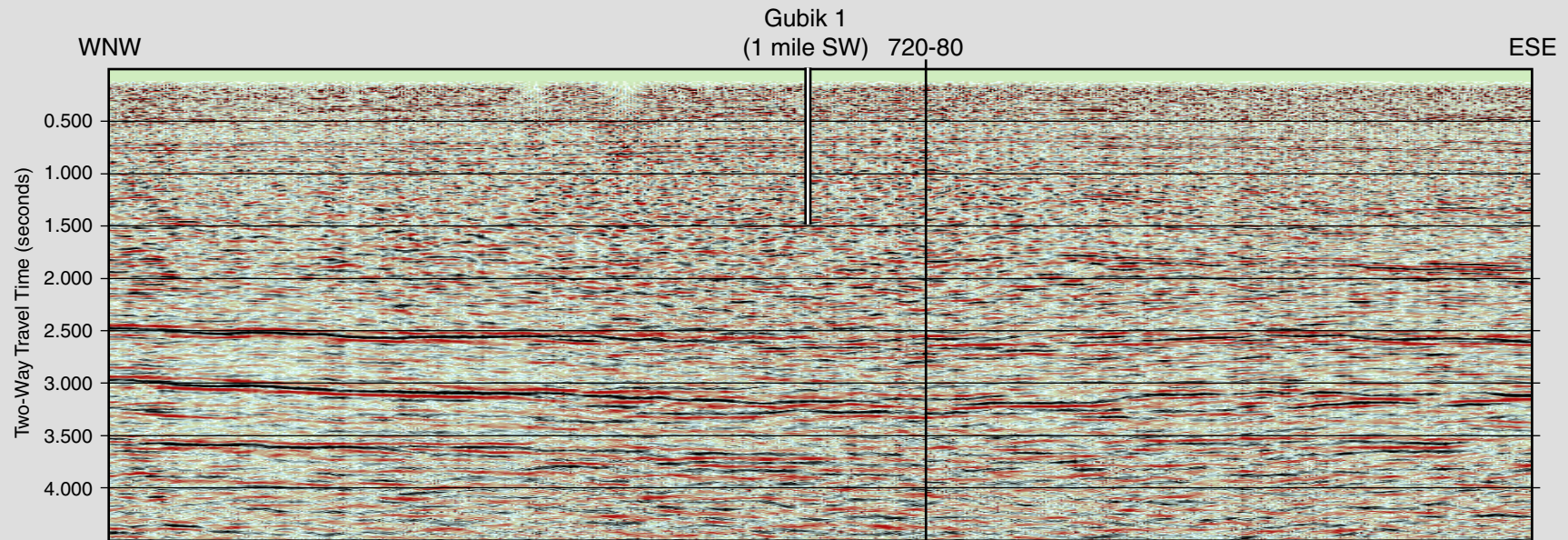
Total reserves: 600 BCF

Gubik 720-80



(Go to Explanation of Interpreted Seismic Reflectors)

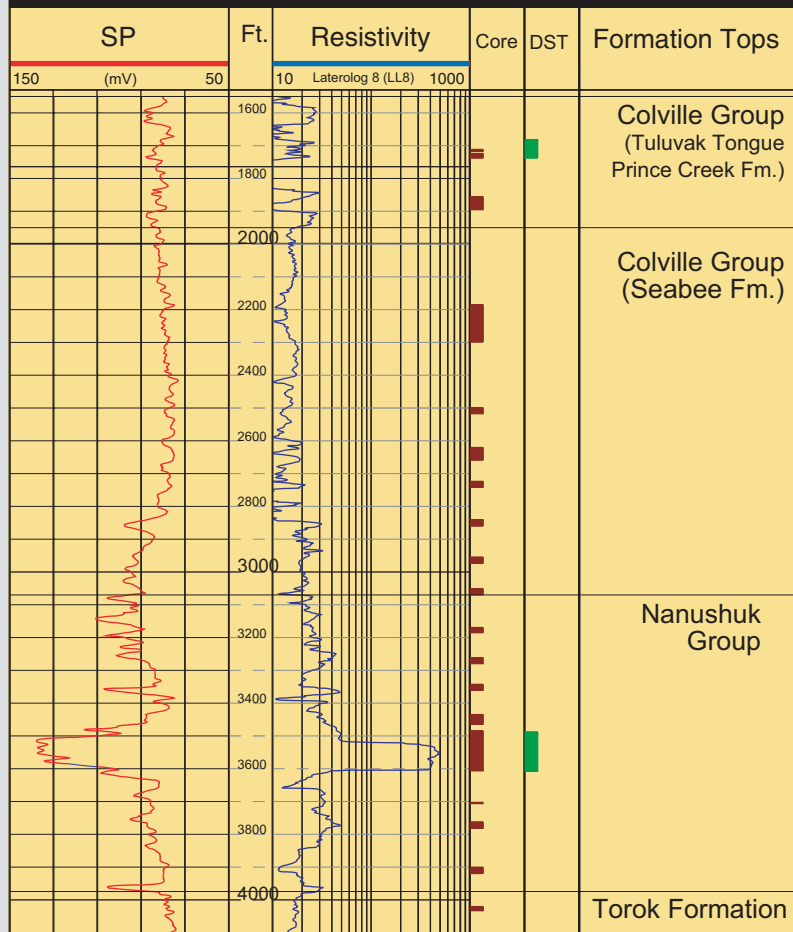
Gubik R-15



2 miles

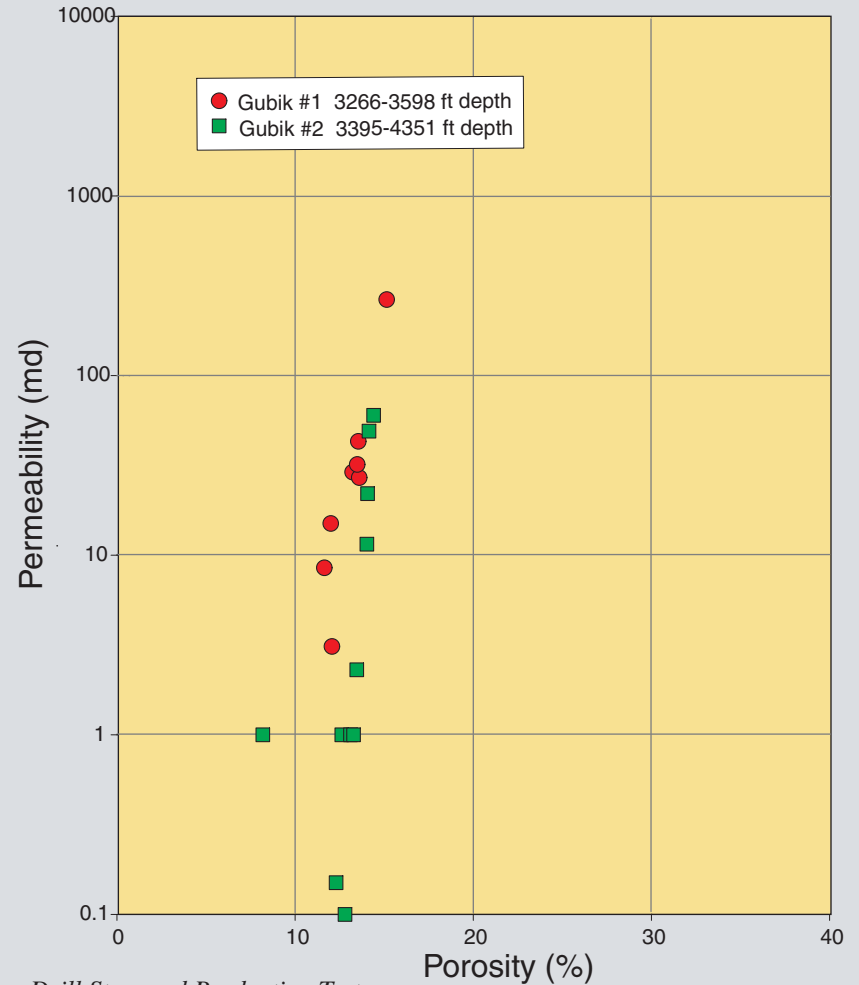
(Go to Explanation of Interpreted Seismic Reflectors)

Gubik 1



Gubik Gas Field - Gubik #1

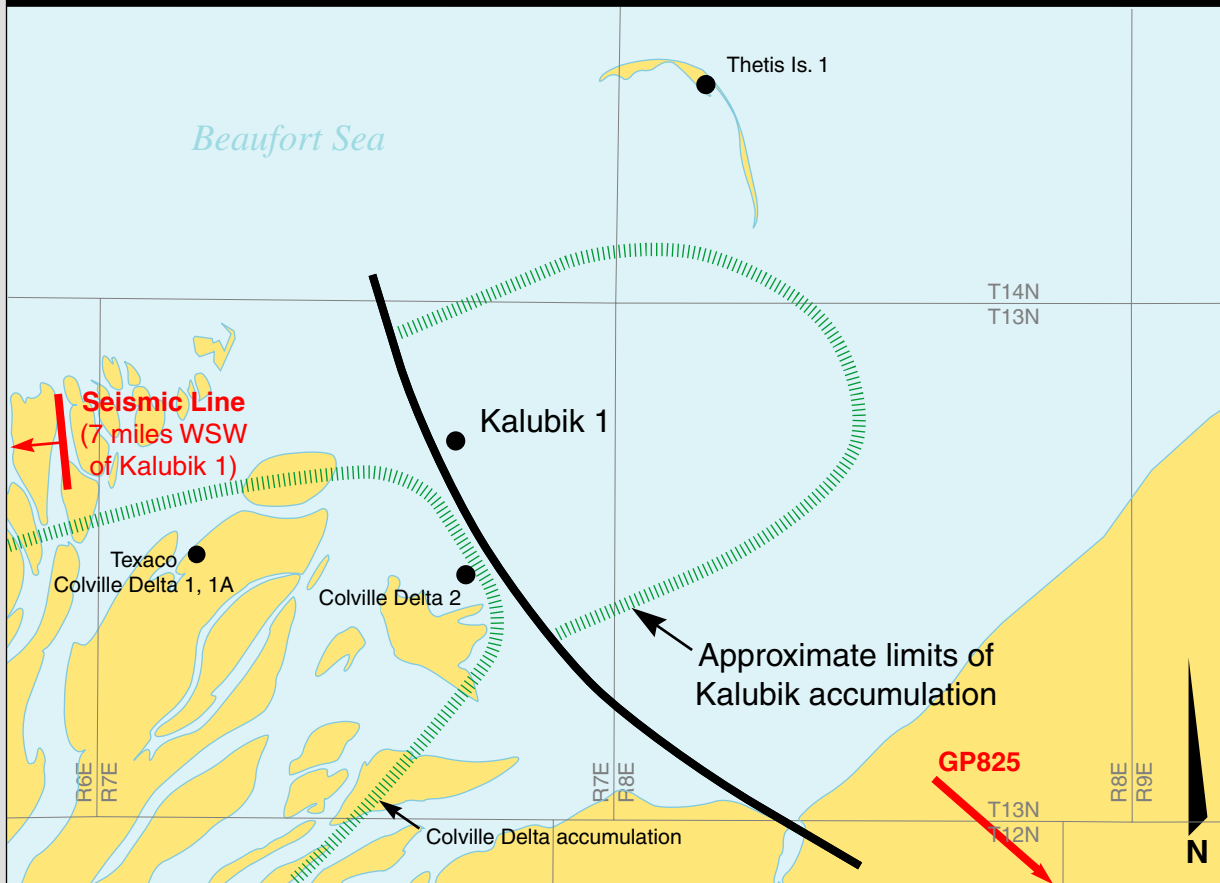
API number: 50-287-10013
 Operator: U.S. Navy
 Location: lat 69.615833° N., long 151.45306° W.
 Kelly Bushing: 156 feet above sea level
 Ground elevation: 144 feet above sea level
 Total depth: 6000 feet measured depth
 Completion date: 8/11/51






Drill Stem and Production Tests:

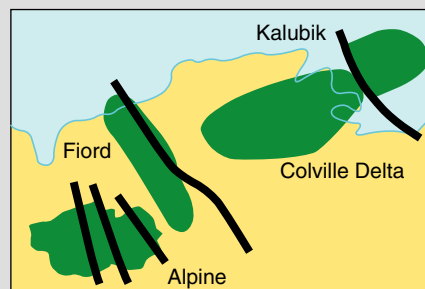
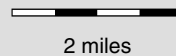
DST 1, 4, 5, and 7 failed.
 DST 2: 1438-1495 ft, flowed gas. Rate not reported.
 DST 3: 1681-1738 ft, flowed gas to surface in seconds at 2060 MCF per day.
 DST 6: 3488-3519 ft, flowed gas at 2561 MCF per day.
 DST 8: 3521-3608 ft, flowed gas at 823 MCF per day.

Kalubik (Kuukpik Unit)



Kalubik accumulation outline is based on distribution of successful wells and not necessarily the oil-water contact nor the limits of the field.

-  Bottom-hole well location
-  Fault
-  Seismic lines



Kalubik (Kuukpik Unit)

Discovery date: 1992

Discovery well: ARCO Kalubik 1

Trap type: Stratigraphic truncation against Lower Cretaceous Unconformity (LCU)

Reservoir: Kuparuk Ss and Nuiqsut sand (Kingak Shale)

Production date: Undeveloped

Producing wells: Not available

Production: Not available; tested at 1,200 BOPD in Kuparuk and 410 BOPD in Nuiqsut sand

Area: 10,000 acres

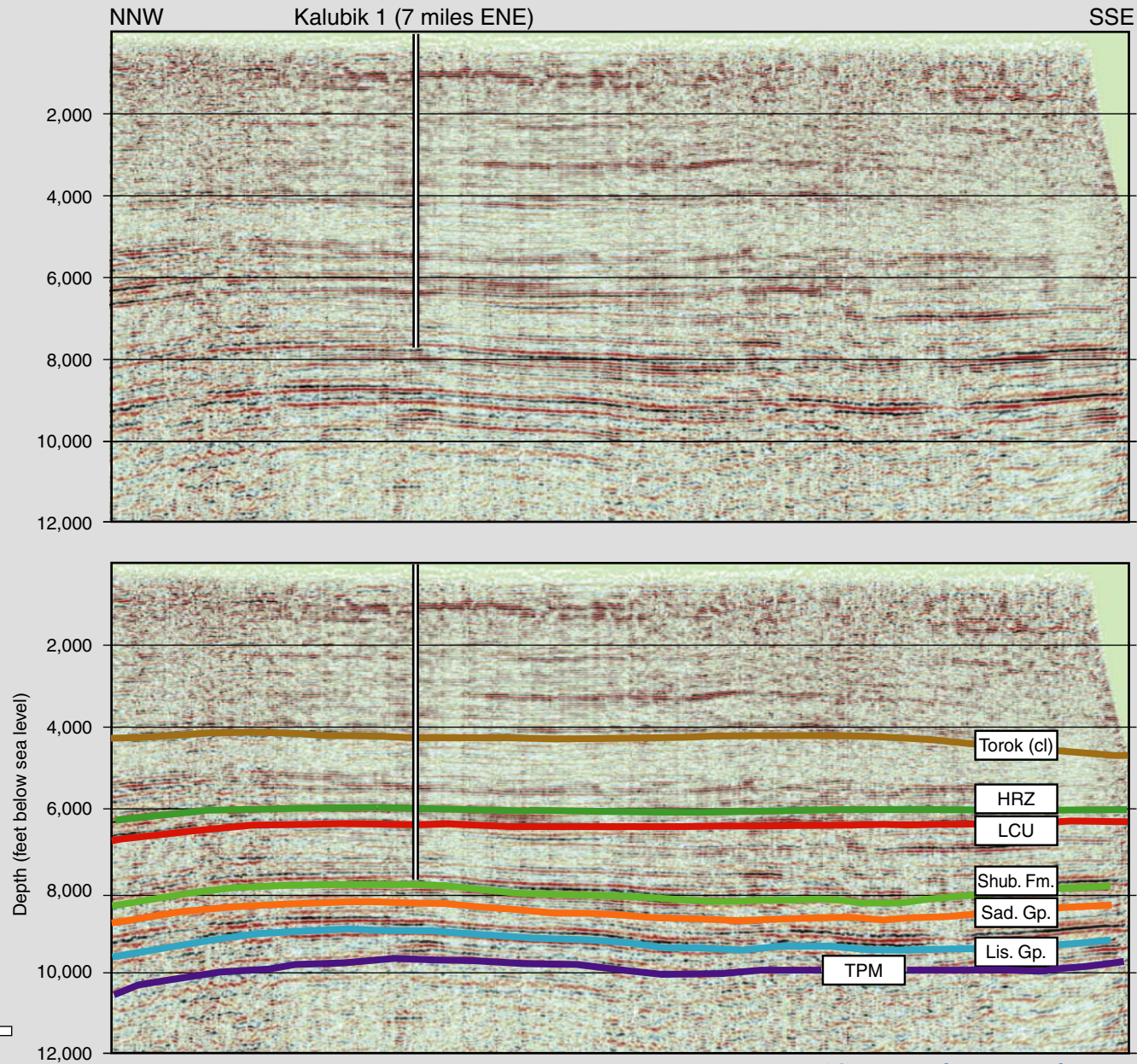
Original oil in place: Not available

Oil gravity: 26° API in Kuparuk

21° API in Nuiqsut

Total reserves: Not available

Kalubik (Kuukpik Unit) Seismic Line



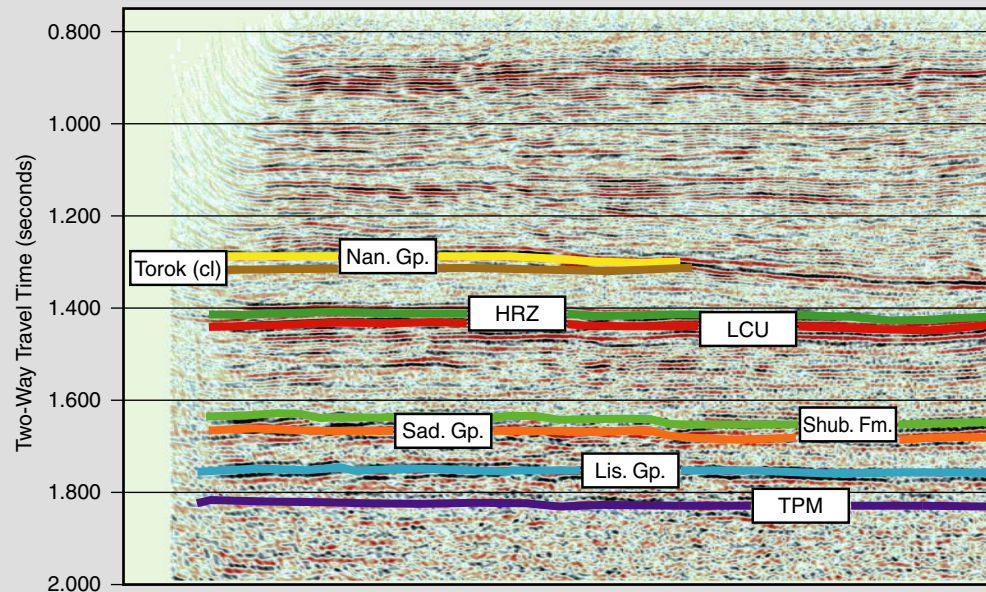
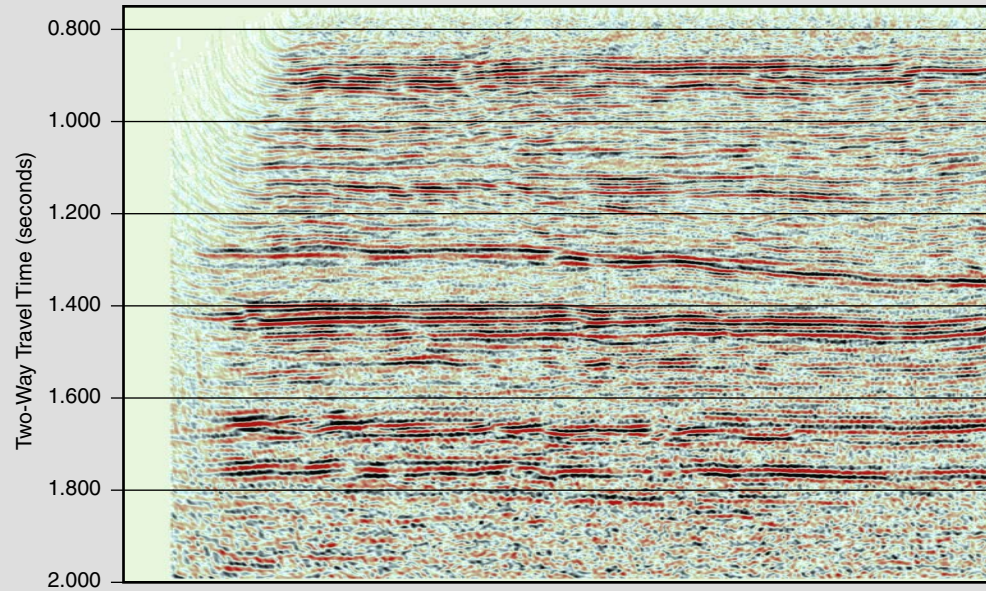
(Go to Explanation of Interpreted Seismic Reflectors)

Kalubik (Kuukpik Unit) GP825



Kalubik 1 (6 miles NW)

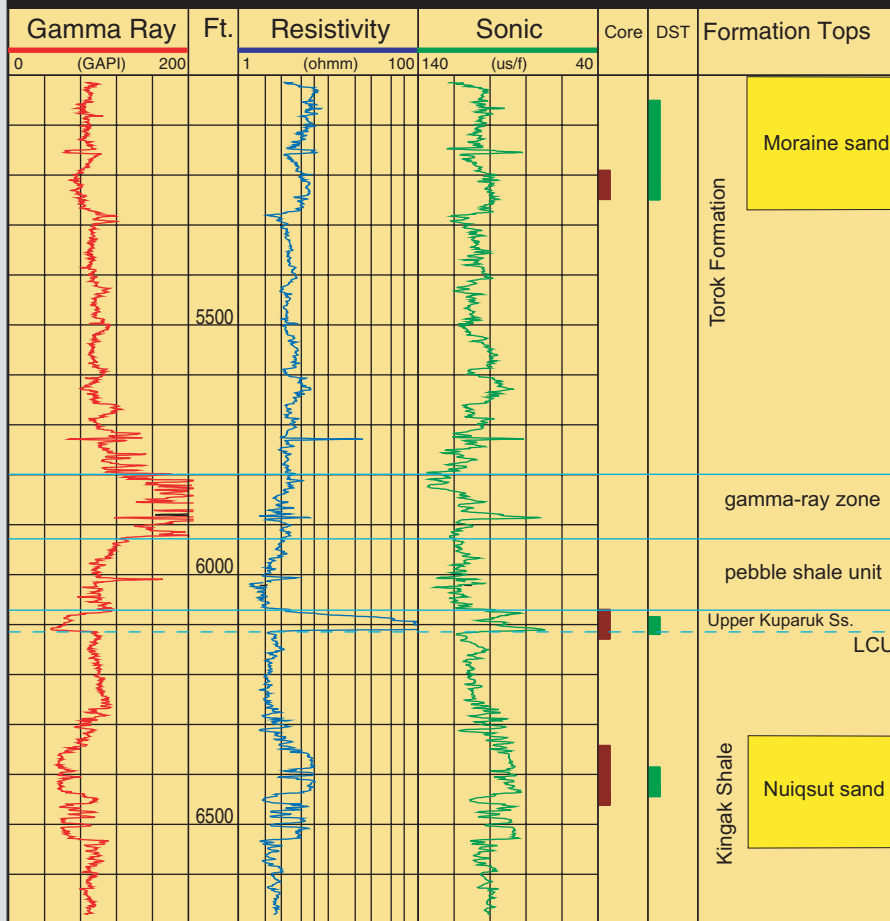
SE



1 mile

(Go to Explanation of Interpreted Seismic Reflectors)

Kalubik 1

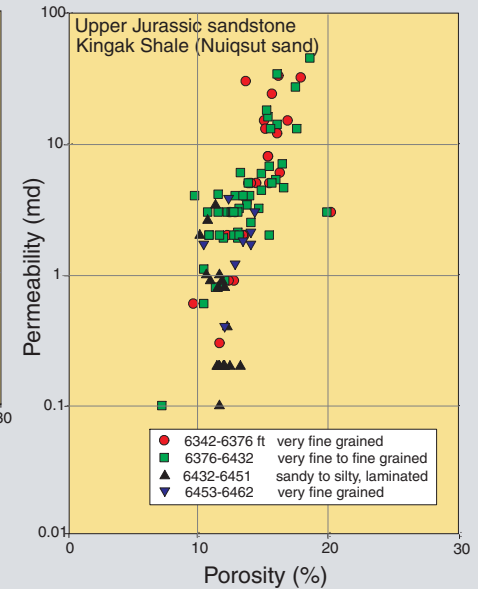
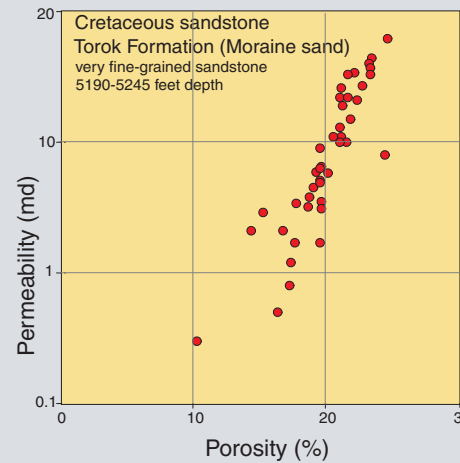


Kalubik

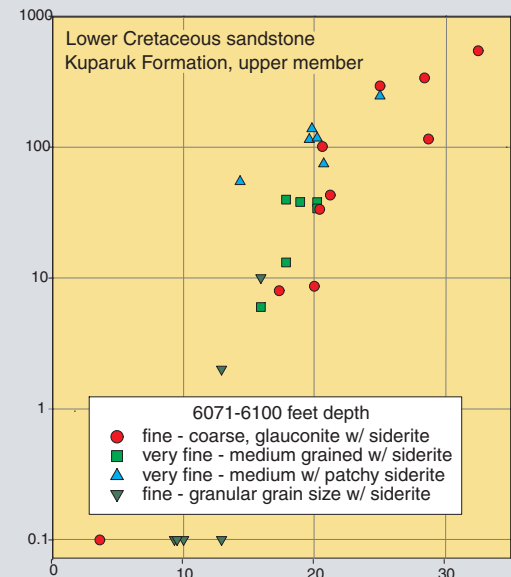
API number: 50-103-20165
 Operator: ARCO Alaska
 Location: lat 70.49243° N., long 150.275° W.
 Kelly Bushing: 33.5 feet above sea level
 Ground elevation: 3.0 feet above sea level
 Total depth: 8273 feet
 Completion date: 5/01/92

Drill Stem Tests:

DST 1: 6385-6445 ft, recovered 280 barrels oil at average rate of 336 barrels per day. API gravity 23°.
 DST 2: 6084-6120 ft, recovered 610 barrels oil at rate of 1200 barrels per day. API gravity 28°.
 DST 3: 5050-5250 ft, recovered 4.5 barrels oil at rate of 10 barrels per day, with 146 barrels of formation water. (Not shown on well log plot.)

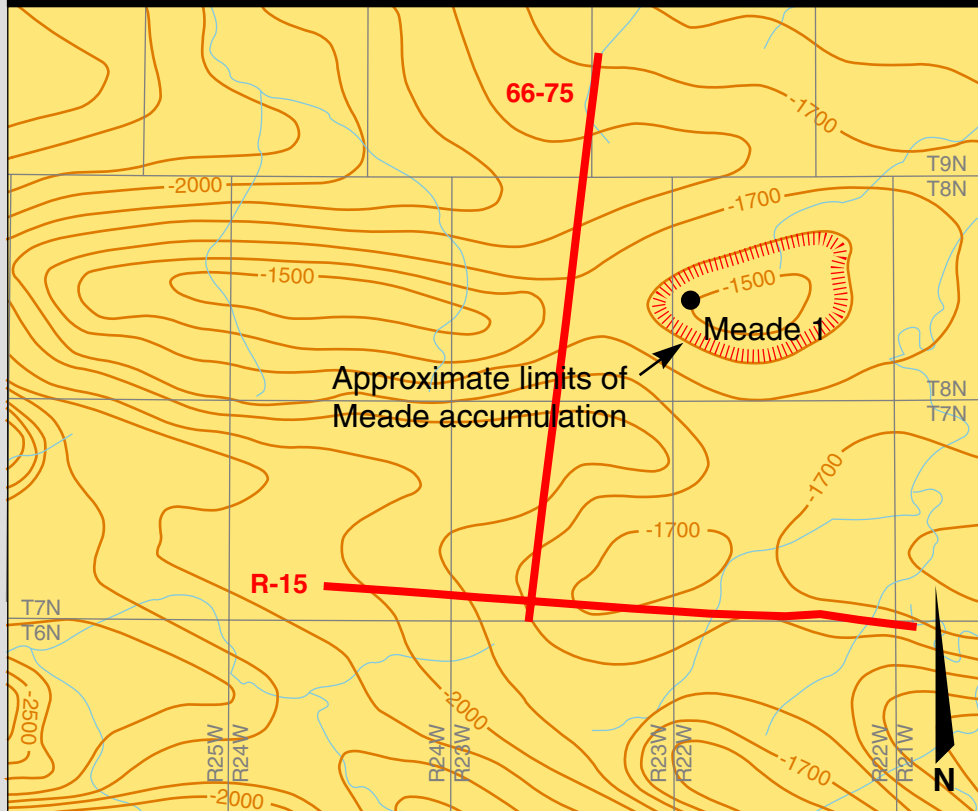


Notes:
 Porosity and permeability from core samples are available for the interval 6342-6462 feet in the Nuiqsut interval of the Kingak Shale (see plot), for the interval 6071-6100 feet in the Kuparuk sandstone (see plot), and from the 5190-5245 interval in the Torok Formation (see plot).





Meade



Source : Harris, Baxter, and Picard, 1978, Tetra Tech Plate IA/N (Shallow Cretaceous depth map) in Summary Report FY'78 prepared for Husky Oil NPR Operations, Inc.

- Bottom-hole well location
- Depth to a horizon within the Nanushuk Group in feet below sea level
- Seismic lines



Meade

Discovery date: 1950

Discovery well: Meade 1

Trap type: Structural closure on Nanushuk Group

Reservoir: Nanushuk Group

Production date: Undeveloped

Producing wells: None

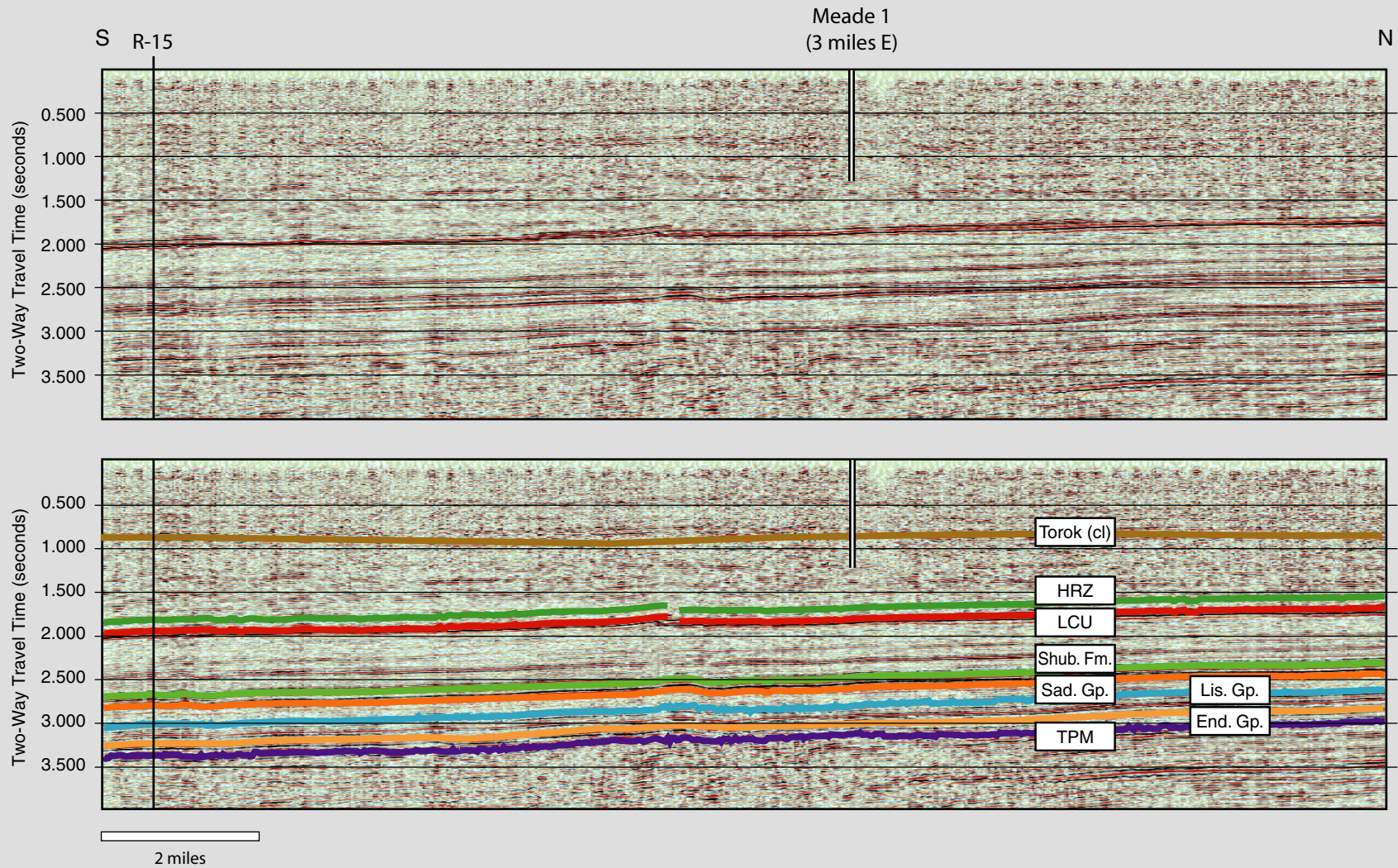
Production: Not available; tested at 301-1132 MCFPD

Area: 5,000 acres

Original gas in place: Not available

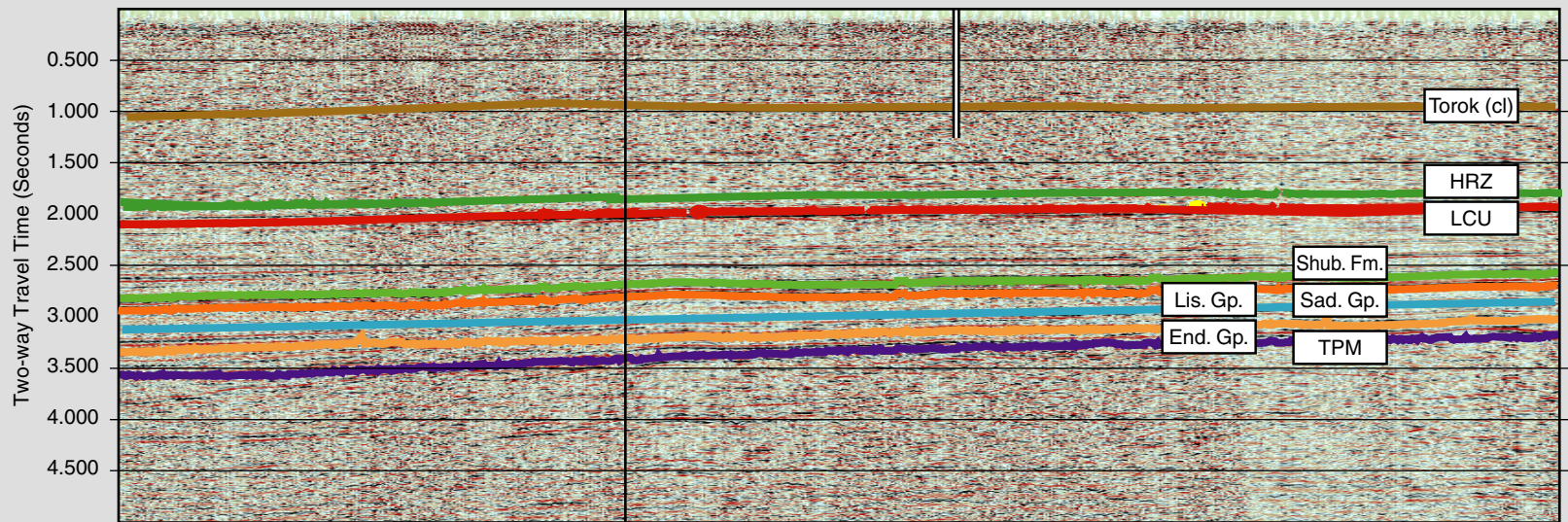
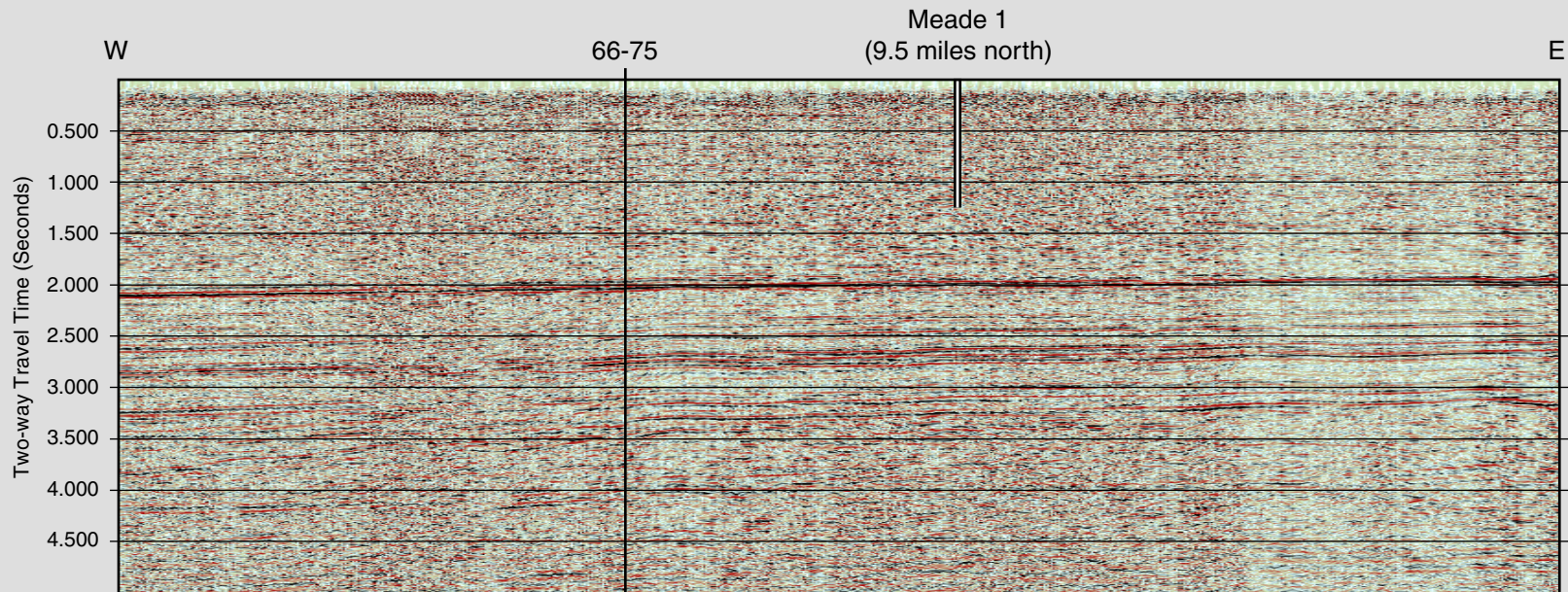
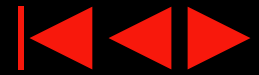
Total reserves: 20 BCF

Meade 66-75



(Go to Explanation of Interpreted Seismic Reflectors)

Meade R-15

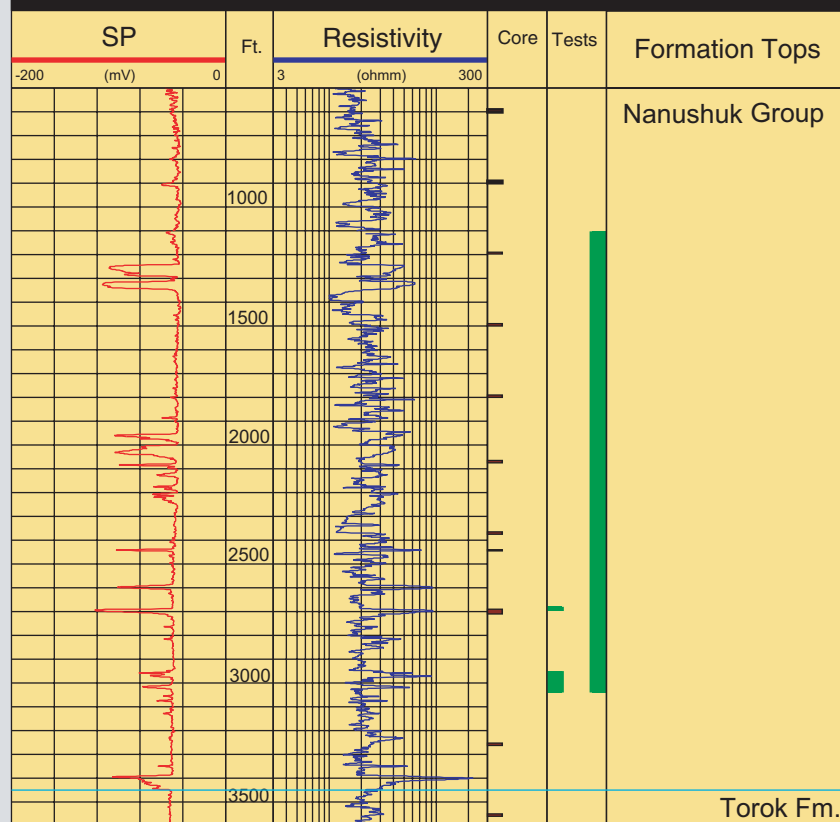


2 miles

(Go to Explanation of Interpreted Seismic Reflectors)



Meade 1



Meade Gas Field - Meade #1

API number: 50-163-10002

Operator: U.S. Navy

Location: lat 70.04167° N., long 157.48972° W.

Kelly Bushing: 211 feet above sea level

Ground elevation: 197 feet above sea level

Total depth: 5305 feet measured depth

Completion date: 8/21/50

Drill Stem Tests:

DST 1: 4116-4184 ft, Recovered 50 ft of gas-cut mud.

DST 2: 2909-3038 ft and DST 3: 2955-3038 ft, packer failed

DST 4: 1101-3038 ft, flowed gas at 301 MCF per day.

DST 5: 1101-3038 ft, flowed gas at 1132 MCF per day.

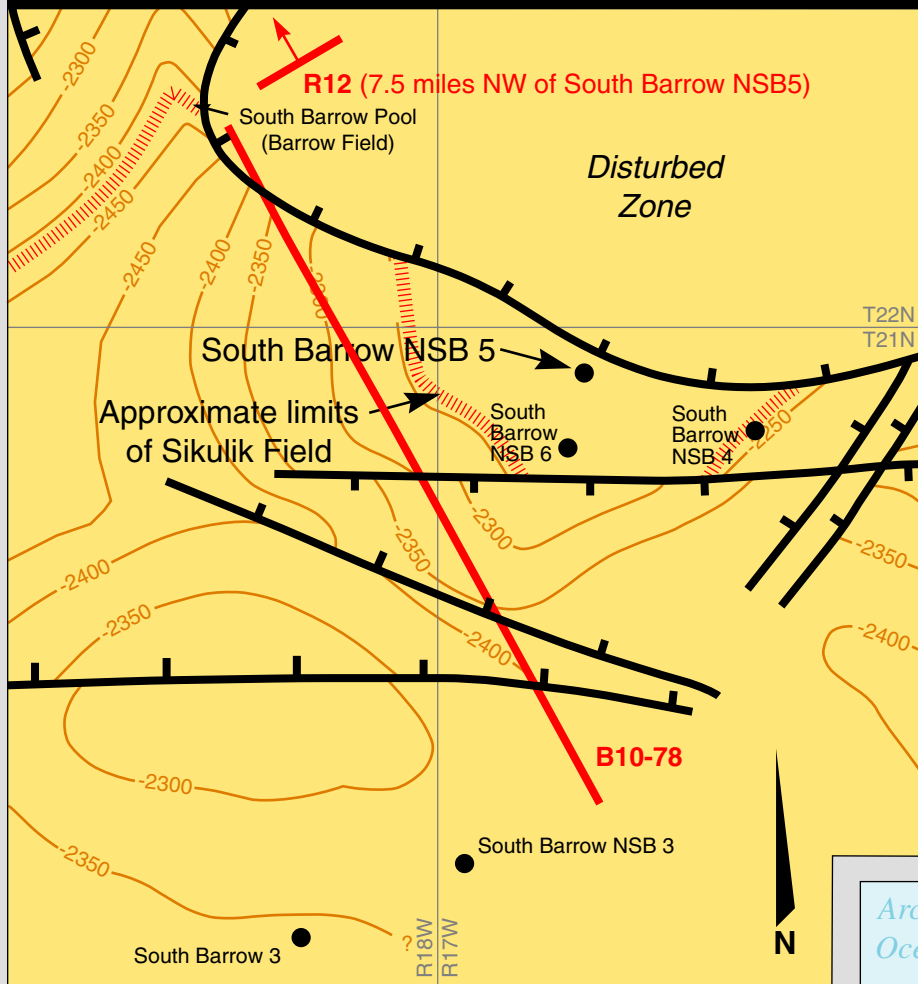
DST 6, 7, and 8: Water-shutoff tests.

DST 9: 2690-2696 ft, strong blow decreased to faint blow, swabbing caused gas to flow intermittently.

Notes:

Only a few scattered core measurements of porosity and permeability (not shown) were obtained from Meade 1.

Sikulik Pool (Barrow Field)



Source: Structure Map-Approximate top Barrow sand, Barrow Area, Natural Petroleum Reserve in Alaska by H. J. Gruy and Associates, Inc., Map No. 2, January 1979.

- Depth to top of Barrow sand in feet below sea level
- Well location
- Fault, teeth on downthrown side
- Seismic lines



Sikulik Pool (Barrow Field)

Discovery date: 1988

Discovery well: South Barrow NSB 5

Trap type: Structural closure on Barrow sand

Reservoir: Barrow sand (Kingak Sh)

Production date: Undeveloped

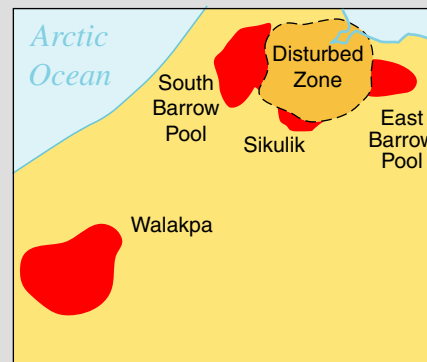
Producing wells: None

Production: 0.3 MMCFPD

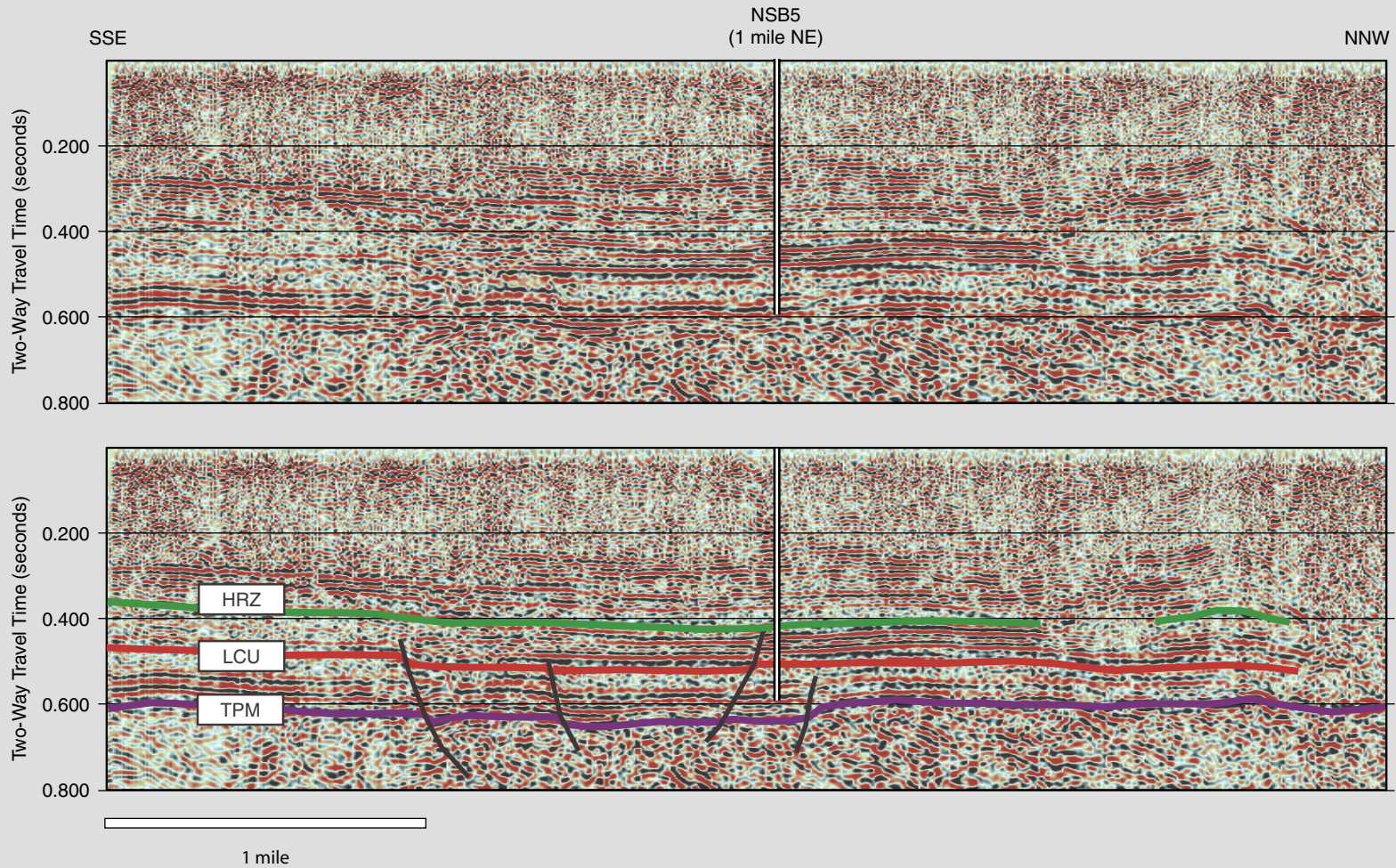
Area: 2,500 acres

Original gas in place: Not available

Total reserves: 16 BCF

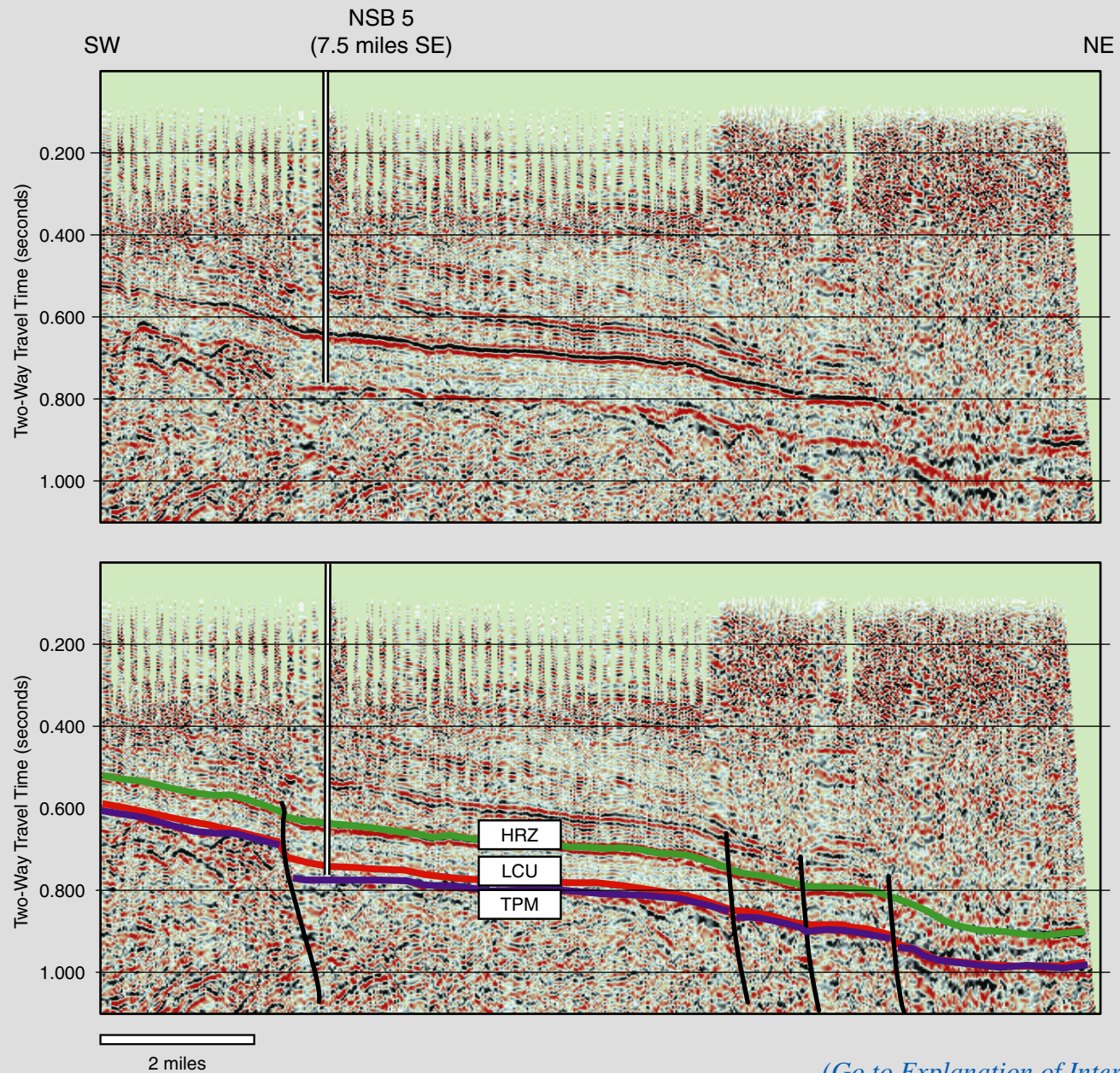


Sikulik Pool (Barrow Field) B10-78

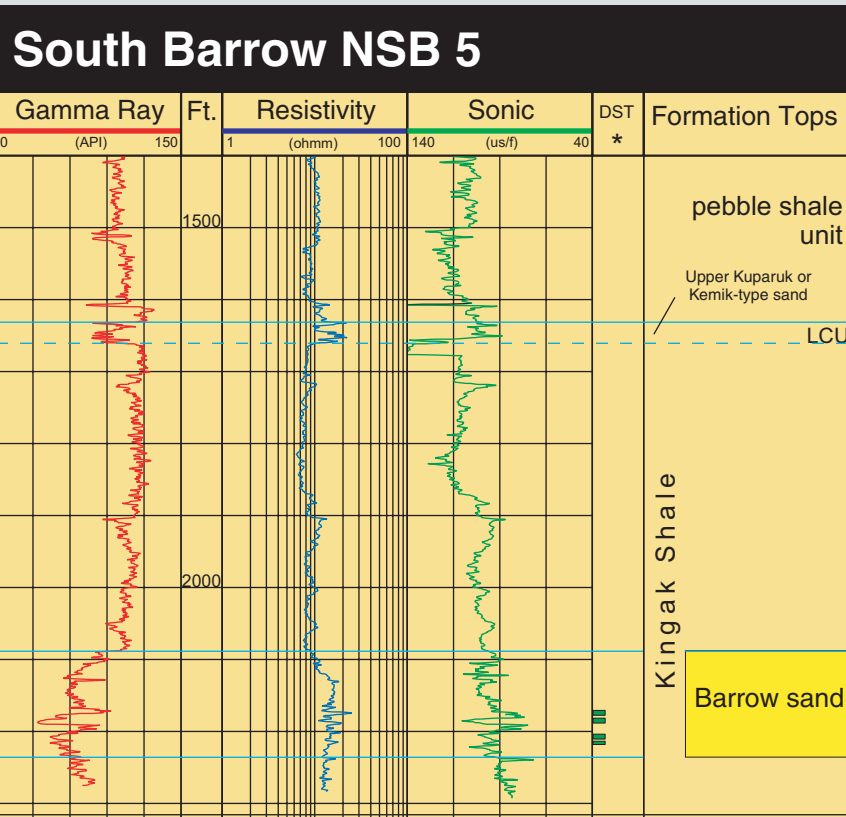


(Go to Explanation of Interpreted Seismic Reflectors)

Sikulik Pool (Barrow Field) R-12



(Go to Explanation of Interpreted Seismic Reflectors)

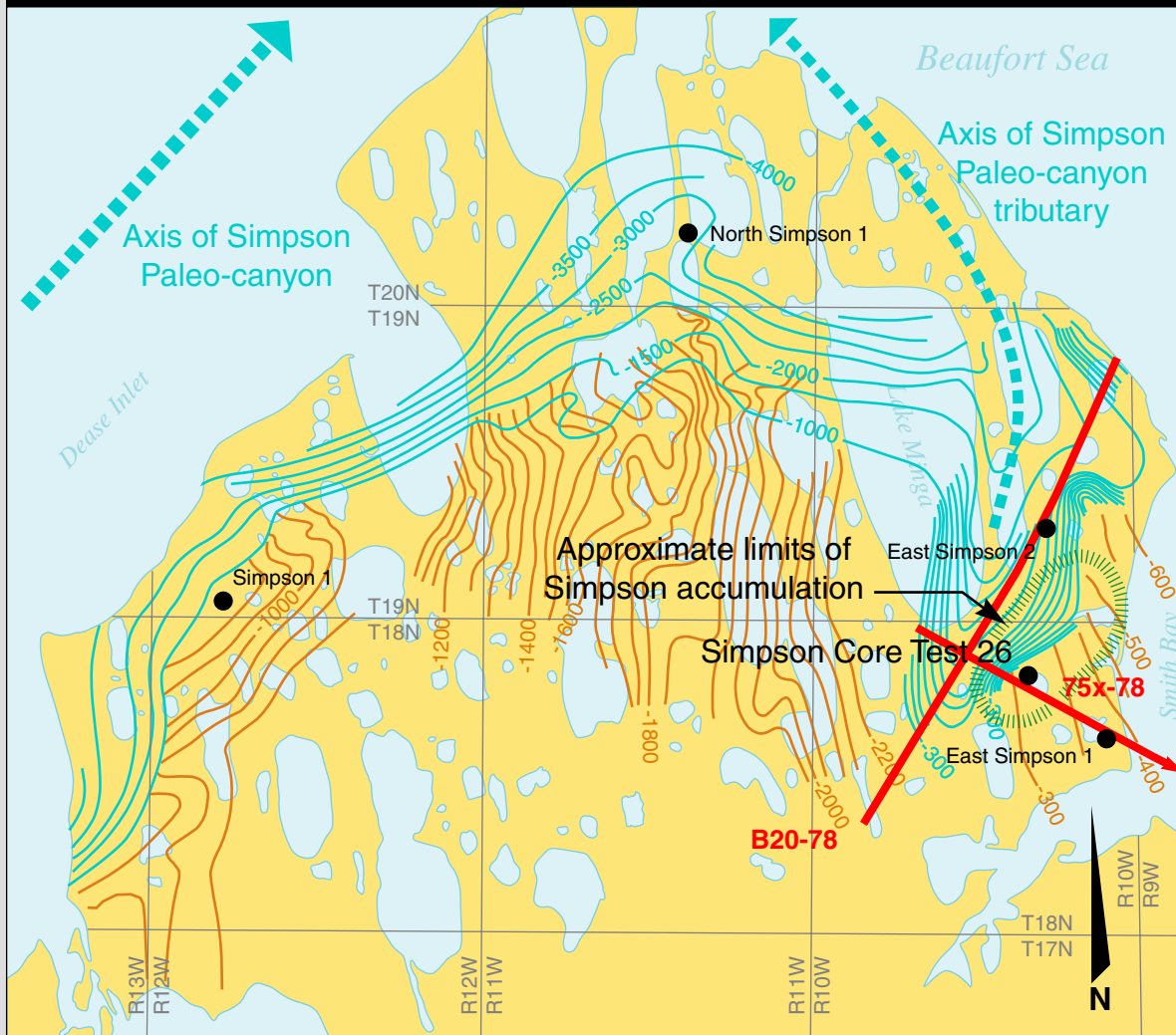


Sikulik Pool (Barrow Field) - South Barrow NSB-5

API number: 50-023-20025
 Operator: North Slope Borough
 Location: lat 71.20606° N., long 156.5129° W.
 Kelly Bushing: 46.1 feet above sea level
 Ground elevation: not available
 Total depth: 2316 feet measured depth
 Completion date: 4/18/88

**DST (Production Test):*
 Flowed 130 MCF per day and 102.8 barrels of water per day through perforations at 2174-2180, 2184-2190, 2203-2210, and 2214-2218 feet.

Simpson



Source: modified from USGS Professional Paper A-304, Plate II

- Well location
- Seismic lines
- Structural contours on the base of the Upper Cretaceous Simpson Canyon (contours in feet below sea level)
- Structural contours on various Nanushuk Group horizons; broken line indicates contour extensions below base of canyon (contours in feet below sea level)



Simpson

Discovery date: 1950

Discovery well: Simpson Core Test 26

Trap type: Stratigraphic trap in Nanushuk Group

Reservoir: Nanushuk Group

Production date: Undeveloped

Producing wells: None

Production: None; tested 120 BOPD and 3 MCFPD

Area: 5,000 acres

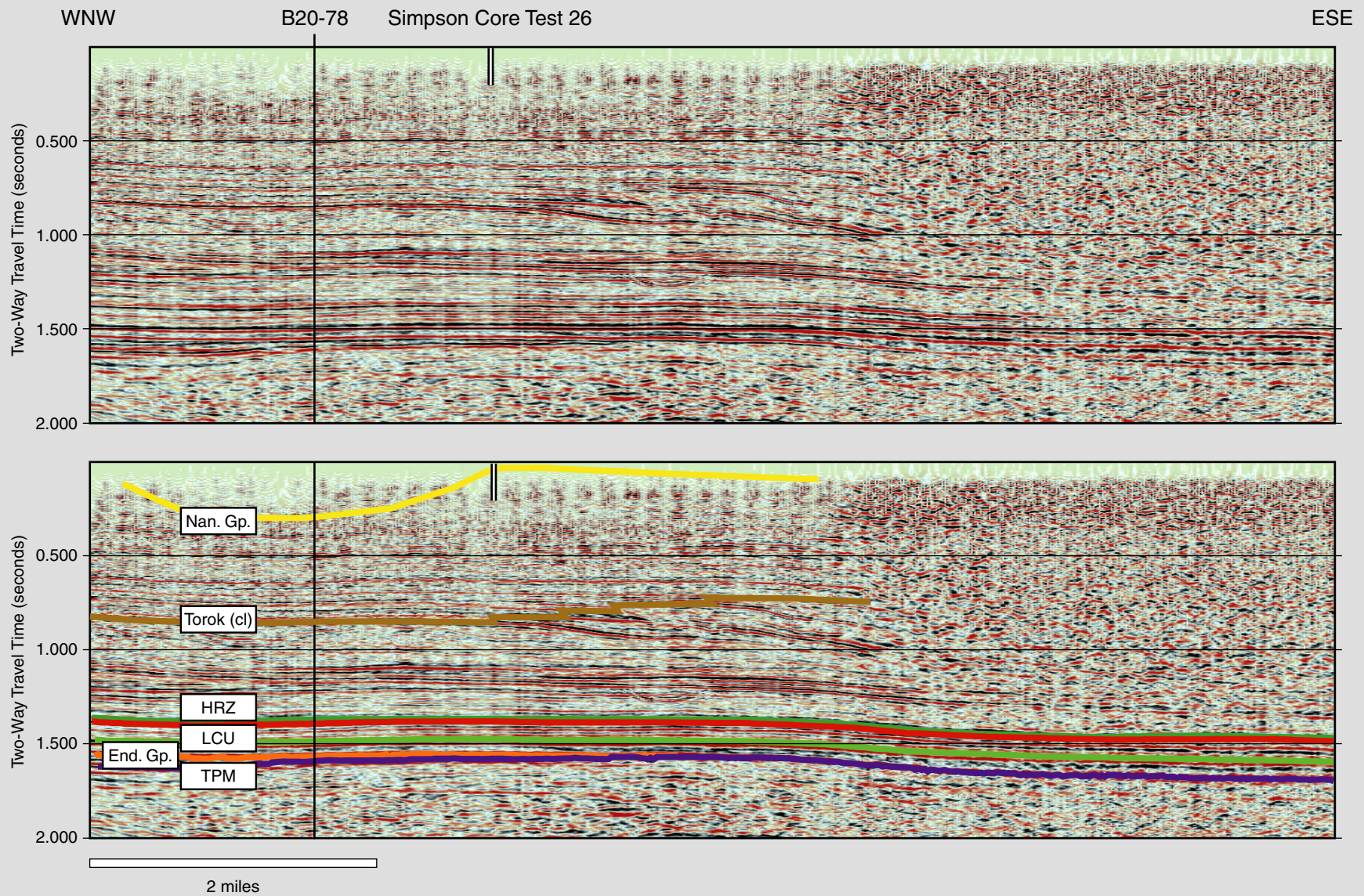
Original oil in place: Not available

Oil gravity: 21.6° API

Total reserves: 12 million barrels

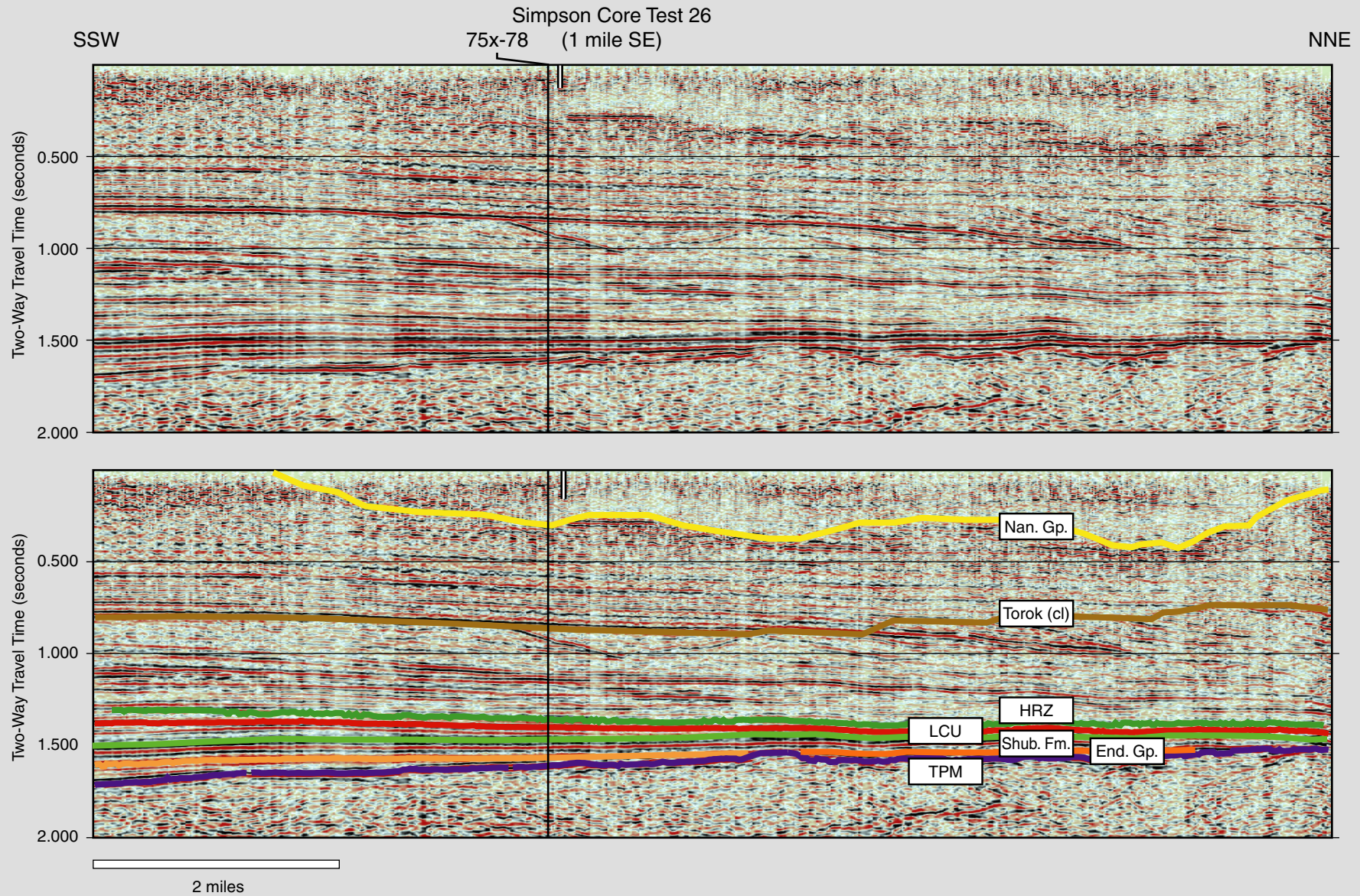
2 miles

Simpson 75x-78



(Go to Explanation of Interpreted Seismic Reflectors)

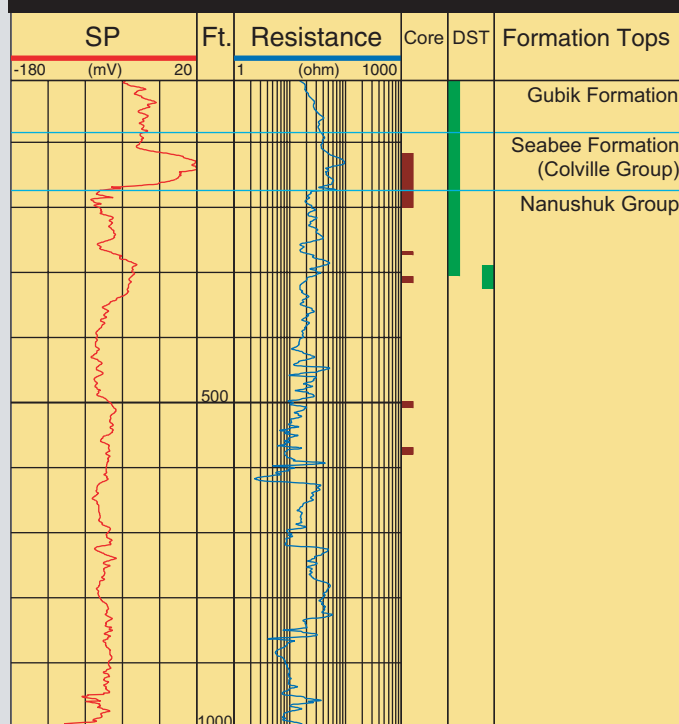
Simpson B20-78



(Go to Explanation of Interpreted Seismic Reflectors)



Simpson Core Test 26



Simpson Oil Field - Simpson Core Test 26

API number: 50-279-10024

Operator: U.S. Navy

Location: lat 70.93556°N., long 154.68444°W.

Kelly Bushing: 23 feet above sea level

Ground elevation: 20 feet above sea level

Total depth: 1171 feet measured depth

Completion date: 10/23/50

Production Tests:

Test 1: 0 – 306 ft, open hole, well flowed at 60 barrels oil per day.

Test 2: 289-325 ft, through perforations, well flowed at 110 barrels oil per day, API gravity 20°.

Test 3: 289–325 ft, through perforations (open hole from bottom of casing at 350 ft to TD of 1171 ft is assumed to be non-productive), well flowed at 92 barrels oil per day and 2500 to 3000 cubic feet of gas per day. Thirteen-day test in March 1951, five months after completion of drilling.

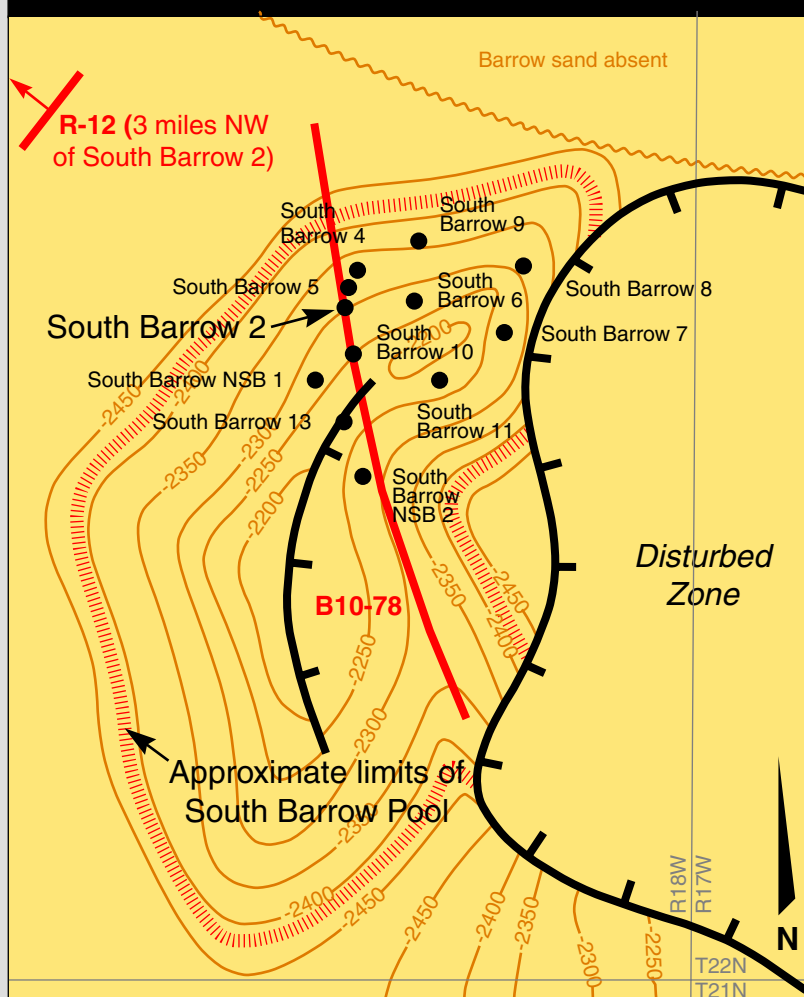
Test 4: 289–325 ft, through perforations, well flowed 120 barrels oil per day (48 gallons per barrel). API gravity 21.6°. Five-day test in May 1951, seven months after completion of drilling.

Notes:

Porosity and permeability measurements were not obtained because the sands in cores were too unconsolidated.

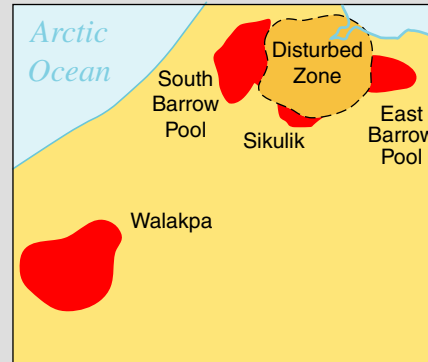
The SP and resistivity logs for Simpson 26, posted on Schlumberger format and dated 9-2-50 and 9-20-50, were acquired with a Widco logger and were measured with a single-point electrode rather than with an array. Therefore the log is actually a resistance log (ohms), which is proportional to resistivity (ohm-m) only when the borehole diameter and wellbore fluid properties are constant. No caliper log was run. "Due to the well flowing oil and gas, considerable trouble (with logging) was encountered, from too much oil in the hole, also from the surging of mud in the hole. Due to the limitations of a mono-electrode recording system, no interpretation regarding oil or gas can be made." (from letter in USGS well files)

South Barrow Pool (Barrow Field)



Source: Structure Map—Approximate top Barrow sand, Barrow Area, Natural Petroleum Reserve in Alaska by H. J. Gruy and Associates, Inc., Map No. 2, January 1979.

- Well location
- Depth to top of Barrow sand in feet below sea level
- ┌ Fault, teeth on downthrown side
- Seismic lines



South Barrow Pool (Barrow Field)

Discovery date: 1949

Discovery well: South Barrow 2

Trap type: Structural closure on Barrow sand

Reservoir: Barrow sand (Kingak Shale)

Production date: 1950

Producing wells: 1

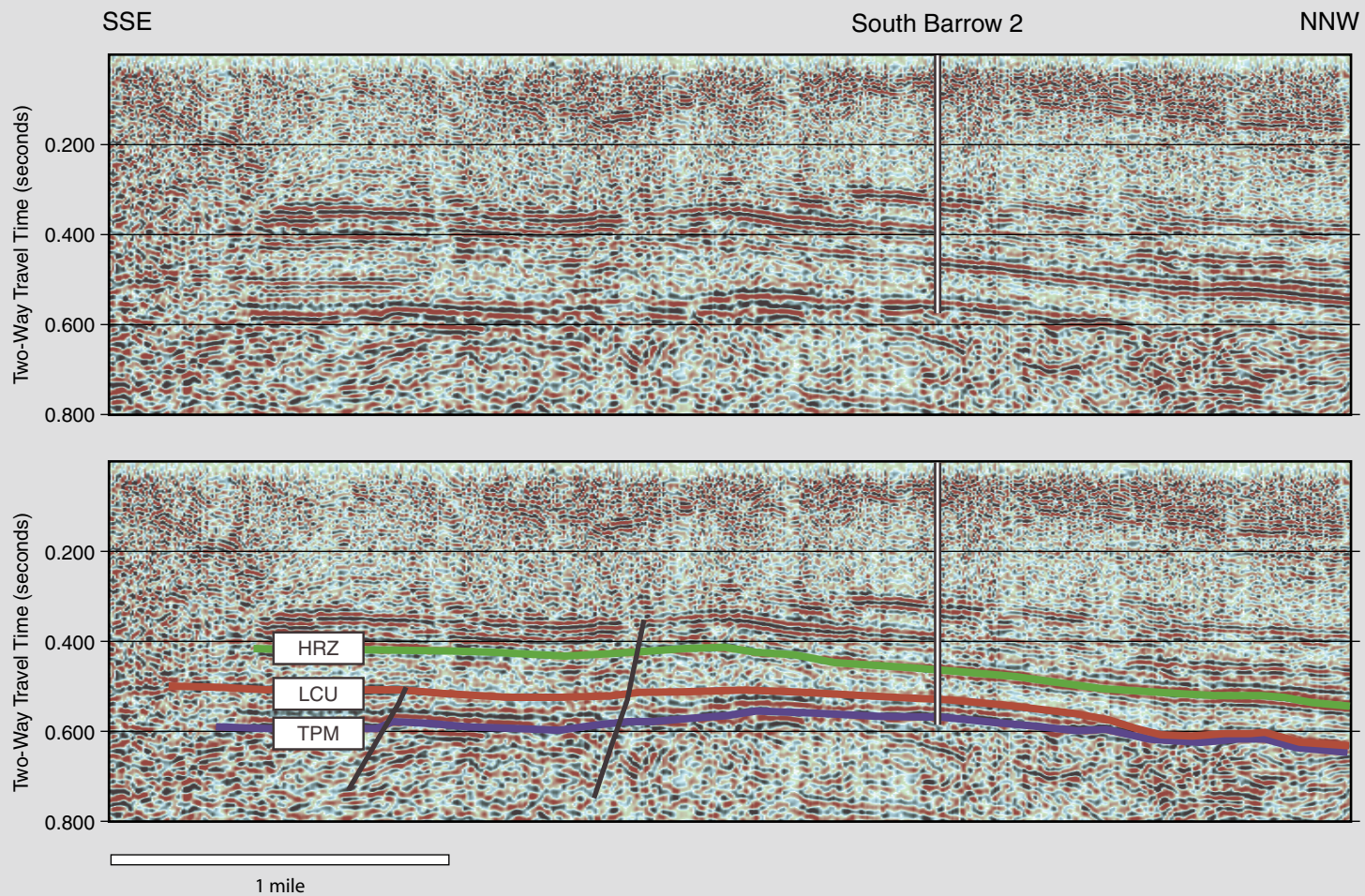
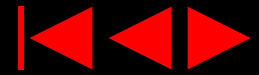
Production: 0.1 MMCFPD

Area: 3,000 acres

Original gas in place: Not available

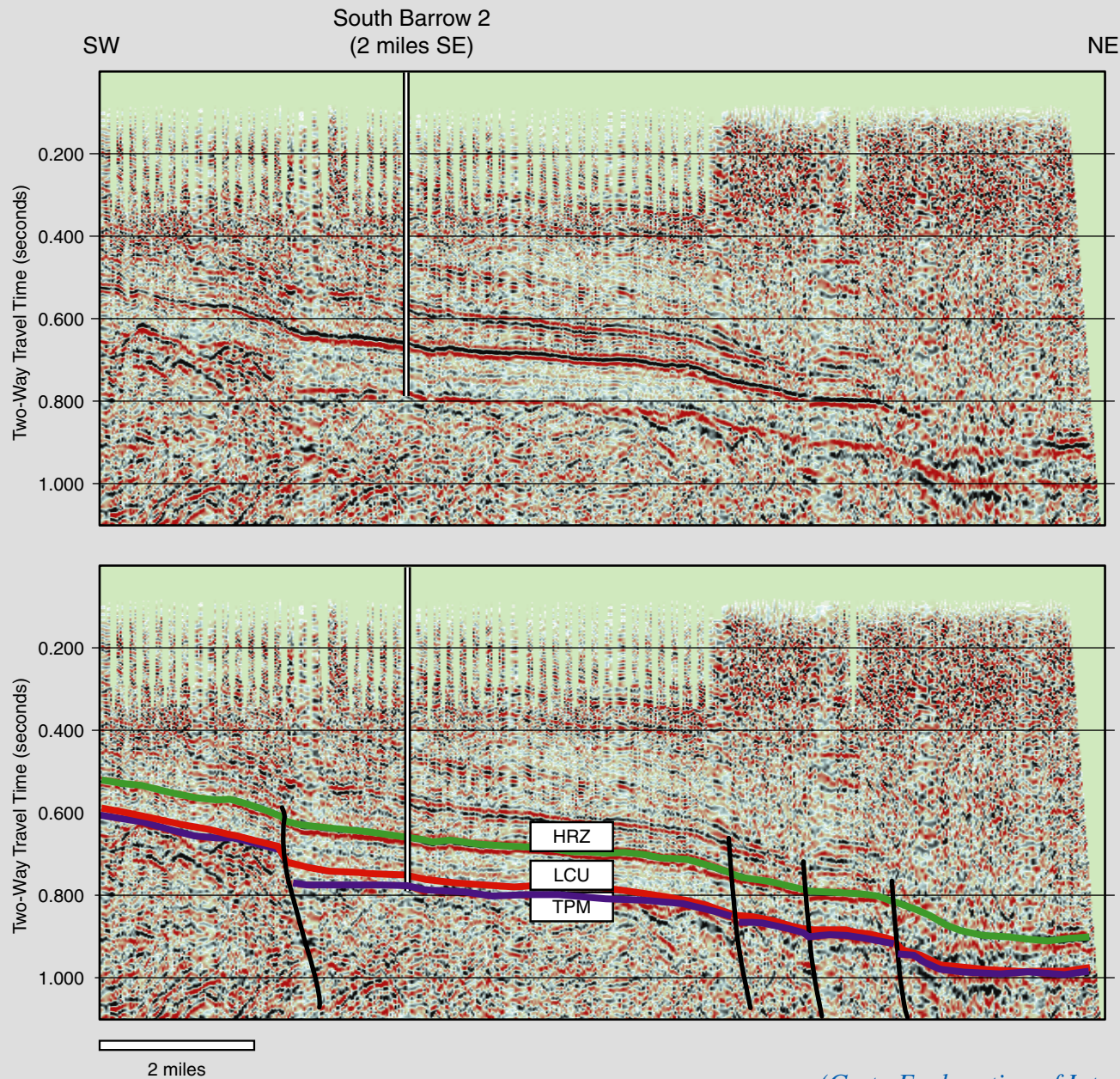
Total reserves: 25.2 BCF

South Barrow Pool (Barrow Field) B10-78



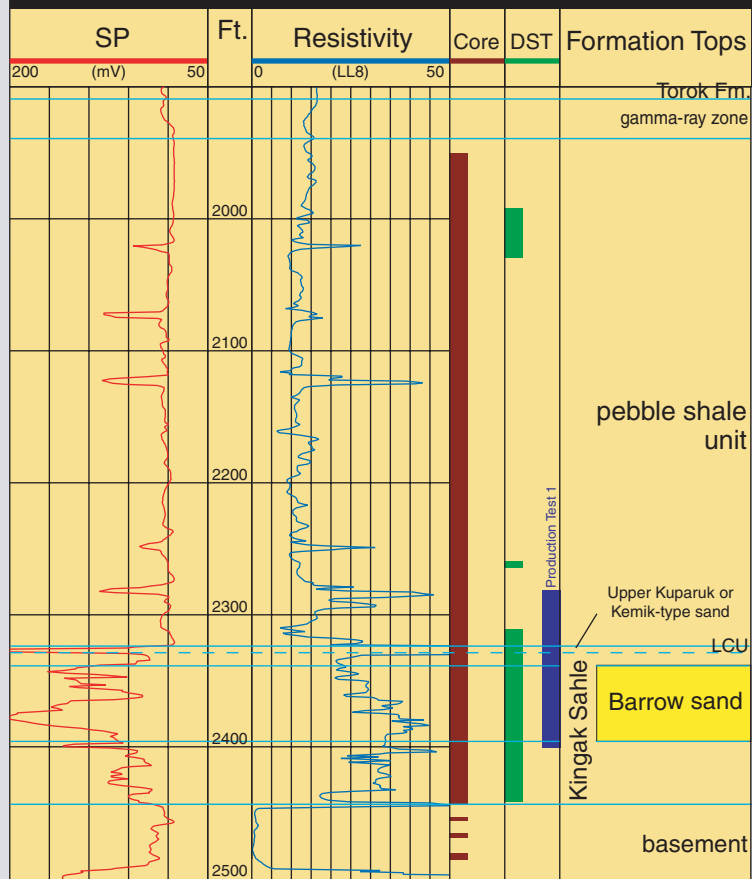
(Go to Explanation of Interpreted Seismic Reflectors)

South Barrow Pool (Barrow Field) R-12



(Go to Explanation of Interpreted Seismic Reflectors)

South Barrow 2



South Barrow Pool (Barrow Field)–South Barrow 2

API number: 50-023-10010

Operator: U.S. Navy

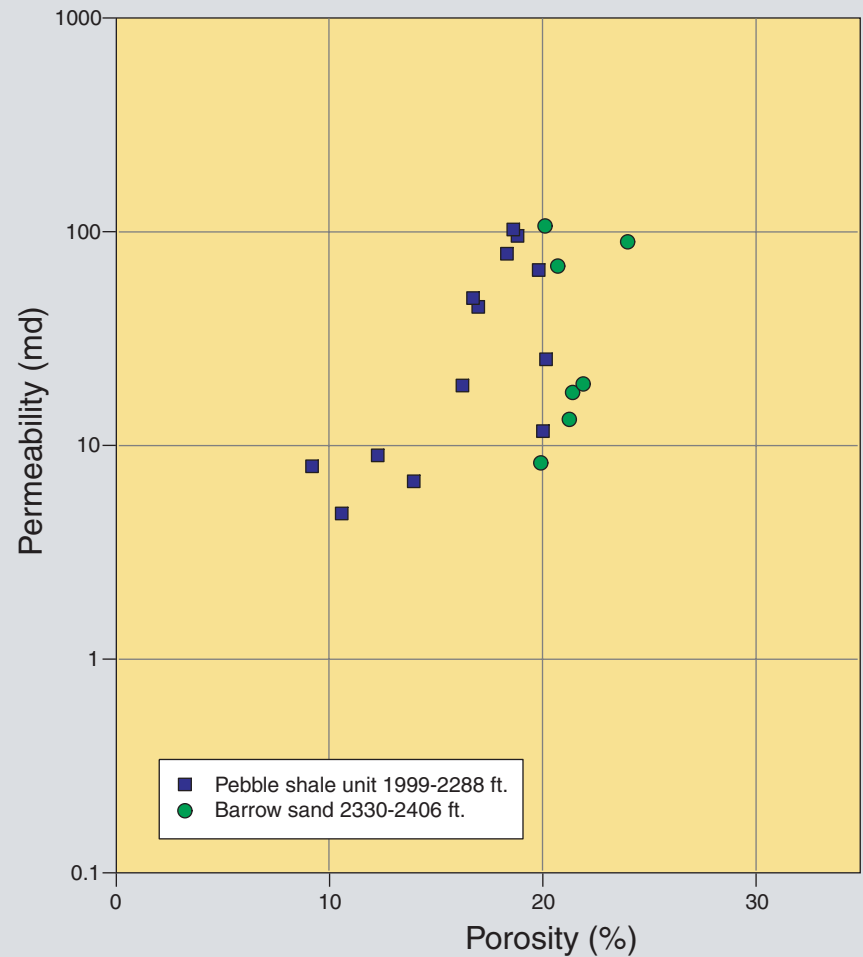
Location: lat. 71.26222° N., long. 156.63417° W.

Kelly Bushing: 35 feet above sea level

Ground elevation: 24 feet above sea level

Total depth: 2505 feet

Completion date: 4/15/49



Drill Stem and Production Tests:

DST1: 1992-2030 ft, weak blow, recovered 250 ft of mud.

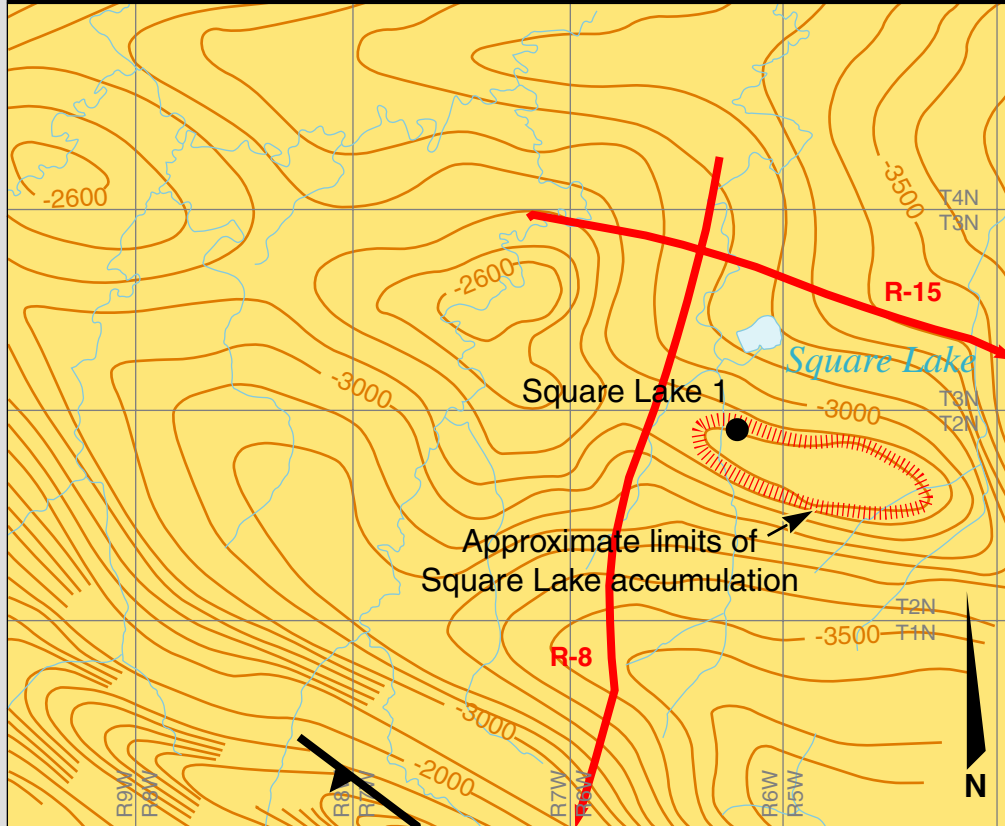
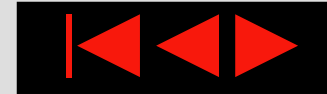
DST 2: 2314-2391 ft, strong blow, flowed gas to surface in 12 minutes.

DST 3: 2381-2443 ft, recovered 95 ft of gas-cut mud.





DST 4: 2260-2265 ft, flowed gas to surface in 29 minutes, recovered 168 ft of highly gas-cut mud.

Production Test 1: 2282-2402 ft, produced gas at 4100 MCF per day.

Square Lake



Source: Miller, N., Presutti, V., and Sterr, A., 1978, Tetra Tech Plate IA/S (Shallow Cretaceous, depth map) in Summary Report FY'78 prepared for Husky Oil NPR Operations, Inc., scale: 1:250,000.

-  Well location
-  Thrust fault, teeth shown on upper plate
-  Depth to reflector within Nanushuk Group in feet below sea level
-  Seismic lines



Square Lake

Discovery date: 1952

Discovery well: Square Lake 1

Trap type: Structural closure on Colville Group

Reservoir: Nanushuk Group

Production date: Undeveloped

Producing wells: None

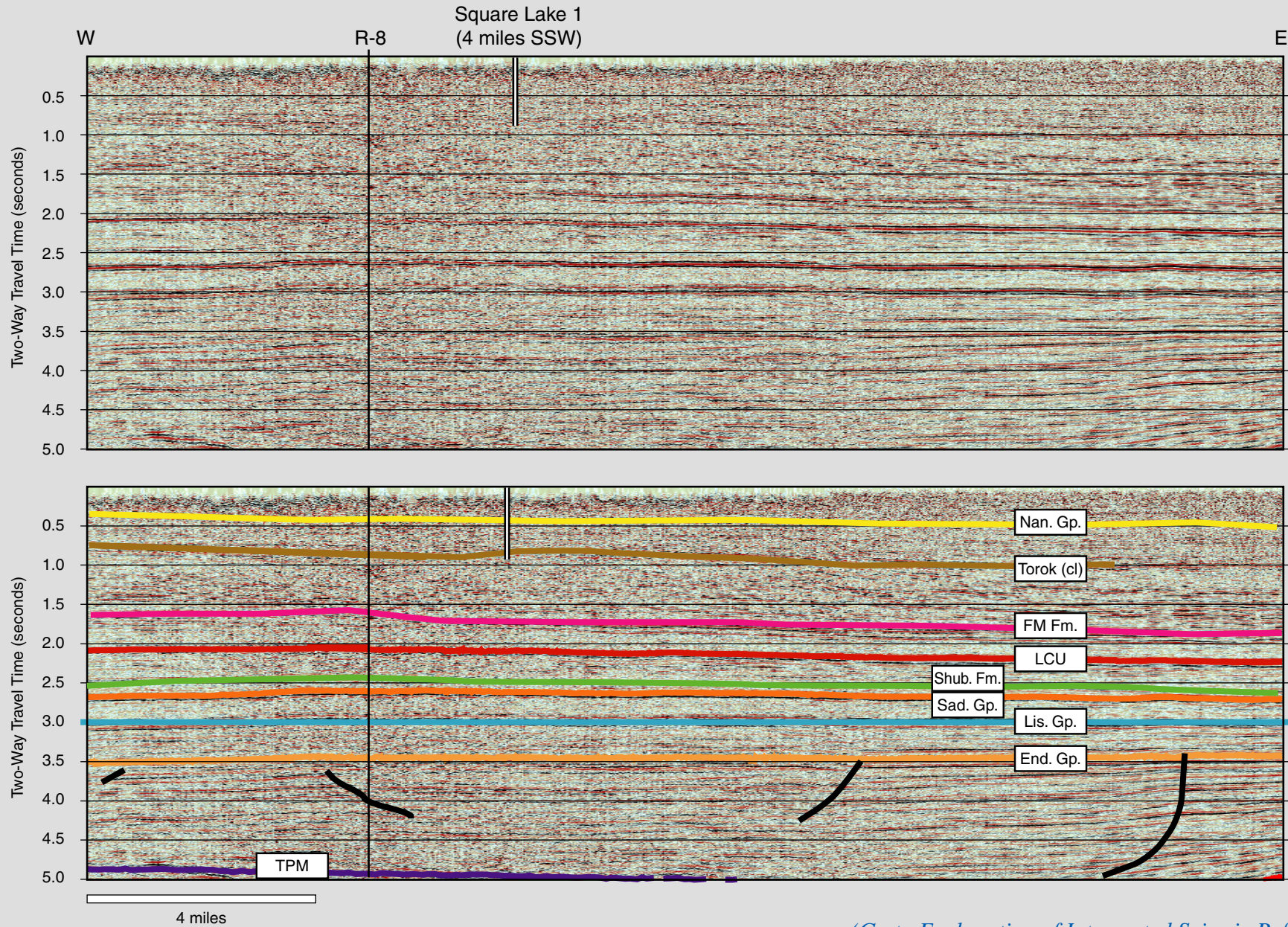
Production: Not available; tested at 0.1 MMCFPD

Area: 5,000 acres

Original gas in place: Not available

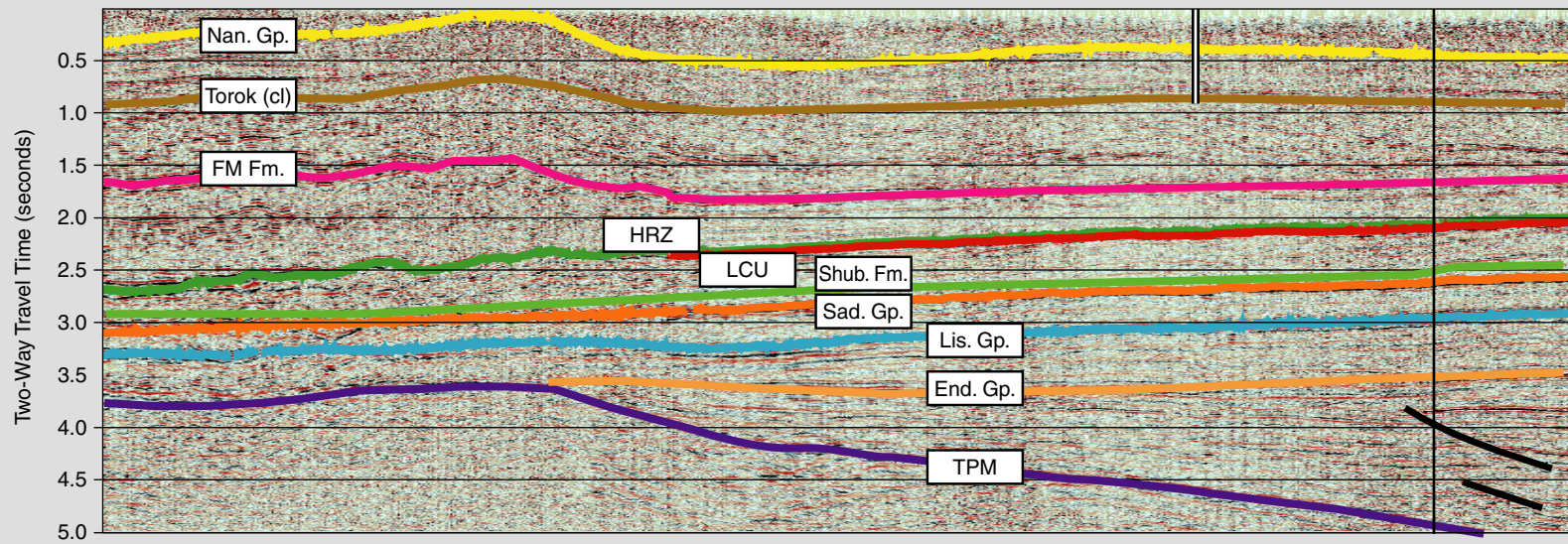
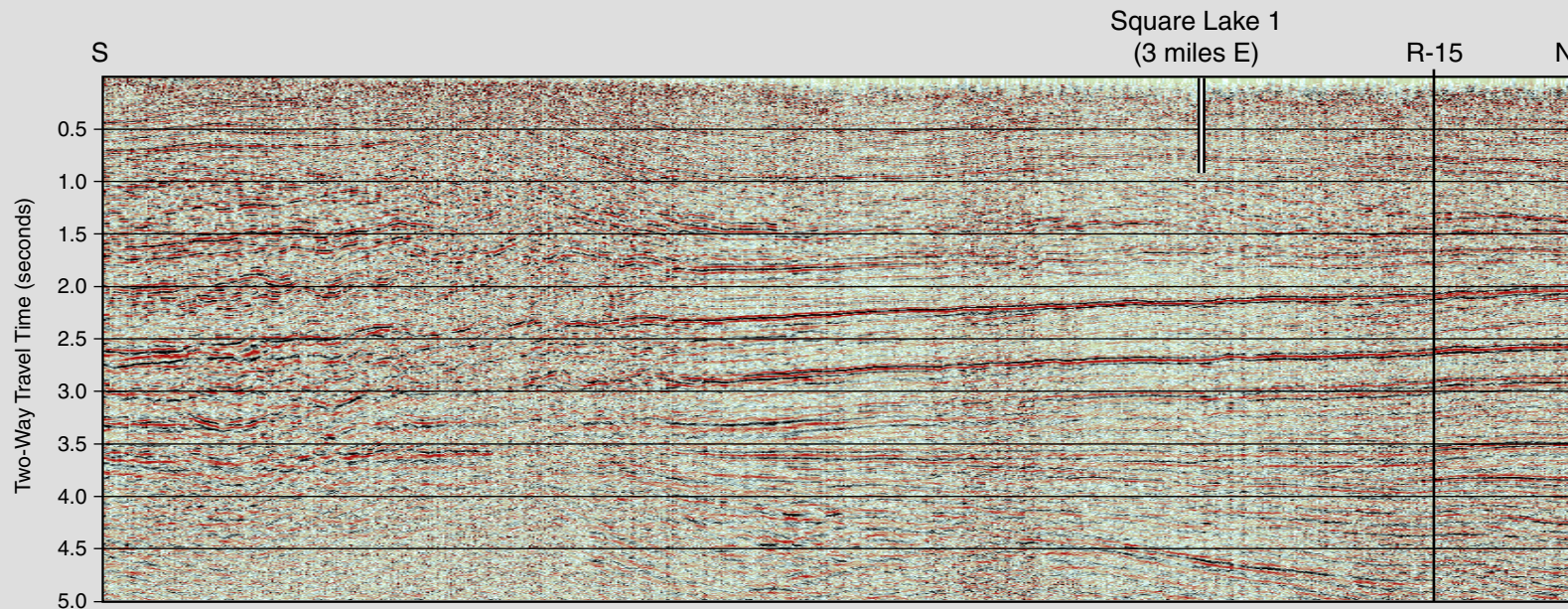
Total reserves: 58 BCF

Square Lake R-15



(Go to Explanation of Interpreted Seismic Reflectors)

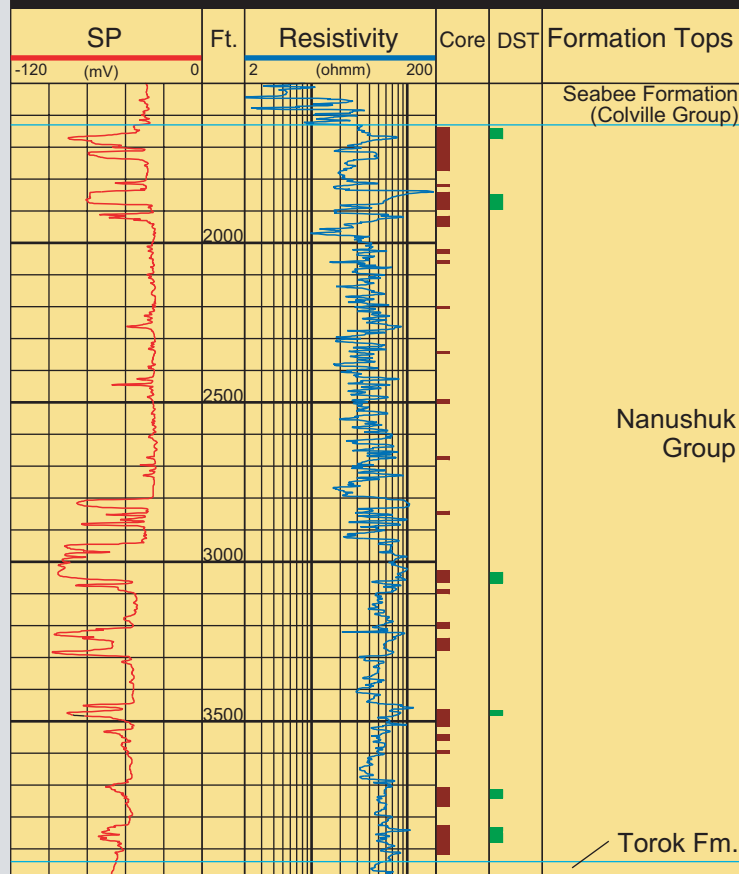
Square Lake R-8



4 miles

(Go to Explanation of Interpreted Seismic Reflectors)

Square Lake 1



Square Lake Gas Field - Square Lake #1

API number: 50-119-10007

Operator: U.S. Navy

Location: lat 69.56667° N., long 153.30000° W.

Kelly Bushing: 340 feet above sea level

Ground elevation: 324 feet above sea level

Total depth: 3987 feet measured depth

Completion date: 4/18/52

Drill Stem Tests:

DST 4: 1646-1675 ft, flowed gas at 112 MCF per day, produced water by heads.

DST 5: 1847-1879 ft, flowed gas to surface in 30 minutes with strong blow, then water and mud.

DST 7: 1878-1897 ft, recovered 90 ft of water-cut mud.

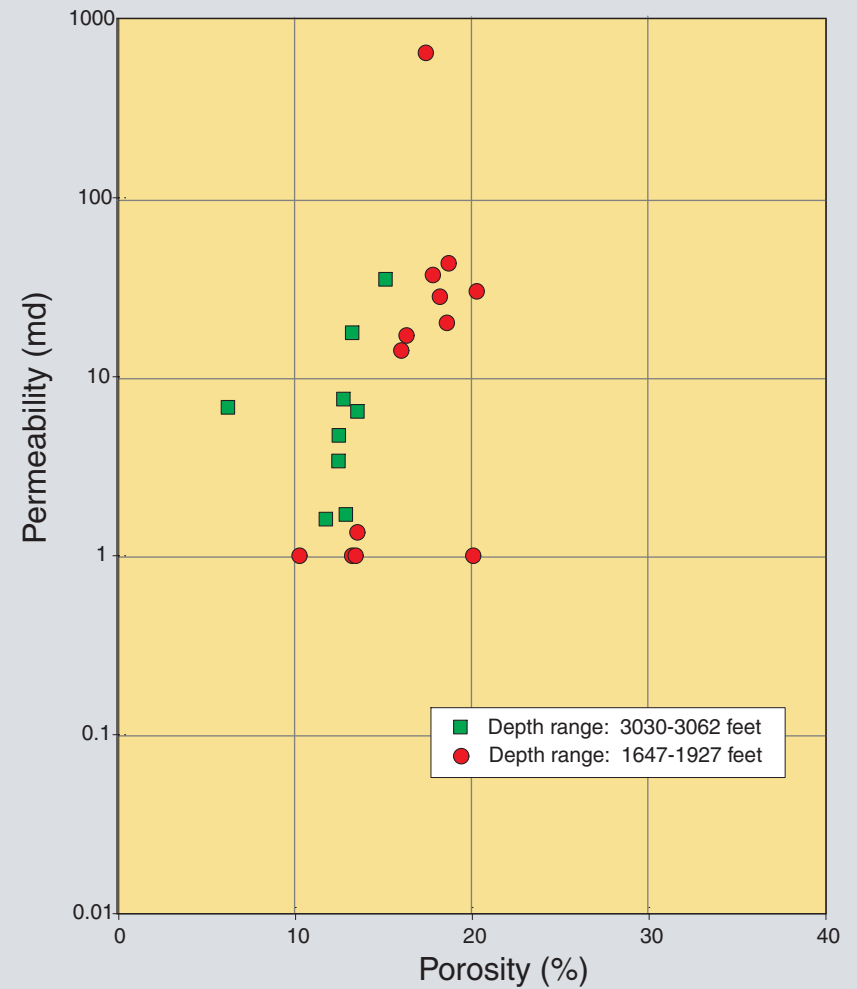
DST 8: 3033-3067 ft, recovered 780 ft of water.

DST 9: 3466-3482 ft, recovered 50 ft of mud.

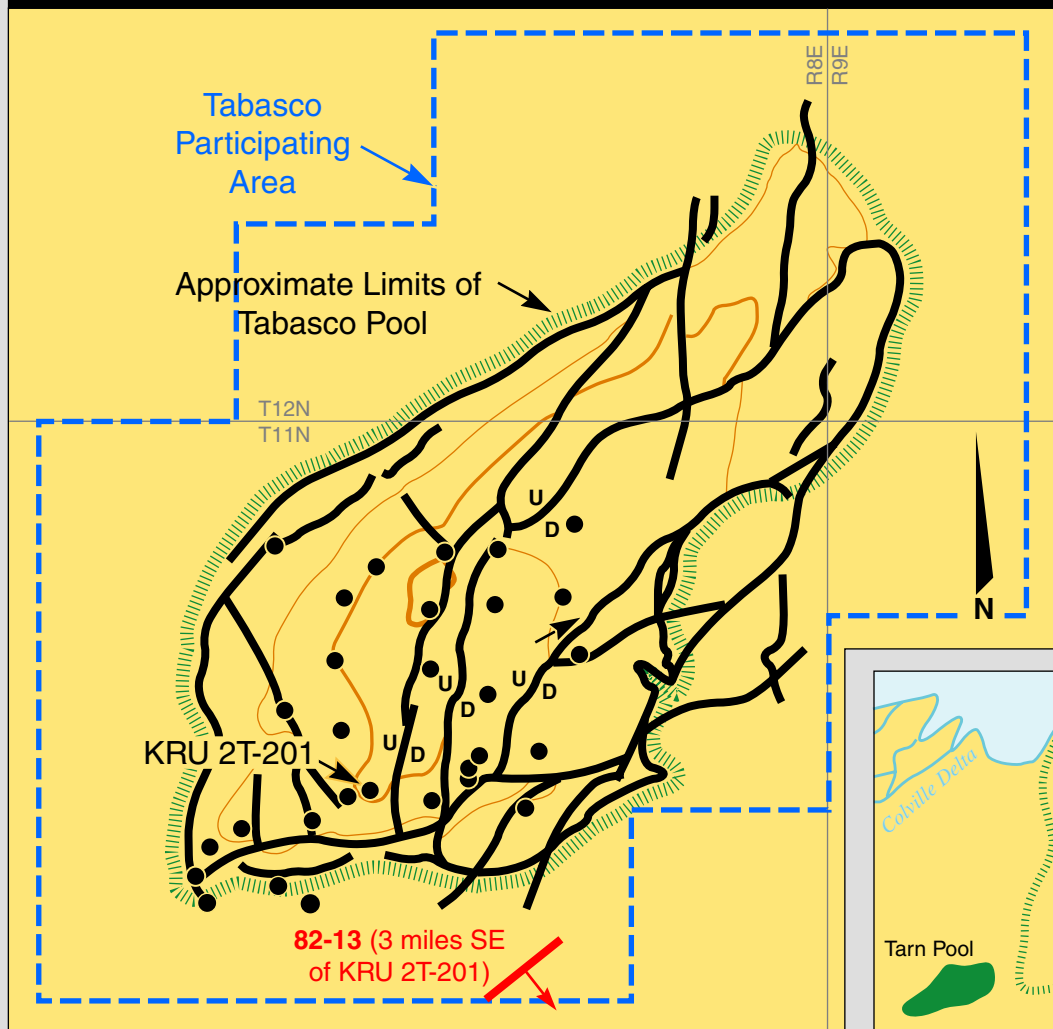
DST 10: 3714-3742 ft, recovered 10 ft of mud.

DST 11: 3834-3845 ft, recovered 10 ft of mud.

DST 12: 3850-3882 ft, recovered 100 ft of mud.



Tabasco Pool (Kuparuk River Field)

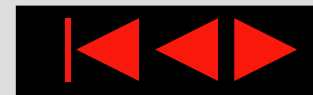


Source: Alaska State Oil and Gas Conservation Commission files.

1 mile

- Well location
- Fault
- Seismic line

Form-line contours based on three-dimensional seismic survey; thicker contours indicate higher position relative to stratigraphic/structural trap



Tabasco Pool (Kuparuk River Field)

Discovery date: 1992

Discovery well: KRU 2T-201

Trap type: Stratigraphic/structural trap in the Colville Group (Tabasco sandstone) on top of Colville High

Reservoir: Tabasco sand, Schrader Bluff Fm (Colville Gp)

Production date: 1998

Producing wells: 10-20 after initial development

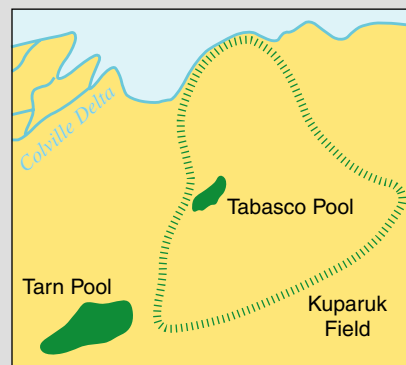
Production: 2,000 BOPD

Area: 2,000 acres

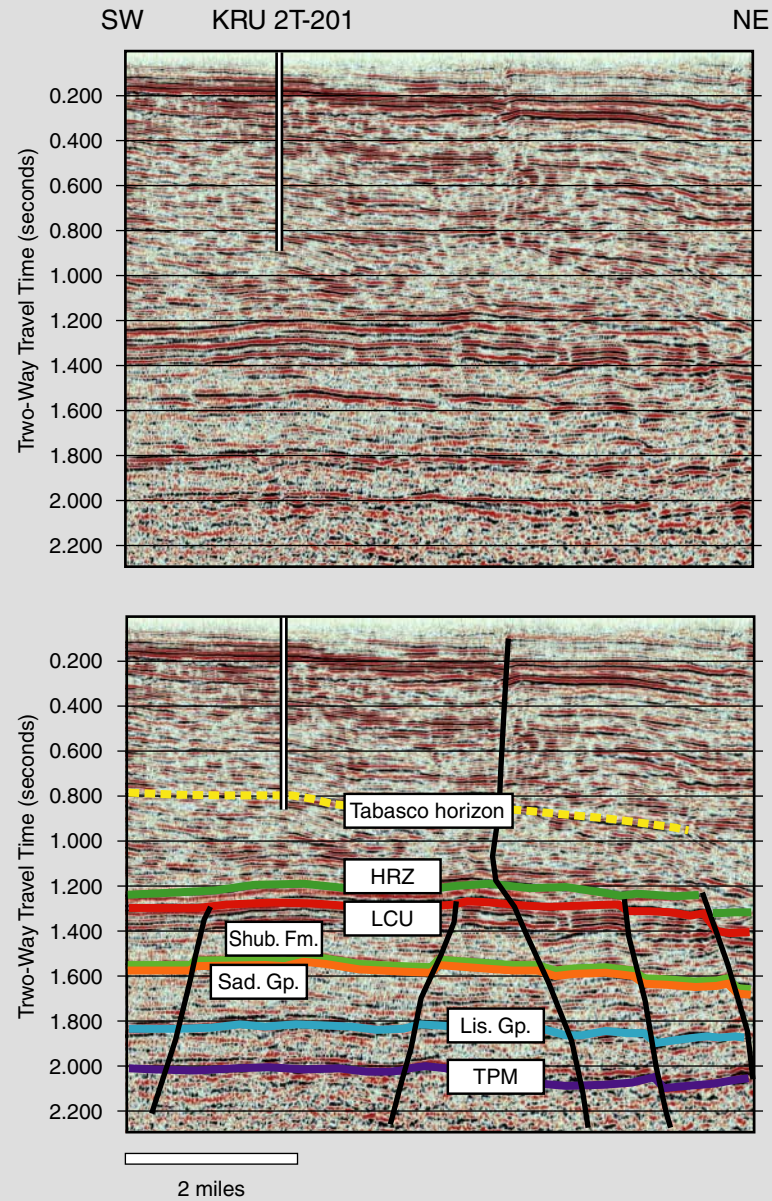
Original oil in place: 85 MMBO (mean)

Oil gravity: 16.5° API

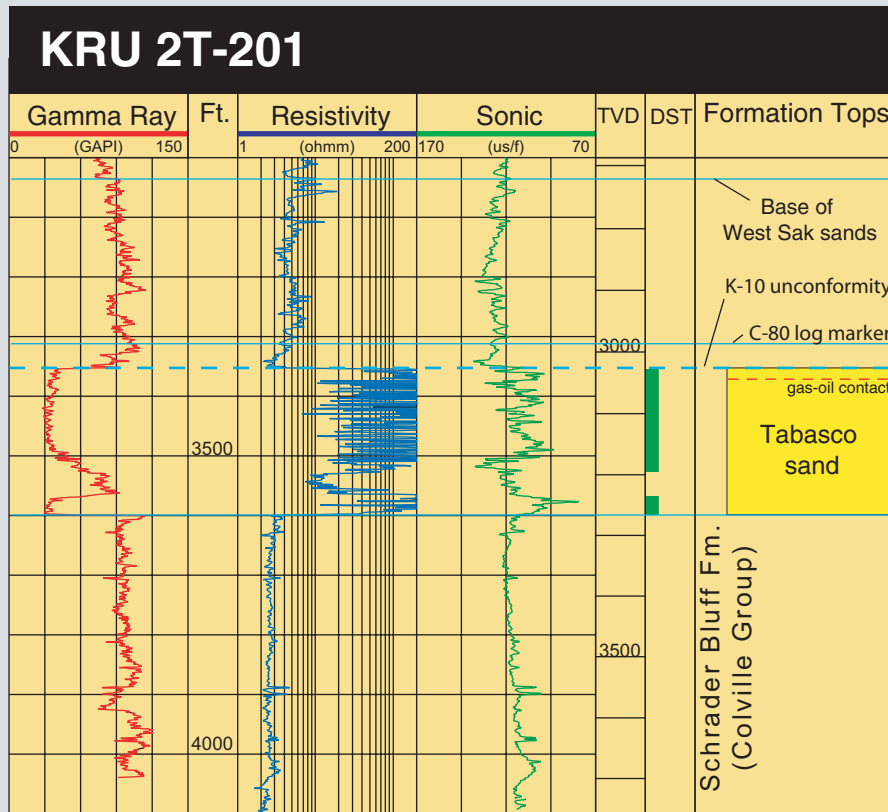
Total reserves: 25 MMBO



Tabasco 82-13



(Go to Explanation of Interpreted Seismic Reflectors)



Tabasco Oil Pool (Kuparuk River Field) - KRU 2T-201

API number: 50-103-20230

Operator: ARCO Alaska

Location: lat 70.32987° N., long 150.00857° W.

Kelly Bushing: 122 feet above sea level

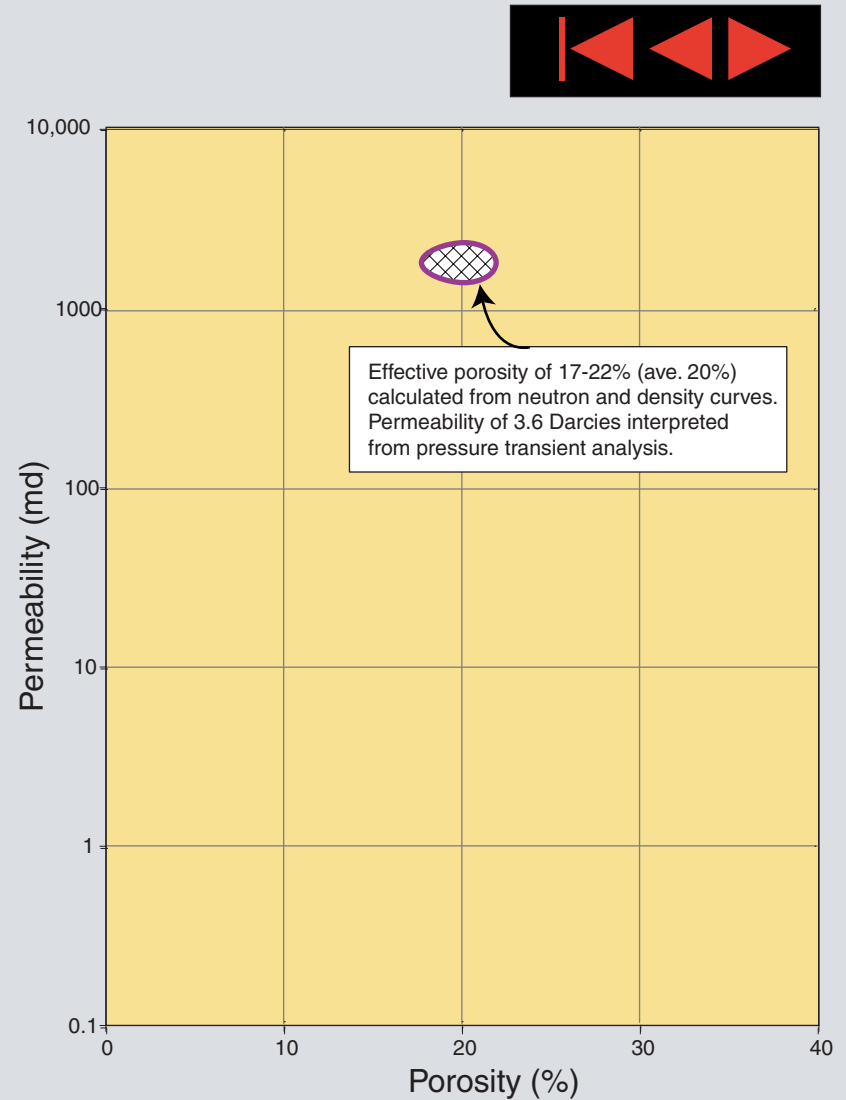
Ground elevation: 81 feet above sea level

Total depth: 4175 feet measured depth

Completion date: 1/01/92

Drill Stem Tests:

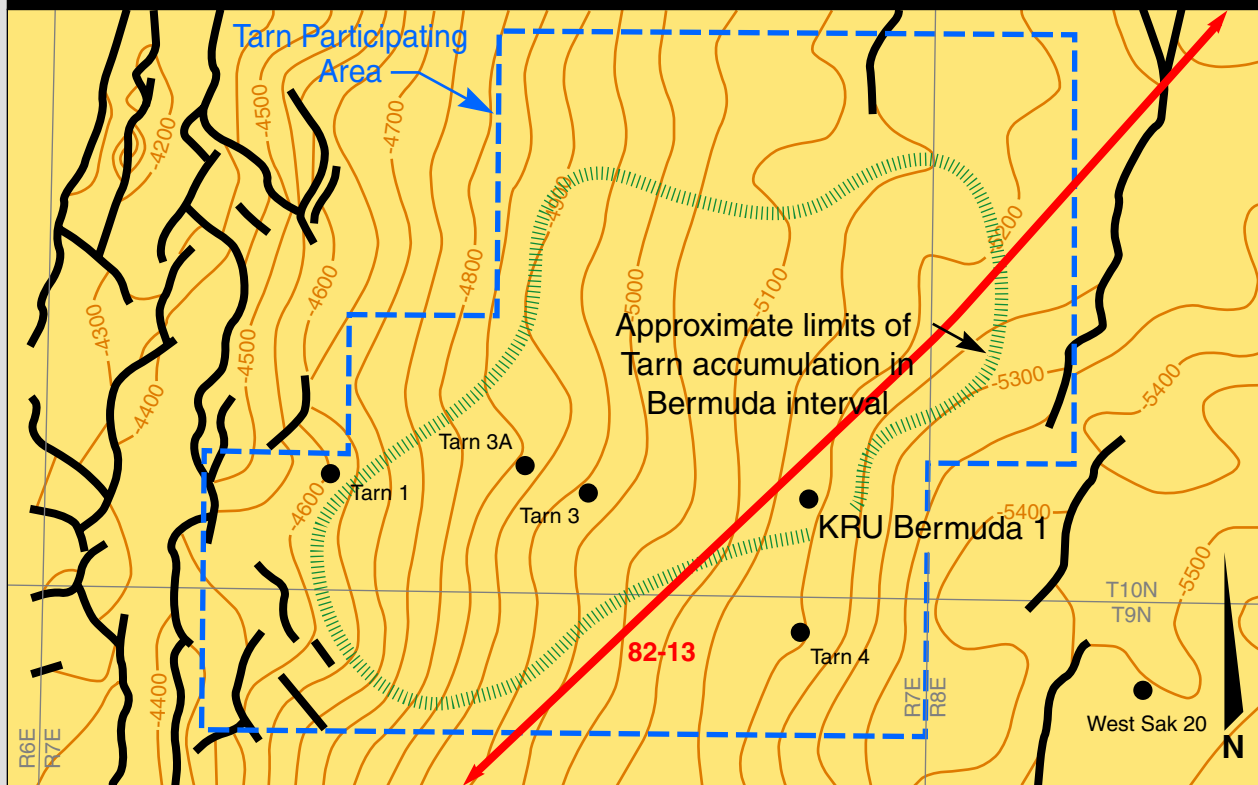
Test 1: 3355-3527 and 3568-3599 ft, flowed oil at rate of 260 barrels per day and 3934 MCF gas per day. API gravity 16.8°.



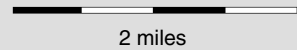
Notes:

KRU 2T-201 is a deviated well, compare TVD and depth (MD) columns on well log plot.

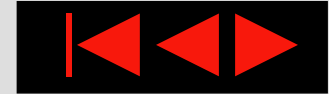
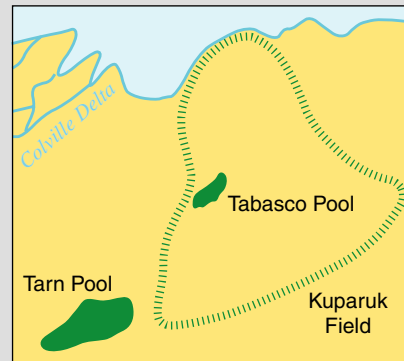
Tarn Pool (Kuparuk River Field)



Source: Tarn Interval trends from Exhibit 2, Kuparuk River Unit, Testimony for Tarn Oil Pool Rules, April 28, 1998, Alaska Oil and Gas Conservation Commission



- Well location
- Faults
- Structural contours on top of Cairn interval (above the Bermuda interval) in feet below sea level
- Seismic line



Tarn Pool (Kuparuk River Field)

Discovery date: 1991

Discovery well: KRU Bermuda 1

Trap type: Stratigraphic trap in the Colville Group on top of Colville High

Reservoir: Seabee Fm. (Colville Gp.)

Production date: 1998

Producing wells: 12 wells initially, 40 when fully developed

Production: 20,000 BOPD

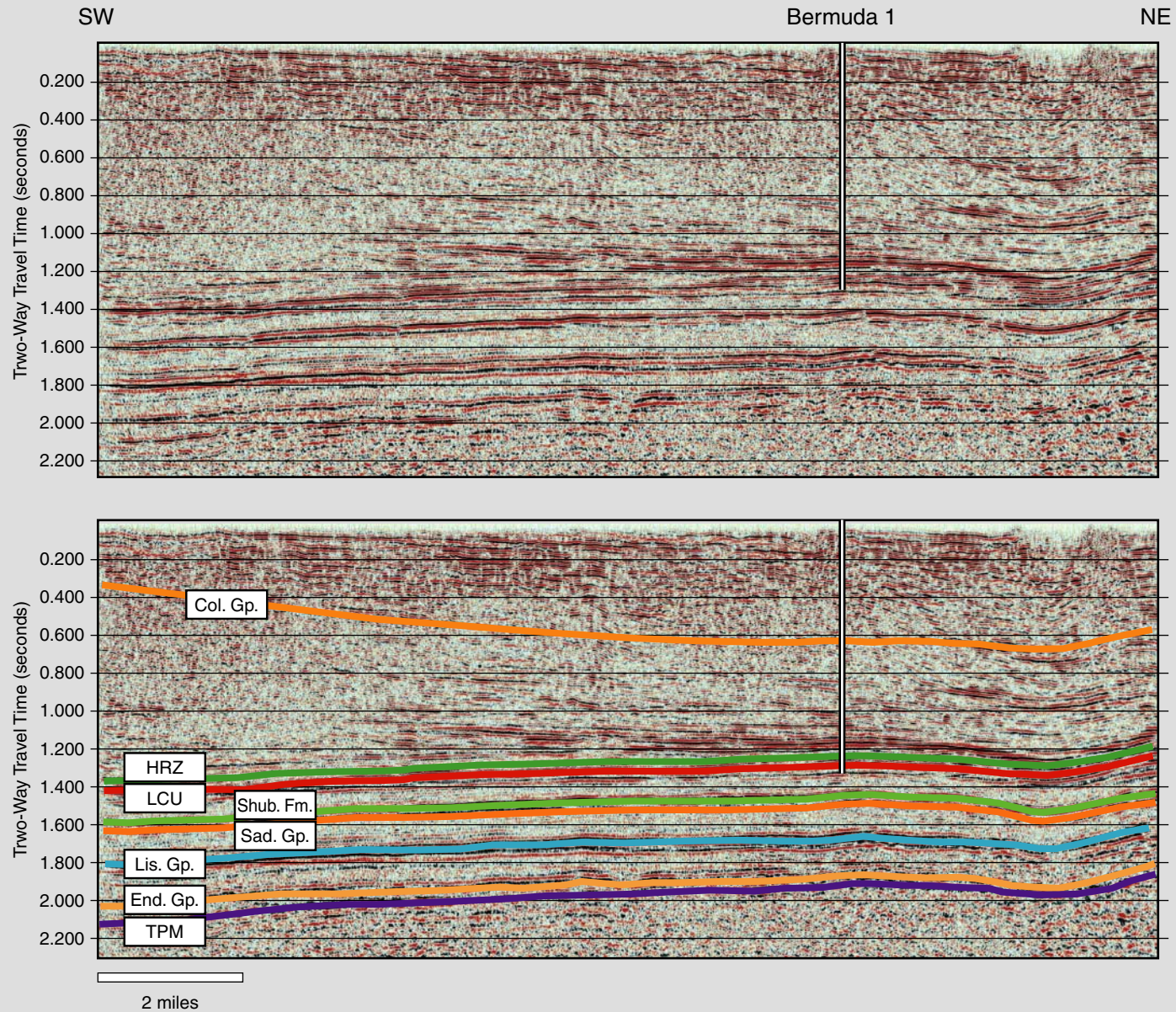
Area: 15,000 acres

Original oil in place: 150 MMBO

Oil gravity: 37° API

Total reserves: 42 MMBO (at 28% recovery factor)

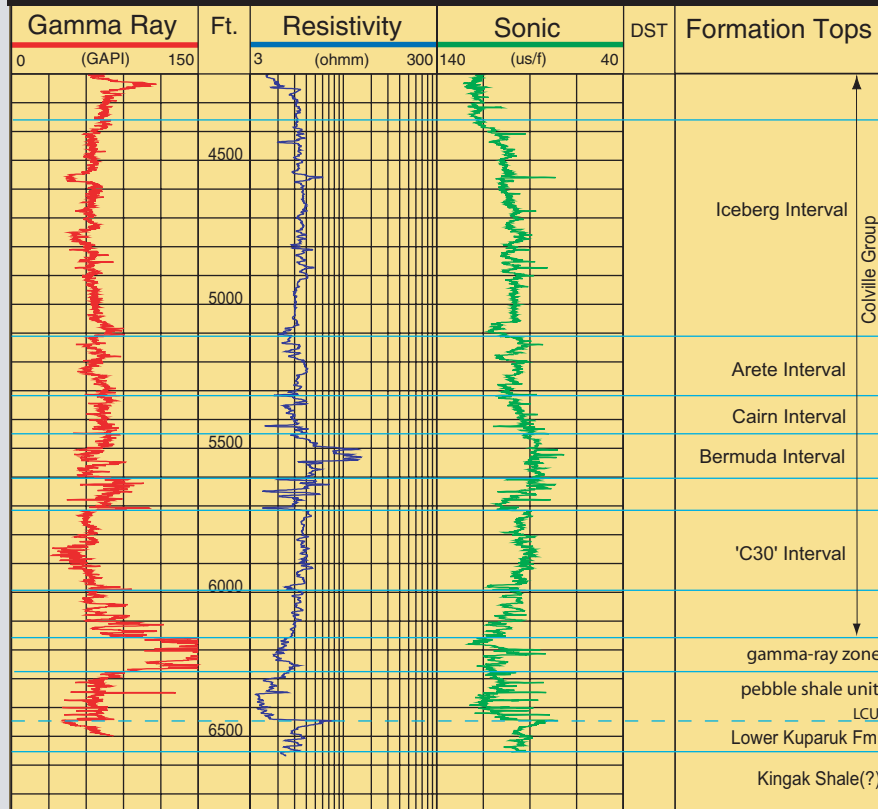
Tarn 82-13



(Go to Explanation of Interpreted Seismic Reflectors)



KRU 36-10-7 (Bermuda)



Tarn Pool (Kuparuk River Field) - KRU 36-10-7 (Bermuda)

API number: 50-103-20149

Accumulation: Tarn Oil Pool (Kuparuk River Field)

Operator: ARCO Alaska

Location: lat 70.18097° N., long 150.26089° W.

Kelly Bushing: 165 feet above sea level

Ground elevation: 123 feet above sea level

Total depth: 6750 feet measured depth

Completion date: 2/02/91

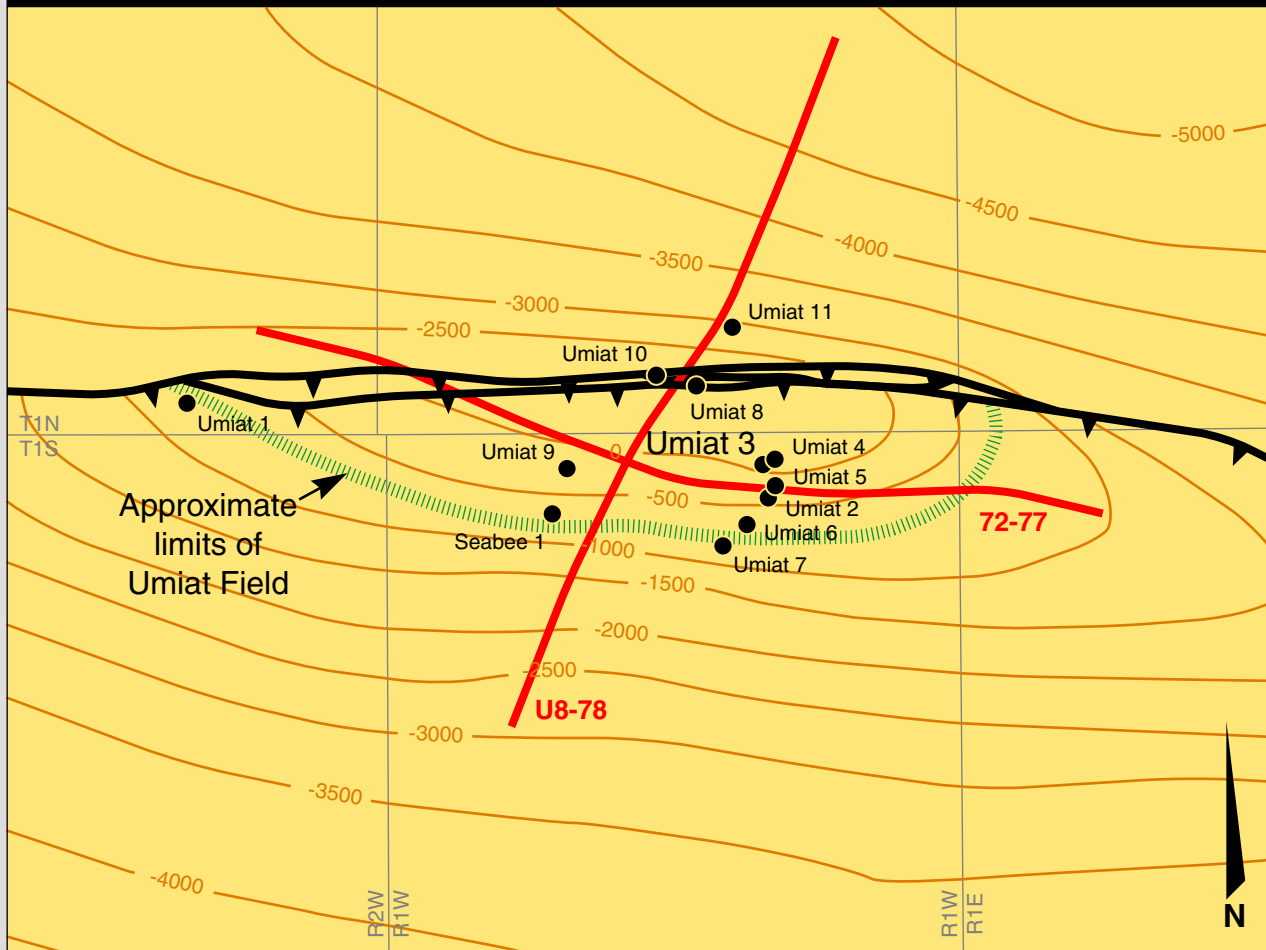
Drill Stem Tests:

Test results from an unspecified depth interval from nearby well Tarn 2 were as follows: The original reservoir pressure was calculated to be 2350 psig in Tarn 2 on the basis of a pressure buildup test immediately following a 10-day flow test. The well flowed an average 1900 BOPD of 37 API gravity crude oil with a gas-oil ratio of 1200 scf/stb at a flowing tubing pressure of 550 psig. Gas-oil ratio was elevated because of reservoir pressure drawdown during the test.





Notes:

Sidewalls cores were cut, but core analyses are not available. No conventional core was taken.

Umiat



Source: Molenaar, C.M., 1982, Umiat field, an oil accumulation in a thrust-faulted anticline, North Slope of Alaska, in Powers, R.B., ed., Geologic studies of the Cordilleran thrust belt, Rocky Mountain Association of Geologists, p. 537-548.

-  Depth to top of a horizon within the Nanushuk Group in feet below sea level
-  Well location
-  Thrust fault, teeth shown on upper plate
-  Seismic lines



Umiat

Discovery date: 1946

Discovery well: Umiat 3

Trap type: Thrust-related structural closure

Reservoir: Nanushuk Group

Production date: Not available

Producing wells: Not available

Production: None

Area: 7,500 acres

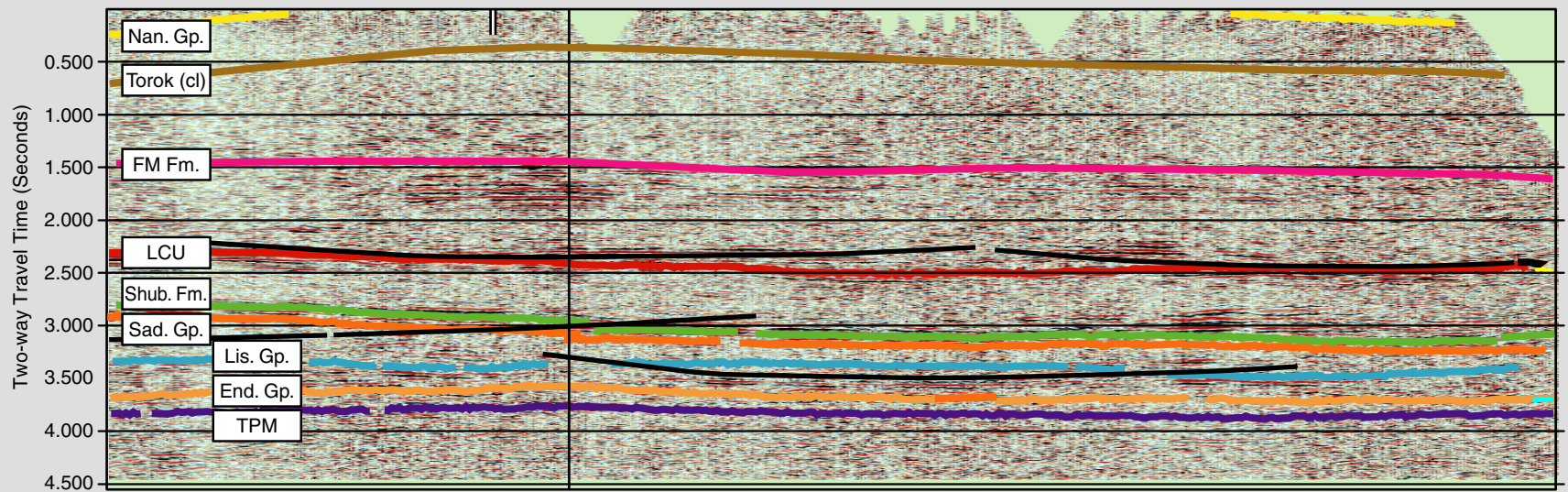
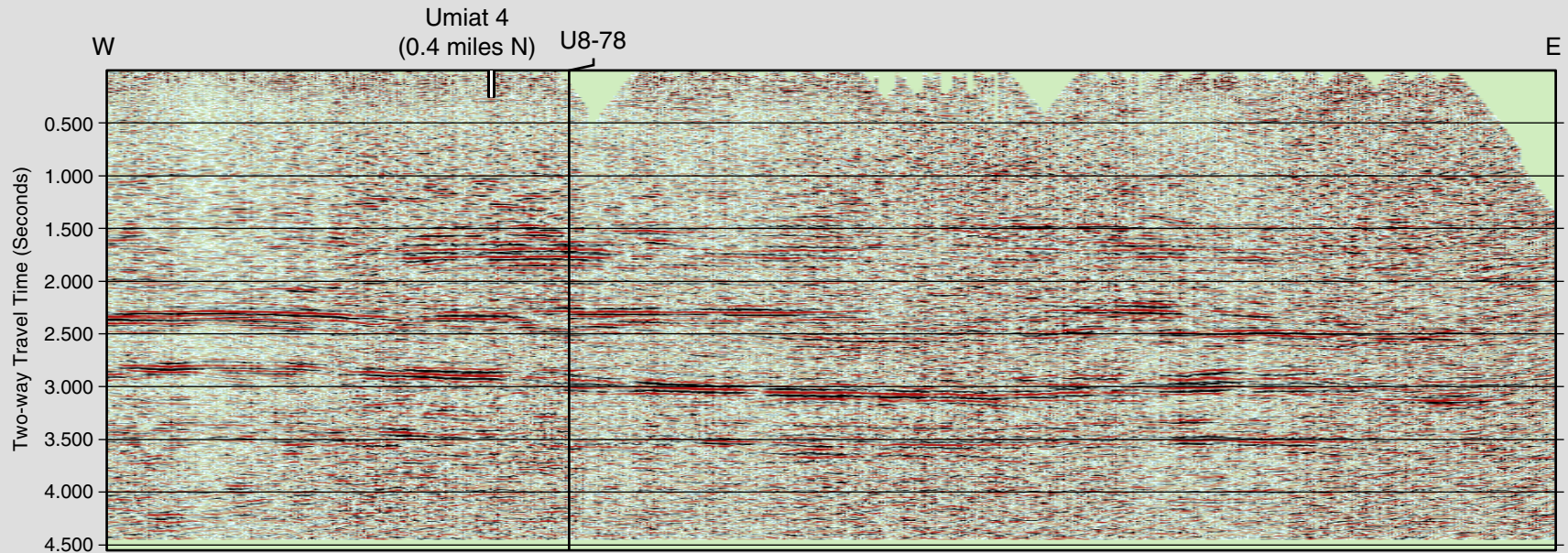
Original oil in place: Not available

Original gas in place: Not available

Oil gravity: 36-37° API

Total reserves: 70 MMBO and 50 BCFG

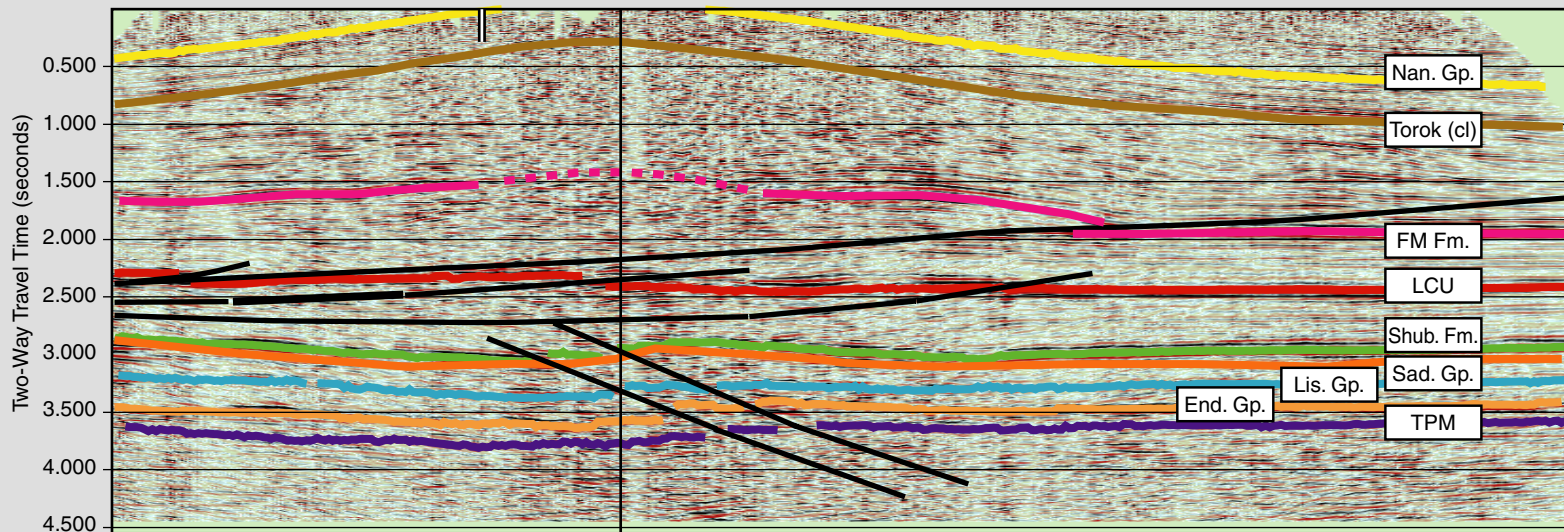
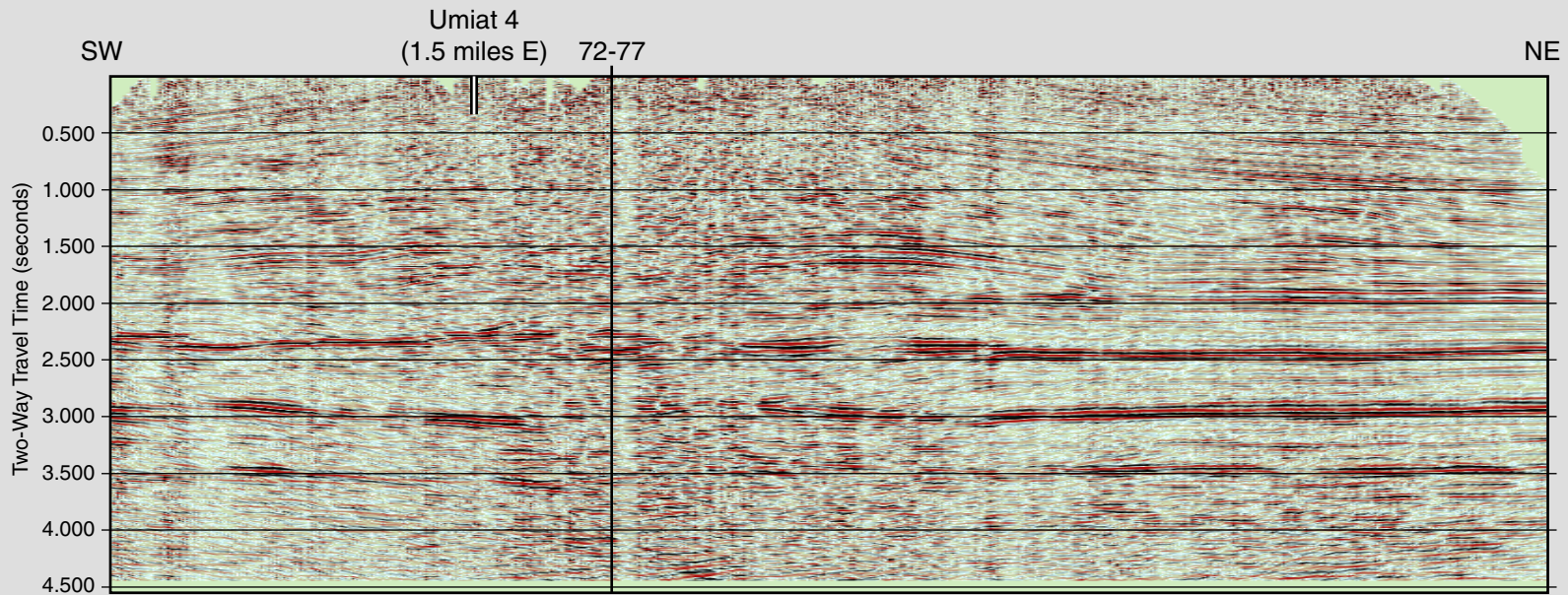
Umiat 72-77



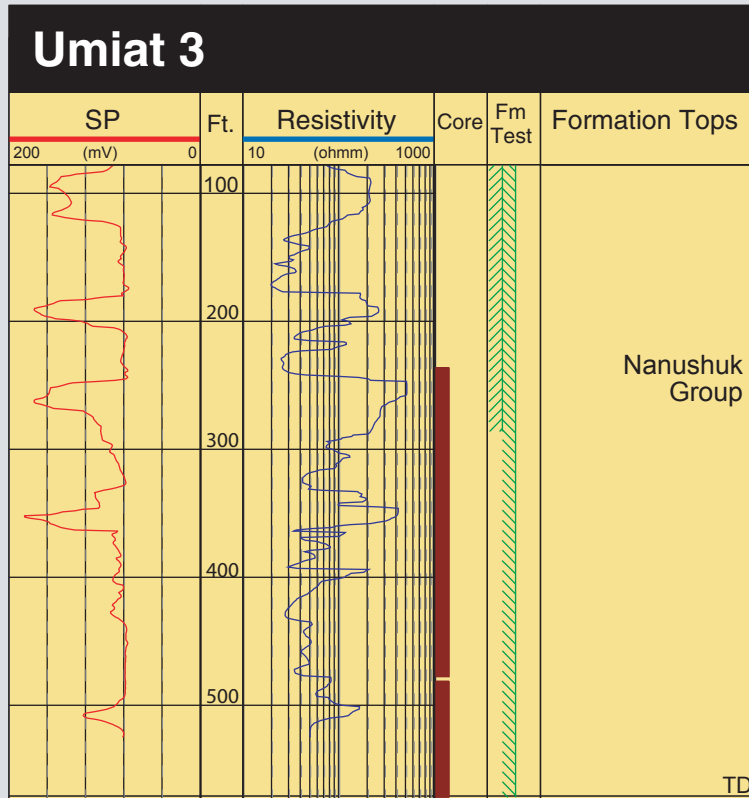
2 miles

(Go to Explanation of Interpreted Seismic Reflectors)

Umiat U8-78



(Go to Explanation of Interpreted Seismic Reflectors)



Umiat Oil Field - Umiat #3

API number: 50-287-10003

Operator: U.S. Navy

Location: lat 69.38667° N., long 152.08472° W.

Kelly Bushing: 288 feet above sea level

Ground elevation: 279 feet above sea level

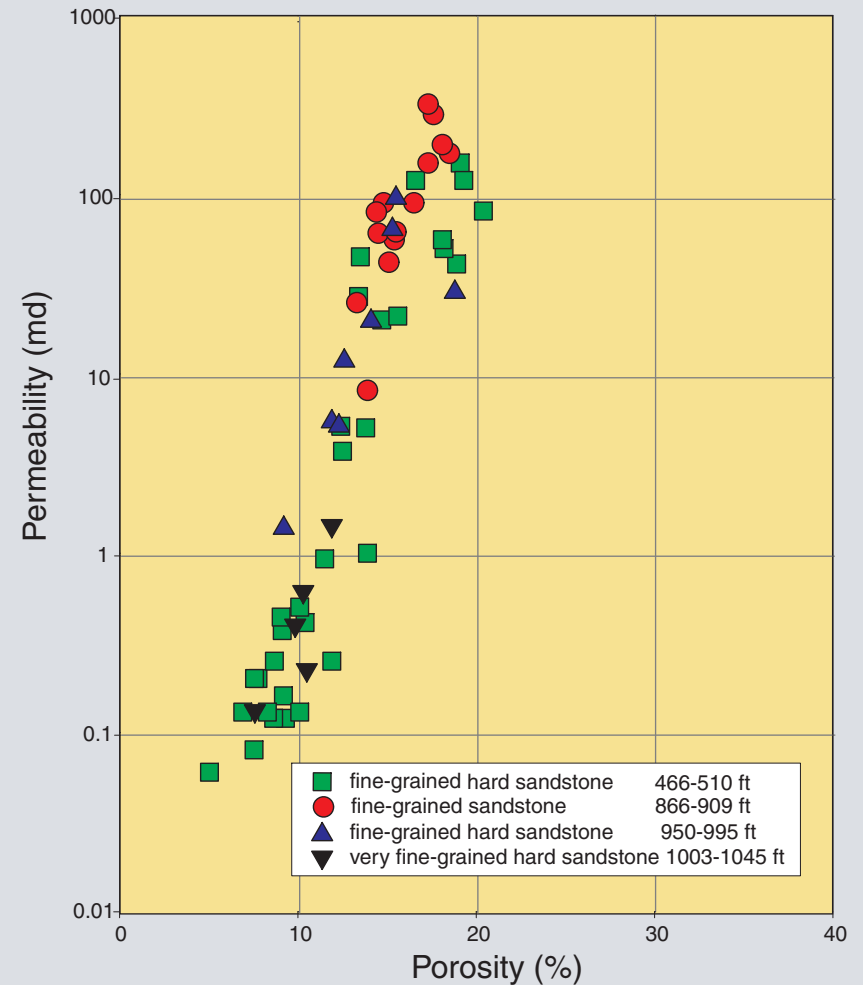
Total depth: 572 feet

Completion date: 12/26/46

Formation Tests:

Two bailing tests were performed in December 1946. When the well was 286 feet deep, bailing produced oil at an estimated rate of 5 barrels per day.

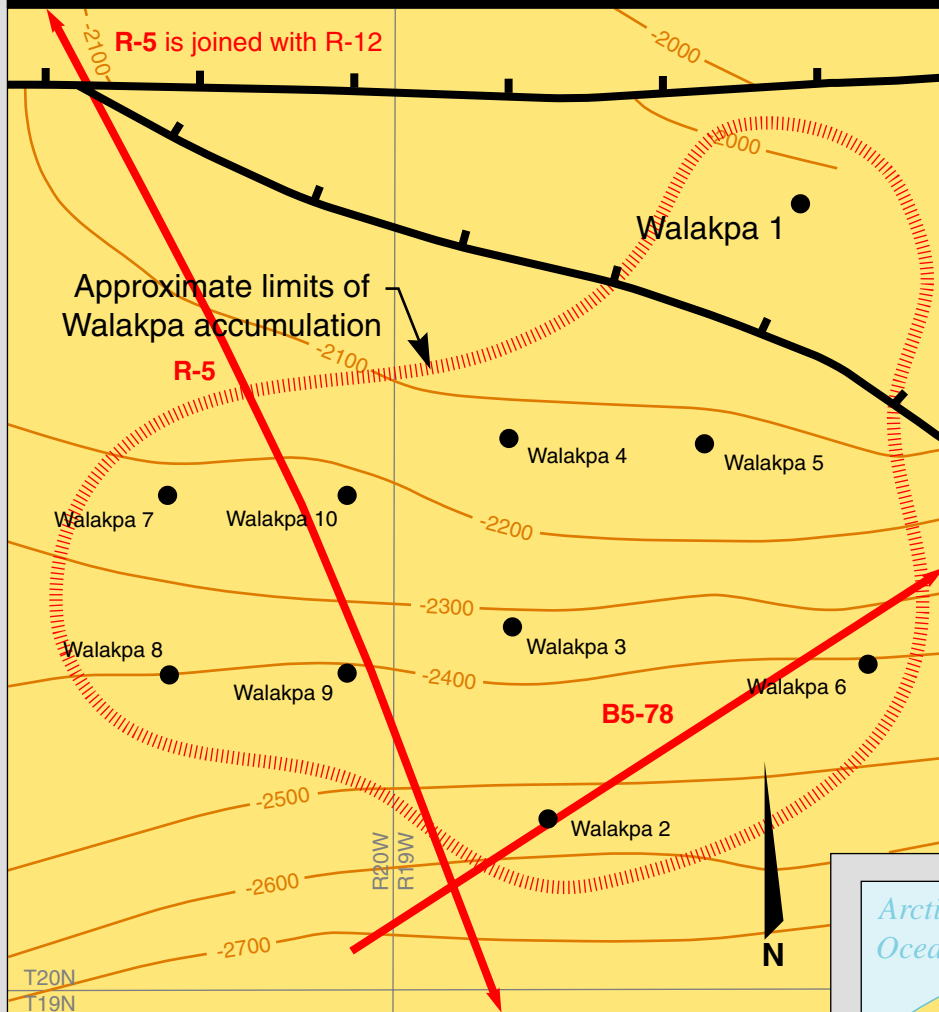
When total depth of 572 feet was reached, bailing produced oil at a rate of 44 barrels per day. In September 1947, after the well was shot at several depths with dynamite and cleaned out to 457 ft, pumping tests recovered water-free oil at a rate of 24 barrels per day.



Note:

A small number of core measurements (not shown) were obtained from Umiat 3. Permeability and porosity data are available from the Umiat 9 well (see plot), located about two miles west of Umiat 3.

Walakpa



Source: Alaska State Oil and Gas Conservation Commission
1998 Annual Report

- Bottom-hole well location
- Fault, teeth on downthrown side
- Depth to top of Walakpa sand in feet below sea level
- Seismic lines



Walakpa

Discovery date: 1980

Discovery well: Walakpa 1

Trap type: Stratigraphic trap in Walakpa sand on flank of large structural closure at Barrow

Reservoir: Walakpa sand (upper part of Kingak Shale)

Production date: 1992

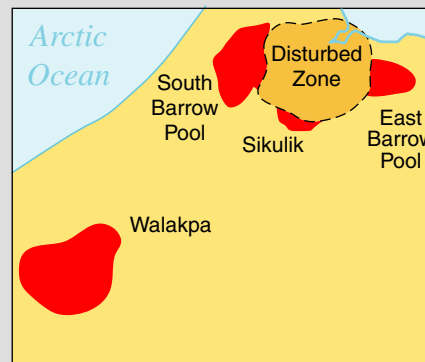
Producing wells: 7

Production: 3 MMCF/day

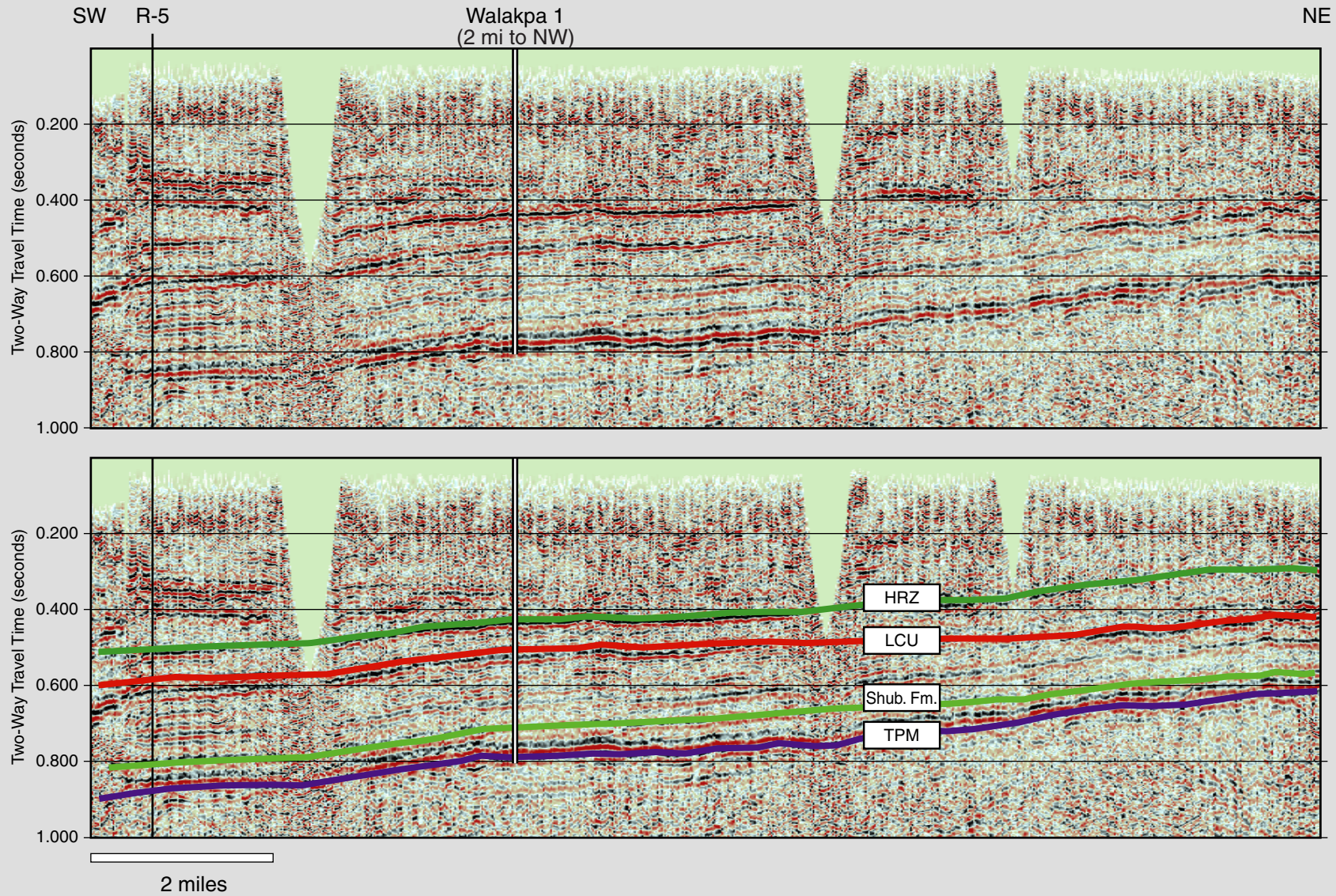
Area: 10,000 acres

Original gas in place: Not available

Total reserves: 30 BCF

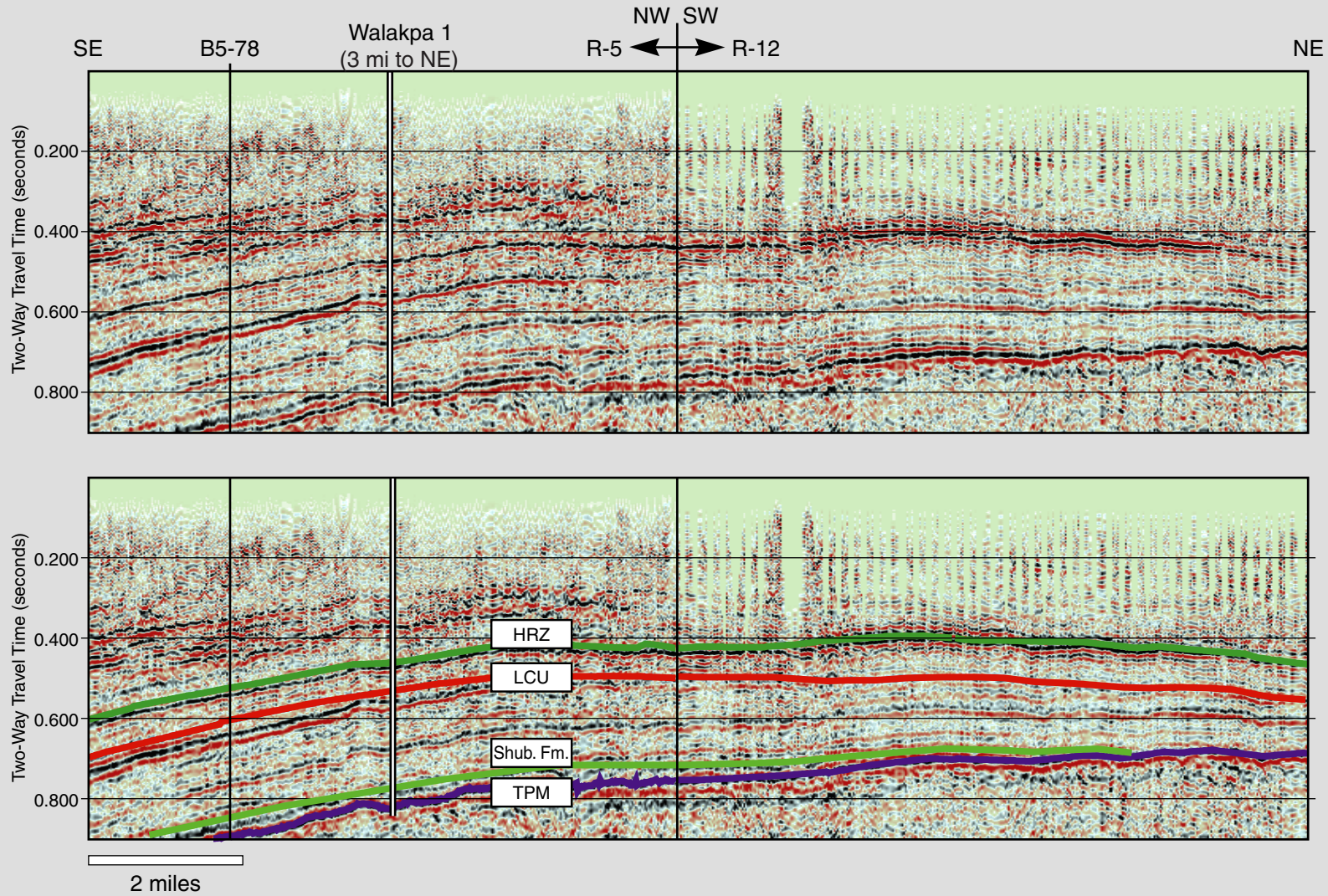


Walakpa B5-78



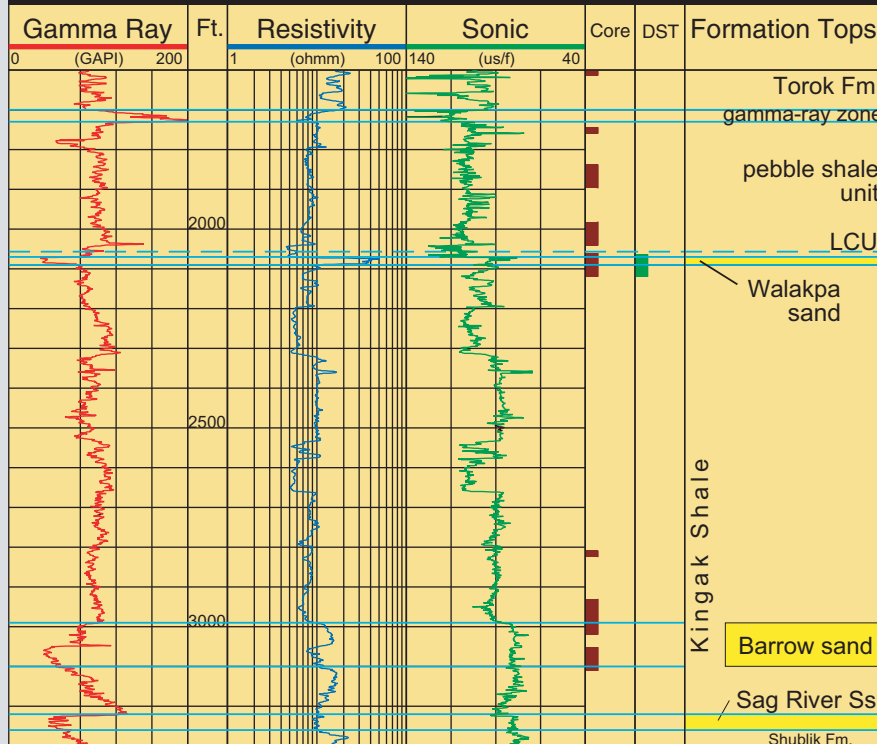
(Go to Explanation of Interpreted Seismic Reflectors)

Walakpa R-5 & R-12



(Go to Explanation of Interpreted Seismic Reflectors)

Walakpa 1



Walakpa Gas Field - Walakpa #1

API number: 50-023-20013

Operator: U.S. Geological Survey

Location: lat 71.09863° N., long 156.88573° W.

Kelly Bushing: 50 feet above sea level

Ground elevation: 31 feet above sea level

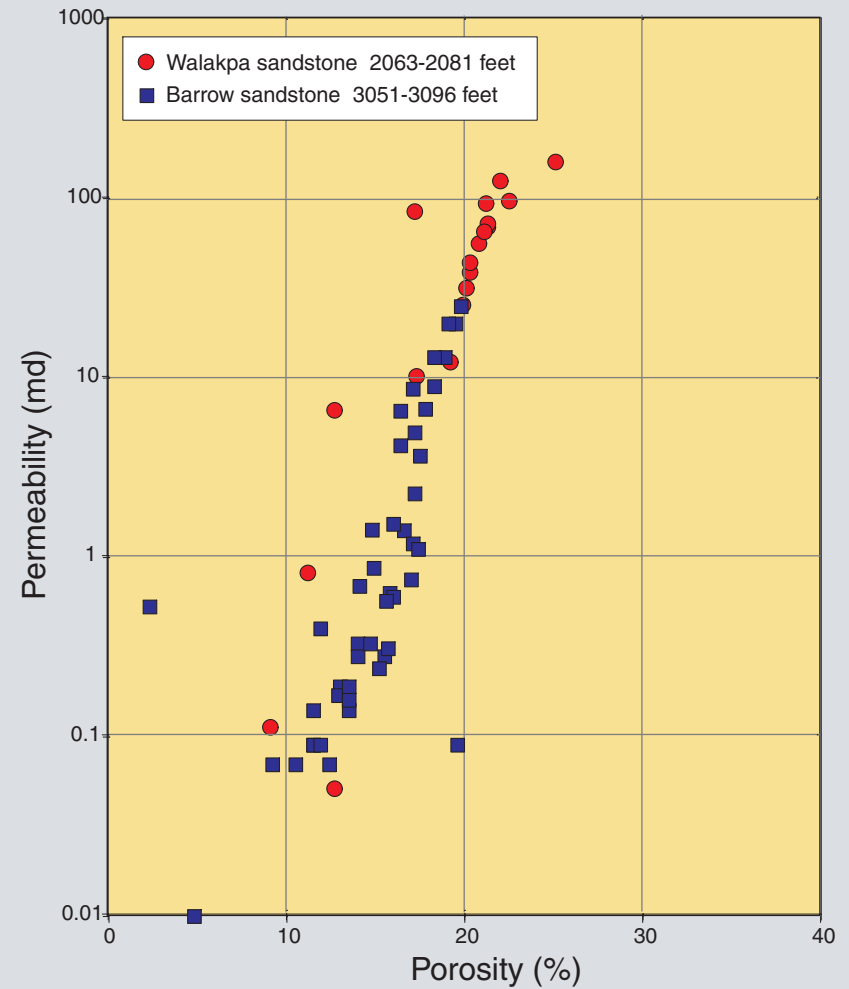
Total depth: 3666 feet measured depth

Completion date: 2/07/80

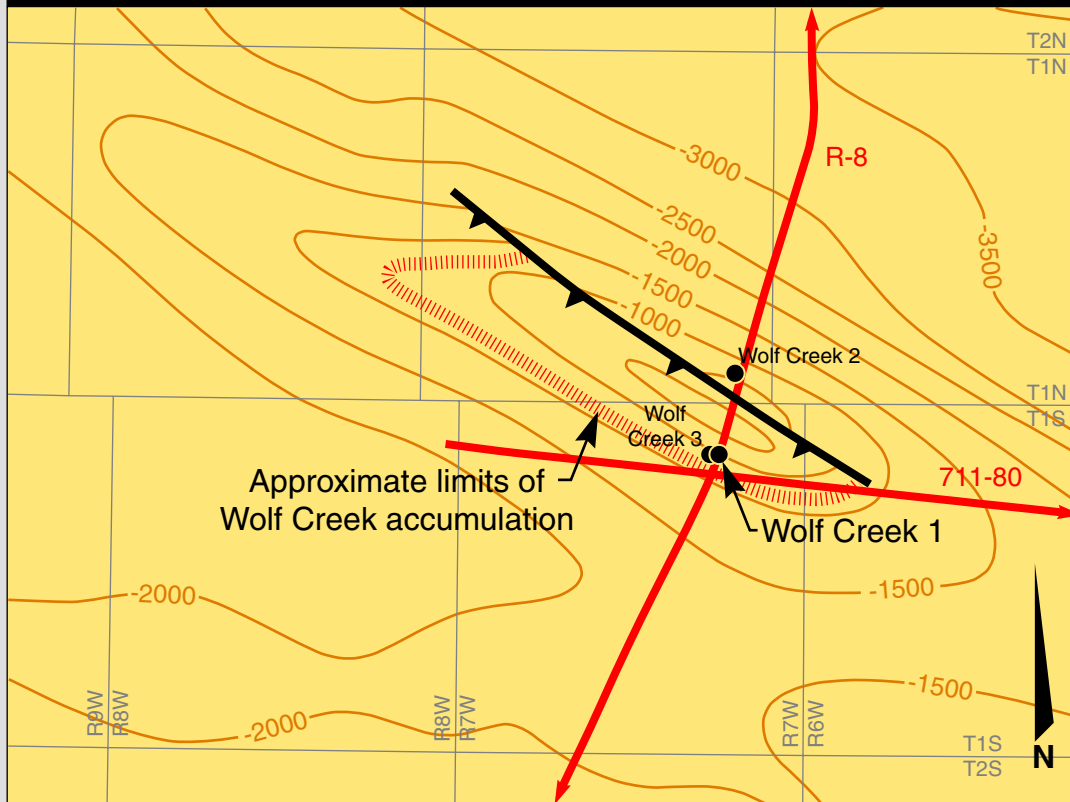
Drill Stem Tests:

DST 1: 2063-2120 ft, flowed gas to surface in 14 minutes at 200 to 854 MCF per day.

DST 2: 2073-2088 ft, flowed gas to surface in 14 minutes at 335 MCF per day.







Wolf Creek



Source: Miller, N., Presutti, V., and Sterr, A., 1978, Tetra Tech Plate IA/S (Shallow Cretaceous depth map) in Summary Report FY'78 prepared for Husky Oil NPR Operations, Inc.

2 miles

-  Well location
-  Thrust fault, teeth shown on upper plate
-  Depth to horizon within Nanushuk Group in feet below sea level
-  Seismic lines



Wolf Creek

Discovery date: 1951

Discovery well: Wolf Creek 1

Trap type: Structural closure on top of Nanushuk

Reservoir: Chandler Fm. (Nanushuk Gp)

Production date: Not available

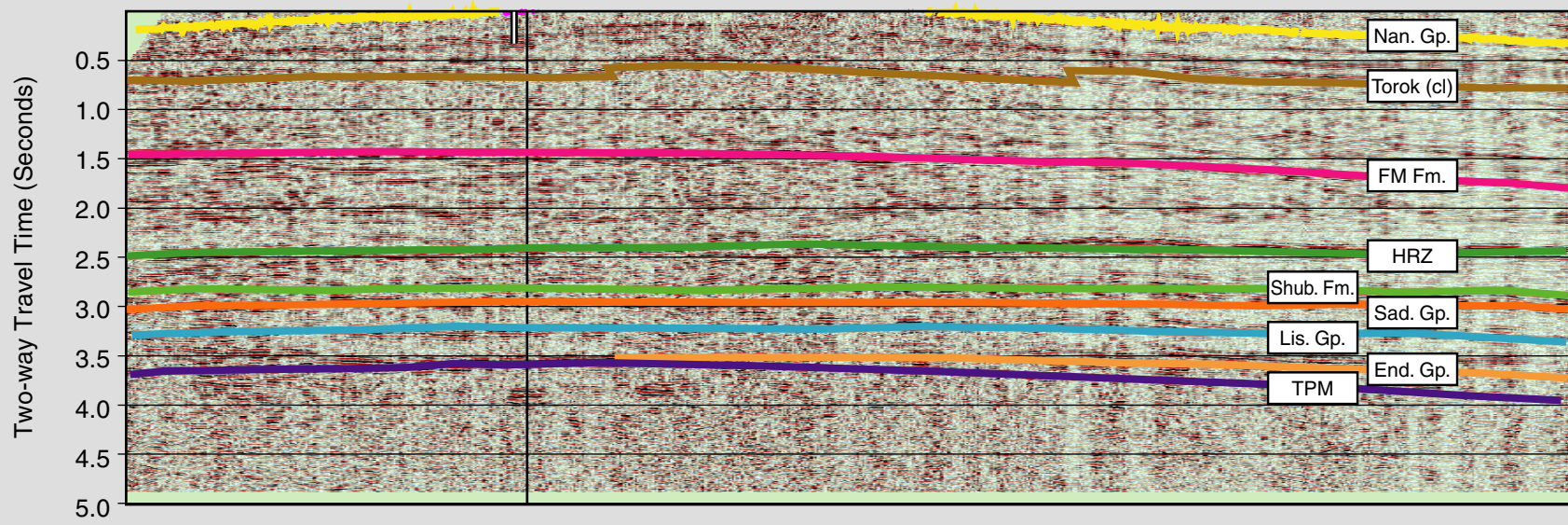
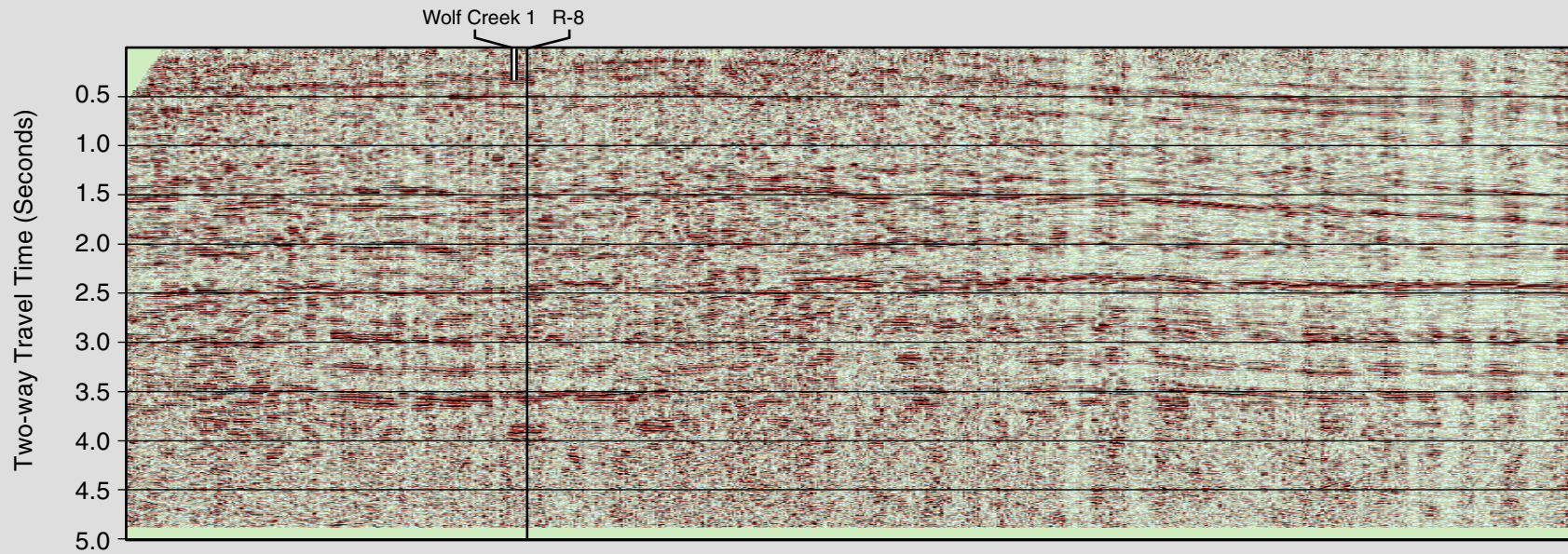
Producing wells: None

Production: None; tested at 116-881 MCF/day

Area: 8,000 acres

Total reserves: Not available

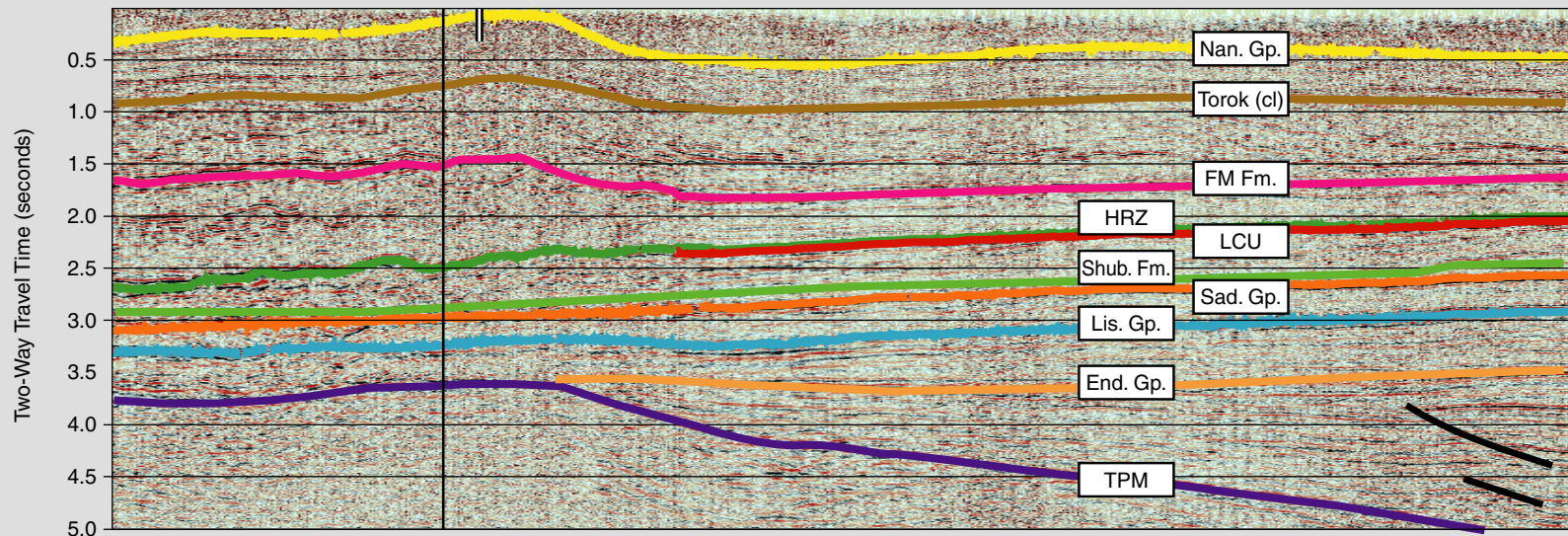
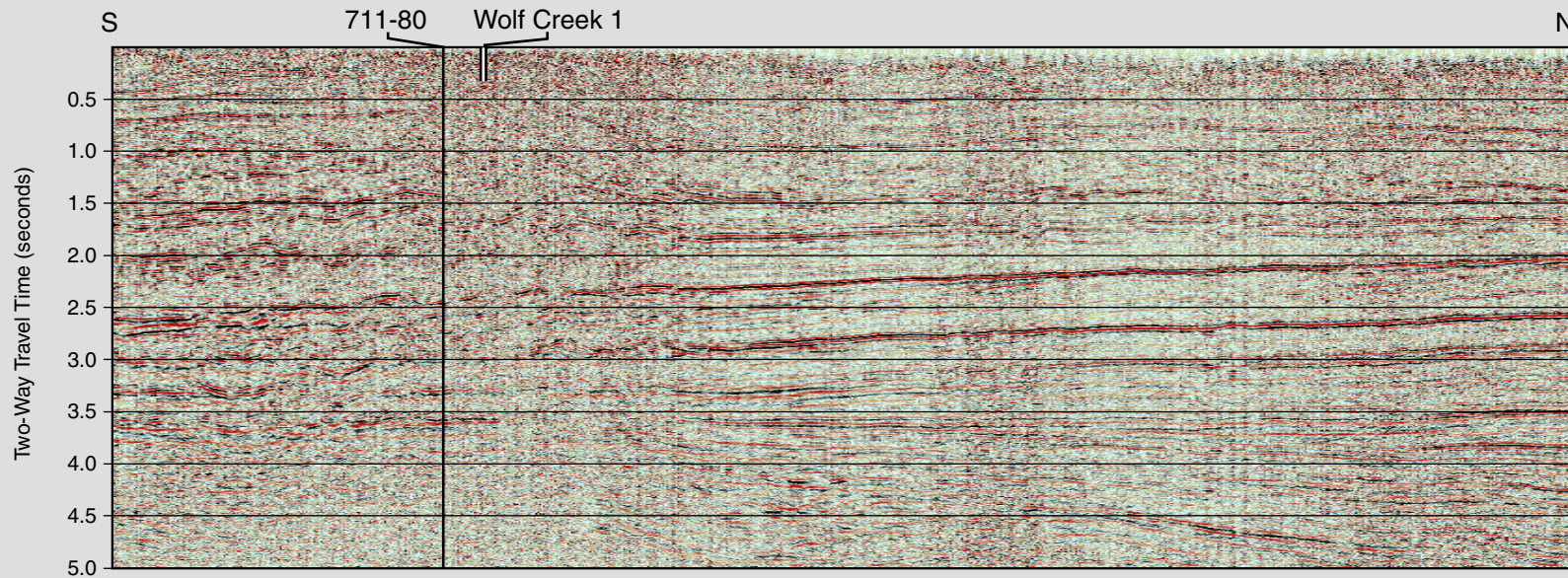
Wolf Creek 711-80



2 miles

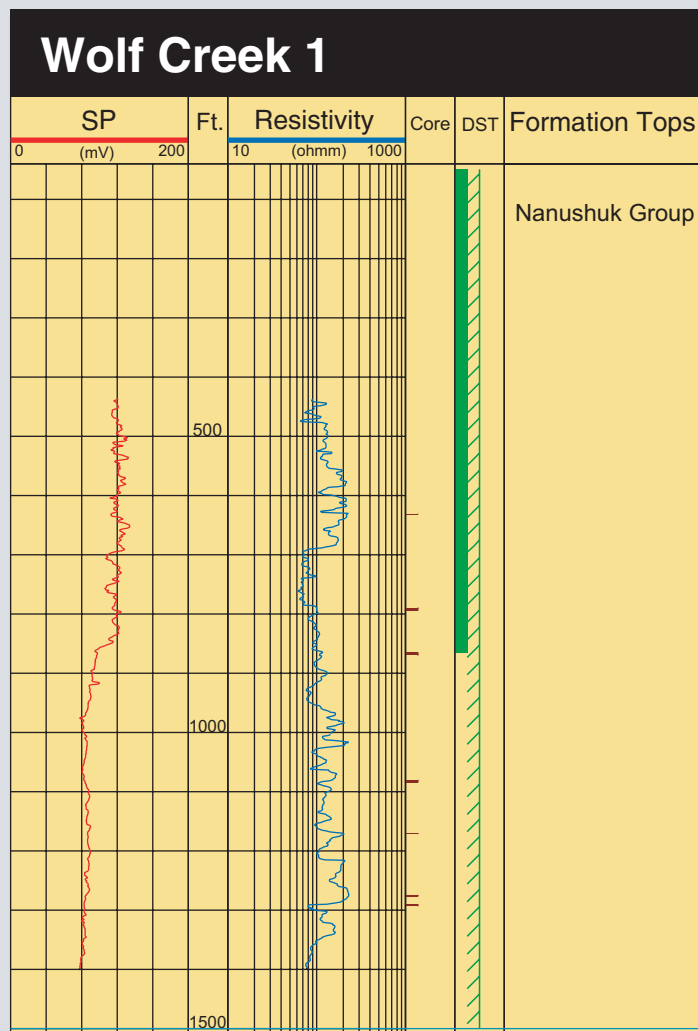
(Go to Explanation of Interpreted Seismic Reflectors)

Wolf Creek R-8



4 miles

(Go to Explanation of Interpreted Seismic Reflectors)



Wolf Creek Gas Field - Wolf Creek #1

API number: 50-119-10008
 Operator: U.S. Navy
 Location: lat 69.38639° N., long 153.52083° W.
 Kelly Bushing: 714 feet above sea level
 Ground elevation: 712 feet above sea level
 Total depth: 1500 feet measured depth
 Completion date: 6/04/51

Drill Stem and Production Tests:

DST 1: 48-865 ft, flowed gas at 116 MCF per day (solid green bar).
 DST 2: 48-1500 ft, flowed gas at 881 MCF per day (cross-hatch pattern).

Notes:

Porosity and permeability data are not available for Wolf Creek 1 and only a few core data were obtained from depths greater than 1500 feet in nearby well Wolf Creek 3.
 Additional flow tests were performed in Wolf Creek 3, showing gas production from as deep as 1670 feet.



Historical Highlights of the NPRA

- 1923** Area comprised of 23-million acres set aside as Naval Petroleum Reserve No. 4
- 1945-52** First government exploration program results in Barrow Area gas production
- 1974-82** Second government exploration program results in additional gas production
- 1982-84** Four industry lease sales and two industry wells drilled
- 1994** Major commercial discovery just northeast of the NPRA
- 1999** Lease sale covering northeastern NPRA
- 1999-2001** Multiple 3-D seismic surveys, 8 wells drilled, and 3 discoveries announced
- 2002** New USGS assessment of undiscovered oil and gas resources

Photograph by George Gryc, 1949, Fish Creek 1 Well