

A SYNOPTIC OVERVIEW OF WINNIPEGOSIS
PINNACLE REEFS IN NORTH DAKOTA

by

David W. Fischer
and
Randolph B. Burke

North Dakota Geological Survey
Grand Forks, ND 58202

MISCELLANEOUS SERIES 68

NORTH DAKOTA GEOLOGICAL SURVEY

Sidney B. Anderson, Acting State Geologist

1987

A SYNOPTIC OVERVIEW OF WINNIPEGOSIS PINNACLE REEFS IN NORTH DAKOTA

PURPOSE

The following is intended to provide background information on the pinnacle reef facies of the Devonian Winnipegosis Formation in the North Dakota portion of the Williston Basin.

RECENT DRILLING ACTIVITY

Recent exploratory activity in Canada has resulted in the discovery of two Winnipegosis wells that are productive in the pinnacle reef facies. In early 1986, Home Petroleum tested a pinnacle reef near Estevan, Saskatchewan. The Tablelands 8-22-2N-9W2 (fig. 1) was reported by Oilweek (March 2, 1987) to be completed flowing 750 BOPD, of 36.5 gravity, sweet crude. The well continues to produce at the initial completion rate, though it is probably capable of higher production rates. Perforations are from approximately 8500 feet, including 100 feet of the potentially productive interval rumored to be over 300 feet thick. Home credits a reserve estimate of five million barrels to the well.

In January 1987 Lasmos et al., Oilweek (March 16, 1987), completed a well in the Winnipegosis pinnacle reef facies approximately seven miles northwest of Home's discovery. The Tablelands 4-36-2-10W2 is reported to be capable of flowing at rates in excess of 550 BOPD, though initially production is restricted to 300 BOPD. The well is reported to have been completed in two separate zones within the Winnipegosis between approximately 8500 to 8550 feet.

A third pinnacle reef test was begun in February 1987. The Dome et al., Estevan South is only 3/4 of a mile north of the international border. Originally rumored a success, the well is now said to be dry.

WINNIPEGOSIS PINNACLE REEFS: PRODUCTION AND SHOWS IN NORTH DAKOTA

The Winnipegosis is productive from five facies in the North Dakota portion of the Williston Basin (Kissling, Eherts; personal commun., 1987). Production can be found on the carbonate shelf as well as in the deeper basin (fig. 2). The pinnacle reef facies is restricted to the deeper basin. To date, the pinnacle reef facies has been productive in only one of seven wells in North Dakota that have penetrated this facies. That production was short-lived, probably best considered a show.

In December of 1980, Shell Oil Company completed the Golden #34X-34 (SWSEsec34, T16IN, R87W, Renville County) pumping 42 BOPD, 19 BWPD from perforations between 8310-8313 feet in the pinnacle reef facies. The well had a cumulative production of 1763 BO, 11,204 BW. The Golden #34X-34 was plugged in July 1981. The well was a 930-foot offset to the Shell Golden #44X-34, that was drilled four months earlier, but had missed the reef (cross section 1).

In September 1981 Inexco Oil tested oil from another pinnacle reef. The Erickson #1-18 (SESEsec18, T157N, R86W) recovered 25 to 30 bbls GCO and 82 to 87 bbls SOCW in a drill stem test from a depth of 8880-8908 feet. No completion was attempted.

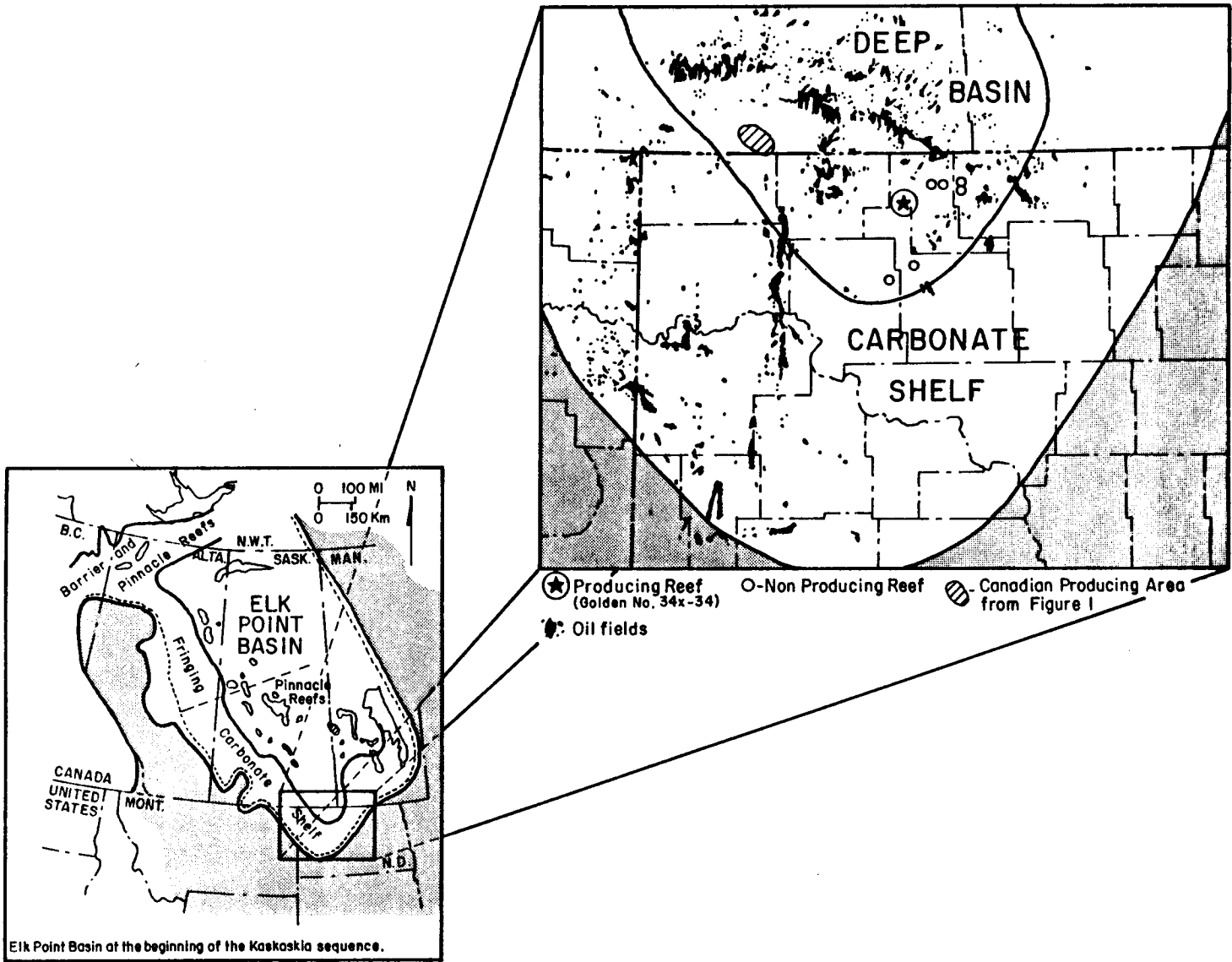
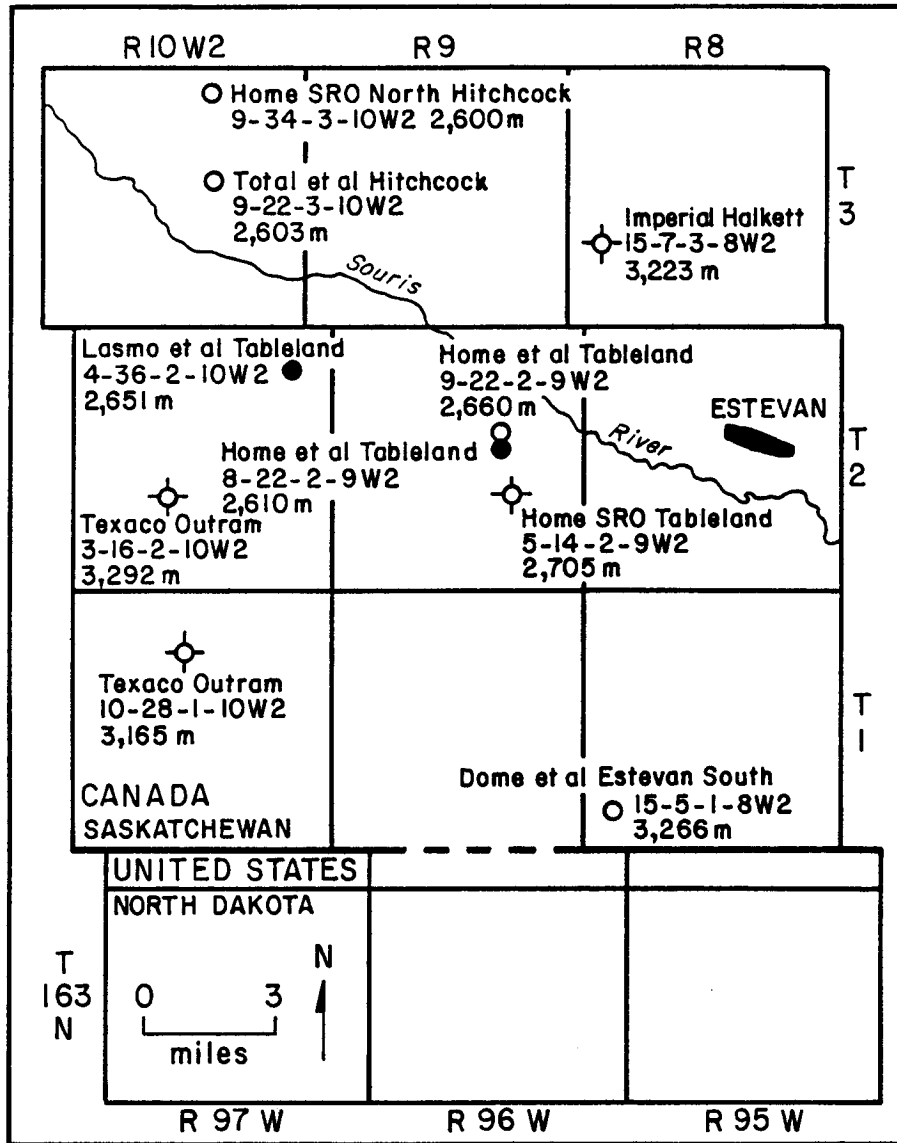


Figure 2. Distribution of known pinnacle reefs in relation to the Elk Point Basin and regional oil production.



Modified from Oilweek, March 2, 1987

Figure 1. Winnepigosis activity map, Saskatchewan, Canada.

A compilation of available data from the NDGS files for the Shell Golden No. 34X-34 follows. Included in the compilation is a brief core description with photos; conventional core analysis: DST information; oil and water analysis; geological cross section.

For your reference, a list of Winnipegosis core available at the NDGS Core and Sample Repository, and a selected Winnipegosis bibliography is included.

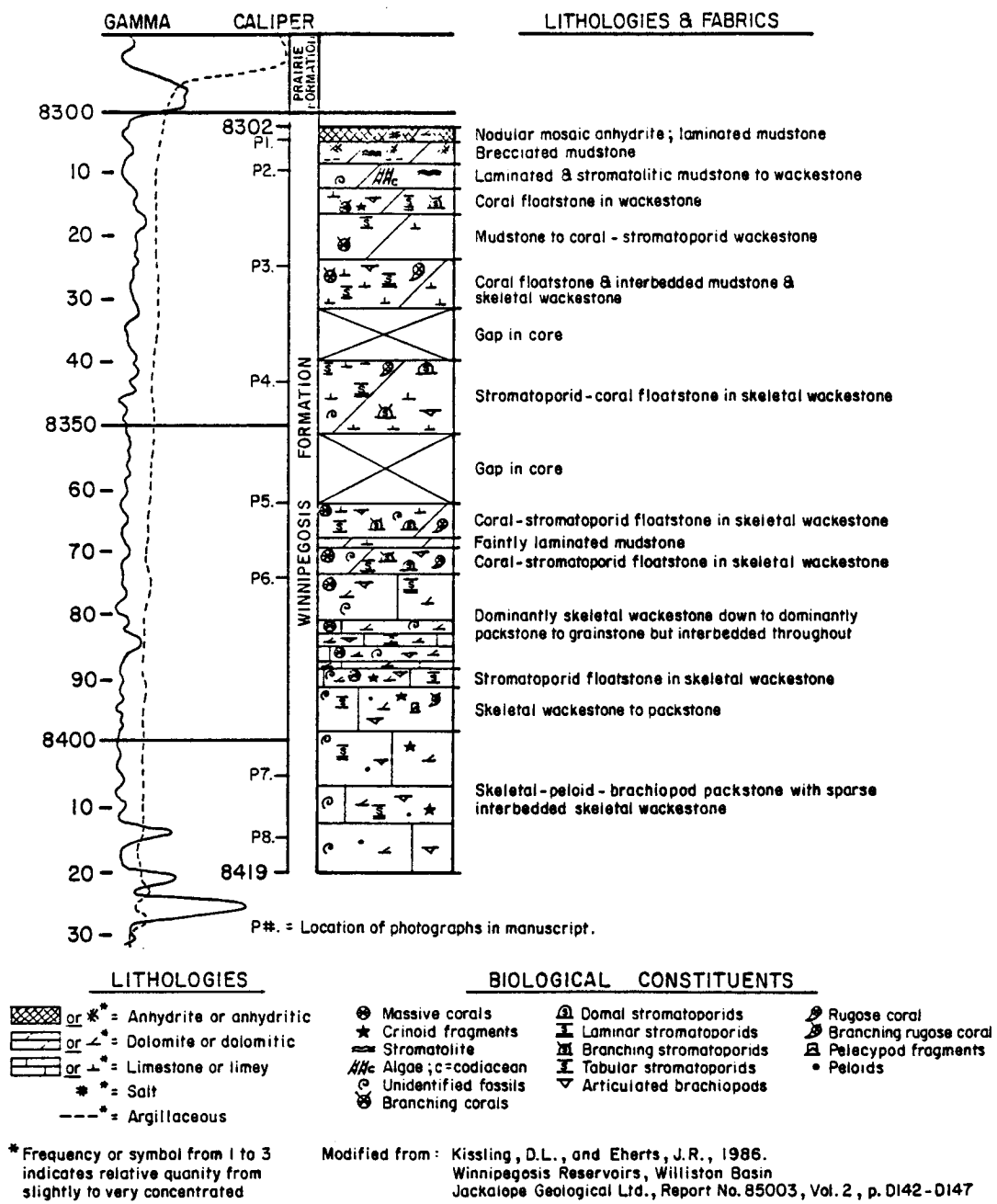
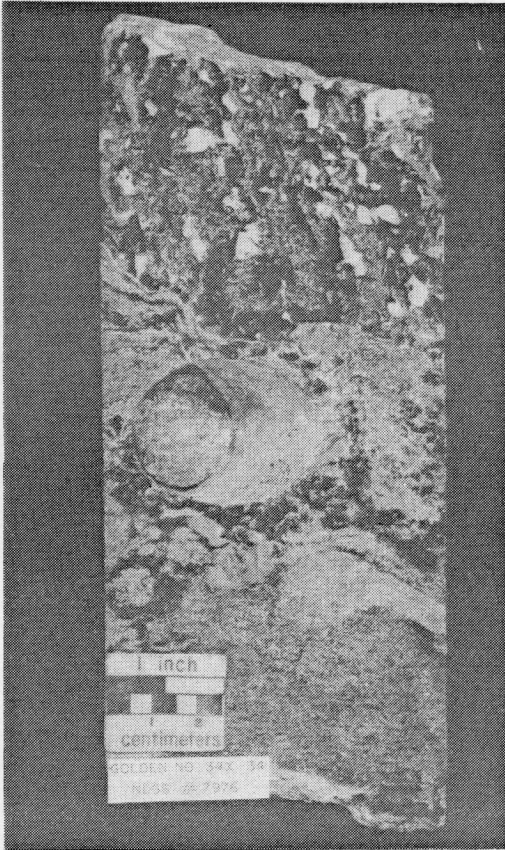
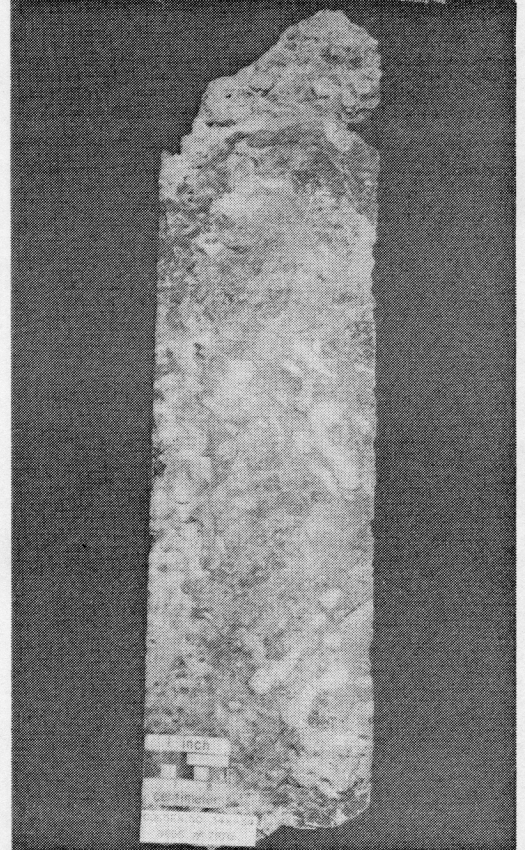


Figure 3. Core description: Shell Golden No. 34X-34.

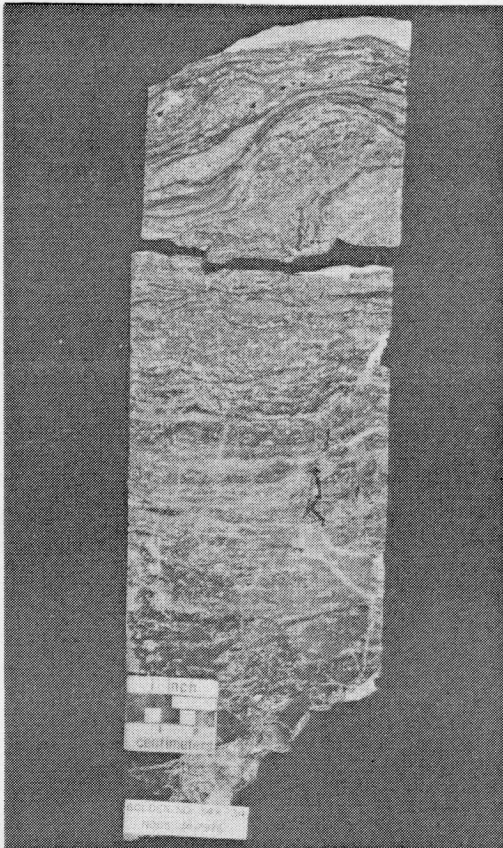
TYPICAL FABRICS WINNIPEGOSIS PINNACLE REEF
SHELL GOLDEN 34X-34



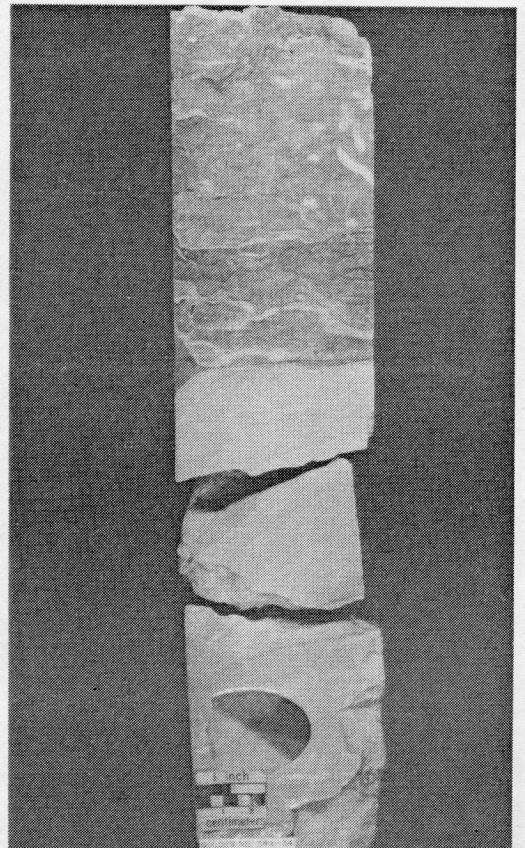
P1. Depth 8304': light brownish gray anhydritic dolomite, brecciated; stromatolite; plugged with anhydrite



P3. Depth 8325': medium gray brown, very calcitic dolomite; coral floatstone in skeletal wackestone; Thamnopora coral



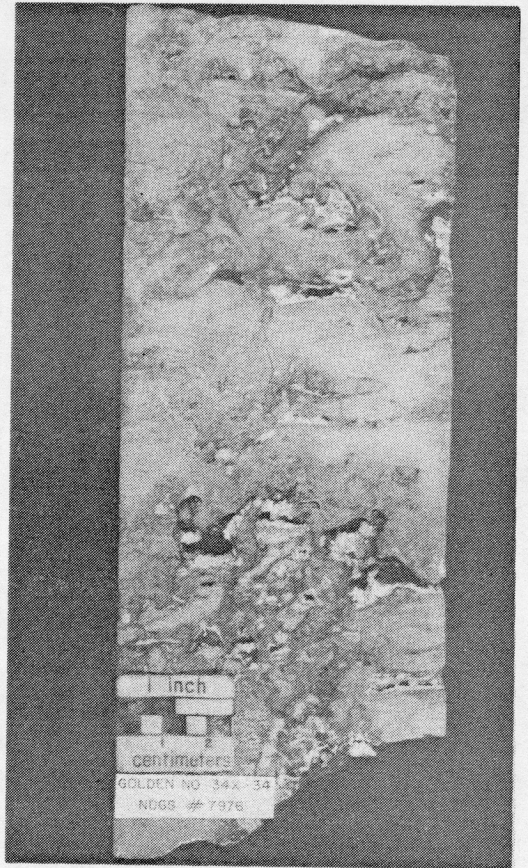
P2. Depth 8310': brownish gray dolomite; massive stromatolite



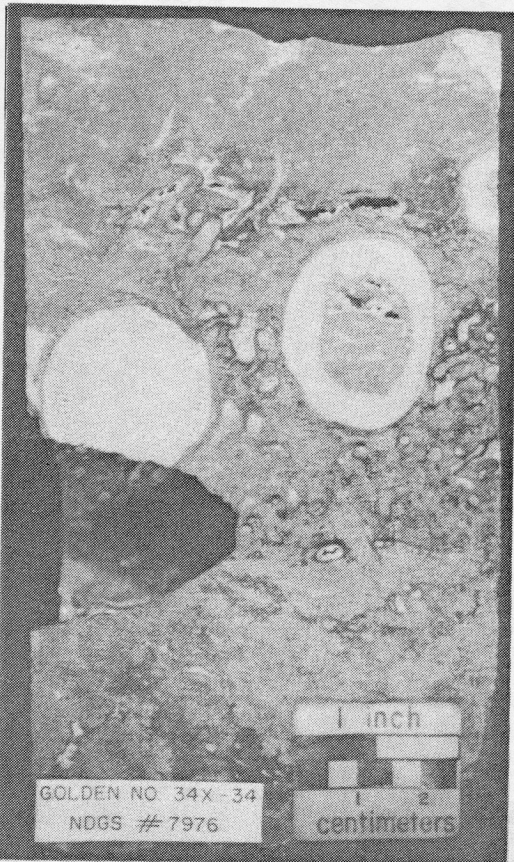
P4. Depth 8343': yellowish brown, very calcitic dolomite; massive stromatoporida in Thamnopora rich skeletal wackestone



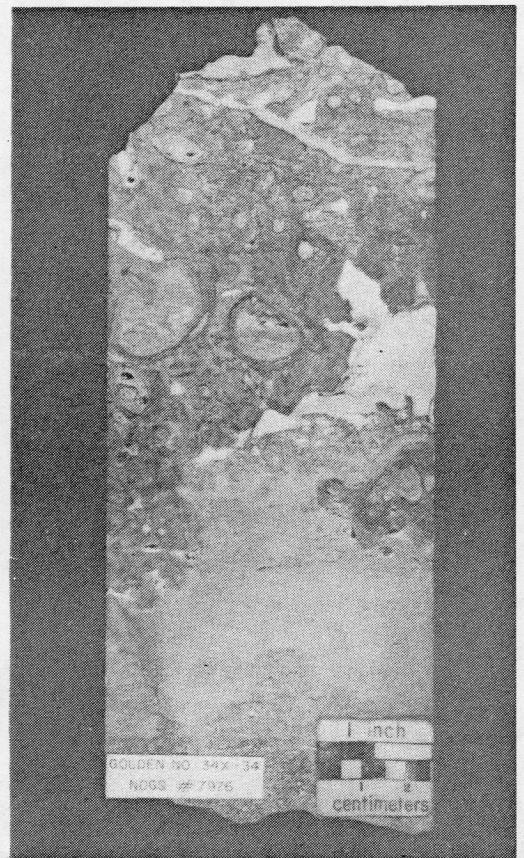
P5. Depth 8362': brownish gray calcitic dolomite; coral-stromatoporid-algal floatstone



P7. Depth 8405': pale yellowish brown, slightly dolomitic limestone; skeletal-peloid-brachiopod packstone to wackestone; note coarse dolospar lined vugs



P6. Depth 8374': light brownish gray dolomitic limestone; rugose corals in skeletal wackestone



P8. Depth 8415': light brownish gray, slightly dolomitic limestone; skeletal-peloid-brachiopod packstone; coarse dolomite in vugs

CORE ANALYSIS

FROM
CORE LABORATORIES, INC.

SHELL OIL COMPANY
NO. 34X-34 GOLDEN
DES LACS
RENVILLE COUNTY

FORMATION : WINNIPEGOSIS
DRLG. FLUID: SALT BASE-NO OIL
LOCATION : SWSE SEC 34-161N-87W
STATE : NORTH DAKOTA

DATE : 9-23-80
FILE NO. : 9105-2731
ANALYSTS : RM
ELEVATION: 1902 KB

CONVENTIONAL CORE ANALYSIS

SAMP. NO.	DEPTH	PERM. TO HORZ.	AIR (MD) VERTICAL	POR. FLD.	FLUID OIL	SATS. WATER	GR. DNS.	DESCRIPTION
1	8302 -3	0.05		1.9	0.0	35.1	2.78	DOLO V/FN XLN
2	8303 -4	0.34		1.6	0.0	41.3	2.76	DOLO V/FN XLN
3	8304 -5	0.27		1.6	0.0	14.2	2.81	DOLO V/FN XLN
4	8305 -6	0.09		1.0	0.0	23.6	2.92	DOLO V/FN XLN
5	8306 -7	0.10		1.6	0.0	14.6	2.94	DOLO V/FN XLN
6	8307 -8	0.07		1.0	0.0	22.7	2.93	ANHY
7	8308 -9	2.8		5.6	2.0	23.7	2.83	VF DOLO V/FN XLN PP VUG
8	8309-10	21		7.8	12.4	41.5	2.83	VF DOLO V/FN XLN PP VUG
9	8310-11	0.36		3.5	15.2	42.6	2.84	VF DOLO V/FN XLN PP VUG
10	8311-12	17		6.5	3.3	46.7	2.85	DOLO V/FN XLN PP VUG
11	8312-13	0.64		8.2	11.9	45.1	2.83	DOLO V/FN XLN PP VUG
12	8313-14	46		9.7	17.7	44.4	2.84	DOLO V/FN XLN PP VUG
13	8314-15	3.1		8.4	11.5	33.1	2.84	DOLO V/FN XLN PP VUG
14	8315-16	100		6.8	14.2	41.1	2.84	VF DOLO V/FN XLN PP VUG
15	8316-17	0.08		8.5	8.7	47.3	2.84	DOLO V/FN XLN
16	8317-18	1.5		3.2	0.0	48.9	2.83	VF DOLO V/FN XLN
17	8318-19	0.22		4.6	4.8	52.8	2.83	DOLO V/FN XLN
18	8319-20	1.1		4.1	19.2	54.8	2.84	DOLO V/FN XLN
19	8320-21	0.04		3.2	3.5	62.9	2.80	DOLO V/FN XLN PP VUG
20	8321-22	0.45		2.8	3.9	63.2	2.82	DOLO V/FN XLN PP VUG
21	8322-23	7.3		3.1	3.8	43.8	2.81	VF DOLO V/FN XLN PP VUG
22	8323-24	13		7.3	1.5	46.6	2.81	DOLO V/FN XLN PP VUG
23	8324-25	5.2		14.1	0.8	81.3	2.82	VF DOLO V/FN XLN PP VUG
24	8325-26	28		10.8	1.0	78.3	2.79	VF DOLO V/FN XLN PP VUG
25	8326-27	14		6.3	1.7	62.0	2.81	DOLO V/FN XLN PP VUG
26	8327-28	3.7		10.2	1.0	50.2	2.83	DOLO V/FN XLN PP VUG
27	8328-29	53		8.0	1.4	71.0	2.80	VF DOLO V/FN XLN PP VUG
28	8329-30	8.5		10.0	1.1	75.9	2.81	DOLO V/FN XLN PP VUG
29	8330-31	5.9		7.1	1.5	54.7	2.82	DOLO V/FN XLN PP VUG
	8331-8339							LOST CORE
30	8339-40	15		12.6	0.8	88.5		DOLO V/FN XLN PP VUG
31	8340-41	15		8.3	1.3	60.9	2.81	DOLO V/FN XLN PP VUG
32	8341-42	3.7		13.4	0.7	59.7		DOLO V/FN XLN PP VUG
33	8342-43	298		14.1	1.4	59.3		DOLO V/FN XLN PP VUGGY
34	8343-44	0.01		5.8	1.9	48.8		DOLO V/FN XLN
35	8344-45	0.05		10.3	2.1	73.2		DOLO V/FN XLN
36	8345-46	31		6.5	1.6	74.5	2.82	VF DOLO V/FN XLN PP VUG
37	8346-47	6.6		12.0	0.8	78.0		VF DOLO V/FN XLN PP VUG
38	8347-48	200		13.4	1.5	52.1		VF DOLO V/FN XLN VUGGY
39	8348-49	0.98		13.0	1.6	58.7		VF DOLO V/FN XLN PP VUG
	8349-8361							LOST CORE
40	8361-62	0.14		11.8	1.8	75.2	2.79	VF DOLO V/FN XLN PP VUG
41	8362-63	0.19		11.7	1.8	67.9		DOLO V/FN XLN PP VUG
42	8363-64	3.1		8.5	0.0	59.5		DOLO V/FN XLN
43	8364-65	66		10.2	1.0	69.2		DOLO V/FN XLN VUGGY
44	8365-66	0.51		9.7	2.2	69.6		DOLO V/FN XLN
45	8366-67	54		8.6	2.5	67.3	2.80	DOLO V/FN XLN VUGGY
46	8367-68	0.07		6.9	1.6	56.6		DOLO V/FN XLN
47	8368-69	1.7		13.7	0.7	83.4		VF DOLO V/FN XLN PP VUG
48	8369-70	15		11.8	0.0	79.0		VF DOLO V/FN XLN PP VUG
49	8370-71	1.0		9.0	0.0	67.2		VF DOLO V/FN XLN PP VUG
50	8371-72	7.2		16.3	0.6	76.2	2.79	DOLO V/FN XLN PP VUG
51	8372-73	7.5		13.9	0.7	83.5		DOLO V/FN XLN PP VUG
52	8373-74	13		10.6	1.0	76.8		DOLO V/FN XLN PP VUG
53	8374-75	8.8		17.5	0.6	84.5		DOLO V/FN XLN PP VUG
54	8375-76	4.4		10.2	0.0	80.3		VF DOLO V/FN XLN LMY
55	8376-77	0.61		7.7	0.0	78.9	2.75	VF DOLO V/FN XLN LMY
56	8377-78	0.06		7.7	1.4	71.0		VF DOLO V/FN XLN LMY
57	8378-79	0.20		5.0	0.0	71.0		VF LM V/FN XLN ALGAL
58	8379-80	0.07		5.5	0.0	61.2		VF LM V/FN XLN ALGAL DOLO
59	8380-81	0.20		3.2	0.0	52.3		VF LM V/FN XLN ALGAL DOLO
60	8381-82	2.9		6.3	0.0	77.4	2.73	VF LM V/FN XLN ALGAL DOLO
61	8382-83	0.06		3.0	0.0	64.6		VF LM V/FN XLN ALGAL
62	8383-84	44		6.6	0.0	57.1		VF LM V/FN XLN ALGAL

SAMP. NO.	DEPTH	PERM. TO HORZ.	AIR (MD) VERTICAL	POR. FLD.	FLUID SATS. OIL	GR. WATER	DNS.	DESCRIPTION
63	8384-85	0.55		4.2	0.0	65.1		VF LM V/FN XLN ALGAL
64	8385-86	14		7.6	0.0	64.9		VF LM V/FN XLN ALGAL
65	8386-87	1.3		6.8	0.0	81.8	2.70	LM V/FN XLN ALGAL
66	8387-88	0.51		8.2	0.0	86.7		LM V/FN XLN ALGAL
67	8388-89	0.16		11.3	0.9	86.5		VF LM V/FN XLN ALGAL
68	8389-90	0.38		15.5	0.6	86.2		LM V/FN XLN CHKY
69	8390-91	0.82		15.7	0.6	82.9		LM V/FN XLN CHKY
70	8391-92	1.4		13.7	1.5	87.1	2.69	LM V/FN XLN CHKY DOLO
71	8392-93	0.93		12.6	0.8	92.3		LM V/FN XLN CHKY DOLO
72	8393-94	1.0		9.9	2.0	80.6		LM V/FN XLN ALGAL
73	8394-95	0.69		8.5	2.4	86.7		LM V/FN XLN ALGAL
74	8395-96	0.23		10.5	1.8	88.0		LM V/FN XLN PP VUG
75	8396-97	0.32		11.4	1.7	76.4	2.69	LM V/FN XLN
76	8397-98	0.22		11.6	0.8	72.0		LM V/FN XLN CHKY
77	8398-99	0.49		11.1	0.9	73.6		VF LM V/FN XLN CHKY
78	8399 -0	69		8.7	0.0	68.1		LM V/FN XLN CHKY VUG
79	8400 -1	0.29		8.3	1.2	64.1		LM V/FN XLN CHKY STYO
80	8401 -2	0.11		10.3	1.0	66.5	2.69	LM V/FN XLN CHKY
81	8402 -3	0.20		8.9	1.1	61.6		LM V/FN XLN CHKY
82	8403 -4	0.07		10.6	1.0	67.4		LM V/FN XLN CHKY
83	8404 -5	0.11		10.0	0.0	66.7		VF LM V/FN XLN CHKY
84	8405 -6	0.69		11.6	0.9	69.6		LM V/FN XLN CHKY
85	8406 -7	0.07		11.6	0.9	71.3	2.68	LM V/FN XLN CHKY
86	8407 -8	0.11		9.7	0.0	78.7		VF LM V/FN XLN CHKY
87	8408 -9	541 *		10.7	0.0	72.0		VF LM V/FN XLN CHKY
88	8409-10	0.24		12.5	0.8	75.0		VF LM V/FN XLN CHKY
89	8410-11	0.18		11.0	0.0	72.1		VF LM V/FN XLN CHKY
90	8411-12	59		12.0	0.0	70.4	2.70	LM V/FN XLN CHKY VUG
91	8412-13	0.06		8.8	0.0	72.9		VF LM V/FN XLN CHKY
92	8413-14	0.16		10.6	0.9	75.5		VF LM V/FN XLN CHKY
93	8414-15	0.63		12.0	0.8	64.9		VF LM V/FN XLN CHKY
94	8415-16	0.27		11.4	0.0	65.1		LM V/FN XLN CHKY
95	8416-17	0.15		12.6	1.6	69.9	2.68	LM V/FN XLN CHKY
96	8417-18	0.26		12.3	0.8	63.4		LM V/FN XLN CHKY
97	8418-19	0.13		10.6	0.9	66.5		VF LM V/FN XLN CHKY

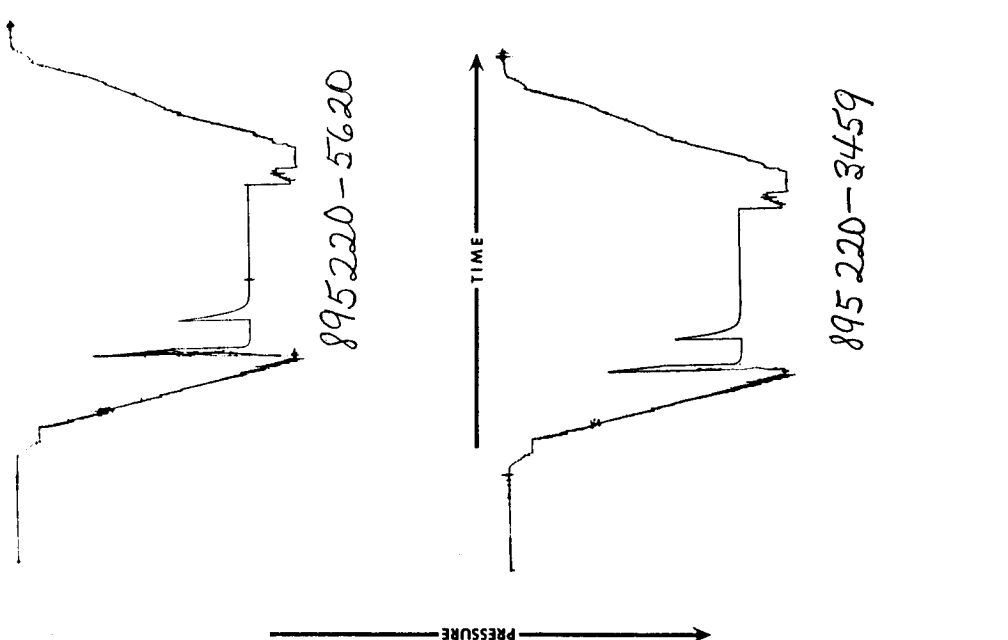
VF=VERTICAL FRACTURE
 * DENOTES FRACTURED PERM PLUG

DST INFORMATION: DST #1: BOTTOM HOLE CONVENTIONAL

WILDLIFE J4A - 31 1 8399' TO 8339' SHELL OIL COMPANY

Liquor Name: _____ Well No. _____ Test No. _____ Tested Interval: _____ Lessor Owner/Company Name: _____

FLUID SAMPLE DATA Sample Pressure: 350 Recovery: Cu. Ft. Gas: 242 cc. Oil: 490 cc. Water: 1400 cc. Mud: _____ Tot. Liquid cc.: 2200 Density: _____ Gravity: _____ API @ _____° F: _____ Viscosity: _____ @ 85° F: 2000000 cpm @ 85° F: 195000 cpm Recovery Mud Filtrate: .04 @ 85° F: 2000000 cpm Mud Filtrate: .054 @ 60° F: 2000000 cpm Mud Filtrate: _____ Mud Weight: 10.5 Ash Content: _____% Moisture: _____% Solids: _____%		Date: 9-20-80 Kind of DST: OPEH HOLE Location: TIOGA Tester: MR. FOSS Witness: MR. OLESON Drilling Contractor: BOMAC DRILLING COMPANY #40 Equipment & HOLE DATA: Formation Tested: ALIENEGOSIS Elevation: _____ Net Productive Interval: Kelly Bushing All Depths Measured From: 5320 Total Depth: 5379 Main Hole/Gauge Size: 3 1/8 Drill Collar Length: 554' ID 2 2 1/2" Drill Pipe Length: 717' ID 3 8/16" Packer Depth: 5300' Packer Depth: 5308' Depth Tester Valve: _____ Core Size: .75" Bottom Choke: _____ Mod. From Tester Valve: _____	
Geol. Loc. Name: 34 161N 87W Field Area: DES LACS County: RENVILLE State: NORTH DAKOTA		PRODUCTION TEST DATA Gauge No. 3459 Depth: 8311' Pressure: _____ 2 1/2 Hour Check: _____ Blanket OFF/ES: _____ 1324	
TESTING DATA Initial Hydrostatic: 4623 Flow Initial: 1249 Flow Final: 2554 Closed In: 3856 Final Hydrostatic: 4580		Gauge No. 7366 Depth: 8336' Pressure: _____ 2 1/2 Hour Check: _____ Blanket OFF/ES: _____ 0744 1324	
Actual Pressure: _____ Initial Hydrostatic: 4623 Flow Initial: 1249 Flow Final: 2554 Closed In: 3856 Final Hydrostatic: 4580		Actual Pressure: _____ Initial Hydrostatic: 4579.7 Flow Initial: 1442.0-0 Flow Final: 2575.6 Closed In: 3865.4 Final Hydrostatic: 4572.3	



FORMATION TEST DATA

DST #2: INFLATE STRADDLE

Phone 713-7609112 Box 122665
Houston, TX 77017

LYNES, INC

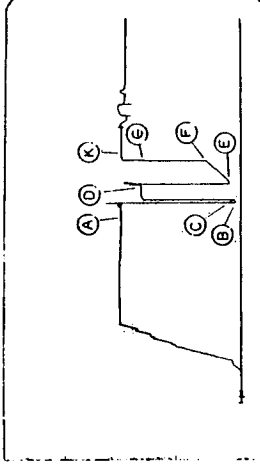
Address See Distribution

Ticket No. 29472

Date 9-27-80

No. Final Copies 15

Contractor - Romac Drilling Rig No. 40 Sp. 5W-SE Sec. 34 Twp. 161 N Rng. 87 W Field Wildcat County Renville State North Dakota Elevation 1897' Ground Formation Manly/Sossils	Top Choke 1/4" Bottom Choke 3/4" Size Hole 7 7/8" Size Bit Hole --- Size Wt. D. P. 4 1/2" 16.60 Size Wt. Pipe --- I. D. of D. C. 2 1/4" Length of D. C. 544' Total Depth 8756' Interval Tested 8307'-8314' Type of Test Inflatas Straddle	Flow No. 1 10 Min. Shut-in No. 1 60 Min. Flow No. 2 90 Min. Shut-in No. 2 120 Min. Flow No. 3 --- Min. Shut-in No. 3 --- Min. Bottom Hole Temp 21.0 °F Mud Weight 10.6 Gravity --- Viscosity 37 Tool opened @ 12:50 PM	Inside Recorder PRD Make Kuske K-1 No. 19013 Cap. 8750 @ 8267' Final Hydrostatic A 4594 Initial Flow B 185 Final Initial Flow C 260 Initial Shut-in D 3826 Second Initial Flow E 449 Second Final Flow F 1337 Second Shut-in G 3752 Third Initial Flow H --- Third Final Flow I --- Third Shut-in J --- Lyles Dist. Williston, N.D. Our Tester: Ron Scott Witnessed By: ---
---	--	--	--



Did Well Flow - Gas YES Oil NO Water NO (Test was reverse circulated)
 RECOVERY IN PIPE: 5700' Total Fluid (ran 55 gallons of Ammonia)
 5700' Heavy Gas cut, lightly Oil cut Mud = 72 bbl.
 (Fluid Recovery Estimated)

Blow Description:
 1st Flow:
 2nd Flow:

Tool opened with no blow, increased to bottom of bucket in 6 minutes, blow continued to increase to 1.75 psi. at end of flow period. Blow increased to 4.5 psi. at end of shut-in period.
 Tool opened with 4.5 psi. with gas to surface in 40 minutes. See Gas Volume Report. After shut-in opened 2" flareline, blow decreased and died at end of shut-in period.
 *Charts indicate packer seats were lost approximately 3 minutes into the final shut-in period.

LYNES, INC.

Sampler Report

Company Shell Oil Company Date 9-27-80
 Well Name & No. Golden #34X - 34 Ticket No. 29472
 County Renville State North Dakota
 Test Interval 8307'-8314' DST No. 2

Total Volume of Sampler: 2200 cc.
 Total Volume of Sample: 1600 cc.
 Pressure in Sampler: 275 psig

Oil: 1600 Black Oil cc.
 Water: NONE cc.
 Mud: NONE cc.
 Gas: 5 cu. ft.
 Other: NONE

Make Up Water ● of Chloride Content ppm.
 Mud Pt Sample B.W. .04 ● of Chloride Content 200.000+ ppm.
 Gas/Oil Ratio Gravity ● °API ●

Where was sample drilled On Location
 Remarks: Grind-Out Sample:
 801 OIL, 109 Water, 81 Mud, 21 Basic Sediment

OIL ANALYSIS

ASTRO-CHEM SERVICE LABORATORY

4102 2nd Ave. West
 Williston, North Dakota 58801
 P. O. Box 972
 Phone 701-572-2355

OIL ANALYSIS REPORT

Sample No. 80-2891 Date 12 Dec. 50
 Well Identification Data
 Company Shell Oil Company City Williston State ND
 Well No. Colman 34 X 34 Formation Williston Depth 5710'-5713' Rod/Tub. 6 1/2" x 2"
 Source Bottom Date Sampled 12 Dec. 50

SPECIFIC GRAVITY 0.8992 @ 60/60° F
 API GRAVITY 21.5 @ 60° F
 NCI Relative to 15.6 LBS/1000 BBLs
 POUR POINT 52 ° F
 VISCOSITY 13.5 KINEMATIC; 68 @ 100° F
73.8 SAYBOLT UNIVERSAL SECONDS @ 100° F
 TOTAL SULFUR 0.6702 % BY WEIGHT
 BOTTOM SEDIMENT & WATER: GROSS SAMPLE 0.6 %
 SAMPLE ANALYZED _____ %
 PARAFFIN 36.78 % BY WEIGHT
 ASPHALTENES _____ % BY WEIGHT

REMARKS: _____

WATER ANALYSIS

ASTRO-CHEM SERVICE LABORATORY

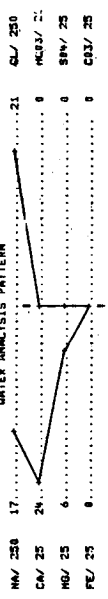
4102 2nd Ave. West
 Williston, North Dakota 58801
 P. O. Box 972
 Phone 701-572-2355

WATER ANALYSIS REPORT

Sample Number: 80-409 DATE OF ANALYSIS: 11/14/50
 COMPANY: SHELL OIL COMPANY
 CITY: HOUSTON STATE: TX
 WELL NAME AND/OR NUMBER: DOLGEN 30A-34
 DATE SAMPLED: 11/4/50 DEPT NUMBER: _____
 SAMPLE SOURCE: SWAB
 LOCATION: _____ OF SEC: _____ TUM: _____ SNG: _____
 FORMATION: UNIMPECOSIS DEPTH: 8310-8313
 DISTRIBUTION: WELL DISTRIBUTION LIST

RESISTIVITY @ 77°F = .043 OHM-METERS PH = 5.38
 SPECIFIC GRAVITY @ 77°F = 1.198 MDS-WEG
 TOTAL DISSOLVED SOLIDS (CALCULATED) = 295380 MG/L
 SODIUM CHLORIDE (CALCULATED) = 269088 MG/L

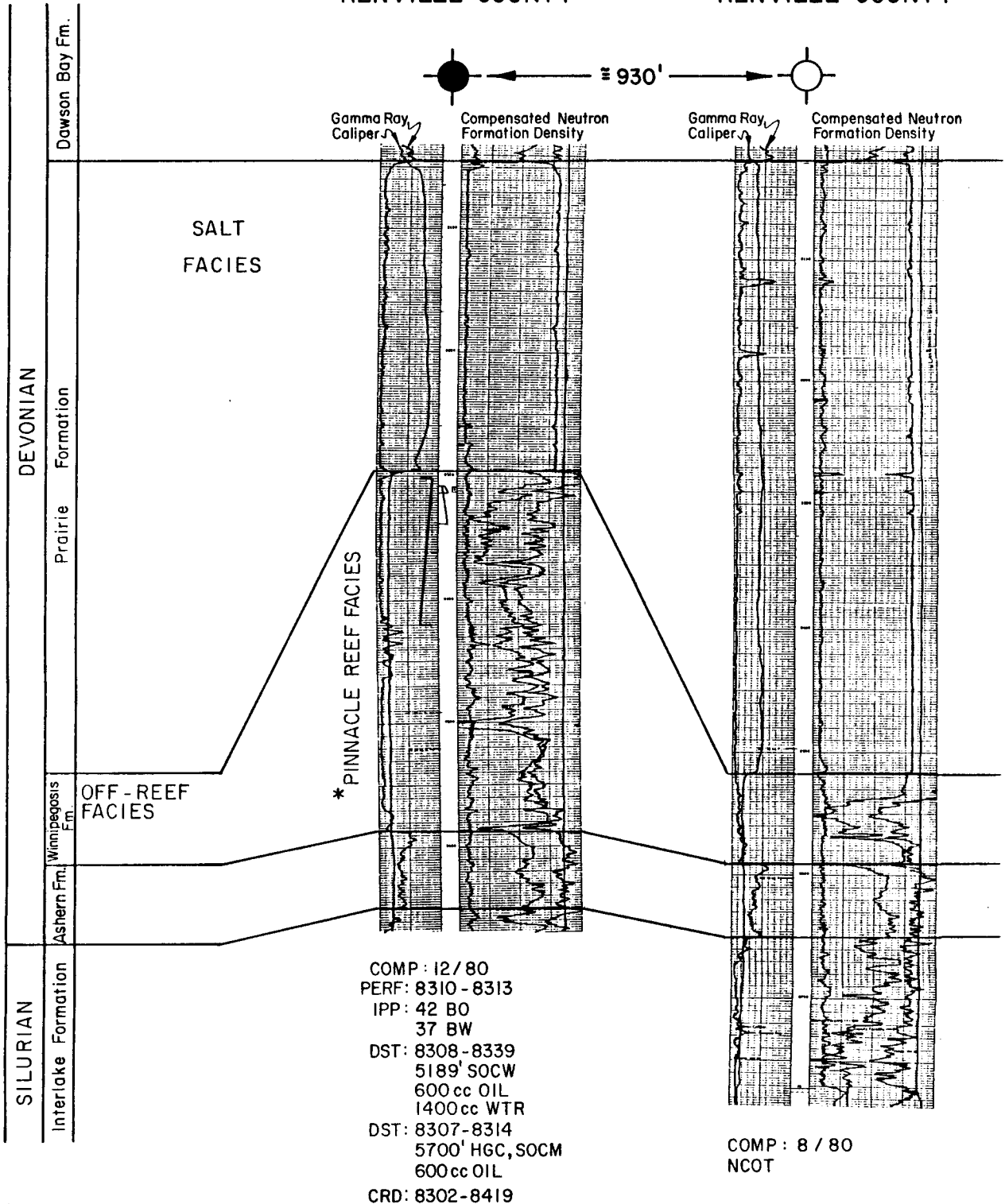
CATIONS		ANIONS	
MG/L	MEQ/L	MG/L	MEQ/L
CALCIUM	48	CHLORIDE	513
MAGNESIUM	139	CARBONATE	1819
SODIUM	4323	BICARBONATE	316
CHROMIUM	3	SULFATE	18.8
IRON	1	NITRATE	0
BARIUM	1		



REMARKS: _____

SHELL OIL COMPANY
 GOLDEN NO. 34x-34
 T.161 N., R.87 W., SEC. 34 SWSE
 DES LACS (Eastward)
 RENVILLE COUNTY

SHELL OIL COMPANY
 GOLDEN NO. 44x-34
 T.161 N., R.87 W., SEC. 34
 WILDCAT
 RENVILLE COUNTY



* See core description Figure 3

Cross Section 1

WINNIPEGOSIS CORE & THIN SECTIONS
(NDGS CORE & SAMPLE LIBRARY)

WELL NO.	LOCATION	TYPE OF SAMPLE	INTERVAL	ELEV. KB	ORIGINAL OPERATOR, ORIGINAL WELL NAME
5257.0	151- 90-34 NWSW	C C	11119-11179 11119-11179	2223 2223	MCCOLLOCH OIL CORP. WAHNER #1-34
147.0	152- 96-15 NWNW	C C C	12220-12255 12218-12225 12225-12255	2480 2480 2480	AMERADA PETROLEUM CORP. GEORGE WOLLAN #1
5158.0	153- 85-13 NENW	C C TS TS	8825-8875 8825-8874 8828	2117 2117 2117 2117	UNION OIL CO. OF CALIF. MYRTLE HANSON #1-C-13
4597.0	154-103- 5 SWNE	C TS	11894-11954 11919	2338 2338	LAMAR HUNT DONALD VOLL #1
4510.0	154-103- 7 SWNE	C TS	11756-11857 11778-11851	2268 2268	LAMAR HUNT BANK OF N.D. OYLOE #1
25.0	155- 95- 6 SWSW	C C	11401-11451 11464-11539	2390 2390	AMERADA PETROLEUM CORP. C. IVERSON #1
5185.0	156- 77- 1 SWSW	C	5229-5284	1503	CHAMPLIN PET. CO. BEST #1 14-1
4992.0	156- 82- 2 NESE	C TS	6885-6939 6848-6926	1618 1618	UNION OIL CO. OF CALIF. HAROLD ANDERSON #1-I-2
5333.0	156- 93-26 SESE	C DC	11874-12163 162-12530	2376 2376	SHELL OIL CO. MORROW #44X-26
5082.0	156- 93-35 NENW	TS TS	12017-12159 12167-12245	2409 2409	SHELL OIL CO. L. TEXEL #21-35
35.0	156- 95-31 SWNE	C	11572-11621	2329	AMERADA PETROLEUM CORP. PALMER H. DILLARD #1
4916.0	156-102-29 NESW	C TS	12008-12071 12008-12071	2408 2408	LAMAR HUNT PAUL HARSTAD #1
4618.0	156-103-17 NENW	C TS TS TS	11650-11651 11651-11757 11691 11754	2413 2413 2413 2413	AMERADA PETROLEUM CORP. NILS TROGSTAD #1
5279.0	157- 76-34 NESW	C TS TS	5099-5129 5096-5121 5121	1476 1476 1476	MCMORON EXPLORATION CO. STATE #1
*11872.0	157- 88-29 NWNE	C	10024-10084	2378	CHALLENGER MINERALS INC. ALVSTAD #31-19
5281.0	158- 75-16 SWSW	C TS	4790-4814 4784-4811	1470 1470	MCMORON EXPLORATION CO. STATE #2
5283.0	158- 77-34 NENE	C TS	5241-5290 5263-5264	1477 1477	MCMORON EXPLORATION CO. FAIRBROTHER #1
506.0	158- 94- 8 SWSE	DC TS	4800-8217 11156-11202	2337 2337	AMERADA PETROLEUM CORP. O. T. BLIKRE #1
10209.0	158- 95- 6 SWSW	CSL	11082-11142	2401	DEPCO, INC. MCGINNITY #24-6
10480.0	158- 95- 7 SENW	DC CSL CSL	8070-11300 11098-11158 11158-11205	2430 2430 2430	DEPCO, INC. SKARDERUD #22-7
4379.0	158- 95-25 NWSW	C	11162-11222	2495	AMERADA PETROLEUM CORP. HJALMAR IVES #3
10059.0	158- 96- 1 SENE	C TS	11109-11159 11108-11132	2347 2347	FULTON PRODUCING CO. GRIMSRUD #1
4790.0	159- 81-20 SESE	C	6427-6452		UNION OIL COMPANY STEEN #1

WELL NO.	LOCATION	TYPE OF SAMPLE	INTERVAL	ELEV. KB	ORIGINAL OPERATOR, ORIGINAL WELL NAME
5692.0	159- 82-32 NENW	C	6872-6932		KIRBY EXPLORATION BROOKS #1
2596.0	160- 80-19 SENW	C C TS	6075-6103 6079-6103 6085-6103	1511 1511 1511	PHILLIPS PETROLEUM CO. GLENN BRANDT #1
38.0	160- 81-31 SWSE	C	5580-7000		CALIFORNIA THOMPSON #1
6603.0	160- 96-36 SWSW	DC TS	7550-11185 10852-10857	2295 2295	CHAPMAN EXPL., INC. STATE OF ND #1-A
5280.0	161- 76-24 SWSW	C TS TS	4704-4750 4702-4750 4717-4744	1527 1527 1527	MCMORON EXPLORATION CO. DERAAS #1
2219.0	161- 79- 6 SESW	C C	5594-5640 5640-5650	1494 1494	CALIFORNIA OIL CO. BERT HENRY #4
* 4924.0	161- 81- 2 NENE	DC TS TS	740-6210 5912-6018 5910-6017	1514 1514 1514	UNION OIL CO. OF CALIF. C. M. HUBER #1-A-2
* 4918.0	161- 82-33 NWSW	DC TS	1990-6500 6621	1561 1561	MARATHON OIL CO. GEORGE C. ADAMS #1
* 6535.0	161- 83- 2 NENE	CRS TS TS	6465-6818 6466-6775 6775-6783	1589 1589 1589	SHELL OIL COMPANY GREEK #41-2
* 6624.0	161- 85- 1 SENW	DC TS TS	4000-9500 7162-7208 7190	1715 1715 1715	SHELL OIL CO. OSTERBERG #22X-1
* 7976.0	161- 87-34 SWSE	C	8302-8362	1899	SHELL OIL CO. GOLDEN #34X-34
5246.0	161- 95- 5 NENE	C TS	10201-10380 10203-10380	2364 2364	SHELL OIL CO. VERNON TANBERG #1
10395.0	161- 98-35 NENE	CRS TS	10374-10493 10382-10468	2085 2085	GETTY OIL COMPANY WILDROSE C. #35-1
10171.0	161- 98-36 NESW	C TS	10492-10518 10493-10513	2174 2174	GETTY OIL CO. WILDROSE #36-11
10348.0	161-102-30 NENW	CSL TS	10047-10080 10057-10074	2113 2113	HNG OIL COMPANY ANDERSON-STATE 30 #2
5277.0	162- 77-11 SWSW	C	4886-4910	1543	MCMORON EXPLORATION CO. TONNESON #1
5184.0	162- 77-14 SENE	C	4867-4882	1552	CHAMPLIN PET. CO. DUNBAR #1 42-14
2638.0	162- 78-12 SWSE	C C TS	5044-5059 5053-5060 5045-5054	1495 1495 1495	PHILLIPS PETROLEUM CO. BRANDVOLD #1
4423.0	162-101-26 NWSW	C TS	10065-10115 10083-10095	2248 2248	PAN AMERICAN PET. CORP. ORVILLE C. RAAUM #1
6296.0	163- 87- 9 NESW	DC C TS	4000-9700 7787-7818 7800-7818	1807 1807 1807	SHELL OIL CO. LARSON #23X-9
2800.0	163- 89-13 SWNW	TS	8288-8323	1887	AMERADA PETROLEUM CORP. GAGNUM #1
10830.0	163- 99- 8 SESE	C TS	8340-8398 9594-9613	2109 2109	THE LOUISIANA LAND AND EXPLORATION CO. THOMTE 1 44-8
10353.0	163-101-32 CNE	CWC TS	9721-9781 9722-9774	2243 2243	THE LOUISIANA LAND AND EXPLORATION CO. CONSTANTINE 41-32 #1

*Denotes pinnacle reef facies core.

SELECTED BIBLIOGRAPHY

- Baillie, A. D., 1955, Devonian System of the Williston Basin; *Bulletin of American Association of Petroleum Geologists*, v. 39, no. 5, pp. 572-629.
- Jones, L., 1965, The Middle Devonian Winnipegosis Formation of Saskatchewan, Saskatchewan Department of Mineral Resources, Report 98.
- Kissling, D. L., 1986, Contrasting Facies and Reservoir Development in Middle Devonian (Onondaga and Winnipegosis) Pinnacle Reefs, *The Outcrop*, v. 35, no. 10, p. 3.
- Kissling, D. L., Eherts, J. R., 1986, Winnipegosis Reservoirs, Williston Basin; Jackalope Geological Ltd. Report 85003.
- Perrin, N. A., Precht, W. F., 1985, Depositional Environments, Paleocology and Diagenesis of Selected Winnipegosis Formation (Middle Devonian) Reef Cores, Williston Basin, North Dakota; *in*, editors, M. Longman, K. Shanley, R. Lindsay, D. Eby, *Rocky Mountain Carbonate Reservoirs: A Core Workshop - SEPM Core Workshop 7*, p. 125-182.
- Perrin, N. A., 1982, Environments of Deposition of the Winnipegosis Formation (Middle Devonian) Williston Basin, North Dakota; *in* 4th International Williston Basin Symposium, Saskatchewan Special Publication 6, p. 51-61.
- Precht, W. F., 1986, Reservoir Development and Hydrocarbon Potential of Winnipegosis (Middle Devonian) Pinnacle Reefs, Southern Elk Point Basin, North Dakota; *Carbonates and Evaporites Journal*, v. 1, pp. 83-99.
- Wardlaw, N. C., Reinson, G. E., 1971, Carbonate and Evaporite Deposition and Diagenesis, Middle Devonian Winnipegosis and Prairie Evaporite Formations of South-Central Saskatchewan; *Bulletin of American Association of Petroleum Geologists*, v. 55, pp. 1759-1786.

REFERENCES

- Grayston, L. D., D. F. Sherwin, and J. F. Allan, 1964, Middle Devonian in R. G. McCrossan, and R. P. Glaister, eds., *Geological History of Western Canada: Alberta Soc. Petroleum Geol.*, p. 49-59.
- Kissling, D. L., Eherts, J. R., Jackalope Geological Ltd., personal communication, 1987.
- _____, 1986, Winnipegosis Reservoirs, Williston Basin; Jackalope Geological Ltd. Report 85003.
- "Best Ever" Well Brings Deep Play to Life; *Oilweek*, v. 38, no. 5, March 2, 1987.
- Excitement Over Winnipegosis Find; *Oilweek*, v. 38, no. 7, March 16, 1987.