NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 57

Summary of the Restad No. 1 Well
Cavalier County, North Dakota
Well #37, Permit #53

By John W. Caldwell
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Los Nietos Oil Company - Restad No. 1, Cavalier County, North Dakota, Section 26, T. 162N., R. 64W., (1980 feet S. of N. line and 660 feet E. of W. line, Section 26). Elevation 1630 K.B. Total depth 3380.

The Los Nietos No. 1 Restad was spudded September 8, 1951, and 10 3/4 inch casing was set to 158 feet with 110 sacks cement. The well was abandoned October 6, 1951. Cement plugs were used as follows: 5 sacks 8-18 feet, 15 sacks 145-180 feet, 15 sacks 1300-1350 feet, 15 sacks 1670-1720 feet, 15 sacks 1940-1990 feet, 15 sacks 2530-2580 feet, and 15 sacks 2865-2915 feet.

	DEPTH	RECOVERY
CORES #1	1530-1548	18'
#2	1753-1772	19'
#3	1772-1798	25'
#4	1798-1838	40'
#5	2240-2270	30'
#6	2290-2310	20'
#7	2310-2355	45'
#8	2355-2365	10'
#9	2490-2522	32'
#10	2522-2565	43'
#11	2745-2760	15'
#12	2845-2875	30'
#13	2910-2960	50'

DST #1 2253-2290

Packer was set at 2253 - open 30 minutes - no shut in. Recovered 35' watery mud. Hydrostatic pressure 1150 PSI - flowing pressure 0 - no shut in pressure. Good initial puff; very faint blow disappearing in 15 minutes.

DST #2 2308-2365

Packer was set at 2308 - open 1 hour 15 minutes - shut in 15 minutes. Recovered 1000' fluid with a little nitrogen gas - 150' gassy mud - 850' gassy salt water. Hydrostatic pressure 1150 PSI - flowing pressure 0 - 475 PSI - shut in pressure 750 PSI. Good blow diminishing to fair at the end of 1 hour.

An electrical log, micro log, limestone log and velocity survey were taken.

WATER ANALYSIS OF DRILL STEM TESTS

	Milligram equivalents in o/o							Total Solids in PPM after
DST #1	Na&K	Ca	Mg	SO_4	Cl	$C0_3$	HCO_3	ignition
Upper Fluid	48.83	1.17	-	29.34	14.34	1.59	4.73	3,304
Lower Fluid	49.57	0.43	-	29.07	14.28	1.88	4.77	3,428
DST #2								
Upper Fluid	43.12	4.25	2.63	4.76	44.97	-	0.27	42,944
Middle Fluid	43.60	3.99	2.41	1.35	48.54	-	0.11	83,524
Lower Fluid	43.85	3.79	2.36	3.22	46.68	-	0.10	74,440

Formation tops determined from sample and electric logs, not all lithologic formation tops are called in the following list. Colors determined from rock color chart.

FORMATION TOPS

Cretaceous System	
Niobrara Formation	620
Greenhorn Formation	1014
Dakota	1350
Jurassic System	
Morrison Formation	1450
Sundance Formation	1482
Devonian System	
Nisku Equivalent	1690
Duperow Formation	1722
Beaverhill Lake Equivalent	1960
Ashern Formation	2520
Silurian System	
Interlake Group	2560
Ordovician System	
Upper Stony Mountain	2698
Lower Stony Mountain	2774
Red River Formation	2856
Total Depth	3380

From	To	Formation
0	40	Shale, olive gray compact, little red oxidized shale.
40	158	Shale, olive gray compact, trace quartz gravel.
158	280	Shale, olive gray compact, trace quartz, gravel, sand.
280	330	Shale, olive gray compact, little interbedded bentonitic gray shale.
330	450	Shale, olive gray compact, little interbedded bentonitic gray shale, occasional dolomite, brownish gray.
450	480	Shale, olive gray compact.
480	510	Shale, olive gray compact, little bentonitic gray shale.
510	610	Shale, light gray bentonitic lumpy, with little olive gray ompact shale.
610	630	Shale, medium gray, bentonitic, lumpy.
630	640	Shale, medium gray, bentonitic, lumpy, white specks, alcareous.
640	670	Shale, medium light gray, bentonitic, lumpy, white specks, calcareous.

From	To	Formation
670	700	Shale, as above, with occasional quartz sand.
700	750	Shale, medium gray, white specks, lumpy, bentonitic, with interbedded gray compact shale.
750	980	Shale, medium gray, clayey, with occasional shell fragments, slightly bentonitic.
980	1000	Shale, medium gray, with white bentonite and numerous quartz grains recirculated?
1000	1010	Shale, medium gray clayey.
1010	1170	Shale, medium dark gray, white specks, calcareous, entonitic large amount of inoceramus prisms and occasional pyrite.
1170	1200	Shale, medium gray clayey, slightly bentonitic.
1200	1260	Shale, medium dark gray clayey, slightly bentonitic.
1260	1350	Shale, medium dark gray clayey, slightly bentonitic, little gray compact shale interbedded.
1350	1370	Sandstone, fine to coarse, white, subangular to subrounded with calcite cement and occasional pyrite cement, onsiderable shale as above.
1365		Circulation 20 minutes. Shale, medium dark gray clayey, little sand.
1370	1390	Shale, medium gray with considerable sand as before.
1390	1420	Shale, medium gray with considerable sand, small amounts of calcareous yellowish gray siltstone.
1420	1460	Sandstone, yellowish gray, very fine grain silty in part, calcareous, considerable shale as above.
1460	1490	Shale, medium gray clayey, with occasional silty calcareous sand.
1490	1500	Shale, medium gray clayey with little pale reddish brown shale.
1500	1510	Shale, pale reddish brown bentonitic and calcareous, with considerable gray shale.
1510	1520	Shale, medium light gray, bentonitic, clayey sandy in part with some red brown shale as above.
1527		Circulation 15 minutes. Shale, medium gray with considerable yellowish gray silty calcareous sandstone.
1527		Circulation 30 minutes. Shale, medium gray clayey, bentonitic, with little silty sand and red brown shale. 1530
1548		Core #1. Shale, medium dark gray calcareous containing numerous brachiopods and pelecypods with interbedded limestone composed of shell fragments with good porosity.
1548	1570	Shale, as above.
1570	1580	Shale, medium light gray, silty and calcareous with some silty limestone, light gray.
1580	1590	Limestone, yellowish gray, granular oolitic in part with little shale as above.
1590	1620	Shale, pale reddish brown, silty.
1620	1630	Shale, pale reddish brown, silty, considerable white very fine grain, silty calcareous sandstone, some light and dark gray shale.
1630	1640	Sandstone, white very fine grain, shaley and calcareous.
1640	1650	Dolomite, yellowish gray, dense, fine grained.
1650	1700	Sandstone, white, fine grained, calcareous, considerable dolomite as above with little red and gray shale.

From	To	Formation
1700	1715	Dolomite, light olive gray, fine grained, some good intercrystalline porosity.
1715	1725	Dolomite, as above with some reddish brown shale.
1725	1735	Dolomite, yellowish gray to pale pink, fine grained, limy dense.
1735	1750	Dolomite, yellowish gray, fine grained, some inter-crystalline porosity.
1745	1750	Circulation. Dolomite, yellowish gray, fine grained, some intercrystalline porosity.
1753	1772	Core #2. Dolomite, yellowish gray, fine grained, inter-crystalline porosity, reddish brown to purple mottling, less porous near bottom and grading to pale red purple near base.
1792	1798	Core #3. Dolomite, pale red purple, fine grained pinpoint porosity, argillaceous, portions mottled interbedded with a yellowish gray argillaceous limestone, dolomitic with occasional anhydrite inclusions. Dolomite becomes yellowish gray grading into pale yellowish brown.
1798	1802	Core #4. Dolomite, yellowish gray, fine grained, grading into very argillaceous reddish brown dolomite.
1802	1818	Limestone, light gray to yellowish gray, dolomitic, fine grained.
1818	1838	Dolomite, pale yellowish brown, fine grained, argillaceous, dense, occasional anhydrite inclusions, some inter-crystalline porosity, samples become limy near base.
1838	1845	Limestone, yellowish gray to pale pink, fine grained dolomite.
1845	1865	Limestone, yellowish gray, dolomitic, little anhydrite and interbedded dolomite.
1865		Circulation 15 minutes. Limestone as above, some pale pink dolomitic shale.
1865	1875	Dolomite, yellowish gray, limy, some limestone as above, little dark gray shale.
1875	1905	Limestone, yellowish gray to very pale pink, fine grained dolomitic, little anhydrite.
1905	1920	Dolomite, pale pink, slightly calcareous, fine grained with some anhydrite, good intercrystalline porosity.
1920	1980	Limestone, yellowish gray to pale pink, fine grained, little white earthly limestone and anhydrite, occasional crinoids.
1980	1995	Limestone, light gray to yellowish gray, fine grained, little porosity.
1995	2000	Limestone, yellowish gray, to pale pink, fine grained, little porosity.
2000	2020	Limestone, yellowish gray to pale pink, fine grained, dolomitic, some porosity intergranular.
2020	2025	Dolomite, pale pink, little intergranular porosity.
2025	2035	Limestone, yellowish gray to pale pink, dolomitic, in part, some intergranular porosity.
2035	2040	Limestone, yellowish gray, dense, very fine grain, conchodial fracture.
2040	2055	Limestone, yellowish gray to pale pink, fine grain, some intergranular porosity.
2055	2070	Limestone, yellowish gray to pale pinkish purple, fine grained, with some anhydrite.

From	To	Formation
2070	2080	Limestone, yellowish gray, little pink, very fine grain, dolomitic with little sucrosic dolomite.
2080	2110	Dolomite, light brown, sucrosic with some limestone as above.
2110	2120	Dolomite, light brown to pale pink, sucrosic with little intercrystalline porosity.
2120	2140	Limestone, light brown, fine grain, dolomitic.
2140	2150	Dolomite, yellowish gray to light brown, argillaceous, sucrosic, limy.
2150	2160	Limestone, yellowish gray to purplish gray dolomitic, fine grained.
2160	2170	Dolomite, light tan, sucrosic limy, some dense yellowish gray limestone.
2170	2205	Dolomite, light brown to purplish pink, fine grain, sucrosic, little anhydrite.
2205	2210	Dolomite, light brown, limy sucrosic with some anhydrite.
2210	2240	Limestone, yellowish gray, medium grained, red and purple mottlings, oolitic, some good porosity, occasional anhydrite fossiliferous.
2240	2270	Core #5. Dolomite, pink to purple mottled argillaceous, limy in part.
2270	2275	Dolomite, light olive gray to purplish brown, limy, fine grained.
2275	2290	Dolomite, yellowish gray, limy, fine grained.
2290	2310	Core #6. Shale, alternating reddish brown and light gray, dolomitic, occasional anhydrite inclusions, lower 5 feet is anhydrite.
2310	2318	Core #7. Anhydrite, pink, dense.
2318	2355	Limestone, yellow gray, slightly porous dolomitic in part with considerable anhydrite inclusions, some inter-crystalline porosity with purple mottlings near base and coarse grained near base.
2355	2365	Core #8. Limestone, yellowish gray to light olive gray, medium to fine grain, numerous anhydrite calcite and dolomite inclusions, fossiliferous.
2365	2395	Limestone, yellowish gray to light olive gray, medium to fine grain, fossiliferous, some purplish mottling.
2395	2435	Shale, pale reddish brown, dolomitic.
2435	2445	Dolomite, yellowish gray to pale purple, fine grain, limy.
2445	2455	Limestone, yellowish gray, fine grain, fossiliferous, some purple mottling.
2455	2465	Dolomite, pale reddish brown, fine grain with limestone as above.
2465	2475	Dolomite, yellowish gray to pale pink, dense, conchodial fracture.
2475	2485	Dolomite, pale reddish brown, fine grain.
2485	2490	Limestone, white to yellowish gray, very fine grain.
2490	2505	Core #9. Limestone, white to yellowish gray, very fine grain, inclusion of anhydrite, fossiliferous, vugs.
2505	2514	Dolomite, very pale brownish gray, fine grained, dense.
2514	2517	Limestone, yellowish gray, very fine grained vugs.
2517	2522	Dolomite, pale pinkish gray, very fine grained.

From	To	Formation
2522	2525	Core #10. Dolomite, pale pinkish gray, fine grained.
2525	2544	Limestone, yellowish gray, very fine grained, fractural calcite fillings, lower portions brecciated and fossiliferous.
2544	2553	Dolomite, white to very pale pink, fine grained, occasional anhydrite inclusion.
2553	2559	Breccia, light olive gray, limestone interbedded in reddish brown dolomitic shale matrix.
2559	2565	Dolomite, white, fine grained, fractured, filled with reddish brown shale as in matrix above.
2565	2600	Dolomite, white to pale pink, fine grained.
2600	2615	Dolomite, yellowish gray to olive gray, fine to medium grain, fossiliferous, occasional anhydrite.
2615	2635	Dolomite, white to yellowish gray, medium to coarse grained, oolitic, some intergranular porosity.
2635	2670	Dolomite, white to yellowish gray, fine to medium grain, occasional oolites.
2670	2675	Dolomite, pale red, dense, fine grained.
2675		Dolomite, white to yellowish gray, fine to medium grain, occasional oolites and occasional chert.
2695	2720	Dolomite, pale red to yellowish gray, fine grained, dense, with little mottled red and gray shale interbedded.
2720	2735	Dolomite, pale red, sandy, limy with little interbedded mottled red and gray shale
2735	2745	Dolomite, as above, becoming very sandy, with yellowish gray very sandy dolomite.
2745	2780	Core #11. Dolomite, yellowish gray, mottled with pink and lavender, dense, sucrosic.
2780	2800	Limestone, pale greenish gray, argillaceous, earthy.
2800	2805	Dolomite, yellowish gray with purple mottling dense.
2805	2835	Limestone, light gray to olive gray, purple mottlings, calcitic, fossiliferous.
2835	2840	Shale, greenish gray, calcareous.
2840	2870	Core #12. Limestone, medium gray, dense, fossiliferous, interbedded with greenish gray, calcareous shale.
2870	2875	Dolomite, very pale orange, very fine grained, calcareous.
2875	2890	Limestone, yellowish gray, porous, fossiliferous, fine grain, grades to olive gray.
2890	2910	Limestone, yellowish gray to olive gray, sugary dolomitic, fine grain.
2910	2951	Core #13. Limestone, very light gray to yellowish gray, sublithographic, dolomitic, grading into yellowish gray to olive gray dolomite.
2951	2960	Limestone, yellowish gray, fine grained, fossiliferous, reefoidal contains Favosites.
2960	2970	Limestone, yellowish gray, fine grained, fossiliferous.
2970	2990	Dolomite, yellowish gray, fine grained, limy, sucrosic in part.
2990	3010	Limestone, yellowish gray to light olive gray, slightly porous, fine grained dolomitic.
3010	3030	Limestone, yellowish gray, to light gray, fine grained, sucrosic.

From	To	Formation
3030	3055	Limestone, yellowish gray to light olive gray, fine grained, calcitic, hard dense pinpoint porosity.
3055	3070	Limestone, yellowish gray to light gray, sugary, fine grain, trace of corals.
3070	3105	Dolomite, light olive gray, medium grain, fossiliferous, limy, sucrosic, intergranular porosity.
3105	3135	Dolomite as above, with soft white limestone, earthy, occasional dolomite rhombs.
3135	3190	Limestone, yellowish gray to olive gray, sucrosic, with dolomite rhombs. Fine to medium grain, little white earthy limestone.
3190	3210	Limestone, yellowish gray to olive gray, fine to medium grain, calcite, fossiliferous, reefoidal, corals.
3210	3220	Limestone, yellowish gray to olive gray, fine grain, sucrosic interbedded with limestone as above.
3220	3270	Limestone, light gray, fine grain, fossiliferous, sucrosic ostracods.
3270	3290	Limestone, light gray, fine grain, sucrosic.
3290	3380	Limestone, yellowish gray to light olive gray, fine to medium grain, calcitic, fossiliferous, trace of pyrite.

Total Depth.