

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 29

Summary of the Elmer Heim No. 1 Well
LaMoure County, North Dakota

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Champlin Refining Company's, Elmer Heim No. 1 Well, LaMoure County, North Dakota. NE 1/4, NE 1/4, NW 1/4, Section 12, T. 133N., R. 65W. (660' from the North line, and 1980' from the West line, Section 12). Elevation: 1620 D.F.

The Champlin Refining Company's, Elmer Heim No. 1 Well was spudded June 27, 1952 and 10 3/4 casing was set at 400.12 feet with 400 sacks of cement. The well was plugged and abandoned as a dry hole July 9, 1952.

Three plugs were set at the following depths:

- 1 - 2400' with 100 sacks cement
- 2 - 1288' with 75 sacks cement
- 3 - 462' with 65 sacks cement

Steel plate was welded on top of surface casing.

Slight staining and fluorescence was found in samples from 1990' to 2040'.

While circulating at 2793' fresh water started flowing and it was impossible to run Schlumberger log, Halliburton then killed the flow and set plugs.

Water analysis courtesy Stanolind Oil and Gas Company.

Radicle	Per Cent by Anal.	(a) P.P.M.	(b)	(a) X (b)	Per Cent Reacting Value	Calculated Compound	P.P.M.
Na	21.16	481	.0435	20.97	31.52	Na ₂ SO ₄	671
Ca	7.44	169	.0499	8.43	12.67	NaCl	392
Mg	2.07	47	.0822	3.86	5.81	Na ₂ CO ₃	
Fe						NaHCO ₃	403
						CaSO ₄	574
						CaCl ₂	
SO ₄	45.97	1,045	.0208	21.74	32.68	CaCO ₃	
Cl	10.47	238	.0282	6.71	10.09	Ca (HCO ₃) ₂	
CO ₃		0	.0333			MgSO ₄	233
HCO ₃	12.89	293	.0164	4.81	7.23	MgCl ₂	
H ₂ S						MgCO ₃	
						Mg (HCO ₃) ₂	
Total Solids as a summation of radicles					2,273	P.P.M.	
Total Solids by evaporation and ignition of residue at low red heat 2,094 P.P.M.							
Sample as received: Resistivity: ohms/M ² M at 77°F. / pH Value 7.45							
Specific gravity 60°/60°F.							

Properties of Reactions in Per Cent

Primary Salinity: $SO_4 + Cl = \dots\dots\dots$ with equal value Na (K) $\dots\dots\dots = \underline{63.04} \%$
 Secondary Salinity: If $SO_4 + Cl$ is greater than Na (K) $\dots\dots\dots = \underline{\hspace{2cm}} \%$

Then $SO_4 + Cl = \dots\dots\dots$ with equal value of Ca + Mg $\dots\dots\dots = \underline{22.50} \%$
 Primary Alkalinity: Excess Na (K) over $SO_4 + Cl = \dots\dots\dots$ with equal value of

$CO_3 + S = \underline{\hspace{2cm}} \%$
 Secondary Alkalinity: Excess Ca + Mg over $SO_4 + Cl = \dots\dots\dots$ with equal value of

$CO_3 + \dots\dots = \underline{14.46} \%$

Chloride Salinity: $Cl \div (SO_4 + Cl) = \dots\dots\dots X 100\% \dots\dots\dots = \underline{23.59}$

Sulphate Salinity: $SO_4 \div (SO_4 + Cl) = \dots\dots\dots X 100\% \dots\dots\dots = \underline{76.41}$

Note: Multiply Parts per Million by .0583 to obtain Grains per Gallon.

Radicle	Per Cent by Anal.	(a) P.P.M.	(b)	(a) X (b)	Per Cent Reacting Value	Calculated Compound	P.P.M.
Na	21.03	496	.0435	21.54	31.23	Na_2SO_4	623
Ca	7.72	182	.0499	9.08	13.17	NaCl	432
Mg	1.99	47	.0822	3.86	5.60	Na_2CO_3	
Fe						$NaHCO_3$	453
						$CaSO_4$	618
						$CaCl_2$	
SO_4	44.20	1,043	.0208	21.96	31.45	$CaCO_3$	
Cl	11.11	262	.0282	7.39	10.72	$Ca(HCO_3)_2$	
CO_3		0	.0333			$MgSO_4$	233
HCO_3	13.95	329	.0164	5.40	7.83	$MgCl_2$	
H_2S						$MgCO_3$	
						$Mg(HCO_3)_2$	
Total solids as a summation of radicles						2.359	P.P.M.
Total solids by evaporation and ignition of residue at low red heat 2,160							P.P.M.
Sample as received: Resistivity: ohms/M ² M at 77°F. / pH Value 7.35							
Specific gravity 60°/60°F.							

Properties of Reaction in Per Cent

Primary Salinity: $SO_4 + Cl = \dots\dots\dots$ with equal value Na (K) $\dots\dots\dots = \underline{62.46} \%$

Secondary Salinity: If $SO_4 + Cl$ is greater than Na (K) $\dots\dots\dots = \underline{\hspace{2cm}} \%$

Then $SO_4 + Cl = \dots\dots\dots$ with equal value of Ca + Mg $\dots\dots\dots = \underline{21.88} \%$

Primary Alkalinity: Excess Na (K) over $SO_4 + Cl = \dots\dots\dots$ with equal value of
 $CO_3 + S \dots\dots\dots = \underline{\hspace{2cm}} \%$

Secondary Alkalinity: Excess Ca + Mg over $SO_4 + Cl = \dots\dots\dots$ with equal value of
 $CO_3 + \dots\dots\dots = \underline{15.66} \%$

Chloride Salinity: $Cl \div (SO_4 + Cl) = \dots\dots\dots X 100\% \dots\dots\dots = \underline{25.42}$

Sulphate Salinity: $SO_4 \div (SO_4 + Cl) = \dots\dots\dots X 100\% \dots\dots\dots = \underline{74.58}$

Note: Multiply Parts per Million by .0583 to obtain Grains per Gallon.

Formation tops were called from sample logs, not all lithologic formation tops called in following list.

Formation Tops

	<u>Depth</u>
Cretaceous System	
Niobrara Formation	700
Greenhorn Formation	840 ?
Muddy	1480
Dakota	1710
Jurassic System	
Morrison Formation	1780
Sundance Formation	1850
Ordovician System	
Red River Formation ?	1990
Upper Winnipeg Sand	2490
Winnipeg Formation	2505
Winnipeg Sand	2660
Pre-Cambrian	2779

The "Upper Winnipeg Sand" has been mentioned previously in the report on the General Atlas Ketterling Well, Circular No. 19. At the present time we do not know what unit this sand belongs to or if it is a new separate unit, so we are terming it the "Upper Winnipeg Sand".

Champlin Heim

240-450	Shale, medium gray. N5
450-460	Shale, olive gray, 5Y4/1.
460-520	Shale, light, olive gray. 5Y6/1 to medium light gray. N6
520-530	Shale, medium light gray. N6
530-550	Shale, medium light gray to light olive gray shale.
550-580	Shale, dark gray shale. N3
580-600	Shale, light gray. N7
600-610	Shale, dark gray. N3
610-690	Shale, black. N2
Niobrara Formation 700	
690-700	Shale black. N1
700-720	
	Shale, medium dark gray with white limey specks.
720-760	Shale, medium dark gray to medium light gray with white limey specks.
760-800	Shale, medium to medium light gray. Shale with white limey specks.
800-830	Shale, medium gray to brown gray shale with white specks.
Greenhorn Formation 840	
830-840	Shale, medium gray with white specks.
840-900	Shale, medium gray to dark gray.
900-910	Circulation 30 minutes. Shale and sandstone, as above and little very fine grained salt and pepper sandstone.
910-1030	Shale and sandstone, medium gray shale few white specks and little very fine grained sandstone.
1030-1040	Shale, medium gray shale, few white specks and brownish hard silty shale.
1040-1060	Shale and sandstone, medium gray shale and little fine grained sandstone, light gray.

1060-1080 Shale and sandstone, medium gray shale and few pieces of very fine grained light gray sandstone.

1080-1120 Shale, medium gray.

1120-1150 Shale, medium gray. Much fragmental calcite and inoceramus prisms.

1150-1160 Shale, medium gray and little very fine grained sandstone.

1160-1230 Shale, medium gray.

1230-1300 Shale, medium dark gray.

1300-1310 Shale, medium dark gray and little very fine grained calcareous silty sandstone.

1310-1340 Shale, medium dark gray,

1340-1350 Shale, medium gray.

1350-1390 Shale, medium dark gray.

1390-1440 Shale, medium gray.

1400 Circulation 30 minutes. Shale, medium dark gray.

1400-1430 Shale, medium gray to dark gray.

Muddy 1480

1430-1480 Shale, medium gray.

1480-1490 Shale and sandstone, medium gray shale and medium grained free quartz, subrounded.

1490-1500 Shale and sandstone, medium gray shale and little medium grained free quartz.

1500-1510 Shale and sandstone, medium gray shale and light tan fine grained sandstone.

1510-1540 Sandstone, fine to medium grained, light tan sandstone.

1540-1550 Sandstone, fine grained, light tan sandstone.

1550-1560 Shale and sandstone, medium gray shale. Brownish concretionary pellets and little sandstone.

1560-1600 Shale, medium gray shale.

1600-1630 Shale, medium light gray silty shale.

Dakota 1710

1630-1710 Shale, medium gray.

1710-1750 Shale, as above and medium to coarse subangular to angular free quartz.

1750-1760 Sandstone, much angular free quartz and reddish concretionary pellets.

Morrison Formation 1780

1760-1780 Sandstone, reddish brown concretionary sandstone pellets.

1780-1800 Shale, medium gray shale.

1800-1820 Shale, reddish and gray.

1820-1840 Shale, gray shale and some reddish shale.

Sundance Formation 1850

1840-1850 Shale, medium light gray.

1850-1880 Sandstone, yellowish gray to whitish fine grained calcareous sandstone.

1880-1900 Sandstone and shale, some sandstone as above and light gray silty shale.

1900-1910 Sandstone and shale, as above, very little sandstone as above. Much medium grained, free quartz.

1910-1920 Sandstone, fine to medium free quartz.

1920-1960 Sandstone, fine to coarse free quartz.

Red River Formation 1990

1960-1990 Sandstone, as above and some brownish quartz, sandstone with silica cement.

1990-2005 Sandstone, fine to coarse free quartz.

2005 Chert, limestone, white chert with much yellow staining some good fluorescence and some fine granular limestone.

2005 Circulation 30 minutes. Chert, limestone as above and some very fine granular light gray limestone with little pinpoint porosity, fair fluorescence.

2005 Circulation 30 minutes. Chert, limestone as above and some very porous light gray limestone.

2005-2010 Limestone, whitish to tan very fine grained dense limestone, some flour.

2010-2020 Limestone, very fine grained to fine granular whitish to light tan limestone, some fluorescence, dense.

2020-2025 Limestone, very fine granular dense limestone, scattered flour.

2025-2040 Limestone very fine granular to very fine grained dense, some flour.

2040-2050 Limestone, very fine grained, whitish to reddish dense limestone with very slight stain.

2050-2060 Limestone, very fine grained to very fine granular dense limestone, whitish to pale yellow brown.

2060-2080 Dolomite, light tan fine granular calcitic dolomite, very slightly flour.

2080-2090 Dolomite, yellow gray fine granular dolomite.

2090-2110 Dolomite, pale yellow brown, fine granular dolomite.

2110-2140 Dolomite, pale yellow brown, fine grained to fine granular dolomite.

2140-2180 Dolomite pale yellow brown, fine granular dolomite.

2180-2190 Dolomite, pale yellow brown fine granular to saccharoidal.

Core 2192

2190-2195 Limestone 1' 6" core, pale yellow brown saccharoidal limestone with reddish streaks, some pinpoint porosity.

2192-2195 Dolomite, bottom 1'. Dolomite pale yellow brown slight calcitic, saccharoidal some pinpoint porosity.

2195-2200 Dolomite, pale yellow brown saccharoidal.

2200-2220 Dolomite, chert, pale yellow brown very saccharoidal, fair pinpoint porosity, little chert.

2220-2230 Dolomite, chert, pale red 10R6/2 to moderate orange pink saccharoidal dolomite fair pinpoint porosity.

2230-2240 Dolomite, limestone, pale yellow brown to very pale red fine grained dolomite and limestone with little chert.

2240-2260 Limestone, whitish to very pale yellow brown fine grained, dense limestone.

2260-2270 Limestone, pinkish to whitish and very pale yellow brown fine grained to fine granular dense limestone.

2270-2280 Limestone, pinkish to pale yellow brown fine grained, dense.

2280-2300 Limestone, whitish to pinkish very fine grained, dense limestone.

2300-2310 Limestone, whitish and yellow gray to pinkish very fine grained, dense limestone and small brachiopod.

2310-2350 Limestone as above.

2350-2380 Limestone, whitish to very pale yellow brown fine grained dense limestone.

2380-2420 Limestone, very pale yellow brown to pinkish very fine grained dense limestone.
2420-2450 Limestone, very pale yellow brown, very fine grained dense limestone.
2450-2490 Limestone, very pale yellow brown fine granular to fine grained, dense.

Upper Winnipeg Sand 2490

2490-2500 Sandstone, medium light gray, fine grained.

Winnipeg Formation 2505

2500-2515 Sandstone, as above and much medium grained free quartz and white to very pale yellow brown limestone.
2515-2520 Sandstone and shale, as above and some green and gray shale.
2520-2530 Shale, green and gray shale.
2530-2540 Shale and sandstone, green and gray shale and fine grained sandstone as above.
2540-2550 Shale, green and gray, mostly green.
2550-2560 Shale, medium dark gray to dark gray.
2560-2570 Shale, green and gray, mostly green.
2570-2580 Shale, green and gray, mostly gray.
2580-2600 Shale, green to olive gray shale.
2600-2610 Shale, medium dark gray to dark gray.
2610-2620 Shale, gray and green.
2620-2650 Shale, gray and much green and some pale reddish fissile shale.
2650-2660 Shale, green and reddish shale few medium grained rounded quartz grains.

Winnipeg Sand 2660

2660-2680 Shale, green and little gray fissile shale.
2680- Circulation 30 minutes. Sandstone, fine to medium green quartz rounded and some with red shale matrix.
2680-2690 Sandstone and shale, fine to medium free quartz and green shale.
2690-2770 Sandstone, reddish fine to medium grained sandstone with glauconite, slightly calcareous.

Pre-Cambrian 2779

2770-2780 Shale, sandstone and granite, green shale, some gray shale and some coarse rounded free quartz and pink granite. Granite, as above and much pink granite.