WRD Exp. (GW)
Aug. 1964

Punched FCH

U. S. DEPARTMENT OF THE INTERIOR — GEOLOGICAL SURVEY

Water Resources Division Well Schedule Form

MASTER CARD

Record by P.J Herick Source of data Files Date 6/4/65 Map H. & T.

State Iowa [16] County (or town) O'Brien [071]

Latitude: 42 58 24 N Longitude: 095 30 09 Sequencial number: 2

Lat-long accuracy: 2 T 94 N, R 39 W, Sec 7, NW ¼, NE ¼, SW ¼ 5PM B & M

Local well number: 094 39W 07 C a b Other number: W-0110

Local use: 001 10 38 CITY 2 Owner or name: SUTHERLAND CITY WELL

Owner or name: SUTHERLAND IOWA Address: Sutherland, Iowa

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist — M

Use of water: (A) Air cond, (C) Comm, (D) Dewatering, (F) Fire, (H) Dom, (I) Irr, (N) Ind, (P) P S, (S) Stock, (T) Instit, (U) Unused — P

Use of well: (A) Anode, (D) Drain, (G) Seismic, (O) Obs, (P) Oil-gas, (R) Recharge, (S) Spring, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed — W

DATA AVAILABLE: Well data 1 Freq. W/L meas.: INVENTORY Ø Field aquifer char.

Hyd. lab. data:

Qual. water data: type: COMPLETE — C

Freq. sampling: INTERMITTENT — I Pumpage inventory: yes / no period:

Aperture cards:

Log data: GEOLOGIST LOG — G

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 615 ft 6115 Meas. Rept — 6

Depth cased: (First perf.) 537'6" ft 5378 Casing type: STEEL Diam. 8 in accuracy — 8

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other — P

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other — C

Date Drilled: 1938 9 8 Pump intake setting: 291 ft 291

Driller: Rasmussen Well Co., Sioux City, Iowa

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) recip, piston, rot, submerg, (T) turb, (Z) other — Deep / Shallow — D

Power (type): diesel, elec, gas, gasoline, hand, nat gas, wind, LPG, M-P. Trans. or meter no.

Descrip. MP LSD ft above / below lsd, Alt. MP 1449

Alt. LSD: 1444 1444 Accuracy (source): ALTIMETER — 7

Water Level 242 ft above / below MP; Ft above / below lsd 242 Accuracy: DRILLER'S LOG — D 3

Date meas: 5/12/38 5 38 Yield: 215 gpm 215 Method determined

Drawdown: 25.4 ft 25 Accuracy: Pumping period hrs

QUALITY OF WATER DATA: Iron 3.7 ppm 6 Sulfate 1080 ppm 9 Chloride 5 ppm 0 Hard. 1200 ppm 9

Sp. Conduct 2260 K x 10^6 Temp. °F Date sampled 4 6 2

Taste, color, etc.

094-39W-07cab

Well Number 42.58.24 N S 09 W 30.09.2
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1-19) Physiographic Province: CENTRAL LOWLAND [1|2] (20-21) Section: WESTERN

LAKE [B] (22) Drainage Basin: LITTLE SIOUX [3|6|C] (23-25) Subbasin: [ ] (26)

Topo of well site: local depression, (D) flat surface, (F) hilltop, (H) hillside, (S) terrace, (T) valley flat, (V) [ ] (27)

MAJOR AQUIFER: Cretaceous system, LOWER series [K|1] (28-29) Dakota Sandstone aquifer, formation, group [D|1] (30-31)

Lithology: FINE SANDSTONE [2|V] (32-33) Origin: MARINE [6] (34) Aquifer Thickness: 272 ft

[2|7|2] (35-37) Length of well open to: 60 ft [6|0] (38-42) Depth to top of: 326 ft [3|2|6] (41-43)

MINOR AQUIFER: ____ system, ____ series [ ] (44-45) ____ aquifer, formation, group [ ] (46-47)

Lithology: ____ [ ] (48-49) Origin: ____ [ ] (50) Aquifer Thickness: ____ ft

[ ] (51-53) Length of well open to: ____ ft [ ] (54-56) Depth to top of: ____ ft [ ] (57-59)

Intervals Screened: ____

Depth to consolidated rock: 326 ft [3|2|6] (60-62) Source of data: WELL CUTTINGS [ ] (64)

Depth to basement: ____ ft [ ] (65-68) Source of data: ____ [ ] (69)

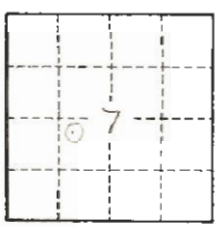
Surficial material: SANDY TILL [S|T] (70-71) Infiltration characteristics: POOR [4] (72)

Coefficient Trans: ____ gpd/ft [ ] (73-75) Coefficient Storage: ____ [ ] (74-76)

Coefficient Perm: ____ gpd/ft^2; Spec cap: ____ gpm/ft; Number of geologic cards: [ ] (79)

Casing:

420' of 10" W.I pipe
535'9" of 8" pipe set at 537'6"
65' of 6" perforated iron pipe,
5/8" perforations on 4" centers,
lapped 5' into 8" csg. and sealed with lead
seal; bottom 17' of hole filled with gravel



Note: This well originally drilled 1930 to 445'.
Deepened 1938 to 615'

Geology: Pleistocene drift 0 - 326'
Cretaceous, Dakota Sandstone 326 - 598'
Devonian (?) dolomite 598 - 615'

GPO 844-225

MAP NO. W-0110

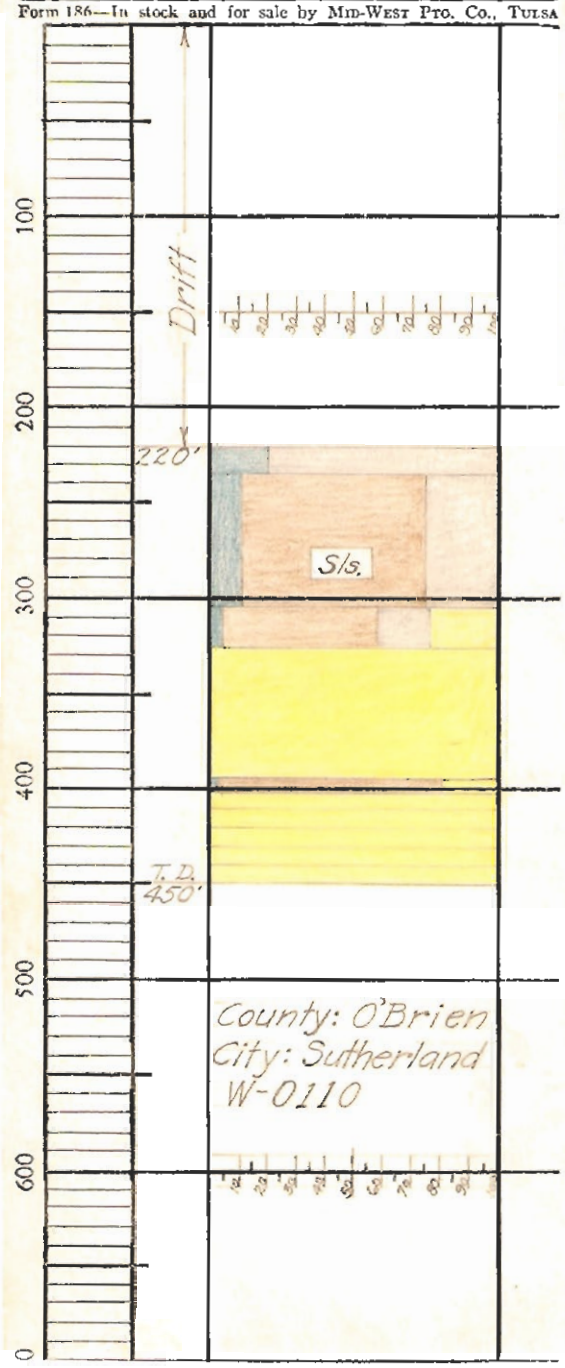
STATE Iowa	COMPANY ~~Sutherland~~
COUNTY O'Brien	FARM / WELL NO.
T. / R.	CONTRACTOR
	COMMENCED
	COMPLETED
	REMARKS
ALTITUDE	
PRODUCTION	

CASING RECORD

	10"
	8¼"
20"	6⅝"
15½"	5 3/16"
12½"	

SHOT / QUARTS / BETWEEN

Form 186—In stock and for sale by MID-WEST PTG. CO., TULSA



John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves, each Patented 1906. 390345

MOORE'S MODERN METHODS

Sutherland, O'Brien Co.

June 2, 1938

260' setting
20' suction
75 g.p.m. into line

75'6" of 6" 60' bottom perf.
Lap of 21' into 8" pipe, no seal (none necessary)
Heavy gravel 590'-615'
Bottom of 6" at 593

465' deep — SWL. = 40'
4" casing
Blasted rock

What is this?

What is Hardness of W. Lake Okabojic
Mr. Green

Milford & Arnolds park ???

Lakeside Laboratory —

Alluvium at Carson

Check samples from Lake City.

Lieber Farm
3 W of Herndon by RR.
Gas with cock
from dry sand

John C. Moore Corporation, Rochester, N.Y. Binder and holes in leaves, each Patented 1906. 390345

Information for Mayor Sutherland

1. How can hole be grouted when only 3/8" clearance between 10" pipe & couplings of 8" pipe - (probably somewhat more than 3/8" clearance)

2. Any advantage in going deeper if water bad.?

3. What is survey's opinion of capacity of Well ?

4. Will perforated pipe be sufficient

5 Opinion on advisability of using one pump to pull to surface & a 2nd pump to boost to tower

Robert Green, Sutherland would like:
1. An analysis of the water on farm N. of Sutherland
2. An analysis of Lake Okabojie water (Town of Millard draws its supply from lake)

John C. Moore Corporation, Rochester, N.Y. Binder and holes in leaves, each Patented 1906. 390345

Sutherland City Well W-0110

begun 4/20/38, finished 5/11/38

Casing data:

Driller, Rasmussen Well Co., Sioux City, Ia.

10" Byers wrought iron pipe from ground surface to 420'.

8" Beyers wrought iron pipe set 1'9" below top of 10" casing & extending 6½' Thru lowest shale zone (531') to 537' 6"

Planned but not yet installed:
65' of 6" preforated iron pipe (5/8" preforations on 4" center) lapped 5' into 8" casing & sealed with lead seal.

Pump data: (for pumping test)

Top of bowls 270', End of 4" suction pipe 291'

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves, each Patented 1906. 390345

Sutherland City Well

Driller's Log

#1.	445	450	5	Sandstone
2.	450	455	5	"
3.	455	460	5	"
4.	460	465	5	"
5.	465	470	5	"
6.	470	475	5	Blue Shale
7.	475	480	5	" "
8.	480	485	5	" "
9.	485	490	5	Blue gray shale & SS mixed
10	490	495	5	" " " " " "
11	495	500	5	" " " " " "
12	500	505	5	Coarse sandstone
13	505	510	5	" " , Trace gray Sh.
14	510	515	5	" " " " "
15	515	520	5	" " " " "
16	520	525	5	" " " " "
17	525	530	5	" " " " "
18	530	531	1	White shale
19	531	535	4	White sandstone
20	535	540	5	" "
21	540	545	5	" "
22	545	550	5	" "
23	550	555	5	" "
24	555	560	5	" "
25	560	565	5	" "
26	565	570	5	Coarse White sandstone
27	570	575	5	" " "
28	575	580	5	" " "
29	580	585	5	" " "
30	585	590	5	" " "
31	590	593	3	" " "

Samples include fragments taken from between 500 & 530'

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves, each Patented 1906 390345

Log 8" Casing Driller, Rasmussen Well Co. Sioux City, Ia.

2' - 5"
19' - 5"
21' - 1"
20' - 6"
21' - 1"
19' - 7"
20' - 10"
21' - 7"
20' - 2"
20' - 6"
20' - 10"
21' - 7"
21' - 7"
21' - 3"
21' - 2"
21' - 5"
21' - 4"
20' - 10"
20' - 8"
20' - 8"
21' - 11"
20' - 1"
20' - 7"
20' - 0"
16' - 10"
1' - 9"
535' 9"
8" Casing.

Casing:
10" to 420' (Byers Wrought iron) Pipe
8" Casing set 1' 9" below ground surface (6½' into SS)
65' screen 5' bap, - 6" Wrought Iron pipe - 5/8" Perf. 4" center
Lead seal (?)

Top of Bowls 270' (8" Bowls)
End of 4½" suction pipe 291'

Well began 4/20/38, finished 5/11/38
Rig - Cable tool

Driller's Log

#1.	445'	450'	5'	SS
2.	450'	455'	5	SS
3	455	460	5	SS
4.	460	465	5	SS
5.	465	470		SS
6.	470	475	5	Blue Shale
7.	475	480	5	" "
8	480	485	5	" "
9	485	490	5	Bl. gray Sh & SS mixed
	490	495	5	
	495	500	5	
	500	505	5	Crse SS
13	505	510	5	" " Tr gray
14	510	515	5	" " " "
15	515	520	5	" " " "
16	520	525	5	" " " "
	525	530	5	" " " "
	530	531	1	Wh. Shale
	531	535	4	" SS

John C. Moore Corporation, Rochester, N.Y. Binder and holes in leaves, each Patented 1906. 390345

20	535 - 540	5'	Wh. SS	
21	540 - 545		"	
22	545 - 550			
23	550 - 555			
24	555 - 560			
25	560 - 565			
26	565 - 570		Crse.	
27	570 - 575		"	
28	575 - 580		"	
29	580 - 585		"	
30	585 - 590		"	
31	590 - 595		"	

Hand Spr. from 500

Clear ground. Coupling Com. will not go Write

1st spla. taken 4:55 after pumping 2 hrs. 55 Min. at 165 GPM with S.L. 244'7" & dd. to 262'8"

Air temp 61°, Water Temp 52°

Measured at end of delivery pipe & from pump

John C. Moore Corporation, Rochester, N.Y. Binder and holes in leaves, each Patented 1906. 390345

Pumping Test Sutherland, Ia.

Pump started at 2:00. Static Level 244.7'

Cumulative Time	Time	Water Level Drawdown	GPM.
1:59'	45"	~~0~~	165
2:01'	30"	263.5'	
2:02'	30"	263.5'	
2:03'	45"	263.0'	
2:04'	45"	262.8'	
2:05'	45"	262.7'	
2:06	45"	262.1'	
2:07	45"	261.7'	
2:18	45"	261.4'	
2:09	45"	261.1'	
2:11	00"	260.9'	
2:15	00"	261.1 1/2'	
2:20	30"	261.5 1/2'	
2:25	30"	261.5" 1/2	
2:35	30"	261.8	
2:45	30"	261.9	
2:55	30"	262.0	
3:05	30"	262.2	
3:15	30"	262.3	
3:25	30"	262.4	

Stopped pumping at 3:27 — Recovery data

3:27	20"	
3:28	20"	237.0
3:29	50"	242.8
3:30	50"	243.4
3:31	50"	243.4
3:32	50"	243.2
3:33	50"	243.5"
3:35	00"	242.11
3:36	00"	242.3
3:37	00"	242.2
3:38	00"	242.15"
3:39	00"	242.35"
3:40	00"	242.30
3:41	00"	242.25"
3:42	00"	242.25"

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves, each Patented 1906. 390345

Pumping Test, Sutherland Ia continued

Time Hrs Min.	Seconds	Drawdown	GPM
3:42	20"	242.5'	~~static level~~
3:43	20"	260.4	165 gpm
3:44	20"	261.0	
3:45	20"	261.3	
3:46	20"	261.4	
3:47	20"	261.5	
3:48	20"	261.5	Pumped dirty water
3:49	20"	261.45	for 10 min.
3:50	20"	261.6	
4:00	00"	261.95'	
4:10	00"	262.3	
4:22	00"	shut down to change	

pulley for increase of pumping speed.

7:12		242.0'	~~Static Level~~
7:13		262.35	215 gpm.
7:15		267.0'	
7:16		267.0'	
7:17		266.7'	

stopped pumping at 7:18

7:19		237.7'	
7:22		242.8'	
7:30		242.0'	

Static Level Taken 7:30 = 242.0'

7:32	00"		
7:33	30"	264.9'	Started pumping
7:34	30"	266.5'	215 gpm
7:35	30"	266.8'	
7:36	30"	266.8	
7:37	30"	267.2	
7:38	30"	267.1	
7:39	30"	267.2	
7:40	30"	267.3	
7:41	30"	267.35	
7:42	30"	267.5	
7:43	30"	267.4	
7:44	30"	267.4	
7:57	30"	267.5	

Pumping test, Sutherland Ia. continued

Time Hrs & min.	sec.	Drawdown	GPM
8:01	30"	267.6	

pumping stopped, Motor trouble, 8:01=30" Recovery

8:02	20"	238.6'	
8:03	20"	238.8"	
8:04	20"	243.9"	
8:06	30"	243.8"	
8:07	30"	243.8"	
8:08	30"	243.7"	
8:09	30"	242.75"	
8:10	30"	242.5"	
8:11	15"	242.5"	
8:12	15"	242.5"	
8:17	00"	242.2	

pumping started 8:17, static level ~~242.2'~~

8:18	00	263.5"	245 gpm
8:19	00	266.2	
8:20	00	266.7	
8:21	00	266.9	
8:22	00	267.15	
8:23	10	267.35	

pumping stopped 8:23 PM May 11, 1911

pumping started 3:30 AM, May 12, 1911 195 gpm.
pumping level taken at 8:30 = -265.8"

MOORE'S MODERN METHODS

240
45
0357

SL 244' 7"

Time	DD	GPM	R.
15945			
201 30"	263' 5"	165	
2:02 30"	263' 2"		
2:03 45	263' 0"		
204 45	262' 8"		
2:05 45	262' 7"		
2:06 45	262' 1"		
2:07 45	261' 7"		
2 08 45	261' 4"		
209 45	261' 1"		
211 00	260' 9"		
2 15 00	261' 1½"		
220:30	261' 5½"		
225:30	261' 5½"		
235:30	261' 8"		
245 30	261' 9"		
255:30	262' 0"		
3:05 30	262' 2"		
3 15:30	262' 3"		
3 25 30	262' 4"	Recovery 327	
327.00			
328 20	237' 0"		
329 50	242' 8"		
330 50	243' 4"		
331 50	243' 4"		
332 50	243' 2"		
333 50	242' 5"		
335 00	242' 4"		
336 00	242' 3"		
3:37 00	242' 2"		
338 00	242 1.5		
339 00	242 3.5		
340 00	242 3.0		
341 00	242 2.5		
342 00	242 2.5		

MOORE'S MODERN METHODS

220 G.P.M.

7:13	262.35
7:14	266.50
7:15	267.0
7:16	267.00
7:16	267.00
7:17	266.7
7:19	237.7 Recovery
7:22	242.8

Static 242.0'

Time 7:30

Time	DD	GPM
7:32		215
7 33 30	264.9'	
7 34 30	266.5'	
7 35 30	266.8	
336 30	266.8	
337 30	267.5 72	
338 30	2.671	
339 30	267.2	
340 30	267.3	
341 30	267.35	
342 30	267.5	
243 30	267.4	
244 30	267.4	
251 30	267.5	
801 30	267.6 Stopped	
802 20	238.6	
803 20	239.6	
804 20	243.4	

270
262.9

270
274

094-39W-07CAB
KDD

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Sutherland town (1930-38)
W-0110

Water Quality
(ppm)

Card Q

State: Iowa [16] (1 2) County: O'Brien [71] (3 4) Town: Sutherland

Well No. Latitude [42584N] (5–11) Longitude [095300] (12–18) Seq. No. [2] (19) Date M D Y [04 17 62] (20–25)

Sampling Depth [615] (26–29) Type [ ] (30) Kx10^6 [2260] (31–35) pH [7.0] (36–38) Temp. °F [ ] (39–41)

SiO_2 [22.] (42–44) Ca [312.] (45–49) Mg [102.] (50–53) Na [107.] (54–58) K [8.6] (59–61)

HCO_3 [378] (62–65) CO_3 [0] (66 67) SO_4 [1080.] (68–72) Cl [50.] (73–78) Source No. [3] (79) [9] (80)

Card R

Duplicate Columns 1-25 from Card Q

F [.5] (26–28) NO_3 [.4] (29–32) PO_4 [ ] (33–35) B [ ] (36–38) Al [ ] (39–41) Fe [3.7] (42–45)

Mn [.56] (46–49) Cu [ ] (50–52) Pb [ ] (53 54) Zn [ ] (55–57)

Solids Determined [1990] (58–63) Calc. [ ] (64–69) Hardness Ca,Mg [1200] (70–73) Non-Carb. [890] (74–77)

Color [ ] (78 79) No. [R] (80)

Card S

Duplicate Columns 1-25 from Card Q

Br [ ] (26–28) I [ ] (29–31) Alk. as $CaCO_3$ [310] (32–35) Free CO_2 [ ] (36–38) SAR [ ] (39–41)

RSC [ ] (42–44) ABS [ ] (45–47) [ ] (48–50) [ ]

Alpha (pc/l) [ ] (55–57) Beta (pc/l) [ ] (58–60) Ra (pc/l) [ ] (61–63) U (ug/l) [ ] (64–66)

No. [S] (80)

Recorded by: P.J. Horick

Punched by: Punched FCH Date: ____

Published: Verified ERC

094-39W-07CAB
KDD

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Sutherland town (1930-38)
W-0110

Water Quality
(ppm)

Card Q

State: Iowa (16) County: O'Brien (71) Town: Sutherland

Well No. Latitude 42 58 24 N (5–11) Longitude 095 30 09 (12–18) Seq. No. 2 (19) Date M D Y 09 29 58 (20–25)

Sampling Depth 615 (26–29) Type 1 (30) Kx10⁶ 2060 (31–35) pH 7.6 (36–38) Temp. °F (39–41)

SiO_2 22. (42–44) Ca 311. (45–49) Mg 91. (50–53) Na 4. (54–58) K 9.2 (59–61)

Source No. 3 (79) Q (80)

HCO_3 379 (62–65) CO_3 0 (66–67) SO_4 1050. (68–72) Cl 80. (73–78)

Card R

Duplicate Columns 1-25 from Card Q

F .7 (26–28) NO_3 4.0 (29–32) PO_4 (33–35) B (36–38) Al (39–41) Fe 10. (42–45)

Mn .47 (46–49) Cu (50–52) Pb (53–54) Zn (55–57)

Solids Determined 1960 (58–63) Calc. (64–69) Hardness Ca,Mg 1170 (70–73) Non-Carb. 884 (74–77)

Color (78–79) No. R (80)

Card S

Duplicate Columns 1-25 from Card Q

Br (26–28) I (29–31) Alk. as $CaCO_3$ 286 (32–35) Free CO_2 (36–38) SAR (39–41)

RSC (42–44) ABS (45–47) (48–50)

Alpha (pc/l) (55–57) Beta (pc/l) (58–60) Ra (pc/l) (61–63) U (ug/l) (64–66)

No. S (80)

Recorded by: P.J. Horick

Punched by: Punched FCH Date:

Published: Verified ERC

034-39W-07CAB
KDD

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Sutherland town (1930-38)
W-0110

Water Quality
(ppm)

Card Q

State: Iowa [16] County: O'Brien [71] Town: Sutherland

Well No. Latitude [425824N] Longitude [0953009] Seq. No. [2] Date M D Y [061238]

Sampling Depth [615] Type [1] Kx10^6 [ ] pH [7.0] Temp. °F [52]

SiO_2 [ ] Ca [332] Mg [95] Na [109] K [c]

HCO_3 [364] CO_3 [0] SO_4 [1100] Cl [80] Source No. [3] [Q]

Card R

Duplicate Columns 1-25 from Card Q

F [0.0] NO_3 [0.0] PO_4 [ ] B [ ] Al [ ] Fe [1.0]

Mn [0.06] Cu [ ] Pb [ ] Zn [ ]

Solids Determined [1980] Calc. [ ] Hardness Ca,Mg [1220] Non-Carb. [923]

Color [ ] No. [R]

Card S

Duplicate Columns 1-25 from Card Q

Br [ ] I [ ] Alk. as $CaCO_3$ [298] Free CO_2 [ ] SAR [ ]

RSC [ ] ABS [ ] [ ] [ ]

Alpha (pc/l) [ ] Beta (pc/l) [ ] Ra (pc/l) [ ] U (ug/l) [ ]

No. [S]

Recorded by: P.J. Horick

Punched by: Punched FCH Date:

Published: Verified EBC

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

Local Well No. 094-39W-07CAB
Aquifer Code(s) KIDI
Owner's Name SUTHERLAND CITY #2 (1939)
W Number 0110

Card Q

State: IOWA [19] (1 2) County: O'BRIEN [71] (3 4) Town: SUTHERLAND, IOWA

Well No. Latitude [42582 4N] (5–11) Longitude [095 30 09] (12–18) Seq. No. [2] (19) Date (M D Y) [09 06 67] (20–25)

Sampling Depth [615] (26–29) Type [1] (30) Kx10^6 [2200] (31–35) pH [7.0] (36–38) Temp. °F [ ] (39–41)

SiO_2 [21.] (42–44) Ca [316.] (45–49) Mg [97.] (50–53) Na [110.] (54–58) K [8.7] (59–61)

HCO_3 [382] (62–65) CO_3 [0] (66 67) SO_4 [1100.] (68–72) Cl [4] (73–78) Source No. [3] (79) [Q] (80)

Card R

Duplicate Columns 1-25 from Card Q

F [.6] (26–28) NO_3 [.1] (29–32) PO_4 [.] (33–35) B [.] (36–38) Al [.] (39–41) Fe [2.9] (42–45)

Mn [.55] (46–49) Cu [.] (50–52) Pb [.] (53 54) Zn [.] (55–57)

Determined Solids [2010] (58–63) Calc. [ ] (64–69) Ca,Mg Hardness [1190] (70–73) Non-Carb. [877] (74–77)

Color [ ] (78 79) No. [R] (80)

Card S

Duplicate Columns 1-25 from Card Q

Br [.] (26–28) I [.] (29–31) Alk. as $CaCO_3$ [313] (32–35) Free CO_2 [ ] (36–38) SAR [.] (39–41)

RSC [ ] (42–44) ABS [.] (45–47) [.] (48–50) [ ]

Alpha (pc/l) [ ] (55–57) Beta (pc/l) [ ] (58–60) Ra (pc/l) [.] (61–63) U (ug/l) [.] (64–66)

No. [S] (80)

Recorded by: D. AARONSON

Punched by: T Date: ____

Published: ____

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

Local Well No. 094-39W-07 CAB
Aquifer Code(s) KIDI
Owner's Name SUTHERLAND CITY #2 (1930)
W Number 0110

Card Q

State: IOWA [19] (1-2) County: O'BRIEN [71] (3-4) Town: SUTHERLAND, IOWA

Well No. Latitude [42 58 24 N] (5-11) Longitude [095 30 09] (12-18) Seq. No. [3] (19) Date M D Y [09 06 34] (20-25)

Sampling Depth [445] (26-29) Type [1] (30) Kx10^6 [ ] (31-35) pH [7.0] (36-38) Temp. °F [ ] (39-41)

SiO_2 [.] (42-44) Ca [193.] (45-49) Mg [138.] (50-53) Na +K [131.] (54-58) K [.C] (59-61)

HCO_3 [376] (62-65) CO_3 [ ] (66-67) SO_4 [957.] (68-72) Cl [10.] (73-78) Source No. [3] (79) [Q] (80)

Card R

Duplicate Columns 1-25 from Card Q

F [TRACE] (26-28) NO_3 [.4] (29-32) PO_4 [.10] (33-35) B [.] (36-38) Al [4.3] (39-41) Fe [.55] (42-45)

Mn [.4] (46-49) Cu [.] (50-52) Pb [.] (53-54) Zn [.] (55-57)

Solids Determined [1950] (58-63) Calc. [ ] (64-69) Hardness Ca,Mg [1060] (70-73) Non-Carb. [.754] (74-77)

Color [ ] (78-79) No. [R] (80)

Card S

Duplicate Columns 1-25 from Card Q

Br [.] (26-28) I [.] (29-31) Alk. as $CaCO_3$ [308] (32-35) Free CO_2 [ ] (36-38) SAR [.] (39-41)

RSC [ ] (42-44) ABS [.] (45-47) [.] (48-50) [ ] (51-54)

Alpha (pc/l) [ ] (55-57) Beta (pc/l) [ ] (58-60) Ra (pc/l) [.] (61-63) U (ug/l) [.] (64-66)

No. [S] (80)

Recorded by: D. AARONSON

Punched by: T Date:

Published:

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

Local Well No. 094-39W-07CAB
Aquifer Code(s) KIDI
Owner's Name SUTHERLAND CITY #2 (1930)
W Number 0110

Card Q

State: IOWA [19] (1 2) County: O'BRIEN [71] (3 4) Town: SUTHERLAND, IOWA

Well No. Latitude [42 58 24 N] (5–11) Longitude [095 30 09] (12–18) Seq. No. [3] (19) Date M D Y [08 30 37] (20–25)

Sampling Depth [445] (26–29) Type [1] (30) Kx10^6 [ ] (31–35) pH [6.9] (36–38) Temp. °F [52] (39–41)

SiO_2 [ ] (42–44) Ca [277] (45–49) Mg [83] (50–53) Na +K [122] (54–58) K [.C] (59–61)

HCO_3 [356] (62–65) CO_3 [ ] (66–67) SO_4 [946] (68–72) Cl [15] (73–78) Source No. [3] (79) [Q] (80)

Card R

Duplicate Columns 1-25 from Card Q

F [0.] (26–28) NO_3 [1.5] (29–32) PO_4 [.04] (33–35) B [ ] (36–38) Al [ ] (39–41) Fe [7.0] (42–45)

Mn [.35] (46–49) Cu [ ] (50–52) Pb [ ] (53–54) Zn [ ] (55–57)

Solids Determined [1820] (58–63) Calc. [ ] (64–69) Hardness Ca,Mg [1050] (70–73) Non-Carb. [756] (74–77)

Color [ ] (78–79) No. [R] (80)

Card S

Duplicate Columns 1-25 from Card Q

Br [ ] (26–28) I [ ] (29–31) Alk. as $CaCO_3$ [292] (32–35) Free CO_2 [ ] (36–38) SAR [ ] (39–41)

RSC [ ] (42–44) ABS [ ] (45–47) [ ] (48–50) [ ]

Alpha (pc/l) [ ] (55–57) Beta (pc/l) [ ] (58–60) Ra (pc/l) [ ] (61–63) U (ug/l) [ ] (64–66)

No. [S] (80)

Recorded by: D. AARONSON

Punched by: T Date:

Published:

IOWA GEOLOGICAL SURVEY
Water Analysis Comparison

Town: _____ County: _____ Location: _____ Sec. ____ T. ____ N., R. ____ E. W.

Owner: _____ Contractor: _____ Date Started: _____

Well Number or Location	1 Arnold's Park	2 Milford Sur.	3 SpiritLake	4	5	6
Depth of Sample						
Formation Source	Surf.run-off	Surf-run-off	Surf.run-off			
Water Level Below Curb						
How Sampled						
Sampled by						
Date Sampled						
Total Solids						
Dissolved Solids	260.0	255.0	376.0			
Insoluble Matter	8.2	8.4	29.0			
Alkalinity (MeO)						
Nitrite (NO_2)						
Nitrate (NO_3)	0.0	0.0	0.0			
Sodium(Na) & Potassium(K)*	18.2	18.3	23.8			
Calcium (Ca)	26.1	25.6	25.9			
Magnesium (Mg)	34.9	34.8	47.5			
Iron (Fe)	0.0	0.0	0.15			
Iron (Unfiltered)**						
Manganese (Mn)	0.04	0.18	0.2			
Aluminum (Al)	1.6	2.0	0.8			
Fluorine (F)	0.0	0.0	1.0			
Chlorine (Cl)	10.0	10.0	7.0			
Sulphates (SO_4)	19.3	17.3	55.4			
Bicarbonates (HCO_3)	214.7	200.1	207.4			
Phosphates (PO_4)	0.0	0.0	0.0			
Borates (BO_3)	0.5	0.5	1.0			
Calculated Hardness***	208.0	207.0	260.0			
Water Lab. Number						

*Na & K not separated, calculated as Sodium(Na): **Includes iron precipitated or flocculated after sample collected: ***Calculated as $CaCO_3$.

Completed Depth _____ ft.; Final Static Water Level _____ ft.; Production _____ GPM; Draw-down _____ ft., at _____ GPM; Gallons per foot draw-down _____. Date Completed _____ 193_.

Remarks: _____

Sent to R.F. Green, Sutherland
July 8, 1938.

CONTRACT

This Contract made in triplicate form in Memorandum of agreement between the City of Sutherland, Iowa, hereafter called the Council, and Rasmussen Well Co.,called the Contractor.

In consideration of price and agreement named herein, the Contractor will furnish all tools, material, and labor for pulling 8" perforated pipe and setting 8" Wrought Iron Pipe to the Dakota Sand Stone, approximately 150' below the present 10" pipe now in well, for the sum of Six Dollars and Ninety Seven Cents ($6.97) per foot.

This price includes the setting of a Test Pump with capacity to pump 200 gal.per Min., providing the Well will furnish same for a ten hour test. Any additional test will be Three Dollars($3.00) per hour.

4 When Well is finished the Contractor will seal with concrete or lead packer between the 8" pipe and 10" pipe to keep upper water from seeping in,or leave a lap up in the 10" pipe to come above the water level, the Council reserving the right to order same by paying actual cost of pipe.

The Council is to remove Pump House to make room for the machine and handeling of material, to take of slush which is taken from Well, to furnish water for drilling operations, and lights if necessary to work nights, with no additional cost to Contractor.

The Contractor will furnish Liability Insurance, take samples every 5' in sample bags to be furnished by the State Geology Dep't., also take samples of water when test is made, in sterilized bottled furnished by the State Geology Dep't.

The State Geology Dep't. has agreed to test samples and report to Council not later than ~~six~~ TEN days after samples have been taken.

The Contractor agrees to leave machine and tools on location until such a report is made with no additional cost to Council.

The Contractor can begin work on or before the 10th day of April,1938.

Payment to be made in 30 days after completion of Well.

Dated this 25 day of March, 1938

Mayor K. J. Reiste

Clerk Jos. M. Hughes

Contractor Rasmussen Well Co

By Howard Rasmussen

Sutherland, O'Brien Co

March 28, 1938

Mr. Howard Rasmussen
Rasmussen Well Company
4229 Floyd Avenue
Sioux City, Iowa

Dear Mr. Rasmussen:

Some time ago I visited the town of Sutherland and met the council at their request. Mr. Reiste, the Mayor, informed me that he had a conference with you in regard to the water situation at Sutherland and that you had stated that you did not believe the Lower Dakota sandstone had been reached. Upon returning to Iowa City, I found that we have a complete set of samples from the Sutherland well, which is 445 feet deep and which was drilled by you in 1930. I have examined the samples, and although I cannot be absolutely sure there is evidence which makes me believe that the drilling has not been carried far enough to penetrate the Lower Dakota sandstone. It would be my recommendation, therefore, to drill deeper in the present well until the Lower Dakota is penetrated.

According to my calculations about 100 feet of additional drilling will be necessary to reach the Lower Dakota. Lack of accurate information in that particular locality prevents a precise forecast of what might be expected, but I feel sure that the section above the Lower Dakota will consist of soft shales, siltstones, and possibly sandstones.

I would suggest that the complete thickness of the Dakota be drilled and that the hole be carried down until limestone or shale of Mississippian or older age is encountered.

The possibility of pulling or driving the casing in the present hole was brought up, and I expressed the opinion that while it might be possible I would recommend that no attempt be made to remove the 10-inch casing now in the well.

Another possibility which was mentioned was inserting 8-inch or 6-inch casing the full length of the present hole and pouring cement into the annular space between the 10-inch and smaller casing. It seemed questionable to me that a good cementing job could be done if 8-inch pipe were used inside the 10-inch. A good cementing job could be done by using 6-inch casing inside the 10-inch, but that would necessitate the using of a rather small ~~pipe~~ pump line. I suggested that the council consult you on this point.

I hope that a very complete set of samples will be saved during additional drilling, because they will be of vital importance in our work. I will be pleased to help in any way during the execution of the project.

Pressure of other work has prevented my writing to you before this time. Mr. Reiste expected you to be in Sutherland within a few days of my visit, and I presume that you have been there by this time.

Very truly yours,

H. G. Hershey

HGH:A
CC: K. J. Reiste, Mayor
Sutherland, Iowa

Town of Sutherland, Iowa

Member Iowa League of Municipalities

OFFICE OF THE MAYOR

Dr. H. G. Hershey

Iowa City Iowa.

Dear Sir:

Replying to yours of the 16th of Feb. will say that since that time our town has prospected near the Waterman creek for water but with no avail.

We are now considering going deeper with our one well that is now 445 feet deep and find that the county farm at Primghar has a well 571 feet deep but we have not been able to get the mineral analysis of this well as yet.

Mr Mark said that he thought that you might be up this way soon and would like to ask if you are considering coming up.

Thanking you for an early reply I beg to remain,

Yours very truly

K. J. Reiste

Mayor

Mayor:
K. J. Reiste

Councilmen:
R. C. Long
W. E. Hockert
R. T. Clayton
L. L. Jones
Lars Jensen

Town Clerk:
Roy M. Hughes

April 4, 1938

Mr. K. J. Reiste
Sutherland, Iowa

Dear Mr. Reiste:

Your letter of March 31 in regard to deepening the present city well at Sutherland has been received. I am very glad to know that you will supervise this work, since I believe you are more familiar with it than the town officers recently elected.

Under separate cover we are sending you a supply of sample bags and a driller's notebook.

I will be very glad to visit Sutherland at the time of the pumping test and collect a sample for mineral analysis. I will appreciate it greatly, however, if you will give me as much advance notice as possible as to when the pumping test will be.

Very truly yours,

H. G. Hershey

HGH:A

Town of Sutherland, Iowa

Member Iowa League of Municipalities

OFFICE OF THE MAYOR

March 31 1938

Dr H. G. Hershey
Iowa City Iowa.

Dear Sir:

Refering to the town well will say that since you were here we have had Rasmussen up and gone over the situation with him and the council decided to go down to the lower S. D. sandstone and we estimated the depth to be about 150feet as we talked when you were here.

We feel that we have a very good price on this contract of $6.97 per foot.

In the contract it calls for the bags for sampleing be furnished from your office and I presume that Howard has ordered them out but if not will you send them to us here.

The contract also calls for a sample to be taken by you and the returns back within ten days that he may not have to leave his machine set to long.

I will get in touch with you at the time we start pumping for test that you may come up for the samples and will also notify you when the work starts as the contract says on or before April 10th.

Election is over and I guess I will have to continue until this work is out of the way.

Thanking you for your interest in this matter I beg to remain,

Yours very truly

K. J. Reiste

Mayor

Mayor:
K. J. Reiste

Councilmen:
R. C. Long
W. E. Hockert
R. T. Clayton
L. L. Jones
Lars Jensen

Town Clerk:
Roy M. Hughes

Town of Sutherland, Iowa

Member Iowa League of Municipalities

OFFICE OF THE MAYOR

Feb 11 1938

Dr Hershey

Iowa City Iowa.

Dear Sir:

We have a bad water condition here and should like to out line it to you.

We have one well that is 217 feet deep with an unlimited supply of water but a very great amount of rust and mineral in it.

We have another well about twenty feet away that is 445 feet deep and the water is about the same as far as iron content is concerned but it also has some florides in it.

Both of these wells are very hard on our equipment as it eats up our pipes and pumps very rapidly.

Four years ago we placed a turbine pump in the deep well and took it out two weeks ago and found the impeller casing (made of cast iron) soft and chalk like with three holes eaten into it.

We are about to the place we feel it folly to send any more money down this hole.

Would it be better to go deeper and get another type of water or go three miles into the country and try and get spring water which we believe is available.

What grade of water would S. D. Sandstone give us and what depth would we be apt to strike it.

What would the cost be to us to have you come to Sutherland to look our situation over.

Thanking you for an early reply I beg to remain

Yours very truly

K. J. Reiste

Mayor

Mayor:
K. J. Reiste

Councilmen:
R. C. Long
W. E. Hockert
R. T. Clayton
L. L. Jones
Lars Jensen

Town Clerk:
Roy M. Hughes

O'BRIEN

August 16, 1938

Mr. Kenneth C. Noble
The Sutherland Courier
Sutherland, Iowa

Dear Mr. Noble:

Your letter of August 4 was received during my absence from Iowa City. I am sorry that answer has been delayed.

In response to your request we are listing below a number of towns in Iowa obtaining water containing approximately one or two parts per million of iron.

TOWN	COUNTY	IRON CONTENT IN PARTS PER MILLION
Sheldon	O'Brien	1.6
Primghar	"	1.3
Boyden	Sioux	2.0
Alton	"	1.0
Sibley	Osceola	1.0-1.4
Aurelia	Cherokee	1.4
Cherokee	"	0.8
Holstein	Ida	1.3
Sac City	Sac	1.6
Schaller	"	0.8
Lytton	"	1.8
Emmetsburg	Palo Alto	2.0
Ruthven	" "	2.0
West Bend	" "	2.0

We do not have accurate data on what treatment if any is being used in the towns mentioned above but we may be able to obtain that information for you.

I hope that this information will be useful and that it fills your needs. If not please do not hesitate to call on us.

Very truly yours,

HGH:LM

H. G. Hershey

October 4, 1938

Mr. R. A. Radford
Regional Director
Public Works Administration
Farm Credit Building
Omaha, Nebraska

Dear Sir:

We have been requested by Mr. K. J. Reiste, Mayor of Sutherland, to send you a copy of the results of the pumping test on the city well at Sutherland which was deepened early this summer and also a copy of the analysis of the water from that well as shown by a sample which we collected at the time of the pumping test on May 11 and 12, 1938. This material is enclosed.

Mr. Reiste informed us that the pumping test data and the water analysis is to be used in support of project No. 1428 F, Sutherland.

If you need additional information on this project with which we can furnish you, please do not hesitate to call on us.

Yours very truly,

H. G. Hershey

HGH:LM
CC Mr. K. J. Reiste,
Mayor of Sutherland
Sutherland, Iowa

Enc.

July 6, 1938

Mr. R. F. Green
Sutherland, Iowa

Dear Mr. Green:

Enclosed is an analysis of water from your well as shown by a sample collected by Mr. W. C. Schuldt of this department on May 11, 1938. For your convenience, a copy of an analysis from the deepened Sutherland City well is also enclosed. You will notice that the water from your well is lower in total solids, calcium, magnesium, sulphate, and hardness, but is higher in manganese and much higher in iron than the city well.

In response to your request for analyses of water from West Okaboji Lake we are enclosing analyses from the city supplies of Arnold's Park and Milford, and for comparative purposes from the Spirit Lake water supply. We do not know exactly the conditions under which these samples were collected because they were taken by members of the State Department of Health. However, I would surmise that they were not taken directly from the lakes but from some points on the city mains near the lakes.

If the Geological Survey can be of further service, I trust that you will call on us.

I am sorry that you have had to wait for this material. I have been away from Iowa City most of the time since I saw you in Sutherland and have had no opportunity to make the report before now.

Yours very truly,

HGH:LM
Enc

H. G. HERSHEY

January 20, 1939

Mr. A. O. Rasmussen
Ida Grove, Iowa

Dear Mr. Rasmussen:

In response to your letter of January 16 regarding the possibility of obtaining a sandstone well on the S½, Sec. 35, T94N, R41W, O'Brien County, we have gone through our records carefully and find that there is every reason to believe that sandstone is present.

It is quite difficult to make an accurate statement as to the depth. Under ordinary circumstances the Dakota formation immediately underlies the sand and gravel at the present bottom of the well. Sometimes, however, there is a certain amount of sandy shale immediately below the sand in which the well is now finished and above the sandstone. Furthermore, we do not know how thick the sand is which is now being used.

From the best information which we have available I estimate that the sandstone will be first encountered somewhere between 420 and 450 feet below the surface, but it may come in a little above or below these estimated figures.

I hope that you will let me know the results of any deeper drilling because, as you know, I am very much interested in the sandstones in that locality.

I am planning a trip into northwestern Iowa for this week end and the early part of next week. If possible, I hope to stop at Ida Grove to see you.

Very truly yours,

HGH:LM

H. G. Hershey

A. O. Rasmussen

25 Years Successful Water Well Drilling

Ida Grove, Iowa

Jan.16.1939

Dr.H.G.Hershey.

Iowa City.
Iowa.

Dear Sir.

I would like to get some information about a well on the S.½ of Sec 35. twp.94. R 41. Obrien County there is a well on this farm about 400 feet deep the party who owns this place would like to know if a sandstone well can be had and at about what depth. as the cost of changing screens runs quite high and has to be changed at least every four years.

I am leaving for Minneapolis tomorrow morning and would like to have a reply as soon as possible.

Thankig You.

I am Respectfully Yours.

A.O.Rasmussen.

Information regarding the availability of Sandstone for a proposed well 5 miles SW of Calumet, Obrien County - Location: S.½ Sec. 35, T94N, R41W.

Prepared by W.C.Schuldt, Jan 19, 1939

Information from Published wells:

Primghar: - The public supply was formerly obtained from a drilled well 420' deep in which water stood about 250' below the surface. This well proved so unsatisfactory that it has been abandoned.

County Farm well 1½ miles E. of Primghar - 408' deep
A well in SE¼ Sec. 1, 95N, R41W 414' deep (at SW corner of Primghar)
A well 3 miles E. of Primghar 380' deep

The above 3 wells all end in fine grained incoherent sand which causes trouble and the water in them remains about 225-275' below the surface.

Sutherland - A well 450' deep drilled by C. Rasmussen reports Dakota ss at 410' (underlying 6' of black sticky clay).

Sanborn, 2 miles E. A well drilled for the Equitable Life Insurance Co. develops water from the sand and gravel in or at the base of the Nebraskan drift.

Information from Unpublished data in the files

RR-CE-1504

Primghar, 1½ miles E., Obrien County Home - a well is developing water from the Dakota sandstone between 500' and 570'. Water has a calc. hardness of 908 ppm

Primghar, Well at fire station next to concrete reservoir - drawing water from basal Pleistocene sand between 400' and 420'

RR Elev. 1455 1465

Hartley, City well #1 , generalized descriptive log indicates the contact between glacial sand and medium grained Dakota sandstone is at 410'

Sutherland - City well # 2, Drilled 1938, indicates the presence of buff, medium grained sandstone at 445'. This well is ? a continuation of the former Sutherland well, reporting Sandstone at 410'. Lower Dakota ss in this well produces a water with a calculated hardness of 1221 ppm. CE 1467

CHEROKEE COUNTY

Information from published data folder:

Cherokee - State hospital well no. 1. Top of the Dakota sandstone occurs at 240' or 255' depending on interpretation of the samples. Curb elevation is 1338'.

Information from unpublished data in the files

RR-CE-1455

Marcus, 5 mi. N.E. (5 mi. SW of proposed location) Equit. Life Insurance well A water analysis data sheet shows water is obtained from a depth of 355' from sand or gravel in or at the base of the Nebraskan drift. Water level is 255' below curb. Elevation unknown.

Cherokee - city well - described H.G.Hershey - Top of the Dakota indicated at 350', Curb elev. 1190'.

Aurelia city well - Top of the Sandstone is found at 278', Curb elev. is [illegible].

Cleghorn - town well - Drillers log indicates sandrock at 460', continuing to 490' curb elev. unknown.

Larabee - city well #1. Samples indicate sand at 378' and one sample of ss representing range from 305' to 375'. Drillers log (Pixler) indicates ss from 290' to 375'. Unreliable

Cleghorn City well#1 - Water sample data sheet indicates top of Dak. at 398' Curb unknown.

Structure Contour map of the Top of the Dakota H.G.H. 1938

Elev. of the top of the Dak. at the site of the proposed well is approximately 1035' above sea level. The state topographic map on 100' contour shows the 1400' contour running thru the proposed site. This map is not sufficiently accurate to be relied upon however, but gives a rough approximation.

Forecast:

In view of the unknown elevation and general lack of information an accurate forecast cannot be made, but it is believed that the Dakota ss will be entered between 420' and 470' below the surface at the proposed location.

Gu

January 12, 1946

Mr. G. H. Beard
Layne-Western Company
4430 Commercial Avenue
Omaha 11, Nebraska

Dear Mr. Beard:

Your air mail letter of January 10, concerning ground-water conditions 2½ miles west of Sutherland has been received. The information which we have assembled appears to be quite dependable as it is based on wells in the immediate vicinity, although the thickness of the drift and the top of the Dakota sandstone immediately underlying the drift may be found to differ somewhat from the forecast.

At the site of the proposed well the drift should be about 300 feet thick. It is composed mainly of yellow or blue-gray boulder clay, although some sand and gravel beds are likely to occur within it. At Sutherland there is sand and gravel containing clay breaks between 175 and 204 feet. At the base of the boulder clay there is a sand, either glacial or Cretaceous in age, which may be as much as 40 feet thick. This horizon rests on Cretaceous shale at about 340 feet.

The shale extends downward to the top of the Dakota sandstone at about 400 feet. Some fine-grained sandstone layers are interbedded in the shale.

The Dakota sandstone appears to be approximately 200 feet thick resting on Mississippian dolomite at a depth of about 600 feet. The lower 100 feet is coarser in texture than the upper part of the sandstone.

Although some water is undoubtedly present within the glacial deposits, the Dakota sandstone appears to be the source of supply for the larger capacity wells in the area. However, waters in the upper part of the drift will probably be less highly mineralized than that from the Dakota. Therefore if a satisfactory yield can be obtained from a relatively shallow sand and gravel horizon, it would be worthwhile to have a chemical analysis made of the water from it.

Pumping tests at Sutherland and Calumet show that large quantities of water are obtainable from the Dakota sandstone. The Sutherland city well drilled entirely through the Dakota yielded 215 g.p.m. with a drawdown of 22½ feet from a static level of 245 feet and at Calumet 51 g.p.m. was produced with a drawdown of 6.8 feet from a static level of 243 feet. The water level is therefore rather deep but the specific capacity is rather high. Water temperatures may be expected to be between 52° and 53° F.

As you know, the Dakota water in the Sutherland area is highly mineralized. Two analyses from wells in the vicinity are enclosed.

At both Calumet and Sutherland perforated pipe rather than screen was used to keep the well from filling with sand.

We shall be most interested in following the drilling of this well and shall be glad to examine the sample cuttings as drilling proceeds.

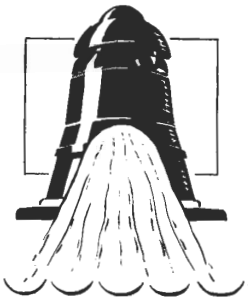
Very truly yours,

H. G. Hershey

HGH:BH

LAYNE WELLS
AND
LAYNE PUMPS

FACTORIES:
MEMPHIS, TENN.
HOUSTON, TEXAS
LOS ANGELES, CALIF.



LAYNE-WESTERN COMPANY

AFFILIATED WITH LAYNE & BOWLER, INC.

TELEPHONE KEnwood 5888

4430 COMMERCIAL AVENUE
OMAHA 11, NEBRASKA

Jan. 10, 1946

JAN 1[illegible] 1946

AIR MAIL

Dr. H. G. Hershey
Iowa Geological Survey
Geolgoy Annex
Iowa City, Iowa

Dear Dr. Hershey

Mr. A. L. Vaughan of Northern Natural Gas Company informed me today they have a fairly tentative location for a Compressor Station on the south side of Highway No. 59 shortly after it turns west, north of Calumet, Iowa. In other words this location is 2½ miles west of Sutherland and about the same distance north and west of Calumet.

We would appreciate very much any information you can give us relative to ground water conditions at this location and if possible would like to have at least some information by Monday morning. We realize this is very short notice and perhaps you will not have time to get together as much information as you would like but at least as much as you can send us will be appreciated.

Mr. Vaughan informs me the Gas Company does not have an option on any of the ground and wants the location held in confidence for the time being.

Yours very truly,

LAYNE-WESTERN COMPANY

G. H. Beard

GHB jk