STATE OF SOUTH DAKOTA
Frank Farrar, Governor

SOUTH DAKOTA GEOLOGICAL SURVEY
Duncan J. McGregor, State Geologist

Special Report 44

GROUND-WATER INVESTIGATION FOR THE CITY OF GETTYSBURG, SOUTH DAKOTA

by
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Vermillion, South Dakota
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INTRODUCTION

Present Investigation

This report contains the results of a special investigation conducted by the South Dakota Geological Survey from June 6 to July 21, 1967, in and around Gettysburg, Potter County, South Dakota (fig. 1), for the purpose of assisting the city in finding a shallow ground-water supply.

Gettysburg now obtains its water from two deep wells located within the city; one being 1,917 feet deep, the other 1,950 feet deep. These wells produce a sufficient quantity of water, but due to high chloride, sodium, fluoride, and total solids content, the quality is inferior.

A survey of ground-water possibilities was conducted in a 436 square-mile area around Gettysburg. The investigation included the preparation of a generalized geologic map, buried outwash map, surface outwash map, the drilling of 96 test holes, the collection of 22 water samples for analysis, and a well interview of nearly all farms in the study area. In addition, 20 electric logs were obtained from test holes.

As a result of this survey it was found that the best ground-water possibilities exist within areas A and B (fig. 2). Area C was also found to have a limited water potential. The data from which these conclusions are made is shown on the data map (fig. 3) showing location of test holes and wells for which information is available.

The field work and preparation of this report were performed under the supervision of Cleo M. Christensen, research geologist with the South Dakota Geological Survey. The assistance and cooperation of the residents in and around Gettysburg, especially Mayor Dorothy Frankhauser, are greatly appreciated. The writer would also like to acknowledge the cooperation of Vergil H. Worm, well driller from Lebanon.

Topography and Drainage

The topography of the area is typical of young glacial drift; namely swell and swale topography of rather low local relief with scattered depressions, some of which contain marshes and intermittent lakes. The area is drained to the southwest by Little Cheyenne Creek, Artichoke Creek, and Okobojo Creek, all of which flow into the Missouri River. Associated with each creek is an integrated drainage net which has resulted in a stream dissected topography.

GENERAL GEOLOGY

Surficial Deposits

The surficial deposits of the Gettysburg area are primarily the result of glacial activity late in the Pleistocene Epoch. Glacial deposits, which are collectively termed drift, are divided into till and outwash deposits.

Till consists of clay and silt-sized particles randomly mixed with boulders, pebbles, and sand, all of which were carried and deposited by the ice itself. The entire Gettysburg area, except for those localities shown as outwash, alluvium, kames, or shale, is covered by till (fig. 4).

Outwash sediments consist of sand and pebbles with minor amounts of silt and clay, which were deposited by the meltwater streams as the glacier wasted. In the immediate Gettysburg vicinity, little outwash is present; however, extensive outwash deposits do exist in the Blue Blanket Valley north of Lebanon and along Okobojo Creek south and southeast of Gettysburg (fig. 4). Some outwash is also present four to five miles northwest of Gettysburg (fig. 4).

Kames, a type of outwash, are formed by the deposition of sediments against or upon the ice. Their importance in the Gettysburg area is not as water-bearing sands, but rather as

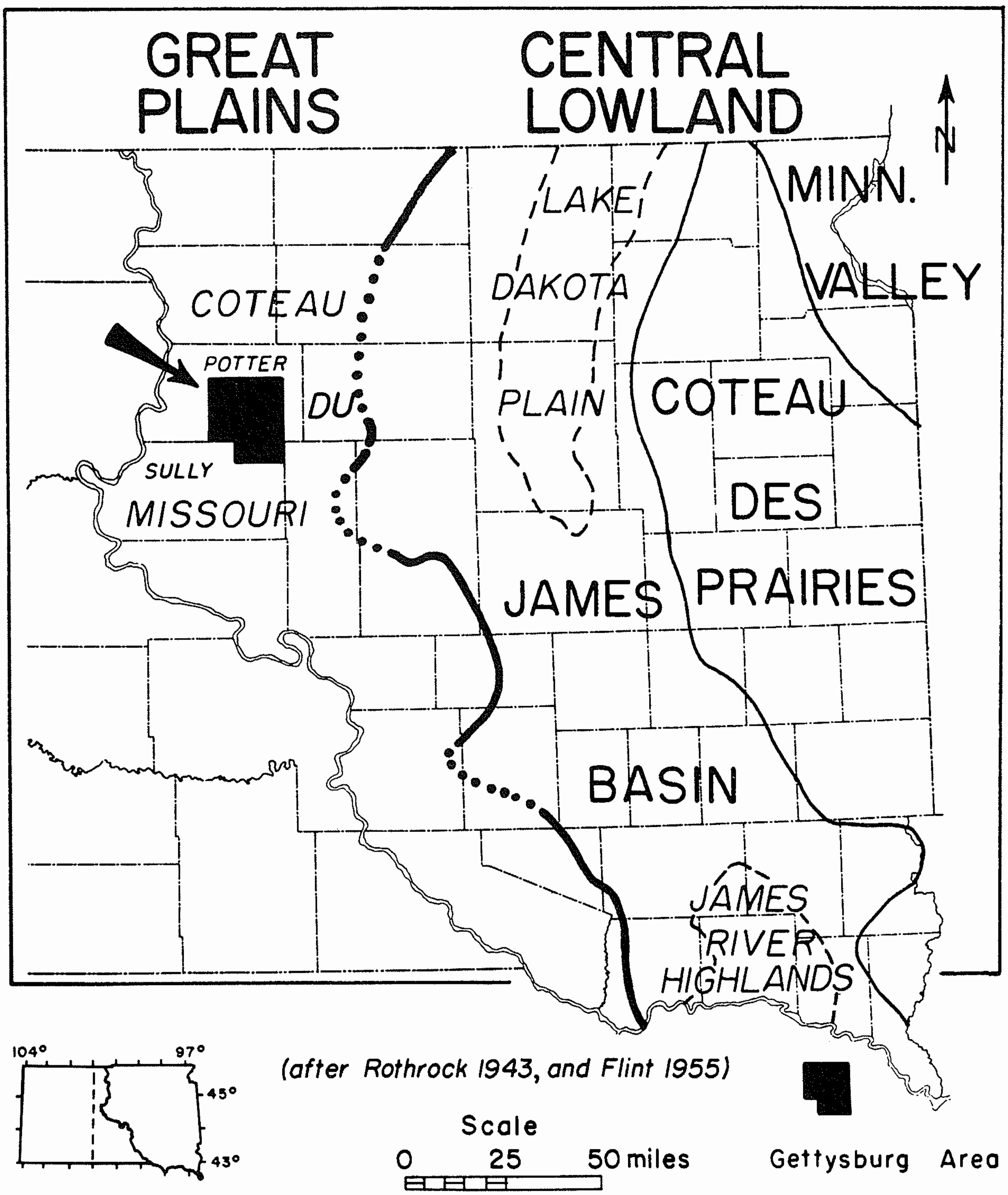

Figure 1. Map of eastern South Dakota showing the major physiographic divisions and location of the Gettysburg area.

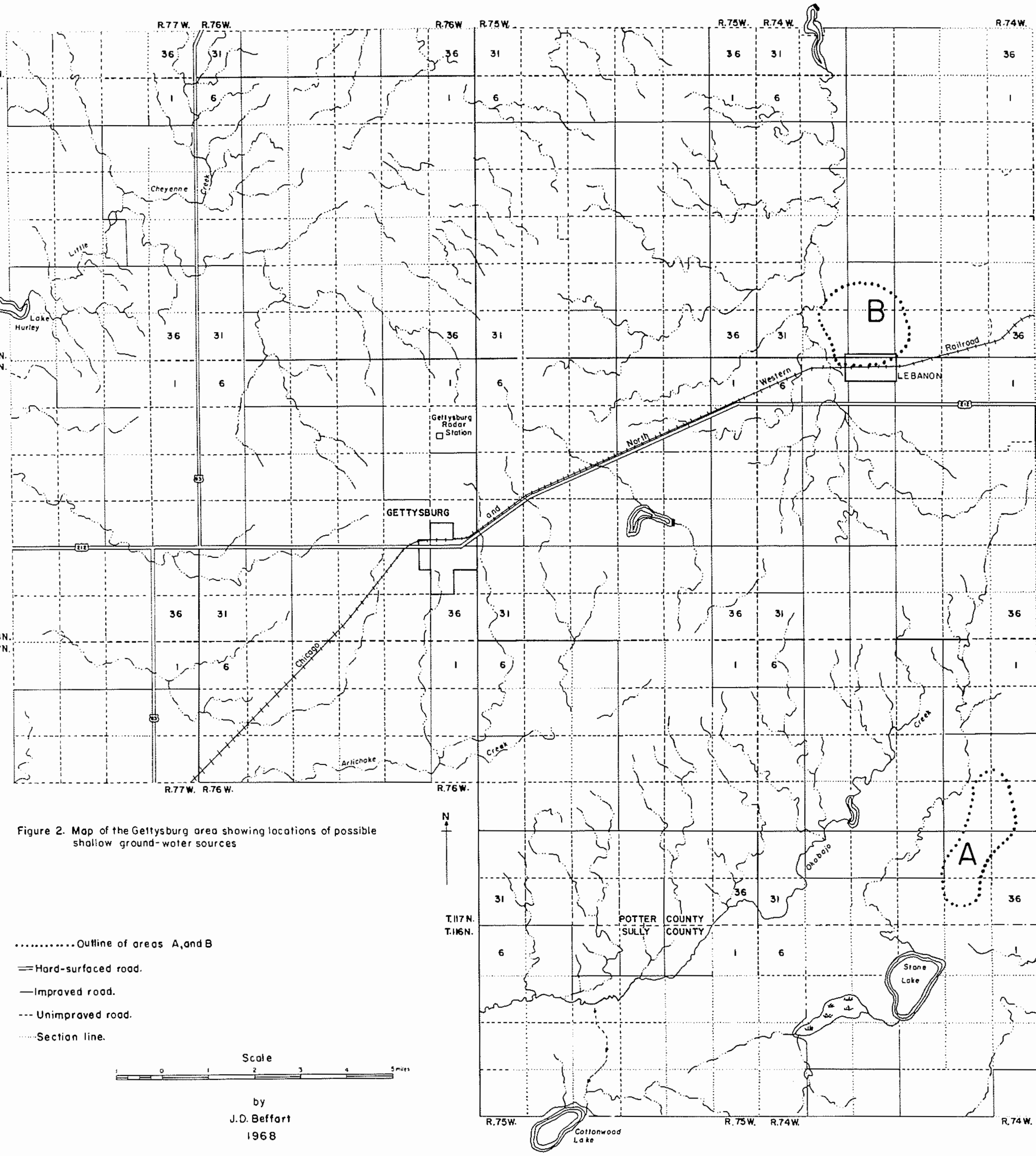

Figure 2. Map of the Gettysburg area showing locations of possible shallow ground-water sources

............Outline of areas A, and B

═ Hard-surfaced road.

— Improved road.

--- Unimproved road.

······ Section line.

Scale

1 0 1 2 3 4 5 miles

by
J. D. Beffort
1968

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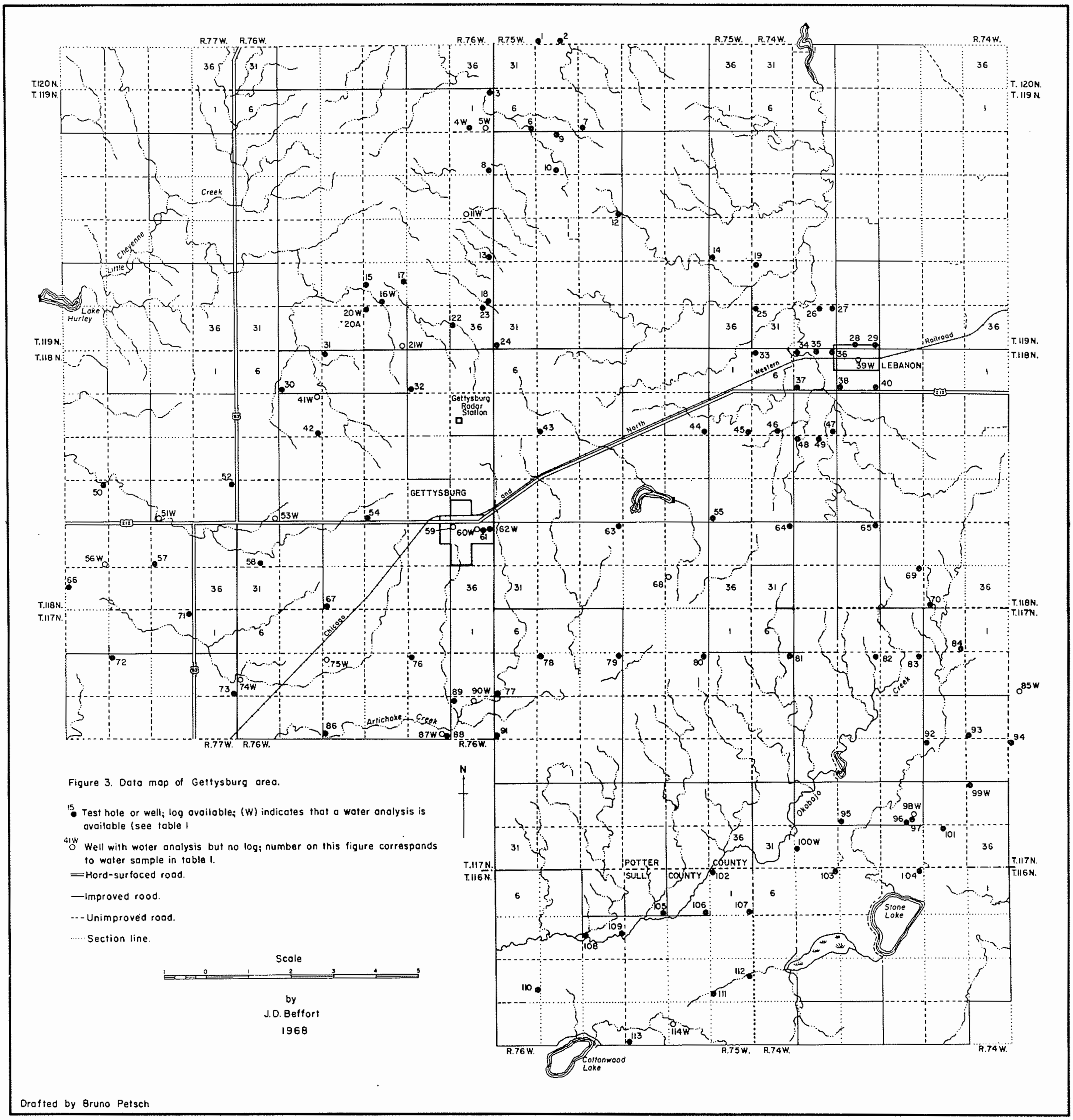

Figure 3. Data map of Gettysburg area.

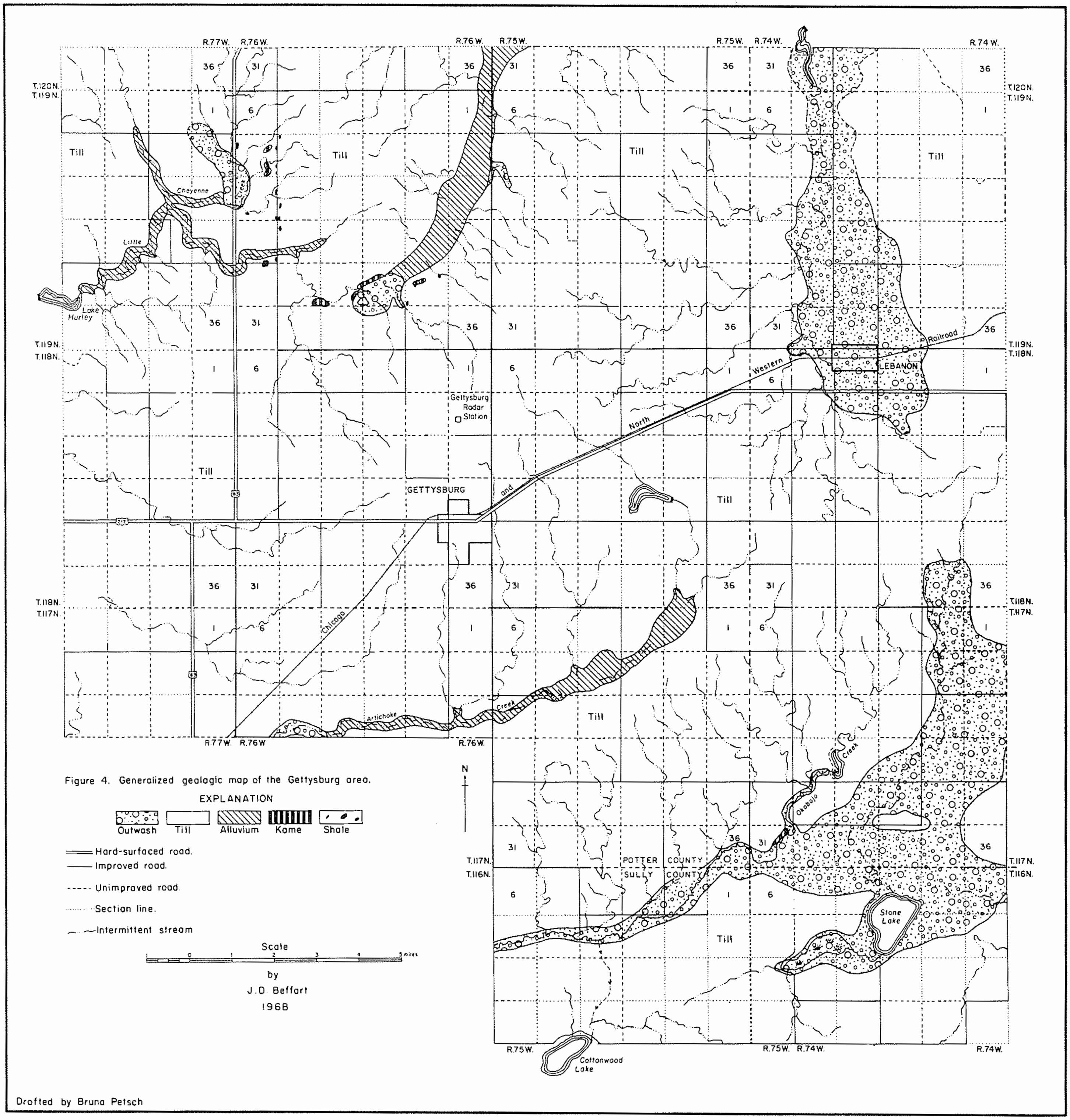

Figure 4. Generalized geologic map of the Gettysburg area.

gravel pits.

Alluvium, which is made up mostly of silt- and clay-sized particles with minor amounts of sand and gravel, has been deposited by recent streams since the retreat of the glaciers. Alluvium is present along nearly all the streams in the study area, but it is usually thin and of limited extent. Only the more extensive alluvial deposits are shown on figure 4.

Subsurface Bedrock

Directly beneath the glacial drift is the Pierre Shale, which is exposed at many places in the study area (fig. 4). Underlying the Pierre Shale, other stratified sedimentary rocks of Cretaceous age are, in descending order, the Niobrara Chalk, Carlile Shale, Greenhorn Limestone, Graneros Shale, and the Dakota Formation. Directly beneath the Dakota Formation is the Skull Creek Shale, then the Fall River Sandstone.

The Pierre Shale is a light- to dark-gray fissile shale with bands of iron concretions and layers of bentonite. In the Gettysburg area it is about 800 feet thick.

The Niobrara Chalk is primarily a light-to dark-gray calcareous rock which contains numerous microscopic specks and thin impure bentonite beds. The Niobrara Chalk is about 140 feet thick in the Gettysburg area.

The Carlile Shale, which is about 320 feet thick in this area, consists chiefly of gray fissile shale and may contain thin interbedded sands and impure limestone.

The Greenhorn Limestone is about 30 feet thick in the Gettysburg area and is composed of light- to dark-gray fragmental limestone and light- to dark-gray chalk and chalky shale. This dense limestone is easily recognized both in well cuttings and on mechanical well logs.

The Graneros Shale is primarily a siliceous shale which is locally sandy. It is about 320 feet thick in this area.

The Dakota Formation is composed of fine to coarse, loose to cemented sandstone, and interbedded shale. This unit is highly variable in thickness throughout the State but is about 250 feet thick in this area.

The Skull Creek Shale, which is a dark-gray shale, pinches out in the eastern part of the study area and ranges in thickness from zero to about 100 feet near the Missouri River.

The Fall River Sandstone is about 175 feet thick in the Gettysburg area and is composed of fine to coarse, poorly consolidated sand. This formation is locally called the "Sundance."

OCCURRENCE OF GROUND WATER

Principles of Occurrence

Ground water is defined as water contained in the voids or opening of rocks or sediments below the water table; therefore, the water table marks the upper surface of the saturated zone of the water-bearing formation. The common belief that ground water occurs in "veins" which crisscross the area in a disconnected maze is a fallacy, for it can be shown that water occurs nearly everywhere beneath the land surface. The depth of a water supply depends upon the water table, which is not static, but fluctuates and in general reflects the surface topography. The water table may range from a few feet to many tens of feet beneath the surface and in the Gettysburg area it ranges from five to 85 feet beneath the land surface. The water table was not encountered in several test holes in the area due to the shallow bedrock depth.

The amount of water which can be stored in a saturated material is equal to the amount of voids or pore spaces in that material. A measurement of the capability of a material to store water (or any other liquid) is called porosity. Porosity depends entirely on the shape and arrangement of the particles in a material, and is not affected by size. Sands and gravels usually have porosities of 20 to 40 percent, whereas sandstones normally have porosities of 15 to 25 percent; the lower porosity of sandstones is due to closer packing and to cementation of the particles.

Permeability is the rate at which a fluid will pass through a substance. If the pore spaces of a material are connected, the permeability of that material will be high. If the pore spaces are not connected, the permeability will be low. Thus, a material may have high porosity and still not yield water readily because of low permeability. Sands and gravels, however, tend to have both high porosity and high permeability. Thus, a geologist is not concerned with finding a "vein" when looking for a good water supply. Because water occurs almost everywhere in the ground, he is searching instead for a sand or gravel or other similarly porous and permeable deposit that lies beneath the water table.

Nearly all ground water is derived from precipitation. Rain or melting snow either percolates downward to the ground-water table or drains off as surface water. Surface water either evaporates, drains to the ocean by means of streams, or percolates down to the water table. In general, the precipitated water that percolates down to the water table flows laterally down the hydraulic gradient and is said to be in transient storage.

Recharge, the addition of water to an aquifer, is accomplished in one or more of the following ways: (1) direct downward percolation derived from rain or melting snow; (2) downward percolation from surface bodies of water; and, (3) underflow of water in transient storage in the aquifer.

Discharge or removal of ground water is accomplished in four main ways: (1) transpiration by plants and evaporation; (2) seepage upward or laterally into surface bodies of water; (3) underflow of water in transient storage from the aquifer; and, (4) pumping water from wells completed in the aquifer.

Ground Water in Alluvium

Small amounts of alluvium occur along the creeks and drainages in the Gettysburg area (fig. 4). Because of the high clay and silt content, the alluvium has low permeability, and therefore would yield only limited supplies of water to wells.

Ground Water in Glacial Deposits

Till does not readily yield large volumes of water to wells because of its highly unsorted nature and resulting low permeability. Outwash, in the form of thin, discontinuous sand and gravel lenses included in the till is present throughout much of the area. These deposits often provide sufficient water for stock and domestic purposes but yield insufficient amounts of water for large capacity wells.

Outwash deposits, because they contain less clay- and silt-sized particles and have a higher permeability, readily yield large quantities of water where they are present below the water table and are of considerable areal extent. Surface outwash is present at several locations around Gettysburg (fig. 4). An outwash buried by 100 feet or more of till is also present northwest of Gettysburg (fig. 5).

Figure 6 shows the saturated thickness and location of the significant surficial outwash deposits in the Gettysburg area. The saturated portion of the broad surface outwash about 10 miles southeast of Gettysburg is relatively thin. Several test holes penetrated less than 20 feet of saturated material (fig. 6) which in most instances is the minimum thickness required for large capacity wells. Within this surface outwash, Area A appears to contain more than 20 feet of saturated sand and gravel (fig. 6). The till "island" which is partly within Area A is about 20 feet thick (test hole 97, App. A) and overlies sand and gravel hydraulically connected to the adjacent surface sand and gravel. Thus all of the gravel in Area A constitutes a single aquifer. The potential water-producing capacity of this area is substantiated by the irrigation well adjacent to test hole 97.

The broad surface outwash around Lebanon (fig. 6) is similar to the area just discussed. Some of the surface outwash is unsaturated, while part of it has less than 20 feet of saturated material. Within this outwash, however, Area B appears to contain 20 to 40 feet of saturated material (see test holes 28 and 29, App. A and fig. 6). If the hydraulic properties of the outwash in Area B are similar to those of the outwash in Area A, it seems likely that high capacity wells could also be drilled in Area B.

Area C is located 5 miles north of Gettysburg (fig. 6). The aquifer in this area is surface

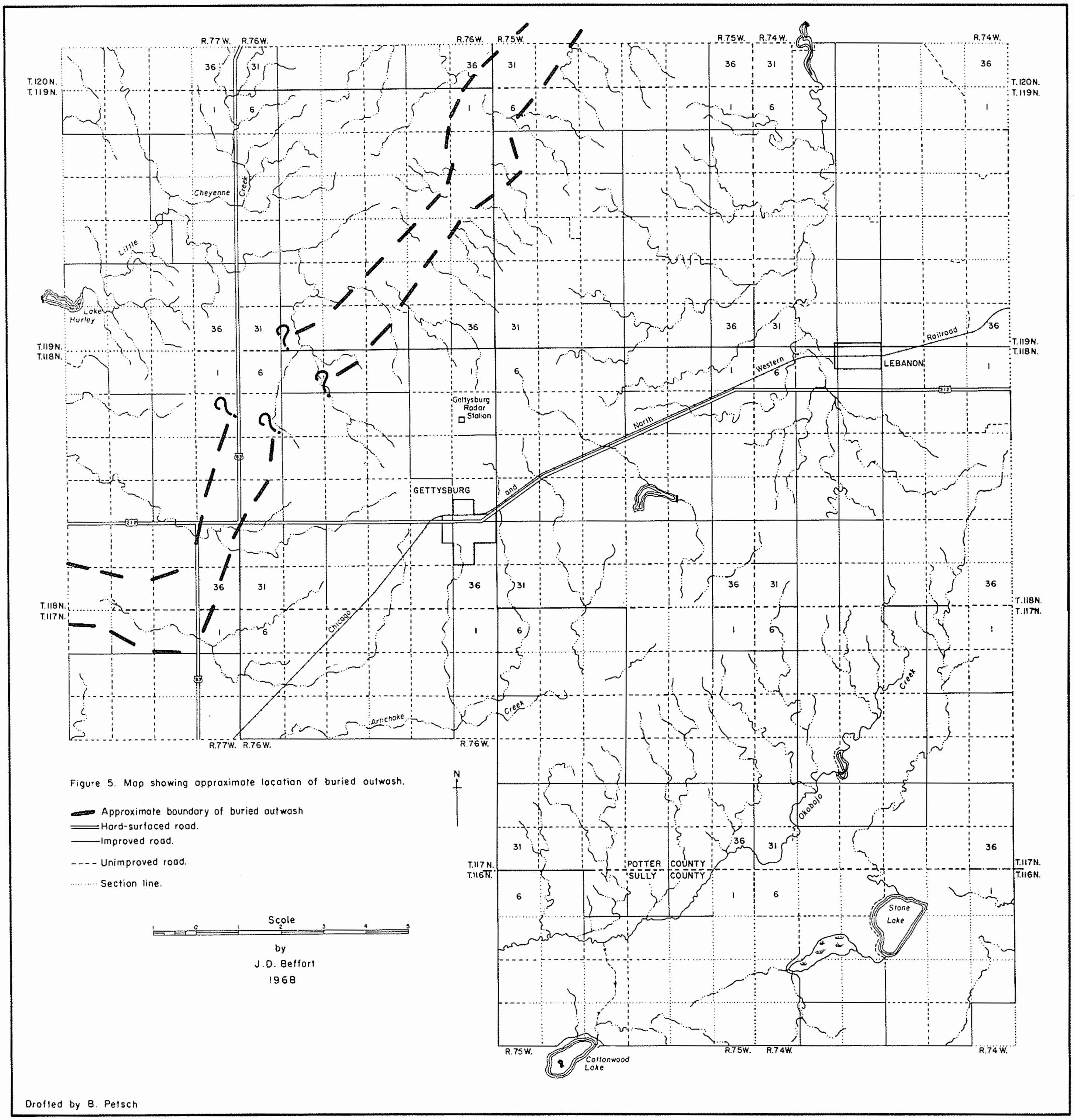

Figure 5. Map showing approximate location of buried outwash.

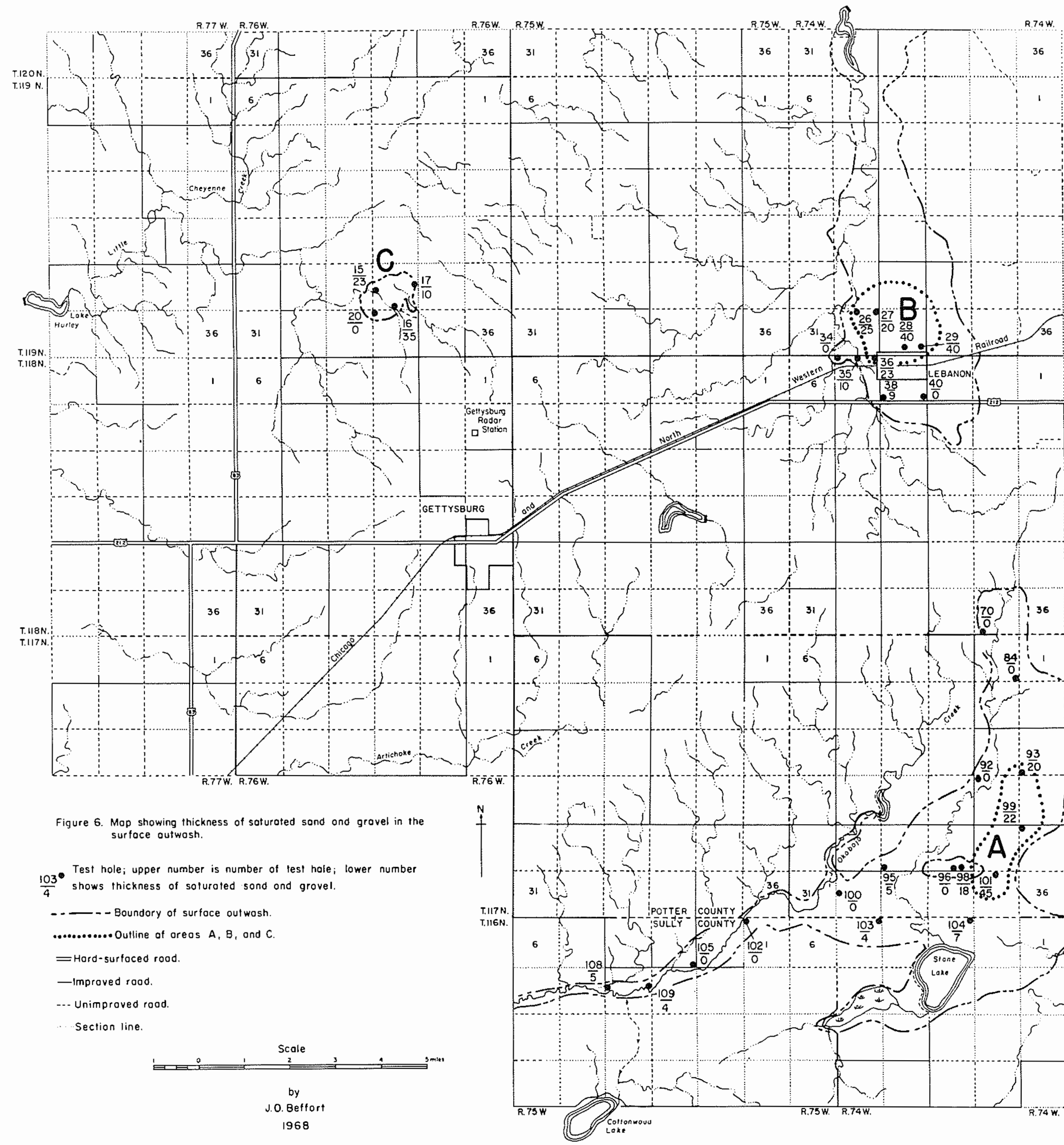

Figure 6. Map showing thickness of saturated sand and gravel in the surface outwash.

103/4 ● Test hole; upper number is number of test hole; lower number shows thickness of saturated sand and gravel.

- - — - - Boundary of surface outwash.

•••••••••• Outline of areas A, B, and C.

═ Hard-surfaced road.

— Improved road.

--- Unimproved road.

····· Section line.

Scale

0 1 2 3 4 5 miles

by

J.O. Beffort

1968

Drafted by Bruno Petsch

outwash up to 35 feet thick (test hole 16, fig. 6 and App. A). Although initially large capacity wells could probably be developed in this area, the limited extent of the aquifer and recharge area indicates that sustained high-capacity pumping would rapidly deplete the aquifer.

A buried outwash is present in a northeast-southwest trending valley (fig. 5). This valley is cut into bedrock and has been refilled with outwash (including some old lake bed deposits) and till. The location of this valley and the aquifer as shown on figure 5 is only approximate, based on several test holes in and near it, well interviews, and geologic mapping. The buried outwash is sometimes very thick, such as shown by test hole 52 (App. A), where 130 feet of sand and gravel was penetrated. However, much of the sand is fine and contains considerable clay, and the gravel, when present, is thin and poorly sorted. Thus, no continuous bed of sufficient thickness and permeability was located which would produce long term, high capacity yields to wells. Adequate water for stock and domestic purposes would, however, be available in most areas. The foregoing conclusions are based on drilling characteristics, examination of cuttings and electric log profiles of most rotary test holes.

Ground Water in the Subsurface Bedrock

A few farms in the area obtain water from the Pierre Shale. However, much of this water probably comes from sand or sandy clay directly above the shale. This water is usually of poor quality and the wells yield small quantities of water.

The sandstones of the Dakota Formation, and the Fall River Sandstone are the only bedrock formations known to yield sufficient water for city needs. The Dakota Formation occurs at a depth of approximately 1800 feet below land surface and the waters are under artesian pressure but do not flow. The Fall River Sandstone occurs at a depth of about 2200 feet below land surface and this formation produces flowing wells.

Quality of Ground Water

Rain and snow are nearly pure before they reach the ground; however, all ground water contains minerals which are obtained: (1) from the atmosphere; (2) from soil and underlying deposits as the water percolates downward to the water table; and (3) from depths below the water table in which the water is circulating. In general, it can be said that the more minerals a water contains, the poorer its quality. The water of the Dakota Formation and Fall River Sandstone is softer than water from glacial deposits, but is usually of poorer quality because of the greater amounts of minerals contained in the water.

Table 1 shows the chemical properties of various water samples collected in the Gettysburg area compared with the present city water (samples 59 and 60) and with standards for drinking water established by the U. S. Department of Public Health in 1962 and modified by the S. D. Department of Health in 1968 (sample A). Figure 3 shows the location of water samples and test holes.

Samples 85, 98, 99, and 100 were collected from the surface outwash area southeast of Gettysburg which includes area A. Samples 85 and 100 exceed the standards only in total solids and sample 85 also has excess magnesium and sulfate. Samples 98 and 99 are well within the established limits. It should be noted that sample 99 from an auger test hole is one of the best waters sampled and is located in recommended area A.

Water sample 39 was obtained from a private well at the south end of area **B** and is considered to be indicative of the water quality in that area. This sample exceeds the standards only in magnesium, and there only slightly.

Water sample 16 is from the surface outwash in Area C and is within the recommended limits for all chemical constituents tested.

Water sample 4 is from a rotary test hole and indicates the quality of water in the buried outwash. This water exceeds the recommended limits in magnesium, chloride, sulfate, and total solids.

Data Collection Point Number	Location	Well or Test Hole Number	Depth in feet	Source[1]	Calcium	Sodium	Magne-sium	Chloride	Sulfate	Iron	Manga-nese	Nitrogen	Fluoride	pH	Hardness as $CaCO_3$	Total Solids
A	U.S. Public Health Department Recommended Limits				---	---	50	250	500[2]	0.3	0.05	10.0	0.9-1.7[3]	---	---	1000[1]
4W	SE¼SE¼SE¼SW¼ sec. 1, T. 119 N., R. 76 W.	Rotary Hole	275	Dr	144		61	570	960	0.08				7.8	510	2540
5W	SW¼SE¼SE¼SE¼ sec. 1, T. 119 N., R. 76 W.	F. Griffith	32	Dr	663		214	130	4150	Trace				7.2	2525	4850
11W	SW¼SW¼SE¼SW¼ sec. 13, T. 119 N., R. 76 W.	E. Anderson	25	Dr	338		78	135	552	0.0				7.2	1160	1540
16W	SE¼SE¼SE¼SW¼ sec. 27, T. 119 N., R. 76 W.	Auger Hole	105	Dr	62		16	9	36	0.24				8.1	220	470
20W	NW¼NW¼NW¼NW¼ sec. 34, T. 119 N., R. 76 W.	Auger Hole	125	Dr	104		33	12	288	0.04				7.8	395	815
20aW	NW¼NW¼NW¼NW¼ sec. 34, T. 119 N., R. 76 W.	Rotary Hole	375	Dr	708		27	22	348	0.08				7.8	380	900
21W	NE¼SE¼SE¼SE¼ sec. 34, T. 119 N., R. 76 W.	C. McLain	60	Dr	450		122	85	2520	1.68				6.8	1620	3270
39W	NE¼ sec. 4, T. 118 N., R. 74 W.	V. Worm		So	86	56	55	100	83	0.0	0.0	2.5	0.6		443	666
41W	SE¼NE¼NE¼NE¼ sec. 8, T. 118 N., R. 76 W.	N. Vandenburg	90	Dr	68		19	28	120	0.04				7.5	250	860
51W	NE¼SE¼SW¼SW¼ sec. 23, T. 118 N., R. 77 W.	J. Worth	22	Dr	200		61	35	553	Trace				7.3	750	1100
53W	SE¼SE¼SE¼SE¼ sec. 19, T. 118 N., R. 76 W.	C. Worth	98	Dr	144		52	85	1010	Trace				7.2	560	1970
56W	SE¼SE¼SE¼SE¼ sec. 28, T. 118 N., R. 77 W.	D. Cronin	22	Dr	160		44	25	348	Trace				7.4	580	870
59W	NW¼ sec. 25, T. 118 N., R. 76 W.	City Well No. 2	1917	D	10	750	3	510	354	0.1	0.0	1.5	2.5	8.3	38	2165
60W	NE¼ sec. 25, T. 118 N., R. 76 W.	City Well No. 1	1950	D	8	750	4	665	185	1.2	0.1	0.6	2.4	8.3	38	2108
62W	SE¼NE¼NE¼NE¼ sec. 25, T. 118 N., R. 76 W.	Dakota Boring	102	Dr	34		10	600	433	0.12				7.7	124	2400
68W	SW¼SW¼NW¼NW¼ sec. 35, T. 118 N., R. 75 W.	C. Orman	24	Dr	265		11	100	445	1.2				7.3	920	1415
74W	NW¼NW¼NW¼SW¼ sec. 7, T. 117 N., R. 76 W.	W. Wordeman	31	Dr	96		19	0.0	24	0.0				7.6	320	500
75W	SW¼NW¼NW¼NW¼ sec. 9, T. 117 N., R. 76 W.	C. Iverson	20	Dr	193		76	35	570	Trace				7.4	790	1015
85W	SE¼SE¼SW¼SW¼ sec. 7, T. 117 N., R. 73 W.	M. Hobes	35	So	340		105	48	1100	0.0				7.6	1250	1545
87W	SE¼SE¼SE¼SE¼ sec. 14, T. 117 N., R. 76 W.	H. Sunne	26	Dr	145		52	220	336	0.4				7.6	570	1120
90W	NW¼NW¼NW¼NE¼ sec. 13, T. 117 N., R. 76 W.	R. LaRosh	60	Dr	72		49	0.0	Trace	0.04				7.7	380	400
98W	NW¼NW¼SE¼SE¼ sec. 27, T. 117 N., R. 74 W.	M. Hobes (irrigation well)	40	So	140		39	26	396	0.02				7.7	510	843
99W	NW¼NW¼NW¼NW¼ sec. 25, T. 117 N., R. 74 W.	Auger Hole	95	So	76		25	18	180	0.20				8.0	290	585
100W	NW¼NW¼NW¼SW¼ sec. 32, T. 117 N., R. 74 W.	Auger Hole	35	So	79		9	45	330	0.30				8.1	290	1112
114W	SE¼SW¼SW¼NW¼ sec. 22, T. 116 N., R. 75 W.	R. Wilhelm	75	Dr	106		36	32	216	0.06				7.5	410	820

1 Source: D = Dakota Sandstone; Dr = Glacial drift (undifferentiated); So = surface outwash

2 Modified for South Dakota by the South Dakota Department of Health (written communication, March 20, 1968).

3 Optimum

In general, the quality of water from the glacial deposits is of better quality than the present city supply (samples 59 and 60).

CONCLUSIONS AND RECOMMENDATIONS

As a result of this survey it was found that Area A southeast of Gettysburg or Area B near Lebanon offer about equal possibilities for development of a shallow ground-water supply. The data collected for this study indicate that the water quality in both areas is similar and that with little or no treatment it would be far superior to the present city supply. Disadvantages of these two areas as a potential water source are: (1) distance from Gettysburg (Area A, 12 miles; Area B, 9 to 10 miles); and (2) a pumping lift of 100 to 250 feet.

Figure 6 shows the data on which Areas A and B were selected. Before definite plans are instigated for development of either of these areas, one or both areas should be further tested for extent and thickness of the aquifers and one or more rigidly controlled aquifer tests should be conducted to determine the hydraulic characteristics of each aquifer. Only after this additional testing can the decision be made as to the advisability of developing one of these areas for a municipal ground-water supply.

As a preliminary measure to further testing of the ground- water supplies it would be advisable to have a complete engineering cost-estimate of developing a ground-water supply at either of the two areas mentioned in this report. This estimate should include installation, maintenance and operation costs projected over a period of at least 20 years. The estimate could then be compared to the cost of alternate water development plans to determine if further consideration of these ground-water aquifers is economically sound.

Should the city finally decide to develop a ground-water supply, all testing and design should be handled by a consulting engineering firm licensed in South Dakota. The South Dakota Water Resources Commission should be consulted for permits to drill wells and to secure water rights. The South Dakota Department of Public Health should be consulted with regard to biological and chemical suitability of the water.

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Rothrock, E. P., 1943, A geology of South Dakota, Pt. 1: The surface: S. Dak. Geol. Survey Bull. 13, pl. 2.

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APPENDIX A

Logs of test holes and wells in the Gettysburg area.

(for locations see figure 3)

No. 1
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 29, T. 120 N., R. 75 W.

0- 9	Clay, brown
9- 20	Clay, grayish-brown
20- 73	Clay, brown (till)
73- 80	Clay, gray (till)
80-125	Clay, gray (till); losing circulation; material appears to be well jointed
125-155	Same, with few gravel stringers
155-170	Clay, medium-gray, soft (shale)

* * * *

No. 2
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SE¼ sec. 29, T. 120 N., R. 75 W.

0- 16	Clay, grayish-brown
16- 20	Clay, dark-gray
20- 35	Clay, brown
35- 50	Clay and till, brown, silty; drills tough
50- 95	Clay, gray (till); reddish zones; a few rocks
95-155	Clay, gray, and some brown clay and shale pebbles; tough drilling; losing water; from 110 to 125 feet cuttings are fine grained with lots of black sand-size shale particles
155-185	Shale, recovered circulation

* * * *

No. 3
SDGS Rotary Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 1, T. 119 N., R. 76 W.

0- 9	Clay, brown
9- 23	Clay, grayish-brown
23- 35	Clay, gray (rocks at 34 feet)
35- 95	Clay, gray
95-125	No samples, losing circulation
125-155	No samples, drills like a poor sand
155-185	No samples, drills like clay
185-200	Clay, gray
200-215	Clay, gray, sandy
215-230	Gravel, clay and sand interbedded

No. 3 – continued.

230-270	Clay, sandy (drills like a gravelly till)
270-295	Shale

* * * *

No. 4W
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SW¼ sec. 1, T. 119 N., R. 76 W.

0- 10	Silt, yellow
10- 30	Clay, brown (till)
30- 50	Clay, gray
50- 65	Clay, gray, and sand stringers; sand is mostly shale pebbles
65-125	Clay, gray
125-155	Clay, gray
155-170	No samples; drills like shale
170-200	Clay, gray
200-245	Till (?), pebbly
245-260	Till (?) or shale
260-275	Shale

* * * *

No. 5W

No log – water sample available, see table 1.

* * * *

No. 6
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 6, T. 119 N., R. 75 W.

0- 2	Topsoil
2- 22	Clay, brown, pebbly
22- 57	Clay, gray-black, pebbly
57-125	Clay, gray, pebbly
	Water level = 64 feet

* * * *

No. 7
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 4, T. 119 N., R. 75 W.

0- 2	Topsoil
2- 7	Clay, gray, pebbly
7- 25	Clay, gray, pebbly
	No water

* * * *

No. 8
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 12, T. 119 N., R. 76 W.

0- 20	Clay, 50 percent; coarse gravel and sand
20- 32	Clay, yellowish-brown; sand and gravel stringers
32- 65	Clay, gray, silty; pebbly till
65- 80	No samples; drills like clay
80-194	Sand, silty; shale pebbles
194-200	Shale

* * * *

No. 9
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NW¼ sec. 8, T. 119 N., R. 75 W.

0- 2	Topsoil, black
2- 12	Clay, brown, with some sand
12- 17	Clay, gray-brown, pebbly
17- 25	Clay, gray, pebbly
	No water

* * * *

No. 10
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SW¼ sec. 8, T. 119 N., R. 75 W.

0- 15	Clay, grayish-brown
15- 23	Clay, reddish-brown
23- 80	Clay, grayish-brown
80-103	Clay, gray
103-125	Clay, medium dark-gray (shale)

* * * *

No. 11W

No log – water sample available, see table 1

* * * *

No. 12
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 16, T. 119 N., R. 75 W.

0- 16	Clay, light-gray turning to brown, pebbly
16- 50	Clay, gray, silty, pebbly
50- 65	Same; gravelly in spots; many shale pebbles last 2 feet
65- 80	Shale pebbles; coming up like gravel; drills like sand

No. 12 – continued.

80-110	Clay, gray, silty, pebbly; also shale pebbles; a few very thin gravel stringers
110-125	Clay, gray, silty, pebbly
125-211	Clay, gray, silty, sandy (lake clay); a few gravel stringers
211-230	Clay, dark-gray (shale)

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No. 13
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 24, T. 119 N., R. 76 W.

0- 15	Clay, brown; a few gravel stringers
15- 20	Shale, weathered
20- 35	Shale, medium dark-gray

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No. 14
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 24, T. 119 N., R. 75 W.

0- 5	Silt, tan
5- 10	Clay, brown
10- 15	Clay, grayish-brown
15- 51	Clay, gray
51- 65	Clay, medium dark-gray (shale); bentonite

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No. 15
SDGS Auger Test Hole
Location: NW¼NW¼NW¼SW¼ sec. 27, T. 119 N., R. 76 W.

0- 1	Topsoil
1- 9	Clay, brown, pebbly
9- 35	Sand, brown, fine to medium, mixed with clay
35- 42	Clay, gray, sandy
42-102	Clay, gray, sandy, pebbly
102-115	Clay, gray to black, a few pebbles
	Water level = 12 feet

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No. 16W
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SW¼ sec. 27, T. 119 N., R. 76 W.

0- 1	Topsoil
1- 7	Clay, brown, pebbly

No. 16W – continued.

7- 12	Clay, dark-brown, pebbly
12- 17	Clay, brown, sandy, silty
17- 52	Gravel, clayey
52- 95	Clay, gray, sandy and pebbly
95-105	Clay, gray, pebbly
	Water level = 17 feet

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No. 17
SDGS Auger Test Hole
Location: SE¼SE¼SE¼NE¼ sec. 27, T. 119 N., R. 76 W.

0- 1	Topsoil
1- 10	Gravel, brown, mixed with clay
10- 22	Sand, brown, medium to coarse, mixed with clay
22- 97	Clay, gray, sandy
97-105	Clay, pebbly
	Water level = 12 feet

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No. 18
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 25, T. 119 N., R. 76 W.

0- 48	Clay, brown and gray, gravelly
48- 65	Shale

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No. 19
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 30, T. 119 N., R. 74 W.

0- 2	Topsoil, black
2- 47	Clay, grayish-brown, pebbly
47- 55	Clay, gray to black, possibly some reworked shale at 55 feet
	No water

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No. 20W
SDGS Auger Test Hole*
Location: NW¼NW¼NW¼NW¼ sec. 34, T. 119 N., R. 76 W.

0- 1	Topsoil
1- 7	Clay, brown, pebbly
7- 17	Clay, gray, with large pebbles and rocks
17- 46	Clay, gray, pebbly

No. 20W – continued.

46-125	Clay, gray, sandy Water level = 42 feet

*See next log (20a) for rotary drill hole near same location.

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No. 20aW
SDGS Rotary Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 34, T. 119 N., R. 76 W.

0- 12	Gravel, very coarse
12- 14	Clay, yellow
14- 50	Clay, gray, silty, pebbly
50-106	Sand, very fine, silty, (lake deposits?)
106-125	Clay, silty, sandy
125-140	Clay, very silty with 2 feet of gravel from 128 to 130 feet
140-155	Clay, silty, gravelly from 149 to 155 feet
155-170	Clay, silty, sandy, and some pea-size gravel
170-185	Clay, gravelly
185-215	Clay, gray, silty, sandy; sand and gravel from 209 to 215 feet
215-230	Sand and gravel with gray clay
230-275	Gravel and clay interbedded; shale pebbles
275-290	No samples, drills like sand and gravel
290-335	Clay, gray, sandy, silty
335-355	Clay with rocks or limestone ledges
355-375	Clay, medium-gray, soft, fissile

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No. 21W

No log - water sample available, see table 1

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No. 22
SDGS Auger Test Hole
Location: SW¼SW¼SW¼NW¼ sec. 36, T. 119 N., R. 76 W.

0- 2	Topsoil, brown
2- 22	Clay, dark-brown, pebbly
22- 37	Clay, gray, pebbly
37- 57	Clay, gray, with fine sand
57- 65	Clay and reworked shale, black
65- 90	Shale Water level = 37 feet

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No. 23
SDGS Auger Test Hole
Location: NW¼NW¼NE¼NE¼ sec. 36, T. 119 N., R. 76 W.

0- 1	Topsoil, brown
1- 37	Clay, brown, pebbly
37- 62	Clay, gray, pebbly
62- 65	Shale
	No water

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No. 24
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 31, T. 119 N., R. 75 W.

0- 8	Clay, yellowish-brown
8- 17	Clay, brown
17- 35	Till, brown, clay-rich
35- 50	Clay, grayish-brown
50- 65	Clay, medium-gray, till
65-110	Clay, dark-gray
110-125	No samples; drills like shale
125-140	Clay, medium dark-gray (shale); bentonite

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No. 25
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 31, T. 119 N., R. 74 W.

0- 1	Topsoil, black
1- 12	Clay, brown, pebbly
12- 35	Clay, gray to black
	No water

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No. 26
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NE¼ sec. 32, T. 119 N., R. 74 W.

0- 2	Topsoil, black
2- 7	Clay, brown, sandy and pebbly
7- 12	Sand, brown, fine-medium, mixed with clay
12- 32	Sand, gray, fine-medium, clean
32- 37	Sand, gray, clayey
37- 42	Clay, gray, sandy, pebbly
42- 47	Clay, gray, a few pebbles
47- 50	Shale
	Water level = 12 feet

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No. 27
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 32, T. 119 N., R. 74 W.

0- 27	Sand, brown, clayey
27- 37	Sand, gray, mixed with clay
37- 42	Clay, gray, sandy, pebbly
42- 50	Clay, gray, a few pebbles

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No. 28
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SW¼ sec. 33, T. 119 N., R. 74 W.

0- 1	Topsoil, black
1- 7	Clay, brown, sandy
7- 27	Sand, brown, medium to coarse
27- 47	Sand, gray, medium to coarse
47- 60	Clay, mixed with sand; large pebbles
60- 65	Shale
	Water level = 7 feet

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No. 29
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 33, T. 119 N., R. 74 W.

0- 2	Topsoil
2- 7	Clay, brown, pebbly
7- 17	Sand, brown, fine to medium, poorly sorted
17- 37	Sand, brown, medium to coarse, fairly clean
37- 47	Sand, gray, mixed with clay
47- 67	Clay, gray, pebbly, sandy
67- 90	Clay, gray, very few pebbles; pieces of reworked shale at 90 feet
	Water level = 6 feet

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No. 30
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 5, T. 118 N., R. 76 W.

0- 10	Silt, tan
10- 20	Clay, medium-brown
20- 50	Clay, gray
50- 65	Clay, gray, silty; rocks at 65 feet
65- 90	No samples; drills like silty till
90- 95	Clay, grayish-brown; (lake deposits?)
95-110	Silt, gray, and clay; also some sand

No. 30 – continued.

110-113	Gravel
113-125	Clay, medium dark-gray (shale)

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No. 31
SDGS Rotary Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 4, T. 118 N., R. 76 W.

0- 17	Clay, grayish-brown
17- 80	Clay, gray, some silt
80- 95	Sand, clayey
95-110	Clay, gray
110-155	No sample; drills like sand
155-162	Gravel, coarse
162-185	No sample; drills like sand
185-215	Sand and a few gravel stringers
215-230	Clay, sandy
230-245	Silt and some gray clay
245-290	Sand, silt, clay interbedded
290-305	Silt
305-360	Sand, silt, clay
360-370	Rocks
370-380	No sample
380-400	Clay, medium-gray (shale)

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No. 32
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 2, T. 118 N., R. 76 W.

0- 5	Road fill
5- 15	Clay, grayish-brown
15- 25	Clay, yellowish-brown (till)
25- 50	Clay, grayish-brown
50- 80	Clay, brown to gray, gravelly
80- 95	Gravel
95-110	Clay, dark-gray (shale)

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No. 33
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 6, T. 118 N., R. 74 W.

0- 2	Topsoil, black
2- 12	Clay, brown, a few pebbles
12- 27	Clay, gray, a few pebbles
27- 30	Shale
	No water

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No. 34
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 5, T. 118 N., R. 74 W.

0- 2	Topsoil
2- 5	Gravel, brown, with clay
5- 18	Clay, gray, with a few small pebbles
18- 20	Shale
	No water

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No. 35
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NE¼ sec. 5, T. 118 N., R. 74 W.

0- 2	Topsoil, black
2- 7	Sand, brown, fine
7- 12	Sand, brown, poorly sorted
12- 17	Sand, gray, mixed with clay
17- 22	Clay, gray, pebbly
22- 25	Shale
	Water level = 7 feet

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No. 36
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 5, T. 118 N., R. 74 W.

0- 2	Topsoil, black
2- 7	Clay, brown, pebbly
7- 22	Sand, brown, fine to medium, poorly sorted
22- 32	Sand, gray, mixed with clay
32- 40	Shale
	Water level = 9 feet

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No. 37
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 5, T. 118 N., R. 74 W.

0- 1	Topsoil, black
1- 22	Clay, brown, pebbly
22- 45	Clay, black, pebbly
45- 50	Shale, black
	Water level = 40 feet

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No. 38
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 4, T. 118 N., R. 74 W.

0- 1	Topsoil
1- 7	Clay, light-brown, silty
7- 17	Sand, brown, very fine
17- 35	Clay, gray, pebbly
35- 40	Shale
	Water level = 8 feet

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No. 39W

No log - water sample available, see table 1

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No. 40
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 4, T. 118 N., R. 74 W.

0- 1	Topsoil, black
1- 22	Clay, brown, gravelly and sandy
22- 32	Clay, gray, gravelly and sandy
32- 58	Clay, gray, pebbly
58- 65	Shale
	Water level = 22 feet

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No. 41W

No log - water sample available, see table 1

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No. 42
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 8, T. 118 N., R. 76 W.

0- 5	Silt, tan
5- 15	Clay, grayish-brown
15- 20	Clay, brownish-gray (clay-rich till)
20- 30	Clay, gray
30- 35	Clay, yellowish-brown
35- 80	Clay, gray
80- 94	Silt, gray
94-110	Clay, medium-gray (shale)

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No. 43
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 8, T. 118 N., R. 75 W.

0- 35	Clay, medium-brown
35- 50	Clay, grayish-brown
50- 60	Clay, light-brown
60-107	Clay, gray
107-125	Clay, medium-gray (shale)

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No. 44
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 11, T. 118 N., R. 75 W.

0- 1	Topsoil
1- 57	Clay, brown, silty and pebbly
57- 67	Clay, black, with reworked shale
67- 70	Shale, black
	Water level = 57 feet

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No. 45
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 12, T. 118 N., R. 75 W.

0- 2	Topsoil
2- 32	Clay, dark-brown, pebbly
32- 67	Clay, gray to black, pebbly
67- 75	Shale, black, reworked
	No water

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No. 46
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SE¼ sec. 7, T. 118 N., R. 74 W.

0- 2	Topsoil, light-brown
2- 17	Clay, gray to black, pebbly
17- 30	Shale, black, reworked
30- 35	Shale, black
	No water

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No. 47
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 8, T. 118 N., R. 74 W.

No. 47 – continued.

0- 2	Topsoil, brown
2- 42	Clay, brown to black, pebbly
42- 55	Clay, black, pebbly
55- 75	Clay, gray to black, sandy, pebbly
	Water level = 50 feet

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No. 48
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 17, T. 118 N., R. 74 W.

0- 2	Topsoil, black
2- 22	Clay, brown, pebbly
22- 35	Clay, black, pebbly
35- 40	Shale, black
	No water

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No. 49
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NE¼ sec. 17, T. 118 N., R. 74 W.

0- 2	Topsoil, brown
2- 12	Clay, brown, pebbly
12- 30	Clay, black, pebbly
30- 35	Shale, black
	No water

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No. 50
SDGS Rotary Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 21, T. 118 N., R. 77 W.

0- 14	Silt, sand, and gravel stringers
14- 17	Shale, weathered
17- 35	Shale, dark-gray clay, hard, blocky

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No. 51W

No log - water sample available, see table 1

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No. 52
SDGS Rotary Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 24, T. 118 N., R. 77 W.

0- 18	Clay, brown, pebbly
18-155	Clay, gray, trace of silt and sand
155-170	Sand
170-185	Sand, clay and silt
185-200	Gravel, poorly sorted
200-245	Sand, poorly sorted
245-285	Sand, trace of gray clay
285-290	Shale, medium- to dark-gray clay

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No. 53W

No log - water sample available, see table 1

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No. 54
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 22, T. 118 N., R. 76 W.

0- 20	Clay, brown
20- 60	Clay, reddish-brown
60- 64	Shale, reworked, and brown clay
64- 80	Shale

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No. 55
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 24, T. 118 N., R. 75 W.

0- 1	Topsoil, black
1- 52	Clay, brown, pebbly
52- 65	Clay, gray, pebbly
65- 75	Shale
	No water

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No. 56W

No log - water sample available, see table 1

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No. 57
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 26, T. 118 N., R. 77 W.

0- 8	Silt, tan
8- 35	Clay, gray-brown (till)
35- 95	Clay, gray-brown
95-105	Gravel, poorly sorted
105-110	No sample; drills like shale
110-125	Clay, medium-gray (shale?)

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No. 58
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SE¼ sec. 30, T. 118 N., R. 76 W.

0- 10	Clay, brown
10- 15	Clay, gray
15- 40	Clay, brown
40- 80	Clay, gray
80- 99	Silt, gray (lake deposits)
99-110	Clay, dark-gray (shale)

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No. 59
Drillers Log
Location: NW¼NW¼ sec. 25, T. 118 N., R. 76 W.

0- 2	Topsoil
2- 92	Clay, yellow
92- 300	Clay, blue
300- 564	Shale, Pierre
564- 624	Chalk rock?
624- 950	Shale, Pierre
950-1436	Shale, black, oily
1436-1441	Caprock, soft
1441-1452	Caprock, hard
1452-1460	Caprock, soft
1460-1611	Shale, black, oily
1611-1613	Shale, sandy
1613-1629	Shale, black, oily
1629-1632	Pyrite
1632-1659	Shale, black, oily
1659-1667	Shale, tough
1667-1730	Shale, black, oily
1730-1789	Shale, sandy
1789-1917	Sand, water-bearing, some layers of shale Water level = 240 feet

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No. 60
Drillers Log
Location: NE¼ sec. 25, T. 118 N., R. 76 W.

0- 95	Clay, sandy, dark-gray
95- 145	Clay, sandy, dark-gray, some shale
145- 247	Shale, dark-gray
247- 267	Shale, dark-gray, sandy
267- 346	Shale, blue-gray
346- 370	Shale, hard, blue-gray
370- 380	Shale, soft, blue, streaks of sand
380- 422	Shale, hard, blue
422- 432	Shale, soft and hard layers, blue
432- 437	Shale, hard
437- 442	Shale, hard and soft streaks, blue
442- 450	Shale, soft, blue
450- 462	Shale, harder, runs soft to hard every 5 or 6 feet
462- 501	Shale, soft, blue
501- 511	Shale, hard, blue
511- 716	Shale, soft, blue
716- 920	Shale, soft, green-gray, bentonite streaks
920- 945	Shale, soft, light-rust, green-gray; bentonite
945- 972	Shale, soft, dark-gray, green, green-gray, and chalk
972-1010	Shale, soft, some chalk streaks, green and light-gray
1010-1080	Shale, soft, some chalk streaks, green, dark-gray, and yellow
1080-1110	Shale, soft, blue and green
1110-1310	Shale, harder, blue and green-gray
1310-1330	Shale, soft, blue-gray
1330-1410	Shale, soft, gray-black, blue-gray
1410-1412	Shale, hard streak, gray-black
1412-1415	Shale, soft, gray-black
1415-1425	Limestone, streaks, light-gray chips and shale (Greenhorn), dark- and light-gray shale
1425-1455	Shale, soft, blue-gray
1455-1458	Shale, soft, streak of limestone, blue, gray, yellow
1458-1640	Shale, soft, blue, green, gray
1640-1646	Shale, soft, streaks of hard rock, blue-gray
1646-1700	Shale, soft, blue-green
1700-1715	Shale, soft, blue-green, gray
1715-1717	Shale, soft, hard streak, blue-gray
1717-1806	Shale, soft, gray-blue
1806-1818	Shale, soft, hard streaks, dark and light-gray
1818-1822	Shale, soft, lignite, brown, gray, black
1822-1832	Sandstone
1832-1845	Shale and sandstone, brown, gray, yellow, black, green
1845-1875	Sandstone, soft, black and white
1875-1891	Slate and coal, hard, black, gray
1891-1901	Sandstone, soft
1901-1905	Shale and sandstone, hard, green, gray, black, brown
1905-1935	Shale and some sandstone and coal, hard, black, green
1935-1945	Shale and sand, soft, green, gray, gray-black
1945-1951	Shale, light-gray, dark-gray

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No. 61
SDGS Rotary Test Hole
Location: SE¼SW¼NE¼NE¼ sec. 25, T. 118 N., R. 76 W.

0- 8	Clay, brown
8- 65	Clay, grayish-brown
65-110	Clay, gray
110-125	No sample
125-155	Clay, gray
155-185	Shale

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No. 62
Drillers Log
Location: SE¼NE¼NE¼NE¼ sec. 25, T. 118 N., R. 76 W.

0- 70	Clay, brown, pebbly, numerous reworked shale pebbles
70- 90	Sand, brown, full of clay and shale pebbles
90-102	Clay, gray, sandy

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No. 63
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 28, T. 118 N., R. 75 W.

0- 2	Topsoil, black
2- 32	Clay, brown, a few small pebbles
32- 52	Clay, gray, pebbly
52- 80	Clay, gray, some sand
80- 87	Clay, gray, hard
87- 95	Shale (?)
	Water level = 52 feet

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No. 64
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 30, T. 118 N., R. 74 W.

0- 2	Topsoil, black
2- 22	Clay, dark-brown, pebbly
22- 67	Clay, gray to black, pebbly
67- 70	Shale
	No water

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No. 65
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 28, T. 118 N., R. 74 W.

0- 2	Topsoil
2- 15	Clay, dark-brown, pebbly
15- 42	Clay, gray, pebbly
42- 50	Shale
	Water level = 45 feet

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No. 66
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼NW¼ sec. 33, T. 118 N., R. 77 W.

0- 20	Clay, brown
20- 35	Clay, reddish-brown
35- 50	Clay, gray
50- 56	Sand, mostly shale pebbles
56- 65	Clay, gray
65- 80	Clay, silty (till)
80- 95	Clay, gray, silty
95-125	Clay, gray, silty, pebbly
125-143	Clay, gray, silty and shale pebbles
143-155	Shale

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No. 67
SDGS Rotary Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 33, T. 118 N., R. 76 W.

0- 8	Clay, yellowish-brown
8- 20	Clay, grayish-brown
20- 35	Clay, reddish-brown
35- 60	Clay, brown and gray
60- 67	Silt (loess?)
67- 80	Clay, gray, red mottling
80- 83	Clay, gray, sandy (Fox Hills?)
83-110	Shale

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No. 68W

No log - water sample available, see table 1

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No. 69
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 34, T. 118 N., R. 74 W.

0- 4	Clay, brown, pebbly
4- 15	Gravel, brown, medium
15- 21	Clay, brown, sandy and pebbly
21- 25	Sand, gray, clayey
25- 30	Shale, reworked
30- 35	Shale
	Water level = 20 feet

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No. 70
SDGS Auger Test Hole
Location: SW¼SW¼SE¼SW¼ sec. 35, T. 118 N., R. 74 W.

0- 6	Gravel, dark-brown, medium to coarse
6- 25	Clay, gray to brown
25- 30	Shale
	No water

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No. 71
SDGS Rotary Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 2, T. 117 N., R. 77 W.

0- 50	Clay, grayish-brown
50- 80	Clay, gray (till)
80- 95	Clay, gray (till); and gray silt (loess?)
95-110	No sample; drills like silt or sand
110-140	Clay, gravelly
140-155	Shale

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No. 72
SDGS Rotary Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 10, T. 117 N., R. 77 W.

0- 5	Silt, brown
5- 35	Clay, brown
35- 57	Clay, brownish-gray
57- 65	Silt, yellowish-brown (loess?)
65- 76	Clay, gray
76- 87	Gravel
87- 95	Clay-rich till, gray, or alluvium
95-106	Silt, gray
106-125	Clay, medium dark-gray (shale)

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No. 73
SDGS Rotary Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 12, T. 117 N., R. 77 W.

0- 13	Clay, brown
13- 20	Clay, grayish-brown
20- 35	Clay, reddish-brown
35- 45	Clay, grayish-brown
45- 80	Clay, gray
80- 95	No samples; drills like clay
95-105	Sand, poorly sorted
105-115	Gravel, coarse
115-121	Sand, poorly sorted
121-125	Clay, medium-gray (shale)
125-140	Shale, slightly calcareous

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No. 74W

No log - water sample available, see table 1

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No. 75W

No log - water sample available, see table 1

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No. 76
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 11, T. 117 N., R. 76 W.

0- 1	Topsoil
1- 80	Clay, dark-brown, pebbly
	No water

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No. 77
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 7, T. 117 N., R. 75 W.

0- 2	Topsoil
2- 17	Clay, brown, pebbly
17- 27	Clay, brown, sandy, pebbly
27- 68	Clay, gray, hard, a few pebbles
68- 75	Shale
	Water level = 17 feet

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No. 78
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 8, T. 117 N., R. 75 W.

0- 2	Topsoil
2- 8	Clay, yellowish-brown, silty
8- 52	Clay, dark-brown, pebbly
52-120	Clay, gray, pebbly
	No water

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No. 79
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 9, T. 117 N., R. 75 W.

0- 1	Topsoil
1- 5	Clay, brown, pebbly
5- 8	Gravel, brown
8- 57	Clay, brown-gray, pebbly
57-100	Clay, gray, pebbly
100-110	Shale
	Water level = 85 feet

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No. 80
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 11, T. 117 N., R. 75 W.

0- 2	Topsoil
2- 57	Clay, brown, pebbly
57- 82	Clay, gray, pebbly
82- 90	Clay, gray; possibility of reworked shale at 90 feet
	No water

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No. 81
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 7, T. 117 N., R. 74 W.

0- 2	Topsoil
2- 32	Clay, brown, pebbly
32- 52	Clay, gray-black, pebbly
52- 75	Clay, gray, pebbly
75- 80	Shale
	Water level = 52 feet

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No. 82
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 9, T. 117 N., R. 74 W.

0- 1	Topsoil
1- 7	Clay, brown
7- 32	Clay, dark-brown, pebbly
32- 47	Sand, gray, fine, silty, clayey
47- 55	Shale
	Water level = 35 feet

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No. 83
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 10, T. 117 N., R. 74 W.

0- 45	Clay, dark-brown, pebbly
45- 50	Clay, gray, pebbly
	No water

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No. 84
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 2, T. 117 N., R. 74 W.

0- 10	Gravel, brown, coarse
10- 37	Clay, dark-brown, sandy
37- 45	Shale, reworked
45- 50	Shale

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No. 85W

No log - water sample available, see table 1

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No. 86
SDGS Auger Test Hole
Location: NW¼SW¼SW¼SW¼ sec. 16, T. 117 N., R. 76 W.

0- 7	Clay, light-brown, pebbly
7- 17	Gravel, brown, coarse
17- 27	Sand and gravel, brown, with clay
27- 33	Sand, gray
33- 40	Shale
	Water level = 16 feet

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No. 87W

No log - water sample available, see table 1

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No. 88
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 14, T. 117 N., R. 76 W.

0- 2	Topsoil
2- 85	Clay, brown, pebbly
85- 90	Shale
	Water level = 27 feet

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No. 89
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 13, T. 117 N., R. 76 W.

0- 2	Topsoil
2- 12	Clay, brown, pebbly
12- 32	Clay, brown, sandy, pebbly
32-100	Clay, gray, pebbly
100-105	Shale
	Water level = 12 feet

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No. 90W

No log - water sample available, see table 1

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No. 91
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 18, T. 117 N., R. 75 W.

0- 1	Topsoil, brown
1- 70	Clay, brown, pebbly, hard
	No water

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No. 92
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 23, T. 117 N., R. 74 W.

0- 20	Clay, gray, gravelly
20- 50	Clay, gray-black, sandy
	No water

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No. 93
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 13, T. 117 N., R. 74 W.

0- 2	Topsoil
2- 22	Clay, yellowish-brown, sandy
22- 27	Clay, gray, sandy
27- 47	Sand, gray, fine
47- 55	Clay, gray, sandy
55- 60	Shale
	Water level = 15 feet

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No. 94
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 19, T. 117 N., R. 73 W.

0- 2	Topsoil
2- 30	Clay, brown, sandy
30- 42	Sand, gray, clay
42- 65	Clay, gray
65- 70	Shale
	Water level = 30 feet

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No. 95
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 28, T. 117 N., R. 74 W.

0- 4	Clay, brown, sandy, pebbly
4- 12	Gravel, medium-gray, brown
12- 15	Clay, brown
15- 20	Sand, brown, medium-grained, clayey
20- 35	Clay, gray, sandy, pebbly
35- 40	Shale, calcareous
	Water level = 15 feet

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No. 96
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SE¼ sec. 27, T. 117 N., R. 74 W.

0- 2	Topsoil
2- 32	Clay, light-brown, sandy (till)
32- 66	Clay, gray, sandy, a few pebbles (till)
66- 70	Shale
	No water

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No. 97
SDGS Auger Test Hole
Location: NW¼NW¼SE¼SE¼ sec. 27, T. 117 N., R. 74 W.

0- 20	Clay, brown, very sandy, pebbly
20- 30	Sand, gravelly, clayey
30- 48	Sand, medium-grained
48- 60	Clay, gray, hard, pebbly
	Water level = 30 feet

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No. 98W

No log - water sample available, see table 1

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No. 99W
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 25, T. 117 N., R. 74 W.

0- 2	Topsoil
2- 7	Clay, brown (till)
7- 17	Gravel, coarse
17- 22	Gravel
22- 37	Sand, brown, mixed with clay
37- 42	Clay, gray, 50 percent sand
42- 90	Clay, gray, a few pebbles, sandy
90- 95	Shale
	Water level = 15 feet

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No. 100W
SDGS Auger Test Hole
Location: NW¼NW¼NW¼SW¼ sec. 32, T. 117 N., R. 74 W.

0- 4	Clay, brown, pebbly
4- 14	Gravel, brown
14- 20	Clay, very sandy and pebbly
20- 28	Shale, reworked
28- 35	Shale
	Water level = 14 feet

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No. 101
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NW¼ sec. 35, T. 117 N., R. 74 W.

No. 101 -- continued.

0- 2	Topsoil
2- 5	Clay, light-brown
5- 22	Sand, brown, fine to medium
22- 50	Sand, gray, medium to coarse
50- 67	Clay, gray, pebbly
67- 70	Shale
	Water level = 5 feet

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No. 102
SDGS Auger Test Hole
Location: NW¼NW¼NW¼NW¼ sec. 2, T. 116 N., R. 75 W.

0- 10	Clay, brown, pebbly
10- 30	Clay, gray-black, sandy
30- 35	Shale
	Water level = 10 feet

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No. 103
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 6, T. 116 N., R. 74 W.

0- 6	Clay, brown, pebbly
6- 10	Gravel, very coarse
10- 16	Clay, gray, pebbly
16- 20	Shale
	Water level = 6 feet

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No. 104
SDGS Auger Test Hole
Location: NE¼NE¼NE¼NE¼ sec. 4, T. 116 N., R. 74 W.

0- 8	Clay, brown, pebbly
8- 15	Gravel, brown, fine to medium
15- 50	Clay, gray, very sandy
50- 55	Shale
	Water level = 8 feet

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No. 105
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 4, T. 116 N., R. 75 W.

No. 105 – continued.

0- 2	Topsoil
2- 14	Clay, brown, pebbly
14- 57	Clay, brown, sandy, pebbly
57- 63	Shale, reworked
63- 70	Shale
	Water level = 14 feet

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No. 106
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 3, T. 116 N., R. 75 W.

0- 2	Topsoil
2- 17	Clay, brown, large pebbles
17- 47	Clay, brown, pebbly, sandy
47- 60	Shale, reworked
60- 67	Shale
	Water level = 17 feet

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No. 107
SDGS Auger Test Hole
Location: SE¼SE¼SE¼SE¼ sec. 2, T. 116 N., R. 75 W.

0- 25	Clay, yellow-brown, silty
25- 55	Clay, gray, pebbly
55- 75	Clay, gray, sandy
75- 80	Clay, many rocks and pebbles
80- 85	Shale
	Water level = 55 feet

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No. 108
SDGS Auger Test Hole
Location: SW¼SW¼SW¼NW¼ sec. 8, T. 116 N., R. 75 W.

0- 2	Topsoil
2- 12	Clay, brown, pebbly
12- 17	Gravel, brown, coarse
17- 32	Clay, brown to black, sandy
32- 42	Shale, reworked
42- 45	Shale
	Water level = 12 feet

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No. 109
SDGS Auger Test Hole
Location: SE¼SE¼SE¼NE¼ sec. 8, T. 116 N., R. 75 W.

0- 2	Topsoil
2- 12	Clay, brown, pebbly
12- 18	Clay, gray-black, sandy
18- 22	Gravel, brown
22- 30	Shale, reworked, with sandy clay
30- 35	Shale
	Water level = 12 feet

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No. 110
SDGS Auger Test Hole
Location: NE¼NE¼SE¼SE¼ sec. 13, T. 116 N., R. 76 W.

0- 2	Topsoil
2- 10	Clay, brown, pebbly
10- 22	Clay, gray-brown, silty
22- 28	Gravel, coarse
28- 40	Shale, reworked
40- 50	Shale
	Water level = 10 feet

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No. 111
SDGS Auger Test Hole
Location: NW¼NW¼SW¼SW¼ sec. 14, T. 116 N., R. 75 W.

0- 15	Clay, dark-brown, pebbly
15-100	Clay, gray, trace of fine sand
	Water level = 15 feet

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No. 112
SDGS Auger Test Hole
Location: NE¼SE¼SE¼NE¼ sec. 14, T. 116 N., R. 75 W.

0- 12	Clay, gray, pebbly
12- 40	Clay, brown, sandy
40-105	Clay, gray, sandy
	Water level = 12 feet

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No. 113
SDGS Auger Test Hole
Location: SW¼SW¼SW¼SW¼ sec. 21, T. 116 N., R. 75 W.

0- 20	Clay, brown, pebbly
20- 60	Clay, gray, pebbly
	No water

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No. 114W

No log - water sample available, see table 1.

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APPENDIX B

Record of wells in the Gettysburg area.

Use: S, stock; D, domestic; I, irrigation
Geologic source: Dr., glacial drift; Sh, shale; D, Dakota Sandstone;
S, Sundance Sandstone

Name	Location	Depth of well in feet	Geologic Source	Use
A. Miekle	NE¼NE¼NE¼NW¼ sec. 4, T. 116 N., R. 74 W.	30	Dr	D,S
L. Nelson	NW¼NW¼NW¼SW¼ sec. 7, T. 116 N., R. 74 W.	70	Dr	D
J. Millar	SE¼NE¼NE¼NE¼ sec. 17, T. 116 N., R. 74 W.	20	Dr	S
C. Fischer	SE¼SW¼SW¼NW¼ sec. 18, T. 116 N., R. 74 W.	70	Dr	S
G. Wolforth	SW¼SW¼NW¼SW¼ sec. 19, T. 116 N., R. 74 W.	55	Dr	D
W. Fischer	SW¼NE¼NW¼NW¼ sec. 20, T. 116 N., R. 74 W.	32	Dr	D,S
P. Wilhelm	SE¼SW¼SW¼NW¼ sec. 22, T. 116 N., R. 75 W.	75	Dr	D,S
M. Hobes	SE¼SE¼SW¼SW¼ sec. 7, T. 117 N., R. 73 W.	35	Dr	D,S
F. Kirby	NW¼NW¼NE¼NE¼ sec. 2, T. 117 N., R. 74 W.	25	Dr	D,S
Munyon	NE¼NE¼SE¼SE¼ sec. 3, T. 117 N., R. 74 W.	65	Dr	D,S
H. Anderson	SE¼NE¼NE¼SW¼ sec. 11, T. 117 N., R. 74 W.	30	Dr	D,S
H. Anderson	SE¼NE¼NE¼SW¼ sec. 11, T. 117 N., R. 74 W.	60	Dr	D,S
H. Anderson	SE¼NE¼NE¼SW¼ sec. 11, T. 117 N., R. 74 W.	40	Dr	D,S
J. DeMots	NW¼NW¼NW¼NE¼ sec. 14, T. 117 N., R. 74 W.	25	Dr	D,S
J. DeMots	NW¼NW¼NW¼NW¼ sec. 13, T. 117 N., R. 74 W.	40	Dr	S

Name	Location	Depth of well in feet	Geologic Source	Use
M. Hobes	NE¼NE¼SE¼SE¼ sec. 15, T. 117 N., R. 74 W.	30	Dr	D,S
N. Leach	SE¼SE¼SE¼SE¼ sec. 21, T. 117 N., R. 74 W.	63	Dr	D,S
R. Goebel	SE¼SE¼SE¼SW¼ sec. 24, T. 117 N., R. 74 W.	19	Dr	D,S
W. Fischer	NW¼NW¼NW¼SW¼ sec. 26, T. 117 N., R. 74 W.	15	Dr	D,S
M. Hobes	NW¼NW¼SE¼SE¼ sec. 27, T. 117 N., R. 74 W.	40	Dr	I
C. Steesen	NE¼NE¼NE¼NE¼ sec. 34, T. 117 N., R. 74 W.	60	Dr	S
L. Schekel	SE¼SE¼SE¼SE¼ sec. 7, T. 117 N., R. 75 W.	1784	D	S
R. Britton	NW¼NW¼SW¼NW¼ sec. 12, T. 117 N., R. 75 W.	1756	D	D,S
K. Archer	NW¼NW¼NW¼SW¼ sec. 36, T. 117 N., R. 75 W.	30	Dr	D,S
T. Williams	SE¼SE¼SE¼NE¼ sec. 2, T. 117 N., R. 76 W.	2166	S	D,S
L. Schnider	NW¼NW¼NW¼SW¼ sec. 6, T. 117 N., R. 76 W.	1805	D	D,S
W. Wardeman	NW¼NW¼NW¼SW¼ sec. 7, T. 117 N., R. 76 W.	31	Dr	D,S
A. Hagney	SW¼SW¼SE¼SW¼ sec. 8, T. 117 N., R. 76 W.	14	Dr	D,S
N. Smith	SW¼SW¼NE¼SE¼ sec. 8, T. 117 N., R. 76 W.	20	Dr	D,S
C. Iverson	SW¼NW¼NW¼NW¼ sec. 9, T. 117 N., R. 76 W.	20	Dr	D,S
R. LaRosh	NW¼NW¼NW¼NE¼ sec. 13, T. 117 N., R. 76 W.	60	Dr	D,S
L. Larrington	NW¼SW¼SW¼NW¼ sec. 14, T. 117 N., R. 76 W.	25	Dr	D,S

Name	Location	Depth of well in feet	Geologic Source	Use
H. Sunne	SE¼SE¼SE¼SE¼ sec. 14, T. 117 N., R. 76 W.	26	Dr	D,S
R. Larrington	SE¼SE¼SE¼SE¼ sec. 15, T. 117 N., R. 76 W.	20	Dr	S
G. Robbennolt	SW¼SE¼SE¼SW¼ sec. 18, T. 117 N., R. 76 W.	30	Dr	D,S
T. Swenson	NE¼NE¼NW¼NW¼ sec. 19, T. 117 N., R. 76 W.	25	Dr	D,S
L. Gorman	SW¼SW¼NW¼NW¼ sec. 19, T. 117 N., R. 76 W.	15	Dr	D,S
P. Hagney	NE¼NW¼NW¼NW¼ sec. 20, T. 117 N., R. 76 W.	30	Dr	D,S
M. Lehmkuhl	NW¼NW¼NW¼NW¼ sec. 21, T. 117 N., R. 76 W.	18	Dr	D,S
G. Hall	SW¼SW¼SW¼NW¼ sec. 1, T. 117 N., R. 77 W.	38	Dr	D,S
A. Marks	NW¼NW¼SW¼SW¼ sec. 3, T. 117 N., R. 77 W.	1847	D	D,S
M. Duman	SW¼SW¼SW¼SE¼ sec. 6, T. 117 N., R. 77 W.	1700	D	D,S
R. Rausch	NE¼NE¼NE¼SE¼ sec. 9, T. 117 N., R. 77 W.	1700	D	D,S
M. White	NW¼NW¼NE¼NE¼ sec. 10, T. 117 N., R. 77 W.	150	Dr	D
M. White	NW¼NW¼NE¼NE¼ sec. 10, T. 117 N., R. 77 W.	1776	D	D,S
M. Parks	NE¼SE¼SE¼NE¼ sec. 17, T. 117 N., R. 77 W.	1800	D	D,S
F. Westphall	NE¼SE¼SE¼SE¼ sec. 23, T. 117 N., R. 77 W.	1700	D	D,S
L. Gorman	SW¼SW¼NE¼SE¼ sec. 24, T. 117 N., R. 77 W.	15	Dr	S
H. Crane	SW¼NW¼NW¼NW¼ sec. 31, T. 118 N., R. 74 W.	110	Dr	S
W. Hall	NW¼SW¼SW¼SE¼ sec. 35, T. 118 N., R. 74 W.	60	Dr	D,S

Name	Location	Depth of well in feet	Geologic Source	Use
L. Comeau	SW¼SW¼SW¼SW¼ sec. 18, T. 118 N., R. 75 W.	130	Dr	S
V. McDowell	NW¼NW¼NW¼NE¼ sec. 28, T. 118 N., R. 75 W.	65	Dr	D,S
D. Johnson	NE¼NE¼NE¼NE¼ sec. 33, T. 118 N., R. 75 W.	60	Dr	S
C. Ormen	SW¼SW¼NW¼NW¼ sec. 35, T. 118 N., R. 75 W.	24	Dr	D
H. Ahlemer	NW¼NW¼NW¼NE¼ sec. 1, T. 118 N., R. 76 W.	45	Dr	D,S
H. Larson	SE¼SE¼SE¼SW¼ sec. 5, T. 118 N., R. 76 W.	16	Dr	D,S
N. Vandenberg	SE¼SW¼NE¼NE¼ sec. 8, T. 118 N., R. 76 W.	90	Dr	D,S
K. Machan	SE¼SE¼SE¼SE¼ sec. 10, T. 118 N., R. 76 W.	156	Dr	S
K. Machan	SE¼SE¼SE¼SE¼ sec. 10, T. 118 N., R. 76 W.	2360	S	D,S
L. Hansen	SW¼SW¼SW¼SW¼ sec. 13, T. 118 N., R. 76 W.	120	Dr	D,S
E. Hansen	SE¼SW¼SW¼SE¼ sec. 14, T. 118 N., R. 76 W.	150	Dr	D
C. Worth	SE¼SE¼SE¼SE¼ sec. 19, T. 118 N., R. 76 W.	98	Dr	D,S
V. Chilstrom	SW¼SW¼SE¼SW¼ sec. 21, T. 118 N., R. 76 W.	1600	D	D,S
H. Larrington	SW¼NE¼NE¼SE¼ sec. 26, T. 118 N., R. 76 W.	100	Dr	D,S
P. Maltaverne	SW¼SW¼SE¼SW¼ sec. 27, T. 118 N., R. 76 W.	150	Dr	D,S
C. Peep	NE¼NE¼SE¼SE¼ sec. 3, T. 118 N., R. 77 W.	40	Dr	D,S
J. Worth	NE¼SE¼SW¼SW¼ sec. 23, T. 118 N., R. 77 W.	22	Dr	D,S
G. Fawcett	NE¼SW¼SW¼SW¼ sec. 24, T. 118 N., R. 77 W.	1800	D	D,S

Name	Location	Depth of well in feet	Geologic Source	Use
D. Underwood	NE¼NE¼NE¼SE¼ sec. 25, T. 118 N., R. 77 W.	40	Dr	D,S
D. Cronin	NE¼NE¼NE¼NE¼ sec. 28, T. 118 N., R. 77 W.	22	Dr	D,S
G. Cavanaugh	NE¼NE¼SW¼SW¼ sec. 31, T. 118 N., R. 77 W.	1700	D	D,S
C. Ochszher	NE¼NE¼NE¼SE¼ sec. 32, T. 118 N., R. 77 W.	250	Dr	D,S
E. Holzworth	SW¼SW¼SW¼NE¼ sec. 22, T. 118 N., R. 78 W.	16	Dr	S
R. Hageman	NW¼NW¼SW¼SW¼ sec. 5, T. 119 N., R. 75 W.	1200	D	D,S
C. Oaks	SE¼NW¼NW¼SW¼ sec. 7, T. 119 N., R. 75 W.	30	Dr	D,S
H. Griese	SW¼SW¼SW¼SE¼ sec. 9, T. 119 N., R. 75 W.	1800	D	D,S
E. Nagle	SW¼SW¼NW¼NE¼ sec. 14, T. 119 N., R. 75 W.	108	Dr	S
C. Sautner	SE¼NE¼NE¼NE¼ sec. 18, T. 119 N., R. 75 W.	40	Dr	D,S
M. Sloat	NW¼SW¼SW¼NW¼ sec. 19, T. 119 N., R. 75 W.	1700	D	S
R. Wise	SW¼SW¼SW¼SE¼ sec. 19, T. 119 N., R. 75 W.	55	Dr	S
L. Griese	SE¼SE¼NE¼NE¼ sec. 23, T. 119 N., R. 75 W.	136	Dr	D,S
M. Boke	NE¼SW¼SW¼SW¼ sec. 28, T. 119 N., R. 75 W.	85	Dr	D,S
W. Frost	SE¼SE¼NE¼NE¼ sec. 29, T. 119 N., R. 75 W.	100	Dr	D,S
F. Priffith	SW¼SE¼SE¼SE¼ sec. 1, T. 119 N., R. 76 W.	32	Dr	D,S
K. Manfull	NW¼NW¼NW¼SW¼ sec. 2, T. 119 N., R. 76 W.	30	Dr	D,S
A. Maas	NW¼NW¼NW¼SW¼ sec. 3, T. 119 N., R. 76 W.	60	Dr	D,S

Name	Location	Depth of well in feet	Geologic Source	Use
J. VanWold	SW¼SW¼NE¼SW¼ sec. 5, T. 119 N., R. 76 W.	50	Dr	D,S
E. Anderson	SW¼SW¼SE¼SW¼ sec. 13, T. 119 N., R. 76 W.	25	Dr	D,S
P. Hinckley	SW¼SW¼NE¼SW¼ sec. 17, T. 119 N., R. 76 W.	80	Dr	S
A. Holzworth	SW¼SE¼SE¼SE¼ sec. 18, T. 119 N., R. 76 W.	1800	D	D
A. Holzworth	SE¼SE¼NE¼NE¼ sec. 13, T. 119 N., R. 77 W.	37	Dr	S
R. Schutterle	SW¼NW¼NW¼SW¼ sec. 19, T. 119 N., R. 76 W.	35	Dr	D,S
D. Kunstle	SE¼NW¼NW¼SE¼ sec. 19, T. 119 N., R. 76 W.	25	Dr	D,S
O. Kathner	NE¼NE¼NE¼SW¼ sec. 25, T. 119 N., R. 76 W.	180	Dr	D,S
W. Cole	SW¼SW¼SW¼NW¼ sec. 29, T. 119 N., R. 76 W.	35	Dr	D,S
E. Tawner	SW¼SE¼SE¼SW¼ sec. 29, T. 119 N., R. 76 W.	40	Dr	D,S
C. McLain	NE¼SE¼SE¼SE¼ sec. 36, T. 119 N., R. 76 W.	60	Dr	D,S
F. Beringer	SW¼SW¼NW¼NW¼ sec. 35, T. 119 N., R. 76 W.	45	Dr	D,S
Nagel Brothers	SE¼SE¼SW¼SE¼ sec. 33, T. 120 N., R. 76 W.	50	Dr	D,S