STATE OF SOUTH DAKOTA
Richard Kneip, Governor

SOUTH DAKOTA GEOLOGICAL SURVEY
Duncan J. McGregor, State Geologist

Special Report 55

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

by

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INTRODUCTION

PRESENT INVESTIGATION

This report contains the results of a special investigation conducted by the South Dakota Geological Survey from July 8 to July 24, 1970, in and around the city of Parkston, Hutchinson County, South Dakota. It is the 55th in a continuing series of investigations to assist the cities in South Dakota in locating their future water supplies.

Parkston now obtains water from 3 wells within the city limits. These wells produce water from a glacial sand and gravel deposit at a depth of approximately 240 feet below the land surface.

Included in the survey of the Parkston area were: (1) geologic mapping of the area, (2) drilling of 11 auger and 8 rotary test holes, (3) a well inventory, and (4) a collection and analyses of 20 water samples.

As a result of this survey additional data on the thickness and extent of the sand and gravel deposit in the area were found. A pump test is recommended in the area to determine a safe spacing of the future wells and to collect data on the design of well(s).

Cooperation of the residents of Parkston, especially that of the city officials, is appreciated. Analyses of water samples were done by the State Geological Survey and the State Chemical Laboratory. The project was financed by the South Dakota Geological Survey and the city of Parkston.

LOCATION AND EXTENT OF AREA

The city of Parkston is located in southeast South Dakota in Hutchinson County, which is in the James Basin, a part of the central lowland physiographic province (fig. 1). The Parkston study area is approximately 20 square miles in size measuring 4 miles north-south and 5 miles east-west.

GENERAL GEOLOGY

SURFICIAL DEPOSITS

Surficial deposits of the Parkston area are the results of glaciation late in the Pleistocene Epoch of geologic time. Glacial deposits are collectively called drift, and can be divided into till and outwash deposits. Till consists of unsorted material that ranges in size from boulder to clay and was deposited directly by the ice.

Outwash is a more homogeneous material, consisting primarily of sand and gravel with minor amounts of silt and clay, which was deposited by melt water streams issuing from a glacier.

Alluvium, a mixture of sand and clay, is deposited by the present streams. Small amounts of alluvial deposits are present along the Pony Creek and North Branch Dry Creek. Figure 2 is a geologic map of the Parkston area.

SUBSURFACE BEDROCK

No bedrock is exposed in the study area, but data obtained from well logs in the area reveal that Cretaceous stratified sedimentary rocks underlie the glacial drift. These deposits in descending order are the Carlile Shale, Greenhorn Limestone, Granerous Shale, and Dakota Formation.

Carlile Shale underlies 200 to 250 feet of glacial deposits. The Carlile Shale consists of light-gray to dark-gray shale interbedded with silt and sand. The Codell Sandstone Member of this Formation was penetrated only in Test Hole 5 (for map location, see fig. 3).

More data are required to determine the thickness of the Greenhorn Limestone, Granerous Shale, and Dakota Formation. The well inventory data indicates that the Dakota Formation is 500 feet below the land surface in the Parkston area. Sioux Quartzite underlies the Dakota Formation.

OCCURRENCE OF GROUND WATER

PRINCIPLES OF OCCURRENCE

Ground water is defined as water contained in the openings within rocks or sediments below the water table. Practically all open spaces in the rocks that lie below the water table are filled with water, the deposits below the water table are in the zone of saturation. The water table is the upper surface of the zone of saturation and is in equilibrium with atmospheric pressure. Water that occurs in the rocks (and soil) that lie above the water table is in the zone of aeration because some of the open spaces in this zone are filled with air; the remaining portion contains water. This water is either held by molecular attraction, returned to the atmosphere by plant use, or is moving downward toward the zone of saturation. Water within the ground above the saturated zone moves downward under the influence of gravity, whereas in the saturated zone it moves in a direction determined by the hydraulic gradient.

Contrary to popular belief, ground water does not occur in "veins" that crisscross the land at random. Instead it can be shown that water is found nearly everywhere beneath the surface, but at varying depths.

Nearly all ground water is derived from precipitation in the form of rain, snow, or ice. This water either evaporates, percolates directly downward to the water table and becomes ground water, or drains off as surface water. Surface water either evaporates, escapes to the ocean by streams, or percolates downward into the rocks.

Recharge is the addition of water to an aquifer (a deposit having structures that permit appreciable water to move through it under ordinary field conditions). Recharge to an aquifer is accomplished in four general ways: (1) by downward percolation of

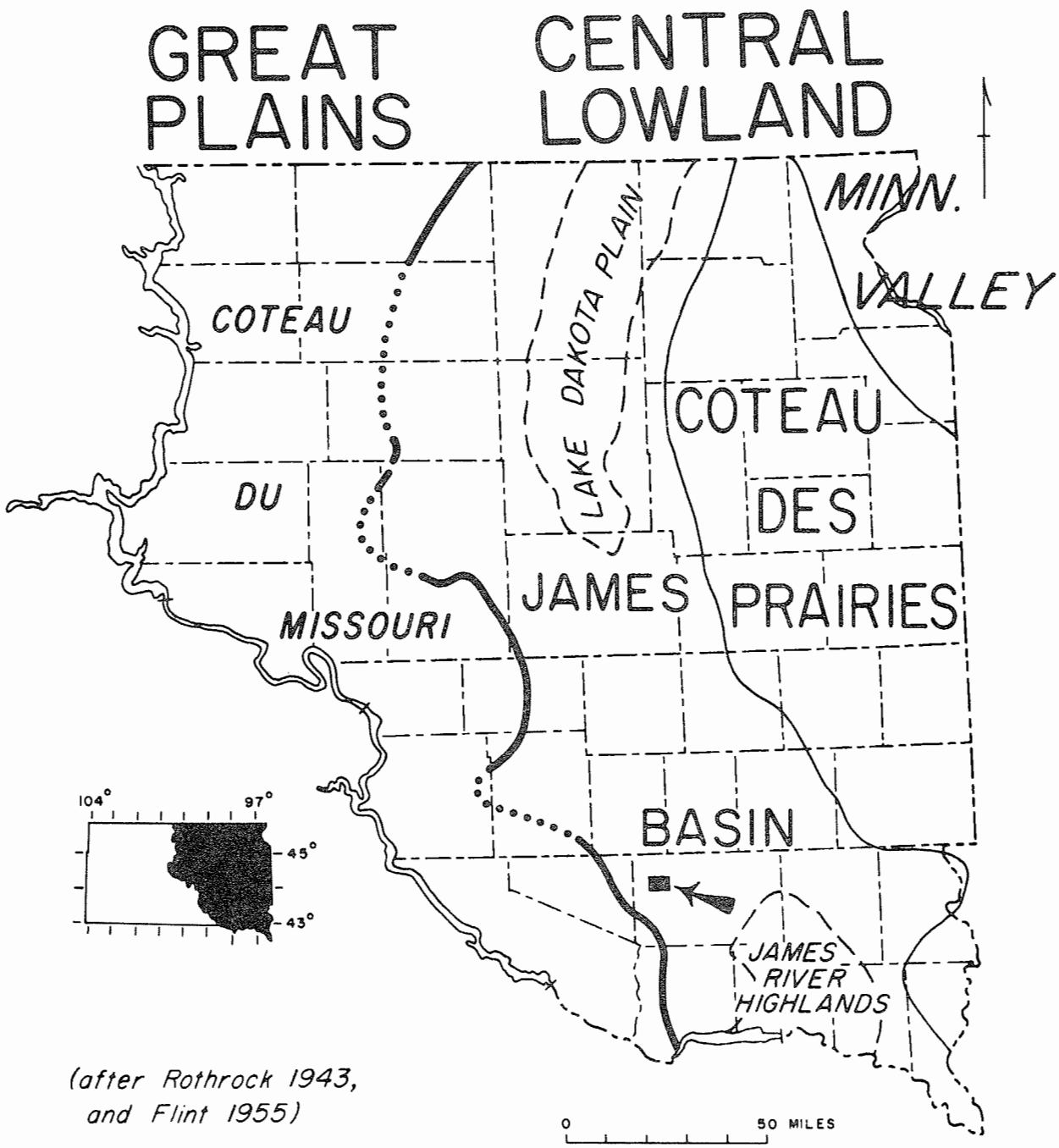
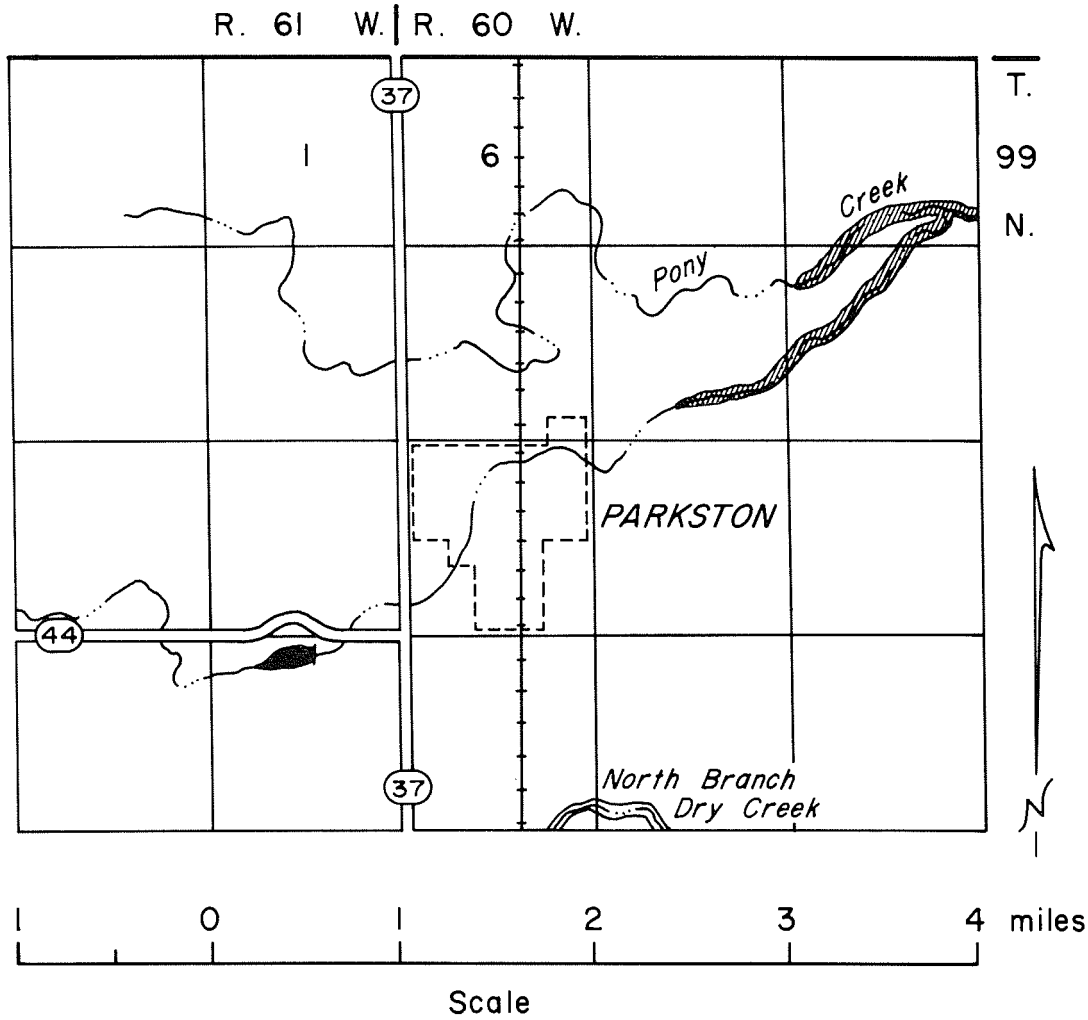


Figure 1. Map of eastern South Dakota showing the major physiographic divisions and location of the Parkston area.



LEGEND

QUATERNARY	Recent	Alluvium
	Pleistocene	Till

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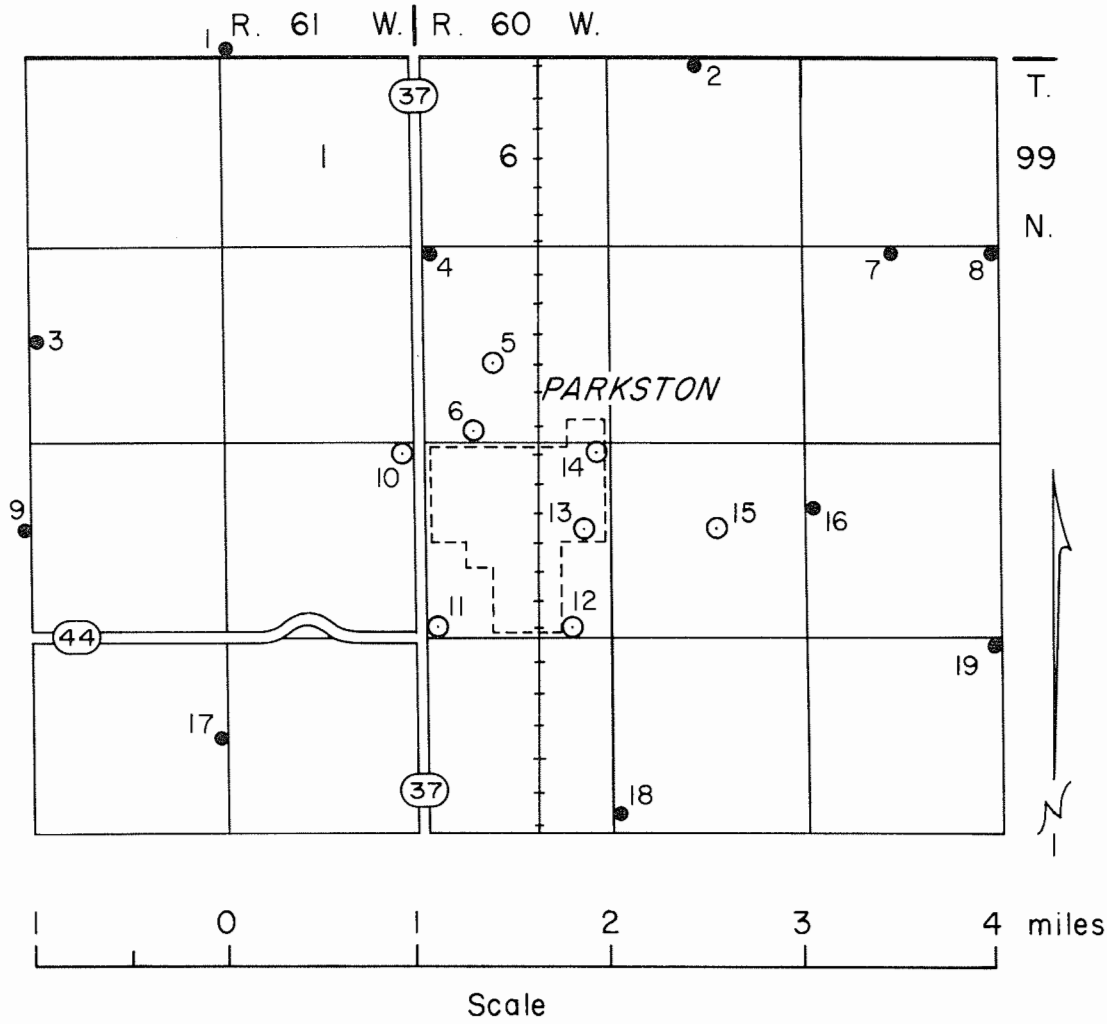
Figure 2. Generalized geologic map of the Parkston area.



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$\odot^5$ Rotary test hole

$\bullet_4$ Auger test hole

Numbers refer to test holes listed in Appendix A.

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Figure 3. Map showing location of rotary and auger test holes in the Parkston area.

precipitation from the ground surface, (2) by downward percolation from surface bodies of water, (3) by lateral movement of ground water into the area, and (4) by artificial recharge, which takes place from excess irrigation, seepage from canals, and water purposely applied to augment ground-water supplies.

Discharge of ground water from an aquifer is accomplished in four ways: (1) by evaporation and transpiration by plants, (2) by seepage upward or laterally into surface bodies of water, (3) by lateral movement of ground water out of the area, and (4) by pumping from wells, which constitutes the major artificial discharge of ground water.

Porosity of a rock or soil is a measure of the contained open pore spaces, and is expressed as the percentage of void spaces to the total volume of the rock. Porosity of a sedimentary deposit depends chiefly on (1) the shape and arrangement of its constituent particles, (2) the degree of sorting of its particles, (3) the cementation and compaction to which it has been subjected since its deposition, (4) the removal of mineral matter through solution by percolating waters, and (5) the fracturing of the rocks, resulting in joints and other openings. Thus, the size of the material has little or no effect on porosity if all other factors are equal.

Permeability of a rock is its capacity for transmitting a fluid. Water will pass through a material with interconnected pores, but will not pass through material with unconnected pores, even if the latter material has a higher porosity. Therefore, permeability and porosity are not synonymous terms.

GROUND WATER IN GLACIAL DEPOSITS

It was stated earlier that glacial deposits are divided into till and outwash. Till does not yield water readily because of its highly unsorted nature and the predominance of silt and clay. Locally there may occur some lenses of sand or gravel within the till which provide an adequate supply of water for a farm well. But till as a unit cannot function as a source of water for municipalities.

Outwash, usually a highly permeable deposit, may constitute an aquifer if it is extensive and located below the water table. An outwash deposit is located at a depth of approximately 200 feet below the land surface in the vicinity of Parkston. Figure 4 shows the thickness of this sand and gravel deposit (also see app. A).

GROUND WATER IN BEDROCK

The Dakota Formation is the only aquifer other than glacial outwash that could supply significant quantities of water to the town. The water in the Dakota Formation is under pressure and gives water to flowing wells in the area.

QUALITY OF GROUND WATER

Ground water always contains dissolved chemicals. Contained chemicals are derived from (1) the atmosphere as water vapor condenses and falls, (2) the soil and underlying deposits as the water moves downward to the water table, and (3) the rocks below the water table. In general, the more chemical substances that a water contains, the poorer its quality.

Table 1 shows the chemical quality of water samples collected in the Parkston area (for map location, see fig. 5). Samples W-2, W-10, and W-12 were collected from wells producing water from the Dakota Formation; the remaining 17 samples were collected from outwash deposits.

Samples from the outwash deposits generally have higher sulfate, manganese, and total solids than the recommended limits set by the South Dakota Department of Health. Sample W-7 has higher iron, and sample W-13 has higher fluoride than the recommended limits. Samples W-5, W-6, W-7, W-8, W-17, and W-18 have less fluoride than the recommended limits. The rest of the chemicals in the water from the outwash deposits are within the limits. Sample W-13 was collected from the new city well and sample W-14 was collected from city well No. 3. Water samples from the city wells are comparable to the rest of the water samples from the outwash deposits.

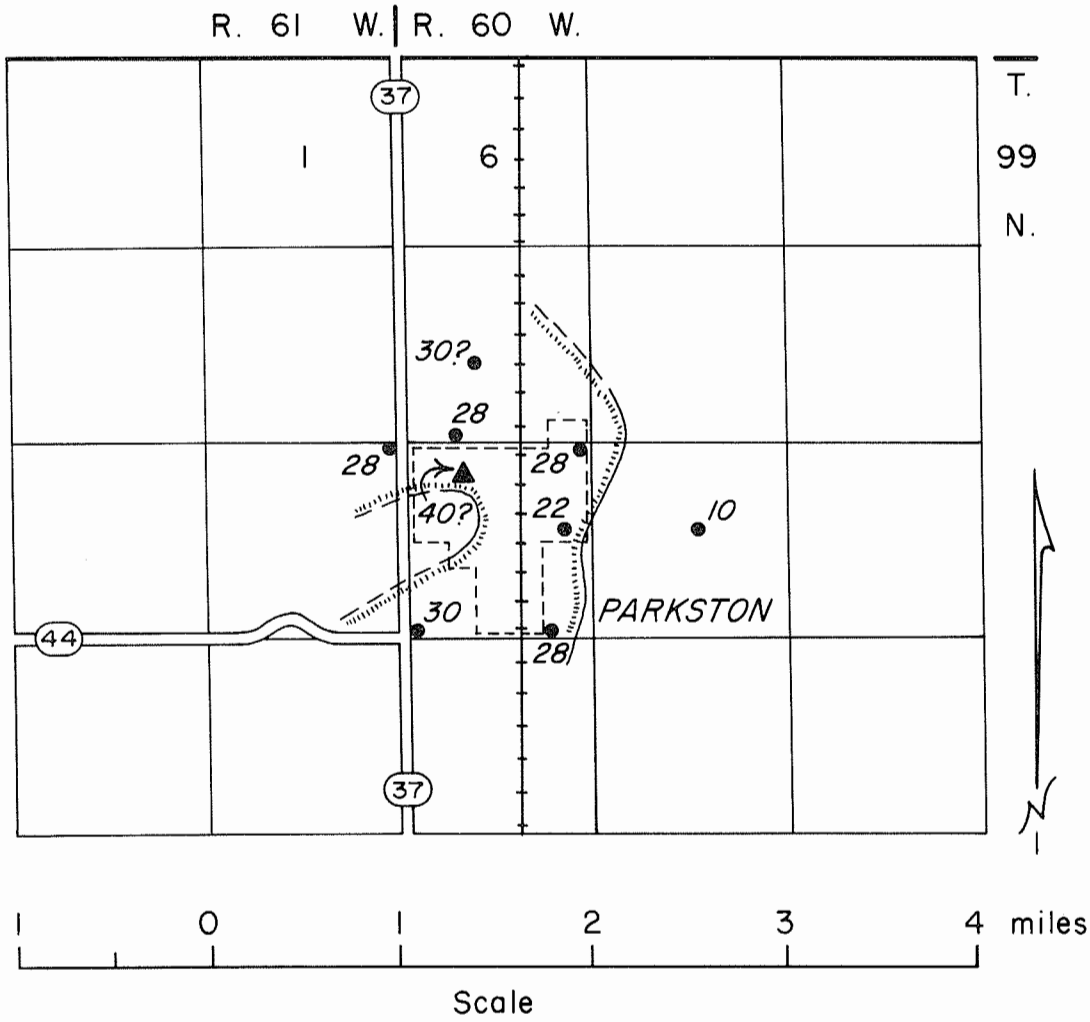
Samples W-2, W-10, and W-12, collected from the flowing wells in the area, have higher sulfate and total solids than the recommended limits. Also, samples from the Dakota Formation are harder than the samples from the outwash.

Table 2 shows the significance of some physical and chemical properties of drinking water.

CONCLUSIONS AND RECOMMENDATIONS

The main aquifer in the study area is the outwash deposit at a depth of approximately 200 feet below the land surface. Figure 4 shows the thickness of this deposit as determined by the rotary test holes. This outwash deposit yields water to the present city wells and will sustain additional well(s) with proper spacing. The aquifer will meet the demands of the town in the near future. It is recommended that the future well be drilled in the areas where the thicker deposits (see fig. 4 and app. A) were penetrated by the test holes. Northwest of the town (in vicinity of Test Hole 10) is one of the favorable areas. The NE¼ of sec. 18, T. 99 N., R. 60 W. (vicinity of Test Hole 14) and the SE¼ of the same section (in vicinity of Test Hole 11) are also promising areas. After an area is selected for water development, it is recommended that a pump test be conducted for a minimum of 72 hours by a qualified engineer or a hydrologist. The South Dakota Geological Survey will provide technical assistance and supervise the conduction of the test. The results of this test will provide a basis for determining expected yield, spacing of the future wells, and the design of well(s).

Water from the outwash deposit has higher sulfate and total solids than the recommended limits, and the water is hard. (See table 1). Therefore, it is recommended that the city consult an engineering



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Area which contains more than 20 feet of sand and gravel. *(dashed in areas of limited data).*

28 Test hole, number indicates thickness of sand and gravel.

40? New city well, number indicates thickness of sand and gravel.

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Figure 4. Map showing thickness of saturated buried sand and gravel in the Parkston area.

Table 1. Chemical analyses of water samples from the Parkston study area

Sample	Source	Parts Per Million											
		Calcium	Sodium	Magnesium	Chlorides	Sulfate	Iron	Manganese	Nitrate Nitrogen	Fluoride	pH	Hardness $CaCO_3$	Total Solids
A		---------	------	---------	250	500[1]	0.3	0.05	10.0	0.9-1.7[2]	-----	--------	1000[1]
W- 1	G	149	300	34	56	958			1.8	0.8		514	1840
W- 2	D	445		80	Tr.	1425	0.02	0.30	Tr.		7.2	1380	2280
W- 3	G	155		11.5	49.6	640	0.09		6.5	1.20	8.0	433	1440
W- 4	G	152		26.1	67.5	485	0.09	2.6	3.0	0.85	7.9	485	1550
W- 5	G	52.5		7.07	25.4	500	0.11	0.30	6.5	0.49	8.3	160	744
W- 6	G	148	344	24	48	768	0.0	1.2	1.8	0.4		464	1578
W- 7	G	136	262	24	62	766	1.0	0.0	0.8	0.6		437	1498
W- 8	G	166	320	14	72	798	0.0	1.4	2.2	0.6		470	1540
W- 9	G	170		21.2	76.6	738	0.07	1.95	4.5	1.19	8.3	510	1592
W-10	D	430		55	55	1125	0.08	0.40	Tr.		7.7	1350	2300
W-11	G	174		22.0	81.0	750	0.09	2.23	6.0	0.90	8.1	523	1636
W-12	D	445		58	Tr.	1375	0.02	0.25	Tr.		6.9	1350	2300
W-13	G	157	356	31	72	800	0.0	2.4	0.8	2.0		520	1664
W-14	G	137	264	20	75	796	0.8		1.8	0.8		423	1592
W-15	G	175		21.0	83.2	825	0.12	2.60	5.5	1.07	8.1	522	1610
W-16	G	187		23.9	83.6	1012	0.10	3.32	7.0	0.82	7.7	564	1730
W-17	G	76	332	30	76	842	0.0		2.2	0.4		540	1654
W-18	G	85	300	29	85	1034	0.0	1.2	1.2	0.4		634	1734
W-19	G	236		12.9	62.4	925	0.10	3.42	6.5	0.86	7.8	641	1624
W-20	G	184		26.1	60.5	712	0.02	1.93	1.5	0.87	7.8	565	1422

A. Drinking water standards, U.S. Public Health Service (1962).

Samples W-1, W-6, W-7, W-8, W-13, W-14, W-17, and W-18 were analyzed by the South Dakota Chemical Laboratory. All other samples were analyzed by the South Dakota Geological Survey.

Source: G, glacial outwash; D, Dakota Formation (flowing wells).

[1]Modified for South Dakota by the Department of Health (written communication, Water Sanitation Section, September 24, 1968).

[2]1.2 is optimum for South Dakota.

Location of Water Samples

(For map location, see fig. 5)

W- 1. SE¼SE¼NW¼NW¼ sec. 4, T. 99 N., R. 60 W., H. Degen, 149 feet deep, water level 32 feet (irrigation well).

W- 2. SW¼SE¼NE¼SE¼ sec. 12, T. 99 N., R. 61 W., G. Mechtenberg, 550 feet deep, flowing well.

W- 3. SW¼SE¼NE¼SE¼ sec. 12, T. 99 N., R. 61 W., G. Mechtenberg, 214 feet deep, water level 18 feet.

W- 4. SW¼SW¼SW¼SW¼ sec. 7, T. 99 N., R. 60 W., J. D. Hofer.

W- 5. SE¼SW¼NW¼SW¼ sec. 7, T. 99 N., R. 60 W., L. Mechtenberg, 175 feet deep, water level 135 feet.

W- 6. NE¼SW¼SW¼NW¼ sec. 7, T. 99 N., R. 60 W., A. Hafner, 204 feet deep, water level 96 feet.

W- 7. SE¼NE¼NE¼NW¼ sec. 13, T. 99 N., R. 61 W., M. Zirpel, 230 feet deep, water level 70 feet.

W- 8. SE¼SE¼NE¼NE¼ sec. 13, T. 99 N., R. 61 W., B. Zirpel, 215 feet deep.

W- 9. NE¼NE¼NE¼SE¼ sec. 13, T. 99 N., R. 61 W., R. Palmer, 218 feet deep, water level 13 feet.

W-10. SE¼SE¼SE¼SE¼ sec. 13, T. 99 N., R. 61 W., L. Roth, 500 feet deep, flowing well.

W-11. NE¼NW¼SW¼SW¼ sec. 18, T. 99 N., R. 60 W., H. Tiede, 235 feet deep, water level 100 feet.

W-12. NE¼SE¼NW¼ sec. 18, T. 99 N., R. 60 W., flowing well next to Pony Creek in the city.

W-13. SE¼NE¼NW¼ sec. 18, T. 99 N., R. 60 W., new city well, 240 feet deep.

W-14. SW¼NE¼NE¼ sec. 18, T. 99 N., R. 60 W., city well No. 3.

W-15. NE¼SW¼NW¼NW¼ sec. 17, T. 99 N., R. 60 W., H. Cramer, 215 feet deep.

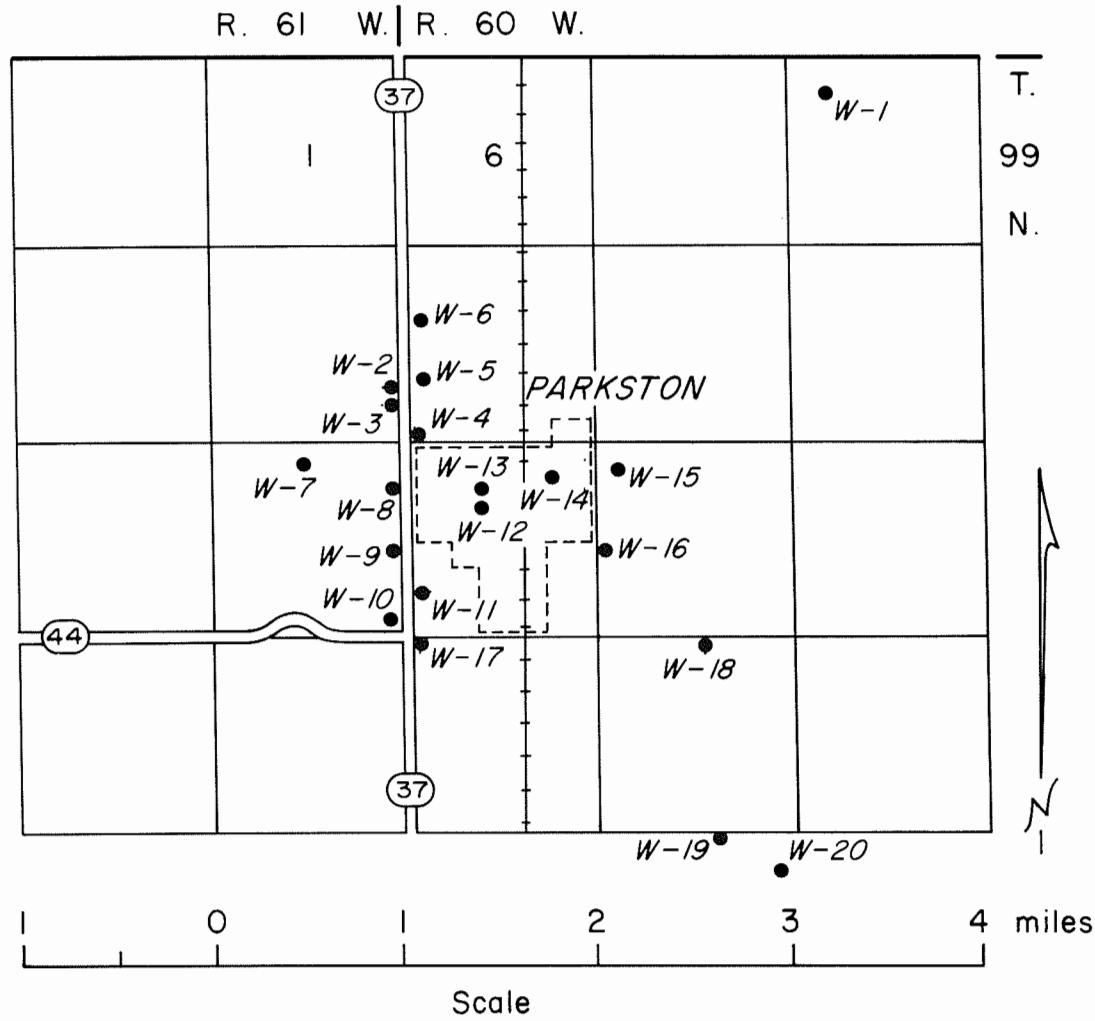
W-16. NW¼NW¼NW¼SW¼ sec. 17, T. 99 N., R. 60 W., R. Koper, 215 feet deep, water level 55 feet.

W-17. NW¼NW¼NW¼NW¼ sec 19, T. 99 N., R. 60 W., C. Adkins, 230 feet deep.

W-18. NW¼NW¼NW¼NE¼ sec. 20, T. 99 N., R. 60 W., C. Roth, 252 feet deep.

W-19. NW¼NW¼NE¼ sec. 29, T. 99 N., R. 60 W., Golf course well (office).

W-20. SE¼NE¼NE¼ sec. 29, T. 99 N., R. 60 W., Golf course well (field).



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W-12 Location of water samples, *(numbers refer to water samples in Table 1).*

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Figure 5. Map showing location of water samples collected in the Parkston area.

Table 2.--Significance of some chemical and physical properties of drinking water.

Chemical Constituents	Significance	Recommended Limits (ppm)[1]
Calcium (Ca) and Magnesium (Mg)	Cause most of the carbonate hardness and scale-forming properties of water by combining with carbonate and bicarbonate present in the water. Seldom can be tasted except in extreme concentrations.	Ca—None Mg—None
Sodium (Na)	Large amounts in combination with chloride will give water a salty taste. Large amounts will limit water for irrigation and industrial use.	None
Chloride (Cl)	Large amounts in combination with sodium give water a salty taste. Large quantities will also increase corrosiveness of water.	250
Sulfate (SO_4)	Large amounts of sulfate in combination with other ions give a bitter taste to water and may act as a laxative to those not used to drinking it. Sulfates of calcium and magnesium will form hard scale. U. S. Public Health Service recommends 250 ppm maximum concentration.	500[2]
Iron (Fe) and Manganese (Mn)	In excess will stain fabrics, utensils, and fixtures and produce objectionable coloration in the water. Both constituents in excess are particularly objectionable.	Fe—0.3 Mn—0.05
Nitrate Nitrogen (N)	In excess may be injurious when used in infant feeding. The U. S. Public Health Service regards 45 ppm as the safe limit of nitrate (NO_3) or 10 ppm nitrate nitrogen (N).	10
Fluoride (F)	Reduces incidence of tooth decay when optimum fluoride content is present in water consumed by children during period of tooth calcification. Excessive fluoride in water may cause mottling of enamel.	0.9-1.7[3]
pH	A measure of the hydrogen ion concentration; pH of 7.0 indicates a neutral solution, pH values lower than 7.0 indicate acidity, pH values higher than 7.0 indicate alkalinity. Alkalinity tends to aid encrustation and acidity tends to aid corrosion.	None
Hardness	Hardness equivalent to carbonate and bicarbonate is called carbonate hardness. Hardness in excess of this amount is noncarbonate hardness. Hardness in water consumes soap and forms soap curd. Will also cause scale in boilers, water heaters, and pipes. Water containing 0-60 ppm hardness considered soft; 61-120 ppm moderately hard; 121-180 ppm hard, and more than 180 ppm very hard. Good drinking water can be very hard.	None
Total Solids	Total of all dissolved constituents. U. S. Public Health Department recommends 500 ppm maximum concentration. Water containing more than 1000 ppm dissolved solids may have a noticeable taste; it may also be unsuitable for irrigation and certain industrial uses.	1000[2]

Modified from Jorgensen (1966).
[1](ppm) parts per million.
[2]Modified for South Dakota by the South Dakota Department of Health (written communication, Water Sanitation Section, September 24, 1968).
[3]1.2 is optimum for South Dakota.

firm with regard to the cost of removal of some of the chemicals.

The Dakota Formation is another possible source of water, but water from this source has higher sulfate, hardness, and total solids than the outwash deposit.

Before a permanent well is drilled, the city officials should contact the State Water Resources Commission to obtain water rights and a permit to drill a city well, and the State Department of Health to determine biological and chemical suitability of the water.

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APPENDIX A

Logs of test holes in the Parkston area
(For map location, see fig. 3)

Test Hole 1
Location: SW¼SW¼SW¼SW¼ sec. 36, T. 100 N., R. 61 W.
Depth to water: 85? feet

0- 1	Soil
1- 23	Clay, yellowish-brown, pebbly, compact, (till)
23-112	Clay, gray, pebbly, (till)

* * * *

Test Hole 2
Location: NE¼NE¼NE¼NW¼ sec. 5, T. 99 N., R. 60 W.
Depth to water: not measured

0- 1	Soil
1- 23	Clay, yellowish-brown, pebbly, (till)
23- 99	Clay, gray, pebbly, (till)

* * * *

Test Hole 3
Location: SW¼SW¼SW¼NW¼ sec. 11, T. 99 N., R. 61 W.
Depth to water: 63 feet

0- 1	Soil
1- 38	Clay, brown, pebbly, (till)
38-137	Clay, gray, sandy, (till)
137-139	Clay, gray, gravelly, (till)

* * * *

Test Hole 4
Location: NW¼NW¼NW¼NW¼ sec. 7, T. 99 N., R. 60 W.
Depth to water: 80? feet

0- 2	Soil
2- 28	Clay, yellowish-brown, pebbly, (till)
28- 90	Clay, gray, pebbly, (till)

* * * *

Test Hole 5 (Rotary Test Hole)
Location: SE¼NE¼NE¼SW¼ sec. 7, T. 99 N., R. 60 W.
Depth to water: not measured

0 - 2	Soil
2 - 32	Clay, yellowish-brown, pebbly, (till)
32 -163	Clay, dark gray, pebbly, (till)
163 -166	Sand and gravel
166 -182?	Sand and clay?
182?-204	Sandstone, yellowish-brown
204 -215	Clay, gray, (shale)

* * * *

Test Hole 6 (Rotary Test Hole)
Location: SW¼SW¼SE¼SW¼ sec. 7, T. 99 N., R. 60 W.
Depth to water: not measured

0- 2	Soil
2- 33	Clay, yellowish-brown, pebbly, (till)
33- 57	Clay, dark-gray, sandy, (till)
57- 59	Sand
59-111	Clay, dark-gray, pebbly, (till)
111-116	Gravel
116-166	Clay, gray, (till)
166-194	Gravel
194-230	Clay, gray, (shale)

* * * *

Test Hole 7
Location: NE¼NE¼NE¼NW¼ sec. 9, T. 99 N., R. 60 W.
Depth to water: 34 feet

0- 1	Soil
1- 25	Clay, brown, pebbly, (till)
25- 42	Clay, gray, gravelly, (till)
42- 94	Clay, gray, sandy, (till)

* * * *

Test Hole 8
Location: NE¼NE¼NE¼NE¼ sec. 9, T. 99 N., R. 60 W.
Depth to water: 16 feet

0- 2	Soil
2- 22	Clay, brown, pebbly, (till)
22- 95	Clay, gray, sandy, (till)
95- 99	Sand, fine

* * * *

Test Hole 9
Location: SE¼SE¼SE¼NE¼ sec. 15, T. 99 N., R. 61 W.
Depth to water: 65 feet

0- 1	Soil
1- 32	Clay, brown, pebbly, (till)
32- 90	Clay, gray, pebbly, (till)

* * * *

Test Hole 10 (Rotary Test Hole)
Location: NE¼NE¼NE¼NE¼ sec. 13, T. 99 N., R. 61 W.
Depth to water: not measured

0- 2	Soil
2- 26	Clay, yellowish-brown, (till)
26-116	Clay, gray, pebbly, (till)
116-118	Gravel
118-180	Clay, gray, gravelly, (till)
180-208	Gravel, coarse
208-256	Clay, gray, (shale?)
256-290	Clay, gray, (shale?)

* * * *

Test Hole 11 (Rotary Test Hole)
Location: SW¼SW¼SW¼SW¼ sec. 18, T. 99 N., R. 60 W.
Depth to water: not measured

0- 2	Soil
2- 32	Clay, yellowish-brown, pebbly, (till)
32-102	Clay, gray, (till)
102-111	Sand and gravel
111-140	Clay, dark gray, (till)
140-220	Clay, dark gray, gravelly, (till)
220-250	Gravel
250-272	Clay, gray, (shale)

* * * *

Test Hole 12 (Rotary Test Hole)
Location: SW¼SW¼SE¼SE¼ sec. 18, T. 99 N., R. 60 W.
Depth to water: not measured

0- 1	Soil
1- 24	Clay, yellowish-brown, (till)
24-156	Clay, gray, gravelly, (till)
156-158	Gravel
158-216	Clay, gray, gravelly, (till)
216-244	Gravel, some clay
244-249	Clay, gray, (shale)

* * * *

Test Hole 13 (Rotary Test Hole)
Location: SW¼SE¼SE¼NE¼ sec. 18, T. 99 N., R. 60 W.
Depth to water: not measured

0- 2	Soil
2- 28	Clay, yellowish-brown, (till)
28- 40	Clay, dark gray, (till)
40- 44	Sand, coarse
44-187	Clay, gray, pebbly, (till)
187-200	Clay and sand
200-222	Gravel
222-410	Clay, light-gray, (shale)

* * * *

Test Hole 14 (Rotary Test Hole)
Locaton: SE¼NE¼NE¼NE¼ sec. 18, T. 99 N., R. 60 W.
Depth to water: not measured

0- 1	Soil
1- 33	Clay, yellowish-brown, (till)
33- 56	Clay, gray, pebbly, (till)
56- 58	Gravel
58-152	Clay, gray, pebbly, (till)
152-153	Gravel
153-190	Clay, gray, pebbly, (till)
190-218	Gravel
218-230	Clay, gray, (shale)

* * * *

Test Hole 15 (Rotary Test Hole)
Location: SW¼SW¼SW¼NE¼ sec. 17, T. 99 N., R. 60 W.
Depth to water: not measured

Test Hole 15 -- continued.

0- 4	Soil
4- 23	Clay, yellow, pebbly, (till)
23-144	Clay, gray, pebbly, (till)
144-146	Gravel
146-158	Clay, gray, (till)
158-162	Gravel
162-170	Clay, gray, (till)
170-180	Gravel
180-196	Clay, gray, (shale)

* * * *

Test Hole 16
Location: SW¼NW¼SW¼NW¼ sec. 16, T. 99 N., R. 60 W.
Depth to water: 65 feet

0- 2	Soil
2- 27	Clay, yellowish-brown, pebbly, (till)
27- 84	Clay, gray, pebbly, (till)

* * * *

Test Hole 17
Location: SE¼SE¼SE¼NE¼ sec. 23, T. 99 N., R. 61 W.
Depth to water: 50 feet

0- 1	Soil
1- 19	Clay, yellowish-brown, pebbly, (till)
19- 43	Clay, brown, pebbly, (till)
43-109	Clay, gray, pebbly, (till)

* * * *

Test Hole 18
Location: NW¼SW¼SW¼SW¼ sec. 20, T. 99 N., R. 60 W.
Depth to water: 2 feet

0- 2	Soil
2- 17	Clay, brown, pebbly, (till)
17- 84	Clay, gray, pebbly, (till)

* * * *

Test Hole 19
Location: NE¼NE¼NE¼NE¼ sec. 21, T. 99 N., R. 60 W.
Depth to water: 12 feet

0- 1	Soil
1- 35	Clay, yellowish-brown, pebbly, (till)
35-119	Clay, gray, pebbly, (till)

* * * *

APPENDIX B

Well Records in the Parkston area

Source: O, outwash and glacial sand lenses; DF, Dakota Formation

Use: D, domestic; S, stock; I, irrigation.

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Weber, M.	SW¼NE¼NE¼NE¼ sec. 19, T. 100 N., R. 61 W.				
Neugbauer, E.	NE¼NE¼NE¼NW¼ sec. 20, T. 100 N., R. 61 W.	250		O	S
Koch, B.	NW¼NW¼SW¼NW¼ sec. 21, T. 100 N., R. 61 W.	240	135	O	D,S
Schoenfelder, W.	SW¼NE¼NE¼ sec. 21, T. 100 N., R. 61 W.				D,S
Schoenfelder, D.	NE¼SW¼NE¼SE¼ sec. 21, T. 100 N., R. 61 W.	180	50	O	D,S
Hohn, E. J.	SW¼NW¼NE¼NW¼ sec. 22, T. 100 N., R. 61 W.	190	58	O	D,S
Bowar, C.	SW¼SE¼NE¼NE¼ sec. 23, T. 100 N., R. 61 W.	153		O	D,S
Hohn, E.	SW¼NE¼NE¼NW¼ sec. 23, T. 100 N., R. 61 W.	40	30	O	D,S
Bilas, J.	SE¼NE¼NW¼NW¼ sec. 24, T. 100 N., R. 61 W.				D,S
Sandhoff Bros.	NW¼NE¼SE¼SE¼ sec. 24, T. 100 N., R. 61 W.	165		O	D,S
Mayr, P.	NW¼NE¼SE¼SE¼ sec. 25, T. 100 N., R. 61 W.	178	57	O	D,S
Sandhoff, A.	SE¼NE¼NW¼NE¼ sec. 25, T. 100 N., R. 61 W.	171		O	D,S
Schoenfelder, M.	NE¼SW¼NE¼NE¼ sec. 26, T. 100 N., R. 61 W.	200		O	D,S
Schoenfelder, E.	SW¼SE¼SE¼ sec. 26, T. 100 N., R. 61 W.	206	60		D,S
Koster, U.	NE¼SE¼NE¼NE¼ sec. 27, T. 100 N., R. 61 W.	180	40	O	D,S
Muntefering, E.	NW¼SW¼SE¼SE¼ sec. 27, T. 100 N., R. 61 W.	207	60	O	D,S
Muntefering, E.	NW¼SW¼SE¼SE¼ sec. 27, T. 100 N., R. 61 W.	207	130	O	S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Walz, S.	NW¼NW¼SE¼NE¼ sec. 28, T. 100 N., R. 61 W.	470			S
Walz, S.	NW¼NW¼SE¼NE¼ sec. 28, T. 100 N., R. 61 W.	208	62	O	D,S
Muntefering, I.	NW¼SE¼SW¼SW¼ sec. 29, T. 100 N., R. 61 W.	240	70	O	D,S
Schoenfelder, V.	SW¼NE¼NW¼NE¼ sec. 29, T. 100 N., R. 61 W.	292		O	D,S
Hohn, V.	NE¼SW¼SW¼SW¼ sec. 32, T. 100 N., R. 61 W.	200	90	O	D,S
Horstman, A.	NE¼SW¼SE¼SE¼ sec. 33, T. 100 N., R. 61 W.				
Boehmer, M.	SE¼SE¼SE¼NW¼ sec. 34, T. 100 N., R. 61 W.	200	60		D,S
Herran, C.	NE¼SE¼SW¼SE¼ sec. 35, T. 100 N., R. 61 W.	212		O	D,S
Bowar, N.	SE¼SE¼NE¼SE¼ sec. 36, T. 100 N., R. 61 W.	170			D,S
Tiede, C.	NE¼NE¼SW¼SE¼ sec. 14, T. 100 N., R. 60 W.	76	64		S
Zwinger, A.	SW¼SW¼SW¼SE¼ sec. 15, T. 100 N., R. 60 W.	140	90	O	D,S
Weber, Jer.	NW¼SW¼SE¼SW¼ sec. 16, T. 100 N., R. 60 W.		30	O	D,S
Erpenbach, W.	NE¼SW¼SW¼SE¼ sec. 17, T. 100 N., R. 60 W.				D,S
Keirtenbach, H.	NE¼SE¼SE¼SE¼ sec. 18, T. 100 N., R. 60 W.	150	45	O	D,S
Roth, W.	NW¼SW¼SE¼SW¼ sec. 19, T. 100 N., R. 60 W.	160		O	D,S
Nelson, D.	NE¼SW¼SE¼SE¼ sec. 19, T. 100 N., R. 60 W.				D,S
Weber, A. L.	SE¼NE¼NW¼NE¼ sec. 20, T. 100 N., R. 60 W.	113	15		D,S
Weber, V.	SW¼NW¼NW¼NE¼ sec. 20, T. 100 N., R. 60 W.	100	40		D,S
Wisner, G.	SW¼NE¼NE¼NW¼ sec. 21, T. 100 N., R. 60 W.	60	15		S
Purtz, W.	NE¼NW¼SW¼SW¼ sec. 21, T. 100 N., R. 60 W.				

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Hohn, J.	SE¼SE¼NE¼NW¼ sec. 22, T. 100 N., R. 60 W.	150	50	O	D,S
Boehmer, Z.	NE¼SW¼SW¼SW¼ sec. 23, T. 100 N., R. 60 W.	155	130	O	D,S
Zwinger, L.	NW¼NW¼NW¼SE¼ sec. 23, T. 100 N., R. 60 W.	120	35	O	D,S
Weber, J. F.	SE¼NW¼NW¼NW¼ sec. 27, T. 100 N., R. 60 W.	118	88	O	D,S
Weber, J. A.	SE¼NW¼NW¼SW¼ sec. 27, T. 100 N., R. 60 W.	118			D,S
Walz, A.	NW¼NW¼SE¼NE¼ sec. 28, T. 100 N., R. 60 W.	77	62	O	D,S
Wagner, Jos.	SE¼SW¼NW¼SW¼ sec. 28, T. 100 N., R. 60 W.	115	30		D
Sandhoff, J.	NW¼NE¼SE¼NE¼ sec. 29, T. 100 N., R. 60 W.	142	20	O	D,S
Ripp, H.	SE¼NW¼NW¼NW¼ sec. 29, T. 100 N., R. 60 W.	140			S
Ripp, H.	SE¼NW¼NW¼NW¼ sec. 29, T. 100 N., R. 60 W.	140			D
Ripp, H.	SE¼NW¼NW¼NW¼ sec. 29, T. 100 N., R. 60 W.	80			S
Roth, R.	NW¼SE¼NE¼NE¼ sec. 30, T. 100 N., R. 60 W.	133	80	O	D,S
Gregor, T.	NW¼SE¼SE¼SE¼ sec. 30, T. 100 N., R. 60 W.	50	30		D,S
Roth, G.	NW¼NE¼SE¼NE¼ sec. 31, T. 100 N., R. 60 W.	133		O	D,S
Thome, N.	NE¼NW¼SW¼NW¼ sec. 31, T. 100 N., R. 60 W.	187	40	O	D,S
Boehmer, J.	NW¼SW¼SE¼SW¼ sec. 32, T. 100 N., R. 60 W.	125	54	O	S
Schoenfelder, G.	SW¼NW¼NW¼NE¼ sec. 32, T. 100 N., R. 60 W.	350			D,S
Thompson, R.	NW¼SE¼SW¼SW¼ sec. 34, T. 100 N., R. 60 W.	125	30		D,S
Bialas, H.	SW¼SE¼SE¼ sec. 34, T. 100 N., R. 60 W.	120		O	D,S
Mayer, U.	NE¼SW¼SW¼SE¼ sec. 34, T. 100 N., R. 60 W.	122	32	O	D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Boehmer, C.	NE¼SE¼SE¼SW¼ sec. 36, T. 100 N., R. 60 W.		15		D,S
Weber, A.	NW¼SE¼NE¼NE¼ sec. 1, T. 99 N., R. 61 W.	188	70	O	S
Appel, M.	SE¼NW¼NW¼NW¼ sec. 1, T. 99 N., R. 61 W.	200	95	O	D,S
Hauser, E.	NE¼SW¼SW¼SW¼ sec. 1, T. 99 N., R. 61 W.	200		O	D,S
Heck, J.	NE¼NW¼SE¼SE¼ sec. 2, T. 99 N., R. 61 W.	200	100	O	D,S
Herrmann, V.	NW¼ sec. 2, T. 99 N., R. 61 W.	180	70		S
Herrmann, V.	NE¼SW¼NW¼SW¼ sec. 2, T. 99 N., R. 61 W.	180	70		D,S
Heisinger, A.	NW¼SE¼NE¼NE¼ sec. 3, T. 99 N., R. 61 W.	280			D,S
Meinen, C.	NE¼NW¼SW¼NW¼ sec. 3, T. 99 N., R. 61 W.	540		DF?	S
Eimers, W.	SE¼SE¼SE¼SW¼ sec. 4, T. 99 N., R. 61 W.	525		DF?	D,S
Koster, A.	SE¼NE¼NE¼NW¼ sec. 4, T. 99 N., R. 61 W.	180	60	O	D,S
Thuringer, N.	NW¼NW¼NW¼NE¼ sec. 5, T. 99 N., R. 61 W.		75	O	D,S
Weber, J. B.	NE¼SW¼SE¼SE¼ sec. 6, T. 99 N., R. 61 W.	235		O	D,S
Koster, G.	NW¼SE¼NE¼SE¼ sec. 7, T. 99 N., R. 61 W.	263		O	D,S
Wagner, J.	SE¼SE¼NE¼NE¼ sec. 8, T. 99 N., R. 61 W.	235		O	S
Eimers, R.	NW¼NE¼SE¼NE¼ sec. 9, T. 99 N., R. 61 W.	218	80	O	D,S
Hohn, W.	SW¼NE¼NE¼SE¼ sec. 9, T. 99 N., R. 61 W.	218	212	O	D,S
Boehmer, P.	NW¼SE¼SW¼SW¼ sec. 9, T. 99 N., R. 61 W.	270	60		D,S
Zirpel, E.	SE¼NE¼NE¼NE¼ sec. 10, T. 99 N., R. 61 W.				S
Weber, E.	NW¼NW¼NW¼SW¼ sec. 10, T. 99 N., R. 61 W.	165	100	O	D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Zirpel, M.	NW¼SE¼SW¼SE¼ sec. 11, T. 99 N., R. 61 W.	210	50	O	S
Heck, J.	NW¼NE¼SE¼NE¼ sec. 11, T. 99 N., R. 61 W.	194	74	O	D,S
Mechtenberg, G.	SW¼SE¼NE¼SE¼ sec. 12, T. 99 N., R. 61 W.	550		DF?	S
Mechtenberg, G.	SW¼SE¼NE¼SE¼ sec. 12, T. 99 N., R. 61 W.	214	80	O	D,S
Jones, A.	NE¼NE¼SW¼SW¼ sec. 12, T. 99 N., R. 61 W.	220		O	
Palmer, R.	NE¼NE¼NE¼SE¼ sec. 13, T. 99 N., R. 61 W.	218	40	O	
Roth, L.	SE¼SE¼SE¼SE¼ sec. 13, T. 99 N., R. 61 W.	500		DF	D,S
Zirpel, M.	SE¼NE¼NE¼NW¼ sec. 13, T. 99 N., R. 61 W.	230	70		D,S
Zirpel, B.	SE¼SE¼NE¼NE¼ sec. 13, T. 99 N., R. 61 W.	215		O	D,S
Reichert, W.	SW¼NE¼NE¼NE¼ sec. 14, T. 99 N., R. 61 W.	214	143		D,S
Tiede, J.	NE¼NW¼SW¼SW¼ sec. 14, T. 99 N., R. 61 W.				S
Reichert, W.	SW¼NE¼NE¼NE¼ sec. 14, T. 99 N., R. 61 W.	550		DF?	D,S
Roth, C.	SW¼SW¼SW¼SE¼ sec. 15, T. 99 N., R. 61 W.	610		DF?	S
Roth, Wm.	SE¼SE¼SE¼SE¼ sec. 16, T. 99 N., R. 61 W.				S
Fritza, N.	SE¼NE¼NW¼NE¼ sec. 16, T. 99 N., R. 61 W.	640		DF?	D,S
Fritza, L.	SW¼SE¼NE¼NE¼ sec. 16, T. 99 N., R. 61 W.	520		DF?	D,S
Wagner, J.	SW¼NE¼NE¼SE¼ sec. 17, T. 99 N., R. 61 W.	235	180	O	D,S
Horstman, H.	SE¼NE¼NE¼NE¼ sec. 17, T. 99 N., R. 61 W.				D,S
Summer, N.	NE¼NW¼SE¼SW¼ sec. 17, T. 99 N., R. 61 W.	300			D,S
Koster, H.	NE¼SW¼SE¼SE¼ sec. 19, T. 99 N., R. 61 W.	190		O	S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Schmidt, L.	SE¼NW¼SW¼NW¼ sec. 20, T. 99 N., R. 61 W.	732			D,S
Hille, E., Jr.	SE¼NW¼NW¼NE¼ sec. 20, T. 99 N., R. 61 W.	400			S
Berg, R.	SW¼NW¼NE¼NE¼ sec. 21, T. 99 N., R. 61 W.	241	100	O	D,S
Polreis, B.	SE¼NW¼NE¼NW¼ sec. 21, T. 99 N., R. 61 W.	365	70		D,S
Roth, A.	SW¼NW¼NE¼ sec. 22, T. 99 N., R. 61 W.	300			S
Tiede, R.	NW¼SE¼SE¼SE¼ sec. 22, T. 99 N., R. 61 W.	360			D,S
Roth, H.	NW¼SE¼SW¼SW¼ sec. 23, T. 99 N., R. 61 W.				
Tiede, H.	SE¼SE¼NW¼NE¼ sec. 24, T. 99 N., R. 61 W.	550			D,S
Roth, W.	SE¼NE¼NW¼NW¼ sec. 24, T. 99 N., R. 61 W.	245			D,S
Thomas, M.	SE¼NE¼NW¼NE¼ sec. 25, T. 99 N., R. 61 W.	560		DF?	S
Heisinger, E.	SE¼NW¼SW¼NW¼ sec. 25, T. 99 N., R. 61 W.	200		O	D,S
Wundel, E.	SW¼NE¼NE¼SE¼ sec. 25, T. 99 N., R. 61 W.	500			S
Winter, E.	NW¼SE¼NE¼NE¼ sec. 26, T. 99 N., R. 61 W.	200		O	D,S
Winter, D.	NW¼SW¼NE¼NW¼ sec. 26, T. 99 N., R. 61 W.	500			D,S
Beiswanger, N.	NW¼SE¼NE¼NE¼ sec. 27, T. 99 N., R. 61 W.	214		O	D,S
Tiede, P.	NW¼NW¼NW¼SW¼ sec. 27, T. 99 N., R. 61 W.				S
Helmuth, S.	NE¼NE¼NE¼SE¼ sec. 28, T. 99 N., R. 61 W.	600			S
Murtte, Wm.	NW¼SE¼SE¼NE¼ sec. 28, T. 99 N., R. 61 W.	550	545	DF?	D,S
Janish, R.	SE¼SE¼SW¼NE¼ sec. 29, T. 99 N., R. 61 W.	201	50	O	D,S
Boehmer, N.	NE¼NE¼SW¼NW¼ sec. 29, T. 99 N., R. 61 W.	180	140	O	D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Winter, R.	NE¼SW¼NE¼NE¼ sec. 31, T. 99 N., R. 61 W.				S
Lang, L.	SE¼SE¼NW¼NE¼ sec. 32, T. 99 N., R. 61 W.	283	45		D,S
Isaak, C.	SW¼NE¼SE¼NE¼ sec. 34, T. 99 N., R. 61 W.	540		DF?	S
Stadlman, F.	SW¼NW¼SE¼SW¼ sec. 34, T. 99 N., R. 61 W.	240	60	O	D,S
Roth, N.	NW¼SW¼NE¼NW¼ sec. 34, T. 99 N., R. 61 W.	240	35	O	D,S
Zirpel, N.	NE¼SW¼NW¼SW¼ sec. 35, T. 99 N., R. 61 W.				D,S
Tiede, E.	SW¼NE¼SE¼NE¼ sec. 36, T. 99 N., R. 61 W.	235	90	O	D,S
Hins, G.	SE¼NE¼NW¼NE¼ sec. 36, T. 99 N., R. 61 W.	185	30	O	D,S
Boehmer, E.	SE¼NW¼NW¼NW¼ sec. 1, T. 99 N., R. 60 W.	350	30		S
Boehmer, E.	SE¼NW¼NW¼NW¼ sec. 1, T. 99 N., R. 60 W.	120	20	O	D
Tatro, J.	NE¼NW¼SW¼SW¼ sec. 1, T. 99 N., R. 60 W.	137		O	D,S
Hafner, P.	NE¼SW¼SW¼NW¼ sec. 3, T. 99 N., R. 60 W.	540		DF?	S
Betterman, F.	SE¼NW¼SW¼SE¼ sec. 3, T. 99 N., R. 60 W.	111		O	D,S
Degen, H.	SE¼SE¼NW¼NW¼ sec. 4, T. 99 N., R. 60 W.	149	32	O	I
Johnson	SE¼NW¼NE¼NE¼ sec. 4, T. 99 N., R. 60 W.	130		O	D,S
Kummer, T.	NE¼SE¼SW¼SW¼ sec. 5, T. 99 N., R. 60 W.	177	32	O	D,S
Kummer, T.	SE¼SE¼SE¼SE¼ sec. 5, T. 99 N., R. 60 W.	138	32	O	D,S
Boehmer, L.	SE¼NW¼NW¼NW¼ sec. 5, T. 99 N., R. 60 W.	170	88	O	D,S
Boddicker, C.	SE¼NW¼NW¼NW¼ sec. 6, T. 99 N., R. 60 W.	200		O	D,S
Vilhauer, C.	SE¼NE¼NE¼NW¼ sec. 7, T. 99 N., R. 60 W.				

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Mechtenberg, L.	SE¼SW¼NW¼SW¼ sec. 7, T. 99 N., R. 60 W.	175	135	O	D,S
Hafner, A.	NE¼SW¼SW¼NW¼ sec. 7, T. 99 N., R. 60 W.	204	96	O	D
Mogok, H.	NW¼SW¼SW¼SW¼ sec. 8, T. 99 N., R. 60 W.	212		O	D,S
Walz, L.	SW¼NE¼NE¼NE¼ sec. 8, T. 99 N., R. 60 W.	450			D,S
Thury, C.	NW¼NE¼SE¼SE¼ sec. 9, T. 99 N., R. 60 W.	187	80	O	D,S
Weber, D.	SW¼NE¼NE¼NE¼ sec. 9, T. 99 N., R. 60 W.				
McClain	NW¼SE¼SE¼SE¼ sec. 10, T. 99 N., R. 60 W.	140		O	D,S
Kummer, N.	NW¼SE¼NE¼NE¼ sec. 10, T. 99 N., R. 60 W.				D,S
Mancini, H.	NE¼SE¼SW¼SE¼ sec. 11, T. 99 N., R. 60 W.	167	130	O	D,S
Van Natta, V.	SW¼NE¼SE¼NE¼ sec. 11, T. 99 N., R. 60 W.	135		O	D,S
Radke, F.	SW¼NE¼NE¼NE¼ sec. 14, T. 99 N., R. 60 W.				D,S
Fergen, J.	NE¼SW¼NW¼SW¼ sec. 14, T. 99 N., R. 60 W.	450		DF?	D,S
Thury, L.	NW¼SE¼SE¼NE¼ sec. 15, T. 99 N., R. 60 W.				D,S
Thury, W.	SE¼NW¼NW¼NW¼ sec. 15, T. 99 N., R. 60 W.	160	32	O	D,S
Kopel, R.	NW¼NW¼NW¼SW¼ sec. 17, T. 99 N., R. 60 W.	215	55	O	D,S
Cremer, H.	NE¼SW¼NW¼NW¼ sec. 17, T. 99 N., R. 60 W.	215		O	D
Tiede, H.	NE¼NW¼SW¼SW¼ sec. 18, T. 99 N., R. 60 W.	235	100	O	D,S
Tiede, H.	NE¼NW¼SW¼SW¼ sec. 18, T. 99 N., R. 60 W.	550		DF?	S
Adkins, C.	NW¼NW¼NW¼NW¼ sec. 19, T. 99 N., R. 60 W.	230			
Roth, C.	NW¼NW¼NW¼NE¼ sec. 20, T. 99 N., R. 60 W.	500		DF?	S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Roth, C.	NW¼NW¼NW¼NE¼ sec. 20, T. 99 N., R. 60 W.	252		O	D,S
Hoffmann, E.	NE¼SW¼SW¼SW¼ sec. 20, T. 99 N., R. 60 W.	545	350	DF?	D,S
Roth, C.	NW¼NW¼NW¼NE¼ sec. 20, T. 99 N., R. 60 W.	496		DF?	S
Freier, M.	NW¼NW¼NW¼NW¼ sec. 21, T. 99 N., R. 60 W.	500		DF?	D,S
Weiss, R.	NE¼NE¼NE¼SW¼ sec. 22, T. 99 N., R. 60 W.	408	6	DF?	D,S
Wiltz, R.	NW¼SE¼SE¼NE¼ sec. 22, T. 99 N., R. 60 W.	465		DF	D,S
Tiede, V.	NE¼NE¼SW¼NW¼ sec. 23, T. 99 N., R. 60 W.	465		DF	D,S
Nonen	NW¼SE¼SE¼SE¼ sec. 23, T. 99 N., R. 60 W.	1000?			D,S
Radke, F.	NE¼NE¼SE¼NE¼ sec. 23, T. 99 N., R. 60 W.	450		DF	D,S
Radke, F.	SW¼SE¼NE¼SE¼ sec. 26, T. 99 N., R. 60 W.	185		O	D,S
Konrad, W.	SE¼NW¼NW¼NW¼ sec. 26, T. 99 N., R. 60 W.	450		DF	D,S
Benson, C. L.	NE¼NW¼SW¼SW¼ sec. 26, T. 99 N., R. 60 W.	459			D,S
Mattheis, D.	NE¼NW¼NW¼SW¼ sec. 27, T. 99 N., R. 60 W.	186		O	D,S
Haustveit, E.	SE¼NW¼NW¼NW¼ sec. 28, T. 99 N., R. 60 W.	200		O	S
Thelen, D.	NE¼SW¼NW¼NE¼ sec. 28, T. 99 N., R. 60 W.	200	45	O	D,S
Henke, A.	SW¼SW¼SW¼SW¼ sec. 28, T. 99 N., R. 60 W.	555		DF?	D,S
Mattheis, E.	NW¼SE¼SE¼NE¼ sec. 28, T. 99 N., R. 60 W.	191	24	O	D,S
Henke, H.	NW¼SE¼NE¼SE¼ sec. 29, T. 99 N., R. 60 W.	530		DF?	S
Benson, D.	NE¼SW¼SW¼SW¼ sec. 29, T. 99 N., R. 60 W.	400			D,S
Teischner, K.	SE¼NE¼NW¼NE¼ sec. 30, T. 99 N., R. 60 W.	520		DF?	D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Tiede, H.	SE¼NW¼NW¼NW¼ sec. 30, T. 99 N., R. 60 W.	235		O	D,S
Teischner, K.	SE¼NE¼NW¼NE¼ sec. 30, T. 99 N., R. 60 W.	530		DF	S
Tiede, H.	SE¼NW¼NW¼NW¼ sec. 30, T. 99 N., R. 60 W.	553		DF	D,S
Lindeman, A.	SE¼SW¼SW¼NW¼ sec. 31, T. 99 N., R. 60 W.	565		DF	S
Stelzer, G.	NW¼NW¼NW¼NW¼ sec. 32, T. 99 N., R. 60 W.	500		DF	S
Nolz, S.	SE¼SW¼NW¼NW¼ sec. 34, T. 99 N., R. 60 W.	600	100	DF	S
Nolz, S.	SE¼SW¼NW¼NW¼ sec. 34, T. 99 N., R. 60 W.	150	100	O	D,S
Conrad, J.	SW¼NE¼NE¼SE¼ sec. 35, T. 99 N., R. 60 W.				D,S
Benson, D.	SW¼NW¼NE¼NW¼ sec. 35, T. 99 N., R. 60 W.	200	18	O	D,S
Wudel, H.	SE¼NW¼SW¼SW¼ sec. 35, T. 99 N., R. 60 W.	520		DF	S
Tiede, D.	NW¼SE¼SE¼SE¼ sec. 1, T. 98 N., R. 61 W.	600		DF?	S
Schoon, W.	SE¼NW¼NW¼NW¼ sec. 1, T. 98 N., R. 61 W.	641		DF?	D,S
Sprecher, E.	NE¼SW¼SW¼NW¼ sec. 2, T. 98 N., R. 61 W.	590		DF?	S
Boddicker, L.	NE¼NW¼SW¼ sec. 3, T. 98 N., R. 61 W.	250		O	D,S
Sommer, J.	SE¼NW¼NW¼NW¼ sec. 4, T. 98 N., R. 61 W.	426		DF	S
Hofner, A.	NE¼SE¼NW¼SE¼ sec. 4, T. 98 N., R. 61 W.	30	25	O	S
Winter, E. D.	SE¼NE¼NW¼NE¼ sec. 4, T. 98 N., R. 61 W.	700			S
Winter, J.	SW¼NE¼NW¼NE¼ sec. 5, T. 98 N., R. 61 W.	20	15	O	S
Fisher, B.	SE¼NW¼NW¼SW¼ sec. 5, T. 98 N., R. 61 W.	300		O	D,S
Sprecher, H.	SW¼NE¼NE¼NE¼ sec. 10, T. 98 N., R. 61 W.	270			D,S

Name	Location	Depth of Well (feet)	Depth to Water (feet)	Source	Use
Albrecht, H.	SW¼NE¼NW¼NE¼ sec. 12, T. 98 N., R. 61 W.	540		DF	S
Hirsch, A.	SE¼NE¼NW¼NW¼ sec. 2, T. 98 N., R. 60 W.		150		D,S
Reiner, E. E.	NW¼SE¼NW¼SE¼ sec. 3, T. 98 N., R. 60 W.	205	25	O	D,S
Maas, H.	SE¼NW¼NW¼SW¼ sec. 4, T. 98 N., R. 60 W.	500		DF?	S
Hofner, F.	NW¼SE¼SE¼NE¼ sec. 4, T. 98 N., R. 60 W.	551		DF?	S
Schulz, Wm.	SW¼NW¼NE¼SW¼ sec. 5, T. 98 N., R. 60 W.	525		DF?	D,S
Kost, R.	SW¼NE¼NE¼SE¼ sec. 5, T. 98 N., R. 60 W.	400		DF?	S
Tiede, R. U.	NW¼NE¼NE¼SE¼ sec. 6, T. 98 N., R. 60 W.	550		DF?	S
Lindeman, D.	NE¼SW¼NE¼SW¼ sec. 7, T. 98 N., R. 60 W.	565		DF?	S
Tiede, A.	SW¼NE¼NW¼NE¼ sec. 8, T. 98 N., R. 60 W.	560		DF?	S
Tiede, A.	SW¼NE¼NW¼NE¼ sec. 8, T. 98 N., R. 60 W.	227	90	O	D,S
Maas, E.	NE¼SW¼NE¼NW¼ sec. 9, T. 98 N., R. 60 W.	130		O	D,S
Maas, E.	NE¼SW¼NE¼NW¼ sec. 9, T. 98 N., R. 60 W.	500		DF	S