STATE OF SOUTH DAKOTA
Richard Kneip, Governor

DEPARTMENT OF NATURAL RESOURCE DEVELOPMENT
Vern W. Butler, Secretary

GEOLOGICAL SURVEY
Duncan J. McGregor, State Geologist

Open-File Report No. 12-UR

GROUND-WATER STUDY FOR THE CITY OF HECLA

by

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GROUND-WATER STUDY FOR THE CITY OF HECLA

This report contains the results of a special ground-water investigation conducted by the South Dakota Geological Survey around the City of Hecla, Brown County, South Dakota. The field work was conducted from June 22 to July 9 and August 5 to August 13, 1976. The investigation involved: (1) interpretation of the geology of the area, (2) drilling of 14 auger holes and 23 rotary holes, and (3) collection and analysis of 7 water samples. The location of test holes is plotted on figure 1, along with locations where water samples were taken. The results of the chemical analysis of the water samples can be found in table 1.

At present the City obtains its water supply from three wells in town. They are approximately 98 feet deep and yield water from a gravel outwash deposit about six feet thick. At the time of this report there are restrictions in town on lawn and garden watering. The present investigation was undertaken to locate a source of water to augment the present water supply

The project was financed by the South Dakota Geological Survey, the Oahe Conservancy Sub-District, and the City of Hecla.

Hecla is located on the glacial Lake Dakota Plain. These sediments consist of very fine sand, silt, and clay. Beneath this sequence, till, and in some places gravel are encountered. The gravel occurs at elevations of 1150 to 1230 feet above the mean sea level, and was encountered in 14 of the 37 holes. The gravel is important as an aquifer, and the purpose of the field work was to locate a gravel deposit as close to town as possible. The gravel has higher permeability than the lake deposits and

yields more water than the fine sand. Figure 2 shows the saturated thickness of gravel at each hole.

To the west of the City of Hecla three test holes penetrated gravel. These holes were No. 2, 3, and 5 (see figs. 1, 2, and app. A).

Along the south edge of town four holes were drilled. Test hole 20 was a shallow hole and did not reach the depth at which the gravel usually occurred. Hole 21 had 2 feet of gravel at a depth of 100 feet below the land surface and Hole 22 had 3 feet of gravel from 86 to 89 feet. Test hole 23 penetrated 7 feet of gravel; however, the drilling was halted due to twisting of the bit, and the total thickness of gravel was not penetrated.

Four holes were drilled along the north edge of town, but no gravel layer was found. An observation well was constructed in fine sand, but the attempts to pump water failed due to the fine nature of the sand and clay.

Twenty holes were drilled to the east of town and the gravel appeared most promising in this direction. Holes No. 1, 9, 10, and 11 had from 1 to 15 feet of gravel, (see fig. 1, 2, and app. A). An observation well was placed in hole 11 where 6 feet of gravel was encountered at a depth of 78 to 84 feet. This observation well pumped quite well with an air compressor and the results of the water sample analysis appear below in this report. In the vicinity of the present city wells, from 7 to 15 foot thick gravel was found in test holes 23, 25, and 32 (see figs. 1, 2, and app. A).

The area around Test Hole No. 25 is recommended for additional

testing. Test Hole No. 25 penetrated 15 feet of gravel from the depth of 90 to 105 feet below the land surfaces, but Test Hole No. 26, ¼ mile northeast of Test Hole 25, did not penetrate any significant gravel layer. Test Holes 24 and 33 were not deep enough to determine the extent of the gravel layer. An observation well constructed in Test Hole No. 25 was pumped satisfactorily by an air compressor. The results of the water sample analysis from this hole is designated by W-7 in table 1. This water is comparable to the present city water (W-2, table 1), and has slightly less dissolved solids and hardness than the city water.

As was previously mentioned, the lake deposits, due to clay content, do not yield significant water. On the other hand, the gravel deposits could yield significant water if the deposit is extensive and contains little clay. The most extensive gravel is to the northeast of town in the vicinity of holes 1, 9, 10, and 11. This area should be considered as a future water source for the City if the recommended site around test hole 25 is found to be unsatisfactory.

A total of seven water samples were analyzed in this study, and the results appear in table 1, along with the recommended limits for chemical constituents. All of the samples were found to be over the recommended limit for manganese, and all but sample 1 exceeded the limit for iron. Samples 3 and 4 had values over the limit for total solids, and sample 3 in addition, has an excess of chlorides. Values for all of the other chemical constituents were within the recommended limits for all seven samples.

Water sample 2 is from the City well, and shows high values,

i.e., those exceeding the limit in total iron (2.0 ppm) and manganese (0.25 ppm). Sample 7, taken from an observation well at the recommended area, also shows an excess of total iron (1.5 ppm) and manganese (0.25 ppm), however the value of total iron is lower than that of the present well. Values for total solids for these two samples are 640 ppm for sample 2, from the City well, and 548 ppm for sample 7, from the observation well. The water from the recommended area appears therefore, to be comparable to, if not better than, the water presently used by the City.

If the City should decide to test the area southeast of town in the vicinity of Test Hole 25, it is recommended that an engineering firm licensed in South Dakota be hired to coordinate the drilling. If the thickness of gravel and clay content is satisfactory, it should be converted to a pump test well. A pump test should be conducted to determine the quantity of water which could be pumped. Also, water samples should be collected and analyzed for quality.

Before a permanent well is drilled, the City officials should contact the Division of Water Rights, Department of Natural Resource Development, to obtain water rights and a permit to drill a municipal well, and the South Dakota Environmental Protection Agency to determine the biological and chemical suitability of the water.

This report was prepared by:

Betsy Slugg
Assad Barari
August, 1976

TABLE 1. RESULTS OF CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED IN THE HECLA AREA

Sample	Location of water sample	Parts per million										
		Depth of well	Calcium	Sodium	Magnesium	Chlorides	Sulfate	Iron	Manganese	Nitrate Nitrogen	Hardness $CaCO_3$	Total Solids
A			--	---	--	250	500[1]	0.3	0.05	10.0	---	1000[1]
W- 1	NENESWSW sec. 25 T128N, R61W, irrigation, 10 feet to water	78	35	180	15	155	25	0.1	0.7	0.5	150	870
W- 2	SESESESE sec. 22 T128N, R61W, city well, 30 feet to water	98	65	90	26	25	100	2.0?	0.25	0.5	270	640
W- 3	SWNWSWNW sec. 23 T128N, R61W, Schroeder	20?	30	550	15	360	450	0.5	0.06	0.5	135	1736
W- 4	SENESENE sec. 22 T128N, R61W, S Treeby	--	95	210	35	70	440	2.0	0.45	0.5	380	1188
W- 5	NENWNENE sec. 27 T128N, R61W, S Treeby	95?	45	90	22	30	100	0.8	0.15	0.5	202	516
W- 6	NWNWNENE sec. 23 T128N, R61W, Observation Well Hole 11, 5 feet to water	98	30	150	21	35	140	0.6	0.50	0.5	160	540
W- 7	SESWSWSW sec. 23 T128N, R61W, Observation Well, Hole 25	108	50	90	23	35	70	1.5	0.25	0.5	220	548

A - Drinking water standards, U.S. Public Health Service (1962). All samples were analyzed by the South Dakota Geological Survey

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

APPENDIX A

LOGS OF TEST HOLES DRILLED IN THE HECLA AREA

128 61 13 cbbb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NW¼SW¼ Section: 13 T. 128 N. ~~X~~ R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 1 (Rotary) Land Owner: _____

County: Brown Date: 8-9-76 Elevation: 1299 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	2	Soil, black, sandy	0-2
	14	Sand, fine, clayey	2-16
	7	Silt, light brown, very fine, sandy	16-23
	31	Silt, dark gray, sandy, clayey	23-54
	20	Silt, dark gray, clayey	54-74
	7	Sand, medium to coarse, angular to subangular'	74-81
	8	Gravel, coarse; sand, medium to coarse, subangular	81-89
	1	Silt, gray, clayey	89-90
		T.D. 90'	
		W.T. 9'	

128 61 17 dadc

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼SE¼NE¼SE¼ Section: 17 T. 128 N. ~~S.~~ XX R. 61 ~~E.~~ X W.

Well: _____ Test Hole: 2 (Rotary) Land Owner: _____

County: Brown Date: 7-7-76 Elevation: 1290 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, clayey, silty	0-1
	7	Clay, gray brown, silty	1-8
	11	Sand, brown-gray, medium	8-19
	106	Clay, gray, sandy, silty	19-125
	5	Gravel, gray, coarse, clayey, sandy, silty	125-130
	13	Clay, sandy, silty	130-143
		Rock	143
		T.D. 143'	
		W.T. 6'	

128 61 19 aaac

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼NE¼NE¼NE¼ Section: 19 T. 128 N. X R. 61 E. W.

Well: _____ Test Hole: 3 (rotary) Land Owner: _____

County: Brown Date: 7-6-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black	0-1
	11	Till, light brown, unsorted	1-12
	68	Till, gray, unsorted, gravel stringers	12-80
	72	Till, shale pebbles, thin gravel stringers	80-152
	20?	Cobbles, 2" ciameter, some clay	152-172?
	31	Shale drill, clay, silty	172?-203
	17	Shale	203-220
		T.D. 220'	
		W.T.5'	

128 61 20 abbb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NW¼NE¼ Section: 20 T. 128 N. X~~S~~ R. 61 ~~E~~. W.

Well: _____ Test Hole: 4 (Auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1292 (A, I, T)

E Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	2	Soil, black, silty, clayey	0-2
	4	Sand, fine to medium, clayey, silty	2-6
	4	Sand, brown, medium, slightly silty	6-10
	15	Sand, brown, medium, very silty, clayey	10-25
	7	Clay, gray, sandy	25-32
	20	Sand, gray, medium, very silty, clayey	32-52
	23	Till	52-85
		T.D. 85'	
		W.T. not measured	

128 61 21 abab

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NE¼NW¼NE¼ Section: 21 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: 5 (rotary) Land Owner: _____

County: Brown Date: 7-8-76 Elevation: 1286 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, silty	0-1
	12	Silt, black, clayey	1-13
	11	Sand, fine to medium, gastropod shells	13-24
	18	Silt, gray, sandy	24-42
	6	Silt, gray	42-48
	5	gravel, 1" diameter	48-53
	18	Silt, gray, fine sand	53-71
	9	Clay, gray, sandy	71-80
	32	Till, gray, unsorted shale or rock	80-112
		T.D. 112'	
		W.T.5'	

128 61 15 dccc

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼SW¼SW¼SE¼ Section: 15 T. 128 N. ~~X~~ R. 61 ~~X~~ W.

Well: _____ Test Hole: 6 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1300 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, yellow, silty, clayey	0-1
	3	Soil, brown, silty, clayey	1-4
	12	Sand, yellow, fine	4-16
	5	Sand, brown, fine	16-21
	44	Sand, gray, fine	21-65
	7	Sand, gray, fine, sandy, silty	65-72
	6	Till	72-78
		T.D. 78'	
		W.T. 10'	

128 61 15 ddcc

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼SW¼SE¼SE¼ Section: 15 T. 128 N. X S. R. 61 XX E. W.

Well: _____ Test Hole: 7 (rotary) Land Owner: _____

County: Brown Date: 8-10-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	12	Silt, yellow brown	1-13
	20	Silt, gray, unoxidized, sandy	13-33
	44	Clay, sand stringers	33-77
	53	Till, dark gray, unsorted	77-130
		T.D. 130'	
		W.T. 5'	

128 61 15 ddcd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼SW¼SE¼SE¼ Section: 15 T. 128 N. ~~X~~ R. 61 ~~X~~ W.

Well: _____ Test Hole: 8 (auger) Land Owner: _____

County: Brown Date: 6-23-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	2	Soil, dark brown	0-2
	2	Sand, light brown, fine	2-4
	5	Silt, yellow brown	4-9
	8	Sand, brown, medium, clean	9-17
	9	Sand, gray, medium	17-26
	30	Sand, gray, medium, silty	26-56
	18	Silt, slightly sandy	56-74
	24	Clay, gravelly	74-98
		T.D. 98'	
		W.T. 6'	
		Obs well 60' 2" PVC	

128 61 23 babb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NE¼NW¼ Section: 23 T. 128 N. XX S. R. 61 X E. W.

Well: _____ Test Hole: 9 (rotary) Land Owner: _____

County: Brown Date: 8-5-76 Elevation: 1290 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	12	Silt, brown, fine sand	1-13
	51	Sand, very fine, subrounded, clean	13-64
	11	Clay, gray, silty	64-75
	3	Gravel, subrounded	75-78
	7	Silt, gray, fine sand	78-85
	1	Limestone	85-86
	32	Till, gray, unsorted, gravelly	86-118
	32	Silt, black, shaley, fine sand	118-150
		T.D. 150'	
		W.T. 6'	

128 61 23 abbb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NW¼NE¼ Section: 23 T. 128 N. XX S. R. 61 X E. W.

Well: _____ Test Hole: 10 (rotary) Land Owner: _____

County: Brown Date: 7-8-76 Elevation: 1287 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	3	Soil, black, sandy	0-3
	5	Sand, brown, medium	3-8
	76	Clay, brown, silty, (gray after 27')	8-84
		gravel, brown, coarse	84-
		T.D. 84' (truck broke down)	
		W.T. 6'	

128 61 23 aabb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NE¼NE¼ Section: 23 T. 128 N. ~~S~~. R. 61 ~~E~~. W.

Well: _____ Test Hole: 11 (rotary) Land Owner: _____

County: Brown Date: 8-9-76 Elevation: 1283 (A, I, T)

E Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	15	Silt, light brown	1-16
	47	Silt, gray	16-63
	15	Sand, very fine to fine, subrounded, silty	63-78
	6	Gravel, clean	78-84
	19	Till, gray, silty	84-103
	1	Rock (limestone)	103-104
	11	Till, gray, silty, clayey	104-115
	15	Shale, black	115-130
		T.D. 130'	
		Obs Well: 100', 2" casing slotted from 77-85'	
		2' above ground	
		W.T. 1'	

128 61 24 bbaa

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NE¼NE¼NW¼NW¼ Section: 24 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: 12 (rotary) Land Owner: _____

County: Brown Date: 8-9-76 Elevation: 1285 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	15	Silt, light brown, sandy	1-16
	29	Silt, gray, sandy	16-45
	13	Sand, gray, very fine, clay layers	45-58
	17	Silt, gray, clay layers	58-75
	45	Clay, gray, silty	75-120
		T.D. 120'	
		W.T. 7'	

128 61 22 adab

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NE¼SE¼NE¼ Section: 22 T. 128 N. ~~X~~ S. R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 13 (rotary) Land Owner: _____

County: Brown Date: 8-11-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	44	Sand, very fine to fine, subrounded, clean	1-45
	31	Silt, gray blue, clayey	45-76
	1	Sand, coarse to very coarse, clayey	76-77
	12	Till, gray, unsorted, gravel stringers	77-89
	37	Till, gray, unsorted, sandy, gravelly	89-126
	14	Shale, black	126-140
		T.D. 140'	
		W.T. 7'	

128 61 23 bccc

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼SW¼SW¼NW¼ Section: 23 T. 128 N. XX S. R. 61 XX E. W.

Well: _____ Test Hole: 14 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, silty, clayey	0-1
	2	Soil, yellow, silty, clayey	1-3
	16	Clay, yellow, silty	3-19
	4	Sand, gray, fine, very silty	19-23
	6	Sand, gray, fine, silty	23-29
	18	Sand, gray, fine, clean	29-47
	5	Sand, gray, fine, silty	47-52
	7	Clay, gray, silty	52-59
	9	Till	59-68
		T.D. 68'	
		W.T 9'	

128 61 23 dbbb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NW¼SE¼ Section: 23 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: 15 (rotary) Land Owner: _____

County: Brown Date: 8-9-76 Elevation: 1283 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	15	Sand, very fine to fine, subrounded, clean	1-16
	9	Silt, light brown, clayey	16-25
	21	Silt, gray, very clayey	25-46
	104	Clay, blue gray	46-150
		T.D. 150'	
		W.T. 8'	

128 61 23 daac

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼NE¼NE¼SE¼ Section: 23 T. 128 N. ~~XX~~ S. R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 16 (rotary) Land Owner: _____

County: Brown Date: 8-6-76 Elevation: 1283 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	19	Sand, fine, subrounded, clean	1-20
	4	Silt, clay, light brown	20-24
	106	Clay, gray, silty, sand stringers	24-130
		T.D. 130'	
		W.T. not measured	

128 61 30 abaa

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NE¼NE¼NW¼NE¼ Section: 30 T. 128 N. S. R. 61 E. W.

Well: _____ Test Hole: 17 (auger) Land Owner: _____

County: Brown Date: 7-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown, sandy, silty	0-1
	4	Silt, yellow-brown	1-5
	7	Sand, brown, medium to coarse, silty	5-12
	12	Sand, fine to medium, silty, clayey	12-24
	41	Clay, gray, sandy, gravelly	24-65
	25	Sand, medium, silty, clayey	65-90
	6	Clay, gray, gravelly	90-96
		T.D. 96'	
		W.T. 4'	

128 61 28 bbbb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NW¼NW¼ Section: 28 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: 18 (auger) Land Owner: _____

County: Brown Date: 7-76 Elevation: 1296 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	2	Soil, brown, silty, clayey	0-2
	4	Clay, yellow, silty	2-6
	3	Sand, brown, fine, silty	6-9
	18	Sand, fine to medium, clean	9-27
	9	Sand, fine, silty, clayey	27-36
	6	Silt, gray, sandy, clayey	36-42
	5	Silt, gray, clayey	42-47
	3	Till	47-50
		T.D. 50'	
		W.T. 4'	

128 61 22 cccc

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼SW¼SW¼SW¼ Section: 22 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: 19 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1297 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, sandy, silty	0-1
	2	Sand, brown, silty	1-3
	2	Sand, yellow, fine, clean	3-5
	3	Sand, brown, fine, clean	5-8
	6	Sand, silt, clay	8-14
	9	Clay, brown, silty	14-23
	33	Clay, gray	23-56
	7	Till	56-63
		T.D. 63'	
		W.T. not measured	

128 61 27 baba

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NE¼NW¼NE¼NW¼ Section: 27 T. 128 N. ~~X~~S. R. 61 ~~X~~E. W.

Well: _____ Test Hole: 20 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown, sandy	0-1
	3	Silt, yellow	1-4
	11	Silt, brown, clayey	4-15
	7	Silt, gray, clayey	15-22
	7	Sand, gray, fine to medium, silty	22-29
	5	Sand, gray, medium, silty	29-34
	20	Sand, gray, medium, slightly silty	34-54
	14	Silt, gray, clayey	54-68
		T.D. 68'	
		W.T. 8'	

128 61 27 aaba

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NE¼NW¼NE¼NE¼ Section: 27 T. 128 N. ~~X~~ R. 61 ~~X~~ W.

Well: _____ Test Hole: 21 (rotary) Land Owner: _____

County: Brown Date: 8-10-76 Elevation: 1297 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	11	Sand, very fine, subrounded, clean	1-12
	14	Silt, gray to light brown, clayey	12-26
	58	Clay, gray	26-84
	10	Sand, fine, subangular, clean	84-94
	1	Gravel, medium, subangular	94-95
	5	Silt, gray, clayey	95-100
	2	Gravel, medium to coarse, subangular	100-102
	9	Clay, sandy (fine subangular)	102-111
	29	Shale, black	111-140
		T.D. 140'	
		W.T. not measured	

128 61 27 aabd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼NW¼NE¼NE¼ Section: 27 T. 128 N. X~~X~~. R. 61 ~~X~~. W.

Well: _____ Test Hole: 22 (rotary) Land Owner: _____

County: Brown Date: 8-10-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black	0-1
	9	Sand, fine, subrounded, clean	1-10
	6	Silt, light green, clayey	10-16
	8	Silt, light brown, clayey	16-24
	62	Silt, gray, clayey	24-86
	3	Gravel, medium, subangular	86-89
	29	Till, gray	89-118
	12	Shale	118-130
		W.T. 9'	

128 61 22 dddd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼SE¼SE¼SE¼ Section: 22 T. 128 N. ~~X~~ S. R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 23 (rotary) Land Owner: _____

County: Brown Date: 7-76 Elevation: 1295 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black	0-1
	10	Sand, brown, fine	1-11
	13	Silt, yellow brown to gray	11-24
	46	Silt, gray	24-70
	5	Till, gray, unsorted	70-75
	5	Gravel, medium to coarse, clean	75-80
	2	Limestone boulders	80-82
		T.D. 82' (bit twisted)	
		W.T. not measured	

128 61 27 aaad

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼NE¼NE¼NE¼ Section: 27 T. 128 N. X S. R. 61 X E. W.

Well: _____ Test Hole: 24 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1300 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, dark brown, silty	0-1
	8	Sand, brown, medium, clean	1-9
	23	Sand, gray, medium, clean	9-32
	11	Sand, gray, medium, slightly silty	32-43
	7	Sand, gray, very silty	43-50
	15	Till	50-65
		T.D. 65'	
		W.T. 9'	

128 61 23 cccd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼SW¼SW¼SW¼ Section: 23 T. 128 N. X S. R. 61 X E. W.

Well: _____ Test Hole: 25 (rotary) Land Owner: _____

County: Brown Date: 8-10-76 Elevation: 1292 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, sandy	0-1
	26	Sand, reddish brown to brown, fine, subangular	1-27
	48	Silt, gray, clayey, sandy, gravelly	27-75
	1	Gravel	75-76
	1	Silt, clay, gravel stringers	76-90
	15	Gravel, coarse, cobbles, clean	90-105
	7	Till, gray, unsorted	105-112
	28	Shale, black	112-140
		T.D. 140'	
		Observation Well:	
		120' of 2" pipe	
		slotted from 89-106'	
		2' above ground	
		W.T. 67 feet (well plugged)	

128 61 23 cdcb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼SW¼SE¼SW¼ Section: 23 T. 128 N. ~~X~~ R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 26 (rotary) Land Owner: _____

County: ~~Brown~~ Date: ~~8-5-76~~ Elevation: 1297 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: ~~SDGS~~

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	6	Soil, light brown, sandy	0-6
	5	Sand, brown, very fine to fine, subangular to subrounded	6-11
	4	Silt, light gray, clayey, sandy	11-15
	39	Silt, light gray, clayey	15-54
	77	Sand, light gray, fine to medium, subangular	
		(silty from 91-92)	54-131
	19	Till	131-150
		T.D. 150'	
		W.T. not measured	

128 61 23 cddd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼SE¼SE¼SW¼ Section: 23 T. 128 N. XX S. R. 61 XX W.

Well: _____ Test Hole: 27 (auger) Land Owner: _____

County: Brown Date: 7-76 Elevation: 1285 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	4	Soil, dark brown, sandy	0-4
	2	Sand, gray, fine, silty, clayey	4-6
	2	Sand, brown, fine, silty	6-8
	3	Sand, gray, fine, very silty, clayey	8-11
	15	Sand, gray, fine, silty	11-26
	5	Silt and clay, gray	26-31
	27	Clay, gray	31-58
	2	Till	58-60
		T.D. 60'	
		W.T. 7'	

128 61 23dccd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼SW¼SW¼SE¼ Section: 23 T. 128 N. ~~XX~~ S. R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 28 (rotary) Land Owner: _____

County: Brown Date: 7-8-76 Elevation: 1284 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, sandy	0-1
	19	Sand, brown to gray, medium	1-20
	21	Clay, gray, silty, sandy	20-41
	131	Clay, gray	41-172
	8	Shale	172-180
		T.D. 180'	
		W.T. 5'	

128 61 23 ddac

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼NE¼SE¼SE¼ Section. 23 T. 128 N. ~~XX~~ S. R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 29 (rotary) Land Owner: _____

County: Brown Date: 8-6-76 Elevation: 1282 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	15	Sand, very fine to fine, subrounded, silty	1-16
	5	Silt, light brown, clayey	16-21
	129	Silt and clay, blue gray	21-150
		T.D. 150'	
		W.T. 7'	

128 61 23 dddd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location ~~SE¼SE¼SE¼SE¼~~ Section: 23 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: ~~30 (rotary)~~ Land Owner: _____

County: ~~Brown~~ Date: ~~7-8-76~~ Elevation: ~~1284~~ (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: ~~SDGS~~

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, sandy	0-1
	8	Sand, brown, medium	1-9
	78	Clay, gray, silty, sandy	9-87
	9	Cobbles, sand, gravel	87-96
	7	Clay	96-103
		T.D. 103'	
		W.T. 5'	

128 61 24 cccc

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼SW¼SW¼SW¼ Section: 24 T. 128 N. ~~XX~~ S. R. 61 ~~X~~ E. W.

Well: _____ Test Hole: 31 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1285 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, sandy, silty	0-1
	3	Sand, tan, fine, silty	1-4
	14	Sand, brown, fine, clean	4-18
	6	Sand, gray, fine	18-24
	3	Sand, gray, fine, silty, clayey	24-27
	15	Clay, gray, sandy	24-39
	8	Clay, gray	39-47
	6	Till	47-53
		T.D. 53'	
		W.T. 5'	

128 61 26 bcbb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼SW¼NW¼ Section: 26 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: 32 (rotary) Land Owner: _____

County: Brown Date: 8-10-76 Elevation: _____ (A, I, T)

E Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	8	Sand, fine to very fine, subrounded, clean	1-9
	14	Silt, gray-green to brown	9-23
	42	Clay, blue gray	23-65
	11	Sand, gravel, subangular, clayey	65-76
	6	Clay, gray, silty	76-82
	3	Gravel, medium, subangular	82-85
	3	Silt and clay	85-88
	4	Cobbles	88-92
	6	Silt, gray	92-98
	32	Shale, black	98-130
		T.D. 130'	
		W.T. 8'	

128 61 26 bbdd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼SE¼NW¼NW¼ Section: 26 T. 128 N. X S. R. 61 XX E. W.

Well: _____ Test Hole: 33 (rotary) Land Owner: _____

County: Brown Date: 8-5-76 Elevation: 1285 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown	0-1
	12	Sand, fine, subangular	1-13
	17	Silt, light brown, clayey	13-30
		T.D. 30'	
		Water loss. Tried 50' and same problem	
		W.T. not measured	

128 61 26 badd

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SE¼SE¼NE¼NW¼ Section: 26 T. 128 N. X S. R. 61 X E. W.

Well: _____ Test Hole: 34 (rotary) Land Owner: _____

County: Brown Date: 8-5-76 Elevation: 1280 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black	0-1
	7	Sand, fine, subrounded, clean	1-8
	2	Silt, white, clayey	8-10
	120	Silt, gray, clayey	10-130
	4	Gravel	130-134
	6	Silt, gray	134-150
		T.D. 150'	
		W.T. 8'	

128 61 26 adaa

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NE¼NE¼SE¼NE¼ Section: 26 T. 128 N. XX S. R. 61 XX E. W.

Well: _____ Test Hole: 35 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1281 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, black, sandy, silty	0-1
	3	Sand, gray, clean	1-4
	3	Silt, yellow, clayey	4-7
	6	Silt, brown, clayey, sandy	7-13
	12	Silt, brown, clayey	13-25
	8	Clay, brown	25-33
	41.	Clay, gray-brown	33-74
	9	Till	74-83
		T.D. 83'	
		W.T. 8'	

128 61 27 cbbb

SOUTH DAKOTA GEOLOGICAL SURVEY

Location NW¼NW¼NW¼SW¼ Section: 27 T. 128 N. ~~S.~~ R. 61 ~~E.~~ W.

Well: _____ Test Hole: 36 (auger) Land Owner: _____

County: Brown Date: 7-76 Elevation: 1300 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	2	Soil, dark brown	0-2
	3	Sand, dark brown	2-5
	8	Clay, yellow brown, silty	5-13
	3	Clay, brown, silty	13-16
	7	Clay, gray	16-23
	8	Sand, gray, fine, silty, clayey	23-31
	5	Sand, gray, fine, silty	31-36
	7	Sand, gray, clean, fine	36-43
	5	Silt, clay	43-48
	11	Clay, gray	48-59
	9	Till	59-68
		T.D. 68'	
		W.T. not measured	

128 61 28 dccc

SOUTH DAKOTA GEOLOGICAL SURVEY

Location SW¼SW¼SW¼SE¼ Section: 28 T. 128 N. XXXX S. R. 61 XX E. W.

Well: _____ Test Hole: 37 (auger) Land Owner: _____

County: Brown Date: 6-76 Elevation: 1296 (A, I, T)

E-Log: _____ Samples: _____ Drilling Company: SDGS

Source of Data: _____

Geologic Unit	Thickness	Lithologic Description	From - to Feet
	1	Soil, brown, silty, sandy	0-1
	3	Sand, brown, medium, clayey	1-4
	6	Silt, brown, sandy, clayey	4-10
	19	Silt, brown, clayey	10-29
	41	Clay, gray, silty	29-70
	10	Silt, gray, clayey	70-80
	7	Clay, sandy, pebbly	80-87
	9	Silt, yellow	87-96
	7	Till	96-103
		W.T. not measured	