Layne Christensen Company *Ranney Division*

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REPORT
OF
SITE B MULBERRY POINT
HYDROGEOLOGIC INVESTIGATION
TO DETERMINE
WATER SUPPLY DEVELOPMENT POTENTIAL
FROM RADIAL COLLECTOR WELL
FOR
LEWIS & CLARK RURAL WATER SUPPLY SYSTEM
CLAY COUNTY, SOUTH DAKOTA

PREPARED FOR:

HDR ENGINEERING
BANNER ASSOCIATES, INC. &
LEWIS & CLARK RURAL WATER SUPPLY SYSTEM

PREPARED BY:

LAYNE CHRISTENSEN COMPANY
SUNBURY, OHIO

DECEMBER 2001

Layne®

RANNEY® METHOD

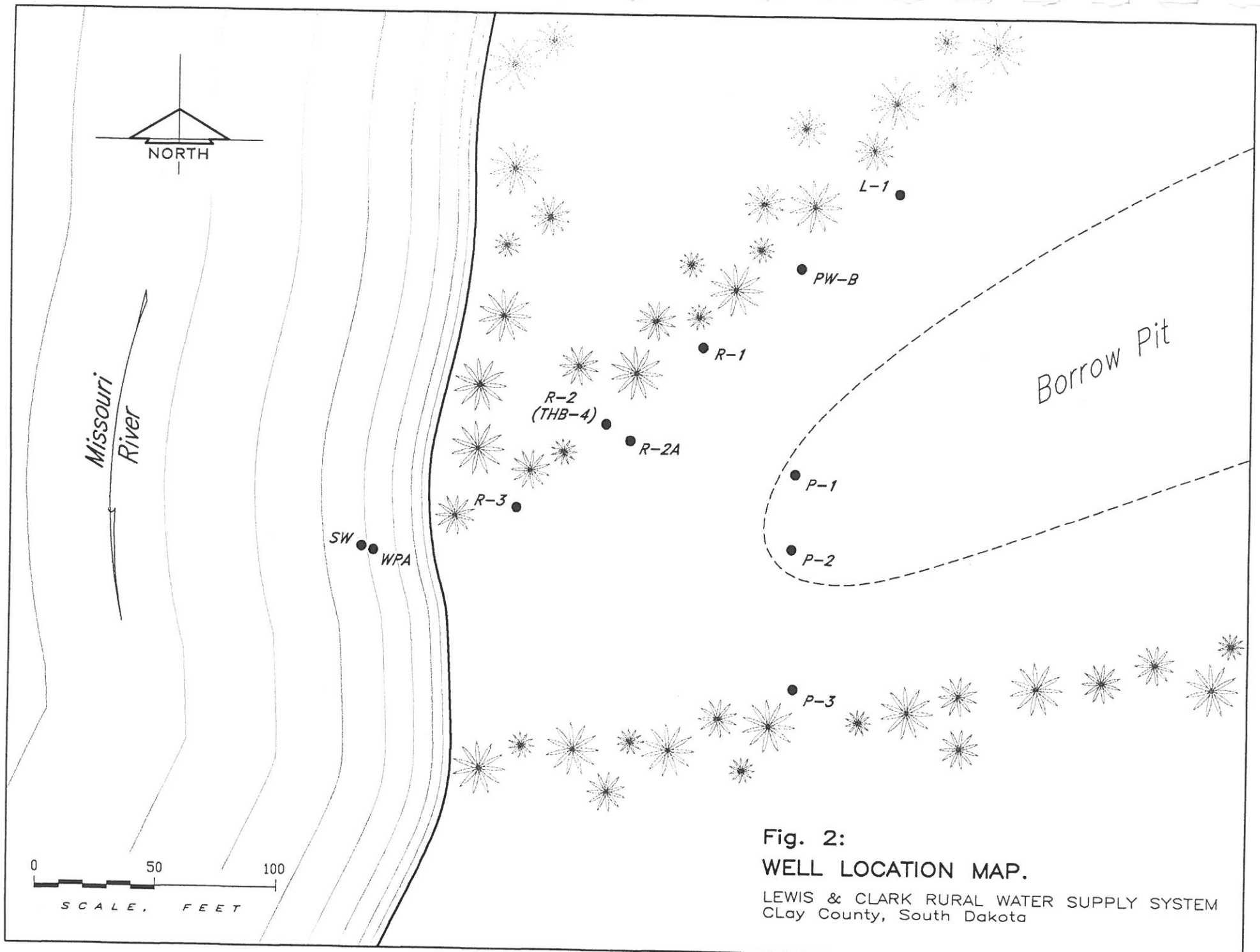

Fig. 2:
WELL LOCATION MAP.

LEWIS & CLARK RURAL WATER SUPPLY SYSTEM
CLay County, South Dakota

RANNEY® METHOD

SW ← → NE

N → S

R-3 | R-2 (TH4) | R-2A | R-1 | L-1 | PW | P-1 | P-2 | P-3

Elevation, FEET M.S.L.

1150 1140 1130 1120 1110 1100 1090 1080 1070 1060 1050 1040 1030 1020

R-3: BROWN; SWL 1125.35; PWL 1123.52; GRAY

R-2 (TH4): BROWN; SWL 1125.29; PWL 1122.58; GRAY

R-2A: BROWN TREES; TAN; SWL 1125.28; PWL 1122.55; GRAY; WOOD; TAN; GRAY

R-1: SWL 1125.23; PWL 1122.65; GRAY

L-1: TREES ROOTS; SWL 1125.44; PWL 1120.30; GRAY (collapsed)

PW: TREES; BROWN; SWL 1124.95; GRAY; GRAY; LIGHT GRAY; LIGNITE; PWL 1186.98

P-1: TREES DEBRIS; SWL 1125.29; PWL 1122.82; GRAY

P-2: TREES; SWL 1125.24; PWL 1123.21; BROWN; GRAY

P-3: SWL 1125.19; PWL 1123.33

KEY:

sand | silt | clay | gravel (fine) | gravel (med-coarse) | cobbles | boulders | lignite | bedrock | screened interval

Fig. 3 — HYDROSTRATIGRAPHIC CROSS SECTION, SITE 'B', MULBERRY POINT.

LEWIS & CLARK RURAL WATER SUPPLY PROJECT
Clay County, South Dakota

Layne

TABLE 1
SITE B WELL CONSTRUCTION DETAILS
LEWIS & CLARK RURAL WATER SUPPLY PROJECT
CLAY COUNTY, SOUTH DAKOTA

Well Name	Site Coordinates northing	Site Coordinates easting	Elevation Grade (ft. msl)	Elevation TOC (ft. msl)	Distance from Test Well (feet)	Total Depth Drilled (feet)	Screen Length (feet)	Screen Depth Interval (feet)	Diameter Borehole (inches)	Diameter Screen (inches)	BOA (feet bg)	BOA (ft. msl)	TOA Static Level (feet bg)	TOA Static Level (ft. msl)	Aquifer Thickness (feet)	Screen Interval top (ft. msl)	Screen Interval bottom (ft. msl)	Screen Depth below TOA top (feet)	Screen Depth below TOA bottom (feet)
PW-B	91,940.41	92,863.53	1142.33	1144.89	0	91	20	67.0 - 87.0	18	12	~ *110*	~ *1031.9*	17.41	1124.92	~ *93.0*	1075.33	1055.33	49.59	69.59
P-1	91,857.15	92,861.94	1139.16	1141.36	84	105	10	80.0 - 90.0	6	2	~ *111*	~ *1028.5*	13.87	1125.29	~ *96.8*	1059.16	1049.16	66.13	76.13
P-2	91,826.70	92,860.69	1138.52	1140.47	114	110	10	95.0 - 105.0	6	2	> *110*	< *1028.52*	13.28	1125.24	~ *96.7*	1043.52	1033.52	81.72	91.72
P-3	91,770.01	92,861.83	1141.58	1143.82	171	105	10	75.0 - 85.0	6	2	~ *110*	~ *1031.9*	16.39	1125.19	~ *93.3*	1066.58	1056.58	58.61	68.61
R-1	91,907.82	92,824.03	1142.35	1144.21	51	105	10	80.0 - 90.0	6	2	~ *110*	~ *1031.9*	17.12	1125.23	~ *93.3*	1062.34	1052.34	62.89	72.89
R-2 (THB-4)	91,876.45	92,785.07	1141.92	1144.60	100	115	10	75.0 - 85.0	8	4	110	1031.92	16.63	1125.29	93.4	1066.92	1056.92	58.37	68.37
R-2-A	91,869.93	92,794.90	1142.55	1144.85	98	100	20	71.0 - 91.0	10	6	~ *111*	~ *1031.9*	17.27	1125.28	~ *93.4*	1071.55	1051.55	53.73	73.73
R-3	91,842.64	92,748.96	1142.71	1144.46	150	107	10	85.0 - 95.0	6	2	~ *111*	~ *1031.9*	17.36	1125.35	~ *93.4*	1057.71	1047.71	67.64	77.64
L-1	91,971.23	92,902.94	1142.49	1144.47	50	105	40	58.0 - 98.0 (L-1 collapsed to 70.7)	10	6	~ *111*	~ *1031.9*	17.05	1125.44	~ *93.5*	1084.49	1044.49	40.95	80.95
River SW	91,826.19	92,686.25	na	1129.41	170	na	na	na na	na	na	na	na	na	1125.89	na	na	na	na	na
WP-A	91,853.62	93,327.39	river bottom	1127.13	170	9 below river bottom	3	6 - 9 below river bottom	2	2				1124.82					
Site D OW	88,618.58	93,664.33	1138.59	1141.27	3500	100	10.0	75.0 85.0	4	4	95	1043.59	13.55	1125.04	81.45	1066.27	1056.27	58.77	68.77
Irrigation #1 owned by Sorenson	92,562.86	95,675.84	1141.15 top concrete	1141.77	3000								17.63	1123.52					

APPENDIX A

WELL LOGS

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B - PW
Test Pumping Well

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Reverse Circulation
Job No. _____ **Date:** 10/4 -10/5/01
Driller: Duane Trask
Drill Fluid: ground water pumped from R-2A

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	6	SOIL, brown, silty, previously disturbed, tree roots	dug out, set 30" surface casing to 6'; set 24" to 11'
6	10	SILT, brown, streaks brown clay, occasional gray clay ball	
10	15	same	brown wash
15	20	SILT, brown, silty clay, clay balls	
20	25	same	
25	27	SILT, brown, sandy	
27	30	SAND, gray, very fine-fine, trace lignite	gray-olive wash at 27'
30	35	same, few small pieces wood, occasional flat coarse gravel	
35	40	SAND, light gray, fine	
40	43	same	
43	45	SAND, dark gray, very fine, silty, layer gray clay @ 44 feet, plus 1 lg clay ball	
45	50	SAND,gray,fine, trace gray clay, occasional vf gravel, stringers dk gray vf sand	
50	55	SAND, dark gray, very fine, silty, trace vf gravel, layer lignite at 50 feet, stringers gray clay @ 53 feet	
55	60	SAND, dark gray, very fine, silty, 20% gray clay balls, 10-20% f-c sand	
60	62	SAND, dark gray, very fine, silty, some fine-very coarse sand - fine-vc gravel	
62	65	SAND, gray, fine, with multicolored medium-very coarse sand - very fine gravel; some fine to very coarse gravel, subangular-flat-subround bit plugged w/: ~50% med gray sand,25% cobbles-bouldrs,25% c sand-c gravel stuck boulder was 0.6'x0.5'x0.3'	cobble stuck in mud pum at 63 feet had to clean out and change bit
65	70	SAND, med-very coarse, with fine-very fine gravel, some c gravel, few cobbles	
70	72.5	same	
72.5	75	SAND, dark gray, very fine, silty, with lignite	
75	79	SAND, dark gray, very fine, silty, with lignite, with fine-coarse sand	
79	82.5	SAND, dark gray, very fine, silty, with lignite (up to coarse gravel size) grading to fine-coarse sand with lignite	
82.5	84	same	
84	90	Boulders & cobbles, little return, very hard drilling	
90	91	Cobbles	

WELL CONSTRUCTION / MATERIALS

Set 20 feet of 100-slot stainless steel screen from 67-87 feet below grade; set 69 feet of butt-welded steel riser from 67 to +3 feet. Gravel pack from 87 to 23 feet b.g.; Bentonite seal from 23 to 15 feet b.g. Developed by surging, bailing and pumping. Concrete grout from 0-15.

WATER LEVEL OBSERVATIONS

19.71 Feet below TOC
after well completion
11/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B - P-1

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud Rotary
Job No. _____ **Date:** 8/26/01
Driller: Duane Trask
Drill Fluid: potable water and bentonite

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	3	Fill	
3	10	Trees and debris	
10	67	SAND, gray, fine-medium, silty	
67	90	SAND, gray, coarse and 50% medium to coarse GRAVEL	
90	105	GRAVEL, coarse-very coarse	Cobbles probable and boulders possible in this horizon as drill pipe rattled & "walked around" bigger material
		NOTE: had to move rig - at initial P-1 location (70 feet from PW) encountered trees at 3 feet, lost circulation at 10 feet, unable to drill past 14 feet	

WELL CONSTRUCTION / MATERIALS

Set 10 feet of 2-inch diameter 20-slot Sch 40 PVC screen from 80-90 feet below grade;
Set ~82 feet of flush threaded Sch 40 PVC riser from 80 to +2 feet.
Gravel pack from 90 to 20 feet b.g.;
Bentonite seal from 0-20 feet b.g. to grade
Developed by airlift and pumping

WATER LEVEL OBSERVATIONS

16.07 Feet below TOC
after well completion
10/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B - P-2

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud Rotary
Job No. _____ **Date:** _____
Driller: Duane Trask
Drill Fluid: ground water pumped from R-2A

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	65	SAND, brown, fine, silty	
65	75	SAND, gray, coarse, little gravel	
75	80	SAND, gray, coarse, some fine	
80	90	SAND, gray, coarse, with coarse GRAVEL and COBBLES	
90	110	SAND, gray, fine-coarse, with fine to medium GRAVEL	

WELL CONSTRUCTION / MATERIALS

Set 10 feet of 2-inch diameter 20-slot Sch 40 PVC screen from 95-105 feet below grade;
Set ~97 feet of flush threaded Sch 40 PVC riser from 95 to +2 feet.
Gravel pack from 105 to 20 feet b.g.;
Bentonite seal from 20 feet b.g. to grade
Developed by airlift and pumping

WATER LEVEL OBSERVATIONS

15.23 Feet below TOC
after well completion
10/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B - P-3

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud Rotary
Job No. _____ **Date:** 8/25/01
Driller: Duane Trask
Drill Fluid: ground water pumped from R-2A

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	70	SAND, fine, silty	
70	72	CLAY, dark gray	
72	90	SAND, gray, coarse, with medium to coarse GRAVEL	rough drilling
90	105	GRAVEL, coarse to very coarse	lost 5-10- feet of hole, could not get past boulders, ruined bit

WELL CONSTRUCTION / MATERIALS

Set 10 feet of 2-inch diameter 20-slot Sch 40 PVC screen from 75-85 feet below grade;
Set ~77 feet of flush threaded Sch 40 PVC riser from 75 to +2.2 feet.
Gravel pack from 85 to 20 feet b.g.;
Bentonite seal from 20 feet b.g. to grade
Developed by airlift and pumping

WATER LEVEL OBSERVATIONS

18.63 Feet below TOC
after well completion
10/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B - R-1

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud Rotary

Job No. _____ **Date:** 8/24/01
Driller: Duane Trask
Drill Fluid: ground water pumped from R-2A

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	1	TOPSOIL, tan-brown, silty	
1	60	SAND, gray, fine-medium	
60	75	SAND, gray, coarse and GRAVEL, fine (pea)	
75	105	SAND, gray, coarse and GRAVEL, fine-coarse	rough drilling

WELL CONSTRUCTION / MATERIALS

Set 10 feet of 2-inch diameter 20-slot Sch 40 PVC screen from 80-90 feet below grade;
Set ~82 feet of flush threaded Sch 40 PVC riser from 80 to +1.86 feet.
Gravel pack from 90 to 20 feet b.g.;
Bentonite seal from 20 to 0 feet b.g.
Developed by airlift and pumping

WATER LEVEL OBSERVATIONS

18.98 Feet below TOC
after well completion
10/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B TH4
OW-R-2

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud-Rotary with 94-mm core sampler
Job No. _____ **Date:** 4/29 - 5/3/01
Driller: Duane Trask
Drill Fluid: Potable water with bentonite

Depth (Feet) From	Depth (Feet) To	Description	Sample Type & No.	Depth (Feet)	Recovery (Inches)
0	5	SAND, brown, fine	wash	0-5	na
5	10	CLAY, brown, silty	wash	5-10	na
10	50	SAND, gray, fine-medium	wash	10-15	na
50	55	SAND, gray, coarse, little fine gravel	94 mm	15-20	30"
55	85	GRAVEL, ~25% fine (birdseye-pea), 25% medium (marble size), 25% coarse (> thumbnail), with/some 25% coarse SAND, few very coarse gravel	94 mm	20-25	30"
			94 mm	25-30	30"
			94 mm	30-35	30"
85	102	GRAVEL, coarse to very coarse, rounded, few cobbles, drilled very hard	94 mm	35-40	30"
			94 mm	40-45	30"
102	110	GRAVEL, COBBLES, BOULDERS, drilled extremely hard and hole would not stay open	94 mm	45-50	30"
			94 mm	50-55	30"
110	115	BEDROCK	94 mm	55-60	30"
			94 mm	60-65	30"
			94 mm	65-70	30"
			94 mm	70-75	30"
			94 mm	75-80	30"
			94 mm	80-85	30"
		depth interval / mud viscosity / mud loss		85-90	30"
		0-25' / 29 / 6"	94 mm	90-95	30"
		25-50' / 34 / 3"	94 mm	95-100	30"
		50-75' / 30 / 4"		100-105	na
		75-110' / 32 / 9"		105-110	na

WELL CONSTRUCTION / MATERIALS

Set 10 feet of Sch 40 PVC 4" diameter flush threaded screen from 75 to 85 feet below grade; set 78 feet of flush threaded riser from 75 to +3 feet. Developed by surging, bailing and pumping.

WATER LEVEL OBSERVATIONS

At Completion: 26 (Feet below toc)

Layne-Western Company
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FIELD BORING LOG

Boring Number: Site B - R-2A

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud-Rotary
Job No. _____ **Date:** 10/3/01
Driller: Duane Trask
Drill Fluid: Potable water with bentonite

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	5	TOPSOIL, dark brown, silty	
5	10	same	
10	15	SAND, tan, very fine, silty, bedded with gray & brown clay & silt	
15	20	same	
20	25	SAND,gray,very fine, bedded with gray sandy silt & gry-brn clay	
25	30	SAND, tan, very fine, silica, lg clump gray clay, occ. wood	
30	35	SAND, tan, very fine, 20% black very fine lignite, lg clump brn-gry silt, wood	
35	40	SAND, grayish-tan, very fine	
40	45	SAND, gray, very fine	
45	50	same, some silt,10% brown clay balls,trace c sand,occ vf gravel	
50	55	SAND, gray, very fine-fine, some med-coarse sand, gray clay balls at 52 feet	
		same as above, except no clay, coarsening downward to:	
55	60	SAND, very fine, gray with multicolored coarse sand - very fine gravel	chatter @ 55 feet
60	65	SAND, brwnish-gray, silty, fine with 35% multicolored coarse sand-fine gravel	
65	70	same	lg rock jammed bit
70	75	same, fine silty gray sand with 30% c sand-fine gravel	chatter hard-cobbles likel
75	80	SAND, very fine, gray, silty, 10-20% coarse sand-fine gravel	
80	85	SAND, very fine, gray, silty, 10-20% coarse sand-fine gravel	
85	90	SAND, very fine, gray, silty, 10-20% coarse sand-fine gravel	
90	95	SAND,very fine,gray,silty, 30% coarse sand-fine gravel,	very hard drilling 93-94'
95	100	SAND, very fine, gray, silty, 10-20% coarse sand-fine gravel	probable cobbles/bouldrs
		NOTE: trees were encountered at original R-2A location;	
		had to move rig; dug out 11 feet	

WELL CONSTRUCTION / MATERIALS

Set 20 feet of 10-slot Sch 40 PVC 6" diameter flush threaded screen from 71 to 91 feet below grade; set 73 feet of flush threaded riser from 71 to +1.89 feet. Developed by surging, bailing and pumping.

WATER LEVEL OBSERVATIONS

19.71 Feet below TOC
after well completion
10/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B - R-3

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud Rotary
Job No. _____ **Date:** 8/23/01
Driller: Duane Trask
Drill Fluid: ground water pumped from R-2A

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	30	SAND, brown, fine	
30	58	SAND, gray, fine-coarse	
58	60	SAND, coarse and GRAVEL	
60	105	SAND, gray, coarse and GRAVEL, fine-coarse	rough drilling
105	107	COBBLES and BOULDERS	rough drilling

WELL CONSTRUCTION / MATERIALS

Set 10 feet of 2-inch diameter 20-slot Sch 40 PVC screen from 85-95 feet below grade;
Set ~87 feet of flush threaded Sch 40 PVC riser from 85 to +1.75 feet.
Gravel pack from 95 to 20 feet b.g.;
Bentonite seal from 0 to 20 feet b.g.
Developed by airlift and pumping

WATER LEVEL OBSERVATIONS

19.11 Feet below TOC
after well completion
10/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B - L-1

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud-Rotary
Job No. _____ **Date:** _____
Driller: Duane Trask
Drill Fluid: Potable water with bentonite

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	6	Trees and roots	
6	40	SAND, fine - medium	
40	71	SAND, gray, fine-coarse	
71	90	SAND,gray, coarse, some gravel	

WELL CONSTRUCTION / MATERIALS

Set 40 feet of 10-slot Sch 40 PVC 6" diameter flush threaded screen from 58 to 98 feet below grade; set 60 feet of flush threaded riser from 68 to +2 feet. Developed by surging, bailing and pumping.

WATER LEVEL OBSERVATIONS

19.03 Feet below TOC
after well completion
10/17/01

Layne-Western Company
A Layne Company
25450 Highway 275 - P.O. Box 597 - Valley, Nebraska

FIELD BORING LOG

Boring Number: Site B
Pilot boring at caisson location
no soil samples obtained

Project: Lewis & Clark Rural Water Supply Project
Location: Site B
Drilling Method: Mud Rotary
Job No. _____ **Date:** _____
Driller: Duane Trask
Drill Fluid: ground water pumped from R-2A

Depth (Feet) From	Depth (Feet) To	Description	Comments
0	46	SAND, brown, fine, silty	
46	66	SAND, gray, fine-coarse	
66	90	SAND, gray, coarse, some gravel	
90	105	SAND & GRAVEL, some rough	"rough" generally
			indicative of cobbles
			& boulders

WELL CONSTRUCTION / MATERIALS

no well installed

APPENDIX B

SIEVE ANALYSES

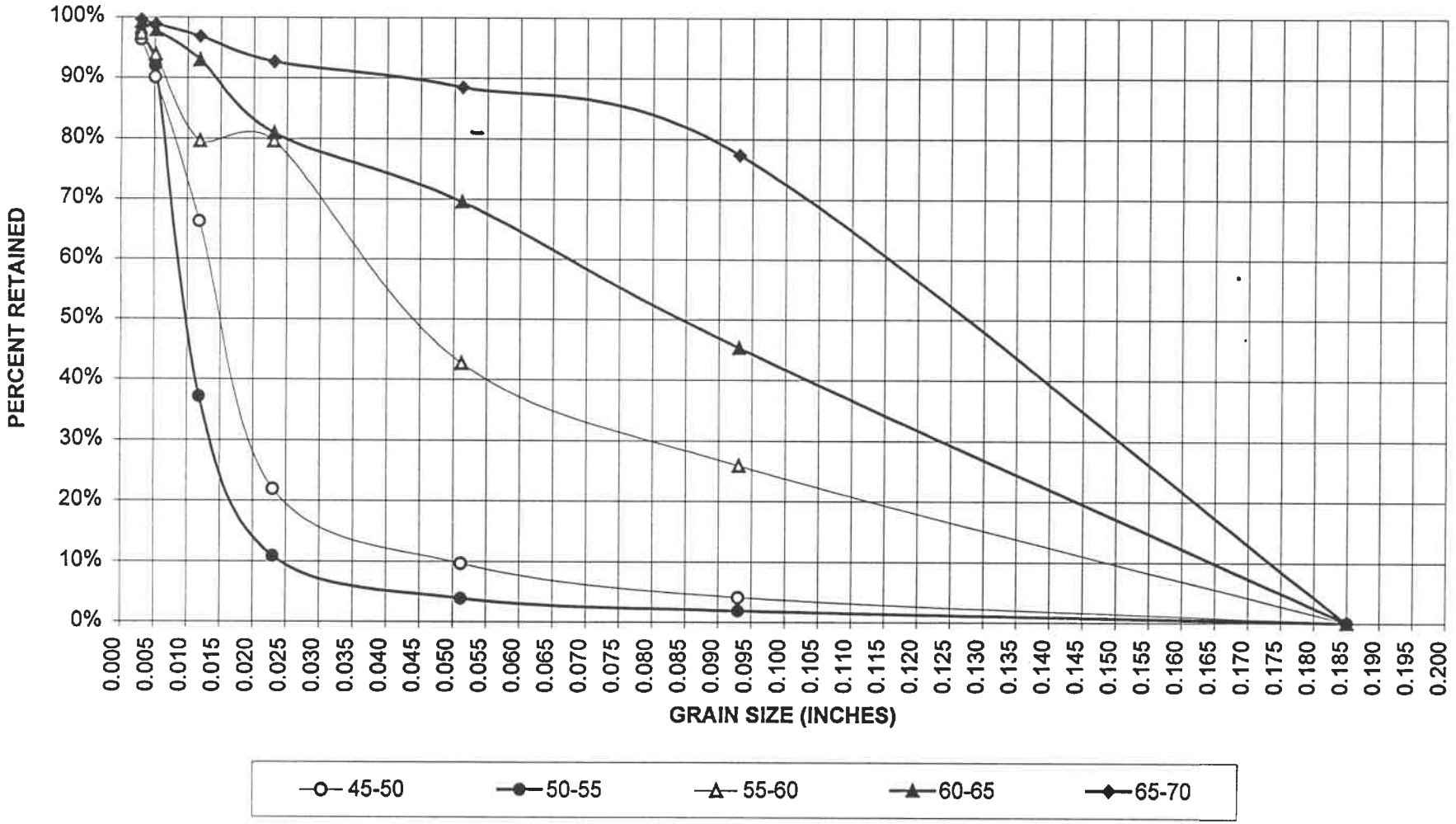
SIEVE ANALYSES
SITE B - TH4
Location: Vermillion, South Dakota
Project Name: Lewis & Clark Rural Water Supply Project

SIEVE SIZE			Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.
no.	mm	inches	Depth Interval:		45-50	Depth Interval:		50-55	Depth Interval:		55-60	Depth Interval:		60-65	Depth Interval:		65-70
4	4.750	0.185		0.0	0.0%		0.0	0.0%		0.0	0.0%		0.0	0.0%		0.0	0.0%
8	2.360	0.093	20.50	20.5	4.1%	9.50	9.5	1.9%	122.00	122.0	25.9%	230.00	230.0	45.3%	390.00	390.0	77.4%
16	1.300	0.051	28.00	48.5	9.7%	10.00	19.5	3.9%	79.00	201.0	42.7%	123.00	353.0	69.5%	56.00	446.0	88.5%
30	0.600	0.023	61.00	109.5	21.9%	35.50	55.0	10.9%	174.00	375.0	79.6%	58.00	411.0	80.9%	21.00	467.0	92.7%
50	0.300	0.012	221.00	330.5	66.2%	133.00	188.0	37.2%		375.0	79.6%	61.00	472.0	92.9%	21.00	488.0	96.8%
100	0.130	0.005	119.00	449.5	90.1%	277.00	465.0	92.0%	67.00	442.0	93.8%	25.00	497.0	97.8%	10.00	498.0	98.8%
200	0.075	0.003	31.00	480.5	96.3%	26.50	491.5	97.2%	16.00	458.0	97.2%	7.00	504.0	99.2%	4.00	502.0	99.6%
Pan + wash past 200			18.50	499.0	100.0%	14.00	505.5	100.0%	13.00	471.0	100.0%	4.00	508.0	100.0%	2.00	504.0	100.0%

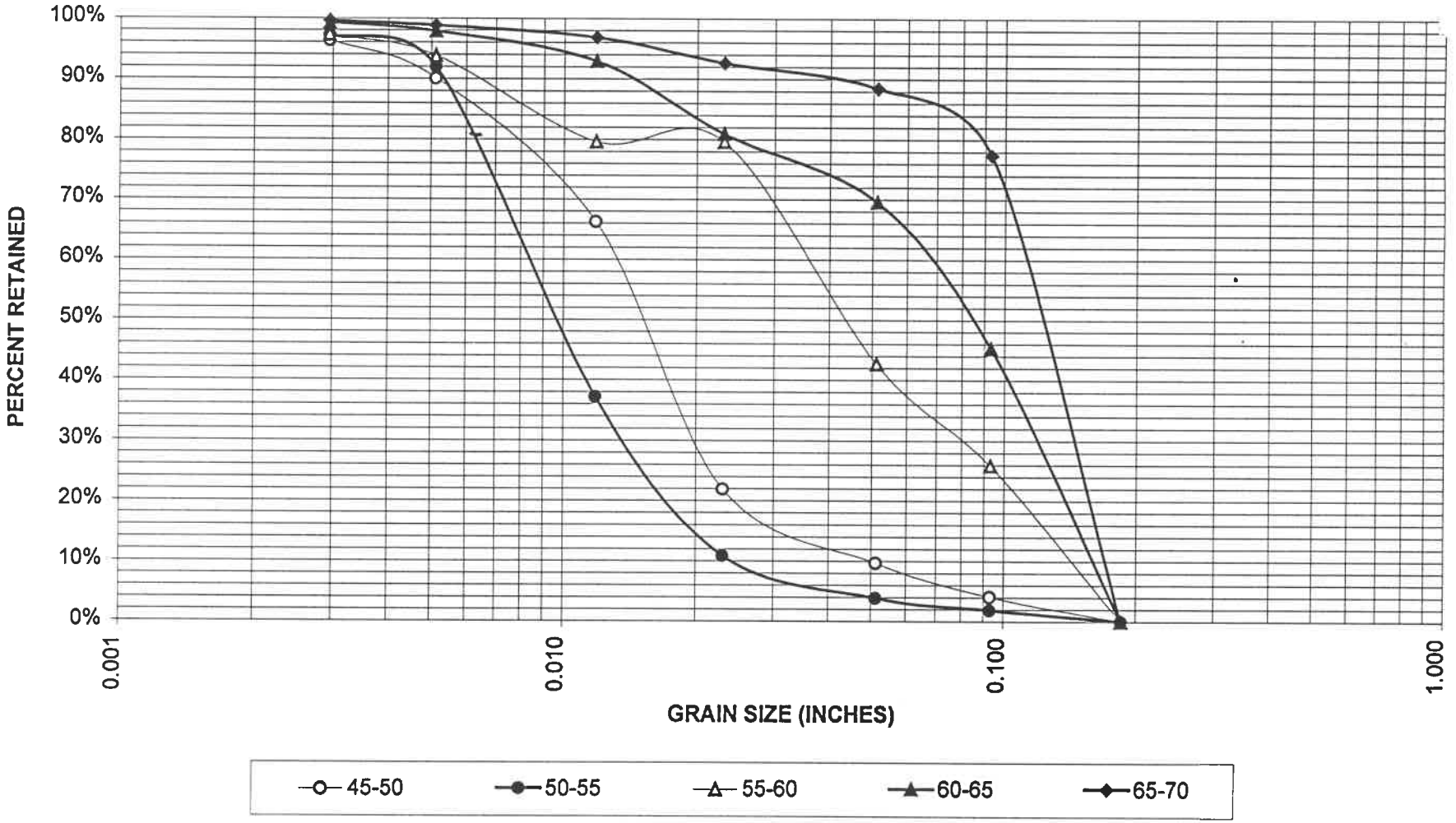
SIEVE SIZE			Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.
no.	mm	inches	Depth Interval:		70-75	Depth Interval:		75-80	Depth Interval:		80-85	Depth Interval:		85-90	Depth Interval:		90-95
4	4.750	0.185		0.0	0.0%	191.00	191.0	43.3%	111.00	111.0	31.9%	169.00	169.0	38.5%	170.00	170.0	41.0%
8	2.360	0.093	400.00	400.0	79.5%	89.50	280.5	63.5%	81.00	192.0	55.2%	96.00	265.0	60.4%	75.00	245.0	59.1%
16	1.300	0.051	48.00	448.0	89.1%	59.00	339.5	76.9%	78.00	270.0	77.6%	116.00	381.0	86.8%	109.00	354.0	85.4%
30	0.600	0.023	20.00	468.0	93.4%	33.00	372.5	84.4%	50.00	320.0	92.0%	38.00	419.0	95.4%	38.00	392.0	94.6%
50	0.300	0.012	21.00	489.0	97.2%	41.00	413.5	93.7%	27.00	347.0	99.7%	12.00	431.0	98.2%	12.00	404.0	97.5%
100	0.130	0.005	9.00	498.0	99.0%		413.5	93.66%		347.0	99.7%		431.0	98.2%		404.0	97.5%
200	0.075	0.003	3.00	501.0	99.6%		413.5	93.7%		347.0	99.7%		431.0	98.2%		404.0	97.5%
Pan + wash past 200			2.00	503.0	100.0%	28.00	441.5	100.0%	1.00	348.0	100.0%	8.00	439.0	100.0%	10.50	414.5	100.0%

SIEVE SIZE			Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.	Weight	Cum. Wt.	Cum % Ret.
no.	mm	inches	Depth Interval:		95-100	Depth Interval:		100-105	Depth Interval:		105-110
4	4.750	0.185	265.00	265.0	61.1%	173.00	173.0	42.4%	137.00	137.0	33.0%
8	2.360	0.093	65.00	330.0	76.1%	89.00	262.0	64.2%	91.00	228.0	54.9%
16	1.300	0.051	79.00	409.0	94.3%	109.00	371.0	90.9%	118.00	346.0	83.4%
20	0.833	0.033		409.0	94.3%		371.0	90.9%	10.00	356.0	85.8%
30	0.600	0.023	15.00	424.0	97.8%	21.00	392.0	96.1%	35.00	391.0	94.2%
50	0.300	0.012	4.50	428.5	98.8%	10.00	402.0	98.5%	14.00	405.0	97.6%
100	0.130	0.005		428.5	98.8%		402.0	98.5%		405.0	97.6%
200	0.075	0.003		428.5	98.8%		402.0	98.5%		405.0	97.6%
Pan + wash past 200			5.00	433.5	100.0%	6.00	408.0	100.0%	10.00	415.0	100.0%

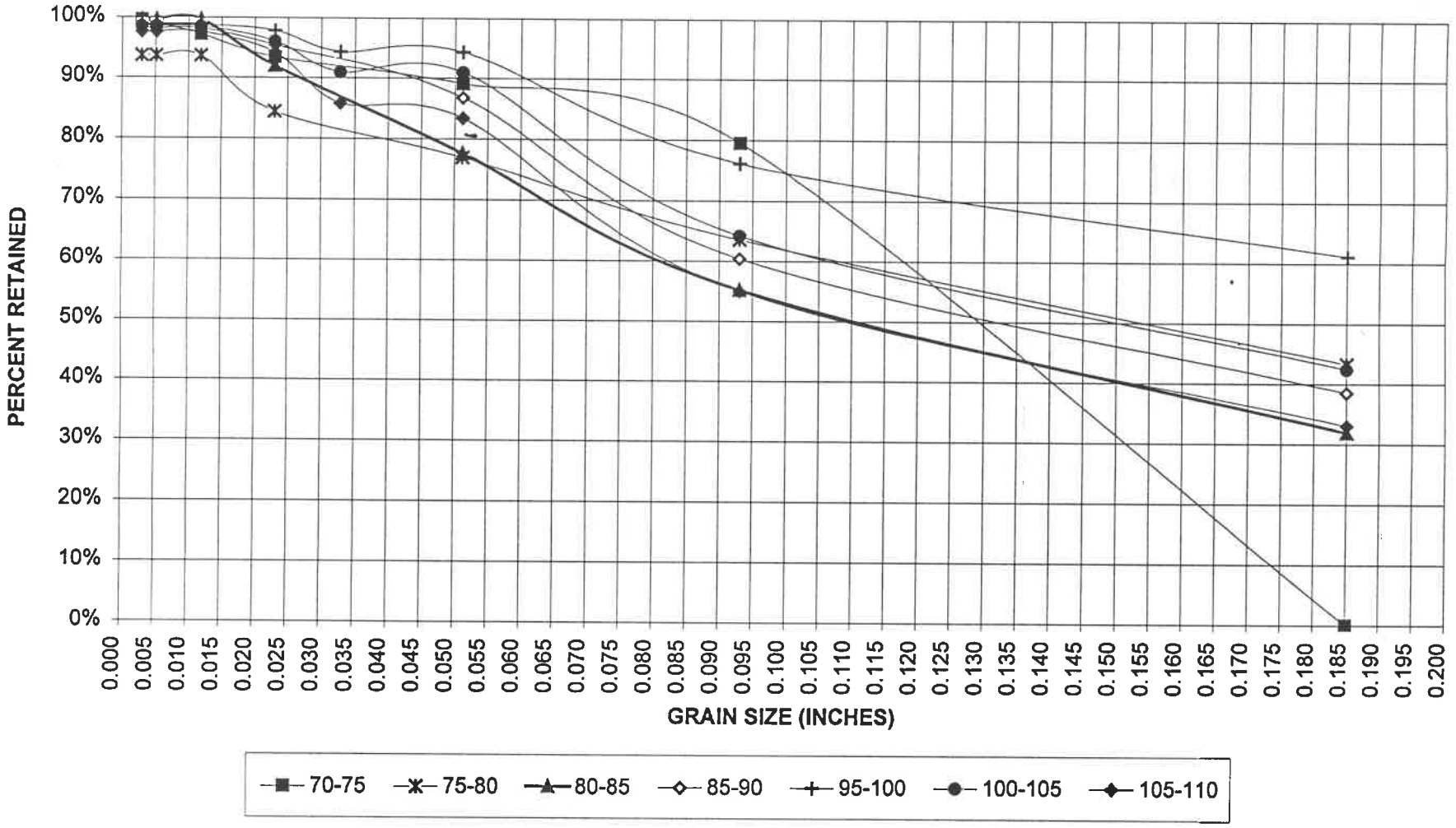
SIEVE ANALYSES
SITE B - TEST HOLE 4 (45-70 feet)
LEWIS & CLARK RURAL WATER SUPPLY PROJECT
CLAY COUNTY, SOUTH DAKOTA



SIEVE ANALYSES (semi-log)
SITE B - TEST HOLE 4 (45-70 feet)
LEWIS & CLARK RURAL WATER SUPPLY PROJECT
CLAY COUNTY, SOUTH DAKOTA



SIEVE ANALYSES
SITE B - TEST HOLE 4 (70-110 feet)
LEWIS & CLARK RURAL WATER SUPPLY PROJECT
CLAY COUNTY, SOUTH DAKOTA



SIEVE ANALYSES (semi-log)
SITE B - TEST HOLE 4 (70-110 feet)
LEWIS & CLARK RURAL WATER SUPPLY PROJECT
CLAY COUNTY, SOUTH DAKOTA