SICAL CHARACTERIZATION TECHNICAL MEMORAN
FOR
THE WEST LAKE LANDFILL OPERABLE UNIT 2
BRIDGETON, MISSOURI

TES
Site: West Lakes LDF
ID #: MSD079900932
Break: 3.4
Other: OU2
Vol-III 8-19-96
0714

VOLUME III:
APPENDICES

Prepared for:

LAIDLAW

LAIDLAW WASTE SYSTEMS INC.

Prepared by:

Golder Associates

40053041
SUPERFUND RECORDS

o. 943-2848

Augus

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Golder Associates

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AUG 16 1996

SUPERFUND DIVISION

PHYSICAL CHARACTERIZATION TECHNICAL MEMORANDUM FOR WEST LAKE LANDFILL OPERABLE UNIT 2 BRIDGETON, MISSOURI

VOLUME III

Prepared For:

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Bridgeton, Missouri 63044

Prepared By:

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St. Louis, Missouri 63303

Distribution:

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August 1996 943-2848.207

APPENDIX A

SOIL BOREHOLE LOGS AND RECORD OF DRILLHOLE LOGS

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (MORE THAN 12% FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LESS THAN 5% FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (MORE THAN 12% FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50%		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50%		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

SOLID WASTE

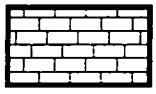
Golder Associates
Denver, Colorado

TITLE: SOIL CLASSIFICATION CHART

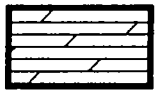
CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

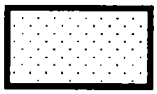
DRAWN BDL	DATE AUG 1996	JOB NO. 943-2848
CHECKED BGT	SCALE N/A	DWG NO./REV. NO.
REVIEWED WEH	FILE NO.	FIGURE NO. A-1

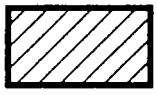
BEDROCK SYMBOL CHART


LIMESTONE

SILTSTONE


DOLOMITE


SANDSTONE


CLAYSTONE

CHERT

Golder Associates Denver, Colorado	TITLE RECORD OF DRILLHOLE BEDROCK GRAPHIC SYMBOLS		
CLIENT/PROJECT LAIDLAW WASTE SYSTEMS INC. WEST LAKE LANDFILL	DRAWN SMA	DATE AUG 1996	JOB NO. 943-2848
	CHECKED CER	SCALE NA	DWG NO./REV. NO. A101
	REVIEWED WEH	FILE NO. 2848A101	FIGURE NO. A-2

Golder Rock Classification System

Weathered state, structure, GSA color (code), grain or crystal size, rock material strength, ROCK TYPE (FORMATION NAME)

TERM	CRITERION
Very thickly bedded	Thicker than 1 m
Thickly bedded	30-100 cm
Medium bedded	10-30 cm
Thinly bedded	3-10 cm
Very thinly bedded	1-3 cm
Thickly laminated	0.3-1 cm
Thinly laminated	Thinner than 0.3 cm

Source: Blatt, H., and E.G. Ehlers, 1982

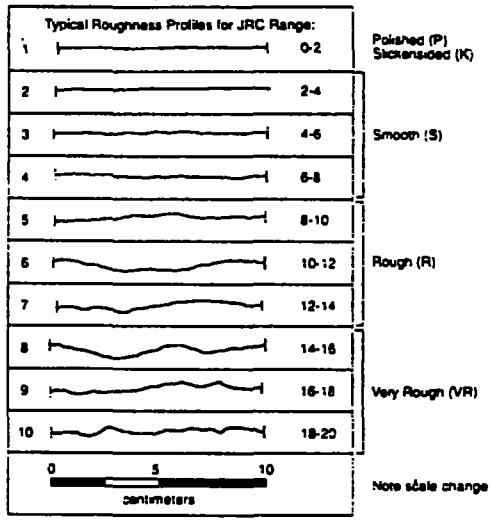
WENTWORTH GRAIN SCALE	
VC - Very Coarse	1-2 mm
C - Coarse	0.5-1 mm
M - Medium	0.25-0.5 mm
F - Fine	0.125-0.25 mm
VF - Very Fine	less than 0.125 mm

Source: Blatt, H., and E.G. Ehlers, 1982

Weathered State*

Term	Description	Grade
Fresh	No visible sign of rock material weathering; perhaps slight discoloration on major discontinuity surfaces.	I
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.	II
Moderately Weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.	III
Highly Weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.	IV
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	V
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI

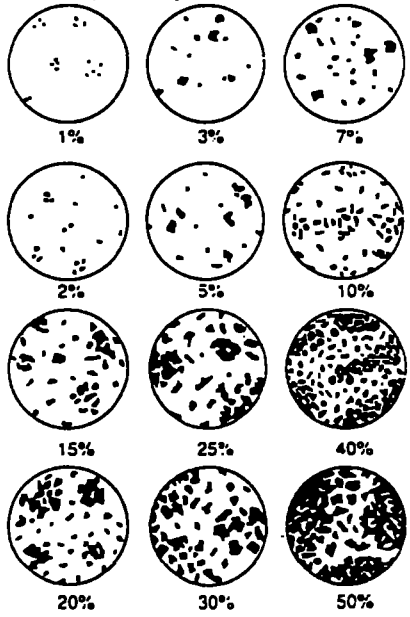
Discontinuity Roughness*



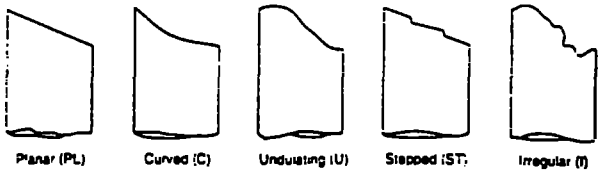
Rock Material Strength*

Grade	Description	Field Identification	Approximate range of uniaxial compressive strength (MPa)
S1	Very Soft Clay	Easily penetrated several inches by fist.	<0.025
S2	Soft Clay	Easily penetrated several inches by thumb.	0.025 - 0.05
S3	Firm Clay	Can by penetrated several inches by thumb with moderate effort.	0.05 - 0.10
S4	Stiff Clay	Readily indented by thumb but penetrated only with great effort.	0.10 - 0.25
S5	Very Stiff Clay	Readily indented by thumbnail.	0.25 - 0.50
S6	Hard Clay	Indented with difficulty by thumbnail.	>0.50
R0	Extremely Weak Rock	Indented with thumbnail.	0.25 - 1.0
R1	Very Weak Rock	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife.	1.0 - 5.0
R2	Weak Rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.	5.0 - 25
R3	Medium Strong Rock	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer.	25 - 50
R4	Strong Rock	Specimen requires more than one blow of geological hammer to fracture it.	50 - 100
R5	Very Strong Rock	Specimen requires many blows of geological hammer to fracture it.	100 - 250
R6	Extremely Strong Rock	Specimen can only be chipped with geological hammer.	>250

Diagrams for estimating percentage composition by volume**



Discontinuity Shape Classification



Fracture Orientation wrt Core Axis

References:
* Brown, 1981
** Terry and Chilingar, 1955
Golder Associates Inc. Technical Procedures TP1.2-2

913 1092.300/25770 4/95

Golder Associates — Denver, Colorado

TITLE: GOLDER ROCK CLASSIFICATION SYSTEM

CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL

DRAWN		DATE AUG 1996	JOB NO. 943-2848
CHECKED BGT		SCALE N/A	DWG NO./REV. NO.
REVIEWED WEH		FILE NO.	FIGURE NO. A-3

PHOTO 1: Example of a natural fracture in the Warsaw Formation at PZ-111-KS, Run# 19 from 223.5-225.5 ft. The fracture was described as follows: 90°-J,I,SM,CL.

PHOTO 2: Example of drilling induced fracture in the St.Louis Formation at PZ-205-SS, Run# 5 from 88.4-90.9 ft. Note that black "X" used in field examination to denote drilling induced fractures.

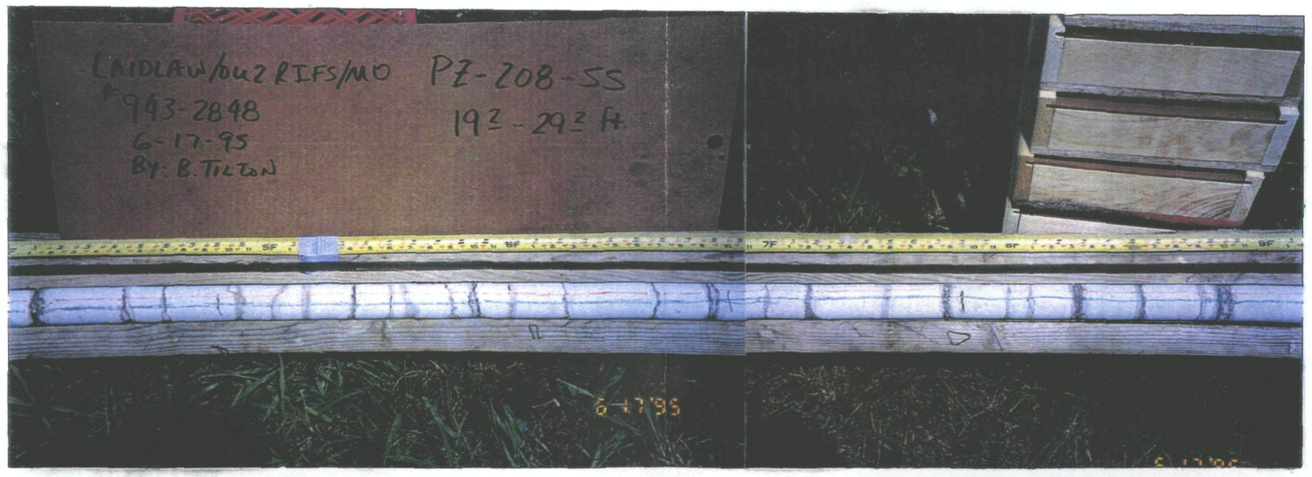


PHOTO: 3 Example of natural fractures in the upper St.Louis formation at PZ-208-SS, Run# 2 from 23.2-28.3 ft. See record of drillhole for descriptions of fractures.

Golder Associates — Denver, Colorado	TITLE: EXAMPLES OF ROCK CORE PHOTOGRAPHS SHOWING NATURAL AND DRILLING INDUCED FRACTURES		
CLIENT/PROJECT: LAIDLAW WASTE SYSTEMS INC. — WEST LAKE LANDFILL	DRAWN BGT	DATE AUG 1996	JOB NO. 943-2848
	CHECKED BGT	SCALE N/A	DWG. NO./REV. NO.
	REVIEWED WEH	FILE NO.	FIGURE NO. A-4

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-100-KS
LAIDLAW/OU2 RI-FS/MQ WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 3
		DRILLING START / FINISH
	WATER LEVEL	
	TIME	START TIME 13:20 / FINISH TIME 17:42
	DATE	START DATE 1/25/95 / FINISH DATE 1/25/95
DATUM NORTHING: 1068842.03 EASTING: 517211.63	CASING DEPTH	ELEVATION 483.8
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	6 3 4 6	1.6'/2.0' (80%)			(0.0-7.2 ft.) Firm, dusky yellowish brown (10YR 2/2), SILTY CLAY, little organics, NR, moist, (CL), (LOESS)	SP 1	
2 3	4 6 7 8	1.8'/2.0' (90%)				SP 2	
4 5	2 5 5 5	1.7'/2.0' (85%)			@ 4.0 ft., color changes to moderate yellowish brown (10YR 5/4)	SP 3	
6 7	2 2 2 3	1.8'/2.0' (90%)			(7.2-11.6 ft.) Firm, moderate yellowish brown (10YR 5/4), mottled SILTY CLAY, NR, moist, (CL), (LOESS)	SP 4	
8 9	3 4 5 5	1.7'/2.0' (85%)				SP 5	
10 11	4 4 5 5	1.4'/2.0' (70%)			(472.2) 11.6	SP 6	
12 13	3 4 3 3	2.0'/2.0' (100%)			(11.6-19.2 ft.) Loose, moderate yellowish brown (10YR 5/4), mottled CLAYEY SILT, NR, moist, (ML), (LOESS)	SP 7	
14	1 3 6 7	1.8'/2.0' (90%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 1/25/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ100KS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-100-KS
		SHEET 2 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	
	TIME	TIME 13:20 / TIME 17:42
	DATE	DATE / DATE
	CASING DEPTH	DATE 1/25/95 / DATE 1/25/95

NORTHING: 1068842.03
DATUM EASTING: 517211.63 ELEVATION 483.8

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE BEARING
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(11.6-19.2 ft.) Loose, moderate yellowish brown (10YR 5/4), mottled CLAYEY SILT, NR, moist, (ML), (LOESS)	SP 8	
16	3 4 7 10	1.2'/2.0' (60%)					
17						SP 9	
18	3 4 5 7	1.9'/2.0' (95%)					
19					(19.2-22.4 ft.) Loose, light olive gray (5Y 6/1), CLAYEY SILT, NR, moist, (ML), (LOESS)	SP 10	
20	5 6 7 8	1.5'/2.0' (75%)					
21						SP 11	
22	2 7 9 10	1.2'/2.0' (60%)			(461.4) 22.4		
23					(22.4-28.2 ft.) Compact light olive gray (5Y 6/1), fine SANDY SILT, NR, dry, (SM), (ALLUVIAL)	SP 12	
24	5 10 9 14	1.7'/2.0' (85%)					
25						SP 13	
26	3 9 14 15	1.4'/2.0' (70%)			@ 25.4 ft., partings of light olive gray (5Y 6/1), CLAYEY SILT		
27						SP 14	
28	3 5 7 11	0.0'/2.0' (0%)			(455.6) 28.2		
29					(28.2-32.1 ft.) Compact, light olive gray (5Y 6/1), mottled CLAYEY SILT, organics wet at 29.0 ft., NR, moist-wet, (ML), (ALLUVIAL)	SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 1/25/95

JOB NO.: 943-2848

FILENAME: PZ100KS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-100-KS
		SHEET 3 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					13:20	17:42
DATE					DATE	DATE
CASING DEPTH					1/25/95	1/25/95

DATUM NORTHING: 1068842.03 EASTING: 517211.63 ELEVATION 483.8

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	4 9 10 19	1.5'/2.0' (75%)			(28.2-32.1 ft.) Compact light olive gray (5Y 6/1), mottled CLAYEY SILT, NR, moist-wet, (ML), (ALLUVIAL)	SP (16)	
32					@ 31.6 ft. ~1 inch of fine SAND (451.7) 32.1		
33	15 14 12 14	1.1'/2.0' (55%)			(32.1-33.9 ft.) Compact, brownish gray, (5YR 4/1), fine SAND, NR, wet, (SM), (ALLUVIAL)	SP (17)	
34	50/6"	0.6'/2.0' (30%)			(33.9 ft.) Loose, light gray (5Y 6/1), CLAYEY SILT, NR, moist, (ALLUVIAL) (449.3) 34.5	SP (18)	Augers chatter, spoon refusal, hit bedrock at 34.5 ft.
35					End of Soil Borehole Log at 34.5 ft. See PZ-100-KS Record of Drillhole for rock descriptions		
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 1/25/95

JOB NO.: 943-2848

FILENAME: PZ100KS

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]ATE: 1/27/95 - 2/13/95
DRIL[illegible]: CME 75

DATU[illegible]
COORD[illegible]S N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-34.0 ft. See Soil Borehole Log PZ-100-KS														0.0-34.0 ft. Drilling conducted with 6.25 inch ID hollow stem augers
	449.80		449.80												
34	34.0-52.3 ft. 34.00 Slightly weathered, very thickly bedded, very light gray (N8), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION) 1 mm. iron concretions common, thin calcite vein (1 cm.), irregular joints, stylolitic		34.00						J,ST,R						1/27/95 Began coring
									J,I,R						
									J,I,R (2)						
									J,PL,R						
									J,C,R						
									J,I,R						
									J,PL,R						
36									J,I,R						
				1	100 %				J,I,R-CL						
									J,I,R						
38									J,PL,R						
			444.30												
			39.50						J,I,R						
40									J,PL,R						
									J,I,R						
									J,C,R						
									J,I,R						
42									J,C,R						
									J,PL,SM-CL (2)						
	42.9 ft. 1 in. thick clay seam								J,C,R						
				2	100 %				J,C,R						
44									J,ST,R						
									J,ST,R						
									J,PL,R						
46									J,PL,R						
									J,PL,R						
									J,C,R						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-H

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	NOTES WATER LEVELS INSTRUMENTATION
48	34.0-52.3 ft. Slightly weathered, very thickly bedded, very light gray (N8), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION), 1 mm. iron concretions common, thin calcite vein (1 cm.), irregular joints, stylolitic		2	100 %	J,PL,R				
					J,PL,R				
					J,PL,R				
					J,ST,R				
		434.30 / 49.50			J,PL,R				
50					J,ST,R				
					J,C,R				
					J,PL,R (3)				
					J,PL,R (2)				
52	52.3-62.5 ft. Fresh, medium bedded, light gray (N7), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, numerous clay filled discontinuities, some iron oxide staining								
54			3	100 %	J,PL,R				
					J,C,R				
56									
					J,I,R				
58									
					J,C,R				
					J,U,R				
		424.30 / 59.50			J,P,S (2)				1/27/95 @ 17:15 Measured water level in hole at 34.49 ft. below ground surface
60					J,I,R				1/28/95 @ 8:18 Measured water level in hole at 36.6 ft. below ground surface
					J,PL,R-CL (2)				
62			4	100 %	J,I,R (2)				
	62.5-67.5 ft. Fresh, medium bedded, medium light gray (N6), crypto-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,C,R (2)				
64									

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES, WATER LEVELS, INSTRUMENTATION
64	62.5-37.5 ft. Fresh, medium bedded, medium light gray (N6), crypto-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)	418.70	4	100 %	J,I,R	
		65.10			J,C,R	
	1-2 in. chert nodules common					1/27/95 @ 17:15 *Quit drilling for the day @ 65.1 ft.*
66					J,PL,SM	
					J,I,R-CL (2)	
68	67.5-76.0 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), m-c grained, medium strong rock, CLASTIC LIMESTONE (ST. LOUIS FORMATION)					
					J,I,R	
					J,C,R	
70			5	99%	J,I,R (2)	
					J,C,R	
					J,I,R	
					J,C,R	
	Shaley partings common, fossiliferous				J,I,R (2)	
72					J,PL,R	
					J,ST,R	
74		408.70				
		75.10			J,PL,SM-CL (2)	
					J,C,R (2)	
76	76.0-88.5 ft. Slightly weathered, medium to thickly bedded, medium gray (N5) to light gray (N7), coarse grained, medium strong, CLASTIC LIMESTONE, (ST. LOUIS FORMATION)				J,PL,R-CL	
			6	99%		
78					J,C,R-CL	
					J,ST,R	
80	Stylolitic, shaley partings, sandy, more porous than above					

WEATHERING INDEX: SW FR, MW, HW, CW
STRENGTH INDEX: R5, R4, R3, R2, R1, R6
POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6
TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	76.0-88.5 ft. Slightly weathered, medium to thickly bedded, medium gray (N5) to light grat (N7), coarse grained, medium strong, CLASTIC LIMESTONE, (ST. LOUIS FORMATION)							J,C,SM					
								J,PL,SM-CL					
82			6	99%									
								J,PL,SM (2)					
84								J,I,R-CL					
								J,I,VR (2)					
		398.70 / 85.10											
86								J,I,R					
								J,PL,R					
88			7	100 %									
	395.30 / 88.50 88.5-94.0 ft. Slightly weathered, thickly laminated to thinly bedded, medium gray (N5), fine grained, extremely weak to very weak, SILTY CLAYSTONE and SILTSTONE, (ST. LOUIS FORMATION) Pyrite in claystone, cross-bedded, fine sandy siltstone interbeds							J,I,R					
								J,I,R-CL					
90								J,PL,SM					
		393.40 / 90.40											
								J,I,R (3)					
								J,I,R					
								J,I,R (3)					
								J,I,R (2)					
92			9	79%				J,ST,SM					
								J,I,SM					92.7-93.3 ft. Core Loss
		390.50 / 93.30						J,I,R					
								J,I,R					
	389.80 / 94.00 94.0-98.0 ft. Slightly weathered, thickly bedded, very light gray (N8), fine grained, medium strong, DOLOMITE (ST. LOUIS FORMATION)							J,C,R					
94								J,ST,R (2)					
			9	98%				J,I,R					
								J,PL,R-CH					
96													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
E: 517211.8
AZIMUTH: 0

COLLAR ELEV: 483.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
96	94.0-98.0 ft. Slightly weathered, thickly bedded, very light gray (N8), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Vuggy, highly silicified, bioturbated				J,I,R-CL	
98	98.0-116.4 ft. Slightly weathered, very thickly bedded, light brownish gray (5Y 6/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)		9	98%		
100	Laminae, vuggy in places, clay infilling, some silicification					
	101.0-103.0 ft. Vuggy				J,C,S-CL	
102		380.50 / 103.30				
104	104.5-106.4 ft. Vuggy, some silicification in veins, clay partings				J,PL,R	
					J,PL,R	
106					J,PL,R	
108			10	99%		
110					J,I,R	
112						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
112	98.0-116.4 ft. Slightly weathered, very thickly bedded, light brownish gray (5Y 6/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)	370.40	10	99%		
		113.40			J,I,VR	
114						
116	116.4-119.6 ft. Fresh, thickly bedded, medium light gray (N6), medium crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)					
118			11	100 %		
	364.20					
120	119.6-120.7 ft. Fresh, thinly bedded, medium gray (N5), finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 119.60 363.10 120.70 Bioturbated, calcite infilling				J,PL,R-CL	
	120.7-123.7 ft. Fresh, thickly bedded, medium light gray (N6), f-m crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)					
122		360.30				
		123.50				1/28/95 @ 17:32 Finish drilling for the day at 123.5 ft., we blow out hole and measure water level at 72.77 ft. below ground surface
124	123.7-147.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Stylolitic				J,I,R	
					J,I,R	
					J,I,R	
126			12	100 %		
	126.9 ft. 1 in. clay seam, fractures at ~124.5 and 127.6 ft.				J,C,R	
					J,I,R	
128						

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DISCONTINUITY DATA (DIP wrt CORE AXIS 0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW, FR, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1, R2 30, R3 150, R4 300, R5 600, R6 1500); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B METHOD: NX Core & water
DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DAT
COOR ES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	123.7-147.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Stylolitic								J,I,R-CL,CH						
									J,C,SM						
130				12	100 %										
									J,ST,R						
132			351.60 / 132.20												
									J,PL,R-CL						
									J,I,R						
134															
136															Note: rock breaks along stylolites and clay partings
									J,PL,S-CL						
				13	100 %										
138															
									J,PL,S						
140															
142			341.60 / 142.20												
				14	100 %										
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	123.7-147.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)												
146													
	336.30 / 147.50												
	147.5-159.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), m-c crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) 147.5 ft. 1 in. clay partings							J,C,R-CL					
148			14	100 %				J,C,SM-CL					148.1-149.0 ft. 1 in. clay filled vertical fracture
150													
152		331.60 / 152.20											1/29/95 @ 16:06 Drillers quit drilling for the day, they blew out the hole, measured water level @ 80.4 ft. below ground surface, drilled to 152.2 ft.
	Stylolitic							J,I,R					
								J,I,R					
								J,I,R					1/30/95 @ 9:38 Measured water level in hole @ 48.3 ft. 1/30/95 @ 9:51 Begin Run 15
154													
								J,I,R					
								J,I,VR					
156	Brecciated, glauconitic, clay and silt sized infilling		15	100 %									
								J,I,R-CL					
158													
								J,I,R					
	159.5-165.5 ft. Fresh, thickly bedded, greenish gray (5GY 6/1), coarsely crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION) 324.30 / 159.50							J,PL,R					
160								J,I,R					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	159.5-165.5 ft. Fresh, thickly bedded, greenish gray (5GY 6/1), coarsely crystalline, medium strong, DOLOMITE, (ST. LOUIS FORMATION)			15	100 %				J,I,VR						
162			321.50 / 162.30												
	Some dark gray organic laminae														
164															
	318.30 / 165.50														
166	165.5-173.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), f-m grained, strong, LIMESTONE, (SALEM FORMATION)								J,C,R						@ 165.5 ft. Inferred contact between ST. LOUIS FORMATION and SALEM FORMATION
	167.3-169.6 ft. Brecciated, glauconite and gray clay infilling, stylolitic, some calcite filled veins			16	100 %										
168									J,C,R						
170															
172			311.50 / 172.30												
174	173.0-181.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)			17	100 %										
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DRI[illegible]ATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATU[illegible]
COOR[illegible]S N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
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INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
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Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
176	173.0-181.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)														
178				17	100 %										
180															
182	181.2-183.0 ft. Thickly bedded, pale yellowish brown (10YR 6/2), coarse grained, strong, (SALEM FORMATION)		301.60 / 182.20												
184	183.0-190.5 ft. Fresh, thinly laminated, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE (SALEM FORMATION)							90	J,I,R-CL						
				18	100 %										
186	185.9-186.7 ft. Clay rich horizons, becoming siltier. *186.7 ft.* Chert nodules, stylolitic														
188								0	J,I,R						
			295.30 / 188.50												
190				19	100 %			90	J,PL,S						
	190.5-205.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), medium grained, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)		292.80 / 191.00					90	J,I,VR						1/31/95 @ 8:00 Measure water level in hole at 38.05 ft. @ 8:10 resume coring on Run 20
192				20	100 %										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES: N: 1068842.0
E: 517211.6
AZIMUTH: 0

COLLAR ELEV: 483.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
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Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Heated, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	190.5-205.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), medium grained, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)								J,I,S						
	Silty, fine sand, fossil fragments, organic laminae, some clayey laminae, cherty, bioturbated														
194															
196				20	100 %										
198															
			283.90												
200			199.90												
202	202.0 ft. Silicified horizons			21	100 %										
204			278.70												
			205.10												1/31/95 @ 17:15 Finish coring @ 205.1 ft., driller tried 1/2 day to get past the chert at this depth and failed
206	205.5-210.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)			22	100 %				J,I,R-CL J,I,R (2) J,I,R J,I,R-CL						
	206.0-206.3 ft. Clay interbed														
	Silty, cherty, some clay horizons, silicified, coarse grained interbeds														
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	205.5-210.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)			22	100 %										
	Silty, cherty, some clay horizons, silicified, coarse grained interbeds 273.80		273.70												
210	210.0-220.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE (SALEM FORMATION)		210.10												
212															
214				23	91%										
216															
218															
									Core Loss						
220			263.70												
			220.10												
	263.10														
	220.7-222.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) shell debris in lower .5 ft., coarser downward, organic laminae 261.30			24	100 %										
222	222.5-233.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (SALEM FORMATION)								J,PL,SM						
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224	222.5-233.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE. (SALEM FORMATION) Chert nodules common, bioturbated, organic laminae, some texture laminae								J,I,SM						
226				24	100 %										
228															
230			253.50 / 230.30												
									J,C,SM						
									J,PL,SM						
232	233.7 ft. Organic clay lense			25	100 %										
	250.00 / 233.80								J,I,R-CL						
234	233.8-241.4 ft. Fresh, thickly bedded, light gray (N7), coarse grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)								J,PL,R						
236			247.60 / 236.20												2/1/95 End drilling @ 16:30, 2/6/95 @ 8:26 Measure water level at 80.8 ft. below ground surface 2/6/95 @ 9:50 Begin coring Run 26
				26	100 %				J,PL,R						
	Stylolitic, sandy, dark gray laminae		246.20 / 237.60												
238									J,PL,R						
				27	75%										
									J,PL,S						
240	239.8 ft. Medium sand, 1 cm. thick layer														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 1/27/95 - 2/13/95
DRILLING: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	233.8-241.4 ft. Fresh, thickly bedded, light gray (N7), coarse grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)														
	241.4-245.6 ft. Fresh, thickly bedded, light gray (N7) to dark gray (N3), coarse grained, medium strong, ARENACEOUS LIMESTONE (SALEM FORMATION)								J,I,R						
242				27	75%				J,I,R						
	242.8 ft. Silty sand, fossiliferous, 1 in. thick clayey horizon								Core Loss						Core loss occurred due to barrel falling down hole
244			239.20 / 244.60												
	238.20 / 245.60 245.6-249.8 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)														Run 28 recovery poor, because core barrel fell in hole and core was lost after Run 27. Run 28 core is broken up due to damage during its retrieval. Contacts @ 245.6 and 249.8 ft. are approximate because of core loss
246															
248				28	81%										
	234.00 / 249.80 249.8-254.5 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, CLAYSTONE, (WARSAW FORMATION) Grades to siltstone near base														
250									Core Loss						
252			231.20 / 252.60												
254				29	96%										
	229.30 / 254.50 254.5-256.4 ft. Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)														
256															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
256															
	227.40														
	256.4-261.3 ft. 256.40 Fresh, thickly bedded, olive black (5Y 6/1), fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)														
	Black organic laminae, slightly pitted, dolomitic			29	96%										
258															
			224.10						Minor Core Loss						2/6/95 @ 16:50 Quit for the day 2/7/95 @ 8:30 Start coring Run 30
			259.70												
260									J,I,SM						
	222.50														
	261.3-264.8 ft. 261.30 Fresh, thickly bedded, olive gray (5Y 4/1), medium crystalline, medium strong, DOLOMITE, (WARSAW FORMATION)														
262															
264															
	219.00														
	264.8-276.7 ft. 264.80 Fresh, thickly bedded, dark gray (N3), microcrystalline, medium strong, LIMESTONE, (WARSAW FORMATION)			30	100%										
266															
268															
	Packstone, fossiliferous														
			213.90												
270			269.90												
				31	100%										
									J,PL,VR						
272															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR, SW, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272	264.8-276.7 ft. Fresh, thickly bedded, dark, gray (N3), microcrystalline, medium strong, LIMESTONE, (WARSAW FORMATION)														
274															
278				31	100 %										
	207.10 / 276.70														
	276.7-278.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE (WARSAW FORMATION)														
278															
	205.30 / 278.50														
	278.5-287.2 ft. Fresh, thickly bedded, medium light gray (N6), coarsely crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)														
			203.90 / 279.90												
280															
282									J,I,VR						
284				32	100 %										
286															
	287.2-301.0 ft. Fresh, thickly bedded, olive black (5Y 2/1), coarse crystalline, medium strong, LIMESTONE, (WARSAW FORMATION)														
288															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATES: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	287.2-301.0 ft. Fresh, thickly bedded, olive black (5Y 2/1), coarse crystalline, medium strong, LIMESTONE, (WARSAW FORMATION)			32	100 %				J,PL,VR-Calcite mineralization						Possible water producer
			193.90												
290			289.90												2/7/95 @ 15:07 Start Run 33
	Stylolitic common, fossiliferous								J,I,VR-Calcite mineralization						
292															
									J,PL,VR-Calcite mineralization						
294				33	100 %										
	295.4-295.7 ft. Vuggy porosity														
296															
298															
			184.50												2/7/95 @ 16:30 Quit drilling @ 299.3 ft. after Run 33 2/8/95 @ 9:10 Start coring Run 34, measured water level @ 18.8 ft. below ground surface
			299.30						J,I,R						
300									J,I,R						
									J,I,R						
			182.80												
	301.0-304.3 ft. Fresh, thickly bedded, olive black (5Y 2/1), medium grained, medium strong, DOLOMITE, (WARSAW FORMATION) Argillaceous, vuggy 301.0-304.3 ft. Vuggy porosity		301.00	34	99%										
302															
304															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
304	179.50 / 304.30 304.3-306.1 ft. Fresh, thickly bedded, medium dark gray (N4), coarsely crystalline, medium strong, LIMESTONE, (WARSAW LIMESTONE)					
306	177.70 / 306.10 306.1-313.0 ft. Fresh, thinly bedded, grayish black (N2), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION) Pyrite crystals, calcite mineralization		34	99%		
308					J,I,SM	
		174.60 / 309.20				
310						
312					J,PL,R	312.5-313.5 ft. 90 and 50 degree fractures are not open
	170.80 / 313.00 313.0-316.5 ft. Fresh, thickly bedded, dark greenish gray (5GY 4/1), medium crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION), glauconitic, stylolitic, vuggy, silty shale interbeds				J,I,VR	314.5-315.5 ft. Second fracture not open
314			35	100%	J,PL,SM-CL (2)	
					J,PL,R	2/8/95 Finish in Run 36, break down due to hydraulic leaks
316	167.30 / 316.50 316.5-341.0 ft. Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION)					
318						
		164.70 / 319.10				2/9/95 @ 7:40 Resume coring Run 36
			36	100%		
320						

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DISCONTINUITY DATA — DIP wrt CORE AXIS (0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW FH, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (RT 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
320	316.5-341.0 ft. Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION)														
	321.1-322.1 ft. 1-2 in. thick limey and dolomite interbeds														
322									J,PL,SM						
									J,I,SM						
									J,PL,SM						
									J,C,SM						
									J,PL,SM						
324				36	100 %										
326															
328	Very fine pyrite crystals, calcite infilled veins, thin (0.2-0.3 in.) dolomite interbeds		154.60 / 329.20												
330									J,ST,SM-CL						
332				37	98%										
334															4 drill induced fractures in Run 37, especially at point core was lost
			148.40 / 335.40	38	99%										
336															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
336	316.5-341.0 ft. Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, CLAYEY SILTSTONE, (WARSAW FORMATION)					
338						5 drill induced fractures in upper 5 ft. of Run 38
340			38	99%	J,PL,SM	
	142.80 / 341.00				J,PL,SM	
	341.0-344.6 ft. Fresh, medium bedded, greenish black (5GY 2/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)					
342						
344	Black organic laminae, calcite filled vugs	139.50				
	139.20 / 344.60	344.30				
	344.6-348.8 ft. Fresh, thinly bedded, olive black (5Y 2/1), fine grained, weak, SILTY CLAYSTONE, (WARSAW FORMATION)					Two drilling induced fractures in upper 2 ft. of Run 39
346						
	Calcite filled vugs					
348			39	100 %		
	135.00 / 348.80					
	348.8-352.8 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)					
350	Vuggy, fossil fragments					
352						

DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90); RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10)

WEATHERING INDEX: SW FR, MW, HW, CW

STRENGTH INDEX: R6, R5, R4, R3, R2, R1

POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6

TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
352													
	131.00 / 352.80												
	352.8-357.6 ft. Fresh, medium bedded, olive gray (5Y 4/1), medium grained, medium strong, LIMESTONE, some fossils, race thin chert layers (<1 in.), (WARSAW FORMATION)		39	100 %									2/9/95 @ 15:15 Finish Run 39, quit work on the hole
354		129.60											2/11/95 @ 13:15 Corehole reamed out with 6 in. bit using Schramm Rotadrill to 354.5 ft.
		354.20 / 129.30											
		354.50											
	354.8-355.0 ft. and 355.4-355.7 ft. Thinly bedded, medium dark gray (N4), Claystone layers												
356								J,I,R					
	126.20 / 357.60												
	357.6-386.6 ft. Fresh, thin to medium bedded, medium light gray (N6), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (KEOKUK FORMATION) Predominantly argillaceous, shaley partings common, numerous light bluish gray (5B 7/1) chert layers (1-2 in. thick), chert nodules (1-10 mm.)												@ 357.6 ft. Inferred top of KEOKUK FORMATION
358			40	100 %				J,I,R					
								J,I,R					
360								J,I,R					
		121.80											
362		362.00											
													363.0-372.0 ft. Numerous drilling induced fractures (2-3 per foot)
364													
			41	100 %									
366													
368													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-H

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1088842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368	357.6-386.6 ft. Fresh, thin to medium bedded, medium light gray (N6), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (KEOKUK FORMATION) Predominantly argillaceous, shaley partings common, numerous light bluish gray (5B 7/1) chert layers (1-2 in. thick), chert nodules (1-10 mm.)														
370				41	100 %										
			111.80												
372			372.00												
374															
	374.2-375.2 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), medium strong, ARENACEOUS DOLOMITE layer, (KEOKUK FORMATION) 109.60 374.20 108.60 375.20			42	100 %				J,I,S,CL						
									B,I,R						
376									B,I,R (2)						
			106.60 377.20												
									J,I,R						
378									B,C,R,CL						
									J,R,R						
380									B,PL,S						
	380.7-381.0 ft. Thinly laminated, dark greenish gray (5G 4/1), SILTY CLAYSTONE layer			43	100 %				B,PL,R						
382									B,U,CL						
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 1/27/95 - 2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068842.0
AZIMUTH: 0

COLLAR ELEV: 483.8
E: 517211.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
384	357.6-386.6 ft. Fresh, thin to medium bedded, medium light gray (N6), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (KEOKUK FORMATION) Predominantly argillaceous, shaley partings common, numerous light bluish gray (5B 7/1) chert layers (1-2 in. thick), chert nodules (1-10 mm.)		43	100 %			90	B,PL,CL					
386							90	B,I,VR					
							60	J,I,VR					
	386.6-391.2 ft. Slightly weathered, thinly bedded, light gray (N7), coarse grained, medium strong to strong, ARENACEOUS LIMESTONE, (KEOKUK FORMATION), Thin dolomite layers layers (<6 in.), argillaceous in some zones, stylolitic, chert nodules (<1 in.), silicified zones (<6 in.), some joints highly weathered, fossiliferous @ 389.0 ft. Open vug with calcite crystals (1/2 in. dia.)	96.80					0	J,I,R					
		387.00					90	B,I,R					2/12/95 @ 18:00 Complete Run 43 2/13/95 @ 9:00 Resume coring Run 44
							90	B,I,R					
388							60	J,I,VR					
			44	100 %			60	J,I,VR					
							90	J,I,R					
390							90	J,I,R					
	92.60	92.60											
	End of Record of Drillhole at 391.2 ft. 391.20	391.20											
392													
394													
396													
398													
400													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 2/22/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1068851.8
AZIMUTH: 0

COLLAR ELEV: 484.3
E: 517195.4
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224, 226, 228, 230, 232, 234	0.0-235.0 ft. No sampling conducted See Record of Drillhole for PZ-100-KS														0.0-34.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers 34.0-235.0 ft. Borehole drilled with 5 7/8 in. bit using compressed air
	249.00		249.00												
236, 238, 240	235.3-237.3 ft. Fresh, thinly bedded, very light gray (N8) to light gray (N7), coarse grained, medium strong, ARENACEOUS LIMESTONE (SALEM FORMATION)		235.30												
	237.3-242.4 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)			1	97%										
	238.7-238.8 ft. Very light gray (N8), coarse grained Dolomite layer							●	B,PL,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 2/22/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1088851.8
AZIMUTH: 0

COLLAR ELEV: 484.3
E: 517195.4
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	237.3-242.4 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION)								J,I,SM						
	240.9-214.3 ft. Fossiliferous, stylolitic														
242	241.3-241.7 ft. Thinly laminated														
	242.1-242.4 ft. Thinly laminated														
	242.4-245.3 ft. Fresh, thickly bedded, light gray (N7), very coarse grained, medium strong, ARENACEOUS LIMESTONE (SALEM FORMATION)			1	97%										
244									J,U,R						
			239.00												
	245.3-246.0 ft. Fresh, thickly bedded, olive gray (5Y 4/1), very fine grained, medium strong, (WARSAW FORMATION) 238.30 246.00		245.30 / 238.30	2	100 %										
246	End of Record of Drillhole at 246.0 ft.		246.00												
248															
250															
252															
254															
256															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

Sheet 1 of 2

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 2/24/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1068867.81
AZIMUTH: 0

COLLAR ELEV: 484.35
E: 517175.03
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD 80 60 40 20	FRACTURES PER FOOT 2 4 6 8 10	DISCONTINUITY DATA: DIP wrt CORE AXIS 0 30 60 90	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX FR SW MW HW CW	STRENGTH INDEX R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi) R1 30 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	0.0-78.9 ft. No sampling conducted See Record of Drillhole for PZ-100-KS														0.0-51.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem auger, then borehole advanced to 78.9 ft. with 5 7/8 in. air rotary bit
66															
68															
70															
72															
74															
76															
78															
	405.45		405.45												
80	78.9-81.8 ft. 78.90 Moderately weathered, medium bedded, light brownish gray (5Y 6/1), fine grained, strong, ARENACEOUS DOLOMITE, open vugs (<1/2 mm), (ST. LOUIS FORMATION)		78.90	1	100 %										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-100-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 2/24/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1068887.81
AZIMUTH: 0

COLLAR ELEV: 484.35
E: 517175.03
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.9-81.8 ft. Moderately weathered, medium bedded, light brownish gray (5Y 6/1), fine grained, strong, ARENACEOUS DOLOMITE, open vugs (<1/2 mm.), (ST. LOUIS FORMATION)	402.55											
82	81.8-90.6 ft. Slightly weathered, thickly bedded, light olive gray (5Y 6/1), very finely crystalline, strong ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)	81.80	1	100 %									
	Below 82.3 ft. Stylolites common						90	J,I,SM					
84	@ 83.9 and 84.5 ft. Chert zones (<2 in.)												
	84.4-84.7 ft. Silicified and finely disseminated pyrite						60	J,P,SM					
		399.65					90	J,P,SM					
	84.7-84.9 ft. Medium gray chert zone	399.25											
	85.1-85.5 ft. Olive gray (5Y 3/2), DOLOMITIC LIMESTONE layer, low porosity, vugs (<1/4 mm)	398.85											
		84.70					90	J,C,SM,CL					
86							90	J,C,SM					
			2	86%			60	J,I,R					
88													
		395.35						Core Loss					
		89.00											
90													
	90.6-94.0 ft. Moderately weathered, thickly bedded, light brownish gray (5Y 6/1), f-m grained, medium strong BIOCLASTIC LIMESTONE, (ST. LOUIS FORMATION)						60	J,I,R					
92			3	100 %									
							90	J,I,R,CL					
		390.35											
94	End of Record of Drillhole at 94.00 ft.	94.00											2/25/95 @ 11:15 Completed drilling
96													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-101-SS
		SHEET 1 OF 1
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
NORTHING: 1068472.89	WATER LEVEL	TIME 13:35 / TIME 14:30
DATUM EASTING: 516622.94 ELEVATION 474.9	TIME / DATE / CASING DEPTH	DATE 2/23/95 / DATE 2/23/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 3 3	1.1'/2.0' (55%)			(0.0-0.2 ft.) Firm, olive gray (5Y 4/1), SILT, trace clay, NR, damp, (CL-ML), (LOESS) (0.2-2.7 ft.) Firm, mottled dark yellowish brown (10YR 4/2), CLAYEY SILT, some roots, NR, damp, (CL-ML), (LOESS)	SP 1	
2 3	5 4 5 4	1.6'/2.0' (80%)			(2.7-8.0 ft.) Firm, stiff, olive gray (5Y 3/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 2	
4 5	1 1 3 5	1.7'/2.0' (85%)				SP 3	
6 7		1.7'/2.0' (85%)				SH 4	
8 9	1 3 6 6	1.7'/2.0' (85%)			(8.0-8.9 ft.) Stiff, mottled olive gray (5Y 3/2) and dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS) (8.9-10.3 ft.) Stiff, mottled moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 5	Iron oxide staining from 8.0-14.0 ft.
10 11	3 5 5 5	1.7'/2.0' (85%)			(10.3-13.2 ft.) Stiff, mottled light olive gray (5Y 5/2) and moderate yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 6	
12 13	1 1 2 6	1.6'/2.0' (80%)			(13.2-14.0 ft.) Soft, dark greenish gray (5GY 4/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS) (460.9) 14.0	SP 7	
14					End of Soil Borehole Log at 14 ft. See PZ-101-SS Record of Drillhole for rock descriptions		Auger refusal at 14.0 ft.

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY V. HERST

DATE 2/23/95

JOB NO.: 943-2848

FILENAME: PZ101SS

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
0	0.0-14.0 ft. See Soil Borehole Log PZ-101-SS														
2															
4															
6															
8															
10															
12															
14	460.80		460.80												
	14.0-27.6 ft. 14.00 Slightly weathered to fresh, medium bedded, very light gray (N8), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Braciopod fossils, iron staining, 1 in. thick clay filled joint at 15.4 ft.		14.00	1	55%				Broken Zone Broken Zone						
16															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-10

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DA MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	14.0-27.6 ft. Slightly weathered to fresh, medium bedded, very light gray (N8), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			1	55%				Core Loss						Core loss due to highly fractured rock
			458.80 / 18.00												
18									J,I,R,Fe (2)						
									J,I,R,Fe (2)						
									J,I,R,Fe (2)						
									J,I,R (2)						
									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R (2)						
									J,I,R						
20									J,I,R						
									J,I,R,CL (3)						
				2	100%				J,I,R,CL (2)						
									J,I,R,CL (2)						
22									J,I,R,CL (2)						
									J,I,R,CL						
									J,I,R						
									J,I,SM						
									J,I,R,CL						
24									J,I,R,CL						
			450.30 / 24.50												
									J,ST,R,Fe						
									J,I,R,CL (3)						
26									J,I,R,CL (2)						
									J,I,SM,CL (3)						
				3	96%				J,I,SM,CL						
									J,U,SM,CL						
28	27.6-40.5 ft. Fresh, medium bedded, very light gray (N8), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some braciopod fossils								J,I,R,CL						
									J,PL,SM,CL (2)						
									J,I,R,CL						
									J,I,SM,CL (2)						
									J,I,SM,CL (2)						
			445.30 / 29.50												
30									J,I,SM (2)						
				4	98%				J,U,SM						
									J,I,R						
									J,I,R,chert						
									J,PL,SM						
									J,I,R,CL (2)						
									J,I,R (2)						
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
32	27.6-40.5 ft. Fresh, medium bedded, very light gray (N8), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,PL,SM,CL	
					J,PL,R (2)	
	32.7 ft. Calcite and pyrite crystals				J,PL,SM	
	33.8 ft. Chert nodule					
34	34.1 ft. Crinoid fossils				J,PL,SM	
	35.0-35.6 ft. Moderately weathered					
			4	98%	J,PL,SM,CL	
36	36.1 ft. Stylolitic					
	37.7-40.5 ft. Large chert nodules					
38					J,I,R (2)	
					J,U,SM,CL	
					J,I,SM	
		435.30 / 39.50			J,I,SM	
40	40.3-40.5 ft. Joints intersecting large chert nodules, some pyrite				J,I,R (2)	
	40.5-50.2 ft. Fresh, medium bedded, very light gray (N8) to light gray (N7), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,PL,R	
42	42.2-45.1 ft. Stylolitic					
			5	100 %	J,I,R	
44					J,I,R	
					J,I,R (2)	
					J,I,R (3)	
46					J,PL,R (4)	
					J,PL,R (2)	
	47.5-49.3 ft. Stylolitic					
48						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DAT MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	40.5-50.2 ft. Fresh, medium bedded, very light gray (N8) to light gray (N7), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		5	100 %				J,I,R (2)					
	49.1 ft. Brachiopoda fossil	425.30					80	J,U,R					
		49.50						J,PL,R					
50	50.2-52.7 ft. Fresh, very thinly to medium bedded, medium light gray (N6) to medium gray (N5), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)						80	J,I,R (3)					
52	51.2-52.2 ft. Numerous calcite veins at 20 degrees to core axis in healed fractures												
	52.7-54.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)							J,PL,SM					
							80	J,PL,SM					
								J,I,R					
54		420.30											
	54.5-58.0 ft. Slightly weathered, medium light olive gray (5Y 6/1), fine to medium grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)	54.50	6	98%			80	J,I,R					
56	Very porous/vuggy, vugs < 1 mm. in diameter												
58	58.0-61.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)							J,I,SM					
		415.30											
	59.7-60.0 ft. Weahtered, crumbly chert	59.50						J,I,R (2)					
60	60.0-61.9 ft. Porous/vuggy (vugs < 1 mm.)						80	J,I,R					
	61.4 ft. Calcite filled (healed) fracture	412.90	7	100 %				J,PL,SM,CL					
62	61.9-66.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)	61.90					80	J,PL,R					
64													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	4 FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	61.9-66.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)	410.30 / 64.50	7	100 %			90	J,U,SM,CL					
66	66.3-72.7 ft. Slightly weathered, medium to thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Very stylolitic, numerous chert nodules, slightly porous/vuggy (vugs <1 mm. in diameter)						90	J,I,R,CL					
							90	J,ST,R,CL					
68							90	J,I,R					
			8	100 %									
70													
							90	J,I,R,CL					
72													
	72.7-78.9 ft. Slightly weathered, medium bedded, pinkish gray (5YR 8/1) to light brownish gray (5YR 6/1), coarse grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) 74.0-74.3 ft. Crumbly texture, porous, limestone 74.4 ft. Cross bedding	402.10 / 72.70					90	J,I,R,CL					
							90	J,PL,SM,CL					
74		400.30 / 74.50					90	J,I,SM					
							90	J,PL,SM,CL					
76	76.4-76.8 ft. Crystalline Limestone layer												
			9	100 %									
78													
	78.9-83.2 ft. Fresh, medium bedded, light brownish gray (5YR 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic to 80.1 ft.	395.90 / 78.90					90	J,U,SM					
							90	J,U,SM					
80							90	J,I,R					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.9-83.2 ft. Fresh, medium bedded, light brownish gray (5YR 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 80.1-80.5 ft. Dolomite							J,PL,R,CL					
82			9	100 %									
	391.60 / 83.2-92.0 ft. Slightly weathered, thickly bedded, yellowish gray (5Y 7/2) to light olive gray (5Y 5/2), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy (vugs <1 mm.)	83.20											
84		390.30 / 84.50											
86													
88													
90	89.7-91.3 ft. Stylolitic 89.9-90.9 ft. Limestone (crystalline)		10	99%				J,PL,R; J,PL,R; J,ST,SM; J,PL,R					
	382.80 / 92.0-94.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)	92.00											
94	93.9-94.1 ft. Thickly laminated	380.30						J,PL,SM,CL					
	94.5-101.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), coarse to very coarse grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)	94.50	11	100 %									
98													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH (FT)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
96	94.5-101.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), coarse to very coarse grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)				J,PL,SM	
	96.3 ft. Calcite crystals				J,PL,SM,CL	
					J,PL,SM	
98	97.1-97.3 ft. Moderately weahtered zone, thickly laminated					
	98.8-99.0 ft. Chert nodules				J,PL,SM	
100			11	100 %		
	100.7 ft. Calcite crystals				J,I,R	
	101.0-119.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)				J,I,SM	
102	101.7-103.0 ft. Stylolitic				J,PL,SM	
					J,PL,SM	
104	104.1-104.8 ft. Slightly weathered dolomite layer, porous/vuggy	370.30 / 104.50			J,PL,SM	
	104.8-106.2 ft. Stylolitic				J,I,R	
					J,I,R	
106	106.7-109.2 ft. Some arenaceous zones				J,PL,R	
108	107.8-108.3 ft. Bioturbated zone, some calcite crystallization		12	100 %		
					J,PL,SM	
110	110.1-111.5 ft. Slightly to moderately weathered dolomite, porous/vuggy				J,I,R	
112						

GRAPHIC LOG; RQD (80 60 40 20); FRACTURES PER FOOT (2 4 6 8 10); DIP wrt CORE AXIS (0 30 60 90); WEATHERING INDEX (SW FR MW HW CW); STRENGTH INDEX (R6 R5 R4 R3 R2 R1); POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068472.9
E: 516822.9
AZIMUTH: 0

COLLAR ELEV: 474.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	101.0-119.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)												
	112.9-113.1 ft. Thinly laminated	361.20	12	100 %			90	J,I,R,CL					
	113.1-113.2 ft. Bioturbated, calcite crystallization	113.60											
114	113.6-115.3 ft. Slightly to moderately weathered, dolomite, porous/vuggy	360.30 / 114.50											
		359.50 / 115.30											
116	116.5 ft. Becoming fine to medium grained												
	116.8-117.7 ft. Some arenaceous laminae						90	J,PL,SM					
118	118.3-118.7 ft. Stylolitic						90	J,PL,SM					
		354.90	13	100 %									
120	119.9-121.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy (<1 mm. in diameter)	119.90											
	121.7-125.0 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, strong, DOLOMITE, (ST. LOUIS FORMATION)												
124							90	J,I,R,CL					
		350.30 / 124.50											
		349.80											
	125.0-128.3 ft. Fresh, thinly bedded, light olive gray (5Y 6/1) to olive gray (5Y 4/1), interbedded microcrystalline and m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)	125.00											
126			14	99%			90	J,I,SM					
							90	J,PL,SM,CL (2)					
							90	J,ST,SM					
128													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-101

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/23/95-2/25/95
DRILL RIG: CME 75

DA MSL
COORDINATES N: 1068472.9
AZIMUTH: 0

COLLAR ELEV: 474.8
E: 516822.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	348.50								J,PL,SM,CL						
	128.3-130.5 ft. 128.30 Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) 129.3-130.3 ft. Porous/vuggy								J,I,R						
130	344.30														
	130.5-140.5 ft. 130.50 Fresh, medium bedded, light olive gray (5Y 6/1), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			14	99%				J,I,SM,CL						
132															
	133.5-133.9 ft. Stylolitic, bioturbated, calcite crystals 133.9-135.3 ft. Microcrystalline		340.30						J,PL,SM						
134			134.50												
	134.9-135.2 ft. Small pyrite crystals 135.0-135.1 ft. Large chert nodules														
	135.7-137.1 ft. Slightly weathered, some calicte crystals and stylolites								J,I,R,CL						
136									J,I,R,CL						
	137.1-138.9 ft. Stylolites 137.4-138.5 ft. Microcrystalline, arenaceous, thickly laminated			15	100 %				J,I,SM						
138									J,PL,R						
140	334.30		334.30												
	End of Record of Drillhole at 140.5 ft. 140.50		140.50												
142															
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-102-SS
		SHEET 1 OF 3
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					15:21	17:33
DATE					DATE	DATE
CASING DEPTH					2/13/95	2/13/95

DATUM NORTHING: 1068087.67 EASTING: 516887.97 ELEVATION 482.1

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 2 2 3	1.3'/2.0' (65%)			(0.0-2.6 ft.) Firm, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP ①	2/13/95 - 15:21 Begin drilling PZ-102-SS Air monitoring 15:27 21% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
2	2 2 2 4	1.4'/2.0' (70%)			(479.5) 2.6		
3					(2.6-5.0 ft.) Firm, moderate yellowish brown (10YR 5/4), homogenous, SILTY CLAY, NR, damp, (CL), (LOESS)	SP ②	
4		2.3'/2.0' (115%)					
5					(477.1) 5.0	SH ③	
					(5.0-13.0 ft.) Firm, moderate yellowish brown (10YR 5/4), trace light gray (N7), homogenous, CLAYEY SILT, NR, damp, (CL-ML), (LOESS)		
6	1 2 3 4	1.6'/2.0' (80%)				SP ④	15:43 @ 6 ft. 21.1% O2 0.0 ppm H2S 0% LEL 0.3 ppm PID
7							
8	1 3 3 5	1.9'/2.0' (95%)				SP ⑤	
9							
10		1.9'/2.0' (95%)				SH ⑥	15:49 @ 10 ft. 21% O2 1.0 ppm H2S 0% LEL 0.3 ppm PID
11							
12	3 4 5 6	1.6'/2.0' (80%)				SP ⑦	
13					(469.1) 13.0		
					(13.0-15.0 ft.) Compact, dark yellowish orange (10YR 6/6), homogenous, fine SAND, trace Silt, NR, dry, (SP), (ALLUVIUM)		
14	5 5 7 7	1.5'/2.0' (75%)				SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/13/95

JOB NO.: 943-2848

FILENAME: PZ102SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-102-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	15:21 / 17:33
	DATE	DATE / DATE
NORTHING: 1068087.67 DATUM EASTING: 516887.97 ELEVATION 482.1	CASING DEPTH	2/13/95 / 2/13/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(15.0-23.6 ft.) Loose to compact, pale yellowish brown (10YR 6/2), homogenous, fine SAND, NR, dry, (SP), (ALLUVIUM)	SP 8	
16	4 4 6 7	1.3'/2.0' (65%)				SP 9	16:03 @ 16 ft. 21.1% O2 1.0 ppm H2S 0% LEL 0.0 ppm PID
17							
18	4 4 5 5	1.4'/2.0' (70%)				SP 10	
19							
20	3 3 4 6	1.6'/2.0' (80%)				SP 11	
21							
22	6 5 4 8	1.5'/2.0' (75%)				SP 12	
23					(458.5) 23.6		
24	5 6 7 10	1.5'/2.0' (75%)			(23.6-25.6 ft.) Stiff, light gray (N7) to light brown (5YR 5/6), laminated CLAYEY SILT, trace fine Sand, some rootlets, NR, moist, (CL-ML), (ALLUVIUM)	SP 13	16:20 @ 24 ft. 21% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
25							
26	5 7 10 11	1.6'/2.0' (80%)			(25.6-28.1 ft.) Very stiff, medium gray (N5), stratified, CLAYEY SILT, some fine SAND, thin organic rootlet beds (<1 cm.), NR, moist, (CL-ML), (ALLUVIUM)	SP 14	
27							
28	4 5 5 7	1.7'/2.0' (85%)			(28.1-29.9 ft.) Stiff, medium gray (N5), stratified, CLAYEY SILT and fine SAND, 1-15 cm. beds, NR, moist, (CL-ML), (ALLUVIUM)	SP 15	16:40 @ 28 ft. 21.1% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
29					(452.2) 29.9 (29.9-34.5 ft.) Hard, light olive gray (5Y 6/1), fractured LIMESTONE, SR, (WEATHERED BEDROCK)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/13/95

JOB NO.: 943-2848

FILENAME: PZ102SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-102-SS
		SHEET 3 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	15:21 / 17:33
	DATE	DATE / DATE
	CASING DEPTH	2/13/95 / 2/13/95

NORTHING: 1068087.67
DATUM EASTING: 516887.97 ELEVATION 482.1

DRILL RIG CME 75 - TRUCK MOUNT
SURFACE CONDITIONS
ANGLE BEARING
SAMPLE HAMMER

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 5 5 20	1.7'/2.0' (85%)			(29.9-34.5 ft.) Hard, light olive gray (5Y 6/1), fractured LIMESTONE, SR, (WEATHERED BEDROCK) @ 30.2 ft., wood fragments	SP 16	
32							
33	13 23 55 31	1.1'/2.0' (55%)				SP 17	
34					(447.6) 34.5		
35	12 18 21 18	0.5'/2.0' (25%)			(34.5-37.0 ft.) Hard, dark greenish gray (5GY 4/1), SILTY CLAY, trace to little fine sand, little fine gravel, NR, moist, (CL), (WEATHERED BEDROCK)	SP 18	17:07 @ 35 ft. 21.3% O2 2.0 ppm H2S 0% LEL 0.0 ppm PID
36							
37					(445.1) 37.0 End of Soil Borehole Log at 37.0 ft. See PZ-102-SS Record of Drillhole for rock descriptions		
38							
39							
40							
41							
42							
43							
44							

LOGGED BY J. MILLER CHK'D BY W. HERST
DATE 2/13/95

JOB NO.: 943-2848
FILENAME: PZ102SS

RECORD OF DRILLHOLE PZ-102

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/14/95
RIG: CME 75

DA MSL
COORDINATES N: 1068087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-37.0 ft. See Soil Borehole Log PZ-102-SS 37.0-37.8 ft. No samples collected														
34															
36															
	444.30		444.30												
38	37.8-41.0 ft. Highly weathered, thickly bedded, dark yellowish orange (10YR 6/6), fine grained, extremely weak, SANDSTONE, (ST. LOUIS FORMATION)		37.80						J,PL,SM-GRF						2/14/95 @ 8:09 Began coring Run 1
									J,I,SM-CL						
									J,PL,SM-CL (2)						
									J,I,SM-GRF						
40									J,PL,SM-intact						
									J,PL,SM-GRF						Fractures in upper portion of Run 1, are mapped in highly weathered sandstone, very clayey, likely drilling induced
	41.0-44.6 ft. Moderately weathered, dark yellowish orange (10YR 6/6), fine grained, weak, SANDSTONE, (ST. LOUIS FORMATION)			1	91%				J,PL,SM-intact						
									J,I,SM						
42									J,I,SM						
									J,I,SM (2)						
									J,I,R (2)						
	438.10														
44	44.00								Core Loss						Core loss due to weak rock
			437.50												
	44.6-59.6 ft. Slightly to moderately weathered, thickly bedded, light olive gray, micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		44.60						J,I,SM						
									J,I,R-CL						Fractures in Run 2, along contacts between lithologies of clay and limestone
									J,I,R-CL						
46				2	70%				J,I,R-CL (2)						
	435.10														
	47.00 @ 47.0 ft. Solutioned, in-filled with unlithified sandy clay, in Run 2, approximately 50%, competent rock								Core Loss						
			434.20												
48			47.90	3	85%										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-102-[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

[redacted]ETHOD: NX Core & water
[redacted]DATE: 2/14/95
DRILLING: CME 75

DATU[redacted]L
COORDINATES N: 1068087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

[redacted]LE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.6-59.6 ft. Slightly to moderately weathered, thickly bedded, light olive gray, micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R-CL						Core loss in Run 2 due to problem with barrel
									J,I,R-CL						
									J,PL,SM (2)						
								●	J,PL,SM						
	48.8-49.0 ft. Glauconitic clay and limestone fragment infilled collapse zone, stylolitic								J,I,R						
								●	J,PL,SM						
50									J,I,R						
									J,PL,R						
				3	85%				J,I,R						
								●	J,PL,SM-CL-intact						
									J,ST,R-Fe						
								●	J,PL,R-solutioned						
52	51.8-52.2 ft. Infilled zone														
	52.0-52.9 ft. Breciated, collapsed, infilled with limestone fragments, sand and clay														
									Core Loss						Core loss due to fractures/lugging of bit, some rock recovered in this interval, but broken up
54			428.00 / 54.10												
								●	J,PL,R						
								●	J,PL,R-Fe						
								●	J,C,SM-CL-intact						
									J,PL,R						
								●	J,I,R-Fe						
									J,PL,R						
56								●	J,ST,R						
								●	J,I,R-CL						
									J,I,SM						Numerous intact, very small, clay filled, irregular fractures 54.7-60.3 ft. Not mapped on graphic log
	56.9-56.9 ft. Collapse, infilling clay								J,PL,SM-CL						
								●	J,I,R						
				4	100%				J,I,R						
	57.4-57.5 ft. Infilled fraction							●	J,I,R						
	57.6-59.8 ft. Solutioned, infilled with limestone fragments, glauconitic clay, sand							●	J,PL,SM-Fe						
58								●	J,PL,SM						
								●	J,I,R						
								●	J,I,R						
								●	J,I,SM,CL						
									J,PL,R						
									J,PL,R-CL						
	59.6-80.8 ft. Fresh to moderately weathered, thinly bedded, light olive gray (5Y 6/1), medium crystalline, extremely weak to medium strong, LIMESTONE, (ST. LOUIS FORMATION)							●	J,PL,SM-CL						
60			421.80 / 60.30												
									J,I,R						
	61.8-62.4 ft. Collapse filled with limestone fragments, clay and sand								J,I,R						
62				5	98%										
									J,PL,R						
									J,C,VR						
									J,I,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-1

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/14/95
DRILL RIG: CME 75

MSL
COORDINATES N: 1068087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	59.6-80.8 ft. Fresh to moderately weathered, thinly bedded, light olive gray (5Y 6/1), medium crystalline, extremely weak to medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,PL,R	
					J,I,R-SM	Numerous very small intact, clay and sand filled fractures 65.5-68.6 ft. Not mapped
66	64.0-65.4 ft. Collapse fraction infilled with clay, limestone fragments, sand		5	98%	J,I,R	
					J,I,R	
	67.3-67.4 ft. Clay, sand and limestone fragment infilled fracture				J,I,R-CL and sand filled	
					J,I,R-intact	
68	67.9-68.0 ft. Clay and limestone framgent infilled fracture				J,I,R-CL	
		413.50 / 68.60				
					J,I,R-calcite filled	
					J,PL,R	
					J,I,R	
70	70.1-70.5 ft. Collapse infilled with limestone fragments, black clay, pyrite crystals, sand				J,C,SM	
					J,C,R	
	71.3-71.7 ft. Breccia filled zone, pyrite, limestone fragments, black clay infilling				J,I,R-Fe	
			6	98%	J,I,R	
72	72.1-73.2 ft. Collapse zone					
					J,I,R-CL (3)	Numerous small intact fractures not mapped 73.2-74.9 ft. Infilled clay, sand, limestone fragments
					J,I,R (2)	
74					J,I,R	
		407.20 / 74.90				
76					J,I,R-calcite	
			7	99%	J,I,R-calcite	
78						
					J,I,R-calcite	
80						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-102

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
G DATE: 2/14/95
DRILL RIG: CME 75

DAT MSL
COORDINATES N: 1068087.7
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	80.3-80.5 ft. Solutioned rock, infilled with limestone fragments, clay								J,I,R						
	401.30								J,I,R						
	80.8-82.3 ft. Moderately weathered, interbedded, light gray (N7), weak, SILTY CLAYSTONE, (ST. LOUIS FORMATION) Cherty								J,I,R						
									J,I,R						
82									J,I,R						
	399.80			7	99%										
	82.3-84.0 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), finely cyrstalline, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM						
									J,PL,SM (2)						
84	398.10														
	84.0-84.4 ft. Slightly weathered, thinly bedded, very light gray (N8), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION)		397.50						J,PL,SM						
	84.4-87.0 ft. Slightly weathered, thinly bedded, dark gray (N3) to medium gray (N5), weak, CLAYSTONE and SILTY CLAYSTONE, (ST. LOUIS FORMATION) Carbonaceous		84.60						J,I,R						
									J,PL,SM (3)						
86															
									J,PL,SM-CL						
	395.10														
	87.0-89.9 ft. Slightly weathered to fresh, light brownish gray (5YR 6/1), microcrystalline, medium strong, CRYSTALLINE LIME -STONE, (ST. LOUIS FORMATION) Upper 1 ft. and lower 3 in. bioturbated, pyrite mineralization			8	100 %										
88									J,PL,SM-CL						
									J,I,SM-CL						2/14/95 @ 14:25 Complete drilling
	392.20		392.20												
90	89.90 End of Record of Drillhole at 89.9 ft.		89.90												
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-102R-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 3
		DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 8:30 / TIME 10:45
		DATE 6/15/95 / DATE 6/15/95
DATUM NORTHING: 1068131.86 EASTING: 516858.81	ELEVATION 484.5	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Flat, grass covered area	
ANGLE	BEARING	
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	5 5 3 5	1.5'/2.0' (75%)			(0.0-6.0 ft.) Firm, dark yellowish brown (10YR 4/2), CLAYEY SILT, trace organics (fine roots), NR, damp, (CL-ML), (TOPSOIL)	SP 1	
3	2 4 5 5	1.8'/2.0' (90%)				SP 2	
5	2 3 4 5	1.8'/2.0' (90%)			@ 4.0 ft., color changes to moderate yellowish brown (10YR 5/4)	SP 3	
6					(478.5) 6.0		
7	2 2 4 5	1.5'/2.0' (75%)			(6.0-14.0 ft.) Loose, mottled, moderate yellowish brown (10YR 5/4) to pale yellowish brown (10YR 6/2), SILT, NR, damp, (ML), (LOESS)	SP 4	
9	5 5 5 5	1.4'/2.0' (70%)				SP 5	
11	4 5 6 9	1.5'/2.0' (75%)			@ 10.0 ft., Silt becomes compact	SP 6	
13	3 5 8 11	1.8'/2.0' (90%)				SP 7	
14	6 6 8 8	2.0'/2.0' (100%)			(14.0-17.8 ft.) Compact, light olive gray (5Y 6/1), SILT, trace iron staining, NR, damp, (ML), (LOESS)	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 7/14/95

JOB NO.: 943-2848

FILENAME: PZ102RSS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-102R-SS	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3	
		DRILLING START	DRILLING FINISH
	WATER LEVEL	TIME 8:30	TIME 10:45
	TIME		
	DATE	DATE 6/15/95	DATE 6/15/95
	CASING DEPTH		
DATUM NORTHING: 1068131.86 EASTING: 516858.81	ELEVATION 484.5		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Flat, grass covered area		
ANGLE BEARING			
SAMPLE HAMMER			

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(14.0-17.8 ft.) Compact, light olive gray (5Y 6/1), SILT, trace iron staining, NR, damp, (ML), (LOESS)	SP 8	
16	3 4 5 8	1.8'/2.0' (90%)					
17					from 17.0-17.8 ft., Silt becomes wet	SP 9	
					(466.7) 17.8		
18	9 9 6 10	1.6'/2.0' (80%)			(17.8-22.7 ft.) Compact, pale yellowish brown (10YR 6/2), fine SAND, trace Silt, trace iron oxide staining, NR, dry, (SP), (ALLUVIUM)	SP 10	
19							
20	4 6 7 9	1.5'/2.0' (75%)				SP 11	
21							
22	4 4 8 6	1.8'/2.0' (90%)					
					(461.8) 22.7		
23					(22.7-24.0 ft.) Compact, pale yellowish brown (10YR 6/2), fine SANDY SILT, NR, damp, (ML), (LOESS)	SP 12	
24	5 6 6 6	1.6'/2.0' (80%)			(24.0-28.0 ft.) Compact, mottled moderate yellowish brown (10YR 5/4) to light olive gray (5Y 6/1), SILT, some iron oxide staining, NR, damp, (ML), (LOESS)	SP 13	
25							
26	5 3 5 8	1.8'/2.0' (90%)			@ 26.0 ft., color changes to olive gray (5Y 4/1) and Silt becomes moist	SP 14	
27							
					(456.5) 28.0		
28	4 6 10 10	2.0'/2.0' (100%)			(28.0-30.8 ft.) Stiff, olive gray (5Y 4/1) CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP 15	
29					@ 29.6 ft., thin silty fine sand seam, damp (<1 in. thick)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 7/14/95

JOB NO.: 943-2848

FILENAME: PZ102RSS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-102R-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 3
		DRILLING START TIME 8:30 DATE 6/15/95 / FINISH TIME 10:45 DATE 6/15/95
DATUM NORTHING: 1068131.86 EASTING: 516858.81	ELEVATION 484.5	

WATER LEVEL					
TIME					
DATE					
CASING DEPTH					

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Flat, grass covered area

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 5 9 14	1.8'/2.0' (90%)			(28.0-30.8 ft.) Stiff, olive gray (5Y 4/1) CLAYEY SILT, NR, moist, (CL-ML), (LOESS) (453.7) 30.8 (30.8-32.0 ft.) Compact, olive gray (5Y 4/1), SILT, NR, moist, (ML), (LOESS) (452.5) 32.0	SP 16	
32 33	47 44 26 27	1.2'/2.0' (60%)			(32.0-35.0 ft.) Very dense, light olive gray (5Y 6/1), fine GRAVEL and SILTY f-c SAND, trace pieces of lignite, NR, wet, (GP), (WEATHERED BEDROCK)	SP 17	@ 32.0 ft., first water encountered overlying bedrock
34 35	16 50/2"	0.4'/1.0' (40%)			(449.5) 35.0	SP 18	
36 37 38 39 40 41 42 43 44					End of Soil Borehole Log at 35.0 ft. See PZ-102R-SS Record of Drillhole for rock descriptions		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 7/14/95

JOB NO.: 943-2848

FILENAME: PZ102RSS

RECORD OF DRILLHOLE PZ-102

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 6/15/95 - 6/16/95
DRILLING: CME 75

DATUM: MSL
COORDINATES N: 1068087.87
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.97
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-35.0 ft. See Soil Borehole Log PZ-102R-SS														
34															
	447.10		447.10												
	35.0-37.0 ft. Highly weathered, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		35.00	1	100 %										6/15/95 @ 11:00 Began coring Highly broken rock due to weathering and drilling
36			445.90												
	37.0-55.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		36.20						J,I,R (6)						
									J,I,R (6)						
38				2	97%				J,PL,SM						
									J,I,R (3)						
									J,I,R (2)						
			442.60						J,I,R,CL (2)						6/15/95 @ 11:50 End Run 2
			39.50						B,I,R (2)						
40									J,I,R,CL (2)						
									J,I,R (4)						
42									J,I,R						
									J,I,R,CL						
									J,I,R (4)						
									J,I,R (3)						
				3	94%										
44									J,I,R (5)						
									J,I,R,CL						
									J,I,R (2)						
									J,I,R,CL (3)						
46									J,PL,SM						
									J,I,R (4)						
									J,I,R,CL (4)						
									J,I,R (2)						
									J,I,R,CL (3)						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-102

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 6/15/95 - 6/16/95
DRILLING: CME 75

DATUM: MSL
COORDINATES N: 1068087.67
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.97
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	37.0-55.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			3	94%				B,I,R,CL						
			433.20						B,I,SM,CL						6/15/95 @ 13:45 End Run 3 Core loss possibly due to wash out of clay seams in joints
			48.90												
			432.60												
			49.50						B,I,R (2)						
50									J,I,R-intact						
									J,I,SM						
									B,PL,SM						
									J,I,R (2)						
									J,I,R						
52				4	100 %				B,I,R						
									B,I,R						
54									J,I,R						
									J,I,R (2)						
			426.30												6/15/95 @ 15:00 End Run 3
56	55.8-61.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic 55.8-56.1 ft. Chert layer		55.80						B,I,R						
				5	100 %				B,I,R						
58	57.8-58.0 ft. Hard, greenish gray (5G 6/1), Siltstone layer								B,I,R (2)						
									J,I,R-intact						
									J,I,R						
			422.60						J,I,R-intact						6/15/95 @ 16:15 End Run 5 Stop drilling for the day 6/16/95 @ 7:15 Began Run 6
			59.50												
60									B,PL,SM,CL (3)						
	61.3-70.4 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic			6	100 %				B,I,R (3) J,PL,SM,Fe						
62									J,PL,SM (2)						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-102

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
G DATE: 6/15/95 - 6/16/95
DRILL RIG: CME 75

DAT MSL
COORDINATES N: 1068087.67
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.97
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	61.3-70.4 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic						
						B,PL,SM	
66						B,PL,SM,CL	
			6	100 %			
68						J,PL,SM	
						B,PL,SM (2)	
		412.60 / 69.50					6/16/95 @ 8:25 End Run 6
						B,I,SM	
70	70.4-75.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic						
						B,I,R	
72			7	100 %			
						B,I,SM	
74	@ 74.2 ft. Stiff, dark greenish gray (5G 4/1), clay seam, (~1/2 in. thick)					J,PL,SM,CL	
	75.2-76.0 ft. Fresh, thinly bedded, medium bluish gray (5B 5/1), micro-crystalline, very strong, Silicified Limestone, (ST. LOUIS FORMATION) 406.10	406.90 / 75.20				B,PL,SM	6/16/95 @ 9:15 End Run 7
						J,I,R	
76	76.0-77.4 ft. 76.00 Fresh, medium bedded, brownish gray (5YR 4/1), microcrystalline, strong, DOLOMITE, (ST. LOUIS FORMATION) Moderately porous, (open vugs <1 mm.) 404.70						
						B,I,SM	
						J,PL,SM	
	77.4-88.6 ft. 77.40 Fresh, very thinly bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some very thinly laminated shaley partings		8	98%		J,PL,SM	
78						J,I,R	
						J,I,R	
80							

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); 2 FRACTURES 6 PER FOOT 10; DIP wrt CORE AXIS (0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW FR, MW, HW, CW); STRENGTH INDEX (R5 R6, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-102

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 6/15/95 - 6/16/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068087.87
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516887.97
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
80	77.4-88.6 ft. Fresh, very thinly bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some very thinly laminated shaley partings				B,PL,SM	
82			8	98%	J,I,R; B,I,R; J,I,R	
		398.10				6/16/95 @ 12:00 End Run 8
84		84.00				
					J,I,SM; B,I,SM	
86					J,I,R	
			9	100 %		
88					J,I,R (2)	
	393.50					
	88.6-90.0 ft. Fresh, medium bedded, medium dark gray (N4), very weak, CLAYSTONE, (ST. LOUIS FORMATION)					6/16/95 @ 15:00 Completed drilling
	392.10	392.10				
90	End of Record of Drillhole at 90.0 ft. 90.00	90.00				
92						
94						
96						

GRAPHIC LOG; RQD (80 60 40 20); FRACTURES PER FOOT (2 4 6 8 10); DIP wrt CORE AXIS (0 30 60 90); WEATHERING INDEX (SW FR MW HW CW); STRENGTH INDEX (R6 R5 R4 R3 R2 R1); POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-103-SS
		SHEET 1 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					07:30	12:00
DATE					DATE	DATE
CASING DEPTH					2/21/95	2/23/95

DATUM NORTHING: 1067660.40 EASTING: 516723.54 ELEVATION 477.8

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-2.0 ft.) No samples collected due to coarse gravel placed for temporary road		
1							
2					(475.8) 2.0		
	1 2 3 4	1.6'/2.0' (80%)			(2.0-16.0 ft.) Firm, dusky yellowish brown (10YR 2/2), CLAYEY SILT, trace fine Sand, NR, damp, (CL-ML), (LOESS)	SP 2	
3							
4	2 4 4 4	1.3'/2.0' (65%)			@ 4.0 ft., color changes to pale yellowish brown (10YR 6/2) with moderate amount of iron oxide staining	SP 3	
5							
6	1 2 2 4	1.3'/2.0' (65%)				SP 4	
7							
8	1 2 3 4	1.8'/2.0' (90%)				SP 5	
9							
10	2 3 5 6	2.0'/2.0' (100%)			@ 10.0 ft., intermittent moist zones (<2 inches thick)	SP 6	
11							
12	1 2 2 3	1.7'/2.0' (85%)			Below 12.0 ft., increase in iron oxide staining (~50%)	SP 7	
13							
14		1.8'/2.0' (90%)				SH 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 2/21/95

JOB NO.: 943-2848

FILENAME: PZ103SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DATUM	NORTHING: 1067660.40 EASTING: 516723.54
ELEVATION	477.8
DRILLING METHOD:	6.25 inch I.D. Hollow Stem Auger
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-103-SS
SHEET	2 OF 4
DRILLING START TIME	07:30
DRILLING FINISH TIME	12:00
DRILLING START DATE	2/21/95
DRILLING FINISH DATE	2/23/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG	CME 75 - TRUCK MOUNT
ANGLE	
BEARING	
SAMPLE HAMMER	
SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(2.0-16.0 ft.) Firm, dusky yellowish brown (10YR 2/2), CLAYEY SILT, trace fine Sand, NR, damp, (CL-ML), (LOESS) (461.8) 16.0	SH 8	
16	7 11 10 11	1.3'/2.0' (65%)			(16.0-20.0 ft.) Loose to compact yellowish orange (10YR 6/6), SILTY fine SAND, NR, damp, (SM), (ALLUVIAL)	SP 9	
17							
18	1 4 3 8	1.1'/2.0' (55%)			@ 18.0 ft., silty sand becomes moist	SP 10	
19							
					(457.8) 20.0		
20	2 6 10 10	2.0'/2.0' (100%)			(20.0-22.0 ft.) Stiff to very stiff, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4) CLAYEY SILT with silty fine sand layers (<2 inches), WR, moist, (CL-ML), (ALLUVIUM)	SP 11	
21							
22	1 3 6 7	1.1'/2.0' (55%)			(22.0-28.0 ft.) Stiff, medium dark gray (N4), CLAYEY SILT, some thin silty fine sand zones (<1 inch), SR, damp to moist, (CL-ML), (ALLUVIUM)	SP 12	
23							
24		0.4'/2.0' (20%)				SH 13	
25							
26	15 47 50/5"	0.9'/2.0' (45%)			@ 26.0-27.5 ft., limestone boulder or layer encountered, first water identified in borehole	SP 14	Wet zone appears to be isolated
27							
28	2 6 7 10	1.4'/2.0' (70%)			(28.0-32.0 ft.) Stiff, greenish gray (5G 6/1) CLAYEY SILT, trace to little fine Sand, NR, damp, (CL-ML), (ALLUVIUM)	SP 15	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

DATE 2/21/95

CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ103SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-103-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 4
		DRILLING START TIME 07:30; FINISH TIME 12:00
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE 2/21/95; DATE 2/23/95
NORTHING: 1067660.40 DATUM EASTING: 516723.54 ELEVATION 477.8		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	2 4 7 9	1.5'/2.0' (75%)			(28.0-32.0 ft.) Stiff, greenish gray (5G 6/1) CLAYEY SILT, trace to little fine Sand, NR, damp, (CL-ML), (ALLUVIUM) @ 31.6 ft., moderate reddish brown (10R 4/6) CLAYEY medium SAND layer (~1/2 inch) (445.8) 32.0	SP 16	
32	2 4 5 11	1.6'/2.0' (80%)			(32.0-47.5 ft.) Stiff to very stiff, pale yellowish green (10G 7/2) SILTY CLAY, trace to little medium Sand, NR, damp, (CL) @ 33.4-33.8 ft., clayey medium grained sand layer, damp, (SC)	SP 17	
34	2 7 8 11	1.8'/2.0' (90%)				SP 18	
36	1 3 7 11	1.5'/2.0' (75%)			@ 36.0 ft., color varies from very pale orange (10R 8/2) to moderate yellowish brown (10R 5/4) to pale green (5G 7/2), trace fine gravel	SP 19	
38	3 4 6 15	2.0'/2.0' (100%)				SP 20	
40	3 5 20 11	2.0'/2.0' (100%)				SP 21	
42	9 19 50/5"	1.0'/2.0' (50%)				SP 22	
43					@ 43.0 ft., extremely weathered limestone boulder or layer encountered		
44	3 36 24 50/2"	0.5'/2.0' (25%)				SP 23	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 2/21/95

JOB NO.: 943-2848

FILENAME: PZ103SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-103-SS
		SHEET 4 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					07:30	12:00
DATE					DATE	DATE
CASING DEPTH					2/21/95	2/23/95

NORTHING: 1067660.40
DATUM EASTING: 516723.54 ELEVATION 477.8

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE BEARING
SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL			SAMPLER TYPE	REMARKS
46					(32.0-47.5 ft.) Stiff to very stiff, pale yellowish green (10G 7/2) SILTY CLAY, trace to little medium Sand, NR, damp, (CL)			SP 23	
47	4 6 8 50/3"	2.0'/2.0' (100%)			@ 45.5 ft., weathered limestone boulder or layer encountered @ 47.1 ft., thin silty fine sand layer (~1 inch), moist	(430.3)	47.5	SP 24	
48	23 5 2 48	1.8'/2.0' (90%)			(47.5-48.0 ft.) Hard, dark yellowish orange (10R 6/6), weathered SILTY CLAYSTONE, NR, damp, (CH)	(429.8)	48.0		
49					@ 48.0 ft., weathered limestone boulder encountered (48.0-50.0 ft.) Hard, moderate yellowish brown (10YR 5/4) SILTY CLAY, some weathered limestone pieces (<1 inch), WR-SR, moist, (CL)	(427.8)	50.0	SP 25	
50					End of Soil Borehole Log at 50.0 ft. See PZ-103-SS Record of Drillhole for rock descriptions				
51									
52									
53									
54									
55									
56									
57									
58									
59									

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON
DATE 2/21/95 CHK'D BY W. HERST

JOB NO.: 943-2848
FILENAME: PZ103SS

RECORD OF DRILLHOLE PZ-103-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

DRILLING METHOD: NX Core & water
DATE: 2/21/95-2/22/95
DRILLING EQUIPMENT: CME 75

DATUM:
COORDINATES N: 1067660.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-50.0 ft. See Soil Borehole Log PZ-103-SS 50.0-51.5 ft. No samples collected														
50															
	426.30		426.30												
52	51.5-62.7 ft. 51.50 Moderately weathered, medium bedded, yellowish gray (5Y 8/1), medium crystalline, weak to medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites with iron oxide staining		51.50						Core Loss						Core loss possibly from 51.5-52.7 ft. in highly fractured rock and clay zones on top of bedrock
54	53.4-53.9 ft. Pinkish gray (5YR 8/1), siltstone layer								J,I,R						
56	54.7 ft. Oxidized pyrite nodules (<3 mm.)			1	84%										
58	56.4 ft. Vertical calcite filled vein (4 in.) 57.0 ft. Calcite filled vein at 90 degrees (1 in. thick)								J,I,R						
									J,I,R,CL						
			418.80 / 59.00												59.0-60.0 ft. Five breaks that had been spun
60									J,I,R (2)						
				2	69%				J,PL,R						
62	62.7-62.9 ft. Extremely weak, greenish gray (5GY 6/1), glauconite clay layer														
	414.90														
64	62.9-71.0 ft. 62.90 Highly weathered, medium bedded, moderate yellowish brown (10YR 5/4), fine grained, weak, ARGILLACEOUS SANDSTONE, (ST. LOUIS FORMATION)								Core Loss						Core loss in soft formation or possible open void

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[redacted]THOD: NX Core & water
D[redacted]ATE: 2/21/95-2/22/95
DRI[redacted]G: CME 75

DAT[redacted]
COO[redacted]S N: 1067660.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	62.9-71.0 ft. Highly weathered, medium bedded, moderate yellowish brown (10YR 5/4), fine grained, weak, ARGILLACEOUS SANDSTONE, (ST. LOUIS FORMATION)				Core Loss	
		411.80 / 68.00				
66	66.0-66.5 ft. Highly weathered, dark yellowish orange (10YR 6/6), extremely weak, SILTSTONE layer	411.30 / 66.50	2	69%	Core Loss	Core loss in soft formation or possible open void
68		408.80 / 69.00				
70	69.6 ft. Very soft, dark yellowish orange (10YR 6/6), clay layer (2 in. thick)		3	100 %		
		406.80 / 71.00				
	71.0-71.7 ft. Slightly weathered, medium bedded, dark greenish gray (5GY 4/1), very fine crystalline, medium strong, DOLOMITIC LIMESTONE, moderate porosity, (ST. LOUIS FORMATION)	406.10 / 71.70			J,PL,SM J,ST,SM J,PL,SM	Run 3 stopped short, bit plugged off in claystones
72		405.80 / 72.00				2/21/95 @ 16:00 Stopped drilling in Run 3 2/22/95 @ 7:30 Began Run 4
74	71.7-78.7 ft. Highly weathered, thinly bedded, medium dark gray (N4) to grayish black (N2), very weak, CLAYEY SILTSTONE, (ST. LOUIS FORMATION) Some disseminated pyrite, some thin layers of claystone (<3 in.)				B,I,R B,I,R J,I,R	
		402.20 / 75.60	4	100 %	J,PL,SM,CL J,PL,SM	
76	75.6-76.3 ft. Brownish gray (5YR 4/1), argillaceous LIMESTONE layer	401.50 / 76.30			J,PL,SM J,PL,SM-intact J,I,R (2) B,I,R	
78					B,I,R	
	78.7-87.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic	399.10 / 78.70				
		398.60 / 79.20	5	100 %		
80		397.80 / 80.00				

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DISCONTINUITY DATA (DIP wrt CORE AXIS 0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW FR, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible] METHOD: NX Core & water
D[illegible] DATE: 2/21/95-2/22/95
DR[illegible] CME 75

DATU[illegible]
COO[illegible] N: 1067660.4
AZIMU[illegible]0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
80	397.80 / 80.00 80.0-81.2 ft. Thinly laminated, olive gray (5Y 4/1), CLAYEY SILTSTONE layer 396.60 / 81.20					
82	78.7-87.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		5	100 %	J,PL,SM,CL (2)	
84						
86		391.80 / 86.00				9:45 Stopped Run 5 short, bit plugged off
88	87.3-87.5 ft. Soft, greenish gray (5GY 6/1), glauconite Clay layer 87.5-103.8 ft. Fresh, thinly bedded, light olive green (5Y 6/1) to olive gray (5Y 4/1), very fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Trace disseminated pyrite				B,PL,SM J,I,R,CL J,I,R (2) J,PL,SM	
90	89.0-91.5 ft. Moderate porosity, open vugs (<3 mm.), glauconite in some vugs (<1%) 90.4 ft. Thin silicified zone (~1/2 in.)		6	98%	J,PL,SM	
92						
94		383.30 / 94.50			J,PL,SM,CL	
96			7	98%	J,I,SM (2)	

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-S[illegible]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]THOD: NX Core & water
D[illegible]ATE: 2/21/95-2/22/95
DR[illegible]: CME 75

DAT[illegible]
COO[illegible]S N: 1067660.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	87.5-103.8 ft. Fresh, thinly bedded, light olive green (5Y 6/1) to olive gray (5Y 4/1), very fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Trace disseminated pyrite								J,I,R						
									J,I,SM						
									J,I,R						
									J,I,R						
98									J,P,SM						
									J,P,SM						
									J,P,SM						
									B,I,SM,CL						
100				7	98%										
	101.3-103.6 ft. Moderate porosity, open vugs (<2 mm.)														
102															
	374.00														
104	103.8-105.6 ft. 103.80 Freshly medium bedded, pale yellowish brown (10YR 6/2) to light brownish gray (5YR 6/1), medium crystalline, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)		373.30						J,U,SM						
			104.50						J,PL,R						
									J,PL,SM-healed with calcite						
	372.10														
106	105.6 ft. 105.70 Brownish gray (5YR 4/1), Claystone layer, (~1 in. thick)														
	105.7-107.2 ft. Fresh, thickly bedded, olive gray (5Y 4/1), finely grained, strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) 370.60 107.20														
108	107.2-109.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), finely crstalline, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Trace disseminated pyrite			8	100 %				J,U,SM						
110	109.6-128.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, some glauconite stringers								J,I,SM,CL						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]THOD: NX Core & water
D[illegible]ATE: 2/21/95-2/22/95
DR[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1067660.4
AZIMUT[illegible]

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
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Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	112.0-113.5 ft. Becomes argillaceous 109.6-128.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, some glauconite stringers			8	100 %										
114									J,I,R,CL						
			363.30 / 114.50												
									J,I,SM						
116															
									J,PL,SM						
									J,I,VR						
									J,PL,SM,CL						
118									J,PL,VR						
	119.2-124.0 ft. Thin chert zone generally less than 2 in. thick			9	100 %										
120	120.0-120.5 ft. Moderate siliceous								J,I,R,CL						
122									J,I,R,CL						
									J,I,SM,CL						
124			353.30 / 124.50												
	Two stylolites														
126				10	100 %										
									J,PL,SM (2)						
									J,P,SM						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]THOD: NX Core & water
D[illegible]ATE: 2/21/95-2/22/95
DR[illegible] CME 75

DATU[illegible]
COO[illegible] N: 1067860.4
AZIMU[illegible]

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Silkensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128			349.40												
	128.4-133.9 ft. Slightly weathered, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)		128.40												
130				10	100 %										
132															
			343.90												2/22/95 16:45 Stopped drilling on Run 10 2/23/95 7:40 Resumed drilling Measured water level at 52.15 ft. below ground surface
134	133.9-136.5 ft. Fresh, medium bedded, light olive gray (5Y 5/2), micro-crystalline to fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Trace disseminated pyrite, some thin veins of calcite (<1/4 in.)		133.90 / 343.50 / 134.30						J,PL,SM,CL						
									J,U,SM						
136			341.30						B,PL,SM						
	136.5-139.7 ft. Slightly weathered, thickly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, ARENACEOUS DOLOMITE, (<1 in.), (ST. LOUIS FORMATION) Thin Limestone layers		136.50												
138				11	100 %										
			338.10												
140	139.7-142.3 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), fine crystalline, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)		139.70						J,C,SM						
									J,PL,SM						
									J,I,R						
142			335.50						J,I,R,CL						
	142.3-144.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) 144.0-144.2 ft. Soft, grayish green (5G 5/2), glauconitic clay layer		142.30												Highly broken rock.
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-103-S[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[redacted]THOD: NX Core & water
D[redacted]ATE: 2/21/95-2/22/95
DRI[redacted]: CME 75

DATU[redacted]
COOR[redacted]S N: 1067660.4
AZIMUTH: 0

COLLAR ELEV: 477.8
E: 516723.5
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	333.50		333.50	11	100				J,I,SM (2)						
	End of Record of Drillhole at 144.3 ft. 144.30		144.30												2/23/95 @ 9:00 Finish drilling corehole.
146															
148															
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/13/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO.	PZ-104-KS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET	1 OF 3
		DRILLING	START / FINISH
	WATER LEVEL	TIME	15:40 / 17:58
	TIME	DATE	2/12/95 / 2/12/95
	DATE		
	CASING DEPTH		
DATUM NORTHING: 1066993.15 EASTING: 516820.50	ELEVATION 482.3		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS		
ANGLE BEARING			
SAMPLE HAMMER			

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 5 4 4	1.6'/2.0' (80%)			(0.0-2.4 ft.) Stiff, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, rootlets, NR, moist, (ML-CL), (LOESS)	SP 1	2/12/95 - 15:40 Began drilling
2 3	2 2 2 2	1.2'/2.0' (60%)			(2.4-7.0 ft.) Soft to firm, dusky yellowish brown (10YR 2/2), homogenous, CLAYEY SILT, NR, moist, (ML-CL), (LOESS)	SP 2	
4 5	2 2 3 3	1.5'/2.0' (75%)				SP 3	
6		2.2'/2.0' (110%)				SH 4	
7 8 9					(7.0-15.4 ft.) Stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (ML-CL), (LOESS)		
8 9	3 4 5 8	0.9'/2.0' (45%)				SP 5	
10 11	3 4 5 7	1.1'/2.0' (55%)				SP 6	
12 13	4 4 6 7	1.1'/2.0' (55%)				SP 7	
14	3 5 8 9	1.2'/2.0' (60%)				SP 8	

LOGGED BY J. MILLER

DATE 2/12/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ104KS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-104-KS
		SHEET 2 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME 15:40 / TIME 17:58
	TIME	
	DATE	DATE 2/12/95 / DATE 2/12/95
NORTHING: 1066993.15 DATUM EASTING: 516820.50 ELEVATION 482.3	CASING DEPTH	

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(7.0-15.4 ft.) Stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (ML-CL), (LOESS) (466.9) 15.4	SH 8	
16		1.7'/2.0' (85%)			(15.4-20.8 ft.) Compact, light gray (N7), homogenous, SILT, NR, dry, (ML), (LOESS)	SH 9	
17							
18	6 5 6 8	1.1'/2.0' (55%)				SP 10	
19							
20	4 4 6 8	1.2'/2.0' (60%)			(461.5) 20.8	SP 11	
21					(20.8-22.4 ft.) Stiff, light olive gray (5Y 6/1), homogenous, CLAYEY SILT, SR, dry, (CL-ML), (LOESS)		
22	6 6 7 8	1.6'/2.0' (80%)			(459.9) 22.4	SP 12	
23					(22.4-23.31 ft.) Compact, pale yellowish brown (10YR 6/2), homogenous, SILTY coarse SAND, NR, dry, (SM), (ALLUVIUM) (459.0) 23.3		
24	6 5 7 9	1.1'/2.0' (55%)			(23.31-24.8 ft.) Compact, light olive gray (5Y 6/1), homogenous, SILT, NR, dry, (ML), (ALLUVIUM) (457.5) 24.8	SP 13	
25					(24.8-31.0 ft.) Compact to stiff, medium gray (N5), stratified very fine SAND and CLAYEY SILT, NR, dry, (SC), (ALLUVIUM)		
26	2 5 5 6	1.3'/2.0' (65%)				SP 14	
27							
28	4 4 5 4	1.6'/2.0' (80%)			@ 28.0 ft., 5-6 inch clayey silt layers, <0.5-2.0 inch fine SAND layers	SP 15	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 2/12/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ104KS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-104-KS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 3
		DRILLING START TIME 15:40 DATE 2/12/95; FINISH TIME 17:58 DATE 2/12/95
NORTHING: 1066993.15 DATUM EASTING: 516820.50 ELEVATION 482.3	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	4 7 7 10	1.6' / 2.0' (80%)			(24.8-31.0 ft.) Compact to stiff, medium gray (N5), stratified very fine SAND and CLAYEY SILT, NR, dry, (SC), (ALLUVIUM) (451.3) 31.0	SP 16	
32	10 5 4 12	0.9' / 2.0' (45%)			(31.0-33.1 ft.) Compact, medium dark gray (N4), homogenous, f-m SAND, trace Silt and Clay, NR, moist, (SP), (ALLUVIUM) @ 28.0 ft., 6 inch clayey silt layer, (0.5-2.0 inch fine SAND layers (449.2) 33.1	SP 17	
34	6 17 28 52	1.6' / 2.0' (80%)			(33.1-36.0 ft.) Very stiff, light gray (N7), homogenous, SILTY CLAY, NR, dry, (CL), (WEATHERED BEDROCK) (446.3) 36.0	SP 18	
36					End of Soil Borehole Log at 36.0 ft. See PZ-104-KS Record of Drillhole for rock descriptions		
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/12/95

JOB NO.: 943-2848

FILENAME: PZ104KS

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

DRILLING METHOD: NX Core & water
DATE: 5/22/95 - 6/4/95
DRILLING: CME 75

DATUM:
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-36.0 ft. See Soil Borehole Log PZ-104-KS 36.0-38.0 ft. No samples collected														
34															
36															
38	444.30		444.30												
	38.0-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 38.00		38.00						J,PL,SM						5/22/95 @ 14:00 Began drilling
									J,PL,R (2)						
									J,PL,R						
									J,PL,R,CL						
40				1	100 %				J,PL,R,Fe						
									J,PL,SM,CL						
42									J,PL,SM,CL						
			439.30						J,P,R,CL						5/22/95 @ 14:40 End of Run 1
			43.00						J,I,R,Fe						
44									J,I,R,Fe						
									J,PL,R,Fe						
									J,PL,R,CL						
	44.9-45.0 ft. Clay layer 437.00														
	45.3-46.6 ft. Clay layer 45.30			2	100 %										
46	435.70 46.60														
									J,PL,SM,CL						
									J,I,R,CL						
48									J,C,R,Fe						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B METHOD: NX Core & water
DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATU
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
48	38.0-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,PL,SM,CL	
	48.0-54.5 ft. Stylolites common, very thinly bedded clay layers common				J,PL,SM,CL (3)	
50			2	100 %	J,PL,SM,CL J,I,R	
52					J,PL,SM,CL	
		429.30			J,PL,SM,CL	5/22/95 @ 16:00 End of Run 2
		53.00				
	53.5-63.0 ft. Joints have approximately 1/2 in. of clay				B,PL,SM (3)	
54					J,I,R (4)	
					J,PL,SM,CL (7)	
56					J,PL,SM,CL (2) J,PL,SM,CL (4)	
					J,PL,SM,CL (2)	
58			3	100 %	J,PL,SM,CL (4)	
					J,PL,SM,CL (4)	
60					J,I,R,CL J,PL,R	
					J,PL,SM,CL	
62	61.9-62.6 ft. Abundant argillaceous partings					
	62.6-62.7 ft. Clay layer				J,PL,SM,CL (2)	
		419.30				5/22/95 @ 17:00 End of Run 3
		63.00				
			4	100 %		
64						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	38.0-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)					J,PL,SM	
	@ 65.6 ft. Chert layer						
66							
	67.3-73.0 ft. Stylolites common					J,PL,SM,CL	
68			4	100 %		J,PL,SM	
						J,PL,SM,CL (2)	
70						J,PL,SM,CL	
72							
		409.30 / 73.00					5/22/95 @ 17:45 End of Run 4
	73.4-83.3 ft. Abundant argillaceous partings						
74						J,I,R	
						B,I,SM	
						J,PL,SM,CL	
76			5	100 %		J,PL,SM,CL	
						J,PL,SM,CL	
						J,PL,SM,CL	
78						J,PL,SM,CL	
	79.1-79.2 ft. Clay layer					J,PL,SM,CL (2)	
80							

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DISCONTINUITY DATA (0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW FR, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BO[redacted]THOD: NX Core & water
DR[redacted]ATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DAT[redacted]
COO[redacted]S N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	38.0-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM,CL						
				5	100 %										
82			399.30												5/22/95 @ 18:30 End of Run 5 Ended drilling for the day
			83.00												5/23/95 @ 7:25 Began drilling
84									J,I,R,CL						
	84.7-84.9 ft. Medium light gray (N6), fine grained, SANDSTONE layer, (ST. LOUIS FORMATION)								J,I,R,CL						
86	84.9-91.4 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), f-m crystalline, medium strong, LIMESTONE (ST. LOUIS FORMATION) Calcite filled fractures, clay filled fractures 86.3-86.6 ft. Clay layer			6	83%				J,I,SM-intact						
									J,I,VR						
									J,I,R,CL						
									J,I,R						
									J,I,R						
88									J,I,R,CL						
			392.90												
			89.40												
90									Core Loss						Core Loss, possible soft rock
			391.60												5/23/95 @ 8:30 End of Run 6
			90.70												
	390.90														
	91.4-91.9 ft. Slightly weathered, thinly bedded, medium gray (N5), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION) Thickly laminated clay layers 91.40 – 390.40 – 91.90								B,PL,SM (2)						
92	91.9-103.0 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) *Abundant argillaceous layers*								J,I,R,CL						
				7	100 %										
94									J,I,R						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO HOD: NX Core & water
DR TE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATU
COORD N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FT)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	91.9-103.0 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant argillaceous layers								J,PL,R; J,PL,R,CL					
				7	100 %									
98			383.10											5/23/95 @ 9:00 End of Run 7
			99.20											
100														
	101.1-103.0 ft. Abundant chert													
102				8	80%									
			379.30											
	103.0-108.0 ft. Slightly weathered, thickly laminated, medium dark gray (N4), fine grained, very weak, SILTSTONE grades to sandy SILTSTONE with depth, (ST. LOUIS FORMATION)		103.00											
104														
106			376.20											
			106.10											Core Loss, soft rock
			374.50											5/23/95 @ 10:10 End of Run 8
			374.50											
108	108.0-118.2 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites present		107.80						B,PL,SM,CL; B,PL,SM,CL (5); J,U,SM,CL					
110				9	100 %									
112														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]TE: 5/22/95 - 6/4/95
DRI[illegible] CME 75

DATU[illegible]
COOR[illegible]N: 1066993.15
AZIMU[illegible]

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	108.0-118.2 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites present			9	100 %				B,PL,SM,CL						
114			368.10 / 114.20												5/23/95 @ 10:40 End of Run 9
116															
118			364.10 / 118.20												
	118.2-119.8 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), medium grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION)			10	100 %			30	J,PL,SM,CL						
			362.50 / 119.80												
120	119.8-121.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM,CL						
122	121.7-123.2 ft. Fresh, medium bedded, light olive gray (5Y 6/1), m-c grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM,CL (2)						
124	123.2-133.8 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Pyrite at contact		358.10 / 124.20						J,I,R						5/23/95 @ 11:40 End of Run 10
126				11	100 %				J,PL,SM,CL						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] ETHOD: NX Core & water
D[illegible] ATE: 5/22/95 - 6/4/95
D[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1066993.15
AZIMU[illegible]

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	123.2-133.8 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Pyrite at contact							J,PL,SM,CL					
130			11	100 %				J,PL,SM,CL					
132								J,I,SM,CL					
134	133.8-135.3 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1) fine grained, weak, SANDSTONE, (ST. LOUIS FORMATION) Thickly laminated, argillaceous layers (348.50, 133.80, 347.00)	348.10 / 134.20						J,I,SM,CL; B,PL,SM					5/23/95 @ 12:20 End of Run 11
136	135.3-137.5 ft. (135.30) Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic							J,PL,SM					
138	137.5-140.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Includes fine sand and silt		12	100 %				J,PL,SM,CL					
140	140.0-144.7 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic							J,PL,SM					
142								J,PL,SM					
144													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOR[illegible]HOD: NX Core & water
DR[illegible]E: 5/22/95 - 6/4/95
DRI[illegible]CME 75

DATUM[illegible]
COOR[illegible]: 1068993.15
AZIMUT[illegible]

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144			338.10	12	100 %				J,PL,SM						5/23/95 @ 13:00 End of Run 12
			144.20						J,PL,R						
	144.7-149.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
146															
148									J,PL,R						
	149.2-152.2 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2) to medium gray (N5), fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites and argillaceous partings common			13	100 %				J,PL,R						
150									B,PL,SM,CL (3)						
									B,PL,SM,CL (2)						
152	152.3-154.6 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
154			328.10												5/23/95 @ 14:10 End of Run 13
			154.20												
	154.6-162.3 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, argillaceous partings								B,PL,SM (2)						
156															
				14	100 %				J,PL,SM						
158															
									B,I,R						
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible] METHOD: NX Core & water
D[illegible] DATE: 5/22/95 - 6/4/95
D[illegible]: CME 75

DAT[illegible]
COO[illegible] N: 1066993.15
AZIM[illegible]

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	160.2-161.2 ft. Abundant clay zones, slightly weathered rock												
162	162.3-167.6 ft. 320.00 / 162.30 Fresh, medium bedded, grayish orange (10YR 7/4), f-m crystalline, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)		14	100 %									@ 162.3 ft. Inferred top of SALEM FORMATION
164		318.10 / 164.20											5/23/95 @ 15:00 End of Run 14
166													
168	167.6-171.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)		15	100 %									
170													
172	171.7-185.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), f-m crystalline, medium strong, LIMESTONE, (SALEM FORMATION)							J,I,R					
174		308.10 / 174.20						B,PL,SM,CL (4)					5/23/95 @ 16:00 End of Run 15
176	175.3-190.1 ft. Abundant argillaceous layers and partings		16	100 %				B,PL,SM					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]TE: 5/22/95 - 6/4/95
DR[illegible] CME 75

DATU[illegible]
COOR[illegible]N: 1066993.15
AZIMU[illegible]

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
178	171.7-185.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to medium crystalline, medium strong, LIMESTONE, (SALEM FORMATION)								J,PL,SM						
178	178.4-185.0 ft. Abundant chert layers and nodules														
180				16	100 %										
182									J,PL,R						
									J,PL,R						
184			298.10 / 184.20												5/23/95 @ 16:45 End of Run 16 Finished drilling for the day 5/24/95 @ 7:30 Began drilling Run 17 Water level before drilling @ 112.0 ft.
186	185.0-186.7 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Chert nodules abundant														
188	186.7-189.0 ft. Slightly weathered, thinly bedded, medium gray (N5), fine and medium grained, medium strong LIMESTONE, (SALEM FORMATION) Abundant argillaceous partings and layers			17	100 %				B,PL,SM,CL						
									B,PL,SM,CL (2)						
190	189.0-197.2 ft. Fresh, thinly bedded to thickly bedded (with depth), pale yellowish brown (10YR 6/2), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Abundant chert nodules														
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 5/22/95 - 6/4/95
CME 75

DAT
COO S N: 1068993.15
AZIMU 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	NOTES WATER LEVELS INSTRUMENTATION
192	189.0-197.2 ft. Fresh, thinly bedded to thickly bedded (with depth), pale yellowish brown (10YR 6/2), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Abundant chert nodules		17	100 %					
194		288.10 / 194.20							5/24/95 @ 8:40 End of Run 17
196									
	197.2-204.0 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2) and medium gray (N5), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Abundant large, strong nodules and layers of chert		18	100 %	J,PL,SM,CL				
198					J,PL,SM,CL; J,PL,SM				
					J,I,R; J,PL,R				
200		281.70 / 200.60							5/24/95 @ 10:15 End of Run 18
202									
204	204.0-222.7 ft. Fresh, medium bedded, grayish orange (10YR 7/4), medium crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Silicified zones and abundant chert		19	99%	J,PL,SM (3)				
206									
					J,PL,SM				
208									

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILLING RIG: CME 75

DATUM:
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
208	204.0-222.7 ft. Fresh, medium bedded, grayish orange (10YR 7/4), medium crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Silicified zones and abundant chert		19	99%	J,PL,SM	
		273.10			J,PL,SM (2)	5/24/95 @ 11:40 End of Run 19
		209.20			J,PL,SM (2)	
210			20	49%	J,I,R	
					J,PL,SM (2)	
		270.80				
	211.50	211.50				
212					Core Loss	Core Loss
		268.40				Core Loss, washed out 5/24/95 @ 13:20 End of Run 20
214		213.90				
					B,PL,SM (2)	
216			21	92%		
218						
		263.50				
		218.80				
		263.10				Core Loss (clay ?) 5/24/95 @ 14:00 End of Run 21
		219.20				
220						
			22	100 %		
222	222.7-228.0 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), coarse crystalline, weak, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Highly silicious, argillaceous					> 10 mechanical breaks/foot
224						

GRAPHIC LOG | RQD (80 60 40 20) | FRACTURES PER FOOT (2 4 6 8 10) | DIP wrt CORE AXIS (0 30 60 90) | GRAPHIC LOG | WEATHERING INDEX (SW FR MW HW CW) | STRENGTH INDEX (R6 R5 R4 R3 R2 R1) | POINT LOAD INDEX (psi) (R1 R2 30 R3 150 R4 300 R5 600 R6 1500) | TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

[redacted]ETHOD: NX Core & water
[redacted] DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DAT[redacted]L
COOR[redacted]TES N: 1086993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224	222.7-228.0 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), coarse crystalline, weak, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Highly silicious, argillaceous														
226				22	100 %				J,PL,R						
228	228.0-230.7 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), f-m crystalline, medium strong, LIMESTONE, (SALEM FORMATION)		253.10 / 229.20												5/24/95 @ 15:30 End of Run 22
230	230.7-238.9 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), m-c crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Argillaceous, silicious								F,U,R (2)						
232															
234				23	100 %				J,PL,R						
236									J,PL,R (2)						236.0-237.0 ft. Additional mechanical breaks
238									J,PL,R						
240	238.9-247.4 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), m-c crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Argillaceous, silicious, includes fossiliferous zones		243.10 / 239.20	24	100 %				B,PL,SM,CL						5/24/95 @ 16:00 End of Run 23

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 5/22/95 - 8/4/95
DRILL RIG: CME 75

DAT
COOR ES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	238.9-247.7 ft. Slightly weathered, medium bedded, grayish orange (10YR 7/4), m-c crystalline, medium strong, LIMESTONE, (SALEM FORMATION) Argillaceous, silicious, includes fossiliferous zones												
242													
244			24	100 %									
246								J,PL,R					
248	247.4-256.8 ft. Fresh, medium bedded, light to medium gray (N6 to N5), m-c crystalline, strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)												
		233.10 / 249.20											5/24/95 @ 16:45 End of Run 24
250													
252			25	100 %									
254													
256													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO METHOD: NX Core & water
DRI DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATU
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90); TYPE AND SURFACE DESCRIPTION

WEATHERING INDEX: SW FR, MW, HW, CW; STRENGTH INDEX: R6, R5, R4, R3, R2, R1; POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
256	226.00							
	256.3-258.8 ft. 256.30 Fresh, thinly bedded, medium dark gray (N4), fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)		25	100 %			B,PL,SM,CL (2)	256.3 ft. Top of WARSAW FORMATION encountered
258	223.50							
	258.8-260.8 ft. 258.80 Fresh, medium bedded, medium gray (N5), m-c crystalline, strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Argillaceous, silicious	223.10 259.20						5/24/95 @ 17:30 End of Run 25
260	221.50							5/26/95 6 in steel casing installed to 257.0 ft. in 9 7/8 in. borehole and sealed with cement Core drilling resumed 6/1/95 @ 11:00
	260.8-264.6 ft. 260.80 Fresh, thinly bedded, olive gray (5Y 4/1), very fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)		26	100 %				
262								
264	217.70	218.10 264.20						
	264.6-267.2 ft. 264.60 Fresh, thinly bedded, medium dark gray (N4), coarse crystalline, strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Chert nodules common (<5 mm.)						B,PL,SM (2)	
266							J,I,R	
	267.2-271.9 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION)		27	100 %			J,U,SM	
268							J,PL,SM	
270								
272	271.9-274.0 ft. Fresh, thinly bedded, medium dark gray (N4), coarse crystalline, strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Chert nodules common (<5 mm.)							

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DRI[illegible]ATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATU[illegible]
COORD[illegible]ES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEP[illegible] (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY %	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272	271.9-274.0 ft. Fresh, thinly bedded, medium dark gray (N4), coarse crystalline, strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Chert nodules common (<5 mm.)		27	100			80	J,PL,SM					
274	274.0-279.9 ft. Fresh, thin to medium bedded, olive gray (5Y 4/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Porous, (<1 mm. open vugs) 274.4-275.5 ft. Several partially calcite crystal filled voids (<2 in.)	208.10 / 274.20				4	80	J,C,SM					274.4-275.5 ft. Possible high porosity zone
							80	J,I,R					
						8	80	J,I,R					
							80	J,I,R (4)					
276													
278													
			28	100			80	B,I,SM					
280	279.9-295.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), coarse crystalline, medium strong to strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Abundant chert nodules (<2 mm.), fossiliferous with some silicified zones, stylolitic						80	J,I,VR					
							80	J,PL,SM,Fe					
282													
284	284.2-285.4 ft. Olive gray (5Y 4/1), Argillaceous Limestone layer	198.10 / 284.20											6/1/95 @ 15:25 End of Run 28
							80	J,PL,SM					
286			29	100									
288													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough

Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	279.9-295.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), coarse crystalline, medium strong to strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Abundant chert nodules (<2 mm.) fossiliferous with some silicified zones, stylolitic												
290			29	100 %									
292													
294		188.10											6/1/95 @ 16:20 End of Run 29
		294.20											
296	295.7-303.7 ft. Fresh, thinly bedded, medium dark gray (N4), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION)												
298	297.5-299.3 ft. Partially silicified, porous (open vugs <3 mm.)						90	J,PL,SM					
	299.3-303.7 ft. Rock becomes weak due to high clay content		30	100 %			90	J,PL,SM,CL					
300													
302													
304	303.7-305.0 ft. Fresh, thinly bedded, medium gray (N5), coarse crystalline, medium strong, LIMESTONE, (WARSAW FORMATION)												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-[illegible]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] METHOD: NX Core & water
DRI[illegible] DATE: 5/22/95 - 8/4/95
DRILL RIG: CME 75

DATU[illegible]
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
304			178.10 / 304.20	30	100 %										6/1/95 @ 17:00 End of Run 30 Stop drilling 6/2/95 @ 8:30 Begin Run 31
	177.30 / 305.00 305.0-309.7 ft. Fresh, thinly bedded, medium dark gray (N4), very fine grained, weak, SILTSTONE, (WARSAW FORMATION)														
306															
308				31	100 %										
	172.60 / 309.70 309.7-313.5 ft. Fresh, thinly bedded, medium gray (N5), m-c crystalline, medium strong, LIMESTONE, (WARSAW FORMATION) Numerous clay partings, stylolitic								B,PL,SM						
310									B,PL,SM						
312									B,PL,SM,CL						
	313.5-322.0 ft. Fresh, thinly to medium bedded, light olive gray (5Y 6/1) to dark gray (N3), very fine to medium grained medium strong, alternating layers of ARGILLACEOUS LIMESTONE and SILTSTONE (2-6 in. thick) (WARSAW FORMATION)								B,U,SM,CL						
314	168.10 / 314.20		188.10 / 314.20												6/2/95 @ 11:30 End of Run 31 Slow drilling, a lot of rod wobble
	167.30 / 315.00								B,PL,SM,CL						
	166.30 / 316.00														
316									B,PL,SM (4)						
	165.30 / 317.00			32	98%										
	164.30 / 318.00														
318															
	163.30 / 319.00														
	162.30 / 320.00														
320															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	2 4 6 8 10 FRACTURES PER FOOT	DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
320	313.5-322.0 ft. Fresh, thinly to medium bedded, light olive gray (5Y 6/1) to dark gray (N3), very fine to medium grained, medium strong, alternating layers of ARGILLACEOUS LIMESTONE and SILTSTONE (2-6 in. thick) (WARSAW FORMATION) 162.30 / 320.00 / 161.30 / 321.00 / 160.30 / 322.00							B,I,R					
322	322.0-347.4 ft. Fresh, thickly bedded, dark gray (N3), very fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)		32	98%									
324		158.10 / 324.20											6/2/95 @ 12:40 End Run 32
326													
328			33	100 %				J,PL,SM,CL					
330													
332		149.10 / 333.20											6/2/95 @ 14:00 End of Run 33
334			34	100 %									
336													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B METHOD: NX Core & water
DATE: 5/22/95 - 6/4/95
DRILLER: CME 75

DATU
COOR S N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
336	322.0-347.4 ft. Fresh, thickly bedded, dark gray (N3), very fine grained, medium strong, SILTSTONE, (WARSAW FORMATION)		34	100 %		
338	338.0-347.2 ft. Siltstone becomes weak	143.10				
	339.3-339.5 ft. Soft, medium gray (N5), Clay seam	338.20				
340						
342						
			35	100 %		
344						
348		134.90				
	347.4-358.3 ft. Fresh, thinly bedded, medium dark gray (N4), fine crystalline, medium strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Argillaceous, numerous shaley partings, some thin interbeds of Siltstone (<4 in. thick), fossiliferous, coarse chert nodules common	347.40				
348		134.10				
		348.20				
350			36	100 %		
352						

ROCK TYPE | GRAPHIC LOG | RQD (80 60 40 20) | FRACTURES PER FOOT (2 4 6 8 10) | DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90) | GRAPHIC LOG | WEATHERING INDEX (SW FR MW HW CW) | STRENGTH INDEX (R6 R5 R4 R3 R2 R1) | POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6) | TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]ATE: 5/22/95 - 6/4/95
DRILL[illegible]IG: CME 75

DATU[illegible]
COORD[illegible]S N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 518820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
Pl-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
352	347.4-358.3 ft. Fresh, thinly bedded, medium dark gray (N4), fine crystalline, medium strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Argillaceous, numerous shaley partings, some thin interbeds of Siltstone (<4 in. thick), fossiliferous, coarse chert nodules common														
354				38	100 %										
356															
358			124.00 / 358.30												
	358.3-384.7 ft. Fresh, thinly bedded, medium gray (N5), alternating fine crystalline and coarse crystalline layers, medium strong to strong, ARGILLACEOUS LIMESTONE, (KEOKUK FORMATION) Some zones fossiliferous, abundant medium bluish gray (5B 5/1), chert layers, coarse grained chert nodules common, thinly laminated, shaley partings common, trace disseminated pyrite														@ 358.3 ft. Inferred top of KEOKUK FORMATION Drilling rate slows significantly due to chert layers 6/2/95 @ 17:00 End of Run 36
360															
								90	J,I,R						
362				37	100 %										
364															
368															
368															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD: NX Core & water
D[illegible]DATE: 5/22/95 - 6/4/95
DRI[illegible]G: CME 75

DAT[illegible]
COO[illegible]ES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 30 R3 150 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368	357.7-384.7 ft. Fresh, thinly bedded, medium gray (N5), alternating fine crystalline and coarse crystalline layers, medium strong to strong, ARGILLACEOUS LIMESTONE, (KEOKUK FORMATION) Some zones fossiliferous, abundant medium bluish gray (5B 5/1), chert layers, coarse grained chert nodules common, thinly laminated, shaley partings, common, trace disseminated pyrite		114.00 / 368.30	37	100 %										6/2/95 @ 18:00 End of Run 37
370				38	98%										
372															
374			108.00 / 374.30												6/2/95 @ 19:15 End of Run 38 Stop drilling 6/3/95 @ 7:00 Drilling resumed
376				39	100 %										
378	Below 378.5 ft. Only occasional shaley partings		103.00 / 379.30						B,U,SM,CL						6/3895 @ 13:30 End of Run 39
380				40	100 %										
382															
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1066993.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
384			98.00	40	100 %										6/3/95 @ 15:00 End of Run 40 Stop drilling 6/4/95 @ 8:00 Drilling resumed
			384.30												
	384.7-393.8 ft. Slightly weathered, thinly bedded, pinkish gray (5Y 8/1) to light olive gray (5Y 6/1), f-m crystalline, medium strong to strong, LIMESTONE, (KEOKUK FORMATION) Some zones coarse grained, chert layers common (<6 in.), stylolitic, some zones silicified														
386															
388															
				41	100 %										
390															
392	@ 392.0 ft. Three open vugs with quartz crystals (<1 in. dia.)														
			88.50												
394	393.8-408.5 ft. Moderate to highly weathered, thinly bedded, light gray (N7), f-c crystalline, medium strong to weak, SILICIFIED LIMESTONE, (KEOKUK FORMATION) Chert nodules and layers common, stylolitic		393.80												
396															
				42	94%										
398	398.5-399.1 ft. Highly weathered, very porous, (open vugs <5 mm.), weak rock														
400															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-[illegible]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

[illegible]ETHOD: NX Core & water
[illegible] DATE: 5/22/95 - 6/4/95
DRILL RIG: CME 75

DAT[illegible]
COO[illegible]ES N: 1066983.15
AZIMUTH: 0

COLLAR ELEV: 482.3
E: 516820.50
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90)

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80, 60, 40, 20)	FRACTURES PER FOOT (2, 4, 6, 8, 10)	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW, MW, HW, CW, FR)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	NOTES WATER LEVELS INSTRUMENTATION
400	393.8-408.5 ft. Moderate to highly weathered, thinly bedded, light gray (N7), f-c crystalline, medium strong to weak, SILICIFIED LIMESTONE, (KEOKUK FORMATION) Chert nodules and layers common, stylolitic		42	94%							
402		79.10									
		403.20 / 78.50									Core Loss in highly weathered rock 6/4/95 @ 14:10 End Run 42
404	@ 403.8 ft. Highly weathered, very porous, weak rock	403.80									
406			43	96%							
408											6/4/95 @ 14:45 Drilling completed
	73.50	73.50									
	End of Record of Drillhole at 408.8 ft. 408.80	408.80									
410											
412											
414											
416											

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 7/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-S

Sheet 1 of 1

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B METHOD: NX Core & water
D DATE: 8/8/95
DRILLING: SCHRAMM

DATU
COOR S N: 1087013.26
AZIMUTH: 0

COLLAR ELEV: 482.1
E: 516834.43
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	0.0-245.3 ft. No sampling conducted See Soil Borehoole Log and Record of Drillhole for PZ-104-KS														0.0-38.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 245.3 ft. with 5 7/8 in. air rotary bit
242															
244															
	236.80		236.80												
	245.3-252.8 ft. 245.30 Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Coarse grained calcite crystals common		245.30												6/6/95 @ 8:30 Began coring
246															
	247.4-250.1 ft. Limestone is moderate yellowish brown (10YR 5/4) due to iron oxide														
248															
250				1	94%										
252															
	229.30														
	252.8-255.0 ft. 252.80 Slightly weathered, thinly bedded, moderate yellowish brown (10YR 5/4), very fine grained, weak, SILTSTONE, (WARSAW FORMATION)														
254			227.70												
	254.4-255.0 ft. Siltstone becomes highly weathered		254.40						Core Loss						Core Loss due to highly weathered SILTSTONE 6/6/95 @ 11:30 Coring completed
	227.10														
	End of Record of Drillhole at 255.0 ft. 255.00														
256															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DA[illegible]ATE: 6/4/95
DRI[illegible]: SCHRAMM

DATU[illegible]
COOR[illegible]S N: 1067028.01
AZIMUTH: 0

COLLAR ELEV: 481.6
E: 516847.19
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	0.0-135.0 ft. No sampling conducted See Record of Drillhole for PZ-104-KS														0.0-38.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 135.0 ft. with 5 7/8 in. air rotary bit
130															
132															
134															
	348.60		348.60												
	135.0-138.1 ft. 135.00 Fresh, medium bedded, pale yellowish brown (10YR 6/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		135.00						J,PL,R						6/4/95 @ 9:30 Begin Run 1
136									J,I,R						
									J,P,R						
138	343.50								J,I,R,CL						
	138.1-138.7 ft. 138.10 Slightly weathered, finely bedded, dark greenish gray (5GY 4/1), very fine grained, very weak, CLAYSTONE, (ST. LOUIS FORMATION) 342.90 138.70								J,I,R,CL						
									J,PL,SM,CL						
									J,I,VR,calcite						
	138.7-145.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			1	100 %				J,C,R						
140															
142									J,PL,SM (2)						
									J,I,SM						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 6/4/95

Golder Associates

RECORD OF DRILLHOLE PZ-104-S[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

[redacted]ETHOD: NX Core & water
[redacted]DATE: 6/4/95
D[redacted]G: SCHRAMM

DAT[redacted]
CO[redacted]S N: 1067028.01
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 516847.19
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	138.7-145.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), very fine grained, medium strong, LIMESTONE, 338.80 (ST. LOUIS FORMATION) 145.00		338.80	1	100 %										
	End of Record of Drillhole at 145.0 ft.		145.00												
146															
148															
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 6/4/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-105-SS
		SHEET 1 OF 3
	SAMPLING METHOD:	DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	14:20 / 17:15
	DATE	DATE / DATE
NORTHING: 1066421.35 DATUM EASTING: 516230.23 ELEVATION 481.2	CASING DEPTH	5/19/95 / 5/19/95

DRILL RIG CME 75 - TRUCK MOUNT | SURFACE CONDITIONS Grassy field

ANGLE -90 BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	1 3 3 2	1.3'/2.0' (65%)			(0.0-4.4 ft.) Firm, moderate yellowish brown (10YR 5/4), SILT, with trace fine Sand, NR, moist, (ML), (LOESS)	SP 1	
2 3	2 2 3 2	1.8'/2.0' (90%)				SP 2	
4	2 3 5 7	2.0'/2.0' (100%)			(476.8) 4.4		
5					(4.4-18.5 ft.) Very soft to stiff, moderate yellowish brown (10YR 5/2), SILTY CLAY, NR, moist, (CL), (LOESS)	SP 3	
6 7	1 2 4 5	1.5'/2.0' (75%)			from 7.0-16.0 ft., grades to include trace fine sand, color grades to light olive gray (5Y 6/1) and moderate yellowish brown (10YR 5/2) (mottled)	SP 4	
8 9	0 2 3 2	2.0'/2.0' (100%)				SP 5	
10 11	1 2 1 2	2.0'/2.0' (100%)				SP 6	
12 13	0 0 1 3	2.0'/2.0' (100%)				SP 7	
14	2 2 5 8	1.9'/2.0' (95%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLDWAY

DATE 7/14/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ105SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-105-SS
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START TIME 14:20 DATE 5/19/95; FINISH TIME 17:15 DATE 5/19/95
DATUM NORTHING: 1066421.35 EASTING: 516230.23	ELEVATION 481.2	

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Grassy field

ANGLE -90 BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 4 7 8	1.9'/2.0' (95%)			from 16.0-18.5 ft., grades to little fine sand, color grades to medium light gray (N6)	SP 8	
17						SP 9	
18	5 5 8 9	1.5'/2.0' (75%)			(18.5-20.5 ft.) Stiff, olive gray (5Y 4/1), fine SANDY CLAY, NR, wet, (CL), (ALLUVIUM)	SP 10	
19							
20	3 6 9 13	1.7'/2.0' (85%)			(460.7) 20.5		
21					(20.5-27.1 ft.) Compact, medium gray (N5), f-m poorly graded SAND, NR, wet, (SP), (ALLUVIUM)	SP 11	
22	1 4 8 9	1.3'/2.0' (65%)			@ 22.5 ft., grades to less silt	SP 12	
23							
24	4 8 18 19	1.5'/2.0' (75%)			@ 24.7 ft., grades to more silt	SP 13	
25							
26	1 4 5 9	1.3'/2.0' (65%)				SP 14	
27					(454.1) 27.1 (27.1-29.6 ft.) Loose to compact, medium gray (N5), SILT with little fine Sand, NR, wet, (ML), (ALLUVIUM)		
28	1 1 3 12	1.7'/2.0' (85%)				SP 15	
29					(451.6) 29.6 (29.6-33.8 ft.) Very loose to dense, medium gray (N5), f-m poorly graded SAND, NR, wet, (SP), (ALLUVIUM)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY CHK'D BY W. HERST

DATE 7/14/95

JOB NO.: 943-2848

FILENAME: PZ105SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	6.25 inch I.D. Hollow Stem Auger					PZ-105-SS	
						SHEET	
	SAMPLING METHOD:					3 OF 3	
LAIDLAW/OU2 RI-FS/MO	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
WEST LAKE LANDFILL	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
OPERABLE UNIT 2	WATER LEVEL					TIME	TIME
	TIME					14:20	17:15
	DATE					DATE	DATE
NORTHING: 1066421.35	CASING DEPTH					5/19/95	5/19/95
DATUM EASTING: 516230.23 ELEVATION 481.2							

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Grassy field

ANGLE -90 BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	2 8 18 29	2.0'/2.0' (100%)			(29.6-33.8 ft.) Very loose to dense, medium gray (N5), f-m poorly graded SAND, NR, wet, (SP), (ALLUVIUM)	SP 16	
32 33	1 10 37 33	2.0'/2.0' (100%)				SP 17	
34	45 50/3'	0.5'/1.0' (50%)			(33.8-35.0 ft.) Very dense, light olive gray (5Y 6/1), LIMESTONE GRAVEL, SR, wet, (WEATHERED LIMESTONE BEDROCK) (446.2) 35.0	SP 18	
35					End of Soil Borehole Log at 35.0 ft. See PZ-105-SS Record of Drillhole for rock descriptions		
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY

DATE 7/14/95 CHK'D BY V. HERST

JOB NO.: 943-2848

FILENAME: PZ105SS

RECORD OF DRILLHOLE PZ-105-[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

[redacted]ETHOD: NS Core & water
[redacted] DATE: 5/20/95 - 5/21/95
DRILL RIG: CME 75

DA[redacted]L
CO[redacted]ES N: 1068421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-35.0 ft. See Soil Borehole Log PZ-105-SS														
34	35.0-39.0 ft. Slightly weathered, thinly bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 446.20		446.20												
	35.2-35.9 ft. Dark yellowish orange (10YR 6/6), Claystone layer 35.20		35.00												5/20/95 @ 8:20 Began drilling Run 1
36				1	73%										
38									Core Loss						5/20/95 @ 9:00 End of Run 1
	39.0-52.9 ft. Slightly weathered, medium bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Clay filled joints and layers of Claystone		442.20 39.00												
40				2	77%										
42									Core Loss						5/20/95 @ 9:45 End of Run 2
			438.30 42.90												
44									J,I,VR,Fe (2)						43.0-44.0 ft. Healed seam at 0°
				3	93%										
46									J,PL,R,CL (3)						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BO[illegible] THOD: NS Core & water
DR[illegible] TE: 5/20/95 - 5/21/95
DRI[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1068421.35
AZIMUT[illegible]

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	39.0-52.9 ft. Slightly weathered, medium bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		432.20	3	93%				J,PL,R,CL; Core Loss						5/20/95 @ 10:20 End of Run 3
	49.0 ft. Color grades to pale yellowish brown (10YR 6/2)		49.00												
50									J,P,R (2); J,P,R (2)						
	50.5 ft. Pyrite present			4	100 %										
	51.0-51.2 ft. Sandstone layer														
52	51.9-52.3 ft. Sandstone layer		428.30												
	52.9-65.2 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		52.90						J,PL,VR						
54	Zones of thin clay or silicous laminations								J,PL,VR						
	54.6-54.8 ft. Chert layer														
56				5	98%				J,I,R,CL						
58	57.8-57.9 ft. Clay layer; 57.9-58.6 ft. Sandstone layer		422.20												5/20/95 @ 12:00 End of Run 5
			59.00												
60									J,PL,R; J,C,SM,CL						
				6	100 %				J,PL,R (3)						
62									J,PL,R (2)						
64									J,PL,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] THOD: NS Core & water
DR[illegible] TE: 5/20/95 - 5/21/95
DRIL[illegible] CME 75

DATU[illegible]
COORD[illegible] N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 518230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (H1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	52.9-65.2 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 416.00								J,PL,R						
									J,PL,R						
	65.2-79.0 ft. 65.20 Fresh, medium bedded, medium gray (N5), microcrystalline to fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Pyrite and calcite filled fractures								J,PL,R (2)						
66				6	100 %										
68									J,I,R (2)						5/20/95 @ 13:00 End of Run 6
			412.20 / 69.00												
									J,ST,SM						
70															
72															
									J,ST,R						
74				7	100 %										
									J,I,R						
76															
78	77.6-78.5 ft. Clayey layer														
	79.0-80.3 ft. 402.20 79.00 Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION) Includes thickly laminated clay layers		402.20 / 79.00	8	99%										5/20/95 @ 14:00 End of Run 7
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NS Core & water
DATE: 5/20/95 - 5/21/95
DRILLING: CME 75

DATUM:
COORDINATES N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	400.90 / 80.30														
	80.3-89.3 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine to medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,I,SM,CL						
82									J,ST,CL (2)						
									J,I,R,CL (2)						
84	84.0-86.8 ft. Abundant chert, some clay layers (green clay)			8	99%										
									J,PL,SM						
									J,PL,SM,CL						
86									J,PL,SM,CL						86.7-86.8 ft. Broken zone
									J,PL,SM,CL						
88									J,PL,SM,CL						
			392.20 / 89.00												
	89.3-118.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 89.3-92.7 ft. Silicified								J,I,R						5/20/95 @ 15:00 End of Run 8
90															
92				9	100 %				J,PL,SM,CL						
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NS Core & water
DR[illegible]TE: 5/20/95 - 5/21/95
DRI[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1066421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	89.3-118.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
				9	100 %				J,PL,SM						
98									J,PL,SM						5/20/95 @ 15:30 End of Run 9
			382.20 / 99.00												
100									J,PL,SM						
	101.5-105.0 ft. Silicified														
102															
									F,PL,SM						
104				10	100 %										
									J,C,SM,CL						
	105.0-115.5 ft. Scattered stylolites, chert														
106															
									J,PL,SM,CL						
									J,PL,SM,CL						
108															
			372.20 / 109.00												5/20/95 @ 16:15 End of Run 10
									J,PL,R,CL						
110															
				11	100 %				J,PL,R,CL						
									J,PL,SM						
112															

DEPTH SCALE: 1.2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BO[illegible] THOD: NS Core & water
DA[illegible] ATE: 5/20/95 - 5/21/95
DRI[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1068421.35
AZIMUTH: 0

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	89.3-118.6 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM						
									J,PL,SM (3)						
114									J,ST,R						
				11	100 %				J,PL,SM,CL (2)						
116															
									J,PL,SM						
118															5/20/95 @ 17:15 End of Run 11 Ended drilling for the day 5/21/95 @ 7:30 Resume drilling
	118.6-131.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, fossiliferous, (ST. LOUIS FORMATION)		362.20 / 119.00						J,PL,SM,CL						
120	120.5-121.4 ft. Claystone layer														
122															
	123.0 ft. Calcite crystals on fracture								B,PL,SM,CL J,PL,R						
	123.7-125.3 ft. ARGILLACEOUS LIMESTONE			12	100 %										
124	124.0 ft. Calcite crystals on fractures														
126									B,PL,SM,CL						
									B,PL,SM,CL						
128	128.0 ft. Calcite crystals on fractures														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] THOD: NS Core & water
DR[illegible] TE: 5/20/95 - 5/21/95
DRI[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1068421.35
AZIMUTH[illegible]

COLLAR ELEV: 481.2
E: 518230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	128.0 ft. Calcite crystals on fractures			12	100 %				J,PL,R B,PL,SM,CL						5/21/95 @ 8:30 End of Run 12
			352.20 / 129.00												
130	129.5 ft. Color grades to light olive gray (5Y 5/2)								B,PL,SM,CL (2)						
132	131.5-141.6 ft. Fresh, medium bedded, light olive gray (5Y 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
134				13	100 %										
136									J,PL,SM,CL						
138									J,PL,SM,CL						
			342.20 / 139.00												5/21/95 @ 9:40 End of Run 13
140															
142	141.6-148.7 ft. Fresh, medium bedded, pale yellowish brown (10Y 6/2) to light olive gray (5Y 5/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, clay filled fractures			14	100 %				J,PL,SM,CL J,PL,SM,CL						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-105-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BO[illegible] THOD: NS Core & water
DR[illegible] TE: 5/20/95 - 5/21/95
DRI[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1066421.35
AZIMUTH[illegible]

COLLAR ELEV: 481.2
E: 516230.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	141.6-148.7 ft. Fresh, medium bedded, pale yellowish brown (10Y 6/2) to light olive gray (5Y 5/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, clay filled fractures								J,PL,SM,CL (2)						
148	146.0-147.0 ft. Clay filled vugs and fractures abundant			14	100 %				J,PL,SM,CL; J,PL,SM,CL						
148	148.7-149.0 ft. Slightly weathered, thinly bedded, grayish orange (10YR 7/4), fine grained, medium strong DOLOMITE, very shallow vugs, (ST. LOUIS FORMATION) 332.50; 148.70; 332.20		332.20						J,PL,SM,CL						5/21/95 @ 10:30 End of drilling
	End of Record of Drillhole at 149.0 ft. 149.00		149.00												
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-106-KS
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 2
DATUM NORTHING: 1066704.02 EASTING: 515431.62	ELEVATION 460.8	

					DRILLING START	DRILLING FINISH
WATER LEVEL						
TIME					TIME 10:30	TIME 13:55
DATE					DATE 2/28/95	DATE 2/28/95
CASING DEPTH						

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-2.0 ft.) No sample collected		Note: All depth measured from top of 1 foot thick gravel pad
1							
2					(458.8) 2.0		
	2 2 2 4	1.5'/2.0' (75%)			(2.0-4.7 ft.) Firm, brownish gray (5YR 4/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP ②	
3							
4	2 4 8 10	1.7'/2.0' (85%)					
					(456.1) 4.7		
5					(4.7-8.8 ft.) Very stiff, brownish gray (5YR 4/1), CLAY, little silt, NR, damp, (CH), (LOESS)	SP ③	
6		2.0'/2.0' (100%)					
7						SH ④	
8	3 6 8 9	1.2'/2.0' (60%)					
9					(8.8-11.9 ft.) Very stiff, mottled pale yellowish brown (10YR 6/2) and moderate yellowish brown (10YR 5/4), CLAY, little silt, iron stained, NR, damp, (CL), (LOESS) @ 10.0-12.0 ft., stiff	SP ⑤	
10	4 4 6 7	0.1'/2.0' (5%)					
11						SP ⑥	
					(448.9) 11.9		
12	1 5 5 5	0.9'/2.0' (45%)			(11.9-15.0 ft.) Stiff, light olive gray (5Y 5/2), CLAYEY SILT, iron stained, NR, damp, (CL-ML), (LOESS)		
13						SP ⑦	
14	8 13 23 19	1.0'/2.0' (50%)				SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT

CHK'D BY W. HERST

DATE 2/28/95

JOB NO.: 943-2848

FILENAME: PZ106KS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-106-KS
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 2
		DRILLING START TIME 10:30 DATE 2/28/95; FINISH TIME 13:55 DATE 2/28/95
DATUM NORTHING: 1066704.02 EASTING: 515431.62 ELEVATION 460.8	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(15.0-15.5 ft.) Compact, pale yellowish brown (10YR 6/2), fine SAND, to gravel, NR, dry, (SP), (ALLUVIAL) (445.3) 15.5	SP 8	
16	50/5"	0.0'/2.0' (0%)			(15.5-21.2 ft.) Dense, very light gray (N8), LIMESTONE GRAVEL interbedded, with medium dark gray (N4), fine SAND, (SR gravel, NR sand), dry, (GP), (ALLUVIAL)	SP 9	
17							
18	10 26 14 15	0.8'/2.0' (40%)				SP 10	
19							
20	6 15 23 32	1.0'/2.0' (50%)				SP 11	
21					(439.6) 21.2		
					(21.2-27.7 ft.) Hard, medium dark gray (N4), CLAY, NR, damp, (CH), (ALLUVIUM)		
22	8 18 24 30	0.6'/2.0' (30%)				SP 12	
23							
24	6 13 20 29	1.3'/2.0' (65%)				SP 13	
25					@ 24.7 ft., becoming dark gray (N3)		
26	9 17 38 40	0.8'/2.0' (40%)				SP 14	
27					(433.1) 27.7		
					(27.7-29.3 ft.) Hard, medium light gray (N6), SILTY CLAY, NR, dry, (CL), (ALLUVIUM) (431.5) 29.3		
28	19 39 50/3"	0.9'/2.0' (45%)			(29.3-30.0 ft.) Very dense, very light gray, (N8), LIMESTONE GRAVEL, SR, dry, (GP)	SP 15	
29					End of Soil Borehole Log at 30.0 ft. See PZ-106-KS Record of Drillhole for rock descriptions		Auger/split spoon refusal at 30.0 feet

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY W. HERST

DATE 2/28/95

JOB NO.: 943-2848

FILENAME: PZ106KS

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]TE: 2/28/95-3/13/95
DRI[illegible] CME 75

DATU[illegible]
COOR[illegible]N: 106703.9
AZIMUT[illegible]

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 30 R3 150 R4 300 R5 600 R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-30.0 ft. See Soil Borehole Log PZ-106-KS														
18															
20															
22															
24															
26															
28															
30	431.80		431.80												
	30.0-36.5 ft. 30.00 Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), medium grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)		30.00	1	69%				J,I,R (2) J,ST,R J,I,R J,PL,SM						2/28/95 @ 14:45 Begin coring
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD: NX Core & water
D[illegible]ATE: 2/28/95-3/13/95
DI[illegible]: CME 75

DATU[illegible]
COO[illegible]S N: 106703.9
AZIMU[illegible]0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	30.0-36.5 ft. Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), medium grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)							J,I,R; J,ST,R; J,PL,R,CL					
	33.5-34.0 ft. Hard clay infilling												
34	34.0-34.5 ft. ARENACEOUS DOLOMITE 427.30		1	69%									
	34.50												Core loss probably due to highly fractured nature of rock
								Core Loss					
36		425.30											
	36.5-37.9 ft. Highly weathered, thickly laminated, medium dark gray (N4), fine grained, medium strong, SILTSTONE, (ST. LOUIS FORMATION)	36.50											
	Cross bedded, Limestone breccia 423.90 37.90												
38	37.9-41.5 ft. Completely weathered, thinly laminated, grayish black (N2), very fine grained, extremely weak, CLAYSTONE, (ST. LOUIS FORMATION)												
	38.5-38.8 ft. 60° silt crossbeds, pyrite crystals abundant		2	83%				B,PL,SM (3)					
40								J,I,SM (5)					
	41.0-41.5 ft. Greenish gray (5GY 6/1) clay layer 420.30							J,I,SM (2); J,I,R; B,PL,SM					
	41.5-42.7 ft. 41.50 Fresh, medium bedded, light greenish gray (5GY 8/1), medium grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) 419.10	419.30											
		42.50											Bit getting plugged off
	42.5-42.7 ft. 42.70 Clay infilling												
44	42.7-48.4 ft. Fresh, thickly bedded, medium light gray (N6), medium grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION)												
			3	96%									
46	46.0-46.5 ft. Siltstone												
	46.7-46.8 ft. Claystone							B,I,R; J,I,R					
	46.8-47.1 ft. Chert												
	47.3-47.5 ft. Siltstone	414.50											
	47.5-48.1 ft. Clay layer	47.30	4	96%									
48													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DI[illegible]ATE: 2/28/95-3/13/95
DR[illegible]: CME 75

DATU[illegible]
COOR[illegible] N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48			413.40												
	48.4-52.3 ft. Moderately weathered, medium bedded, medium light gray (N6), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		48.40												
50	49.6-50.6 ft. Chert nodules 50.0-50.1 ft. Claystone 50.3-50.6 ft. Claystone 51.0-51.5 ft. Claystone			4	96%				J,I,R,CL						
52			409.50												
	52.3-55.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, numerous pyrite crystals		52.30						J,I,R (2)						
									J,I,R						
									J,I,R						
									J,I,R,CL						
									J,I,R (2)						
54															
									J,I,R (2)						
56	55.7-59.6 ft. Slightly weathered, medium bedded, medium light gray (N6), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Porous/vuggy, some pyrite crystals and chert nodules, vugs <1 mm. diameter			5	99%				J,PL,R,CL						
58			402.40												
			402.20												
	59.6-70.0 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy, vugs <1 mm.		59.40 / 59.60												
60				6	98%				J,PL,SM						
62	62.2-62.8 ft. Claystone 62.8-63.4 ft. Calcite crystals								B,PL,SM						
									B,PL,SM						
									J,I,R, calcite crystals						
									J,I,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/28/95-3/13/95
CME 75

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	NOTES WATER LEVELS INSTRUMENTATION
64								J,I,R calcite crystals				
	64.7-65.2 ft. calcite crystals							J,I,R				
								J,I,R				
								J,I,R calcite crystals				
			6	98%								
66	65.9-66.9 ft. Calcite crystals and iron staining											
		394.20 / 67.60										8:45 End Core Run 6
68	67.8-68.6 ft. Calcite crystals, some iron staining							J,I,SM				
								J,I,R				
								J,I,SM				
								J,PL,SM				
	69.7-70.7 ft. Calcite crystals	391.80 / 70.00						J,PL,SM				
70	70.0-98.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)							J,I,SM				
								J,I,R,CL				
								J,I,R,Fe				
								J,I,R				
			7	99%								
72												
	72.6-73.3 ft. 0° calcite vein											
	73.4-73.6 ft. Arenaceous, slightly weathered							J,I,R,CL (2)				
74		387.40 / 74.40										9:30 End Core Run 7
								J,I,R (2)				
76												
	76.4-80.9 ft. Microcrystalline, stylolitic							J,I,R				
			8	100%				J,I,SM (3)				
78												
								J,I,R (2)				
	79.6-79.8 ft. Dolomite layer							J,PL,SM,CL				
80												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/FB-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD: NX Core & water
D[illegible]ATE: 2/28/95-3/13/95
D[illegible] CME 75

DAT[illegible]
COO[illegible]S N: 106703.9
AZIMU[illegible]0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION (DISCONTINUITY DATA)	NOTES WATER LEVELS INSTRUMENTATION
80	70.0-98.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)					
	80.9-82.8 ft. Fine grained, arenaceous		8	100 %	J,I,R (2)	
82		379.00 / 82.80				10:15 End Core Run 8
					J,PL,SM,CL; J,I,R	
84	83.9-84.2 ft. Calcite filled vugs					
	85.0-87.1 ft. Microcrystalline, stylolitic				J,I,R	
86			9	100 %	J,PL,SM	
	87.1-88.3 ft. Porous/vuggy Dolomite				J,PL,SM	
88	88.3-90.6 ft. Microcrystalline, stylolitic				B,I,R; J,I,R	
		372.40 / 89.40			J,I,R	11:05 End Core Run 9
90	90.6-92.0 ft. Porous/vuggy Dolomite					
					J,PL,R	
92	92.2-94.1 ft. Microcrystalline, some silty laminae		10	99%	J,I,R,CL; J,I,SM; J,I,R; J,I,R	
94					J,I,R,CL	
					J,I,R,CL	
96	95.9-96.1 ft. Moderately weathered, arenaceous					

GRAPHIC LOG; RQD (80 60 40 20); FRACTURES PER FOOT (2 4 6 8 10); DIP wrt CORE AXIS (0 30 60 90); WEATHERING INDEX (SW FR MW HW CW); STRENGTH INDEX (R6 R5 R4 R3 R2 R1); POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 2/28/95-3/13/95
: CME 75

DAT
CO S N: 108703.9
AZIM 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
96	70.0-98.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,PL,SM,CL	
	97.5-97.8 ft. Dolomitic		10	99%		
98	98.0-119.3 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy	363.80 / 98.00				
		362.40 / 99.40				11:55 End Core Run 10
100						
	101.2-104.3 ft. Medium grained Limestone				J,PL,SM,CL; J,PL,SM; J,I,R	
102					J,PL,R	
					J,PL,R (2)	
104			11	100 %	J,PL,SM,CL	
106						
	107.1-108.0 ft. Interbedded Limestone and Dolomite					
108	108.0-110.9 ft. Arenaceous Limestone				J,I,R; J,I,SM,CL	
		352.40 / 109.40			J,I,R	13:25 End Core Run 11
110	110.0-110.3 ft. 45° healed fracture				J,I,R (2); J,I,R	
			12	98%	J,I,R,CL	
	111.0-111.9 ft. Moderate to highly weathered, arenaceous Dolomite, some chert					
112						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[redacted]THOD: NX Core & water
DR[redacted]TE: 2/28/95-3/13/95
DR[redacted] CME 75

DATU[redacted]
COO[redacted] N: 106703.9
AZIMU[redacted]

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	112.0-112.4 ft. Crystalline Limestone, moderately weathered								J,I,R,CL						
									J,ST,SM						
									J,I,SM (2)						
	113.2-115.0 ft. Crystalline Limestone								J,I,SM,CL (2)						
									J,PL,SM						
114									J,I,SM						
	115.0-115.3 ft. 10° calcite filled vein (2 mm. thick)								J,I,SM						
				12	98%										
116															
									J,I,SM						
	117.0-119.0 ft. 10° calcite filled veins (2 mm. thick)														
118															
	342.50		342.40												
	119.3-133.8 ft. 119.30 Fresh, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Some braciopod fossils		119.40												14:05 End Core Run 12
120															
122															
	123.1-124.9 ft. Greenish gray (5GY 6/1) to dark greenish gray (5GY 4/1), Dolomite with calcite veins and vugs			13	98%										
124									J,I,R						
	124.9-126.0 ft. 10° calcite filled veins								J,I,R,calcite						
	125.6-133.2 ft. Microcrystalline to fine grained, thinly laminated, Silt and Dolomite interbeds								J,PL,R (2)						
126									J,I,R,CL (2)						
	127.6-131.7 ft. Large chert nodules														
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]TE: 2/28/95-3/13/95
DR[illegible] CME 75

DATU[illegible]
COOR[illegible]N: 106703.9
AZIMU[illegible]

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	119.3-133.8 ft. Fresh, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Some braciopod fossils		332.40	13	98%				J,PL,SM						14:50 End Core Run 13
			129.40												
130									J,PL,SM						
									J,I,SM						
									J,I,SM (2)						
132	132.4-132.5 ft. Claystone								B,PL,SM						
			328.00												
134	133.8-146.6 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)		133.80	14	100 %										@ 133.8 ft. Inferred top of SALEM FORMATION
136															
138															
	138.7-139.7 ft. Fine to medium grained arenaceous Limestone, cross bedded		322.60						J,I,SM						
			139.20						J,PL,SM						8:45 End Core Run 14
140	139.7-142.1 ft. Fine grained to microcrystalline														
	140.4-140.7 ft. Chert layer														
									J,PL,SM						
				15	99%				J,PL,SM,CL						
142	142.1-142.4 ft. Clay layer														
									J,I,SM,CL (2)						
	142.5-142.7 ft. Chert nodules														
									J,I,R						
	143.4-146.1 ft. Medium grained Limestone														
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[redacted]ETHOD: NX Core & water
D[redacted]ATE: 2/28/95-3/13/95
D[redacted] CME 75

DAT[redacted]
COO[redacted] N: 106703.9
AZIMU[redacted]

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	144.0-144.4 ft. Chert layer														
	146.1-146.2 ft. Chert nodule														
146	146.2-146.6 ft. Thinly laminated, arenaceous Limestone, cross bedded 315.20			15	99%				J,I,R (2)						
	146.6-152.6 ft. 148.60 Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (SALEM FORMATION) Slightly porous/vuggy, interbedded chert nodules														
148			313.00												
	148.8-149.0 ft. Chert zone		148.80												9:50 End Core Run 15
150															
	150.4-150.7 ft. Chert zone								J,U,R						
				16	100 %				J,I,SM						Driller reports rock is very hard
									J,I,R (2)						
	151.8-152.0 ft. Chert zone														
152	152.5 ft. 1 in. diameter, black claystone clast 309.20								J,I,R						
	152.6-160.5 ft. 152.60 Fresh, thinly laminated, light olive gray (5Y 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Crossbedded, numerous chert nodules/beds		308.70						J,PL,SM						
			153.10												10:40 End Core Run 16
									J,PL,SM						
154	153.0-153.6 ft. Chert zone														
									J,I,R						Driller reports rock is very hard
	155.5-155.6 ft. Chert zone														
156	156.1-157.5 ft. Pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2) 156.4 ft. Brachiopod fossils 157.0-157.2 ft. Chert zone			17	97%										
									J,I,SM						
158	158.2-158.4 ft. Chert zone								J,U,SM						
									J,U,SM (2)						
	159.0-159.4 ft. Chert zone								J,U,SM						
			302.50						J,PL,SM						
			159.30						J,I,SM						11:50 End Core Run 17
	159.6-159.7 ft. Chert nodule			18	100 %										
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	160.2-160.4 ft. Chert zone 160.5-174.3 ft. Fresh, thickly laminated, medium light gray (N6), coarse grained, medium strong, FOSSILIFEROUS DOLOMITIC LIMESTONE, (SALEM FORMATION)								J,I,SM						
									J,U,R						
162															
164				18	100 %				J,ST,R						
166															
									J,PL,SM						
168			292.50 / 169.30												13:45 End Core Run 18
170															
172				19	100 %										
174	287.50														
	174.3-178.8 ft. *Fresh, thinly bedded, pale yellowish brown (10YR 6/2) to medium light gray (N6), f-c grained, medium strong, CALCAREOUS DOLOMITE, (SALEM FORMATION)* Some fossils, cross bedding		174.30												
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B METHOD: NX Core & water
DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATU
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
176	174.3-178.8 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2) to medium light gray (N6), fine to coarse grained, medium strong, CALCAREOUS DOLOMITE, (SALEM FORMATION) Some fossils, cross bedding							0	J,PL,SM						
								90	J,PL,R						
				19	100 %										
178	176.9-177.2 ft. Chert zone 178.3-178.5 ft. Chert zone														
	178.8-187.0 ft. Slightly weathered, medium bedded, moderate yellowish brown (10YR 5/4), medium grained, medium strong, DOLOMITE, (SALEM FORMATION) Some fossils, calcite crystals, porous/vuggy 180.2-180.3 ft. Chert nodule		282.50 / 179.30					90	J,I,R						14:30 End Core Run 19
180								90	J,PL,R						
182															
184	183.9-184.1 ft. Chert zone							90	J,I,R						
				20	99%			60	J,I,R						
186															
			274.80					90	J,I,SM (2)						
	187.0-189.3 ft. Fresh, thinly laminated, pale yellowish brown (10YR 6/2), medium grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) Some cross bedding, fossils		187.00												
188			272.50 / 189.30												15:30 End Core Run 20
190	189.3-201.3 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), interbedded medium and very coarse grained, medium strong, ARGILLACEOUS FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) 190.8-191.4 ft. Brecciated			21	98%										
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	189.3-201.3 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), interbedded medium and very coarse grained, medium strong, ARGILLACEOUS FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)														
194															
	195.4-195.7 ft. Cross bedded, brecciated			21	98%										
196															
198															
			262.50 / 199.30												16:35 End Core Run 21
200	200.5-201.2 ft. Cross bedded, brecciated														
	260.60 / 201.20														
202	201.2-209.2 ft. Fresh, thinly laminated, medium dark gray (N4), very fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Brachiopod fossils			22	99%				J,PL,SM,CL						201.9-202.5 ft. GTS-1 collected for perm. testing at laboratory
204	205.1-207.2 ft. Medium gray (N5), fine to medium grained														
206									J,I,R,CL						
208	207.1-207.2 ft. Brecciated 207.3-End of Borehole Olive gray (5Y 4/1), medium strong								J,PL,SM,CL						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	201.2-209.2 ft. Fresh, thinly laminated, medium dark gray (N4), very fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) 252.60			22	99%										
	Brachiopod fossils 209.20		252.50												17:35 End Core Run 22
	209.2-225.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)		209.30						J,PL,SM						3/11/95 @ 10:15 Begin coring Run 23 after installing 6 in. dia. casing to 204 ft.
210															
212	212.2-213.7 ft. Slightly weathered, porous/vuggy, calcareous Dolomite, some fossils								B,PL,SM						
									J,I,SM (2)						
									J,I,SM						
214				23	98%										
216															
	217.3-218.5 ft. Medium grained														
218															
			242.50 219.30												12:30 End Core Run 23
220	220.1-221.9 ft. Medium grained								J,PL,R						
									J,I,R						
				24	101 %										
222															
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Heated, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
224	209.2-225.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)					
	236.40 / 225.40					
226	225.4-233.2 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Some calcite crystals, fossils 225.4-228.3 ft. Slightly porous/vuggy (<1 mm.)		24	101 %	J,ST,SM,CL	
228		232.50 / 229.30				13:55 End Core Run 24 229.6-230.1 ft. GTS-2 collected for perm. testing at laboratory
230						
232					J,I,SM,CL	
	228.60 / 233.20					
234	233.2-251.3 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Stylolitic, some calcite crystals		25	98%	J,PL,SM	
236	235.9-238.3 ft. Slightly weathered					
238					J,I,R	
	239.0-240.0 ft. Slightly weathered	222.50 / 239.30	26	100 %	J,I,R; J,I,R; J,I,R	14:50 End Core Run 25
240						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Silkensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Heated, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240	233.2-251.3 ft. Fresh, medium bedded, olive gray (5Y 4/1), very coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Stylolitic, some calcite crystals								J,I,R						
242															
244				26	100 %										
246	246.3-246.5 ft. Fine grained, Dolomitic Limestone														
248			212.50 / 249.30												15:40 End Core Run 26
250	250.3-251.3 ft. Medium grained								J,I,R						
			210.50 / 251.30						J,I,R; J,I,R						
252	251.3-257.7 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Porous/vuggy (<1 mm.)			27	98%				J,PL,SM,CL (2)						
254															
256															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

[redacted]CORD OF DRILLHOLE PZ-106-[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[redacted]ETHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATU[redacted]
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
256	251.3-257.7 ft. Slightly weathered, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION) Porous/vuggy (<1 mm.)							J,PL,SM					
	204.10 / 257.70		27	98%									
258	257.7-259.7 ft. Fresh, medium bedded, olive gray (5Y 4/1), medium grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)							J,PL,SM,CL					
		202.50 / 259.30											16:25 End Core Run 27
	202.10 / 259.70												
260	259.7-263.7 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, weak, CALCAREOUS CLAYSTONE, (WARSAW FORMATION)							B,I,SM,CL					
262	261.8-262.3 ft. Calcite crystals, some large vugs (>10 mm.)							J,PL,SM					
								J,I,SM brecciated					
	263.5-163.7 ft. Highly weathered							B,I,SM (4)					
	198.10 / 263.70												
264	263.7-269.3 ft. Fresh, medium bedded, olive gray (5Y 4/1), coarse grained, strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)		28	98%				J,I,SM,CL					
268	266.3-266.4 ft. Claystone							J,I,SM,CL					
268	268.3-269.3 ft. Calcareous claystone							J,I,SM,CL J,PL,SM					
	192.50 / 269.30	192.50 / 269.30											17:15 End Core Run 28
270	269.3-284.2 ft. Fresh, medium bedded, medium dark gray (N4), very fine grained, very weak, CLAYSTONE, (WARSAW FORMATION) Some calcite crystals		29	96%				J,PL,SM					
272	271.3-271.7 ft. Slightly wethered, porous							J,PL,SM (2)					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 30 R3 150 R4 300 R5 600 R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272	269.3-284.2 ft. Fresh, medium bedded, medium dark gray (N4), very fine grained, very weak, CLAYSTONE, (WARSAW FORMATION) Some calcite crystals			29	96%				J,PL,SM						
274			187.50 / 274.30												8:45 End Core Run 29 Problems coring, drill string very wobbly due to large diameter casing
	275.1-276.0 ft. Slightly weathered, porous														
276															
	277.6 ft. Calcite filled vug (3 cm.)														
278				30	103 %										
280															
282															
	282.7-283.2 ft. Calcareous, weak														
	283.3-284.1 ft. Slightly weathered, porous														
284	284.2-301.4 ft. Fresh, medium bedded, medium dark gray (N4), fine grained, medium strong, CALCAREOUS CLAYSTONE, (WARSAW FORMATION)		177.80 / 284.20						J,I,SM						10:00 End Core Run 30 Cuttings not coming out with return; flush hole
286				31	100 %				J,PL,SM						
									J,I,SM						
288															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-H

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	4 FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	284.2-301.4 ft. Fresh, medium bedded, medium dark gray (N4), fine grained, medium strong, CALCAREOUS CLAYSTONE, (WARSAW FORMATION)			31	100 %										
			172.60 / 289.20												12:00 End Core Run 31
	289.2-290.6 ft. Dolomite														
290															
292									J,I,SM; J,I,SM,CL						
	293.4-295.6 ft. Dolomite														
294				32	99%										
296															
298															
			162.60 / 299.20												13:50 End Core Run 32
300															
	160.40 / 301.40														
302	301.4-346.4 ft. Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE, (WARSAW FORMATION) Some Claystone partings			33	100 %										
	302.6-304.3 ft. Dolomitic Claystone, some fossils														
304															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 461.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (HT 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
304	301.4-346.4 ft. Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE, (WARSAW FORMATION) Some Claystone partings		157.60 / 304.20	33	100 %										14:15 End Core Run 33
306															
308	307.9 ft. Calcite filled vug (3 cm.)			34	99%										
310															
312															
314			147.60 / 314.20												14:50 End Core Run 34
	315.5 ft. Chert zone														
316	316.2 ft. Chert zone			35	100 %										
318									J,U,SM,CL						
320															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

CORD OF DRILLHOLE PZ-106-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO THOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
320	301.4-346.4 ft. Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE, (WARSAW FORMATION) Some Claystone partings												
322			35	100 %									
	323.2-323.3 ft. Chert zone												
324		137.60 / 324.20											15:45 End Core Run 35
	324.8 ft. Chert zone												
	325.3, 325.8, and 326.3 ft. Chert zones												
326													
	327.4 ft. Chert zone												
328													
	328.5 ft. Chert zone												
	329.1 ft. Chert zone		36	99%									
	329.6-329.9 ft. Chert zone												
330													
332													
	333.4 ft. Chert zone						90	J,I,SM,CL					
334		127.60 / 334.20					90	J,I,SM					16:40 End Core Run 36
			37	100 %									
336	335.8 ft. Chert zone												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
336	301.4-346.4 ft. Fresh, thinly bedded, medium dark gray (N4), m-vc grained, medium strong, LIMESTONE, (WARSAW FORMATION) Some Claystone partings														
	336.6-346.4 ft. No more claystone partings														
	336.9 ft. Chert zone														
338	337.9-339.2 ft. Chert zone							●	J,I,R calcite crystals						
340	339.9 ft. Chert zone			37	100 %										
	340.9-341.3 ft. Chert zone														
342	342.0-342.2 ft. Chert zone							●	J,I,SM,chert						
	342.3-343.5 ft. Chert zone														
	343.8 ft. Chert zone							●	J,I,SM						
344			117.60					●	J,I,SM						
			344.20												8:30 End Core Run 37
	344.6 ft. Chert zone														
								●	J,I,R,fossils						
346	115.40														
	346.4-363.6 ft. 346.40 Slightly weathered, thinly to medium bedded, light gray (N7), medium grained, medium strong, CALCAREOUS DOLOMITE, (KEOKUK FORMATION) Interbedded with chert zones and nodules; porous/vuggy; some filled with calcite crystals; some calcite veins							●	J,I,R,chert						
348				38	98%										
350								●	J,I,SM						
352								●	J,I,SM,chert						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
352	346.4-363.6 ft. Slightly weathered, thinly to medium bedded, light gray (N7), medium grained, medium strong, CALCAREOUS DOLOMITE (KEOKUK FORMATION) Interbedded with chert zones and nodules; porous/vuggy; some filled with calcite crystals; some calcite veins		38	98%	J,I,R	
354		107.60			J,I,SM	
		354.20			J,I,R	9:30 End Core Run 38
					J,I,R	
356					J,I,R	
358	358.0-361.1 ft. Moderately weathered, very vuggy				J,I,R; J,I,R; calcite crystals; J,I,R	
			39	95%		
360						Drilling rate much slower due to presence of chert
					J,I,R (2)	
362					J,PL,R (2)	
	98.80 / 363.00	98.40			Core Loss	362.9-363.4 ft. Core loss 11:00 End Core Run 39
	363.6-370.1 ft. Slightly weathered, thinly bedded, light gray (N7), m-vc grained, medium strong, DOLOMITIC LIMESTONE, (KEOKUK FORMATION) Slightly vuggy, some chert nodules	363.40			J,I,R (3)	
364					J,I,SM	
					J,I,R	
			40	100%		
366						
368						

DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90); RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10)

WEATHERING INDEX: SW, FR, MW, HW, CW
STRENGTH INDEX: R6, R5, R4, R3, R2, R1
POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/28/95-3/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 106703.9
AZIMUTH: 0

COLLAR ELEV: 481.8
E: 515432.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368	363.6-370.1 ft. Slightly weathered, thinly bedded, light gray (N7), m-vc grained, medium strong, DOLOMITIC LIMESTONE, (KEOKUK FORMATION) Slightly vuggy, some chert nodules								J,I,SM,chert; J,PL,SM						
370	369.4-370.1 ft. Chert layer 91.70 370.10														
	370.1-373.4 ft. Moderately weathered, medium bedded, medium light gray (N6), fine grained, medium strong, DOLOMITE, (KEOKUK FORMATION) Porous/vuggy, some chert nodules and calcite crystals			40	100 %				J,I,SM (2)						
372															3/13/95 @ 12:05 Core Run 40
	88.40		88.40						J,I,SM; J,I,SM						
	End of Record of Drillhole at 373.4 ft. 373.40		373.40												
374															
376															
378															
380															
382															
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 3/24/95
DRILL RIG: SCRAMM

DATUM:
COORDINATES N: 1066715.1
AZIMUTH: 0

COLLAR ELEV: 461.5
E: 515418.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
176	0.0-189.9 ft. No sampling conducted See Record of Drillhole for PZ-106-KS														0.0-30.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 189.9 ft. with 5 7/8 in. air rotary bit
178															
180															
182															
184															
186															
188															
	271.60		271.60												
190	189.9-199.9 ft. Fresh, thinly laminated, light olive gray (5Y 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE. (SALEM FORMATION) Fossiliferous		189.90	1	99%				J,I,R						3/24/95 @ 11:00 Began coring
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 5/26/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO METHOD: NX Core & water
DRILLING DATE: 3/24/95
DRILL RIG: SCRAMM

DATUM:
COORDINATES N: 1066715.1
AZIMUTH: 0

COLLAR ELEV: 461.5
E: 515418.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	2 4 6 8 10 FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	189.9-199.9 ft. Fresh, thinly laminated, light olive gray (5Y 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) Fossiliferous								J,I,SM						
									J,I,R						
194															
196				1	99%										
198															
	261.60		261.60												3/24/95 @ 13:15 Finish Run 1
200	End of Record of Drillhole at 208.0 ft. 199.90		199.90												
202															
204															
206															
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 5/26/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/4/95 - 4/5/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1068726.3
AZIMUTH: 0

COLLAR ELEV: 481.0
E: 515399.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	0.0-154.9 ft. No sampling conducted See Record of Drillhole for PZ-106-KS														0.0-30.0 ft. Drilling conducted with 6 1/4 in. ID hollow stem augers, then borehole advanced to 154.9 ft. with 5 7/8 in. air rotary bit
146															
148															
150															
152															
154															
	306.10		306.10												
	154.9-160.3 ft. 154.90 Fresh, thinly bedded to thinly laminated, light olive gray (5Y 6/1), f-m grained, medium strong, AGILLACEOUS LIMESTONE, (SALEM FORMATION) Chert nodules, silt lenses, stylolitic, fossiliferous		154.90												4/4/95 @ 12:20 Begin Run 1 @ 13:30 Rig breaks down
156									J,I,R						
				1	100 %				J,C,R J,I,R						
158															
									J,I,SM						4/5/95 @ 7:30 Resume drilling at 159.5 ft.
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: J. MILLER
CHECKED: B. TILTON
DATE: 5/26/95

Golder Associates

RECORD OF DRILLHOLE PZ-106-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/4/95 - 4/5/95
DRILL RIG: SCHRAMM

DATUM: MSL
COORDINATES N: 1066726.3
AZIMUTH: 0

COLLAR ELEV: 461.0
E: 515389.9
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	160.3-165.0 ft. *Slightly weahtered, thickly laminated, yellowish gray (5Y 7/2), coarse grained, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION)*								J,C,SM						
162				1	100 %				J,I,R (2)						
164	Fossil fragments, sandy														4/5/95 @ 10:00 End Run 1
	296.00		296.00												
	End of Record of Drillhole at 165.0 ft. 165.00		165.00												
166															
168															
170															
172															
174															
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: J. MILLER
CHECKED: B. TILTON
DATE: 5/26/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-107-SS	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 3	
		DRILLING START	DRILLING FINISH
	WATER LEVEL	TIME 13:00	TIME 16:25
	TIME		
	DATE	DATE 3/26/95	DATE 3/26/95
NORTHING: 1067163.45 DATUM EASTING: 515254.52 ELEVATION 462.6	CASING DEPTH		
DRILL RIG CME 75	SURFACE CONDITIONS		
ANGLE -90° BEARING			
SAMPLE HAMMER			

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 5 5 5	0.9'/2.0' (45%)			(0.0-2.0 ft.) Stiff, moderate yellowish brown (10YR 5/4), SILTY CLAY, trace of very fine Sand, WR, damp, (CL), (FILL)	SP 1	
2, 3	2 2 4 18	1.0'/2.0' (50%)			(2.0-4.0 ft.) Firm, yellowish brown (10YR 5/4), SILTY CLAY, little Gravel, trace amount of trash at bottom, WR, damp, (CL), (FILL)	SP 2	
4, 5	3 8 11 10	1.1'/2.0' (55%)			(4.0-6.0 ft.) Very stiff, medium light gray (N5) to dark greenish gray (5GY 4/1), SILTY CLAY, some Gravel, SR, moist, (CL), (FILL)	SP 3	
					(456.6) 6.0		
6, 7	4 8 23 5	1.1'/2.0' (55%)			(6.0-8.0 ft.) Mixed damp waste and silty clay	SP 4	
8, 9	7 2 4 1	0.3'/2.0' (15%)			(8.0-10.0 ft.) Trash	SP 5	
10, 11	3 3 4 4	0.0'/2.0' (0%)			(10.0-12.0 ft.) Waste becomes wet	SP 6	
					(450.6) 12.0		
12, 13	8 32 15 9	0.0'/2.0' (0%)	NO RECOVERY		(12.0-14.0 ft.) No Recovery	SP 7	from 12.0-28.0 ft., no samples recovered, but drilling indicated mixed waste and silty clay layers
14	6 12 8 5	0.0'/2.0' (0%)			(14.0-15.0 ft.) No Recovery	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ107SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-107-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START TIME 13:00 DATE 3/26/95; FINISH TIME 16:25 DATE 3/26/95
NORTHING: 1067163.45 DATUM EASTING: 515254.52 ELEVATION 462.6	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE -90° BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
			NO RECOVERY		(15.0-16.0 ft.) No Recovery	SP 8	
16	5 8 13 6	0.0' / 2.0' (0%)			(16.0-18.0 ft.) No Recovery	SP 9	
17							
18	5 7 35 41	0.0' / 2.0' (0%)			(18.0-20.0 ft.) No Recovery	SP 10	
19							
20	5 5 5 3	0.0' / 2.0' (0%)			(20.0-22.0 ft.) No Recovery	SP 11	
21							
22	5 4 7 9	0.0' / 2.0' (0%)			(22.0-24.0 ft.) No Recovery	SP 12	
23							
24	6 7 7 10	0.0' / 2.0' (0%)			(24.0-26.0 ft.) No Recovery	SP 13	
25							
26	5 5 9 12	0.4' / 2.0' (20%)		X	(26.0-28.0 ft.) Waste	SP 14	
27							
28					(434.6) 28.0 (28.0-32.0 ft.) Stiff, dark greenish gray (5GY 4/1), SILTY CLAY, NR, wet, (CL), (LOESS)		
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIN CHK'D BY W. HERSI

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ107SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-107-SS
		SHEET 3 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

WATER LEVEL					START TIME	FINISH TIME
TIME					13:00	16:25
DATE					DATE	DATE
CASING DEPTH					3/26/95	3/26/95

NORTHING: 1067163.45
DATUM EASTING: 515254.52 ELEVATION 462.6

DRILL RIG CME 75 SURFACE CONDITIONS

ANGLE -90° BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(28.0-32.0 ft.) Stiff, dark greenish gray (5GY 4/1), SILTY CLAY, NR, wet, (CL), (LOESS)			
31								
32					(430.6) 32.0 End of Soil Borehole Log at 32.0 ft.			
					See PZ-107-SS Record of Drillhole for rock descriptions below 55.0 ft.			
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CASIN CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ107SS

RECORD OF DRILLHOLE PZ-107-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067163.45
AZIMUTH: 0

COLLAR ELEV: 462.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-32.0 ft. See Soil Borehole Log PZ-107-SS 32.0-54.0 ft. No samples collected														5/18/95 - 5/19/95 A 9 7/8 in. borehole (air rotary) was advanced through 10 1/4 in. ID hollow stem augers from 30.0-55.0 ft., and 6 in. steel was sealed in borehole from surface to 55.0 ft. with neat cement. Bedrock was encountered at 51.0 ft. BGS during drilling
50															
52															
54	408.60 54.00 54.0-59.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		408.60 54.00												5/21/95 @ 15:30 Began coring
56				1	92%				J,PL,SM,CL						
58									J,PL,SM						5/21/95 @ 15:50 End of Run 1
60	59.0-63.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 60.0 ft. Fossiliferous		403.60 59.00						J,PL,R B,PL,SM						
62				2	98%				J,PL,SM,CL J,PL,R						
64	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)								B,PL,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

DRILLING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067163.45
AZIMUTH: 0

COLLAR ELEV: 482.8
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)								B,PL,SM						
	64.3 ft. Argillaceous layers common, stylolites common								B,PL,SM,CL						
66				2	98%										
									J,PL,SM						
									J,PL,SM,CL						
68															
									J,PL,SM,CL						5/21/95 @ 16:15 End of Run 2
			393.60 / 69.00												
									J,PL,R						
70															
									B,PL,SM,CL (5)						
72	72.1-72.6 ft. Argillaceous layer								B,PL,SM,CL						
									J,I,R						
74				3	100 %										
									B,PL,SM,CL						
76	76.7-77.2 ft. Argillaceous layer														
78	78.4-79.9 ft. Argillaceous layer								J,PL,SM (2)						5/21/95 @ 17:40 End of Run 3
			383.60 / 79.00												
				4	100 %				J,PL,SM						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1087183.45
AZIMUTH: 0

COLLAR ELEV: 482.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH (FEET)	ROCK TYPE: DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	63.5-82.3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION)								J,PL,SM (3)						
									J,PL,SM (2)						
82	82.3-84.6 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
84	84.6-88.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Thinly laminated Clay layers abundant			4	100 %										
86									J,PL,SM,CL (2)						
									J,C,SM						
88	88.5-94.1 ft. Fresh, medium bedded, light olive gray (5Y 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites abundant		373.60 / 89.00												5/21/95 @ 18:40 End of Run 4 Quit drilling for the day 5/22/95 @ 7:30 Began drilling
90															
92				5	100 %										
94	94.1-97.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant thinly laminated Clay layers								B,PL,SM,CL (3)						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-107-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/21/95 - 5/22/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067163.45
AZIMUTH: 0

COLLAR ELEV: 482.6
E: 515254.52
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	94.1-97.2 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE,(ST. LOUIS FORMATION) Abundant thinly laminated Clay layers			5	100 %				B,PL,SM						
98	97.2-100.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), fine to medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Calcite filled healed fractures common		363.60 / 99.00												5/22/95 @ 8:10 End of Run 5
100									J,PL,R,CL						
	100.7-104.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant thinly laminated clay layers			6	100 %				J,PL,R						
102									J,PL,R						
									J,PL,R						5/22/95 @ 8:30 Finished coring
	358.60		358.60												
104	End of Record of Borehole at 104.0 ft. 104.00		104.00												
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-108-SS
		SHEET 1 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	16:30 / 7:50
	DATE	DATE / DATE
NORTHING: 1067678.37 DATUM EASTING: 515972.61 ELEVATION 454.1	CASING DEPTH	3/21/95 / 3/22/95

DRILL RIG CME 75	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	20 25 13 9	1.2'/2.0' (60%)			(0.0-2.0 ft.) Dense, pale yellowish brown (10YR 6/2), CLAYEY GRAVEL, some fine to coarse Sand, SR, damp, (GC), (FILL)	SP 1	
2					(452.1) 2.0		
3	3 6 7 6	1.0'/2.0' (50%)			(2.0-6.0 ft.) Stiff to very stiff, dark yellowish brown (10YR 4/2), SILTY CLAY, some Gravel, little fine to coarse Sand, SR, damp, (CL), (FILL)	SP 2	
4	6 11 11 11	0.8'/2.0' (40%)				SP 3	
6	3 8 11 15	0.9'/2.0' (45%)			(6.0-12.0 ft.) Stiff to very stiff, dark yellowish brown (10YR 4/2), SILTY CLAY, trace Gravel, trace to some fine to coarse Sand, SR, damp, (CL), (FILL)	SP 4	
8	6 6 8 7	0.5'/2.0' (25%)				SP 5	
10	8 8 10 12	0.4'/2.0' (20%)				SP 6	
12	8 8 12 15	1.6'/2.0' (80%)			(12.0-19.0 ft.) Very stiff, yellowish gray (5Y 7/2), SILTY CLAY, trace fine Gravel consisting of limestone, trace to little fine to coarse Sand, moderate amount of iron oxide staining, SR, damp, (CL), (ALLUVIUM)	SP 7	
14	4 8 11 14	1.8'/2.0' (90%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSID CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ108SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-108-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 2
		DRILLING START TIME 16:30 DATE 3/21/95; FINISH TIME 7:50 DATE 3/22/95
DATUM NORTHING: 1067678.37 EASTING: 515972.61 ELEVATION 454.1	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	5 9 7 9	1.8'/2.0' (90%)			(12.0-19.0 ft.) Very stiff, yellowish gray (5Y 7/2), SILTY CLAY, trace fine Gravel consisting of limestone, trace to little fine to coarse Sand, moderate amount of iron oxide staining, SR, damp, (CL), (ALLUVIUM)	SP 8	
17						SP 9	
18	3 5 9 38	1.2'/2.0' (60%)			(19.0-20.0 ft.) Very stiff, light olive gray (10Y 5/4), SILTY CLAY, little highly weathered limestone, gravel pieces, little fine to coarse Sand, moderate iron oxide staining, NR, damp, (CL), (ALLUVIUM) (434.1) 20.0	SP 10	
19							
20					End of Soil Borehole Log at 20.0 ft. See PZ-108-SS Record of Drillhole for rock descriptions		Top of weathered bedrock encountered @ 20.0 ft.
21							
22							
23							
24							
25							
26							
27							
28							
29							

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ108SS

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
18	0.0-20.0 ft. See Soil Borehole Log PZ-108-SS												
18													
20		434.10											
	20.0-24.4 ft. Highly weathered, thinly bedded, pale olive (10Y 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Clay infillings 20.2-20.4 ft. Bluish-gray Shale 20.7-20.9 ft. Bluish-gray Shale	20.00											3/22/95 @ 8:30 Started coring Run 1
22			1	59%									
	21.6-22.1 ft. Chert (Brown-angular)												Core loss probably due to highly fractured nature of rock, clay infilling may also be the reason
								Core Loss					
24		429.70											
	24.4-29.6 ft. Fresh, thickly bedded, light olive gray (5Y 5/2), fine grained, medium strong, FOSSILIFEROUS LIMESTONE, (ST. LOUIS FORMATION)	24.40						J,I,R; J,I,R					
26			2	100 %									
	27.4-28.6 ft. Thin layers of bluish-gray Siltstone	428.70 27.40											
28		425.50 28.60											
	29.6-36.3 ft. Fresh, thickly bedded, yellowish gray (5Y 7/2), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Fossils common, stylolitic, little pyrite crystals	424.50 29.60											
30			3	99%				J,I,R; J,I,R; J,I,R					
32													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
32	422.00					
	32.1-33.3 ft. 32.10 Dolomitic Limestone				J,I,CL; J,I,R	
	33.3-35.0 ft. Arenaceous Dolomite				J,I,R; J,PL,CL; J,I,CL	
34			3	99%		
	419.10 35.35.00 35.0-36.2 ft. Bluish-gray Shale layer					
36	417.90 36.20	417.80 36.30				
	36.3-41.3 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION) Scattered pyrite crystals, trace of fossils				J,PL,CL	
38	38.1-40.2 ft. Arenaceous Limestone with Shale thin beds		4	96%	J,PL,CL	
40	40.2-41.3 ft. Arenaceous Dolomite				J,PL,SM	
	412.80 41.30	412.80 41.30				
42	41.3-50.6 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Few large (~5 mm.) pyrite crystals, thin layers of bluish-gray Shale, vugs <1 mm., crystals and chert nodules, abundant intact open joints		5	93%	J,I,R (6); J,I,CL (2); J,I,R (2); J,I,CL; J,I,CL (3)	This zone may show high permeability due to the open joints intact
44						
		408.40 45.70				
46	45.7-46.1 ft. Arenaceous Limestone 46.1-47.1 ft. Stylolitic with joints, filled with glauconite crystals, Limestone		6	100 %		
		407.00 47.10				
	47.1-47.5 ft. Stylolitic, microcrystalline, abundant crystals of quartz		7	100 %	J,I,R (3)	
48						

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DISCONTINUITY DATA (DIP wrt CORE AXIS 0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW, FR, MW, HW, CW); STRENGTH INDEX (R5, R6, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1, R2 30, R3 150, R4 300, R5 600, R6 1500); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1067878.4
E: 515972.6
AZIMUTH: 0

COLLAR ELEV: 454.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	41.3-50.6 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Few large (~5 mm.) pyrite crystals, thin layers of bluish-gray Shale, vugs <1 mm., crystals and chert nodules, abundant intact open joints	404.70 / 49.40	7	100 %									Intact open joints observed in bottom 8 inches
50	48.6-49.4 ft. Abundant open intact joints 50.6-54.4 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION)							J,I,R (2)					
								J,I,CL (2)					
								J,I,R (2)					
52	Porous, vugs up to 3 mm., semi-filled with quartz crystals Lenses/big crystals of pyrite at 50.9 ft., abundant veins of calcite throughout sample		8	100 %				J,I,R					
								J,I,R (2)					
								J,I,R					
54	54.4-60.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Little veins of calcite <2 mm., few porous areas showing vugs up to 3 mm., trace of pyrite at 58.4 ft.	399.70 / 54.40											
56													
58								J,I,R (2)					
			9	100 %				J,I,R					
60	60.0-66.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few 1-3 mm. calcite veins, stylolitic, few zones showing 1 mm. or less vugs							J,I,R					
								J,I,R					
								J,I,R					
62								J,I,R					
								J,I,R					
64								J,I,R					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	60.0-66.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION). Few 1-3 mm. calcite veins, stylolitic, few zones showing 1 mm. or less vugs	389.70 / 64.40	9	100 %	J,I,R	
	64.4-65.6 ft. Little gray quartzose chert rosettes are observed				J,I,R	
66					J,I,CL	
	66.5-71.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Scattered fossils throughout				J,I,R	
68					J,I,R	
			10	99%	J,I,CL (4)	
70					J,I,R	
	71.2-72.7 ft. Fresh, medium bedded, greenish gray (5GY 6/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Cross bedded				J,I,R (2)	
					J,I,CL	
72					J,I,CL (4)	
	72.7-76.3 ft. Strongly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, highly laminated					
74		379.70 / 74.40				3/23/95 @ 7:30 Began drilling, water level at start was 11.9 ft. BGS
76	76.3-79.4 ft. Moderately weathered, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, few intact open joints filled with clayey material, trace of quartz crystals and trace of pyrite		11	100 %	J,I,R (3)	
					J,I,R	
78					J,I,CL	
	79.4-93.6 ft. Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), fine grained, medium strong, STYLOLITIC LIMESTONE, (ST. LOUIS FORMATION)				J,I,R (4)	
					J,I,CL (2)	
		374.70 / 79.40			J,I,CL (2)	
80	79.5 ft. Calcite vein of approximately 5-10 mm. thick		12	98%		

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATU[illegible]
COOR[illegible]ES N: 1087878.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
80	79.4-93.6 ft. Fresh, medium bedded, yellowish gray (5Y 8/1) to light olive gray (5Y 6/1), fine grained, medium strong, STYLOLITIC LIMESTONE, (ST. LOUIS FORMATION) 79.5 ft. Calcite vein of approximately 5-10 mm. thick				J,I,R; J,P,R; J,I,R; J,I,R (2)	
82			12	98%	J,I,R	
84	84.4-85.8 ft. Crystalline Stylolitic Limestone	369.70 / 84.40			J,I,R; J,I,CL; J,I,R; J,I,R (2)	
86	85.8-87.6 ft. Fine grained, Limestone, stylolitic, abundant quartz and pyrite cyrstals				J,I,R; J,I,CL	
88	87.9 ft. 5 mm. joint filled with a dark greenish-gray (5G 4/1), clayey material 87.9-93.6 ft. Stylolitic crystalline Limestone		13	99%		
90	90.1-91.9 ft. Abundant silicified fossils				J,I,CL (2)	
92					J,I,CL; J,I,R	
94	93.6-96.4 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few calcite veins (1 mm.)	359.70 / 94.40	14	100 %	J,P,SM	
96						

GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DIP wrt CORE AXIS (0, 30, 60, 90); WEATHERING INDEX (SW FR, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067878.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DISCONTINUITY DATA

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	NOTES WATER LEVELS INSTRUMENTATION
96	96.4-109.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1) to olive gray (5Y 4/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, abundant calcite veins, pyrite crystals observed in clay filled joints, large (<4 mm.) calcite crystals at 98.0 ft.				J,I,R; J,I,CL; J,I,R; J,I,R				
98	96.4-104.0 ft. Abundant clayey filled intact joints				J,I,CL (2)				
100	100.0-102.5 ft. Oolitic Limestone		14	100 %	J,I,CL (2)				
	101.0-102.0 ft. Brecciated Limestone, cemented with greenish-blue clayey material								
102					J,I,CL (2); J,I,R				
104		349.70 / 104.40							
	104.8-104.9 ft. Layer of bluish-green clayey material, foliated								
106					J,I,R				
	107.2-107.7 ft. Highly brecciated				J,P,SM				
108	100.0-108.4 ft. Scattered calcite veins (1-2 mm.) throughout this core section		15	100 %	J,I,R				
	109.4-114.8 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few chert nodules, banded down to 111.4 ft. with finely crystalline Limestone (.20-1 mm.)				J,I,R; J,I,R; J,I,CL				
110									
112									

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	109.4-114.8 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few chert nodules, banded down to 111.4 ft. with finely crystalline Limestone (.20-1 mm.)			15	100 %										
114	111.9-112.9 ft. Abundant rounded pyrite crystals		339.70 / 114.40												
	114.8-119.4 ft. Fresh, medium to thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)														@ 114.8 ft. top of Salem Limestone encountered
116	Very large brachiopods from 115.4-118.7 ft.							90	J,C,SM						
118	118.3-119.5 ft. Dark greenish gray (5GY 4/1), Oolitic Limestone with calcite veins and large crystals of calcite (10 mm.)			16	100 %			90	J,I,CL						
								90	J,I,CL						
120	120.4-120.7 ft. Highly brecciated							90	J,I,R						
	121.0-121.3 ft. Highly brecciated							90	J,I,CL						
	121.8-124.4 ft. Dolomitic Limestone							90	J,I,CL						
122	122.4-124.4 ft. Very large chert nodules							90	J,PL,SM						
								90	J,PL,CL						
124	124.4-130.4 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Large beds of chert, large chert nodules		329.70 / 124.40												
								90	J,I,R						
126				17	100 %			90	J,PL,SM						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067678.4
E: 515972.6
AZIMUTH: 0

COLLAR ELEV: 454.1
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	124.4-130.4 ft. Fresh, thickly bedded, olive gray (5Y 4/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Large beds of chert, large chert nodules												
130	130.4-134.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), medium grained, strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION)		17	100 %			90	J,I,R					
132													
134	134.2-134.6 ft. Crystalline Limestone	319.70											
	134.6-139.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (SALEM FORMATION) Stylolitic, large (10 mm.) calcite crystals, abundant clay filled intact joints, abundant chert nodules	134.40					90	J,I,CL					
136							90	J,I,CL					
138	138.6-139.0 ft. Crinoid fragments												
	139.0-140.8 ft. Finely grained Arenaceous Limestone		18	100 %									
140	140.8-144.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Interbedded with Dolomite						90	J,I,R					
142													
144													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-108-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DRI[illegible]ATE: 3/22/95-3/23/95
DRILL RIG: CME 75

DATU[illegible]
COOR[illegible]ES N: 1067678.4
AZIMUTH: 0

COLLAR ELEV: 454.1
E: 515972.6
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	140.8-144.4 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Interbedded with Dolomite (309.70 – 144.40)		309.70 / 144.40	18	100 %			●	J,I,R						3/23/95 @ 16:35 Coring completed
146	End of Record of Drillhole at 144.4 ft.														
148															
150															
152															
154															
156															
158															
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/2/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-109-SS
		SHEET 1 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
	WATER LEVEL	TIME 7:48 / TIME 8:48
	TIME	
	DATE	DATE 4/7/95 / DATE 4/7/95
NORTHING: 1068011.70 DATUM EASTING: 516144.36 ELEVATION 456.8	CASING DEPTH	

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE -90° BEARING NA

SAMPLE HAMMER 140 lbs.

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	1 1 1 2	2.0'/2.0' (100%)			(0.0-2.0 ft.) Very loose, light olive gray (5Y 6/1), SILT, trace of fine to coarse Gravel, trace very fine Sand, NR, moist, (ML), (FILL)	SP 1	
2	50/4"	0.4'/2.0' (20%)			(454.8) 2.0 (2.0-6.0 ft.) Very dense, light olive gray (5Y 6/1), f-c GRAVEL, little fines, SR, damp, (GP), (FILL)	SP 2	
3							
4	50/3"	0.2'/2.0' (10%)				SP 3	
5							
6	5 6 8 8	1.8'/2.0' (90%)			(450.8) 6.0 (6.0-12.0 ft.) Stiff, dark yellowish brown (10YR 4/2), mottled CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 4	
7							
8	5 7 8 11	1.6'/2.0' (80%)				SP 5	
9							
10	4 5 6 8	2.0'/2.0' (100%)				SP 6	
11							
12	4 3 5 7	1.8'/2.0' (90%)			(12.0-16.0 ft.) Firm, mottled moderate yellowish brown (10YR 5/4) to light olive gray (5Y 6/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 7	
13							
14	4 8 39 50/2"	1.9'/2.0' (95%)			@ 14.5 ft., little fine Gravel	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 5/31/95

JOB NO.: 943-2848

FILENAME: PZ109SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-109-SS
		SHEET 2 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	START TIME 7:48, FINISH TIME 8:48; START DATE 4/7/95, FINISH DATE 4/7/95
DATUM NORTHING: 1068011.70 EASTING: 516144.36	ELEVATION 456.8	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE -90°	BEARING NA	
SAMPLE HAMMER 140 lbs.		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16					(12.0-16.0 ft.) Firm, mottled moderate yellowish brown (10YR 5/4) to light olive gray (5Y 6/1), CLAYEY SILT, NR, damp, (CL-ML), (LOESS) (440.8) 16.0	SP (8)	Top of weathered bedrock encountered @ 15.7 ft.
					End of Soil Borehole Log at 16.0 ft.		
17					See PZ-109-SS Record of Drillhole for rock descriptions		
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIN

DATE 5/31/95

CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ109SS

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM:
COORDINATES: N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 458.8
E: 516144.36
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80, 60, 40, 20)	FRACTURES PER FOOT (2, 4, 6, 8, 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
0	0.0-15.7 ft. See Soil Borehole Log PZ-109-SS														
2															
4															
6															
8															
10															
12															
14	15.7-20.7 ft. Moderately weathered, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, pyrite and calcite crystals common, stylolitic, abundant clay filled intact joints		441.10 / 15.70	1	100 %										4/7/95 @ 9:47 Begin coring Run 1
16															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[redacted]THOD: NX Core & water
DR[redacted]ATE: 4/7/95-4/8/95
DRIL[redacted] CME 75

DATU[redacted]
COOR[redacted]N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 518144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	15.7-20.7 ft. Moderately weathered, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, pyrite and calcite crystals common, stylolitic, abundant clay filled intact joints								J,PL,SM (2)						
									J,I,R (2)						
									J,I,R (2)						
									J,PL,SM						
18									J,I,R (2)						
									J,U,R						
	19.8-20.0 ft. Layer of brown chert														
20				1	100 %				J,PL,R (2)						
	20.7-31.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, stylolitic, pyrite and calcite crystals common, abundant argillaceous partings								J,PL,R						
									J,I,R						
22															
24			432.30 / 24.50												4/7/95 @ 10:47 Begin coring Run 2
									J,I,R						
	25.0-25.5 ft. Bioclastic Limestone								J,I,CL						
	25.5-27.2 ft. Microcrystalline Limestone								J,U,SM (2)						
									J,I,R						
26									J,I,R (3)						
									J,PL,R (3)						
									J,I,CL (2)						
28				2	100 %				J,I,CL (2)						
									J,I,R						
									J,I,CL (2)						
	29.9-31.3 ft. Dark greenish gray (5GY 4/1), intraclastic Limestone								J,I,CL (3)						
30	31.3-31.4 ft. Layer of dark greenish yellow clay								J,I,R						
									J,I,CL						
	31.5-32.5 ft. Fresh, thinly bedded, greenish black (5G 2/1), fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Large (3 mm.) calcite veins		425.30 / 31.50						J,I,CL (2)						
32									J,I,CL						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILLING RIG: CME 75

DATUM:
COORDINATES: N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32									J,I,R					
	424.30 / 32.50													
	32.5-34.9 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Little argillaceous partings, pyrite crystals present			2	100 %				J,PL,CL; J,I,CL					
34			422.30 / 34.50											4/7/95 @ 12:55 Begin coring Run 3
	34.9-40.5 ft. Slightly weathered, thickly bedded, grayish orange (10YR 7/4) to light olive gray (5Y 6/1), f-m grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs up to 2 mm., calcite crystals and veins up to 3 mm. present, little pyrite crystals													
36	35.0-38.7 ft. Very porous material								J,I,R					
38									J,I,CL					
	39.0-39.2 ft. Layer of brown chert			3	99%				J,I,R					
40									J,I,CL					
	40.5-45.6 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, chert nodules common, abundant argillaceous partings, calcite veins up to 8 mm., pyrite crystals scattered													
42									J,I,R					
44			412.30 / 44.50											4/7/95 @ 13:50 Begin coring Run 4
	45.6-58.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, abundant calcite crystals and veins up to 2 mm., little pyrite crystals			4	99%				J,I,CL; J,I,CL; J,I,R (2)					
46														
48														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 4/7/95-4/8/95
DRILLING: CME 75

DATUM:
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	48.5-51.6 ft. Abundant argillaceous partings and clay filled intact open joints 48.9-53.8 ft. Highly brecciated Limestone, cemented with a greenish gray clayey material								J,I,R						
50				4	99%				J,I,CL J,I,CL						
52	52.0-53.3 ft. Intraclastic Limestone								J,PL,SM J,I,R						
54	53.8-54.2 ft. Greenish black (5G 2/1), fine grained Dolomite (403.00, 53.80, 402.60, 54.20)		402.30 54.50												4/7/95 @ 14:42 Begin coring Run 5
56	54.9-55.3 ft. Intraclastic Limestone 55.5-58.2 ft. Fossiliferous Limestone, abundant argillaceous partings														
58	58.2-74.6 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Little fossils, vugs up to 8 mm., calcite veins with pyrite common, some calcite crystals 58.2-62.3 ft. Limestone shows high porosity			5	100 %				J,I,CL (2) J,I,R						
60									J,I,R						
62									J,I,R						
64									J,I,R J,I,R						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/7/95-4/8/95
DRILL RIG: CME 75

DATUM:
COORDINATES: N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 458.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64			392.30 / 64.50	5	100 %									4/7/95 @ 15:30 Begin coring Run 6
	65.0-69.4 ft. Apparent low porosity Limestone, vugs <1 mm.													
	65.7-66.7 ft. Stylolitic Limestone, becomes medium strong													
66									J,I,R					
68														
	69.4-72.8 ft. Apparent moderate porosity Limestone, vugs 1-2 mm.			6	100 %				J,PL,SM					
									J,I,R					
70									J,I,R					
									J,I,R					
									J,I,CL					
72	72.0-73.2 ft. Large (25 mm.) calcite crystals observed													
	72.8-74.3 ft. Apparent high porosity Limestone, vugs up to 8 mm.													
									J,I,CL					
74									J,I,R					
			382.30 / 74.50											4/7/95 @ 16:21 Begin coring Run 7
	74.6-75.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION) Oolitic, little fossils, abundant calcite crystals, little chert								J,I,CL (2)					
									J,I,R					
76	75.7-77.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs up to 5 mm., abundant calcite crystals, glauconite in defined places, Limestone has an apparent moderate to high porosity			7	100 %									
78														
	77.8-90.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossils, little chert, stylolites, large calcite crystals, some pyrite								J,I,CL					
80														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[redacted]HOD: NX Core & water
DR[redacted]TE: 4/7/95-4/8/95
DRILL[redacted] CME 75

DATUM[redacted]
COORD[redacted]N: 1068011.70
AZIMUTH: [redacted]

COLLAR ELEV: 456.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	80.0-82.4 ft. Some intact joings filled with clayey material								J,I,CL						
	81.1-82.6 ft. Interbedded layers of argillaceous Limestone (5 mm.)								J,I,CL						
									J,PL,CL						
82				7	100 %										
	83.0-84.2 ft. Argillaceous Limestone, large calcite crystals, vugs up to 1 mm., relative low porosity								J,I,R						
84									J,I,R						4/7/95 @ 15:05 Stop coring
			372.30 / 84.50												4/8/95 @ 8:00 Begin coring Run 8
	85.5-87.3 ft. Limestone with numerous argillaceous partings and intact joints filled with clayey material								J,I,R						
86															
	87.3-88.2 ft. Argillaceous Limestone, bioturbated top 2 in.														
88	88.2-89.0 ft. Limestone, stylolitic microcrystalline								J,PL,CL						
	89.4-90.8 ft. Medium bluish gray (5B 5/1), fine grained, Argillaceous Limestone			8	100 %				J,I,R						
90									J,PL,SM						
	90.8-93.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,I,CL						
92	Interbedded with Argillaceous Limestone and bluish gray Limestone, stylolites present, calcite veins and pyrite crystals observed								J,I,CL						
	93.3-95.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
94			362.30 / 94.50						J,I,CL						4/8/95 @ 9:04 Begin coring Run 9
	Few layers (up to 20 mm.) of Dolomitic Limestone, argillaceous partings present, pyrite and calcite common														
				9	100 %										
	95.3-99.8 ft. (see next page)								J,PL,SM						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD: NX Core & water
D[illegible]ATE: 4/7/95-4/8/95
DR[illegible]: CME 75

DATU[illegible]
COOR[illegible]S N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Heated, GRF-Gravel Filed

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	95.3-99.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, strong LIMESTONE, (ST. LOUIS FORMATION) Stylolites not common, pyrite anc calcite veins <1 mm. observed, argillaceous partings common, few open joints filled with clayey material								J,PL,CL						
									J,PL,CL						
98									J,I,CL						
									J,I,CL						
	99.8-104.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs up to 2 mm. present, biourbated in places, calcite crystals common			9	100 %										
100															
102									J,U,CL						
104			352.30 / 104.50												4/8/95 @ 9:52 Begin coring Run 10
	104.7-107.9 ft. Fresh, thickly bedded, olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Pyrite and calcite veins common, few large calcite crystals														
106	106.5-106.6 ft. Layer of olive black (5Y 2/1), clayey material, folliated 106.9-107.9 ft. Fossils common								J,C,R						
108	107.9-111.0 ft. Fresh, thickly bedded, olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites present, vugs up to 1 mm., bioturbated in places, calcite crystals are common, more porous in bottom foot			10	100 %				J,PL,CL						
110	111.0-118.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, little fossils, abundant pyrite and calcite crystals, abundant argillaceous partings, intra-clasts common								J,I,CL						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOR[illegible] HOD: NX Core & water
DRI[illegible] TE: 4/7/95-4/8/95
DRILL[illegible] CME 75

DATUM[illegible]
COORD[illegible] N: 1068011.70
AZIMUTH: [illegible]

COLLAR ELEV: 456.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FT)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	111.0-118.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, little fossils, abundant pyrite and calcite crystals, abundant argillaceous partings, intra-clasts common	343.10 / 113.70	10	100 %									4/8/95 @ 10:55 Begin coring Run 11
114													
	115.3-115.6 ft. Layer of grayish green (10G 4/6) Shale, intra-clastic							J,I,CL					
								J,I,CL					
116								J,I,CL					
								J,I,CL					
	116.5-117.1 ft. Slightly weathered Limestone							J,I,R					
								J,I,R					
								J,I,R					
								J,PL,CL					
118	118.0-123.2 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Banded with fine to medium grained Limestone, large crystals of calcite, few calcite veins and little pyrite		11	100 %									
120								J,I,CL					
122													
	123.2-130.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to microcrystalline, strong to medium strong, LIMESTONE, (SALEM FORMATION) Stylolites observed, abundant fossils, oolitic, chert nodules common, large calcite crystals, little pyrite crystals scattered, calcite veins present but not abundant 125.4-125.5 ft. Bed of chert	333.60 / 123.20 / 333.10 / 123.70						J,PL,SM					123.2 ft. Top of SALEM FORMATION encountered
124													4/8/95 @ 12:50 Begin coring Run 12
								J,I,R					
								J,I,R					
126			12	99%									
	127.6-128.3 ft. Intraclastic Limestone cemented with dark greenish gray (5GY 4/1) clayey material							J,I,R					
128													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-109-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 4/7/95-4/8/95
CME 75

DATUM:
COORDINATES N: 1068011.70
AZIMUTH: 0

COLLAR ELEV: 458.8
E: 516144.36
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128									J,I,CL						
	129.0-129.3 ft. Intraclastic Limestone and chert cemented with dark greenish gray (5Y 4/1) clayey material								J,PL,SM						
130	130.0-135.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION)								J,PL,SM						
				12	99%				J,PL,R						
	Chert nodules and layers up to 15 mm. are abundant, abundant calcite crystals, pyrite common, some very thin calcite veins								J,PL,SM (2)						
132									J,I,R						
									J,PL,SM						
									J,PL,SM						
									J,PL,R						Fragmented rock may be drill induced
			323.10												
			133.70												
134									J,PL,SM						
									J,PL,SM						
				13	100%				J,I,CL						
									J,I,R						4/8/95 @ 15:30 Coring completed
	321.10		321.10												
	End of Record of Drillhole at 135.7 ft. 135.70		135.70												
136															
138															
140															
142															
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: R. BOOTH
DATE: 5/5/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-110-SS
		SHEET 1 OF 5
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	13:30 / 14:00
	DATE	DATE / DATE
DATUM NORTHING: 1068336.09 EASTING: 515919.72	CASING DEPTH	3/13/95 / 3/14/95
ELEVATION 456.8		

DRILL RIG SCHRAMM - ROTADRILL	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	7 9 21 19	0.4'/2.0' (20%)			(0.0-4.0 ft.) Dense, pale yellowish brown (10YR 6/2), SANDY CLAY, little Gravel, damp, SR, (CL), (FILL)	SP 1	
2 3	10 11 12 18	0.6'/2.0' (30%)				SP 2	
4					(452.8) 4.0		
4 5	5 6 7 8	1.7'/2.0' (85%)			(4.0-12.0 ft.) Stiff, mottled medium gray (N5) to moderate yellowish brown (10YR 5/4), CLAYEY SILT, trace fine Sand, trace Gravel, SR, damp, (CL-ML), (LOESS)	SP 3	
6 7	8 8 7 7	1.3'/2.0' (65%)				SP 4	
8 9	4 3 4 4	0.3'/2.0' (15%)				SP 5	
10 11	4 4 4 5	1.3'/2.0' (65%)				SP 6	
12					(444.8) 12.0		
12 13	5 8 9 16	1.3'/2.0' (65%)			(12.0-15.8 ft.) Compact, pale yellowish brown (10YR 6/2), SILTY fine SAND, trace fine Gravel, SR, moist, (SM), (ALLUVIAL)	SP 7	
14	3 6 6 5	1.5'/2.0' (75%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

DATE 3/13/95

CHK'D BY W. HIRSI

JOB NO.: 943-2848

FILENAME: P71105S

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-110-SS	
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:	SHEET 2 OF 5	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START	FINISH
	WATER LEVEL	TIME	TIME
	TIME	13:30	14:00
	DATE	DATE	DATE
NORTHING: 1068336.09 DATUM EASTING: 515919.72 ELEVATION 456.8	CASING DEPTH	3/13/95	3/14/95
DRILL RIG SCHRAMM - ROTADRILL	SURFACE CONDITIONS		
ANGLE BEARING			
SAMPLE HAMMER			

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 3/13/95

JOB NO.: 943-2848

FILENAME: PZ110SS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(12.0-15.8 ft.) Compact, pale yellowish brown (10YR 6/2), SILTY fine SAND, trace fine Gravel, SR, moist, (SM), (ALLUVIAL) (441.0) 15.8	SP 8	
16	3 5 6 4	1.9'/2.0' (95%)			(15.8-16.8 ft.) Stiff, dark yellowish brown (10YR 4/2), CLAYEY SILT, little fine Sand, NR, damp, (CL-ML), (LOESS) from 16.8-16.9 ft., moist, silty fine Sand layer (439.9) 16.9	SP 9	
17					(16.9-18.3 ft.) Stiff, grayish black (N2), CLAY, trace organics consisting of fine roots, NR, damp, (CL), (LOESS) (438.5) 18.3		
18	3 4 5 3	1.5'/2.0' (75%)			(18.3-20.3 ft.) Stiff, olive gray (5Y 4/1), CLAYEY SILT, trace very fine Sand, NR, damp to moist, (CL-ML), (LOESS) (436.5) 20.3	SP 10	
19							
20	3 4 5 7	2.0'/2.0' (100%)			(20.3-24.5 ft.) Stiff, medium gray (N5), SILTY CLAY, NR, damp, (CL)	SP 11	
21					@ 21.7 ft. silty clay becomes moist		
22	1 3 3 3	2.0'/2.0' (100%)			@ 22.3 ft., thin wet zone (<1 inch)	SP 12	
23							
24	1 2 2 3	1.6'/2.0' (80%)			(432.3) 24.5 (24.5-26.0 ft.) Soft, olive gray (5Y 4/1), SILT, trace Clay, NR, wet, (ML), (LOESS) (430.8) 26.0	SP 13	
25							
26	3 9 19 20	1.2'/2.0' (60%)			(26.0-28.0 ft.) Compact, olive gray (5Y 4/1), SILTY fine SAND, NR, wet, (SM), (LOESS)	SP 14	@ 26.0 feet first groundwater encountered in borehole
27							
28	26 46 46 46	1.3'/2.0' (65%)			@ 28.0 ft., silty fine sand becomes very dense and color changes to dark yellowish brown (10YR 4/2) (28.0-46.0 ft.) Very dense to compact, dark yellowish brown (10YR 4/2), SILTY fine SAND, NR, wet, (SM), (ALLUVIAL)	SP 15	
29							

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-110-SS
	SAMPLING METHOD:	SHEET 3 OF 5
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					13:30	14:00
DATE					DATE	DATE
CASING DEPTH					3/13/95	3/14/95

NORTHING: 1068336.09
DATUM EASTING: 515919.72 ELEVATION 456.8

DRILL RIG SCHRAMM - ROTADRILL

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	26 49 >50	1.0'/2.0' (50%)			(28.0-46.0 ft.) Very dense to compact, dark yellowish brown (10YR 4/2), SILTY fine SAND, NR, wet, (SM), (ALLUVIAL)	SP (16)	
32 33	4 10 10 12	1.0'/2.0' (50%)				SP (17)	
34 35	21 50 >50	1.2'/2.0' (60%)				SP (18)	
36 37	7 7 15	1.1'/2.0' (55%)				SP (19)	
38 39	7 9 9	1.2'/2.0' (60%)				SP (20)	
40 41	6 18 30	1.4'/2.0' (70%)				SP (21)	
42 43	7 9 9	1.2'/2.0' (60%)			@ 42.0 ft., color changes to olive gray (5Y 4/1)	SP (22)	
44	7 11 12	0.7'/2.0' (35%)				SP (23)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 3/13/95

JOB NO.: 943-2848

FILENAME: PZ110SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-110-SS
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 4 OF 5
		DRILLING START TIME 13:30 DATE 3/13/95; FINISH TIME 14:00 DATE 3/14/95
DATUM NORTHING: 1068336.09 EASTING: 515919.72	ELEVATION 456.8	

WATER LEVEL					
TIME					
DATE					
CASING DEPTH					

DRILL RIG SCHRAMM - ROTADRILL

SURFACE CONDITIONS

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(28.0-46.0 ft.) Very dense to compact, dark yellowish brown (10YR 4/2), SILTY fine SAND, NR, wet, (SM), (ALLUVIAL) (410.8) 46.0	SP 23	
46	7 9 13	1.0' / 2.0' (50%)			(46.0-48.3 ft.) Compact, medium light gray (N6), fine to medium SAND, trace silt, trace fine Gravel, NR, wet, (SP), (ALLUVIAL)	SP 24	
47							
48	7 11 15	1.3' / 2.0' (65%)			(408.5) 48.3		
					(48.3-59.0 ft.) Compact, olive gray (5Y 4/1), SILTY fine SAND, trace fine Gravel, NR, wet, (SM), (ALLUVIAL)	SP 25	
49							
50	11 25 41	1.4' / 2.0' (70%)				SP 26	
51							
52	12 23 35	1.2' / 2.0' (60%)			from 52.0-52.5 ft., silty medium grained sand layer	SP 27	
53							
54	12 19 23	0.0' / 2.0' (0%)				SP 28	
55							
56	9 13 30	1.3' / 2.0' (65%)				SP 29	
57							
58	4 2 40	1.6' / 2.0' (80%)			(59.0-59.5 ft.) Very stiff, olive gray (5Y 4/1), CLAY, trace Silt, NR, moist, grayish black (N2), fibrous wood piece at 59.5 ft., (CL), (ALLUVIAL) (397.3) 59.5	SP 30	
59					(59.5-60.5 ft.) Hard, light olive gray (5Y 6/1), highly weathered LIMESTONE, SR, (BEDROCK), (ST. LOUIS LIMESTONE)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

CHK'D BY W. HERST

DATE 3/13/95

JOB NO.: 943-2848

FILENAME: PZ110SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-110-SS	
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 5 OF 5	
		DRILLING	
		START	FINISH
	WATER LEVEL	TIME	TIME
	TIME	13:30	14:00
	DATE	DATE	DATE
NORTHING: 1068336.09 DATUM EASTING: 515919.72 ELEVATION 456.8	CASING DEPTH	3/13/95	3/14/95
DRILL RIG SCHRAMM - ROTADRILL	SURFACE CONDITIONS		
ANGLE BEARING			
SAMPLE HAMMER			

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
	50	0.5'/0.5' (100%)			(59.5-60.5 ft.) Hard, light olive gray (5Y 6/1), highly weathered LIMESTONE, SR, (BEDROCK), (ST. LOUIS LIMESTONE) (396.3) 60.5	SP	31	
61					End of Soil Borehole Log at 60.5 ft.			
62					See PZ-110-SS Record of Drillhole for rock descriptions			
63								
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY R. TILTON

DATE 3/13/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ110SS

RECORD OF DRILLHOLE PZ-110-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

B[redacted]THOD: NX Core & water
D[redacted]DATE: 3/24/95-3/25/95
DRI[redacted]G: CME 75

DAT[redacted]
COO[redacted]S N: 1068336.1
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 515919.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-60.0 ft. See Soil Borehole Log PZ-110-SS														
50															
52															
54															
56															
58															
60	396.80		396.80												
	60.0-70.4 ft. 60.00 Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE. (ST. LOUIS FORMATION) Calcite veins and crystals observed throughout core run		60.00						J,PL,SM						3/24/95 @ 15:25 Began coring Run 1
									J,I,R						
62	61.6-63.0 ft. Porous/vuggy (up to 2 mm.)			1	85%				J,I,R						
									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-110-[illegible]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

[illegible] METHOD: NX Core & water
[illegible] DATE: 3/24/95-3/25/95
DRILL RIG: CME 75

DAT[illegible]L
COO[illegible]ES N: 1068336.1
AZIMUTH: 0

COLLAR ELEV: 456.8
E: 515819.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	60.0-70.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Calcite veins and crystals observed throughout core run								J,I,R (3)						
									J,I,R						
									J,I,R						
									J,I,R						
66	65.0 ft. A 2 mm. pyrite layer														
				1	85%				J,I,R (2)						
									J,I,R						
	388.80 / 68.00														
68									Core Loss						Core Loss Reason unknown
			387.40 / 69.40												
	69.4-70.4 ft. Porous/vuggy, voids up to 3 mm., abundant veins of pyrite/calcite								J,I,R						3/24/95 @ 16:15 Began coring Run 2
70															
	70.4-70.9 ft. Light olive brown (5Y 4/4), Claystone								J,I,R						
	70.9-75.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Abundant 1-2 mm. pyrite veins, porous, some small <1 mm. calcite crystals, iron staining in places								J,I,R						
									J,I,R						
72									J,PL,SM (2)						
74				2	100 %				J,I,R						
									J,I,R						
	381.80 / 75.00														
	75.0-80.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Abundant pyrite crystals and calcite veins up to 3 mm., stylolites common								J,I,R (2)						
76									J,I,R (2)						
									J,I,R (3)						
78									J,I,R (3)						
									J,I,R						
			377.60 / 79.20						J,I,R						3/24/95 @ 17:15 Began coring Run 3
	79.7-80.8 ft. Highly weathered, Dolomitic Limestone with very large calcite crystals (up to 15 mm.)			3	100 %				J,I,R (2)						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-110-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible] THOD: NX Core & water
D[illegible] ATE: 3/24/95-3/25/95
DR[illegible] CME 75

DATU[illegible]
COOR[illegible] N: 1068336.1
AZIMU[illegible]

COLLAR ELEV: 456.8
E: 515919.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	79.7-80.8 ft. Highly weathered, Dolomitic Limestone with very large calcite crystals (up to 15 mm.) 376.00 / 80.80								J,I,CL						
									J,I,CL						
									J,I,R						
	80.8-93.4 ft. Slightly weathered, thickly bedded, olive gray (5Y 4/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,I,R						
82	Stylolitic, some pyrite crystals in clay filled joints, abundant argillaceous partings								J,I,CL						
									J,I,CL						
									J,I,R						
84									J,I,R						
				3	100 %				J,I,CL (2)						
									J,I,R						
									J,I,R						
86									J,I,R						
	87.0-89.4 ft. Interbedded layers of Argillaceous Limestone and Arenaceous Limestone								J,I,CL						
88															
			367.60 / 89.20												3/25/95 @ 8:15 Began coring Run 4
	89.2-90.8 ft. Abundant calcite veins (1-2 mm.) and abundant pyrite crystals								J,I,R (2)						
90									J,I,R						
									J,I,CL						
	90.7-92.8 ft. Fossiliferous with abundant argillaceous partings								J,I,CL						
									J,I,R						
									J,I,CL						
92									J,I,R						
				4	100 %				J,I,R (2)						
	93.4-98.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few calcite veins and some calcite crystals Few interbedded layers of Dolomitic Limestone								J,PL,SM						
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-110-SS

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible] ETHOD: NX Core & water
D[illegible] ATE: 3/24/95-3/25/95
DR[illegible] CME 75

DAT[illegible]
COO[illegible] N: 1068336.1
AZIMU[illegible]

COLLAR ELEV: 456.8
E: 515919.7
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP w/r CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	93.4-98.4 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Few calcite veins and some calcite crystals Few interbedded layers of Dolomitic Limestone			4	100 %										
98	98.4-112.8 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), fine grained, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common		357.60 / 99.20						J,I,CL; J,I,R						3/25/95 @ 9:10 Began coring Run 5
100	99.7-102.0 ft. Abundant calcite crystals up to 3 mm. 100.4-100.7 ft. Argillaceous partings								J,I,R; J,I,CL (3); J,I,R						
102									J,I,R (2)						
104	103.6-107.5 ft. Slightly weathered Limestone			5	99%				J,I,R; J,PL,SM						
106	104.8-106.8 ft. Abundant pyrite and quartz veins up to 2 mm. 105.0-109.0 ft. Few calcite veins <2 mm., but large (5-10 mm.) calcite crystals								J,I,CL; J,I,R; J,I,R (3)						
108			347.60												
	End of Record of Drillhole at 109.2 ft.		109.20												
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D. Hollow Stem Auger	F-1-D
		SHEET 1 OF 6
	SAMPLING METHOD: Split Spoon	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2		DRILLING
		START / FINISH
	WATER LEVEL	TIME: unknown / TIME: unknown
	TIME	
	DATE	DATE: 8/5/90 / DATE: 8/8/90
NORTHING: 1068600 DATUM EASTING: 515805 ELEVATION ~459.0	CASING DEPTH	

DRILL RIG	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
1					(0.0-5.0 ft.) Top 4 ft., dark yellowish brown (10YR 4/4), lean CLAY with sand, some silt and little gravel, (FILL) Botton 1 ft., dark gray (5Y 6/1), SILT, with some black colored intermixing			
2								
3								
4								
5					(5.0-10.0 ft.) Intermixed gray silt (as above) with gravel, sand, and some clay, (FILL)			
6								
7								
8								
9								
10					(10.0-15.0 ft.) Mottled dark gray (5Y 4/1), greenish gray (5BG 5/1) and dark yellowish brown (10YR 4/4), lean CLAY, with some silt			
11								
12								
13								
14								

DRILLING CONTR UNKNOWN

LOGGED BY FOTH & VAN DYKE & ASSOCIATES, INC.

DATE 7/17/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: F1D

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MQ WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	F-1-D
	SAMPLING METHOD: Split Spoon	SHEET 2 OF 6
		DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					unknown	unknown
DATE					DATE	DATE
CASING DEPTH					8/5/90	8/8/90

NORTHING: 1068600
DATUM EASTING: 515805 ELEVATION ~459.0

DRILL RIG	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(15.0-20.0 ft.) Same as above with increasing silt content with depth			
16								
17								
18					(20.0-25.0 ft.) Top is dark gray (2.5Y 4/0), SILT, with little clay Bottom 2 ft., gray (5Y 4/1), very fine to fine, SAND stratified with darker layers,			
19								
20								
21								
22								
23								
24								
25					(25.0-30.0 ft.) Dark gray (5Y 4/1), fine to very fine SAND, a little coarser than above			
26								
27								
28								
29								

DRILLING CONTR UNKNOWN

LOGGED BY FOTH & VAN DYKE & ASSOCIATES, INC.

DATE 7/17/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: F1D

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	F-1-D
	SAMPLING METHOD: Split Spoon	SHEET 3 OF 6
		DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					unknown	unknown
DATE					DATE	DATE
CASING DEPTH					8/5/90	8/8/90

NORTHING: 1068600
DATUM EASTING: 515805 ELEVATION ~459.0

DRILL RIG	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(30.0-32.0 ft.) Same as above			
31								
32								
					(32.5-34.5 ft.) Same as above			
33								
34								
					(34.5-36.5 ft.) Gray (5Y 5/1), fine to very fine SAND, contains little gravel, up to 1/4 in. in dia. bottom 3 in.			
35								
36								
37								
					(37.5-39.5 ft.) Gray (5Y 5/1), fine to very fine SAND, very dense (without gravel)			
38								
39								
					(39.5-41.5 ft.) Same as above, but not as dense, although density seems higher than blow counts indicate			
40								
41								
42								
					(42.5-44.5 ft.) Gray (5Y 5/1), very fine to coarse, poorly graded SAND, with trace of fine gravel			
43								
44								
					(44.5-46.5 ft.) Same as above			

DRILLING CONTR UNKNOWN

LOGGED BY FOTH & VAN DYKE & ASSOCIATES, INC.

DATE 7/17/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: F1D

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	F-1-D
	SAMPLING METHOD: Split Spoon	SHEET 4 OF 6
		DRILLING

						START	FINISH
WATER LEVEL						TIME	TIME
TIME						unknown	unknown
DATE						DATE	DATE
CASING DEPTH						8/5/90	8/8/90

NORTHING: 1068600
DATUM EASTING: 515805 ELEVATION ~459.0

DRILL RIG	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(44.5-46.5 ft.) Same as above			
46								
47								
48								
49								
50					(49.5-51.5 ft.) Top is same as above Bottom 12 in., dark gray (5Y 4/1), very fine to fine SAND, with some very dark gray layers(?), stratified or intermixed (?)			
51								
52								
53								
54								
55					(54.5-56.5 ft.) Upper 3 1/2 in., very dark gray (2.5Y 3/0), lean CLAY, with some sand Bottom, very dark gray, very fine to coarse, stratified SAND, fine piece of wood			
56								
57								
58								
59					(59.5-61.5 ft.) Very dark gray (2.5Y 3/0), very fine to coarse, poorly graded SAND			

DRILLING CONTR UNKNOWN

LOGGED BY FOTH & VAN DYKE & ASSOCIATES, INC.

DATE 7/17/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: F1D

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	F-1-D
	SAMPLING METHOD: Split Spoon	SHEET 5 OF 6

						DRILLING START	DRILLING FINISH
WATER LEVEL						TIME	TIME
TIME						unknown	unknown
DATE						DATE	DATE
CASING DEPTH						8/5/90	8/8/90

DATUM NORTHING: 1068600 EASTING: 515805 ELEVATION ~459.0

DRILL RIG	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
61					(59.5-61.5 ft.) Very dark gray (2.5Y 3/0), very fine to coarse, poorly graded SAND			
62								
63								
64					(64.5-66.5 ft.) 2 in. very fine to fine, very dark gray SAND 2 in. very fine to fine, very dark gray SAND 3 in. very dark gray lean CLAY 1/2 in. fine GRAVEL, subrounded 1 in. very coarse to coarse, gray SAND Bottom, fine to very fine, very dark gray SAND			
65								
66								
67								
68								
69					(69.5-71.5 ft.) No recovery			
70								
71								
72					(74.5-76.5 ft.) Top is very dark to dark gray (2.5Y 3/0 to 4/0), medium to very fine SAND Middle 3 in., very fine to very coarse SAND with trace to little very fine gravel Bottom 7 in., is black to very dark gray (2.5Y 2/0 to 3/0), very fine to fine SAND, with silt and organics (black color)			
73								
74								

DRILLING CONTR UNKNOWN

LOGGED BY FOTH & VAN DYKE & ASSOCIATES, INC.

DATE 7/17/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: F1D

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	F-1-D
	SAMPLING METHOD: Split Spoon	SHEET 6 OF 6
		DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					unknown	unknown
DATE					DATE	DATE
CASING DEPTH					8/5/90	8/8/90

DATUM NORTHING: 1068600 EASTING: 515805 ELEVATION ~459.0

DRILL RIG	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
76					(74.5-76.5 ft.) Top is very dark to dark gray (2.5Y 3/0 to 4/0), medium to very fine SAND Middle 3 in., very fine to very coarse SAND with trace to little very fine gravel Bottom 7 in., is black to very dark gray (2.5Y 2/0 to 3/0), very fine to fine SAND, with silt and organics (black color)			
77								
78					(78.5-79.5 ft.) Fine to coarse, poorly graded GRAVEL, (round to angular), with very fine to coarse sand			
79								
					End of Soil Borehole Log at 79.5 ft.			
80					NOTE: Golder received faxed copy of original borehole log from Foth & Van Dyke. Golder re-typed log and this version may not exactly duplicate original due to format change and readibility of copy received by Golder.			
81								
82								
83								
84								
85								
86								
87								
88								
89								

DRILLING CONTR UNKNOWN

LOGGED BY FOTH & VAN DYKE & ASSOCIATES, INC.

DATE 7/17/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: F1D

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] METHOD: NX Core & water
D[illegible] DATE: 3/15/95-3/21/95
D[illegible] CME 75

DAT[illegible]L
CO[illegible]S N: 1068820.78
AZIM[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DISCONTINUITY DATA

SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	0.0-79.5ft. No sampling conducted See Foth & Van Dyke log F-1-D dated 9/1/90 79.5-80.0 ft. No samples collected														0.0-84.0 ft. Borehole advanced with 14 3/4 in. tricone bit using mud rotary, then 10 in. steel casing set in borehole to seal off saturated alluvial deposits. Extremely weathered bedrock encountered @ ~79.0 ft. and bedrock encountered @ 84.0 ft.
82															
84			374.60												
	84.6-86.8 ft. 84.60 Slightly weathered, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) 85.1-85.3 ft. Limestone 85.7 ft. Calcite crystals		84.60						Broken Zone J,U,SM J,PL,SM						3/15/95 @ 7:45 Began coring
86	372.40 86.8-91.5 ft. 86.80 Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)			1	96%										
88									J,PL,SM J,I,R J,PL,SM,CL						
			369.80 89.40						J,I,R						End core Run 1 @ 8:20
90	90.4-90.5 ft. Argillaceous partings								J,I,SM (2)						
	367.70 91.5-96.8 ft. 91.50 Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) 92.1-93.6 ft. Slightly porous/vuggy, some calcite crystals			2	100 %										
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

B[illegible] METHOD: NX Core & water
D[illegible] DATE: 3/15/95-3/21/95
D[illegible] CME 75

DAT[illegible]
COO[illegible] N: 1068620.78
AZIM[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96			362.40												
	96.8-99.5 ft. 96.80 Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, strong DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)			2	100 %				J,U,SM						
98									J,PL,SM						
	98.7-98.9 ft. Argillaceous partings								J,PL,SM,CL (2)						
			359.80												
	359.70 99.50 99.5-103.7 ft. Fresh, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Some calcite filled veins, pyrite crystals		99.40												End core Run 2 @ 9:20
100															
102															
	355.50 103.70 103.7-106.9 ft. Fresh, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Some stylolites, argillaceous partings			3	98%				J,I,SM,CL						
104															
106									J,I,R						
	106.9-110.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)														
108	108.1-108.5 ft. Slightly weathered, some stylolites, argillaceous partings								J,U,SM J,I,SM,CL (2)						
			349.80												
			109.40						J,I,SM (2)						
110	110.0-112.1 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)			4	100 %										End Core Run 3 @ 10:25
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[redacted] METHOD: NX Core & water
[redacted] DATE: 3/15/95-3/21/95
[redacted] CME 75

DAT[redacted]L
CO[redacted]S N: 1068620.78
AZIM[redacted]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
112	347.10 / 112.10 112.1-115.8 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, weak, ARGILLACEOUS DOLOMITE, (ST. LOUIS FORMATION)				J,I,SM	
114						
	343.40 / 115.80		4	100 %		
116	115.8-120.6 ft. Fresh, medium bedded, olive gray (5Y 4/1), fine grained, medium strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)					
118						
	119.0-119.4 ft. Some calcite filled vugs (<2 mm)	339.60				
	119.4-120.3 ft. Argillaceous, weak	119.40				
120						
	120.6-127.0 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystals				J,I,SM J,I,SM J,I,R J,PL,SM,CL	
122						
	123.0-127.0 ft. Thinly laminated argillaceous partings				J,U,SM,CL	
			5	98%	J,PL,SM	
124						
					J,PL,SM	
					J,PL,SM J,I,R	
126						
	127.0-136.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine to medium grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) / 332.20 / 127.00					127.0 ft. Inferred top of SALEM FORMATION encountered
128	127.0-128.5 ft. Numerous chert zones					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

DRILLING METHOD: NX Core & water
DATE: 3/15/95-3/21/95
RIG: CME 75

DATUM: MSL
COORDINATES N: 1068820.78
E: 515850.23
AZIMUTH: 0

COLLAR ELEV: 459.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	127.0-136.9 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine to medium grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION)			5	98%										
			329.80 / 129.40												
130															
								60	J,PL,SM						
132								90	J,I,SM (2)						
								60	J,I,SM (2)						
134	134.4-135.4 ft. Chert zones (<1/2 in. thick)			6	99%										
								90	B,P,SM (2)						
136	136.9-144.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 322.00														
	137.2-137.7 ft. 137.20 ARGILLACEOUS DOLOMITE layer							90	J,I,R,CL						
	137.0 ft. Stylolites							60	J,PL,R						
138	138.0-139.4 ft. Numerous stylolites							90	J,I,SM,CL						
								60	J,I,R						
	139.4-141.8 ft. Four chert zones (1-5 in. thick)		319.80 / 139.40					60	B,PL,SM						139.4-141.8 ft. Very slow drilling
140								90	J,I,SM (2)						
				7	100 %										3/15/95 @ 15:00 Stop drilling for the day 3/20/95 @ 7:30 Began Run 8
			317.40 / 141.80												
142								90	B,I,R						
								90	B,U,SM						
	142.9 and 143.8 ft. Light olive gray (5Y 6/1), arenaceous DOLOMITE layers (<4 in. thick)			8	92%			60	J,I,R						
144															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] METHOD: NX Core & water
D[illegible] DATE: 3/15/95-3/21/95
D[illegible] CME 75

DATU[illegible]
COO[illegible] N: 1068620.78
AZIM[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
144	314.90	314.90	8	92%		
	144.3-147.5 ft. 144.30 Fresh, thinly bedded, olive gray (5Y 4/1), fine grained, strong, CHERT, (SALEM FORMATION) Arenaceous	144.30			J,I,SM	
146	146.5 and 146.8 ft. Thin olive gray (5Y 4/1), arenaceous Dolomite layers (<3 in. thick)		9	100 %	J,I,R	
	311.70 147.5 147.50 147.5-157.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) Some chert nodules (5-10 mm. dia.), some thin chert layers (<2 in. thick)				J,I,R J,I,R	
148		309.90 149.30				
	149.3-149.6 ft. Chert layers 149.7 ft. Coarse calcite crystals (<1/2 in. dia.)				B,PL,SM B,I,R	
150						
152					J,I,R (2) J,I,SM	
	152.5-153.5 ft. Porous zone, open vugs (<1 in. dia.)					
	153.4 and 154.2 ft. Chert layers (<5 in.)				J,C,SM	
154			10	100 %		
156	155.8 and 156.9 ft. Chert layers (<5 in.)				J,I,R	
					J,I,R J,I,R	
	157.5-174.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) Few chert nodules, (~5 mm.), scattered chert (thin layers of chert <3 mm.)				J,PL,SM J,PL,SM	
158		299.70 159.50				
	159.5-159.8 ft. Chert layer		11	100 %		
160						

GRAPHIC LOG | WEATHERING INDEX (SW FR, MW, HW, CW) | STRENGTH INDEX (R6, R5, R4, R3, R2, R1) | POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6) | TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOR[illegible] METHOD: NX Core & water
D[illegible] ATE: 3/15/95-3/21/95
D[illegible] CME 75

DAT[illegible] GL
CO[illegible] S N: 1068820.78
AZIM[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	157.5-174.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (SALEM FORMATION) Few chert nodules, (~5 mm.), scattered chert (thin layers of chert <3 mm.)							90	J,PL,SM (3)						Most fractures observed are characterized as drill induced
162	160.5-160.7 ft. Chert layer 161.5-161.7 ft. Chert layer			11	100 %										
	163.3-163.6 ft. Calcite crystals layer (large crystals)							90	J,I,R (2)						
164								60	J,I,R						
			294.70 / 164.50												
	294.20 / 165.00														
	165.0-167.0 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)														165.1-169.5 ft. 4-6 breaks per foot that were drill incuded
166															
168				12	100 %										
170	Scattered chert clasts throughout the sample 170.0-171.5 ft. Zone showing moderate porosity, open vugs (<2 mm.)														
172	172.8-173.2 ft. Conglomerate limestone with shale fragments 173.2-174.5 ft. Abundant fossil fragments replaced by silica														
174			284.70 / 174.50												
	174.5-176.6 ft. Fresh, thickly bedded, pale olive (10Y 6/2), fine to medium crystalline, strong, ARGILACEOUS LIMESTONE, (SALEM FORMATION) Abundant fossil fragments			13	100 %										
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible] METHOD: NX Core & water
[illegible] DATE: 3/15/95-3/21/95
[illegible]: CME 75

DAT[illegible]L
CO[illegible]S N: 1068820.78
AZIM[illegible]0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
176	176.6-179.1 ft. Fresh, medium bedded, pale olive (10Y 6/2), fine to medium grained, strong, SILICEOUS LIMESTONE, (SALEM FORMATION) Abundant fossil fragments														
178															
180	179.1-184.5 ft. Fresh, thickly bedded, pale olive (10Y 6/2), fine to medium coarse, strong, ARENACEOUS LIMESTONE, (SALEM FORMATION) Abundant fossil fragments Some layers of grayish yellow (5Y 8/4), clay material			13	100 %										
182															
184			274.70 / 184.50												
186	184.5-188.5 ft. Fresh, medium bedded, yellowish gray (5Y 7/2), f-c grained, strong ARENACEOUS LIMESTONE, (SALEM FORMATION) Some fossil fragments, and some grayish yellow (5Y 2/4), clay material layers														
188				14	100 %										
190	188.5-194.5 ft. Slightly weathered, pale olive (10Y 6/2), medium bedded, very coarse, strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION) Few chert nodules, few stylolites in bottom 4 ft., abundant layers of grayish yellow (5Y 8/4) clay, fossiliferous								B,PL,SM B,PL,SM						Stopped drilling for the day
192															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] METHOD: NX Core & water
D[illegible] ATE: 3/15/95-3/21/95
D[illegible] CME 75

DATU[illegible]
COO[illegible] N: 1068820.78
AZIM[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
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SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/t CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	188.5-194.5 ft. Slightly weathered, pale olive (10Y 6/2), medium bedded, very coarse, strong, BIOCLASTIC LIMESTONE, (SALEM FORMATION) Few chert nodules, few stylolites in bottom 4 ft., abundant layers of grayish yellow (5Y 8/4) clay, fossiliferous			14	100 %						SW FR MW HW CW	R6 R5 R4 R3 R2 R1	R1 30 R2 150 R3 300 R4 600 R5 1500 R6		
194			264.70 / 194.50												3/21/95 @ 7:30 Water level = 20.1 ft. BGS
	194.5-197.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Few chert nodules stylolitic, abundant fossil fragments														
196															
	197.5-204.5 ft. Fresh, thinly bedded, light olive gray (5Y 4/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Few chert nodules, few stylolites, abundant fossil fragments and abundant layers of grayish yellow (5Y 8/4) clay throughout sample			15	100 %										
198															
200															
202															
204			254.70 / 204.50												
	204.5-210.8 ft. Fresh, thinly bedded, dark greenish gray (5GY 4/1), f-c grained, medium strong, LIMESTONE, (SALEM FORMATION) Few chert nodules, stylolites, few clay layers of a grayish yellow color, <3 mm. vugs, with calcite crystals			16	100 %										
206															
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]ETHOD: NX Core & water
DI[illegible]ATE: 3/15/95-3/21/95
DI[illegible] CME 75

DATU[illegible]
COO[illegible]N: 1068820.78
AZIMU[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
208	204.5-210.8 ft. Fresh, thinly bedded, dark greenish gray (5GY 4/1), f-c grained, medium strong, LIMESTONE, (SALEM FORMATION) Few chert nodules, stylolites, few clay layers of a grayish yellow color, <3 mm. vugs, with calcite crystals								
210		248.40							
	210.8-212.8 ft. Fresh, thickly bedded, dark greenish gray (5GY 4/1) to greenish black (5GY 2/1), very fine grained, weak, SILTSTONE, (WARSAW FORMATION)	210.80	16	100 %					210.8 ft. Encountered top of WARSAW FORMATION
212		248.40							
	212.8-219.7 ft. Fresh, thinly bedded, light olive gray, fine to coarse grained, medium strong, DOLOMITIC LIMESTONE, (WARSAW FORMATION) Fossiliferous, few chert nodules, stylolites	212.80							
214		244.70							
		214.50							
216			17	100 %					
218									3/21/95 @ 11:00 End Run 17 Drilling stopped until surface casing installed to top of WARSAW FORMATION
		239.50	239.50						
		219.70	219.70						
220	220.2-224.3 ft. Slightly weathered, thickly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, DOLOMITE, (WARSAW FORMATION)							J,PL,SM,CL	4/9/95 Borehole reamed out to 84.0 ft. with 14 3/4 in. tricone bit and mud rotary then 10 in. casing set in hole
222			18	100 %					4/9/95 6 in. steel casing set to 215.3 ft. and sealed with neat cement. A 10 in. air rotary bit was used to drill borehole.
								J,U,SM-calcite	4/22/95 @ 11:02 Begin drilling Run 18 with NX core
224									

WEATHERING INDEX: FR, SW, MW, HW, CW
STRENGTH INDEX: R6, R5, R4, R3, R2, R1
POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6
TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]ETHOD: NX Core & water
D[illegible]ATE: 3/15/95-3/21/95
DI[illegible] CME 75

DAT[illegible]
COO[illegible]S N: 1068620.78
AZIMU[illegible]0

COLLAR ELEV: 459.2
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INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
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DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
224	234.90												
	224.3-227.4 ft. 224.30 Fresh, thickly bedded, light brownish gray (5YR 6/1) to medium gray (N5), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Not porous, sandy, fine fossil debris, clast supported							J,I,SM					
226			18	100 %				J,U,SM,CL					
	231.80												
	227.4-231.6 ft. 227.40 Slightly weathered, thickly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, DOLOMITE, (WARSAW FORMATION) Porous-vuggy, crystallized, numerous calcite filled vugs and veins							J,I,R					
228		230.10											
		229.10											
230													
	227.60							J,I,R					
	231.6-233.3 ft. 231.60 Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Bioturbated												
232	233.3-236.1 ft. Fresh, thickly laminated, medium dark gray (N4), very fine grained, weak, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Bioturbated, almost Claystone							J,I,SM,CL					
234			19	100 %									
236	223.10												
	236.1-239.4 ft. 236.10 Fresh, thickly laminated to thinly bedded, medium gray (N5), very fine grained, medium strong, ARGILLACEOUS CALCAREOUS DOLOMITE, (WARSAW FORMATION) Stylolitic, greenish clay infilled vug and vein @ 238.6 ft.							J,PL,SM,CL					
238													
	239.4-243.5 ft. Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) Few stylolites, <0.1 ft. clay seams	220.10						J,PL,R-calcite					
		219.80 239.10						J,I,SM,CL					
		239.40	20	100 %									
240													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
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Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] METHOD: NX Core & water
D[illegible] DATE: 3/15/95-3/21/95
D[illegible] CME 75

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COLLAR ELEV: 459.2
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J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
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SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
240															
242															
	215.70														
244	243.5-244.0 ft. Fresh, thickly bedded, medium dark gray (N4), fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION) 243.50 / 215.20 / 244.00			20	100 %										
	244.0-250.3 ft. Fresh, thickly bedded, medium dark gray (N4), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION) 246.1-246.5 ft. Argillaceous Limestone, stylolitic								J,PL,SM,CL						
246															
248			210.00												
			249.20												
250															
	208.50														
252	250.7-251.3 ft. Fresh, thinly to thickly laminated, medium gray (N5), very fine grained, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION) 250.70 / 207.90 / 251.30								J,I,SM,CL						
	251.3-256.5 ft. Fresh, thickly bedded, medium light gray (N6) to light olive gray (5Y 2/1), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)			21	100 %										
254															
256	Fossil fragments at 255.6 ft., few Clay partings, some porosity, vugs in lower 2 in.								J,I,SM						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOR[illegible]ETHOD: NX Core & water
DR[illegible]TE: 3/15/95-3/21/95
DR[illegible] CME 75

DATU[illegible]
COOR[illegible]N: 1068820.78
AZIMU[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
256									J,I,R,CL						
	202.70														
	256.5-260.1 ft. 258.50 Slightly weathered, thickly bedded, medium gray (N5), very finely crystalline, medium strong, ARGILLACEOUS DOLOMITE, (WARSAW FORMATION)			21	100 %				J,PL,SM,CL						
258															
	Some porosity, large vug @ 258.8 ft., some smaller vugs elsewhere, some calcite filled, black organic laminae		200.10 / 259.10												4/22/95 @ 17:45 End Run 21 Quit drilling for the day 4/23/95 @ 7:30 Begin Run 22
260	260.1-265.5 ft. Fresh, thinly to thickly laminated, greenish black (5GY 2/1), very fine grained, weak, DOLOMITIC SILTSTONE, (WARSAW FORMATION)								J,I,SM,CL						
262															
264				22	98%										
	193.70								J,PL,SM,CL						
	265.5-269.0 ft. 265.50 Fresh, thickly bedded, medium light gray (N6) to light olive gray (5Y 6/1), coarse grained, medium strong, FOSSILIFEROUS LIMESTONE, (WARSAW FORMATION)														
266															
268															
	190.20		190.10 / 269.10												
	269.0-272.8 ft. 269.00 Fresh, thickly laminated to thinly bedded, medium dark gray (N4), very fine grained, medium strong, DOLOMITIC SILTSTONE, (WARSAW FORMATION) Abundant 0.1-0.4 ft. interbeds of coarse crystalline arenaceous Dolomite			23	98%				J,PL,SM,CL						
270															
272															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] METHOD: NX Core & water
D[illegible] DATE: 3/15/95-3/21/95
D[illegible] CME 75

DAT[illegible]L
CO[illegible]S N: 1068620.78
AZIM[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
272								J,PL,SM,CL					
	188.40												
	272.8-274.0 ft. 272.80 Fresh, thickly laminated, greenish black (5GY 2/1), very fine grained, weak, CLAYSTONE, (WARSAW FORMATION) 185.20							J,PL,SM,CL (2)					
274	274.0-290.2 ft. 274.00 Fresh, thickly laminated to medium bedded, medium light gray (N6) to medium dark gray (N4), vf-m grained, weak to medium strong, SILTSTONE, (WARSAW FORMATION) Calcite filled vugs, interbeds of Silty to Sandy Dolomitic Siltstone		23	98%				J,U,SM,CL					
276													
278													
		180.20 / 279.00											
280													
282			24	100 %									
284								J,I,SM					
286													
288													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DA[illegible]TE: 3/15/95-3/21/95
DR[illegible] CME 75

DATU[illegible]
COOR[illegible]N: 1068620.78
AZIMU[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
288	274.0-290.2 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6) to medium dark gray (N4), vf-m grained, weak to medium strong, SILTSTONE, (WARSAW FORMATION) Calcite filled vugs, interbeds of Silty to Sandy Dolomitic Siltstone		170.30	24	100 %										
			288.90	25	100 %										
290	169.00		169.00												
	290.2-293.7 ft. Fresh, thickly laminated to thinly bedded, medium gray (N5), finely crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION) Dark gray (N3) argillaceous laminae, bioturbated		290.20												
292	165.50														
294	293.7-295.2 ft. Fresh, thinly laminated, medium dark gray (N8), very fine grained, weak, SILTSTONE, (WARSAW FORMATION)			26	100 %										
	293.70 / 164.00														
296	295.2-306.8 ft. Fresh, thickly laminated to thinly bedded, medium gray (N5), finely crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION) Argillaceous laminae, no porosity		295.20						J,U,SM						
298			160.20												
			299.00												
300				27	100 %										
302	302.8-303.6 ft. Fossiliferous Dolomite interbed														
304															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-KS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] ETHOD: NX Core & water
D[illegible] ATE: 3/15/95-3/21/95
D[illegible] CME 75

DAT[illegible]
CO[illegible] S N: 1068620.78
AZIM[illegible]

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
304	295.2-306.8 ft. Fresh, thickly laminated to thinly bedded, medium gray (N5), finely crystalline, medium strong, ARENACEOUS DOLOMITE, (WARSAW FORMATION) Argillaceous laminae, no porosity												
306			27	100 %									
	152.40 / 306.80 306.8-315.2 ft. Fresh, thickly laminated to thinly bedded, very light gray (N8) to dark greenish gray (5GY 4/1), f-m grained, medium strong, FOSSILIFEROUS LIMESTONE and DOLOMITIC SILTSTONE, (WARSAW FORMATION) Interbedded fossiliferous beds and shaley beds												
308		150.30 / 308.90											
310													
								J,PL,SMC,L					
312								J,PL,SM,CL					
								J,PL,SM,CL					
314			28	100 %									
	315.2-328.7 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6) to olive gray (5Y 4/1), ? to medium sand, medium strong, FOSSILIFEROUS LIMESTONE and CALCAREOUS SILTSTONE, (WARSAW FORMATION)							J,PL,SM					
316													
318													4/23/95 @ 15:02 End Run 28 Quit drilling for the day 4/24/95 @ 12:00 Begin Run 29
								J,PL,SM,CL					
		140.10 / 319.10											
			29	100 %									
320													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 8/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
320	315.2-328.7 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6) to olive gray (5Y 4/1), medium sand, medium strong, FOSSILIFEROUS LIMESTONE and CALCAREOUS SILTSTONE, (WARSAW FORMATION)							J,PL,R					
322	Calcareous Shale interbeds <0.1-0.5 ft. thick, some lithographic textures, commonly silicified												
324			29	100 %									
326													
328	328.7-330.8 ft. Fresh, thickly laminated, light gray (N7) to light olive gray (5Y 6/1), clay sized to coarse silt sized, medium strong, ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Chert common, calcite vugs	130.10 / 329.10						J,I,SM,CL					
330	330.8-336.4 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6), clay sized to very coarse sand sized, medium strong, LITHOCLASTIC LIMESTONE and CALCAREOUS SILTSTONE, (WARSAW FORMATION) Interbedded <0.1-0.3 lithoclastic beds with clayey shales, silicification common, few stylolites												
332			30	100 %				J,I,R-open					
334													
336								J,U,SM					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
336	336.4-343.7 ft. Fresh, thickly laminated to medium bedded, medium light gray (N6), clay sized to very coarse sand sized, medium strong, ARENACEOUS LIMESTONE and ARGILLACEOUS LIMESTONE, (WARSAW FORMATION) Highly silicified, some lithographic textures			30	100 %				J,PL,SM						
338									J,U,SM,CL						
			120.10 / 339.10												
340															
342															
	115.50 / 343.70 343.7-368.8 ft. Fresh, thickly laminated to medium bedded, very light gray (N8) to medium light gray (N6), fine silt sized to coarse silt sized, medium strong, SILICEOUS LIMESTONE and ARENACEOUS LIMESTONE, (KEOKUK FORMATION) Diseminated chert abundant, calcareous dolomitic, silty Clay interbeds, differential compaction features			31	100 %										343.7 ft. Top of KEOKUK FORMATION encountered
344															
346									J,I,R						
348			110.60 / 348.60												
350	350.5-350.9 ft. Porous			32	100 %				J,I,R						
	351.6-363.8 ft. Porous, vuggy														
352															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068620.78
E: 515850.23
AZIMUTH: 0

COLLAR ELEV: 459.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
352	343.7-368.8 ft. Fresh, thickly laminated to medium bedded, very light gray (N8) to medium light gray (N6), fine silt sized to coarse silt sized, medium strong, SILICIOUS LIMESTONE and ARENACEOUS LIMESTONE, (KEOKUK FORMATION) Diseminated chert abundant, calcareous dolomitic, silty Clay interbeds, differential compaction features														
354				32	100 %										
356															
358									J,I,R (2)						
			100.40 / 358.80												
									J,I,VR						
360									J,I,VR						
362									J,PL,VR						
				33	100 %				J,PL,R						
364									J,I,R						
366															
368															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 8/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-K

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2648
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/15/95-3/21/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068620.78
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515850.23
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE: DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
368				33	100 %										4/24/95 @ 18:45 End Run 33
	90.40		90.40												
	End of Record of Drillhole at 368.8 ft. 368.80		368.80												
370															
372															
374															
376															
378															
380															
382															
384															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: B. TILTON
DATE: 6/5/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 4/11/95
DRILL RIG: Schramm

DATUM:
COORDINATES N: 1068638.1
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515834.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

DEPTH SCALE (FEET)	ROCK TYPE: DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
192	0.0-199.9 ft. No sampling conducted See Record of Drillhole for PZ-111-KS														0.0-98.0 ft. On 4/10/95 borehole advanced with 9 7/8 in. bit using mud rotary then 6 in. steel casing grouted in annulas with neat cement, at 91.0 ft. component bedrock encountered
194															
196															
198															
	259.30		259.30												
200	199.9-209.9 ft. 199.90 Fresh, very thickly bedded, medium gray (N5), coarsely crystalline, medium strong, FOSSILIFEROUS LIMESTONE Upper 0.1 ft. abundantly fossiliferous		199.90						J,PL,SM (3)						4/11/95 @ 10:24 Began Run 1
202	Argillaceous, arenaceous, abundantly fossiliferous, few stylolites, few calcite filled vugs								J,PL,R						
204				1	99%										
206															
208															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: J. MILLER
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

RECORD OF DRILLHOLE PZ-111-S

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/11/95
DRILL RIG: Schramm

DATUM:
COORDINATES N: 1068638.1
AZIMUTH: 0

COLLAR ELEV: 459.2
E: 515834.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
208	199.9-209.9 ft. Fresh, very thickly bedded, medium gray (N5), coarsely crystalline, medium strong, FOSSILIFEROUS LIMESTONE Upper 0.1 ft. abundantly fossiliferous		249.30	1	99%										4/11/95 @ 12:08 End Run 1
	249.30														
210	End of Record of Drillhole at 209.9 ft.		209.90												
	209.90														
212															
214															
216															
218															
220															
222															
224															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: J. MILLER
CHECKED: B. TILTON
DATE: 5/24/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-112-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 3
		DRILLING START TIME 13:20 DATE 4/10/95; FINISH TIME 15:29 DATE 4/10/95
NORTHING: 1069002.00 DATUM EASTING: 515674.01 ELEVATION 457.9	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE VERTICAL BEARING		
SAMPLE HAMMER 140 lbs.		

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 2 7	1.1'/2.0' (55%)			(0.0-4.0 ft.) Loose to compact, moderate yellowish brown (10YR 5/4) to dark greenish gray (5G 4/1), SILT, trace fine Gravel, NR, damp, (ML), (FILL)	SP ①	
2	5 12 7 6	0.0'/2.0' (0%)				SP ②	
3					(453.9) 4.0		
4	6 50/6"	0.8'/2.0' (40%)			(4.0-8.5 ft.) Very dense, medium bluish gray (5GY 5/1), f-c SAND, trace of fine Gravel, SR, damp, (SP), (FILL)	SP ③	
5							
6					@ 5.0 ft., cobbles and rock encountered		Drilling very hard from 5.0-8.0 ft. Split Spoons not collected
7							
8	6 7 11 9	1.6'/2.0' (80%)			(449.4) 8.5		
9					(8.5-10.0 ft.) Waste	SP ④	
10					(447.9) 10.0		
	3 4 9 5	0.6'/2.0' (30%)			(10.0-10.6 ft.) Compact, medium bluish gray (5B 5/1), f-c SAND, trace of fine Gravel, SR, moist, (SP), (FILL) (447.3) 10.6		
11					(10.6-20.0 ft.) Waste	SP ⑤	
12	4 20 14 9	0.8'/2.0' (40%)				SP ⑥	
13							
14	3 3 8 18	0.2'/2.0' (10%)				SP ⑦	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CUSIN CHK'D BY W. HERST

DATE 5/31/95

JOB NO.: 943-2848

FILENAME: PZ112AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-112-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START TIME 13:20 DATE 4/10/95; FINISH TIME 15:29 DATE 4/10/95
NORTHING: 1069002.00 DATUM EASTING: 515674.01 ELEVATION 457.9	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE VERTICAL BEARING		
SAMPLE HAMMER 140 lbs.		

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	9 10 11 25	0.8'/2.0' (40%)			(10.6-20.0 ft.) Waste	SP 7	
17						SP 8	
18	50/5"	0.1'/2.0' (5%)				SP 9	
19					(437.9) 20.0		
20	5 3 3 3	1.5'/2.0' (75%)			(20.0-20.5 ft.) Firm, greenish black (5G 2/1), CLAYEY SILT, NR, damp, (CL-ML), (FILL) (437.4) 20.5	SP 10	
21					(20.5-22.0 ft.) Loose, medium light gray (N6), f-c SAND, NR, damp to moist, (SP), (FILL) (435.9) 22.0		
22	3 4 6 8	0.4'/2.0' (20%)			(22.0-24.0 ft.) Stiff, greenish black (5G 2/1), CLAYEY SILT, NR, wet, (CL-ML), (ALLUVIUM)	SP 11	First water encountered @ 23.0 ft.
23					(433.9) 24.0		
24	12 17 16 15	2.0'/2.0' (100%)			(24.0-26.0 ft.) Dense, dark greenish gray (5GY 4/1), fine SAND, NR, wet, (SP), (ALLUVIUM)	SP 12	
25					(431.9) 26.0		
26	4 2 3 7	1.8'/2.0' (90%)			(26.0-28.0 ft.) Loose, olive gray (5Y 4/1), CLAYEY fine SAND, NR, wet, (SC), (ALLUVIUM)	SP 13	
27					(429.9) 28.0		
28	3 3 10 21	1.3'/2.0' (65%)			(28.0-36.0 ft.) Compact to dense, olive gray (5Y 4/1), fine SAND, NR, wet, (SP), (ALLUVIUM)	SP 14	
29							

LOGGED BY S. COSID CHK'D BY W. HERST

DATE 5/31/95

JOB NO.: 943-2848

FILENAME: PZ112AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-112-AS
		SHEET 3 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					13:20	15:29
DATE					DATE	DATE
CASING DEPTH					4/10/95	4/10/95

NORTHING: 1069002.00
DATUM EASTING: 515674.01 ELEVATION 457.9

DRILL RIG CME 75 | SURFACE CONDITIONS

ANGLE VERTICAL BEARING

SAMPLE HAMMER 140 lbs.

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	10 30 50/6"	1.2'/2.0' (60%)			(28.0-36.0 ft.) Compact to dense, olive gray (5Y 4/1), fine SAND, NR, wet, (SP), (ALLUVIUM)	SP 15	
32 33	9 11 11 16	1.0'/2.0' (50%)			from 32.0-34.0 ft., sand becomes f-m grained	SP 16	
34 35	10 13 15 20	2.0'/2.0' (100%)			from 34.0-36.0 ft., sand becomes f-c grained	SP 17	
36					(421.9) 36.0 End of Soil Borehole Log at 36.0 ft.		
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CDSID CHK'D BY W. HERST

DATE 5/31/95

JOB NO.: 943-2848

FILENAME: PZ112AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-113-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 3
		DRILLING START TIME 11:07 DATE 4/11/95; FINISH TIME 14:55 DATE 4/11/95
NORTHING: 1069224.31 DATUM EASTING: 515747.72 ELEVATION 459.9	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE VERTICAL BEARING NA		
SAMPLE HAMMER 140 lbs.		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1, 2					(0.0-2.5 ft.) Asphalt (457.4) 2.5		
3	10 11 11	1.5'/1.5' (100%)			(2.5-4.0 ft.) Compact, light olive gray (5Y 6/1), CLAYEY GRAVEL, little f-c Sand, SR, damp, (GC), (FILL) (455.9) 4.0	SP 1	
4	6 10 11	1.7'/2.0' (85%)			(4.0-4.8 ft.) Compact, olive gray (5Y 4/1), SILTY fine SAND, mottled NR, damp, (SM), (FILL) (455.1) 4.8	SP 2	
5	13				(4.8-10.0 ft.) Stiff, mottled, light olive gray (5Y 6/1) to greenish black (5GY 2/1), CLAYEY SILT, mottled, NR, damp, (CL-ML), (LOESS)		
6	5 8 7	1.7'/2.0' (85%)				SP 3	
7	9						
8	2 3 5	1.2'/2.0' (60%)				SP 4	
9	6				(449.9) 10.0		
10	3 3 3	1.4'/2.0' (70%)			(10.0-18.0 ft.) Loose, light olive gray (5Y 4/1), mottled SILT, NR, damp, (ML), (LOESS)	SP 5	
11	4						
12	3 2 3	1.3'/2.0' (65%)				SP 6	
13	6						
14	4 3 3 3	1.3'/2.0' (65%)				SP 7	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERSI

DATE 1/25/95

JOB NO.: 943-2848

FILENAME: PZ113AS

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-113-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START TIME 11:07 DATE 4/11/95; FINISH TIME 14:55 DATE 4/11/95
NORTHING: 1069224.31 DATUM EASTING: 515747.72 ELEVATION 459.92	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE VERTICAL BEARING NA		
SAMPLE HAMMER 140 lbs.		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 1/25/95

JOB NO.: 943-2848

FILENAME: PZ113AS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(10.0-18.0 ft.) Loose, light olive gray (5Y 4/1), SILT, mottled, NR, damp, (ML), (LOESS)	SP 7	
16	2 2 2 3	1.6'/2.0' (80%)					
17						SP 8	
					(441.9) 18.0		
18	1 2 4 2	2.0'/2.0' (100%)			(18.0-21.3 ft.) Firm to soft, dark greenish gray (5GY 4/1), mottled CLAYEY SILT, NR, moist, (CL-ML), (ALLUVIUM)		
19						SP 9	
20	0 0 3 6	2.0'/2.0' (100%)					
21						SP 10	
					(438.6) 21.3		
					(21.3-26.2 ft.) Firm to stiff, greenish black (5GY 2/1), CLAY, NR, moist, (CH), (ALLUVIUM)		
22	5 6 8 9	1.6'/2.0' (80%)					
23						SP 11	
24	2 3 4 8	1.9'/2.0' (95%)					First water encountered @ 24.5 ft.
25						SP 12	
26	7 9 12 14	2.0'/2.0' (100%)					
					(433.7) 26.2		
					(26.2-40.0 ft.) Compact to dense, dark greenish gray (5GY 4/1), fine SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)		
27						SP 13	
28	8 11 11 18	1.8'/2.0' (90%)					
29						SP 14	

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	BORING NO. PZ-113-AS SHEET 3 OF 3

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME 11:07	TIME 14:55
TIME						
DATE					DATE 4/11/95	DATE 4/11/95
CASING DEPTH						

NORTHING: 1069224.31
DATUM EASTING: 515747.72 ELEVATION 459.92

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE VERTICAL BEARING NA
SAMPLE HAMMER 140 lbs.
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	10 14 18 21	1.8' / 2.0' (90%)			(26.2-40.0 ft.) Compact to dense, dark greenish gray (5GY 4/1), fine SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP 15	
32 33	8 12 17 15	1.2' / 2.0' (60%)			from 32.0-34.0 ft., color changes to pale yellowish brown (10YR 6/2)	SP 16	
34 35	8 10 15 16	2.0' / 2.0' (100%)			from 34.0-34.5 ft., sand becomes fine to medium grained	SP 17	
36 37	6 7 7 10	1.9' / 2.0' (95%)			from 37.5-38.0 ft., some coarse sand	SP 18	
38 39							from 38.0-40.0 ft., unable to collect split spoon samples due to heaving sands
40					(419.9) 40.0 End of Soil Borehole Log at 40.0 ft.		
41 42 43 44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 1/25/95

JOB NO.: 943-2848

FILENAME: PZ113AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger 40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)	BORING NO. PZ-113-AD SHEET 1 OF 7
	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)	DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	START TIME 11:03, DATE 4/26/95 FINISH TIME 15:50, DATE 4/27/95
DATUM NORTHING: 1069233.33 EASTING: 515759.85 ELEVATION 459.9		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Paved road	
ANGLE VERTICAL BEARING NA		
SAMPLE HAMMER 140		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-20.0 ft.) No samples collected, see Soil Borehole Log PZ-113-AS for descriptions		
16							
17							
18							
19							
20 (439.9)							
	2 5 9	0.9'/1.5' (60%)			(20.0-27.0 ft.) Stiff, olive gray (5Y 4/1), SILTY CLAY, trace very fine Sand, NR, moist, (CH), (ALLUVIUM)	SP 1	
21							
22	6 8 13	1.0'/1.5' (67%)				SP 2	
23	5 7 7	1.5'/1.5' (100%)				SP 3	
24							
25	2 7 7	1.3'/1.5' (87%)				SP 4	
26	4 6 8	1.2'/1.5' (80%)				SP 5	
27 (432.9)					(27.0-40.0 ft.) Compact, dark greenish gray (5GY 4/1), fine SAND, some Clay, NR, wet, (SC), (ALLUVIUM)		
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 6/21/95

CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger				PZ-113-AD
	40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)				SHEET 2 OF 7
	SAMPLING METHOD:				
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)				DRILLING
	SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)				START / FINISH
	WATER LEVEL				TIME 11:03 / TIME 15:50
	TIME				
	DATE				DATE 4/26/95 / DATE 4/27/95
NORTHING: 1069233.33 DATUM EASTING: 515759.85 ELEVATION 459.9	CASING DEPTH				

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Paved road
ANGLE VERTICAL BEARING NA	
SAMPLE HAMMER 140	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(27.0-40.0 ft.) Compact, dark greenish gray (5GY 4/1), fine SAND, some Clay, NR, wet, (SC), (ALLUVIUM)		
31							
32							
33							
34							
35							
36							
37							
38							
39							
40					(419.9) 40.0		
	4 8 9	0.5' 1.5' (33%)			(40.0-41.5 ft.) Compact, light brown (5YR 5/6) to pale yellowish brown (10YR 6/2), medium SAND, trace very fine Sand, NR, wet, (SP), (ALLUVIUM)	SP 6	
41					(418.4) 41.5		
42	6 6 8	0.3' 1.5' (17%)			(41.5-44.0 ft.) Compact, light brown (5YR 5/6) to light brown (5YR 6/4), fine GRAVEL, NR, wet, (GW), (ALLUVIUM)	SP 7	
43	4 7 11 13	0.9' 2.0' (45%)			(415.9) 44.0	SP 8	
44					(44.0-48.5 ft.) Compact, dark yellowish brown (10YR 4/2), medium SAND, trace coarse Sand, trace fine Sand, NR, wet, (SP), (ALLUVIUM)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger 40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)	PZ-113-AD
	SAMPLING METHOD:	SHEET 3 OF 7
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					11:03	15:50
DATE					DATE	DATE
CASING DEPTH					4/26/95	4/27/95

NORTHING: 1069233.33
DATUM EASTING: 515759.85 ELEVATION 459.9

DRILL RIG CME 75 - TRUCK MOUNT
SURFACE CONDITIONS Paved road
ANGLE VERTICAL BEARING NA
SAMPLE HAMMER 140

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	5 6 9 2	0.7'/2.0' (35%)			(44.0-48.5 ft.) Compact, dark yellowish brown (10YR 4/2), medium SAND, trace coarse Sand, trace fine Sand, NR, wet, (SP), (ALLUVIUM)	SP 9	
47	8 13 15 19	1.1'/2.0' (55%)				SP 10	
48					(48.5-49.5 ft.) Compact, olive gray (5Y 4/1), fine SAND, some medium Sand, NR, wet, (SP), (ALLUVIUM)		
49	10 10 10 11	0.9'/2.0' (45%)			(49.5-53.0 ft.) Compact, olive gray (5Y 4/1), medium SAND, trace fine Sand, trace coarse Sand and fine Gravel, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP 11	
50							
51	6 7 9 7	0.9'/2.0' (45%)				SP 12	
52							
53					(406.9) 53.0		
53	3 6 5 6	0.9'/2.0' (45%)			(53.0-61.5 ft.) Compact, olive gray (5Y 4/1), medium SAND, little Sand, trace fine Gravel, trace fine Sand and Silt, NR, wet, (SW), (ALLUVIUM)	SP 13	
54							
55	6 4 5 6	0.9'/2.0' (45%)				SP 14	
56							
57	4 4 5 6	0.9'/2.0' (45%)				SP 15	
58							
59	5 6 6 7	1.0'/2.0' (50%)				SP 16	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger	PZ-113-AD
	40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)	SHEET 4 OF 7
	SAMPLING METHOD:	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)	START / FINISH
	WATER LEVEL	TIME 11:03 / TIME 15:50
	TIME	
	DATE	DATE 4/26/95 / DATE 4/27/95
NORTHING: 1069233.33 DATUM EASTING: 515759.85 ELEVATION 459.9	CASING DEPTH	

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Paved road
ANGLE VERTICAL BEARING NA	
SAMPLE HAMMER 140	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(53.0-61.5 ft.) Compact, olive gray (5Y 4/1), medium SAND, little Sand, trace fine Gravel, trace fine Sand and Silt, NR, wet, (SW), (ALLUVIUM)	SP (16)	
61	6 10 10 12	0.9'/2.0' (45%)			(398.4) 61.5		
62					(61.5-65.0 ft.) Compact, dark greenish gray (5GY 4/1), >95% fine to medium grained subrounded SAND, <5% Silt, NR, saturated, (SP), (ALLUVIUM), grades finer	SP (17)	
63	10 20 27 45	1.2'/2.0' (60%)				HD (18)	
64							
65		1.7'/2.0' (85%)			(65.0-92.0 ft.) Compact to very dense, dark greenish gray (5GY 4/1), 75% fine SAND, 20% medium Sand, 5% Silt, NR, saturated, (SP), (ALLUVIUM)	SP (19)	
66							
67	7 20 25 28	0.9'/2.0' (45%)				SP (20)	
68							
69	10 15 26 26	1.4'/2.0' (70%)				HD (21)	
70							
71	8 10 14 22	1.2'/2.0' (60%)				SP (22)	
72							
73	6 10 13 17	1.2'/2.0' (60%)				SP (23)	
74							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger 40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)	PZ-113-AD
	SAMPLING METHOD:	SHEET 5 OF 7
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					11:03	15:50
DATE					DATE	DATE
CASING DEPTH					4/26/95	4/27/95

NORTHING: 1069233.33
DATUM EASTING: 515759.85 ELEVATION 459.9

DRILL RIG CME 75 - TRUCK MOUNT
SURFACE CONDITIONS Paved road
ANGLE VERTICAL BEARING NA
SAMPLE HAMMER 140

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
76	17 25 35 36	1.1'/2.0' (55%)			(65.0-92.0 ft.) Compact to very dense, dark greenish gray (5GY 4/1), 75% fine SAND, 20% medium Sand, 5% Silt, NR, saturated, (SP), (ALLUVIUM)	HD (24)	
77	17 25 34 39	1.8'/2.0' (90%)				HD (25)	
78							
79	22 28 28 31	1.3'/2.0' (65%)				SP (26)	
80							
81	15 24 24 36	1.2'/2.0' (60%)				SP (27)	
82							
83	20 48 48 60	1.5'/2.0' (75%)				HD (28)	
84							
85	12 24 34 38	1.0'/2.0' (50%)				SP (29)	
86							
87	18 22 32 50+	1.2'/2.0' (60%)				SP (30)	
88							
89	48 50	0.6'/0.8' (75%)				HD (31)	

DRILLING CONTR LAYNE-WESTERN
LOGGED BY J. MILLER
DATE 6/21/95
CHK'D BY W. HERST
JOB NO.: 943-2848
FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger	PZ-113-AD
	40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)	SHEET 6 OF 7
	SAMPLING METHOD:	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	11:03 / 15:50
	DATE	DATE / DATE
NORTHING: 1069233.33 DATUM EASTING: 515759.85 ELEVATION 459.9	CASING DEPTH	4/26/95 / 4/27/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Paved road
ANGLE VERTICAL BEARING NA	
SAMPLE HAMMER 140	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
91					(65.0-92.0 ft.) Compact to very dense, dark greenish gray (5GY 4/1), 75% fine SAND, 20% medium Sand, 5% Silt, NR, saturated, (SP), (ALLUVIUM)		
92					(367.9) 92.0 (92.0-108.3 ft.) Dense, dark greenish gray (5GY 4/1), fine to coarse subrounded to well rounded SAND, NR, saturated, (SW), (ALLUVIUM)		
93							
94	10 15 20 22	1.0'/1.0' (100%)				SP (32)	
95							
96							
97							
98							
99	9 13 17 23	1.1'/2.0' (55%)				SP (33)	
100							
101							
102							
103							
104	10 11 14 12	0.6'/2.0' (30%)				SP (34)	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ113AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	0.0-40.0 ft.: 4.25 inch I.D. Hollow Stem Auger 40.0-108.3 ft.: 3.875 inch Mud Rotary (Tricone)	PZ-113-AD
	SAMPLING METHOD:	SHEET 7 OF 7
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SPLIT SPOON: 3.0 inch O.D./.375 inch I.D. (HD)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					11:03	15:50
DATE					DATE	DATE
CASING DEPTH					4/26/95	4/27/95

DATUM NORTHING: 1069233.33 EASTING: 515759.85 ELEVATION 459.9

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Paved road

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
106					(92.0-108.3 ft.) Dense, dark greenish gray (5GY 4/1), fine to coarse subrounded to well rounded SAND, NR, saturated, (SW), (ALLUVIUM)	SP (34)		
107								
108					(351.6) 108.3			
109					End of Soil Borehole Log at 108.3 ft. See PZ-113-AD Record of Drillhole for rock descriptions			
110								
111								
112								
113								
114								
115								
116								
117								
118								
119								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ113AD

RECORD OF DRILLHOLE PZ-113-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 5/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069242.39
AZIMUTH: 0

COLLAR ELEV: 460.0
E: 515778.57
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	0.0-114.6 ft. See Soil Borehole Log PZ-113-AD														0.0-114.5 ft. Borehole advanced using 9 7/8 in. diameter mud rotary bit then 6 in. casing sealed in borehole with neat cement
114	345.40		345.40												
	114.6-120.2 ft. 114.60 Fresh, thickly to medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong LIMESTONE, (ST. LOUIS FORMATION) Trace fossils, trace silicious zones		114.60						J,PL,SM						5/9/95 @ 9:30 Began coring
									J,PL,R						
									J,PL,R						
116									J,C,R,CL						
									J,C,R,CL						
	117.1-118.5 ft. Increase grain size and clay fraction, medium light gray (N6)			1	71%				J,PL,R						
									J,PL,R,CL						
118															
	118.5-120.0 ft. Medium light gray (N6) to light gray (N7)								J,C,VR (3)						
									J,C,VR (2)						
									J,C,VR						
									J,ST,R (2)						5/9/95 @ 9:50 End of Run 1
			340.00						Core Loss						
120	120.2-142.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Scattered 1 in. thick chert nodules		120.00						J,PL,R (4)						
									J,PL,R (4)						
									J,PL,SM						
122									J,PL,R (3)						
									J,PL,R,CL						
									J,PL,SM (5)						
124				2	100 %				J,PL,SM						
									J,PL,SM						
126									J,PL,R						
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-113-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/9/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1069242.39
AZIMUTH: 0

COLLAR ELEV: 460.0
E: 515778.57
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	120.2-142.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Scattered 1 in. thick chert nodules	330.60	2	100 %	60 60 40 20	2 4 6 8 10		J,PL,R	FR SW MW HW CW	R6 R5 R4 R3 R2 R1	R1 30 R2 150 R3 300 R4 600 R5 1500 R6		5/9/95 @ 11:00 End of Run 2
130		129.40						B,PL,SM (4)					
								B,PL,SM					
132			3	100 %									
134	134.2-134.8 ft. Coarse grained	325.60											5/9/95 @ 11:50 End of Run 3
	134.8-135.4 ft. Occasional stylolites present, fine to medium grained	134.40											
136								J,C,SM					
								J,I,R					
138	137.8-139.1 ft. Silty Claystone interbedded with Limestone							J,PL,R					
			4	100 %				B,I,R,CL					
								B,PL,SM (3)					
140													
	141.4-142.3 ft. Chert zone							J,PL,SM					
142		317.70											
	142.3-159.4 ft. Fresh, thickly bedded, light olive gray (5Y 5/2) to pale yellowish brown (10YR 6/2), very fine grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) Scattered 1/2 in. -1 in. chert nodules, vuggy	142.30											142.3 ft. Inferred top of SALEM FORMATION encountered
144													5/9/95 @ 12:40 End of Run 4

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-113-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/9/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1069242.39
AZIMUTH: 0

COLLAR ELEV: 460.0
E: 515778.57
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	NOTES, WATER LEVELS, INSTRUMENTATION
144	142.3-159.4 ft. Fresh, thickly bedded, light olive gray (5Y 5/2) to pale yellowish brown (10YR 6/2), very fine grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) Scattered 1/2 in. - 1 in. chert nodules, vuggy	315.60 / 144.40	4	100 %					5/9/95 @ 12:40 End of Run 4
146									
148									
			5	99%					
150	149.7-150.2 ft. Increased percentage of Dolomite 150.2-150.7 ft. Chert zone								
152									
	152.9-155.5 ft. Fresh, thickly bedded, medium dark gray (N4), vf-f grained, medium strong, LIMESTONE, (SALEM FORMATION)								
154		305.60 / 154.40							5/9/95 @ 14:30 End of Run 5
	304.50								
156	155.5-155.8 ft. Fresh, thinly bedded, medium dark gray (N4), very weak, CLAYSTONE, (SALEM FORMATION) 155.50 / 304.20 / 155.80								
	155.8-159.4 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, strong, DOLOMITIC LIMESTONE with abundant chert nodules 157.0-159.4 ft. Scattered chert nodules		6	100 %				B,PL,SM (2) J,PL,R	
158									5/9/95 @ 15:40 Ended coring
	300.60	300.60							
	End of Record of Drillhole at 159.4 ft. 159.40	159.40							
160									

Graphic log: 142.3-159.4 ft. Fresh, thickly bedded, light olive gray (5Y 5/2) to pale yellowish brown (10YR 6/2), very fine grained, medium strong, DOLOMITIC LIMESTONE, (SALEM FORMATION) Scattered 1/2 in. - 1 in. chert nodules, vuggy; 149.7-150.2 ft. Increased percentage of Dolomite; 150.2-150.7 ft. Chert zone; 152.9-155.5 ft. Fresh, thickly bedded, medium dark gray (N4), vf-f grained, medium strong, LIMESTONE, (SALEM FORMATION); 155.5-155.8 ft. Fresh, thinly bedded, medium dark gray (N4), very weak, CLAYSTONE, (SALEM FORMATION); 155.8-159.4 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, strong, DOLOMITIC LIMESTONE with abundant chert nodules; 157.0-159.4 ft. Scattered chert nodules

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-114-AS
		SHEET 1 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 11:50 / TIME 12:40
NORTHING: 1069418.88 DATUM EASTING: 516768.25 ELEVATION 449.8		DATE 4/20/95 / DATE 4/20/95
DRILL RIG CME 75	SURFACE CONDITIONS Grassy	
ANGLE -90° BEARING NA		
SAMPLE HAMMER 140 lbs.		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 4 8 9	1.7'/2.0' (85%)			(0.0-2.0 ft.) Compact, dark yellowish brown (10YR 4/2), f-m SAND, some clayey Silt, NR, moist, (SM), (FILL) (447.8) 2.0	SP 1	
2 3	8 14 10 5	1.3'/2.0' (65%)			(2.0-4.0 ft.) Concrete, (FILL) (445.8) 4.0	SP 2	
4 5	2 7 7 5	1.3'/2.0' (65%)			(4.0-6.0 ft.) Loose, moderate gray (N5), moist, f-c subrounded SAND, some clayey Silt, (SM), (FILL), lower 0.3 ft. is concrete (443.8) 6.0	SP 3	
6 7	1 2 1 3	0.7'/2.0' (35%)			(6.0-8.0 ft.) Soft to firm, medium dark gray (N4) to olive gray (5Y 4/1), clayey SILT, some fine and medium Sand, trace subrounded coarse Sand, (ML), (FILL) (441.8) 8.0	SP 4	
8 9	2 2 3 3	0.7'/2.0' (35%)			(8.0-12.0 ft.) Soft, greenish black (5GY 2/1) to medium gray (N5), silty CLAY, little fine Sand, NR, moist, (CL), (FILL)	SP 5	
10 11	1 1 2 2	2.0'/2.0' (100%)				SP 6	
12 13	1 3 4 6	1.8'/2.0' (90%)			(12.0-15.5 ft.) Firm, medium dark gray (N4), SILTY CLAY, little fine Sand, NR, moist, (CL), (ALLUVIUM) below 14.0 ft., grades sandier with depth	SP 7	
14	1 3 4 2	1.9'/2.0' (95%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY CHK'D BY W. HERST

DATE 4/20/95

JOB NO.: 943-2848

FILENAME: PZ114AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-114-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 2
		DRILLING START TIME 11:50 / FINISH TIME 12:40
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE 4/20/95 / DATE 4/20/95
DATUM NORTHING: 1069418.88 EASTING: 516768.25	ELEVATION 449.8	
DRILL RIG CME 75	SURFACE CONDITIONS Grassy	
ANGLE -90°	BEARING NA	
SAMPLE HAMMER 140 lbs.		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(12.0-15.5 ft.) Firm, medium dark gray (N4), SILTY CLAY, little fine Sand, NR, moist, (CL), (ALLUVIUM)	SP 8	
16	0 1 3 4	2.0'/2.0' (100%)			(15.5-17.4 ft.) Firm, medium gray (N5), SILTY CLAY, some f-m Sand, NR, moist to wet, (CL), (ALLUVIUM), grades sandier	SP 9	
17					(432.4) 17.4		
18	3 3 5 2	1.2'/2.0' (60%)			(17.4-18.5 ft.) Loose, medium gray (N5), f-m SAND, some silty Clay, NR, wet, (SP), (ALLUVIUM), grades sandier and coarser (18.5-30.0 ft.) Loose to compact, medium gray (N5), f-m SAND, trace fines, thin layers of mica (<1/4" thick), NR, moist, (SP), (ALLUVIUM)	SP 10	
19							
20	2 3 3 3	1.8'/2.0' (90%)				SP 11	
21							
22	3 2 5 3	1.3'/2.0' (65%)				SP 12	
23							
24	4 7 8 13	1.5'/2.0' (75%)			@ 23.7 ft., color changes to moderate brown (5YR 4/4) and moderate yellowish brown (10YR 5/2)	SP 13	
25							
26	9 7 4 3	0.3'/2.0' (15%)				SP 14	
27							
28	2 6 6 7	1.6'/2.0' (80%)				SP 15	
29					@ 29.1-29.6 ft., organics present, bits of wood and grass		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY

DATE 4/20/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ114AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger 4.0 inch Tricone Bit with Bentonite	PZ-115-SS
	SAMPLING METHOD:	SHEET 1 OF 1
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START TIME 8:30 DATE 5/5/95; FINISH TIME 9:55 DATE 5/5/95

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

NORTHING: 1069408.54
DATUM EASTING: 516755.35 ELEVATION 450.6

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE -90° BEARING NA
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	6 7 7 6	1.0'/2.0' (50%)			(0.0-30.0 ft.) No samples collected, see Soil Borehole Log PZ-114-AS for descriptions (30.0-33.5 ft.) Compact, olive gray (5Y 4/1), SILTY f-m SAND, wet, NR, (SM), (ALLUVIUM)	SP 1	0.0-30.0 ft. Drilling conducted with 4.25-inch augers Below 30.0 ft. Drilling conducted with mud rotary techniques to control heaving sands.
32 33	8 8 50/3"	1.0'/1.5' (67%)			(417.1) 33.5	SP 2	
34					End of Soil Borehole Log at 33.5 ft. See PZ-115-SS Record of Drillhole for rock descriptions		
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY V. HERST

DATE 6/21/95

JOB NO.: 943-2848

FILENAME: PZ115SS

RECORD OF DRILLHOLE PZ-115-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD: NX Core & water
DR[illegible] DATE: 5/10/95
DRILL RIG: CME 75

DATU[illegible]
COOR[illegible]ES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.6
E: 516755.35
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R5 R6, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-33.5 ft. See Soil Borehole Log PZ-115-SS 33.5-38.0 ft. No samples collected														3/9/95 9 7/8 in. mud rotary bit used to drill into bedrock then 6 in. steel casing grouted into borehole with neat cement
34															
36															
38	412.60 38.00 38.0-47.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		412.60 38.00	1	100 %										5/10/95 @ 8:30 Began drilling
			410.90 39.70												5/10/95 @ 8:50 End of Run 1
40	40.0-41.8 ft. Scattered silica zones and veins								J,PL,VR (2)						
									J,PL,VR (3)						
	41.2-47.7 ft. Microcrystalline, pale yellowish brown (10YR 6/2), slightly weathered								J,IR,VR (4)						
42	41.8-42.8 and 43.6-47.3 ft. Layers of green clay and clay filling around inplace pieces of rock														
									J,PL,VR (2)						
									J,IR,VR (3)						
44				2	97%				J,IR,VR (7)						
									J,IR,VR (6)						
46									J,IR,VR (7)						
	47.7-49.0 ft. Slightly weathered, thickly bedded, pale yellowish brown (10YR 6/2), microcrystalline, strong, DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Vuggy (1 mm. to 5 mm. in diameter), some vugs filled with calcite or quartz								J,I,VR (7)						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-115-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/10/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.8
E: 516755.35
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
48	48.8-48.9 ft. Claystone layers		2	97%		5/10/95 @ 10:10 End of Run 2
	49.0-50.2 ft. Slightly weathered, thickly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)	400.90 / 49.70				
50	Dolomite and clay zones, vuggy				J,PL,VR	
	50.2-58.5 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)					
52	50.2-51.4 ft. Thin clay laminations within rock visible but no preferential breaks or weak zones are associated					
	53.0-55.1 ft. Thin clay laminations, healed and unhealed bedding partings				B,PL,SM	
					B,PL,SM (3)	
54					J,PL,R,CL	
					J,PL,SM	
			3	100%		
	55.1-55.4 ft. Highly weathered, extremely weak Claystone zone				J,PL,SM	
	55.4-58.5 ft. Thin clay laminations and healed bedding partings, trace stylolites					
56					J,PL,SM	
					J,PL,SM	
58	58.5-64.6 ft. Fresh, thickly bedded, pale yellowish brown (10YR 6/2), very fine, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vuggy	390.90 / 59.70				5/10/95 @ 11:45 End of Run 3
60						
62			4	100%		
64						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-115-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

DRILLING METHOD: NX Core & water
DATE: 5/10/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.6
E: 516755.35
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
84									J,IR,VR						
									J,C,SM						
	64.6-65.8 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION)								J,PL,VR						
86	Scattered stylolites and silica replacement of stylolites														
	65.8-66.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)			4	100 %				J,PL,VR						
	Vuggy								J,PL,SM						
88	66.7-69.7 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), f-vf grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								B,PL,R						
	Zones of Claystone interbedded (1/2 in. - 1 1/2 in.)														5/10/95 @ 12:30 End of Run 4
			380.90						B,PL,R,CL						
	69.7-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION)		89.70						J,PL,VR						
70	69.7-75.7 ft. Fine to medium grained, trace fossils								J,IR,R						
72	72.0-72.2 ft. Highly weathered, weak, Claystone seam								B,PL,SM (2)						
	72.2-73.3 ft. Scattered chert								B,PL,SM						
74				5	100 %				J,C,SM (2)						
									J,PL,SM						
76	76.2 ft. Void filled with calcite crystals								J,PL,R						
	77.2-78.0 ft. Abundant stylolites								J,PL,R						
									J,I,R						
78									J,I,R						
									J,PL,SM						
	79.1-84.7 ft. Dolomite content increases, slightly weathered								J,I,R (2)						5/10/95 @ 13:50 End of Run 5
	79.4-81.0 ft. Abundant stylolites		370.90 / 79.70	6	100 %				J,I,R						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 8/15/95

Golder Associates

RECORD OF DRILLHOLE PZ-115-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 5/10/95
DRILL RIG: CME 75

COOR ES N: 1069408.54
AZIMUTH: 0

COLLAR ELEV: 450.8
E: 516755.35
INCLINATION: -90

ROCK TYPE

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	69.7-84.7 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), microcrystalline to fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,I,R (2)						
82				6	100 %				J,I,R						
									J,I,R (2)						
84	84.2-84.7 ft. Abundant stylolites								B,PL,R						5/10/95 @ 15:00 End of coring
	365.90		365.90												
	End of Record of Drillhole at 84.7 ft. 84.70		84.70												
86															
88															
90															
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/15/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-116-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 3
		DRILLING START TIME 12:45; FINISH TIME 15:00
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE START 6/5/95; DATE FINISH 6/5/95
DATUM NORTHING: 1066410.28 EASTING: 515843.88	ELEVATION 483.1	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Edge of haul road and flat fill area.	
ANGLE	BEARING	
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-1.0 ft.) No samples collected, gravel road base encountered (482.1) 1.0		
1	5 6 4 5	0.9'/2.0' (45%)			(1.0-5.0 ft.) Stiff, dark yellowish brown (10YR 4/2), CLAYEY SILT, trace Gravel, WR, damp, (ML), (FILL)	SP 1	
2							
3	2 2 4 5	0.7'/2.0' (35%)				SP 2	
4							
5	3 3 5 5	1.5'/2.0' (75%)			(5.0-15.0 ft.) Loose, moderate yellowish brown (10YR 5/4), thinly laminated, SILT, SR, (ML), (LOESS)	SP 3	
6							
7	3 5 8 9	1.7'/2.0' (85%)			@ 7.0 ft., color changes to mottled pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4), and silt becomes compact	SP 4	
8							
9	7 8 8 9	1.6'/2.0' (80%)				SP 5	
10							
11	5 8 9 10	1.2'/2.0' (60%)			@ 11.0 ft., color is predominantly pale yellowish brown (10YR 6/2)	SP 6	
12							
13	6 7 7 6	1.3'/2.0' (65%)				SP 7	
14							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON

CHK'D BY W. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ116SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-116-SS
		SHEET 2 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	12:45 / 15:00
	DATE	DATE / DATE
DATUM NORTHING: 1066410.28 EASTING: 515843.88	CASING DEPTH	6/5/95 / 6/5/95
ELEVATION 483.1		

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Edge of haul road and flat fill area.

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	5 6 6 10	1.4' / 2.0' (70%)			(15.0-22.8 ft.) Compact, pale yellowish brown (10YR 6/2), SILT, SR-NR, damp, (ML), (LOESS)	SP 8	
17	9 5 4 6	1.3' / 2.0' (65%)				SP 9	
19	4 6 5 4	1.7' / 2.0' (85%)				SP 10	
21	1 4 6 9	1.6' / 2.0' (80%)			(460.3) 22.8	SP 11	
23	6 7 5 6	2.0' / 2.0' (100%)			(22.8-24.2 ft.) Compact, moderate yellowish brown (10YR 5/4), SILTY fine SAND, WR, damp, (SM), (ALLUVIUM) (458.9) 24.2	SP 12	
25	8 14 22 14	2.0' / 2.0' (100%)			(24.2-25.6 ft.) Compact, medium gray (N5), SILT, trace iron oxide staining, NR, moist, (ML), (LOESS) (457.5) 25.6	SP 13	
26					(25.6-27.0 ft.) Dense, pale yellowish brown (10YR 6/2), fine SAND, trace Silt, NR, damp (SP), (ALLUVIUM) (456.1) 27.0		
27	4 11 17 18	2.0' / 2.0' (100%)			(27.0-28.0 ft.) Compact, medium gray (N5), SILT, NR, moist, (ML), (ALLUVIUM) (455.1) 28.0	SP 14	
28					(28.0-32.0 ft.) Compact, medium light gray (N6), fine SAND, trace Silt, NR, moist, (SP)		
29	8 9 11 10	2.0' / 2.0' (100%)				SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. TILTON CHK'D BY W. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ116SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-116-SS
		SHEET 3 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					12:45	15:00
DATE					DATE	DATE
CASING DEPTH					6/5/95	6/5/95

NORTHING: 1066410.28
DATUM EASTING: 515843.88 ELEVATION 483.1

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Edge of haul road and flat fill area.

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	15 50/5"	0.5'/1.0' (50%)			(28.0-32.0 ft.) Compact, medium light gray (N6), fine SAND, trace Silt, NR, moist, (SP) @ 30.8 ft., some black organic material in sand	SP (15) SP (16)	
32					@ 31.5 ft., gravel size pieces of Limestone in Sand, water encountered at 31.0 ft., on top of bedrock (451.1) 32.0		
33					End of Soil Borehole Log at 32.0 ft. See PZ-116-SS Record of Drillhole for rock descriptions		
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HILTON CHK'D BY W. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ116SS

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]HOD: NX Core & water
DR[illegible]ATE: 6/5/95 - 6/14/95
DRILL[illegible]G: CME 75

DATU[illegible]
COORD[illegible]N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (H1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-32.0 ft. See Soil Borehole Log PZ-116-SS 32.0-33.4 ft. No samples collected		449.70												
	33.4-60.2 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Occasional 0.5 - 2 mm. pyrite grains, weathered and grading into fresh at depth		33.40	1	71%										RQD of Run 1 was unassesable due to uncertainty in fracture origin. Drill bit was worn, poor quality recovery
34			447.10												
36			36.00												
			446.20												
			36.90						J,I,R,Fe						
	37.6-38.7 ft. Stiff, Clay layer, light olive gray (5Y 6/1)		445.50 / 37.60						J,I,R						
38			444.40 / 38.70												
				2	81%										
40									J,I,R (3)						
42			440.90												
			42.20												
			439.90												
	43.2-43.4 ft. Very stiff, Clay layer, light olive gray (5Y 6/1)		439.70 / 43.40												
			43.20												
44				3	88%				J,PL,R						
									J,PL,R,CL						
			438.20						J,I,R						
			44.90						J,I,R						
	45.1-45.3 ft. Soft Clay layer		437.80 / 45.30						J,I,R,CL						6/8/95 @ 13:10 Began Run 4
46			436.90												
	46.2-48.0 ft. Highly weathered, thinly bedded, medium light gray (N6), fine grained, weak, BRECCIATED LIMESTONE in medium bluish gray (5B 5/1), clay matrix, (COLLAPSE ZONE)		48.20	4	96%										
48			435.10 / 48.00												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 8/5/95 - 8/14/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (RT 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	435.10 / 48.00 48.0-60.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic								J,I,R,CL						
				4	96%				J,PL,SM,Fe						
			433.20 / 49.90						J,PL,R						
50									J,U,R						
52									J,PL,R						
									J,PL,R (3)						
									J,PL,R,CL						
54									J,C,R						
									J,PL,R,CL						
				5	100%				J,I,R						
56															
									J,PL,R,CL (2)						
									J,PL,R						
									J,PL,R,CL						
58									J,PL,R (3)						
									J,PL,R (2)						
60	422.90 / 60.20 60.2-64.8 ft. Fresh, thinly bedded, olive gray (5Y 4/1), fine grained, very strong, DOLOMITE, (ST. LOUIS FORMATION)		423.10 / 60.00						J,I,R						
62	61.9-62.5 ft. Light olive gray (5Y 6/1), very fine grained Limestone layer			6	100%				J,I,R						
									J,PL,R						
									J,PL,R,CL						
									J,PL,R,CL						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: O. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]ATE: 6/5/95 - 6/14/95
DRILL[illegible]G: CME 75

DATU[illegible]
COOR[illegible]S N: 1068410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Silkensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64		418.30 / 64.80										
	64.8-71.2 ft. Fresh, medium bedded, light olive ray (5Y 6/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)											
66							J,PL,R,CL					
			6	100 %								
							J,PL,R,CL					
68												
70		413.10 / 70.00										
72							J,PL,R,CL					
	72.4-87.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic 72.6-73.0 ft. Abundant chert zones (<3 in. thick)						J,PL,R,CL					
							B,PL,R					
							J,PL,R,CL					
74		408.00 / 75.10	7	99%								
	75.1-75.8 ft. Hard, Clay layer	407.30 / 75.80										
76							J,PL,R,CL (2)					
78							J,PL,R,CL (2)					
							J,I,R,CL					
80		403.10 / 80.00										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	72.4-87.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic	403.10 / 80.00						J,C,R					
								J,PL,R (2)					
82	82.2-83.3 ft. Glauconitic intraclasts, argillaceous							B,PL,R					
								J,U,R,CL					
								J,I,R					
84								J,I,R,CL					
			8	100 %				J,PL,R,CL					
86								B,C,R,CL					
								J,I,R,CL					
	87.0-101.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)							J,PL,R,CL					
88	87.8-91.3 ft. Porous zone, open vugs (<2 mm. dia.)							J,I,R					
90		393.00 / 90.10											
92			9	100 %									
94													
96													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

COOR ES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	87.0-101.3 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)														
98				9	100 %										
			383.10												
100			100.00												
									B,PL,R,CL						
	101.3-106.3 ft. Fresh, thickly bedded, light brownish gray (5YR 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)														
102									B,PL,R,CL						
				10	98%				J,PL,R						
104									J,PL,R						
	105.1-105.7 ft. Abundant, thinly laminated, shaley partings								J,PL,R (3)						
									J,PL,R,CL						
									J,PL,R,CL						
106			376.80												
	106.3-108.8 ft. Fresh, thinly bedded, light brownish gray (5YR 6/1), fine crystalline, extremely strong, SILICIFIED LIMESTONE, (ST. LOUIS FORMATION)		108.30												
				11	100 %										
108									J,I,R,SPUN						
			374.30												
	108.8-135.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong to strong, LIMESTONE (ST. LOUIS FORMATION) Stylolitic		108.80						J,PL,R						
									J,I,R (2)						
110															
				12	100 %										
									B,PL,SM						
									B,PL,SM						
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DATE: 6/5/95 - 6/14/95
DRILLING: CME 75

DATUM:
COORDINATES N: 1066410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	108.8-135.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		12	100 %			90	J,PL,R,CL (3)					
		369.10 / 114.00											
114							90	J,PL,R (2)					
116			13	100 %			90	J,PL,R					
							90	J,I,R (2)					
							90	PL,R (6)					
118		364.10 / 119.00											6/9/95 @ 14:30 Completed Run 13 6/14/95 @ 8:00 Began Run 4 Water level in open corehole = 21.1 ft. bgs prior to drilling
							90	J,I,R					
120							90	B,I,R (3)					@ 120.3, 122.8, 123.3, 125.5 and 126.7 ft., possible open intact joints, (<5 breaks/in.)
							90	J,I,R (2)					
	121.2-122.2 ft. Argillaceous Limestone												
122													
	@ 122.5 ft. Very stiff, light olive gray (5Y 6/1), Silt layer (< 1/2 in. thick)		14	100 %			90	J,I,R					
124							90	J,I,SM					
	124.7-127.0 ft. Limestone becomes fine to medium crystalline						90	B,I,SM,CL					
							90	J,I,R					
126	126.4-127.0 ft. Moderately weathered zone						60	J,I,R					
128													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]ATE: 6/5/95 - 6/14/95
DRILL RIG: CME 75

DATU[illegible]
COORD[illegible]S N: 1068410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
128	108.8-135.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong to strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		354.10 / 129.00	14	100 %			90	J,PL,SM						6/14/95 @ 9:10 Completed Run 14
130															
								90	J,PL,SM						
132								30	J,PL,SM						
								90	J,I,R (3)						133.0-133.5 ft. Possible open intact joints, highly broken zone
								90	J,I,R						
134				15	98%										
								90	B,I,R,CL						
	134.9-135.7 ft. Limestone becomes fine grained		347.60 / 135.50												@ 135.5 ft. Inferred top of Salem Formation
136	135.5-139.1 ft. Fresh, thickly bedded, olive gray (5Y 4/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION)														
138			344.10 / 139.00												6/14/95 @ 10:11 Completed Run 15
	139.1-141.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS LIMESTONE. (SALEM FORMATION)							90	B,PL,SM,CL						
140	@ 139.6 ft. Very stiff, olive gray (5Y 4/1), Silt layer (<1 in. thick)														
								90	J,PL,SM						
				16	92%			60	J,I,R (2)						
142	141.8-151.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong LIMESTONE, (SALEM FORMATION)							90	J,I,R						
	Thin layers of glauconite Clay, surrounding Limestone matrix							90	J,I,R,CL (2)						
								90	B,I,SM						6/14/95 @ 11:00 Completed Run 16 Stopped short as bit plugged, core loss in highly broken rock
144			339.10 / 144.00												

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B METHOD: NX Core & water
DATE: 6/5/95 - 6/14/95
DRILLING: CME 75

DAT
COORDINATES N: 1068410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
144	141.8-151.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong LIMESTONE, (SALEM FORMATION) Thin layers of glauconite Clay, surrounding Limestone matrix	339.10 / 144.00			B,U,R,CL; J,I,R (2); J,I,R (3)	
146	@ 144.7 ft. Vug with calcite crystals (<1/2 in. dia.) 146.0-151.2 ft. Limestone becomes argillaceous					
148			17	100 %		
150						
152	151.2-162.5 ft. Fresh, thinly bedded, olive gray (5Y 4/1), fine crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Thinly laminated, shaley partings common, some chert nodules (<2 in. dia.)				J,I,R; J,I,R	
154	154.5-155.2 ft. Limestone becomes argillaceous	329.10 / 154.00			J,I,R (2); B,PL,SM,CL	6/14/95 @ 12:00 End Run 17
156			18	100 %		
158	157.5-162.5 ft. Abundant chert zones (<2 in. thick)				J,I,R (2); B,I,SM	@ 157.0 and 158.8 ft. Possible open/intact joints, highly broken zone
160					J,PL,SM; B,PL,SM	

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-116-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B METHOD: NX Core & water
DATE: 6/5/95 - 6/14/95
DRILLING: CME 75

DATU
COOR S N: 1068410.28
AZIMUTH: 0

COLLAR ELEV: 483.1
E: 515843.88
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (H1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	151.2-162.5 ft. Fresh, thinly bedded, olive gray (5Y 4/1), fine crystalline, medium strong, FOSSILIFEROUS LIMESTONE, (SALEM FORMATION) Thinly laminated, shaley partings common, some chert nodules (<2 in. dia.)			18	100 %										
162	320.60		320.60												6/14/95 @ 13:25 End Run 18
	End of Record of Drillhole at 162.5 ft. 162.50		162.50												
164															
166															
168															
170															
172															
174															
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: E. SWANSON
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.	
	4.25 inch I.D. Hollow Stem Auger	PZ-200-SS	
		SHEET	
	SAMPLING METHOD:	1 OF 2	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START	FINISH
	WATER LEVEL	TIME	TIME
	TIME	10:56	14:05
	DATE	DATE	DATE
NORTHING: 1068496.19 DATUM EASTING: 516972.30 ELEVATION 483.6	CASING DEPTH	2/10/95	2/10/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1							No sample 0.0-2.0 ft., due to gravel pad
2					(481.6) 2.0		
	6 8 8 6	0.8'/2.0' (40%)			(2.0-8.1 ft.) Very stiff, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP 2	
3							
4	3 8 12 15	1.3'/2.0' (65%)				SP 3	
5							
6		2.3'/2.0' (115%)				SH 4	
7							
8	6 8 10 13	2.0'/2.0' (100%)			(8.1-16.5 ft.) Stiff to very stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 5	
9							
10	3 7 11 13	1.7'/2.0' (85%)				SP 6	
11							
12	8 6 7 8	1.9'/2.0' (95%)				SP 7	
13							
14		2.3'/2.0' (115%)				SH 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/10/95

JOB NO.: 943-2848

FILENAME: PZ200SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-200-SS
	SAMPLING METHOD:	SHEET 2 OF 2
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					10:56	14:05
DATE					DATE	DATE
CASING DEPTH					2/10/95	2/10/95

NORTHING: 1068496.19
DATUM EASTING: 516972.30 ELEVATION 483.6

DRILL RIG CME 75 - TRUCK MOUNT
SURFACE CONDITIONS
ANGLE BEARING
SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	4 5 7 9	1.5'/2.0' (75%)			(8.1-16.5 ft.) Stiff to very stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), homogenous, mottled CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SH 8	
17					(16.5-19.7 ft.) Stiff, light olive gray (5Y 6/1) to moderate brown (5YR 4/4), homogenous, mottled CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP 9	
18	3 5 15 18	1.5'/2.0' (75%)					
19					(463.9) 19.7	SP 10	
20	5 15 14 12	0.0'/2.0' (0%)			(19.7-20.5 ft.) Compact, moderate yellowish brown (10YR 5/4), homogenous, fine SAND, trace Silt, NR, dry, (SM), (ALLUVIUM) (463.1) 20.5		
21					(20.5-25.5 ft.) Very stiff, light olive gray (5Y 6/1) to light brown (5YR 5/6), stratified, CLAYEY SILT, mottled with black manganese stains, NR, moist, (CL-ML), (ALLUVIUM)	SP 11	
22	5 6 9 9	1.2'/2.0' (60%)					
23						SP 12	
24	8 14 26 28	1.4'/2.0' (70%)			@ 24.3 ft., <1 inch fine sand lenses		
25					(458.1) 25.5	SP 13	
26	14 33 40/4"	0.7'/1.3' (54%)			(25.5-27.6 ft.) Dense, light brown (5YR 5/6), stratified, fine SAND, NR, dry, (SP), (ALLUVIUM)	SP 14	
27					@ 27.3 ft., <1 inch clayey silt lenses (456.3) 27.3		
28					End of Soil Borehole Log at 27.3 ft. See PZ-200-SS Record of Drillhole for rock descriptions		2/10/95 - 14:05 Finish drilling at 27.3 ft., - hit bedrock End of soil borehole at 27.3 ft.
29							

DRILLING CONTR LAYNE-WESTERN
LOGGED BY J. MILLER CHK'D BY W. HERST
DATE 2/10/95
JOB NO.: 943-2848
FILENAME: PZ200SS

RECORD OF DRILLHOLE PZ-200-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 516972.2
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-27.3 ft. See Soil Borehole Log PZ-200-SS														
18															
20															
22															
24															
26															2/10/95 @ 16:12 Start Run 1 16:16 Stop-no circulation, pull core, quit for the day at 16:30
	458.31		456.31												
	27.3-44.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, iron staining, calcite mineralization, 1 in. clay parting at 30.1 ft.		27.30	1	88%				J,C,R (3) J,I,R,calcite J,PL,R-CL J,PL-J,R J,PL,R (3) J,I,R J,PL,R (3) J,PL,R (2) J,I,R						2/11/95 Measure water level in augers, dry to 27.0 ft.
28															
30			453.11						Core Loss						
			30.50	2	100 %				J,I,R J,PL,R-CL J,I,R (4) J,I,R (3)						2/11/95 @ 10:50
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 516972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	27.3-44.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium crystalline, weak, LIMESTONE, (ST. LOUIS FORMATION)								J,ST,R						
									J,I,R-calcite						
									J,PL,R-open						
									J,PL,R						
									J,I,R-open						
									J,I,R (4)						
									J,C,R						
34									J,PL,SM (2)						
									J,C,R-CL						
									J,C,R						
									J,I,R						
									J,PL,R						
									J,C,R-CL						
36				2	100 %										
									J,I,R,CL (2)						
									J,I,R-open						
38									J,I,R-CL (2)						
									J,I,R (2)						
									J,PL,R-open						
									J,PL,SM						
40			443.51 / 40.10						J,PL,R (2)						
									J,I,R-CL (2)						
									J,PL,SM-open						
									J,I,R (2)						
42									J,I,R (3)						
									J,I,R-CL-open (5)						
									J,I,R (2)						
44				3	100 %				J,PL,SM-open (3)						
	44.5-68.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,PL,R-open						
									J,I,R (2)						
									J,I,R						
46									J,I,R-open						
									J,I,R (2)						
									J,I,R-CL						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 516972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.5-68.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		3	100 %			90	J,I,R					
50	Argillaceous laminae, clay partings, stylolitic, brachiopod fossils	433.51 / 50.10											
							90	J,PL,SM					
52							90	J,PL,SM					
54							90	J,PL,SM					
			4	99%									
56							90	J,PL,SM					
							90	J,I,R					
							90	J,I,R					
58							90	J,I,R					
							90	J,I,R-CL (3)					
							90	J,I,R (2)					
							90	J,PL,SM-open					
							90	J,PL,SM-CL (3)					
60		423.51 / 60.10											
							90	J,PL,SM-CL (5)					
							90	J,PL,R					
							90	J,PL,R (2)					
							90	J,PL,SM-CL (2)					
62			5	85%									
							90	J,PL,R (2)					
							90	J,ST,R					
							90	J,PL,R					
64	Argillaceous laminae, clay partings, stylolitic, brachiopods						90	J,PL,SM					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068496.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 516972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	44.5-68.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), medium crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,PL,SM-CL	
					J,PL,SM-CL	
66			5	85%	J,I,R-open (2)	
					J,PL,SM-CL	
					J,PL,R	
68						
	414.91	415.01				
	68.7-76.0 ft. 68.70 Slightly weathered, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)	68.60			J,I,R-intact	2/11/95 @ 16:30 Quit drilling for the day at 68.6 ft. after Run 5 2/12/95 @ 8:00 Begin coring Run 6
					J,I,R-intact	
70					J,I,R	
	Vuggy, fossiliferous				J,I,R-intact	
72					J,I,R-intact	
					J,PL,SM	
	73.0-74.0 ft. Medium crystalline, non-vuggy				J,I,R	
	Chert at 74.2-74.5 ft., fractured, solutionized immediately below		6	100 %	J,I,R	
74					J,I,R	
					J,I,R	
					J,I,R (2)	
					J,I,R	
					J,C,R-CL	
	407.81					
76	76.0-78.5 ft. 76.00 Fresh, thinly bedded, light olive gray (5Y 5/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,I,R-intact	
					J,I,SM-CL	
78						
	78.5-86.0 ft. Fresh, thinly bedded, yellowish gray (5Y 7/2), medium crystalline, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)	404.91 78.70	7	100 %	J,I,R-CL	
80						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068498.2
AZIMUTH: 0

COLLAR ELEV: 483.61
E: 516972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.5-86.0 ft. Fresh, thinly bedded, yellowish gray (5Y 7/2), medium crystalline, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,I,R-CL						
									J,I,R						
									J,I,R						
									J,I,R-calcite						
									J,I,R						
82									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R						
84				7	100 %				J,I,R-CL						
									J,I,R-CL						
86	86.0-92.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)								J,I,R-CL						
									J,I,R-CL-intact						
									J,PL,SM						
88									J,I,R-CL						
			394.91 / 88.70												
	Stylolitic, breciated, glauconite infillings 89.0-90.2 ft. Moderately weathered								J,I,R-CL						
90									J,I,R						
									J,I,R-CL						
				8	100 %				J,PL,SM-CL (2)						
	391.61 / 92.00														
92	92.0-98.7 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)								J,PL,SM (2)						2/13/95 @ 12:53 Measure water level at 54.3 ft. below ground surface
			389.91 / 93.70												2/14/95 @ 8:02 Measure water level at 69.5 ft. below ground surface
94															2/14/95 @ 17:15 Measure water level at 70.42 ft. below ground surface
				9	100 %										
									J,I,R						
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-200-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX core & water
DRILLING DATE: 2/10/95 -2/13/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1068496.2
AZIMUTH: 0

COLLAR ELEV: 483.81
E: 516972.2
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	92.0-98.7 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARENACEOUS DOLOMITE, (ST. LOUIS FORMATION)			9	100 %				J,I,R J,I,R-CL J,I,R J,I,R-CL J,PL,SM						
98			384.91												
	End of Record of Drillhole at 98.7 ft. 98.70		98.70												
100															
102															
104															
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: J. MILLER
CHECKED: R. BOOTH
DATE: 3/9/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-201-SS
		SHEET 1 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME 8:30 / TIME 10:30
	TIME	
	DATE	DATE 2/15/95 / DATE 2/15/95
	CASING DEPTH	

NORTHING: 1067819.55
DATUM EASTING: 516862.06 ELEVATION 478.0

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE BEARING

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 3 3	2.0'/2.0' (100%)			(0.0-3.4 ft.) Firm, dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)	SP 1	
2 3	2 2 4 5	1.3'/2.0' (65%)				SP 2	
4 5	1 2 3 3	2.0'/2.0' (100%)			(3.4-17.4 ft.) Soft to firm, yellowish brown (10YR 6/2), CLAYEY SILT, trace fine Sand, little iron staining and black organic nodules, NR, moist, (CL-ML), (LOESS)	SP 3	
6 7	1 2 3 4	2.0'/2.0' (100%)				SP 4	Air monitoring 9:00 20% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
8 9	2 4 3 4	2.0'/2.0' (100%)				SP 5	
10 11	1 2 2 2	2.0'/2.0' (100%)				SP 6	
12 13	1 1 1 2	2.0'/2.0' (100%)				SP 7	Air monitoring 9:15 20% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
14	1 1 2 3	2.0'/2.0' (100%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 2/15/95 CHK'D BY W HERST

JOB NO.: 941-2848

FILENAME: PZ201SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-201-SS
		SHEET 2 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	8:30 / 10:30
	DATE	DATE / DATE
	CASING DEPTH	2/15/95 / 2/15/95

NORTHING: 1067819.55
DATUM EASTING: 516862.06 ELEVATION 478.0

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE BEARING
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 5 6 7	1.3'/2.0' (65%)			(3.4-17.4 ft.) Soft to firm, yellowish brown (10YR 6/2), CLAYEY SILT, trace fine Sand, little iron staining and black organic nodules, NR, moist, (CL-ML), (LOESS) @ 15.5-16.0 ft., CLAYEY SILT becomes wet	SP 8	
17					(460.6) 17.4	SP 9	
18		0.5'/2.0' (25%)			(17.4-20.5 ft.) Compact, pale yellowish brown (10YR 5/4), fine SAND, little Silt, NR, damp, (SP), (ALLUVIUM)		
19						SH 10	
20	3 3 5 6	1.5'/2.0' (75%)			(457.5) 20.5		
21					(20.5-30.0 ft.) Firm to stiff, olive gray (5Y 4/1) to moderate yellowish brown (10YR 5/4), laminated CLAYEY SILT, NR, moist, (CL-ML), (LACUSTRINE)	SP 11	
22	3 5 6 7	1.2'/2.0' (60%)					
23						SP 12	
24	3 5 7 8	1.7'/2.0' (85%)			@ 23.7-24.0 ft., medium dark gray (N4), SILTY fine sand layer, damp, (SM)		
25					@ 24.8, 25.2, and 25.6 ft., thin silty fine sand layers (<1 inch)	SP 13	
26		1.8'/2.0' (90%)					
27						SH 14	
28	13 50/3"	0.6'/2.0' (30%)					
29					@ 29.0 ft., limestone rock encountered	SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/15/95

JOB NO.: 943-2848

FILENAME: PZ201SS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-201-SS
		SHEET 3 OF 3
	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START TIME 8:30 DATE 2/15/95 FINISH TIME 10:30 DATE 2/15/95
NORTHING: 1067819.55 DATUM EASTING: 516862.06 ELEVATION 478.0	WATER LEVEL / TIME / DATE / CASING DEPTH	

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
	10 12 6 6	1.5'/2.0' (75%)			(30.0-30.7 ft.) Very stiff, medium gray (N4), CLAYEY SILT, some fine Gravel, little fine to coarse Sand, NR, moist, (CL-ML), (ALLUVIUM) (447.3) 30.7	SP 16	Air monitoring 10:30 20% O2 0.0 ppm H2S 0% LEL 0.0 ppm PID
31					(30.7-32.0 ft.) Stiff, dark greenish gray (5G 4/1), SILTY CLAY, trace fine sand, contains pieces of weathered limestone, NR-SR, damp, (CL), (ALLUVIUM)		
32	50/5"	0.3'/1.0' (30%)				SP 17	
33					(445.0) 33.0 End of Soil Borehole Log at 32.0 ft. See PZ-201-SS Record of Drillhole for rock descriptions		
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 2/15/95

JOB NO.: 943-2848

FILENAME: PZ201SS

RECORD OF DRILLHOLE PZ-201-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 516862.08
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-32.8 ft. See Soil Borehole Log PZ-201-SS	448.25											
	32.8-38.7 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), medium crystalline, weak, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, calcite crystals (<1 cm.)	32.80	1	94%			90	J,PL,R,CL (2)					
34		446.55											
		34.50					90	J,I,R					
							90	J,I,R					
							90	J,PL,SM-intact					
36							90	J,I,R					
							90	J,I,R,CL					
							90	J,PL,SM,CL-intact					
			2	100%			90	J,I,R,CL					
							90	J,PL,S,CL					
							90	J,PL,SM,CL					
38							90	J,I,R,CL					
							90	J,PL,SM,CL-intact					
	38.7-49.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1) to greenish gray (5GY 6/1), fine crystalline, medium strong, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION) Weathered, pyrite nodules (<2 mm.), stylolitic						90	J,I,R,CL (2)					
		441.55					90	J,I,R,CL					
		39.50					90	J,I,R					
40							90	J,I,R,CL					
							90	J,I,R					
							90	J,I,R,CL					
42							90	J,I,R,CL (3)					
							90	J,P,SM,CL					
							90	J,I,R,CL (2)					
							90	J,P,SM,CL (2)					
			3	100%			90	J,I,R,CL (3)					
44							90	J,PL,SM,CL					
							90	J,PL,SM,CL					
							90	J,PL,SM,CL					
							90	J,PL,SM,CL					
							90	J,PL,SM,CL					
							90	J,PL,SM,CL (2)					
46							90	J,PL,SM,CL					
							90	J,PL,SM,CL					
							90	J,PL,SM,CL (3)					
							90	J,PL,SM,CL (2)					
							90	J,PL,SM,CL					
48							90	J,PL,SM					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-201-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 516882.06
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	4 FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	38.7-49.5 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1) to greenish gray (5GY 6/1), fine crystalline, medium strong, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION)							J,PL,SM,CL					
			3	100 %				J,PL,SM,CL					@ 49.5 ft. Drilling rate slows down
		431.55 / 49.50						J,I,R (2)					
50	49.5-59.5 ft. Fresh, medium bedded, olive gray (5Y 6/1), micro-crystalline, strong, CRYSTALLINE LIMESTONE, (ST. LOUIS FORMATION) Fossiliferous, stylolites							B,I,R					
	50.9-51.8 ft. Argillaceous Limestone												
52	@ 51.5 ft. Light olive gray (5Y 6/1), Clay seam (~1/2 in.)							J,P,R					
54	54.0-55.0 ft. Moderately silicified Limestone							B,I,R (3)					
			4	100 %				J,C-intact					
	55.0-55.1 ft. Light brown (5YR 5/6), chert zone							B,PL,R					
								B,PL,SM					
56								J,PL,SM,CL (2)					
								J,PL,SM,CL (2)					
58								J,I,R					
	@ 58.4 ft. Light brown (5G 6/1), Clay seam (~1/2 in.)												
		421.55 / 59.50						J,P,R					
	59.5-69.5 ft. Fresh, medium to thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, medium grained calcite crystals												2/15/95 @ 16:00 Stop drilling 2/20/95 @ 8:30 Begin drilling @ 59.5 ft.
60								J,I,VR					
								J,I,VR (3)					
			5	100 %				J,I,R (3)					
62								J,I,R					
								J,I,R (2)					
								J,I,R (2)					
64													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-201-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 516862.06
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	59.5-69.5 ft. Fresh, medium to thinly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, medium grained calcite crystals														
66				5	100 %										
68									J,I,R,CL,Fe						
			411.55 / 69.50												
70	69.5-89.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common								J,I,R,Fe						
									J,I,R						
72									J,I,R						
									J,I,R						
74									J,I,R						
	@ 75.0 and 76.5 ft. Medium bluish gray (5B 5/1), glauconite zones (less than 1 in.)			6	100 %				J,U,K,CL						
									B,U,K,CL						
	75.2-75.6 ft. Medium bluish gray (5B 5/1), chert layer								J,U,SM						
76	75.6-77.1 ft. Argillaceous, moderately porous, some open vugs (<2 mm.)														
									B,I,R,CL						
									J,I,R						
78	78.0-79.5 ft. Moderate to highly weathered fractures								J,I,R						
									J,I,R						
									J,I,R						
			401.55 / 79.50	7	96%										
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-201-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/15/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067819.55
AZIMUTH: 0

COLLAR ELEV: 481.05
E: 516882.06
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	69.5-89.5 ft. Fresh, medium bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common								J,U,R,Fe						
									J,I,R						@ 80.7 ft. Core loss
									J,PL,SM						
	81.3-81.4 ft. Medium dark gray (N4), Claystone laminae								J,I,R						
									J,I,K						
82	@ 81.6 ft. Becoming intermittently siliceous (zones <1 in. thick), some pyritized fractures/vugs								J,I,R						
				7	96%										
84									J,I,R						
									J,I,R						
									J,I,R						
									J,I,R						
	@ 85.5 and 86.5 ft. Thin zones of glauconite in fractures								J,I,R,CL						
86															
									J,I,R,CL						
			393.55 / 87.50												
									J,I,R						
88									J,I,R						
				8	85%										
									J,I,R,CL						
	391.55		391.55												
	End of Record of Drillhole 89.50 at 89.5 ft.		89.50												
90															
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: W. HERST
DATE: 3/2/95

Golder Associates

RECORD OF DRILLHOLE PZ-201A

Sheet 1 of 1

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/22/95
DRILL RIG: SCHRAMM

DATUM:
COORDINATES N: 1067831.8
AZIMUTH: 0

COLLAR ELEV: 478.4
E: 516846.4
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 30 R3 150 R4 300 R5 600 R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
			398.40												
80	0.0-80.0 ft. 398.20 / 80.20 See Soil Borehole Log PZ-201-SS		80.00						B,U,SM-CL						3/22/95 6 1/4 in. ID hollow stem auger advanced to 31.0 ft. then advanced borehole to 80.0 ft. with 5 7/8 in. air rotary bit
	80.0-80.2 ft. Slightly weathered, thinly laminated, dark greenish gray (5GY 4/1), very fine grained, extremely weak, SILTSTONE, (ST. LOUIS FORMATION)								J,U,VR,CL						4/22/95 @ 13:45 Began coring
									J,I,VR,CL,Fe						
82	80.2-88.3 ft. Fresh, thickly bedded, light brownish gray (5YR 6/1), microcrystalline, weak, LIMESTONE, (ST. LOUIS FORMATION)								J,C,R,CL						
									J,ST,R,CL						
									J,ST,R,CL						
84									J,I,R						
									J,ST,R						
				1	97%										
									J,I,R						
86															
									J,U,ST,CL (3)						
88	390.10														
	88.3-90.0 ft. 88.30 Fresh, thickly bedded, dark yellowish orange (10YR 6/6) grading to moderate yellowish brown (10YR 5/2), very fine grained, extremely weak to very weak, SILTSTONE, (ST. LOUIS FORMATION)								B,I,R						4/22/95 @ 16:30 Ended coring
90	Grades stronger with depth 388.40 / 90.00		388.40 / 90.00												
	End of Record of Drillhole at 90.0 ft.														
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: M. VOGT

LOGGED: B. TILTON
CHECKED: B. TILTON
DATE: 5/16/95

Golder Associates

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2
DRILLING METHOD:	6.25 inch I.D. Hollow Stem Auger
SAMPLING METHOD:	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)
BORING NO.	PZ-202-SS
SHEET	1 OF 3
DRILLING	START TIME 07:50 DATE 2/26/95 FINISH TIME 09:45 DATE 2/26/95
WATER LEVEL / TIME / DATE / CASING DEPTH	
DATUM	NORTHING: 1067320.25 EASTING: 517101.58
ELEVATION	479.0
DRILL RIG	CME 75 - TRUCK MOUNT
ANGLE	BEARING
SAMPLE HAMMER	
SURFACE CONDITIONS	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	1 2 2 3	1.6' / 2.0' (80%)			(0.0-4.6 ft.) Firm, dark yellowish brown (10YR 4/2), homogenous, CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP ①	
2 3	6 2 2 4	1.4' / 2.0' (70%)			@ 3.4 ft., color changes to dusky yellowish brown (10YR 2/2)	SP ②	
4	1 3 6 7	1.6' / 2.0' (80%)			(474.4) 4.6	SP ③	
5					(4.6-8.3 ft.) Stiff, mottled light olive gray (5Y 5/2) and olive gray (5Y 4/1), CLAY, little Silt, trace Gravel, NR, moist, (CL), (LOESS)		
6 7		0.0' / 2.0' (0%)				SH ④	
8	1 2 4 4	1.7' / 2.0' (85%)			(470.7) 8.3	SP ⑤	
9					(8.3-19.1 ft.) Soft to firm, light olive gray (5Y 6/1), SILTY CLAY, iron stained, NR, moist, (CL-ML), (LOESS)		
10 11	2 4 4 4	1.6' / 2.0' (80%)				SP ⑥	
12 13	2 2 4 6	1.1' / 2.0' (55%)				SP ⑦	
14	weight of hammer for 12" 1 2	1.5' / 2.0' (75%)			@ 13.5 ft., becoming increasingly iron stained @ 14.0 ft., becoming wet, very soft	SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT

DATE 2/26/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ202SS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-202-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 07:50 / TIME 09:45
		DATE 2/26/95 / DATE 2/26/95
NORTHING: 1067320.25 DATUM EASTING: 517101.58 ELEVATION 479.0		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(8.3-19.1 ft.) Soft to firm, light olive gray (5Y 6/1), SILTY CLAY, iron stained, NR, moist, (CL-ML), (LOESS)	SP 8	
16	weight of hammer for 18" 1	1.4'/2.0' (70%)					
						SP 9	
17							
18	weight of hammer for 6' 2 3 5	2.0'/2.0' (100%)				SP 10	
19					(19.1-19.4 ft.) Firm, light olive gray (5Y 5/2), SILTY CLAY, NR, moist, (CL-ML), (LOESS)		
20	2 3 5 6	1.4'/2.0' (70%)			(19.4-21.9 ft.) Firm, olive gray (5Y 4/1), SILTY CLAY, iron stained, NR, moist, (CL-ML), (LOESS)	SP 11	
21							
22	1 3 4 5	0.4'/2.0' (20%)			(21.9-24.5 ft.) Loose, olive gray (5Y 4/1), fine SANDY SILT, NR, damp, (ML), (LOESS)	SP 12	
23							
24	1 5 9 12	1.5'/2.0' (75%)			(24.5-25.0 ft.) Firm, olive gray (5Y 4/1), laminated, SILTY CLAY, NR, damp, (CL-ML), (LOESS) (454.0) 25.0	SP 13	
25					(25.0-29.5 ft.) Compact, olive gray (5Y 4/1), laminated, fine SANDY SILT, NR, dry, (SM), (ALLUVIUM)		
26	2 8 9 9	0.1'/2.0' (5%)			@ 25.5 ft., becoming moist	SP 14	
27							
28	5 7 6 9	1.5'/2.0' (75%)				SP 15	
29					(29.5-30.8 ft.) Compact, olive gray (5Y 4/1), fine SAND interbedded with SILT, NR, moist, (SM), (ALLUVIUM)		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY V. HERST

DATE 2/26/95

JOB NO.: 943-2848

FILENAME: PZ202SS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-202-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 3
NORTHING: 1067320.25 DATUM EASTING: 517101.58 ELEVATION 479.0		DRILLING START TIME 07:50 DATE 2/26/95; FINISH TIME 09:45 DATE 2/26/95

WATER LEVEL					
TIME					
DATE					
CASING DEPTH					

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE BEARING
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
	2 50/2"	0.8'/0.8' (100%)			(29.5-30.8 ft.) Compact, olive gray (5Y 4/1), fine SAND interbedded with SILT, NR, moist, (SM), (ALLUVIUM) (448.2) 30.8	SP (16)	
31					End of Soil Borehole Log at 30.8 ft. See PZ-202-SS Record of Drillhole for rock descriptions		Split spoon and auger refusal at 30.8 ft.
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY W HERST
DATE 2/26/95

JOB NO.: 943-2848
FILENAME: PZ202SS

RECORD OF DRILLHOLE PZ-202-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/26/95 - 2/27/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.8
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R8 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-30.8 ft. See Soil Borehole Log PZ-202-SS														
18															
20															
22															
24															
26															
28															
30															
	30.8-44.1 ft. 448.21		448.21												
	Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 30.80		30.80	1	63%				Broken Zone						Some sand in return water; driller says material seems to be very rubbly
32	31.4 and 31.9 ft. Iron stained clay infilling														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 2/26/95 - 2/27/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067320.2
E: 517101.6
AZIMUTH: 0

COLLAR ELEV: 479.01
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
32	30.8-44.1 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), medium grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)					
	33.4-34.7 ft. Limestone becomes moderately weathered, grayish orange (10YR 7/4) with dark yellowish orange (10YR 6/6) staining and cross bedded				J,I,R (2)	
					J,U,R	
34					J,U,R	
					J,PL,SM	
			1	63%	J,PL,SM	
					J,U,R	
36					Core Loss	35.8 ft. Drilling is slow due to rubbly conditions
		441.41 / 37.60				37.0 ft. Water pump keeps shutting down, driller reports that bit is getting plugged off
38					J,C,SM	
					J,C,SM	
					J,I,R	
					J,C,SM (2)	
					J,PL,SM	
					J,I,R	
					J,I,R,Fe	
					J,C,SM (3)	
40					J,C,SM	
					J,I,SM	
			2	52%	J,C,SM (2)	
					J,I,SM (3)	
42					Core Loss	
44		434.91 / 44.10				
	44.1-59.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)				J,I,R (4)	
					J,I,R	
					J,C,R	
	45.1-46.1 ft. Large pyrite crystals Some calcite crystals				J,U,SM,CL	
					J,I,SM	
					J,I,SM,CL	
46			3	96%	J,I,SM,CL	
					J,I,SM	
					J,C,SM	
					J,PL,SM	
					J,PL,SM,CL	
					J,I,R	
					J,I,SM,CL (2)	
					J,I,SM (2)	
48						

DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90)

WEATHERING INDEX: SW, FR, MW, HW, CW
STRENGTH INDEX: R1, R2, R3, R4, R5, R6
POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible] METHOD: NX Core & water
DRIL[illegible] DATE: 2/26/95 - 2/27/95
DRILL RIG: CME 75

DATU[illegible]
COORD[illegible]ES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.6
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.1-59.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)			3	96%				J,I,SM						
									J,I,SM						
									J,PL,SM,CL						
			429.91 / 49.10												
	49.4-49.8 ft. Medium to coarse grained								J,I,R,CL						
									J,C,SM,CL						
									J,I,R						
50									J,I,R						
									J,I,SM						
									J,I,R						
									J,C,R						
	51.0 ft. Iron stained nodules														
	51.0-51.6 ft. 0° healed fractures														
	51.6-52.4 ft. Slightly weathered, aranaceous, thinly laminated														
52									J,PL,R,CL						
	52.9-53.9 ft. 0° healed fracture														
54				4	99%										
									J,I,R						
	55.3-56.6 ft. Medium to coarse grained								J,PL,R (2)						
	55.9 ft. Chert filled vein														
56									J,PL,R						
									J,I,SM,CL						
58									J,I,SM,CL						
									J,I,SM						
									J,I,R,CL						
			419.91 / 59.10												
	59.1-67.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R (4)						
60	60.3-61.3 ft. Stylolitic														
				5	100 %				J,I,R						
									J,I,SM						
									J,I,SM (2)						
62									J,I,R						
									J,I,R						
									J,I,SM,CL						
									J,I,R						
	63.8-64.3 ft. 20° healed fracture								J,I,R						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/26/95 - 2/27/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	NOTES WATER LEVELS INSTRUMENTATION
64	59.1-67.8 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				J,I,R				
	64.5-65.1 ft. Silty interbeds								
	64.3-66.4 ft. Fine to medium grained								
66			5	100 %	J,PL,SM (3)				
	412.01 / 67.00								
	67.0-69.7 ft. Fresh thickly bedded, light olive gray (5Y 6/1) to greenish gray (5GY 6/1), medium grained, medium strong, DOLOMITE (ST. LOUIS FORMATION)				J,PL,SM (3)				
68	69.0-69.2 ft. Becomes slightly weathered, dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4)				J,I,SM				
		409.91 / 69.10							
	67.6-67.8 ft. Clay infilling								
	69.7-78.9 ft. Moderately weathered, medium bedded, dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4), m-c grained, medium strong, ARGILLACEOUS DOLOMITE, (ST. LOUIS FORMATION)								
70			6	94%					
72	72.5-76.1 ft. Vuggy, moderately to highly weathered, some calcite crystals				J,I,R (3)				
					J,I,R				
					J,I,R				
					J,I,R				
74		404.91 / 74.10			Core Loss				
					J,I,R (2)				
					J,I,R (4)				
76			7	87%	J,I,R				
					J,I,R,CL				
	76.9-77.2 ft. Chert								
	77.3-77.4 ft. Highly weathered				J,I,R				
	78.0-78.1 ft. Highly weathered				J,PL,R,CL				
78		400.91 / 78.10			J,I,R				
		400.31 / 78.70			Core Loss				
					J,C,R,CL				
	78.9-89.2 ft. Fresh, medium bedded, yellowish gray (5Y 7/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		8	100 %	J,U,SM				
80					J,I,SM				

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-202-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 2/26/95 - 2/27/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067320.2
AZIMUTH: 0

COLLAR ELEV: 479.01
E: 517101.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FT)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.9-89.2 ft. Fresh, medium bedded, yellowish gray (5Y 7/2), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)							J,PL,SM; J,PL,SM					
82	82.1-82.2 ft. Porous/vuggy							J,I,SM,CL					
	83.6 ft. 1" thick clay infilling							J,I,R,CL					
84	83.7-84.3 ft. Micrycrystalline		8	100%				J,I,R (3)					
	85.0-85.2 ft. Moderately weathered between joints							J,I,R (2)					
	85.6-87.1 ft. Pyrite crystals												
86	85.7-88.4 ft. Slightly weathered, some cross bedding							J,I,SM (2); J,I,SM					
								J,PL,SM; J,U,R; J,I,R					
88	88.4-88.9 ft. Coarse grained	390.31											
	89.0-89.2 ft. Moderately weathered	88.70 / 389.81						J,PL,SM					
	89.2-89.9 ft. Moderately weathered, thinly laminated, medium dark gray (N4), very fine grained, extremely weak rock, SILTSTONE, with claystone interbeds, (ST. LOUIS FORMATION)	89.20 / 389.11 / 89.90											
90			9	97%				J,I,SM,CL					
	89.9-92.0 ft. Fresh, thickly laminated to medium bedded, medium gray (N5), fine grained, medium strong, SANDSTONE, (ST. LOUIS FORMATION)	387.01											
92	End of Record of Drillhole at 92.0 ft.	92.00 / 387.01											
94													
96													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: R. BOOTH
DATE: 3/13/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-203-SS
		SHEET 1 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					15:00	18:00
DATE					DATE	DATE
CASING DEPTH					5/25/95	5/25/95

DATUM NORTHING: 1066661.50 EASTING: 516607.70 ELEVATION 484.2

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE -90 BEARING NA

SAMPLE HAMMER 140 lb. - falling 30 inches

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-4.2 ft.) Soft, dark yellowish brown (10YR 4/2), fine sandy SILT, moist, (ML), (LOESS)		
2	1 2 2 2	1.3' / 2.0' (65%)				SP 1	
3							
4	1 2 3 3	0.8' / 2.0' (40%)			(480.0) 4.2 (4.2-16.2 ft.) Firm, moderate yellowish brown (10YR 5/2) to light gray (N7), silty CLAY, moist, (CL), (ALLUVIUM)	SP 2	
5							
6	1 3 3 5	2.0' / 2.0' (100%)				SP 3	
7							
8	1 3 3 6	1.7' / 2.0' (85%)				SP 4	
9							
10	2 4 3 5	2.0' / 2.0' (100%)			@ 10.4-16.0 ft., wet	SP 5	
11							
12	0 1 2 3	1.5' / 2.0' (75%)				SP 6	
13							
14	1 1 2 3	2.0' / 2.0' (100%)				SP 7	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY CHK'D BY W. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ203SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-203-SS
		SHEET 2 OF 3
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
		START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	15:00 / 18:00
	DATE	DATE / DATE
NORTHING: 1066661.50 DATUM EASTING: 516607.70 ELEVATION 484.2	CASING DEPTH	5/25/95 / 5/25/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS
ANGLE -90 BEARING NA	
SAMPLE HAMMER 140 lb. - falling 30 inches	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(4.2-16.2 ft.) Firm, moderate yellowish brown (10YR 5/2) to light gray (N7), silty CLAY, moist, (CL), (ALLUVIUM) (468.0) 16.2	SP 7	
16	0 0 3 4	1.2'/2.0' (60%)			(16.2-26.4 ft.) Soft to firm, medium yellowish brown (10YR 5/2) and light gray (N7), clayey SILT, trace fine Sand, moist, (ML), (LOESS)	SP 8	
17							
18	2 2 5 6	1.0'/2.0' (50%)				SP 9	
19							
20	4 3 5 6	2.0'/2.0' (100%)				SP 10	
21							
22	1 2 5 6	0.9'/2.0' (45%)			@ 22.0-25.8 ft., color changes to medium yellowish brown (10YR 5/2)	SP 11	
23							
24	3 4 4 5	1.8'/2.0' (90%)				SP 12	
25							
26	1 4 6 9	1.4'/2.0' (70%)			@ 25.8-26.4 ft., color is medium gray (N5) (457.8) 26.4 (26.4-41.2 ft.) Loose to very dense, medium gray (N5), fine SAND, trace Silt, saturated, (SP), (ALLUVIUM)	SP 13	
27							
28	3 4 5 7	1.4'/2.0' (70%)				SP 14	
29					@ 29.0-41.2 ft., occasional beds of SILT interbedded		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY CHK'D BY W. HERST

DATE 6/20/95

JOB NO.: 943-2848

FILENAME: PZ203SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-203-SS
		SHEET 3 OF 3
	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					15:00	18:00
DATE					DATE	DATE
CASING DEPTH					5/25/95	5/25/95

DATUM NORTHING: 1066661.50 EASTING: 516607.70 ELEVATION 484.2

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE -90 BEARING NA

SAMPLE HAMMER 140 lb. - falling 30 inches

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 6 7 12	1.5'/2.0' (75%)			@ 29.0-41.2 ft., occasional beds of SILT interbedded	SP 15	
32	4 5 12 10	1.7'/2.0' (85%)				SP 16	
33							
34	1 4 5 10	1.6'/2.0' (80%)				SP 17	
35							
36	4 7 11 13	0.8'/2.0' (40%)			@ 36.0-41.2 ft., includes little medium sand	SP 18	
37							
38	5 10 25 50	1.6'/2.0' (80%)				SP 19	
39							
40	15 30 30 50	1.9'/1.9' (100%)				SP 20	
41					(443.0) 41.2		
					(41.2-42.0 ft.) Hard, medium gray (N5) and dark reddish brown (10R 3/4), mottled, SILT, (ML), (ALLUVIUM) (442.2) 42.0		
42					End of Soil Borehole Log at 42.0 ft.		
43					See Record of Drillhole PZ-203-SS for rock descriptions		
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY D. ALLOWAY

DATE 6/20/95

CHK'D BY W. HERST

JOB NO.: 941-2848

FILENAME: PZ203SS

RECORD OF DRILLHOLE PZ-203-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 5/26/95 & 5/31/95
DRILLING RIG: CME 75

DATUM:
COORDINATES: N: 1066661.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 516607.70
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (60 80 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 30 R3 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-42.0 ft. See Soil Borehole Log PZ-203-SS 42.0-44.8 ft. No samples collected														
34															
36															
38															
40															
42															
44	439.40		439.40												
	44.8-53.4 ft. 44.80 Hard, medium light gray (N6) to dark reddish brown (10R 3/4), SILTY CLAY, moist, (CL), (ALLUVIAL)		44.80												5/26/95 @ 9:15 Began drilling
46				1	100										
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 5/26/95 & 5/31/95
DRILLING: CME 75

DATUM:
COORDINATES N: 1066681.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 516607.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (RT 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	48.1-57.5 ft. Pale green (10G 6/2)														
				1	100										
50															
			433.40												
	50.80		50.80												50.8-52.0 ft. and 52.3-53.7 ft. Core loss due to Clay washing out End of Run 1 @ 10:15
52									Core Loss						
			430.80												
	53.4-73.6 ft. Moderately weathered, thickly bedded, yellowish gray (5Y 7/2), f-m grained, medium strong, BRECCIATED LIMESTONE, (ST. LOUIS FORMATION) Clay and poorly lithified Sandstone around pieces of Limestone		53.40												
54									J,I,R,CL						
									J,I,R						
									J,I,R						
									J,I,R						
56															
									J,P,SM						
				2	86%										
58															
									J,I,R						
									J,I,R						
									J,I,R,CL						
									J,I,R,CL						
60															
									J,C,SM (2)						5/26/95 @ 11:00 End of Run 2
			423.40												
			60.80												
									J,PL,SM						
62															
				3	97%										
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 5/26/95 & 5/31/95
DRILLING: CME 75

COORDINATES N: 1068661.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 518607.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	53.4-73.6 ft. Moderately weathered, thickly bedded, yellowish gray (5Y 7/2), f-m grained, medium strong, BRECCIATED LIMESTONE, (ST. LOUIS FORMATION) Clay and poorly lithified Sandstone around pieces of Limestone						
66					60	J,PL,SM	
			3	97%	90	J,PL,SM,CL	
68					60	J,PL,SM,CL (2)	
					30	B,PL,SM,CL	
70					60	J,I,R,CL	5/26/95 @ 12:00 End of Run 3
		413.40 / 70.80					
					30	J,PL,R,CL	
72					90	J,C,SM	
74	73.6-81.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2) to grayish orange pink (5YR 7/2), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		4	100 %			
76	76.1-77.1 ft. Clay layer						
	77.6-77.9 ft. Clay layer	406.50 / 77.70					
78			5	100 %			
80							

Weathering Index: SW, FR, MW, HW, CW
Strength Index: R6, R5, R4, R3, R2, R1
Point Load Index (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6
Test Orientation

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203-S[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

[redacted]ETHOD: NX Core & water
[redacted]DATE: 5/26/95 & 5/31/95
[redacted]G: CME 75

DAT[redacted]
COO[redacted]S N: 1066681.50
AZIMU[redacted]: 0

COLLAR ELEV: 484.2
E: 516607.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	73.6-81.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2) to grayish orange pink (5YR 7/2), m-c grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic 402.70 / 81.50														
82	81.5-98.0 ft. Highly weathered, pale yellowish brown (10YR 6/2), f-c grained, very weak, LIMESTONE boulders in SILT matric (Collapse Zone)		400.20	5	100 %										81.5-98.0 ft. Collapse Zone, RQD measurements not valid
84	84.0-85.5 ft. Limestone boulder		84.00												
86	85.5-87.2 ft. Weak, dark gray (N3), thinly laminated Siltstone 398.70 / 85.50														
88	87.2-90.0 ft. Limestone boulder 397.00 / 87.20			6	100 %										5/26/95 @ 15:00 Stop drilling
90	90.0-90.5 ft. Weak, light olive gray (5Y 6/1), Siltstone 393.70 / 90.50; 90.5-92.4 ft. Limestone boulder		394.20 / 90.00												5/31/95 @ 8:30 Resume drilling after 4-day break, water level in open hole @ 34.1 ft. bgs
92	92.4-95.0 ft. Very weak, medium dark gray (N4) to grayish black (N2), thinly laminated, Siltstone layer 392.50 / 91.70			7	82%				Core Loss						92.5-93.4 ft. Core loss in soft unit
94															
96	95.0-96.0 ft. Limestone boulder 388.20 / 96.00		389.20 / 95.00	8	100 %										

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

RECORD OF DRILLHOLE PZ-203

PROJECT: LA/DLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/26/95 & 5/31/95
DRILL RIG: CME 75

DATUM: MSL
COORDINATES N: 1066661.50
AZIMUTH: 0

COLLAR ELEV: 484.2
E: 516607.70
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR, MW HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	96.0-98.0 ft. Very weak, light olive gray (5Y 6/1), thinly laminated, Siltstone layer		388.20 / 96.00												
98	98.0-104.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		386.20 / 98.00	8	100 %										
100	100.3-100.7 ft. Chert zone		384.20 / 100.00						J,PL,SM						
									B,PL,SM,CL						
									J,I,VR,Calcite						
102									B,I,R						
									J,I,R						
104	104.2-110.0 ft. Slightly weathered, thinly bedded, olive gray (5Y 4/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 104.4-105.0 ft. Highly weathered zone and weak 105.0-108.8 ft. *Intermittent vuggy zone* (<3 mm.), zones <2 in. thick			9	98%				J,I,R						
									J,I,VR calcite crystals						
108															5/31/95 @ 11:00 Complete coring
			374.20												
110	End of Record of Drillhole at 110.0 ft.		110.00												
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/13/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-204-SS	
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 1	
		DRILLING START	DRILLING FINISH
	WATER LEVEL	TIME 15:50	TIME 07:45
	TIME		
	DATE	DATE 3/7/95	DATE 3/7/95
NORTHING: 1066426.61 DATUM EASTING: 515533.49 ELEVATION 467.0	CASING DEPTH		

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Muddy, no vegetation.

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-6.0 ft.) CONCRETE, (FILL)		Auger from 0.0-6.5 feet with no sampling
1							
2							
3							
4							
5							
6							
7	1 2 2	0.5'/1.5' (33%)			@ 6.5-7.9 ft., crushed CONCRETE, (FILL) (459.1) 7.9	SP 1	Begin split spoon sampling at 6.5 feet
8	2 4 6 5	1.1'/2.0' (55%)			(7.9-9.3 ft.) Stiff, mottled moderate yellowish brown (10YR 5/4) and dark yellowish orange (10YR 6/6), CLAYEY SILT, iron stained, some roots, NR, damp, (CL-ML), (LOESS)	SP 2	
9					(9.3-10.5 ft.) Stiff, pale yellowish brown (10YR 6/2) and medium dark gray (N4), CLAYEY SILT, some fine sand, NR, damp, (CL-ML), (LOESS)		
10	3 4 5 5	1.5'/2.0' (75%)			(10.5-14.6 ft.) Stiff, medium dark gray (N4), CLAYEY SILT, little fine sand, NR, damp, (CL-ML), (LOESS)	SP 3	
11					@ 11.2-11.5 ft., silty CLAY		
12	1 6 8 9	0.8'/2.0' (40%)				SP 4	
13					(453.0) 14.0		
14					End of Soil Borehole Log at 14.0 ft. See PZ-204-SS Record of Drillhole for rock descriptions		Auger/split spoon refusal at 14.0 feet

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY W. HERST

DATE 3/7/95

JOB NO.: 943-2848

FILENAME: PZ204SS

RECORD OF DRILLHOLE PZ-204-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068426.81
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (60 80 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
0	0.0-14.0 ft. See Soil Borehole Log PZ-204-SS 14.0-14.6 ft. No samples collected														
2															
4															
6															
8															
10															
12															
14	452.40		452.40												
16	14.6-45.1 ft. 14.60 Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystal veins (<1 mm. thick), few fossils		14.60	1	89%										3/8/95 @ 8:15 Begin coring

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068426.61
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW, FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1, R2, R3, R4, R5, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	14.6-45.1 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystal veins (<1 mm. thick), few fossils							J,PL,SM,CL					
								J,I,SM,CL					
								J,I,SM					
								J,I,SM,CL					
								J,I,SM,CL					
								J,I,SM					
								J,ST,SM,CL					
			1	89%				J,I,SM,CL					
18								J,I,SM					
								J,I,SM					
								J,PL,SM,CL					
								J,I,SM					
		447.70						Core Loss					Core loss due to highly fractured rock; core End Run 1 @ 9:50
		19.30						J,I,SM (2)					
20								J,I,SM (2)					
								J,I,SM,CL (3)					
								J,U,SM,CL					
								J,I,SM,CL (3)					
			2	96%				J,U,SM,CL (2)					
22								J,I,SM,CL (2)					
	22.6-28.0 ft. Very fine grained							J,I,SM					
								J,I,SM,CL (2)					
		443.00											
24		24.00											3/8/95 @ 10:50 End Run 2
								J,I,R					Use new bit during Run 3; slightly larger diameter, therefore hole reamed slightly
26								J,PL,SM					
								J,I,SM,CL					
			3	98%				J,I,SM,CL,					
								J,I,SM					
								J,I,SM,Fe					
								J,U,SM					
28	28.0-30.7 ft. Medium grained 28.1-28.5 ft. 0 iron stained vein (1 mm. thick)												
		437.70											
	29.3-29.8 ft. Slightly weathered, iron stained	29.30						J,PL,SM,Fe					3/8/95 @ 13:15 End Run 3
30								J,I,R					
								J,PL,SM (2)					
			4	98%				J,I,R					
								J,I,R					
								J,U,SM					
								J,I,R					
32													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1066428.61
AZIMUTH: 0

COLLAR ELEV: 487.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	14.6-45.1 ft. Fresh, medium bedded, light olive gray (5Y 6/1), micro-crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystal veins (<1 mm. thick), few fossils								J,I,R						
34									J,I,R (4)						
				4	98%				J,I,SM,CL (4)						
36									J,I,SM,CL (5)						
									J,I,SM,CL (2)						
38			427.70 / 39.30						J,I,SM,CL						3/5895 @ 14:05 End Run 4
40									J,I,SM						
									J,I,SM,CL (6)						
									J,I,SM						
									J,I,SM,CL						
42	41.8-42.8 ft. Fine grained, calcareous dolomite														
	42.8-45.1 ft. Medium grained, dolomitic limestone								J,I,SM						
				5	102%										
44									J,I,R (4)						
	45.1-49.3 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Porous/vuggy (vugs ~1 mm. thick); some 10 degree calcite veins (<2 mm. thick)		421.90 / 45.10						B,U,R						
46															
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068426.81
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	48.8-49.3 ft. Fine grained, dolomitic limestone 417.70	417.70	5	102 %									3/8/95 @ 14:40 End Run 5
	49.3-64.3 ft. 49.30 Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)	49.30					90	J,I,SM (6)					
50	49.3-49.8 ft. Thinly laminated						90	J,I,SM (2)					
	49.8-50.9 ft. Chert zone						90	J,I,R,CL					
52							90	J,I,R,CL					
	52.8-54.5 ft. Intricate pattern of calcite veins												
54			6	98%			90	J,I,R,CL					
	54.8-55.9 ft. Moderately weathered						90	J,I,R,CL					
56													
	56.6-58.1 ft. Moderately weathered						90	J,PL,SM,CL					
							90	J,I,R,CL					
	57.5-57.7 ft. Claystone 409.50						90	B,U,R,CL					
	57.70						90	B,U,SM,CL					
58	408.90												
	58.1-58.5 ft. 58.10 Claystone 408.50						90	B,I,R,CL					
	58.5-59.9 ft. 58.50 Siltstone, 45 degree crossbed						60	J,PL,SM,CL (2)					
							90	J,I,SM,CL					
		407.70 / 59.30											3/8/95 @ 15:35 End Run 6
							90	J,I,R					
							90	J,I,SM (2)					
	407.10						0	J,I,R					
60	60.0-60.4 ft. 59.90 Calcareous dolomite						90	J,I,R					
							90	J,PL,SM,CL					
							90	J,U,SM,CL					
							90	J,PL,R,CL					
	405.40												
	61.6-62.4 ft. 61.60 Calcareous dolomite, slightly weathered		7	100 %			90	J,PL,SM					
62	404.60												
	62.40						90	J,I,SM,CL (5)					
	63.0-64.3 ft. Microcrystalline												
64													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1066426.61
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	402.70 / 64.30					
	64.3-79.9 ft. Moderately weathered, thinly bedded, pale to dark yellowish brown (10YR 6/2-10YR 4/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) Very porous/vuggy (<1 mm.-5 mm.)				J,I,SM,CL (2); J,U,R; J,I,SM,CL	
66			7	100 %		
68		397.70 / 69.30				3/8/95 @ 16:20 End Run 7
	69.6-70.3 ft. Slightly weathered					
70						
72						
74			8	100 %		
76						
78		387.70 / 79.30				3/8/95 @ 16:55 End Run 8
	387.10 / 79.90		9	98%	J,I,R	
80						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 3/8/95 - 3/9/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1068426.61
AZIMUTH: 0

COLLAR ELEV: 467.0
E: 515533.49
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	79.9-90.3 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), coarse grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some calcite crystals, stylolites														
82				9	98%				J,PL,SM,CL						
									J,U,SM,CL						
									J,I,SM,CL						
84			382.70												
			84.30												3/8/95 @ 17:20 End Run 9
									J,I,R						
									J,PL,SM						
	85.7-89.6 ft. Microcrystalline														
86									J,I,SM (2)						
									J,I,SM						
				10	100 %										
									J,I,SM						
88															
									J,I,SM,CL (2)						
									J,I,R,CL (2)						
									J,PL,SM						
90	376.70		376.70												3/8/95 @ 17:50 End Run 10
	End of Record of Drillhole at 90.3 ft. 90.30		90.30												
92															
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: M. HIRT
CHECKED: W. HERST
DATE: 3/29/95

Golder Associates

RECORD OF DRILLHOLE PZ-204A

Sheet 1 of 1

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 6/21/95
DRILL RIG: SCHRAMM

DATUM:
COORDINATES N: 1066429.82
AZIMUTH: 0

COLLAR ELEV: 466.7
E: 515558.28
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	ROCK TYPE / DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW/FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	0.0-80.0 ft. See Soil Borehole Log and Record of Drillhole for PZ-204-SS	386.70 / 80.00											0.0-14.0 ft. Borehole advanced with 6 1/4 in. ID hollow stem augers
	80.0-90.0 ft. Fresh, medium to thickly bedded, light olive gray (5Y 6/1), finely crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)							J,PL,R,CL					14.0-80.0 ft. Borehole advanced with 5 7/8 in. dia. air rotary bit
								J,PL,R,CL					6/21/95 @ 13:00 Began coring
82	Stylolitic												
	82.5-83.1 ft. Thinly laminated, fossiliferous							J,C,R,CL (3)					
	82.3-85.8 ft. Small vugs (1/4 in.) filled with glauconite												
84								J,C,VR-CL					
			1	96%				J,PL,R,CL					
	@ 85.4 ft. Grades to microcrystalline Limestone							J,C,SM,CL					
86								J,ST,R,CL					
								J,C,R,CL					
								J,C,R,CL (2)					
88													
		377.10						J,P,R					
	378.70	89.60						Core Loss					6/21/95 @ 15:45 Ended coring
90	End of Record of Drillhole at 90.0 ft.	90.00											
92													
94													
96													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: R. BOOTH
CHECKED: B. TILTON
DATE: 7/12/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-205-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 4
		DRILLING START TIME 16:35; FINISH TIME 11:00
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE START 3/25/95; DATE FINISH 3/25/95
DATUM NORTHING: 1067463.60 EASTING: 515463.34	ELEVATION 459.3	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE -90°	BEARING	
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 7 7 10	1.5'/2.0' (75%)			(0.0-2.2 ft.) Stiff, dark greenish gray (5GY 4/1) to olive gray (5Y 6/1), SILTY CLAY, trace fine Sand, SR, damp, (CL), (FILL)	SP 1	
2					(457.1) 2.2		
3	1 2 2 4	0.5'/2.0' (25%)			(2.2-6.0 ft.) Soft, black (N1), CLAYEY SILT, trace fine Sand, WR, moist to wet, (CL-ML), (FILL)	SP 2	
4	2 2 2 3	1.5'/2.0' (75%)				SP 3	Soil becomes wet @ 4.0 ft.
6					(453.3) 6.0		
7	1 4 4 3	0.1'/2.0' (5%)			(6.0-12.0 ft.) Mixed wet waste and clayey silt	SP 4	
8	6 5 6 4	0.1'/2.0' (5%)			(8.0-10.0 ft.) Mixed wet waste and clayey silt	SP 5	
10	2 2 3 3	0.6'/2.0' (30%)				SP 6	
12					(447.3) 12.0		
13	2 9 3 2	0.0'/2.0' (0%)	NO RECOVERY		(12.0-14.0 ft.) No Recovery	SP 7	from 12.0-28.0 ft., no samples recovered, but drilling indicated mixed waste and silty clay layers
14	6 8 8 7	0.0'/2.0' (0%)			(14.0-15.0 ft.) No Recovery	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. CASID CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ205AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-205-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 4
		DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 16:35 / TIME 11:00
		DATE 3/25/95 / DATE 3/25/95
DATUM NORTHING: 1067463.60 EASTING: 515463.34	ELEVATION 459.3	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE -90° BEARING		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(15.0-16.0 ft.) No Recovery	SP 8	
16	5 5 5 4	0.0'/2.0' (0%)	NO RECOVERY		(16.0-18.0 ft.) No Recovery	SP 9	
17							
18	5 2 1 5	0.0'/2.0' (0%)			(18.0-20.0 ft.) No Recovery	SP 10	
19							
20	1 2 3 3	0.0'/2.0' (0%)			(20.0-22.0 ft.) No Recovery	SP 11	
21							
22	3 2 1 4	0.0'/2.0' (0%)			(22.0-24.0 ft.) No Recovery	SP 12	
23							
24	3 3 23 50/1"	0.0'/2.0' (0%)			(24.0-26.0 ft.) No Recovery	SP 13	
25							
26	8 6 8 10	0.0'/2.0' (0%)			(26.0-28.0 ft.) No Recovery	SP 14	
27							
28	1 2 4 5	0.0'/2.0' (0%)			(431.3) 28.0 (28.0-30.0 ft.) Loose, dark greenish gray (5GY 4/1), SANDY SILT, NR, wet, (ML)	SP 15	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO

DATE 6/1/95

CHK'D BY V. HERST

JOB NO.: 943-2848

FILENAME: PZ205AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-205--AS
		SHEET 3 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	16:35 / 11:00
	DATE	DATE / DATE
	CASING DEPTH	3/25/95 / 3/25/95

NORTHING: 1067463.60
DATUM EASTING: 515463.34 ELEVATION 459.3

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE -90° BEARING
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(30.0-31.0 ft.) No samples collected (428.3) 31.0		5/21/95, 10.0 in. ID steel casing installed through 10.25 in. ID augers to 29.0 ft. Casing sealed in borehole with neat cement grout to surface.
31	6 5 5 8	1.2'/2.0' (60%)			(31.0-36.5 ft.) Stiff, medium dark gray (N4), SILTY CLAY, with thin fine sand layers (1" thick), moist, NR, (CL), (ALLUVIUM)	SP 16	
32							
33	9 3 5 12	1.3'/2.0' (65%)				SP 17	
34							
35	7 7 9 9	1.0'/2.0' (50%)				SP 18	
36					(422.8) 36.5		
37	7 14 21 17	1.1'/2.0' (55%)			(36.5-39.0 ft.) Dense, olive gray (5Y 4/1), SILTY fine SAND, wet, NR, (SM), (ALLUVIUM)	SP 19	
38							
39	4 3 3 4	1.4'/2.0' (70%)			(420.3) 39.0 (39.0-44.2 ft.) Firm, olive gray (5Y 4/1), SILTY CLAY, moist to wet, NR, (CL) from 40.2-40.4 ft., wet, fine, sandy clay layer	SP 20	
40							
41	3 4 4 5	1.7'/2.0' (85%)			from 41.8-42.0 ft., wet, fine, sandy clay layer	SP 21	
42							
43	2 7 11 18	1.3'/2.0' (65%)				SP 22	
44					(415.1) 44.2 (44.2-49.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, trace silt, wet, NR, (SM), (ALLUVIUM)		

DRILLING CONTR LAYNE-WESTERN
LOGGED BY S. CUSIO CHK'D BY V. HERST
DATE 6/1/95
JOB NO.: 943-2848
FILENAME: PZ205AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-205-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 4 OF 4
		DRILLING START / FINISH
	WATER LEVEL	
	TIME	START TIME 16:35 / FINISH TIME 11:00
	DATE	START DATE 3/25/95 / FINISH DATE 3/25/95
	CASING DEPTH	

NORTHING: 1067463.60
DATUM EASTING: 515463.34 ELEVATION 459.3

DRILL RIG CME 75 - TRUCK MOUNT
SURFACE CONDITIONS
ANGLE -90° BEARING
SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	6 8 12 16	1.6'/2.0' (80%)			(44.2-49.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, trace silt, wet, NR, (SM), (ALLUVIUM)	SP 23	
47	3 5 50/4"	1.1'/2.0' (55%)				SP 24	
48							
49					(410.3) 49.0 End of Soil Borehole Log at 49.0 ft.		Top of weathered bedrock encountered @ 48.5 ft.
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ205AS

RECORD OF DRILLHOLE PZ-205-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 80)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	0.0-49.0 ft. See Soil Borehole Log PZ-205-AS 49.0-54.0 ft. No samples collected														0.0-49.0 ft. Borehole advanced with 10.25 in. ID hollow stem augers 49.0-54.0 ft. Borehole advanced with 9 7/8 in. bit using mud rotary then 6 in. steel casing grouted into annulas with neat cement Bedrock encountered @ 48.5 ft.
50															
52															
54	405.50 54.00 54.0-67.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		405.50 54.00												5/18/95 @ 8:15 Began coring
56				1	93%				J,PL,SM,Fe						
									J,PL,SM						
									J,ST,SM						
58									J,C,SM,Fe						
	400.50 59.00		400.10												5/18/95 @ 8:40 End of Run 1
			59.40						B,PL,SM						
60															
62				2	99%										
	62.3-69.5 ft. Grain size is medium grained								J,PL,SM (2)						
									J,PL,SM						
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BOREHOLE METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1067483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation

PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular

P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough

Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filed

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES, WATER LEVELS, INSTRUMENTATION
64	54.0-67.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)				J,PL,R	
	65.0-75.9 ft. Scattered chert nodules				B,PL,SM (2)	
66	65.8-66.0 ft. Claystone layer				J,PL,SM,Fe	
			2	99%		
	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic					
68						5/18/95 @ 10:40 End of Run 2
		390.10			J,PL,R,Fe	
		69.40			J,PL,R	
70	69.8-75.9 ft. Very fine to microcrystalline zones of thinly laminated layers of clay within the limestone, color is medium light gray (N6)				J,PL,R (2)	
					J,I,R	
72			3	100 %		
					J,PL,R	
					J,I,R	
74						5/18/95 @ 11:45 End of Run 3 Ended drilling for the day due to bad weather. 5/19/95 @ 7:40 Began drilling
		385.00			J,I,R (3)	
		74.50			J,PL,R	
					J,PL,R,Fe	
76					J,PL,R	
	76.6-77.4 ft. Argillaceous layer					
			4	100 %	J,PL,R	
78						
					J,I,R	
	78.7-80.0 ft. Argillaceous zone, unfilled vugs (1-3 mm. in diameter)					
					J,PL,R	
					J,PL,R (2)	
80						

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DIP wrt CORE AXIS (0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW FR, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM:
COORDINATES: N: 1067483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, X-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
80	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic				J,PL,R (2)	
					J,PL,R	
82	81.8-86.4 ft. Argillaceous zone, unfilled vugs, (1-3 mm. in diameter)		4	100 %		
					J,PL,R	
84					J,PL,R	5/19/95 @ 9:15 End of Run 4
	84.5-86.4 ft. Color grades to light olive gray (5GY 6/1)	375.00 / 84.50			J,PL,R	
86					B,PL,SM	
					J,PL,SM	
					J,PL,SM	
					J,C,SM	
					J,PL,R	
88	88.6-93.8 ft. Argillaceous, vuggy, color is light olive gray (5GY 6/1)		5	100 %		
90						
92					B,PL,SM	
94						5/19/95 @ 10:40 End of Run 5
	94.5-97.5 ft. Argillaceous, color is light olive gray (5GY 6/1)	365.00 / 94.50	6	100 %	J,PL,SM	
96						

Columns: GRAPHIC LOG; RQD (80, 60, 40, 20); FRACTURES PER FOOT (2, 4, 6, 8, 10); DISCONTINUITY DATA: DIP wrt CORE AXIS (0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW, FR, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

RECORD OF DRILLHOLE PZ-205-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 5/17/95 - 5/19/95
DRILL RIG: CME 75

DATUM:
COORDINATES: N: 1067483.54
AZIMUTH: 0

COLLAR ELEV: 459.5
E: 515477.78
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic														
	97.5-99.5 ft. Thin clay laminae			6	100 %				J,I,R,Fe						
98									J,PL,SM,CL						
	360.00		360.00						J,I,R						5/19/95 @ 11:30 Finished drilling
	End of Record of Drillhole at 99.5 ft. 99.50		99.50												
100															
102															
104															
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: D. ALLOWAY
CHECKED: B. TILTON
DATE: 6/20/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	6.25 inch I.D. Hollow Stem Auger	PZ-206-SS
		SHEET 1 OF 3
	SAMPLING METHOD:	
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
NORTHING: 1068030.83 DATUM EASTING: 515809.45 ELEVATION 458.4	WATER LEVEL / TIME / DATE / CASING DEPTH	START TIME 14:30, DATE 3/9/95; FINISH TIME 8:50, DATE 3/10/95

DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Wet to muddy sand adjacent to access road;
ANGLE VERTICAL BEARING	no vegetation.
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	23 29 20 22	0.8'/2.0' (40%)			(0.0-6.0 ft.) Dense, medium light gray (N6), LIMESTONE GRAVEL and SAND, SR, dry, (GP), (FILL)	SP 1	
2 3	3 15 10 30	0.9'/2.0' (45%)				SP 2	
4 5	33 25 16 18	0.1'/2.0' (5%)			(452.4) 6.0	SP 3	
6 7	6 5 3 4	0.4'/2.0' (20%)			(6.0-15.6 ft.) Firm, moderate yellowish brown (10YR 5/4), CLAYEY SILT, little fine sand, iron stained, laminated, NR, damp, (CL-ML), (LOESS)	SP 4	
8 9	3 3 3 5	0.9'/2.0' (45%)				SP 5	
10 11	2 2 3 4	1.1'/2.0' (55%)				SP 6	
12 13	1 2 3 3	1.6'/2.0' (80%)			@ 12.7 ft., becoming moist @ 13.2-13.3 ft., medium dark gray (N4), SILTY CLAY	SP 7	
14	2 3 5 3	0.8'/2.0' (40%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. HIRT CHK'D BY W. HERST

DATE 3/9/95

JOB NO.: 943-2848

FILENAME: PZ206SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-206-SS
		SHEET 2 OF 3
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					14:30	8:50
DATE					DATE	DATE
CASING DEPTH					3/9/95	3/10/95

NORTHING: 1068030.83
DATUM EASTING: 515809.45 ELEVATION 458.4

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE VERTICAL BEARING
SAMPLE HAMMER

SURFACE CONDITIONS Wet to muddy sand adjacent to access road; no vegetation.

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(6.0-15.6 ft.) Firm, moderate yellowish brown (10YR 5/4), CLAYEY SILT, little fine sand, iron stained, laminated, NR, damp, (CL-ML), (LOESS) (442.8) 15.6	SP 8	
16	1 2 5 7	1.2'/2.0' (60%)			(15.6-17.6 ft.) Firm, dark gray (N3), SILTY CLAY, damp, (CL), (LOESS)	SP 9	
17					(440.8) 17.6		
18	1 3 3 4	2.0'/2.0' (100%)			(17.6-18.0 ft.) Stiff, olive gray (5Y 4/1), CLAY, little silt, NR, moist, (CL), (LOESS) (18.0-22.8 ft.) Firm, olive gray (5Y 4/1), CLAYEY SILT, trace fine sand, NR, moist, (CL-ML), (LOESS)	SP 10	
19							
20	hammer weight 2 4 4	1.7'/2.0' (85%)				SP 11	
21							
22	2 2 2 3	1.5'/2.0' (75%)			@ 22.0 ft., becoming some fine sand	SP 12	
23					(22.8-29.7 ft.) Firm, light olive gray (5Y 5/2), CLAYEY SILT, iron stained, laminated, NR, moist, (CL-ML), (LOESS)		
24	3 2 3 5	1.5'/2.0' (75%)			@ 24.5-24.8 ft., some sand, wet	SP 13	
25					@ 25.2-25.4 ft., some sand, wet		
26	1 1 5 5	1.2'/2.0' (60%)				SP 14	
27					@ 27.2-29.7 ft., wet @ 27.4-27.6 ft., fine to medium sand layers		
28	1 2 3 3	1.7'/2.0' (85%)			@ 28.6-29.7 ft., little sand	SP 15	
29					(29.7-31.3 ft.) Firm, medium dark gray (N4), CLAYEY SILT, NR, damp, (CL-ML), (LOESS)		

LOGGED BY M. HIRT CHK'D BY W. HERST
DATE 3/9/95

JOB NO.: 943-2848
FILENAME: PZ206SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-206-SS
LAIDLAW\RI-FS\MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 3
		DRILLING START TIME 14:30; FINISH TIME 8:50
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE START 3/9/95; DATE FINISH 3/10/95
DATUM NORTHING: 1068030.83 EASTING: 515809.45	ELEVATION 458.4	
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS Wet to muddy sand adjacent to access road; no vegetation.	
ANGLE VERTICAL	BEARING	
SAMPLE HAMMER		

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	1 4 12 16	1.8'/2.0' (90%)			(29.7-31.3 ft.) Firm, medium dark gray (N4), CLAYEY SILT, NR, damp, (CL-ML), (LOESS) @ 31.1-31.3 ft., wet (427.1) 31.3	SP 16	
32	2 6 7 8	2.0'/2.0' (100%)			(31.3-36.9 ft.) Compact to loose, moderate to dark yellowish brown (10YR 5/4-10YR 4/2), f-m SAND, trace silt, NR, wet, (SP), (ALLUVIAL)	SP 17	Split spoon wet
33							
34	0 2 2 4	2.0'/2.0' (100%)			@ 34.0 ft., becoming medium sand	SP 18	Split spoon wet
35							
36	7 8 7 8	1.3'/2.0' (65%)			@ 35.9-36.9 ft., SAND and CLAY (421.5) 36.9	SP 19	Add water to inside of augers to prevent sand blow
37					(36.9-37.7 ft.) Stiff, olive gray (5Y 4/1), CLAYEY f-m SAND, NR, MOIST, (SC), (ALLUVIAL) (420.7) 37.7		
38	6 2 3 11	0.7'/2.0' (35%)			(37.7-41.1 ft.) Stiff, olive gray (5Y 4/1), CLAYEY SILT, trace sand, laminated, NR, wet, (CL-ML), (LOESS)	SP 20	
39							
40	6 7 12 16	1.0'/2.0' (50%)			(417.3) 41.1	SP 21	
41					(41.1-43.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, trace silt, NR, wet, (SM), (ALLUVIAL)		
42	2 23 50/0"	0.7'/2.0' (35%)			(415.4) 43.0	SP 22	Split spoon refusal at 43.0 feet; auger to 44.0 feet
43					End of Soil Borehole Log at 43.0 ft. See PZ-206-SS Record of Drillhole for rock descriptions		
44	50/1"	0.0'/1.0' (0%)				SP 23	Split spoon refusal at 44.0 feet

LOGGED BY M. HIRT DATE 3/9/95 CHK'D BY W. HERST

JOB NO.: 943-2848 FILENAME: PZ206SS

RECORD OF DRILLHOLE PZ-206-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP w/r CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-43.0 ft. See Soil Borehole Log PZ-206-SS														
34															
36															
38															
40															
42	415.40														
	43.0-44.5 ft. No samples collected 43.00														Advanced 4" diam. HW casing to 46.0 ft., begin coring on top of rubble at 44.5 ft.
44	413.90		413.90												
	44.5-51.7 ft. 44.50 Slightly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		44.50												
46	44.5-46.1 ft. Some chlorite on broken surfaces			1	77%										
									J,I,SM,CL (2)						
									J,I,SM						
									J,U,SM,Fe						
	47.7-49.4 ft. Moderately weathered, porous/ vuggy								J,I,SM,Fe						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM: NAD 27
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	44.5-51.7 ft. Slightly weathered, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)	409.40	1	77%				Core Loss					Core loss due to fractured, weathered rock Core Run 1 at 11:55
		49.00						J,I,SM (6)					
50								J,PL,SM					
								J,I,R (2)					
		406.70						J,I,SM					
	51.7-52.7 ft. Completely weathered, thickly laminated, greenish gray (5GY 6/1), very fine grained, extremely weak, CLAYSTONE, (ST. LOUIS FORMATION) 51.70 – 52.30	51.70						J,I,SM,CL					
52		406.10						Core Loss					Core loss due to presence of weak claystone
	52.7-59.2 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), very fine grained, medium strong, DOLOMITE, (ST. LOUIS FORMATION) 54.2-55.3 ft. Moderately weathered, very porous/vuggy, (<1-3 mm.)							J,I,R					
54			2	96%									
								J,I,R					
56													
58		399.40											
		399.20											
	59.2-66.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 1-2 mm. calcite veins common, stylolitic, few zones showing up to 5 mm. vugs, little pyrite crystals, few Arenaceous Limestone beds throughout up to 10 mm.	59.00											End Core Run 2 at 14:10 4/5/95 @ 13:15 Begin coring Run 3
60								J,I,R					
			3	100%				J,I,R					
62													
								J,I,R (2)					
								J,I,R					
64		394.40											
		64.00											4/5/95 @ 13:40 Begin coring Run 4

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64			394.40 / 64.00												4/5/95 @ 13:40 Begin coring Run 4
	64.5-67.3 ft. Small (up to 1 mm.), glauconite lenses, few pyrite veins <1 mm., but abundant crystals								J,I,CL (3)						
									J,I,R						
									J,I,R						
66															
	66.5-68.5 ft. Fresh, thickly bedded, olive gray (5Y 4/1), f-m grained, medium strong, ARENACEOUS LIMESTONE, (ST. LOUIS FORMATION) Abundant calcite crystals <1 mm.								J,I,R (2)						
68	66.6 ft. A large >20 mm. calcite crystals								J,I,R						
	68.5-70.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)			4	100 %				J,I,CL						
									J,I,CL (2)						
70	Calcite crystals common, argillaceous partings observed 70.2-71.8 ft. Arenaceous Limestone with abundant calcity crystals														
72	71.8-80.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Calcite crystals common, fossils present but not abundant, stylolitic, pyrite crystals and veins up to 1 mm. abundant								J,I,R						
74			384.40 / 74.00						J,I,SM,CL						
									J,I,R						
									J,I,SM,CL						4/5/95 @ 14:25 Begin coring Run 5
									J,I,R (5)						
76															
				5	100 %				J,I,R (2)						
	77.3-77.8 ft. Argillaceous Limestone								J,I,SM,CL						
78	77.8-78.1 ft. Chert nodules														
									J,I,SM,CL (2)						
									J,I,R (2)						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/18/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/8/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

ROCK TYPE: J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation; PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular; P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough; Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	80.0-85.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained to microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Large calcite veins up to 12 mm., abundant pyrite crystals and veins up to 1 mm., argillaceous partings scattered throughout, stylolitic							J,I,R (2)					
								J,I,SM,CL					
82			5	100 %				J,I,SM,CL					
								J,I,R					
84		374.40 / 84.00											4/5/95 @ 15:24 Begin coring Run 6
	85.0-87.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolites common, calcite and pyrite veins present, trace of glauconite, few chert nodules							J,I,SM,CL (2)					
86								J,I,R,CL					
	87.5-89.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Calcite and pyrite crystals abundant, few calcite veins <1 mm.							J,I,R					
88			6	100 %									
	89.5-93.3 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Calcite and pyrite crystals abundant, few calcite veins <1 mm.							J,I,R					
90								J,I,R,CL					
								J,I,R,CL					
92								J,I,CL (2)					
	93.3-99.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, bioturbated, abundant calcite veins up to 1 mm., few pyrite crystals	364.40 / 94.00											4/5/95 @ 16:16 Begin coring Run 7
94			7	100 %									
96													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BORING METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515609.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
96	93.3-99.1 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, bioturbated, abundant calcite veins up to 1 mm., few pyrite crystals				J,I,R	
98						
100	99.1-102.5 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained to crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Abundant argillaceous partings, calcite veins up to 10 mm., pyrite crystals scattered		7	100 %	J,I,R,CL J,I,R	
102	102.5-105.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, calcite and pyrite crystals common, small <2 mm. vugs/porous, calcite veins <1 mm. scattered	354.40			J,I,R,CL	4/5/95 @ 17:00 Stop coring for the day
104		104.00				4/6/95 @ 8:13 Begin coring Run 8
106	105.0-108.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, abundant calcite and pyrite veins up to 2 mm., fossiliferous, argillaceous partings common, few large crystals of calcite up to 8 mm.		8	100 %	J,I,R,CL (2) J,I,R J,I,R J,I,R,CL	
108	108.0-113.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic abundant calcite and pyrite veins, chert nodules common	349.40			J,I,R	4/6/95 @ 9:17 Begin coring Run 9
110	109.4-110.1 ft. Bed of bluish green, clayey material, foliated, intra-clasts of Limestone	109.00	9	97%	J,I,SM,CL J,I,SM,CL J,I,SM,CL (2) J,I,R	
112						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

RECORD OF DRILLHOLE PZ-206-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BC METHOD: NX Core & water
DRILLING DATE: 4/5/95 - 4/6/95
DRILL RIG: CME 75

DATUM:
COORDINATES N: 1060830.8
AZIMUTH: 0

COLLAR ELEV: 458.4
E: 515809.5
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-Fe Oxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112									J,I,SM,CL						
	113.0-117.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Banded with fine to medium grained Limestone up to 8 mm. thick, calcite crystals and veins up to 1 mm. present, stylolites rare but present														
114									J,I,R,CL						
									J,I,R,CL						
				9	97%										
116															
	341.40														
	117.0-120.7 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic, fossiliferous, pyrite and calcite veins common, oolitic, fossils are brachiopods and crinoids. Argillaceous partings from 119.0-119.7 ft.		117.00												117.0 ft. Inferred top of SALEM FORMATION encountered
118									J,I,R,CL						
			339.40												
			119.00												4/6/95 @ 10:23 Begin coring Run 10
									J,I,R,CL						
120															
	120.7-122.5 ft. Fresh, thickly bedded, olive gray (5Y 6/1), fine grained, strong, ARGILLACEOUS LIMESTONE, (SALEM FORMATION) Abundant argillaceous partings and calcite crystals, partings appear like spider form														
122				10	98%										
	122.5-125.0 ft. Fresh, thickly bedded, light olive gray (5Y 6/1), fine grained, medium strong, LIMESTONE, (SALEM FORMATION) Beds of chert up to 60 mm., stylolitic, abundant argillaceous partings								J,I,R,CL						
									J,I,R						
									J,I,R,CL						
124									J,I,R						
									J,I,R (2)						4/6/95 @ 11:05 Coring completed
	333.40		333.40												
	End of Record of Drillhole at 125.0 ft. 125.00		125.00												
126															
128															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: S. COSIO
CHECKED: J. MILLER
DATE: 5/16/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D. Hollow Stem Auger	PZ-207-AS
		SHEET 1 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	12:35 / 17:42
	DATE	DATE / DATE
NORTHING: 1069644.67 DATUM EASTING: 516037.64 ELEVATION 461.9	CASING DEPTH	4/9/95 / 4/9/95

DRILL RIG CME 75 - TRUCK MOUNT

ANGLE VERTICAL BEARING NA

SAMPLE HAMMER 140 lbs.

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 50/6	0.0'/2.0' (0%)			(0.0-2.0 ft.) Concrete	SP 1	
2					(459.9) 2.0		
3	11 10 7 6	1.1'/2.0' (55%)			(2.0-4.0 ft.) Very stiff, mottled, moderate yellowish brown (10YR 5/4) to dark greenish gray (5GY 4/1), SILT, NR, damp, (ML), (LOESS)	SP 2	
4					(457.9) 4.0		
5	3 4 5 6	1.5'/2.0' (75%)			(4.0-5.8 ft.) Stiff, dark greenish gray (5GY 4/1), CLAYEY SILT, some fine Gravel, mottled, NR, damp, (CL-ML), (LOESS)	SP 3	
					(456.1) 5.8		
6	16 4 1 2	0.1'/2.0' (5%)			(5.8-12.0 ft.) Waste	SP 4	
8	3 3 7 8	0.1'/2.0' (5%)				SP 5	
9					below 9.5 ft., waste becomes wet		First water encountered @ 9.5 ft.
10	5 2 4 23	0.3'/2.0' (15%)				SP 6	
11							
12					(449.9) 12.0		
	4 14 18 3	0.7'/2.0' (35%)			(12.0-12.7 ft.) Hard, dark greenish gray (5GY 4/1), CLAY, trace fine Gravel, NR, wet, (CL), (FILL) (449.2) 12.7	SP 7	
13					(12.7-14.0 ft.) Waste		
14	4 6 1 4	0.0'/2.0' (0%)			(14.0-16.0 ft.) No Recovery	SP 8	from 14.0-20.0 ft., no samples recovered, but drilling indicates waste

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: P7207AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-207-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
NORTHING: 1069644.67 DATUM EASTING: 516037.64 ELEVATION 461.9	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 12:35 DATE 4/9/95; FINISH TIME 17:42 DATE 4/9/95
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE VERTICAL BEARING NA		
SAMPLE HAMMER 140 lbs.		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(12.7-20.0 ft.) Waste	SP 8	
16	3 1 5 7	0.0' / 2.0' (0%)			(16.0-18.0 ft.) No Recovery	SP 9	
17							
18	4 5 6 11	0.0' / 2.0' (0%)			(18.0-20.0 ft.) No Recovery	SP 10	
19							
					(441.9) 20.0		
20	6 5 5 6	1.0' / 2.0' (50%)			(20.0-20.4 ft.) Stiff, dark greenish gray (5GY 4/1), SILT, trace fine Gravel, NR, wet, (ML), (FILL) (441.5) 20.4	SP 11	
21					(20.4-20.6 ft.) Loose, dark greenish gray (5GY 4/1), fine SAND, NR, wet, (SW), (FILL) (441.3) 20.6		
22	10 18 8 4	0.9' / 2.0' (45%)			(20.6-22.0 ft.) Waste (22.0-24.0 ft.) No Recovery	SP 12	from 22.0-28.0 ft., no samples recovered, but drilling indicates waste
23							
24	3 3 3 18	0.0' / 2.0' (0%)			(24.0-26.0 ft.) No Recovery	SP 13	
25							
26	30 31 14 5	0.0' / 2.0' (0%)			(26.0-28.0 ft.) No Recovery	SP 14	
27							
					(433.9) 28.0		
28	1 9 10 5	0.6' / 2.0' (30%)			(28.0-32.0 ft.) Firm to very stiff, greenish black (5G 4/1) to dusky blue-green (5BG 3/2), SILT, little Sand and Gravel, NR, wet, (ML), (FILL)	SP 15	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ207AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D. Hollow Stem Auger	BORING NO. PZ-207-AS
		SHEET 3 OF 3
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	START TIME 12:35, FINISH TIME 17:42; START DATE 4/9/95, FINISH DATE 4/9/95
NORTHING: 1069644.67 DATUM EASTING: 516037.64 ELEVATION 461.9		
DRILL RIG CME 75 - TRUCK MOUNT	SURFACE CONDITIONS	
ANGLE VERTICAL BEARING NA		
SAMPLE HAMMER 140 lbs.		

DRILLING CONTR LAYNE-WESTERN

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	4 1 4 4	0.1' / 2.0' (5%)			(28.0-32.0 ft.) Firm to very stiff, greenish black (5G 4/1) to dusky blue-green (5BG 3/2), SILT, little Sand and Gravel, NR, wet, (ML), (FILL) (429.9) 32.0	SP 16	
32	3 10 15 20	1.1' / 2.0' (55%)			(32.0-40.0 ft.) Very loose to compact, dark greenish gray (5GY 4/1), fine SAND, NR, wet, (SW), (ALLUVIUM)	SP 17	
34	10 8 18 15	1.3' / 2.0' (65%)				SP 18	
36	0 0 0 0	2.0' / 2.0' (100%)				SP 19	
38	1 4 5 7	0.5' / 2.0' (25%)			(421.9) 40.0	SP 20	
40					End of Soil Borehole Log at 40.0 ft.		
41							
42							
43							
44							

LOGGED BY S. COSIO CHK'D BY W. HERST

DATE 6/1/95

JOB NO.: 943-2848

FILENAME: PZ207AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1069219.14
DATUM EASTING: 517169.45 ELEVATION 472.5

DRILLING METHOD: 6.25 inch I.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

WATER LEVEL					
TIME					
DATE					
CASING DEPTH					

BORING NO. PZ-208-SS

SHEET 1 OF 2

DRILLING	
START	FINISH
TIME 8:15	TIME 9:45
DATE 6/17/95	DATE 6/17/95

DRILL RIG CME 75 - TRUCK MOUNT
ANGLE **BEARING**
SAMPLE HAMMER
SURFACE CONDITIONS Grass covered lawn

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 2 3	1.1'/2.0' (55%)			(0.0-4.0 ft.) Firm, dark yellowish brown (10YR 4/2), SILT CLAY, trace organics consisting of fine roots, NR, damp, (CL), (TOPSOIL)	SP 1	
2 3	2 2 2 3	1.7'/2.0' (85%)			@ 2.0 ft., color changes to moderate yellowish brown (10YR 5/4)	SP 2	
4					(468.5) 4.0		
4 5	2 2 4 4	1.7'/2.0' (85%)			(4.0-7.5 ft.) Loose, moderate yellowish brown (10YR 5/4) to pale yellowish brown (10YR 6/2), CLAYEY SILT, NR, moist, (CL-ML), (LOESS)	SP 3	
6 7	2 3 4 5	0.9'/2.0' (45%)				SP 4	
					(465.0) 7.5		
8 9	2 3 3 4	1.5'/2.0' (75%)			(7.5-15.0 ft.) Loose, pale yellowish brown (10YR 6/2), SILT, trace iron oxide staining, occasional thin, damp, fine sand seams (<1 1/2 in. thick), (ML), (LOESS)	SP 5	
10 11	4 5 3 5	1.9'/2.0' (95%)				SP 6	
12 13	1 2 5 8	0.5'/2.0' (25%)			from 12.0-14.0 ft., little fine sand throughout silt	SP 7	
14	5 6 7 7	1.8'/2.0' (90%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER CHK'D BY W. HERST

DATE 7/14/95

JOB NO.: 943-2848

FILENAME: PZ208SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	6.25 inch I.D. Hollow Stem Auger	PZ-208-SS
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

WATER LEVEL					START TIME	FINISH TIME
TIME					8:15	9:45
DATE					DATE 6/17/95	DATE 6/17/95
CASING DEPTH						

DATUM NORTHING: 1069219.14 EASTING: 517169.45 ELEVATION 472.5

DRILL RIG CME 75 - TRUCK MOUNT

SURFACE CONDITIONS Grass covered lawn

ANGLE BEARING

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	7 50	0.5' 1.0' (50%)			(15.0-17.0 ft.) Compact, pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 6/2), fine SAND, trace Silt, trace iron oxide staining, NR, damp, (SP), (ALLUVIUM)	SP 8	
					@ 16.0 ft., fine sand becomes wet	SP 9	
17					(455.5) 17.0		
					End of Soil Borehole Log at 17.0 ft.		
18					See PZ-208-SS Record of Drillhole for rock descriptions		
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY J. MILLER

DATE 7/14/95 CHK'D BY W. HERST

JOB NO.: 943-2848

FILENAME: PZ208SS

RECORD OF DRILLHOLE PZ-208-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 6/17/95
DRILLING: CME 75

DATUM:
COORDINATES N: 1069219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX (SW FR, MW, HW, CW)	STRENGTH INDEX (R6, R5, R4, R3, R2, R1)	POINT LOAD INDEX (psi) (R1 30, R2 150, R3 300, R4 600, R5 1500, R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-17.0 ft. See Soil Borehole Log PZ-202-SS 17.0-17.4 ft. No samples collected	455.10											
	17.4-24.3 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), fine crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossils	17.40											6/17/95 @ 10:15 Begain Run 1
18			1	100				J,I,R (4)					
								J,PL,SM					
		453.30											6/17/95 @ 10:30 End Run 1
		19.20						B,I,R (2)					
								J,PL,SM,CL					
								J,PL,SM					
20								J,PL,SM (3)					
								J,I,SM					
								J,I,SM,Fe					
								J,I,R (3)					
22								J,I,R					
								J,I,SM (4)					
								J,I,R (2)					
								J,I,SM,CL					
								J,I,R (2)					
24	24.3-59.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossiliferous zones		2	100				J,I,R,CL					
								J,I,R,CL (4)					
								J,I,R					
								J,I,R					
								J,I,R,CL (4)					
26								J,I,R,CL					
								J,I,R					
								J,I,SM,CL (2)					
								J,I,R (3)					
								J,I,R,CL (2)					
28								J,I,R,CL (2)					
								J,I,R					
		443.30						J,I,R,CL					6/17/95 @ 11:00 End Run 2
	Below 29.2 ft. no fossils present	29.20						J,P,SM,CL					
								J,I,R					
								J,I,R					
30								J,I,R,CL					
								J,I,R					
			3	100				J,I,R,CL (2)					
								J,I,SM,CL (4)					
								J,I,R,CL					
32													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-S[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[redacted]THOD: NX Core & water
D[redacted]ATE: 6/17/95
DR[redacted]. CME 75

DAT[redacted]
COO[redacted]S N: 1069219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	24.3-59.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossiliferous zones							J,I,SM,CL					
								J,I,R					
								J,I,R,CL					
								J,I,R,CL					
								J,I,R,CL (2)					
								J,I,R					
	Below 33.0 ft. Limestone becomes microcrystalline with intermittent zones that are very fine to fine crystalline							J,I,R,CL					
34								J,I,R,CL					
								J,I,R,CL					
								J,I,R					
			3	100 %				J,PL,SM,CL (3)					
36								J,I,R,CL (6)					
								J,U,SM,CL					
								J,I,SM,CL (5)					
38								J,PL,SM,CL (3)					
		433.30											6/17/95 @ 11:40 End Run 3
		39.20						J,I,R					
								J,I,SM					
								J,C,SM					
40								J,I,R,Fe					
								J,I,R,Fe					
	40.7-41.5 ft. Moderately weathered zone							J,PL,SM,CL					
								J,PL,SM,CL					
42	42.4-46.7 ft. Intermittent dark gray (N3) chert nodules (1/2 to 2 in. dia.)												
			4	100 %				J,PL,R,Fe					
44								J,I,SM,Fe					
								J,PL,SM					
46								J,PL,SM					
	Below 46.5 ft. stylolites common							J,PL,SM (2)					
								J,I,R,CL					
48													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[illegible]THOD: NX Core & water
DR[illegible]ATE: 6/17/95
DRI[illegible]: CME 75

DATU[illegible]
COOR[illegible]S N: 1069219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FT)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1300 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
48	24.3-59.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Some fossiliferous zones		423.30	4	100 %			90	J,I,R,CL						6/17/95 @ 12:40 End Run 4
			49.20					90	J,I,SM						
50								90	B,PL,SM						
								90	B,PL,SM						
								90	J,I,R,CL						
52															
54				5	100 %										
								90	J,PL,SM,CL						
56															
								90	B,PL,SM						
								90	J,C,SM,CL						
58			413.30												
			59.20												
60	59.8-65.9 ft. Moderately weathered, thickly bedded, dark yellowish orange (10YR 6/6), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Heavy iron oxide staining			6	100 %			90	B,PL,SM,Fe						
62															
64															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & water
DATE: 6/17/95
CME 75

DAT
CO ES N: 1069219.14
AZIMU 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	59.8-65.9 ft. Moderately weathered, thickly bedded, dark yellowish orange (10YR 6/6), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Heavy iron oxide staining				B,I,R,Fe; B,I,SM	
66	65.4-65.7 ft. Very porous zone, open vugs, (<1 mm.), highly weathered 65.9-71.4 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic		6	100 %	B,I,SM	
68					J,I,SM	
	@ 68.8 ft. Very stiff, greenish gray (5G 6/1), glauconite clay seam (~1/2 in.)	403.50 / 69.00				
70					J,I,R,CL; J,U,SM,CL; J,PL,SM,CL	
72	71.4-74.8 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, BIOTURBATED LIMESTONE, (ST. LOUIS FORMATION) Glauconite clay seams surrounding Limestone pieces, Limestone					
74			7	100 %	B,I,R,CL; J,I,SM	
76	74.8-76.8 ft. Slightly weathered, thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)				J,I,R,CL; J,PL,SM,CL; J,I,R,CL	
78	76.8-78.5 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), micro-crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)				B,I,R,CL; J,I,SM,CL (2); J,PL,SM,CL	
	78.5-84.5 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)	393.50 / 79.00	8	100 %	B,PL,SM	6/17/95 @ 15:45 End Run 7
80						

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible] ETHOD: NX Core & water
D[illegible] ATE: 6/17/95
DR[illegible]: CME 75

DAT[illegible]
COO[illegible] S N: 1069219.14
AZIMU[illegible] 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (FR SW MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	78.5-84.5 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 81.5-83.0 ft. Low porosity zone, open vugs (<1 mm. dia.)														
82	82.5-83.2 ft. Moderately weathered zone								B,PL,SM,CL; J,PL,SM,CL; J,I,R,CL						
84				8	100 %										
	84.8-85.8 ft. Fresh, medium bedded, light olive gray (5Y 6/1), finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)														
86	85.8-92.8 ft. Slightly weathered, medium bedded, pale yellowish brown (10YR 6/2), very finely grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 86.0-88.0 ft. Low porosity zone, intermittent zones with open vugs (<1 mm. - 2 m. dia.) with iron oxide staining														
88	@ 88.0 ft. Firm, clay seam (~1/2 in.)		383.50 / 89.00						B,I,SM,CL						6/17/95 @ 16:50 End Run 8
90															
92				9	100 %				B,PL,SM,CL						
	92.8-99.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION)														
94	Slightly argillaceous, stylolitic 94.1-94.8 ft. Argillaceous Limestone layer														
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

RECORD OF DRILLHOLE PZ-208-S

PROJECT: LAIDLAW/FI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD: NX Core & water
D[illegible]ATE: 6/17/95
DRI[illegible]G: CME 75

DAT[illegible]
COO[illegible]S N: 1069219.14
AZIMUTH: 0

COLLAR ELEV: 472.5
E: 517169.45
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill, CH-Chlorite, H-Healed, GRF-Gravel Filled

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD 80 60 40 20	FRACTURES PER FOOT 2 4 6 8 10	DISCONTINUITY DATA: DIP wrt CORE AXIS 0 30 60 90	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX SW FR MW HW CW	STRENGTH INDEX R6 R5 R4 R3 R2 R1	POINT LOAD INDEX (psi) R1 30 R2 150 R3 300 R4 600 R5 1500 R6	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	92.8-99.0 ft. Fresh, medium bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Slightly argillaceous, stylolitic			9	100 %				B,PL,SM,CL						
98	98.0-99.0 ft. Limestone becomes coarsely crystalline														
	373.50		373.50												6/17/95 @ 17:40 Coring completed
	End of Record of Drillhole at 99.0 ft. 99.00		99.00												
100															
102															
104															
106															
108															
110															
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. TILTON
CHECKED: R. BOOTH
DATE: 7/12/95

Golder Associates

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D. Hollow Stem Auger	PZ-300-AD
	3.625 inch Mud Rotary	SHEET
	SAMPLING METHOD:	1 OF 1
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME 13:00 / TIME 16:00
	TIME	
	DATE	DATE 9/24/95 / DATE 9/24/95
	CASING DEPTH	
NORTHING: 1065213.84 DATUM EASTING: 513828.06 ELEVATION 448.1		
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	0 0 0 2	2.0'/2.0' (100%)			(0.0-30.0 ft.) No samples collected, see Soil Borehole Log PZ-300-SS for descriptions (30.0-39.7 ft.) Very loose, olive gray (5Y 4/1), SILT, trace fine Sand, NR, wet, (ML), (LOESS)	SP 1	
32 33	0 1 3 4	1.6'/2.0' (80%)				SP 2	
34 35	0 0 1 2	1.9'/2.0' (95%)				SP 3	
36 37	0 0 0 2	2.0'/2.0' (100%)				SP 4	
38 39	0 0 0 2	2.0'/2.0' (100%)			(408.4) 39.7	SP 5	
40 41	1 2 3 3	1.5'/2.0' (75%)			(39.7-42.2 ft.) Loose, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP 6	
42 43	2 50	0.7'/2.0' (35%)			(405.9) 42.2 (42.2-42.8 ft.) Loose, light olive gray (5Y 5/2), well graded SAND, NR, wet, (SW), (ALLUVIUM) (42.8-43.0 ft.) Very dense, very light gray (N5), highly weathered LIMESTONE bedrock, SR, wet, (WEATHERED BEDROCK) (405.3) 42.8	SP 7	
44					End of Soil Borehole Log at 42.8 ft.		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ300AD

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-300-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 2
NORTHING: 1065198.44 DATUM EASTING: 513867.83 ELEVATION 448.5	WATER LEVEL 11.7 FT. TIME 9:40 DATE 9/23/95 CASING DEPTH 33.4 FT.	DRILLING START TIME 8:00 DATE 9/22/95; FINISH TIME 12:00 DATE 9/22/95
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 5 4 5	1.8'/2.0' (90%)			(0.0-1.5 ft.) Loose, moderate yellowish brown (5YR 5/4), SILT, little to some Clay, NR, damp, (ML), (LOESS)	SP 1	
2					(1.5-5.0 ft.) Compact, yellowish gray to dusky yellow (5Y 7/2 to 5Y 6/4), SILT, trace Clay, NR, (ML)		
3	5 6 5 4	1.8'/2.0' (90%)				SP 2	
4	2 3 2 2	1.6'/2.0' (80%)				SP 3	
5					(5.0-8.5 ft.) Loose, dark yellowish brown (10YR 4/2), CLAYEY SILT, NR, damp, (ML), (LOESS)		
6	1 2 1 2	1.8'/2.0' (90%)				SP 4	
7							
8	2 3 4 5	1.9'/2.0' (95%)			(440.0) 8.5	SP 5	
9					(8.5-16.5 ft.) Loose, olive gray (5Y 4/1), SILT and CLAY, NR, damp, (CL-ML), (LOESS)		
10	1 1 2 3	1.4'/2.0' (70%)				SP 6	
11					@ 11.5 ft., moist		
12	2 2 2 4	2.0'/2.0' (100%)				SP 7	
13					@ 13.2 ft., wet		
14	1 2 2 3	2.0'/2.0' (100%)			@ 14.4 ft., moist	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ300AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-300-AS
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START TIME	FINISH TIME
WATER LEVEL	11.7 FT.				8:00	12:00
TIME	9:40					
DATE	9/23/95				DATE 9/22/95	DATE 9/22/95
CASING DEPTH	33.4 FT.					

NORTHING: 1065198.44
DATUM EASTING: 513867.83 ELEVATION 448.5

DRILL RIG CME 750 SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 1 1 1	2.0'/2.0' (100%)			(8.5-16.5 ft.) Loose, olive gray (5Y 4/1), SILT and CLAY, NR, damp, (CL-ML), (LOESS)	SP 8	
					(432.0) 16.5		
17					(16.5-20.0 ft.) Very loose, olive gray (5Y 4/1), SILT, trace Clay, NR, wet, (ML), (LOESS)	SP 9	
18	1 2	1.8'/2.0' (90%)					
19						SP 10	
					(428.5) 20.0		
20					End of Soil Borehole Log at 20.0 ft.		
21							
22							
23							
24							
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ300AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-300-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 3
		DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	START TIME 16:30 DATE 9/22/95; FINISH TIME 10:30 DATE 9/23/95
NORTHING: 1065204.75 DATUM EASTING: 513849.81 ELEVATION 448.4		
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 4 5 4	1.8'/2.0' (90%)			(0.0-2.2 ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, trace Clay, NR, dry, (ML), (LOESS)	SP 1	
2 3	3 4 7 7	1.9'/2.0' (95%)			(2.2-4.9 ft.) Compact, dusky yellow (5Y 6/4), SILT, NR, dry, (ML), (LOESS)	SP 2	
4 5	3 3 4 4	1.5'/2.0' (75%)			(4.9-8.1 ft.) Loose, olive gray (5Y 4/1), SILT, little Clay, NR, dry, (ML), (LOESS)	SP 3	
6 7	2 2 3 3	1.8'/2.0' (90%)			(440.3) 8.1	SP 4	
8 9	1 2 3 4	2.0'/2.0' (100%)			(8.1-10.0 ft.) Loose, olive gray (5Y 3/2), plastic SILT, NR, damp, (MH), (LOESS) (438.4) 10.0	SP 5	
10 11	1 1 1 2	1.6'/2.0' (80%)			(10.0-16.0 ft.) Very loose, moderate olive brown to light olive gray (5Y 4/4 to 5Y 5/2), SILT, NR, moist, trace iron staining, (ML), (LOESS) @ 11.4 ft., wet	SP 6	
12 13	1 1 1 1	0.9'/2.0' (45%)			@ 13.0 ft. moist	SP 7	
14	1 1 2 2	2.0'/2.0' (100%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ300SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-300-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START TIME 16:30 DATE 9/22/95; FINISH TIME 10:30 DATE 9/23/95
NORTHING: 1065204.75 DATUM EASTING: 513849.81 ELEVATION 448.4	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	1 2 1 2	1.9'/2.0' (95%)			(10.0-16.0 ft.) Very loose, moderate olive brown to light olive gray (5Y 4/4 to 5Y 5/2), SILT, NR, moist, trace iron staining, (ML), (LOESS)	SP 8	
17					(16.0-21.5 ft.) Very loose, moderate olive brown (5Y 4/4), SILT, trace fine Sand, NR, wet, (ML), (LOESS)	SP 9	
18	0 1 2 2	1.9'/2.0' (95%)				SP 10	
19							
20	0 2 1 2	2.0'/2.0' (100%)				SP 11	9/22/95 @ 17:30 Stopped drilling at 20.0 ft. 9/23/95 @ 7:30 Resumed drilling
21							
22	1 1 2 2	1.7'/2.0' (85%)			(21.5-35.4 ft.) Very loose, olive gray (5Y 4/1), SILT, trace Clay and fine Sand, NR, wet, (ML), (LOESS)	SP 12	
23							
24	0 0 2 1	2.0'/2.0' (100%)				SP 13	
25							
26	0 0 0 1	2.0'/2.0' (100%)				SP 14	
27							
28	0 0 1 2	2.0'/2.0' (100%)				SP 15	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ300SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-300-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 3
		DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME 16:30 / TIME 10:30
		DATE 9/22/95 / DATE 9/23/95
DATUM NORTHING: 1065204.75 EASTING: 513849.81	ELEVATION 448.4	
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90°	BEARING NA	
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	1 2 1 4	2.0'/2.0' (100%)			(21.5-35.4 ft.) Very loose, olive gray (5Y 4/1), SILT, trace Clay and fine Sand, NR, wet, (ML), (LOESS)	SP 16	
32	0 0 0 1	1.6'/2.0' (80%)				SP 17	
33							
34	0 2 2 4	1.5'/2.0' (75%)				SP 18	
35					(413.0) 35.4		
36	1 1 3 5	0.6'/2.0' (30%)			(35.4-35.9 ft.) Loose, olive gray (5Y 4/1), fine SILTY SAND, NR, wet, (SM), (ALLUVIUM) (412.5) 35.9 (35.9-39.9 ft.) Loose, dark greenish gray (5GY 4/1), well graded SAND, some fine Gravel, NR, wet, (SW), (ALLUVIUM)	SP 19	36.0-38.0 ft. 5 ft. heave in augers, switch to mud rotary at 38.0 ft.
37							
38	4 3 6 10	1.2'/2.0' (60%)				SP 20	
39							
40	16 50	0.6'/0.7' (86%)			(408.5) 39.9 (39.9-42.0 ft.) Very dense, light olive gray (5Y 6/1), highly weathered LIMESTONE bedrock, little Sand and Gravel, SR, wet, (GP), (WEATHERED BEDROCK)	SP 21	
41							
42					(406.4) 42.0 End of Soil Borehole Log at 42.0 ft. See PZ-300-SS Record of Drillhole for rock descriptions.		
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON

DATE 10/9/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ300SS

RECORD OF DRILLHOLE PZ-300-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDTETON, MO

BO[illegible]THOD: NX Core & Water
DA[illegible]ATE: 9/23/95-9/24/95
DRI[illegible]: CME 750

DATU[illegible]
COO[illegible]S N: 1065204.8
AZIMUT[illegible]

COLLAR ELEV: 448.4
E: 513849.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (60 80 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	0.0-41.0 ft. See Soil Borehole Log PZ-300-SS														
34															
36															
38															
40															
	407.40														
	41.0-42.0 ft. LIMESTONE GRAVEL 41.00 / 406.90		406.90						Core Loss						
	41.50		41.50												
42	42.0-47.1 ft. Fresh, very thinly to thinly bedded, light olive gray (5Y 6/1), very fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Occasional stylolites								J,I,R						
									B,PL,R(2)						
									J,I,R						
44									J,PL,R(2)						
									J,C,SM						
				1	94%				J,PL,SM						
									B,PL,SM						
46															
	47.1-67.8 ft. Fresh, very thinly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong LIMESTONE, (ST. LOUIS FORMATION) Stylolites								B,I,SM						
48															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-300-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDTETON, MO

B[illegible] THOD: NX Core & Water
D[illegible] ATE. 9/23/95-9/24/95
DR[illegible]: CME 750

DAT[illegible]
COO[illegible] S N: 1065204.8
AZIMU[illegible]

COLLAR ELEV: 448.4
E: 513849.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
48	47.1-67.8 ft. Fresh, very thinly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		1	94%	B,PL,SM; F,I,R; J,I,R(2); J,I,R	
		398.90 / 49.50			B,PL,SM	9/23/95 @ 14:25 End Run 1
50	50.-50.5 ft. Vuggy				J,I,R; B,PL,SM; J,PL,R; B,PL,SM(2)	
52					B,PL,R; B,C,R; J,I,R; B,PL,SM; J,PL,R; B,I,R; B,PL,SM	
54	54.5 ft. 0.1 ft. seam of CHERT		2	97%		
56					B,PL,SM,CL	
58	58.2-59.2 ft. Layer of greenish gray (5G 6/1), ARGILLACEOUS LIMESTONE				B,PL,SM	
		388.90 / 59.50			J,I,R	9/23/95 @ 15:50 End Run 2
60					B,I,R	
62	61.2-62.6 ft. Layer of light olive gray (5Y 5/2), weak, ARGILLACEOUS DOLOMITIC LIMESTONE		3	100 %	B,PL,SM; J,I,R; B,PL,SM	
64						

Columns: RQD (80, 60, 40, 20); 2 4 FRACTURES 6 8 PER FOOT 10; DISCONTINUITY DATA: DIP w/r1 CORE AXIS (0, 30, 60, 90); GRAPHIC LOG; WEATHERING INDEX (SW FR, MW, HW, CW); STRENGTH INDEX (R6, R5, R4, R3, R2, R1); POINT LOAD INDEX (psi) (RT 30, R2 150, R3 300, R4 600, R5 1500, R6); TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-300-S[illegible]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDTETON, MO

B[illegible] THOD: NX Core & Water
D[illegible] ATE: 9/23/95-9/24/95
DR[illegible] CME 750

DAT[illegible]
COO[illegible] S N: 1065204.8
AZIMU[illegible]

COLLAR ELEV: 448.4
E: 513849.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FT)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
64	47.1-67.8 ft. Fresh, very thinly bedded, pale yellowish brown (10YR 6/2), microcrystalline, medium strong LIMESTONE, (ST. LOUIS FORMATION) Stylolites					B,PL,SM	
						B,PL,SM	
66			3	100 %			
68	67.8-73.0 ft. Fresh, medium bedded, pale olive (10Y 4/2), very finely crystalline, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs to 69.0 ft.	378.90 / 69.50					9/23/95 @ 16:50 End Run 4
70							
72						J,I,R	
74	73.0-77.5 ft. Fresh, very thinly bedded, grayish olive, (10Y 4/2), finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Stylolites		4	100 %		B,PL,SM B,U,SM	
76						B,PL,SM	
78	77.5-80.7 ft. Fresh, medium bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) Vugs to 78.5 ft., occasional stylolites	368.90 / 79.50	5	99%			9/23/95 @ 17:55 End Run 4
80							

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-300-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDTETON, MO

B[illegible]ETHOD: NX Core & Water
D[illegible]ATE: 9/23/95-9/24/95
D[illegible] CME 750

DAT[illegible]
COO[illegible]S N: 1065204.8
AZIMU[illegible]

COLLAR ELEV: 448.4
E: 513849.8
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80															
	80.7-88.2 ft. Fresh, thinly bedded, light olive gray (5Y 6/1), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Frequent stylolites								B,PL,SM,CL						
									J,I,R						
82									B,PL,SM						
									F,PL,SM						
									F,PL,SM(2)						
									J,PL,SM						
									J,I,R						
84															
									J,I,R						
	84.5-84.7 ft. Chert nodules			5	99%				J,I,R						
									B,I,R,CL(2)						
	85.0-86.0 ft. Greenish gray (5G 6/1), clay in fractures								J,I,R						
									J,I,R						
86															
									B,PL,SM						
88															
	88.2-92.5 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), very finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)		358.90 / 89.50												9/23/95 @ 17:50 End Run 5
90									J,I,SM,calcite						9/24/95 @ 8:00 Begin Run 6
									J,I,SM						
92															
				6	100 %				J,PL,SM						
									J,PL,SM						
	92.5-95.0 ft. Fresh, very thinly bedded, light olive gray (5Y 5/2), microcrystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)								B,C,SM						
94															
			353.40												9/24/95 @ 9:50 End Run 6
	End of Record of Drillhole at 95.0 ft. 95.00		95.00												
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D. MAHURIN

LOGGED: B. HARRINGTON
CHECKED: B. TILTON
DATE: 10/9/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-301-SS
		SHEET 1 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	11:30 / 14:15
	DATE	DATE / DATE
	CASING DEPTH	9/19/95 / 9/19/95

NORTHING: 1064801.68
DATUM EASTING: 515516.99 ELEVATION 513.1

DRILL RIG CME 750
ANGLE 90° BEARING NA
SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 2 4 5	1.6'/2.0' (80%)			(0.0-6.0 ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, trace iron staining, NR, damp, (ML), (LOESS)	SP ①	
2 3	2 3 4 5	1.8'/2.0' (90%)				SP ②	
4 5	1 2 3 4	2.0'/2.0' (100%)			from 4.0-6.8 ft., SILT becomes moist	SP ③	
6 7	1 1 2 2	2.0'/2.0' (100%)			(6.0-9.6 ft.) Very loose, pale to moderate yellowish brown (10YR 6/2 to 10YR 5/4), SILT, little Fe staining, NR, intermittent wet zones beginning at 6.8 ft. (ML), (LOESS)	SP ④	
8 9	1 3 3 11	2.0'/2.0' (100%)			(503.5) 9.6	SP ⑤	
10 11	3 36 50	1.0'/2.0' (50%)			(9.6-18.0 ft.) Very dense, dark yellowish orange (10YR 6/6), SILTSTONE, thickly laminated, NR, damp, (CHELTENHAM FORMATION)	SP ⑥	
12 13	30 50	0.8'/2.0' (40%)				SP ⑦	
14	50	0.5'/2.0' (25%)				SP ⑧	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ301SS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-301-SS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 2
		DRILLING: START TIME 11:30 DATE 9/19/95; FINISH TIME 14:15 DATE 9/19/95
NORTHING: 1064801.68 DATUM EASTING: 515516.99 ELEVATION 513.1	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
	50	0.5'/2.0' (25%)			(9.6-18.0 ft.) Very dense, dark yellowish orange (10YR 6/6), SILTSTONE, thickly laminated, NR, damp, (CHELTENHAM FORMATION) (16.0-18.0 ft.) Advanced augers to 18.0 ft. to prepare for core drilling, no samples collected	SP (8)	
16							
17							
18					(495.1) 18.0 End of Soil Borehole Log at 18.0 ft. See PZ-301-SS Record of Drillhole for rock descriptions.		
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ301SS

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[redacted]THOD: NX Core & Water
D[redacted]ATE: 9/19/95-9/21/95
DRI[redacted]: CME 750

DAT[redacted]
COO[redacted]S N 1064801.7
AZIMU[redacted]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
16	0.0-16.0 ft. See Soil Borehole Log PZ-301-SS 16.0-19.1 ft. No samples collected														
18															
	494.00		494.00												
	19.1-26.0 ft. 19.10 Moderately weathered, very thinly bedded to thinly laminated, dark yellowish orange (10YR 6/6), very fine grained, extremely weak, SILTSTONE, (CHELTENHAM FORMATION)		19.10						B,I,SM						
									B,P,SM						
20									J,I,R						
22									J,I,R						
									B,I,R						
									J,I,R,intact						
									J,I,R						
									J,I,SM						
									B,I,SM						
	23.6 ft. Dark yellowish orange (10YR 6/6), soft clay seam			1	93%				B,I,SM,CL						
24									B,I,SM						
									B,P,SM(5)						
									J,I,R,CL,Fe						
									J,PL,SM						
26									J,I,R(2)						
	26.3-28.5 ft. Moderately weathered, very thinly bedded, olive gray (5Y 4/1) to medium dark gray (N4), very fine grained, extremely weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)								J,I,R						
									J,I,SM						
									B,PL,SM(3)						
									J,PL,SM						9/14/95 @ 17:00 End Run 1
									J,PL,SM(2)						
28			484.60												
	28.5-36.0 ft. Highly weathered, thinly bedded, medium gray (N5), very fine grained, extremely weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)		28.50						Core Loss						
			484.00 29.10												
									B,PL,SM,Fe						9/20/95 @ 8:15 Begin Run 2
									J,C,R,Fe						
									J,I,R						
									B,I,R						
30									B,I,R,Fe						
									J,I,R						
				2	97%				B,I,R,Fe						
32															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-S

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD. NX Core & Water
D[illegible]DATE: 9/19/95-9/21/95
DR[illegible]S: CME 750

DAT[illegible]
COO[illegible]S N. 1064801.7
AZIMU[illegible]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA (DIP wrt CORE AXIS)	TYPE AND SURFACE DESCRIPTION	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
32	28.5-36.0 ft. Highly weathered, thinly bedded, medium gray (N5), very fine grained, extremely weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)												
34			2	97%									
36	477.10 / 36.00 — 36.0-37.7 ft. Slightly weathered, medium bedded, grayish black (N2) to black (N1), very fine grained, very weak, LIGNITE COAL, (CHELTENHAM FORMATION)												
	475.40 / 37.70 — 37.7-53.0 ft. Highly weathered, medium bedded, light gray (N7) to light brownish gray (5YR 6/1), very fine grained, extremely weak, CLAYSTONE, (CHELTENHAM FORMATION)												9/20/95 @ 9:30 End Run 2
38		474.30											
		38.80 / 474.00						Core Loss					
		39.10											39.0-60.0 ft. Numerous drilling induced fractures due to extremely weak rock
40													
42			3	61%									
44		468.10											
		45.00											
46								Core Loss					
48													

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[redacted]ETHOD: NX Core & Water
D[redacted]DATE: 9/19/95-9/21/95
D[redacted]: CME 750

DAT[redacted]
CO[redacted]S N: 1064801.7
AZIM[redacted]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
48	37.7-53.0 ft. Highly weathered, medium bedded, light gray (N7) to light brownish gray (5YR 6/1), very fine grained, extremely weak, CLAYSTONE, (CHELTENHAM FORMATION)				Core Loss	9/20/95 @ 11:00 End Run 3
50		461.70				
		51.40				
52	53.0-60.4 ft. Moderately weathered, thinly bedded, olive gray (5Y 4/1) to dark gray (N3), very fine grained, very weak, SILTY CLAYSTONE, (CHELTENHAM FORMATION)		4	66%		
54		457.90				
		55.20				
56					Core Loss	
		455.90				
		57.20				
58						
60	60.0 ft. CLAYSTONE becomes sandy	452.70			J,I,R	
	60.4-62.5 ft. Fresh, thickly laminated, light olive gray (5Y 6/1), fine to medium grained, strong, LIMESTONE, (CHELTENHAM FORMATION)	60.40	5	79%	J,I,R	
					J,C,SM	
					J,I,R	
					J,I,R(2)	
62					J,I,R	
		450.60			J,I,R	
	62.5-71.5 ft. Moderately weathered, thinly bedded, greenish gray (5G 6/1), very fine grained, very weak, CLAYSTONE, (CHELTENHAM FORMATION)	62.50			J,I,R	
					J,I,R(2)	
64	Some gravel sized Chert and Limestone					

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]ETHOD: NX Core & Water
D[illegible]ATE: 9/19/95-9/21/95
DR[illegible] CME 750

DAT[illegible]
CO[illegible]S N 1064801.7
AZIM[illegible]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	4 FRACTURES PER FOOT	DISCONTINUITY DATA: DIP w/r CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
64	62.5-71.5 ft. Moderately weathered, thinly bedded, greenish gray (5G 6/1), very fine grained, very weak, CLAYSTONE, (CHELTENHAM FORMATION) Some gravel sized Chert and Limestone		448.30 / 64.80	5	79%				J,I,R						9/20/95 @ 13:00 End Run 5
66									J,I,R(2)						
									B,I,R						
									J,I,R						
68				6	96%										
70									J,I,R						9/20/95 @ 14:00 End Run 6
	441.90		441.90												
	71.20 / 441.60		71.20 / 441.60						Core Loss						
	71.50		71.50												
72	71.5-88.0 ft. Fresh, thinly bedded, light gray (N7), very finely crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R						
									J,I,R						
									J,I,R						
									J,I,R(4)						
									J,I,R(4)						
74									J,I,R						
									J,PL,SM(2)						
									B,PL,SM(3)						
				7	100 %				J,C,SM						
76									J,I,R						
									B,PL,SM						
									B,PL,R						
78									B,C,R						
															9/20/95 @ 15:45 End Run 8
									B,PL,SM						
80															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[redacted]ETHOD: NX Core & Water
D[redacted]ATE: 9/19/95-9/21/95
D[redacted]: CME 750

DAT[redacted]
CO[redacted]S N: 1064801.7
AZIM[redacted]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
80	71.5-88.0 ft. Fresh, thinly bedded, light gray (N7), very finely crystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)		432.90 / 80.20	7	100 %				B,PL,SM(2)						
									J,U,SM						
									B,PL,SM(2)						
									B,C,SM,CL						
82									B,I,SM						
									B,I,R(2)						
84				8	95%										
									B,PL,SM(2)						
									B,I,R(2)						
86									J,PL,SM,CL						
									B,PL,R(3)						
	425.70 / 87.40		425.70 / 87.40												
	425.10		425.10						Core Loss						
88	88.0-88.5 ft. Moderately weathered layer of CHERT		88.00						J,I,R,CL						
	424.60 / 88.50								B,I,R						
	88.5-104.9 ft. Fresh, thinly bedded, light brownish gray (5YR 6/1), microcrystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)								J,I,R,CL						
									J,I,R,CL						
									B,PL,SM,CL						
				8	95%				J,I,R						
90			422.90 / 90.20												9/20/95 @ 15:45 End Run 9
									B,PL,SM						
									B,I,SM						
92									J,C,R						
				9	99%				B,PL,SM(2)						
									B,C,R						
94															
96															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

METHOD: NX Core & Water
DATE: 9/19/95-9/21/95
CME 750

COORDS N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD	4 FRACTURES PER FOOT	DISCONTINUITY DATA: DIP wrt CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX	STRENGTH INDEX	POINT LOAD INDEX (psi)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
96	88.5-104.9 ft. Fresh, thinly bedded, light brownish gray (5YR 6/1), microcrystalline, strong, LIMESTONE, (ST. LOUIS FORMATION)							60	B,I,SM						
								60	B,I,SM						
								90	B,I,SM						
98				9	99%										
100			412.90												9/20/95 @ 15:00 End Run 9
			100.20					90	B,C,R						
								60	J,I,R,CL						
102								90	B,PL,SM(3)						
								90	B,PL,SM						
104								60	B,I,SM						
	104.9-119.3 ft. Fresh, thinly bedded, olive gray (5Y 3/2), micro-crystalline, strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Frequent vugs, fossiliferous 106.6 ft. Seam of grayish blue green (5BG 5/2) clay (<1/2")			10	100 %			90	B,PL,SM,CL						
106															
108															
110	109.8 ft. Color change to yellowish gray, less argillaceous and less vuggy		402.90												9/20/95 @ 18:00 End Run 10 9/21/95 @ 7:15 Begin Run 11
			110.20												
				11	100 %										
112															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]THOD: NX Core & Water
D[illegible]ATE: 9/19/95-9/21/95
DR[illegible]: CME 750

DAT[illegible]
CO[illegible]S N: 1064801.7
AZIM[illegible]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
112	104.9-119.3 ft. Fresh, thinly bedded, olive gray (5Y 3/2), micro-crystalline, strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION) Frequent vugs, fossiliferous														
114	114.0 ft. Vugs no longer present														
116				11	100 %										
118									B,PL,SM						
120	119.3-137.3 ft. Fresh, medium to thinly bedded, light olive gray (5Y 5/2), very finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		392.90 / 120.20												9/21/95 @ 8:10 End Run 11
122									B,PL,SM						
									B,PL,SM,CL						
124				12	101 %										
	124.6 ft. Calcite crystals in formation														
126															
	127.0 ft. Intermittent stylolites								B,PL,SM						
128	128.0-129.5 ft. Iron pyrite crystals														

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-S[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

[redacted]ETHOD: NX Core & Water
[redacted]DATE: 9/19/95-9/21/95
[redacted]G: CME 750

DA[redacted]
CO[redacted]S N: 1064801.7
AZIMU[redacted]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FEET)	ROCK TYPE DESCRIPTION	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	TYPE AND SURFACE DESCRIPTION	NOTES WATER LEVELS INSTRUMENTATION
128	119.3-137.3 ft. Fresh, medium to thinly bedded, light olive gray (5Y 5/2), very finely crystalline, medium strong, LIMESTONE, (ST. LOUIS FORMATION)		12	101 %	B,PL,SM	
					J,C,SM	
					B,PL,SM,CL	9/21/95 @ 9:20 End Run 12
130	130.0 ft. Frequent stylolites	382.90 / 130.20			B,PL,SM	
					B,C,SM	
132					B,PL,SM	
134						
			13	100 %	B,PL,R	
136						
	137.3-138.0 ft. Fresh, medium bedded, grayish blue green (5BG 5/2), very finely crystalline, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)				B,PL,SM,CL	
138	138.0-160.3 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), micro-crystalline, medium strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)					9/21/95 @ 10:35 End Run 13
140		372.90 / 140.20				
					J,PL,SM	
142			14	100 %	J,PL,SM	
					B,PL,R	
					J,I,R	
					B,PL,SM	
144						

DISCONTINUITY DATA: 0 / 30 / 60 / 90 DIP wrt CORE AXIS

GRAPHIC LOG: RQD 80 60 40 20; FRACTURES 2 4 6 8 PER FOOT 10

WEATHERING INDEX: SW FR, MW, HW, CW

STRENGTH INDEX: R5 R6, R4, R3, R2, R1

POINT LOAD INDEX (psi): R1 30, R2 150, R3 300, R4 600, R5 1500, R6

TEST ORIENTATION

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-SS

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

B[illegible]THOD: NX Core & Water
D[illegible]ATE: 9/19/95-9/21/95
DR[illegible]: CME 750

DAT[illegible]
COO[illegible]S N: 1064801.7
AZIMU[illegible]

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slickensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (Feet)	ROCK TYPE DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: Dip wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R5 R6 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 30 R2 150 R3 300 R4 600 R5 1500 R6)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
144	138.0-160.3 ft. Fresh, thinly bedded, light olive gray (5Y 5/2), micro-crystalline, medium strong, ARGILLACEOUS DOLOMITIC LIMESTONE, (ST. LOUIS FORMATION)								B,C,SM						
146				14	100 %										
148															
150			362.80 / 150.30												9/21/95 @ 11:30 End Run 14
									J,I,SM						
152															
									B,PL,R						
154				15	100 %										
156									B,PL,SM						
	156.5-159.0 ft. *Alternating beds of* light olive gray and grayish blue green														
158															
									B,C,SM,CL						
									J,I,R,CL						
160															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

RECORD OF DRILLHOLE PZ-301-S[redacted]

PROJECT: LAIDLAW/RI-FS
PROJECT NO: 943-2848
LOCATION: BRIDGETON, MO

BO[redacted]THOD: NX Core & Water
DR[redacted]ATE: 9/19/95-9/21/95
DRI[redacted]: CME 750

DATU[redacted]
COOR[redacted]S N: 1064801.7
AZIMUTH:

COLLAR ELEV: 513.1
E: 515517.0
INCLINATION: -90

J-Joint, F-Fault, S-Shear, B-Bedding, F-Foliation
PL-Planar, C-Curved, U-Undulating, ST-Stepped, I-Irregular
P-Polished, K-Slikensided, SM-Smooth, R-Rough, VR-V. Rough
Fe-FeOxide, CL-Clay Infill

DEPTH SCALE (FT)	ROCK TYPE / DESCRIPTION	GRAPHIC LOG	ELEV / DEPTH (FT)	RUN NO.	CORE RECOVERY	RQD (80 60 40 20)	FRACTURES PER FOOT (2 4 6 8 10)	DISCONTINUITY DATA: DIP wrt CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	WEATHERING INDEX (SW FR MW HW CW)	STRENGTH INDEX (R6 R5 R4 R3 R2 R1)	POINT LOAD INDEX (psi) (R1 R2 30 R3 150 R4 300 R5 600 R6 1500)	TEST ORIENTATION	NOTES WATER LEVELS INSTRUMENTATION
160	352.80		352.80	15	100 %										9/21/95 @ 12:35 End Run 15
	End of Record of Drillhole at 160.3 ft. 160.30		160.30												
162															
164															
166															
168															
170															
172															
174															
176															

DEPTH SCALE: 1:2
DRILLING CONTRACTOR: LAYNE-WESTERN
DRILLER: D.MAHURIN

LOGGED: B.HARRINGTON
CHECKED: B.TILTON
DATE: 10/9/95

Golder Associates

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					PZ-302-AS
						SHEET 1 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)					
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
	WATER LEVEL	18 FT.				TIME 11:45 / TIME 14:35
	TIME	14:00				
	DATE	9/25/95				DATE 9/25/95 / DATE 9/25/95
NORTHING: 1067197.73 DATUM EASTING: 514737.29 ELEVATION 449.5	CASING DEPTH	20 FT.				
DRILL RIG CME 750	SURFACE CONDITIONS					
ANGLE 90° BEARING NA						
SAMPLE HAMMER						

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	5 7 5 5	1.6'/2.0' (80%)			(0.0-1.5 ft.) Compact, dark yellowish orange (5YR 6/6), CLAYEY SILT, fine Gravel sized pebbles, (FILL) (1.5-15.0 ft.) Loose, olive gray (5Y 4/1), SILT, NR, dry to wet, some inter-mixed fill to 2.5 ft. (SM), (LOESS)	SP 1	
2	4 5 5 6	1.5'/2.0' (75%)				SP 2	
3					@ 3.5 ft. damp		
4		1.7'/2.0' (85%)					0.0 ppm PID
5						ST 3	
6	1 1 1 2	1.9'/2.0' (95%)			@ 6.7 ft. moist	SP 4	
7							
8	0 0 0 1	1.9'/2.0' (95%)				SP 5	
9							
10	1 2 2 2	1.4'/2.0' (70%)				SP 6	0.0 ppm PID
11					from 11.5-11.7 ft., wet from 11.7-13.1 ft., moist		
12	1 2 1 4	2.0'/2.0' (100%)				SP 7	
13					from 13.1-13.6 ft., wet from 13.6-15.0 ft., moist		
14	4 5 6 3	1.2'/2.0' (60%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ302AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					PZ-302-AS
						SHEET
	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)					2 OF 2
LAIDLAW/OU2 RI-FS/MO	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING
WEST LAKE LANDFILL	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
OPERABLE UNIT 2	WATER LEVEL	18 FT.				TIME 11:45 / TIME 14:35
	TIME	14:00				
	DATE	9/25/95				DATE 9/25/95 / DATE 9/25/95
NORTHING: 1067197.73	CASING DEPTH	20 FT.				
DATUM EASTING: 514737.29 ELEVATION 449.5						

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(15.0-21.9 ft.) Loose, olive gray (5Y 4/1), medium SAND, NR, wet, (SP),(ALLUVIUM)	SP 8	
16	1 9 8 6	1.5'/2.0' (75%)				CA 9	
17							
18	1 3 5 9	2.0'/2.0' (100%)				SP 10	0.0 ppm PID
19					from 19.2-21.0 ft., trace to little Silt in Sand		
20	3 5 5 4	1.6'/2.0' (80%)				SP 11	
21					(21.9-24.0 ft.) Loose, dark yellowish brown (10YR 6/2), f-m SAND, little iron staining, NR, wet, (ALLUVIUM)		
22	0 0 1 2	2.0'/2.0' (100%)				SP 12	0.0 ppm PID
23					(-24.0) 24.0		
24					End of Soil Borehole Log at 24.0 ft.		
25							
26							
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ302AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.	
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					PZ-302-AI	
	3.625 inch Mud Rotary					SHEET	
	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)					1 OF 2	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING	
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START	FINISH
	WATER LEVEL					TIME	TIME
	TIME					8:15	11:30
	DATE					DATE	DATE
NORTHING: 1067210.24 DATUM EASTING: 514720.49 ELEVATION 450.0	CASING DEPTH					9/26/95	9/26/95

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-22.0 ft.) No samples collected, see Soil Borehole Log PZ-302-AS for descriptions		
16							
17							
18							
19							
20							
21							
22					(428.0) 22.0		
	4 2 7 6	0.1' / 2.0' (5%)			(22.0-25.4 ft.) Loose, pale yellowish brown (10YR 6/2), f-m SAND with trace iron staining, NR, wet, (SP), (ALLUVIUM)	SP 1	
23							
24	3 2 3 10	1.2' / 2.0' (60%)				SP 2	0.0 ppm PID
25					(25.4-26.1 ft.) Compact, olive gray (5Y 4/1), f-m SAND, trace Silt, iron staining, NR, wet, (SP), (ALLUVIUM)		
26	10 7 9 14	1.6' / 2.0' (80%)			(26.1-37.4 ft.) Compact to dense, light olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP 3	
27							
28	8 8 12 10	1.0' / 2.0' (50%)				SP 4	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ302AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-302-AI
	3.625 inch Mud Rotary	SHEET
	SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" I.D. (CA)	2 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	8:15 / 11:30
	DATE	DATE / DATE
NORTHING: 1067210.24 DATUM EASTING: 514720.49 ELEVATION 450.0	CASING DEPTH	9/26/95 / 9/26/95

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	8 9 10 13	1.4'/2.0' (70%)			(26.1-37.4 ft.) Compact to dense, light olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP 5	
32 33	11 9 10 14	1.6'/2.0' (80%)				SP 6	
34 35	16 18 20 24	1.1'/2.0' (55%)				CA 7	
36 37	7 7 10 14	1.2'/2.0' (60%)			(412.6) 37.4	SP 8	
38 39	6 11 11 12	1.3'/2.0' (65%)			(37.4-42.0 ft.) Compact, olive gray (5Y 4/1), well graded SAND, NR, wet, (SW), (ALLUVIUM)	SP 9	
40 41	10 14 14 12	1.3'/2.0' (65%)			(408.0) 42.0	SP 10	0.0 ppm PID
42 43 44					End of Soil Borehole Log at 42.0 ft.		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ302AI

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-303-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 2
		DRILLING START TIME 16:45 DATE 10/4/95; FINISH TIME 8:45 DATE 10/5/95
NORTHING: 1067763.32 DATUM EASTING: 514425.53 ELEVATION 450.8	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	3 5 7 9	1.9'/2.0' (95%)			(0.0-3.1 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) (3.1-4.6 ft.) Compact, olive gray (5Y 4/1), SANDY SILT, NR, dry, (ML), (LOESS)	SP 1	
2 3	7 7 6 8	1.8'/2.0' (90%)				SP 2	
4	2 3 5 5	1.8'/2.0' (90%)			(446.2) 4.6		
5					(4.6-7.4 ft.) Loose, olive gray (5Y 4/1), fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)	SP 3	0.0 ppm PID
6 7	1 3 2 3	1.9'/2.0' (95%)			(7.4-12.2 ft.) Loose, olive black, fine SAND, NR, moist, (SP), (ALLUVIUM)	SP 4	
8 9	1 1 6 6	1.7'/2.0' (85%)				SP 5	Faint petroleum odor @ 7.4 ft.
10 11	2 2 2 2	1.2'/2.0' (60%)				SP 6	0.1 ppm PID
12 13	3 6 7 8	1.8'/2.0' (90%)			(12.2-26.0 ft.) Compact to dense, medium dark gray (N4), f-m SAND, NR, damp, (SP), (ALLUVIUM)	SP 7	Strong petroleum odor
14	6 5 9 10	1.8'/2.0' (90%)				SP 8	0.9 ppm PID

DRILLING CONTR LAYNE-WESTERN
LOGGED BY B. HARRINGTON CHK'D BY B. TILTON
DATE 10/9/95
JOB NO.: 943-2848
FILENAME: PZ303AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-303-AS
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME 16:45 / TIME 8:45
	TIME	
	DATE	DATE 10/4/95 / DATE 10/5/95
	CASING DEPTH	

DATUM NORTHING: 1067763.32 EASTING: 514425.53 ELEVATION 450.8

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(12.2-26.0 ft.) Compact to dense, medium dark gray (N4), f-m SAND, NR, damp to wet, (SP), (ALLUVIUM)	SP 8	
16	5 3 4 12	1.8'/2.0' (90%)			from 15.3-15.6 ft., seam of olive black sandy SILT		
17					@ 17.0 ft. wet	SP 9	
					from 17.5-17.8 ft., seam of olive black SILT		
18	6 17 28 49	1.8'/2.0' (90%)					
19						SP 10	
20	11 19 13 10	2.0'/2.0' (100%)					6.6 ppm PID
21						SP 11	
22	3 5 10 11	1.9'/2.0' (95%)					Petroleum sheen in Split Spoon
23						SP 12	
24	3 16 26 39	2.0'/2.0' (100%)					3.7 ppm PID
25						SP 13	
26					(424.8) 26.0		
					End of Soil Borehole Log at 26.0 ft.		
27							
28							
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ303AS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. PZ-304-AS
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 1 OF 2
		DRILLING START TIME 10:10 DATE 9/27/95; FINISH TIME 12:10 DATE 9/27/95
DATUM NORTHING: 1068146.47 EASTING: 514434.57 ELEVATION 451.4	WATER LEVEL / TIME / DATE / CASING DEPTH	
DRILL RIG CME 750	SURFACE CONDITIONS	
ANGLE 90° BEARING NA		
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	4 4 4 7	1.8'/2.0' (90%)			(0.0-3.7 ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) @ 0.6 ft, damp	SP 1	
2	6 8 7 8	1.5'/2.0' (75%)			(3.7-6.8 ft.) Compact, olive gray (5Y 4/1), SILT, NR, damp, (ML), (LOESS) @ 6.0 ft, trace organic material	SP 2	
4	3 4 5 6	1.7'/2.0' (85%)				SP 3	
6	2 3 4 4	1.6'/2.0' (80%)			(6.8-10.4 ft.) Loose, olive gray (5Y 4/1), fine SANDY SILT, NR, damp, (ML), (LOESS)	SP 4	0.0 ppm PID
8	2 1 2 2	1.2'/2.0' (60%)			@ 8.4 ft, moist	SP 5	
10	1 3 5 5	1.7'/2.0' (85%)			(10.4-13.0 ft.) Loose, olive gray (5Y 4/1), SILT, NR, damp, (ML), (LOESS)	SP 6	
12	1 2 4 11	1.6'/2.0' (80%)			(438.4) 13.0	SP 7	0.0 ppm PID
13					(13.0-14.2 ft.) Loose, olive gray (5Y 4/1), SILTY fine SAND, NR, moist, (SM), (ALLUVIUM) (437.2) 14.2		
14	5 7 10 20	1.7'/2.0' (85%)			(14.2-27.1 ft.) Compact to dense, light olive gray (5Y 6/1), fine SAND, NR, damp, (SP), (ALLUVIUM)	SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AS

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	PZ-304-AS
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH
	WATER LEVEL	TIME 10:10 / TIME 12:10
	TIME	
	DATE	DATE 9/27/95 / DATE 9/27/95
	CASING DEPTH	

DATUM NORTHING: 1068146.47 EASTING: 514434.57 ELEVATION 451.4

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(14.2-27.1 ft.) Compact to dense, light olive gray (5Y 6/1), fine SAND, NR, damp, (SP), (ALLUVIUM)	SP 8	
16	9 15 17 11	1.4'/2.0' (70%)					
17						SP 9	
18	5 6 14 24	1.8'/2.0' (90%)			@ 17.7 ft, moist @ 18.0 ft, wet		0.0 ppm PID Slight organic odor
19						SP 10	
20	2 15 18 14	1.7'/2.0' (85%)					
21						SP 11	
22	3 5 8 14	0.7'/2.0' (35%)					0.1 ppm PID
23						SP 12	
24	3 5 14 15	1.6'/2.0' (80%)					
25						SP 13	
26	5 11 12 13	1.2'/2.0' (60%)					0.0 ppm PID
27					(27.1-28.0 ft.) Compact, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM) (423.4) 28.0	SP 14	
28					End of Soil Borehole Log at 28.0 ft.		
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AS

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger 3.625 inch Mud Rotary	PZ-304-AI
	SAMPLING METHOD:	SHEET 1 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

					START	FINISH
WATER LEVEL	18.5 FT.				TIME	TIME
TIME	16:00				8:00	14:15
DATE	10/2/95				DATE	DATE
CASING DEPTH	40.0 FT.				10/2/95	10/2/95

NORTHING: 1068125.91
DATUM EASTING: 514434.70 ELEVATION 451.6

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(0.0-28.0 ft.) No samples collected, see Soil Borehole Log PZ-304-AS for descriptions			
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28 (423.6)	12 15 14 12	1.6'/2.0' (80%)			(28.0-39.3 ft.) Compact, light olive gray (5Y 5/2), well graded, SAND, NR, wet, (SW), (ALLUVIUM)	SP 1		0.0 ppm PID
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AI

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger 3.625 inch Mud Rotary	PZ-304-AI
	SAMPLING METHOD:	SHEET 2 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

					START	FINISH
WATER LEVEL	18.5 FT.				TIME 8:00	TIME 14:15
TIME	16:00					
DATE	10/2/95				DATE 10/2/95	DATE 10/2/95
CASING DEPTH	40.0 FT.					

DATUM NORTHING: 1068125.91 EASTING: 514434.70 ELEVATION 451.6

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	8 11 12 13	1.0'/2.0' (50%)			(28.0-39.3 ft.) Compact, light olive gray (5Y 5/2), well graded, SAND, NR, wet, (SW), (ALLUVIUM)	SP ②	
32	8 15 15 12	1.1'/2.0' (55%)				SP ③	
33							
34	5 8 4 3	1.2'/2.0' (60%)				SP ④	0.0 ppm PID
35					from 35.6-35.8 ft, Lignite coal partical		
36	1.1 6 6 7 8	2.0'/2.0' (100%)				SP ⑤	
37							
38	9 9 17 16	1.3'/2.0' (65%)				SP ⑥	
39					(412.3) 39.3		
40	10 18 28 27	1.8'/2.0' (90%)			(39.3-46.0 ft.) Compact to dense, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM)	SP ⑦	0.0 ppm PID
41							
42	7 11 12 14	1.4'/2.0' (70%)				SP ⑧	
43					from 43.0-43.5 ft, seam of compact, olive gray (5Y 4/1), well graded SAND		
44	15 17 10 14	0.7'/2.0' (35%)				SP ⑨	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: PZ304AI

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger 3.625 inch Mud Rotary	PZ-304-AI
	SAMPLING METHOD:	SHEET 3 OF 3
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING START / FINISH

					START TIME	FINISH TIME
WATER LEVEL	18.5 FT.				8:00	14:15
TIME	16:00					
DATE	10/2/95				DATE 10/2/95	DATE 10/2/95
CASING DEPTH	40.0 FT.					

NORTHING: 1068125.91
DATUM EASTING: 514434.70 ELEVATION 451.6

DRILL RIG CME 750 SURFACE CONDITIONS
ANGLE 90° BEARING NA
SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(39.3-46.0 ft.) Compact to dense, olive gray (5Y 4/1), f-m SAND, NR, wet, (SP), (ALLUVIUM) (405.6) 46.0	SP 9	0.0 ppm PID
46	3 3 6 6	1.2'/2.0' (60%)			(46.0-48.4 ft.) Loose, olive gray (5Y 4/1), well graded SAND, some fine Gravel, NR, wet, (SW), (ALLUVIUM)	SP 10	
47							
48	9 12 17 15	1.3'/2.0' (65%)			(403.2) 48.4		
49					(48.4-50.0 ft.) Compact, olive gray (5Y 4/1), f-m SAND, trace coarse Sand and fine Gravel, NR, wet, (SP), (ALLUVIUM) (401.6) 50.0	SP 11	
50					End of Soil Borehole Log at 50.0 ft.		0.0 ppm PID
51							
52							
53							
54							
55							
56							
57							
58							
59							

DRILLING CONTR LAYNE-WESTERN
LOGGED BY B. HARRINGTON CHK'D BY B. TILTON
DATE 10/9/95
JOB NO.: 943-2848
FILENAME: PZ304AI

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch x 8.25 inch Hollow Stem Auger to 38.5 ft; 3.625 inch Mud Rotary 42.0-63.0 ft; 4.25 inch x 8.25 inch Hollow Stem Auger 38.5-64.0 ft.	BORING NO.	PZ-305-AI
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: CALIFORNIA BARREL (CB) SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET	1 OF 3
		DRILLING	START / FINISH
	WATER LEVEL: 22.85 FT.	TIME	11:00 / 8:30
	TIME: 8:05		
	DATE: 10/19/95	DATE	10/18/95 / 10/19/95
	CASING DEPTH: 40.0 FT.		
DATUM NORTHING: 1068064.93 EASTING: 515633.57	ELEVATION 457.6		
DRILL RIG CME 750	SURFACE CONDITIONS Gravel road base.		
ANGLE 90°	BEARING NA		
SAMPLE HAMMER			

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(0.0-36.0 ft.) No samples collected, see Soil Borehole Log LR-104 for descriptions		
31							
32							
33							
34							
35							
36					(421.6) 36.0		
	6 8 21 50	1.4'/2.0' (70%)			(36.0-54.5 ft.) Compact to dense, dark gray (N3), fine SAND, trace to little Silt, NR, wet, (SP), (ALLUVIUM)	SP 1	
37					From 37.5-42.0 ft, becomes very dense		
38	12 41 50	1.1'/2.0' (55%)				SP 2	
39							
40	21 43 53 45	2.0'/2.0' (100%)				SP 3	
41							
42	4 5 6 9	1.2'/2.0' (60%)			From 42.0-45.0 ft, becomes compact, with occasional thin (1/2 in.) layers of medium gray (N4), SANDY CLAY, (CL)	SP 4	@ 42.0 ft, switched over to mud rotary
43							
44	5 9 20 30	1.4'/2.0' (70%)				SP 5	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ305AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch x 8.25 inch Hollow Stem Auger to 38.5 ft; 3.625 inch Mud Rotary 42.0-63.0 ft; 4.25 inch x 8.25 inch Hollow Stem Auger 38.5-64.0 ft.	BORING NO. PZ-305-AI
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: CALIFORNIA BARREL (CB) SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 2 OF 3
		DRILLING START / FINISH

						START	FINISH
WATER LEVEL	22.85 FT					TIME 11:00	TIME 8:30
TIME	8:05						
DATE	10/19/95					DATE 10/18/95	DATE 10/19/95
CASING DEPTH	40.0 FT.						

DATUM NORTHING: 1068064.93 EASTING: 515633.57 ELEVATION 457.6

DRILL RIG CME 750 | SURFACE CONDITIONS Gravel road base.

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(36.0-54.5 ft.) Compact to dense, dark gray (N3), fine SAND, trace to little Silt, NR, wet, (SP), (ALLUVIUM)	SP 5	
46	19 26 24 30	1.3'/2.0' (65%)				SP 6	
47							
48	16 28 34 33	1.7'/2.0' (85%)				SP 7	
49							
50	22 23 16 15	1.7'/2.0' (85%)				SP 8	
51							
52	10 12 50 22	1.0'/2.0' (50%)				SP 9	
53							
54	10 13 20 23	1.4'/2.0' (70%)			(54.5-64.0 ft.) Compact to dense, medium dark gray (N4), f-m SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP 10	
55							
56	12 14 20 26	1.1'/2.0' (55%)				SP 11	
57							
58	11 14 22 28	1.0'/2.0' (50%)				SP 12	
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: PZ305AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch x 8.25 inch Hollow Stem Auger to 38.5 ft; 3.625 inch Mud Rotary 42.0-63.0 ft; 4.25 inch x 8.25 inch Hollow Stem Auger 38.5-64.0 ft.	BORING NO. PZ-305-AI
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: CALIFORNIA BARREL (CB) SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	SHEET 3 OF 3
		DRILLING START / FINISH
	WATER LEVEL: 22.85 FT	TIME: 11:00 / 8:30
	TIME: 8:05	
	DATE: 10/19/95	DATE: 10/18/95 / 10/19/95
	CASING DEPTH: 40.0 FT.	
DATUM NORTHING: 1068064.93 EASTING: 515633.57	ELEVATION 457.6	
DRILL RIG CME 750	SURFACE CONDITIONS Gravel road base.	
ANGLE 90°	BEARING NA	
SAMPLE HAMMER		

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
61	14 13 14 19	1.0'/2.0' (50%)			(54.5-64.0 ft.) Compact to dense, medium dark gray (N4), f-m SAND, trace Silt, NR, wet, (SP), (ALLUVIUM)	SP (13)	
62	14 14 15 17	1.1'/2.0' (55%)				SP (14)	
63							
64					(393.6) 64.0 End of Soil Borehole Log at 64.0 ft.		
65							
66							
67							
68							
69							
70							
71							
72							
73							
74							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: PZ305AI

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					SB-01
						SHEET 1 OF 2
	SAMPLING METHOD:					DRILLING
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
	WATER LEVEL	18.5 FT.				TIME 13:30 / TIME 14:30
	TIME	14:45				
	DATE	10/5/96				DATE 10/5/96 / DATE 10/5/96
NORTHING: 1067731.19 DATUM EASTING: 514424.53 ELEVATION 450.6	CASING DEPTH					

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
1	3 4 6 7	1.7'/2.0' (85%)			(0.0-1.2 ft.) Loose, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) (1.2-6.0 ft.) Compact, olive gray (5Y 4/1), SILT, NR, dry, (ML), (LOESS)	SP 1		
2 3	7 5 4 5	0.5'/2.0' (25%)				SP 2		
4 5						SH 3		
6					(444.6) 6.0			
7	2 2 1 1	1.9'/2.0' (95%)			(6.0-6.9 ft.) Very loose, greenish gray (5GY 6/1), SILTY SAND, damp, NR, (SM), ALLUVIUM) (443.7) 6.9	SP 4	15.6	
8 9	1 2 2 4	0.8'/2.0' (40%)			(6.9-11.7 ft.) Very loose, greenish gray (5GY 6/1), SILTY CLAY, damp, NR, (CL), (ALLUVIUM) @ 7.1 ft, stained olive black	SP 5	10.1	From 7.1-8.1 ft. petroleum odor and soil staining observed
10 11	2 3 3 4	2.0'/2.0' (100%)				SP 6	22.4	
					(438.9) 11.7			
12 13	2 3 4 5	2.0'/2.0' (100%)			(11.7-12.4 ft.) Loose, medium dark gray (N4), SILTY fine SAND, NR, moist, stained, petroleum odor, (SM), (ALLUVIUM) (438.2) 12.4	SP 7	31.2	
14	4 6 10 15	1.7'/2.0' (85%)			(12.4-20.0 ft.) Loose, medium gray (N5), f-m SAND stained, NR, damp, (SP), (ALLUVIUM)	SP 8	40.7	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/5/96

JOB NO.: 943-2848

FILENAME: SB01

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	SB-01
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

						START	FINISH
WATER LEVEL	18.5 FT.					TIME 13:30	TIME 14:30
TIME	14:45						
DATE	10/5/96					DATE 10/5/96	DATE 10/5/96
CASING DEPTH							

NORTHING: 1067731.19
DATUM EASTING: 514424.53 ELEVATION 450.6

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
					(12.4-20.0 ft.) Loose, medium gray (N5), f-m SAND stained, NR, damp, (SP), (ALLUVIUM)	SP 8		
16	11 9 6 7	1.5'/2.0' (75%)			@ 15.6 ft., moist	SP 9	54.4	
17								
18	4 5 8 9	1.8'/2.0' (90%)			@ 18.1 ft., wet	SP 10	65.7	
19								
20					(430.6) 20.0			
					End of Soil Borehole Log at 20.0 ft. At completion of drilling, borehole sealed to surface with cement/bentonite grout.			
21								
22								
23								
24								
25								
26								
27								
28								
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/5/96

JOB NO.: 943-2848

FILENAME: SB01

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				SB-02
					SHEET 1 OF 2
	SAMPLING METHOD:				DRILLING
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)				START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				
	WATER LEVEL	17.9 FT.			TIME 15:25 / TIME 16:25
	TIME	16:40			
	DATE	10/5/95			DATE 10/5/95 / DATE 10/5/95
NORTHING: 1067823.40 DATUM EASTING: 514428.39 ELEVATION 450.5	CASING DEPTH				

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
1	3 6 6 8	1.8'/2.0' (90%)			(0.0-3.4 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, trace organic material, NR, dry, (ML), (FILL)	SP 1		
2	3 6 7 5	1.4'/2.0' (70%)			@ 1.8 ft., damp	SP 2	0.6	
3					(447.1) 3.4			
4	4 3 2 2	1.3'/2.0' (65%)			(3.4-7.3 ft.) Compact, pale olive (10Y 6/2), fine SILTY SAND, NR, damp, (SM), (ALLUVIUM)	SP 3	2.3	
5					from 4.9-5.1 ft., seam of crushed LIMESTONE GRAVEL			
6	3 2 2 2	2.0'/2.0' (100%)				SP 4	1.0	
7					(7.3-8.5 ft.) Loose, pale olive (10YR 6/2), fine SILTY SAND, little Clay, NR, moist, (SM), (ALLUVIUM)			
8	3 2 2 2	1.4'/2.0' (70%)			(442.0) 8.5			
9					(8.5-10.4 ft.) Soft, olive gray (5Y 4/1), SILTY CLAY, NR, damp, (CL), (ALLUVIUM)	SP 5	2.1	
10	2 4 6 7	1.6'/2.0' (80%)			(10.4-14.3 ft.) Stiff, light olive gray to moderate yellowish brown (5Y 6/1 to 10YR 5/4), CLAY, NR, damp, (CL), (ALLUVIUM)	SP 6	0.6	
11								
12	2 3 4 5	1.8'/2.0' (90%)				SP 7	0.5	
13					from 13.1-13.6 ft., seam of light olive gray (5Y 6/1), SILTY CLAY, moist, NR, (CL), (ALLUVIUM)			
14	3 3 4 9	1.9'/2.0' (95%)			(436.2) 14.3 (14.3-16.5 ft.) Loose, olive gray (5Y 4/1), SILT, NR, moist, (ML), (ALLUVIUM)	SP 8	0.3	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: SB02

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					SB-02
						SHEET
	SAMPLING METHOD:					2 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
	WATER LEVEL	17.9 FT.				TIME / TIME
	TIME	16:40				15:25 / 16:25
	DATE	10/5/95				DATE / DATE
NORTHING: 1067823.40 DATUM EASTING: 514428.39 ELEVATION 450.5	CASING DEPTH					10/5/95 / 10/5/95

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
16	6 6 5 8	1.7' 2.0' (85%)			(14.3-16.5 ft.) Loose, olive gray (5Y 4/1), SILT, NR, moist, (ML), (ALLUVIUM)	SP 8		
					(434.0) 16.5			
17					(16.5-18.0 ft.) Compact, light olive gray (5Y 6/1), fine SAND, NR, wet, (SP), (ALLUVIUM)	SP 9	0.1	
					(432.5) 18.0			
18					End of Soil Borehole Log at 18.0 ft. At completion of drilling, borehole sealed to surface with cement/bentonite grout.			
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: SB02

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	SB-03
		SHEET 1 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	15.6 FT.				TIME 13:40	TIME 14:30
TIME	15:00					
DATE	10/9/95				DATE 10/9/95	DATE 10/9/95
CASING DEPTH	16.0 FT.					

DATUM NORTHING: 1067429.24 EASTING: 514472.47 ELEVATION 449.7

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
1	6 8 11 10	1.2'/2.0' (60%)			(0.0-4.2 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL)	SP 1		
2							N/A	
3	5 4 5 7	1.5'/2.0' (75%)				SP 2		
4	2 4 4 6	0.6'/2.0' (30%)			(4.2-6.4 ft.) Loose, olive gray (5Y 4/1), SILT, trace Clay, NR, damp, (ML), (LOESS)	SP 3	0.0	@ 4.6 ft., stones prevented complete Split Spoon recovery
5								
6	2 3 3 2	1.0'/2.0' (50%)			(6.4-12.2 ft.) Loose, olive gray (5Y 4/1), SILT, trace Clay and fine Sand, NR, damp, (ML), (LOESS)	SP 4	2.8	
7								
8	1 2 2 3	0.6'/2.0' (30%)				SP 5	1.3	
9								
10	1 1 1 3	1.7'/2.0' (85%)			@ 9.9 ft., moist, slight staining and petroleum odor to 12.2 ft.	SP 6	1.8	
11								
12	1 2 3 7	1.5'/2.0' (75%)			(12.2-13.5 ft.) Loose, olive gray (5Y 4/1), SANDY SILT, NR, wet, (ML), (LOESS)	SP 7	0.0	
13								
14	10 8 10 9	1.5'/2.0' (75%)			(13.5-14.2 ft.) Compact, olive gray (5Y 4/1), SILT, NR, moist, (ML), (LOESS) (435.5) 14.2 (14.2-16.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, NR, wet, (SP)	SP 8	0.0	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: SB03

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	SB-03
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START TIME	FINISH TIME
WATER LEVEL	15.6 FT.				13:40	14:30
TIME	15:00					
DATE	10/9/95				DATE 10/9/95	DATE 10/9/95
CASING DEPTH	16.0 FT.					

DATUM NORTHING: 1067429.24 EASTING: 514472.47 ELEVATION 449.7

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
16					(14.2-16.0 ft.) Compact, olive gray (5Y 4/1), fine SAND, NR, wet, (ALLUVIAL, (SP) (433.7) 16.0	SP (8)		
					End of Soil Borehole Log at 16.0 ft.			
17					At completion of drilling, borehole sealed to surface with cement/bentonite grout.			
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: SB03

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					SB-04
						SHEET 1 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:					DRILLING
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
	WATER LEVEL	15.4 FT.				TIME 12:35 / TIME 13:20
	TIME	13:20				
	DATE	10/9/95				DATE 10/9/95 / DATE 10/9/95
NORTHING: 1067360.43 DATUM EASTING: 514524.13 ELEVATION 447.9	CASING DEPTH	14.0 FT.				

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
1	5 11 10 8	1.6'/2.0' (80%)			(0.0-2.3 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL)	SP ①	N/A	
3	6 4 6 7	1.3'/2.0' (65%)			(2.3-4.0 ft.) Loose to compact, dark greenish gray (5GY 4/1), SILT, NR, damp, (ML), (LOESS)	SP ②	0.0	
5	3 3 4 5	1.4'/2.0' (70%)			(4.0-7.2 ft.) Loose, olive gray (5Y 4/1), SILT, fine Sand and Clay, NR, damp, (ML), (LOESS)	SP ③	1.4	
7	1 2 2 2	1.4'/2.0' (70%)				SP ④	0.3	
9	1 1 2 2	1.5'/2.0' (75%)			(7.2-13.0 ft.) Very loose, olive gray (5Y 4/1), SILT, with trace Clay, slightly stained, NR, damp, (ML), (LOESS)	SP ⑤	12.9	from 7.2-13.0 ft., slight petroleum staining observed @ 9.0 ft. Soil black in color, slight petroleum odor
11	3 3 2 2	1.4'/2.0' (70%)			from 10.7-11.3 ft, seam of light olive gray (5Y 6/1) fine SAND (SP)	SP ⑥	4.0	0.0 ppm PID
13	2 4 5 8	1.3'/2.0' (65%)			(434.9) 13.0	SP ⑦	0.0	
14	4 4 4 4	1.6'/2.0' (80%)			(13.0-16.0 ft.) Loose, olive gray (5Y 4/1), f-m SAND, with trace Silt, NR, moist, (SP), (ALLUVIUM) @ 14.9 ft, wet	SP ⑧	0.0	0.0 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: SB04

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	SB-04
		SHEET 2 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	15.4 FT.				TIME 12:35	TIME 13:20
TIME	13:20					
DATE	10/9/95				DATE 10/9/95	DATE 10/9/95
CASING DEPTH	14.0 FT.					

DATUM NORTHING: 1067360.43 EASTING: 514524.13 ELEVATION 447.9

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	P.I.D. HEADSPACE ANALYSIS (PPM)	REMARKS
					(13.0-16.0 ft.) Loose, olive gray (5Y 4/1), f-m SAND, with trace Silt, NR, moist, (SP), (ALLUVIUM) (431.9) 16.0	SP (B)		
16					End of Soil Borehole Log at 16.0 ft.			
					At completion of drilling, borehole sealed to surface with cement/bentonite grout.			
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: SB04

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-100
		SHEET 1 OF 2
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	19.0 FT.				TIME	TIME
TIME	11:55				7:30	11:00
DATE	10/04/95				DATE	DATE
CASING DEPTH	26.0 FT.				10/04/95	10/04/95

DATUM NORTHING: 1067293.73 EASTING: 514893.56 ELEVATION 467.2

DRILL RIG CME 750 SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	0 6 7 4	1.7'/2.0' (85%)			(0.0-5.5 ft.) Compact, moderate yellowish brown (10YR 5/4), CLAYEY SILT, NR, damp, (CL), (FILL) @ 0.8 ft, dry	SP 1	Landfill cap 1.5 ft. thick
2 3	3 1 2 2	0.9'/2.0' (45%)			from 1.5-5.5 ft, Intermixed organic matter and trace waste	SP 2	
4 5	2 3 4 36	0.3'/2.0' (15%)			@ 5.0 ft, wet (461.7) 5.5	SP 3	0.0 ppm PID
					(5.5-22.0 ft.) WASTE, wet		
6 7	3 14 5 3	0.6'/2.0' (30%)				SP 4	
8 9	4 6 4 5	0.5'/2.0' (25%)				SP 5	0.1 ppm PID
10 11	4 2 3 8	0.5'/2.0' (25%)				SP 6	0.0 ppm PID
12 13	7 14 26 11	0.4'/2.0' (20%)				SP 7	
14	50/2	0.1'/2.0' (5%)				SP 8	1.1 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR100

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	BORING NO. LR-100
		SHEET 2 OF 2
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD: SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP) SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	DRILLING

					START	FINISH
WATER LEVEL	19.0 FT.				TIME 7:30	TIME 11:00
TIME	11:55					
DATE	10/04/95				DATE 10/04/95	DATE 10/04/95
CASING DEPTH	26.0 FT.					

DATUM NORTHING: 1067293.73 EASTING: 514893.56 ELEVATION 467.2

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(5.5-22.0 ft.) WASTE, wet	SP 8	
16	8 11 21 11	0.2'/2.0' (10%)					
17						SP 9	
18	8 13 7 8	0.4'/2.0' (20%)					0.0 ppm PID
19						SP 10	
20	4 5 10 5	0.6'/2.0' (30%)			@ 19.9 ft, increasing amount of olive gray SILT intermixed with waste		
21						SP 11	
22	4 7 6 6	0.1'/2.0' (5%)					0.0 ppm PID
23						SP 12	
24	5 4 4 5	0.8'/2.0' (40%)					
25						SP 13	
26	4 5 5 7	0.4'/2.0' (20%)					0.2 ppm PID
27					(440.2) 27.0 (27.0-28.0 ft.) Compact, olive gray (5Y 4/1), SILT, NR, wet, (ML), (LOESS)	SP 14	
28					(439.2) 28.0 End of Soil Borehole Log at 28.0 ft.		
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR100

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-101
		SHEET 1 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	DRY	51.0 FT.				
TIME	11:15	15:30			TIME 8:00	TIME 15:20
DATE	10/10/95	10/10/95			DATE 10/10/95	DATE 10/10/95
CASING DEPTH	35.0 FT.	55.0 FT.				

NORTHING: 1068402.25
DATUM EASTING: 514718.41 ELEVATION 500.2

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
		0.1'/1.0' (10%)			(0.0-1.0 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) (499.2) 1.0	ST 1	
1	20 39 25 23	1.6'/2.0' (80%)			(1.0-2.6 ft.) Crushed, LIMESTONE Gravel, (GP), (FILL) (497.6) 2.6	SP 2	
2							
3	4 8 10 6	1.1'/2.0' (55%)			(2.6-5.0 ft.) Compact, olive gray (5Y 4/1), SILT, NR, dry, (ML), (FILL) (495.5) 4.7	SP 3	
4							
5	7 6 25 50/3	1.0'/2.0' (50%)			(4.7-12.4 ft.) WASTE, damp	SP 4	
6							
7	6 7 11 5	0.9'/2.0' (45%)				SP 5	0.0 ppm PID
8							
9	40 8 5 14	1.1'/2.0' (55%)			@ 10.0 ft., moist	SP 6	
10							
11	12 15 5 7	1.3'/2.0' (65%)			(487.8) 12.4	SP 7	
12							
13	8 16 10 15				(12.4-19.9 ft.) Compact, olive gray (5Y 4/1), SILT, with little waste, damp, (ML), (FILL)	SP 8	
14					@ 14.5 ft., wet		

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MD WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-101
		SHEET 2 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	DRY	51.0 FT.			TIME	TIME
TIME	11:15	15:30			8:00	15:20
DATE	10/10/95	10/10/95			DATE	DATE
CASING DEPTH	35.0 FT.	55.0 FT.			10/10/95	10/10/95

NORTHING: 1068402.25
DATUM EASTING: 514718.41 ELEVATION 500.2

DRILL RIG CME 750 SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	6 13 20 50/5	1.7'/2.0' (85%)			(12.4-19.9 ft.) Compact, olive gray (5Y 4/1), SILT, with little waste, damp, (ML), (FILL)	SP 9	
17	22 18 18 16	0.6'/2.0' (30%)				SP 10	0.0 ppm PID
19	5 8 26 10	0.9'/2.0' (45%)			(480.3) 19.9	SP 11	
20					(19.9-51.5 ft.) WASTE, damp		
21	4 7 50 25	0.9'/2.0' (45%)			from 21.4-21.5 ft., layer of olive gray (5Y 4/1), SILT, with little waste, wet	SP 12	
23	29 18 25 50/4	1.4'/2.0' (70%)			from 23.5-24.0 ft., layer of olive gray (5Y 4/1), SILT, with little waste, wet, (ML) @ 24.0 ft., moist	SP 13	0.0 ppm PID
25	27 19 38 38	0.5'/2.0' (25%)			@ 26.0 ft., wet	SP 14	
27	8 15 50/6	0.8'/2.0' (40%)				SP 15	0.0 ppm PID
29	50/1	0.1'/2.0' (5%)				SP 16	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION

LAIDLAW/OU2 RI-FS/MO
WEST LAKE LANDFILL
OPERABLE UNIT 2

NORTHING: 1068402.25
DATUM EASTING: 514718.41 ELEVATION 500.2

DRILLING METHOD: 4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger

SAMPLING METHOD:
SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)
SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)

BORING NO. LR-101

SHEET 3 OF 4

					DRILLING START	DRILLING FINISH
WATER LEVEL	DRY	51.0 FT.				
TIME	11:15	15:30			TIME 8:00	TIME 15:20
DATE	10/10/95	10/10/95			DATE 10/10/95	DATE 10/10/95
CASING DEPTH	35.0 FT.	55.0 FT.				

DRILL RIG CME 750
ANGLE 90° **BEARING** NA
SAMPLE HAMMER
SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(19.5-51.5 ft.) WASTE, damp	SP 18	Rods warm upon withdrawal from borehole.
31	50/5	0.2'/2.0' (10%)					
32						SP 17	
33	9, 23, 10, 16	1.5'/2.0' (75%)				SP 18	0.0 ppm PID
34							
35	9, 11, 17, 17	1.8'/2.0' (90%)			from 35.3-35.7 ft., layer of olive gray (5Y 4/1), SILT, moist, (ML)	SP 19	@ 11:00 Rain
36							
37	9, 38, 29, 17				@ 37.0 ft., wet	SP 20	1.1 ppm PID 34% LEL, stop drilling temporarily
38							
39	42, 45, 36, 17	1.3'/2.0' (65%)				SP 21	
40					@ 40.0 ft., moist		
41	11, 11, 18, 20	1.1'/2.0' (55%)				SP 22	
42							
43	12, 18, 40, 50/1	1.6'/2.0' (80%)				SP 23	6.1 ppm PID
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-101
		SHEET 4 OF 4
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

WATER LEVEL	DRY	51.0 FT.			START TIME	FINISH TIME
TIME	11:15	15:30			8:00	15:20
DATE	10/10/95	10/10/95			DATE 10/10/95	DATE 10/10/95
CASING DEPTH	35.0 FT.	55.0 FT.				

DATUM NORTHING: 1068402.25 EASTING: 514718.41 ELEVATION 500.2

DRILL RIG CME 750 SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
	50/5	0.5'/2.0' (25%)			(19.5-51.5 ft.) WASTE, damp	SP 24	Drill rods very warm upon withdrawal from borehole.
46							
47	34 15 25 33	1.8'/2.0' (90%)			From 47.0-48.0 ft. ammonia odor	SP 25	
48							
49	12 11 14 16	1.9'/2.0' (95%)				SP 26	Newsprint dated 1974-1976 0.3 ppm PID 34% LEL Temporarily stop drilling
50							
51	5 13 55 50/5	2.0'/2.0' (100%)			(448.7) 51.5	SP 27	
52					(51.5-52.1 ft.) Compact, olive gray (5Y 4/1), SILT, moist, (ML), (FILL) (448.1) 52.1		
					(52.1-54.7 ft.) Dense, black stained SILT and mixed WASTE, some Gravel (looks as if burned), damp to moist, (FILL)		
53	29 25 6 10	1.6'/2.0' (80%)				SP 28	0.0 ppm PID
54					(445.5) 54.7		
55	1 1 1 3	2.0'/2.0' (100%)			(54.7-57.0 ft.) Very loose, very light gray (N8), very fine SAND and thinly laminated lime, appears to be mine spoils, WR, wet, (FILL)	SP 29	Water level began to rise rapidly after penetrating mine spoils.
56							
57					(443.2) 57.0		
					End of Soil Borehole Log at 55.0 ft.		
58					At completion of drilling, borehole sealed to surface with cement/bentonite grout.		
59							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR101

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-102
		SHEET 1 OF 6
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	54.0 FT.				TIME	TIME
TIME	10:15				11:55	14:30
DATE	10/8/95				DATE	DATE
CASING DEPTH	60.0 FT.				10/6/95	10/7/95

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1		1.5'/2.0' (75%)			(0.0-1.5 ft.) Compact, moderate yellowish brown (10YR 5/4), SILT, NR, dry, (ML), (FILL) (510.5) 1.5	ST 1	
2	50/3	0.3'/2.0' (15%)			(1.5-19.5 ft.) WASTE, consisting of wood, asphalt, carpet and other demolition wastes intermixed with olive black composite soil	SP 2	Petroleum odor
3							
4	15 17 5 6	1.1'/2.0' (55%)				SP 3	0.0 ppm PID
5							
6	9 22 22 4	0.5'/2.0' (25%)				SP 4	
7							
8	3 50/6	0.8'/2.0' (40%)			from 8.4-8.8 ft. layer of dark gray SILT with gravel sized stones	SP 5	0.3 ppm PID
9							
10	11 50/3	0.7'/2.0' (35%)			@ 10.5 ft. asphalt	SP 6	
11							
12	50/6	0.5'/2.0' (25%)			from 12.0-14.2 ft. carpet	SP 7	0.9 ppm PID
13							
14	15 50/6	0.7'/2.0' (35%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-102
		SHEET 2 OF 6
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	54.0 FT.				TIME 11:55	TIME 14:30
TIME	10:15					
DATE	10/8/95				DATE 10/6/95	DATE 10/7/95
CASING DEPTH	60.0 FT.					

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	50/4	0.0'/2.0' (0%)			(1.5-19.5 ft.) Compacted, WASTE, consisting of wood, asphalt, carpet and other demolition wastes intermixed with olive black composite soil	SP 8	0.1 ppm PID
17						SP 9	
18	16 20 24 11	0.3'/2.0' (15%)					
19					(492.5) 19.5	SP 10	
20	10 8 8 5	0.8'/2.0' (40%)			(19.5-20.5 ft.) Compact, greenish gray (5GY 6/1), SILT, damp, (ML), (FILL) (491.5) 20.5		0.1 ppm PID
21					(20.5-36.0 ft.) WASTE, municipal intermixed with medium gray SILT, moist, strong leachate odor	SP 11	
22	0 0 13 33	0.2'/2.0' (10%)			@ 22.0 ft, wet		
23						SP 12	
24	28 50/4	0.0'/2.0' (0%)					0.7 ppm PID
25					@ 25.0 ft, moist	SP 13	
26	0 0 8 6	0.4'/2.0' (20%)					
27						SP 14	
28	50/3	0.3'/2.0' (15%)					0.0 ppm PID
29						SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR102

SOIL BOREHOLE LOG

LAIDLAW WASTE SYSTEMS INC.

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-102
						SHEET
	SAMPLING METHOD:					3 OF 6
LAIDLAW/OU2 RI-FS/MO	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)					DRILLING
WEST LAKE LANDFILL	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
OPERABLE UNIT 2	WATER LEVEL	54.0 FT.				TIME / TIME
	TIME	10:15				11:55 / 14:30
	DATE	10/8/95				DATE / DATE
NORTHING: 1068937.21	CASING DEPTH	60.0 FT.				10/6/95 / 10/7/95
DATUM EASTING: 514788.13 ELEVATION 512.0						

DRILL RIG CME 750	SURFACE CONDITIONS
ANGLE 90° BEARING NA	
SAMPLE HAMMER	

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
	14 50/5	0.0'/2.0' (0%)			(20.5-36.0 ft.) Compacted WASTE, municipal intermixed with medium gray SILT, moist, strong leachate odor	SP 16	
31							
32	32 33 20 12	0.0'/2.0' (0%)				SP 17	1.2 ppm PID
33							
34	13 9 10 50/4	0.2'/2.0' (10%)				SP 18	
35							1.1 ppm PID
36	50/5	0.0'/2.0' (0%)			(36.0-48.4 ft.) WASTE, demolition and construction debris, aphalt, particle board, wood, corrugated cardboard, brick, etc, intermixed with black composite soil, moist	SP 19	
37							
38	41 50/3	0.4'/2.0' (20%)				SP 20	
39							
40	20 50/1	0.2'/2.0' (10%)				SP 21	0.2 ppm PID
41							
42	27 13 25 24	0.6'/2.0' (30%)				SP 22	
43							
44	50/5	0.0'/2.0' (0%)				SP 23	1.0 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-102
						SHEET 4 OF 6
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:					DRILLING
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)					START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					
	WATER LEVEL	54.0 FT.				TIME / TIME
	TIME	10:15				11:55 / 14:30
	DATE	10/8/95				DATE / DATE
NORTHING: 1068937.21 DATUM EASTING: 514788.13 ELEVATION 512.0	CASING DEPTH	60.0 FT.				10/6/95 / 10/7/95

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
46	6 17 15 16	1.8'/2.0' (90%)			(36.0-48.4 ft.) Compacted WASTE, demolition and construction debris, asphalt, particle board, wood, corrugated cardboard, brick, etc., intermixed with black composite soil, moist from 45.0-45.5 ft, layer of compact, medium gray (N5), SILT, some Gravel, moist, (ML), (FILL)	SP 23	
47						SP 24	
48	7 18 27 17	2.0'/2.0' (100%)			(463.6) 48.4		1.1 ppm PID
49					(48.4-50.8 ft.) Dense, olive gray (SY 4/1), SILT, with little waste and demolition debris, moist, (ML), (FILL)	SP 25	
50	7 9 10 12	1.6'/2.0' (80%)			(461.2) 50.8		
51					(50.8-58.0 ft.) WASTE, demolition debris, bricks, wood, etc., with little olive gray Silt, moist	SP 26	
52	8 11 50/5	1.5'/2.0' (75%)					
53					@ 53.0 ft, wet	SP 27	
54	10 14 50/4	1.1'/2.0' (55%)					
55						SP 28	
56	14 16 16 18	1.2'/2.0' (60%)					0.7 ppm PID
57						SP 29	
58	3 50/6	0.6'/2.0' (30%)			(454.0) 58.0 (58.0-62.8 ft.) Compact, olive gray (SY 4/1), SILT and GRAVEL, wet, (ML/GP), (FILL)	SP 30	
59							0.2 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				LR-102
					SHEET 5 OF 6
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SAMPLING METHOD:				DRILLING
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)				
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				START / FINISH
	WATER LEVEL	54.0 FT.			TIME 11:55 / TIME 14:30
	TIME	10:15			
	DATE	10/8/95			DATE 10/6/95 / DATE 10/7/95
NORTHING: 1068937.21 DATUM EASTING: 514788.13 ELEVATION 512.0	CASING DEPTH	60.0 FT.			

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
61	13 19 9 14	2.0' / 2.0' (100%)			(58.0-62.8 ft.) Compact, olive gray (5Y 4/1), SILT and GRAVEL, wet, (ML/GP), (FILL)	SP 31	
62	13 33 32 35	1.4' / 2.0' (70%)			(449.2) 62.8	SP 32	
63					(62.8-76.0 ft.) WASTE, demolition debris that appears to have been burned, wet to moist, with some olive gray Silt		
64	8 40 50/5	1.1' / 2.0' (55%)			below 64.0 ft, waste becomes moist to damp	SP 33	0.1 ppm PID
65							
66	65 49 25 50/1	0.5' / 2.0' (25%)				SP 34	
67							
68	8 29 21 12	0.4' / 2.0' (20%)				SP 35	0.0 ppm PID
69							
70	4 9 12 27	0.6' / 2.0' (30%)				SP 36	
71							
72	28 17 30 50/5	1.2' / 2.0' (60%)				SP 37	0.1 ppm PID
73							
74	50/2	0.0' / 2.0' (0%)				SP 38	0.7 ppm PID

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-102
		SHEET 6 OF 6
	SAMPLING METHOD:	
	SPLIT SPOON: 3.0 inch O.D./2 13/16 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	54.0 FT.				TIME	TIME
TIME	10:15				11:55	14:30
DATE	10/8/95				DATE	DATE
CASING DEPTH	60.0 FT.				10/6/95	10/7/95

DATUM NORTHING: 1068937.21 EASTING: 514788.13 ELEVATION 512.0

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE		REMARKS
					(62.8-76.0 ft.) Compacted WASTE, demolition debris, moist to damp, with some olive gray Silt (436.0) 76.0	SP (38)		
76					End of Soil Borehole Log at 76.0 ft.			
77								
78								
79								
80								
81								
82								
83								
84								
85								
86								
87								
88								
89								

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR102

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-103
		SHEET 1 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	26.74 FT				TIME	TIME
TIME	9:16				14:00	9:00
DATE	10/20/95				DATE	DATE
CASING DEPTH	38.0 FT.				10/19/95	10/20/95

DATUM NORTHING: 1068527.38 EASTING: 515217.07 ELEVATION 460.1

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	2 4 6 8	1.0'/2.0' (50%)			(0.0-2.5 ft.) Stiff, moderate yellowish brown (10YR 5/4), CLAYEY SILT, trace fine Gravel, occasional cobbles, NR, dry, (CL-ML), (FILL)	SP 1	
2	17 12 13 16	1.3'/2.0' (65%)			(457.6) 2.5 (2.5-3.5 ft.) Very stiff, medium gray (N5), SANDY SILT, little c-f Gravel, occasional cobbles, SR, damp, (ML), (FILL)	SP 2	
3							
4	9 10 8 11	0.7'/2.0' (35%)			(3.5-7.5 ft.) Very stiff, medium bluish gray (SB 5/1), SILT, little c-f Sand, WR, damp, (ML), (FILL)	SP 3	
5							
6	3 8 5 4	1.2'/2.0' (60%)				SP 4	
7					(7.5-10.0 ft.) Stiff, medium light gray (N6), SANDY SILT, little c-f Gravel, SR, damp, (ML), (FILL)		
8	3 5 4 4	1.1'/2.0' (55%)				SP 5	
9							
10	2 2 3 2	1.6'/2.0' (80%)			(10.0-19.3 ft.) Firm, medium gray (N5), SILT, little fine Sand, trace iron staining, SR, damp, (ML), (LOESS)	SP 6	
11							
12	1 2 3 3	1.4'/2.0' (70%)				SP 7	@ 12.0 ft. Hole began making gas at low levels
13							
14	2 2 3 4	2.0'/2.0' (100%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/23/95

JOB NO.: 943-2848

FILENAME: LR103

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-103
						SHEET 2 OF 3
	SAMPLING METHOD:					
LAIDLAW/OU2 RI-FS/MO	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING
WEST LAKE LANDFILL	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
OPERABLE UNIT 2	WATER LEVEL	26.74 FT				TIME 14:00 / TIME 9:00
	TIME	9:16				
	DATE	10/20/95				DATE 10/19/95 / DATE 10/20/95
NORTHING: 1068527.38	CASING DEPTH	38.0 FT.				
DATUM EASTING: 515217.07 ELEVATION 460.1						

DRILL RIG CME 750 | SURFACE CONDITIONS
ANGLE 90° BEARING NA
SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(10.0-19.3 ft.) Firm, medium gray (N5), SILT, little fine Sand, trace iron staining, SR, damp, (ML), (LOESS)	SP 8	
16	3 3 4 5	2.0' / 2.0' (100%)					
17						SP 9	
18	1 2 2 4	2.0' / 2.0' (100%)			from 18.0-19.0 ft, wet zone		
19					(440.8) 19.3	SP 10	
					(19.3-24.2 ft.) Firm, grayish black (N2), SILTY CLAY, NR, damp, (CL), (ALLUVIUM)		
20	2 4 6 7	2.0' / 2.0' (100%)					
21						SH 11	
22	2 4 5 8	2.0' / 2.0' (100%)			@ 22.3 ft, color changes to medium dark gray (N4)		
23						SP 12	
24					(435.9) 24.2		
	6 12 17 15	2.0' / 2.0' (100%)			(24.2-38.0 ft.) Compact, medium gray to medium dark gray (N5 to N4), fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)		
25						SP 13	
26	4 4 6 15	1.2' / 2.0' (60%)					@ 26.0 ft, encountered water
27					from 27.2-27.5 ft, CLAYEY SILT layer	SP 14	
28	8 8 15 15	2.0' / 2.0' (100%)					
29						SP 15	

DRILLING CONTR LAYNE-WESTERN
LOGGED BY M. SANDFORT CHK'D BY B. TILTON
DATE 10/23/95
JOB NO.: 943-2848
FILENAME: LR103

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:					BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger					LR-103
						SHEET
	SAMPLING METHOD:					3 OF 3
LAIDLAW/OU2 RI-FS/MO	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)					DRILLING
WEST LAKE LANDFILL	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)					START / FINISH
OPERABLE UNIT 2	WATER LEVEL	26.74 FT				TIME / TIME
	TIME	9:16				14:00 / 9:00
	DATE	10/20/95				DATE / DATE
NORTHING: 1068527.38	CASING DEPTH	38.0 FT.				10/19/95 / 10/20/95
DATUM EASTING: 515217.07 ELEVATION 460.1						

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	4 4 7 10	1.5'/2.0' (75%)			(24.2-38.0 ft.) Compact, medium gray to medium dark gray (N5 to N4), fine SAND, trace Silt, NR, damp, (SP), (ALLUVIUM)	SP 16	
32 33	5 11 14 27	1.3'/2.0' (65%)			from 32.3-32.5 ft., layers of decayed vegetation	SP 17	
34 35	6 12 15 15					SP 18	
36 37	5 6 12 14				@ 37.0 ft., SAND becomes medium to fine grained	SP 19	
38					(422.1) 38.0 End of Soil Borehole Log at 38.0 ft.		
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT

DATE 10/23/95 CHK'D BY B. TILTON

JOB NO.: 943-2848

FILENAME: LR103

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D.8.25 inch O.D. Hollow Stem Auger	LR-104
		SHEET 1 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	26.0 FT.	25.6 FT.			TIME	TIME
TIME	14:25	7:44			13:00	15:25
DATE	10/17/95	10/18/95			DATE	DATE
CASING DEPTH	26.5 FT.	38.0 FT.			10/17/95	10/17/95

DATUM NORTHING: 1068078.63 EASTING: 515623.34 ELEVATION 458.0

DRILL RIG CME 750

ANGLE 90° BEARING NA

SAMPLE HAMMER

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1					(0.0-2.0 ft.) Dense, yellowish gray (5Y 8/1), LIMESTONE GRAVEL, little fines, SR, damp, (GP), (ROAD BASE)	NS	
					(456.0) 2.0		
2	9 9 13 15	1.5'/2.0' (75%)			(2.0-4.0 ft.) Very stiff, light olive gray (5Y 6/1), CLAYEY SILT, little Gravel, trace brick pieces, SR, damp, (CL-ML), (FILL)	SP 1	
3							
4	5 9 9 12	0.7'/2.0' (35%)			(4.0-10.0 ft.) Stiff, light olive gray (5Y 5/2), CLAYEY SILT, little Gravel, SR, damp, (CL-ML), (FILL)	SP 2	
5							
6	5 5 6 8	0.8'/2.0' (40%)				SP 3	
7							
8	5 8 10 11	0.5'/2.0' (25%)				SP 4	
9							
					(448.0) 10.0		
10	5 9 12 50/6	1.8'/2.0' (90%)			(10.0-18.0 ft.) Compact, light olive brown and light olive gray (5Y 5/6 and 5Y 5/2), SILT, trace Gravel, trace Fe staining, little decayed plant matter, SR, damp to moist, (ML), (ALLUVIUM)	SP 5	
11							
12	9 3 3 4	1.5'/2.0' (75%)				SP 6	
13					below 13.0 ft., color changes to grayish olive green (5GY 3/2), becomes moist		
14							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/17/95

JOB NO.: 943-2848

FILENAME: LR104

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
	4.25 inch I.D.8.25 inch O.D. Hollow Stem Auger	LR-104
		SHEET 2 OF 3
	SAMPLING METHOD:	
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	26.0 FT.	25.6 FT.			TIME	TIME
TIME	14:25	7:44			13:00	15:25
DATE	10/17/95	10/18/95			DATE	DATE
CASING DEPTH	26.5 FT.	38.0 FT.			10/17/95	10/17/95

DATUM NORTHING: 1068078.63 EASTING: 515623.34 ELEVATION 458.0

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
16	3 8 5 6	1.2'/2.0' (60%)			(10.0-18.0 ft.) Compact, light olive brown and light olive gray (5Y 5/6 and 5Y 5/2), SILT, trace Gravel, trace Fe staining, little decayed plant matter, SR, damp to moist, (ML), (ALLUVIUM)		
17					From 16.5-17.0 ft., grayish olive green (5GY 3/2), SILTY SAND layer, moist, (SM)	SP 8	
18	2 5 7 12	1.5'/2.0' (75%)			(440.0) 18.0 (18.0-26.2 ft.) Firm to stiff, dark gray (N3), SILTY CLAY, NR, damp, (CL), (ALLUVIUM)	SP 9	
19							
20	1 4 5 7	1.6'/2.0' (80%)				SP 10	
21							
22	2 4 4 5	2.0'/2.0' (100%)				SP 11	
23					From 23.3-23.8 ft, wet Silt zone		
24	2 3 6 6	1.7'/2.0' (85%)				SP 12	
25					From 25.0-26.2 ft., wet Silt zone		
26	2 6 12 12	1.2'/2.0' (60%)			(431.8) 26.2 (26.2-37.3 ft.) Compact, dark gray (N3), fine SAND, little Silt, occasional Silt layers, NR, wet, (SP), (ALLUVIUM)	SP 13	@ 26.0 ft., first free water encountered
27							
28	2 5 6 7	1.4'/2.0' (70%)				SP 14	
29							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY M. SANDFORT CHK'D BY B. TILTON

DATE 10/17/95

JOB NO.: 943-2848

FILENAME: LR104

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	4.25 inch I.D.8.25 inch O.D. Hollow Stem Auger				LR-104
					SHEET 3 OF 3
	SAMPLING METHOD:				
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)				DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				START / FINISH
	WATER LEVEL	26.0 FT.	25.6 FT.		TIME / TIME
	TIME	14:25	7:44		13:00 / 15:25
	DATE	10/17/95	10/18/95		DATE / DATE
NORTHING: 1068078.63 DATUM EASTING: 515623.34 ELEVATION 458.0	CASING DEPTH	26.5 FT.	38.0 FT.		10/17/95 / 10/17/95

DRILL RIG CME 750 | SURFACE CONDITIONS
ANGLE 90° BEARING NA
SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31	5 7 8 11	1.6'/2.0' (80%)			(26.2-37.3 ft.) Compact, dark gray (N3), fine SAND, little Silt, occasional Silt layers, NR, wet, (SP), (ALLUVIUM) @ 34.0 ft., color changes to medium dark gray (N4)	SP 15	
32	2 3 5 6	1.4'/2.0' (70%)			from 35.5-36.0 ft., trace carbonized wood	SP 16	Began injecting water to control heaving sands
34	2 3 4 5	1.6'/2.0' (80%)				SP 17	
36	0 1 2 4	1.5'/2.0' (75%)				SP 18	
37					(420.7) 37.3		
					(37.3-38.0 ft.) Medium dark gray (N4), firm SILTY CLAY, NR, damp, (CL) (420.0) 38.0		
38					End of Soil Borehole Log at 38.0 ft.		
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN
LOGGED BY M. SANDFORT CHK'D BY B. TILTON
DATE 10/17/95
JOB NO.: 943-2848
FILENAME: LR104

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-105
		SHEET 1 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	21.3 FT.	32.0 FT.			TIME 9:45	TIME 14:45
TIME	13:50	11:00				
DATE	10/03/95	10/04/95			DATE 10/03/95	DATE 10/03/95
CASING DEPTH	28.0 FT.	36.0 FT.				

DATUM NORTHING: 1067709.56 EASTING: 514524.56 ELEVATION 484.2

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
1	6 8 6 8	1.8'/2.0' (90%)			(0.0-2.2 ft.) Compact, moderate yellowish brown (10YR 5/4), SILTY CLAY, NR, dry, (CL), (FILL) @ 1.3 ft., damp	SP 1	
2	4 3 7 43	1.3'/2.0' (65%)			(482.0) 2.2 (2.2-3.2 ft.) Loose, light olive gray (5Y 5/2), SILT, NR, damp, (ML), (FILL) (481.0) 3.2	SP 2	
3					(3.2-29.2 ft.) WASTE, damp		
4	4 3 2 4	0.4'/2.0' (20%)				SP 3	0.0 ppm PID
5							
6	8 6 10 5	0.7'/2.0' (35%)				SP 4	
7					@ 7.5 ft., moist		
8	1 2 2 4	0.4'/2.0' (20%)				SP 5	
9					@ 9.6 ft., wet		
10	2 3 4 6	0.5'/2.0' (25%)				SP 6	Faint petroleum odor
11							
12	6 3 4 4	0.5'/2.0' (25%)				SP 7	
13							
14	22 5 50/4	0.4'/2.0' (20%)				SP 8	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR105

LAIDLAW
LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO.
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger	LR-105
		SHEET 2 OF 3
	SAMPLING METHOD:	
	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)	DRILLING
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)	START / FINISH

					START	FINISH
WATER LEVEL	21.3 FT.	32.0 FT.			TIME 9:45	TIME 14:45
TIME	13:50	11:00				
DATE	10/03/95	10/04/95			DATE 10/03/95	DATE 10/03/95
CASING DEPTH	28.0 FT.	36.0 FT.				

DATUM NORTHING: 1067709.56 EASTING: 514524.56 ELEVATION 484.2

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
					(3.2-29.2 ft.) WASTE, damp	SP 8	
16	9 3 5 6	0.9'/2.0' (45%)					0.0 ppm PID
17						SP 9	
18	3 5 7 50/3	0.9'/2.0' (45%)				SP 10	
19							
20	50/5	0.4'/2.0' (20%)			from 19.9-23.8 ft. some Limestone and granular soil intermixed with waste		0.0 ppm PID
21						SP 11	
22	7 13 20 12	1.0'/2.0' (50%)				SP 12	
23							
24	7 8 19 17	1.4'/2.0' (70%)					Landfill gas odor 0.0 ppm PID Lost shoe on Split Spoon
25						SP 13	
26	13 21 17 25	1.5'/2.0' (75%)				SP 14	
27							
28	9 37 15 11						0.0 ppm PID
29					(29.2-30.0 ft.) Compact, medium gray (N5), SILTY CLAY, NR, wet, (CL), (FILL) from 29.2-29.8 ft. layer of LIMESTONE GRAVEL	SP 15	

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR105

LAIDLAW WASTE SYSTEMS INC.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	DRILLING METHOD:				BORING NO.
	4.25 inch I.D./8.25 inch O.D. Hollow Stem Auger				LR-105
					SHEET 3 OF 3
	SAMPLING METHOD:				DRILLING
LAIDLAW/OU2 RI-FS/MO WEST LAKE LANDFILL OPERABLE UNIT 2	SPLIT SPOON: 2.0 inch O.D./1.5 inch I.D. (SP)				START / FINISH
	SHELBY TUBE: 3.0 inch O.D./2 13/16 inch I.D. (SH)				
	WATER LEVEL	21.3 FT.	32.0 FT.		TIME / TIME
	TIME	13:50	11:00		9:45 / 14:45
	DATE	10/03/95	10/04/95		DATE / DATE
NORTHING: 1067709.56 DATUM EASTING: 514524.56 ELEVATION 484.2	CASING DEPTH	28.0 FT.	36.0 FT.		10/03/95 / 10/03/95

DRILL RIG CME 750 | SURFACE CONDITIONS

ANGLE 90° BEARING NA

SAMPLE HAMMER

DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER TYPE	REMARKS
31		0.9'/2.0' (45%)			(30.0-36.0 ft.) WASTE, wet	ST (16)	@ 31.2 ft., chunk of limestone crushed end of Shelby Tube 0.0 ppm PID
32	10 11 50/3	0.4'/2.0' (20%)				SP (17)	
33							
34	37 29 24 30	0.2'/2.0' (10%)				SP (18)	
35							
36	1 2 3 4	1.8'/2.0' (90%)			(448.2) 36.0 (36.0-38.0 ft.) Loose, olive gray (5Y 4/1), SILT, little fine Sand, NR, moist, (ML), (LOESS)	SP (19)	0.0 ppm PID
37							
38					(446.2) 38.0 End of Soil Borehole Log at 38.0 ft.		
39							
40							
41							
42							
43							
44							

DRILLING CONTR LAYNE-WESTERN

LOGGED BY B. HARRINGTON CHK'D BY B. TILTON

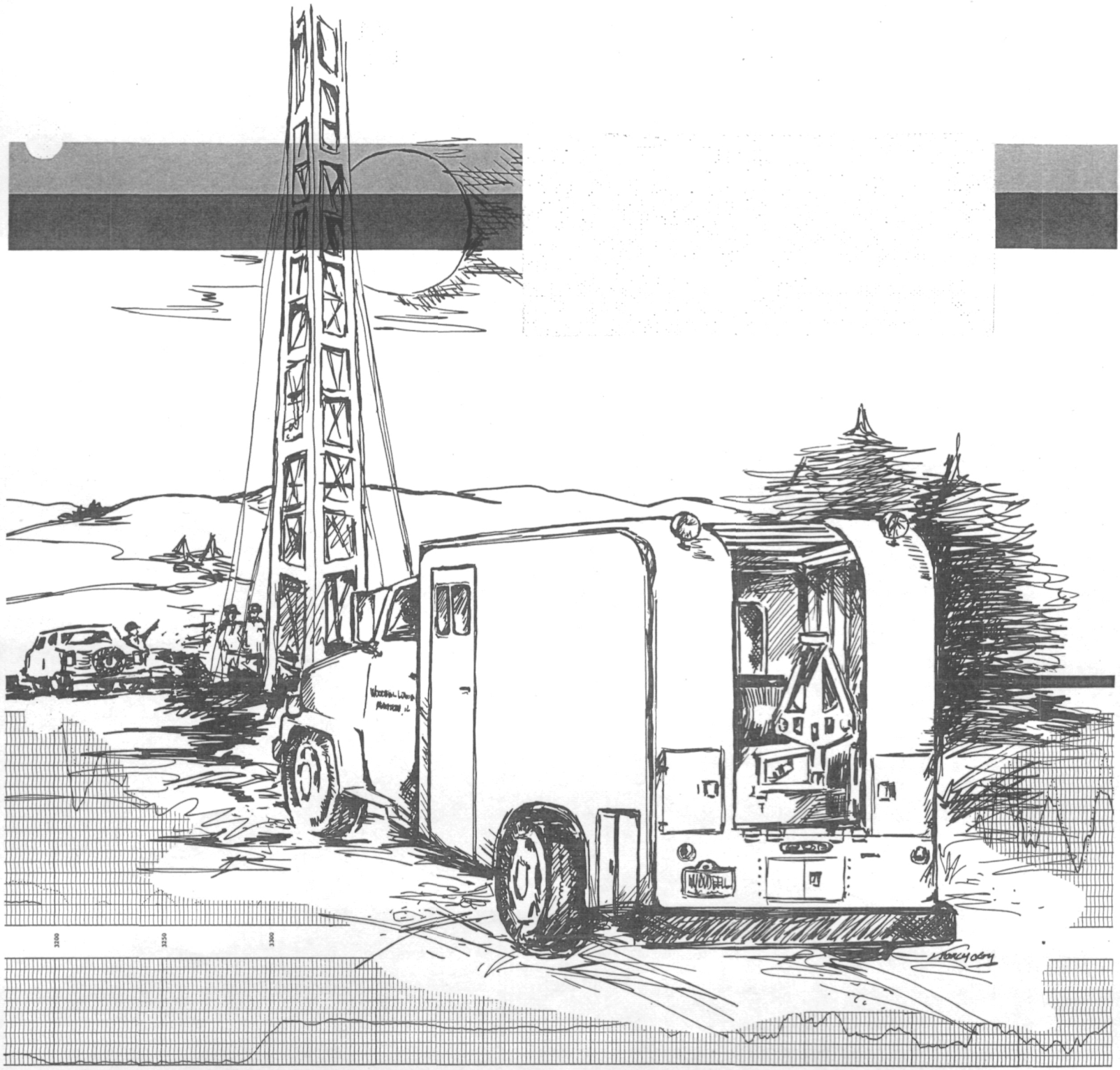
DATE 10/9/95

JOB NO.: 943-2848

FILENAME: LR105

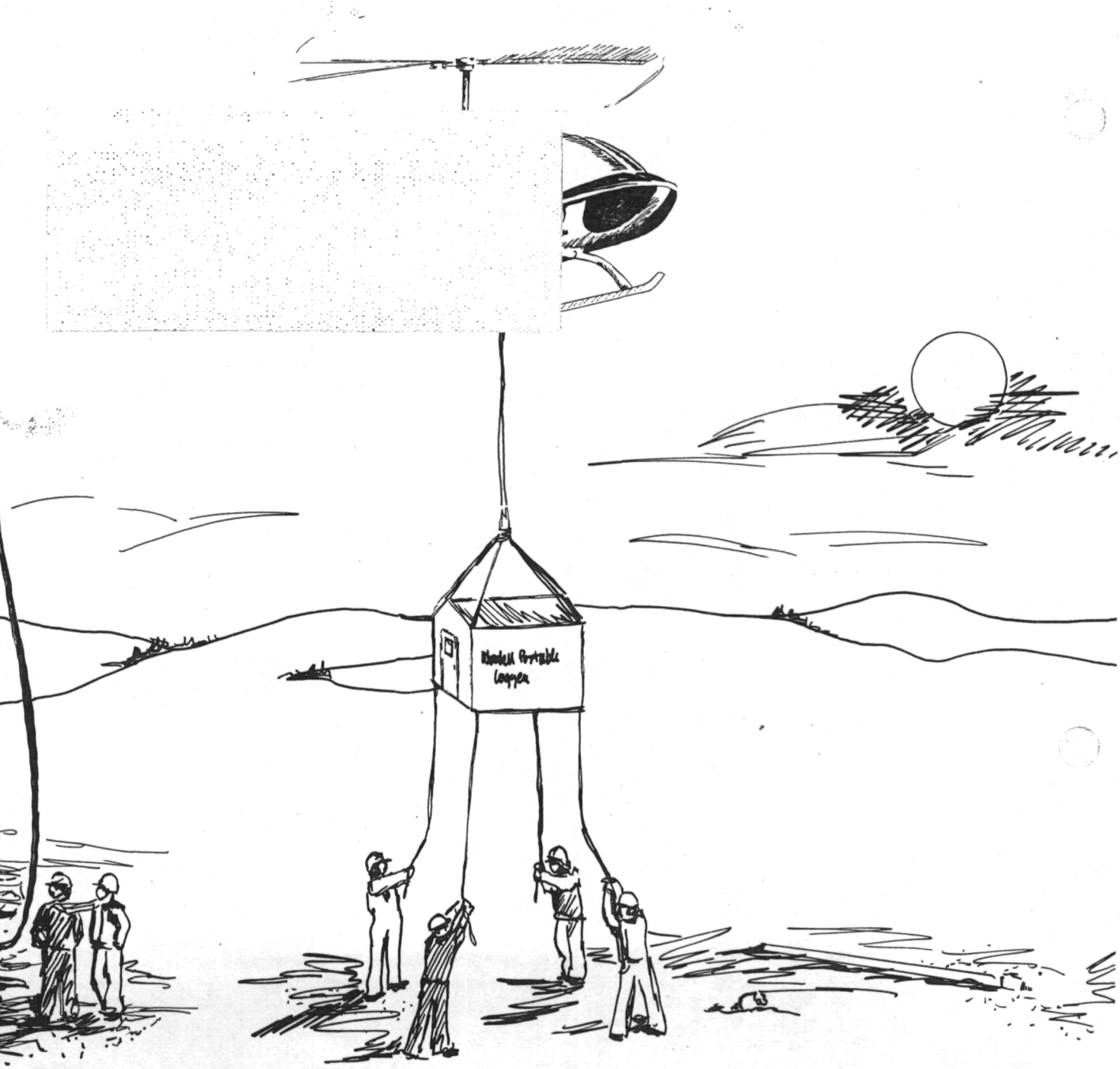
APPENDIX B

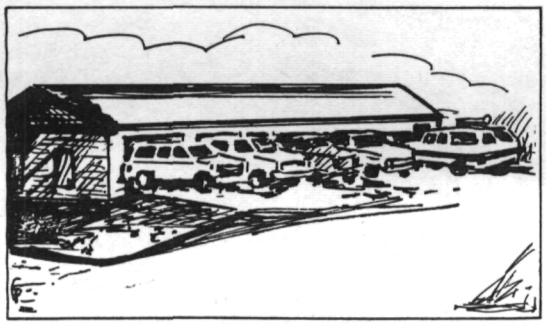
GEOPHYSICAL TEST LOGS



Wooddell Logging, Inc.

P. O. Box 1095
Mattoon, Illinois 61938
(217) 234-2033





Our main office and shop is conveniently located in Mattoon, Illinois. We provide a full line of logging and perforating services to the coal, uranium and oil industries.

The Corpus Christi Field Office is equipped to service the South Texas Uranium Operators, as well as those exploring the Gulf Coast Lignite Properties.

Golder Associates

Laidlaw Waste Systems
Bridgeton Landfill
St. Charles County, Missouri

Report of Geophysical Logging

Field Survey 24 Jan - 8 June 1995

20 August 1995

Goldrept

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August 21, 1995

Scope

The geological logging for Laidlaw Waste Systems-Bridgeton Sanitary Landfill was contracted for by Golder Associates, Inc. under an October 1994 Scope of Work #933-2688.

A borehole geophysical survey will be conducted at the deepest borehole at each location. The program will include correlation and definition of aquifer or other lithologic units, estimation of aquifer properties such as porosity and permeability, and an assessment of the physical properties associated with the materials surrounding the borehole will be natural gamma ray, caliper, resistivity, neutron and gamma-gamma density.

Equipment

Wooddell Logging, Inc. uses various equipment fabricated and manufactured in-house and certain other equipment from the following vendors:

Comprobe, Inc.	Gearhart Industries, Inc.
Hewlett-Packard	Tandon
Rochester Corp.	Zenith Data Systems
S.E.I., Inc.	Tektronics
Compaq Computer	Geonics
Sumagraphics	Epson
OWL Technical	Mt. Sopris

The equipment (specific tools are listed in Appendix A) and computers used at the LWS-Bridgeton Site in St. Charles County, MO were mounted in a four wheel drive geophysical logging truck. The truck incorporated the capability of lowering the tools via a boom assembly directly down the hole.

Decontamination

The vehicle, drawworks, boom assembly and cable were initially steam cleaned upon arrival to the site at the LWS-Bridgeton site. This was accomplished under the authorization of Brian Tilton of Golder Associated. The initial cleanup was a lengthy decontamination process to insure the cleanliness of the equipment. Cleanup between holes was a major concern. The approved water supply was used at the designated steam cleaning pad.

An extra lengthy cleaning process on the cable and tools followed their logging to insure cleanliness

before entering any monitor well to be logged. A medical grade sterile plastic tubing was utilized to package the logging tools and hand tools after cleaning them. Surgical gloves were used by Wooddell Logging, Inc. personnel when handling tools, equipment, and well heads. The truck, tools and cable were steam cleaned on the completion of the project.

The Natural Gamma Ray Log

The Gamma Ray log which measures the natural radioactivity of rocks continuously was introduced in 1939 by Well Surveys, Inc. as a technique that could determine the lithology of cased wells which had never been logged before. The introduction of this log made it possible to go back into old cased wells and determine tops and bottoms of formations for which such records were not available.

Gamma Rays are bursts of high energy electromagnetic waves which are highly penetrating even in dense matter. They are emitted as a result of the disintegration of radioactive elements (U, Th, and K) together with alpha and beta rays, but the latter have little penetrating power and cannot be measured in well bore.

The energy of the Gamma Rays given off by rocks is variable but on the average if is 1 Mev. The Gamma Ray emitted by potassium, however, has an energy of 1.5 Mev.

The penetrating power of Gamma Rays varies with their energy as well as with the substance through which they penetrate. Gamma Rays, which are electromagnetic waves like light and heat, do not stop their penetration of matter suddenly (unlike alpha and beta particles which have a definite range), but, rather, their energy gradually declines with distance.

Since the average energy of natural Gamma Rays is 1 Mev., the distance investigated by the Gamma Ray log is about one foot from the bore hole in water-saturated sands and limestones. The presence of casing reduces the Gamma Ray intensity by about 30% but does not prevent it from actuating detectors even though the Gamma Rays are degraded as a result of energy loss. The Gamma Rays that originate close to the well walls contribute most of the counting rate recorded and also most of

the high energy counts. As a rule of thumb, one may say that at any point in the well, half the counts come from less than 5 in. around the well bore, 75% from 9 in. and 90% from 13 in.

Statistical Fluctuations in Gamma Ray Logs

The source of statistical fluctuations are the random variations of the rock radioactivity which do not repeat and which tend to mask small changes in formation characteristics. This phenomenon os common to all radioactivity measurements. It is not due to instability of the measuring instruments but is inherent in the radioactivity decay process itself. All radioactive nuclei eventually disintegrate but no one can predict the exact instant at which any given nucleus will decay. It does so when it pleases and is not influenced by other disintegrations or by pressure or by temperature. Thus nuclei decay is a random sequence which fluctuates about a mean value.

Small deflections on a log may be changes in lithology or merely statistics. To determine which, repeat runs or 'statistical checks' should be recorded. The statistics may be reduced by measuring for a longer period of time, that is, by reducing the speed of logging.

Gamma Ray Interpretation

Of all the formations encountered in drilling wells, shales, and clays, shales seem to contain the greatest concentrations of radioactive isotopes. Practically without exception, shales and clays are more radioactive than clean sands, clean limestones, clean dolomite and chert. Rocks that are argillaceous may have somewhat higher readings than a 'cleaner' rock of the same type. Generally, they will contain several of the radioactive elements, and it is impossible to tell, without special logging equipment, whether the gamma radiation is primarily due to one or the other of the elements.

The Natural Gamma Ray Log also shows higher counts if a radioactive ore is encountered. If significant concentrations of radioactive isotopes are found in contaminated areas similar high readings may occur.

Bentonite is used in many monitor wells as a seal. This clay often times may be seen on the Natural Gamma Ray Log in and around the sealed horizon as an increased Gamma kick. Often times this is interpreted as a shale or a formation clay when in fact it is the back fill seal. The wells at LWS-Bridgeton were logged in open holes below cemented conductor pipe. Bentonite seals and filter sand packs were not encountered.

Therefore, the Gamma Ray Log essentially distinguishes shales and clays from other formations. The recording equipment is so designed that the curve deflects toward the right when the radioactivity increases, for which deflections indicate the presence of shales and clays.

Gamma Ray Logs may be recorded in both open and cased holes filled with any fluid whatsoever (including air; i.e., empty). The Gamma Ray Log is used primarily for bed definition, determination of interfaces, and correlation. Difficulties are experienced when attempting to quantify readings for comparison to zones in other wells when some readings are in air with other readings in fluids.

The Gamma Gamma (Density) Log

In 1953 the scattered Gamma-ray log was introduces under the name density log by G.R. Newton as a log that could determine rock density in place, for the purpose of aiding geophysicists to make allowance for density variations with depth in prospecting.

From the formation evaluation standpoint, the main objective of the Gamma-Gamma log is the determination of bulk density of rocks in an open hole. A source of gamma radiations (Cesium 137) irradiates the formations. The emitted gamma rays interact with the electrons of matter around the well bore and a gamma detector above the source counts the back scatter rays. The intensity of the back scatter rays depends on the electron density of the matter penetrated (rather than the chemical nature of the atom as in the Neutron log).

It has been shown that the response of a Gamma-Gamma tool is an exponential function of the density of the medium, with denser materials having lower count rates.

Borehole effects such as hole diameter, mud cake, pipe, backfill, and medium fluid density can all contribute to the data collected at the receiver. Higher counting rates can generally be seen above a well's fluid level. Surface casing tends to mask formation response to the emitted gamma rays and deaden the intensity of counted gamma rays.

In several holes of typically the same construction (pipe, backfill, bit size, fluid type, etc.), the contributing factors of bore hole effects can often times be ignored when looking at similar logs.

Landfills (inside fill areas), waste sites, glacial fills, and cased holes are not considered optimum conditions for density logs. However, it is another tool that often times must be relied upon to make proper geophysical evaluation of these man-made sites.

The Neutron Log

Well Surveys, Inc. introduced the Neutron Log in 1941. Neutron bombardment of the well bore makes it possible to identify hydrogen richness. The primary and basic principal is the slowing of neutrons by protons.

Neutrons are emitted from a source at a high energy (4 mev) and at high speed collide with nuclei of matter in the bore hole and in the formation; ultimately they are captured. The incident neutron collides with a nucleus and is scattered, whereas the target nucleus recoils. If the target nuclei contain much hydrogen, the neutrons' energies reach a thermal level very rapidly and soon thereafter they are captured. Their energies are emitted in the form of a gamma rays of capture. However, if the target nuclei do not contain much hydrogen, the distance traveled by the neutrons before they are thermalized is larger and the emission of gamma rays of capture takes place at a greater distance from the source. The neutron source should thus by looked upon as a spherical cloud whose radius is modulated by the hydrogen richness of substance surrounding the source.

In the Neutron-Gamma curve, the Geiger-Mueller tubes and scintillation counters are preferred. The gamma rays of capture are those of significance because a high intensity signal indicates the absence of

hydrogenous substance (and of porosity).

In the Neutron-Neutron curve, the detecting instrument is a slow neutron detector which may be an ordinary ionization chamber or counter containing boron or cadmium. When these substances capture a neutron, they emit an alpha particle that ionizes the detector and as causes a pulse which is recorded. The reaction to hydrogen is substantially the same as above, as is the response to rock porosity.

Borehole effects such as hole diameter, mudcake, casing pipe, backfill, and medium fluid density all contribute to the response of the neutron tool's detector. The presence of hole enlargements or cave-ins gives rise to false indications. The resolution for the lithology in hole sizes much greater than 10" is nearly lost and only borehole characteristics are recorded. The presence of casing decreases the counting rate and resolution of the tool as with density logging. As a rule, neutron logging through casing can be used only qualitatively. It is often useful to compare logs of a general area with logs from wells with similar well construction. Such comparisons can yield both formation responses and well construction details.

Drift Survey

Drift tools are utilized to detect the location and true vertical depth of a well at any point throughout the borehole. Orientation is determined by utilizing either a gyro or compass system. Deviation is measured by use of an inclinometer. Information from a drift survey can be utilized to determine true vertical thickness of any geographical unit. Core holes showing bedding planes with suspect bedding dips can be surveyed to determine if the borehole is crooked or to qualify the core data.

Borehole #PZ-100 was drift surveyed after the logging tool became lodged in the well at about 92 feet.

Basic Interpretation

The correct evaluation of well logs must be based on all conditions of the geographical strata and well

construction, as well as the instrumentation measurements. The use of several geophysical logging tools aids in the confirmation of results. Log interpretation is as much an art as a science. This is especially true in the unconsolidated material such as glacial material, soils, and refuse dumps. It must be noted that three of the tools utilized, Natural Gamma Ray, Gamma-Gamma Density and Neutron measure different chemical and physical properties. The correlation between tops, bottoms, and thickness of zones might vary slightly on any given log.

The Natural Gamma Detector measures from a single point. Our previous discussion disclosed the fact that over half of the counts came from less than 5" around the well bore. Likewise, counts can come from 5" above or below the detector. Thus the Natural Gamma Ray detector records counts from approximately one foot of hole at all times with most of the counts coming from 4" of linear hole. The best boundary pick is 1/3 of the way on curve deflections.

The Neutron tool utilized a 14" spacing between source and detector, while the Gamma-Gamma Density's spacing was 12". Midway points on deflections are generally the best choice for pick bed boundaries for these two logs.
Near the top of the well several situations should be noted:

1 The Natural Gamma Ray tool can most often 'see' the radioactive sources housed in their storage shields inside the logging vehicle. This causes increased count rates with the curve transcending to the right. Large piles of refuse, clay, gravel, etc, stacked between the truck and the logging tool can mask this event.

2 The Density tool (Gamma-Gamma tool) decreases in counting rate as there is an absence of media to be effected and reflected to the detector. The log curve thus trends to the right in the open air at the surface.

3 The Neutron tool likewise decreases in the counting rate in the open air like the Density tool. The Neutron curve tends to the left on the graph paper.

Reference Depths

All of the geophysical logs were measured from ground level. This level used is the ground level prior to drilling and should be the same elevation as utilized by the drillers and the representative who filled out the soil boring logs. The ground level used may or may not have been the ground level at the time of the actual log. It is our experience that the drilling operation often times alters the surface and the well completion cement around the protective casing usually extends above ground level.

The ground level can be arrived at several ways:

1) If the ground level around the protective casing looks good and undisturbed, then it is used.

2) The ground level can be calculated utilizing either the actual riser pipe stick up above ground level or the protective casing stick up above ground level as found in the well completion details.

3) Lastly the straight line method from undisturbed areas either side of the well bore may be utilized.

The logging of MW1201 was zeroed at top of casing. This method was used so the exact length of casing could be determined off of the log without addition of stack up above ground level. It was understood by the logger that this monitor well was going to be pulled and grouted closed.

Although ground level is a time dependent variable (especially around newly constructed wells) it is still utilized for consistency with the drillers, engineers, geologists, etc. Often times the drill holes are laid out by surveyors and is the only reference at the time of drilling and logging.

It has been found that reference points such as the top of the protective casing or the top of the riser may be different than when they were installed or surveyed. Risers may be added to and lengthened while protective casings tend to settle. Bottom hole references may be utilized for rough reference, however, this relies on the accuracy of the well installation and older wells may tend to be silted off giving a false bottom.

Geology

The site is located in the eastern edge of the historic Missouri River Valley, at the transition between the alluvial floodplain to the west and the loess bluffs to the east. The western portion of the property is underlain with alluvial materials up to about 100 feet deep, with the limestone bedrock surface at an elevation of about 450 feet MSL at the edge of the historic valley, near the center of the site. The eastern portion of the property is underlain with a thin veneer of the alluvial materials underlying the limestone bedrock. Loess bluffs are further east.

The alluvial materials consist of clays, silts, sands, and gravel mixtures, ranging in thickness from zero at the contact with the loess to about 100 feet in the center of the valley. The uppermost bedrock beneath the site consists of the St. Louis and Salem Foundation limestones, extending to a depth of about 250 feet below the ground surface. A limestone quarry is present in the eastern portion of the site, and is currently used as a solid waste landfill. The 40 foot thick Warsaw Foundation shale underlies the limestone, and the Keokuk Limestone underlies the Warsaw shale.

Appendix B contains a table of the correlation of different geological units at each well location. This information was supplied to us by Golder Assciates. The geophysical tools can not differentiate between named geological units, however, they show zones with differing geophysical units. Ten similar geophysical zoness have been identified are are tabulated in Appendix B

Depth Measurements

In all instances, log measurements were taken from ground level, due to the inaccuracy of the existing ground level around the wells and due to the disturbance of the soil, our readings may vary slightly. We are relying on the surveyors elevations and locations. However, we do not know where they measured these points.

Fluid Level Measurements

Our fluid levels may vary from those taken by Golder Associates. The value and displacement of our tools in the casing will cause the fluid level to deviate slightly from equilibrium. It can be noted that the fluid level can be changing during the geophysical investigation. This is noted in several instances by comparing the fluid levels in the Environmental Suite and the corresponding Electric Log from a given well.

Calibration Procedure

Instrumentation and recording equipment conform to NIMS specifications (Nuclear Instrument Modules Specifications) and API Standards (American Petroleum Institute). The Natural Gamma Ray, Gamma Gamma Density, and Neutron Neutron logs are all in the family of the Pulse Logging Systems (PLS). Pulse Logging Systems utilize a subsurface-to-surface pulse signal transmission as opposed to a direct current transmission. PLS equipment remains stable under conditions of varying cable length, varying temperature ranges, and varying signal distortion.

Most radiation detection devices sense random events and generate pulses that are amplified, shaped and sent to the surface, these signals are proportional to the count rate. This is consistent with the Natural Gamma Ray, Gamma Gamma Density and Neutron Neutron logs that were run at the LWS-Bridgeton site.

Calibration of these tools is accomplished by utilizing a crystal controlled timing circuit to generate pulses. This equipment is designed so that the pulse rate will not vary more than 0.1% over the combined range of zero to full scale. Additional equipment checks are performed utilizing test sources for qualitative review of the tools responses.

All of the radioactive logs are recorded in Counts Per Second (CPS) units. The recorder scales are set up utilizing the Signal Pulse Generator and the scales are represented on the individual logs.

Each tool was calibrated in conjunction to the manufacturers specifications prior to each run. This was accomplished by setting the output circuitry to the same calibration settings as the previous log of the same type. The Signal Pulse Generator was then utilized to check the calibrations and fine tune the settings when necessary.

It was the endeavor of the field crew to try and establish a set scale for each type of log. It soon became apparent that the geology, varying hole conditions, and varying construction made this an impossible field task. The digitalization and resultant printing of the geophysical logs to scale enable us to represent similar wells with common scales.

The clean logging tools and cable were lowered into the borehole directly from the boom assembly of the truck or via a portable sheave wheel mounted over the well head. Depth measurements were taken by zeroing the tools detector at ground level. Tool calibrations and recorder settings were made and the tool was slowly winched down the hole. On the way in the hole the tool response was noted and when necessary the calibration procedure was enacted to change scales to better represent the tools response. The bottom of the well was tagged and all slack was taken out of the cable. The geophysical log was then taken on the way out of the hole. In several instances the log was rerun in another scale to better 'see' the formation.

Upon completion of a tool's run, it was removed from the well bore and another tool was taken from it's clean plastic confines and placed on the cable head. With the tool detector hanging in the well at ground level the calibration and logging procedure was again repeated. Upon completion of all well logs at a site, all equipment used was removed to the decontamination area (see Decontamination). The well was secured and the well site policed.

Because of the tools direct contact with the well head and associated fluids of unknown origin, the disposables (plastic tool wrappers, surgical gloves, etc.) were placed in trash bags and deposited in on-site drums for disposal.

Conclusions:

Well log descriptions may be found in Appendix C. The individual well logs are in Appendix D.

Accuracy of Results

All geophysical logs and interpretations are opinions based on inferences from electrical or other measurement devices of geological formations and events which may or may not exist, and we cannot, and do not guarantee the accuracy of correctness of any interpretations, and we shall not except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, employees, and agents or anyone else not related to Wooddell Logging, Inc. who might base interpretations and opinions on our geophysical logs. These interpretations are also subject to our General Terms and Conditions as set forth in our published price schedule.

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Acknowledgements

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Respectfully Submitted,

Kenneth L. Wooddell II, President
Wooddell Logging, Inc., Mattoon IL

revised
August 18, 1995

Appendix A

Logging Tools Utilized

Natural Gamma Ray

All of the wells were logged with a Comprobe, Inc. model 1804 Scintillation Gamma Ray tool. This 1 5/8" OD tool houses a 7/8" by 2 1/2" Sodium Iodide crystal detector. This tool carries the Wooddell ID
#WL-GRS1.

Neutron-Neutron

The 1 5/8" Neutron tool utilized for the thermal Neutron logging is a mate to the 1 5/8" Gamma Ray tool and the 1 5/8" Casing Collar tool. These tools can be stacked and run simultaneously if desired. The Neutron detector is a proportional HE3 type which measures 1" by 6". The Comprobe tool is #1805 and the Wooddell designation is #WL-GRN2. This tool was activated with a 2.8 Ci. Am241Be source spaced 14" below the detector.

Gamma Gamma

Two types of Gamma-Gamma (Density) tools were utilized. Both tools were activated with the same 125mCi. Cs137 source. The source to detector spacing was the same for both tools at 12" with the same style 1/2" by 1/2" crystals.

The smaller wells were logged with a Comprobe, Inc. 1 1/4" tool designated as model #1204. The Wooddell number is #WL-SD4. This tool is referred to as a 4 PI tool since there is only shielding above and below the detector. The source can radiate in all 360° around the borehole while the detector is affected by all sides of the borehole. It was necessary to use this tool in well #PZ-104-KS.

The larger tool manufactured by Comprobe as model #2104 measures 2 1/8". Wooddell's number is #WL-BD4. This tool is decentralized to the side of the casing with the use of a bow spring assembly. By virtue of its larger size, the crystal can be shielded on all sides with only windows present on the side of the tool exposed to the borehole wall. This arrangement is utilized to provide sensitivity by minimizing backscatter.

Caliper

Borehole size measurements were accomplished with a Comprobe, Inc. model #1210, 1 1/4" motorized caliper tool. The Wooddell designation is tool #WL-1AC. Arm lengths were chosen to provide a 1 1/4" to 18" reading area.

Resistivity

The Comprobe model #1245 downhole electrode sub was utilized with the Gearhart Owen model #06-9825-004 Resistivity SP module to provide the point resistivity logs. Electric Logs were recorded from a Gearhart Owen ELM-202 system.

Directional Tool

The OWL Technical model #1275 Digital Borehole drift tool utilizes a compass directional orientation device along with an inclinometer to determine position and orientation. Directional readings from 0° to 359° are measured within 1° sensitivity and accuracy better than ±2°. Drift or inclination can be measured from 0 to 30°, sensitivity 0.1° with and internal accuracy of ±2°.

Appendix B

Natural Gamma Stratigraphic Correlations

		PZ-100	PZ-104	PZ-106	PZ-111	MW1201
Surface Elevations		483.76	481.56	461.77	459.18	479.00
Unit	1	170	171	125	120	162
	2	183	183	140	136	178
	3	188	188	144	142	183
	4	202	201	156	154	195
	5	206	205	160	158	200
	6	231	208	184	Not Present	224
	7	235	233	188	Not Present	228
	8	306	306	260	260	Not drilled to
	9	310	311	264	265	Not drilled to
	10	350	352	302	304	Not drilled to

Golder top of unit	PZ-100	PZ-104	PZ-106	PZ-111
St. Louis	34.0	36.0	31.0	78.9
Salem	165.5	164.2	133.8	127.0
Warsaw	245.6	256.3	201.2	210.8
Keokuk	357.2	358.3	346.4	343.7

Natural Gamma Stratigraphic Correlations Zones

Zone	Unit Top	Unit Base	
A	1	2	Clean
B	2	3	Argillaceous
C	3	4	Clean
D	4	5	Argillaceous
E	5	6	Clean
F	6	7	Argillaceous
G	7	8	Argillaceous with shaly streaks
H	8	9	Argillaceous
I	9	10	Very argillaceous to shaly
J	10	TD	Decreasing argillaceous with depth (Increasing porosity on radiation logs)

Note: These zones can be used to generalize all of the geophysical logs across the Bridgeton site

Appendix C

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # PZ-100-KS

Elevation 483.8

DEPTH			DESCRIPTION	MSL		
0	-	33	Soils and clay above top of St. Louis Formation.	483.8	-	450.8
33	-	34	Clean stone behind casing.	450.8	-	449.8
34	-	60	Clean stone matrix.	449.8	-	423.8
60	-	87.5	Argillaceous stone with shaley interbeds.	423.8	-	396.3
87.5	-	93.5	Shale/clay with stone layers.	396.3	-	390.3
93.5	-	170	Argillaceous matrix with a shale streak at 120'. Possible porosity zones from 97 to 113' and 190 to 232'.	390.3	-	313.8
170	-	183	Clean stone.	313.8	-	300.8
183	-	188	Increased Gamma counts indicating increase in clay/shale content. Correlation units 2 & 3.	300.8	-	295.8
188	-	202	Clean stone.	295.8	-	281.8
202	-	206	Increased Gamma counts indicating increase in clay/shale content. Correlation units 4 & 5.	281.8	-	277.8
206	-	231	Clean stone.	277.8	-	252.8
231	-	235	Increased Gamma counts indicating increase in clay/shale content. Correlation units 6 & 7.	252.8	-	248.8
235	-	245	Clean stone.	248.8	-	238.8
245	-	254	Shale.	238.8	-	229.8
254	-	264	Argillaceous matrix.	229.8	-	219.8
264	-	306	Clean stone.	219.8	-	177.8
306	-	310	Argillaceous to shaley. Correlation units 8 & 9.	177.8	-	173.8
310	-	348	Argillaceous to shaley.	173.8	-	135.8
348	-	350	Correlation unit 10.	135.8	-	133.8
350	-	353	Clean stone.			

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # PZ-104-KS

Elevation 482.3

DEPTH			DESCRIPTION	MSL		
0	-	250	6" Casing. Caliper arm hung at bottom of casing, log halted at that point.	482.3	-	232.3
250	-	256	Mostly stone.	232.3	-	226.3
256	-	306	Bedded siltstone and argillaceous limestone, identified as the Warsaw Formation.	226.3	-	176.3
306	-	311	Siltstone	176.3	-	171.3
311	-	322	Bedded siltstone and argillaceous limestone, identified as the Warsaw Formation.	171.3	-	160.3
322	-	346.3	Siltstone	160.3	-	136
346.3	-	362	Limestone with thinly bedded siltstone.	136	-	120.3
362	-	384	Limestone with thin shale partings, Keokuk Formation.	120.3	-	98.3
384		408	Clean limestone with trace shale. Below 391' to TD increased porosity.	98.3	-	74.3

Other possible zones of porosity:
268.4 - 269.6
297.5 - 298.5
314.5 - 317.6
318.4 - 322.0

Electric log not included in description.

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # PZ-104-SD

Elevation 482.1

DEPTH			DESCRIPTION	MSL		
0	-	38	Soil boring auger to 38'.	482.1	-	444.1
38	-	43.5	Void between auger and top of rock.	444.1	-	438.6
43.5	-	63.5	Limestone with some clay layers and voids.	438.6	-	418.6
63.5	-	84	Limestone with increased clay layers.	418.6	-	398.1
84	-	94	Clay with limestone and sandstone.	398.1	-	388.1
94	-	162.3	St. Louis Formation limestone with bedded clay, sandstone, and siltstone. Possible porosity zones 116.4 - 119.2, 120.2 - 122.2, 144.0 - 146.0, and 151.5 - 153.5.	388.1	-	319.8
162.3	-	250	Salem Formation limestone with argillaceous partings and layers. Possible porosity zones 191 - 197' and 209 - 214'.	319.8	-	232.1

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # PZ-106-KS

Elevation 461.8

DEPTH			DESCRIPTION	MSL		
0	-	204	6" casing ending in limestone.	461.8	-	257.8
204	-	210.2	Argillaceous zone with void.	257.8	-	251.6
210.2	-	232.3	Clean stone grading to a clean stone with clay/shale partings at depth. Increased porosity in stone zones below 226.3'.	251.6	-	229.5
232.3	-	234	Shale.	229.5	-	227.8
234	-	260	Clean stone with argillaceous zones. Possible porosity from 251.5 to 258.3'.	227.8	-	201.8
260	-	264	Argillaceous, correlation units 8 & 9.	201.8	-	197.8
264	-	269.7	Clean stone.	197.8	-	192.1
269.7	-	300.5	Clay/shale with stone streaks.	192.1	-	161.3
300.5	-	303.1	Correlation unit 10.	161.3	-	158.7
303.1	-	322	Argillaceous.	158.7	-	139.8
322	-	326.2	Shale.	139.8	-	135.6
326.2	-	373.8	Clean stone with increased porosity below 347' to TD.	135.6	-	88

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # PZ-106-SD

Elevation 461.4

DEPTH			DESCRIPTION	MSL		
0	-	25	6" casing ending in limestone.	461.4	-	436.4
25	-	31	Soils	436.4	-	430.4
31	-	57.5	Argillaceous limestone with sandstone, claystone, & siltstone.	430.4	-	403.9
57.5	-	124	Clean stone with clay/shale partings.	403.9	-	337.4
124	-	138	Clean stone, tight.	337.4	-	323.4
138	-	144.2	Argillaceous, correlation units 2 & 3.	323.4	-	317.2
144.2	-	155.7	Clean stone.	317.2	-	305.7
155.7	-	160.1	Argillaceous, correlation units 4 & 5.	305.7	-	301.3
160.1	-	183.3	Clean stone with increased porosity below 173.9.	301.3	-	278.1
183.3	-	188	Argillaceous, correlation units 6 & 7.	278.1	-	273.4
188	-	199.4	Clean stone.	273.4	-	262

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # PZ-111-KS

Elevation 459.2

DEPTH			DESCRIPTION	MSL		
0	-	215.5	6" casing ending in limestone.	459.2	-	243.7
215.5	-	232	Clean stone with porosity from 220.8 to 227'.	243.7	-	227.2
232	-	240	Argillaceous limestone.	227.2	-	219.2
240	-	260	Clean stone.	219.2	-	199.2
260	-	265	Argillaceous, correlation units 8 & 9.	199.2	-	194.2
265	-	270.3	Clean stone.	194.2	-	188.9
270.3	-	308	Argillaceous, correlation units 10 at 302 to 304.5'.	188.9	-	151.2
308	-	340	Clean stone to bottom of Warsaw.	151.2	-	119.2
340	-	368	Clean Keokuk stone to TD. Increased porosity 355.5 to 364.5'.	119.2	-	91.2

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # PZ-111-SD

Elevation 459.2

DEPTH			DESCRIPTION	MSL		
0	-	98.2	6" casing ending in weathered stone.	459.2	-	361
98.2	-	121	Clean stone with argillaecous partings.	361	-	338.2
121	-	136	Clean Stone.	338.2	-	323.2
136	-	142	Argillaceous, correlation units 2 & 3.	323.2	-	317.2
142	-	154	Clean stone. Porus 145 to 151'.	317.2	-	305.2
154	-	158	Argillaceous, correlation units 4 & 5.	305.2	-	301.2
158	-	208.4	Clean stone, porus to 177',tight to TD.	301.2	-	250.8

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Golder Associates, Inc.

Laidlaw Waste Systems
Bridgeton Landfill

Geophysical Gamma Ray Log Description

WELL # MW-1201

Elevation 479

DEPTH			DESCRIPTION	MSL		
0	-	48	Rusty steel casing approximately 6.1" ID to 48'. Possible bentonite seal from 42 - 48'.	479	-	431
48	-	55	Clean stone.	431	-	424
55	-	152.4	Stone (limestone?) with some clay/shale/siltstone layers.	424	-	326.6
152.4	-	162	Increased Gamma counts indicating increase in clay/shale content.	326.6	-	317
162	-	178	Clean stone.	317	-	301
178	-	183	Increased Gamma counts indicating increase in clay/shale content. correlation units 2 &3.	301	-	296
183	-	195	Clean stone.	296	-	284
195	-	200	Increased Gamma counts indicating increase in clay/shale content. Correlation units 4 & 5.	284	-	279
200	-	224	Clean stone.	279	-	255
224	-	228	Increased Gamma counts indicating increase in clay/shale content. Correlation units 6 & 7.F11	255	-	251
228	-	250	Clean stone.	251	-	229

Log descriptions qualified by conclusions in the Report of Geophysical Logging.

Wooddell Logging, Inc.

Appendix D

WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-2033

Environmental Suite

COMPANY: Golder & Associates
WELL: PZ-100-KS
FIELD: LAIDLAW INC. – BRIDGETON –

LOCATION:
1068842.03 N
51721 1.63 E

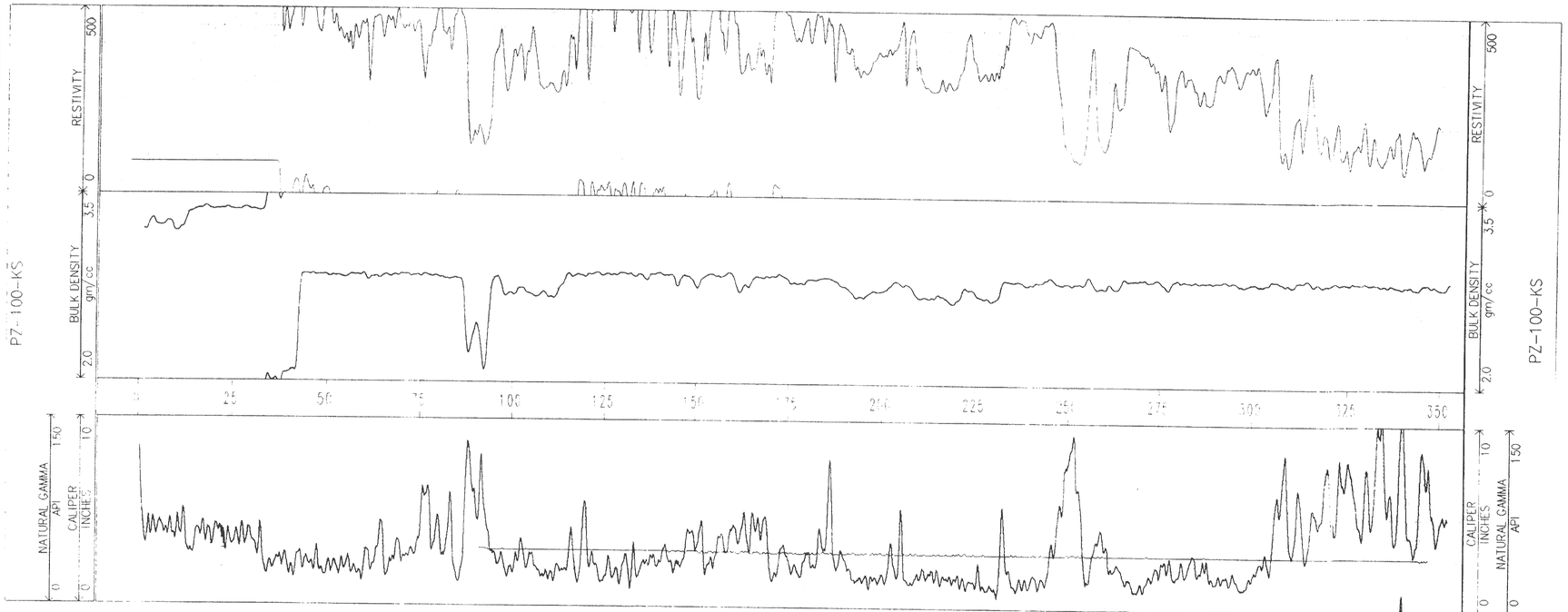
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 483.8'
LOG MEASURED FROM: GROUND LEVEL

DATE	09 FEB 95			
	ONE			
DRILLER : Layne				
BIT DIAMETER TO	10 1/4" TO 34.0'			
BIT DIAMETER TO	5 7/8" TO 391.0'			
TYPE OF CASING	AUGAR TO 34.0'			
DIA. OF CASING	6 INCH			
LOGGER :				
CASING DEPTH				
TYPE FLUID IN HOLE	Water			
FLUID LEVEL				
RECORDED BY:	M. Drake			
OBSERVER.	Mr. Ward Herst			

RUN #		
PROBE TYPE / S/N.		
MODULE TYPE / S/N		
LOGGING SPEED	12.0 fpm	
	0.0'	
SAMPLE INTERVAL =	0.2'	

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-2033

Environmental Suite

COMPANY: Golder & Associates

WELL: PZ-104-KS

FIELD: LAIDLAW INC. - BRIDGETON -

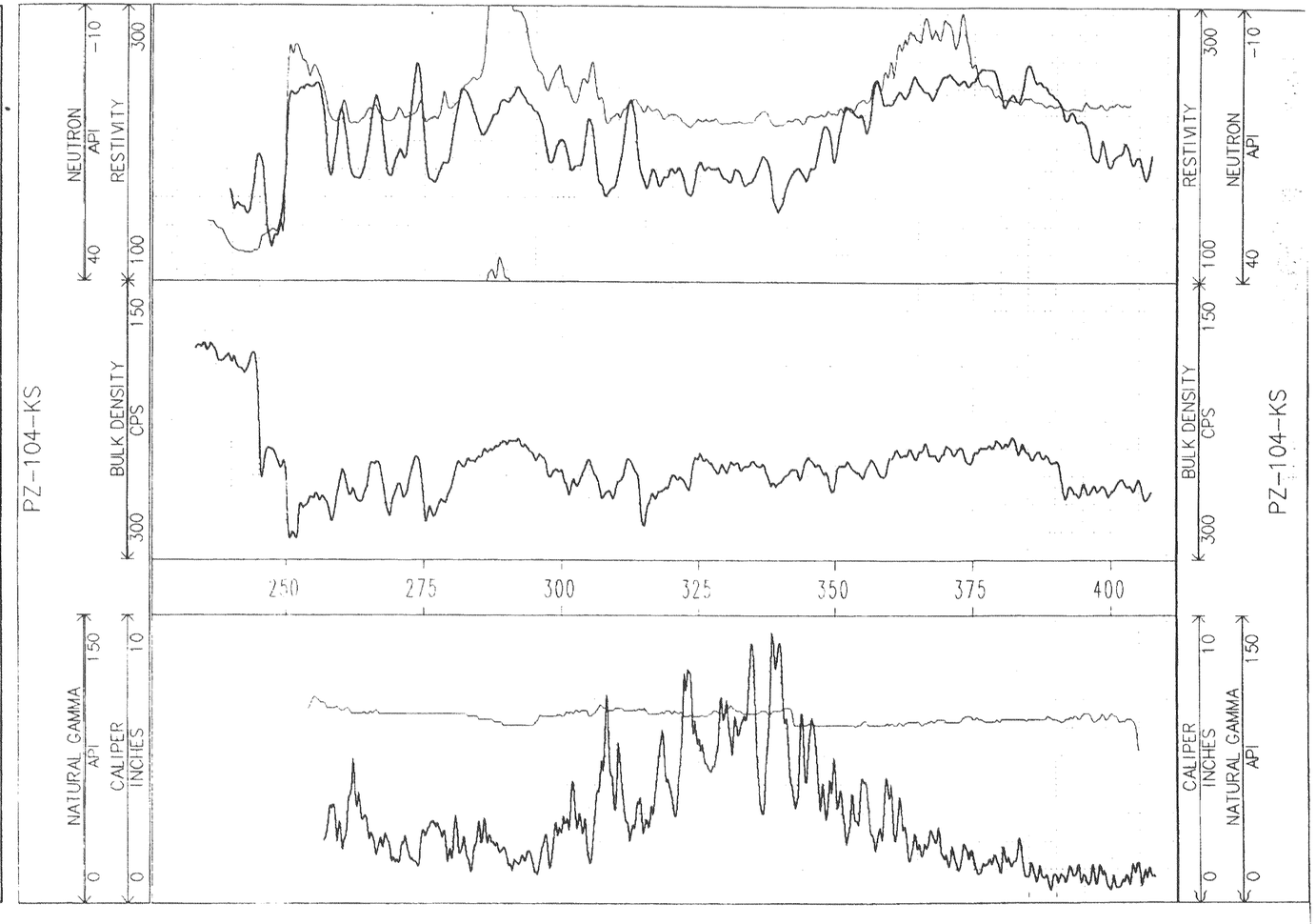
LOCATION:
1066993.15 N
516820.50 E

OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 482.3'
LOG MEASURED FROM: GROUND LEVEL

DATE	08 JUNE 95			
	ONE			
DRILLER : Layne				
BIT DIAMETER TO	9 7/8" TO 249.0'			
BIT DIAMETER TO	5 7/8" TO 408.0'			
TYPE OF CASING	STEEL TO 249.0'			
DIA. OF CASING	6 INCH			
LOGGER :				
CASING DEPTH	250.0'			
TYPE FLUID IN HOLE	Water			
FLUID LEVEL	NA			
RECORDED BY:	M. Drake			
OBSERVER:	Mr. Ward Herst			

RUN #														
PROBE TYPE / S.N.														
MODULE TYPE / S.N.														
LOGGING SPEED					12.0 fpm									
					0.0									
SAMPLE INTERVAL =					0.2									
COMMENTS:														



WLI

Wooddell Logging Inc.

Mattoon, Illinois

217 234-2033

Environmental Suite

COMPANY: Golder & Associates

WELL: PZ-104-SD

FIELD: LAIDLAW INC. - BRIDGETON -

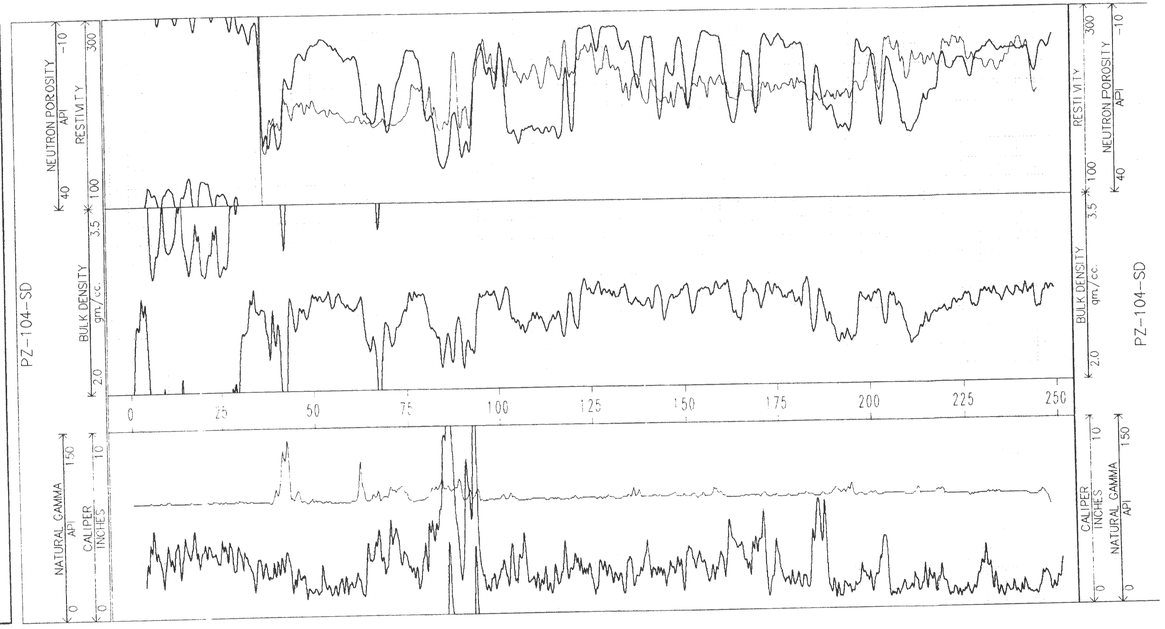
LOCATION:
1067013.26 N
516834.43 E

OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 482.1'
LOG MEASURED FROM: GROUND LEVEL

DATE	08 JUNE 95			
	ONE			
DRILLER : Layne				
BIT DIAMETER TO	10 1/4" TO 38.0'			
BIT DIAMETER TO	5 7/8" TO 252.0'			
TYPE OF CASING	AUGAR TO 38.0'			
DIA. OF CASING	6 INCH			
LOGGER :				
CASING DEPTH	38.0'			
TYPE FLUID IN HOLE	Water			
FLUID LEVEL	36.0'			
RECORDED BY	M. Drake			
OBSERVER	Mr. Ward Herst			

RUN #	
PROBE TYPE / S.N.	
MODULE TYPE / S.N.	
LOGGING SPEED	120 fpm
	0.0'
SAMPLE INTERVAL =	0.2'
COMMENT'S:	



WLI

Wooddell Logging Inc.

Mattoon, Illinois
217 234-2033

Environmental Suite

COMPANY: Golder & Associates
WELL: PZ-106-KS
FIELD: LAIDLAW INC. - BRIDGETON -

LOCATION:
1066704.02 N
515431.62 E

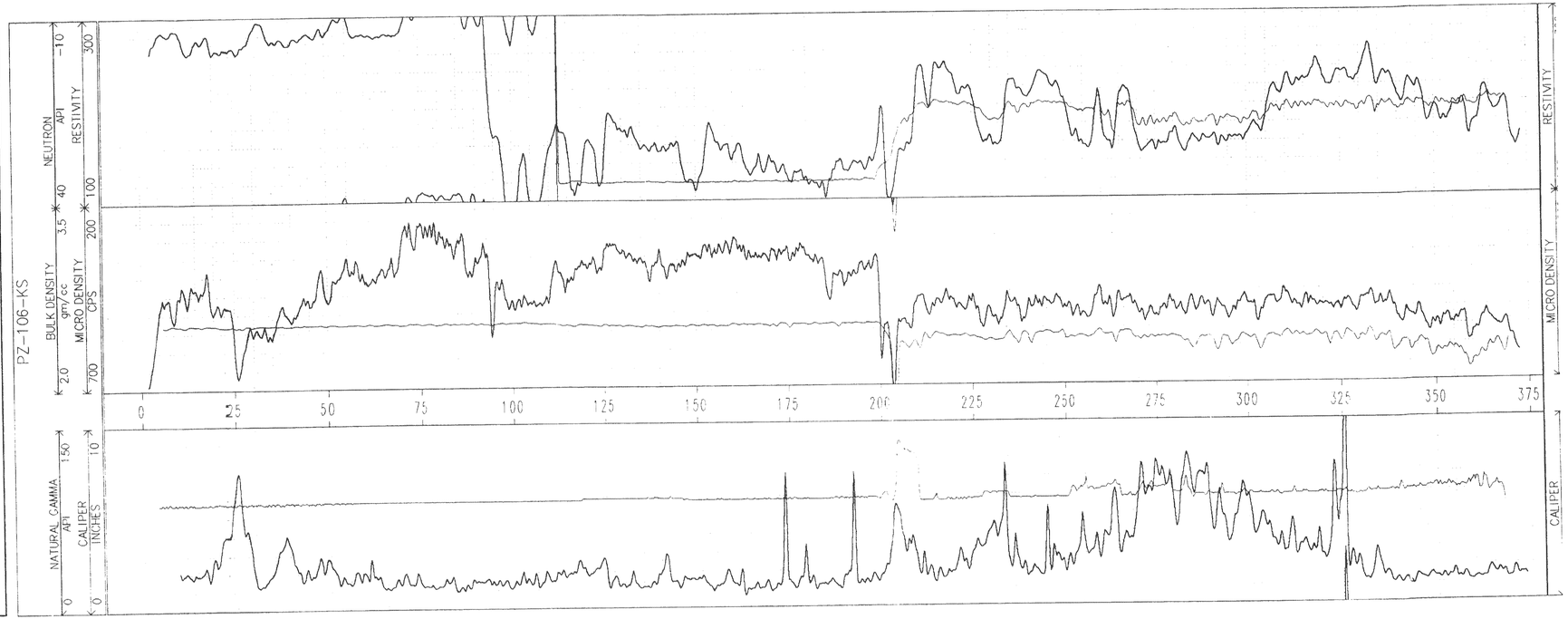
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 461.8'
LOG MEASURED FROM: GROUND LEVEL

DATE	20 MARCH 95			
	ONE			
DRILLER : Layne				
BIT DIAMETER TO	9 7/8" TO 204.0'			
BIT DIAMETER TO	5 7/8" TO 375.0'			
TYPE OF CASING	STEEL TO 204.0'			
DIA. OF CASING	6 INCH			
LOGGER :				
CASING DEPTH	203.5'			
TYPE FLUID IN HOLE	Water			
FLUID LEVEL	102.0'			
RECORDED BY:	M. Drake			
OBSERVER:	Mr. Ward Herst			

RUN #				
PROBE TYPE / S.N.				
MODULE TYPE / S.N.				
LOGGING SPEED	12.0 fpm			
	0.0'			
SAMPLE INTERVAL =	0.2'			

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-2033

Environmental Suite

COMPANY: Golder & Associates
WELL: PZ-106-SD
FIELD: LAIDLAW INC. - BRIDGETON -

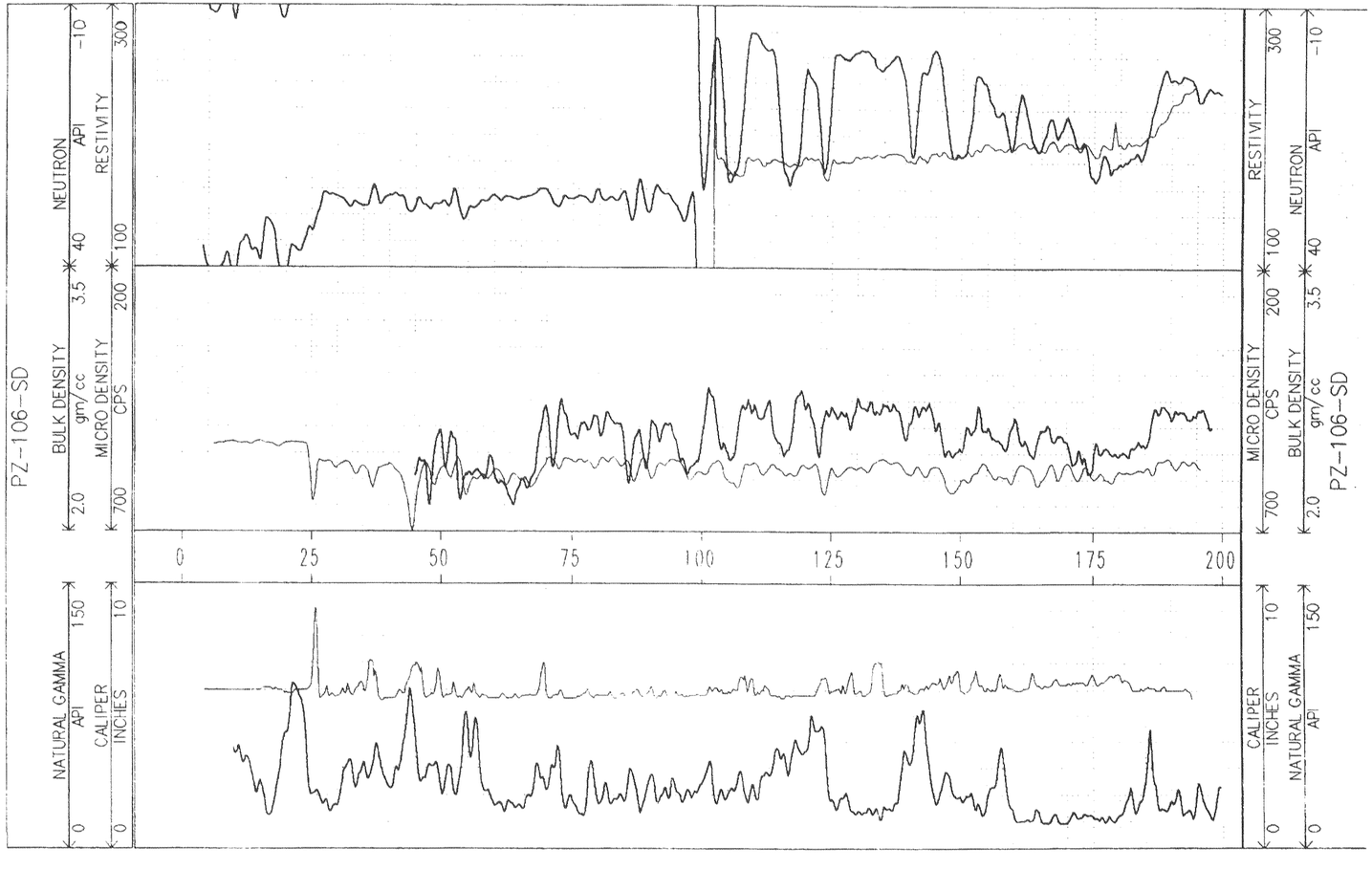
LOCATION:
1066715.14 N
515415.96 E

OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 461.4'
LOG MEASURED FROM: GROUND LEVEL

DATE	24 MARCH 95			
	ONE			
DRILLER : Layne				
BIT DIAMETER TO	10 1/4" TO 98.0'			
BIT DIAMETER TO	5 7/8" TO 204.0'			
TYPE OF CASING	AUGAR TO 34.0'			
DIA. OF CASING	6 INCH			
LOGGER :				
CASING DEPTH	25.0'			
TYPE FLUID IN HOLE	Water			
FLUID LEVEL	102.0'			
RECORDED BY:	M. Drake			
OBSERVER:	Mr. Ward Herst			

RUN #														
PROBE TYPE / S.N.														
MODULE TYPE / S.N.														
LOGGING SPEED					12.0 fpm									
					0.0'									
SAMPLE INTERVAL =					0.2'									
COMMENTS:														



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-2033

Environmental Suite

COMPANY: Golder & Associates
WELL: PZ-111-KS
FIELD: LAIDLAW INC. - BRIDGETON -

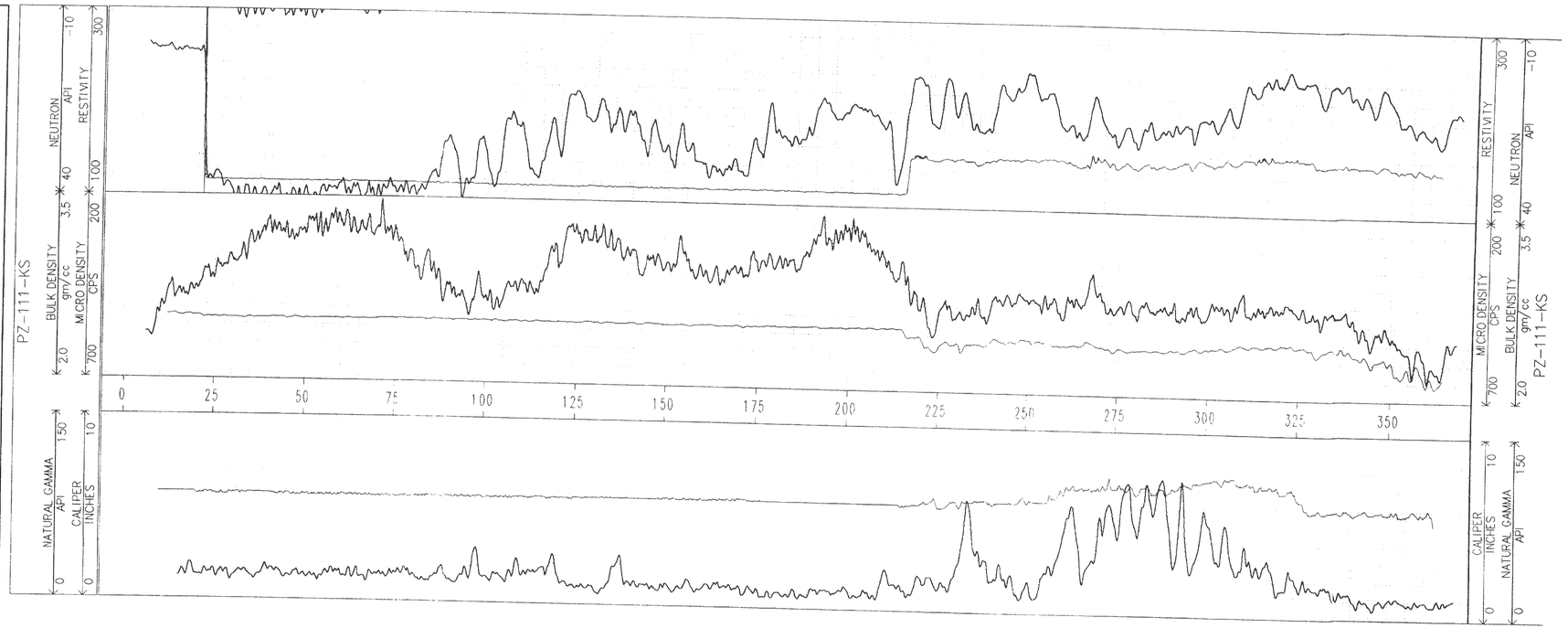
LOCATION:
1068620.78 N
515850.23 E

OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 459.2'
LOG MEASURED FROM: GROUND LEVEL

DATE:	27 APRIL 95			
	ONE			
DRILLER: Layne				
BIT DIAMETER TO	9 7/8" TO 215.3			
BIT DIAMETER TO	5 7/8" TO 368.8			
TYPE OF CASING	STEEL TO 215.3'			
DIA. OF CASING	6 INCH			
LOGGER:				
CASING DEPTH	215.5'			
TYPE FLUID IN HOLE	Water			
FLUID LEVEL	21.5'			
RECORDED BY:	M. Drake			
OBSERVER:	Mr. Ward Herst			

RUN #				
PROBE TYPE / S/N				
MODULE TYPE / S/N				
LOGGING SPEED	120 fpm			
SAMPLE INTERVAL	0.0'			
	0.2'			
COMMENTS:				



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-2033

Environmental Suite

COMPANY: Golder & Associates
WELL: PZ-111-SD
FIELD: LAIDLAW INC - BRIDGETON -

LOCATION:
1068638.11 N
515834.57 E

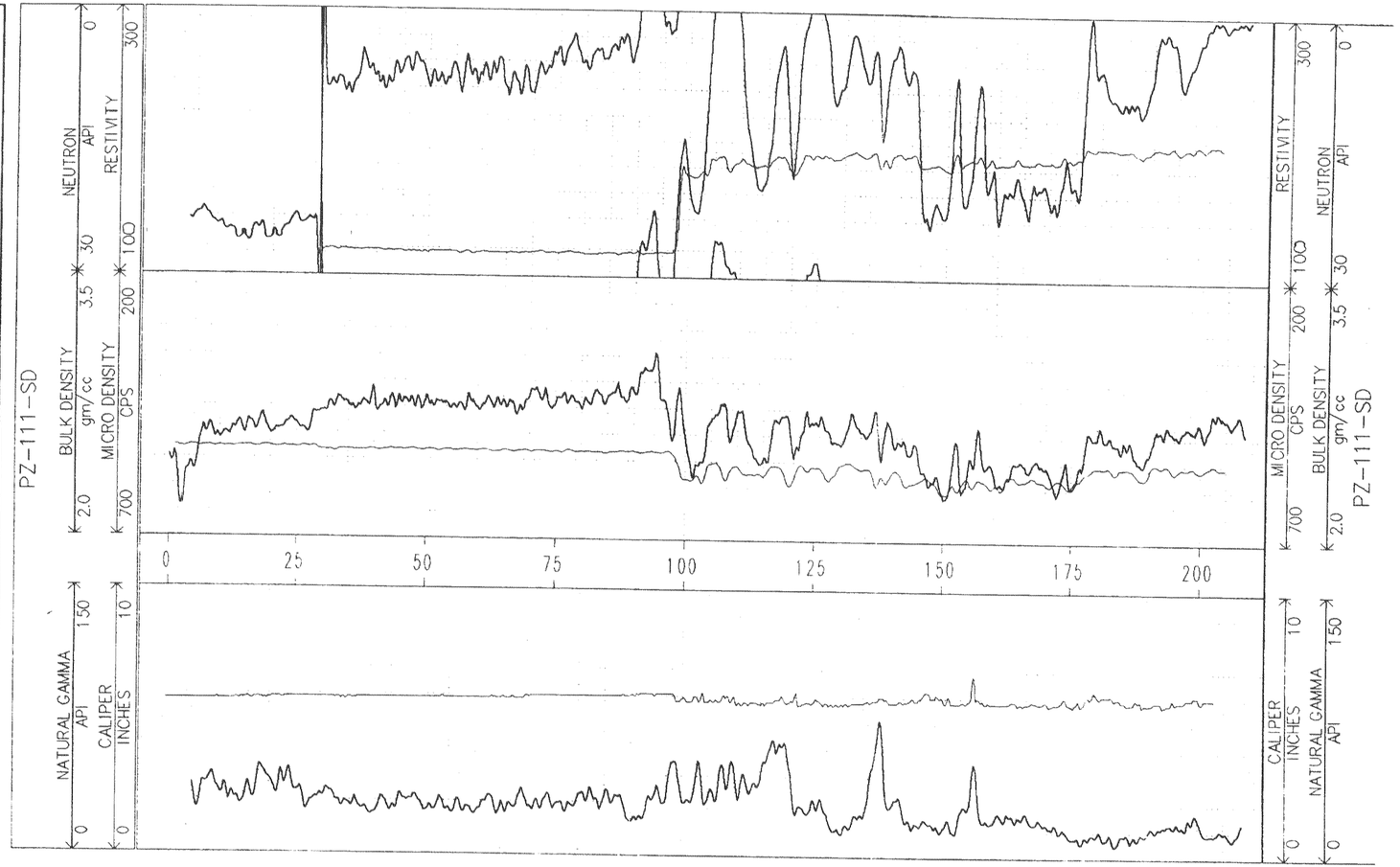
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 459.2'
LOG MEASURED FROM: GROUND LEVEL

DATE:	14 APRIL 95			
	ONE			
DRILLER : Layne				
BIT DIAMETER TO	9 7/8" TO 98.0'			
BIT DIAMETER TO	5 7/8" TO 201.1'			
TYPE OF CASING	STEEL TO 98.0'			
DIA. OF CASING	6 INCH			
LOGGER :				
CASING DEPTH	98.2'			
TYPE FLUID IN HOLE	Water			
FLUID LEVEL	29.0'			
RECORDED BY:	M. Drake			
OBSERVER:	Mr. Ward Herst			

RUN #	
PROBE TYPE / S.N.	
MODULE TYPE / S.N.	
LOGGING SPEED	12.0 fpm
	0.0'
SAMPLE INTERVAL =	0.2'

COMMENTS:



APPENDIX C

AQUIFER TEST LOGS

APPENDIX C-1

PACKER TEST DATA

TABLE C-1.1
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS	PZ-100-KS
TEST #	1	2	3	4	5	6	7	8	9
TYPE OF PACKER	Single	Single	Single	Double	Double	Double	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	53.5	58.4	81.3	39.8	52.5	82.3	120.7	122.5	99.4
TOP OF TESTED INTERVAL (feet BGS)	377.0	366.0	265.0	37.3	50.0	110.0	195.0	220.0	290.0
BOT OF TESTED INTERVAL (feet BGS)	391.0	391.0	391.0	42.3	55.0	115.0	200.0	225.0	295.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	57.5	62.4	85.3	43.8	56.5	86.3	124.7	126.5	103.4
H(pressure) -psi	172	143	146	12	20	100.0	12.0	35.0	120.0
Q (gpm)	0.2000	0.1500	3.2000	8.3000	0.0530	0.0180	0.0920	0.0660	3.3000
K (ft/min)	2.7E-06	1.5E-06	8.0E-06	1.5E-03	6.6E-06	7.2E-07	7.7E-06	4.1E-06	1.1E-04
K (cm/sec)	1.4E-06	7.6E-07	4.0E-06	7.5E-04	3.3E-06	3.7E-07	3.9E-06	2.1E-06	5.6E-05

NOTES:

1. The formu $K = [Q/(2PILH)]*\ln(L/r)$

Where
K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells
water levels shown for unsaturated test zones are assumed to be the center of the test interval for calculation purpose

Name: 100KSSUM.XLS

TABLE C-1.2
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-104-SD	PZ-104-SD	PZ-104-SD	PZ-104-SD	PZ-104-SD	PZ-104-SD
TEST #	1	2	3	4	5	6
TYPE OF PACKER	Single	Single	Double	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	129.6	124.6	129.3	132.9	115.5	52.5
TOP OF TESTED INTERVAL (feet BGS)	162.0	235.0	208.0	188.0	113.0	50.0
BOT OF TESTED INTERVAL (feet BGS)	252.5	252.5	213.0	193.0	118.0	55.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	133.6	128.6	133.3	136.9	119.5	56.5
H(pressure) -psi	35	60	100	-	75	40.0
Q (gpm)	1.5000	0.0330	0.4800	-	0.0066	0.0670
K (ft/min)	9.7E-06	6.4E-07	1.7E-05	NA	2.9E-07	5.7E-06
K (cm/sec)	4.9E-06	3.2E-07	8.5E-06	NA	1.5E-07	2.9E-06

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2PILH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells water levels shown for unsaturated test zones are assumed to be the center of the test interval for calculation purpose
NA= leakage during test

fname: 104SDSUM.XLS

TABLE C-1.3
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS	PZ-104-KS
TEST #	1	2	3	4	5	6	7	8
TYPE OF PACKER	Single	Single	Single	Single	Single	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	40.4	48.3	58.9	66.8	72.1	56.5	68.7	98.4
TOP OF TESTED INTERVAL (feet BGS)	390.0	360.0	320.0	290.0	270.0	366.0	343.0	287.0
BOT OF TESTED INTERVAL (feet BGS)	408.0	408.0	408.0	408.0	408.0	371.0	348.0	292.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	44.4	52.3	62.9	70.8	76.1	60.5	72.7	102.4
H(pressure) -psi	75	85	115	132	85	35.0	48.0	60.0
Q (gpm)	1.1000	1.2000	1.5000	1.7500	1.6000	0.0880	0.0528	0.1010
K (ft/min)	2.6E-05	1.1E-05	6.5E-06	5.2E-06	5.7E-06	7.9E-06	3.7E-06	5.3E-06
K (cm/sec)	1.3E-05	5.7E-06	3.3E-06	2.6E-06	2.9E-06	4.0E-06	1.9E-06	2.7E-06

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2PILH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells.

fname: 104KSSUM.XLS

TABLE C-1.4
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-106-SD	PZ-106-SD	PZ-106-SD	PZ-106-SD	PZ-106-SD
TEST #	1	2	3	4	5
TYPE OF PACKER	Single	Single	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	104.6	103.5	103.0	63.5	44.5
TOP OF TESTED INTERVAL (feet BGS)	187.0	140.0	148.0	61.0	42.0
BOT OF TESTED INTERVAL (feet BGS)	201.0	201.0	153.0	66.0	47.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	108.6	107.5	107.0	67.5	48.5
H(pressure) -psi	69	70	90	30	10
Q (gpm)	0.0154	7.0000	0.2500	0.0440	0.0660
K (ft/min)	3.5E-07	5.0E-05	1.0E-05	4.1E-06	1.2E-05
K (cm/sec)	1.8E-07	2.5E-05	5.1E-06	2.1E-06	6.0E-06

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2PILH)]*\ln(L/r)$$

Where

K = Hydraulic Conductivity
Q = constant rate of flow into test interval
L = length of the test interval (feet)
H = differential head of water applied in excess of static = H(gravity) + H(pressure)
d = diameter of borehole test interval
* = water levels have been interpolated from measurements taken from completed wells. water levels shown for unsaturated test zones are assumed to be the center of the test interval for calculation purpose

Name: 106SDSUM.XLS

TABLE C-1.5
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-106-KS	PZ-106-KS	PZ-106-KS	PZ-106-KS	PZ-106-KS	PZ-106-KS
TEST #	1	2	3	4	5	6
TYPE OF PACKER	Single	Single	Single	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	21.5	23.6	34.4	91.6	83.4	23.8
TOP OF TESTED INTERVAL (feet BGS)	364.0	346.0	301.0	215.0	237.0	357.0
BOT OF TESTED INTERVAL (feet BGS)	374.0	374.0	374.0	220.0	242.0	362.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	25.5	27.6	38.4	95.6	87.4	27.8
H(pressure) -psi	80	125	41	30	38	88.0
Q (gpm)	0.9000	3.8000	4.6000	0.0066	0.0660	1.0000
K (ft/min)	3.4E-05	4.3E-05	5.7E-05	5.1E-07	4.8E-06	5.5E-05
K (cm/sec)	1.7E-05	2.2E-05	2.9E-05	2.6E-07	2.4E-06	2.8E-05

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2PILH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells.

filename: 106KSSUM.XLS

TABLE C-1.6
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-111-SD	PZ-111-SD	PZ-111-SD	PZ-111-SD	PZ-111-SD	PZ-111-SD
TEST #	1	2	3	4	5	6
TYPE OF PACKER	Single	Single	Single	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	87.5	87.5	87.5	87.5	87.5	87.5
TOP OF TESTED INTERVAL (feet BGS)	175.0	140.0	105.0	195.0	125.0	162.0
BOT OF TESTED INTERVAL (feet BGS)	210.0	210.0	210.0	200.0	130.0	167.0
VERTICAL GAUGE HEIGHT (feet AGS)	3.0	3.0	3.0	3.0	3.0	3.0
H(gravity) -feet	90.5	90.5	90.5	90.5	90.5	90.5
H(pressure) -psi	68	65	43	46	46	102.0
Q (gpm)	0.2000	0.9000	0.6000	0.0018	0.0165	0.0396
K (ft/min)	2.4E-06	6.4E-06	3.9E-06	1.1E-07	1.1E-06	1.5E-06
K (cm/sec)	1.2E-06	3.3E-06	2.0E-06	5.8E-08	5.4E-07	7.9E-07

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2PILH)]*\ln(L/r)$$

Where

K = Hydraulic Conductivity
Q = constant rate of flow into test interval
L = length of the test interval (feet)
H = differential head of water applied in excess of static = H(gravity) + H(pressure)
d = diameter of borehole test interval
* = water levels have been interpolated from measurements taken from completed wells.

fname: 111SDSUM.XLS

TABLE C-1.7
SUMMARY OF CONSTANT HEAD TEST ANALYSES

COREHOLE NO.	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS	PZ-111-KS
TEST #	1	2	3	4	5	6	7	8	9
TYPE OF PACKER	Single	Single	Single	Single	Double	Double	Double	Double	Double
BOREHOLE DIA. (in)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
PRE-TEST W.L. * (feet BGS)	22.8	34.2	40.7	49.3	22.0	27.1	62.7	77.3	79.5
TOP OF TESTED INTERVAL (feet BGS)	343.0	290.0	260.0	220.0	355.0	343.0	260.0	226.0	221.0
BOT OF TESTED INTERVAL (feet BGS)	368.0	368.0	368.0	368.0	360.0	348.0	265.0	231.0	226.0
VERTICAL GAUGE HEIGHT (feet AGS)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
H(gravity) -feet	26.8	38.2	44.7	53.3	26.0	31.1	66.7	81.3	83.5
H(pressure) -psi	42	60	60	80	54	65.0	66.0	94.0	94.0
Q (gpm)	1.3000	1.9000	1.8500	2.3500	1.0000	0.7000	0.0660	0.0771	0.0440
K (ft/min)	4.1E-05	1.7E-05	1.2E-05	9.1E-06	8.5E-05	4.9E-05	3.8E-06	3.3E-06	1.9E-06
K (cm/sec)	2.1E-05	8.6E-06	6.1E-06	4.6E-06	4.3E-05	2.5E-05	2.0E-06	1.7E-06	9.5E-07

NOTES:

1. The formula used for the packer test analysis is:

$$K = [Q/(2PILH)]*\ln(L/r)$$

Where

K= Hydraulic Conductivity
Q= constant rate of flow into test interval
L= length of the test interval (feet)
H= differential head of water applied in excess of static = H(gravity) + H(pressure)
d= diameter of borehole test interval
*= water levels have been interpolated from measurements taken from completed wells.

fname: 111KSSUM.XLS

APPENDIX C-2

SLUG TEST DATA

RISING HEAD TEST PZ-100-SS

WELL NO. PZ-100-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	69.61	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	72.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	96.0	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	26.39	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	23.2	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.30	FEET
MAX. HEAD IN SCREEN?	Y	

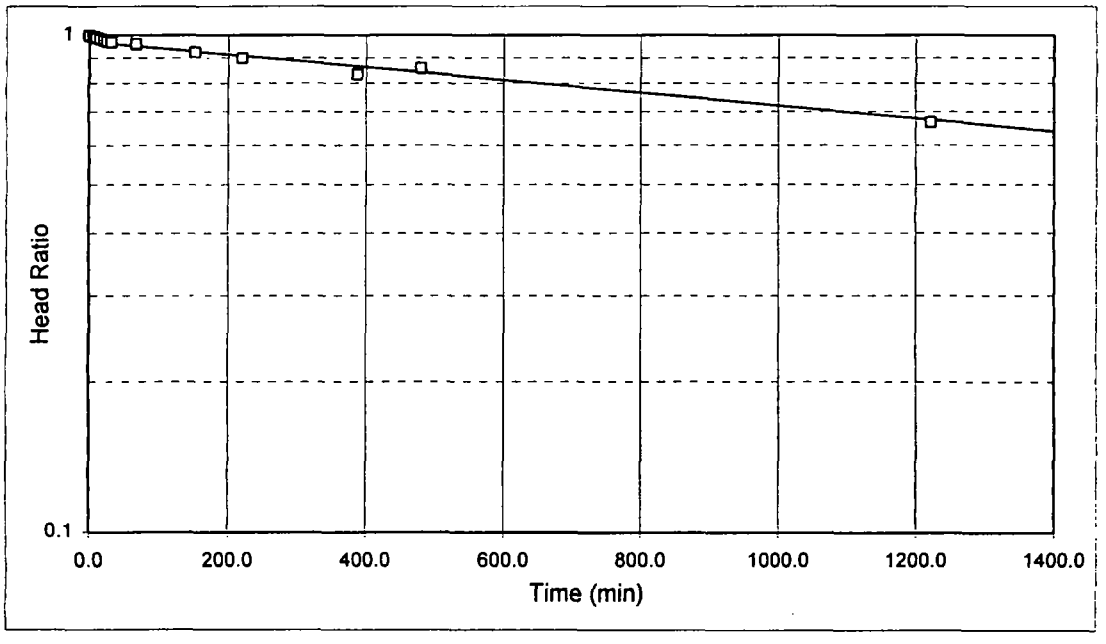
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1025	0	72.91	0.0	3.30	1.00
1	1026	0	72.9	1.0	3.29	1.00
1	1031	0	72.89	6.0	3.28	0.99
1	1036	0	72.87	11.0	3.26	0.99
1	1041	0	72.85	16.0	3.24	0.98
1	1046	0	72.83	21.0	3.22	0.98
1	1051	0	72.82	26.0	3.21	0.97
1	1056	0	72.81	31.0	3.20	0.97
1	1131	0	72.78	66.0	3.17	0.96
1	1256	0	72.66	151.0	3.05	0.92
1	1405	0	72.58	220.0	2.97	0.90
1	1652	0	72.36	387.0	2.75	0.83
1	1825	0	72.44	480.0	2.83	0.86
2	647	45	71.81	1222.0	2.20	0.67

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	23.2	K=	1.02E-07	cm/sec
t_1 (min) =	0	K=	2.90E-04	ft/day
t_2 (min) =	1400			
h_1/h_0 =	0.97			
h_2/h_0 =	0.64			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

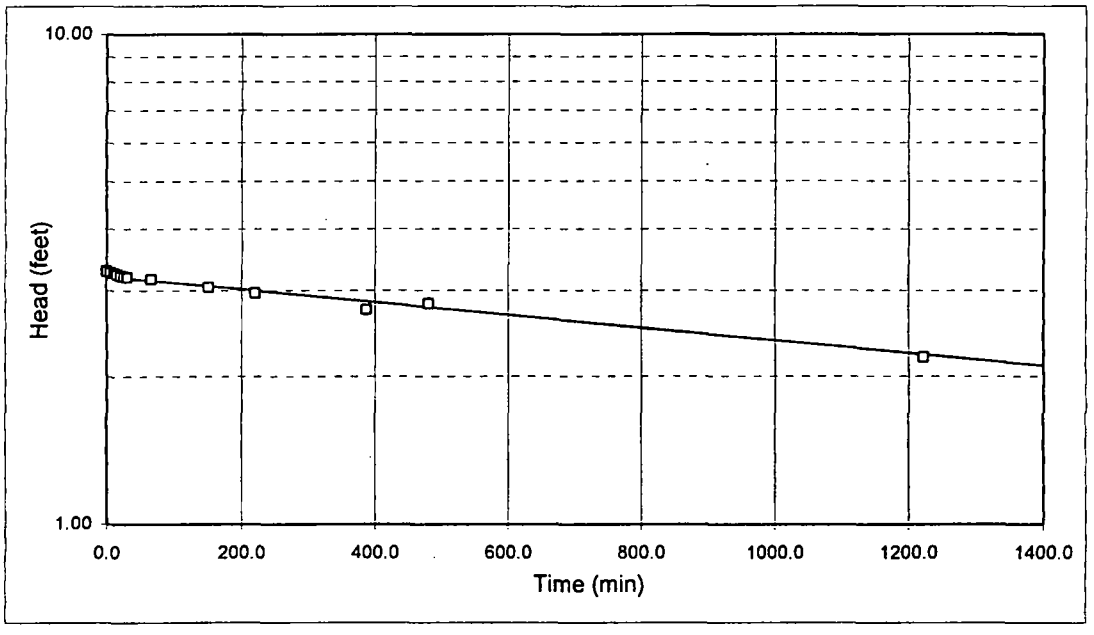
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	23.2	K=	5.65E-08	cm/sec
$\ln(R_e/r_w)$	3.04	K=	1.60E-04	ft/day
y_0 =	3.21			
y_t =	2.11			
t =	1400.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-100-SD

WELL NO. PZ-100-SD

DATE	7/31/95	
INITIAL DEPTH TO WATER	88.62	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	232.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	247.5	FEET (btoc)
SATURATED THICKNESS	160	FEET
WATER TABLE TO BOTTOM OF SCREEN	158.88	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.95	FEET
MAX. HEAD IN SCREEN?	N	

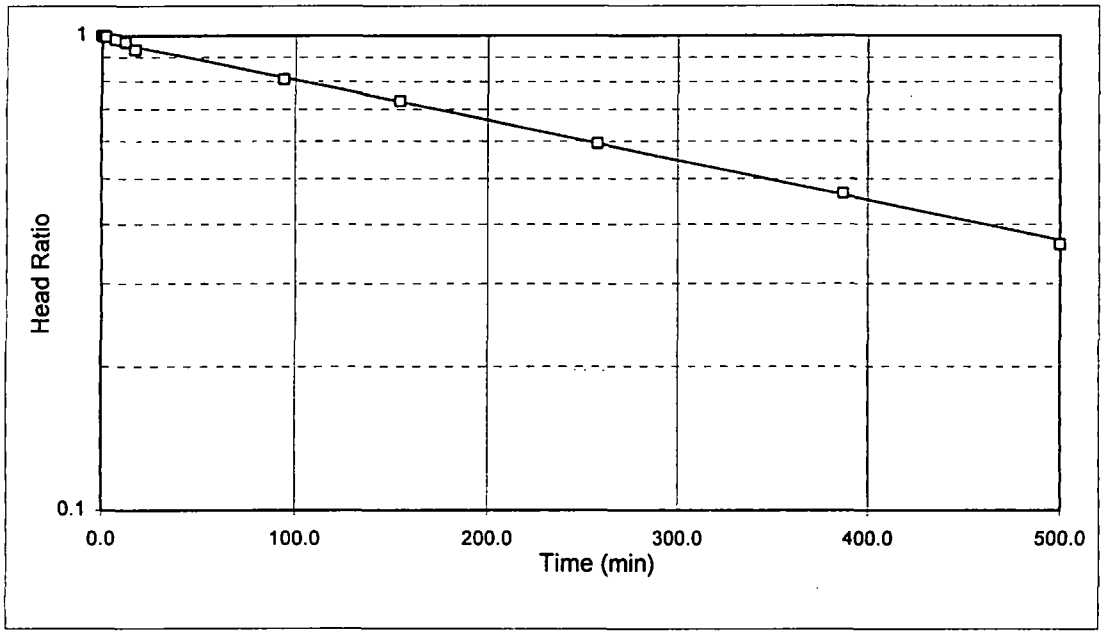
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	733	0	90.57	0.0	1.95	1.00
1	734	0	90.57	1.0	1.95	1.00
1	735	0	90.56	2.0	1.94	0.99
1	740	0	90.53	7.0	1.91	0.98
1	745	0	90.51	12.0	1.89	0.97
1	750	0	90.44	17.0	1.82	0.93
1	907	0	90.2	94.0	1.58	0.81
1	1007	30	90.04	154.5	1.42	0.73
1	1150	30	89.78	257.5	1.16	0.59
1	1400	0	89.53	387.0	0.91	0.47
1	1553	0	89.33	500.0	0.71	0.36

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SD

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15.5	K=	9.11E-07	cm/sec
t_1 (min) =	0	K=	2.58E-03	ft/day
t_2 (min) =	500			
h_1/h_0 =	0.98			
h_2/h_0 =	0.37			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/31/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/19/96

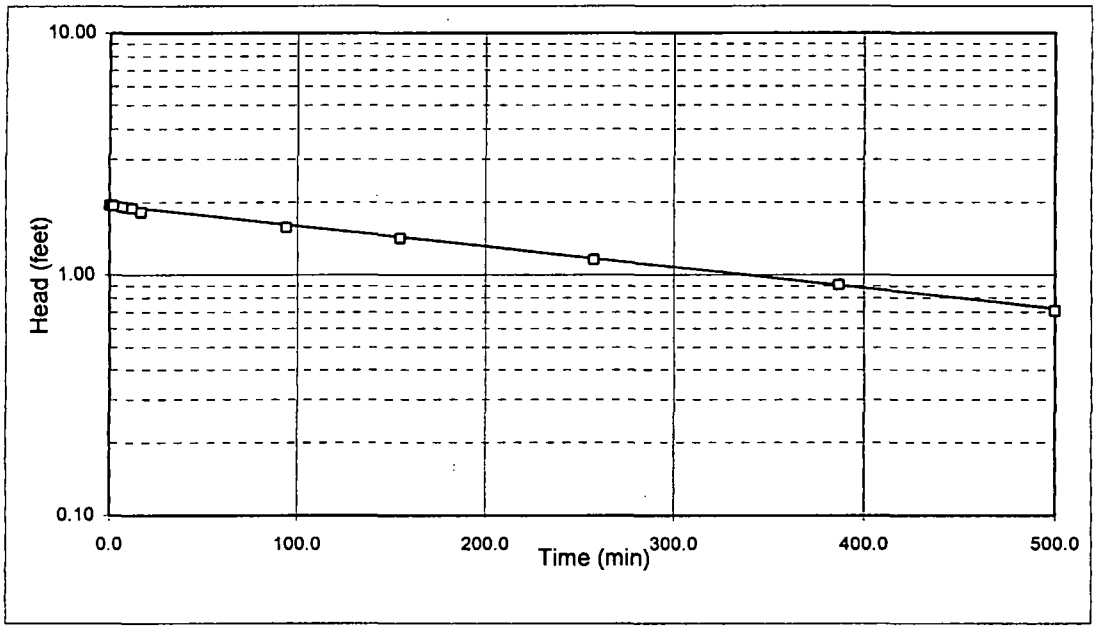
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-SD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.5	K=	6.36E-07	cm/sec
$\ln(R_e/r_w)$	4.20	K=	1.80E-03	ft/day
y_0 =	1.95			
y_t =	0.72			
t =	500.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/31/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/19/96

RISING HEAD TEST PZ-100-KS

WELL NO PZ-100-KS

DATE	6/20/95	
INITIAL DEPTH TO WATER	48.1	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	368.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	387.9	FEET (btoc)
BOTTOM OF AQUIFER	519	FEET (btoc)
SATURATED THICKNESS	150	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	19	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.77	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	741	0	51.87	0.0	3.77	1.00
1	742	0	51.8	60.0	3.70	0.98
1	749	0	51.7	480.0	3.60	0.95
1	755	23	51.6	863.0	3.50	0.93
1	801	45	51.5	1245.0	3.40	0.90
1	808	15	51.4	1635.0	3.30	0.88
1	816	20	51.3	2120.0	3.20	0.85
1	825	15	51.2	2655.0	3.10	0.82
1	1039	42	50.02	10722.0	1.92	0.51
1	1140	30	49.63	14370.0	1.53	0.41
1	1300	0	49.28	19140.0	1.18	0.31
1	1347	30	49.16	21990.0	1.06	0.28
1	1352	30	49.13	22290.0	1.03	0.27
1	1357	30	49.12	22590.0	1.02	0.27
1	1402	30	49.1	22890.0	1.00	0.27
1	1407	30	49.09	23190.0	0.99	0.26
1	1412	30	49.07	23490.0	0.97	0.26
1	1417	30	49.06	23790.0	0.96	0.25
1	1422	30	49.03	24090.0	0.93	0.25
1	1427	30	49.01	24390.0	0.91	0.24
1	1432	30	49	24690.0	0.90	0.24
1	1520	30	48.86	27570.0	0.76	0.20
1	1525	30	48.84	27870.0	0.74	0.20
1	1530	30	48.83	28170.0	0.73	0.19
1	1535	30	48.8	28470.0	0.70	0.19

COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-100-KS

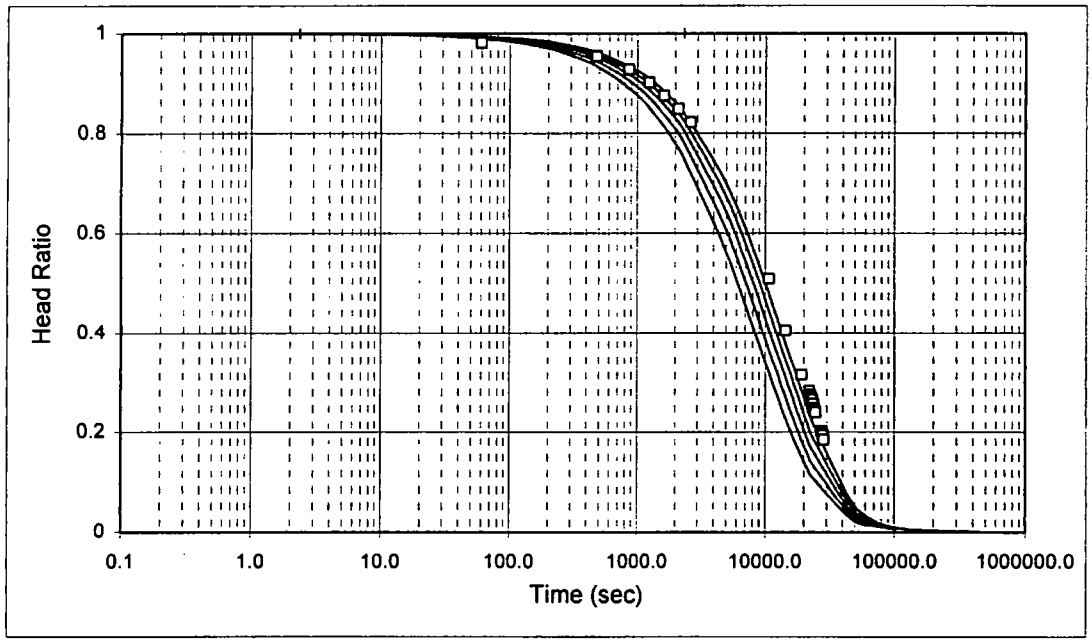
$$K = \frac{r_c^{\,2}\beta}{tb} \quad \text{and} \quad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
h_t/h_0 = F(α,B)

S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_{ew} =	0.25			
t =	2344.2	K=	6.02E-07	cm/sec
α =	1	K=	0.002	ft/day
B =	1E-09	S =	1.11E-10	
b =	150.00			



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-101-SS
WELL NO. PZ-101-SS

DATE	6/20/95	
INITIAL DEPTH TO WATER	84.1	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	127.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	141.8	FEET (btoc)
SATURATED THICKNESS	150	FEET
WATER TABLE TO BOTTOM OF SCREEN	57.7	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.68	FEET
MAX. HEAD IN SCREEN?	N	

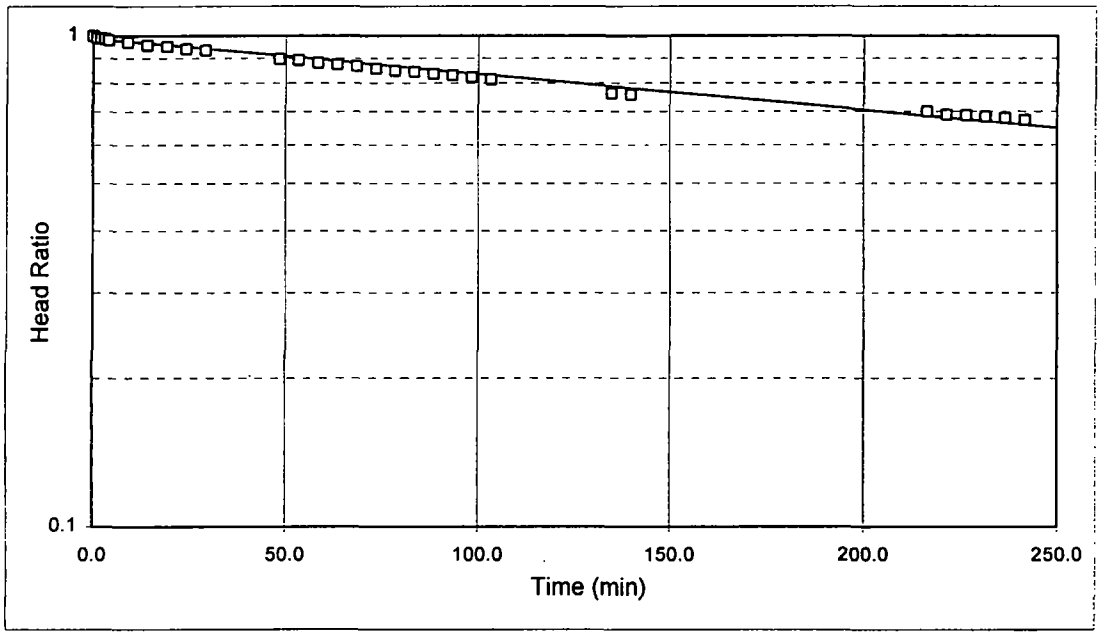
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1101	45	88.78	0.0	4.68	1.00
1	1102	45	88.74	1.0	4.64	0.99
1	1103	45	88.73	2.0	4.63	0.99
1	1104	45	88.72	3.0	4.62	0.99
1	1105	45	88.69	4.0	4.59	0.98
1	1110	45	88.64	9.0	4.54	0.97
1	1115	45	88.58	14.0	4.48	0.96
1	1120	45	88.55	19.0	4.45	0.95
1	1125	45	88.5	24.0	4.40	0.94
1	1130	45	88.47	29.0	4.37	0.93
1	1150	0	88.3	48.3	4.20	0.90
1	1155	0	88.28	53.3	4.18	0.89
1	1200	0	88.22	58.3	4.12	0.88
1	1205	0	88.19	63.3	4.09	0.87
1	1210	0	88.16	68.3	4.06	0.87
1	1215	0	88.11	73.3	4.01	0.86
1	1220	0	88.07	78.2	3.97	0.85
1	1225	0	88.05	83.3	3.95	0.84
1	1230	0	88.01	88.3	3.91	0.84
1	1235	0	87.99	93.3	3.89	0.83
1	1240	0	87.95	98.3	3.85	0.82
1	1245	0	87.91	103.3	3.81	0.81
1	1316	30	87.67	134.8	3.57	0.76
1	1321	30	87.65	139.8	3.55	0.76
1	1438	30	87.38	216.8	3.28	0.70
1	1443	30	87.33	221.8	3.23	0.69
1	1448	30	87.32	226.8	3.22	0.69
1	1453	30	87.3	231.8	3.20	0.68
1	1458	30	87.28	236.8	3.18	0.68
1	1503	30	87.25	241.8	3.15	0.67

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-101-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14	K=	8.58E-07	cm/sec
t_1 (min) =	0	K=	2.43E-03	ft/day
t_2 (min) =	250			
h_1/h_0 =	0.99			
h_2/h_0 =	0.65			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

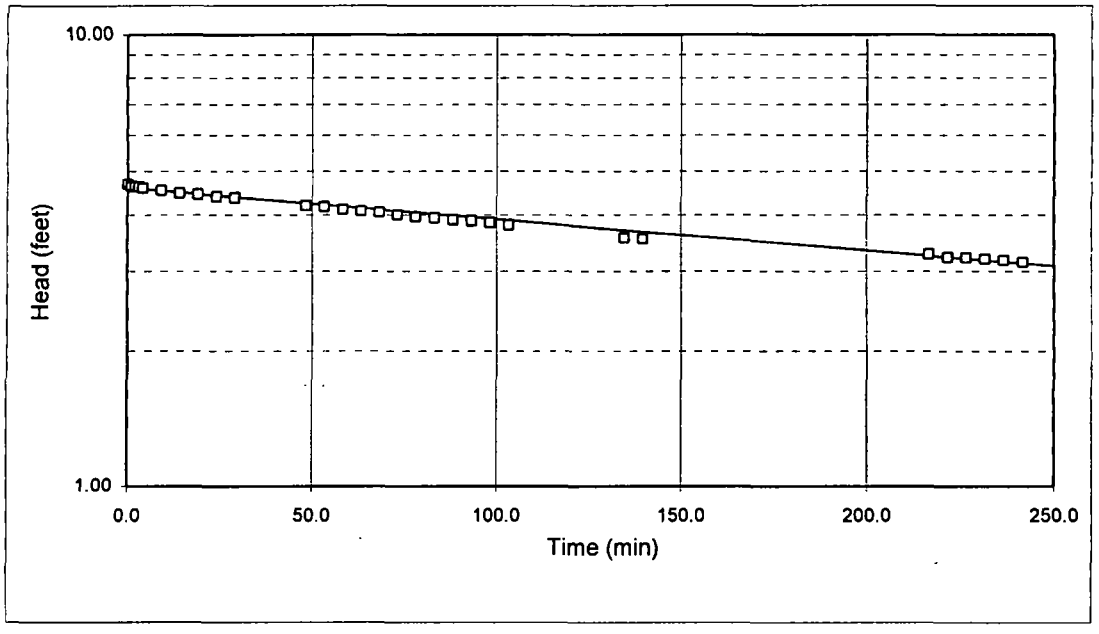
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-101-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14	K=	5.10E-07	cm/sec
$\ln(R_e/r_w)$	3.21	K=	1.45E-03	ft/day
y_0 =	4.59			
y_t =	3.09			
t =	250.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-102R-SS

WELL NO. PZ-102R-SS

DATE	7/24/95	
INITIAL DEPTH TO WATER	61.28	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	76.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.4	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	30.12	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.74	FEET
MAX. HEAD IN SCREEN?	N	

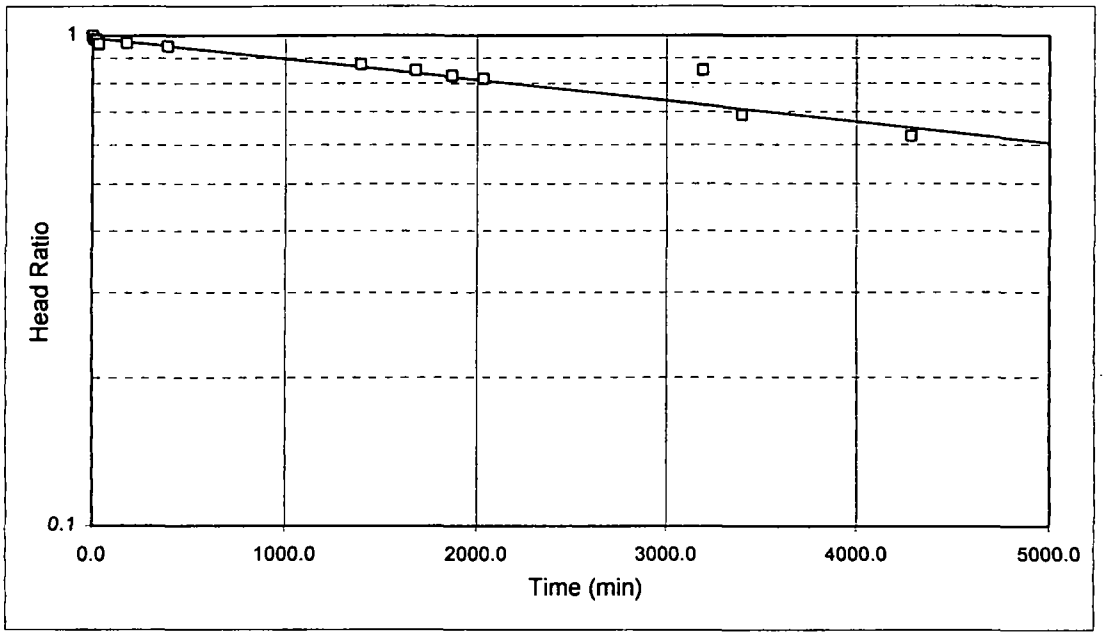
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	803	30	65.02	0.0	3.74	1.00
1	805	0	65.02	1.5	3.74	1.00
1	810	0	64.97	6.5	3.69	0.99
1	815	0	64.96	11.5	3.68	0.98
1	820	0	64.96	16.5	3.68	0.98
1	825	0	64.94	21.5	3.66	0.98
1	835	0	64.88	31.5	3.60	0.96
1	1100	30	64.9	177.0	3.62	0.97
1	1432	0	64.84	388.5	3.56	0.95
2	719	0	64.55	1395.5	3.27	0.87
2	1205	0	64.46	1681.5	3.18	0.85
2	1512	0	64.38	1868.5	3.10	0.83
2	1756	0	64.34	2032.5	3.06	0.82
3	1314	0	64.46	3190.5	3.18	0.85
3	1639	0	63.86	3395.5	2.58	0.69
4	727	0	63.62	4283.5	2.34	0.63

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-102R-SS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15.3	K=	4.67E-08	cm/sec
t_1 (min) =	0	K=	1.32E-04	ft/day
t_2 (min) =	5000			
h_1/h_0 =	0.99			
h_2/h_0 =	0.61			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

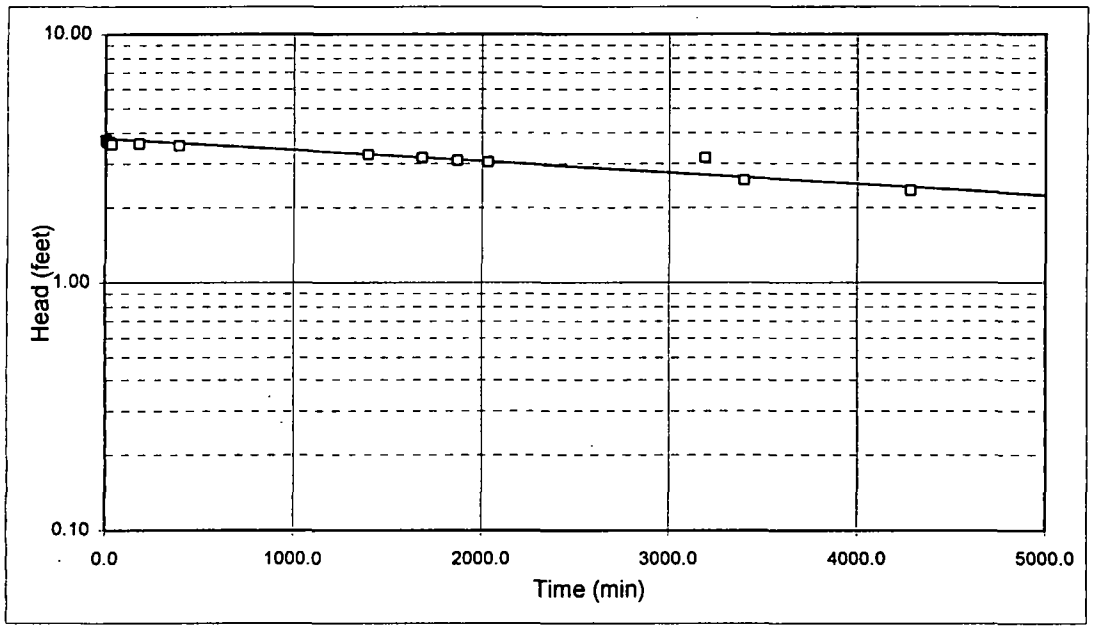
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-102R-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.3	K=	3.01E-08	cm/sec
$\ln(R_e/r_w)$	2.95	K=	8.55E-05	ft/day
y_0 =	3.80			
y_t =	2.24			
t =	5000.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-103-SS

WELL NO. PZ-103-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	133.73	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	133.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	147.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	14.17	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.17	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	4.09	FEET
MAX. HEAD IN SCREEN?	Y	

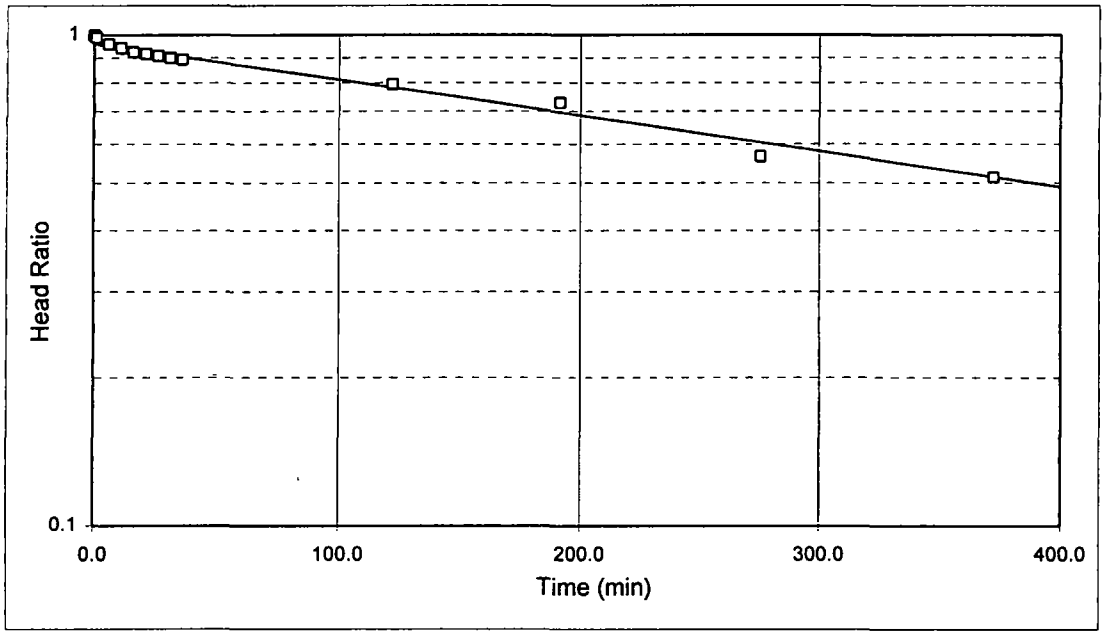
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1208	30	137.82	0.0	4.09	1.00
1	1209	30	137.78	1.0	4.05	0.99
1	1214	30	137.65	6.0	3.92	0.96
1	1219	30	137.58	11.0	3.85	0.94
1	1224	30	137.51	16.0	3.78	0.92
1	1229	30	137.48	21.0	3.75	0.92
1	1234	30	137.45	26.0	3.72	0.91
1	1239	30	137.41	31.0	3.68	0.90
1	1244	30	137.38	36.0	3.65	0.89
1	1410	30	136.98	122.0	3.25	0.79
1	1520	0	136.71	191.5	2.98	0.73
1	1644	0	136.05	275.5	2.32	0.57
1	1821	0	135.83	372.5	2.10	0.51

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-103-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
y_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.17	K=	8.43E-07	cm/sec
t_1 (min) =	0	K=	2.39E-03	ft/day
t_2 (min) =	400			
h_1/h_0 =	0.96			
h_2/h_0 =	0.49			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

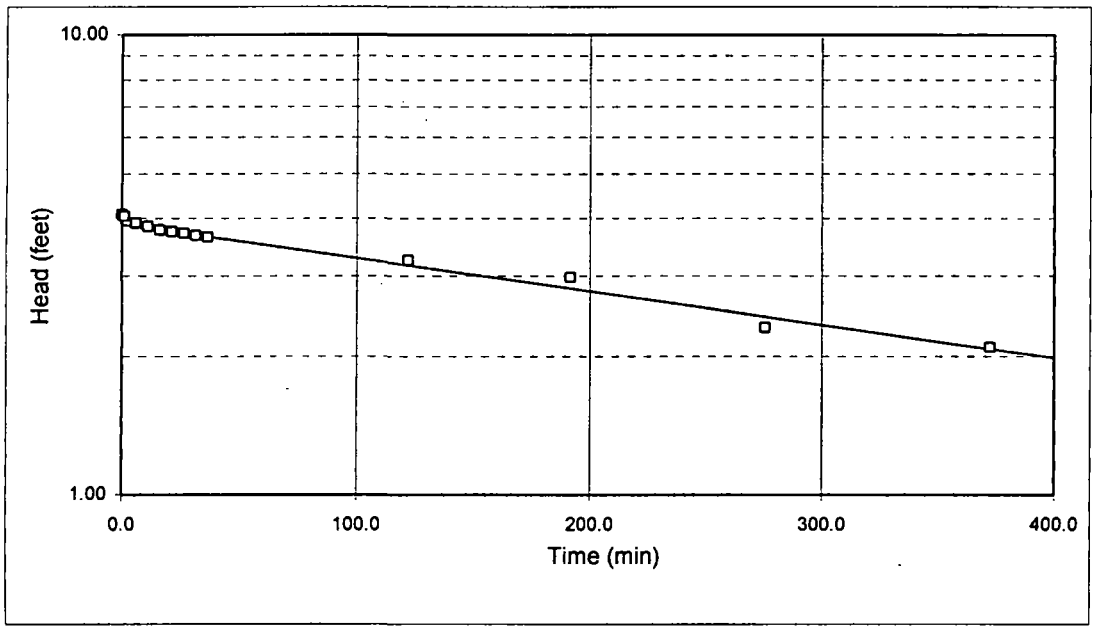
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-103-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	14.17	K=	1.66E-06	cm/sec
$\ln(R_e/r_w)$	2.61	K=	4.72E-03	ft/day
y_0 =	3.88			
y_t =	1.99			
t =	400.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-104-SS

WELL NO. PZ-104-SS

DATE	7/19/95	
INITIAL DEPTH TO WATER	132.18	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	132.6	FEET (btoc)
BOTTOM OF OPEN INTERVAL	147.1	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	14.92	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.24	FEET
MAX. HEAD IN SCREEN?	Y	

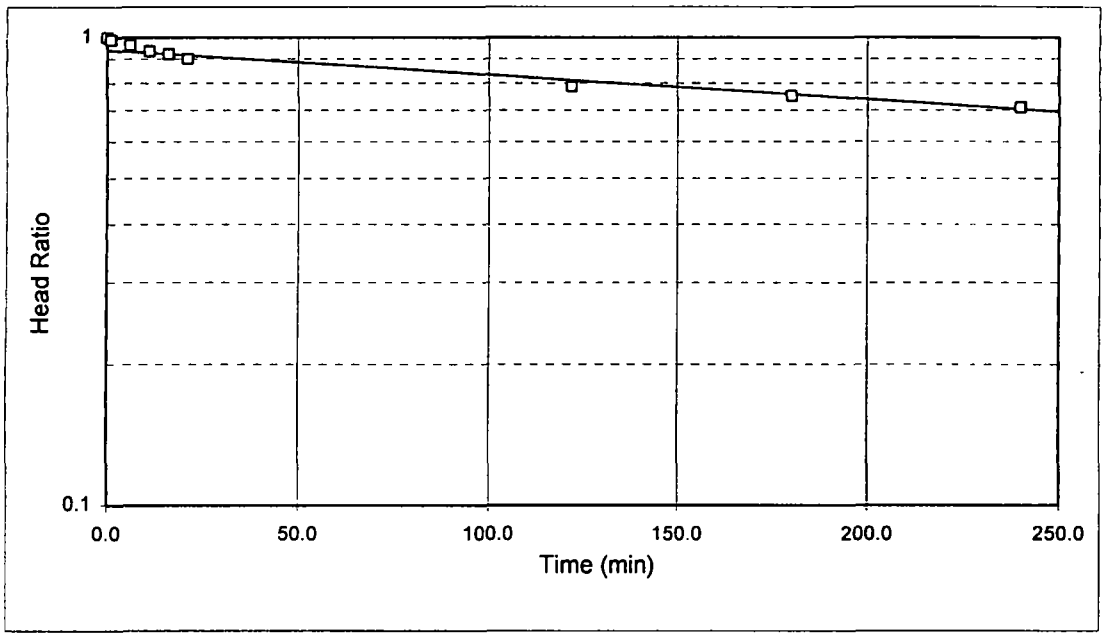
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1237	0	135.42	0.0	3.24	1.00
1	1238	0	135.38	1.0	3.20	0.99
1	1243	0	135.3	6.0	3.12	0.96
1	1248	0	135.21	11.0	3.03	0.94
1	1253	0	135.17	16.0	2.99	0.92
1	1258	0	135.1	21.0	2.92	0.90
1	1439	0	134.73	122.0	2.55	0.79
1	1537	0	134.61	180.0	2.43	0.75
1	1637	0	134.48	240.0	2.30	0.71

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.5	K=	5.97E-07	cm/sec
t_1 (min) =	0	K=	1.69E-03	ft/day
t_2 (min) =	250			
h_1/h_0 =	0.94			
h_2/h_0 =	0.70			



Project Name:	LAIDLAW / OU-2 RIFS / MO	Analysis By:	DSL
Project No.:	943-2848	Checked By:	CVK
Test Date:	07/19/95	Analysis Date:	10/11/95

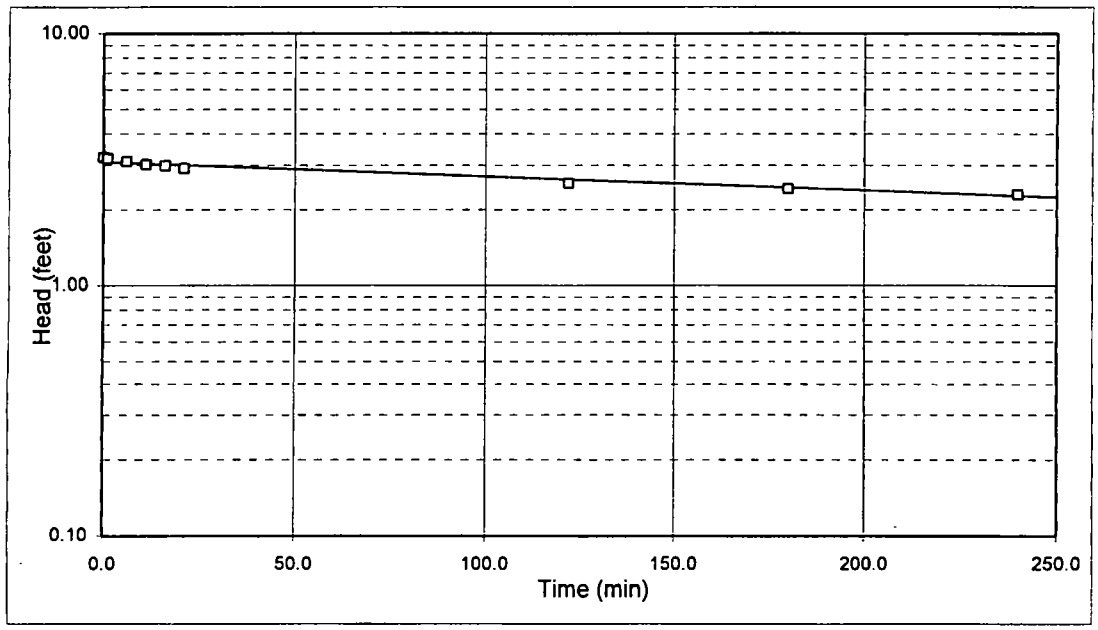
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	14.5	K=	1.26E-06	cm/sec
$\ln(R_e/r_w)$	2.64	K=	3.57E-03	ft/day
y_0 =	3.09			
y_t =	2.24			
t =	250.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-104-SD

WELL NO. PZ-104-SD

DATE	7/20/95	
INITIAL DEPTH TO WATER	126.54	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	232.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	248.6	FEET (btoc)
SATURATED THICKNESS	125	FEET
WATER TABLE TO BOTTOM OF SCREEN	122.06	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	16.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.91	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	852	0	129.45	0.0	2.91	1.00
1	854	0	129.26	2.0	2.72	0.93
1	855	0	129.17	3.0	2.63	0.90
1	857	0	128.96	5.0	2.42	0.83
1	858	0	128.84	6.0	2.30	0.79
1	859	0	128.77	7.0	2.23	0.77
1	900	0	128.69	8.0	2.15	0.74
1	905	0	128.3	13.0	1.76	0.60
1	910	0	127.99	18.0	1.45	0.50
1	915	0	127.73	23.0	1.19	0.41
1	920	0	127.49	28.0	0.95	0.33
1	927	0	126.96	35.0	0.42	0.14
1	932	0	126.72	40.0	0.18	0.06
1	937	0	126.62	45.0	0.08	0.03
1	942	0	126.62	50.0	0.08	0.03

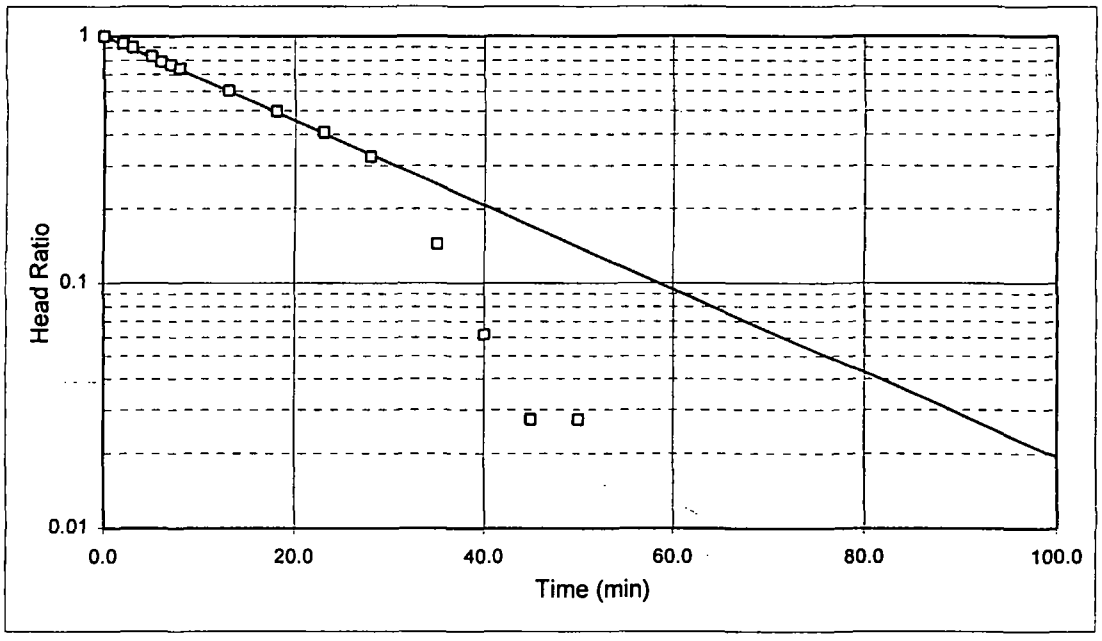
HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SD

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

125

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	16.5	K=	1.76E-05	cm/sec
t_1 (min) =	0	K=	5.00E-02	ft/day
t_2 (min) =	100			
h_1/h_0 =	1.00			
h_2/h_0 =	0.02			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-SD

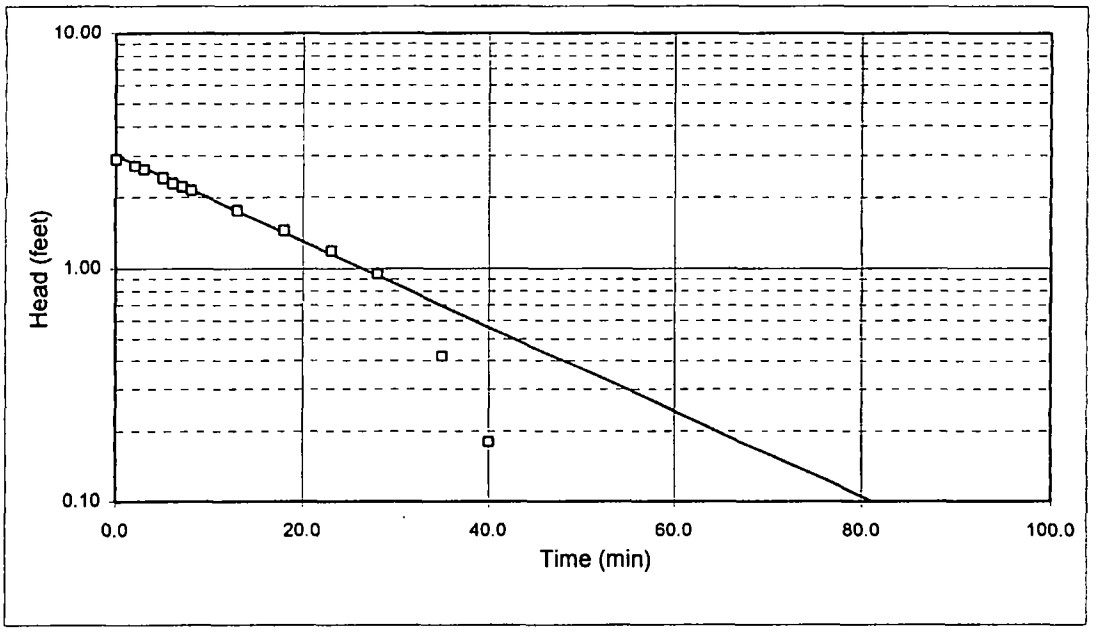
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

125

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	16.5	K=	1.24E-05	cm/sec
$\ln(R_e/r_w)$	3.98	K=	3.52E-02	ft/day
y_0 =	3.02			
y_t =	0.10			
t =	81.1			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-104-KS

WELL NO PZ-104-KS

DATE	7/20/95	
INITIAL DEPTH TO WATER	39.16	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	394.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	409.7	FEET (btoc)
BOTTOM OF AQUIFER	500	FEET (btoc)
SATURATED THICKNESS	370.54	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.36	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	757	0	42.52	0.0	3.36	1.00
1	758	0	42.38	60.0	3.22	0.96
1	759	0	42.22	120.0	3.06	0.91
1	800	0	42.08	180.0	2.92	0.87
1	801	0	41.96	240.0	2.80	0.83
1	802	0	41.83	300.0	2.67	0.79
1	803	0	41.72	360.0	2.56	0.76
1	804	0	41.61	420.0	2.45	0.73
1	805	0	41.49	480.0	2.33	0.69
1	810	0	41.04	780.0	1.88	0.56
1	815	0	40.67	1080.0	1.51	0.45
1	820	0	40.37	1380.0	1.21	0.36
1	825	0	40.14	1680.0	0.98	0.29
1	832	0	39.89	2100.0	0.73	0.22
1	837	0	39.74	2400.0	0.58	0.17
1	842	0	39.61	2700.0	0.45	0.13
1	847	0	39.54	3000.0	0.38	0.11
1	856	0	39.4	3540.0	0.24	0.07
1	903	30	39.35	3990.0	0.19	0.06
1	916	0	39.25	4740.0	0.09	0.03

COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-104-KS

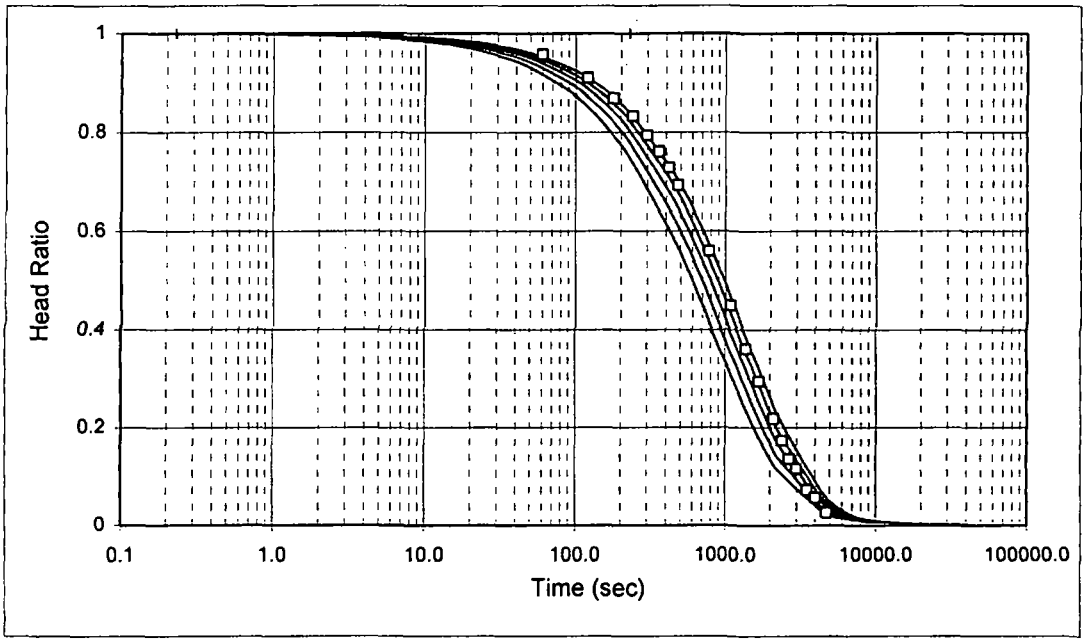
$$K = \frac{r_c^{\,2}\beta}{tb} \quad \text{and} \quad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
$h_t/h_0 = F(\alpha,B)$

S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_{ew} =	0.25			
t =	229.1	K=	2.49E-06	cm/sec
α =	1	K=	0.007	ft/day
B =	1E-09	S =	1.11E-10	
b =	370.54			



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-105-SS

WELL NO. PZ-105-SS

DATE	7/20/95	
INITIAL DEPTH TO WATER	144.29	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	137.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	151.4	FEET (btoc)
SATURATED THICKNESS	500	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.11	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	7.11	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.56	FEET
MAX. HEAD IN SCREEN?	Y	

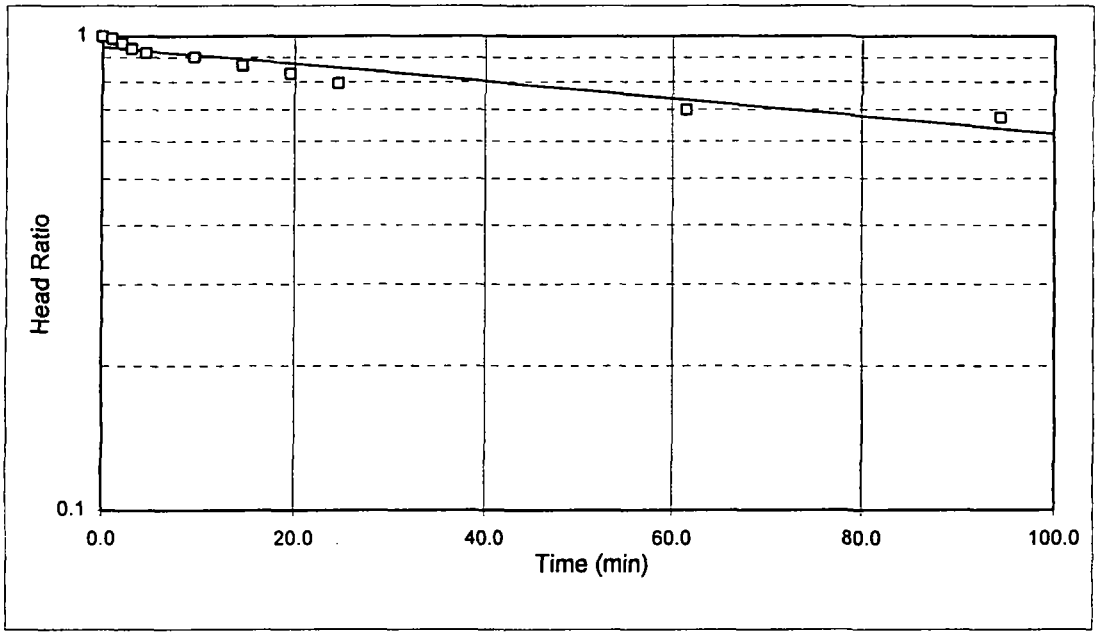
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1300	30	145.85	0.0	1.56	1.00
1	1301	30	145.83	1.0	1.54	0.99
1	1302	30	145.8	2.0	1.51	0.97
1	1303	30	145.76	3.0	1.47	0.94
1	1305	0	145.73	4.5	1.44	0.92
1	1310	0	145.7	9.5	1.41	0.90
1	1315	0	145.64	14.5	1.35	0.87
1	1320	0	145.59	19.5	1.30	0.83
1	1325	0	145.53	24.5	1.24	0.79
1	1402	0	145.38	61.5	1.09	0.70
1	1435	0	145.34	94.5	1.05	0.67

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-105-SS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	7.11	K=	3.51E-06	cm/sec
t_1 (min) =	0	K=	9.96E-03	ft/day
t_2 (min) =	100			
h_1/h_0 =	0.95			
h_2/h_0 =	0.62			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

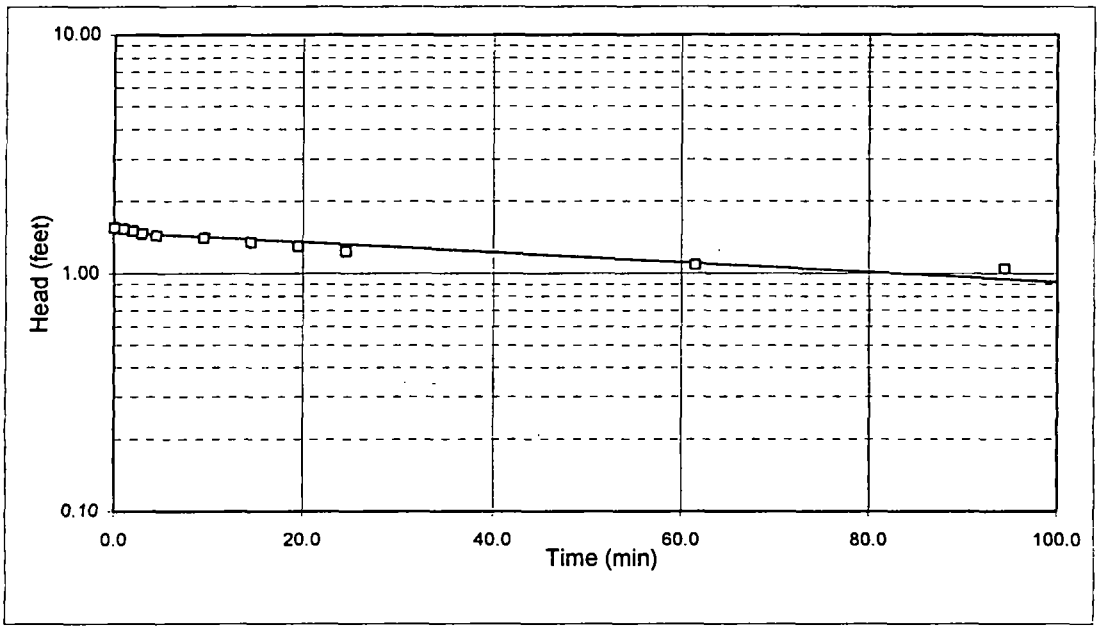
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-105-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	7.11	K=	8.46E-06	cm/sec
$\ln(R_e/r_w)$	2.00	K=	2.40E-02	ft/day
y_0 =	1.49			
y_t =	0.92			
t =	100.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-106-SS

WELL NO. PZ-106-SS

DATE	7/19/95	
INITIAL DEPTH TO WATER	105.11	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	151.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	166.8	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	61.69	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.63	FEET
MAX. HEAD IN SCREEN?	N	

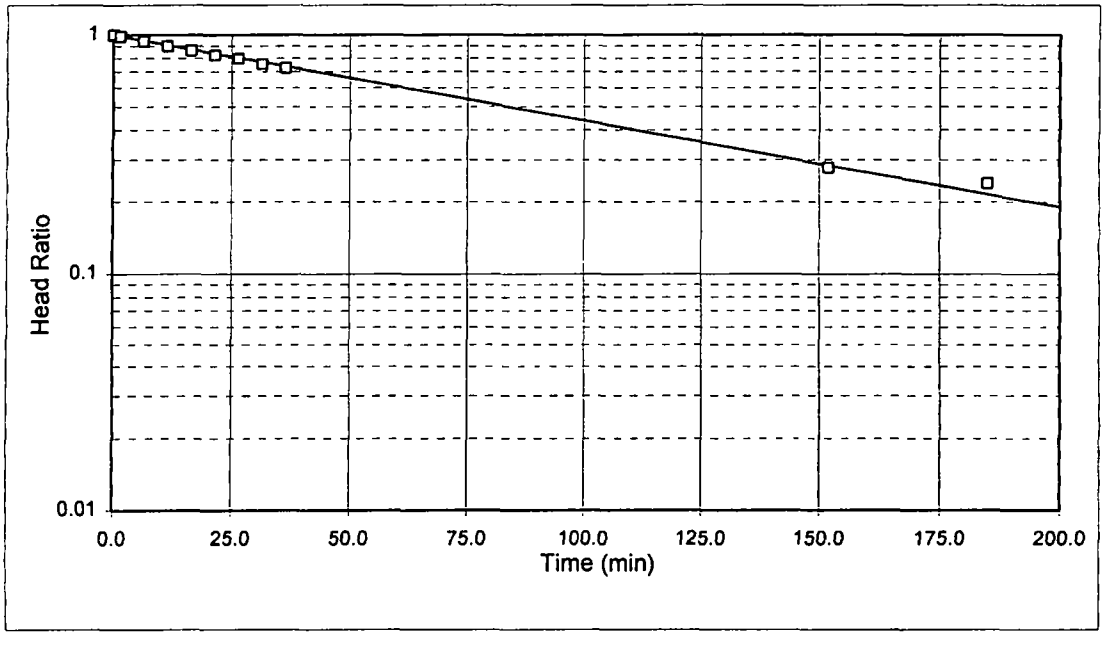
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	813	30	108.74	0.0	3.63	1.00
1	815	0	108.68	1.5	3.57	0.98
1	820	0	108.53	6.5	3.42	0.94
1	825	0	108.37	11.5	3.26	0.90
1	830	0	108.24	16.5	3.13	0.86
1	835	0	108.1	21.5	2.99	0.82
1	840	0	108	26.5	2.89	0.80
1	845	0	107.85	31.5	2.74	0.75
1	850	0	107.75	36.5	2.64	0.73
1	1045	30	106.12	152.0	1.01	0.28
1	1118	30	105.98	185.0	0.87	0.24
1	1140	0	105.74	206.5	0.63	0.17

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15.3	K=	3.93E-06	cm/sec
t_1 (min) =	0	K=	1.11E-02	ft/day
t_2 (min) =	200			
h_1/h_0 =	1.00			
h_2/h_0 =	0.19			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

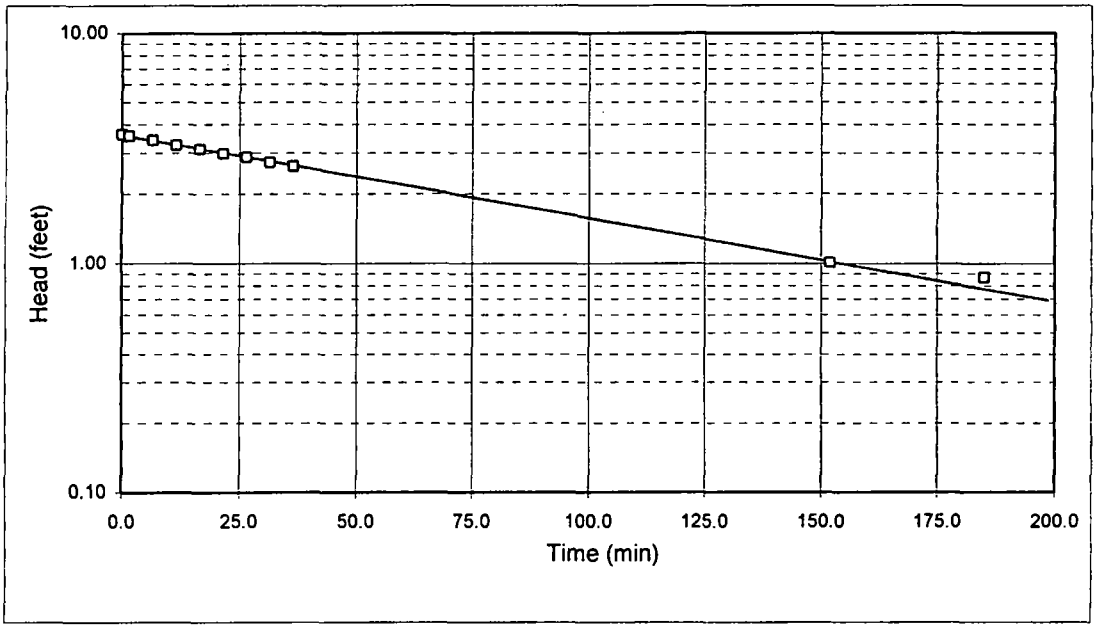
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.3	K=	2.50E-06	cm/sec
$\ln(R_e/r_w)$	3.39	K=	7.07E-03	ft/day
y_0 =	3.60			
y_t =	0.69			
t =	198.7			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-106-SD

WELL NO. PZ-106-SD

DATE	7/21/95	
INITIAL DEPTH TO WATER	107.17	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	189	FEET (btoc)
BOTTOM OF OPEN INTERVAL	203.1	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	95.93	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.1	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.84	FEET
MAX. HEAD IN SCREEN?	N	

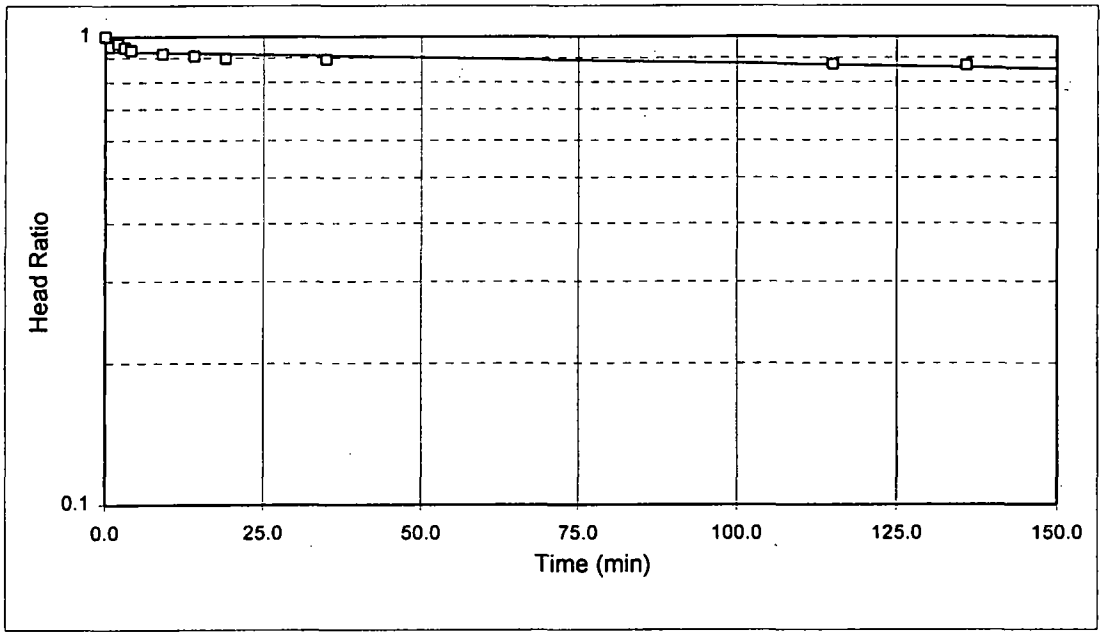
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1205	0	111.01	0.0	3.84	1.00
1	1207	0	110.88	2.0	3.71	0.97
1	1208	0	110.81	3.0	3.64	0.95
1	1209	0	110.76	4.0	3.59	0.93
1	1214	0	110.7	9.0	3.53	0.92
1	1219	0	110.66	14.0	3.49	0.91
1	1224	0	110.62	19.0	3.45	0.90
1	1240	0	110.6	35.0	3.43	0.89
1	1400	0	110.52	115.0	3.35	0.87
1	1421	0	110.5	136.0	3.33	0.87

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SD

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{y_1}{y_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.1	K=	2.98E-07	cm/sec
t_1 (min) =	0	K=	8.45E-04	ft/day
t_2 (min) =	150			
y_1 =	0.93			
y_2 =	0.85			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 9/24/95

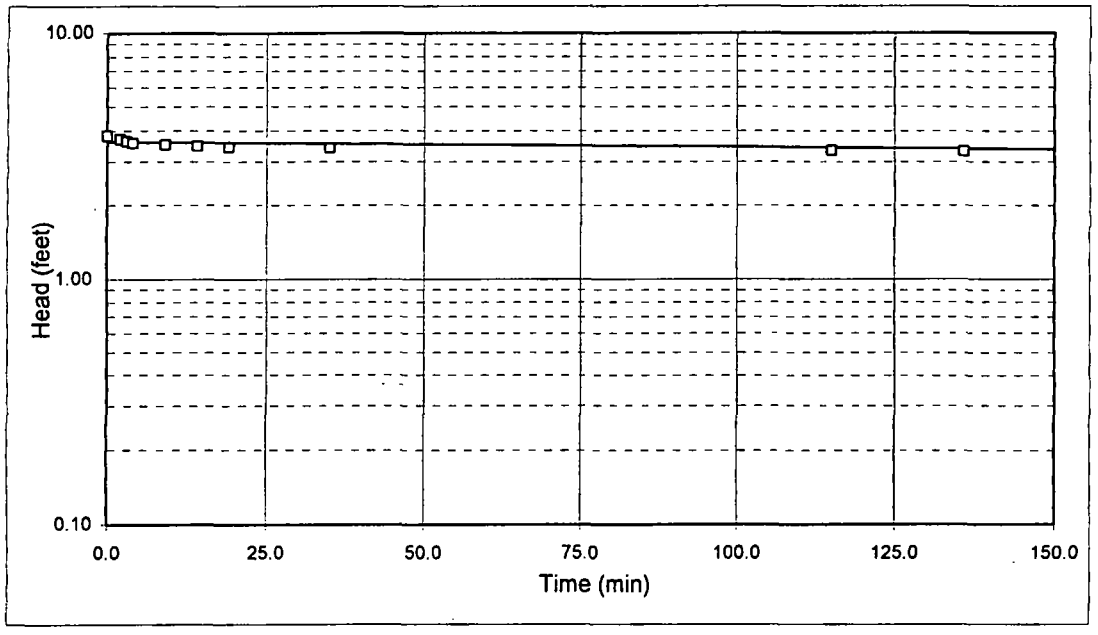
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-SD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.1	K=	1.56E-07	cm/sec
$\ln(R_e/r_w)$	3.75	K=	4.42E-04	ft/day
y_0 =	3.63			
y_t =	3.39			
t =	150.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 9/24/95

RISING HEAD TEST PZ-106-KS

WELL NO PZ-106-KS

DATE	7/20/95	
INITIAL DEPTH TO WATER	21.64	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	362.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	377.5	FEET (btoc)
BOTTOM OF AQUIFER	500	FEET (btoc)
SATURATED THICKNESS	355.86	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.81	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	1123	30	23.45	0.0	1.81	1.00
1	1124	30	23.38	60.0	1.74	0.96
1	1125	30	23.29	120.0	1.65	0.91
1	1126	30	23.21	180.0	1.57	0.87
1	1127	30	23.13	240.0	1.49	0.82
1	1128	30	23.05	300.0	1.41	0.78
1	1129	30	22.99	360.0	1.35	0.75
1	1130	30	22.92	420.0	1.28	0.71
1	1131	30	22.85	480.0	1.21	0.67
1	1136	30	22.6	780.0	0.96	0.53
1	1141	30	22.38	1080.0	0.74	0.41
1	1146	30	22.2	1380.0	0.56	0.31
1	1151	30	22.09	1680.0	0.45	0.25
1	1156	30	22	1980.0	0.36	0.20
1	1201	30	21.91	2280.0	0.27	0.15
1	1210	0	21.82	2790.0	0.18	0.10

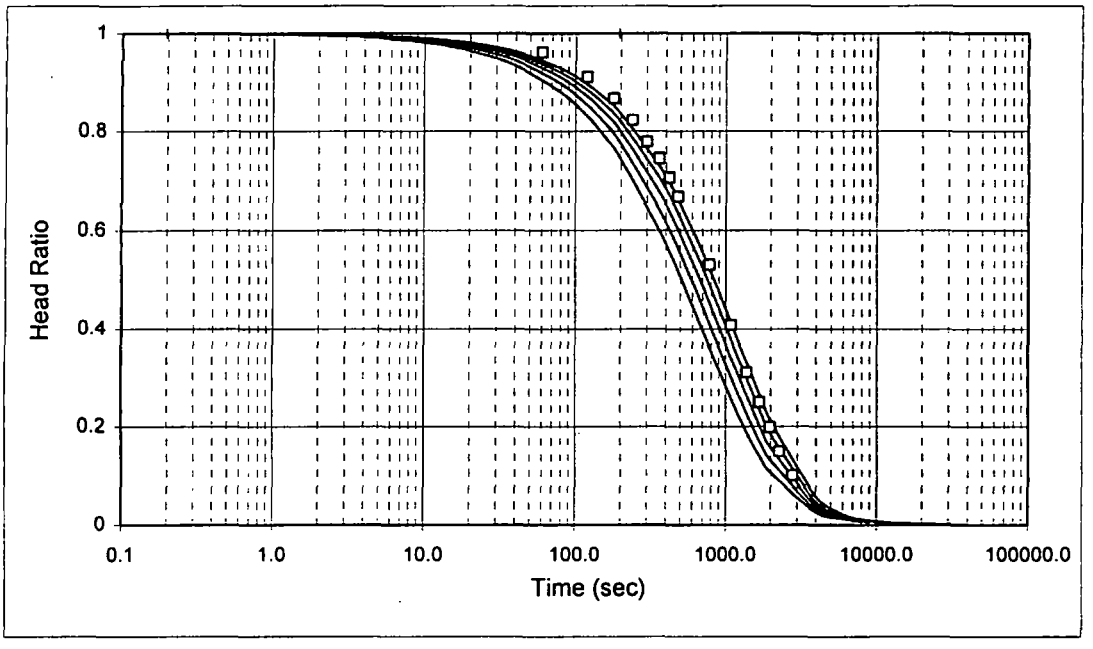
COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-106-KS

$$K = \frac{r_c^{\,2}\beta}{tb} \quad \text{and} \quad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
h_t/h_0 = F(α,B)
S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_{ew} =	0.25			
t =	195.0	K=	3.05E-06	cm/sec
α =	1	K=	0.009	ft/day
B =	1E-09	S =	1.11E-10	
b =	355.86			



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 07/20/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 9/24/95

RISING HEAD TEST PZ-107-SS

WELL NO. PZ-107-SS

DATE	7/15/95	
INITIAL DEPTH TO WATER	30.26	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	91.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	105.0	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	74.74	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	7.44	FEET
MAX. HEAD IN SCREEN?	N	

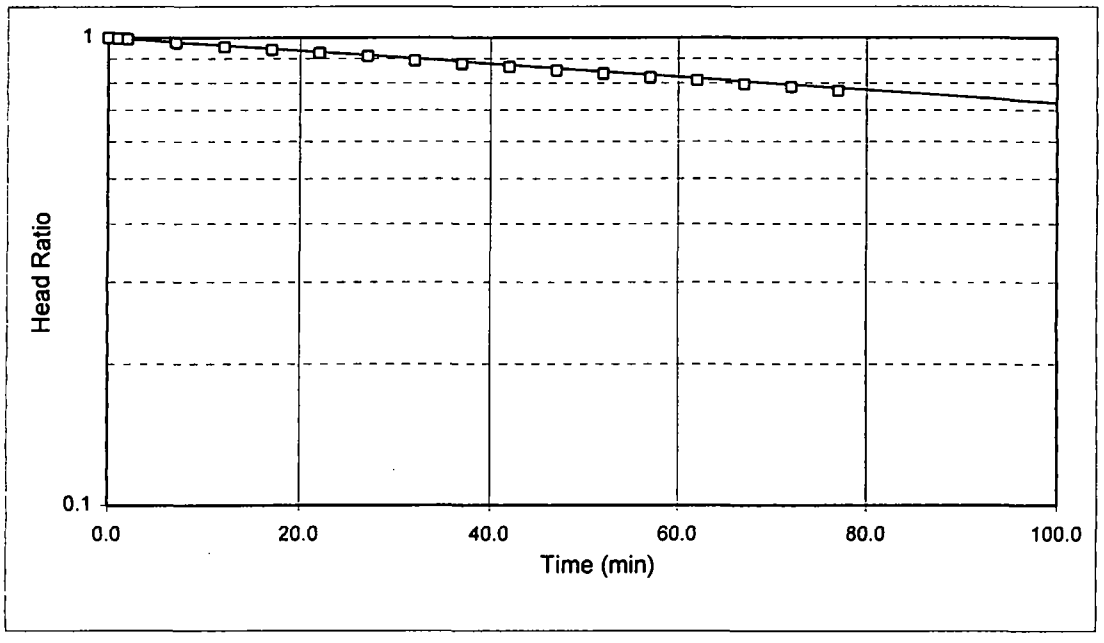
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1143	0	37.7	0.0	7.44	1.00
1	1144	0	37.68	1.0	7.42	1.00
1	1145	0	37.65	2.0	7.39	0.99
1	1150	0	37.51	7.0	7.25	0.97
1	1155	0	37.37	12.0	7.11	0.96
1	1200	0	37.26	17.0	7.00	0.94
1	1205	0	37.15	22.0	6.89	0.93
1	1210	0	37.05	27.0	6.79	0.91
1	1215	0	36.9	32.0	6.64	0.89
1	1220	0	36.79	37.0	6.53	0.88
1	1225	0	36.7	42.0	6.44	0.87
1	1230	0	36.59	47.0	6.33	0.85
1	1235	0	36.49	52.0	6.23	0.84
1	1240	0	36.37	57.0	6.11	0.82
1	1245	0	36.29	62.0	6.03	0.81
1	1250	0	36.17	67.0	5.91	0.79
1	1255	0	36.09	72.0	5.83	0.78
1	1300	0	35.98	77.0	5.72	0.77
1	1325	0	35.52	102.0	5.26	0.71

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-107-SS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14	K=	1.63E-06	cm/sec
t_1 (min) =	0	K=	4.63E-03	ft/day
t_2 (min) =	100			
h_1/h_0 =	1.00			
h_2/h_0 =	0.72			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/15/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

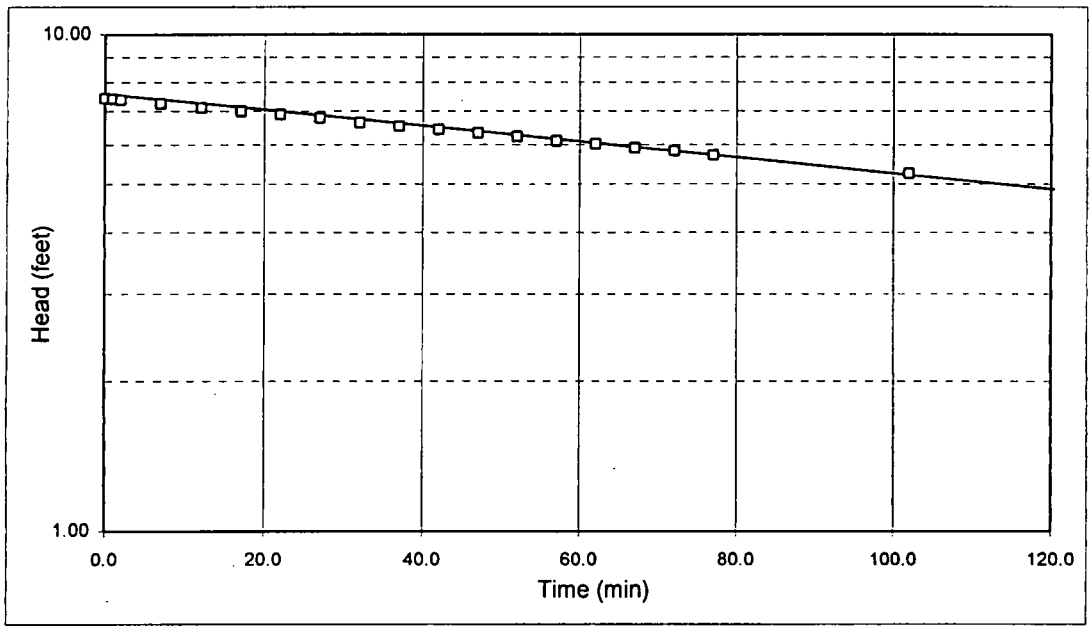
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-107-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14	K=	1.19E-06	cm/sec
$\ln(R_e/r_w)$	3.31	K=	3.37E-03	ft/day
y_0 =	7.59			
y_t =	4.89			
t =	120.4			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/15/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-108-SS

WELL NO. PZ-108-SS

DATE	7/21/95	
INITIAL DEPTH TO WATER	87.11	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	132.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	146.0	FEET (btoc)
SATURATED THICKNESS	110	FEET
WATER TABLE TO BOTTOM OF SCREEN	58.89	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	13.9	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.67	FEET
MAX. HEAD IN SCREEN?	N	

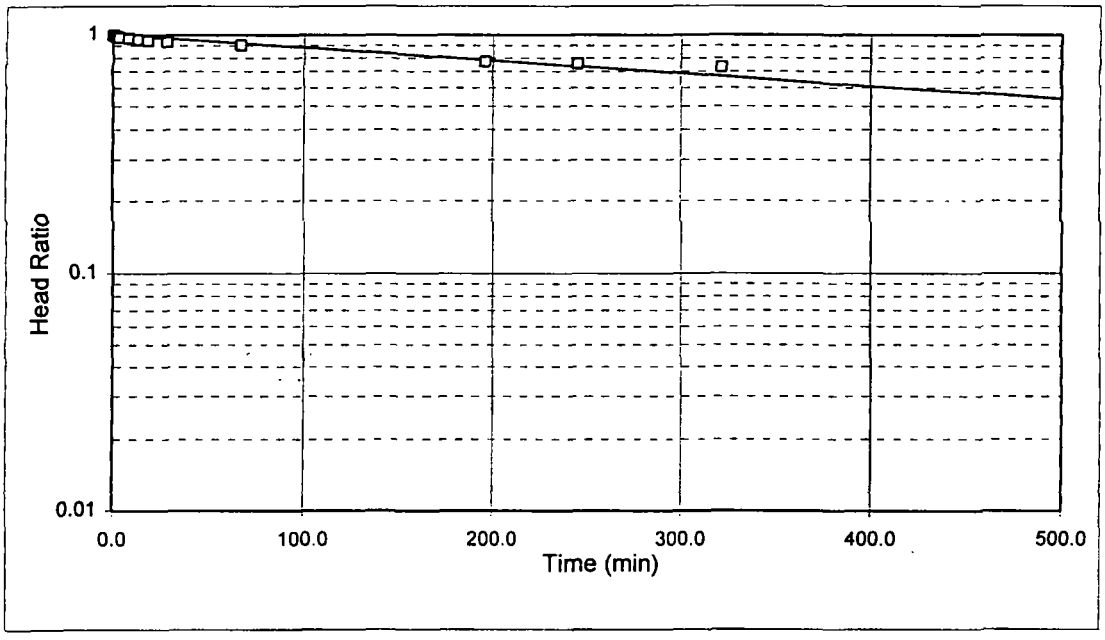
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	927	30	90.78	0.0	3.67	1.00
1	928	30	90.74	1.0	3.63	0.99
1	929	30	90.71	2.0	3.60	0.98
1	930	30	90.69	3.0	3.58	0.98
1	935	30	90.66	8.0	3.55	0.97
1	940	30	90.61	13.0	3.50	0.95
1	945	30	90.58	18.0	3.47	0.95
1	955	30	90.54	28.0	3.43	0.93
1	1034	0	90.43	66.5	3.32	0.90
1	1243	30	89.94	196.0	2.83	0.77
1	1332	30	89.89	245.0	2.78	0.76
1	1449	0	89.8	321.5	2.69	0.73

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-108-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	13.9	K=	6.34E-07	cm/sec
t_1(min) =	0	K=	1.80E-03	ft/day
t_2(min) =	500			
h_1/h_0 =	1.00			
h_2/h_0 =	0.54			



Project Name:	LAIDLAW / OU-2 RIFS / MO	Analysis By:	DSL
Project No.:	943-2848	Checked By:	CVK
Test Date:	07/21/95	Analysis Date:	10/11/95

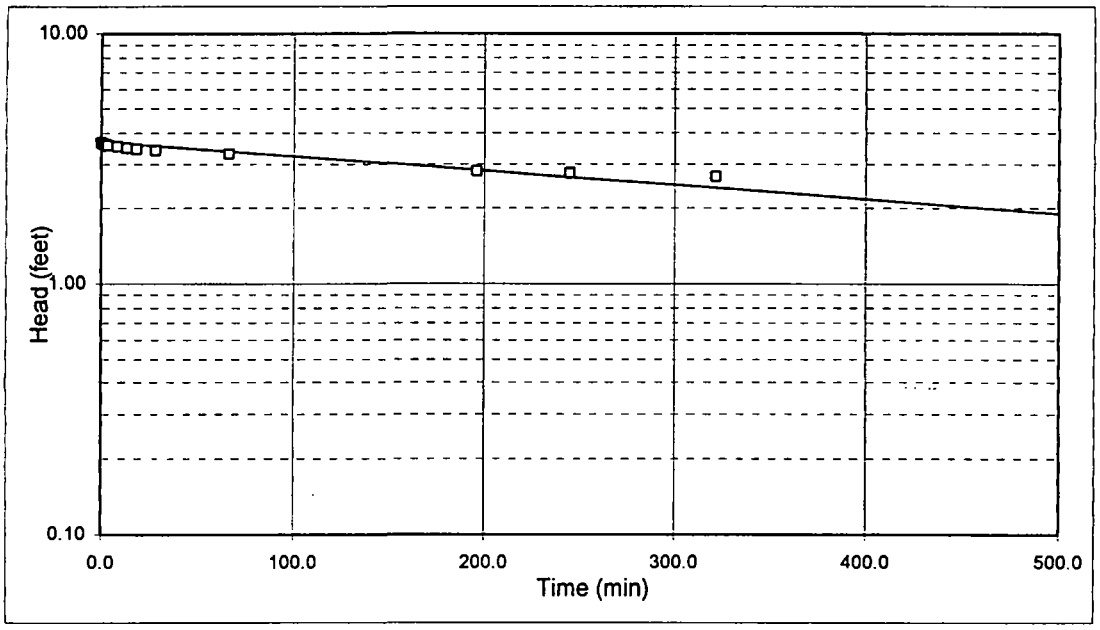
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-108-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	13.9	K=	4.33E-07	cm/sec
$\ln(R_e/r_w)$	3.27	K=	1.23E-03	ft/day
y_0 =	3.70			
y_t =	1.91			
t =	500.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-109-SS

WELL NO. PZ-109-SS

DATE	7/21/95	
INITIAL DEPTH TO WATER	84.41	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	123.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	137.4	FEET (btoc)
SATURATED THICKNESS	110	FEET
WATER TABLE TO BOTTOM OF SCREEN	52.99	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.35	FEET
MAX. HEAD IN SCREEN?	N	

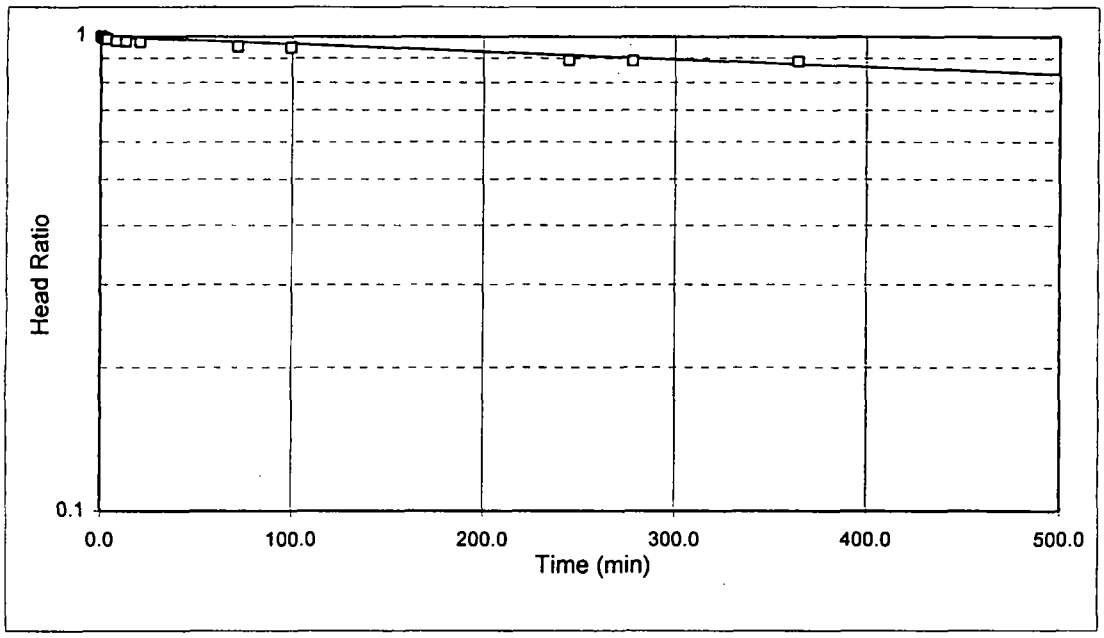
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	850	0	87.76	0.0	3.35	1.00
1	851	0	87.74	1.0	3.33	0.99
1	852	0	87.73	2.0	3.32	0.99
1	853	0	87.72	3.0	3.31	0.99
1	858	0	87.69	8.0	3.28	0.98
1	903	0	87.68	13.0	3.27	0.98
1	910	30	87.67	20.5	3.26	0.97
1	1001	30	87.6	71.5	3.19	0.95
1	1029	30	87.58	99.5	3.17	0.95
1	1254	30	87.4	244.5	2.99	0.89
1	1328	0	87.39	278.0	2.98	0.89
1	1454	30	87.38	364.5	2.97	0.89

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-109-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.4	K=	1.83E-07	cm/sec
t_1 (min) =	0	K=	5.19E-04	ft/day
t_2 (min) =	500			
h_1/h_0 =	1.00			
h_2/h_0 =	0.83			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

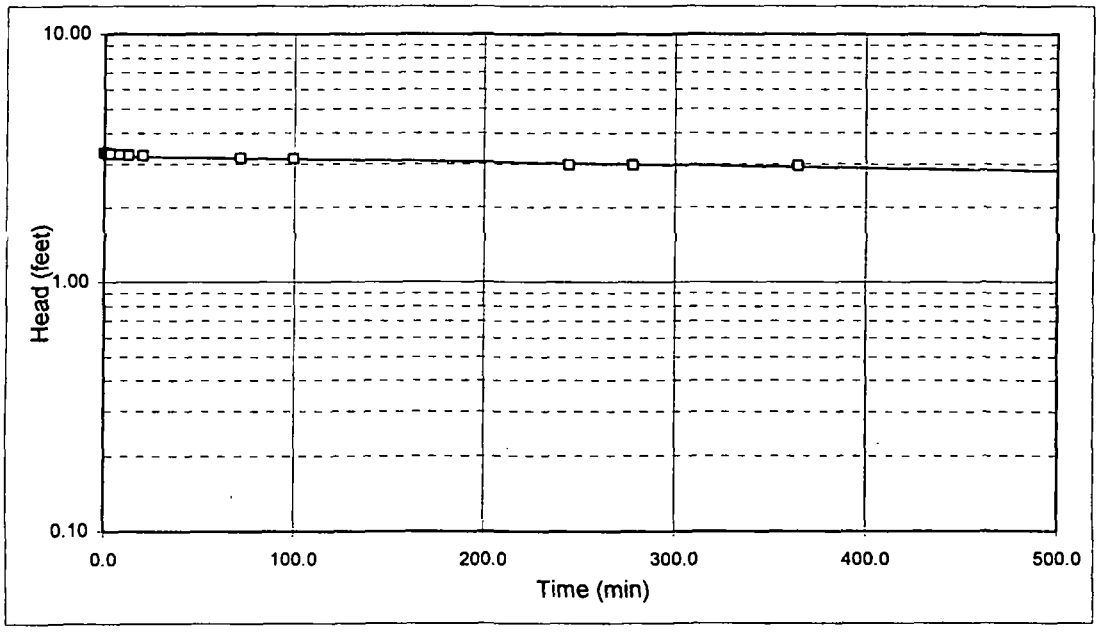
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-109-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.4	K=	8.67E-08	cm/sec
$\ln(R_e/r_w)$	3.24	K=	2.46E-04	ft/day
y_0 =	3.24			
y_t =	2.82			
t =	500.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-110-SS

WELL NO. PZ-110-SS

DATE	6/21/95	
INITIAL DEPTH TO WATER	85.75	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	98.6	FEET (btoc)
BOTTOM OF OPEN INTERVAL	113.6	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	27.85	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.77	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1229	0	88.52	0.0	2.77	1.00
1	1230	0	88.5	1.0	2.75	0.99
1	1231	0	88.49	2.0	2.74	0.99
1	1236	0	88.4	7.0	2.65	0.96
1	1241	0	88.36	12.0	2.61	0.94
1	1246	0	88.34	17.0	2.59	0.94
1	1251	0	88.3	22.0	2.55	0.92
1	1256	0	88.27	27.0	2.52	0.91
1	1301	0	88.22	32.0	2.47	0.89
1	1306	0	88.18	37.0	2.43	0.88
1	1311	0	88.14	42.0	2.39	0.86
1	1316	0	88.1	47.0	2.35	0.85
1	1321	0	88.08	52.0	2.33	0.84
1	1326	0	88.03	57.0	2.28	0.82
1	1331	0	88	62.0	2.25	0.81
1	1336	0	87.96	67.0	2.21	0.80
1	1341	0	87.91	72.0	2.16	0.78
1	1346	0	87.88	77.0	2.13	0.77
1	1351	0	87.84	82.0	2.09	0.75
1	1356	0	87.82	87.0	2.07	0.75
1	1401	0	87.79	92.0	2.04	0.74
1	1406	0	87.73	97.0	1.98	0.71
1	1411	0	87.71	102.0	1.96	0.71
1	1416	0	87.69	107.0	1.94	0.70
1	1421	0	87.64	112.0	1.89	0.68

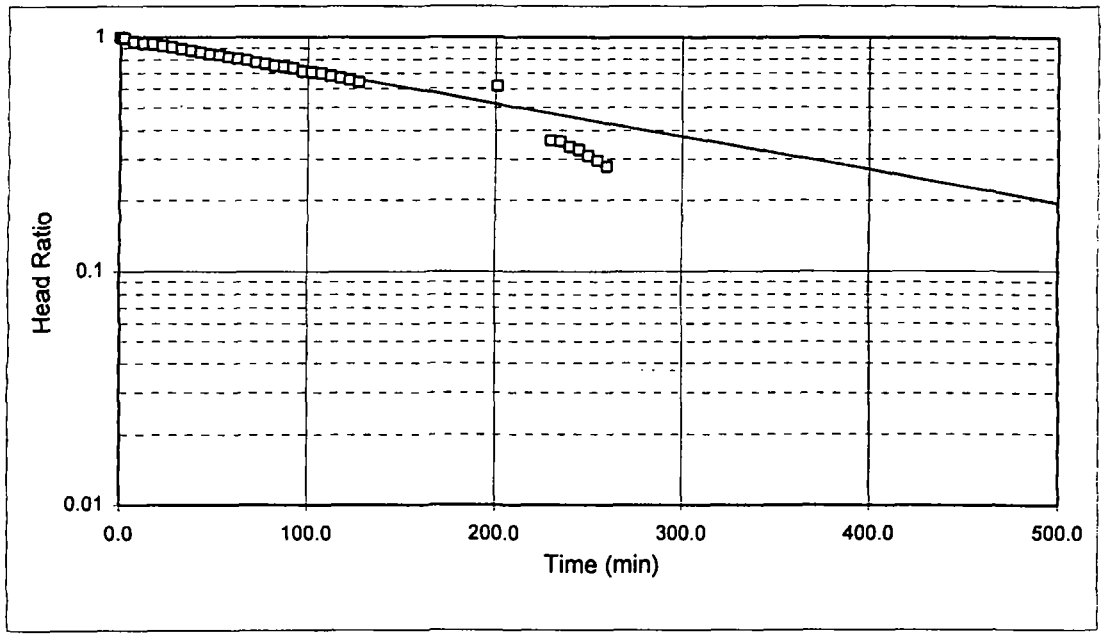
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1426	0	87.61	117.0	1.86	0.67
1	1431	0	87.57	122.0	1.82	0.66
1	1436	0	87.53	127.0	1.78	0.64
1	1550	0	87.46	201.0	1.71	0.62
1	1618	30	86.75	229.5	1.00	0.36
1	1623	30	86.74	234.5	0.99	0.36
1	1628	30	86.69	239.5	0.94	0.34
1	1633	30	86.66	244.5	0.91	0.33
1	1638	30	86.61	249.5	0.86	0.31
1	1643	30	86.57	254.5	0.82	0.30
1	1648	30	86.52	259.5	0.77	0.28

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-110-SS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15	K=	1.57E-06	cm/sec
t_1 (min) =	0	K=	4.46E-03	ft/day
t_2 (min) =	500			
h_1/h_0 =	1.00			
h_2/h_0 =	0.19			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

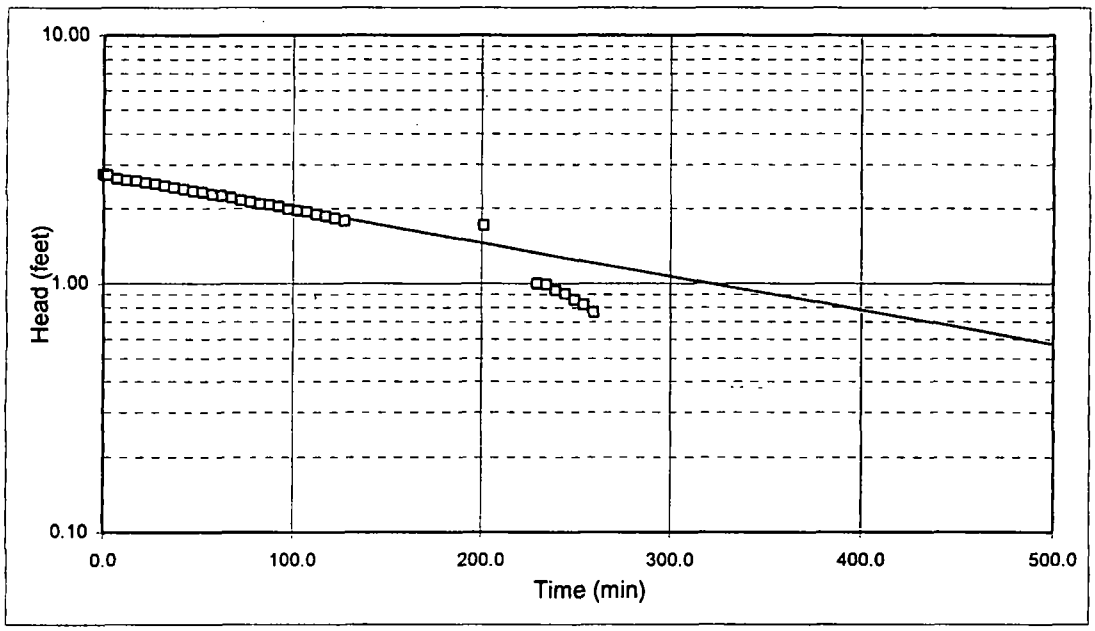
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-110-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15	K=	8.91E-07	cm/sec
$\ln(R_e/r_w)$	2.91	K=	2.52E-03	ft/day
y_0 =	2.69			
y_t =	0.58			
t =	500.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-111-SD

WELL NO. PZ-111-SD

DATE	7/24/95	
INITIAL DEPTH TO WATER	37.68	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	197.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	212.3	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	174.62	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.88	FEET
MAX. HEAD IN SCREEN?	N	

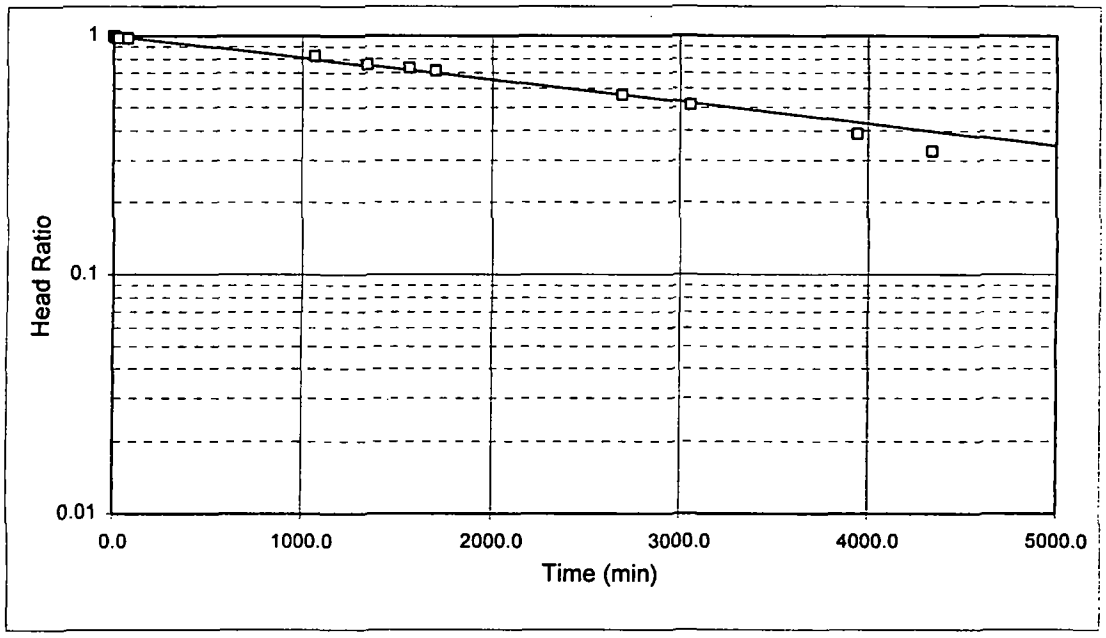
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1324	30	41.56	0.0	3.88	1.00
1	1325	30	41.54	1.0	3.86	0.99
1	1327	0	41.53	2.5	3.85	0.99
1	1330	0	41.53	5.5	3.85	0.99
1	1335	0	41.51	10.5	3.83	0.99
1	1340	0	41.5	15.5	3.82	0.98
1	1350	0	41.49	25.5	3.81	0.98
1	1440	0	41.48	75.5	3.80	0.98
2	711	0	40.88	1066.5	3.20	0.82
2	1146	0	40.63	1341.5	2.95	0.76
2	1527	0	40.53	1562.5	2.85	0.73
2	1744	0	40.45	1699.5	2.77	0.71
3	1014	0	39.88	2689.5	2.20	0.57
3	1619	0	39.67	3054.5	1.99	0.51
4	709	0	39.19	3944.5	1.51	0.39
4	1349	0	38.96	4344.5	1.28	0.33

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-111-SD

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15.3	K=	1.00E-07	cm/sec
t_1 (min) =	0	K=	2.85E-04	ft/day
t_2 (min) =	5000			
h_1/h_0 =	1.00			
h_2/h_0 =	0.35			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

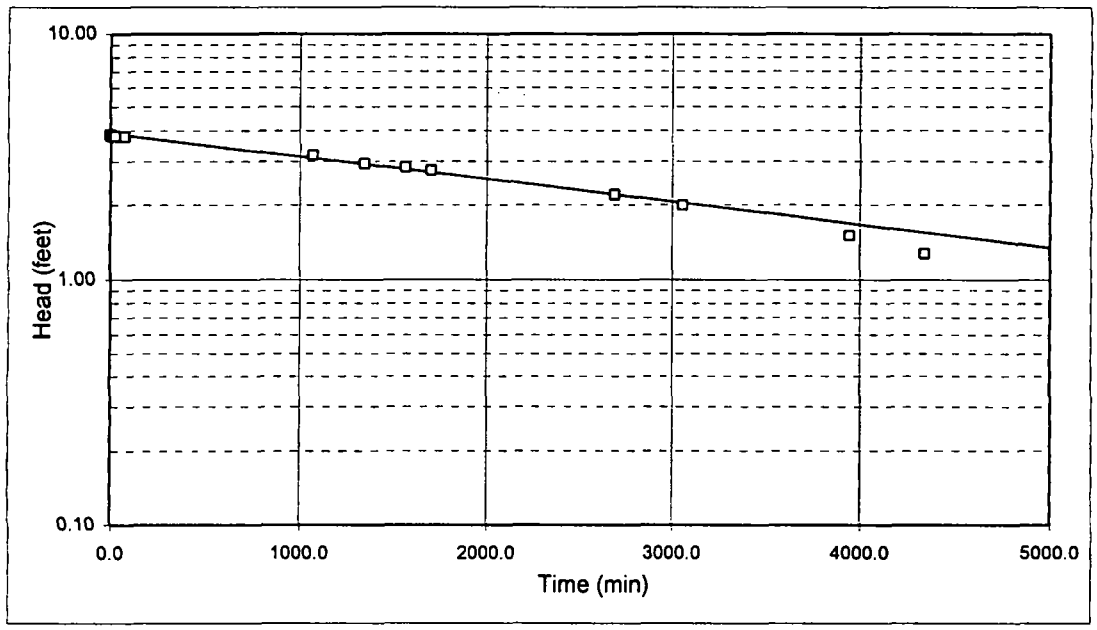
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-111-SD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.3	K=	6.78E-08	cm/sec
$\ln(R_e/r_w)$	4.01	K=	1.92E-04	ft/day
y_0 =	3.89			
y_t =	1.35			
t =	5000.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-111-KS

WELL NO PZ-111-KS

DATE	7/24/95	
INITIAL DEPTH TO WATER	18.89	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	353.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	370.5	FEET (btoc)
BOTTOM OF AQUIFER	500	FEET (btoc)
SATURATED THICKNESS	351.6	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	17.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.51	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (SEC)	HEAD (FEET)	HEAD RATIO
1	1236	30	22.4	0.0	3.51	1.00
1	1237	30	22.19	60.0	3.30	0.94
1	1238	0	22.08	90.0	3.19	0.91
1	1238	30	21.98	120.0	3.09	0.88
1	1239	0	21.88	150.0	2.99	0.85
1	1240	0	21.68	210.0	2.79	0.79
1	1241	0	21.53	270.0	2.64	0.75
1	1242	0	21.36	330.0	2.47	0.70
1	1243	0	21.21	390.0	2.32	0.66
1	1244	0	21.09	450.0	2.20	0.63
1	1245	0	20.96	510.0	2.07	0.59
1	1250	0	20.42	810.0	1.53	0.44
1	1255	0	20.02	1110.0	1.13	0.32
1	1300	0	19.74	1410.0	0.85	0.24
1	1305	0	19.53	1710.0	0.64	0.18
1	1310	0	19.37	2010.0	0.48	0.14
1	1315	0	19.24	2310.0	0.35	0.10
1	1320	0	19.17	2610.0	0.28	0.08
1	1328	0	19.07	3090.0	0.18	0.05
1	1331	0	19.05	3270.0	0.16	0.05

COOPER-PAPADOPULOS SLUG TEST ANALYSIS
RISING HEAD TEST PZ-111-KS

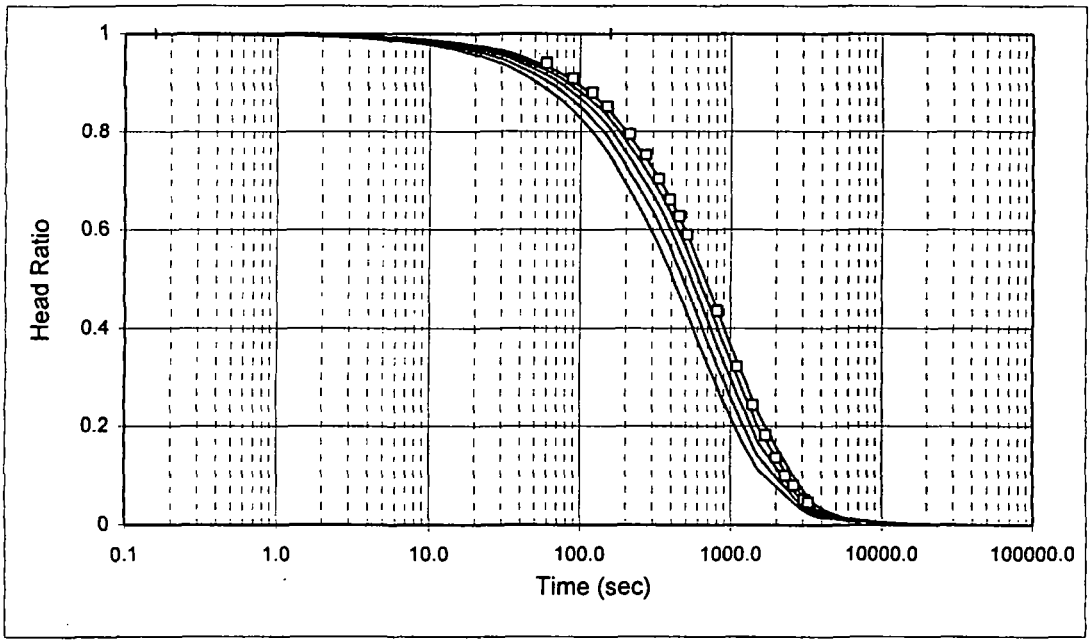
$$K = \frac{r_c^{\,2}\beta}{tb} \quad \text{and} \quad S = \frac{r_c^{\,2}\alpha}{r_{ew}^{\,2}}$$

where:

r_c = casing radius (feet)
r_{ew} = effective radius of screen (feet)
t = time (seconds)
K = Hydraulic conductivity (ft/sec)
$h_t/h_0 = F(\alpha,B)$

S = Storativity (dim)
h_t = Head at time t (feet)
b = Aquifer thickness (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_{ew} =	0.25			
t =	157.8	K=	3.82E-06	cm/sec
α =	1	K=	0.011	ft/day
B =	1E-09	S =	1.11E-10	
b =	351.61			



Project Name: LAIDLAW / OU2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-112-AS-FH1
WELL NO. PZ-112-AS-FH1

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	10.19	FEET H_2O
INITIAL DEPTH TO WATER	24.79	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	37.9	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	13.11	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	9.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.37	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	930	5	12.563	0.00	22.42	2.37	1.00
1995	206	930	6	12.297	0.02	22.68	2.11	0.89
1995	206	930	7	12.132	0.03	22.85	1.94	0.82
1995	206	930	8	11.973	0.05	23.01	1.78	0.75
1995	206	930	9	11.829	0.07	23.15	1.64	0.69
1995	206	930	10	11.698	0.08	23.28	1.51	0.64
1995	206	930	11	11.577	0.10	23.40	1.39	0.58
1995	206	930	12	11.469	0.12	23.51	1.28	0.54
1995	206	930	13	11.366	0.13	23.61	1.18	0.50
1995	206	930	14	11.273	0.15	23.71	1.08	0.46
1995	206	930	15	11.189	0.17	23.79	1.00	0.42
1995	206	930	16	11.111	0.18	23.87	0.92	0.39
1995	206	930	17	11.04	0.20	23.94	0.85	0.36
1995	206	930	18	10.973	0.22	24.01	0.78	0.33
1995	206	930	19	10.913	0.23	24.07	0.72	0.30
1995	206	930	20	10.858	0.25	24.12	0.67	0.28
1995	206	930	21	10.807	0.27	24.17	0.62	0.26
1995	206	930	22	10.76	0.28	24.22	0.57	0.24
1995	206	930	23	10.718	0.30	24.26	0.53	0.22
1995	206	930	24	10.679	0.32	24.30	0.49	0.21
1995	206	930	25	10.643	0.33	24.34	0.45	0.19
1995	206	930	26	10.61	0.35	24.37	0.42	0.18
1995	206	930	27	10.58	0.37	24.40	0.39	0.16
1995	206	930	28	10.55	0.38	24.43	0.36	0.15
1995	206	930	29	10.527	0.40	24.45	0.34	0.14
1995	206	930	30	10.501	0.42	24.48	0.31	0.13
1995	206	930	31	10.48	0.43	24.50	0.29	0.12

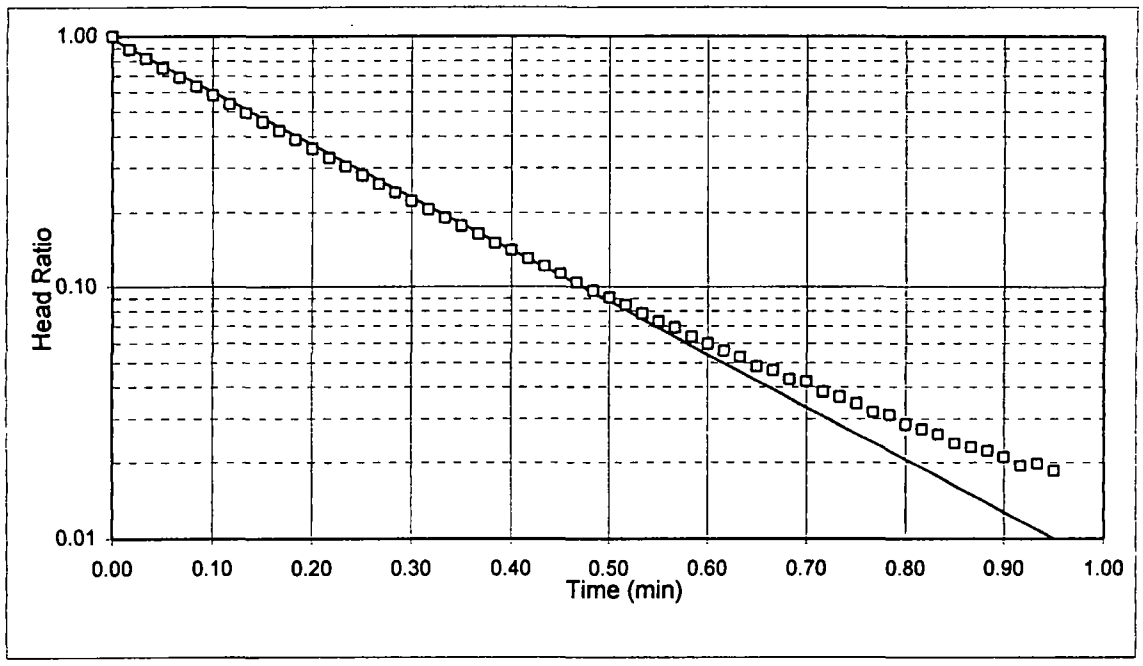
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	930	32	10.459	0.45	24.52	0.27	0.11
1995	206	930	33	10.437	0.47	24.54	0.25	0.10
1995	206	930	34	10.419	0.48	24.56	0.23	0.10
1995	206	930	35	10.405	0.50	24.58	0.22	0.09
1995	206	930	36	10.391	0.52	24.59	0.20	0.08
1995	206	930	37	10.376	0.53	24.60	0.19	0.08
1995	206	930	38	10.363	0.55	24.62	0.17	0.07
1995	206	930	39	10.354	0.57	24.63	0.16	0.07
1995	206	930	40	10.341	0.58	24.64	0.15	0.06
1995	206	930	41	10.332	0.60	24.65	0.14	0.06
1995	206	930	42	10.323	0.62	24.66	0.13	0.06
1995	206	930	43	10.316	0.63	24.66	0.13	0.05
1995	206	930	44	10.305	0.65	24.68	0.12	0.05
1995	206	930	45	10.301	0.67	24.68	0.11	0.05
1995	206	930	46	10.292	0.68	24.69	0.10	0.04
1995	206	930	47	10.29	0.70	24.69	0.10	0.04
1995	206	930	48	10.281	0.72	24.70	0.09	0.04
1995	206	930	49	10.277	0.73	24.70	0.09	0.04
1995	206	930	50	10.272	0.75	24.71	0.08	0.03
1995	206	930	51	10.266	0.77	24.71	0.08	0.03
1995	206	930	52	10.264	0.78	24.72	0.07	0.03
1995	206	930	53	10.258	0.80	24.72	0.07	0.03
1995	206	930	54	10.255	0.82	24.73	0.07	0.03
1995	206	930	55	10.252	0.83	24.73	0.06	0.03
1995	206	930	56	10.247	0.85	24.73	0.06	0.02
1995	206	930	57	10.245	0.87	24.74	0.05	0.02
1995	206	930	58	10.243	0.88	24.74	0.05	0.02
1995	206	930	59	10.24	0.90	24.74	0.05	0.02
1995	206	931	0	10.236	0.92	24.74	0.05	0.02
1995	206	931	1	10.237	0.93	24.74	0.05	0.02
1995	206	931	2	10.234	0.95	24.75	0.04	0.02

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-112-AS-FH1

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
Re =	0.34			
L_e =	9.4	K=	2.99E-03	cm/sec
t_1 (min) =	0	K=	8.49E+00	ft/day
t_2 (min) =	0.95			
h_1/h_0 =	0.98			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

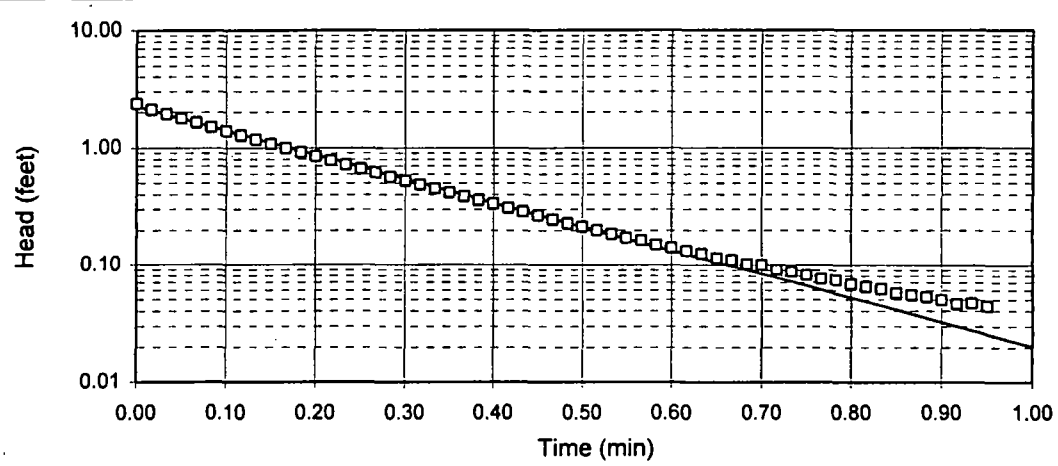
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-112-AS-FH1

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	9.4	K=	1.69E-03	cm/sec
$\ln(R_e/r_w)$	1.91	K=	4.78E+00	ft/day
y_0 =	2.24			
y_t =	0.02			
t =	1.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-112-AS-RH1

WELL NO. PZ-112-AS-RH1

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	10.19	FEET H_2O
INITIAL DEPTH TO WATER	24.79	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	37.9	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	13.11	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	9.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.11	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	927	3	8.0808	0.00	26.90	2.11	1.00
305	206	927	4	8.3167	0.02	26.66	1.87	0.89
305	206	927	5	8.4263	0.03	26.55	1.76	0.84
305	206	927	6	8.5257	0.05	26.45	1.66	0.79
305	206	927	7	8.6166	0.07	26.36	1.57	0.75
305	206	927	8	8.6893	0.08	26.29	1.50	0.71
305	206	927	9	8.777	0.10	26.20	1.41	0.67
305	206	927	10	8.8401	0.12	26.14	1.35	0.64
305	206	927	11	8.9063	0.13	26.07	1.28	0.61
305	206	927	12	8.9705	0.15	26.01	1.22	0.58
305	206	927	13	9.0322	0.17	25.95	1.16	0.55
305	206	927	14	9.0879	0.18	25.89	1.10	0.52
305	206	927	15	9.1451	0.20	25.83	1.04	0.50
305	206	927	16	9.1968	0.22	25.78	0.99	0.47
305	206	927	17	9.2457	0.23	25.73	0.94	0.45
305	206	927	18	9.2924	0.25	25.69	0.90	0.43
305	206	927	19	9.331	0.27	25.65	0.86	0.41
305	206	927	20	9.3731	0.28	25.61	0.82	0.39
305	206	927	21	9.4275	0.30	25.55	0.76	0.36
305	206	927	22	9.464	0.32	25.52	0.73	0.34
305	206	927	23	9.4971	0.33	25.48	0.69	0.33
305	206	927	24	9.5336	0.35	25.45	0.66	0.31
305	206	927	25	9.5627	0.37	25.42	0.63	0.30
305	206	927	26	9.5944	0.38	25.39	0.60	0.28
305	206	927	27	9.6222	0.40	25.36	0.57	0.27
305	206	927	28	9.6506	0.42	25.33	0.54	0.26
305	206	927	29	9.677	0.43	25.30	0.51	0.24

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	927	30	9.702	0.45	25.28	0.49	0.23
305	206	927	31	9.7254	0.47	25.25	0.46	0.22
305	206	927	32	9.7484	0.48	25.23	0.44	0.21
305	206	927	33	9.7687	0.50	25.21	0.42	0.20
305	206	927	34	9.7907	0.52	25.19	0.40	0.19
305	206	927	35	9.8072	0.53	25.17	0.38	0.18
305	206	927	36	9.8284	0.55	25.15	0.36	0.17
305	206	927	37	9.8434	0.57	25.14	0.35	0.16
305	206	927	38	9.8597	0.58	25.12	0.33	0.16
305	206	927	39	9.8793	0.60	25.10	0.31	0.15
305	206	927	40	9.8906	0.62	25.09	0.30	0.14
305	206	927	41	9.9077	0.63	25.07	0.28	0.13
305	206	927	42	9.9219	0.65	25.06	0.27	0.13
305	206	927	43	9.9343	0.67	25.05	0.26	0.12
305	206	927	44	9.9423	0.68	25.04	0.25	0.12
305	206	927	45	9.9571	0.70	25.02	0.23	0.11
305	206	927	46	9.9673	0.72	25.01	0.22	0.11
305	206	927	47	9.9784	0.73	25.00	0.21	0.10
305	206	927	48	9.9858	0.75	24.99	0.20	0.10
305	206	927	49	9.9954	0.77	24.98	0.19	0.09
305	206	927	50	10.01	0.78	24.97	0.18	0.09
305	206	927	51	10.015	0.80	24.97	0.17	0.08
305	206	927	52	10.024	0.82	24.96	0.17	0.08
305	206	927	53	10.031	0.83	24.95	0.16	0.08
305	206	927	54	10.037	0.85	24.94	0.15	0.07
305	206	927	55	10.048	0.87	24.93	0.14	0.07
305	206	927	56	10.052	0.88	24.93	0.14	0.07
305	206	927	57	10.062	0.90	24.92	0.13	0.06
305	206	927	58	10.065	0.92	24.92	0.13	0.06
305	206	927	59	10.074	0.93	24.91	0.12	0.05
305	206	928	0	10.078	0.95	24.90	0.11	0.05
305	206	928	1	10.084	0.97	24.90	0.11	0.05
305	206	928	2	10.089	0.98	24.89	0.10	0.05
305	206	928	3	10.094	1.00	24.89	0.10	0.05
305	206	928	4	10.098	1.02	24.88	0.09	0.04
305	206	928	5	10.101	1.03	24.88	0.09	0.04
305	206	928	6	10.109	1.05	24.87	0.08	0.04
305	206	928	7	10.112	1.07	24.87	0.08	0.04
305	206	928	8	10.116	1.08	24.86	0.07	0.04
305	206	928	9	10.119	1.10	24.86	0.07	0.03
305	206	928	10	10.122	1.12	24.86	0.07	0.03
305	206	928	11	10.127	1.13	24.85	0.06	0.03
305	206	928	12	10.126	1.15	24.85	0.06	0.03
305	206	928	13	10.136	1.17	24.84	0.05	0.03
305	206	928	14	10.136	1.18	24.84	0.05	0.03

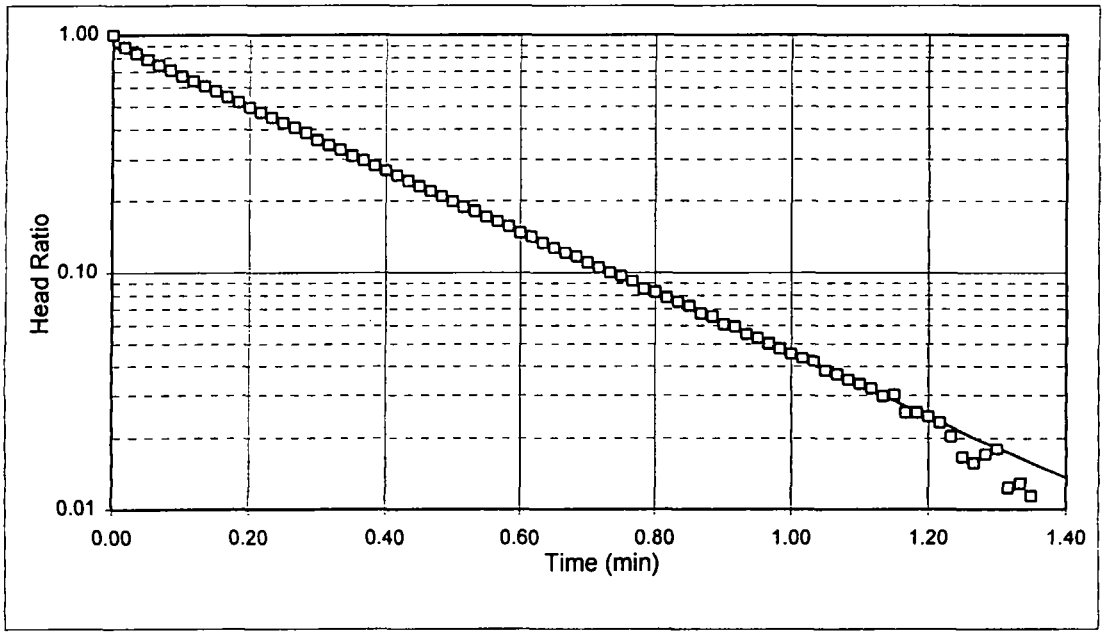
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	928	15	10.138	1.20	24.84	0.05	0.02
305	206	928	16	10.141	1.22	24.84	0.05	0.02
305	206	928	17	10.147	1.23	24.83	0.04	0.02
305	206	928	18	10.155	1.25	24.83	0.04	0.02
305	206	928	19	10.157	1.27	24.82	0.03	0.02
305	206	928	20	10.154	1.28	24.83	0.04	0.02
305	206	928	21	10.152	1.30	24.83	0.04	0.02
305	206	928	22	10.164	1.32	24.82	0.03	0.01
305	206	928	23	10.163	1.33	24.82	0.03	0.01
305	206	928	24	10.166	1.35	24.81	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-112-AS-RH1

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = equivalent radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	9.4	K=	1.86E-03	cm/sec
t_1 (min) =	0	K=	5.28E+00	ft/day
t_2 (min) =	1.40			
h_1/h_0 =	0.90			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

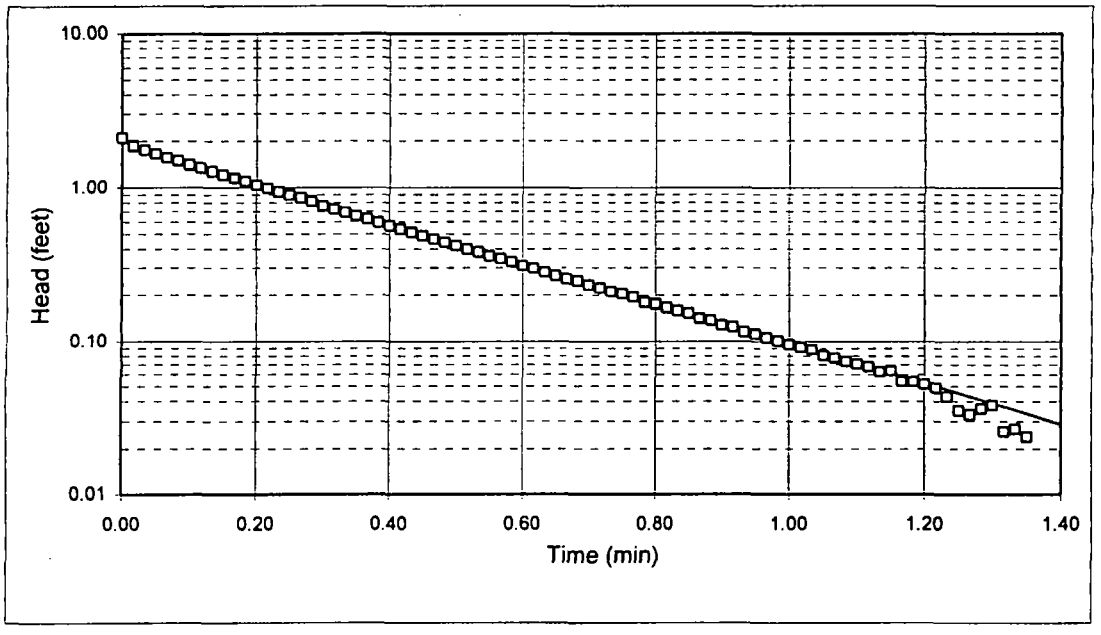
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-112-AS-RH1

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	9.4	K=	1.09E-03	cm/sec
$\ln(R_e/r_w)$	1.91	K=	3.08E+00	ft/day
y_0 =	2.00			
y_t =	0.03			
t =	1.40			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-AS

WELL NO. PZ-113-AS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	9.9	FEET H_2O
INITIAL DEPTH TO WATER	26.27	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	26.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	41.5	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	15.23	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	0.98	FEET
MAX. HEAD IN SCREEN?	N	

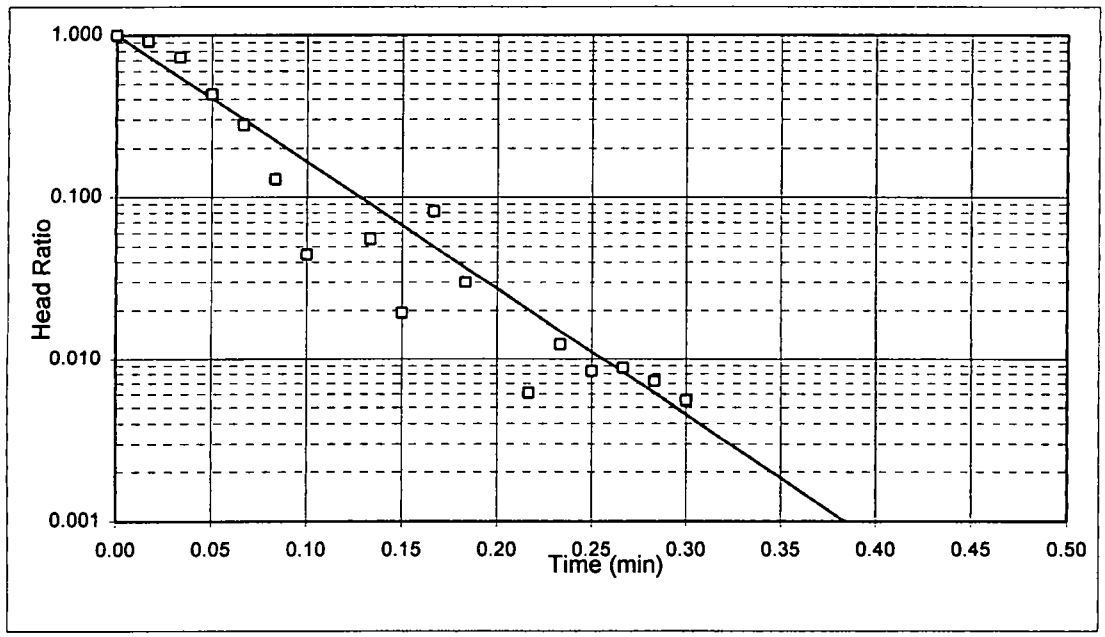
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1447	2	10.881	0.00	25.29	0.98	1.000
1995	206	1447	3	10.804	0.02	25.37	0.90	0.922
1995	206	1447	4	10.62	0.03	25.55	0.72	0.734
1995	206	1447	5	10.323	0.05	25.85	0.42	0.431
1995	206	1447	6	10.174	0.07	26.00	0.27	0.279
1995	206	1447	7	10.027	0.08	26.14	0.13	0.129
1995	206	1447	8	9.856	0.10	26.23	0.04	0.045
1995	206	1447	10	9.8452	0.13	26.22	0.05	0.056
1995	206	1447	11	9.9191	0.15	26.25	0.02	0.019
1995	206	1447	12	9.8198	0.17	26.19	0.08	0.082
1995	206	1447	13	9.8705	0.18	26.24	0.03	0.030
1995	206	1447	15	9.906	0.22	26.26	0.01	0.006
1995	206	1447	16	9.9122	0.23	26.26	0.01	0.012
1995	206	1447	17	9.9082	0.25	26.26	0.01	0.008
1995	206	1447	18	9.9086	0.27	26.26	0.01	0.009
1995	206	1447	19	9.9071	0.28	26.26	0.01	0.007
1995	206	1447	20	9.9054	0.30	26.26	0.01	0.006

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	15	K=	7.99E-03	cm/sec
t_1 (min) =	0	K=	2.26E+01	ft/day
t_2 (min) =	0.38			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

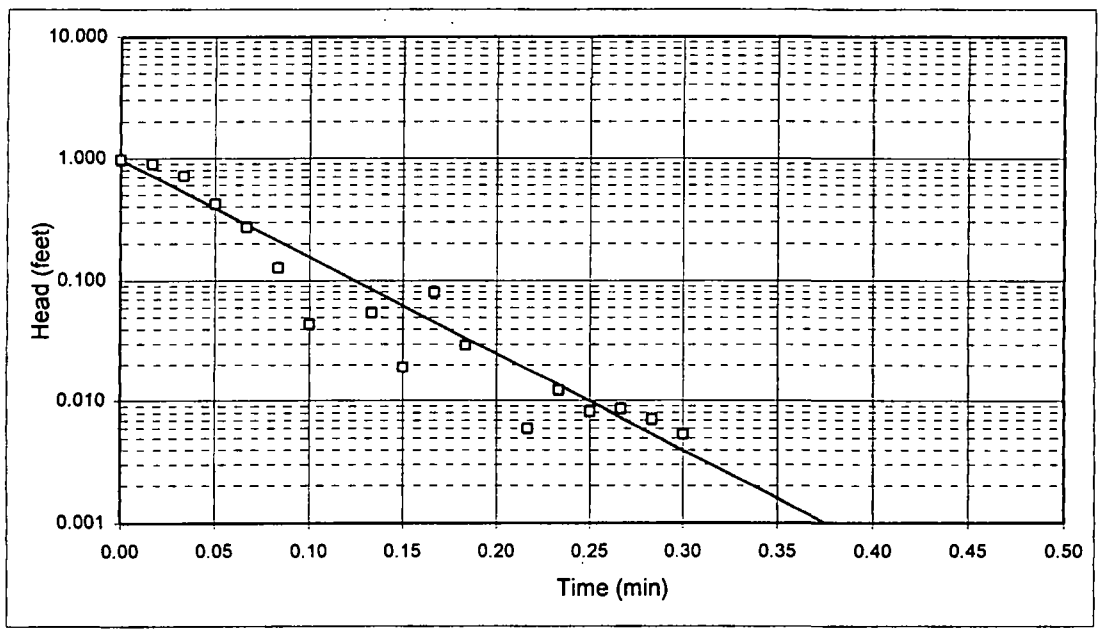
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	15	K=	5.08E-03	cm/sec
$\ln(R_e/r_w)$	2.35	K=	1.44E+01	ft/day
y_0 =	0.98			
y_t =	0.00			
t =	0.38			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

RISING HEAD TEST PZ-113-AS

WELL NO. PZ-113-AS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	9.9	FEET H_2O
INITIAL DEPTH TO WATER	26.27	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	26.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	41.5	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	15.23	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.53	FEET
MAX. HEAD IN SCREEN?	Y	

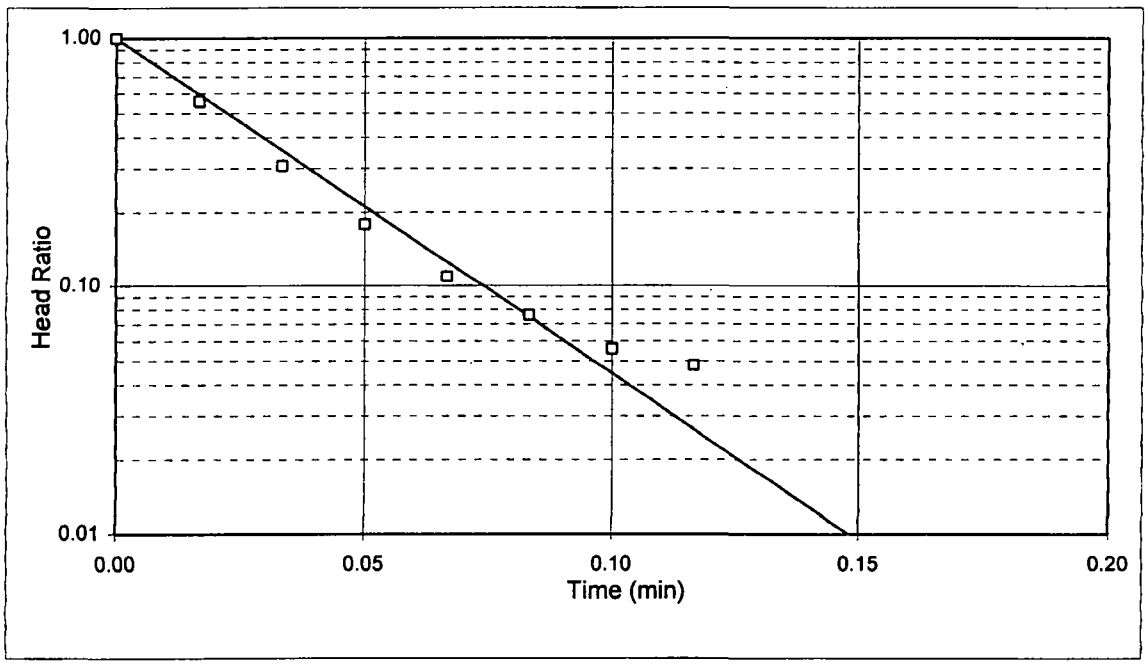
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1449	2	8.3689	0.00	27.80	1.53	1.00
1995	206	1449	3	9.045	0.02	27.13	0.86	0.56
1995	206	1449	4	9.4283	0.03	26.74	0.47	0.31
1995	206	1449	5	9.6252	0.05	26.54	0.27	0.18
1995	206	1449	6	9.732	0.07	26.44	0.17	0.11
1995	206	1449	7	9.7835	0.08	26.39	0.12	0.08
1995	206	1449	8	9.8142	0.10	26.36	0.09	0.06
1995	206	1449	9	9.8263	0.12	26.34	0.07	0.05

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-113-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	15	K=	1.38E-02	cm/sec
t_1 (min) =	0	K=	3.91E+01	ft/day
t_2 (min) =	0.15			
h_1/h_0 =	1.00			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

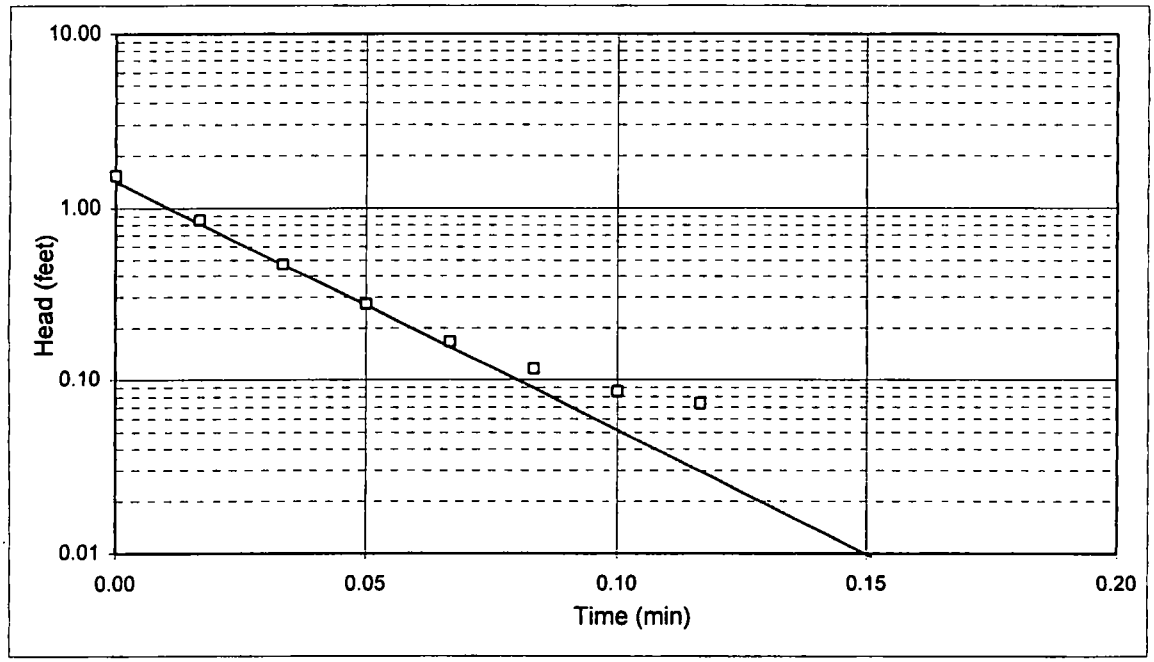
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-113-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
r_w =	0.34			
L_e =	15	K=	5.31E-02	cm/sec
$\ln(R_e/r_w)$	2.35	K=	1.51E+02	ft/day
y_0 =	1.41			
y_t =	0.01			
t =	0.15			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-AD (TEST 1)

WELL NO.	PZ-113-AD (TEST 1)	
DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	15.28	FEET H_2O
INITIAL DEPTH TO WATER	26.33	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	90.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	110.3	FEET (btoc)
SATURATED THICKNESS	85	FEET
WATER TABLE TO BOTTOM OF SCREEN	83.97	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	19.6	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.37	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1404	2	16.649	0.00	24.96	1.37	1.00
1995	206	1404	3	15.649	0.02	25.96	0.37	0.27
1995	206	1404	4	15.688	0.03	25.92	0.41	0.30
1995	206	1404	5	14.46	0.05	25.51	0.82	0.60
1995	206	1404	6	14.767	0.07	25.82	0.51	0.37
1995	206	1404	7	14.47	0.08	25.52	0.81	0.59
1995	206	1404	8	14.736	0.10	25.79	0.54	0.40
1995	206	1404	9	15.135	0.12	26.19	0.15	0.11
1995	206	1404	10	15.514	0.13	26.10	0.23	0.17
1995	206	1404	11	15.75	0.15	25.86	0.47	0.34
1995	206	1404	12	15.801	0.17	25.81	0.52	0.38
1995	206	1404	13	15.681	0.18	25.93	0.40	0.29
1995	206	1404	14	15.451	0.20	26.16	0.17	0.12
1995	206	1404	15	15.204	0.22	26.25	0.08	0.06
1995	206	1404	16	15.007	0.23	26.06	0.27	0.20
1995	206	1404	17	14.941	0.25	25.99	0.34	0.25
1995	206	1404	18	14.985	0.27	26.04	0.30	0.22
1995	206	1404	19	15.126	0.28	26.18	0.15	0.11
1995	206	1404	21	15.422	0.32	26.19	0.14	0.10
1995	206	1404	22	15.5	0.33	26.11	0.22	0.16
1995	206	1404	23	15.494	0.35	26.12	0.21	0.16
1995	206	1404	24	15.417	0.37	26.19	0.14	0.10
1995	206	1404	27	15.147	0.42	26.20	0.13	0.10
1995	206	1404	28	15.136	0.43	26.19	0.14	0.11
1995	206	1404	29	15.17	0.45	26.22	0.11	0.08
1995	206	1404	30	15.237	0.47	26.29	0.04	0.03

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1404	31	15.305	0.48	26.31	0.02	0.02
1995	206	1404	32	15.356	0.50	26.25	0.08	0.06
1995	206	1404	33	15.372	0.52	26.24	0.09	0.07
1995	206	1404	34	15.358	0.53	26.25	0.08	0.06
1995	206	1404	35	15.317	0.55	26.29	0.04	0.03
1995	206	1404	36	15.272	0.57	26.32	0.01	0.01
1995	206	1404	37	15.235	0.58	26.29	0.05	0.03
1995	206	1404	38	15.215	0.60	26.27	0.06	0.05
1995	206	1404	39	15.219	0.62	26.27	0.06	0.04
1995	206	1404	40	15.239	0.63	26.29	0.04	0.03
1995	206	1404	41	15.269	0.65	26.32	0.01	0.01
1995	206	1404	42	15.298	0.67	26.31	0.02	0.01
1995	206	1404	43	15.314	0.68	26.30	0.03	0.02
1995	206	1404	44	15.318	0.70	26.29	0.04	0.03
1995	206	1404	45	15.305	0.72	26.31	0.02	0.02
1995	206	1404	46	15.285	0.73	26.33	0.01	0.00

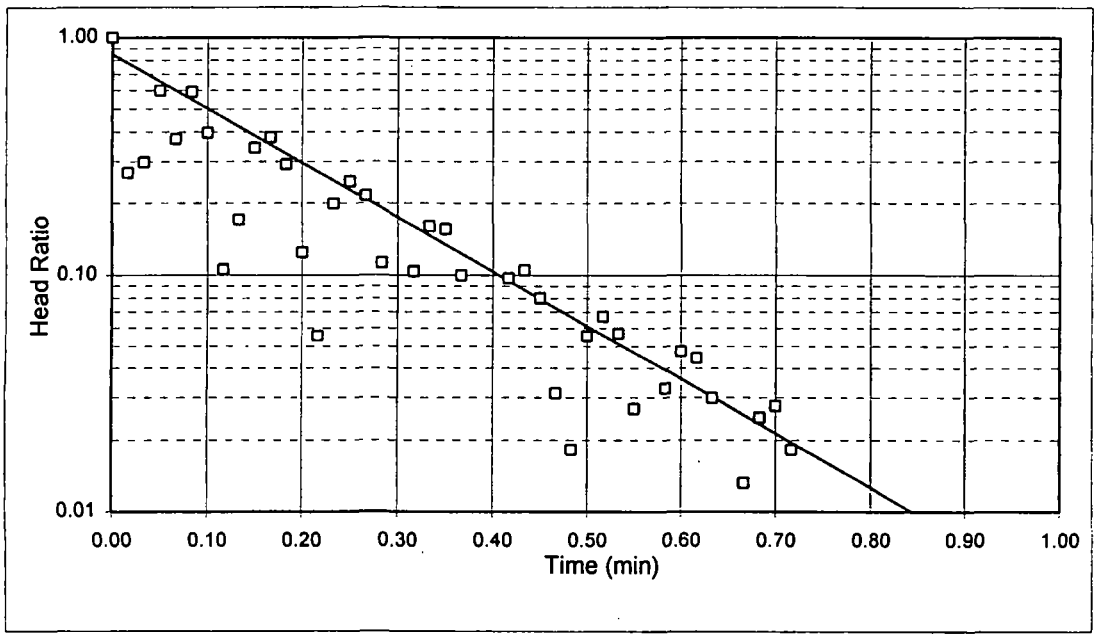
HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

85

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	19.6	K=	1.81E-03	cm/sec
t_1 (min) =	0	K=	5.14E+00	ft/day
t_2 (min) =	0.84			
h_1/h_0 =	0.85			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 1)

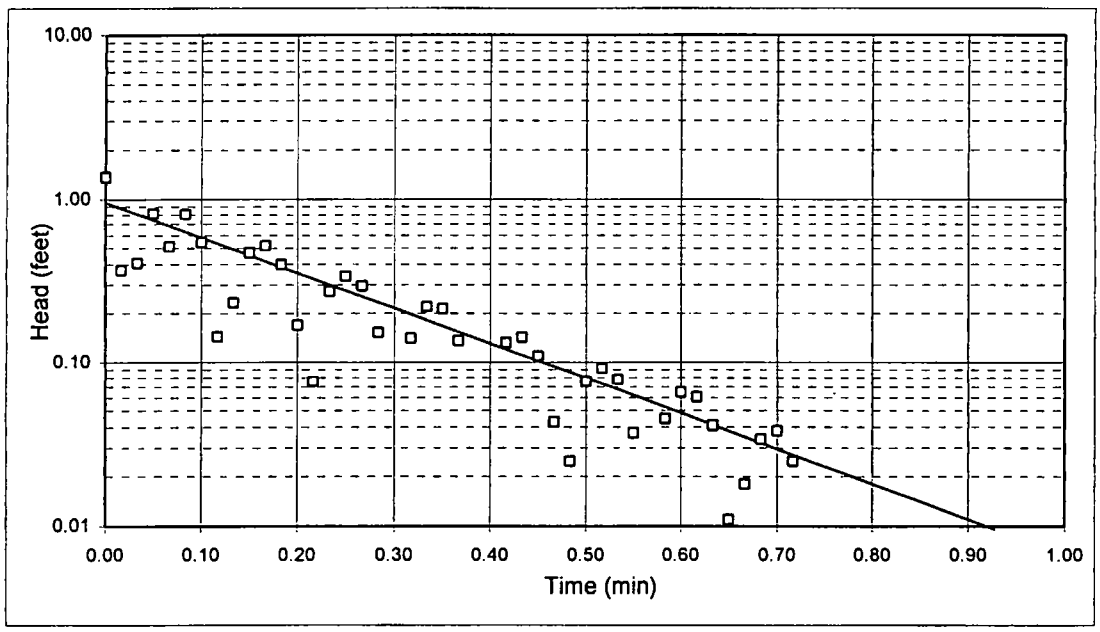
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

85

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.43			
L_e =	19.6	K=	1.49E-03	cm/sec
$\ln(R_e/r_w)$	3.35	K=	4.24E+00	ft/day
y_0 =	0.95			
y_t =	0.01			
t =	0.93			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-AD (TEST 2)

WELL NO.	PZ-113-AD (TEST 2)	
DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	15.28	FEET H_2O
INITIAL DEPTH TO WATER	26.33	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	90.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	110.3	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	83.97	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	19.6	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.20	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	1407	5	16.477	0.00	25.13	1.20	1.00
305	206	1407	6	16.289	0.02	25.32	1.01	0.84
305	206	1407	7	15.788	0.03	25.82	0.51	0.42
305	206	1407	8	15.155	0.05	26.21	0.13	0.10
305	206	1407	9	14.646	0.07	25.70	0.63	0.53
305	206	1407	10	14.418	0.08	25.47	0.86	0.72
305	206	1407	11	14.524	0.10	25.57	0.76	0.63
305	206	1407	12	14.877	0.12	25.93	0.40	0.34
305	206	1407	13	15.313	0.13	26.30	0.03	0.03
305	206	1407	14	15.668	0.15	25.94	0.39	0.32
305	206	1407	15	15.832	0.17	25.78	0.55	0.46
305	206	1407	16	15.777	0.18	25.83	0.50	0.42
305	206	1407	17	15.553	0.20	26.06	0.27	0.23
305	206	1407	18	15.25	0.22	26.30	0.03	0.03
305	206	1407	19	14.993	0.23	26.04	0.29	0.24
305	206	1407	20	14.86	0.25	25.91	0.42	0.35
305	206	1407	21	14.884	0.27	25.93	0.40	0.33
305	206	1407	22	15.032	0.28	26.08	0.25	0.21
305	206	1407	23	15.241	0.30	26.29	0.04	0.03
305	206	1407	24	15.427	0.32	26.18	0.15	0.12
305	206	1407	25	15.531	0.33	26.08	0.25	0.21
305	206	1407	26	15.526	0.35	26.08	0.25	0.21
305	206	1407	27	15.43	0.37	26.18	0.15	0.13
305	206	1407	28	15.287	0.38	26.32	0.01	0.01
305	206	1407	29	15.152	0.40	26.20	0.13	0.11
305	206	1407	30	15.073	0.42	26.12	0.21	0.17

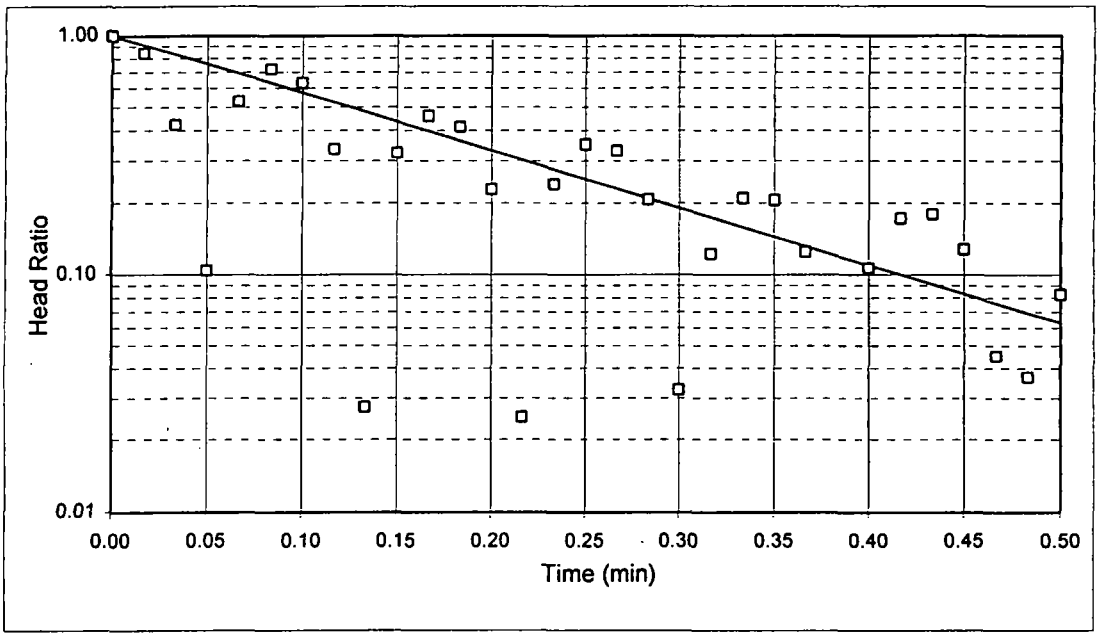
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	206	1407	31	15.065	0.43	26.12	0.22	0.18
305	206	1407	32	15.126	0.45	26.18	0.15	0.13
305	206	1407	33	15.226	0.47	26.28	0.05	0.05
305	206	1407	34	15.324	0.48	26.29	0.04	0.04
305	206	1407	35	15.379	0.50	26.23	0.10	0.08
305	206	1407	36	15.386	0.52	26.22	0.11	0.09
305	206	1407	37	15.346	0.53	26.26	0.07	0.06

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	19.6	K=	1.90E-03	cm/sec
t_1 (min) =	0	K=	5.39E+00	ft/day
t_2 (min) =	0.50			
h_1/h_0 =	1.00			
h_2/h_0 =	0.06			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

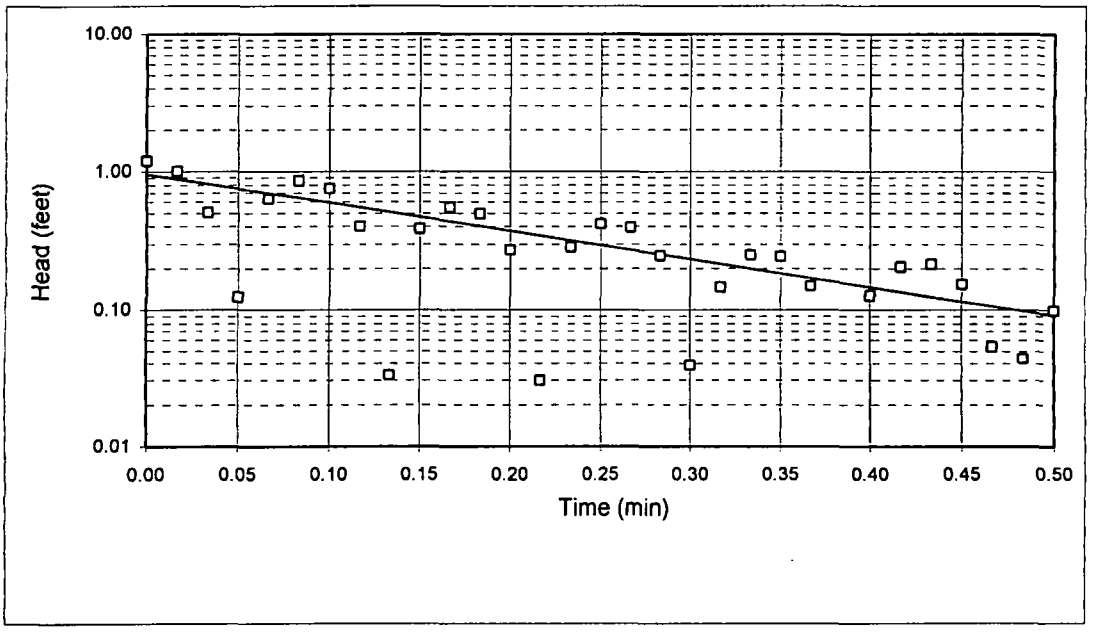
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-AD (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.43			
L_e =	19.6	K=	#N/A	cm/sec
$\ln(R_e/r_w)$	#N/A	K=	#N/A	ft/day
y_0 =	0.95			
y_t =	0.09			
t =	0.50			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-113-SS

WELL NO. PZ-113-SS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	15.008	FEET H_2O
INITIAL DEPTH TO WATER	26.61	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	146.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	160.8	FEET (btoc)
SATURATED THICKNESS	190	FEET
WATER TABLE TO BOTTOM OF SCREEN	134.19	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.83	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1117	35	18.834	0.00	22.78	3.83	1.00
1995	206	1117	37	18.248	0.03	23.37	3.24	0.85
1995	206	1117	39	18.23	0.07	23.39	3.22	0.84
1995	206	1117	41	18.226	0.10	23.39	3.22	0.84
1995	206	1117	43	18.225	0.13	23.39	3.22	0.84
1995	206	1117	45	18.226	0.17	23.39	3.22	0.84
1995	206	1117	47	18.228	0.20	23.39	3.22	0.84
1995	206	1117	49	18.224	0.23	23.39	3.22	0.84
1995	206	1117	51	18.223	0.27	23.40	3.22	0.84
1995	206	1117	53	18.224	0.30	23.39	3.22	0.84
1995	206	1117	55	18.225	0.33	23.39	3.22	0.84
1995	206	1117	57	18.224	0.37	23.39	3.22	0.84
1995	206	1117	59	18.224	0.40	23.39	3.22	0.84
1995	206	1118	1	18.223	0.43	23.40	3.22	0.84
1995	206	1118	3	18.224	0.47	23.39	3.22	0.84
1995	206	1118	5	18.224	0.50	23.39	3.22	0.84
1995	206	1118	8	18.223	0.55	23.40	3.22	0.84
1995	206	1118	10	18.222	0.58	23.40	3.21	0.84
1995	206	1118	12	18.223	0.62	23.40	3.22	0.84
1995	206	1118	14	18.223	0.65	23.40	3.22	0.84
1995	206	1118	16	18.224	0.68	23.39	3.22	0.84
1995	206	1118	18	18.222	0.72	23.40	3.21	0.84
1995	206	1118	20	18.222	0.75	23.40	3.21	0.84
1995	206	1118	22	18.222	0.78	23.40	3.21	0.84
1995	206	1118	24	18.221	0.82	23.40	3.21	0.84
1995	206	1118	26	18.222	0.85	23.40	3.21	0.84
1995	206	1118	28	18.221	0.88	23.40	3.21	0.84
1995	206	1118	30	18.219	0.92	23.40	3.21	0.84
1995	206	1118	32	18.221	0.95	23.40	3.21	0.84
1995	206	1118	34	18.22	0.98	23.40	3.21	0.84
1995	206	1118	36	18.221	1.02	23.40	3.21	0.84
1995	206	1118	38	18.219	1.05	23.40	3.21	0.84
1995	206	1118	40	18.218	1.08	23.40	3.21	0.84
1995	206	1118	42	18.219	1.12	23.40	3.21	0.84

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1118	44	18.22	1.15	23.40	3.21	0.84
1995	206	1118	46	18.218	1.18	23.40	3.21	0.84
1995	206	1118	48	18.219	1.22	23.40	3.21	0.84
1995	206	1118	50	18.216	1.25	23.40	3.21	0.84
1995	206	1118	52	18.219	1.28	23.40	3.21	0.84
1995	206	1118	54	18.219	1.32	23.40	3.21	0.84
1995	206	1118	56	18.222	1.35	23.40	3.21	0.84
1995	206	1118	58	18.219	1.38	23.40	3.21	0.84
1995	206	1119	0	18.217	1.42	23.40	3.21	0.84
1995	206	1119	10	18.215	1.58	23.40	3.21	0.84
1995	206	1119	20	18.213	1.75	23.41	3.21	0.84
1995	206	1119	30	18.211	1.92	23.41	3.20	0.84
1995	206	1119	40	18.21	2.08	23.41	3.20	0.84
1995	206	1119	50	18.205	2.25	23.41	3.20	0.84
1995	206	1120	0	18.202	2.42	23.42	3.19	0.83
1995	206	1120	10	18.202	2.58	23.42	3.19	0.83
1995	206	1120	20	18.197	2.75	23.42	3.19	0.83
1995	206	1120	30	18.196	2.92	23.42	3.19	0.83
1995	206	1120	40	18.189	3.08	23.43	3.18	0.83
1995	206	1120	50	18.184	3.25	23.43	3.18	0.83
1995	206	1121	0	18.184	3.42	23.43	3.18	0.83
1995	206	1121	10	18.181	3.58	23.44	3.17	0.83
1995	206	1121	20	18.173	3.75	23.45	3.17	0.83
1995	206	1121	30	18.168	3.92	23.45	3.16	0.83
1995	206	1122	0	18.159	4.42	23.46	3.15	0.82
1995	206	1123	0	18.127	5.42	23.49	3.12	0.82
1995	206	1124	0	18.092	6.42	23.53	3.08	0.81
1995	206	1125	0	18.055	7.42	23.56	3.05	0.80
1995	206	1126	0	18.046	8.42	23.57	3.04	0.79
1995	206	1127	0	18.011	9.42	23.61	3.00	0.78
1995	206	1128	0	17.981	10.42	23.64	2.97	0.78
1995	206	1129	0	17.946	11.42	23.67	2.94	0.77
1995	206	1130	0	17.913	12.42	23.71	2.91	0.76
1995	206	1131	0	17.884	13.42	23.73	2.88	0.75
1995	206	1132	0	17.848	14.42	23.77	2.84	0.74
1995	206	1133	0	17.817	15.42	23.80	2.81	0.73
1995	206	1134	0	17.786	16.42	23.83	2.78	0.73
1995	206	1135	0	17.754	17.42	23.86	2.75	0.72
1995	206	1136	0	17.725	18.42	23.89	2.72	0.71
1995	206	1137	0	17.695	19.42	23.92	2.69	0.70
1995	206	1138	0	17.66	20.42	23.96	2.65	0.69
1995	206	1139	0	17.634	21.42	23.98	2.63	0.69
1995	206	1140	0	17.603	22.42	24.02	2.60	0.68
1995	206	1141	0	17.574	23.42	24.04	2.57	0.67
1995	206	1142	0	17.546	24.42	24.07	2.54	0.66
1995	206	1143	0	17.515	25.42	24.10	2.51	0.66
1995	206	1144	0	17.488	26.42	24.13	2.48	0.65
1995	206	1145	0	17.462	27.42	24.16	2.45	0.64
1995	206	1146	0	17.433	28.42	24.19	2.43	0.63
1995	206	1147	0	17.406	29.42	24.21	2.40	0.63
1995	206	1148	0	17.378	30.42	24.24	2.37	0.62
1995	206	1149	0	17.35	31.42	24.27	2.34	0.61
1995	206	1150	0	17.322	32.42	24.30	2.31	0.60

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1151	0	17.298	33.42	24.32	2.29	0.60
1995	206	1152	0	17.273	34.42	24.35	2.27	0.59
1995	206	1153	0	17.244	35.42	24.37	2.24	0.58
1995	206	1154	0	17.217	36.42	24.40	2.21	0.58
1995	206	1155	0	17.194	37.42	24.42	2.19	0.57
1995	206	1156	0	17.168	38.42	24.45	2.16	0.56
1995	206	1157	0	17.144	39.42	24.47	2.14	0.56
1995	206	1158	0	17.123	40.42	24.50	2.12	0.55
1995	206	1159	0	17.099	41.42	24.52	2.09	0.55
1995	206	1200	0	17.074	42.42	24.54	2.07	0.54
1995	206	1201	0	17.052	43.42	24.57	2.04	0.53
1995	206	1202	0	17.031	44.42	24.59	2.02	0.53
1995	206	1203	0	17.008	45.42	24.61	2.00	0.52
1995	206	1204	0	16.987	46.42	24.63	1.98	0.52
1995	206	1205	0	16.965	47.42	24.65	1.96	0.51
1995	206	1206	0	16.943	48.42	24.68	1.94	0.51
1995	206	1207	0	16.922	49.42	24.70	1.91	0.50
1995	206	1208	0	16.898	50.42	24.72	1.89	0.49
1995	206	1209	0	16.879	51.42	24.74	1.87	0.49
1995	206	1210	0	16.86	52.42	24.76	1.85	0.48
1995	206	1211	0	16.841	53.42	24.78	1.83	0.48
1995	206	1212	0	16.82	54.42	24.80	1.81	0.47
1995	206	1213	0	16.8	55.42	24.82	1.79	0.47
1995	206	1214	0	16.781	56.42	24.84	1.77	0.46
1995	206	1215	0	16.764	57.42	24.85	1.76	0.46
1995	206	1216	0	16.745	58.42	24.87	1.74	0.45
1995	206	1217	0	16.726	59.42	24.89	1.72	0.45
1995	206	1218	0	16.709	60.42	24.91	1.70	0.44
1995	206	1219	0	16.691	61.42	24.93	1.68	0.44
1995	206	1220	0	16.672	62.42	24.95	1.66	0.43
1995	206	1221	0	16.654	63.42	24.96	1.65	0.43
1995	206	1222	0	16.634	64.42	24.98	1.63	0.42
1995	206	1223	0	16.617	65.42	25.00	1.61	0.42
1995	206	1224	0	16.599	66.42	25.02	1.59	0.42
1995	206	1225	0	16.584	67.42	25.03	1.58	0.41
1995	206	1226	0	16.569	68.42	25.05	1.56	0.41
1995	206	1227	0	16.551	69.42	25.07	1.54	0.40
1995	206	1228	0	16.537	70.42	25.08	1.53	0.40
1995	206	1229	0	16.517	71.42	25.10	1.51	0.39
1995	206	1230	0	16.504	72.42	25.11	1.50	0.39
1995	206	1231	0	16.487	73.42	25.13	1.48	0.39
1995	206	1232	0	16.47	74.42	25.15	1.46	0.38
1995	206	1233	0	16.453	75.42	25.17	1.45	0.38
1995	206	1234	0	16.437	76.42	25.18	1.43	0.37
1995	206	1235	0	16.425	77.42	25.19	1.42	0.37
1995	206	1236	0	16.411	78.42	25.21	1.40	0.37
1995	206	1237	0	16.397	79.42	25.22	1.39	0.36
1995	206	1238	0	16.38	80.42	25.24	1.37	0.36
1995	206	1239	0	16.367	81.42	25.25	1.36	0.36
1995	206	1240	0	16.352	82.42	25.27	1.34	0.35
1995	206	1241	0	16.338	83.42	25.28	1.33	0.35
1995	206	1242	0	16.325	84.42	25.29	1.32	0.34
1995	206	1243	0	16.313	85.42	25.31	1.31	0.34

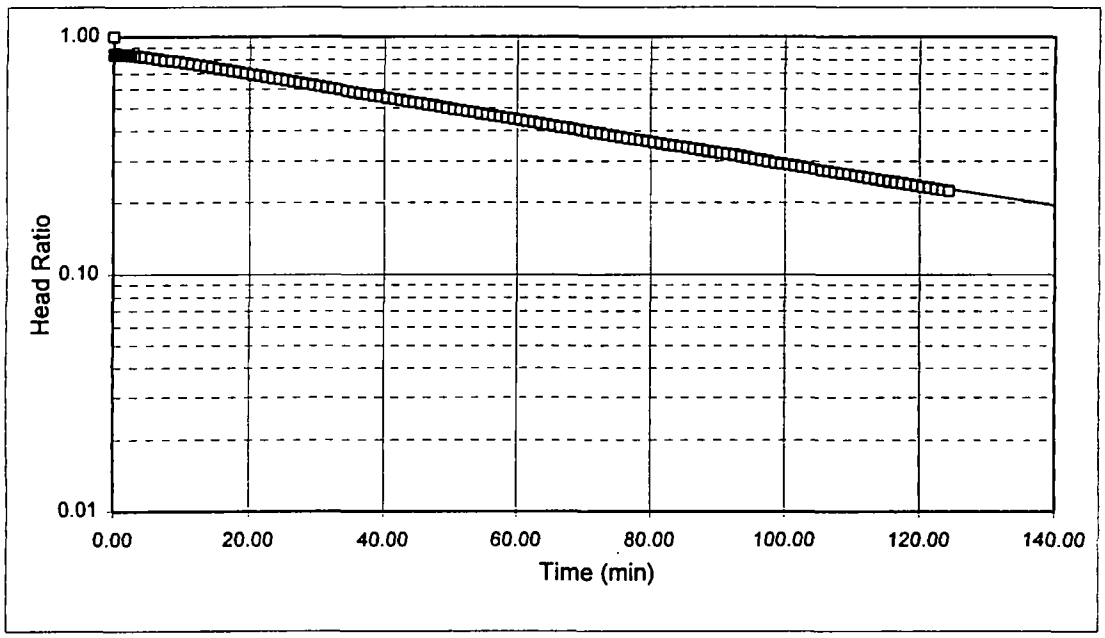
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1244	0	16.298	86.42	25.32	1.29	0.34
1995	206	1245	0	16.285	87.42	25.33	1.28	0.33
1995	206	1246	0	16.27	88.42	25.35	1.26	0.33
1995	206	1247	0	16.257	89.42	25.36	1.25	0.33
1995	206	1248	0	16.246	90.42	25.37	1.24	0.32
1995	206	1249	0	16.234	91.42	25.38	1.23	0.32
1995	206	1250	0	16.222	92.42	25.40	1.21	0.32
1995	206	1251	0	16.206	93.42	25.41	1.20	0.31
1995	206	1252	0	16.193	94.42	25.43	1.19	0.31
1995	206	1253	0	16.179	95.42	25.44	1.17	0.31
1995	206	1254	0	16.166	96.42	25.45	1.16	0.30
1995	206	1255	0	16.152	97.42	25.47	1.14	0.30
1995	206	1256	0	16.137	98.42	25.48	1.13	0.30
1995	206	1257	0	16.129	99.42	25.49	1.12	0.29
1995	206	1258	0	16.117	100.42	25.50	1.11	0.29
1995	206	1259	0	16.106	101.42	25.51	1.10	0.29
1995	206	1300	0	16.095	102.42	25.52	1.09	0.28
1995	206	1301	0	16.083	103.42	25.54	1.08	0.28
1995	206	1302	0	16.071	104.42	25.55	1.06	0.28
1995	206	1303	0	16.06	105.42	25.56	1.05	0.27
1995	206	1304	0	16.051	106.42	25.57	1.04	0.27
1995	206	1305	0	16.036	107.42	25.58	1.03	0.27
1995	206	1306	0	16.028	108.42	25.59	1.02	0.27
1995	206	1307	0	16.02	109.42	25.60	1.01	0.26
1995	206	1308	0	16.007	110.42	25.61	1.00	0.26
1995	206	1309	0	15.995	111.42	25.62	0.99	0.26
1995	206	1310	0	15.983	112.42	25.64	0.98	0.25
1995	206	1311	0	15.975	113.42	25.64	0.97	0.25
1995	206	1312	0	15.964	114.42	25.65	0.96	0.25
1995	206	1313	0	15.955	115.42	25.66	0.95	0.25
1995	206	1314	0	15.946	116.42	25.67	0.94	0.25
1995	206	1315	0	15.936	117.42	25.68	0.93	0.24
1995	206	1316	0	15.925	118.42	25.69	0.92	0.24
1995	206	1317	0	15.917	119.42	25.70	0.91	0.24
1995	206	1318	0	15.905	120.42	25.71	0.90	0.23
1995	206	1319	0	15.896	121.42	25.72	0.89	0.23
1995	206	1320	0	15.886	122.42	25.73	0.88	0.23
1995	206	1321	0	15.878	123.42	25.74	0.87	0.23
1995	206	1322	0	15.87	124.42	25.75	0.86	0.23

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.5	K=	5.24E-06	cm/sec
t_1 (min) =	9.42	K=	1.49E-02	ft/day
t_2 (min) =	140.00			
h_1/h_0 =	0.78			
h_2/h_0 =	0.19			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

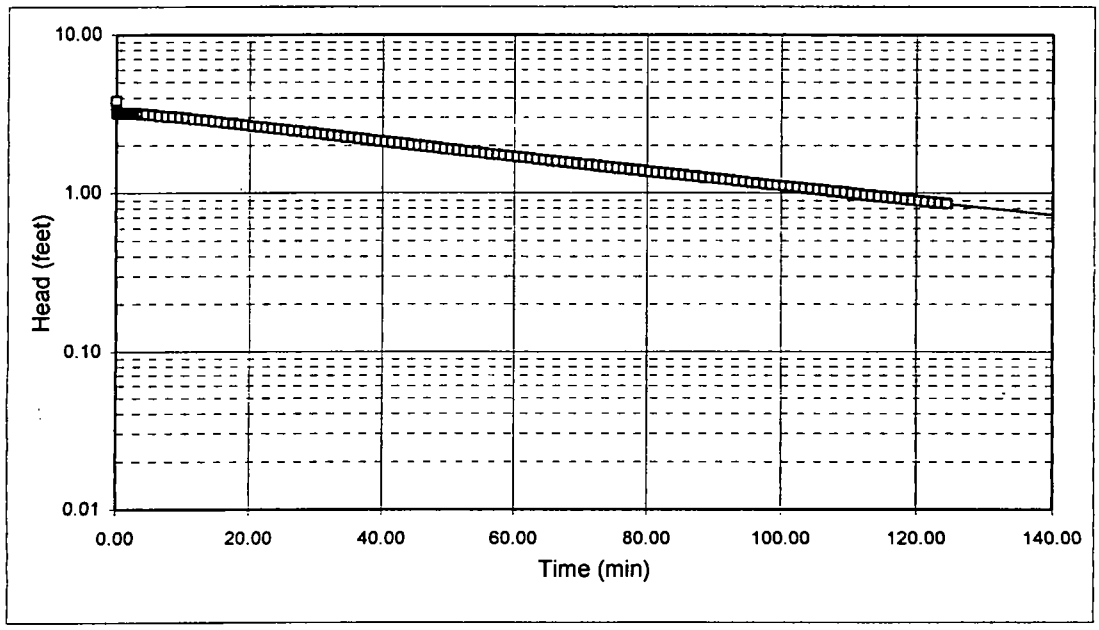
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-113-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.5	K=	4.86E-06	cm/sec
$\ln(R_e/r_w)$	3.80	K=	1.38E-02	ft/day
y_0 =	3.16			
y_t =	0.72			
t =	140.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-114-AS (TEST 1)

WELL NO.	PZ-114-AS (TEST 1)	
DATE		
INITAL HEAD ON TRANSDUCER	10.02	FEET H_2O
INITIAL DEPTH TO WATER	12.07	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	18.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	32.0	FEET (btoc)
SATURATED THICKNESS	40	FEET
WATER TABLE TO BOTTOM OF SCREEN	19.9	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	13.7	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	5.20	FEET
MAX. HEAD IN SCREEN?	N	

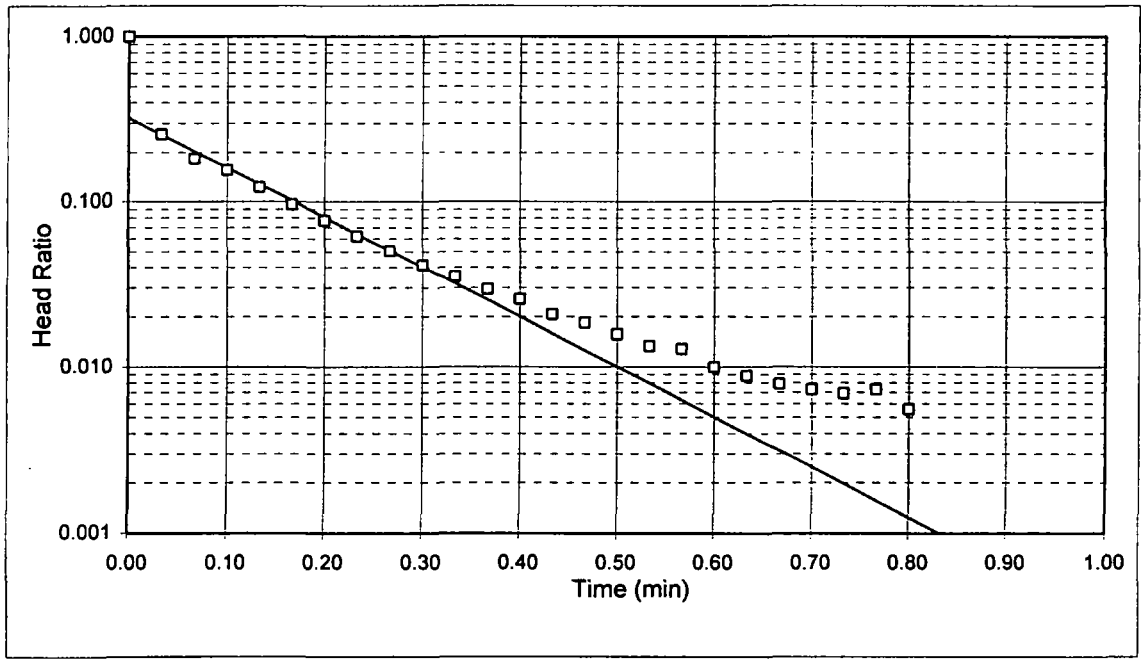
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	172	940	16	15.217	0.00	6.87	5.20	1.000
1995	172	940	18	11.364	0.03	10.73	1.34	0.259
1995	172	940	20	10.974	0.07	11.12	0.95	0.184
1995	172	940	22	10.832	0.10	11.26	0.81	0.156
1995	172	940	24	10.658	0.13	11.43	0.64	0.123
1995	172	940	26	10.519	0.17	11.57	0.50	0.096
1995	172	940	28	10.421	0.20	11.67	0.40	0.077
1995	172	940	30	10.343	0.23	11.75	0.32	0.062
1995	172	940	32	10.283	0.27	11.81	0.26	0.051
1995	172	940	34	10.235	0.30	11.86	0.22	0.041
1995	172	940	36	10.203	0.33	11.89	0.18	0.035
1995	172	940	38	10.173	0.37	11.92	0.15	0.029
1995	172	940	40	10.153	0.40	11.94	0.13	0.026
1995	172	940	42	10.128	0.43	11.96	0.11	0.021
1995	172	940	44	10.116	0.47	11.97	0.10	0.018
1995	172	940	46	10.102	0.50	11.99	0.08	0.016
1995	172	940	48	10.09	0.53	12.00	0.07	0.013
1995	172	940	50	10.087	0.57	12.00	0.07	0.013
1995	172	940	52	10.072	0.60	12.02	0.05	0.010
1995	172	940	54	10.066	0.63	12.02	0.05	0.009
1995	172	940	56	10.061	0.67	12.03	0.04	0.008
1995	172	940	58	10.058	0.70	12.03	0.04	0.007
1995	172	941	0	10.056	0.73	12.03	0.04	0.007
1995	172	941	2	10.058	0.77	12.03	0.04	0.007
1995	172	941	4	10.049	0.80	12.04	0.03	0.006

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	13.7	K=	3.10E-03	cm/sec
t_1 (min) =	0	K=	8.79E+00	ft/day
t_2 (min) =	0.83			
h_1/h_0 =	0.32			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

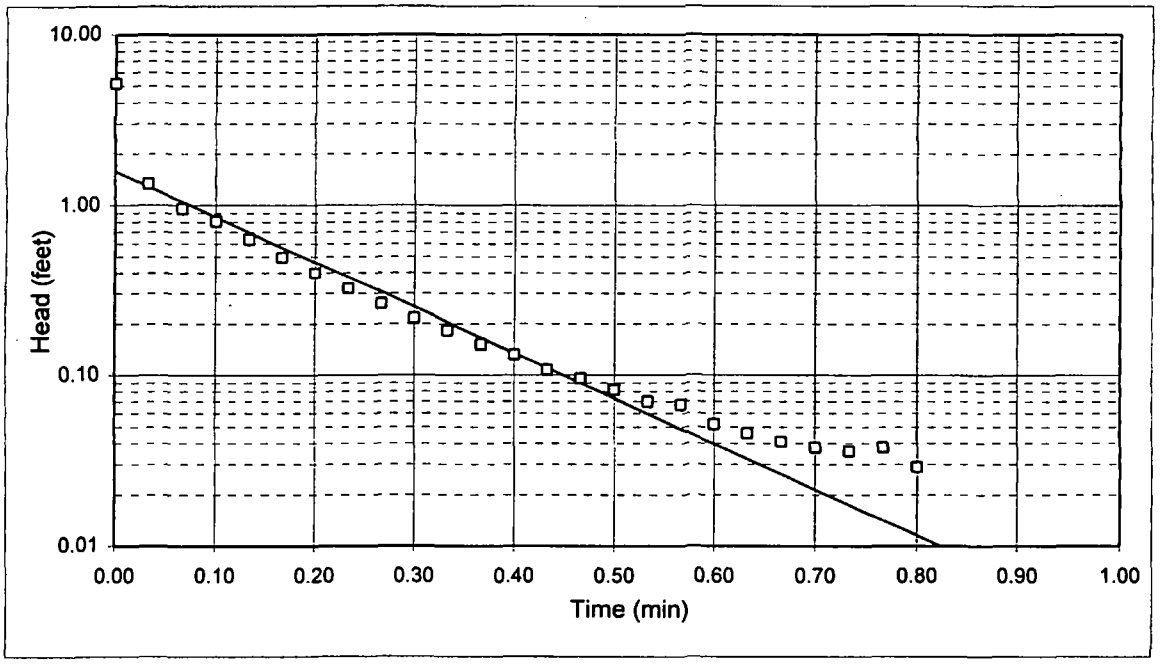
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.43			
L_e =	13.7	K=	1.69E-03	cm/sec
$\ln(R_e/r_w)$	2.14	K=	4.79E+00	ft/day
y_0 =	1.58			
y_t =	0.01			
t =	0.82			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-114-AS (TEST 2)

WELL NO.	PZ-114-AS (TEST 2)	
DATE	6/21/95	
INITAL HEAD ON TRANSDUCER	10.02	FEET H_2O
INITIAL DEPTH TO WATER	12.07	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	18.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	32.0	FEET (btoc)
SATURATED THICKNESS	40	FEET
WATER TABLE TO BOTTOM OF SCREEN	19.9	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	13.7	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	5.07	FEET
MAX. HEAD IN SCREEN?	N	

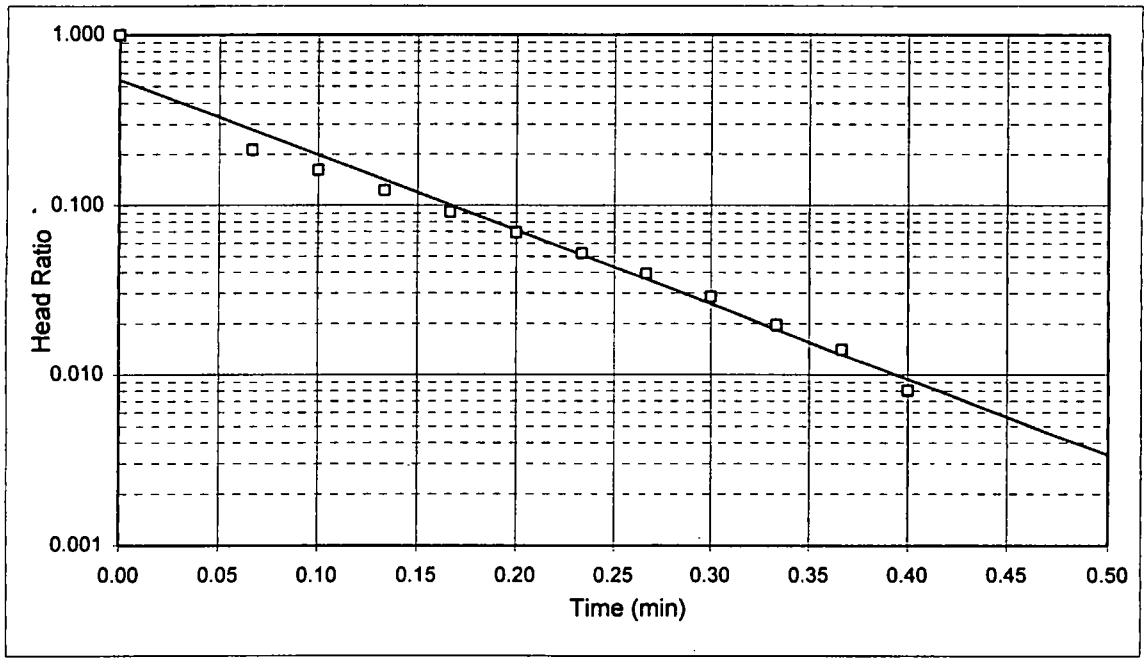
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	172	944	8	15.094	0.00	7.00	5.07	1.000
1995	172	944	12	11.099	0.07	10.99	1.08	0.213
1995	172	944	14	10.84	0.10	11.25	0.82	0.162
1995	172	944	16	10.643	0.13	11.45	0.62	0.123
1995	172	944	18	10.486	0.17	11.60	0.47	0.092
1995	172	944	20	10.373	0.20	11.72	0.35	0.070
1995	172	944	22	10.286	0.23	11.80	0.27	0.052
1995	172	944	24	10.22	0.27	11.87	0.20	0.039
1995	172	944	26	10.165	0.30	11.93	0.15	0.029
1995	172	944	28	10.12	0.33	11.97	0.10	0.020
1995	172	944	30	10.092	0.37	12.00	0.07	0.014
1995	172	944	32	10.061	0.40	12.03	0.04	0.008

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	13.7	K=	4.54E-03	cm/sec
t_1 (min) =	0	K=	1.29E+01	ft/day
t_2 (min) =	0.50			
h_1/h_0 =	0.55			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

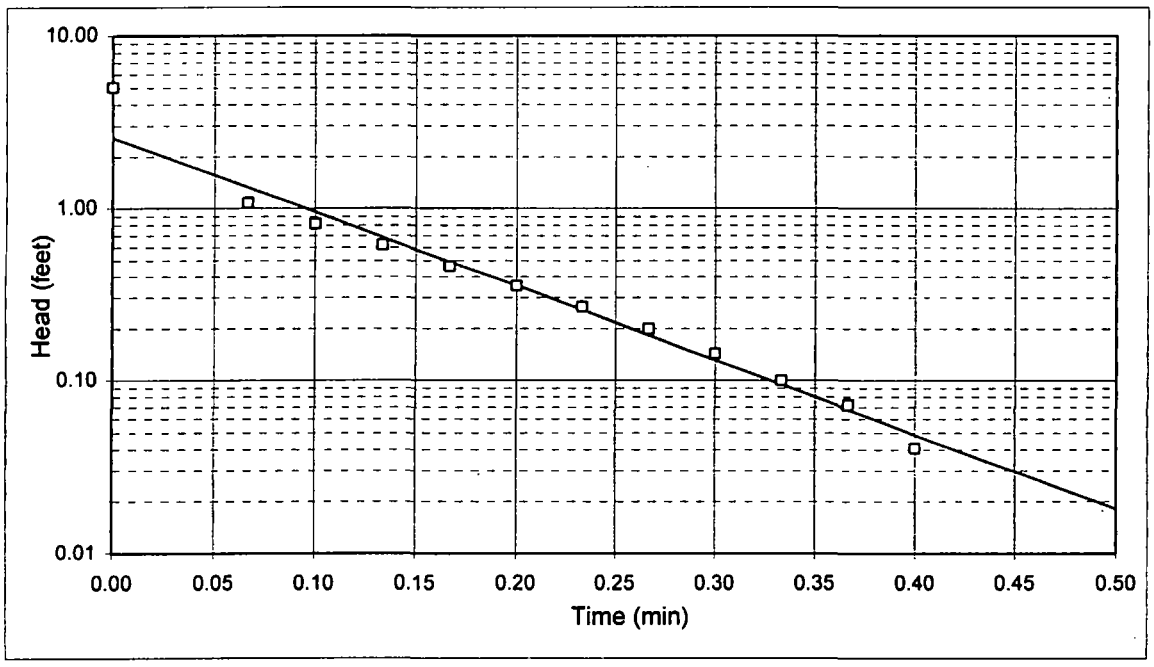
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-114-AS (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.43			
L_e =	13.7	K=	2.72E-03	cm/sec
$\ln(R_e/r_w)$	2.14	K=	7.72E+00	ft/day
y_0 =	2.57			
y_t =	0.02			
t =	0.50			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/21/95

Analysis By: DSL
Checked By: CVK
Analysis Date: 10/11/95

FALLING HEAD TEST PZ-115-SS

WELL NO. PZ-115-SS

DATE	6/22/95	
INITAL HEAD ON TRANSDUCER	14.99	FEET H_2O
INITIAL DEPTH TO WATER	25.14	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	72.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	86.7	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	61.56	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.72	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	173	852	30	18.706	0.00	21.42	3.72	1.00
1995	173	852	40	18.191	0.17	21.94	3.20	0.86
1995	173	853	20	17.883	0.83	22.25	2.89	0.78
1995	173	853	30	17.836	1.00	22.29	2.85	0.77
1995	173	853	40	17.797	1.17	22.33	2.81	0.76
1995	173	853	50	17.759	1.33	22.37	2.77	0.75
1995	173	854	0	17.726	1.50	22.40	2.74	0.74
1995	173	854	10	17.689	1.67	22.44	2.70	0.73
1995	173	854	20	17.654	1.83	22.48	2.66	0.72
1995	173	854	30	17.623	2.00	22.51	2.63	0.71
1995	173	854	40	17.592	2.17	22.54	2.60	0.70
1995	173	854	50	17.562	2.33	22.57	2.57	0.69
1995	173	855	0	17.532	2.50	22.60	2.54	0.68
1995	173	855	10	17.499	2.67	22.63	2.51	0.68
1995	173	855	20	17.469	2.83	22.66	2.48	0.67
1995	173	855	30	17.442	3.00	22.69	2.45	0.66
1995	173	855	40	17.415	3.17	22.72	2.43	0.65
1995	173	855	50	17.388	3.33	22.74	2.40	0.65
1995	173	856	0	17.364	3.50	22.77	2.37	0.64
1995	173	856	10	17.336	3.67	22.79	2.35	0.63
1995	173	856	30	17.283	4.00	22.85	2.29	0.62
1995	173	857	0	17.21	4.50	22.92	2.22	0.60
1995	173	857	30	17.133	5.00	23.00	2.14	0.58
1995	173	858	0	17.068	5.50	23.06	2.08	0.56
1995	173	858	30	17.002	6.00	23.13	2.01	0.54
1995	173	859	0	16.942	6.50	23.19	1.95	0.53
1995	173	859	30	16.885	7.00	23.25	1.90	0.51

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	173	900	0	16.831	7.50	23.30	1.84	0.50
1995	173	900	30	16.778	8.00	23.35	1.79	0.48
1995	173	901	0	16.728	8.50	23.40	1.74	0.47
1995	173	901	30	16.68	9.00	23.45	1.69	0.45
1995	173	902	0	16.632	9.50	23.50	1.64	0.44
1995	173	902	30	16.589	10.00	23.54	1.60	0.43
1995	173	903	0	16.547	10.50	23.58	1.56	0.42
1995	173	903	30	16.507	11.00	23.62	1.52	0.41
1995	173	904	0	16.468	11.50	23.66	1.48	0.40
1995	173	905	0	16.392	12.50	23.74	1.40	0.38
1995	173	910	0	16.1	17.50	24.03	1.11	0.30
1995	173	915	0	15.903	22.50	24.23	0.91	0.25
1995	173	920	0	15.772	27.50	24.36	0.78	0.21
1995	173	925	0	15.683	32.50	24.45	0.69	0.19
1995	173	930	0	15.622	37.50	24.51	0.63	0.17
1995	173	935	0	15.582	42.50	24.55	0.59	0.16
1995	173	940	0	15.55	47.50	24.58	0.56	0.15
1995	173	945	0	15.523	52.50	24.61	0.53	0.14
1995	173	950	0	15.504	57.50	24.63	0.51	0.14
1995	173	955	0	15.491	62.50	24.64	0.50	0.13
1995	173	1000	0	15.475	67.50	24.66	0.48	0.13
1995	173	1005	0	15.463	72.50	24.67	0.47	0.13
1995	173	1010	0	15.452	77.50	24.68	0.46	0.12
1995	173	1015	0	15.441	82.50	24.69	0.45	0.12
1995	173	1020	0	15.433	87.50	24.70	0.44	0.12
1995	173	1025	0	15.422	92.50	24.71	0.43	0.12
1995	173	1030	0	15.412	97.50	24.72	0.42	0.11
1995	173	1035	0	15.407	102.50	24.72	0.42	0.11
1995	173	1040	0	15.399	107.50	24.73	0.41	0.11
1995	173	1045	0	15.392	112.50	24.74	0.40	0.11
1995	173	1050	0	15.386	117.50	24.74	0.40	0.11
1995	173	1055	0	15.379	122.50	24.75	0.39	0.10
1995	173	1100	0	15.37	127.50	24.76	0.38	0.10
1995	173	1105	0	15.366	132.50	24.76	0.38	0.10
1995	173	1110	0	15.359	137.50	24.77	0.37	0.10
1995	173	1115	0	15.354	142.50	24.78	0.36	0.10
1995	173	1120	0	15.346	147.50	24.78	0.36	0.10
1995	173	1125	0	15.339	152.50	24.79	0.35	0.09
1995	173	1130	0	15.336	157.50	24.79	0.35	0.09
1995	173	1135	0	15.331	162.50	24.80	0.34	0.09
1995	173	1140	0	15.327	167.50	24.80	0.34	0.09
1995	173	1145	0	15.32	172.50	24.81	0.33	0.09
1995	173	1150	0	15.314	177.50	24.82	0.32	0.09
1995	173	1155	0	15.31	182.50	24.82	0.32	0.09
1995	173	1200	0	15.305	187.50	24.83	0.31	0.08

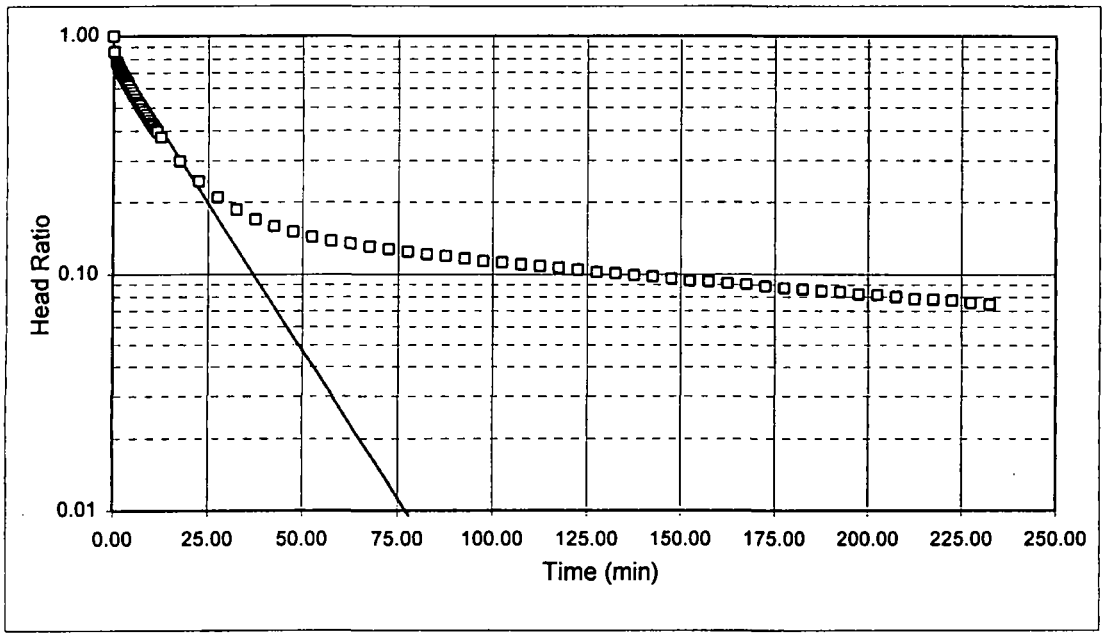
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	173	1205	0	15.302	192.50	24.83	0.31	0.08
1995	173	1210	0	15.296	197.50	24.83	0.31	0.08
1995	173	1215	0	15.294	202.50	24.84	0.30	0.08
1995	173	1220	0	15.288	207.50	24.84	0.30	0.08
1995	173	1225	0	15.282	212.50	24.85	0.29	0.08
1995	173	1230	0	15.281	217.50	24.85	0.29	0.08
1995	173	1235	0	15.278	222.50	24.85	0.29	0.08
1995	173	1240	0	15.272	227.50	24.86	0.28	0.08
1995	173	1245	0	15.267	232.50	24.86	0.28	0.07

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-115-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14	K=	2.91E-05	cm/sec
t_1 (min) =	1.17	K=	8.24E-02	ft/day
t_2 (min) =	78.30			
h_1/h_0 =	0.78			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/22/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

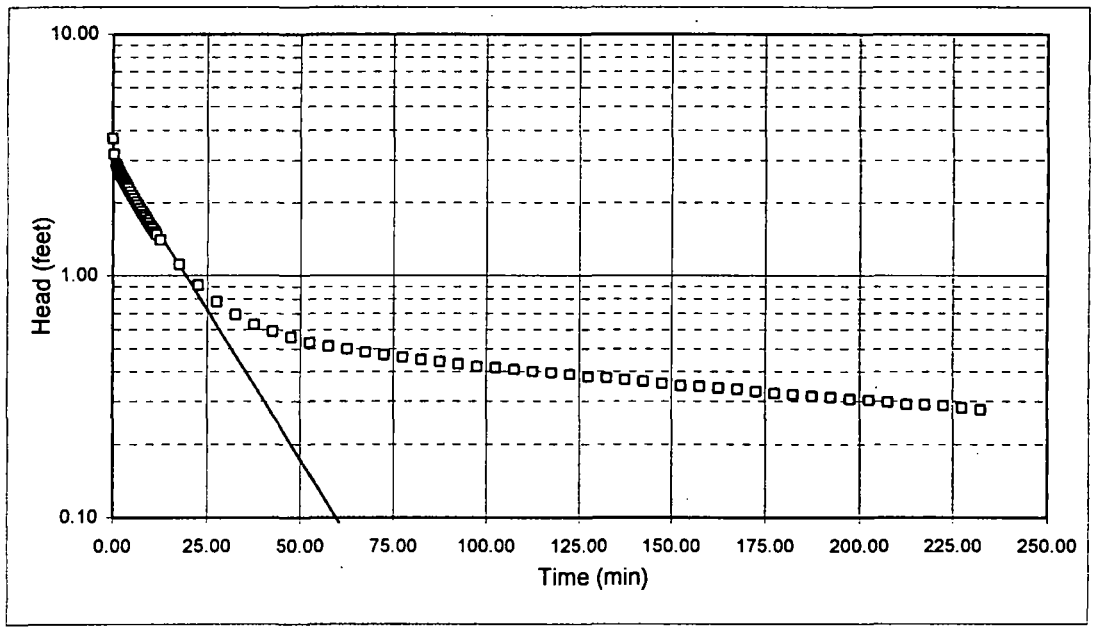
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-115-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14	K=	2.40E-05	cm/sec
$\ln(R_e/r_w)$	3.38	K=	6.81E-02	ft/day
y_0 =	2.84			
y_t =	0.01			
t =	99.20			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/22/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-116-SS

WELL NO. PZ-116-SS

DATE	7/24/95	
INITIAL DEPTH TO WATER	138.08	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	148.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	163.8	FEET (btoc)
SATURATED THICKNESS	80	FEET
WATER TABLE TO BOTTOM OF SCREEN	25.72	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.93	FEET
MAX. HEAD IN SCREEN?	N	

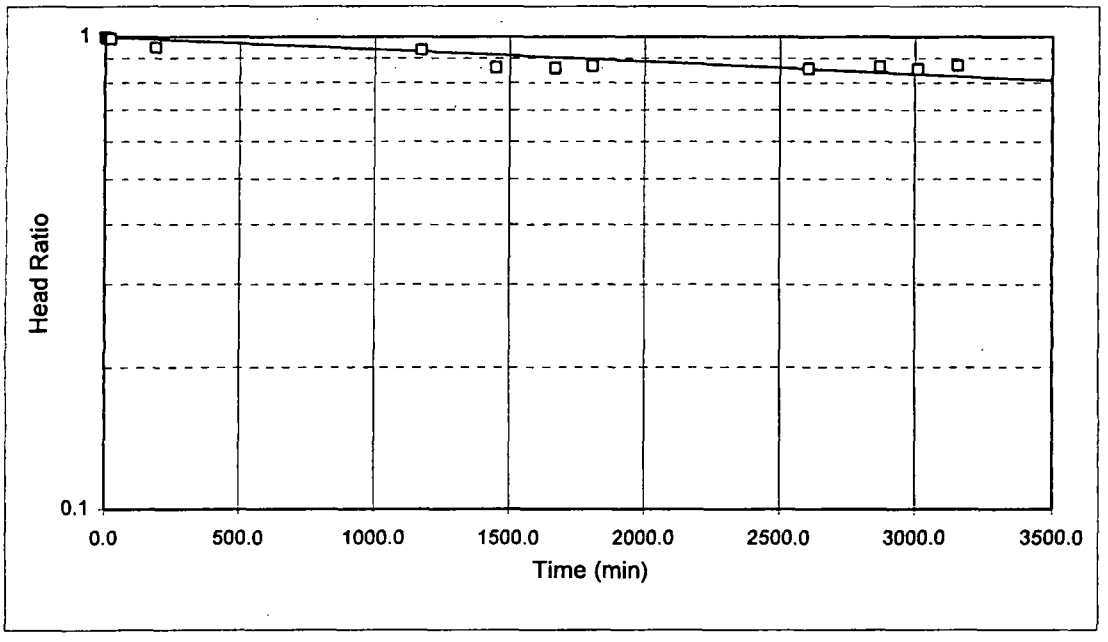
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1132	30	142.01	0.0	3.93	1.00
1	1135	0	142	2.5	3.92	1.00
1	1140	0	141.99	7.5	3.91	0.99
1	1145	0	141.99	12.5	3.91	0.99
1	1152	30	141.98	20.0	3.90	0.99
1	1440	0	141.82	187.5	3.74	0.95
2	702	0	141.77	1169.5	3.69	0.94
2	1139	0	141.47	1446.5	3.39	0.86
2	1520	0	141.46	1667.5	3.38	0.86
2	1738	0	141.49	1805.5	3.41	0.87
3	1122	0	141.48	2869.5	3.40	0.87
3	1608	0	141.5	3155.5	3.42	0.87
3	658	0	141.45	2605.5	3.37	0.86
3	1342	0	141.44	3009.5	3.36	0.85

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-116-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15	K=	2.90E-08	cm/sec
t_1 (min) =	0	K=	8.22E-05	ft/day
t_2 (min) =	3500			
h_1/h_0 =	1.00			
h_2/h_0 =	0.81			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

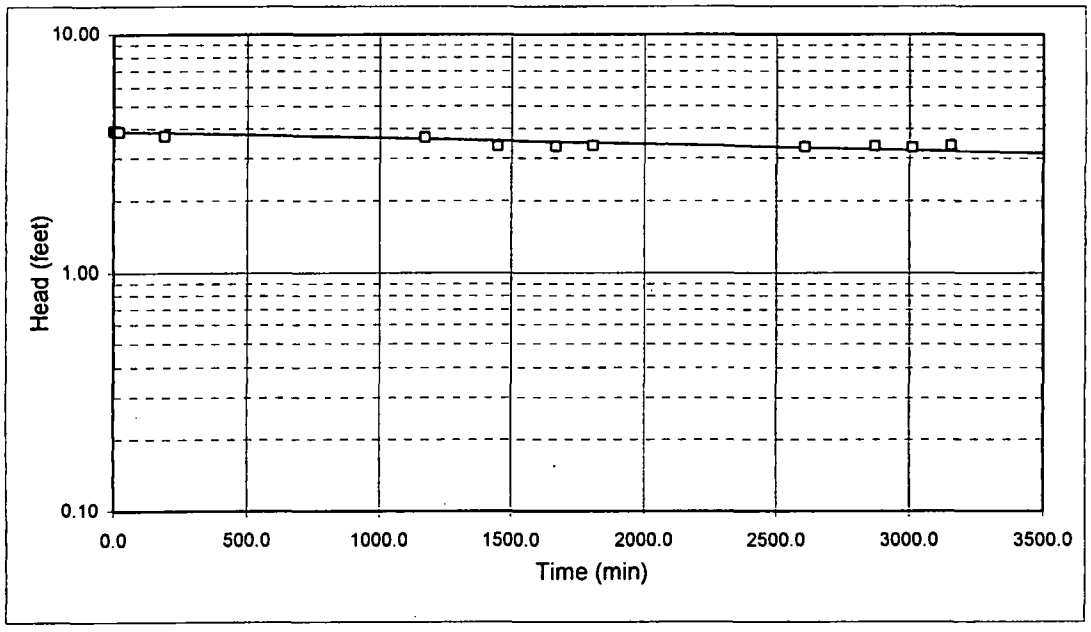
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-116-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15	K=	1.73E-08	cm/sec
$\ln(R_e/r_w)$	2.95	K=	4.91E-05	ft/day
y_0 =	3.90			
y_t =	3.16			
t =	3500.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/24/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

RISING HEAD TEST PZ-200-SS

WELL NO. PZ-200-SS

DATE	6/20/95	
INITIAL DEPTH TO WATER	70.96	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	9.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	100.7	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	29.76	FEET
EQUIVALENT DIAMETER	3.69	INCHES
SATURATED OPEN INTERVAL LENGTH	29.76	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	2.00	FEET
MAX. HEAD IN SCREEN?	Y	

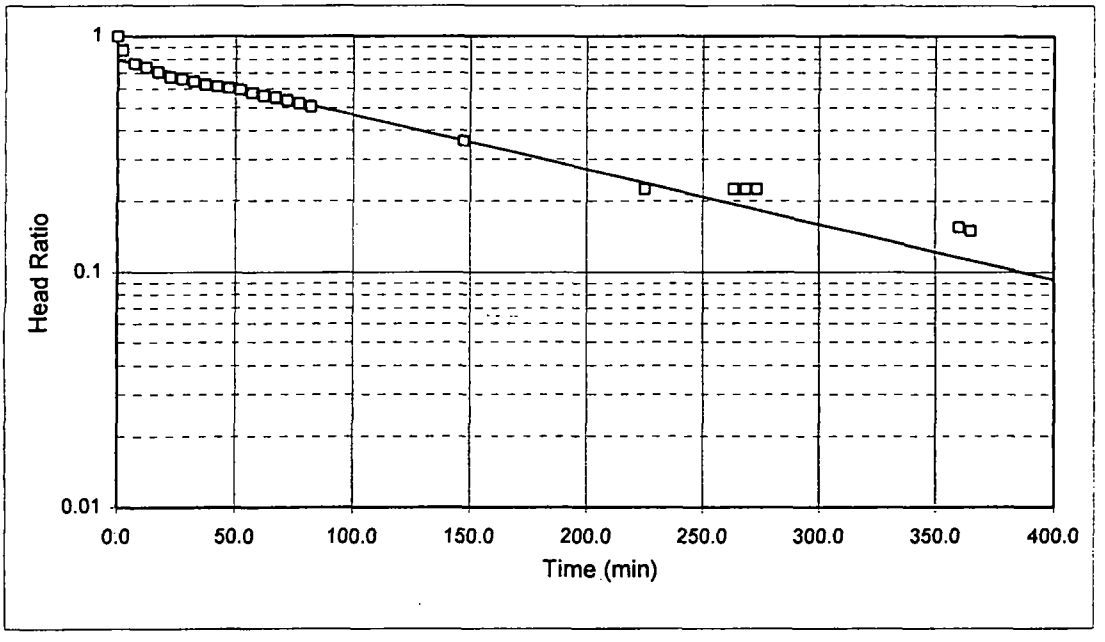
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	908	40	72.96	0.0	2.00	1.00
1	910	40	72.71	2.0	1.75	0.88
1	915	40	72.49	7.0	1.53	0.77
1	920	40	72.44	12.0	1.48	0.74
1	925	40	72.37	17.0	1.41	0.71
1	930	40	72.3	22.0	1.34	0.67
1	935	40	72.28	27.0	1.32	0.66
1	940	40	72.25	32.0	1.29	0.65
1	945	40	72.21	37.0	1.25	0.63
1	950	40	72.19	42.0	1.23	0.62
1	955	40	72.17	47.0	1.21	0.61
1	1000	40	72.15	52.0	1.19	0.60
1	1005	40	72.11	57.0	1.15	0.58
1	1010	40	72.08	62.0	1.12	0.56
1	1015	40	72.06	67.0	1.10	0.55
1	1020	40	72.03	72.0	1.07	0.54
1	1025	40	72	77.0	1.04	0.52
1	1030	40	71.97	82.0	1.01	0.51
1	1136	0	71.68	147.3	0.72	0.36
1	1253	30	71.41	224.8	0.45	0.23
1	1332	0	71.41	263.3	0.45	0.23
1	1337	0	71.41	268.3	0.45	0.23
1	1342	0	71.41	273.3	0.45	0.23
1	1509	0	71.27	360.3	0.31	0.16
1	1514	0	71.26	365.3	0.30	0.15

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-200-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	29.76	K=	1.52E-06	cm/sec
t_1 (min) =	0	K=	4.30E-03	ft/day
t_2 (min) =	400			
h_1/h_0 =	0.79			
h_2/h_0 =	0.09			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

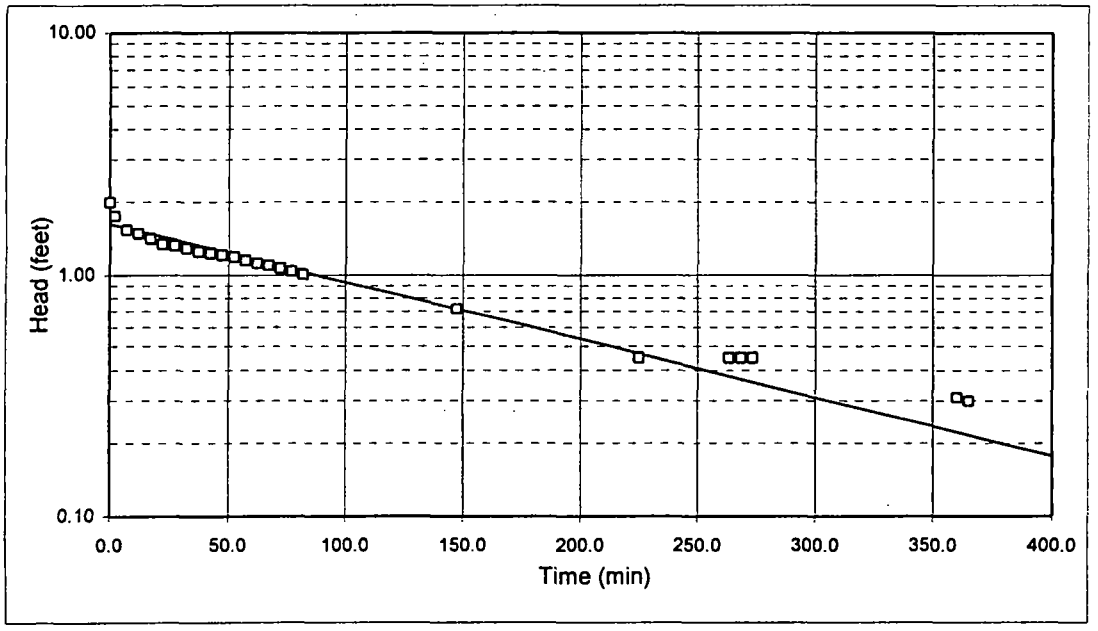
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-200-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	29.76	K=	2.83E-06	cm/sec
$\ln(R_e/r_w)$	3.18	K=	8.03E-03	ft/day
y_0 =	1.62			
y_t =	0.18			
t =	400.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/20/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-201-SS

WELL NO. PZ-201-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	25.43	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	9.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.3	FEET (btoc)
SATURATED THICKNESS	220	FEET
WATER TABLE TO BOTTOM OF SCREEN	65.89	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	65.89	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.40	FEET
MAX. HEAD IN SCREEN?	Y	

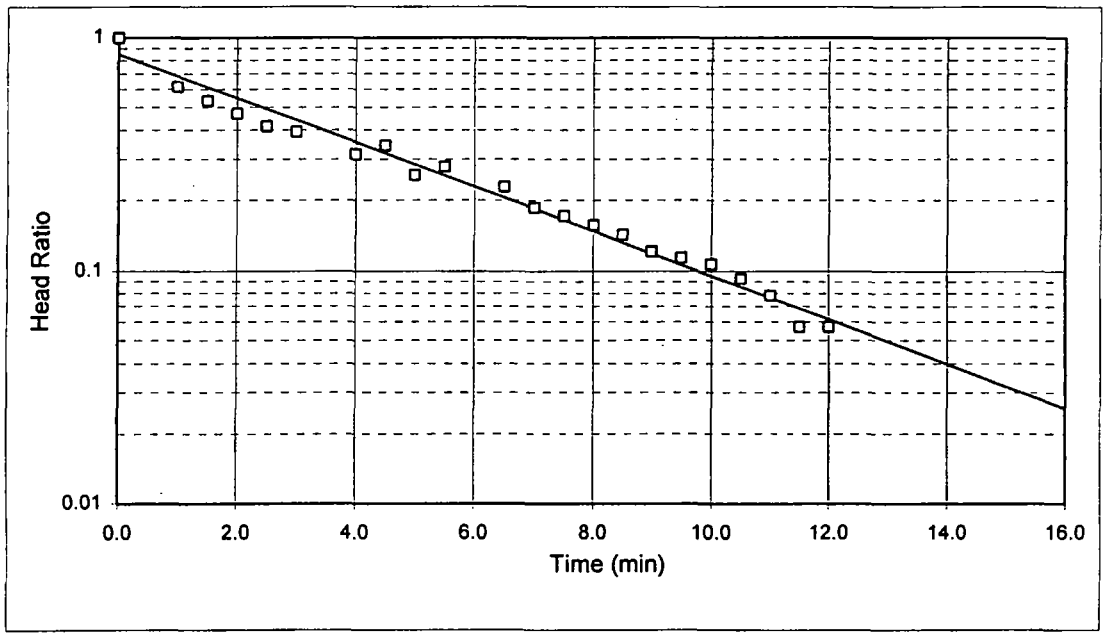
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1115	0	26.83	0.0	1.40	1.00
1	1116	0	26.29	1.0	0.86	0.61
1	1116	30	26.18	1.5	0.75	0.54
1	1117	0	26.09	2.0	0.66	0.47
1	1117	30	26.01	2.5	0.58	0.41
1	1118	0	25.98	3.0	0.55	0.39
1	1119	30	25.91	4.5	0.48	0.34
1	1119	0	25.87	4.0	0.44	0.31
1	1120	30	25.82	5.5	0.39	0.28
1	1120	0	25.79	5.0	0.36	0.26
1	1121	30	25.75	6.5	0.32	0.23
1	1122	0	25.69	7.0	0.26	0.19
1	1122	30	25.67	7.5	0.24	0.17
1	1123	0	25.65	8.0	0.22	0.16
1	1123	30	25.63	8.5	0.20	0.14
1	1124	0	25.6	9.0	0.17	0.12
1	1124	30	25.59	9.5	0.16	0.11
1	1125	0	25.58	10.0	0.15	0.11
1	1125	30	25.56	10.5	0.13	0.09
1	1126	0	25.54	11.0	0.11	0.08
1	1126	30	25.51	11.5	0.08	0.06
1	1127	0	25.51	12.0	0.08	0.06

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-201-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	65.89	K=	3.26E-05	cm/sec
t_1 (min) =	0	K=	9.25E-02	ft/day
t_2 (min) =	16			
h_1/h_0 =	0.85			
h_2/h_0 =	0.03			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

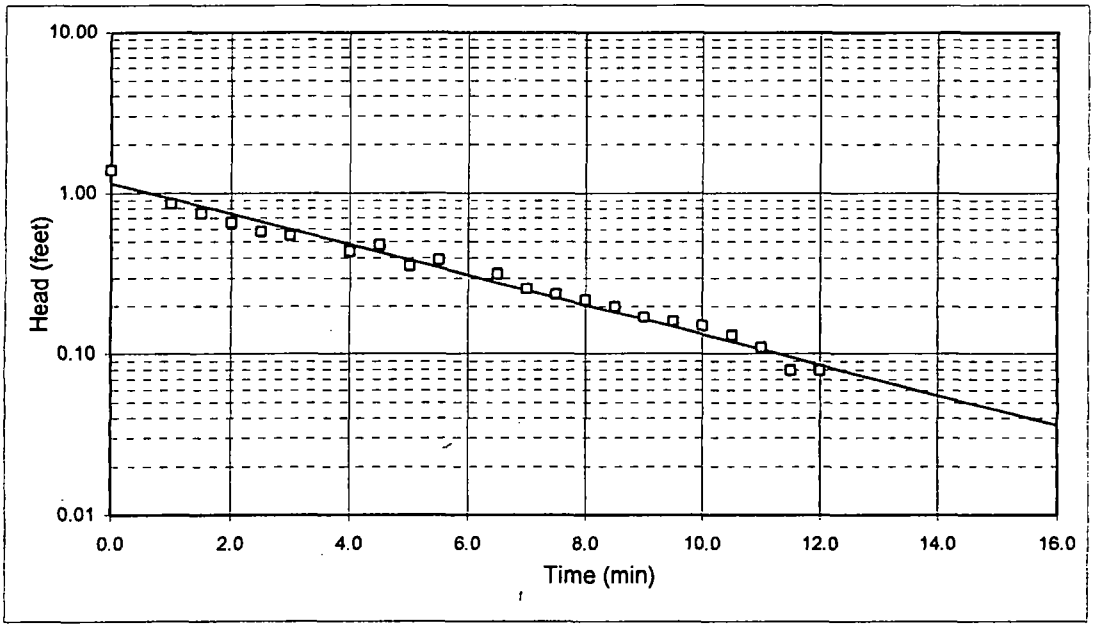
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-201-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e' = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	65.89	K=	5.39E-05	cm/sec
$\ln(R_e/r_w)$	3.88	K=	1.53E-01	ft/day
y_0 =	1.15			
y_t =	0.04			
t =	16.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

FALLING HEAD TEST PZ-201A-SS

WELL NO. PZ-201A-SS

DATE	7/17/95	
INITIAL DEPTH TO WATER	65.46	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	76.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.8	FEET (btoc)
SATURATED THICKNESS	180	FEET
WATER TABLE TO BOTTOM OF SCREEN	26.34	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.89	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.42	FEET
MAX. HEAD IN SCREEN?	N	

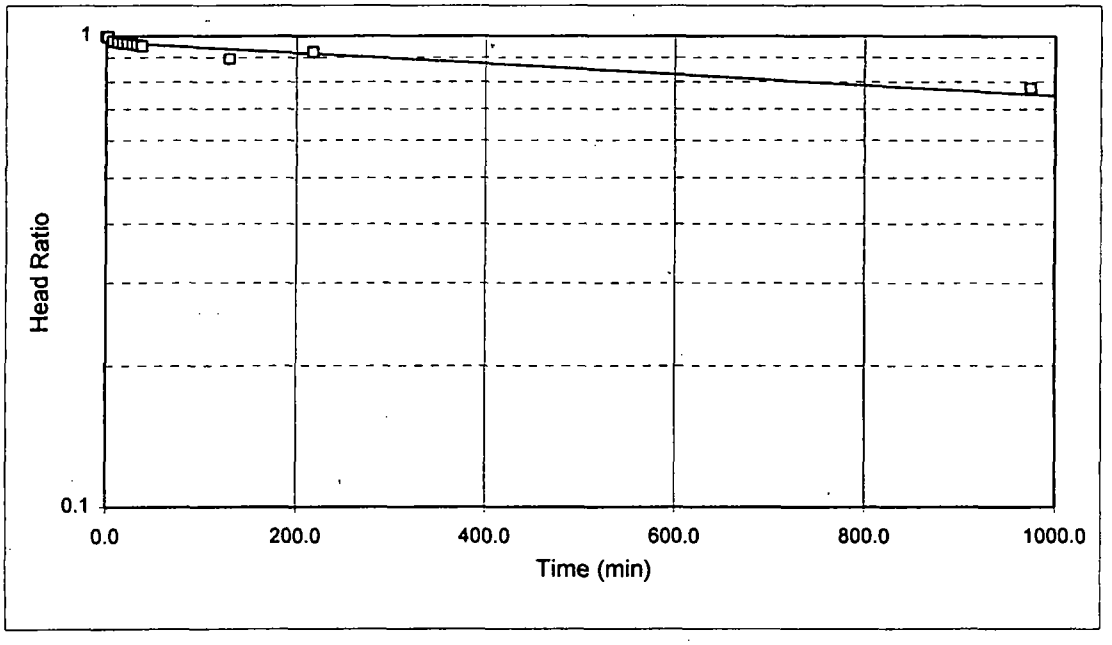
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1439	0	68.88	0.0	3.42	1.00
1	1440	0	68.87	1.0	3.41	1.00
1	1441	0	68.87	2.0	3.41	1.00
1	1446	0	68.8	7.0	3.34	0.98
1	1451	0	68.78	12.0	3.32	0.97
1	1456	0	68.77	17.0	3.31	0.97
1	1501	0	68.76	22.0	3.30	0.96
1	1506	0	68.75	27.0	3.29	0.96
1	1511	0	68.74	32.0	3.28	0.96
1	1516	0	68.72	37.0	3.26	0.95
1	1647	30	68.52	128.5	3.06	0.89
1	1816	0	68.62	217.0	3.16	0.92
2	654	0	68.11	975.0	2.65	0.77

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-201A-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.89	K=	1.27E-07	cm/sec
t_1 (min) =	0	K=	3.60E-04	ft/day
t_2 (min) =	1000			
h_1/h_0 =	0.97			
h_2/h_0 =	0.75			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

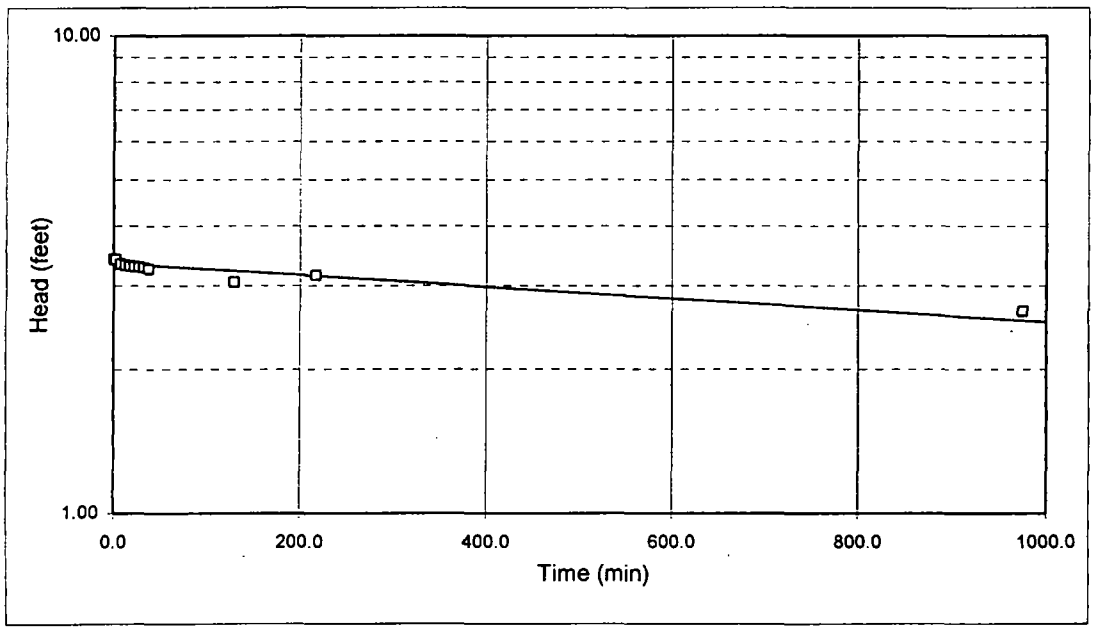
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-201A-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.89	K=	8.34E-08	cm/sec
$\ln(R_e/r_w)$	2.88	K=	2.36E-04	ft/day
y_0 =	3.35			
y_t =	2.51			
t =	1000.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/17/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-202-SS

WELL NO. PZ-202-SS

DATE	7/19/95	
INITAL HEAD ON TRANSDUCER	14.968	FEET H_2O
INITIAL DEPTH TO WATER	36.3	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	40.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	92.2	FEET (btoc)
SATURATED THICKNESS	210	FEET
WATER TABLE TO BOTTOM OF SCREEN	55.9	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	52	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	0.53	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	200	1517	58	15.503	0.00	35.77	0.53	1.00
1995	200	1517	59	15.454	0.02	35.81	0.49	0.91
1995	200	1518	0	15.296	0.03	35.97	0.33	0.61
1995	200	1518	1	15.212	0.05	36.06	0.24	0.46
1995	200	1518	2	15.153	0.07	36.12	0.19	0.35
1995	200	1518	3	15.107	0.08	36.16	0.14	0.26
1995	200	1518	4	15.067	0.10	36.20	0.10	0.19
1995	200	1518	5	15.054	0.12	36.21	0.09	0.16
1995	200	1518	6	15.026	0.13	36.24	0.06	0.11
1995	200	1518	7	15.02	0.15	36.25	0.05	0.10
1995	200	1518	8	15.023	0.17	36.25	0.05	0.10
1995	200	1518	9	15.015	0.18	36.25	0.05	0.09
1995	200	1518	10	15.003	0.20	36.27	0.03	0.07
1995	200	1518	11	14.997	0.22	36.27	0.03	0.05
1995	200	1518	12	15.01	0.23	36.26	0.04	0.08
1995	200	1518	13	15.008	0.25	36.26	0.04	0.07
1995	200	1518	14	14.994	0.27	36.27	0.03	0.05
1995	200	1518	15	15.008	0.28	36.26	0.04	0.07
1995	200	1518	16	15.007	0.30	36.26	0.04	0.07
1995	200	1518	17	15.009	0.32	36.26	0.04	0.08
1995	200	1518	18	15.005	0.33	36.26	0.04	0.07
1995	200	1518	19	15.006	0.35	36.26	0.04	0.07
1995	200	1518	20	15.004	0.37	36.26	0.04	0.07
1995	200	1518	21	14.991	0.38	36.28	0.02	0.04
1995	200	1518	22	15.003	0.40	36.27	0.03	0.07
1995	200	1518	23	15.005	0.42	36.26	0.04	0.07
1995	200	1518	24	14.991	0.43	36.28	0.02	0.04

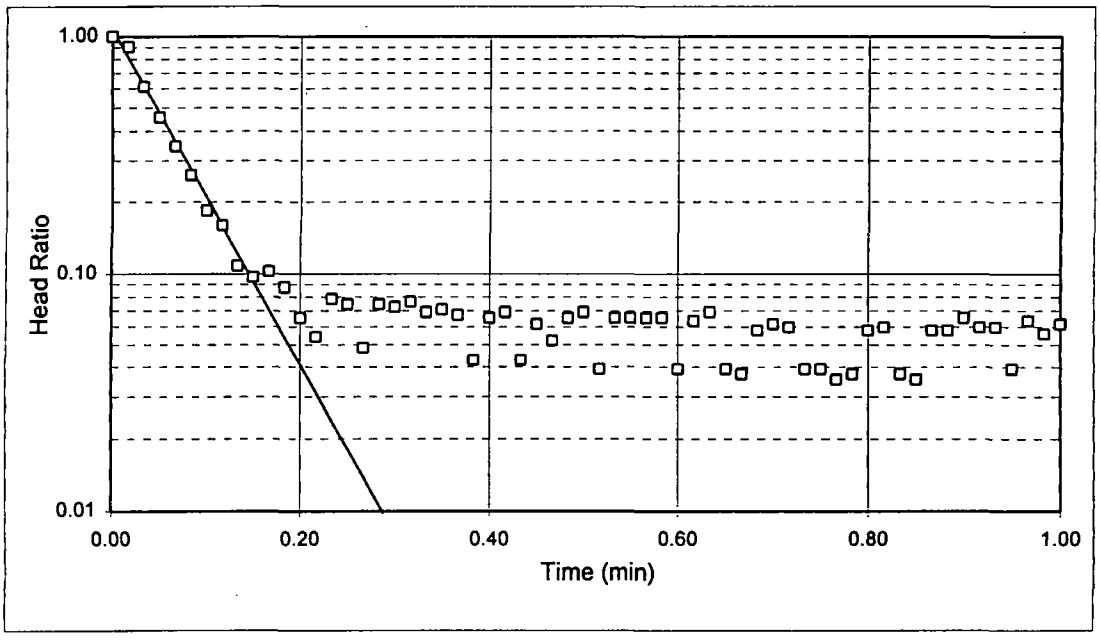
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	200	1518	25	15.001	0.45	36.27	0.03	0.06
1995	200	1518	26	14.996	0.47	36.27	0.03	0.05
1995	200	1518	27	15.003	0.48	36.27	0.03	0.07
1995	200	1518	28	15.005	0.50	36.26	0.04	0.07
1995	200	1518	29	14.989	0.52	36.28	0.02	0.04
1995	200	1518	30	15.003	0.53	36.27	0.03	0.07
1995	200	1518	31	15.003	0.55	36.27	0.03	0.07
1995	200	1518	32	15.003	0.57	36.27	0.03	0.07
1995	200	1518	33	15.003	0.58	36.27	0.03	0.07
1995	200	1518	34	14.989	0.60	36.28	0.02	0.04
1995	200	1518	35	15.002	0.62	36.27	0.03	0.06
1995	200	1518	36	15.005	0.63	36.26	0.04	0.07
1995	200	1518	37	14.989	0.65	36.28	0.02	0.04
1995	200	1518	38	14.988	0.67	36.28	0.02	0.04
1995	200	1518	39	14.999	0.68	36.27	0.03	0.06
1995	200	1518	40	15.001	0.70	36.27	0.03	0.06
1995	200	1518	41	15	0.72	36.27	0.03	0.06
1995	200	1518	42	14.989	0.73	36.28	0.02	0.04
1995	200	1518	43	14.989	0.75	36.28	0.02	0.04
1995	200	1518	44	14.987	0.77	36.28	0.02	0.04
1995	200	1518	45	14.988	0.78	36.28	0.02	0.04
1995	200	1518	46	14.999	0.80	36.27	0.03	0.06
1995	200	1518	47	15	0.82	36.27	0.03	0.06
1995	200	1518	48	14.988	0.83	36.28	0.02	0.04
1995	200	1518	49	14.987	0.85	36.28	0.02	0.04
1995	200	1518	50	14.999	0.87	36.27	0.03	0.06
1995	200	1518	51	14.999	0.88	36.27	0.03	0.06
1995	200	1518	52	15.003	0.90	36.27	0.03	0.07
1995	200	1518	53	15	0.92	36.27	0.03	0.06
1995	200	1518	54	15	0.93	36.27	0.03	0.06
1995	200	1518	55	14.989	0.95	36.28	0.02	0.04
1995	200	1518	56	15.002	0.97	36.27	0.03	0.06
1995	200	1518	57	14.998	0.98	36.27	0.03	0.06
1995	200	1518	58	15.001	1.00	36.27	0.03	0.06

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-202-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	52	K=	2.95E-03	cm/sec
t_1 (min) =	0	K=	8.37E+00	ft/day
t_2 (min) =	0.29			
h_1/h_0 =	1.07			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

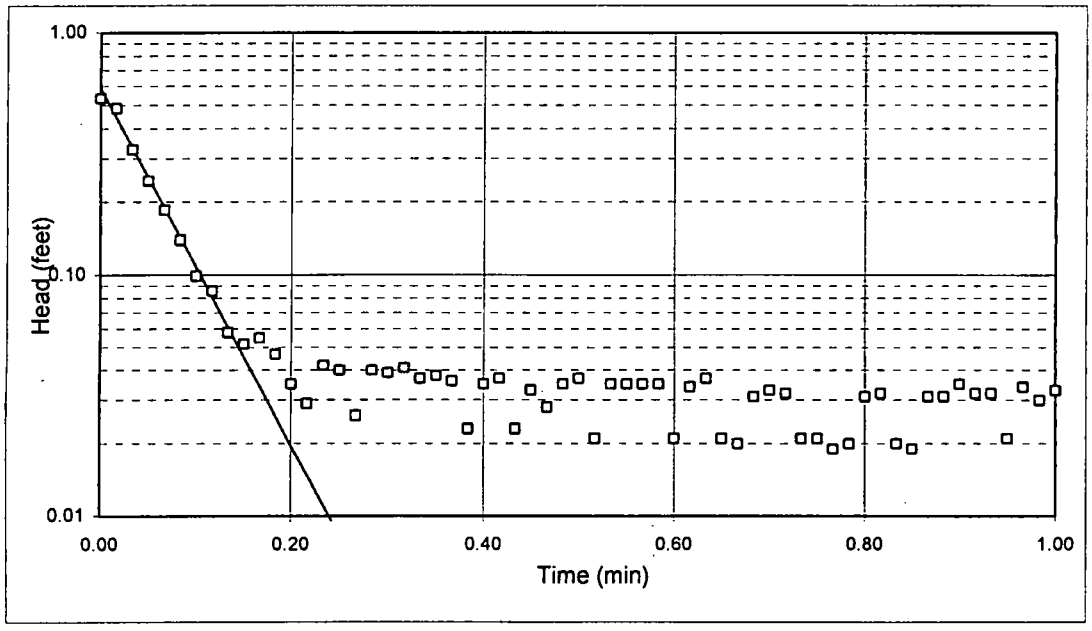
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-202-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	52	K=	2.51E-03	cm/sec
$\ln(R_e/r_w)$	4.35	K=	7.11E+00	ft/day
y_0 =	0.59			
y_t =	0.01			
t =	0.25			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

RISING HEAD TEST PZ-204-SS

WELL NO. PZ-204-SS

DATE	6/23/95	
INITIAL DEPTH TO WATER	27.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	11.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	92.9	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	65.55	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	65.55	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.04	FEET
MAX. HEAD IN SCREEN?	Y	

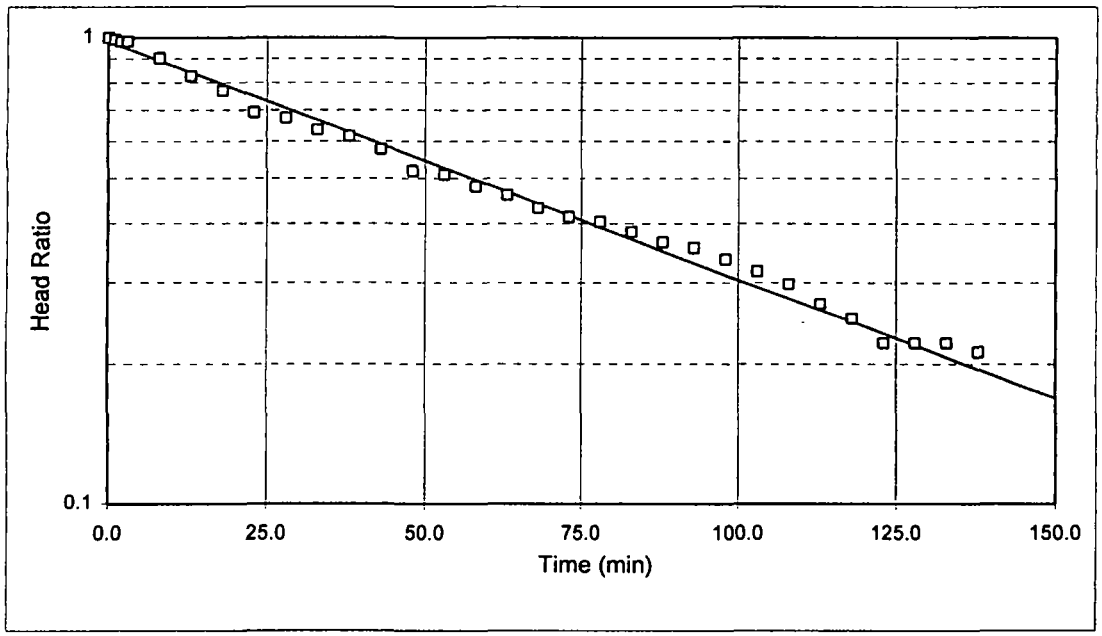
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	758	30	28.39	0.0	1.04	1.00
1	759	30	28.38	1.0	1.03	0.99
1	800	30	28.37	2.0	1.02	0.98
1	801	30	28.37	3.0	1.02	0.98
1	806	30	28.29	8.0	0.94	0.90
1	811	30	28.21	13.0	0.86	0.83
1	816	30	28.15	18.0	0.80	0.77
1	821	30	28.07	23.0	0.72	0.69
1	826	30	28.05	28.0	0.70	0.67
1	831	30	28.01	33.0	0.66	0.63
1	836	30	27.99	38.0	0.64	0.62
1	841	30	27.95	43.0	0.60	0.58
1	846	30	27.89	48.0	0.54	0.52
1	851	30	27.88	53.0	0.53	0.51
1	856	30	27.85	58.0	0.50	0.48
1	901	30	27.83	63.0	0.48	0.46
1	906	30	27.8	68.0	0.45	0.43
1	911	30	27.78	73.0	0.43	0.41
1	916	30	27.77	78.0	0.42	0.40
1	921	30	27.75	83.0	0.40	0.38
1	926	30	27.73	88.0	0.38	0.37
1	931	30	27.72	93.0	0.37	0.36
1	936	30	27.7	98.0	0.35	0.34
1	941	30	27.68	103.0	0.33	0.32
1	946	30	27.66	108.0	0.31	0.30
1	951	30	27.63	113.0	0.28	0.27
1	956	30	27.61	118.0	0.26	0.25
1	1001	30	27.58	123.0	0.23	0.22
1	1006	30	27.58	128.0	0.23	0.22
1	1011	30	27.58	133.0	0.23	0.22
1	1016	30	27.57	138.0	0.22	0.21

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-204-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	65.55	K=	1.76E-06	cm/sec
t_1 (min) =	0	K=	4.98E-03	ft/day
t_2 (min) =	150			
h_1/h_0 =	0.98			
h_2/h_0 =	0.17			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/23/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

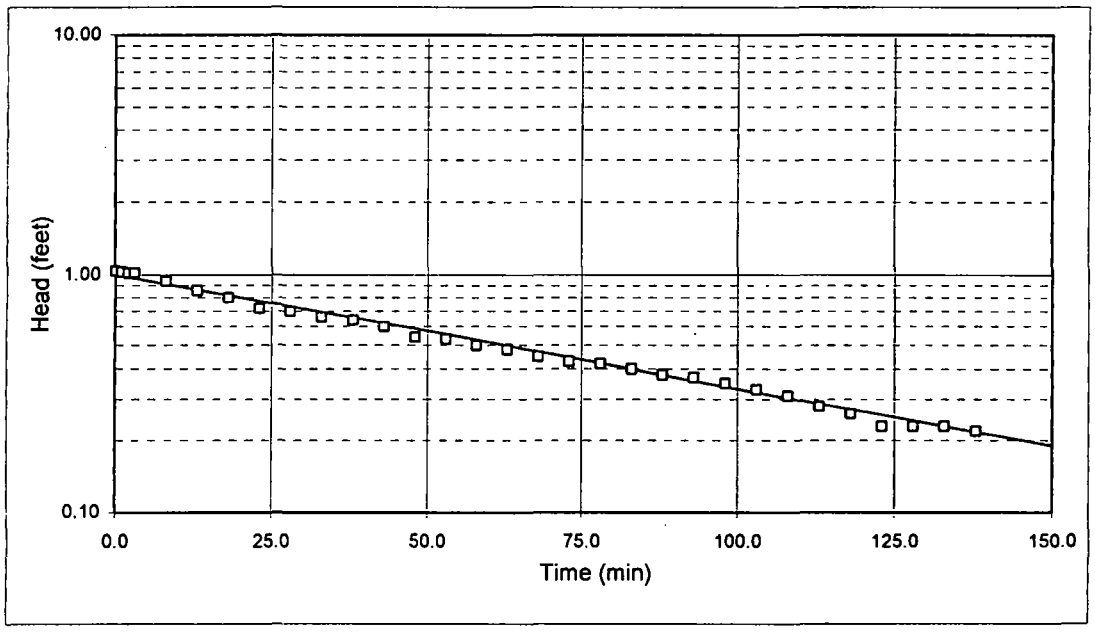
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-204-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.15			
r_w =	0.25			
L_e =	65.55	K=	2.78E-06	cm/sec
$\ln(R_e/r_w)$	3.90	K=	7.88E-03	ft/day
y_0 =	1.00			
y_t =	0.19			
t =	150.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/23/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

RISING HEAD TEST PZ-204A-SS

WELL NO. PZ-204A-SS

DATE	7/19/95	
INITIAL DEPTH TO WATER	67.12	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	76.0	FEET (btoc)
BOTTOM OF OPEN INTERVAL	91.5	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	24.38	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.61	FEET
MAX. HEAD IN SCREEN?	N	

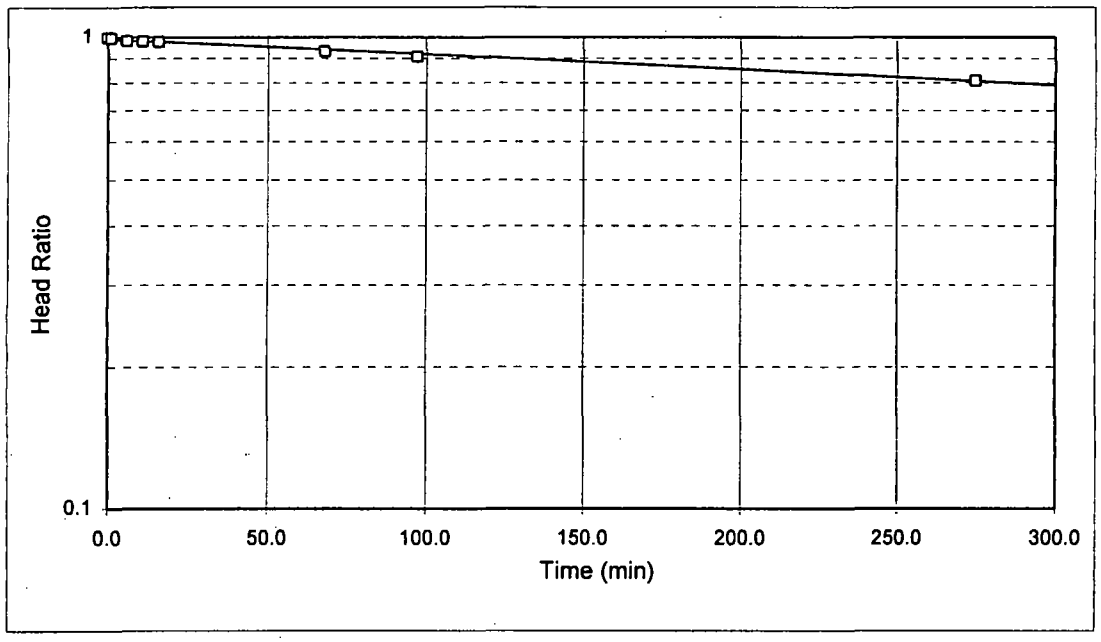
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1156	0	70.73	0.0	3.61	1.00
1	1157	0	70.72	1.0	3.60	1.00
1	1202	0	70.67	6.0	3.55	0.98
1	1207	0	70.66	11.0	3.54	0.98
1	1212	0	70.65	16.0	3.53	0.98
1	1304	0	70.49	68.0	3.37	0.93
1	1333	0	70.4	97.0	3.28	0.91
1	1631	0	70.04	275.0	2.92	0.81

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-204A-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet)
R_e = filter pack radius (feet)
L_e = length of screened interval (feet)
t = time (seconds)
h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15.5	K=	3.48E-07	cm/sec
t_1 (min) =	0	K=	9.87E-04	ft/day
t_2 (min) =	300			
h_1/h_0 =	0.99			
h_2/h_0 =	0.79			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

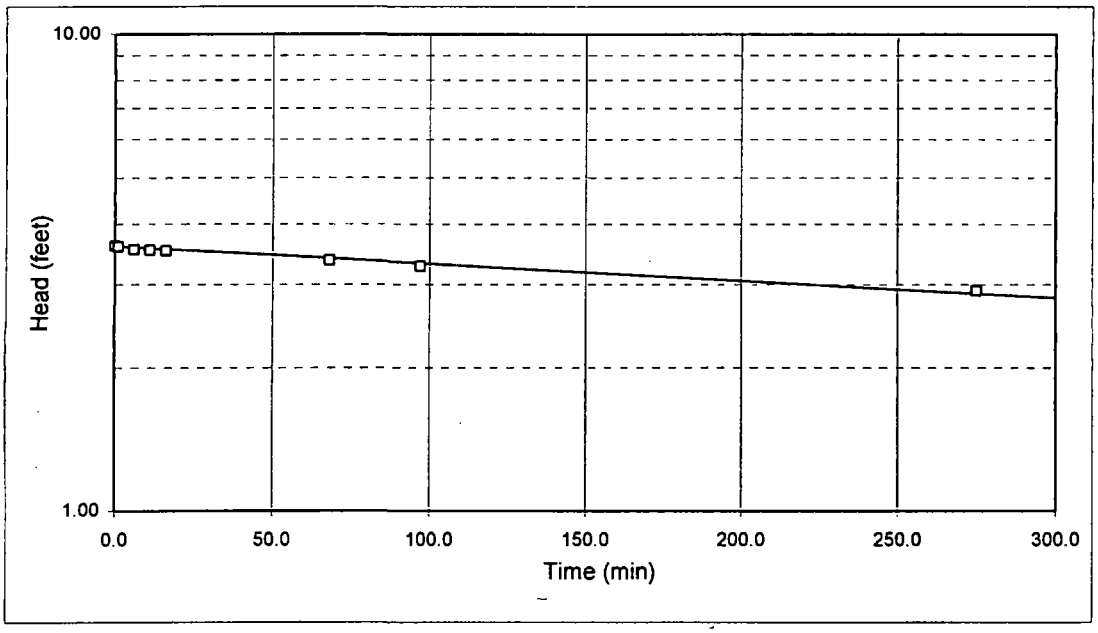
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-204A-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.5	K=	2.26E-07	cm/sec
$\ln(R_e/r_w)$	2.88	K=	6.42E-04	ft/day
y_0 =	3.60			
y_t =	2.82			
t =	300.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/19/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-205-AS

WELL NO. PZ-205-AS

DATE	7/25/95	
INITAL HEAD ON TRANSDUCER	14.92	FEET H_2O
INITIAL DEPTH TO WATER	26.71	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	36.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	50.7	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	23.99	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.80	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1600	4	17.718	0.00	23.91	2.80	1.00
1995	206	1600	6	17.177	0.03	24.45	2.26	0.81
1995	206	1600	7	17.148	0.05	24.48	2.23	0.80
1995	206	1600	8	17.102	0.07	24.53	2.18	0.78
1995	206	1600	9	17.052	0.08	24.58	2.13	0.76
1995	206	1600	10	17.005	0.10	24.63	2.09	0.75
1995	206	1600	11	16.961	0.12	24.67	2.04	0.73
1995	206	1600	12	16.917	0.13	24.71	2.00	0.71
1995	206	1600	13	16.874	0.15	24.76	1.95	0.70
1995	206	1600	14	16.83	0.17	24.80	1.91	0.68
1995	206	1600	15	16.791	0.18	24.84	1.87	0.67
1995	206	1600	16	16.755	0.20	24.88	1.84	0.66
1995	206	1600	17	16.717	0.22	24.91	1.80	0.64
1995	206	1600	18	16.677	0.23	24.95	1.76	0.63
1995	206	1600	19	16.643	0.25	24.99	1.72	0.62
1995	206	1600	20	16.606	0.27	25.02	1.69	0.60
1995	206	1600	21	16.57	0.28	25.06	1.65	0.59
1995	206	1600	22	16.537	0.30	25.09	1.62	0.58
1995	206	1600	23	16.501	0.32	25.13	1.58	0.57
1995	206	1600	24	16.471	0.33	25.16	1.55	0.55
1995	206	1600	25	16.434	0.35	25.20	1.51	0.54
1995	206	1600	26	16.406	0.37	25.22	1.49	0.53
1995	206	1600	27	16.376	0.38	25.25	1.46	0.52
1995	206	1600	28	16.346	0.40	25.28	1.43	0.51
1995	206	1600	29	16.318	0.42	25.31	1.40	0.50
1995	206	1600	30	16.289	0.43	25.34	1.37	0.49
1995	206	1600	31	16.259	0.45	25.37	1.34	0.48

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1600	32	16.233	0.47	25.40	1.31	0.47
1995	206	1600	33	16.202	0.48	25.43	1.28	0.46
1995	206	1600	34	16.18	0.50	25.45	1.26	0.45
1995	206	1600	35	16.152	0.52	25.48	1.23	0.44
1995	206	1600	36	16.128	0.53	25.50	1.21	0.43
1995	206	1600	37	16.101	0.55	25.53	1.18	0.42
1995	206	1600	38	16.079	0.57	25.55	1.16	0.41
1995	206	1600	39	16.053	0.58	25.58	1.13	0.40
1995	206	1600	40	16.03	0.60	25.60	1.11	0.40
1995	206	1600	41	16.01	0.62	25.62	1.09	0.39
1995	206	1600	42	15.986	0.63	25.64	1.07	0.38
1995	206	1600	43	15.965	0.65	25.67	1.05	0.37
1995	206	1600	44	15.944	0.67	25.69	1.02	0.37
1995	206	1600	45	15.921	0.68	25.71	1.00	0.36
1995	206	1600	46	15.903	0.70	25.73	0.98	0.35
1995	206	1600	47	15.88	0.72	25.75	0.96	0.34
1995	206	1600	48	15.863	0.73	25.77	0.94	0.34
1995	206	1600	49	15.843	0.75	25.79	0.92	0.33
1995	206	1600	50	15.824	0.77	25.81	0.90	0.32
1995	206	1600	51	15.806	0.78	25.82	0.89	0.32
1995	206	1600	52	15.787	0.80	25.84	0.87	0.31
1995	206	1600	53	15.77	0.82	25.86	0.85	0.30
1995	206	1600	54	15.753	0.83	25.88	0.83	0.30
1995	206	1600	55	15.735	0.85	25.90	0.81	0.29
1995	206	1600	56	15.718	0.87	25.91	0.80	0.29
1995	206	1600	57	15.701	0.88	25.93	0.78	0.28
1995	206	1600	58	15.684	0.90	25.95	0.76	0.27
1995	206	1600	59	15.668	0.92	25.96	0.75	0.27
1995	206	1601	0	15.652	0.93	25.98	0.73	0.26
1995	206	1601	1	15.638	0.95	25.99	0.72	0.26
1995	206	1601	2	15.621	0.97	26.01	0.70	0.25
1995	206	1601	3	15.606	0.98	26.02	0.69	0.25
1995	206	1601	4	15.592	1.00	26.04	0.67	0.24
1995	206	1601	5	15.577	1.02	26.05	0.66	0.23
1995	206	1601	6	15.562	1.03	26.07	0.64	0.23
1995	206	1601	7	15.551	1.05	26.08	0.63	0.23
1995	206	1601	8	15.539	1.07	26.09	0.62	0.22
1995	206	1601	9	15.524	1.08	26.11	0.60	0.22
1995	206	1601	10	15.511	1.10	26.12	0.59	0.21
1995	206	1601	11	15.501	1.12	26.13	0.58	0.21
1995	206	1601	12	15.488	1.13	26.14	0.57	0.20
1995	206	1601	13	15.475	1.15	26.16	0.56	0.20
1995	206	1601	14	15.464	1.17	26.17	0.54	0.19
1995	206	1601	15	15.452	1.18	26.18	0.53	0.19
1995	206	1601	16	15.441	1.20	26.19	0.52	0.19

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1601	17	15.431	1.22	26.20	0.51	0.18
1995	206	1601	18	15.417	1.23	26.21	0.50	0.18
1995	206	1601	19	15.41	1.25	26.22	0.49	0.18
1995	206	1601	20	15.398	1.27	26.23	0.48	0.17
1995	206	1601	21	15.386	1.28	26.24	0.47	0.17
1995	206	1601	22	15.377	1.30	26.25	0.46	0.16
1995	206	1601	23	15.364	1.32	26.27	0.44	0.16
1995	206	1601	24	15.356	1.33	26.27	0.44	0.16
1995	206	1601	25	15.347	1.35	26.28	0.43	0.15
1995	206	1601	26	15.34	1.37	26.29	0.42	0.15
1995	206	1601	27	15.33	1.38	26.30	0.41	0.15
1995	206	1601	28	15.32	1.40	26.31	0.40	0.14
1995	206	1601	29	15.311	1.42	26.32	0.39	0.14
1995	206	1601	30	15.302	1.43	26.33	0.38	0.14
1995	206	1601	31	15.296	1.45	26.33	0.38	0.13
1995	206	1601	32	15.287	1.47	26.34	0.37	0.13
1995	206	1601	33	15.278	1.48	26.35	0.36	0.13
1995	206	1601	34	15.268	1.50	26.36	0.35	0.12
1995	206	1601	35	15.26	1.52	26.37	0.34	0.12
1995	206	1601	36	15.253	1.53	26.38	0.33	0.12
1995	206	1601	37	15.246	1.55	26.38	0.33	0.12
1995	206	1601	38	15.24	1.57	26.39	0.32	0.11
1995	206	1601	39	15.232	1.58	26.40	0.31	0.11
1995	206	1601	40	15.226	1.60	26.40	0.31	0.11
1995	206	1601	41	15.217	1.62	26.41	0.30	0.11
1995	206	1601	42	15.21	1.63	26.42	0.29	0.10
1995	206	1601	43	15.204	1.65	26.43	0.28	0.10
1995	206	1601	44	15.197	1.67	26.43	0.28	0.10
1995	206	1601	45	15.189	1.68	26.44	0.27	0.10
1995	206	1601	46	15.183	1.70	26.45	0.26	0.09
1995	206	1601	47	15.18	1.72	26.45	0.26	0.09
1995	206	1601	48	15.171	1.73	26.46	0.25	0.09
1995	206	1601	49	15.169	1.75	26.46	0.25	0.09
1995	206	1601	50	15.16	1.77	26.47	0.24	0.09
1995	206	1601	51	15.152	1.78	26.48	0.23	0.08
1995	206	1601	52	15.151	1.80	26.48	0.23	0.08
1995	206	1601	53	15.145	1.82	26.49	0.23	0.08
1995	206	1601	54	15.14	1.83	26.49	0.22	0.08
1995	206	1601	55	15.133	1.85	26.50	0.21	0.08
1995	206	1601	56	15.128	1.87	26.50	0.21	0.07
1995	206	1601	57	15.125	1.88	26.51	0.20	0.07
1995	206	1601	58	15.12	1.90	26.51	0.20	0.07
1995	206	1601	59	15.113	1.92	26.52	0.19	0.07
1995	206	1602	0	15.108	1.93	26.52	0.19	0.07
1995	206	1602	1	15.105	1.95	26.53	0.19	0.07

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1602	2	15.102	1.97	26.53	0.18	0.07
1995	206	1602	3	15.097	1.98	26.53	0.18	0.06
1995	206	1602	4	15.092	2.00	26.54	0.17	0.06
1995	206	1602	5	15.086	2.02	26.54	0.17	0.06
1995	206	1602	6	15.082	2.03	26.55	0.16	0.06
1995	206	1602	7	15.076	2.05	26.55	0.16	0.06
1995	206	1602	8	15.075	2.07	26.56	0.16	0.06
1995	206	1602	9	15.07	2.08	26.56	0.15	0.05
1995	206	1602	10	15.067	2.10	26.56	0.15	0.05
1995	206	1602	11	15.063	2.12	26.57	0.14	0.05
1995	206	1602	12	15.059	2.13	26.57	0.14	0.05
1995	206	1602	13	15.054	2.15	26.58	0.13	0.05
1995	206	1602	14	15.052	2.17	26.58	0.13	0.05
1995	206	1602	15	15.048	2.18	26.58	0.13	0.05
1995	206	1602	16	15.045	2.20	26.59	0.13	0.04
1995	206	1602	17	15.042	2.22	26.59	0.12	0.04
1995	206	1602	18	15.04	2.23	26.59	0.12	0.04
1995	206	1602	19	15.035	2.25	26.60	0.12	0.04
1995	206	1602	20	15.032	2.27	26.60	0.11	0.04
1995	206	1602	21	15.029	2.28	26.60	0.11	0.04
1995	206	1602	22	15.025	2.30	26.61	0.11	0.04
1995	206	1602	23	15.02	2.32	26.61	0.10	0.04
1995	206	1602	24	15.018	2.33	26.61	0.10	0.04
1995	206	1602	25	15.017	2.35	26.61	0.10	0.03
1995	206	1602	26	15.013	2.37	26.62	0.09	0.03
1995	206	1602	27	15.012	2.38	26.62	0.09	0.03
1995	206	1602	28	15.009	2.40	26.62	0.09	0.03
1995	206	1602	29	15.007	2.42	26.62	0.09	0.03
1995	206	1602	30	15.004	2.43	26.63	0.08	0.03
1995	206	1602	31	14.998	2.45	26.63	0.08	0.03
1995	206	1602	32	14.995	2.47	26.64	0.07	0.03
1995	206	1602	33	14.993	2.48	26.64	0.07	0.03
1995	206	1602	34	14.995	2.50	26.64	0.07	0.03
1995	206	1602	35	14.992	2.52	26.64	0.07	0.03
1995	206	1602	36	14.988	2.53	26.64	0.07	0.02
1995	206	1602	37	14.985	2.55	26.65	0.06	0.02
1995	206	1602	38	14.984	2.57	26.65	0.06	0.02
1995	206	1602	39	14.982	2.58	26.65	0.06	0.02
1995	206	1602	40	14.981	2.60	26.65	0.06	0.02
1995	206	1602	41	14.979	2.62	26.65	0.06	0.02
1995	206	1602	42	14.972	2.63	26.66	0.05	0.02
1995	206	1602	43	14.974	2.65	26.66	0.05	0.02
1995	206	1602	44	14.971	2.67	26.66	0.05	0.02
1995	206	1602	45	14.969	2.68	26.66	0.05	0.02
1995	206	1602	46	14.968	2.70	26.66	0.05	0.02

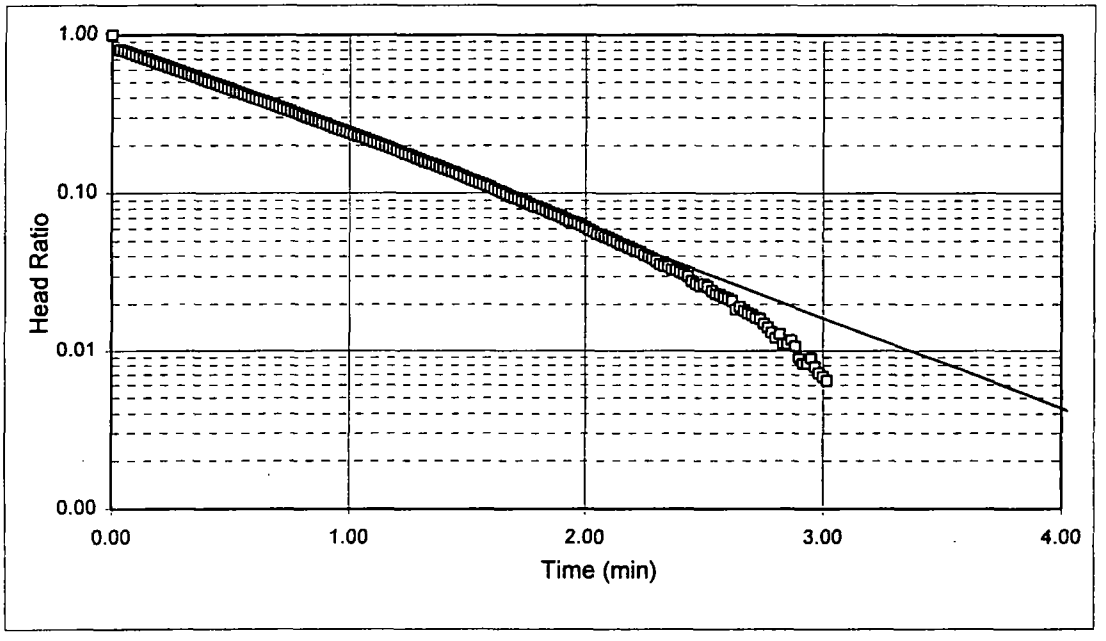
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	206	1602	47	14.966	2.72	26.66	0.05	0.02
1995	206	1602	48	14.965	2.73	26.67	0.05	0.02
1995	206	1602	49	14.962	2.75	26.67	0.04	0.02
1995	206	1602	50	14.96	2.77	26.67	0.04	0.01
1995	206	1602	51	14.957	2.78	26.67	0.04	0.01
1995	206	1602	52	14.954	2.80	26.68	0.03	0.01
1995	206	1602	53	14.956	2.82	26.67	0.04	0.01
1995	206	1602	54	14.951	2.83	26.68	0.03	0.01
1995	206	1602	55	14.951	2.85	26.68	0.03	0.01
1995	206	1602	56	14.953	2.87	26.68	0.03	0.01
1995	206	1602	57	14.95	2.88	26.68	0.03	0.01
1995	206	1602	58	14.945	2.90	26.69	0.02	0.01
1995	206	1602	59	14.943	2.92	26.69	0.02	0.01
1995	206	1603	0	14.943	2.93	26.69	0.02	0.01
1995	206	1603	1	14.945	2.95	26.69	0.02	0.01
1995	206	1603	2	14.942	2.97	26.69	0.02	0.01
1995	206	1603	3	14.94	2.98	26.69	0.02	0.01
1995	206	1603	4	14.939	3.00	26.69	0.02	0.01
1995	206	1603	5	14.938	3.02	26.69	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-AS

$$K = \frac{r_c'}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	14.5	K=	6.03E-04	cm/sec
t_1 (min) =	0	K=	1.71E+00	ft/day
t_2 (min) =	4.03			
h_1/h_0 =	0.87			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

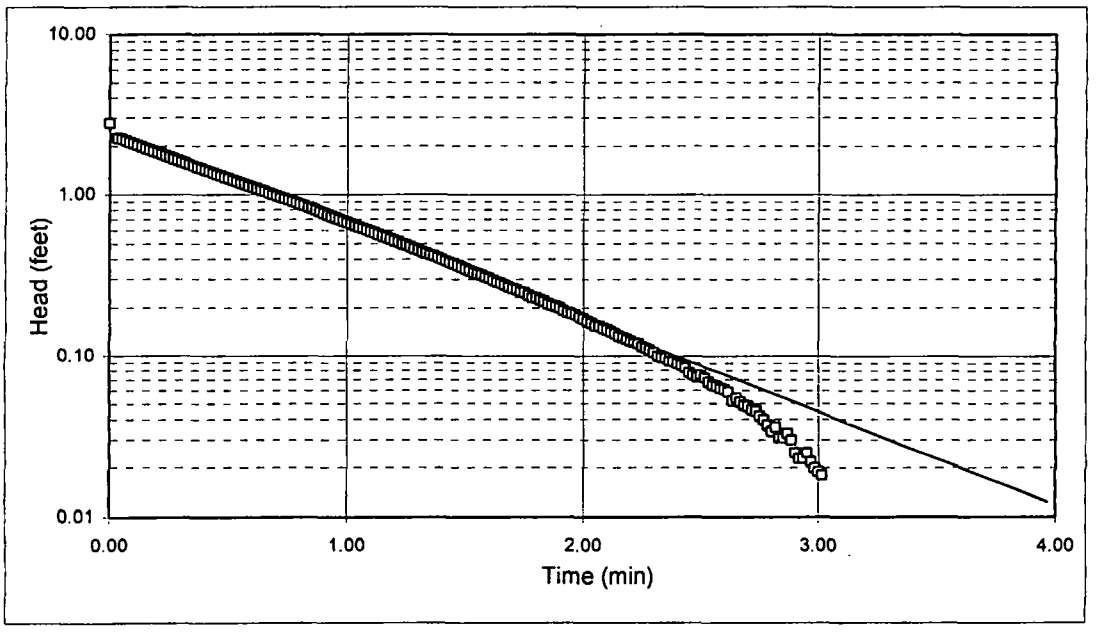
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	14.5	K=	4.36E-04	cm/sec
$\ln(R_e/r_w)$	2.70	K=	1.23E+00	ft/day
y_0 =	2.40			
y_t =	0.01			
t =	3.97			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

FALLING HEAD TEST PZ-205-SS

WELL NO. PZ-205-SS

DATE	7/18/95	
INITAL HEAD ON TRANSDUCER	10.86	FEET H_2O
INITIAL DEPTH TO WATER	37.66	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	86.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	100.7	FEET (btoc)
SATURATED THICKNESS	170	FEET
WATER TABLE TO BOTTOM OF SCREEN	63.04	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.5	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.34	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	856	0	13.195	0.0	35.33	2.34	1.000
1995	199	856	5	13.189	0.1	35.33	2.33	0.997
1995	199	856	10	13.173	0.2	35.35	2.31	0.991
1995	199	856	15	13.176	0.3	35.34	2.32	0.992
1995	199	856	20	13.161	0.3	35.36	2.30	0.985
1995	199	856	25	13.172	0.4	35.35	2.31	0.990
1995	199	856	30	13.174	0.5	35.35	2.31	0.991
1995	199	856	35	13.171	0.6	35.35	2.31	0.990
1995	199	856	40	13.172	0.7	35.35	2.31	0.990
1995	199	856	45	13.173	0.8	35.35	2.31	0.991
1995	199	856	50	13.171	0.8	35.35	2.31	0.990
1995	199	856	55	13.171	0.9	35.35	2.31	0.990
1995	199	857	0	13.171	1.0	35.35	2.31	0.990
1995	199	857	5	13.17	1.1	35.35	2.31	0.989
1995	199	857	10	13.17	1.2	35.35	2.31	0.989
1995	199	857	15	13.168	1.2	35.35	2.31	0.988
1995	199	857	20	13.169	1.3	35.35	2.31	0.989
1995	199	857	25	13.17	1.4	35.35	2.31	0.989
1995	199	857	30	13.096	1.5	35.42	2.24	0.958
1995	199	857	35	13.101	1.6	35.42	2.24	0.960
1995	199	857	40	13.103	1.7	35.42	2.24	0.961
1995	199	857	45	13.103	1.7	35.42	2.24	0.961
1995	199	857	50	13.104	1.8	35.42	2.24	0.961
1995	199	857	55	13.103	1.9	35.42	2.24	0.961
1995	199	858	0	13.103	2.0	35.42	2.24	0.961
1995	199	858	5	13.102	2.1	35.42	2.24	0.960
1995	199	858	10	13.104	2.2	35.42	2.24	0.961

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	858	15	13.103	2.2	35.42	2.24	0.961
1995	199	858	20	13.103	2.3	35.42	2.24	0.961
1995	199	858	25	13.102	2.4	35.42	2.24	0.960
1995	199	858	30	13.102	2.5	35.42	2.24	0.960
1995	199	858	35	13.102	2.6	35.42	2.24	0.960
1995	199	858	40	13.103	2.7	35.42	2.24	0.961
1995	199	858	45	13.102	2.7	35.42	2.24	0.960
1995	199	858	50	13.102	2.8	35.42	2.24	0.960
1995	199	858	55	13.101	2.9	35.42	2.24	0.960
1995	199	859	0	13.102	3.0	35.42	2.24	0.960
1995	199	859	5	13.101	3.1	35.42	2.24	0.960
1995	199	859	10	13.1	3.2	35.42	2.24	0.959
1995	199	859	15	13.101	3.2	35.42	2.24	0.960
1995	199	859	20	13.101	3.3	35.42	2.24	0.960
1995	199	859	25	13.103	3.4	35.42	2.24	0.961
1995	199	859	30	13.102	3.5	35.42	2.24	0.960
1995	199	859	35	13.102	3.6	35.42	2.24	0.960
1995	199	859	40	13.101	3.7	35.42	2.24	0.960
1995	199	859	45	13.101	3.7	35.42	2.24	0.960
1995	199	859	50	13.102	3.8	35.42	2.24	0.960
1995	199	859	55	13.101	3.9	35.42	2.24	0.960
1995	199	900	0	13.101	4.0	35.42	2.24	0.960
1995	199	900	5	13.101	4.1	35.42	2.24	0.960
1995	199	900	10	13.1	4.2	35.42	2.24	0.959
1995	199	900	15	13.1	4.2	35.42	2.24	0.959
1995	199	900	20	13.1	4.3	35.42	2.24	0.959
1995	199	900	25	13.099	4.4	35.42	2.24	0.959
1995	199	900	30	13.1	4.5	35.42	2.24	0.959
1995	199	900	35	13.099	4.6	35.42	2.24	0.959
1995	199	900	40	13.099	4.7	35.42	2.24	0.959
1995	199	900	45	13.1	4.7	35.42	2.24	0.959
1995	199	900	50	13.101	4.8	35.42	2.24	0.960
1995	199	900	55	13.102	4.9	35.42	2.24	0.960
1995	199	901	0	13.101	5.0	35.42	2.24	0.960
1995	199	901	5	13.1	5.1	35.42	2.24	0.959
1995	199	901	10	13.101	5.2	35.42	2.24	0.960
1995	199	901	15	13.101	5.2	35.42	2.24	0.960
1995	199	901	20	13.1	5.3	35.42	2.24	0.959
1995	199	901	25	13.1	5.4	35.42	2.24	0.959
1995	199	901	30	13.1	5.5	35.42	2.24	0.959
1995	199	901	35	13.1	5.6	35.42	2.24	0.959
1995	199	901	40	13.099	5.7	35.42	2.24	0.959
1995	199	901	45	13.098	5.7	35.42	2.24	0.958
1995	199	901	50	13.099	5.8	35.42	2.24	0.959
1995	199	901	55	13.098	5.9	35.42	2.24	0.958

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	902	0	13.098	6.0	35.42	2.24	0.958
1995	199	902	5	13.098	6.1	35.42	2.24	0.958
1995	199	902	10	13.098	6.2	35.42	2.24	0.958
1995	199	902	15	13.099	6.2	35.42	2.24	0.959
1995	199	902	20	13.098	6.3	35.42	2.24	0.958
1995	199	902	25	13.098	6.4	35.42	2.24	0.958
1995	199	902	30	13.097	6.5	35.42	2.24	0.958
1995	199	902	35	13.098	6.6	35.42	2.24	0.958
1995	199	902	40	13.098	6.7	35.42	2.24	0.958
1995	199	902	45	13.096	6.7	35.42	2.24	0.958
1995	199	902	50	13.095	6.8	35.43	2.24	0.957
1995	199	905	0	13.089	9.0	35.43	2.23	0.955
1995	199	910	0	13.077	14.0	35.44	2.22	0.949
1995	199	915	0	13.065	19.0	35.46	2.21	0.944
1995	199	920	0	13.054	24.0	35.47	2.19	0.940
1995	199	925	0	13.045	29.0	35.48	2.19	0.936
1995	199	930	0	13.035	34.0	35.49	2.18	0.931
1995	199	935	0	13.025	39.0	35.50	2.17	0.927
1995	199	940	0	13.016	44.0	35.50	2.16	0.923
1995	199	945	0	13.008	49.0	35.51	2.15	0.920
1995	199	950	0	12.998	54.0	35.52	2.14	0.916
1995	199	955	0	12.991	59.0	35.53	2.13	0.913
1995	199	1000	0	12.985	64.0	35.54	2.13	0.910
1995	199	1005	0	12.977	69.0	35.54	2.12	0.907
1995	199	1010	0	12.97	74.0	35.55	2.11	0.904
1995	199	1015	0	12.961	79.0	35.56	2.10	0.900
1995	199	1020	0	12.952	84.0	35.57	2.09	0.896
1995	199	1025	0	12.946	89.0	35.57	2.09	0.893
1995	199	1030	0	12.938	94.0	35.58	2.08	0.890
1995	199	1035	0	12.928	99.0	35.59	2.07	0.886
1995	199	1040	0	12.922	104.0	35.60	2.06	0.883
1995	199	1045	0	12.917	109.0	35.60	2.06	0.881
1995	199	1050	0	12.908	114.0	35.61	2.05	0.877
1995	199	1055	0	12.9	119.0	35.62	2.04	0.874
1995	199	1100	0	12.893	124.0	35.63	2.03	0.871
1995	199	1105	0	12.885	129.0	35.64	2.03	0.867
1995	199	1110	0	12.879	134.0	35.64	2.02	0.865
1995	199	1115	0	12.87	139.0	35.65	2.01	0.861
1995	199	1120	0	12.861	144.0	35.66	2.00	0.857
1995	199	1125	0	12.853	149.0	35.67	1.99	0.854
1995	199	1130	0	12.844	154.0	35.68	1.98	0.850
1995	199	1135	0	12.837	159.0	35.68	1.98	0.847
1995	199	1140	0	12.828	164.0	35.69	1.97	0.843
1995	199	1145	0	12.82	169.0	35.70	1.96	0.839
1995	199	1150	0	12.813	174.0	35.71	1.95	0.836

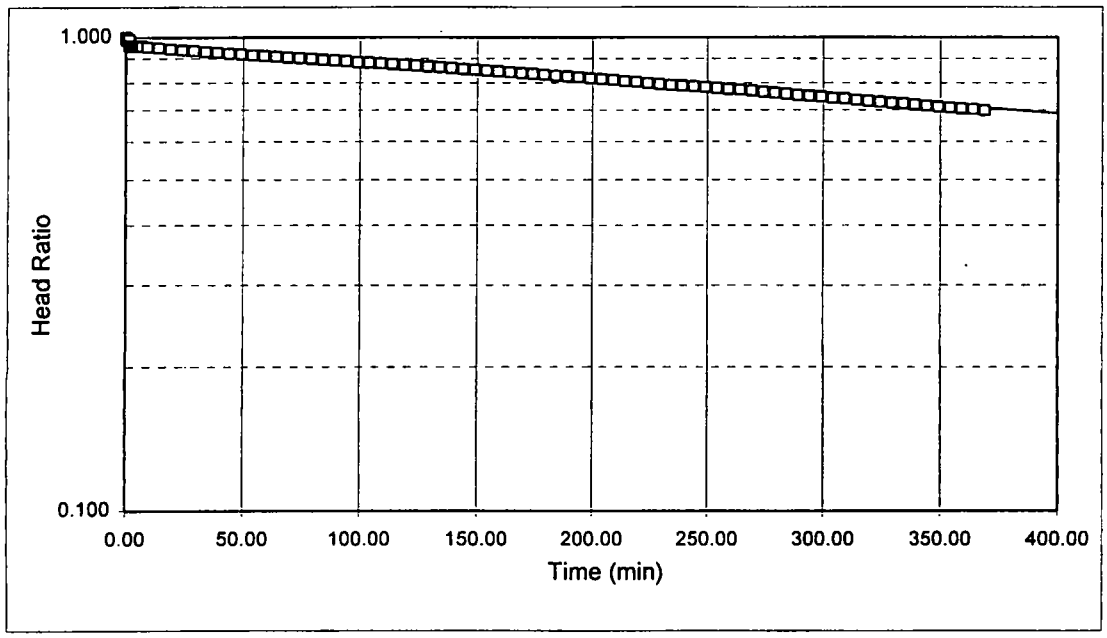
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
1995	199	1155	0	12.805	179.0	35.72	1.95	0.833
1995	199	1200	0	12.795	184.0	35.73	1.94	0.829
1995	199	1205	0	12.789	189.0	35.73	1.93	0.826
1995	199	1210	0	12.78	194.0	35.74	1.92	0.822
1995	199	1215	0	12.771	199.0	35.75	1.91	0.818
1995	199	1220	0	12.765	204.0	35.76	1.91	0.816
1995	199	1225	0	12.755	209.0	35.77	1.90	0.812
1995	199	1230	0	12.745	214.0	35.78	1.89	0.807
1995	199	1235	0	12.737	219.0	35.78	1.88	0.804
1995	199	1240	0	12.728	224.0	35.79	1.87	0.800
1995	199	1245	0	12.718	229.0	35.80	1.86	0.796
1995	199	1250	0	12.71	234.0	35.81	1.85	0.792
1995	199	1255	0	12.704	239.0	35.82	1.84	0.790
1995	199	1300	0	12.697	244.0	35.82	1.84	0.787
1995	199	1305	0	12.689	249.0	35.83	1.83	0.783
1995	199	1310	0	12.681	254.0	35.84	1.82	0.780
1995	199	1315	0	12.671	259.0	35.85	1.81	0.776
1995	199	1320	0	12.665	264.0	35.86	1.81	0.773
1995	199	1325	0	12.657	269.0	35.86	1.80	0.770
1995	199	1330	0	12.647	274.0	35.87	1.79	0.765
1995	199	1335	0	12.637	279.0	35.88	1.78	0.761
1995	199	1340	0	12.631	284.0	35.89	1.77	0.758
1995	199	1345	0	12.62	289.0	35.90	1.76	0.754
1995	199	1350	0	12.614	294.0	35.91	1.75	0.751
1995	199	1355	0	12.608	299.0	35.91	1.75	0.749
1995	199	1400	0	12.595	304.0	35.93	1.74	0.743
1995	199	1405	0	12.591	309.0	35.93	1.73	0.741
1995	199	1410	0	12.578	314.0	35.94	1.72	0.736
1995	199	1415	0	12.569	319.0	35.95	1.71	0.732
1995	199	1420	0	12.562	324.0	35.96	1.70	0.729
1995	199	1425	0	12.555	329.0	35.97	1.70	0.726
1995	199	1430	0	12.549	334.0	35.97	1.69	0.723
1995	199	1435	0	12.539	339.0	35.98	1.68	0.719
1995	199	1440	0	12.53	344.0	35.99	1.67	0.715
1995	199	1445	0	12.522	349.0	36.00	1.66	0.712
1995	199	1450	0	12.514	354.0	36.01	1.65	0.708
1995	199	1455	0	12.507	359.0	36.01	1.65	0.705
1995	199	1500	0	12.503	364.0	36.02	1.64	0.704
1995	199	1505	0	12.492	369.0	36.03	1.63	0.699

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-SS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.5	K=	4.36E-07	cm/sec
t_1 (min) =	0	K=	1.23E-03	ft/day
t_2 (min) =	400.00			
h_1/h_0 =	0.98			
h_2/h_0 =	0.69			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/18/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

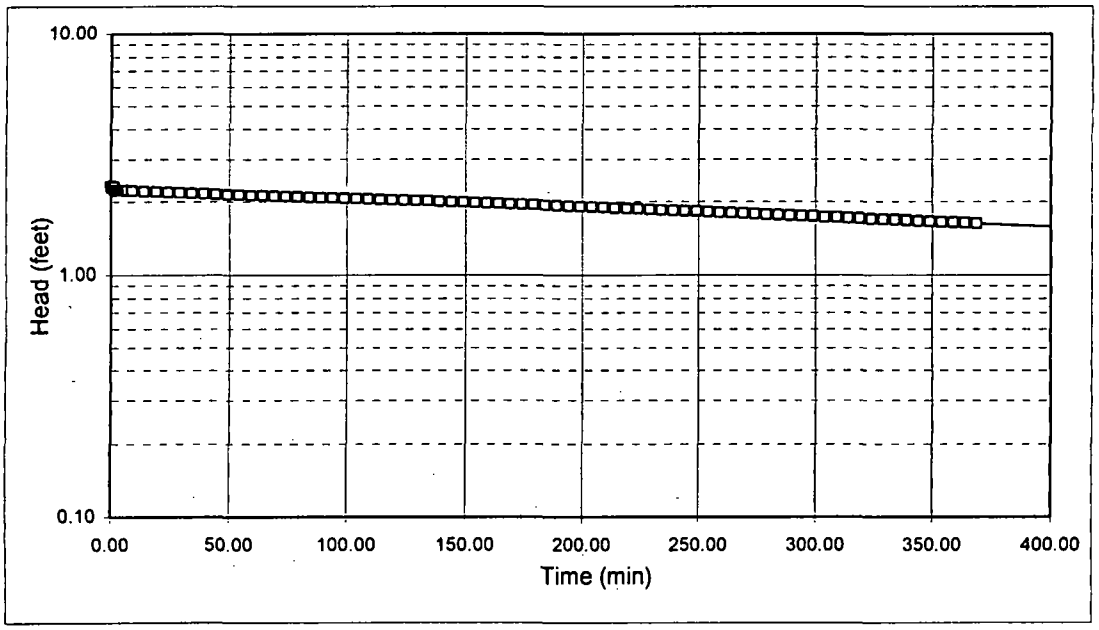
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-205-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.5	K=	3.88E-07	cm/sec
$\ln(R_e/r_w)$	3.43	K=	1.10E-03	ft/day
y_0 =	2.30			
y_t =	1.58			
t =	400.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/18/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/9/96

RISING HEAD TEST PZ-206-SS

WELL NO. PZ-206-SS

DATE	6/23/95	
INITIAL DEPTH TO WATER	40.14	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	112.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	127.3	FEET (btoc)
SATURATED THICKNESS	160	FEET
WATER TABLE TO BOTTOM OF SCREEN	87.16	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14.4	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	5.60	FEET
MAX. HEAD IN SCREEN?	N	

DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1152	0	45.74	0.0	5.60	1.00
1	1154	0	45.2	2.0	5.06	0.90
1	1155	0	44.96	3.0	4.82	0.86
1	1155	30	44.84	3.5	4.70	0.84
1	1156	0	44.75	4.0	4.61	0.82
1	1157	0	44.62	5.0	4.48	0.80
1	1157	30	44.49	5.5	4.35	0.78
1	1158	30	44.29	6.5	4.15	0.74
1	1159	0	44.16	7.0	4.02	0.72
1	1159	30	44.11	7.5	3.97	0.71
1	1200	0	44.04	8.0	3.90	0.70
1	1201	0	43.89	9.0	3.75	0.67
1	1201	30	43.8	9.5	3.66	0.65
1	1202	0	43.73	10.0	3.59	0.64
1	1202	30	43.67	10.5	3.53	0.63
1	1203	0	43.61	11.0	3.47	0.62
1	1203	30	43.54	11.5	3.40	0.61
1	1204	0	43.47	12.0	3.33	0.59
1	1204	30	43.39	12.5	3.25	0.58
1	1205	0	43.35	13.0	3.21	0.57
1	1205	30	43.28	13.5	3.14	0.56
1	1206	0	43.24	14.0	3.10	0.55
1	1207	0	43.13	15.0	2.99	0.53
1	1208	0	43.01	16.0	2.87	0.51

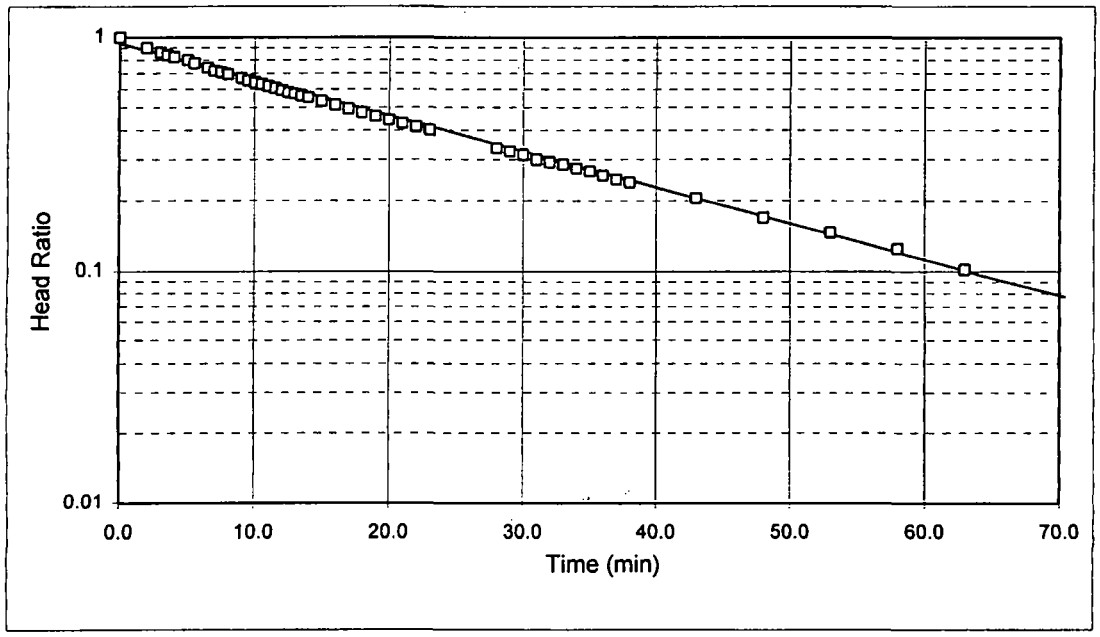
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1209	0	42.91	17.0	2.77	0.49
1	1210	0	42.81	18.0	2.67	0.48
1	1211	0	42.71	19.0	2.57	0.46
1	1212	0	42.62	20.0	2.48	0.44
1	1213	0	42.54	21.0	2.40	0.43
1	1214	0	42.46	22.0	2.32	0.41
1	1215	0	42.39	23.0	2.25	0.40
1	1220	0	42.02	28.0	1.88	0.34
1	1221	0	41.96	29.0	1.82	0.33
1	1222	0	41.9	30.0	1.76	0.31
1	1223	0	41.82	31.0	1.68	0.30
1	1224	0	41.78	32.0	1.64	0.29
1	1225	0	41.74	33.0	1.60	0.29
1	1226	0	41.68	34.0	1.54	0.28
1	1227	0	41.64	35.0	1.50	0.27
1	1228	0	41.58	36.0	1.44	0.26
1	1229	0	41.52	37.0	1.38	0.25
1	1230	0	41.48	38.0	1.34	0.24
1	1235	0	41.29	43.0	1.15	0.21
1	1240	0	41.09	48.0	0.95	0.17
1	1245	0	40.96	53.0	0.82	0.15
1	1250	0	40.84	58.0	0.70	0.13
1	1255	0	40.71	63.0	0.57	0.10

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-206-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14.4	K=	1.76E-05	cm/sec
t_1 (min) =	0	K=	4.99E-02	ft/day
t_2 (min) =	70.4			
h_1/h_0 =	0.94			
h_2/h_0 =	0.08			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/23/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

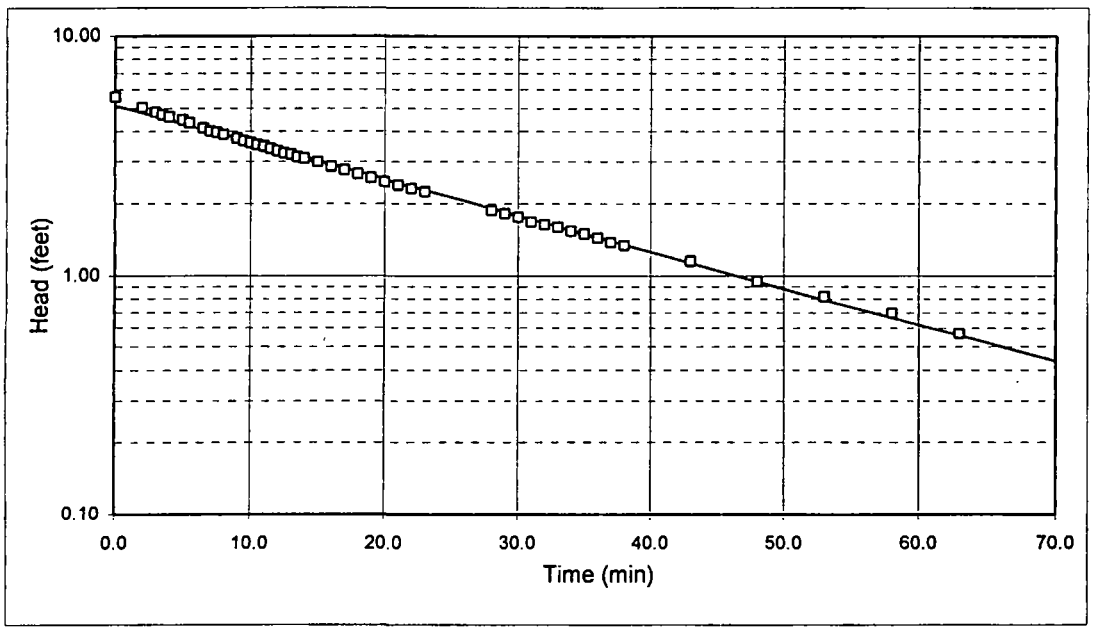
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-206-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14.4	K=	1.13E-05	cm/sec
$\ln(R_e/r_w)$	3.41	K=	3.19E-02	ft/day
y_0 =	5.13			
y_t =	0.44			
t =	70.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 06/23/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-207-AS

WELL NO. PZ-207-AS

DATE	7/21/95	
INITAL HEAD ON TRANSDUCER	10.316	FEET H_2O
INITIAL DEPTH TO WATER	28.06	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	33.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	41.7	FEET (btoc)
SATURATED THICKNESS	120	FEET
WATER TABLE TO BOTTOM OF SCREEN	13.64	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.25	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	202	1127	32	9.063	0.00	29.31	1.25	1.00
305	202	1127	33	9.3334	0.02	29.04	0.98	0.78
305	202	1127	34	9.5265	0.03	28.85	0.79	0.63
305	202	1127	35	9.6731	0.05	28.70	0.64	0.51
305	202	1127	36	9.7758	0.07	28.60	0.54	0.43
305	202	1127	37	9.8567	0.08	28.52	0.46	0.37
305	202	1127	38	9.9132	0.10	28.46	0.40	0.32
305	202	1127	39	9.9567	0.12	28.42	0.36	0.29
305	202	1127	40	9.9925	0.13	28.38	0.32	0.26
305	202	1127	41	10.017	0.15	28.36	0.30	0.24
305	202	1127	42	10.034	0.17	28.34	0.28	0.23
305	202	1127	43	10.17	0.18	28.21	0.15	0.12
305	202	1127	44	10.184	0.20	28.19	0.13	0.11
305	202	1127	45	10.193	0.22	28.18	0.12	0.10
305	202	1127	46	10.197	0.23	28.18	0.12	0.09
305	202	1127	47	10.204	0.25	28.17	0.11	0.09
305	202	1127	48	10.208	0.27	28.17	0.11	0.09
305	202	1127	49	10.209	0.28	28.17	0.11	0.09
305	202	1127	50	10.214	0.30	28.16	0.10	0.08
305	202	1127	51	10.215	0.32	28.16	0.10	0.08
305	202	1127	52	10.216	0.33	28.16	0.10	0.08
305	202	1127	53	10.218	0.35	28.16	0.10	0.08
305	202	1127	54	10.22	0.37	28.16	0.10	0.08
305	202	1127	55	10.221	0.38	28.16	0.10	0.08

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	202	1127	56	10.221	0.40	28.16	0.10	0.08
305	202	1127	57	10.222	0.42	28.15	0.09	0.08
305	202	1127	58	10.223	0.43	28.15	0.09	0.07
305	202	1127	59	10.224	0.45	28.15	0.09	0.07
305	202	1128	0	10.223	0.47	28.15	0.09	0.07
305	202	1128	1	10.224	0.48	28.15	0.09	0.07
305	202	1128	2	10.225	0.50	28.15	0.09	0.07
305	202	1128	3	10.226	0.52	28.15	0.09	0.07
305	202	1128	4	10.225	0.53	28.15	0.09	0.07
305	202	1128	5	10.225	0.55	28.15	0.09	0.07
305	202	1128	6	10.226	0.57	28.15	0.09	0.07
305	202	1128	7	10.225	0.58	28.15	0.09	0.07
305	202	1128	8	10.226	0.60	28.15	0.09	0.07
305	202	1128	9	10.228	0.62	28.15	0.09	0.07
305	202	1128	10	10.226	0.63	28.15	0.09	0.07
305	202	1128	11	10.226	0.65	28.15	0.09	0.07
305	202	1128	12	10.226	0.67	28.15	0.09	0.07
305	202	1128	13	10.226	0.68	28.15	0.09	0.07
305	202	1128	14	10.226	0.70	28.15	0.09	0.07
305	202	1128	15	10.226	0.72	28.15	0.09	0.07
305	202	1128	16	10.227	0.73	28.15	0.09	0.07
305	202	1128	17	10.228	0.75	28.15	0.09	0.07
305	202	1128	18	10.226	0.77	28.15	0.09	0.07
305	202	1128	19	10.228	0.78	28.15	0.09	0.07
305	202	1128	20	10.228	0.80	28.15	0.09	0.07
305	202	1128	21	10.227	0.82	28.15	0.09	0.07
305	202	1128	22	10.229	0.83	28.15	0.09	0.07
305	202	1128	23	10.227	0.85	28.15	0.09	0.07
305	202	1128	24	10.227	0.87	28.15	0.09	0.07
305	202	1128	25	10.227	0.88	28.15	0.09	0.07
305	202	1128	26	10.229	0.90	28.15	0.09	0.07
305	202	1128	27	10.228	0.92	28.15	0.09	0.07
305	202	1128	28	10.228	0.93	28.15	0.09	0.07
305	202	1128	29	10.227	0.95	28.15	0.09	0.07
305	202	1128	30	10.228	0.97	28.15	0.09	0.07
305	202	1128	31	10.228	0.98	28.15	0.09	0.07
305	202	1128	32	10.228	1.00	28.15	0.09	0.07
305	202	1128	33	10.229	1.02	28.15	0.09	0.07
305	202	1128	34	10.228	1.03	28.15	0.09	0.07
305	202	1128	35	10.229	1.05	28.15	0.09	0.07
305	202	1128	36	10.228	1.07	28.15	0.09	0.07
305	202	1128	37	10.228	1.08	28.15	0.09	0.07

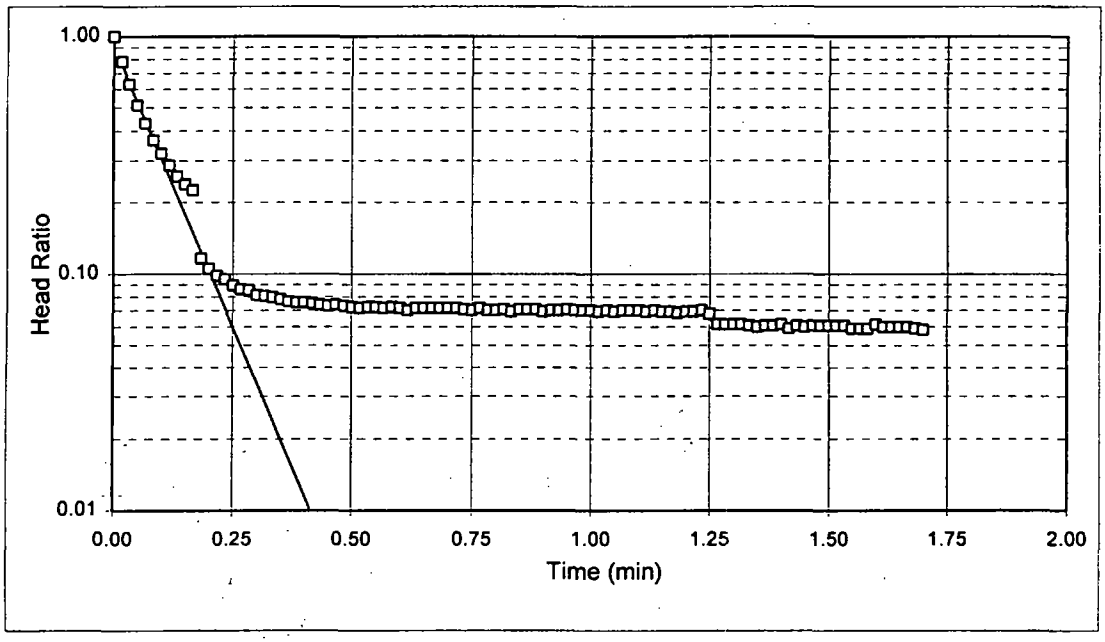
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	202	1128	38	10.228	1.10	28.15	0.09	0.07
305	202	1128	39	10.229	1.12	28.15	0.09	0.07
305	202	1128	40	10.228	1.13	28.15	0.09	0.07
305	202	1128	41	10.229	1.15	28.15	0.09	0.07
305	202	1128	42	10.229	1.17	28.15	0.09	0.07
305	202	1128	43	10.23	1.18	28.15	0.09	0.07
305	202	1128	44	10.229	1.20	28.15	0.09	0.07
305	202	1128	45	10.229	1.22	28.15	0.09	0.07
305	202	1128	46	10.228	1.23	28.15	0.09	0.07
305	202	1128	47	10.231	1.25	28.15	0.09	0.07
305	202	1128	48	10.239	1.27	28.14	0.08	0.06
305	202	1128	49	10.239	1.28	28.14	0.08	0.06
305	202	1128	50	10.239	1.30	28.14	0.08	0.06
305	202	1128	51	10.239	1.32	28.14	0.08	0.06
305	202	1128	52	10.24	1.33	28.14	0.08	0.06
305	202	1128	53	10.241	1.35	28.14	0.07	0.06
305	202	1128	54	10.24	1.37	28.14	0.08	0.06
305	202	1128	55	10.24	1.38	28.14	0.08	0.06
305	202	1128	56	10.239	1.40	28.14	0.08	0.06
305	202	1128	57	10.242	1.42	28.13	0.07	0.06
305	202	1128	58	10.24	1.43	28.14	0.08	0.06
305	202	1128	59	10.241	1.45	28.14	0.07	0.06
305	202	1129	0	10.24	1.47	28.14	0.08	0.06
305	202	1129	1	10.24	1.48	28.14	0.08	0.06
305	202	1129	2	10.24	1.50	28.14	0.08	0.06
305	202	1129	3	10.24	1.52	28.14	0.08	0.06
305	202	1129	4	10.24	1.53	28.14	0.08	0.06
305	202	1129	5	10.242	1.55	28.13	0.07	0.06
305	202	1129	6	10.242	1.57	28.13	0.07	0.06
305	202	1129	7	10.242	1.58	28.13	0.07	0.06
305	202	1129	8	10.239	1.60	28.14	0.08	0.06
305	202	1129	9	10.241	1.62	28.14	0.07	0.06
305	202	1129	10	10.241	1.63	28.14	0.07	0.06
305	202	1129	11	10.241	1.65	28.14	0.07	0.06
305	202	1129	12	10.241	1.67	28.14	0.07	0.06
305	202	1129	13	10.242	1.68	28.13	0.07	0.06
305	202	1129	14	10.243	1.70	28.13	0.07	0.06

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-207-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	8	K=	7.55E-03	cm/sec
t_1 (min) =	0.013	K=	2.14E+01	ft/day
t_2 (min) =	0.41			
h_1/h_0 =	0.79			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

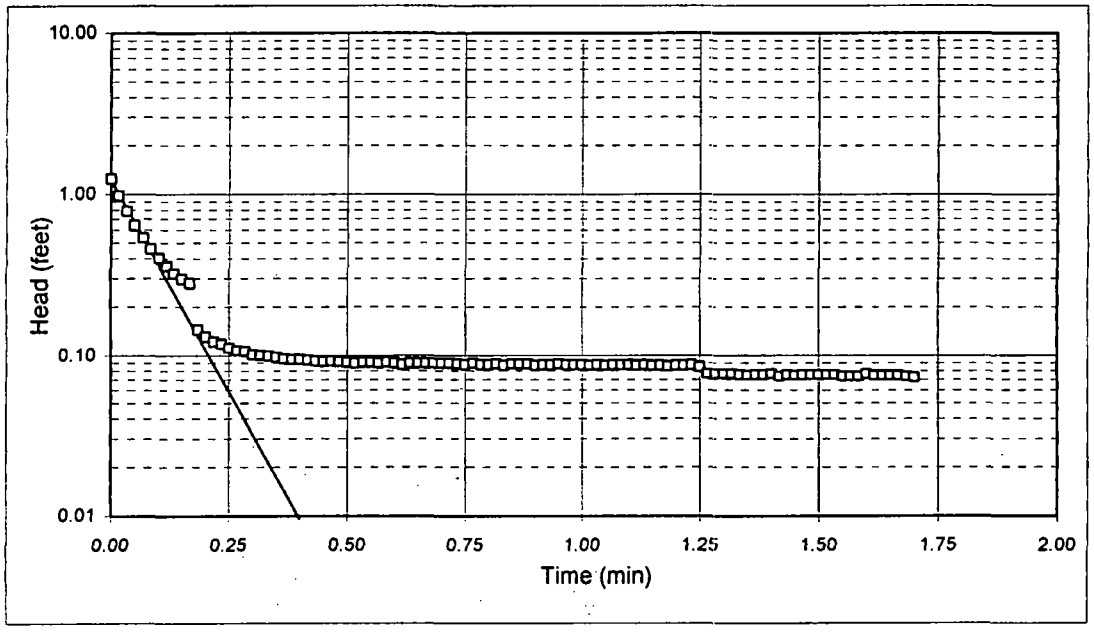
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-207-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	8	K=	4.76E-03	cm/sec
$\ln(R_e/r_w)$	1.78	K=	1.35E+01	ft/day
y_0 =	1.23			
y_t =	0.01			
t =	0.40			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/21/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

RISING HEAD TEST PZ-208-SS

WELL NO. PZ-208-SS

DATE	7/25/95	
INITIAL DEPTH TO WATER	37.81	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	85.6	FEET (btoc)
BOTTOM OF OPEN INTERVAL	100.9	FEET (btoc)
SATURATED THICKNESS	190	FEET
WATER TABLE TO BOTTOM OF SCREEN	63.09	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	15.3	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	1.92	FEET
MAX. HEAD IN SCREEN?	N	

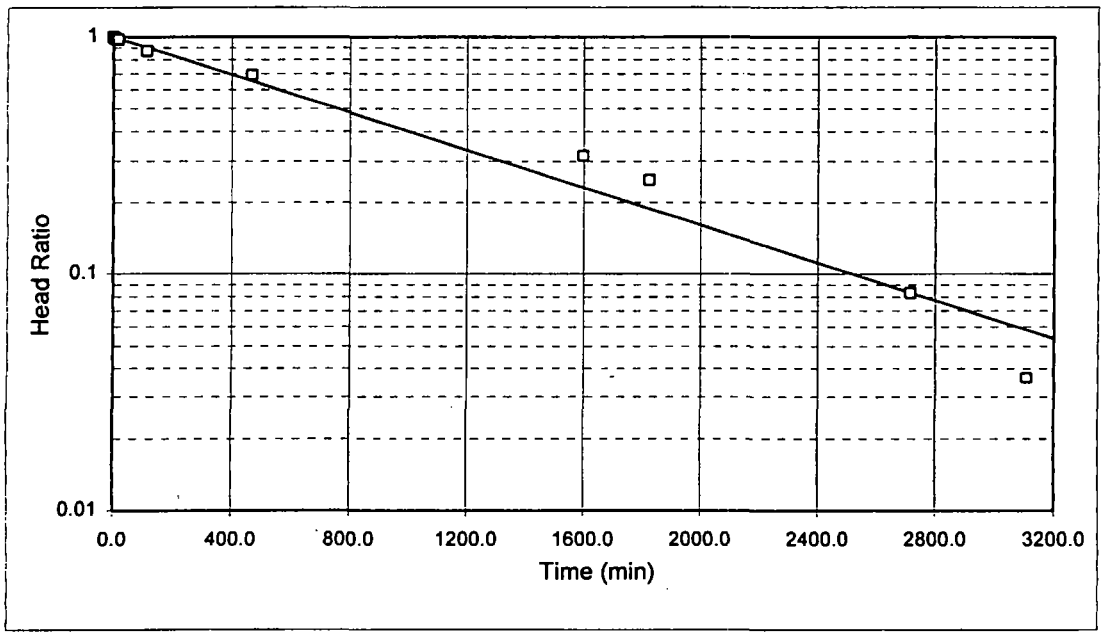
DAY	HR-MIN	SEC	DEPTH TO WATER (FEET)	ELAPSED TIME (MIN)	HEAD (FEET)	HEAD RATIO
1	1003	0	39.73	0.0	1.92	1.00
1	1004	0	39.71	1.0	1.90	0.99
1	1005	0	39.71	2.0	1.90	0.99
1	1010	0	39.7	7.0	1.89	0.98
1	1018	0	39.69	15.0	1.88	0.98
1	1155	0	39.49	112.0	1.68	0.88
1	1751	0	39.14	468.0	1.33	0.69
2	1241	0	38.42	1598.0	0.61	0.32
2	1627	0	38.29	1824.0	0.48	0.25
3	720	0	37.97	2717.0	0.16	0.08
3	1350	0	37.88	3107.0	0.07	0.04

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-208-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = filter pack radius (feet)
- L_e = length of screened interval (feet)
- t = time (seconds)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	15.3	K=	4.33E-07	cm/sec
t_1 (min) =	0	K=	1.23E-03	ft/day
t_2 (min) =	3200			
h_1/h_0 =	1.00			
h_2/h_0 =	0.05			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

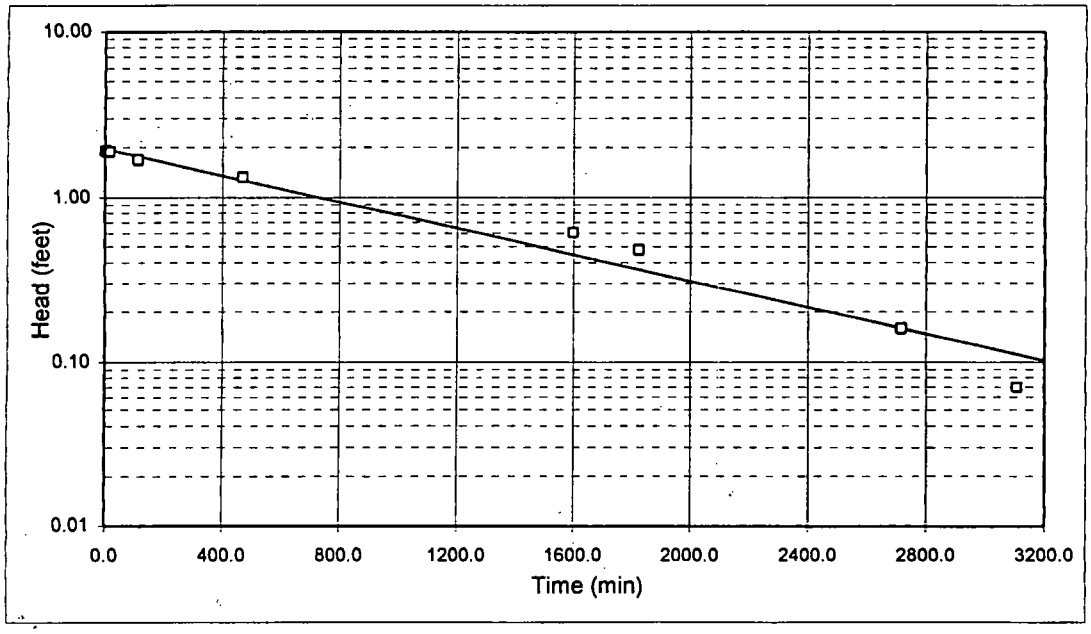
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-208-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	15.3	K=	2.73E-07	cm/sec
$\ln(R_e/r_w)$	3.26	K=	7.73E-04	ft/day
y_0 =	1.95			
y_t =	0.10			
t =	3200.0			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 07/25/95

Analysis By: CVK
Checked By: DSL
Analysis Date: 1/10/96

FALLING HEAD TEST PZ-300-AS

WELL NO. PZ-300-AS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	6.69	FEET H_2O
INITIAL DEPTH TO WATER	14.48	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	8.46	FEET (btoc)
BOTTOM OF OPEN INTERVAL	22.16	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.68	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	7.68	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.25	FEET
MAX. HEAD IN SCREEN?	Y	

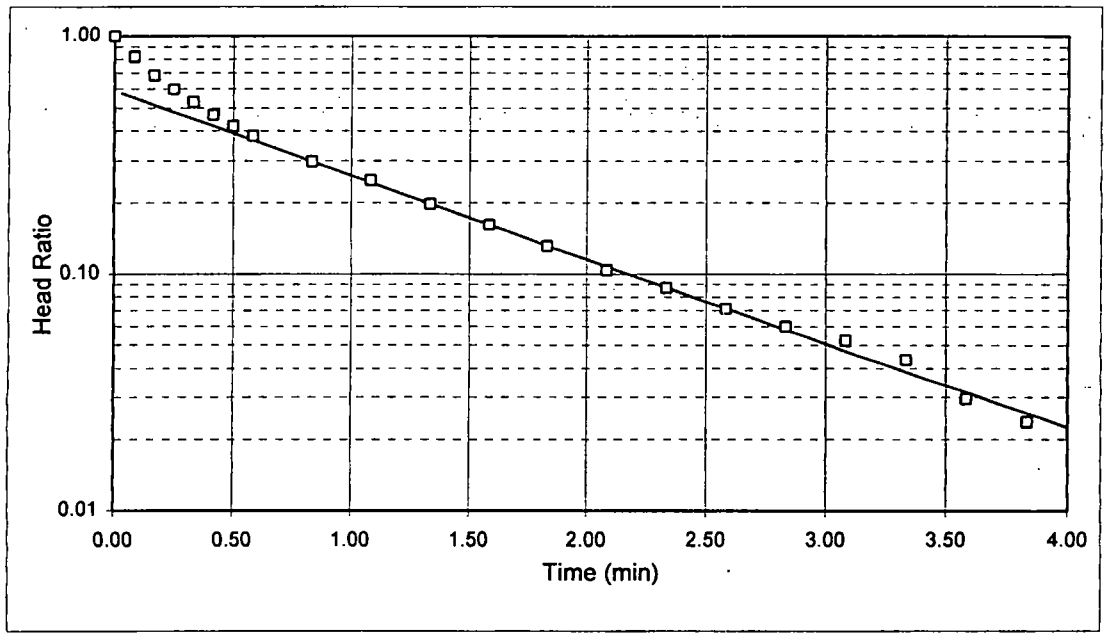
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
307	295	1135	36	6.9399	0.00	14.23	0.25	1.00
307	295	1135	41	6.895	0.08	14.28	0.20	0.82
307	295	1135	46	6.8614	0.17	14.31	0.17	0.69
307	295	1135	51	6.8398	0.25	14.33	0.15	0.60
307	295	1135	56	6.8222	0.33	14.35	0.13	0.53
307	295	1136	1	6.807	0.42	14.36	0.12	0.47
307	295	1136	6	6.7949	0.50	14.38	0.10	0.42
307	295	1136	11	6.7854	0.58	14.38	0.10	0.38
307	295	1136	26	6.7646	0.83	14.41	0.07	0.30
307	295	1136	41	6.7522	1.08	14.42	0.06	0.25
307	295	1136	56	6.7395	1.33	14.43	0.05	0.20
307	295	1137	11	6.7304	1.58	14.44	0.04	0.16
307	295	1137	26	6.7229	1.83	14.45	0.03	0.13
307	295	1137	41	6.7159	2.08	14.45	0.03	0.10
307	295	1137	56	6.7118	2.33	14.46	0.02	0.09
307	295	1138	11	6.7078	2.58	14.46	0.02	0.07
307	295	1138	26	6.705	2.83	14.47	0.02	0.06
307	295	1138	41	6.7031	3.08	14.47	0.01	0.05
307	295	1138	56	6.7009	3.33	14.47	0.01	0.04
307	295	1139	11	6.6974	3.58	14.47	0.01	0.03
307	295	1139	26	6.6959	3.83	14.47	0.01	0.02

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	7.68	K=	5.83E-04	cm/sec
t_1 (min) =	0.03	K=	1.65E+00	ft/day
t_2 (min) =	4.00			
h_1/h_0 =	0.58			
h_2/h_0 =	0.02			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-303-AS

WELL NO. PZ-303-AS

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	6.3	FEET H_2O
INITIAL DEPTH TO WATER	20.96	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	14.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	28.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.92	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	7.92	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.62	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1145	17	6.9176	0.00	20.34	0.62	1.00
305	305	1145	18	6.8904	0.02	20.37	0.59	0.96
305	305	1145	19	6.7545	0.03	20.51	0.45	0.74
305	305	1145	20	6.8514	0.05	20.41	0.55	0.89
305	305	1145	21	6.7295	0.07	20.53	0.43	0.70
305	305	1145	22	6.7046	0.08	20.56	0.40	0.66
305	305	1145	23	6.6789	0.10	20.58	0.38	0.61
305	305	1145	24	6.6451	0.12	20.61	0.35	0.56
305	305	1145	25	6.633	0.13	20.63	0.33	0.54
305	305	1145	26	6.6206	0.15	20.64	0.32	0.52
305	305	1145	27	6.6191	0.17	20.64	0.32	0.52
305	305	1145	28	6.6088	0.18	20.65	0.31	0.50
305	305	1145	29	6.6027	0.20	20.66	0.30	0.49
305	305	1145	30	6.5975	0.22	20.66	0.30	0.48
305	305	1145	31	6.5928	0.23	20.67	0.29	0.47
305	305	1145	32	6.5846	0.25	20.68	0.28	0.46
305	305	1145	33	6.5853	0.27	20.67	0.29	0.46
305	305	1145	34	6.5764	0.28	20.68	0.28	0.45
305	305	1145	35	6.5711	0.30	20.69	0.27	0.44
305	305	1145	36	6.5672	0.32	20.69	0.27	0.43
305	305	1145	37	6.5631	0.33	20.70	0.26	0.43
305	305	1145	38	6.5586	0.35	20.70	0.26	0.42
305	305	1145	39	6.5554	0.37	20.70	0.26	0.41
305	305	1145	40	6.5495	0.38	20.71	0.25	0.40
305	305	1145	41	6.5459	0.40	20.71	0.25	0.40
305	305	1145	42	6.5439	0.42	20.72	0.24	0.39
305	305	1145	43	6.5392	0.43	20.72	0.24	0.39

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1145	44	6.5352	0.45	20.72	0.24	0.38
305	305	1145	45	6.5311	0.47	20.73	0.23	0.37
305	305	1145	46	6.5272	0.48	20.73	0.23	0.37
305	305	1145	47	6.5248	0.50	20.74	0.22	0.36
305	305	1145	48	6.5178	0.52	20.74	0.22	0.35
305	305	1145	49	6.5121	0.53	20.75	0.21	0.34
305	305	1145	50	6.5118	0.55	20.75	0.21	0.34
305	305	1145	51	6.5109	0.57	20.75	0.21	0.34
305	305	1145	52	6.5093	0.58	20.75	0.21	0.34
305	305	1145	53	6.5075	0.60	20.75	0.21	0.34
305	305	1145	54	6.5053	0.62	20.75	0.21	0.33
305	305	1145	55	6.5022	0.63	20.76	0.20	0.33
305	305	1145	56	6.5	0.65	20.76	0.20	0.32
305	305	1145	57	6.4975	0.67	20.76	0.20	0.32
305	305	1145	58	6.4947	0.68	20.77	0.19	0.32
305	305	1145	59	6.4922	0.70	20.77	0.19	0.31
305	305	1146	0	6.4907	0.72	20.77	0.19	0.31
305	305	1146	1	6.4879	0.73	20.77	0.19	0.30
305	305	1146	2	6.489	0.75	20.77	0.19	0.31
305	305	1146	3	6.485	0.77	20.78	0.19	0.30
305	305	1146	4	6.4871	0.78	20.77	0.19	0.30
305	305	1146	5	6.3968	0.80	20.86	0.10	0.16
305	305	1146	6	6.4968	0.82	20.76	0.20	0.32
305	305	1146	7	6.4873	0.83	20.77	0.19	0.30
305	305	1146	8	6.4824	0.85	20.78	0.18	0.30
305	305	1146	9	6.4792	0.87	20.78	0.18	0.29
305	305	1146	10	6.4767	0.88	20.78	0.18	0.29
305	305	1146	11	6.4737	0.90	20.79	0.17	0.28
305	305	1146	12	6.4714	0.92	20.79	0.17	0.28
305	305	1146	13	6.4687	0.93	20.79	0.17	0.27
305	305	1146	14	6.4673	0.95	20.79	0.17	0.27
305	305	1146	15	6.4659	0.97	20.79	0.17	0.27
305	305	1146	16	6.4643	0.98	20.80	0.16	0.27
305	305	1146	17	6.4666	1.00	20.79	0.17	0.27
305	305	1146	18	6.465	1.02	20.80	0.16	0.27
305	305	1146	19	6.4608	1.03	20.80	0.16	0.26
305	305	1146	20	6.4656	1.05	20.79	0.17	0.27
305	305	1146	21	6.4583	1.07	20.80	0.16	0.26
305	305	1146	22	6.4613	1.08	20.80	0.16	0.26
305	305	1146	23	6.4606	1.10	20.80	0.16	0.26
305	305	1146	24	6.4562	1.12	20.80	0.16	0.25
305	305	1146	25	6.4551	1.13	20.80	0.16	0.25
305	305	1146	26	6.4573	1.15	20.80	0.16	0.25
305	305	1146	27	6.4571	1.17	20.80	0.16	0.25
305	305	1146	28	6.4521	1.18	20.81	0.15	0.25

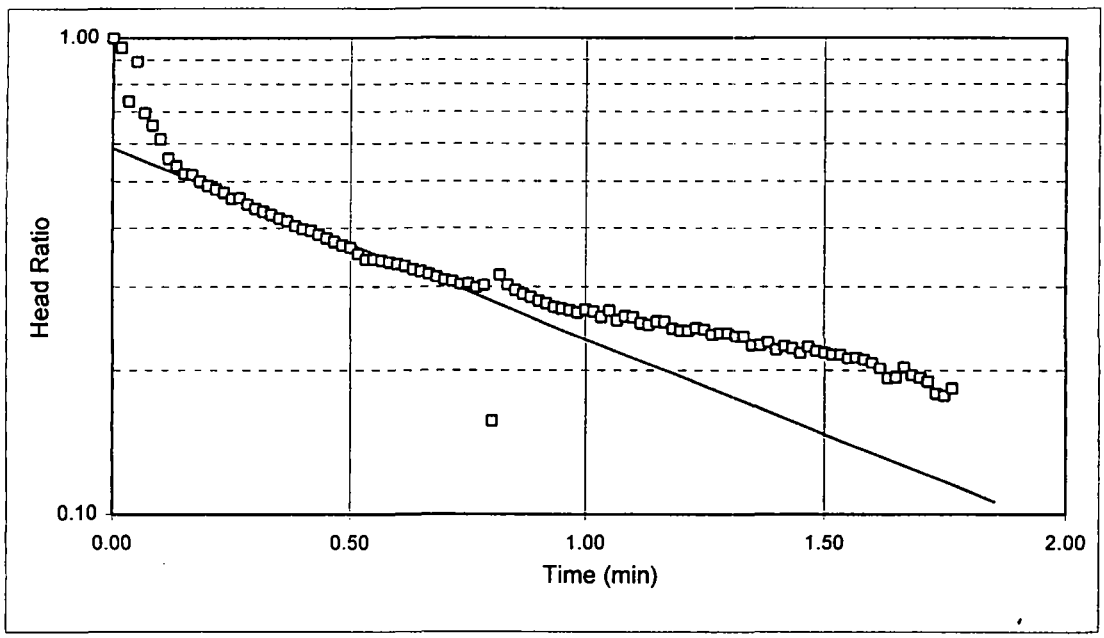
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1146	29	6.4508	1.20	20.81	0.15	0.24
305	305	1146	30	6.4507	1.22	20.81	0.15	0.24
305	305	1146	31	6.4527	1.23	20.81	0.15	0.25
305	305	1146	32	6.4513	1.25	20.81	0.15	0.24
305	305	1146	33	6.4476	1.27	20.81	0.15	0.24
305	305	1146	34	6.4488	1.28	20.81	0.15	0.24
305	305	1146	35	6.4485	1.30	20.81	0.15	0.24
305	305	1146	36	6.4466	1.32	20.81	0.15	0.24
305	305	1146	37	6.4463	1.33	20.81	0.15	0.24
305	305	1146	38	6.4403	1.35	20.82	0.14	0.23
305	305	1146	39	6.4402	1.37	20.82	0.14	0.23
305	305	1146	40	6.4422	1.38	20.82	0.14	0.23
305	305	1146	41	6.4373	1.40	20.82	0.14	0.22
305	305	1146	42	6.4396	1.42	20.82	0.14	0.23
305	305	1146	43	6.4381	1.43	20.82	0.14	0.22
305	305	1146	44	6.4349	1.45	20.83	0.13	0.22
305	305	1146	45	6.4393	1.47	20.82	0.14	0.23
305	305	1146	46	6.4363	1.48	20.82	0.14	0.22
305	305	1146	47	6.4352	1.50	20.82	0.14	0.22
305	305	1146	48	6.4338	1.52	20.83	0.13	0.22
305	305	1146	49	6.4337	1.53	20.83	0.13	0.22
305	305	1146	50	6.4314	1.55	20.83	0.13	0.21
305	305	1146	51	6.4319	1.57	20.83	0.13	0.21
305	305	1146	52	6.4306	1.58	20.83	0.13	0.21
305	305	1146	53	6.4283	1.60	20.83	0.13	0.21
305	305	1146	54	6.4248	1.62	20.84	0.12	0.20
305	305	1146	55	6.419	1.63	20.84	0.12	0.19
305	305	1146	56	6.4194	1.65	20.84	0.12	0.19
305	305	1146	57	6.4257	1.67	20.83	0.13	0.20
305	305	1146	58	6.4207	1.68	20.84	0.12	0.20
305	305	1146	59	6.4191	1.70	20.84	0.12	0.19
305	305	1147	0	6.4169	1.72	20.84	0.12	0.19
305	305	1147	1	6.4102	1.73	20.85	0.11	0.18
305	305	1147	2	6.4092	1.75	20.85	0.11	0.18
305	305	1147	3	6.4131	1.77	20.85	0.11	0.18

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-303-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	7.92	K=	6.00E-04	cm/sec
t_1 (min) =	0	K=	1.70E+00	ft/day
t_2 (min) =	1.86			
h_1/h_0 =	0.59			
h_2/h_0 =	0.11			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-300-AS

WELL NO. PZ-300-AS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	6.69	FEET H_2O
INITIAL DEPTH TO WATER	14.48	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	8.5	FEET (btoc)
BOTTOM OF OPEN INTERVAL	22.2	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.68	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	7.68	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.95	FEET
MAX. HEAD IN SCREEN?	Y	

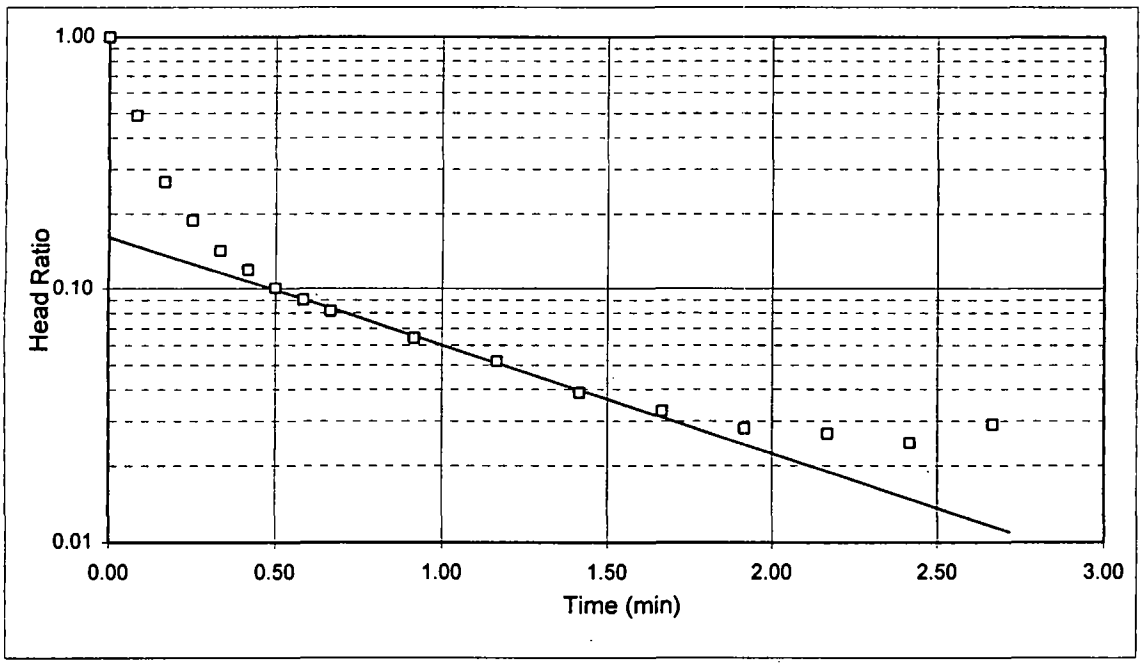
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
307	295	1143	12	5.7409	0.00	15.43	0.95	1.00
307	295	1143	17	6.2245	0.08	14.95	0.47	0.49
307	295	1143	22	6.4359	0.17	14.73	0.25	0.27
307	295	1143	27	6.511	0.25	14.66	0.18	0.19
307	295	1143	32	6.5537	0.33	14.62	0.14	0.14
307	295	1143	37	6.576	0.42	14.59	0.11	0.12
307	295	1143	42	6.5945	0.50	14.58	0.10	0.10
307	295	1143	47	6.6042	0.58	14.57	0.09	0.09
307	295	1143	52	6.6124	0.67	14.56	0.08	0.08
307	295	1144	7	6.6291	0.92	14.54	0.06	0.06
307	295	1144	22	6.6406	1.17	14.53	0.05	0.05
307	295	1144	37	6.6531	1.42	14.52	0.04	0.04
307	295	1144	52	6.6587	1.67	14.51	0.03	0.03
307	295	1145	7	6.6633	1.92	14.51	0.03	0.03
307	295	1145	22	6.6645	2.17	14.51	0.03	0.03
307	295	1145	37	6.6666	2.42	14.50	0.02	0.02
307	295	1145	52	6.6623	2.67	14.51	0.03	0.03

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	7.68	K=	7.07E-04	cm/sec
t_1 (min) =	0	K=	2.00E+00	ft/day
t_2 (min) =	2.72			
h_1/h_0 =	0.16			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

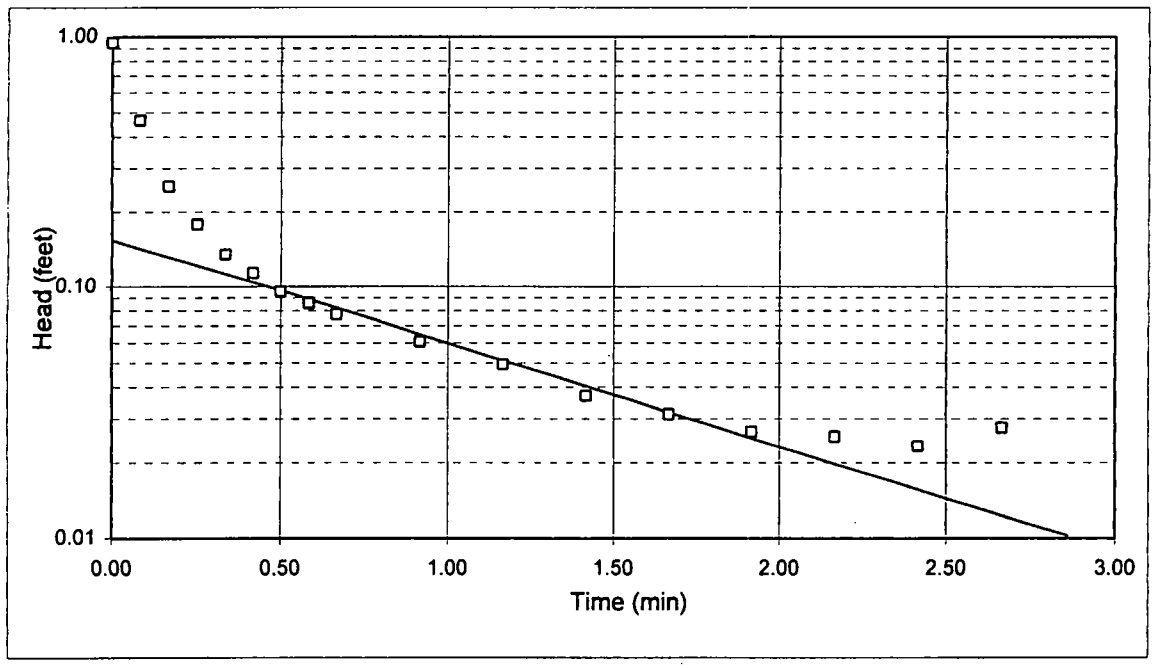
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
r_w =	0.34			
L_e =	7.68	K=	2.13E-03	cm/sec
$\ln(R_e/r_w)$	1.68	K=	6.04E+00	ft/day
y_0 =	0.15			
y_t =	0.01			
t =	2.86			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-300-AD

WELL NO. PZ-300-AD

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	9.93	FEET H_2O
INITIAL DEPTH TO WATER	16.55	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	35.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	43.7	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	27.17	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.62	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.55	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	841	48	12.475	0.00	14.01	2.55	1.00
305	295	841	50	12.417	0.03	14.06	2.49	0.98
305	295	841	52	12.363	0.07	14.12	2.43	0.96
305	295	841	54	12.317	0.10	14.16	2.39	0.94
305	295	841	56	12.27	0.13	14.21	2.34	0.92
305	295	841	58	12.221	0.17	14.26	2.29	0.90
305	295	842	0	12.176	0.20	14.30	2.25	0.88
305	295	842	2	12.133	0.23	14.35	2.20	0.87
305	295	842	4	12.09	0.27	14.39	2.16	0.85
305	295	842	6	12.047	0.30	14.43	2.12	0.83
305	295	842	8	12.005	0.33	14.48	2.08	0.82
305	295	842	10	11.969	0.37	14.51	2.04	0.80
305	295	842	12	11.926	0.40	14.55	2.00	0.78
305	295	842	14	11.888	0.43	14.59	1.96	0.77
305	295	842	16	11.855	0.47	14.63	1.93	0.76
305	295	842	18	11.816	0.50	14.66	1.89	0.74
305	295	842	20	11.785	0.53	14.70	1.86	0.73
305	295	842	22	11.745	0.57	14.74	1.82	0.71
305	295	842	24	11.712	0.60	14.77	1.78	0.70
305	295	842	26	11.683	0.63	14.80	1.75	0.69
305	295	842	28	11.65	0.67	14.83	1.72	0.68
305	295	842	30	11.62	0.70	14.86	1.69	0.66
305	295	842	32	11.592	0.73	14.89	1.66	0.65
305	295	842	34	11.563	0.77	14.92	1.63	0.64

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	842	36	11.532	0.80	14.95	1.60	0.63
305	295	842	38	11.502	0.83	14.98	1.57	0.62
305	295	842	40	11.477	0.87	15.00	1.55	0.61
305	295	842	42	11.447	0.90	15.03	1.52	0.60
305	295	842	44	11.422	0.93	15.06	1.49	0.59
305	295	842	46	11.396	0.97	15.08	1.47	0.58
305	295	842	48	11.366	1.00	15.11	1.44	0.56
305	295	842	50	11.344	1.03	15.14	1.41	0.56
305	295	842	52	11.318	1.07	15.16	1.39	0.55
305	295	842	54	11.29	1.10	15.19	1.36	0.53
305	295	842	56	11.264	1.13	15.22	1.33	0.52
305	295	842	58	11.241	1.17	15.24	1.31	0.52
305	295	843	0	11.22	1.20	15.26	1.29	0.51
305	295	843	2	11.195	1.23	15.29	1.27	0.50
305	295	843	4	11.174	1.27	15.31	1.24	0.49
305	295	843	6	11.152	1.30	15.33	1.22	0.48
305	295	843	20	11.004	1.53	15.48	1.07	0.42
305	295	843	30	10.912	1.70	15.57	0.98	0.39
305	295	843	40	10.822	1.87	15.66	0.89	0.35
305	295	843	50	10.746	2.03	15.73	0.82	0.32
305	295	844	0	10.672	2.20	15.81	0.74	0.29
305	295	844	10	10.608	2.37	15.87	0.68	0.27
305	295	844	20	10.55	2.53	15.93	0.62	0.24
305	295	844	30	10.496	2.70	15.98	0.57	0.22
305	295	844	40	10.439	2.87	16.04	0.51	0.20
305	295	844	50	10.394	3.03	16.09	0.46	0.18
305	295	845	0	10.354	3.20	16.13	0.42	0.17
305	295	845	10	10.314	3.37	16.17	0.38	0.15
305	295	845	20	10.277	3.53	16.20	0.35	0.14
305	295	845	30	10.251	3.70	16.23	0.32	0.13
305	295	845	40	10.212	3.87	16.27	0.28	0.11
305	295	845	50	10.192	4.03	16.29	0.26	0.10
305	295	846	0	10.167	4.20	16.31	0.24	0.09
305	295	846	10	10.145	4.37	16.34	0.22	0.08
305	295	846	20	10.123	4.53	16.36	0.19	0.08
305	295	846	30	10.104	4.70	16.38	0.17	0.07
305	295	846	40	10.089	4.87	16.39	0.16	0.06
305	295	846	50	10.071	5.03	16.41	0.14	0.06
305	295	847	0	10.058	5.20	16.42	0.13	0.05
305	295	847	10	10.045	5.37	16.44	0.11	0.05
305	295	847	20	10.031	5.53	16.45	0.10	0.04
305	295	847	30	10.021	5.70	16.46	0.09	0.04

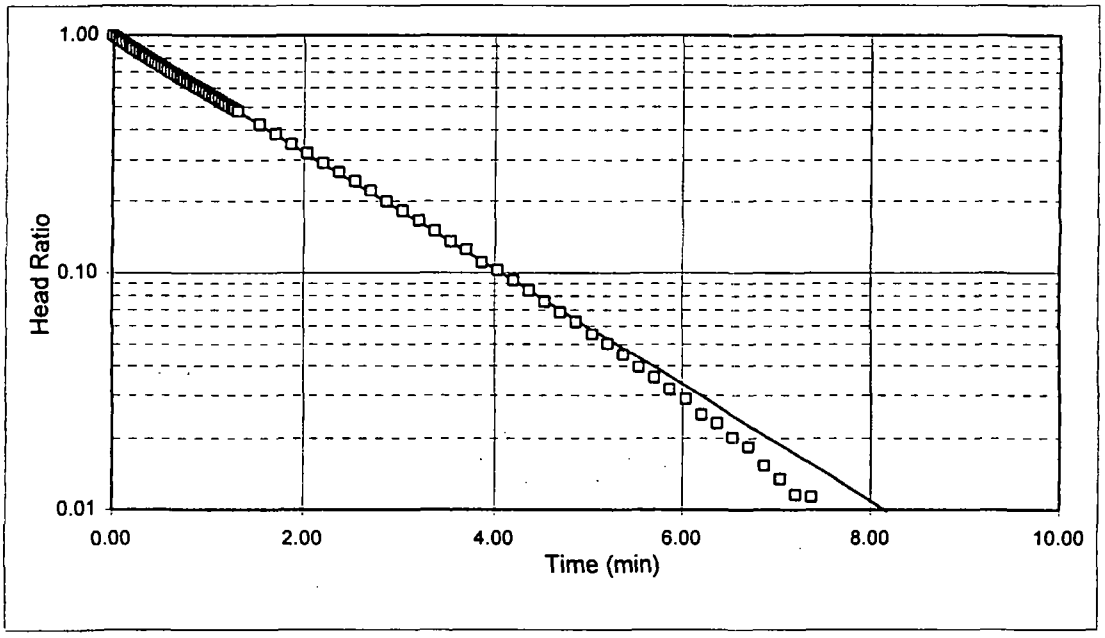
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	847	40	10.011	5.87	16.47	0.08	0.03
305	295	847	50	10.004	6.03	16.48	0.07	0.03
305	295	848	0	9.994	6.20	16.49	0.06	0.03
305	295	848	10	9.9889	6.37	16.49	0.06	0.02
305	295	848	20	9.9813	6.53	16.50	0.05	0.02
305	295	848	30	9.9767	6.70	16.50	0.05	0.02
305	295	848	40	9.9688	6.87	16.51	0.04	0.02
305	295	848	50	9.9641	7.03	16.52	0.03	0.01
305	295	849	0	9.9593	7.20	16.52	0.03	0.01
305	295	849	10	9.9588	7.37	16.52	0.03	0.01
305	295	849	20	9.9523	7.53	16.53	0.02	0.01
305	295	849	30	9.9478	7.70	16.53	0.02	0.01
305	295	849	40	9.9475	7.87	16.53	0.02	0.01
305	295	849	50	9.9463	8.03	16.53	0.02	0.01
305	295	850	0	9.9377	8.20	16.54	0.01	0.00
305	295	850	30	9.933	8.70	16.55	0.00	0.00
305	295	850	44	9.9316	8.93	16.55	0.00	0.00
305	295	850	46	9.9311	8.97	16.55	0.00	0.00
305	295	850	48	9.931	9.00	16.55	0.00	0.00
305	295	850	50	9.9279	9.03	16.55	0.00	0.00
305	295	850	52	9.9295	9.07	16.55	0.00	0.00
305	295	850	54	9.9298	9.10	16.55	0.00	0.00
305	295	850	56	9.9297	9.13	16.55	0.00	0.00
305	295	850	58	9.929	9.17	16.55	0.00	0.00

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-AD

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	8.62	K=	3.73E-04	cm/sec
t_1 (min) =	0	K=	1.06E+00	ft/day
t_2 (min) =	8.18			
h_1/h_0 =	1.00			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

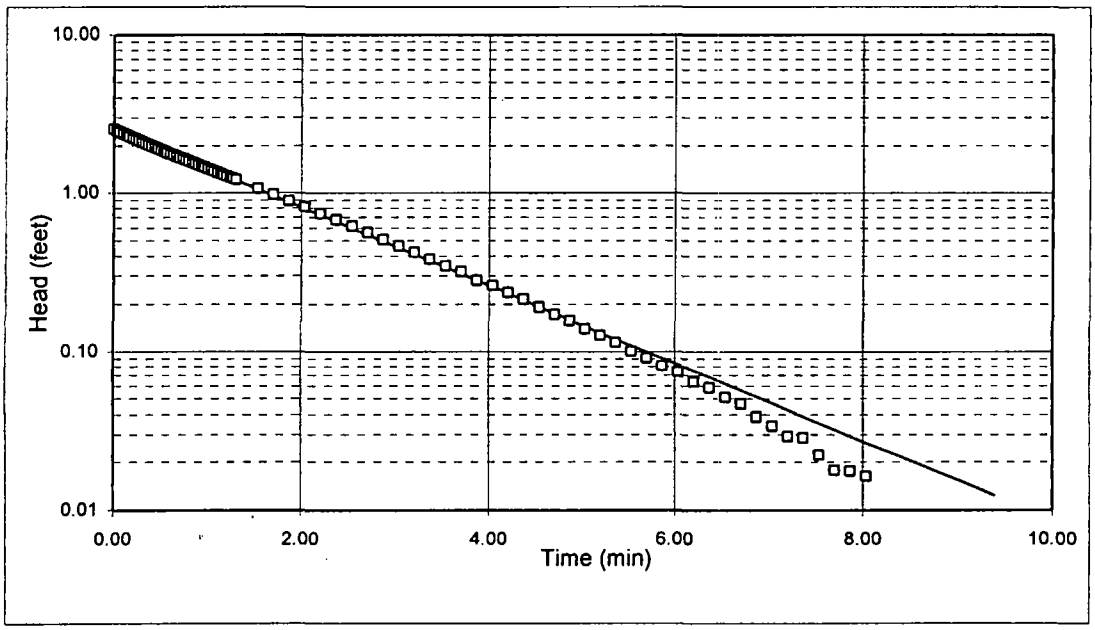
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-AD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	8.62	K=	2.72E-04	cm/sec
$\ln(R_e/r_w)$	2.35	K=	7.72E-01	ft/day
y_0 =	2.51			
y_t =	0.01			
t =	9.40			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-300-AD

WELL NO. PZ-300-AD

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	9.93	FEET H_2O
INITIAL DEPTH TO WATER	16.55	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	35.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	43.7	FEET (btoc)
SATURATED THICKNESS	30	FEET
WATER TABLE TO BOTTOM OF SCREEN	27.15	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.6	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	3.13	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	851	2	6.8026	0.00	19.68	3.13	1.00
305	295	851	4	6.8462	0.03	19.63	3.08	0.99
305	295	851	6	6.9483	0.07	19.53	2.98	0.95
305	295	851	8	6.9944	0.10	19.49	2.94	0.94
305	295	851	10	7.0197	0.13	19.46	2.91	0.93
305	295	851	12	7.0565	0.17	19.42	2.87	0.92
305	295	851	14	7.0863	0.20	19.39	2.84	0.91
305	295	851	16	7.1148	0.23	19.37	2.82	0.90
305	295	851	18	7.1418	0.27	19.34	2.79	0.89
305	295	851	20	7.1667	0.30	19.31	2.76	0.88
305	295	851	22	7.1922	0.33	19.29	2.74	0.88
305	295	851	24	7.2145	0.37	19.27	2.72	0.87
305	295	851	26	7.2381	0.40	19.24	2.69	0.86
305	295	851	28	7.2621	0.43	19.22	2.67	0.85
305	295	851	30	7.2825	0.47	19.20	2.65	0.85
305	295	851	32	7.3067	0.50	19.17	2.62	0.84
305	295	851	34	7.3281	0.53	19.15	2.60	0.83
305	295	851	36	7.3481	0.57	19.13	2.58	0.83
305	295	851	38	7.3735	0.60	19.11	2.56	0.82
305	295	851	40	7.3843	0.63	19.10	2.55	0.81
305	295	851	42	7.4092	0.67	19.07	2.52	0.81
305	295	851	44	7.427	0.70	19.05	2.50	0.80
305	295	851	46	7.4521	0.73	19.03	2.48	0.79
305	295	851	48	7.4716	0.77	19.01	2.46	0.79
305	295	851	50	7.4888	0.80	18.99	2.44	0.78
305	295	851	52	7.5094	0.83	18.97	2.42	0.77
305	295	851	54	7.5276	0.87	18.95	2.40	0.77
305	295	851	56	7.5449	0.90	18.94	2.39	0.76
305	295	851	58	7.5651	0.93	18.91	2.36	0.76
305	295	852	0	7.5779	0.97	18.90	2.35	0.75

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	852	2	7.5964	1.00	18.88	2.33	0.75
305	295	852	4	7.6172	1.03	18.86	2.31	0.74
305	295	852	6	7.634	1.07	18.85	2.30	0.73
305	295	852	8	7.6503	1.10	18.83	2.28	0.73
305	295	852	10	7.6672	1.13	18.81	2.26	0.72
305	295	852	12	7.6855	1.17	18.79	2.24	0.72
305	295	852	14	7.702	1.20	18.78	2.23	0.71
305	295	852	16	7.7187	1.23	18.76	2.21	0.71
305	295	852	18	7.7351	1.27	18.74	2.19	0.70
305	295	852	20	7.7513	1.30	18.73	2.18	0.70
305	295	852	22	7.7683	1.33	18.71	2.16	0.69
305	295	852	24	7.7829	1.37	18.70	2.15	0.69
305	295	852	26	7.7991	1.40	18.68	2.13	0.68
305	295	852	28	7.8145	1.43	18.67	2.12	0.68
305	295	852	30	7.8298	1.47	18.65	2.10	0.67
305	295	852	32	7.8455	1.50	18.63	2.08	0.67
305	295	852	34	7.8606	1.53	18.62	2.07	0.66
305	295	852	36	7.8794	1.57	18.60	2.05	0.66
305	295	852	38	7.8948	1.60	18.59	2.04	0.65
305	295	852	40	7.9108	1.63	18.57	2.02	0.65
305	295	852	42	7.9243	1.67	18.56	2.01	0.64
305	295	852	44	7.9407	1.70	18.54	1.99	0.64
305	295	852	46	7.9525	1.73	18.53	1.98	0.63
305	295	852	48	7.9703	1.77	18.51	1.96	0.63
305	295	852	50	7.9841	1.80	18.50	1.95	0.62
305	295	852	52	7.9973	1.83	18.48	1.93	0.62
305	295	852	54	8.0127	1.87	18.47	1.92	0.61
305	295	852	56	8.0307	1.90	18.45	1.90	0.61
305	295	852	58	8.044	1.93	18.44	1.89	0.60
305	295	853	0	8.052	1.97	18.43	1.88	0.60
305	295	853	2	8.0681	2.00	18.41	1.86	0.60
305	295	853	10	8.1272	2.13	18.35	1.80	0.58
305	295	853	20	8.1926	2.30	18.29	1.74	0.56
305	295	853	30	8.2542	2.47	18.23	1.68	0.54
305	295	853	40	8.3159	2.63	18.16	1.61	0.52
305	295	853	50	8.3751	2.80	18.10	1.55	0.50
305	295	854	0	8.4301	2.97	18.05	1.50	0.48
305	295	854	10	8.4846	3.13	18.00	1.45	0.46
305	295	854	20	8.5435	3.30	17.94	1.39	0.44
305	295	854	30	8.5945	3.47	17.89	1.34	0.43
305	295	854	40	8.6398	3.63	17.84	1.29	0.41
305	295	854	50	8.6851	3.80	17.79	1.24	0.40
305	295	855	0	8.7309	3.97	17.75	1.20	0.38
305	295	855	10	8.7786	4.13	17.70	1.15	0.37
305	295	855	20	8.8196	4.30	17.66	1.11	0.36
305	295	855	30	8.8617	4.47	17.62	1.07	0.34
305	295	855	40	8.9019	4.63	17.58	1.03	0.33
305	295	855	50	8.9404	4.80	17.54	0.99	0.32

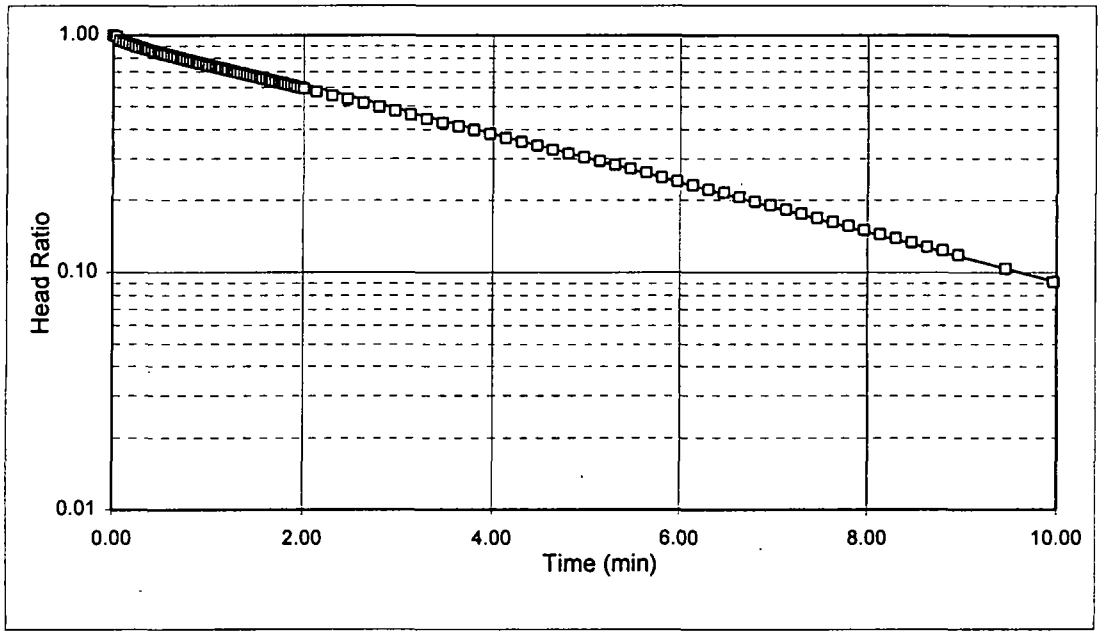
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	856	0	8.9782	4.97	17.50	0.95	0.30
305	295	856	10	9.0138	5.13	17.47	0.92	0.29
305	295	856	20	9.0454	5.30	17.43	0.88	0.28
305	295	856	30	9.0792	5.47	17.40	0.85	0.27
305	295	856	40	9.1093	5.63	17.37	0.82	0.26
305	295	856	50	9.1488	5.80	17.33	0.78	0.25
305	295	857	0	9.1761	5.97	17.30	0.75	0.24
305	295	857	10	9.2054	6.13	17.27	0.72	0.23
305	295	857	20	9.2345	6.30	17.25	0.70	0.22
305	295	857	30	9.2554	6.47	17.22	0.67	0.22
305	295	857	40	9.2843	6.63	17.20	0.65	0.21
305	295	857	50	9.3116	6.80	17.17	0.62	0.20
305	295	858	0	9.3325	6.97	17.15	0.60	0.19
305	295	858	10	9.3577	7.13	17.12	0.57	0.18
305	295	858	20	9.3798	7.30	17.10	0.55	0.18
305	295	858	30	9.4009	7.47	17.08	0.53	0.17
305	295	858	40	9.4203	7.63	17.06	0.51	0.16
305	295	858	50	9.4399	7.80	17.04	0.49	0.16
305	295	859	0	9.459	7.97	17.02	0.47	0.15
305	295	859	10	9.4773	8.13	17.00	0.45	0.14
305	295	859	20	9.4948	8.30	16.99	0.44	0.14
305	295	859	30	9.5117	8.47	16.97	0.42	0.13
305	295	859	40	9.5297	8.63	16.95	0.40	0.13
305	295	859	50	9.5437	8.80	16.94	0.39	0.12
305	295	900	0	9.5594	8.97	16.92	0.37	0.12
305	295	900	30	9.6053	9.47	16.87	0.32	0.10
305	295	901	0	9.644	9.97	16.84	0.29	0.09
305	295	901	30	9.6756	10.47	16.80	0.25	0.08
305	295	902	0	9.7028	10.97	16.78	0.23	0.07
305	295	902	30	9.7316	11.47	16.75	0.20	0.06
305	295	903	0	9.7594	11.97	16.72	0.17	0.05
305	295	903	30	9.7817	12.47	16.70	0.15	0.05
305	295	904	0	9.7995	12.97	16.68	0.13	0.04
305	295	904	30	9.8121	13.47	16.67	0.12	0.04
305	295	905	0	9.8268	13.97	16.65	0.10	0.03
305	295	905	30	9.8384	14.47	16.64	0.09	0.03
305	295	906	0	9.85	14.97	16.63	0.08	0.03
305	295	906	30	9.8624	15.47	16.62	0.07	0.02
305	295	907	0	9.8725	15.97	16.61	0.06	0.02
305	295	907	30	9.8824	16.47	16.60	0.05	0.02
305	295	908	0	9.8892	16.97	16.59	0.04	0.01
305	295	908	30	9.8959	17.47	16.58	0.03	0.01
305	295	909	0	9.8989	17.97	16.58	0.03	0.01
305	295	909	30	9.9022	18.47	16.58	0.03	0.01
305	295	910	0	9.9109	18.97	16.57	0.02	0.01
305	295	910	30	9.9113	19.47	16.57	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AD

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	8.6	K=	1.58E-04	cm/sec
t_1 (win) =	0	K=	4.48E-01	ft/day
t_2 (win) =	10.00			
h_1/h_0 =	1.00			
h_2/h_0 =	0.09			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

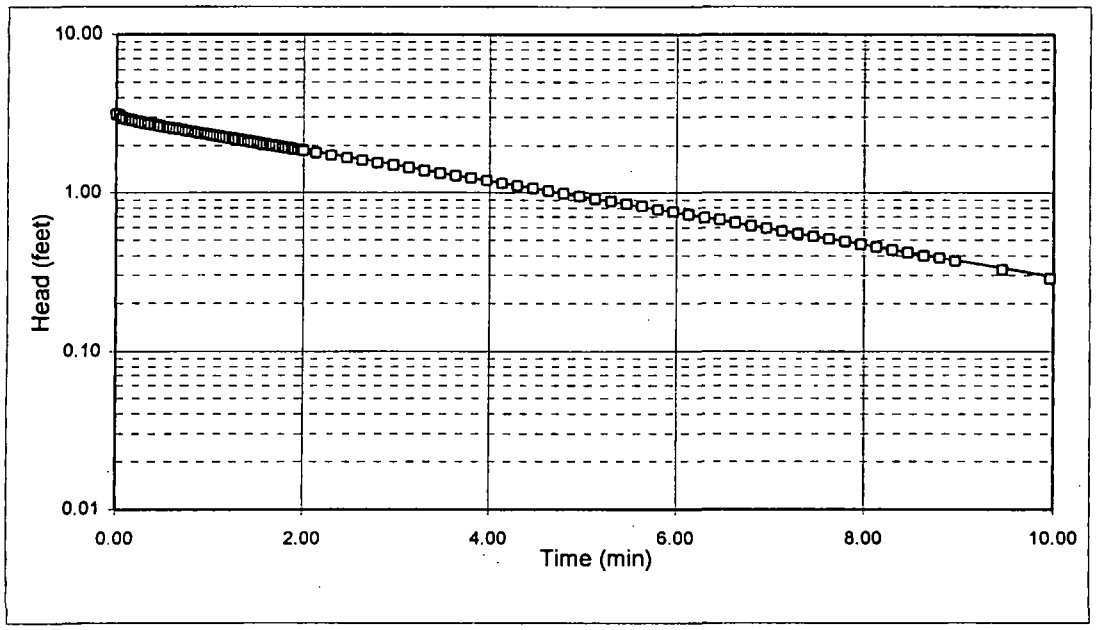
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-300-AD

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	8.6	K=	1.12E-04	cm/sec
$\ln(R_e/r_w)$	2.35	K=	3.18E-01	ft/day
y_0 =	3.02			
y_t =	0.30			
t =	10.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-300-SS

WELL NO. PZ-300-SS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	9.81	FEET H_2O
INITIAL DEPTH TO WATER	21.1	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	81.7	FEET (btoc)
BOTTOM OF OPEN INTERVAL	95.7	FEET (btoc)
SATURATED THICKNESS	160	FEET
WATER TABLE TO BOTTOM OF SCREEN	74.6	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	14	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.22	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1407	34	14.032	0.00	16.88	4.22	1.00
305	295	1407	36	13.028	0.03	17.88	3.22	0.76
305	295	1407	38	12.925	0.07	17.99	3.12	0.74
305	295	1407	40	12.913	0.10	18.00	3.10	0.73
305	295	1407	42	12.902	0.13	18.01	3.09	0.73
305	295	1407	44	12.891	0.17	18.02	3.08	0.73
305	295	1407	46	12.879	0.20	18.03	3.07	0.73
305	295	1407	48	12.868	0.23	18.04	3.06	0.72
305	295	1407	50	12.861	0.27	18.05	3.05	0.72
305	295	1407	52	12.849	0.30	18.06	3.04	0.72
305	295	1407	54	12.843	0.33	18.07	3.03	0.72
305	295	1407	56	12.833	0.37	18.08	3.02	0.72
305	295	1407	58	12.824	0.40	18.09	3.01	0.71
305	295	1408	0	12.816	0.43	18.09	3.01	0.71
305	295	1408	2	12.807	0.47	18.10	3.00	0.71
305	295	1408	4	12.799	0.50	18.11	2.99	0.71
305	295	1408	6	12.791	0.53	18.12	2.98	0.71
305	295	1408	8	12.783	0.57	18.13	2.97	0.70
305	295	1408	10	12.778	0.60	18.13	2.97	0.70
305	295	1408	12	12.767	0.63	18.14	2.96	0.70
305	295	1408	14	12.762	0.67	18.15	2.95	0.70
305	295	1408	16	12.753	0.70	18.16	2.94	0.70
305	295	1408	18	12.747	0.73	18.16	2.94	0.70
305	295	1408	20	12.739	0.77	18.17	2.93	0.69
305	295	1408	22	12.732	0.80	18.18	2.92	0.69
305	295	1408	24	12.727	0.83	18.18	2.92	0.69
305	295	1408	26	12.716	0.87	18.19	2.91	0.69
305	295	1408	28	12.714	0.90	18.20	2.90	0.69
305	295	1408	30	12.709	0.93	18.20	2.90	0.69
305	295	1408	32	12.702	0.97	18.21	2.89	0.68

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1408	34	12.696	1.00	18.21	2.89	0.68
305	295	1408	36	12.69	1.03	18.22	2.88	0.68
305	295	1408	38	12.684	1.07	18.23	2.87	0.68
305	295	1408	40	12.677	1.10	18.23	2.87	0.68
305	295	1408	42	12.669	1.13	18.24	2.86	0.68
305	295	1408	44	12.663	1.17	18.25	2.85	0.68
305	295	1408	46	12.655	1.20	18.26	2.85	0.67
305	295	1408	48	12.649	1.23	18.26	2.84	0.67
305	295	1408	50	12.643	1.27	18.27	2.83	0.67
305	295	1408	52	12.637	1.30	18.27	2.83	0.67
305	295	1409	0	12.616	1.43	18.29	2.81	0.66
305	295	1409	10	12.598	1.60	18.31	2.79	0.66
305	295	1409	20	12.568	1.77	18.34	2.76	0.65
305	295	1409	30	12.544	1.93	18.37	2.73	0.65
305	295	1409	40	12.529	2.10	18.38	2.72	0.64
305	295	1409	50	12.521	2.27	18.39	2.71	0.64
305	295	1410	0	12.505	2.43	18.41	2.70	0.64
305	295	1410	10	12.495	2.60	18.42	2.69	0.64
305	295	1410	20	12.479	2.77	18.43	2.67	0.63
305	295	1410	30	12.47	2.93	18.44	2.66	0.63
305	295	1410	40	12.46	3.10	18.45	2.65	0.63
305	295	1410	50	12.456	3.27	18.45	2.65	0.63
305	295	1411	0	12.45	3.43	18.46	2.64	0.63
305	295	1412	0	12.425	4.43	18.49	2.62	0.62
305	295	1413	0	12.403	5.43	18.51	2.59	0.61
305	295	1414	0	12.38	6.43	18.53	2.57	0.61
305	295	1415	0	12.361	7.43	18.55	2.55	0.60
305	295	1416	0	12.338	8.43	18.57	2.53	0.60
305	295	1417	0	12.317	9.43	18.59	2.51	0.59
305	295	1418	0	12.296	10.43	18.61	2.49	0.59
305	295	1419	0	12.278	11.43	18.63	2.47	0.58
305	295	1420	0	12.261	12.43	18.65	2.45	0.58
305	295	1421	0	12.244	13.43	18.67	2.43	0.58
305	295	1422	0	12.228	14.43	18.68	2.42	0.57
305	295	1423	0	12.21	15.43	18.70	2.40	0.57
305	295	1424	0	12.197	16.43	18.71	2.39	0.57
305	295	1425	0	12.18	17.43	18.73	2.37	0.56
305	295	1426	0	12.169	18.43	18.74	2.36	0.56
305	295	1427	0	12.148	19.43	18.76	2.34	0.55
305	295	1430	0	12.109	22.43	18.80	2.30	0.54
305	295	1440	0	12	32.43	18.91	2.19	0.52
305	295	1450	0	11.907	42.43	19.00	2.10	0.50
305	295	1500	0	11.822	52.43	19.09	2.01	0.48
305	295	1510	0	11.746	62.43	19.16	1.94	0.46
305	295	1519	40	11.678	72.10	19.23	1.87	0.44
305	295	1519	50	11.682	72.27	19.23	1.87	0.44
305	295	1520	0	11.683	72.43	19.23	1.87	0.44
305	295	1520	10	11.68	72.60	19.23	1.87	0.44

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1520	20	11.681	72.77	19.23	1.87	0.44
305	295	1520	30	11.68	72.93	19.23	1.87	0.44
305	295	1520	40	11.677	73.10	19.23	1.87	0.44
305	295	1520	50	11.679	73.27	19.23	1.87	0.44
305	295	1521	0	11.675	73.43	19.24	1.87	0.44
305	295	1521	10	11.67	73.60	19.24	1.86	0.44
305	295	1521	20	11.671	73.77	19.24	1.86	0.44
305	295	1521	30	11.67	73.93	19.24	1.86	0.44
305	295	1521	40	11.669	74.10	19.24	1.86	0.44
305	295	1521	50	11.672	74.27	19.24	1.86	0.44
305	295	1522	0	11.672	74.43	19.24	1.86	0.44
305	295	1522	10	11.67	74.60	19.24	1.86	0.44
305	295	1522	20	11.668	74.77	19.24	1.86	0.44
305	295	1522	30	11.667	74.93	19.24	1.86	0.44
305	295	1522	40	11.666	75.10	19.24	1.86	0.44
305	295	1522	50	11.666	75.27	19.24	1.86	0.44
305	295	1523	0	11.664	75.43	19.25	1.85	0.44
305	295	1523	10	11.662	75.60	19.25	1.85	0.44
305	295	1523	20	11.662	75.77	19.25	1.85	0.44
305	295	1523	30	11.66	75.93	19.25	1.85	0.44
305	295	1523	40	11.659	76.10	19.25	1.85	0.44
305	295	1523	50	11.658	76.27	19.25	1.85	0.44
305	295	1524	0	11.657	76.43	19.25	1.85	0.44
305	295	1524	10	11.656	76.60	19.25	1.85	0.44
305	295	1524	20	11.655	76.77	19.26	1.85	0.44
305	295	1524	30	11.653	76.93	19.26	1.84	0.44
305	295	1524	40	11.652	77.10	19.26	1.84	0.44
305	295	1524	50	11.65	77.27	19.26	1.84	0.44
305	295	1525	0	11.65	77.43	19.26	1.84	0.44
305	295	1525	10	11.649	77.60	19.26	1.84	0.44
305	295	1525	20	11.647	77.77	19.26	1.84	0.44
305	295	1525	30	11.646	77.93	19.26	1.84	0.43
305	295	1525	40	11.645	78.10	19.27	1.84	0.43
305	295	1525	50	11.644	78.27	19.27	1.83	0.43
305	295	1526	0	11.644	78.43	19.27	1.83	0.43
305	295	1526	10	11.641	78.60	19.27	1.83	0.43
305	295	1526	20	11.64	78.77	19.27	1.83	0.43
305	295	1526	30	11.639	78.93	19.27	1.83	0.43
305	295	1526	40	11.637	79.10	19.27	1.83	0.43
305	295	1526	50	11.636	79.27	19.27	1.83	0.43
305	295	1527	0	11.636	79.43	19.27	1.83	0.43
305	295	1527	10	11.636	79.60	19.27	1.83	0.43
305	295	1527	20	11.637	79.77	19.27	1.83	0.43
305	295	1527	30	11.633	79.93	19.28	1.82	0.43
305	295	1527	40	11.631	80.10	19.28	1.82	0.43
305	295	1527	50	11.632	80.27	19.28	1.82	0.43
305	295	1528	0	11.631	80.43	19.28	1.82	0.43
305	295	1528	10	11.629	80.60	19.28	1.82	0.43

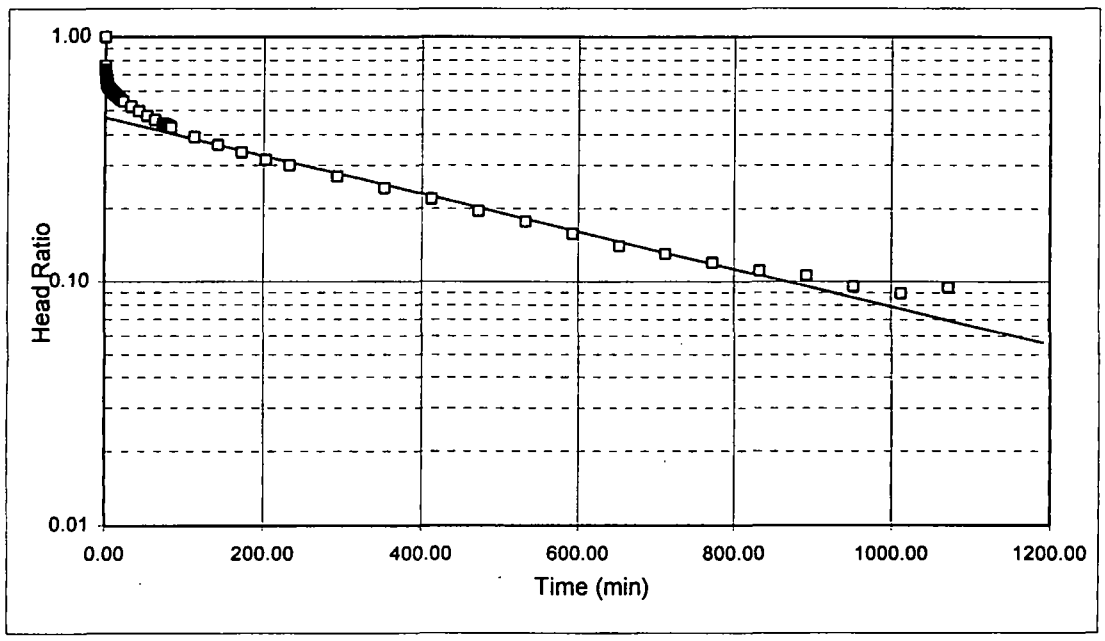
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1528	20	11.625	80.77	19.29	1.82	0.43
305	295	1528	30	11.628	80.93	19.28	1.82	0.43
305	295	1528	40	11.624	81.10	19.29	1.81	0.43
305	295	1528	50	11.624	81.27	19.29	1.81	0.43
305	295	1529	0	11.624	81.43	19.29	1.81	0.43
305	295	1529	10	11.622	81.60	19.29	1.81	0.43
305	295	1529	20	11.621	81.77	19.29	1.81	0.43
305	295	1529	30	11.621	81.93	19.29	1.81	0.43
305	295	1529	40	11.619	82.10	19.29	1.81	0.43
305	295	1529	50	11.616	82.27	19.29	1.81	0.43
305	295	1530	0	11.617	82.43	19.29	1.81	0.43
305	295	1530	10	11.616	82.60	19.29	1.81	0.43
305	295	1530	20	11.616	82.77	19.29	1.81	0.43
305	295	1600	0	11.46	112.43	19.45	1.65	0.39
305	295	1630	0	11.345	142.43	19.57	1.54	0.36
305	295	1700	0	11.241	172.43	19.67	1.43	0.34
305	295	1730	0	11.146	202.43	19.76	1.34	0.32
305	295	1800	0	11.077	232.43	19.83	1.27	0.30
305	295	1900	0	10.951	292.43	19.96	1.14	0.27
305	295	2000	0	10.832	352.43	20.08	1.02	0.24
305	295	2100	0	10.734	412.43	20.18	0.92	0.22
305	295	2200	0	10.637	472.43	20.27	0.83	0.20
305	295	2300	0	10.557	532.43	20.35	0.75	0.18
305	296	0	0	10.475	592.43	20.44	0.66	0.16
305	296	100	0	10.403	652.43	20.51	0.59	0.14
305	296	200	0	10.361	712.43	20.55	0.55	0.13
305	296	300	0	10.316	772.43	20.59	0.51	0.12
305	296	400	0	10.279	832.43	20.63	0.47	0.11
305	296	500	0	10.258	892.43	20.65	0.45	0.11
305	296	600	0	10.213	952.43	20.70	0.40	0.10
305	296	700	0	10.188	1012.43	20.72	0.38	0.09
305	296	800	0	10.21	1072.43	20.70	0.40	0.09

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	14	K=	9.01E-07	cm/sec
t_1 (min) =	0	K=	2.55E-03	ft/day
t_2 (min) =	1192.00			
h_1/h_0 =	0.47			
h_2/h_0 =	0.06			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

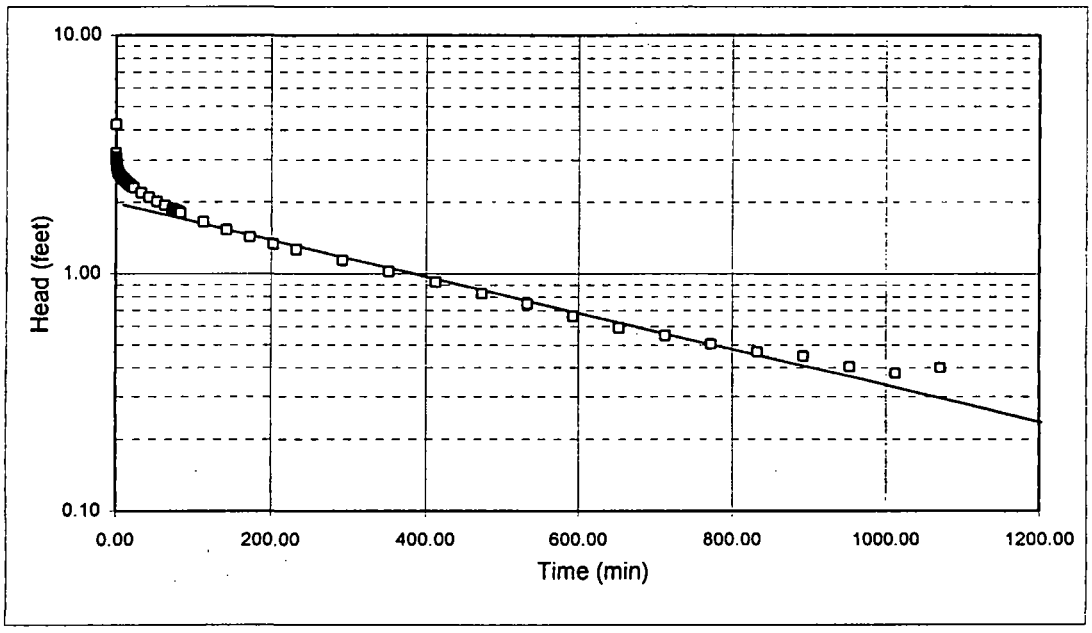
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-300-SS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.25			
L_e =	14	K=	7.73E-07	cm/sec
$\ln(R_e/r_w)$	3.48	K=	2.19E-03	ft/day
y_0 =	1.96			
y_t =	0.23			
t =	1204.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-301-SS

WELL NO. PZ-301-SS

DATE	10/21/95	
INITAL HEAD ON TRANSDUCER	na	FEET H_2O
INITIAL DEPTH TO WATER	157.56	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	6	INCHES
TOP OF OPEN INTERVAL	148.1	FEET (btoc)
BOTTOM OF OPEN INTERVAL	163.1	FEET (btoc)
SATURATED THICKNESS	100	FEET
WATER TABLE TO BOTTOM OF SCREEN	5.54	FEET
EQUIVALENT DIAMETER	3.69	INCHES
OPEN INTERVAL LENGTH	5.54	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	2.11	FEET
MAX. HEAD IN SCREEN?	Y	

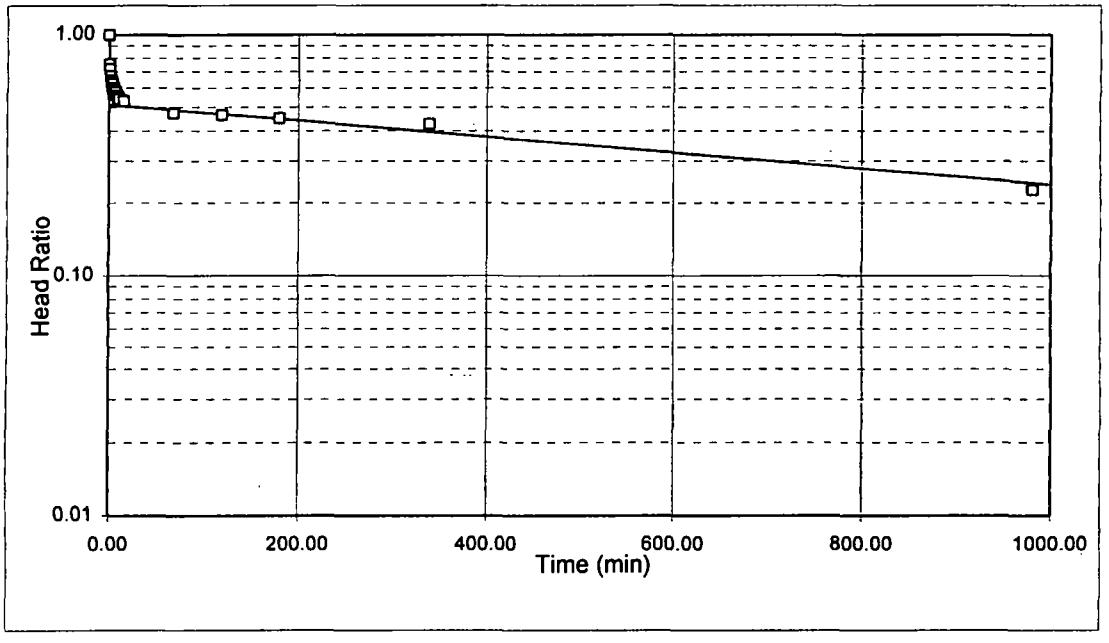
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	295	1444	0	159.67	0.00	159.67	2.11	1.00
305	295	1444	30	159.16	0.50	159.16	1.60	0.76
305	295	1445	0	159.08	1.00	159.08	1.52	0.72
305	295	1445	30	158.98	1.50	158.98	1.42	0.67
305	295	1446	0	158.93	2.00	158.93	1.37	0.65
305	295	1446	30	158.9	2.50	158.9	1.34	0.64
305	295	1447	0	158.88	3.00	158.88	1.32	0.63
305	295	1447	30	158.84	3.50	158.84	1.28	0.61
305	295	1448	0	158.84	4.00	158.84	1.28	0.61
305	295	1448	30	158.82	4.50	158.82	1.26	0.60
305	295	1449	0	158.8	5.00	158.8	1.24	0.59
305	295	1449	30	158.79	5.50	158.79	1.23	0.58
305	295	1450	0	158.78	6.00	158.78	1.22	0.58
305	295	1451	0	158.78	7.00	158.78	1.22	0.58
305	295	1452	0	158.74	8.00	158.74	1.18	0.56
305	295	1453	0	158.73	9.00	158.73	1.17	0.55
305	295	1454	0	158.71	10.00	158.71	1.15	0.55
305	295	1455	0	158.7	11.00	158.7	1.14	0.54
305	295	1500	0	158.68	16.00	158.68	1.12	0.53
305	295	1552	0	158.56	68.00	158.56	1.00	0.47
305	295	1643	0	158.54	119.00	158.54	0.98	0.46
305	295	1744	0	158.51	180.00	158.51	0.95	0.45
305	295	2023	0	158.46	339.00	158.46	0.90	0.43
305	296	705	0	158.04	981.00	158.04	0.48	0.23

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-301-SS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.25			
L_e =	5.54	K=	7.52E-07	cm/sec
t_1 (min) =	0	K=	2.13E-03	ft/day
t_2 (min) =	997.00			
h_1/h_0 =	0.51			
h_2/h_0 =	0.24			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/21/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-302-AS

WELL NO. PZ-302-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	5.25	FEET H_2O
INITIAL DEPTH TO WATER	18.97	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	10.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	24.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	5.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	5.25	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.89	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1301	14	6.1448	0.00	18.08	0.89	1.00
305	298	1301	16	6.0465	0.03	18.17	0.80	0.89
305	298	1301	18	6.0451	0.07	18.17	0.80	0.89
305	298	1301	20	6.0416	0.10	18.18	0.79	0.88
305	298	1301	22	6.0347	0.13	18.19	0.78	0.88
305	298	1301	24	6.032	0.17	18.19	0.78	0.87
305	298	1301	26	6.032	0.20	18.19	0.78	0.87
305	298	1301	28	6.028	0.23	18.19	0.78	0.87
305	298	1301	30	6.0219	0.27	18.20	0.77	0.86
305	298	1301	32	6.0193	0.30	18.20	0.77	0.86
305	298	1301	34	6.0163	0.33	18.20	0.77	0.86
305	298	1301	36	6.0116	0.37	18.21	0.76	0.85
305	298	1301	38	6.0074	0.40	18.21	0.76	0.85
305	298	1301	40	6.0035	0.43	18.22	0.75	0.84
305	298	1301	42	5.9986	0.47	18.22	0.75	0.84
305	298	1301	44	5.9934	0.50	18.23	0.74	0.83
305	298	1301	46	5.9895	0.53	18.23	0.74	0.83
305	298	1301	48	5.9852	0.57	18.23	0.74	0.82
305	298	1301	50	5.9795	0.60	18.24	0.73	0.82
305	298	1301	52	5.9767	0.63	18.24	0.73	0.81
305	298	1301	54	5.972	0.67	18.25	0.72	0.81
305	298	1302	0	5.9613	0.77	18.26	0.71	0.79
305	298	1302	10	5.9406	0.93	18.28	0.69	0.77
305	298	1302	20	5.9185	1.10	18.30	0.67	0.75

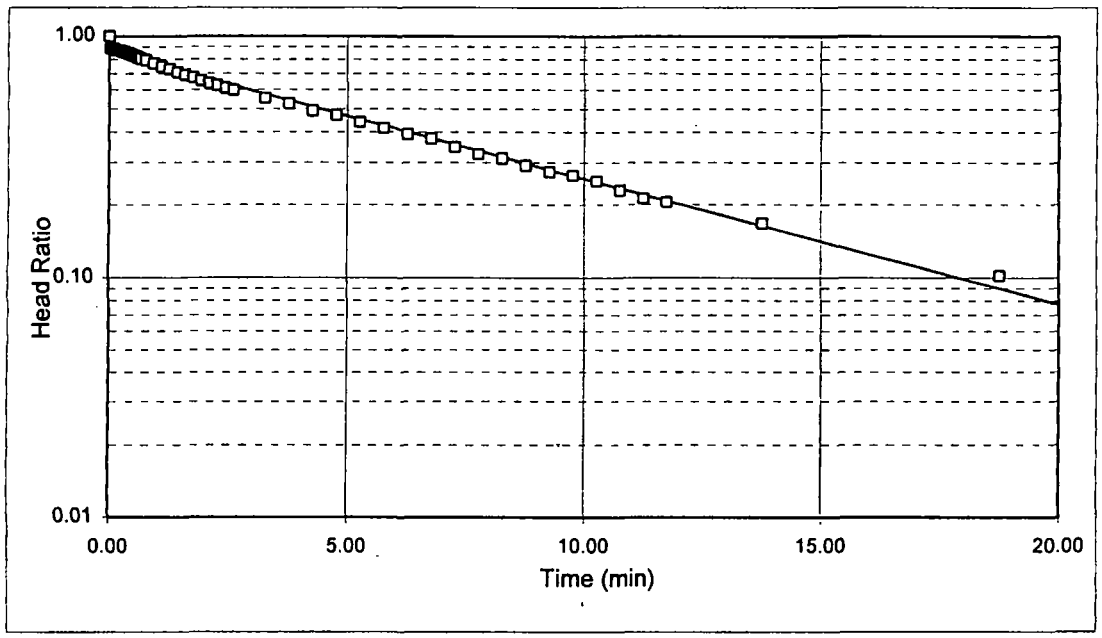
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1302	30	5.9028	1.27	18.32	0.65	0.73
305	298	1302	40	5.8839	1.43	18.34	0.63	0.71
305	298	1302	50	5.8677	1.60	18.35	0.62	0.69
305	298	1303	0	5.8535	1.77	18.37	0.60	0.67
305	298	1303	10	5.8368	1.93	18.38	0.59	0.66
305	298	1303	20	5.8208	2.10	18.40	0.57	0.64
305	298	1303	30	5.8092	2.27	18.41	0.56	0.62
305	298	1303	40	5.7968	2.43	18.42	0.55	0.61
305	298	1303	50	5.7858	2.60	18.43	0.54	0.60
305	298	1304	30	5.7469	3.27	18.47	0.50	0.56
305	298	1305	0	5.7202	3.77	18.50	0.47	0.53
305	298	1305	30	5.6898	4.27	18.53	0.44	0.49
305	298	1306	0	5.6727	4.77	18.55	0.42	0.47
305	298	1306	30	5.645	5.27	18.58	0.40	0.44
305	298	1307	0	5.6225	5.77	18.60	0.37	0.42
305	298	1307	30	5.6014	6.27	18.62	0.35	0.39
305	298	1308	0	5.5873	6.77	18.63	0.34	0.38
305	298	1308	30	5.5613	7.27	18.66	0.31	0.35
305	298	1309	0	5.541	7.77	18.68	0.29	0.33
305	298	1309	30	5.5296	8.27	18.69	0.28	0.31
305	298	1310	0	5.5112	8.77	18.71	0.26	0.29
305	298	1310	30	5.4965	9.27	18.72	0.25	0.28
305	298	1311	0	5.4883	9.77	18.73	0.24	0.27
305	298	1311	30	5.4754	10.27	18.74	0.23	0.25
305	298	1312	0	5.4562	10.77	18.76	0.21	0.23
305	298	1312	30	5.4405	11.27	18.78	0.19	0.21
305	298	1313	0	5.4343	11.77	18.79	0.18	0.21
305	298	1315	0	5.4005	13.77	18.82	0.15	0.17
305	298	1320	0	5.3411	18.77	18.88	0.09	0.10

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-302-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	5.25	K=	1.10E-04	cm/sec
t_1 (min) =	0	K=	3.11E-01	ft/day
t_2 (min) =	20.00			
h_1/h_0 =	0.85			
h_2/h_0 =	0.08			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-302-AS

WELL NO. PZ-302-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	5.25	FEET H_2O
INITIAL DEPTH TO WATER	18.97	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	10.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	24.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	5.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	5.25	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.98	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1321	2	3.2668	0.00	20.95	1.98	1.00
305	298	1321	4	3.3596	0.03	20.86	1.89	0.95
305	298	1321	6	3.4169	0.07	20.80	1.83	0.92
305	298	1321	8	3.4495	0.10	20.77	1.80	0.91
305	298	1321	10	3.4796	0.13	20.74	1.77	0.89
305	298	1321	12	3.5151	0.17	20.70	1.73	0.87
305	298	1321	14	3.5516	0.20	20.67	1.70	0.86
305	298	1321	16	3.5814	0.23	20.64	1.67	0.84
305	298	1321	18	3.6061	0.27	20.61	1.64	0.83
305	298	1321	20	3.637	0.30	20.58	1.61	0.81
305	298	1321	22	3.6609	0.33	20.56	1.59	0.80
305	298	1321	24	3.6831	0.37	20.54	1.57	0.79
305	298	1321	26	3.7066	0.40	20.51	1.54	0.78
305	298	1321	28	3.731	0.43	20.49	1.52	0.77
305	298	1321	30	3.7522	0.47	20.47	1.50	0.76
305	298	1321	32	3.7779	0.50	20.44	1.47	0.74
305	298	1321	34	3.7976	0.53	20.42	1.45	0.73
305	298	1321	36	3.8146	0.57	20.41	1.44	0.72
305	298	1321	38	3.8337	0.60	20.39	1.42	0.71
305	298	1321	40	3.851	0.63	20.37	1.40	0.71
305	298	1321	42	3.8669	0.67	20.35	1.38	0.70
305	298	1321	44	3.8807	0.70	20.34	1.37	0.69
305	298	1321	46	3.8964	0.73	20.32	1.35	0.68
305	298	1321	48	3.9103	0.77	20.31	1.34	0.68

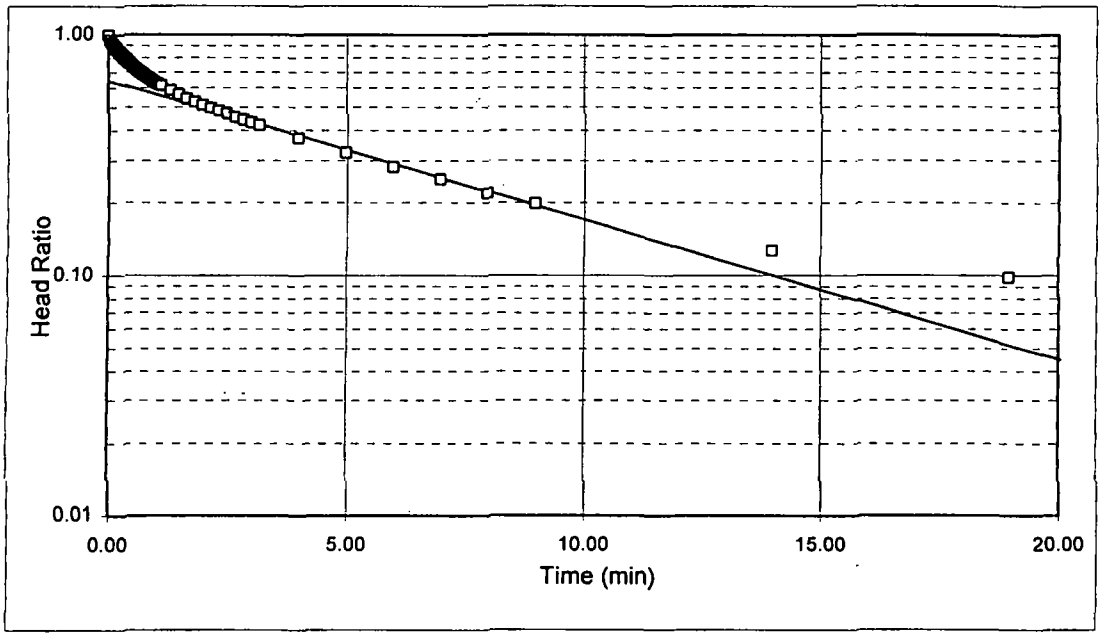
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1321	50	3.9252	0.80	20.29	1.32	0.67
305	298	1321	52	3.9371	0.83	20.28	1.31	0.66
305	298	1321	54	3.9497	0.87	20.27	1.30	0.66
305	298	1321	56	3.9632	0.90	20.26	1.29	0.65
305	298	1321	58	3.9799	0.93	20.24	1.27	0.64
305	298	1322	0	3.9929	0.97	20.23	1.26	0.63
305	298	1322	2	4.0024	1.00	20.22	1.25	0.63
305	298	1322	4	4.0122	1.03	20.21	1.24	0.62
305	298	1322	6	4.0211	1.07	20.20	1.23	0.62
305	298	1322	8	4.0303	1.10	20.19	1.22	0.62
305	298	1322	20	4.0851	1.30	20.13	1.16	0.59
305	298	1322	30	4.1325	1.47	20.09	1.12	0.56
305	298	1322	40	4.1745	1.63	20.05	1.08	0.54
305	298	1322	50	4.2057	1.80	20.01	1.04	0.53
305	298	1323	0	4.2387	1.97	19.98	1.01	0.51
305	298	1323	10	4.2652	2.13	19.95	0.98	0.50
305	298	1323	20	4.2926	2.30	19.93	0.96	0.48
305	298	1323	30	4.3195	2.47	19.90	0.93	0.47
305	298	1323	40	4.3498	2.63	19.87	0.90	0.45
305	298	1323	50	4.373	2.80	19.85	0.88	0.44
305	298	1324	0	4.3936	2.97	19.83	0.86	0.43
305	298	1324	10	4.4141	3.13	19.81	0.84	0.42
305	298	1325	0	4.5115	3.97	19.71	0.74	0.37
305	298	1326	0	4.6081	4.97	19.61	0.64	0.32
305	298	1327	0	4.6884	5.97	19.53	0.56	0.28
305	298	1328	0	4.7512	6.97	19.47	0.50	0.25
305	298	1329	0	4.814	7.97	19.41	0.44	0.22
305	298	1330	0	4.8557	8.97	19.36	0.39	0.20
305	298	1335	0	4.9976	13.97	19.22	0.25	0.13
305	298	1340	0	5.0548	18.97	19.17	0.20	0.10

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-302-AS

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	5.25	K=	1.22E-04	cm/sec
t_1 (min) =	0	K=	3.46E-01	ft/day
t_2 (min) =	20.06			
h_1/h_0 =	0.65			
h_2/h_0 =	0.04			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-302-AI

WELL NO. PZ-302-AI

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	10.1	FEET H_2O
INITIAL DEPTH TO WATER	18.90	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	44.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	25.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	16	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	0.94	FEET
MAX. HEAD IN SCREEN?	N	

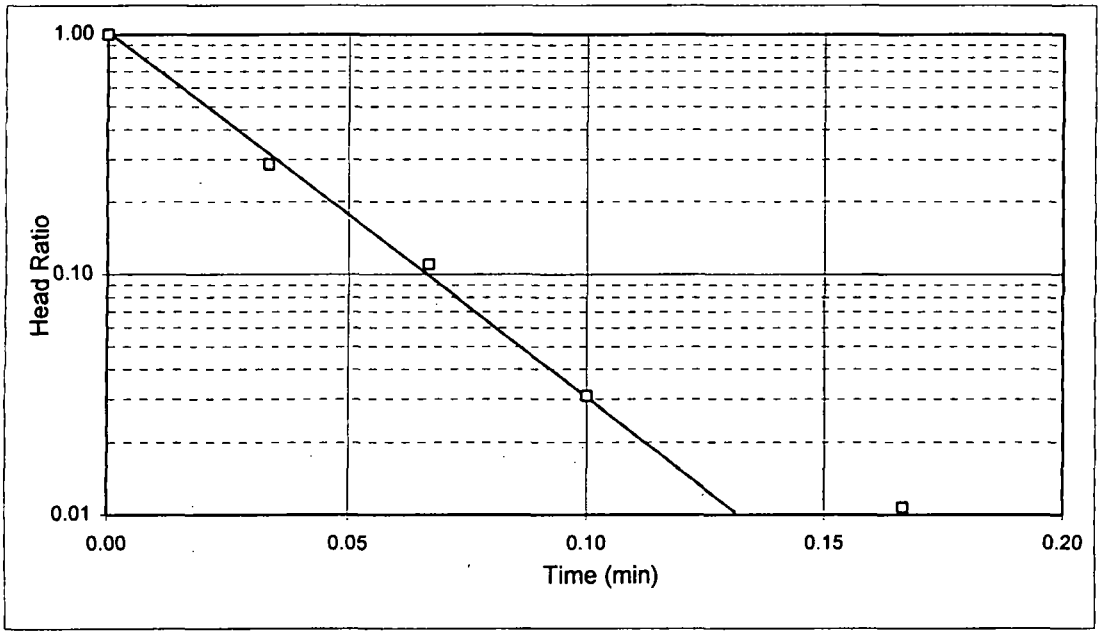
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1108	58	11.035	0.00	17.97	0.94	1.00
305	298	1109	0	10.369	0.03	18.63	0.27	0.29
305	298	1109	2	10.203	0.07	18.80	0.10	0.11
305	298	1109	4	10.129	0.10	18.87	0.03	0.03
305	298	1109	6	10.107	0.13	18.89	0.01	0.01
305	298	1109	8	10.09	0.17	18.89	0.01	0.01

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-302-AI

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	16	K=	1.48E-02	cm/sec
t_1 (min) =	0	K=	4.21E+01	ft/day
t_2 (min) =	0.13			
h_1/h_0 =	1.02			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

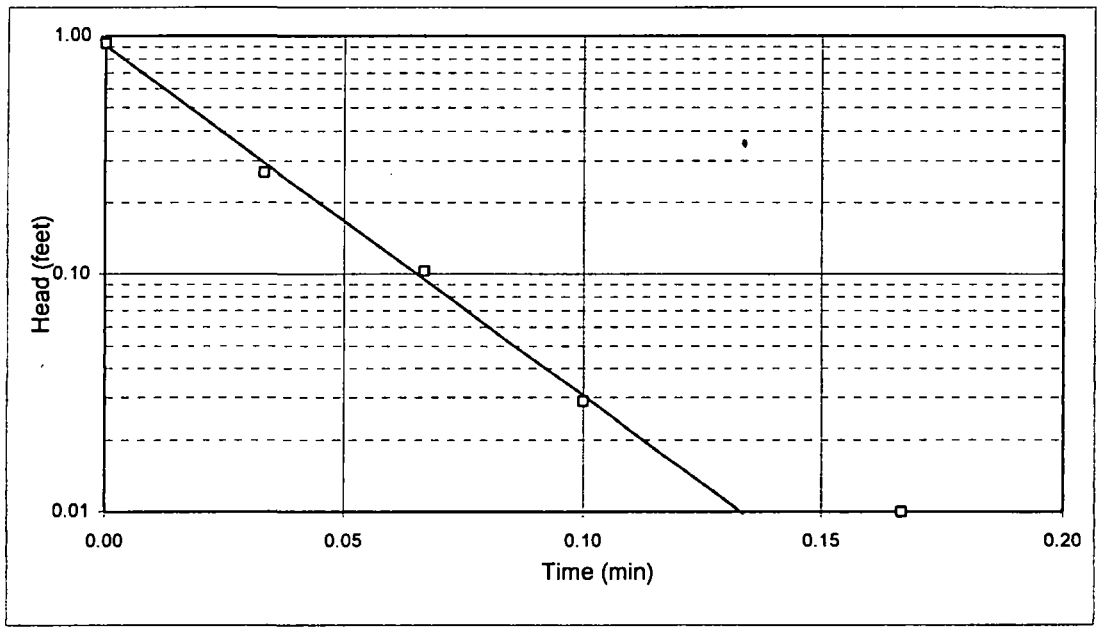
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-302-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	16	K=	9.78E-03	cm/sec
$\ln(R_e/r_w)$	2.61	K=	2.77E+01	ft/day
y_0 =	0.91			
y_t =	0.01			
t =	0.13			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-302-AI

WELL NO. PZ-302-AI

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	10.1	FEET H_2O
INITIAL DEPTH TO WATER	18.90	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	28.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	44.2	FEET (btoc)
SATURATED THICKNESS	90	FEET
WATER TABLE TO BOTTOM OF SCREEN	25.25	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	16	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	4.59	FEET
MAX. HEAD IN SCREEN?	N	

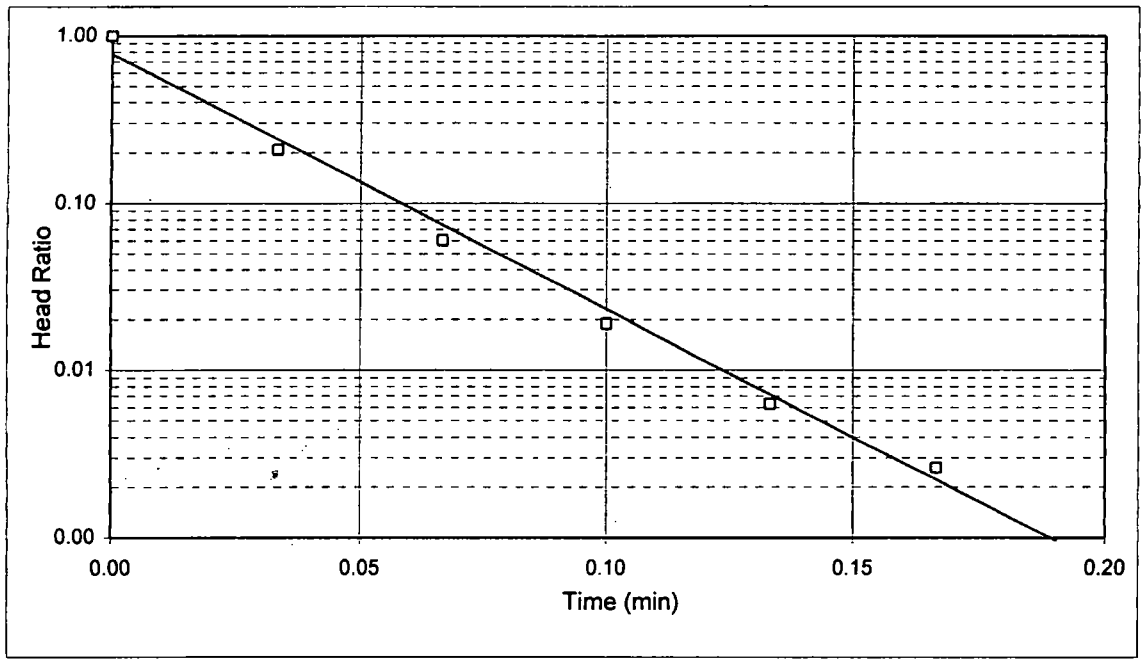
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1111	28	5.5104	0.00	23.49	4.59	1.00
305	298	1111	30	9.1419	0.03	19.86	0.96	0.21
305	298	1111	32	9.8217	0.07	19.18	0.28	0.06
305	298	1111	34	10.013	0.10	18.99	0.09	0.02
305	298	1111	36	10.071	0.13	18.93	0.03	0.01
305	298	1111	38	10.088	0.17	18.91	0.01	0.00

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-302-AI

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	16	K=	1.49E-02	cm/sec
t_1 (min) =	0	K=	4.22E+01	ft/day
t_2 (min) =	0.19			
h_1/h_0 =	0.78			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

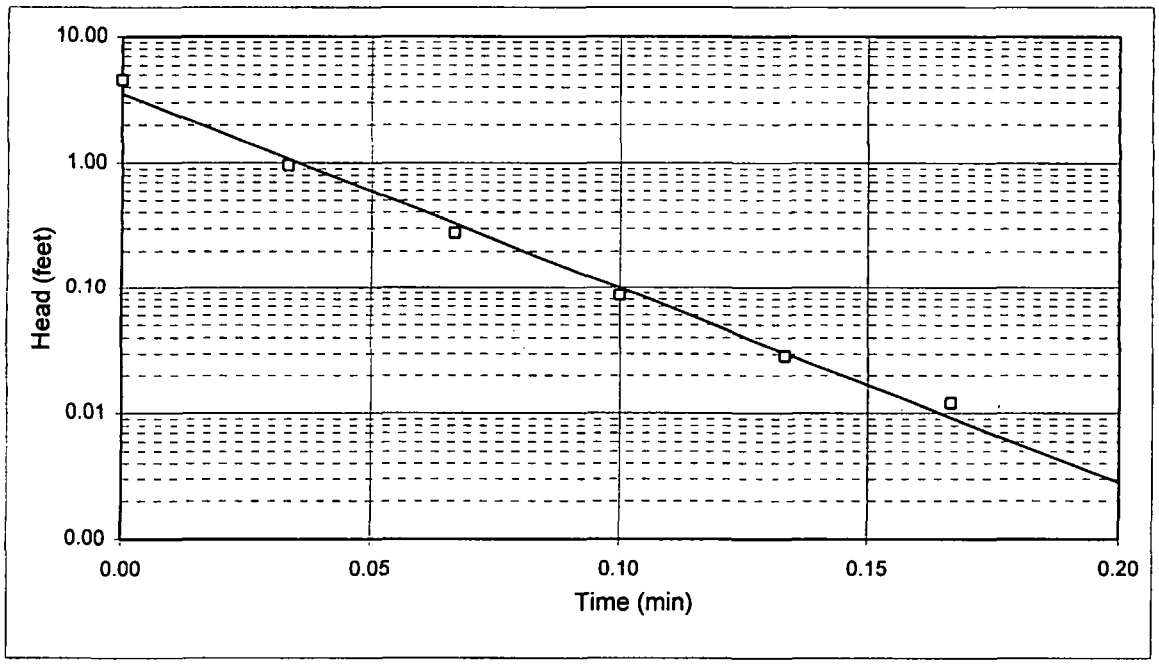
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-302-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	16	K=	1.03E-02	cm/sec
$\ln(R_e/r_w)$	2.61	K=	2.92E+01	ft/day
y_0 =	3.55			
y_t =	0.00			
t =	0.20			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-303-AS

WELL NO. PZ-303-AS

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	6.3	FEET H_2O
INITIAL DEPTH TO WATER	20.96	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	14.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	28.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.92	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	7.92	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.71	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1140	28	7.0117	0.00	20.25	0.71	1.00
305	305	1140	29	6.9891	0.02	20.27	0.69	0.97
305	305	1140	30	6.9531	0.03	20.31	0.65	0.92
305	305	1140	31	6.9387	0.05	20.32	0.64	0.90
305	305	1140	32	7.1578	0.07	20.10	0.86	1.21
305	305	1140	33	6.895	0.08	20.37	0.59	0.84
305	305	1140	34	6.886	0.10	20.37	0.59	0.82
305	305	1140	35	6.8729	0.12	20.39	0.57	0.80
305	305	1140	36	6.8633	0.13	20.40	0.56	0.79
305	305	1140	37	6.8573	0.15	20.40	0.56	0.78
305	305	1140	38	6.8517	0.17	20.41	0.55	0.78
305	305	1140	39	6.8446	0.18	20.42	0.54	0.77
305	305	1140	40	6.8373	0.20	20.42	0.54	0.75
305	305	1140	41	6.8337	0.22	20.43	0.53	0.75
305	305	1140	42	6.8085	0.23	20.45	0.51	0.71
305	305	1140	43	6.8229	0.25	20.44	0.52	0.73
305	305	1140	44	6.8224	0.27	20.44	0.52	0.73
305	305	1140	45	6.8238	0.28	20.44	0.52	0.74
305	305	1140	46	6.8204	0.30	20.44	0.52	0.73
305	305	1140	47	6.8155	0.32	20.44	0.52	0.72
305	305	1140	48	6.8113	0.33	20.45	0.51	0.72
305	305	1140	49	6.8054	0.35	20.45	0.51	0.71
305	305	1140	50	6.7971	0.37	20.46	0.50	0.70
305	305	1140	51	6.7896	0.38	20.47	0.49	0.69
305	305	1140	52	6.7825	0.40	20.48	0.48	0.68
305	305	1140	53	6.775	0.42	20.49	0.48	0.67
305	305	1140	54	6.7641	0.43	20.50	0.46	0.65

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1140	55	6.7626	0.45	20.50	0.46	0.65
305	305	1140	56	6.7508	0.47	20.51	0.45	0.63
305	305	1140	57	6.7435	0.48	20.52	0.44	0.62
305	305	1140	58	6.7383	0.50	20.52	0.44	0.62
305	305	1140	59	6.7318	0.52	20.53	0.43	0.61
305	305	1141	0	6.7263	0.53	20.53	0.43	0.60
305	305	1141	1	6.7197	0.55	20.54	0.42	0.59
305	305	1141	2	6.7188	0.57	20.54	0.42	0.59
305	305	1141	3	6.7093	0.58	20.55	0.41	0.58
305	305	1141	4	6.7377	0.60	20.52	0.44	0.62
305	305	1141	5	6.6657	0.62	20.59	0.37	0.51
305	305	1141	6	6.7052	0.63	20.55	0.41	0.57
305	305	1141	7	6.6993	0.65	20.56	0.40	0.56
305	305	1141	8	6.6973	0.67	20.56	0.40	0.56
305	305	1141	9	6.6889	0.68	20.57	0.39	0.55
305	305	1141	10	6.6878	0.70	20.57	0.39	0.54
305	305	1141	11	6.6792	0.72	20.58	0.38	0.53
305	305	1141	12	6.6761	0.73	20.58	0.38	0.53
305	305	1141	13	6.5809	0.75	20.68	0.28	0.39
305	305	1141	14	6.6627	0.77	20.60	0.36	0.51
305	305	1141	15	6.6697	0.78	20.59	0.37	0.52
305	305	1141	16	6.6812	0.80	20.58	0.38	0.54
305	305	1141	17	6.6623	0.82	20.60	0.36	0.51
305	305	1141	18	6.6551	0.83	20.60	0.36	0.50
305	305	1141	19	6.6509	0.85	20.61	0.35	0.49
305	305	1141	20	6.6471	0.87	20.61	0.35	0.49
305	305	1141	21	6.6438	0.88	20.62	0.34	0.48
305	305	1141	22	6.6388	0.90	20.62	0.34	0.48
305	305	1141	23	6.6354	0.92	20.62	0.34	0.47
305	305	1141	24	6.6342	0.93	20.63	0.33	0.47
305	305	1141	25	6.6295	0.95	20.63	0.33	0.46
305	305	1141	26	6.626	0.97	20.63	0.33	0.46
305	305	1141	27	6.6214	0.98	20.64	0.32	0.45
305	305	1141	28	6.6204	1.00	20.64	0.32	0.45
305	305	1141	29	6.6156	1.02	20.64	0.32	0.44
305	305	1141	30	6.6127	1.03	20.65	0.31	0.44
305	305	1141	31	6.6108	1.05	20.65	0.31	0.44
305	305	1141	32	6.6086	1.07	20.65	0.31	0.43
305	305	1141	33	6.6054	1.08	20.65	0.31	0.43
305	305	1141	34	6.6033	1.10	20.66	0.30	0.43
305	305	1141	35	6.6011	1.12	20.66	0.30	0.42
305	305	1141	36	6.599	1.13	20.66	0.30	0.42
305	305	1141	37	6.5973	1.15	20.66	0.30	0.42
305	305	1141	38	6.5935	1.17	20.67	0.29	0.41
305	305	1141	39	6.5912	1.18	20.67	0.29	0.41

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1141	40	6.5877	1.20	20.67	0.29	0.40
305	305	1141	41	6.5863	1.22	20.67	0.29	0.40
305	305	1141	42	6.5828	1.23	20.68	0.28	0.40
305	305	1141	43	6.58	1.25	20.68	0.28	0.39
305	305	1141	44	6.577	1.27	20.68	0.28	0.39
305	305	1141	45	6.578	1.28	20.68	0.28	0.39
305	305	1141	46	6.5716	1.30	20.69	0.27	0.38
305	305	1141	47	6.5696	1.32	20.69	0.27	0.38
305	305	1141	48	6.572	1.33	20.69	0.27	0.38
305	305	1141	49	6.5659	1.35	20.69	0.27	0.37
305	305	1141	50	6.5612	1.37	20.70	0.26	0.37
305	305	1141	51	6.5629	1.38	20.70	0.26	0.37
305	305	1141	52	6.5616	1.40	20.70	0.26	0.37
305	305	1141	53	6.5557	1.42	20.70	0.26	0.36
305	305	1141	54	6.5571	1.43	20.70	0.26	0.36
305	305	1141	55	6.5538	1.45	20.71	0.25	0.36
305	305	1141	56	6.5524	1.47	20.71	0.25	0.35
305	305	1141	57	6.55	1.48	20.71	0.25	0.35
305	305	1141	58	6.5479	1.50	20.71	0.25	0.35
305	305	1141	59	6.5453	1.52	20.71	0.25	0.34
305	305	1142	0	6.5402	1.53	20.72	0.24	0.34
305	305	1142	1	6.5368	1.55	20.72	0.24	0.33
305	305	1142	2	6.5352	1.57	20.72	0.24	0.33
305	305	1142	3	6.5338	1.58	20.73	0.23	0.33
305	305	1142	4	6.5305	1.60	20.73	0.23	0.32
305	305	1142	5	6.529	1.62	20.73	0.23	0.32
305	305	1142	6	6.5257	1.63	20.73	0.23	0.32
305	305	1142	7	6.5235	1.65	20.74	0.22	0.31
305	305	1142	8	6.5211	1.67	20.74	0.22	0.31
305	305	1142	9	6.5197	1.68	20.74	0.22	0.31
305	305	1142	10	6.5164	1.70	20.74	0.22	0.30
305	305	1142	11	6.516	1.72	20.74	0.22	0.30
305	305	1142	12	6.5144	1.73	20.75	0.21	0.30
305	305	1142	13	6.5123	1.75	20.75	0.21	0.30
305	305	1142	14	6.5126	1.77	20.75	0.21	0.30
305	305	1142	15	6.51	1.78	20.75	0.21	0.30
305	305	1142	16	6.5082	1.80	20.75	0.21	0.29
305	305	1142	17	6.5071	1.82	20.75	0.21	0.29
305	305	1142	18	6.505	1.83	20.76	0.20	0.29
305	305	1142	19	6.5032	1.85	20.76	0.20	0.29
305	305	1142	20	6.4996	1.87	20.76	0.20	0.28
305	305	1142	21	6.4979	1.88	20.76	0.20	0.28
305	305	1142	22	6.4969	1.90	20.76	0.20	0.28
305	305	1142	23	6.4955	1.92	20.76	0.20	0.27
305	305	1142	24	6.4939	1.93	20.77	0.19	0.27

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1142	25	6.4926	1.95	20.77	0.19	0.27
305	305	1142	26	6.4912	1.97	20.77	0.19	0.27
305	305	1142	27	6.4895	1.98	20.77	0.19	0.27
305	305	1142	28	6.4883	2.00	20.77	0.19	0.26
305	305	1142	29	6.4871	2.02	20.77	0.19	0.26
305	305	1142	30	6.4858	2.03	20.77	0.19	0.26
305	305	1142	31	6.4844	2.05	20.78	0.18	0.26
305	305	1142	32	6.4839	2.07	20.78	0.18	0.26
305	305	1142	33	6.483	2.08	20.78	0.18	0.26
305	305	1142	34	6.4806	2.10	20.78	0.18	0.25
305	305	1142	35	6.4791	2.12	20.78	0.18	0.25
305	305	1142	36	6.4781	2.13	20.78	0.18	0.25
305	305	1142	37	6.4771	2.15	20.78	0.18	0.25
305	305	1142	38	6.4759	2.17	20.78	0.18	0.25
305	305	1142	39	6.4746	2.18	20.79	0.17	0.25
305	305	1142	40	6.4744	2.20	20.79	0.17	0.25
305	305	1142	41	6.4731	2.22	20.79	0.17	0.24
305	305	1142	42	6.4721	2.23	20.79	0.17	0.24
305	305	1142	43	6.4708	2.25	20.79	0.17	0.24
305	305	1142	44	6.4701	2.27	20.79	0.17	0.24
305	305	1142	45	6.4689	2.28	20.79	0.17	0.24
305	305	1142	46	6.4677	2.30	20.79	0.17	0.24
305	305	1142	47	6.4668	2.32	20.79	0.17	0.23
305	305	1142	48	6.4652	2.33	20.79	0.17	0.23
305	305	1142	49	6.4645	2.35	20.80	0.16	0.23
305	305	1142	50	6.4631	2.37	20.80	0.16	0.23
305	305	1142	51	6.4631	2.38	20.80	0.16	0.23
305	305	1142	52	6.4636	2.40	20.80	0.16	0.23
305	305	1142	53	6.4609	2.42	20.80	0.16	0.23
305	305	1142	54	6.4606	2.43	20.80	0.16	0.23
305	305	1142	55	6.4597	2.45	20.80	0.16	0.22
305	305	1142	56	6.4596	2.47	20.80	0.16	0.22
305	305	1142	57	6.4589	2.48	20.80	0.16	0.22
305	305	1142	58	6.4579	2.50	20.80	0.16	0.22
305	305	1142	59	6.4576	2.52	20.80	0.16	0.22
305	305	1143	0	6.4576	2.53	20.80	0.16	0.22
305	305	1143	1	6.455	2.55	20.81	0.16	0.22
305	305	1143	2	6.4553	2.57	20.80	0.16	0.22
305	305	1143	3	6.4542	2.58	20.81	0.15	0.22
305	305	1143	4	6.4546	2.60	20.81	0.15	0.22
305	305	1143	5	6.4535	2.62	20.81	0.15	0.22
305	305	1143	6	6.4534	2.63	20.81	0.15	0.22
305	305	1143	7	6.4522	2.65	20.81	0.15	0.21
305	305	1143	8	6.4517	2.67	20.81	0.15	0.21
305	305	1143	9	6.4514	2.68	20.81	0.15	0.21

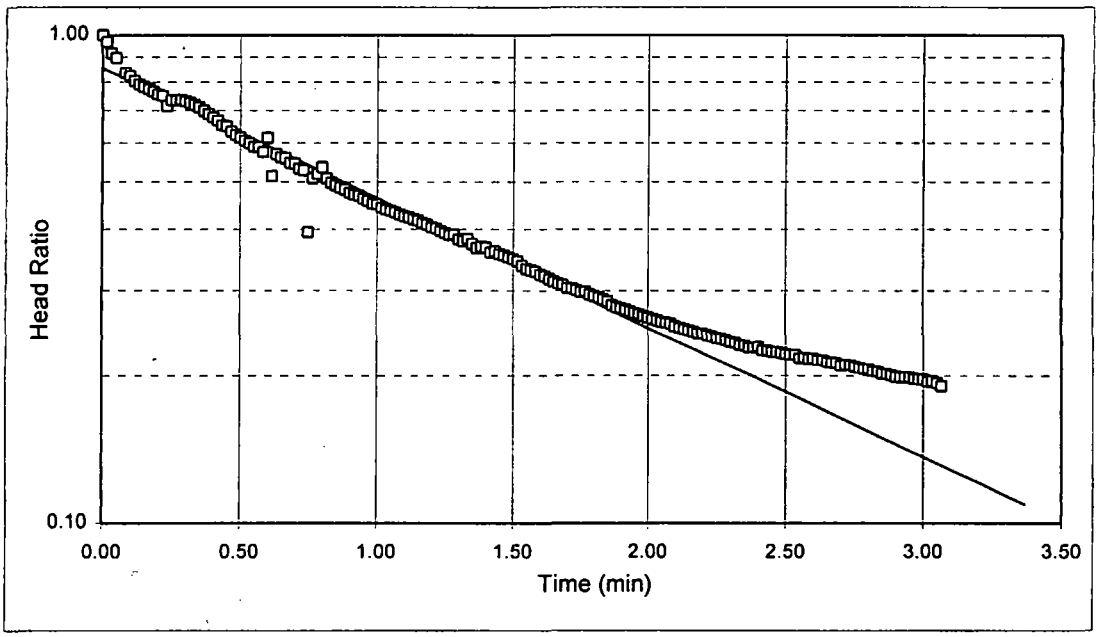
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1143	10	6.4494	2.70	20.81	0.15	0.21
305	305	1143	11	6.4501	2.72	20.81	0.15	0.21
305	305	1143	12	6.4497	2.73	20.81	0.15	0.21
305	305	1143	13	6.4487	2.75	20.81	0.15	0.21
305	305	1143	14	6.4477	2.77	20.81	0.15	0.21
305	305	1143	15	6.4472	2.78	20.81	0.15	0.21
305	305	1143	16	6.4472	2.80	20.81	0.15	0.21
305	305	1143	17	6.4455	2.82	20.81	0.15	0.20
305	305	1143	18	6.4453	2.83	20.81	0.15	0.20
305	305	1143	19	6.4438	2.85	20.82	0.14	0.20
305	305	1143	20	6.4435	2.87	20.82	0.14	0.20
305	305	1143	21	6.4426	2.88	20.82	0.14	0.20
305	305	1143	22	6.4417	2.90	20.82	0.14	0.20
305	305	1143	23	6.4414	2.92	20.82	0.14	0.20
305	305	1143	24	6.4415	2.93	20.82	0.14	0.20
305	305	1143	25	6.4411	2.95	20.82	0.14	0.20
305	305	1143	26	6.4404	2.97	20.82	0.14	0.20
305	305	1143	27	6.4402	2.98	20.82	0.14	0.20
305	305	1143	28	6.4398	3.00	20.82	0.14	0.20
305	305	1143	29	6.4385	3.02	20.82	0.14	0.19
305	305	1143	30	6.4388	3.03	20.82	0.14	0.20
305	305	1143	31	6.4376	3.05	20.82	0.14	0.19
305	305	1143	32	6.4355	3.07	20.82	0.14	0.19
305	305	1143	31	6.4376	3.05	20.82	0.14	0.19
305	305	1143	32	6.4355	3.07	20.82	0.14	0.19

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-303-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	7.92	K=	3.98E-04	cm/sec
t_1 (min) =	0	K=	1.13E+00	ft/day
t_2 (min) =	3.37			
h_1/h_0 =	0.86			
h_2/h_0 =	0.11			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-303-AS

WELL NO. PZ-303-AS

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	6.3	FEET H_2O
INITIAL DEPTH TO WATER	20.96	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	10.25	INCHES
TOP OF OPEN INTERVAL	14.2	FEET (btoc)
BOTTOM OF OPEN INTERVAL	28.9	FEET (btoc)
SATURATED THICKNESS	130	FEET
WATER TABLE TO BOTTOM OF SCREEN	7.92	FEET
EQUIVALENT DIAMETER	5.86	INCHES
OPEN INTERVAL LENGTH	7.92	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	1.24	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1143	34	5.0619	0.00	22.20	1.24	1.00
305	305	1143	35	5.2636	0.02	22.00	1.04	0.84
305	305	1143	36	5.399	0.03	21.86	0.90	0.73
305	305	1143	37	5.4883	0.05	21.77	0.81	0.66
305	305	1143	38	5.5617	0.07	21.70	0.74	0.60
305	305	1143	39	5.6208	0.08	21.64	0.68	0.55
305	305	1143	40	5.6747	0.10	21.59	0.63	0.51
305	305	1143	41	5.7239	0.12	21.54	0.58	0.47
305	305	1143	42	5.7655	0.13	21.49	0.53	0.43
305	305	1143	43	5.8101	0.15	21.45	0.49	0.40
305	305	1143	44	5.8564	0.17	21.40	0.44	0.36
305	305	1143	45	5.8925	0.18	21.37	0.41	0.33
305	305	1143	46	5.9307	0.20	21.33	0.37	0.30
305	305	1143	47	5.9607	0.22	21.30	0.34	0.27
305	305	1143	48	5.9848	0.23	21.28	0.32	0.25
305	305	1143	49	6.0136	0.25	21.25	0.29	0.23
305	305	1143	50	6.0444	0.27	21.22	0.26	0.21
305	305	1143	51	6.0691	0.28	21.19	0.23	0.19
305	305	1143	52	6.0926	0.30	21.17	0.21	0.17
305	305	1143	53	6.1123	0.32	21.15	0.19	0.15
305	305	1143	54	6.1324	0.33	21.13	0.17	0.14
305	305	1143	55	6.1497	0.35	21.11	0.15	0.12
305	305	1143	56	6.1703	0.37	21.09	0.13	0.10
305	305	1143	57	6.1853	0.38	21.07	0.11	0.09

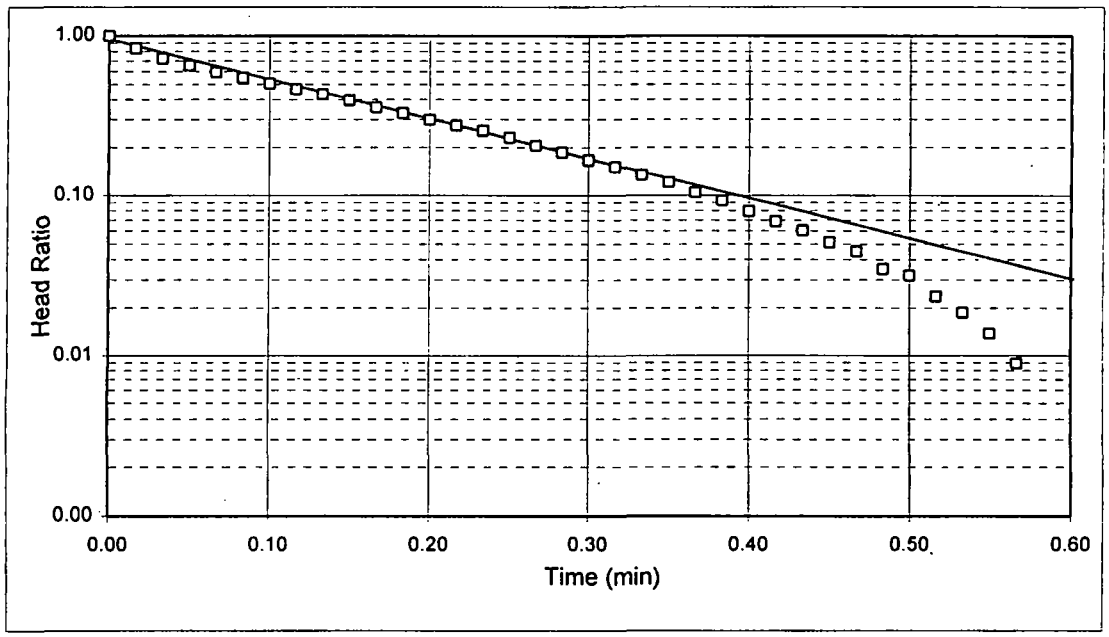
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1143	58	6.2013	0.40	21.06	0.10	0.08
305	305	1143	59	6.2144	0.42	21.05	0.09	0.07
305	305	1144	0	6.2249	0.43	21.04	0.08	0.06
305	305	1144	1	6.2366	0.45	21.02	0.06	0.05
305	305	1144	2	6.2443	0.47	21.02	0.06	0.04
305	305	1144	3	6.2565	0.48	21.00	0.04	0.04
305	305	1144	4	6.2603	0.50	21.00	0.04	0.03
305	305	1144	5	6.2707	0.52	20.99	0.03	0.02
305	305	1144	6	6.2768	0.53	20.98	0.02	0.02
305	305	1144	7	6.2828	0.55	20.98	0.02	0.01
305	305	1144	8	6.2889	0.57	20.97	0.01	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-303-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.43			
L_e =	7.92	K=	3.73E-03	cm/sec
t_1 (min) =	0	K=	1.06E+01	ft/day
t_2 (min) =	0.60			
h_1/h_0 =	0.95			
h_2/h_0 =	0.03			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

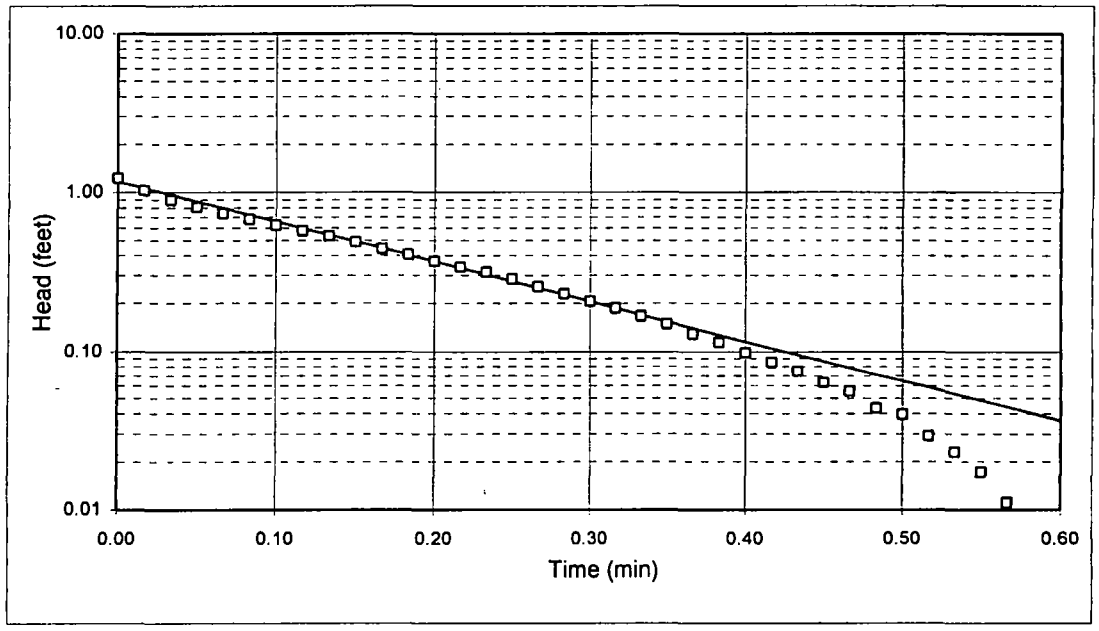
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-303-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.24			
r_w =	0.43			
L_e =	7.92	K=	1.48E-02	cm/sec
$\ln(R_e/r_w)$	1.34	K=	4.20E+01	ft/day
y_0 =	1.17			
y_t =	0.04			
t =	0.60			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-304-AS

WELL NO. PZ-304-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	7.28	FEET H_2O
INITIAL DEPTH TO WATER	21.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	13.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	30.3	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	8.96	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.96	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	0.39	FEET
MAX. HEAD IN SCREEN?	Y	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1438	44	7.6689	0.00	20.96	0.39	1.00
305	298	1438	46	7.5014	0.03	21.13	0.22	0.57
305	298	1438	48	7.4805	0.07	21.15	0.20	0.52
305	298	1438	50	7.4567	0.10	21.17	0.18	0.45
305	298	1438	52	7.4413	0.13	21.19	0.16	0.41
305	298	1438	54	7.5322	0.17	21.10	0.25	0.65
305	298	1438	56	7.4344	0.20	21.20	0.15	0.40
305	298	1438	58	7.4224	0.23	21.21	0.14	0.37
305	298	1439	0	7.4117	0.27	21.22	0.13	0.34
305	298	1439	2	7.409	0.30	21.22	0.13	0.33
305	298	1439	4	7.3946	0.33	21.24	0.11	0.29
305	298	1439	6	7.3879	0.37	21.24	0.11	0.28
305	298	1439	8	7.3814	0.40	21.25	0.10	0.26
305	298	1439	10	7.3773	0.43	21.25	0.10	0.25
305	298	1439	12	7.3724	0.47	21.26	0.09	0.24
305	298	1439	14	7.3658	0.50	21.26	0.09	0.22
305	298	1439	16	7.3609	0.53	21.27	0.08	0.21
305	298	1439	18	7.3603	0.57	21.27	0.08	0.21
305	298	1439	20	7.3566	0.60	21.27	0.08	0.20
305	298	1439	22	7.3524	0.63	21.28	0.07	0.19
305	298	1439	24	7.3498	0.67	21.28	0.07	0.18
305	298	1439	26	7.3429	0.70	21.29	0.06	0.16
305	298	1439	28	7.3438	0.73	21.29	0.06	0.16
305	298	1439	30	7.3411	0.77	21.29	0.06	0.16
305	298	1439	32	7.3355	0.80	21.29	0.06	0.14
305	298	1439	34	7.3354	0.83	21.29	0.06	0.14
305	298	1439	36	7.3322	0.87	21.30	0.05	0.13
305	298	1439	38	7.3297	0.90	21.30	0.05	0.13
305	298	1439	40	7.3275	0.93	21.30	0.05	0.12
305	298	1439	42	7.326	0.97	21.30	0.05	0.12

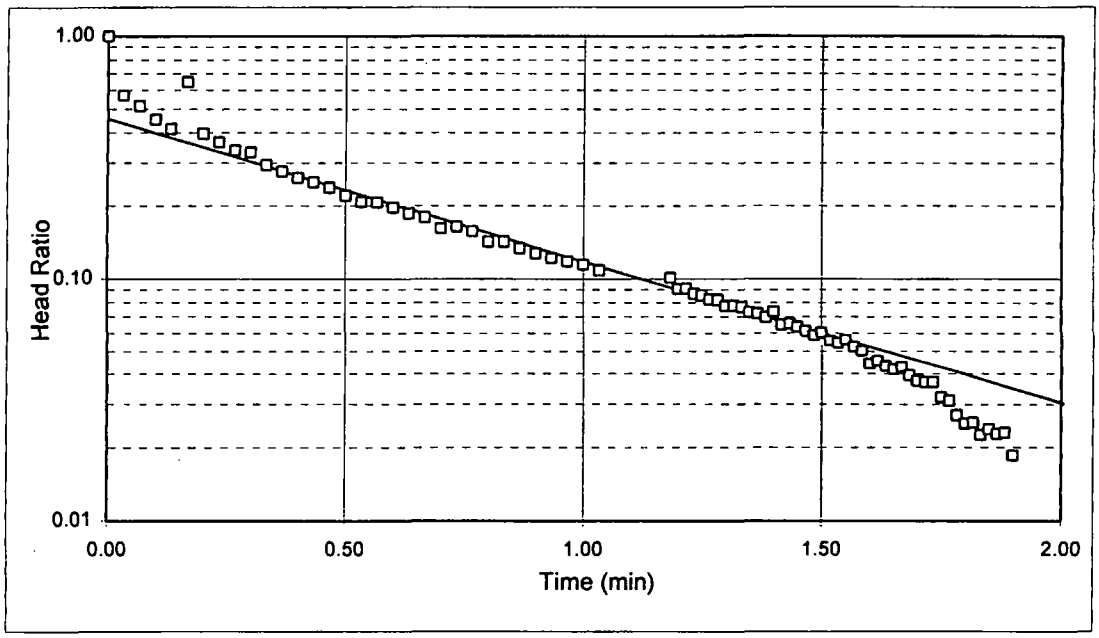
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1439	44	7.3246	1.00	21.31	0.04	0.11
305	298	1439	46	7.3223	1.03	21.31	0.04	0.11
305	298	1439	55	7.3194	1.18	21.31	0.04	0.10
305	298	1439	56	7.3154	1.20	21.31	0.04	0.09
305	298	1439	57	7.3155	1.22	21.31	0.04	0.09
305	298	1439	58	7.3138	1.23	21.32	0.03	0.09
305	298	1439	59	7.3133	1.25	21.32	0.03	0.09
305	298	1440	0	7.3121	1.27	21.32	0.03	0.08
305	298	1440	1	7.3119	1.28	21.32	0.03	0.08
305	298	1440	2	7.3102	1.30	21.32	0.03	0.08
305	298	1440	3	7.3103	1.32	21.32	0.03	0.08
305	298	1440	4	7.3099	1.33	21.32	0.03	0.08
305	298	1440	5	7.3085	1.35	21.32	0.03	0.07
305	298	1440	6	7.3081	1.37	21.32	0.03	0.07
305	298	1440	7	7.3072	1.38	21.32	0.03	0.07
305	298	1440	8	7.3086	1.40	21.32	0.03	0.07
305	298	1440	9	7.3053	1.42	21.32	0.03	0.07
305	298	1440	10	7.3056	1.43	21.32	0.03	0.07
305	298	1440	11	7.3048	1.45	21.33	0.02	0.06
305	298	1440	12	7.3038	1.47	21.33	0.02	0.06
305	298	1440	13	7.3028	1.48	21.33	0.02	0.06
305	298	1440	14	7.3035	1.50	21.33	0.02	0.06
305	298	1440	15	7.3017	1.52	21.33	0.02	0.06
305	298	1440	16	7.3012	1.53	21.33	0.02	0.05
305	298	1440	17	7.3019	1.55	21.33	0.02	0.06
305	298	1440	18	7.3004	1.57	21.33	0.02	0.05
305	298	1440	19	7.2996	1.58	21.33	0.02	0.05
305	298	1440	20	7.2972	1.60	21.33	0.02	0.04
305	298	1440	21	7.2977	1.62	21.33	0.02	0.05
305	298	1440	22	7.2968	1.63	21.33	0.02	0.04
305	298	1440	23	7.2963	1.65	21.33	0.02	0.04
305	298	1440	24	7.2967	1.67	21.33	0.02	0.04
305	298	1440	25	7.2954	1.68	21.33	0.02	0.04
305	298	1440	26	7.2946	1.70	21.34	0.01	0.04
305	298	1440	27	7.2944	1.72	21.34	0.01	0.04
305	298	1440	28	7.2944	1.73	21.34	0.01	0.04
305	298	1440	29	7.2925	1.75	21.34	0.01	0.03
305	298	1440	30	7.2921	1.77	21.34	0.01	0.03
305	298	1440	31	7.2906	1.78	21.34	0.01	0.03
305	298	1440	32	7.2898	1.80	21.34	0.01	0.03
305	298	1440	33	7.2899	1.82	21.34	0.01	0.03
305	298	1440	34	7.2888	1.83	21.34	0.01	0.02
305	298	1440	35	7.2893	1.85	21.34	0.01	0.02
305	298	1440	36	7.2889	1.87	21.34	0.01	0.02
305	298	1440	37	7.289	1.88	21.34	0.01	0.02
305	298	1440	38	7.2872	1.90	21.34	0.01	0.02

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-304-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	8.96	K=	8.69E-04	cm/sec
t_1 (min) =	0	K=	2.46E+00	ft/day
t_2 (min) =	2.01			
h_1/h_0 =	0.46			
h_2/h_0 =	0.03			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

RISING HEAD TEST PZ-304-AS

WELL NO. PZ-304-AS

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	7.28	FEET H_2O
INITIAL DEPTH TO WATER	21.35	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	13.8	FEET (btoc)
BOTTOM OF OPEN INTERVAL	30.3	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	8.96	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	8.96	FEET
STATIC IN SCREEN?	Y	
MAX. HEAD CHANGE	2.48	FEET
MAX. HEAD IN SCREEN?	Y	

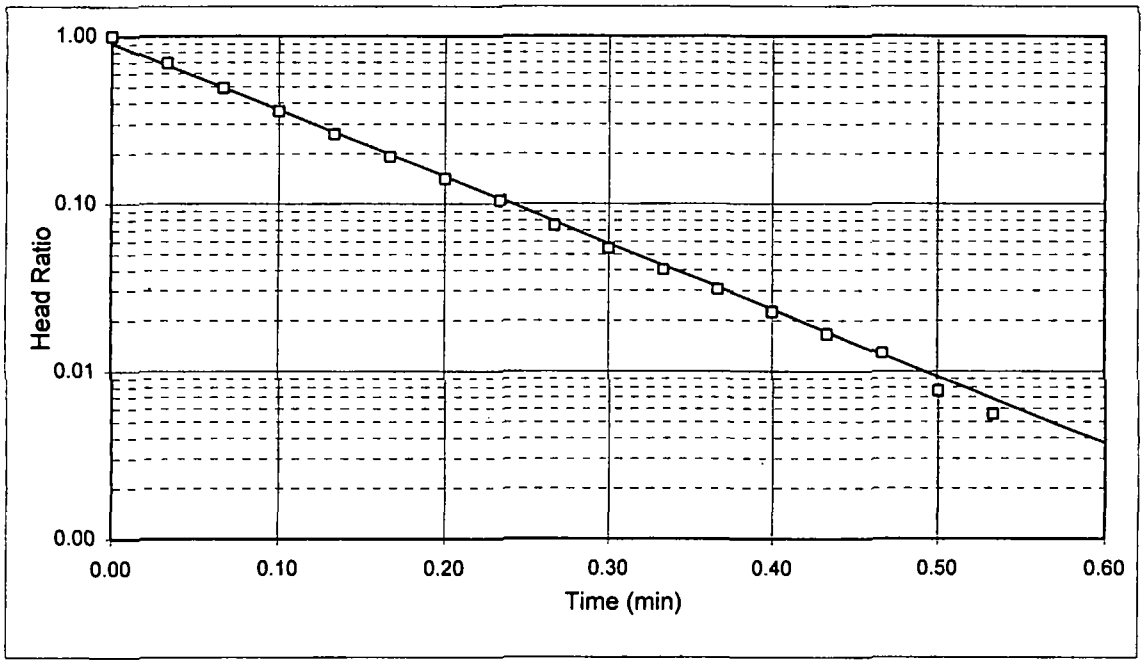
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1442	36	4.797	0.00	23.83	2.48	1.00
305	298	1442	38	5.555	0.03	23.08	1.73	0.69
305	298	1442	40	6.0565	0.07	22.57	1.22	0.49
305	298	1442	42	6.3892	0.10	22.24	0.89	0.36
305	298	1442	44	6.6299	0.13	22.00	0.65	0.26
305	298	1442	46	6.8063	0.17	21.82	0.47	0.19
305	298	1442	48	6.9305	0.20	21.70	0.35	0.14
305	298	1442	50	7.0198	0.23	21.61	0.26	0.10
305	298	1442	52	7.0945	0.27	21.54	0.19	0.07
305	298	1442	54	7.1446	0.30	21.49	0.14	0.05
305	298	1442	56	7.1798	0.33	21.45	0.10	0.04
305	298	1442	58	7.204	0.37	21.43	0.08	0.03
305	298	1443	0	7.2242	0.40	21.41	0.06	0.02
305	298	1443	2	7.2386	0.43	21.39	0.04	0.02
305	298	1443	4	7.2479	0.47	21.38	0.03	0.01
305	298	1443	6	7.261	0.50	21.37	0.02	0.01
305	298	1443	8	7.2662	0.53	21.36	0.01	0.01

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST PZ-304-AS

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	8.96	K=	5.89E-03	cm/sec
t_1 (min) =	0	K=	1.67E+01	ft/day
t_2 (min) =	0.60			
h_1/h_0 =	0.91			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

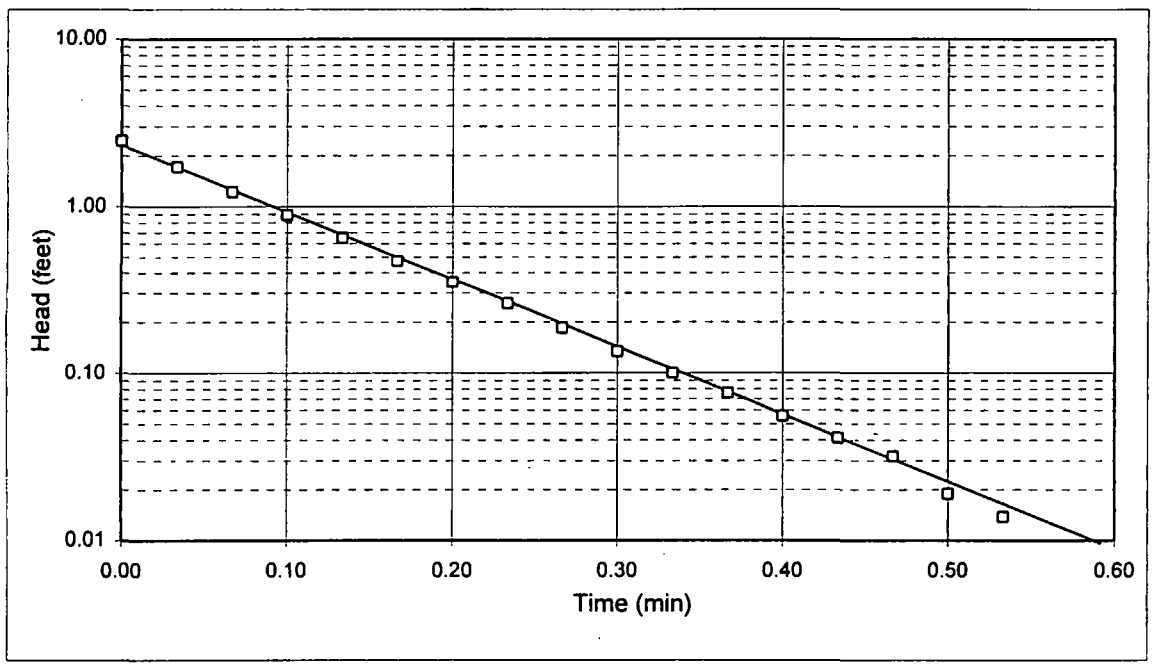
BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST PZ-304-AS

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
r_w =	0.34			
L_e =	8.96	K=	1.84E-02	cm/sec
$\ln(R_e/r_w)$	1.73	K=	5.22E+01	ft/day
y_0 =	2.34			
y_t =	0.01			
t =	0.59			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-304-AI

WELL NO. PZ-304-AI

DATE	10/24/95	
INITAL HEAD ON TRANSDUCER	9.9	FEET H_2O
INITIAL DEPTH TO WATER	21.72	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	38.3	FEET (btoc)
BOTTOM OF OPEN INTERVAL	52.4	FEET (btoc)
SATURATED THICKNESS	140	FEET
WATER TABLE TO BOTTOM OF SCREEN	30.7	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	14.1	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.48	FEET
MAX. HEAD IN SCREEN?	N	

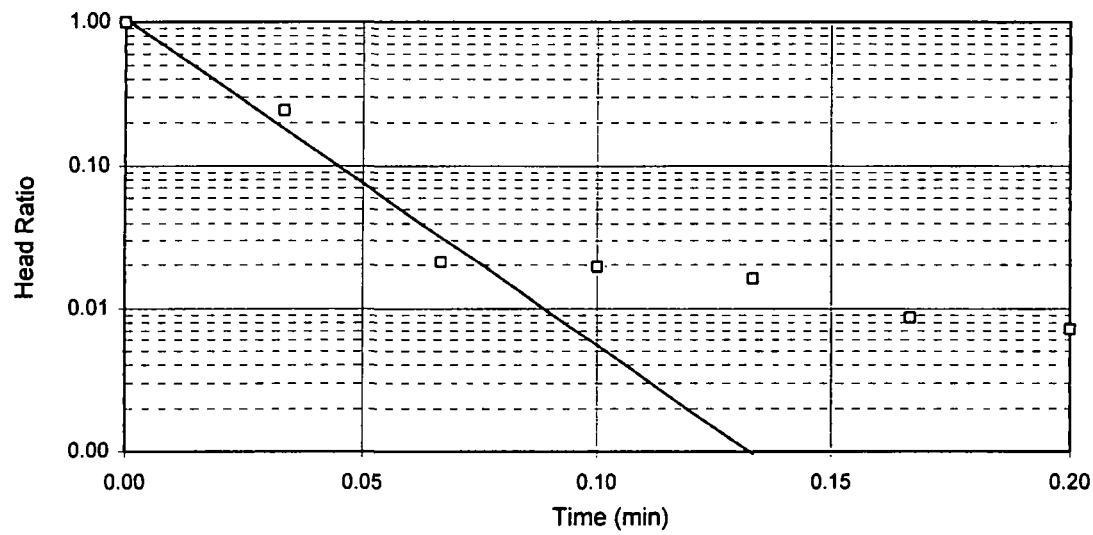
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	298	1414	6	12.383	0.00	19.24	2.48	1.00
305	298	1414	8	9.2916	0.03	21.11	0.61	0.25
305	298	1414	10	9.8479	0.07	21.67	0.05	0.02
305	298	1414	12	9.9482	0.10	21.67	0.05	0.02
305	298	1414	14	9.9399	0.13	21.68	0.04	0.02
305	298	1414	16	9.9217	0.17	21.70	0.02	0.01
305	298	1414	18	9.9179	0.20	21.70	0.02	0.01

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-304-AI

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	14.1	K=	2.44E-02	cm/sec
t_1 (min) =	0	K=	6.91E+01	ft/day
t_2 (min) =	0.13			
h_1/h_0 =	1.05			
h_2/h_0 =	0.00			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

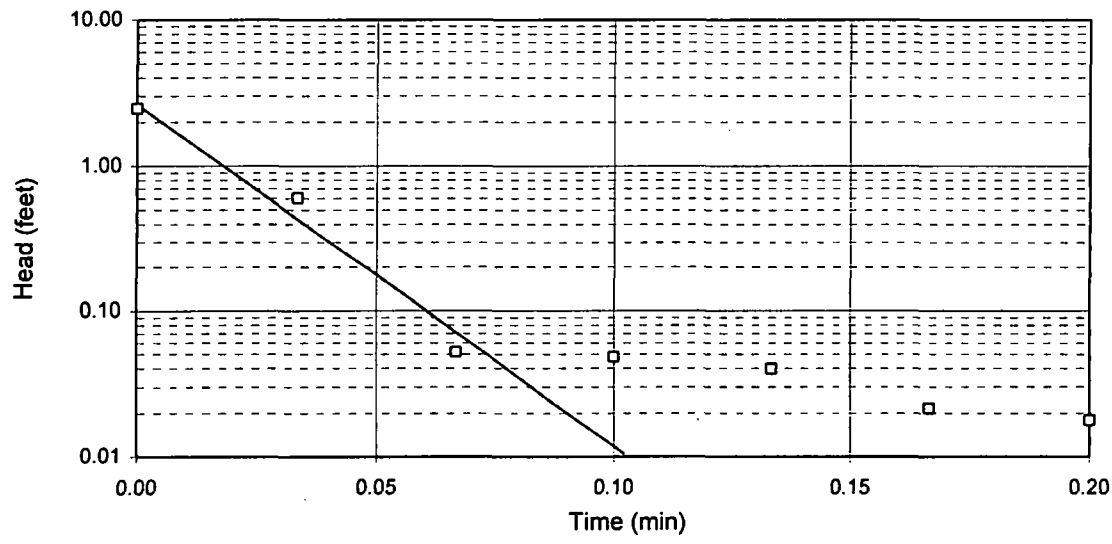
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-304-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	14.1	K=	1.71E-02	cm/sec
$\ln(R_e/r_w)$	2.53	K=	4.86E+01	ft/day
y_0 =	2.63			
y_t =	0.01			
t =	0.10			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/24/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-305-AI

WELL NO. PZ-305-AI

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	10.74	FEET H_2O
INITIAL DEPTH TO WATER	27.18	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	50.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	65.0	FEET (btoc)
SATURATED THICKNESS	50	FEET
WATER TABLE TO BOTTOM OF SCREEN	37.8	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	14.1	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	0.32	FEET
MAX. HEAD IN SCREEN?	N	

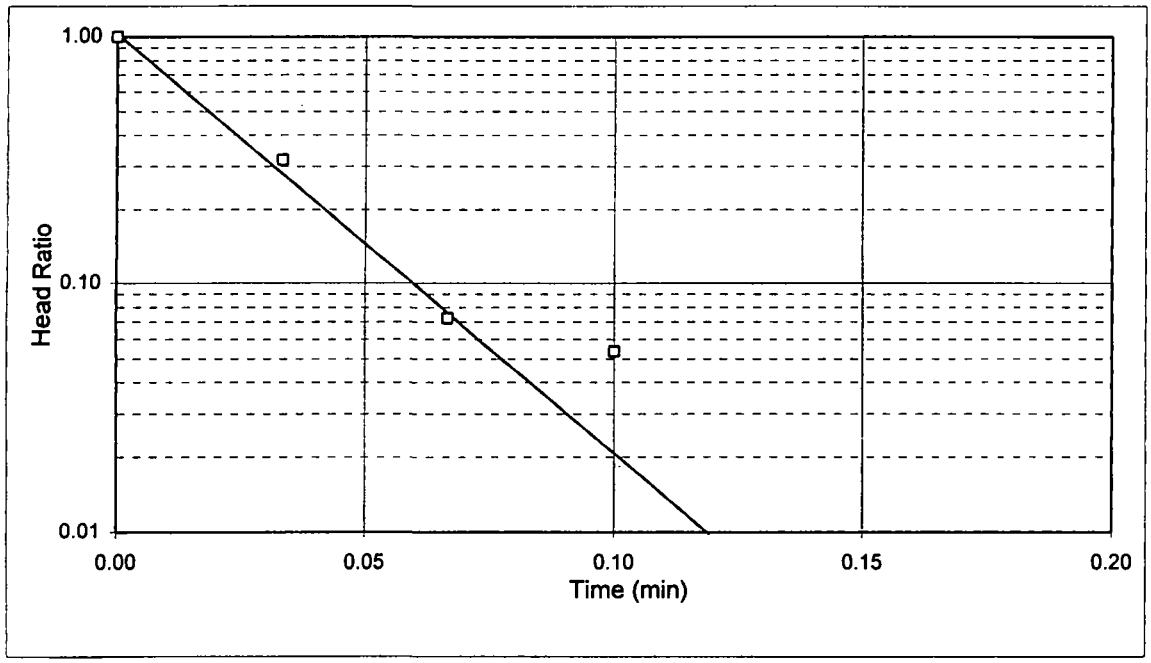
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	958	34	11.057	0.00	26.86	0.32	1.00
305	305	958	36	10.639	0.03	27.08	0.10	0.32
305	305	958	38	10.717	0.07	27.16	0.02	0.07
305	305	958	40	10.757	0.10	27.16	0.02	0.05
305	305	958	42	10.739	0.13	27.18	0.00	0.00
305	305	958	44	10.739	0.17	27.18	0.00	0.00

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = filter pack radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	14.1	K=	1.81E-02	cm/sec
t_1 (min) =	0	K=	5.13E+01	ft/day
t_2 (min) =	0.12			
h_1/h_0 =	1.02			
h_2/h_0 =	0.01			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

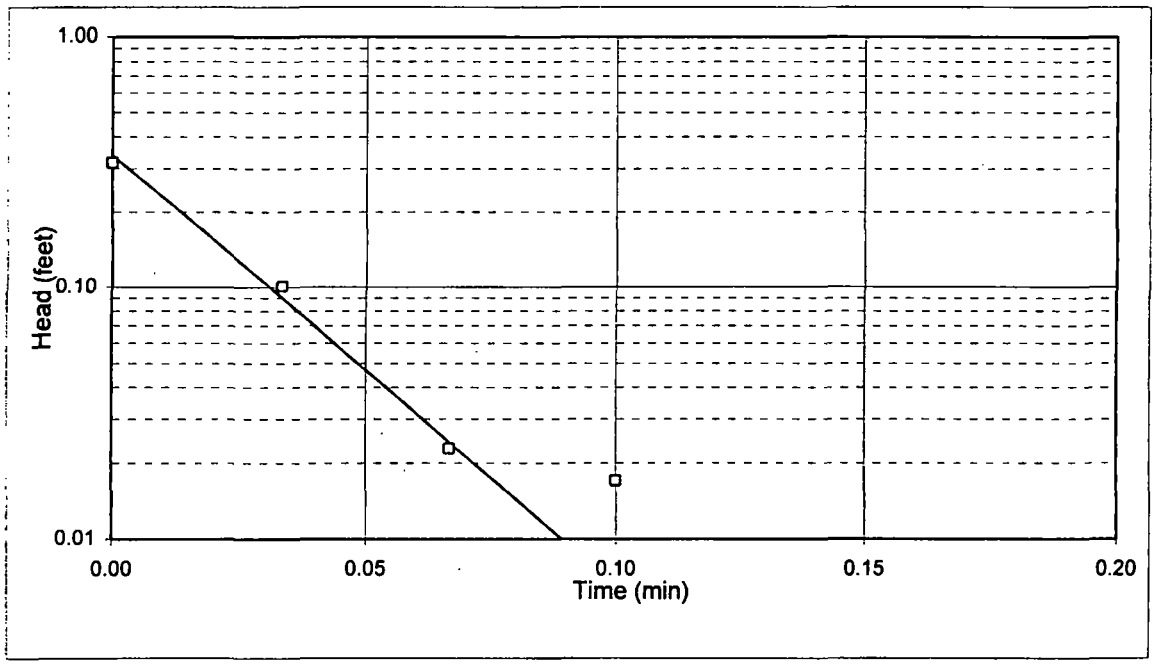
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	14.1	K=	1.38E-02	cm/sec
$\ln(R_e/r_w)$	2.80	K=	3.92E+01	ft/day
y_0 =	0.34			
y_t =	0.01			
t =	0.09			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By: FRB
Analysis Date: 1/22/96

FALLING HEAD TEST PZ-305-AI

WELL NO. PZ-305-AI

DATE	10/31/95	
INITAL HEAD ON TRANSDUCER	10.74	FEET H_2O
INITIAL DEPTH TO WATER	27.18	FEET (btoc)
CASING DIAMETER	2	INCHES
SAND DIAMETER	8.25	INCHES
TOP OF OPEN INTERVAL	50.9	FEET (btoc)
BOTTOM OF OPEN INTERVAL	65.0	FEET (btoc)
SATURATED THICKNESS	500	FEET
WATER TABLE TO BOTTOM OF SCREEN	37.8	FEET
EQUIVALENT DIAMETER	4.82	INCHES
OPEN INTERVAL LENGTH	14.1	FEET
STATIC IN SCREEN?	N	
MAX. HEAD CHANGE	2.52	FEET
MAX. HEAD IN SCREEN?	N	

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	957	30	13.26	0.00	24.66	2.52	1.00
305	305	957	32	10.474	0.03	26.91	0.27	0.11
305	305	957	34	10.707	0.07	27.15	0.03	0.01
305	305	957	36	10.817	0.10	27.10	0.08	0.03
305	305	957	38	10.765	0.13	27.16	0.02	0.01
305	305	957	40	10.744	0.17	27.18	0.00	0.00
305	305	957	42	10.75	0.20	27.17	0.01	0.00
305	305	957	44	10.752	0.23	27.17	0.01	0.00
305	305	957	46	10.749	0.27	27.17	0.01	0.00
305	305	957	48	10.748	0.30	27.17	0.01	0.00
305	305	957	50	10.748	0.33	27.17	0.01	0.00
305	305	957	52	10.748	0.37	27.17	0.01	0.00
305	305	957	54	10.748	0.40	27.17	0.01	0.00
305	305	957	56	10.748	0.43	27.17	0.01	0.00
305	305	957	58	10.747	0.47	27.17	0.01	0.00
305	305	958	34	11.057	1.07	26.86	0.32	0.13
305	305	958	36	10.639	1.10	27.08	0.10	0.04
305	305	958	38	10.717	1.13	27.16	0.02	0.01
305	305	958	40	10.757	1.17	27.16	0.02	0.01
305	305	958	42	10.739	1.20	27.18	0.00	0.00
305	305	958	44	10.739	1.23	27.18	0.00	0.00
305	305	959	51	10.926	2.35	26.99	0.19	0.07
305	305	959	52	10.425	2.37	26.87	0.31	0.12
305	305	959	53	10.604	2.38	27.04	0.14	0.05
305	305	959	54	10.741	2.40	27.18	0.00	0.00
305	305	959	55	10.79	2.42	27.13	0.05	0.02
305	305	959	56	10.804	2.43	27.12	0.06	0.03
305	305	959	57	10.781	2.45	27.14	0.04	0.02
305	305	959	58	10.753	2.47	27.17	0.01	0.01
305	305	959	59	10.741	2.48	27.18	0.00	0.00

DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1000	0	10.741	2.50	27.18	0.00	0.00
305	305	1001	21	9.8456	3.85	28.07	0.89	0.35
305	305	1001	22	11.004	3.87	27.44	0.26	0.10
305	305	1001	23	11.242	3.88	27.68	0.50	0.20
305	305	1001	24	10.981	3.90	27.42	0.24	0.10
305	305	1001	25	10.723	3.92	27.20	0.02	0.01
305	305	1001	26	10.636	3.93	27.28	0.10	0.04
305	305	1001	27	10.669	3.95	27.25	0.07	0.03
305	305	1001	28	10.726	3.97	27.19	0.01	0.01
305	305	1001	29	10.754	3.98	27.19	0.01	0.01
305	305	1001	30	10.756	4.00	27.20	0.02	0.01
305	305	1001	31	10.746	4.02	27.19	0.01	0.00
305	305	1001	32	10.738	4.03	27.18	0.00	0.00
305	305	1001	33	10.739	4.05	27.18	0.00	0.00
305	305	1001	34	10.739	4.07	27.18	0.00	0.00
305	305	1002	41	11.331	5.18	26.59	0.59	0.23
305	305	1002	42	10.251	5.20	26.69	0.49	0.19
305	305	1002	43	10.521	5.22	26.96	0.22	0.09
305	305	1002	44	10.672	5.23	27.11	0.07	0.03
305	305	1002	45	10.779	5.25	27.14	0.04	0.02
305	305	1002	46	10.812	5.27	27.11	0.07	0.03
305	305	1002	47	10.803	5.28	27.12	0.06	0.03
305	305	1002	48	10.77	5.30	27.15	0.03	0.01
305	305	1002	49	10.749	5.32	27.17	0.01	0.00
305	305	1002	50	10.745	5.33	27.18	0.00	0.00
305	305	1002	51	10.745	5.35	27.18	0.00	0.00
305	305	1003	25	4.5032	5.92	33.42	6.24	2.47
305	305	1003	26	10.801	5.93	27.24	0.06	0.02
305	305	1003	27	11.451	5.95	27.89	0.71	0.28
305	305	1003	28	11.212	5.97	27.65	0.47	0.19
305	305	1003	29	10.806	5.98	27.25	0.07	0.03
305	305	1003	30	10.616	6.00	27.30	0.12	0.05
305	305	1003	31	10.624	6.02	27.30	0.12	0.05
305	305	1003	32	10.703	6.03	27.22	0.04	0.01
305	305	1003	33	10.753	6.05	27.19	0.01	0.01
305	305	1003	34	10.762	6.07	27.20	0.02	0.01
305	305	1003	35	10.751	6.08	27.19	0.01	0.00
305	305	1003	36	10.74	6.10	27.18	0.00	0.00
305	305	1003	37	10.736	6.12	27.18	0.00	0.00
305	305	1003	38	10.74	6.13	27.18	0.00	0.00
305	305	1003	39	10.742	6.15	27.18	0.00	0.00
305	305	1003	40	10.743	6.17	27.18	0.00	0.00
305	305	1003	41	10.745	6.18	27.19	0.00	0.00
305	305	1003	42	10.745	6.20	27.19	0.00	0.00
305	305	1003	43	10.741	6.22	27.18	0.00	0.00
305	305	1003	44	10.742	6.23	27.18	0.00	0.00
305	305	1003	45	10.744	6.25	27.18	0.00	0.00
305	305	1003	46	10.742	6.27	27.18	0.00	0.00

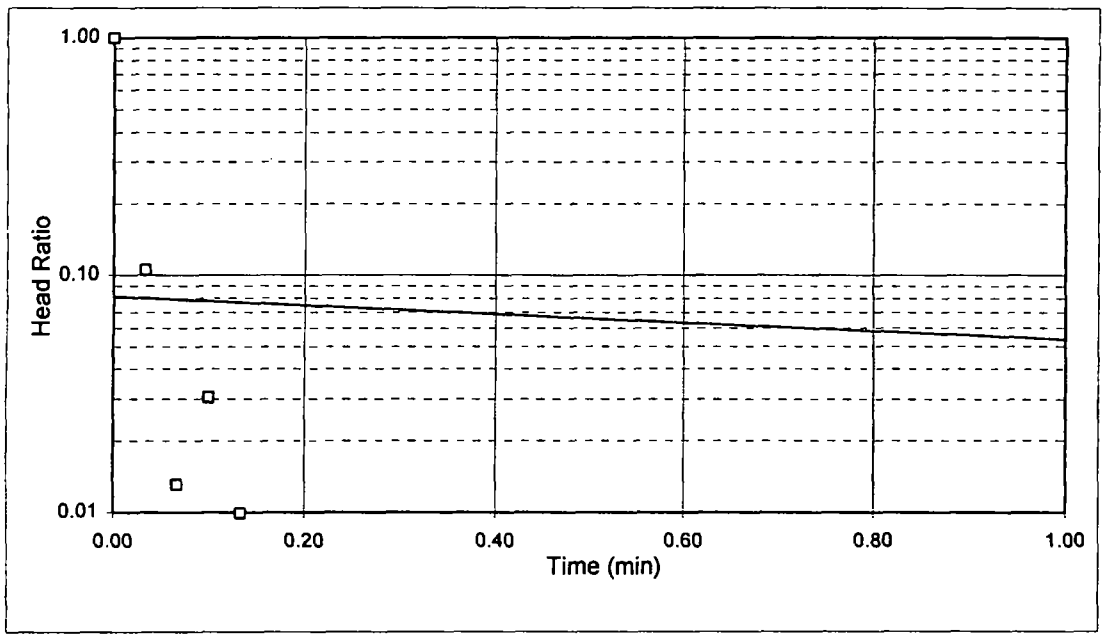
DATALOGGER TIME				TRANSDUCER TR1	ELAPSED TIME	DEPTH TO WATER	HEAD	HEAD RATIO
YEAR	DAY	HR-MIN	SEC	(FEET H_2O)	(MIN)	(FEET)	(FEET)	
305	305	1003	47	10.744	6.28	27.18	0.00	0.00
305	305	1003	48	10.745	6.30	27.19	0.00	0.00
305	305	1003	49	10.744	6.32	27.18	0.00	0.00
305	305	1003	50	10.743	6.33	27.18	0.00	0.00
305	305	1003	51	10.745	6.35	27.19	0.00	0.00
305	305	1003	52	10.745	6.37	27.19	0.00	0.00
305	305	1003	53	10.745	6.38	27.19	0.00	0.00
305	305	1003	54	10.744	6.40	27.18	0.00	0.00
305	305	1003	55	10.745	6.42	27.19	0.00	0.00
305	305	1003	56	10.744	6.43	27.18	0.00	0.00
305	305	1003	57	10.743	6.45	27.18	0.00	0.00
305	305	1003	58	10.744	6.47	27.18	0.00	0.00
305	305	1003	59	10.744	6.48	27.18	0.00	0.00
305	305	1004	0	10.745	6.50	27.19	0.00	0.00
305	305	1004	1	10.745	6.52	27.19	0.00	0.00
305	305	1004	2	10.745	6.53	27.19	0.00	0.00
305	305	1004	3	10.745	6.55	27.19	0.00	0.00
305	305	1004	4	10.743	6.57	27.18	0.00	0.00
305	305	1004	5	10.744	6.58	27.18	0.00	0.00
305	305	1004	6	10.745	6.60	27.19	0.00	0.00
305	305	1004	7	10.746	6.62	27.19	0.01	0.00
305	305	1004	8	10.745	6.63	27.19	0.00	0.00

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
r_c = casing radius (feet);
R_e = equivalent radius (feet);
L_e = length of screened interval (feet);
t = time (seconds); and,
h_t = head at time t (feet).

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	14.1	K=	1.93E-04	cm/sec
t_1 (min) =	0	K=	5.46E-01	ft/day
t_2 (min) =	1.00			
h_1/h_0 =	0.08			
h_2/h_0 =	0.05			



Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By:
Analysis Date: 1/22/96

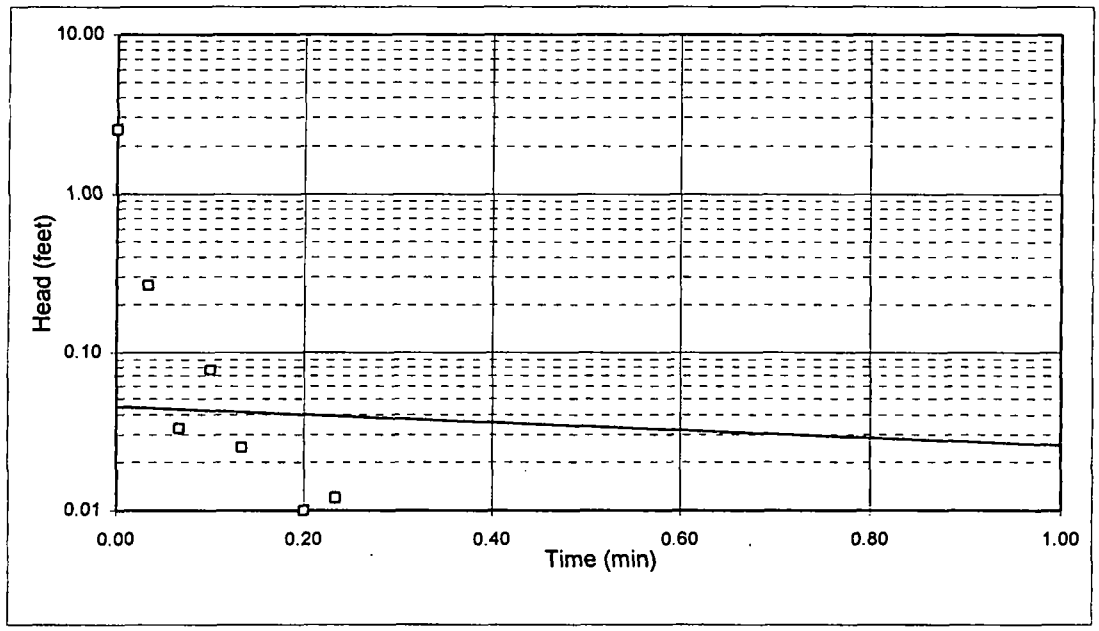
BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST PZ-305-AI

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln \frac{y_0}{y_t}$$

where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
r_w =	0.34			
L_e =	14.1	K=	1.72E-04	cm/sec
$\ln(R_e/r_w)$	2.49	K=	4.89E-01	ft/day
y_0 =	0.04			
y_t =	0.03			
t =	1.00			

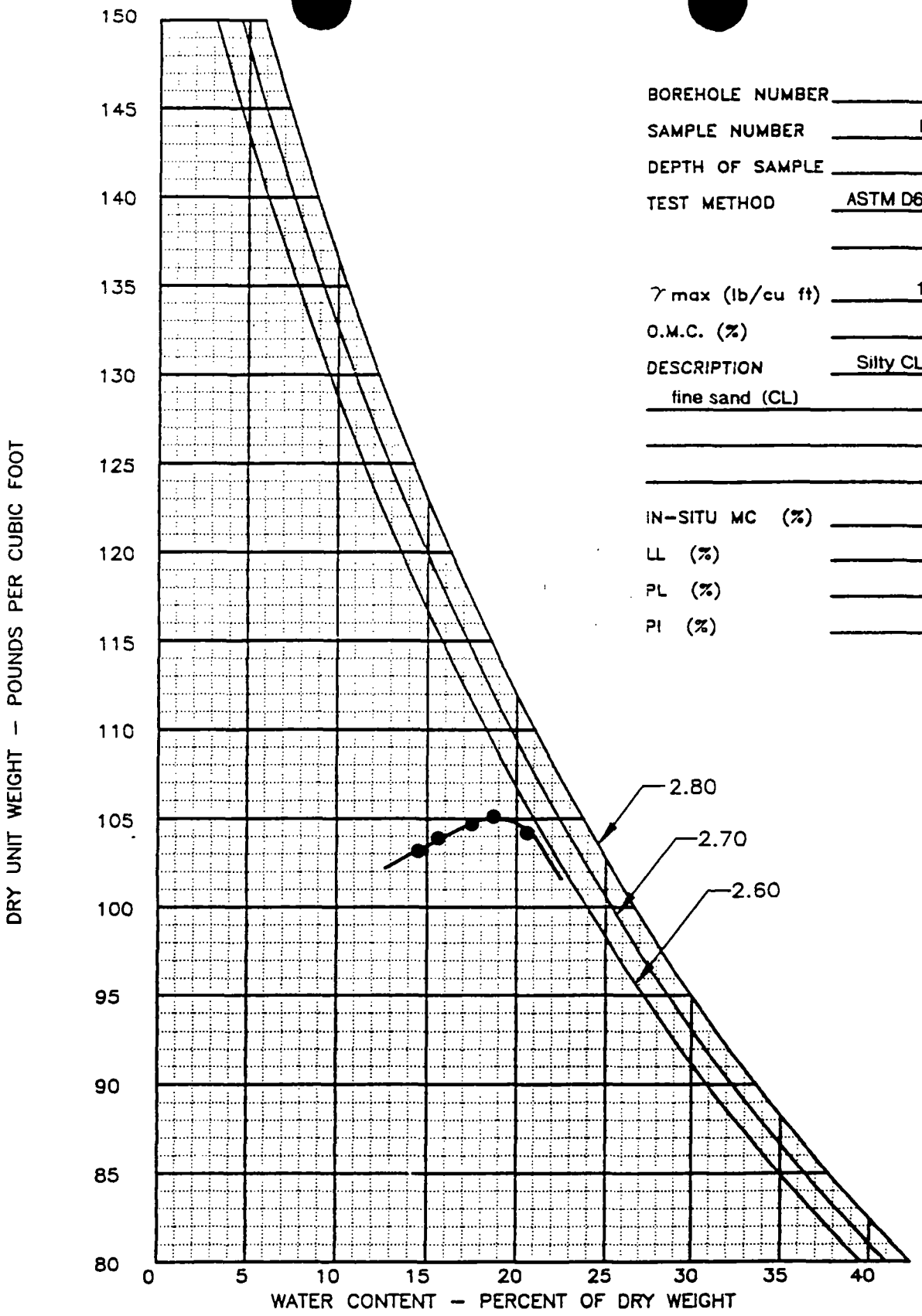


Project Name: LAIDLAW / OU-2 RIFS / MO
Project No.: 943-2848
Test Date: 10/31/95

Analysis By: CVK
Checked By:
Analysis Date: 1/22/96

APPENDIX D

GEOTECHNICAL TEST DATA



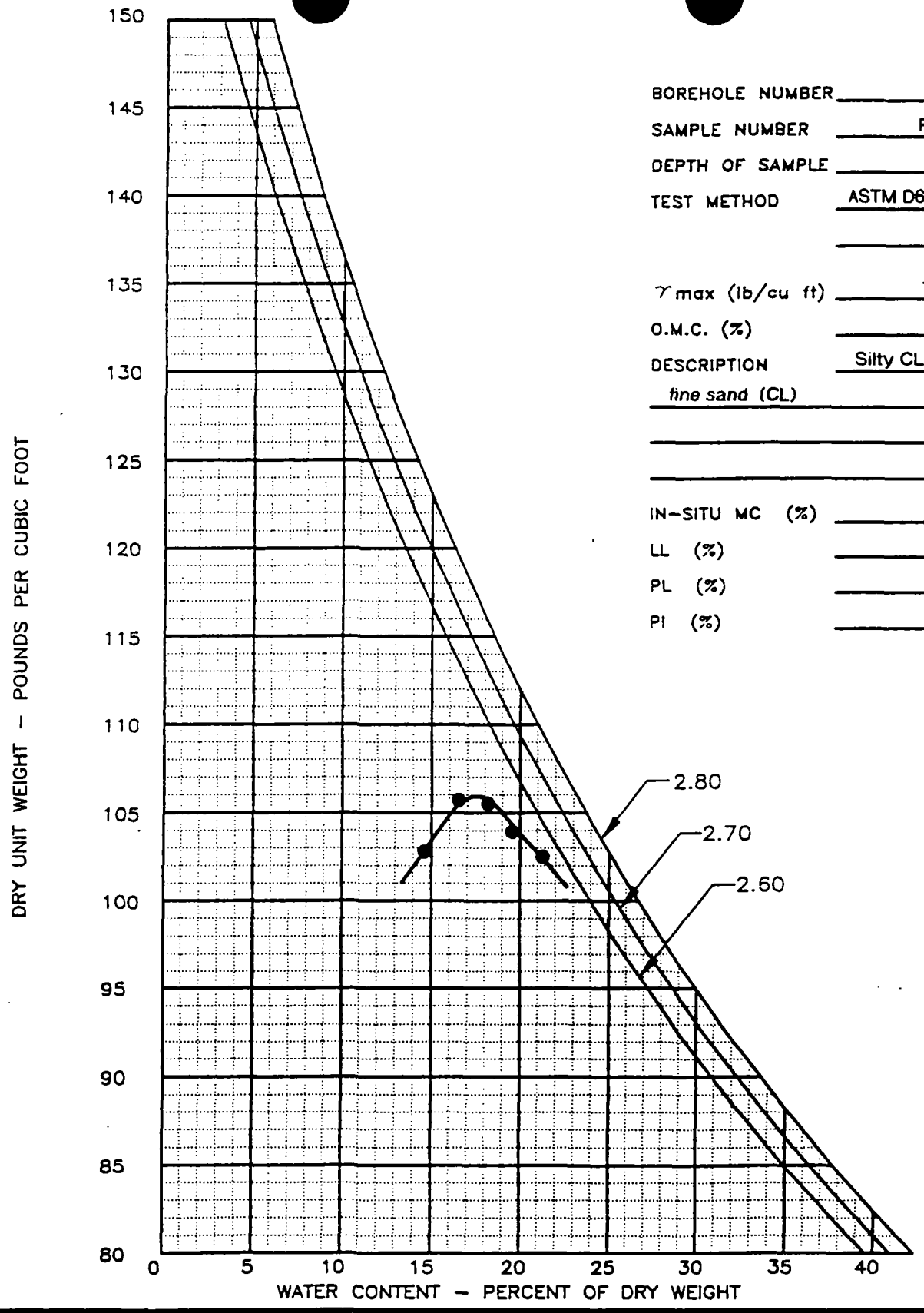
BOREHOLE NUMBER	
SAMPLE NUMBER	PS-1
DEPTH OF SAMPLE	
TEST METHOD	ASTM D698 METHOD A
γ max (lb/cu ft)	105.0
O.M.C. (%)	19.0
DESCRIPTION	Silty CLAY with trace fine sand (CL)
IN-SITU MC (%)	23.0
LL (%)	47
PL (%)	17
PI (%)	30

Golder Associates Denver, Colorado

TITLE

PROCTOR CURVE SAMPLE #PS-1

CLIENT/PROJECT	DRAWN ASF	DATE JULY 1995	JOB NO. 943-2848.202
LAIDLAW/OU2 RIFS/MO	CHECKED KMR	SCALE AS SHOWN	DWG NO./REV. NO.
	REVIEWED	FILE NO. WATER.DWG	FIGURE NO.



BOREHOLE NUMBER	
SAMPLE NUMBER	PS-2
DEPTH OF SAMPLE	
TEST METHOD	ASTM D698 METHOD A
γ max (lb/cu ft)	106.0
O.M.C. (%)	17.5
DESCRIPTION	Silty CLAY with trace fine sand (CL)
IN-SITU MC (%)	25.9
LL (%)	39
PL (%)	22
PI (%)	17

Golder Associates Denver, Colorado

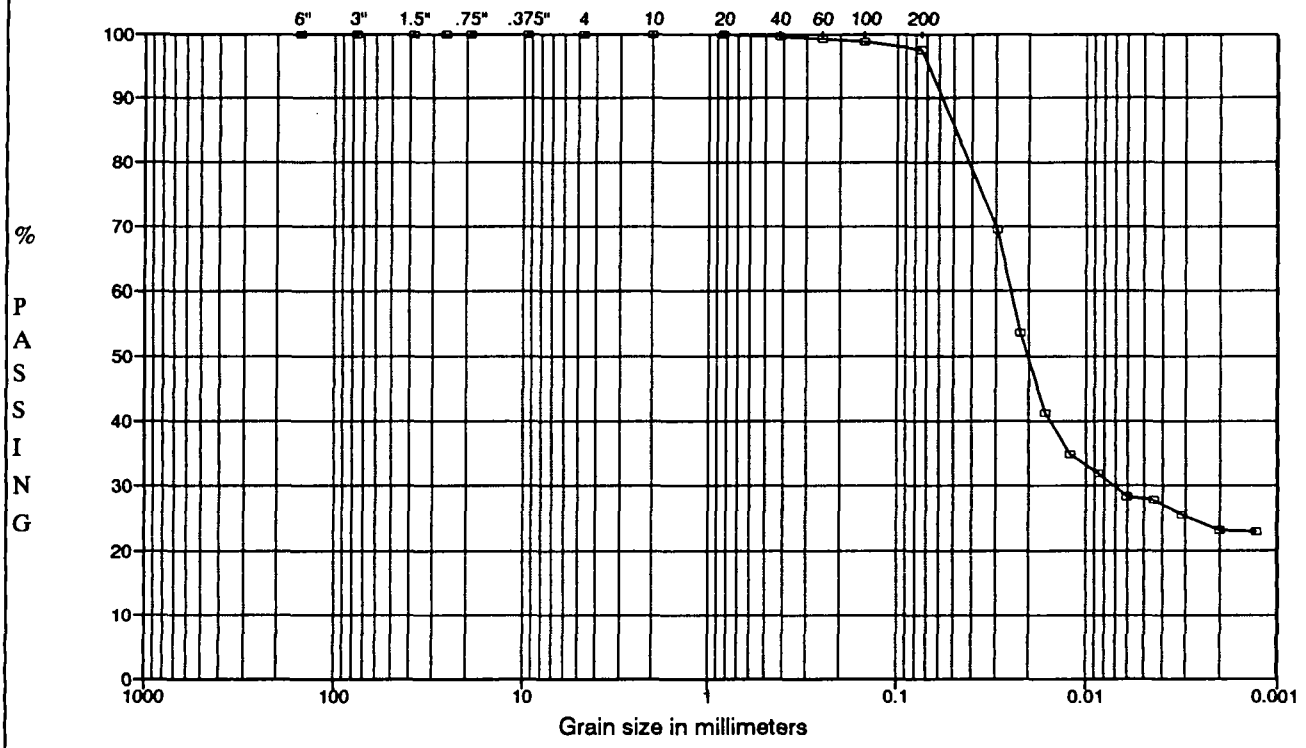
TITLE

PROCTOR CURVE SAMPLE #PS-2

CLIENT/PROJECT	DRAWN ASF	DATE JULY 1995	JOB NO. 943-2848.202
LAIDLAW/OU2 RIFS/MO	CHECKED KMR	SCALE AS SHOWN	DWG NO./REV. NO.
	REVIEWED	FILE NO. WATER.DWG	FIGURE NO.

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID	W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE SAMPLE NO. PS-2 DEPTH	25.9	39	22	17	2.81	Silty CLAY with trace fine sand

Sample Type: Date Tested: 6/28/95 USCS: CL

TECH: BRB
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

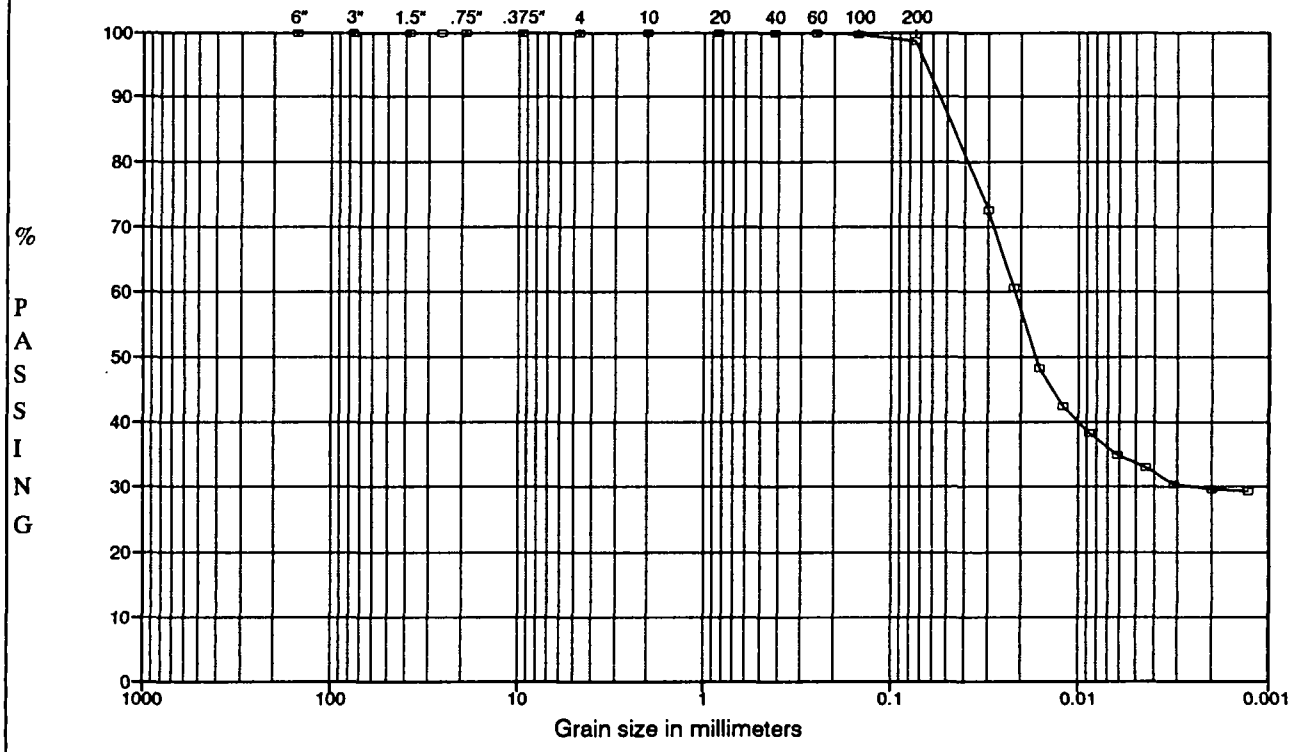
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848P32

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID	W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE SAMPLE NO. PS-1 DEPTH	23.0	47	17	30	2.74	Silty CLAY with trace fine sand

Sample Type: Date Tested: 6/28/95 USCS: CL

TECH: BRB
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

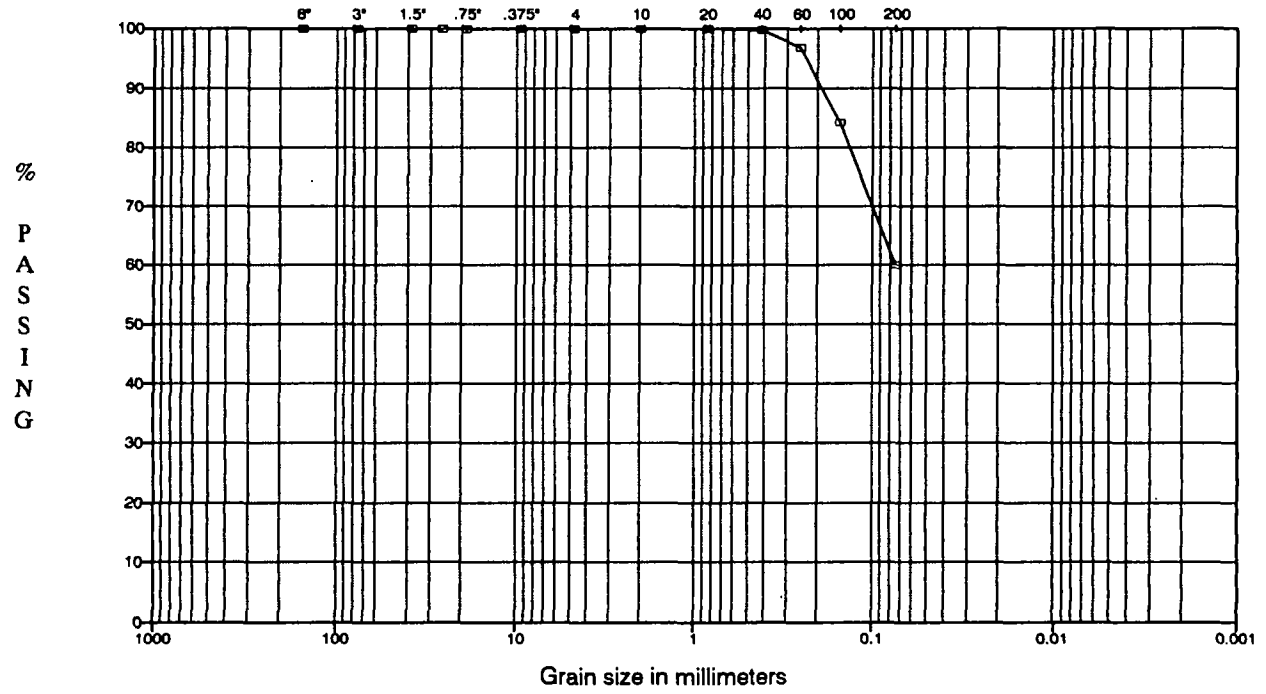
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848751

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt or Clay)
	Coarse	Fine	C	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-208-SS	--	--	--	--	--	FINES and fine SAND
SAMPLE NO.							
DEPTH (FT.)	10-12'						

Sample Type: Date Tested: 6/29/95 USCS: --

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

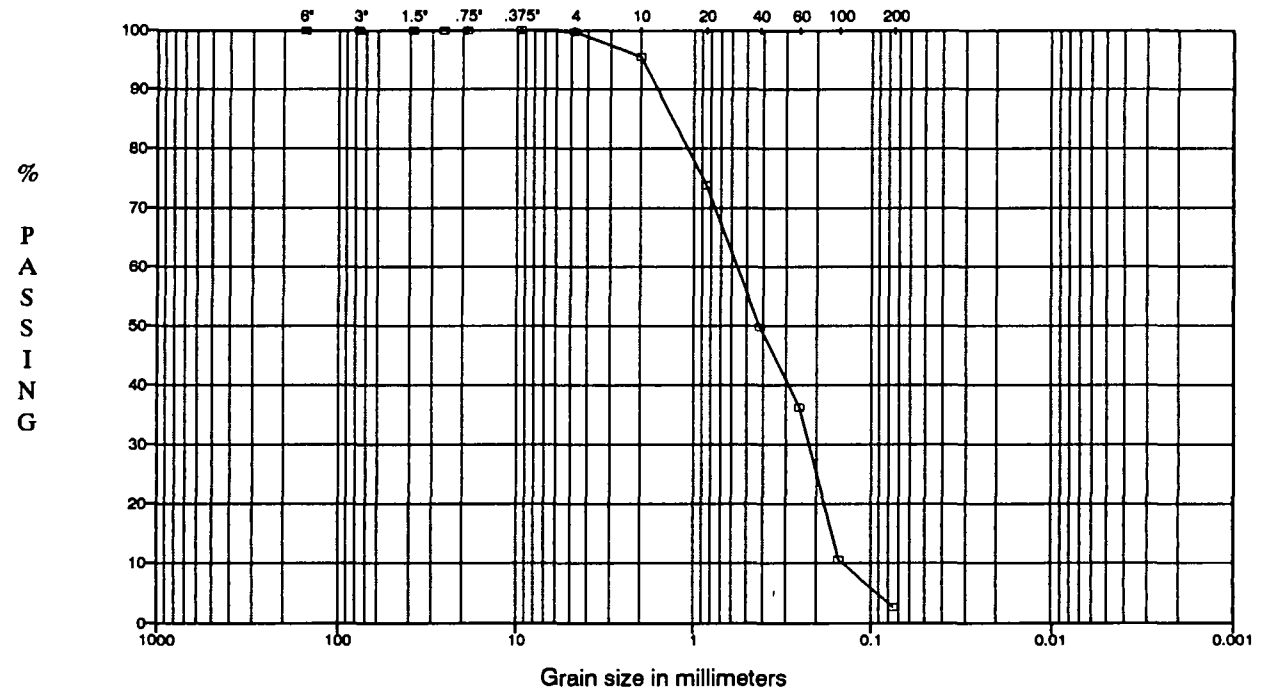
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848206

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt or Clay)
	Coarse	Fine	C	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		17.0%	–	–	–	–	Coarse to fine SAND with trace fines
SAMPLE NO.	PZ-207AS						
DEPTH (FT.)	36.0-38.0						

Sample Type: Date Tested: 4/28/95 USCS: SP

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

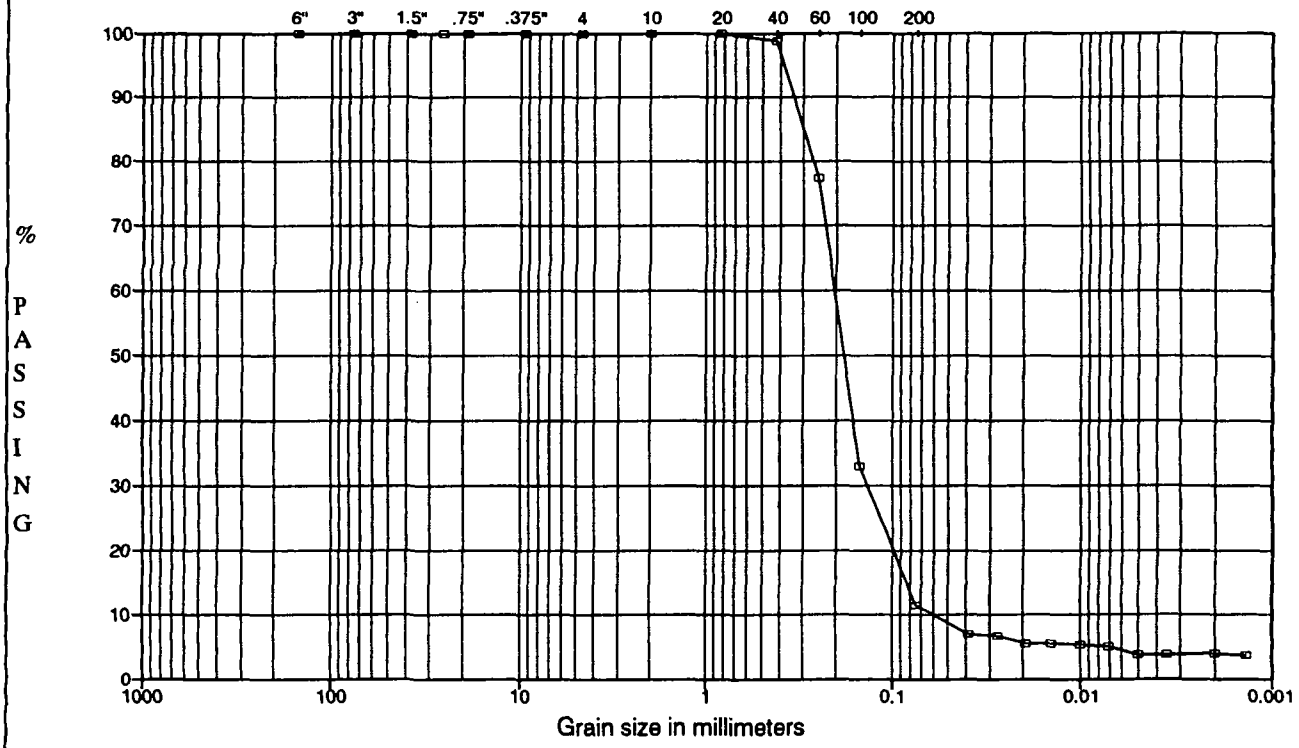
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848297

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	NP	NP	2.62	Medium to fine SAND with little silt
SAMPLE NO.	PZ-206-SS						
DEPTH	8-10,32-34						

Sample Type: Date Tested: 4/6/95 USCS: SP-SM

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

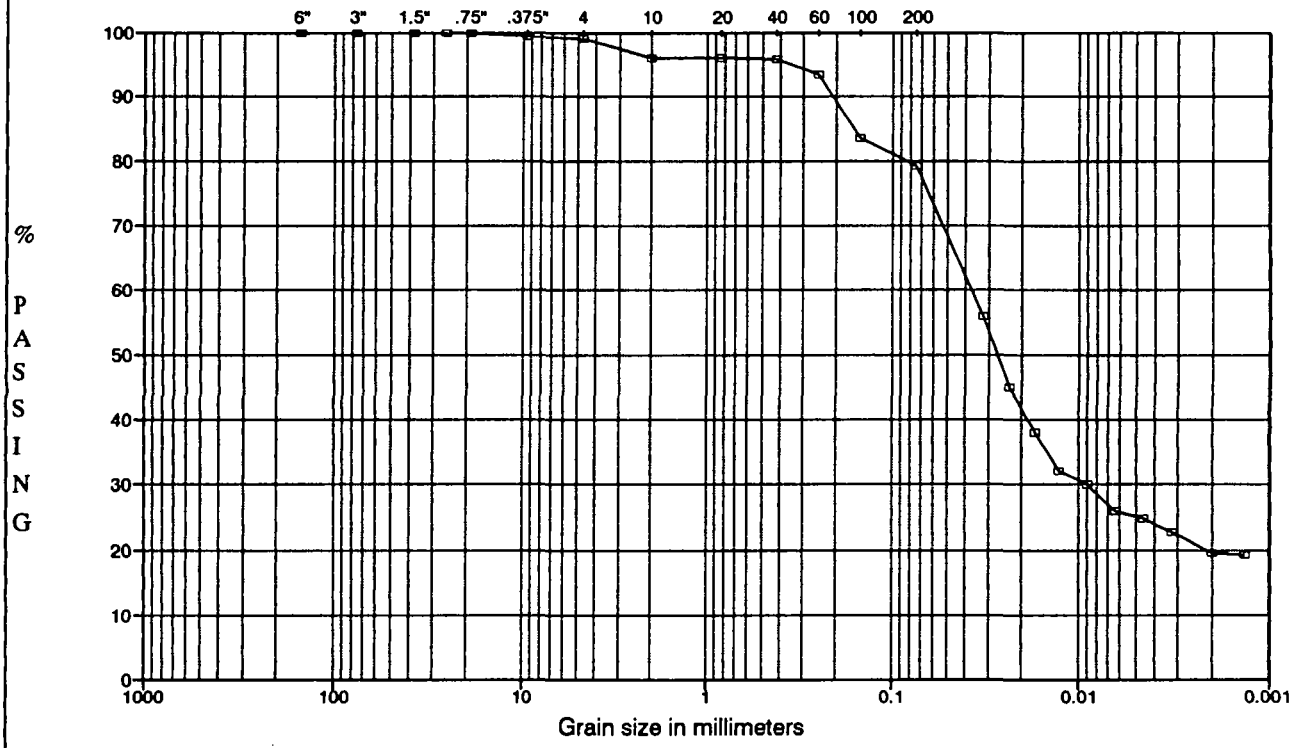
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848206

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-205-AS	--	--	--	--	2.68	SILT with some coarse to fine sand, trace fine gravel
SAMPLE NO.							
DEPTH	31-33'						

Sample Type: Date Tested: 6/28/95 USCS: ML

TECH: BRB
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

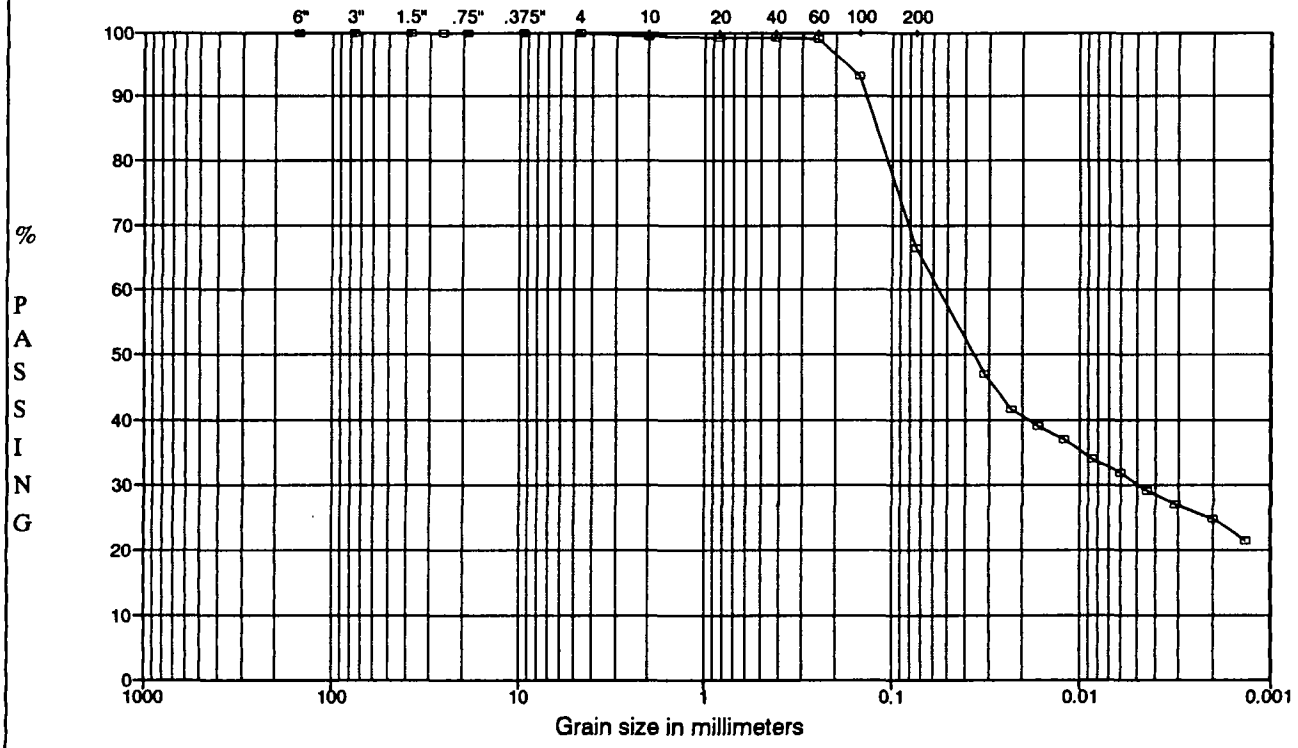
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848205B

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-205-AS	--	--	--	--	2.81	FINES and coarse to fine SAND
SAMPLE NO.							
DEPTH	41-43'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

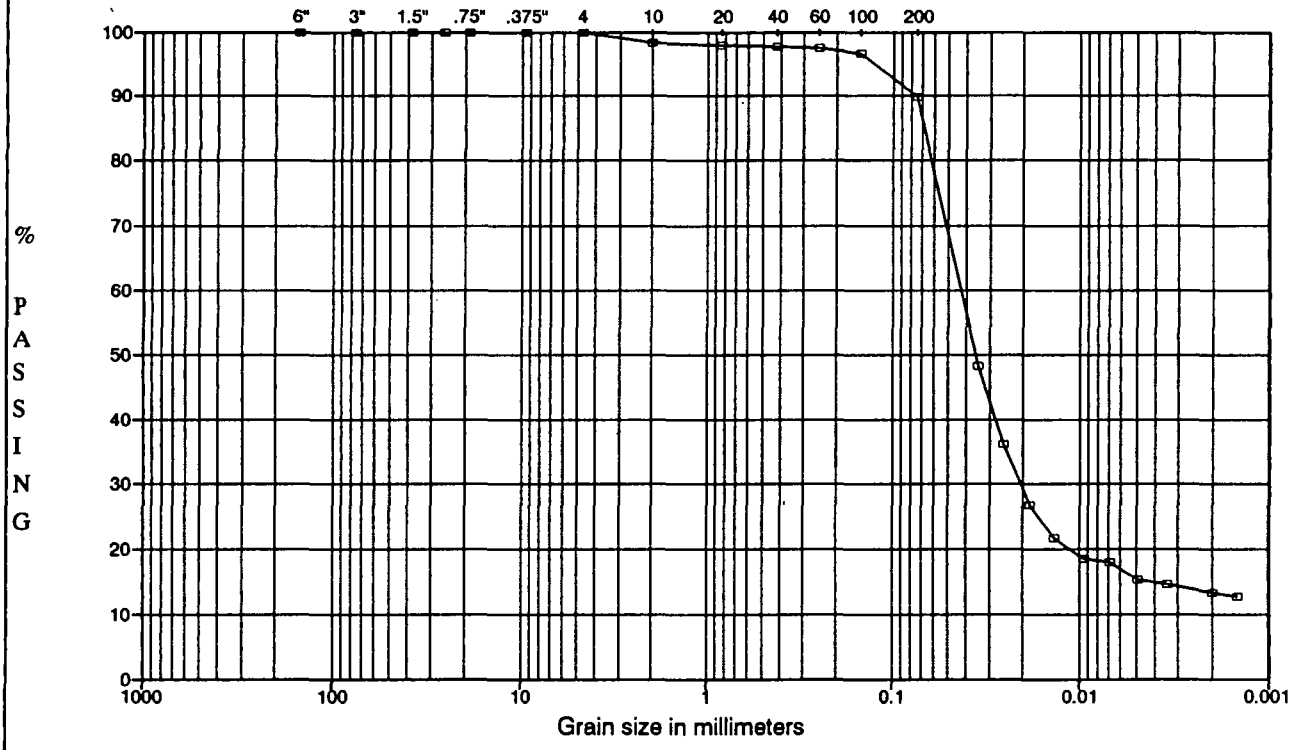
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848205A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.64	FINES with little coarse to fine sand
SAMPLE NO.	PZ-205-SS						
DEPTH	28-30						

Sample Type: Date Tested: 4/9/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

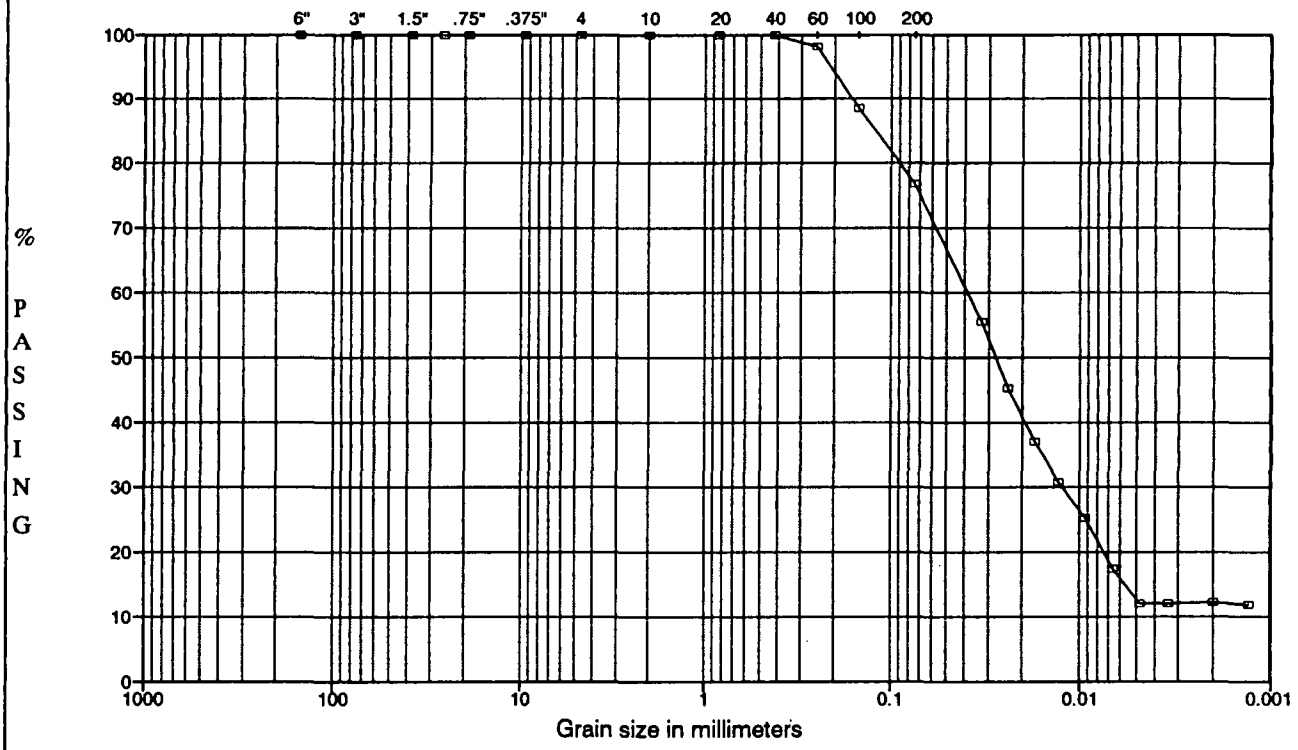
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848205

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	NP	NP	2.68	SILT with some fine sand
SAMPLE NO.	PZ-204-SS						
DEPTH	8-10,10-12						

Sample Type: Date Tested: 4/6/95 USCS: ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

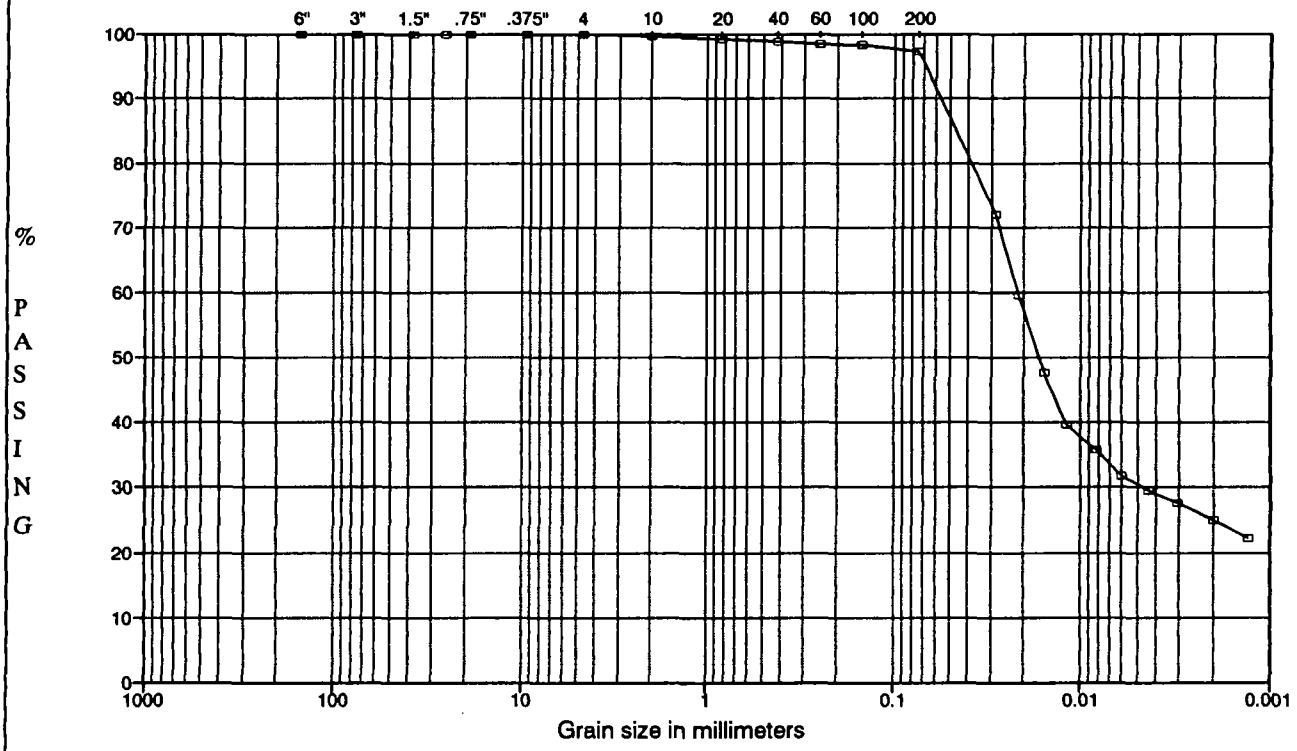
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848204

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-203-SS	--	--	--	--	2.85	FINES with trace medium to fine sand
SAMPLE NO.							
DEPTH	8-10'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

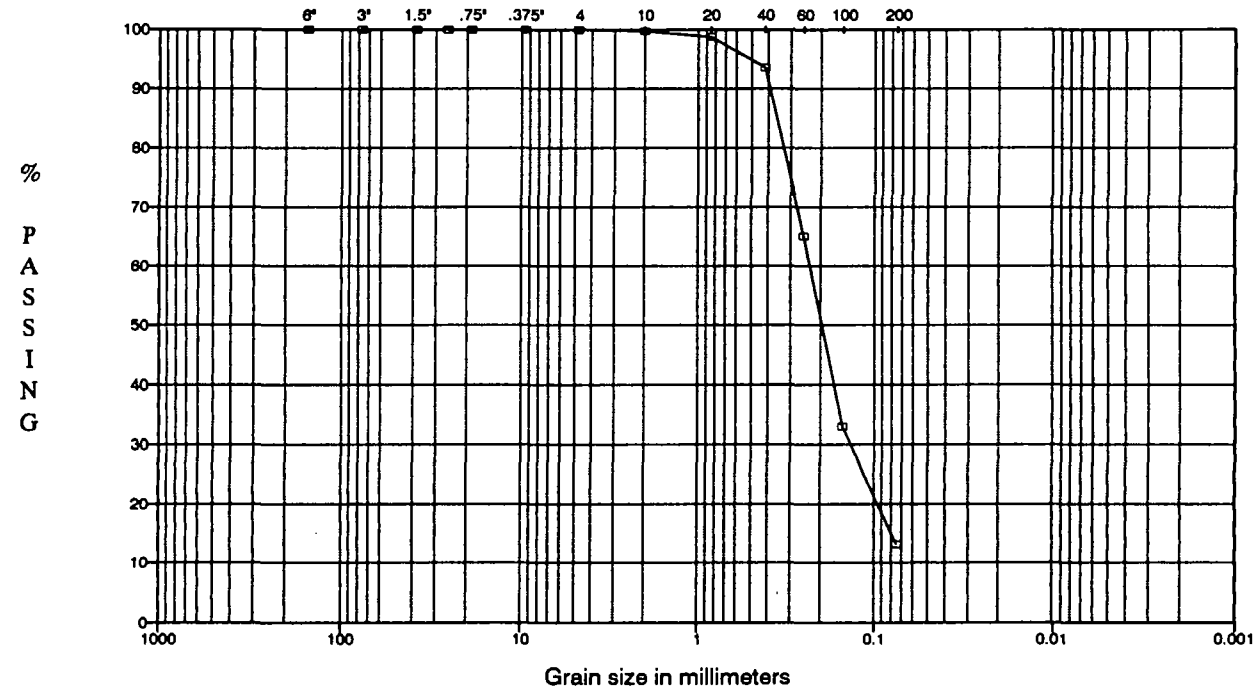
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2840B3A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-203-SS	–	–	–	–	–	Medium to fine SAND with some fines
SAMPLE NO.							
DEPTH (FT.)	38-40'						

Sample Type: Date Tested: 6/26/95 USCS: –

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

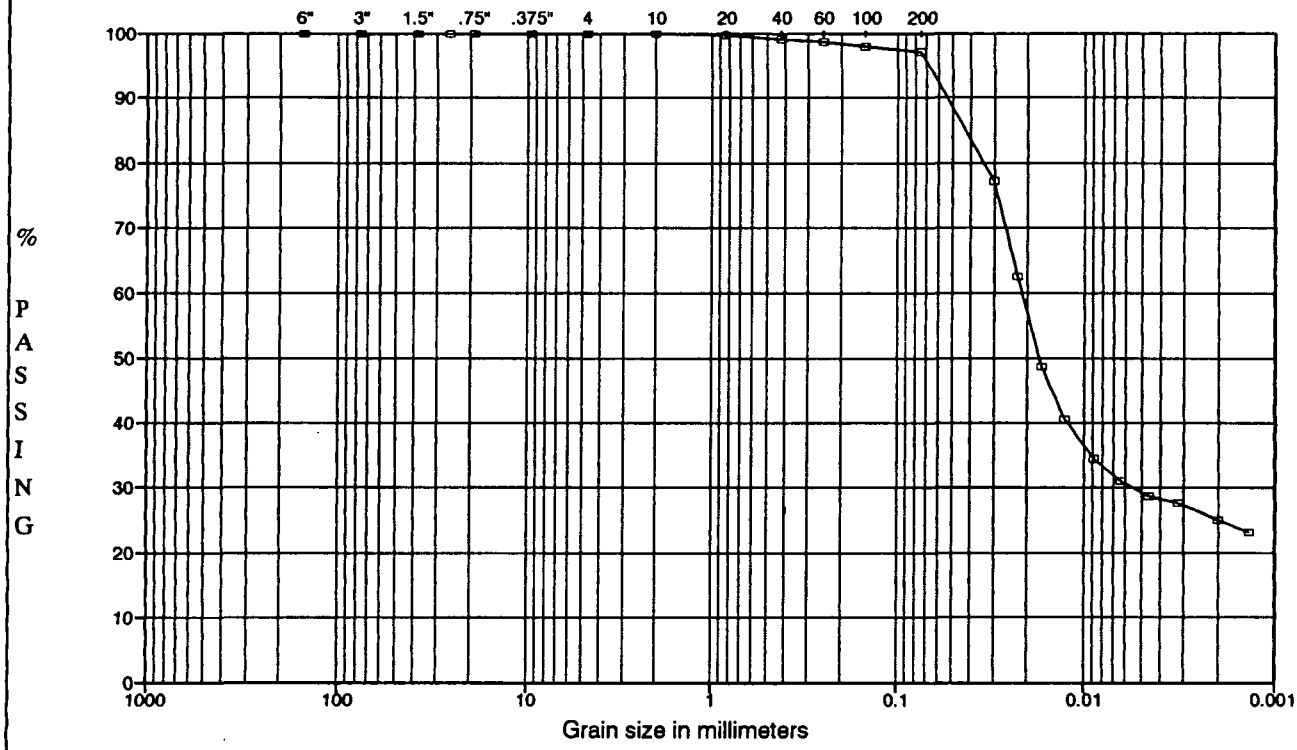
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848203

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		26.7	45	24	21	2.74	Silty CLAY with trace medium to fine sand
SAMPLE NO.	PZ-202-SS						
DEPTH	6-8,8-10						

Sample Type: Date Tested: 4/9/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

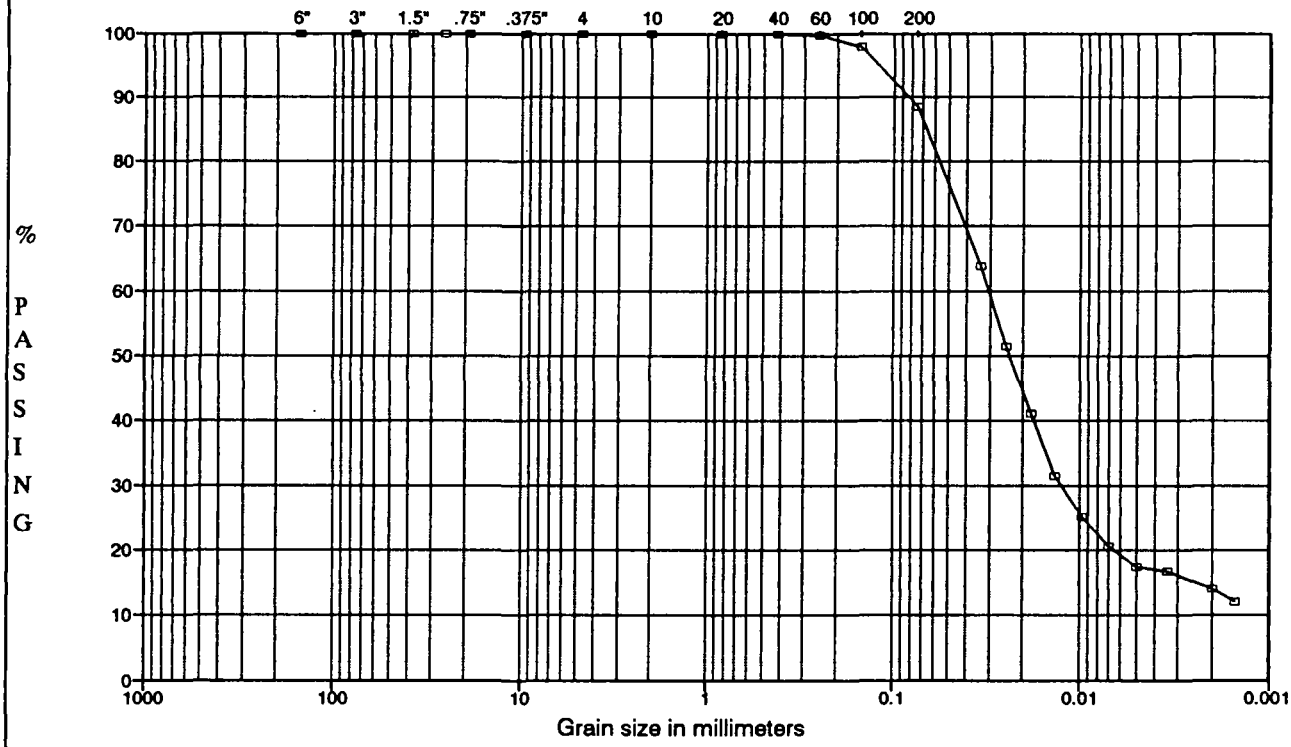
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2844202

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		34.5	--	NP	NP	2.62	SILT with little fine sand
SAMPLE NO.	PZ-201-SS						
DEPTH	24-26,26-28						

Sample Type: Date Tested: 4/9/95 USCS: ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

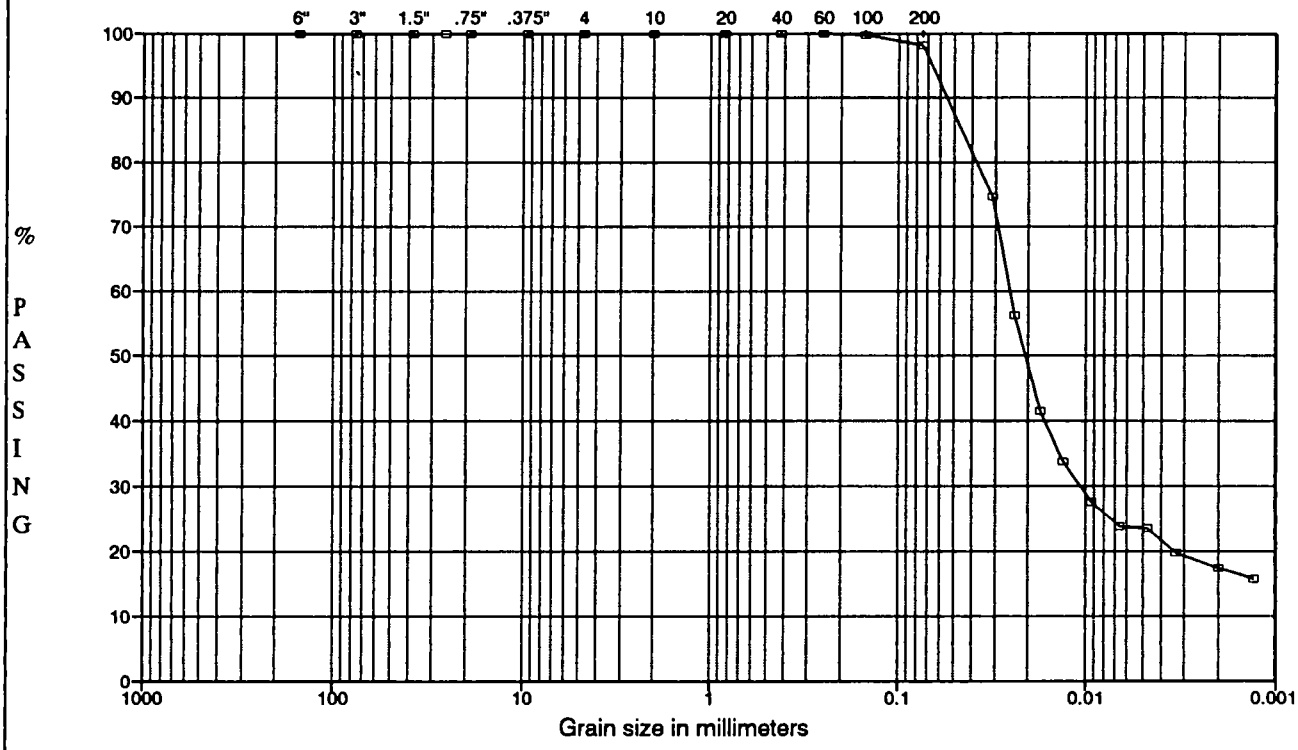
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848291

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
	Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		27.5	36	24	12	2.64	Clayey SILT with trace fine sand
SAMPLE NO.	PZ-200-SS						
DEPTH	6-8,8-10						
Sample Type:		Date Tested: 04/06/95					USCS: CL-ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

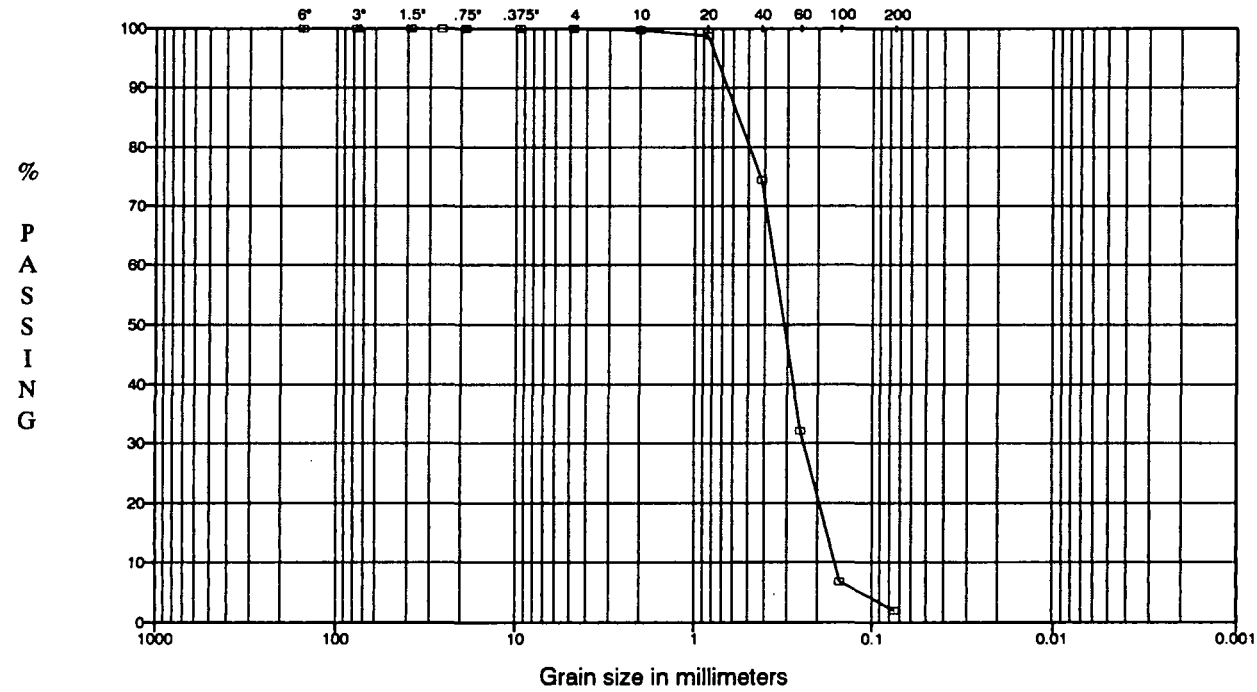
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848200

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt or Clay)
	Coarse	Fine	C	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-116-SS	--	--	--	--	--	Medium to fine SAND with trace fines
SAMPLE NO.							
DEPTH (FT.)	29-31'						

Sample Type: Date Tested: 6/26/95 USCS: SP

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

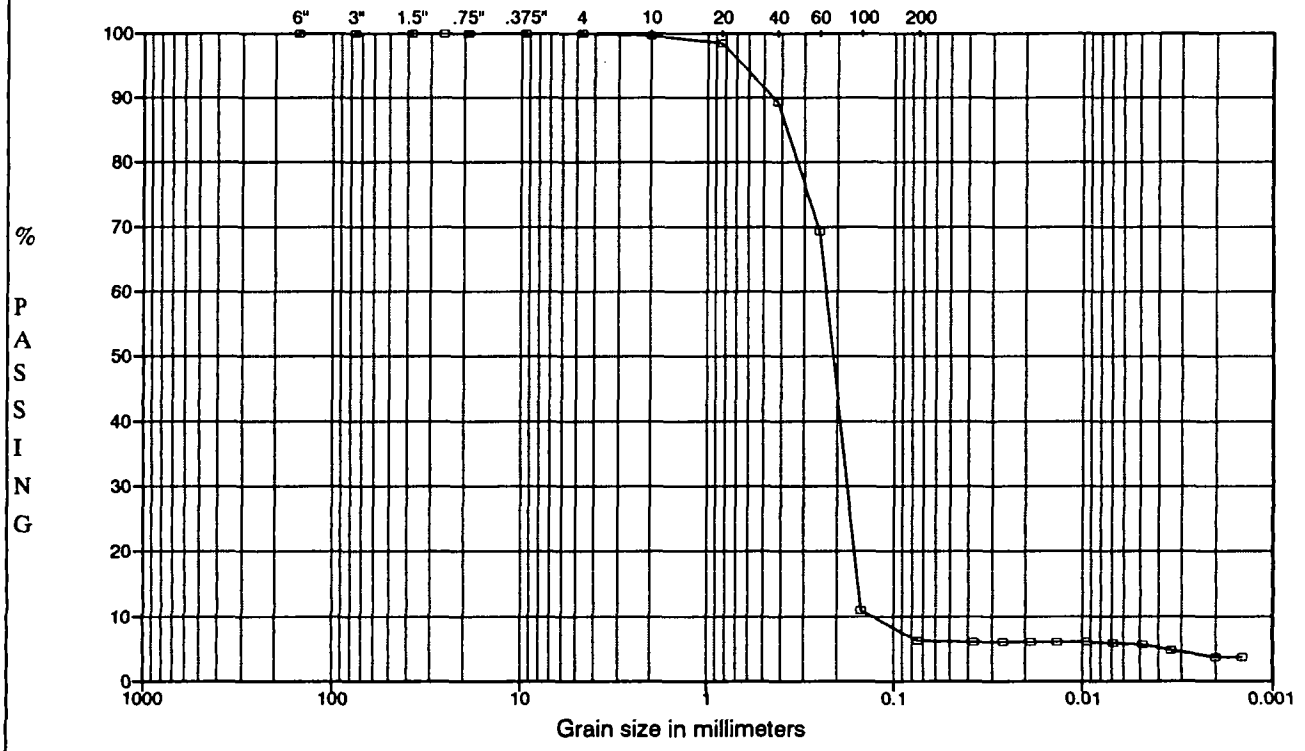
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848116

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-115-SS	--	--	--	--	2.72	Medium to fine SAND with little fines
SAMPLE NO.							
DEPTH	30-32'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

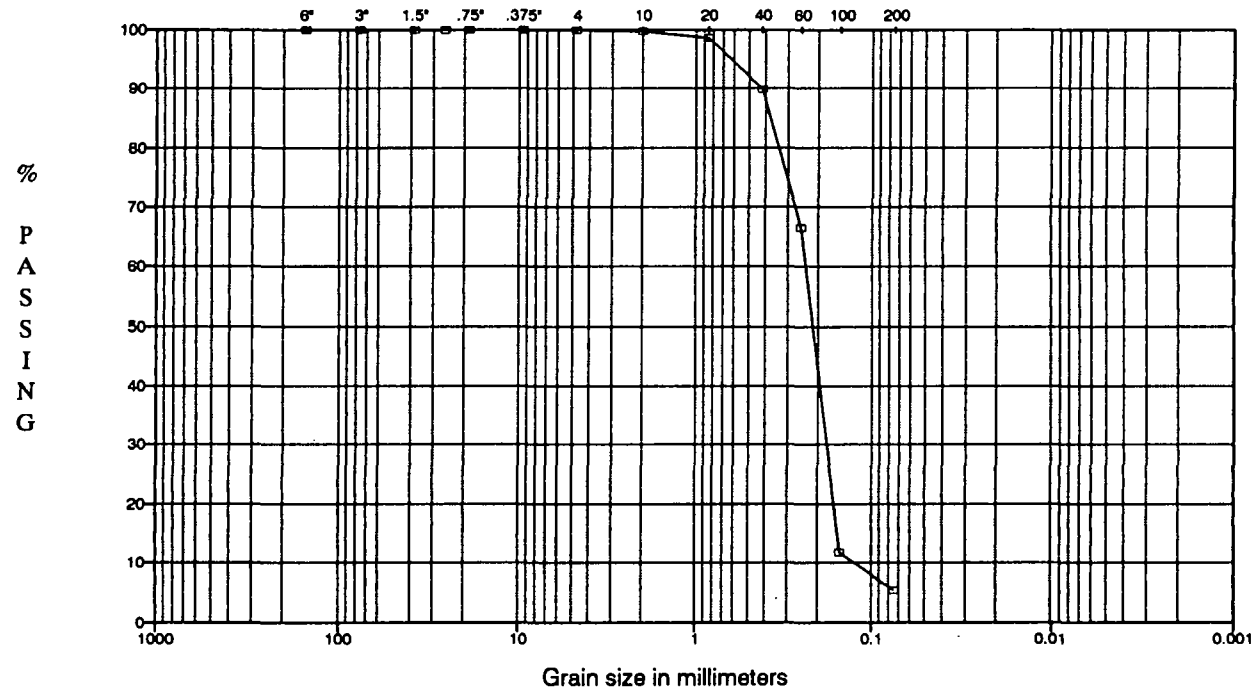
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848115A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt or Clay)
	Coarse	Fine	C	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		17.0%				--	
SAMPLE NO.	PZ-115-SS						
DEPTH (FT.)	30-32'						

Sample Type: Date Tested: 6/26/95 USCS:

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

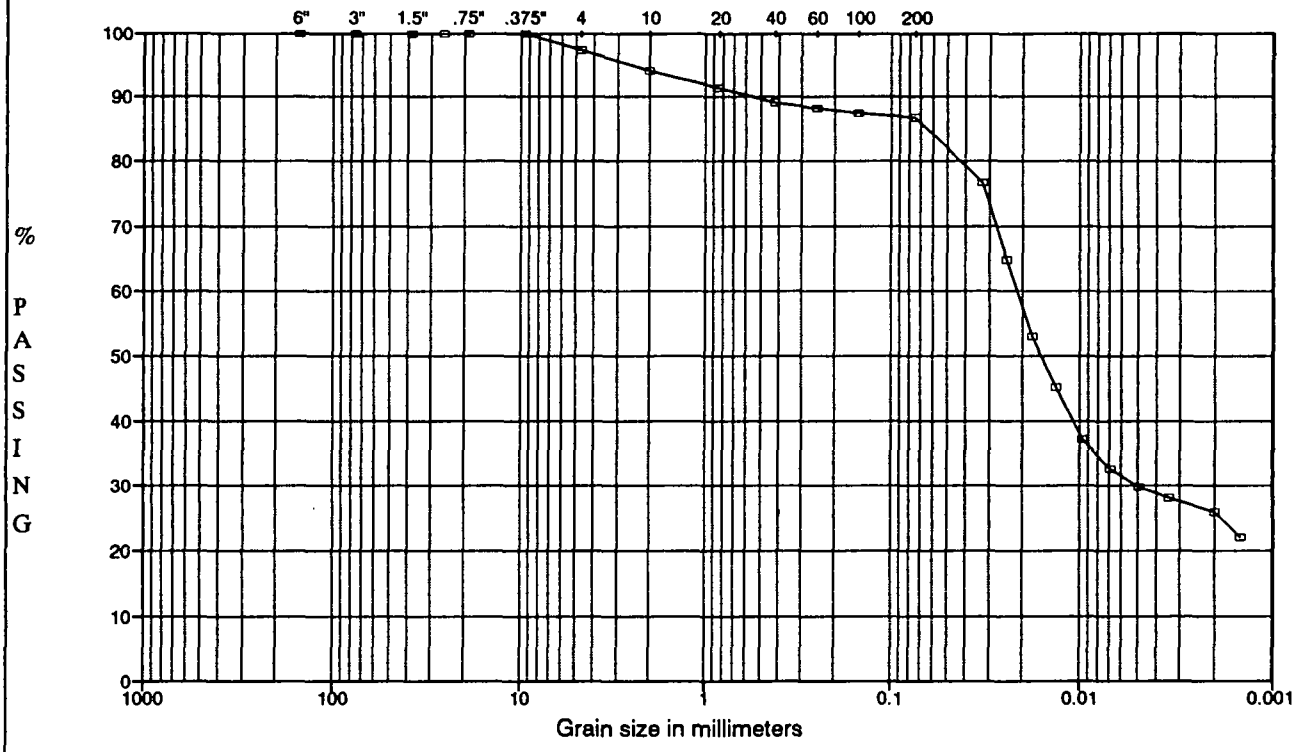
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		33.2	40	24	16	2.51	Silty CLAY with little coarse to fine sand, trace fine gravel
SAMPLE NO.	PZ-114-AS						
DEPTH	12.0-14.0						

Sample Type: Date Tested: 4/29/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

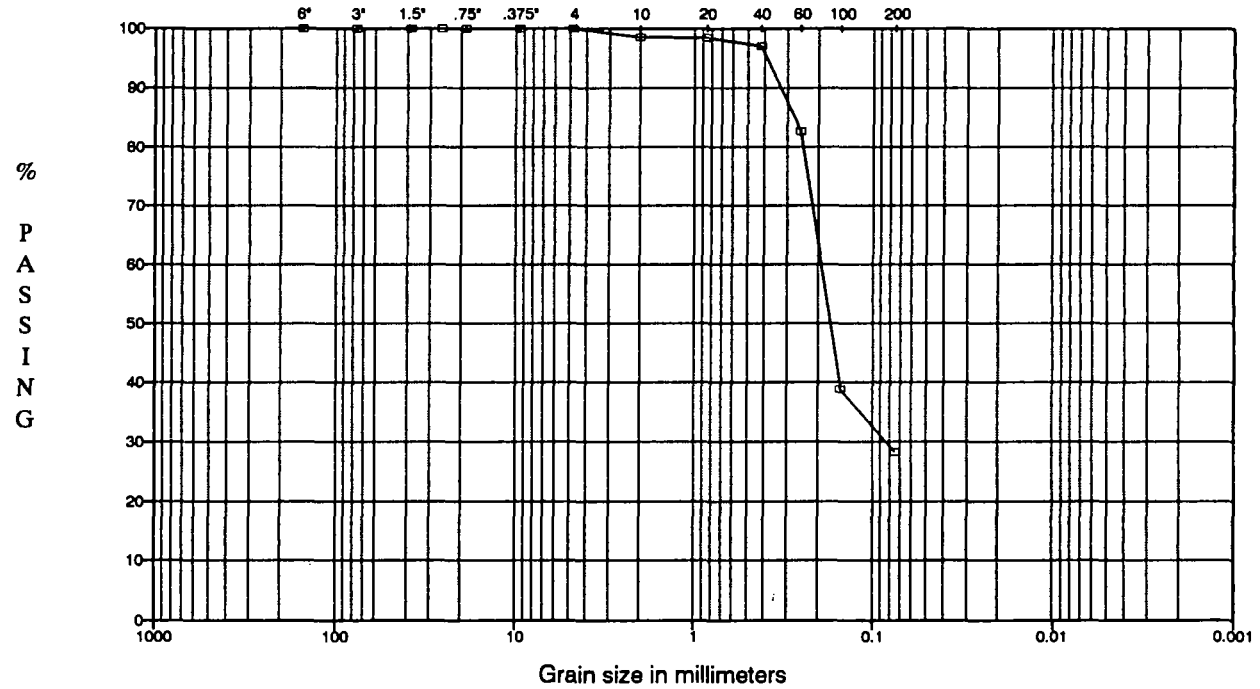
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848114A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

ARTICLE SIZE DISTRIBUTION ASTM D421 D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt or Clay)
	Coarse	Fine	C	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		20.3%	--	--	--	--	Coarse to fine SAND with some fines
SAMPLE NO.	PZ-114AS						
DEPTH (FT.)	24.0-26.0						

Sample Type: Date Tested: 4/28/95 USCS: --

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

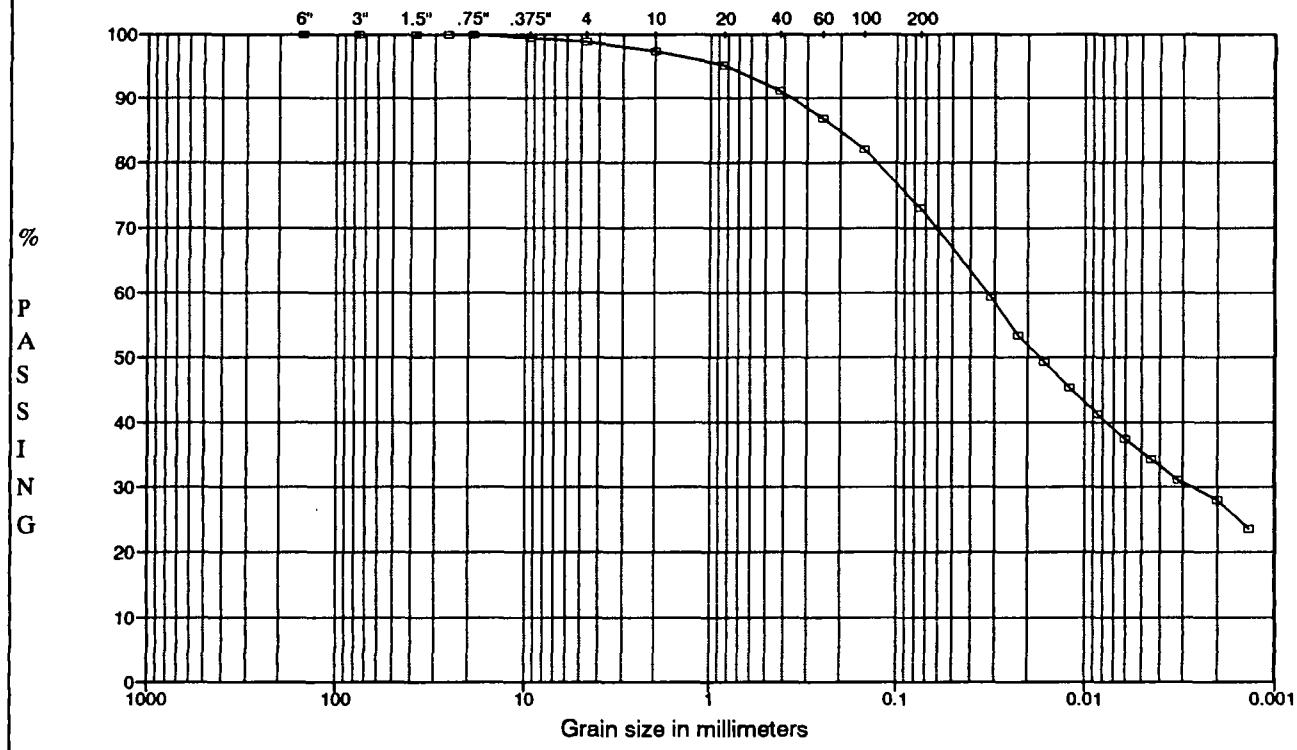
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848114

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-113-AS	--	--	--	--	2.69	FINES with some coarse to fine sand
SAMPLE NO.							
DEPTH	8-10'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

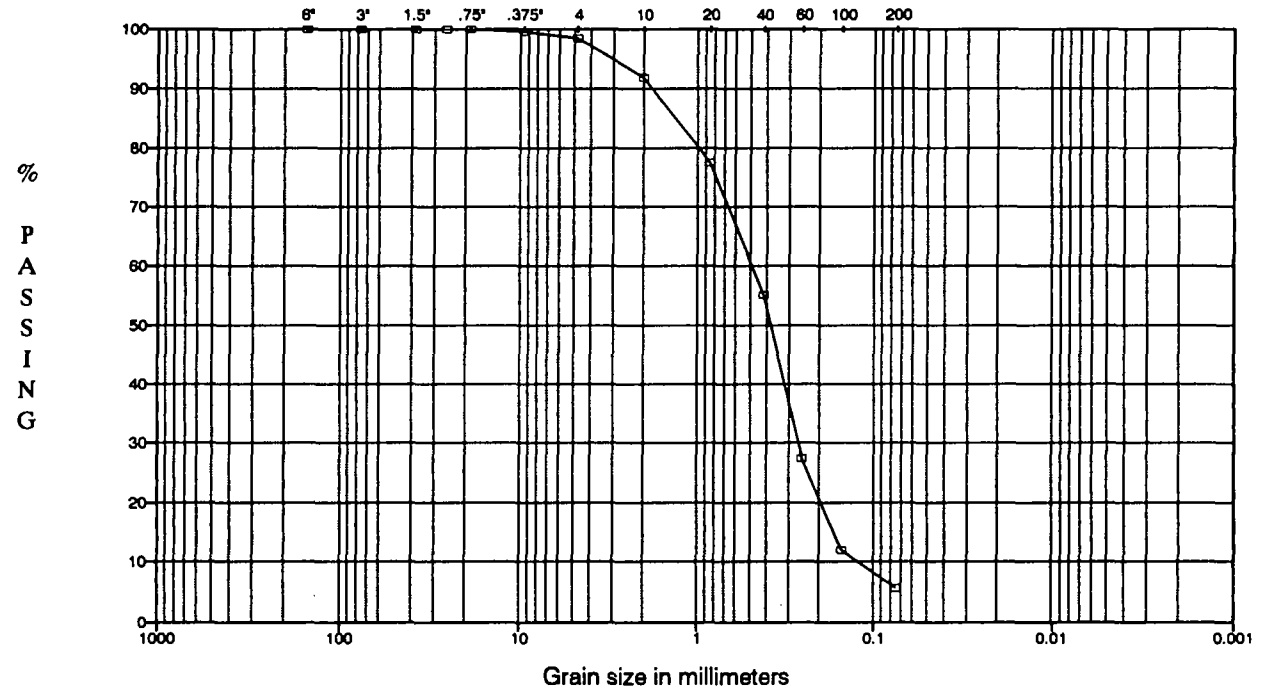
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113D

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

ARTICLE SIZE DISTRIBUTION ASTM D421 D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-113-AS	–	–	–	–	–	Coarse to fine SAND with little fines, trace fine gravel
SAMPLE NO.							
DEPTH (FT.)	94-96'						

Sample Type: Date Tested: 6/26/95 USCS: –

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

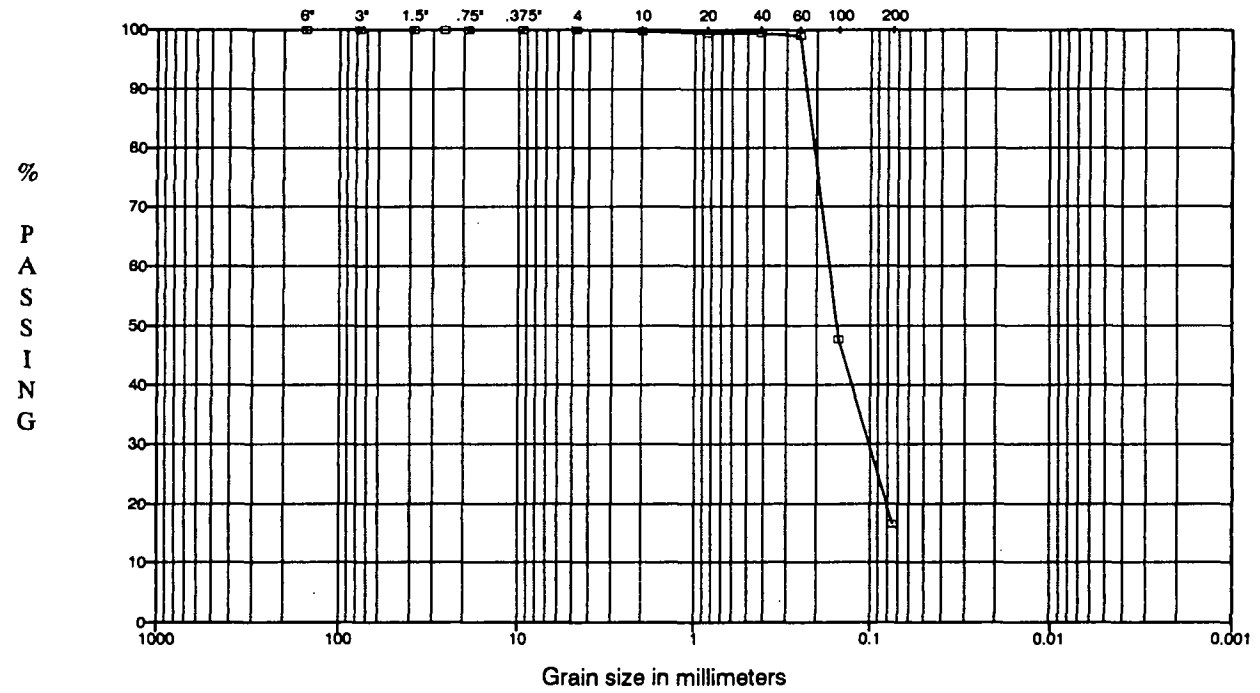
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113C

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

ARTICLE SIZE DISTRIBUTION ASTM D421 [illegible] D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-113-AS	–	–	–	–	–	Fine SAND with some fines
SAMPLE NO.							
DEPTH (FT.)	28-30'						

Sample Type: Date Tested: 6/26/95 USCS: –

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

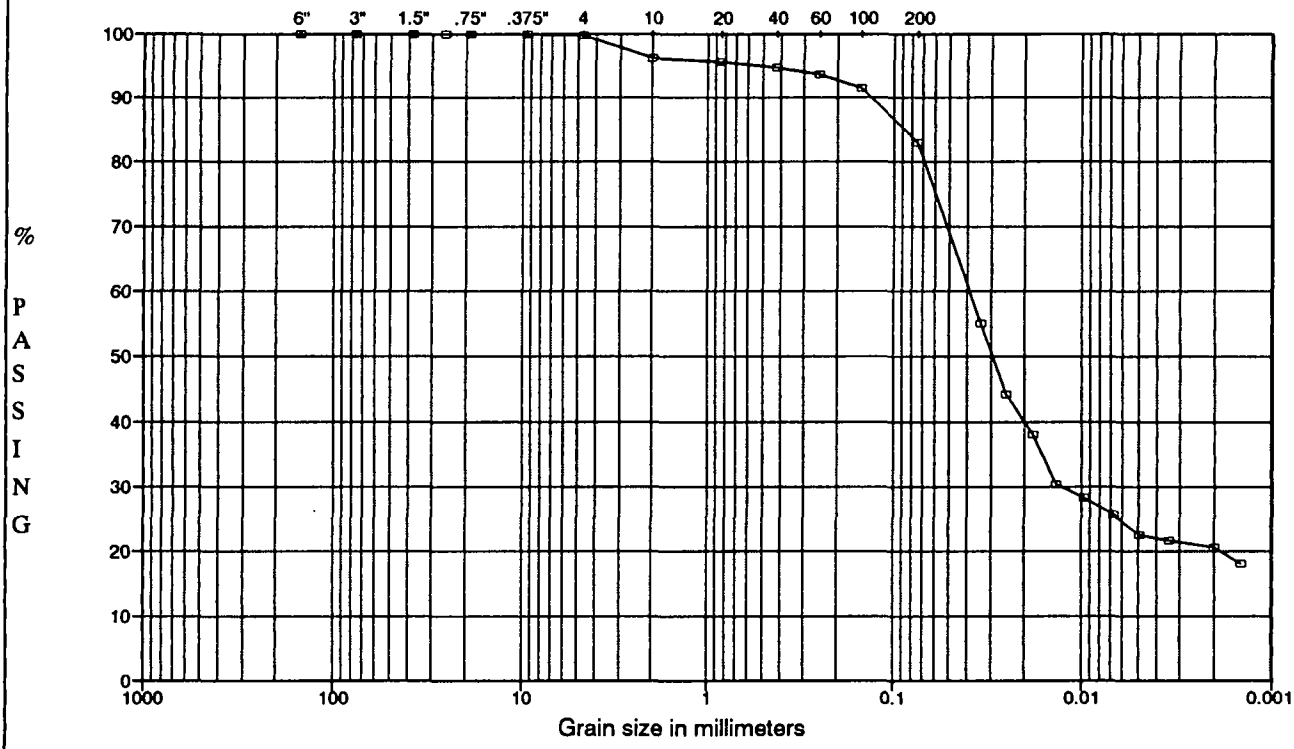
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 28481138

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		20.1	32	23	9	2.62	Silty CLAY with some coarse to fine sand
SAMPLE NO.	PZ-113-AS						
DEPTH	10.0-12.0						

Sample Type: Date Tested: 4/29/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

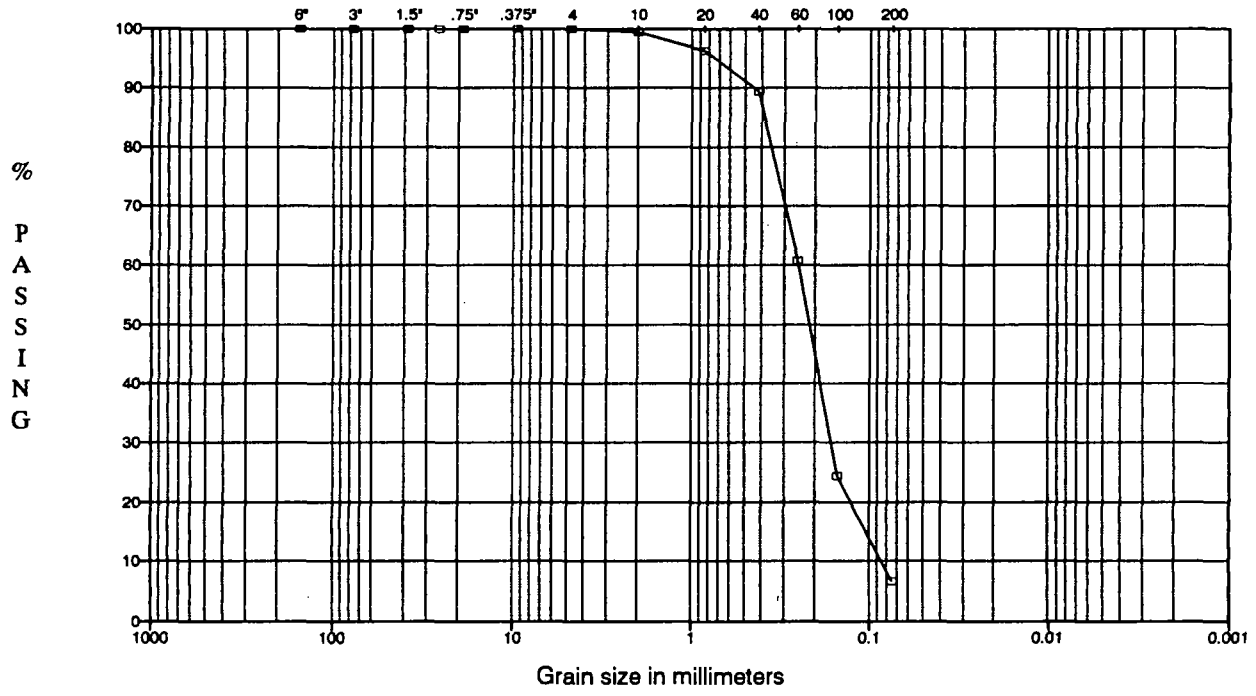
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

ARTICLE SIZE DISTRIBUTION ASTM D421 [illegible] D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		18.0%	--	--	--	--	Coarse to fine SAND with little fines
SAMPLE NO.	PZ-113AS						
DEPTH (FT.)	34.0-36.0						

Sample Type: Date Tested: 4/28/95 USCS: SP-SM

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

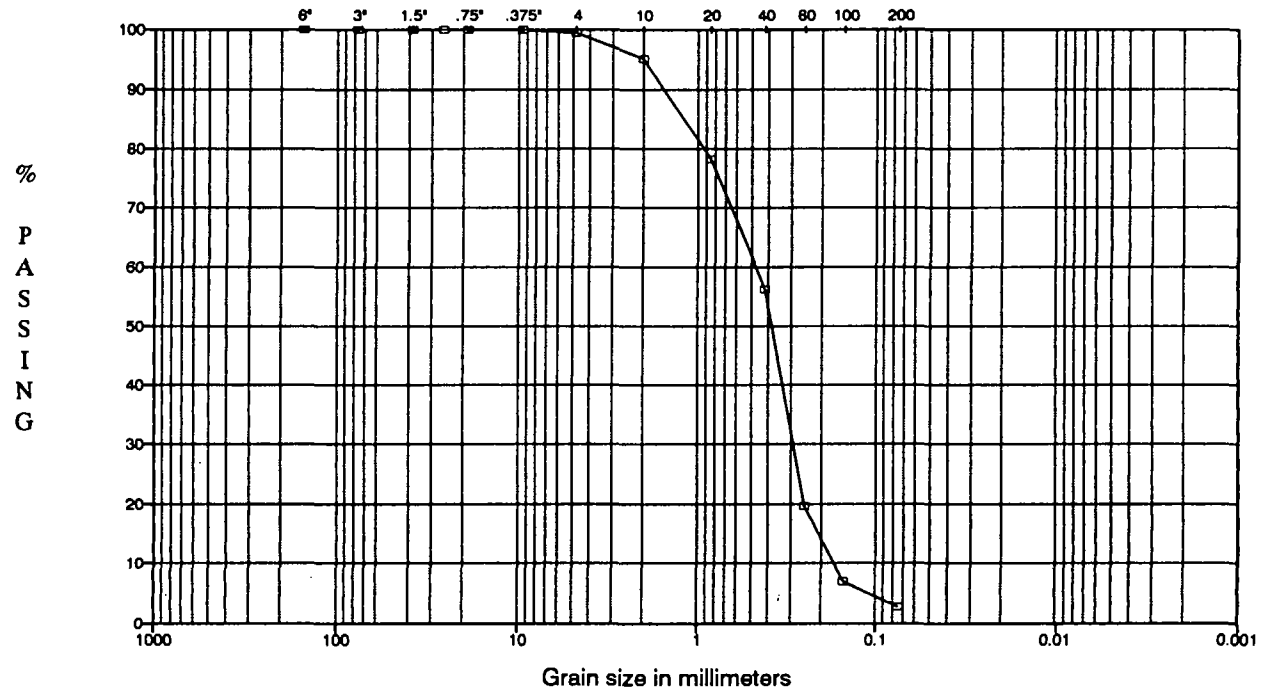
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848113

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

RTICLE SIZE DISTRIBUTION ASTM D421 D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	C	Med	Fine	FINES (Silt or Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		14.0%	--	--	--	--	Coarse to fine SAND with trace fines,
SAMPLE NO.	PZ-112AS						trace fine gravel
DEPTH (FT.)	34.0-36.0						

Sample Type: Date Tested: 4/28/95 USCS: SP

TECH: KRF
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

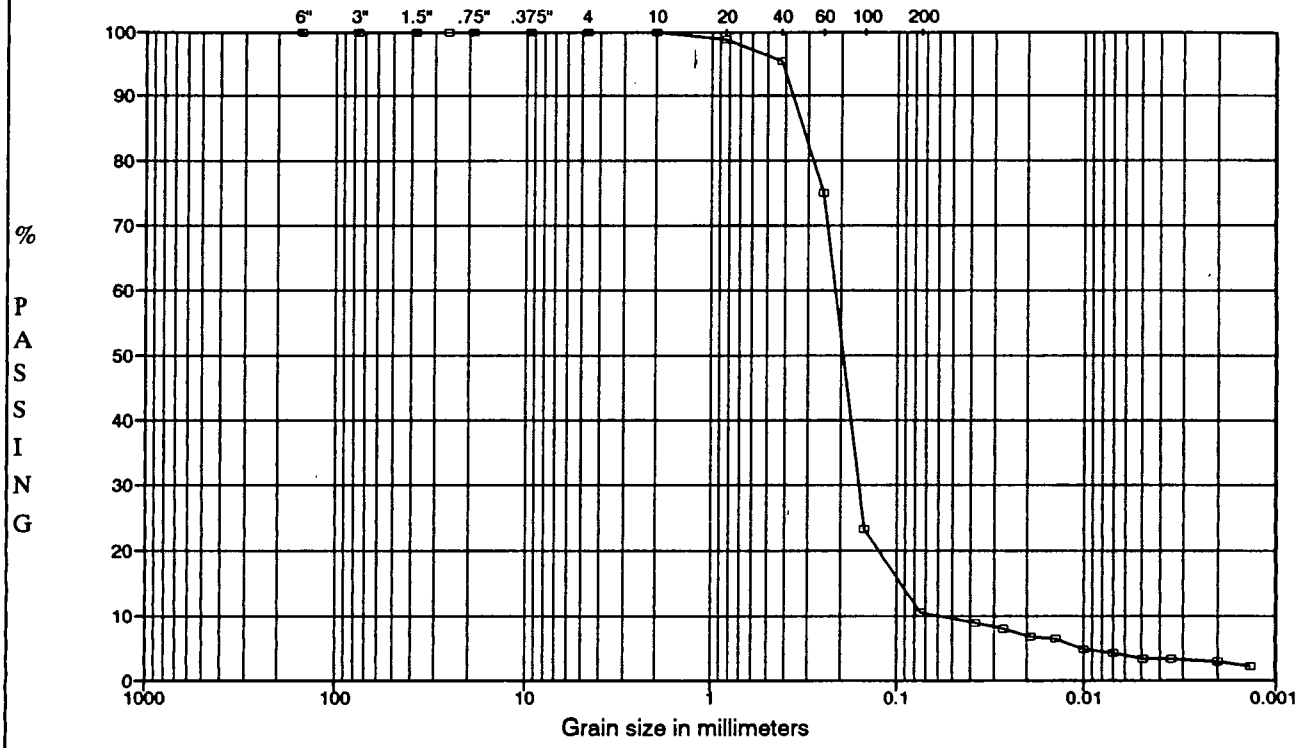
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848112

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.67	Medium to fine SAND with little fines
SAMPLE NO.	PZ-110-SS						
DEPTH	52-54						

Sample Type: Date Tested: 4/6/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

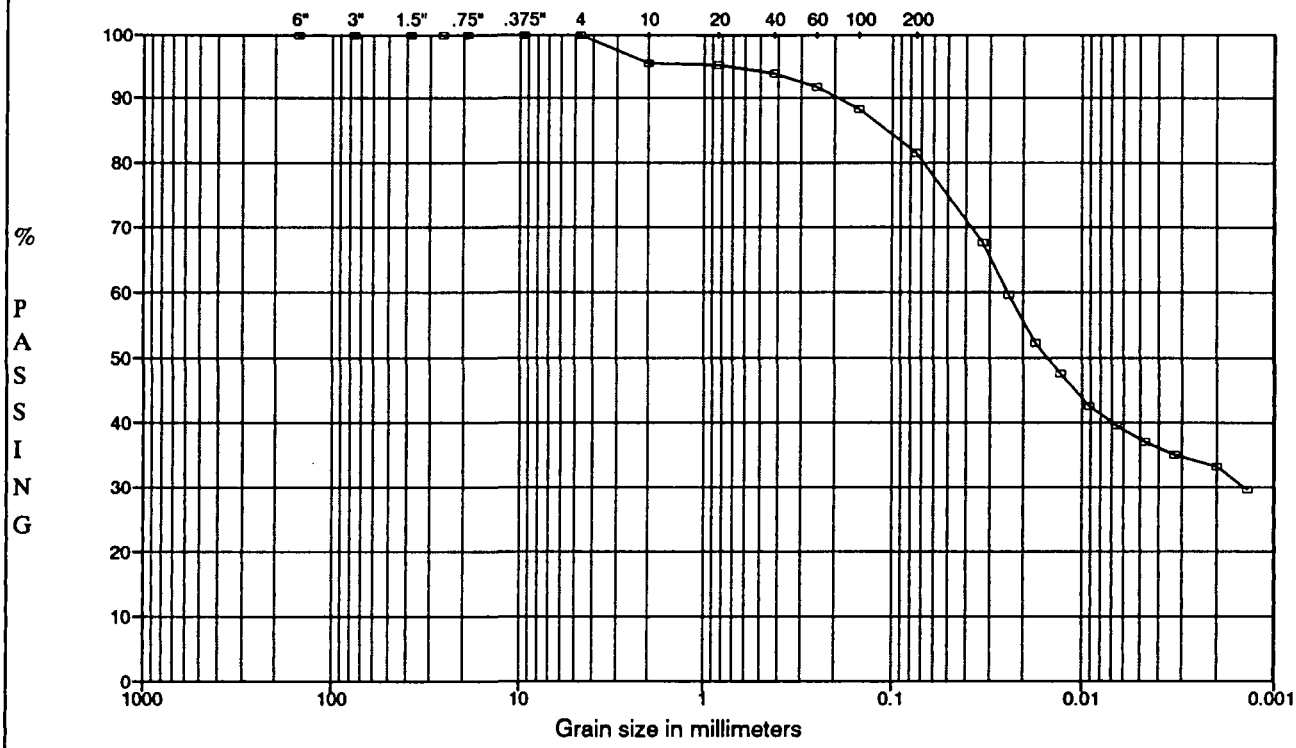
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848110

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		28.1	44	19	25	2.61	Silty CLAY with some coarse to fine sand
SAMPLE NO.	PZ-109-SS						
DEPTH	10.0-12.0						

Sample Type: Date Tested: 4/29/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

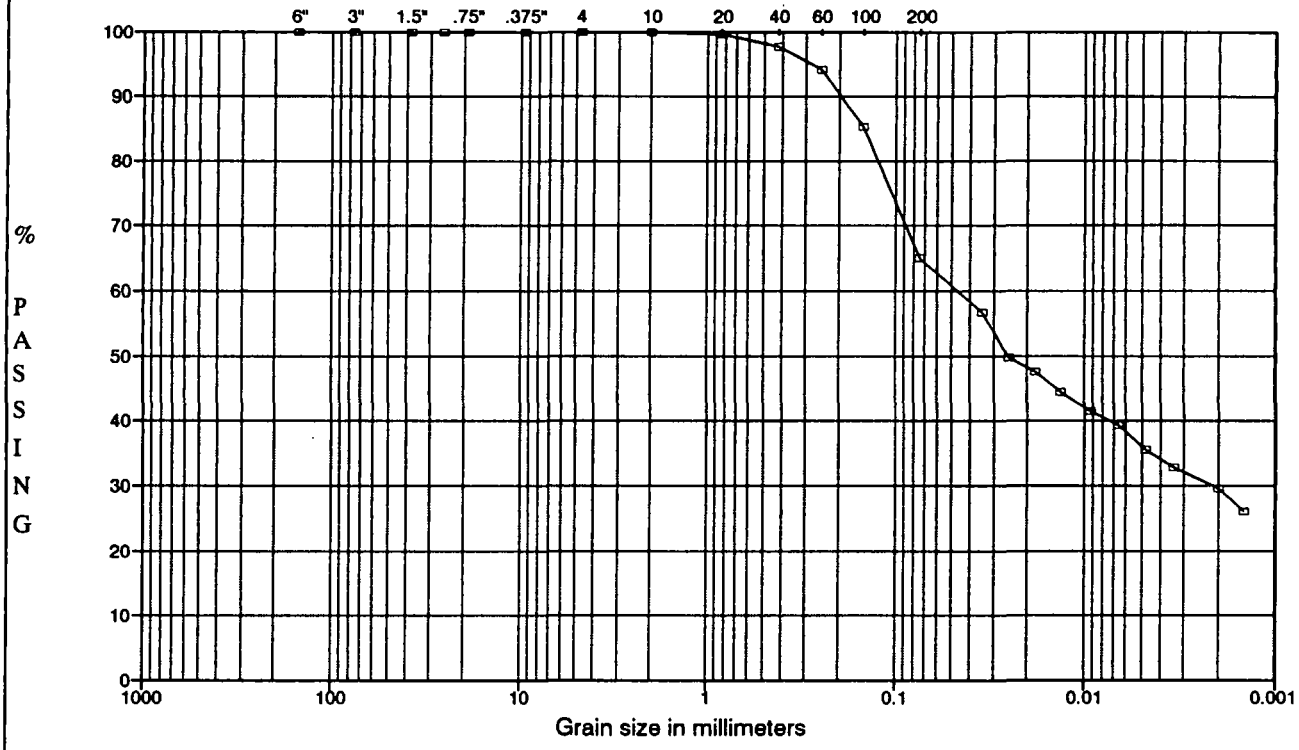
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848109

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.56	FINES and medium to fine SAND
SAMPLE NO.	PZ-108-SS						
DEPTH	16-18						

Sample Type: Date Tested: 4/9/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

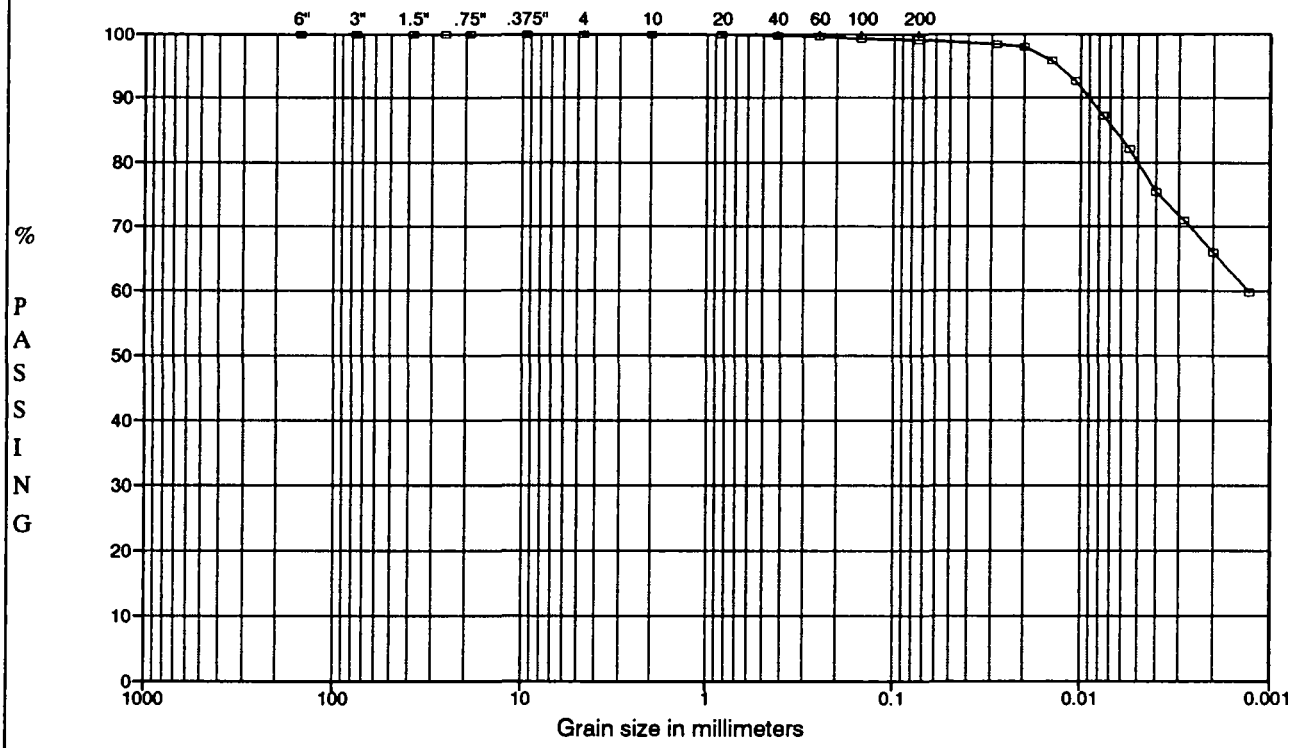
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848106

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			--	--	--	2.69	FINES with trace fine sand
SAMPLE NO.	PZ-107-SS						
DEPTH	22-24						

Sample Type: Date Tested: 4/9/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

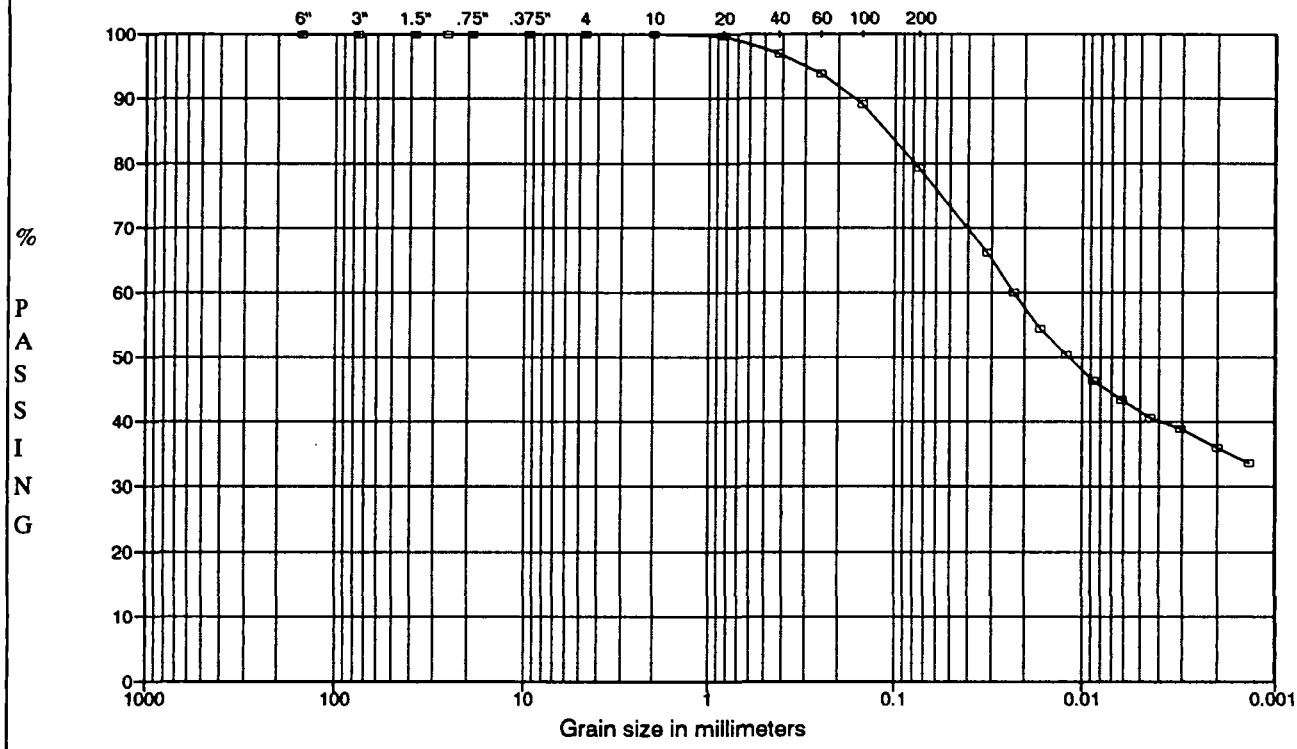
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2845107

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		22.2	47	20	27	2.77	Silty CLAY with some medium to fine sand
SAMPLE NO.	PZ-106-KS						
DEPTH	6-8,8-10						

Sample Type: Date Tested: 4/9/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

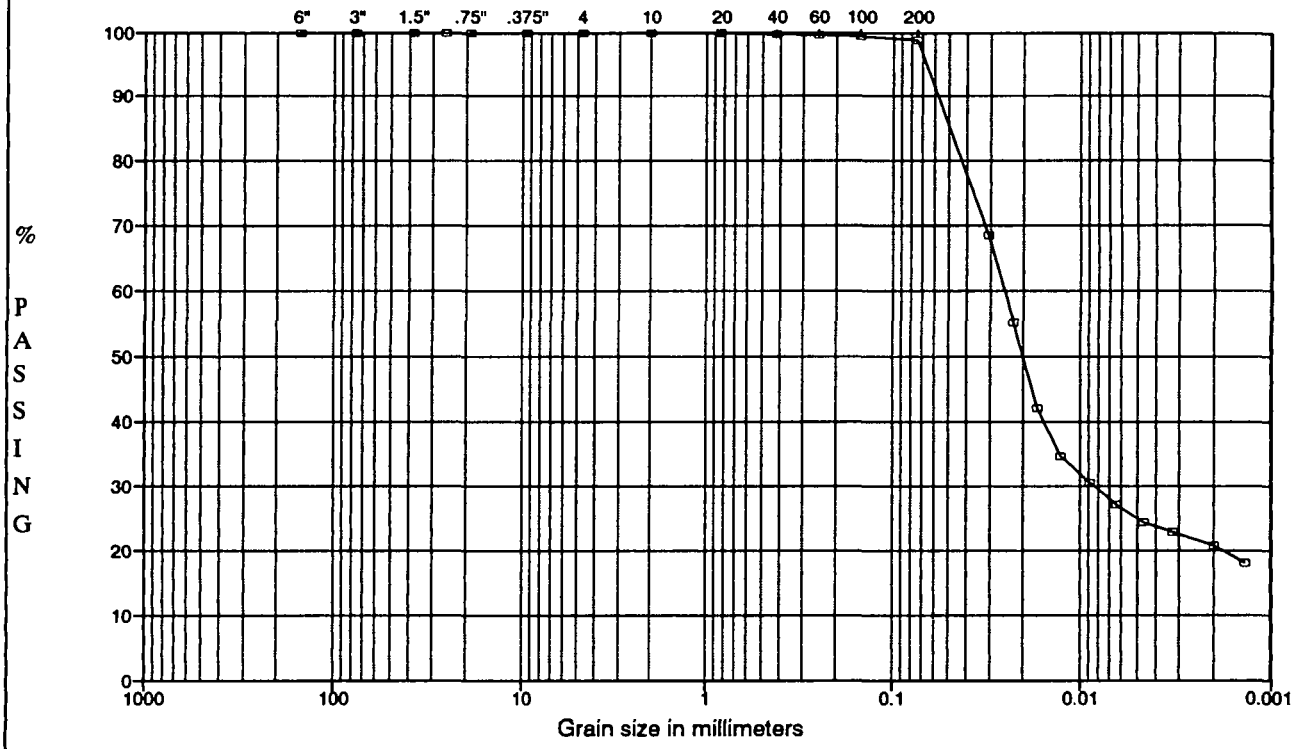
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848106

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-105-SS	--	--	--	--	2.71	FINES with trace fine sand
SAMPLE NO.							
DEPTH	10-12'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

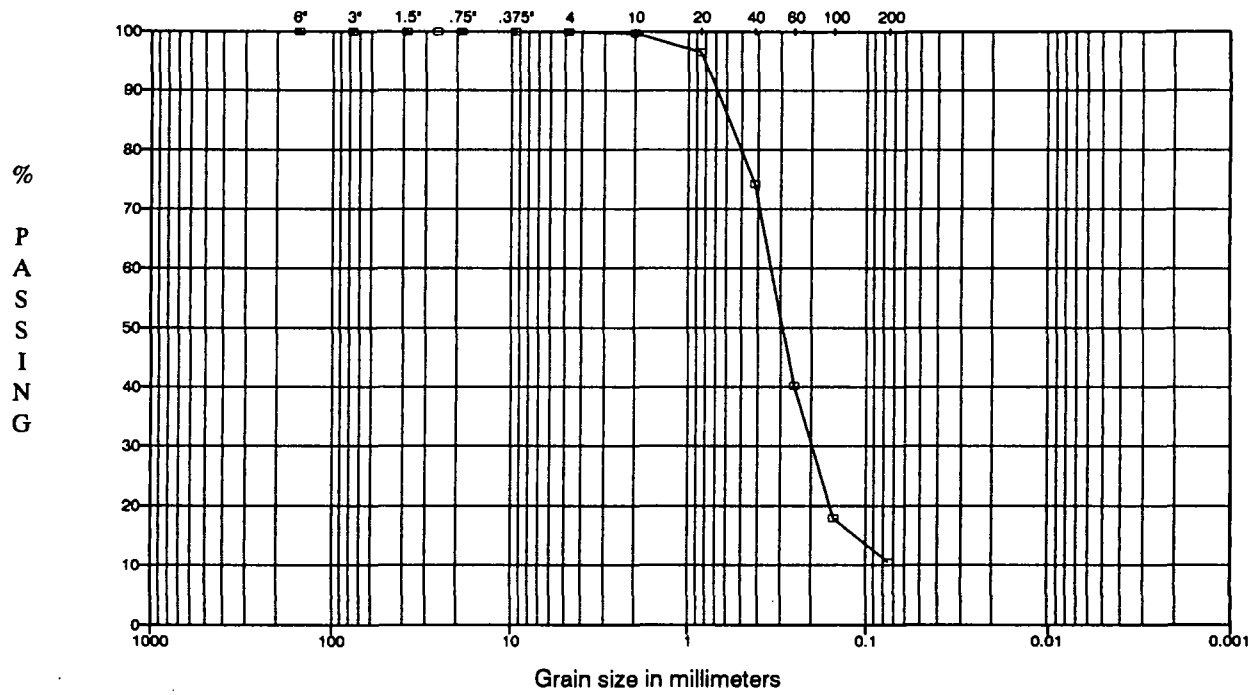
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848105A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

RTICLE SIZE DISTRIBUTION ASTM D421 D422

US STANDARD SIEVE OPENING SIZES



USCS

	Coarse	Fine	C	Med	Fine	
COBBLES	GRAVEL		SAND			FINES (Silt or Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-105-SS	--	--	--	--	--	Medium to fine SAND with little fines
SAMPLE NO.							
DEPTH (FT.)	30-32'						

Sample Type: Date Tested: 6/26/95 USCS: --

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

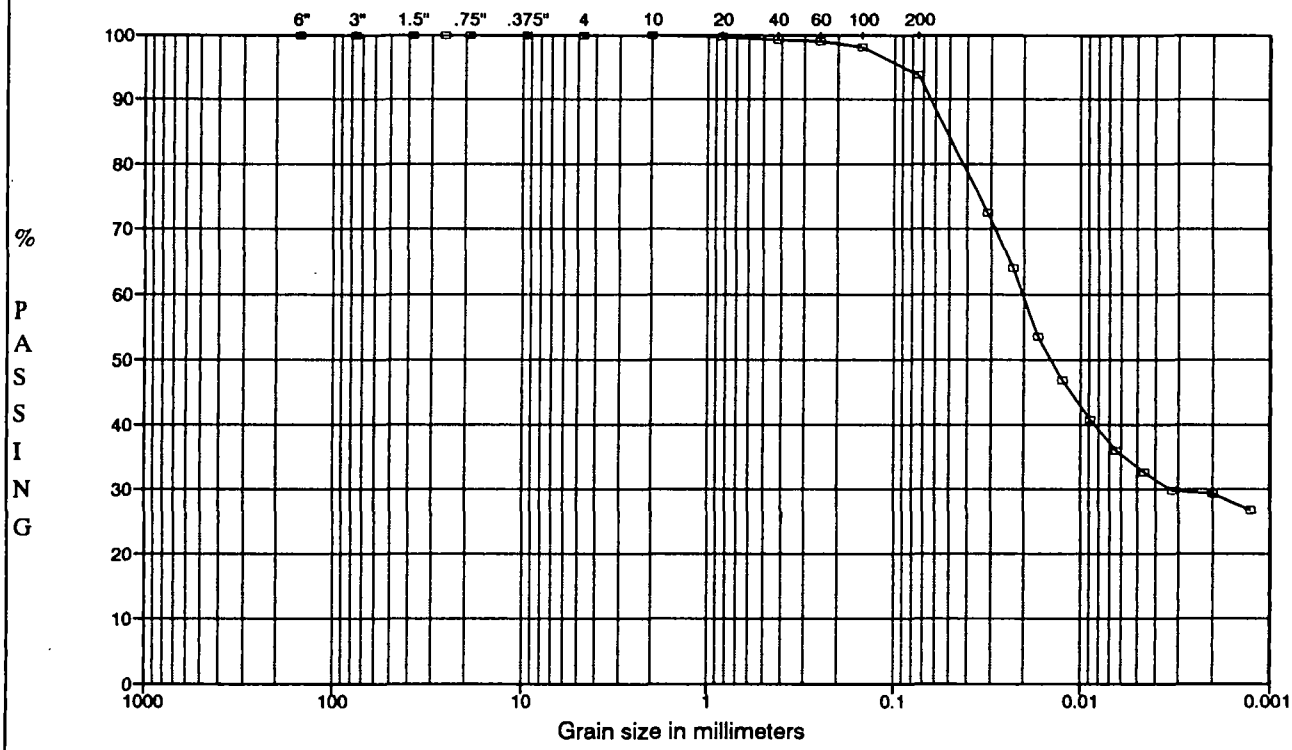
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848105

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		23.6	46	25	21	2.66	Silty CLAY with little medium to fine sand
SAMPLE NO.	PZ-104-KS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/6/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

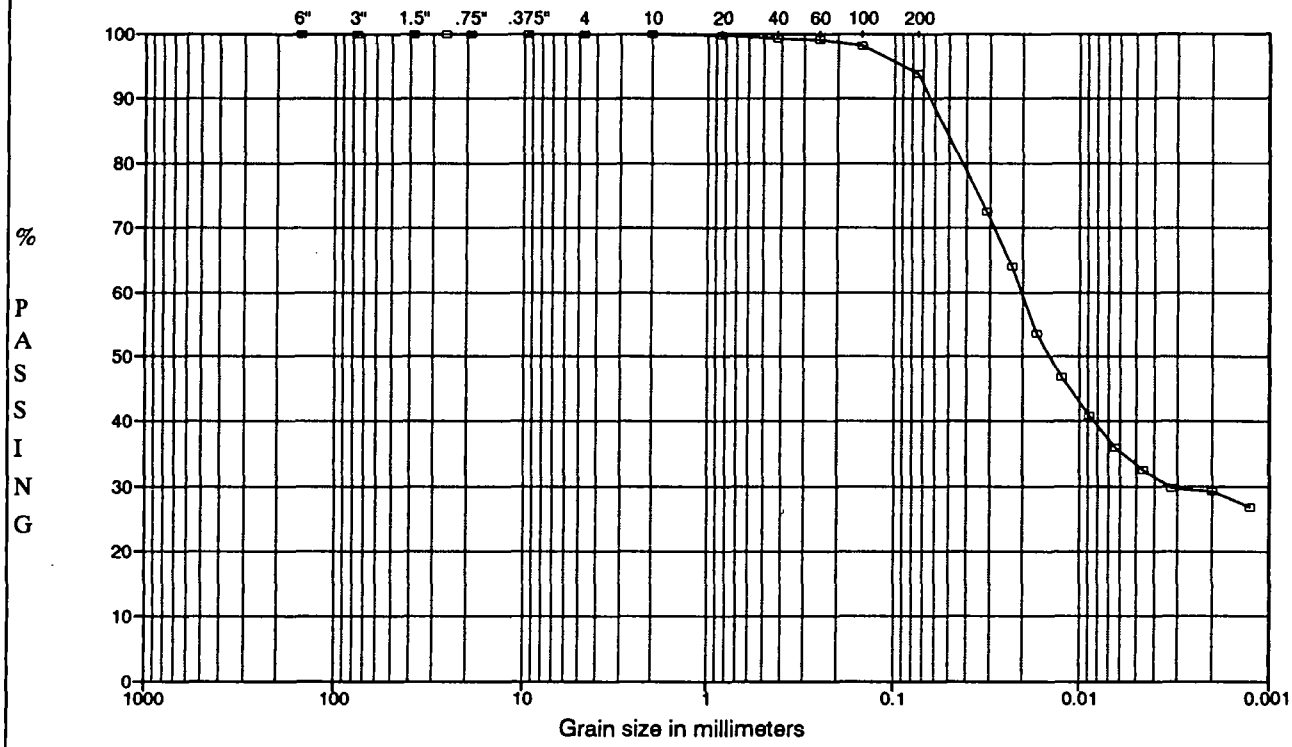
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848104

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
	Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		23.6	46	25	21	2.66	Silty CLAY with little medium to fine sand
SAMPLE NO.	PZ-104-KS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/6/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

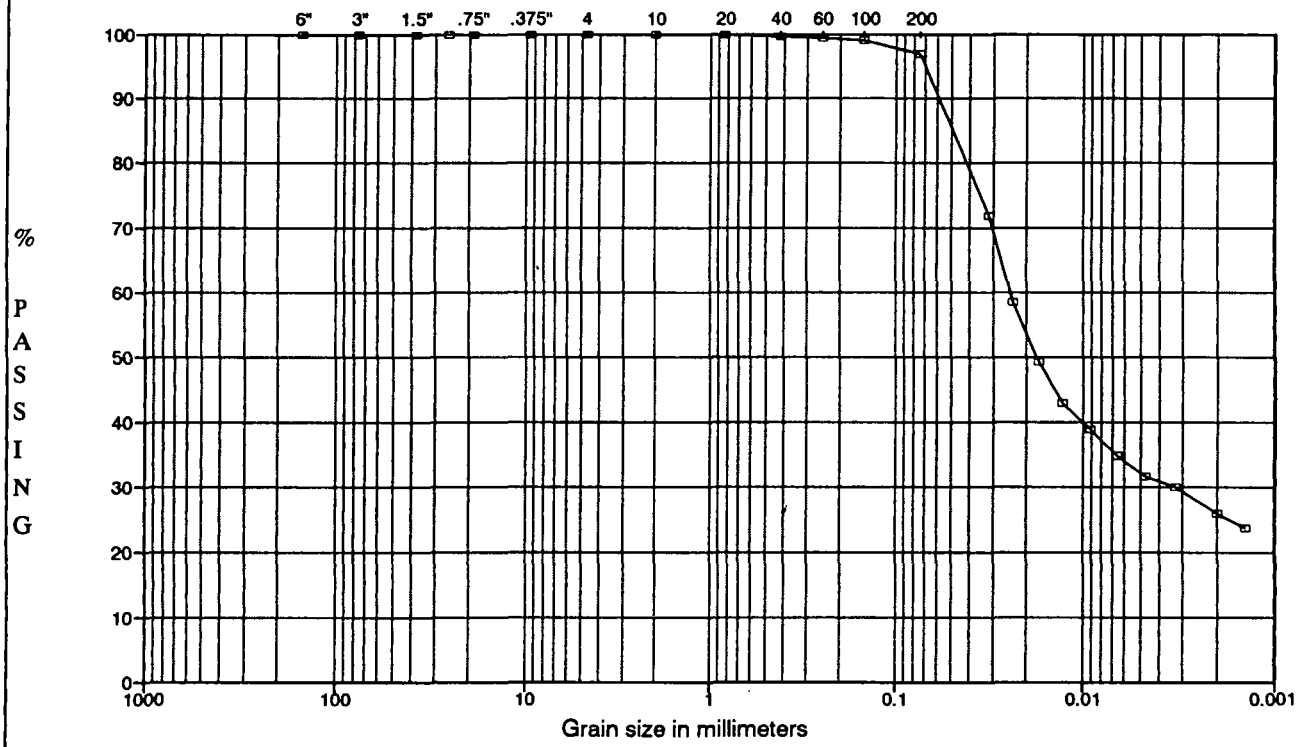
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848104

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL: Coarse	GRAVEL: Fine	SAND: Cor	SAND: Med	SAND: Fine	FINES (Silt and Clay)

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		28.3	--	NP	NP	2.67	SILT with trace medium to fine sand
SAMPLE NO.	PZ-103-SS						
DEPTH	12-14,14-16						

Sample Type: Date Tested: 4/9/95 USCS: ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

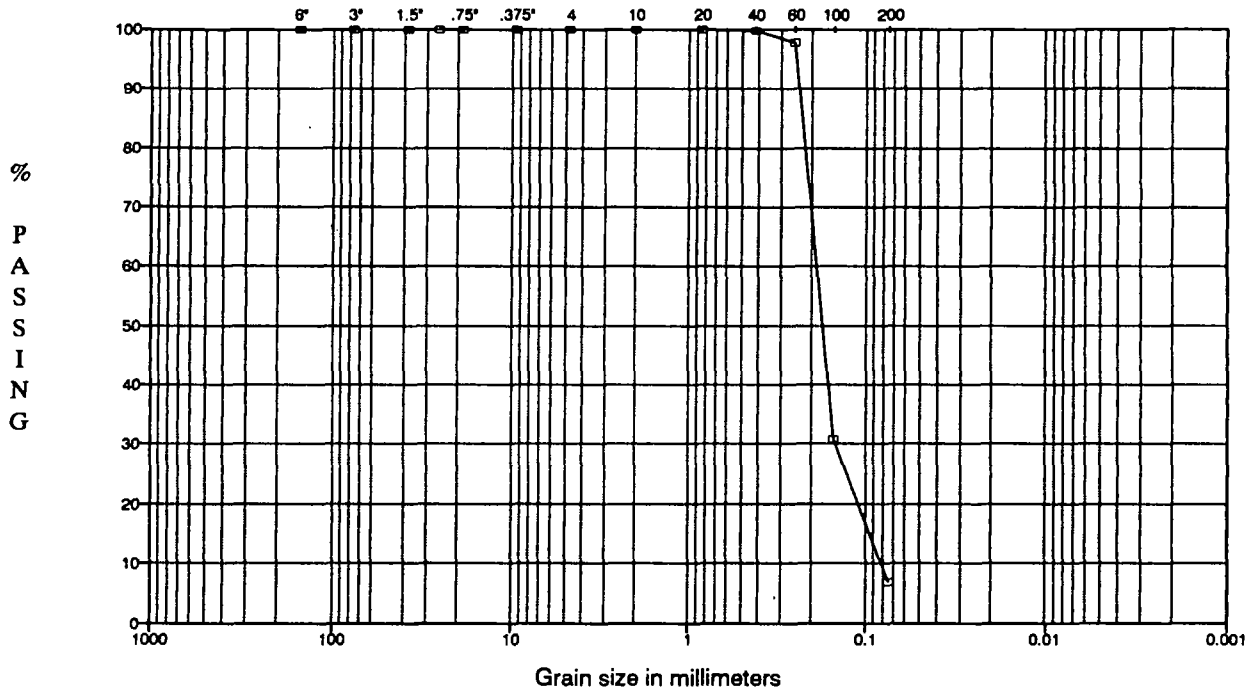
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 284810

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

ARTICLE SIZE DISTRIBUTION ASTM D421 [illegible] D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt or Clay)
	Coarse	Fine	C	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		17.0%				--	
SAMPLE NO.	PZ-102R-SS						
DEPTH (FT.)	18-20'						

Sample Type: Date Tested: 6/26/95 USCS:

TECH: HM
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

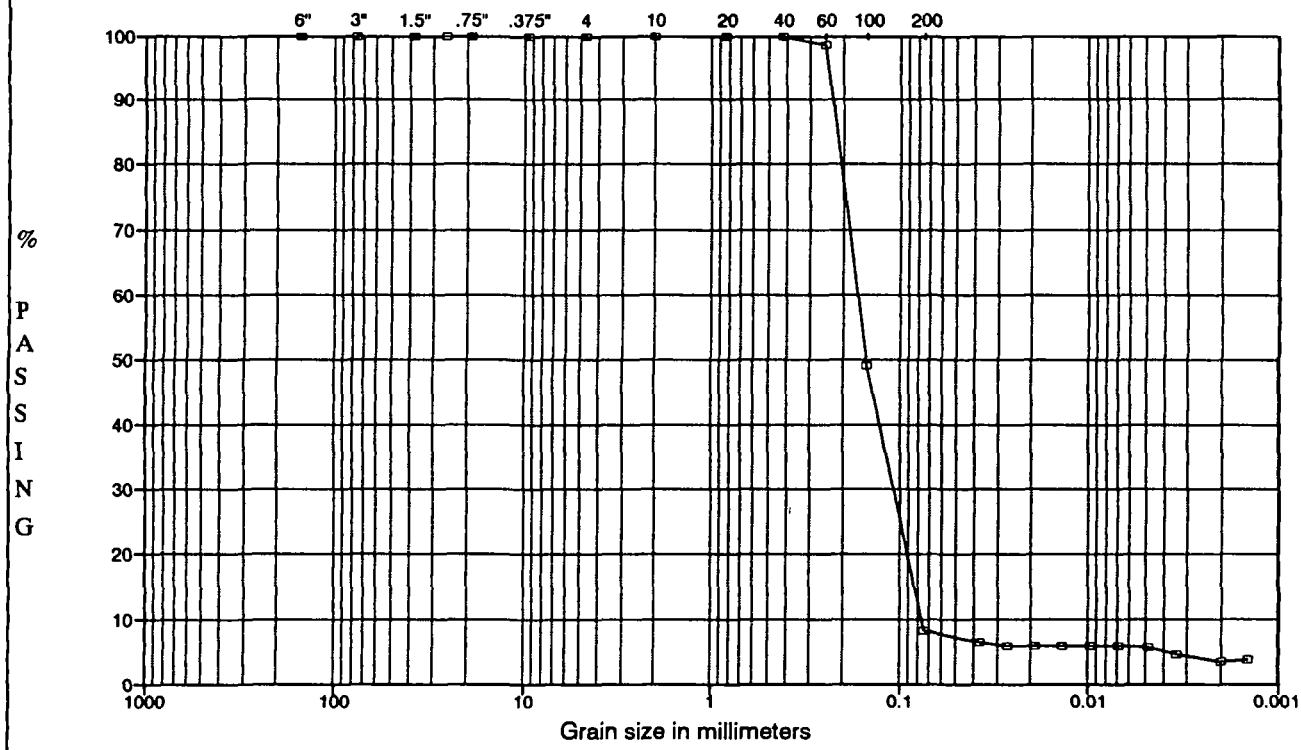
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848102R

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	GRAVEL		SAND			FINES (Silt and Clay)
	Coarse	Fine	Cor	Med	Fine	

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-102R-SS	--	--	--	--	2.69	Fine SAND with little fines
SAMPLE NO.							
DEPTH	18-20'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

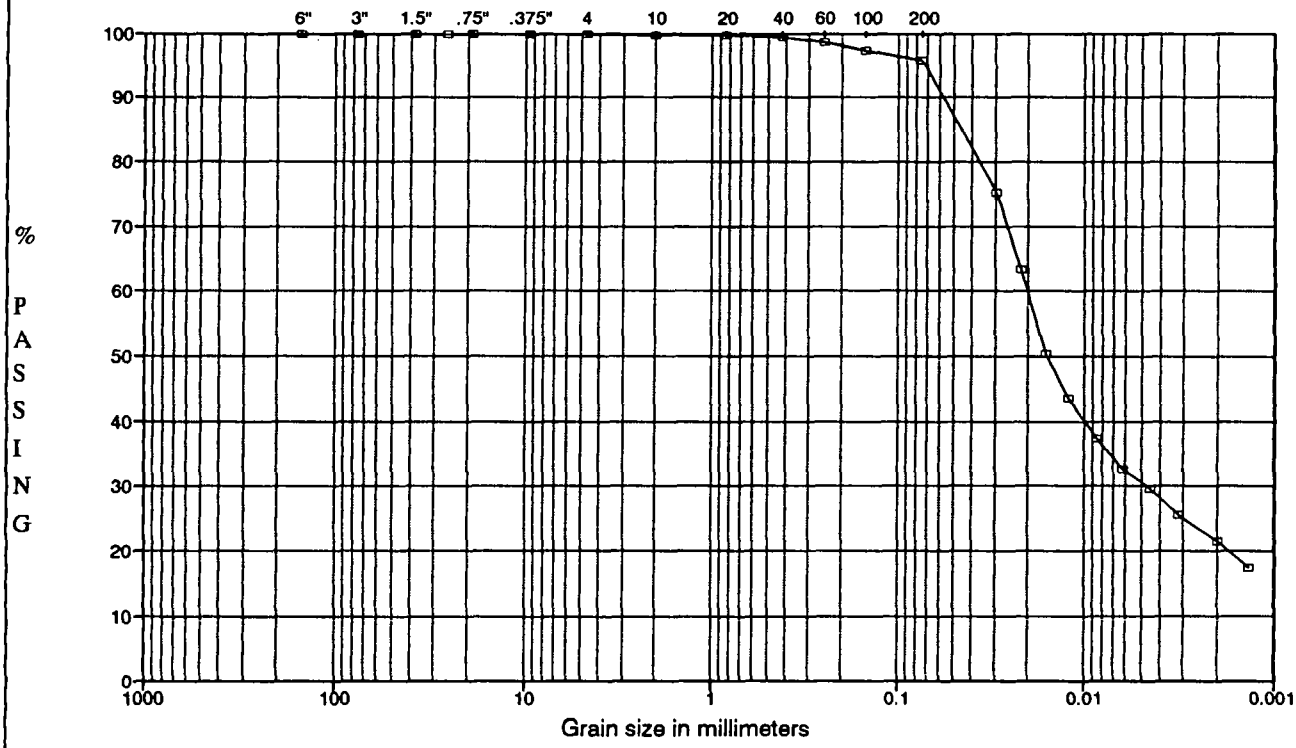
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 28481928

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE	PZ-102R-SS	--	--	--	--	2.76	FINES with trace fine sand
SAMPLE NO.							
DEPTH	12-14'						

Sample Type: Date Tested: 6/27/95 USCS: --

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

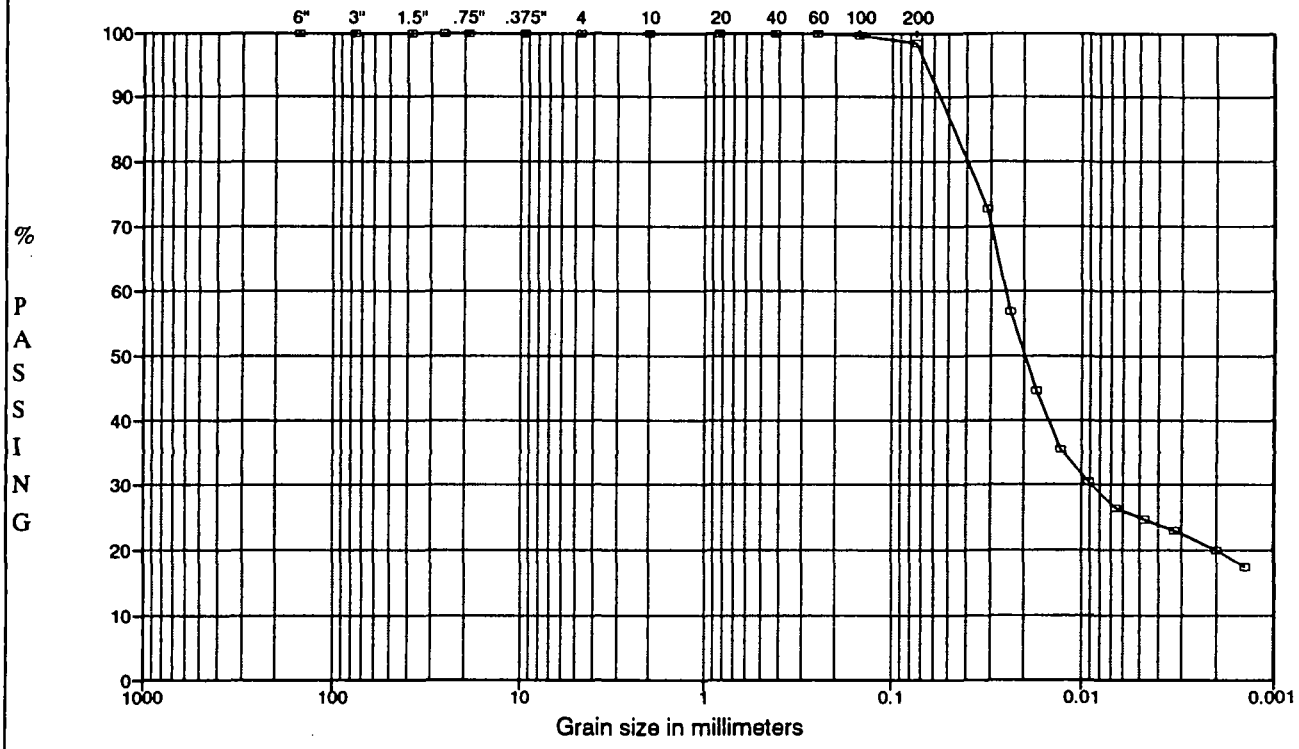
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848102A

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		28.2	39	25	14	2.69	Clayey SILT with trace fine sand
SAMPLE NO.	PZ-102-SS						
DEPTH	4-6,8-10						

Sample Type: Date Tested: 4/9/95 USCS: CL-ML

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

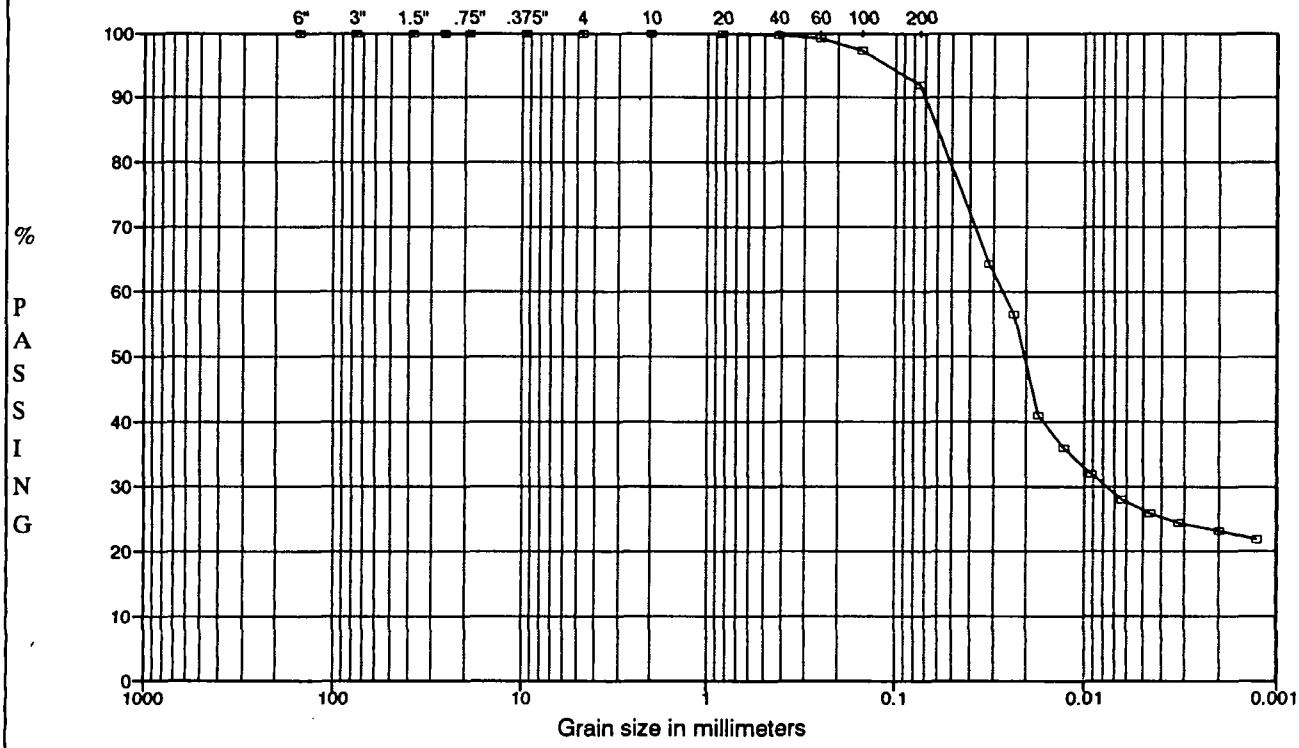
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848102

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE		24.4	38	22	16	2.68	Silty CLAY with little fine sand
SAMPLE NO.	PZ-101-SS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/6/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

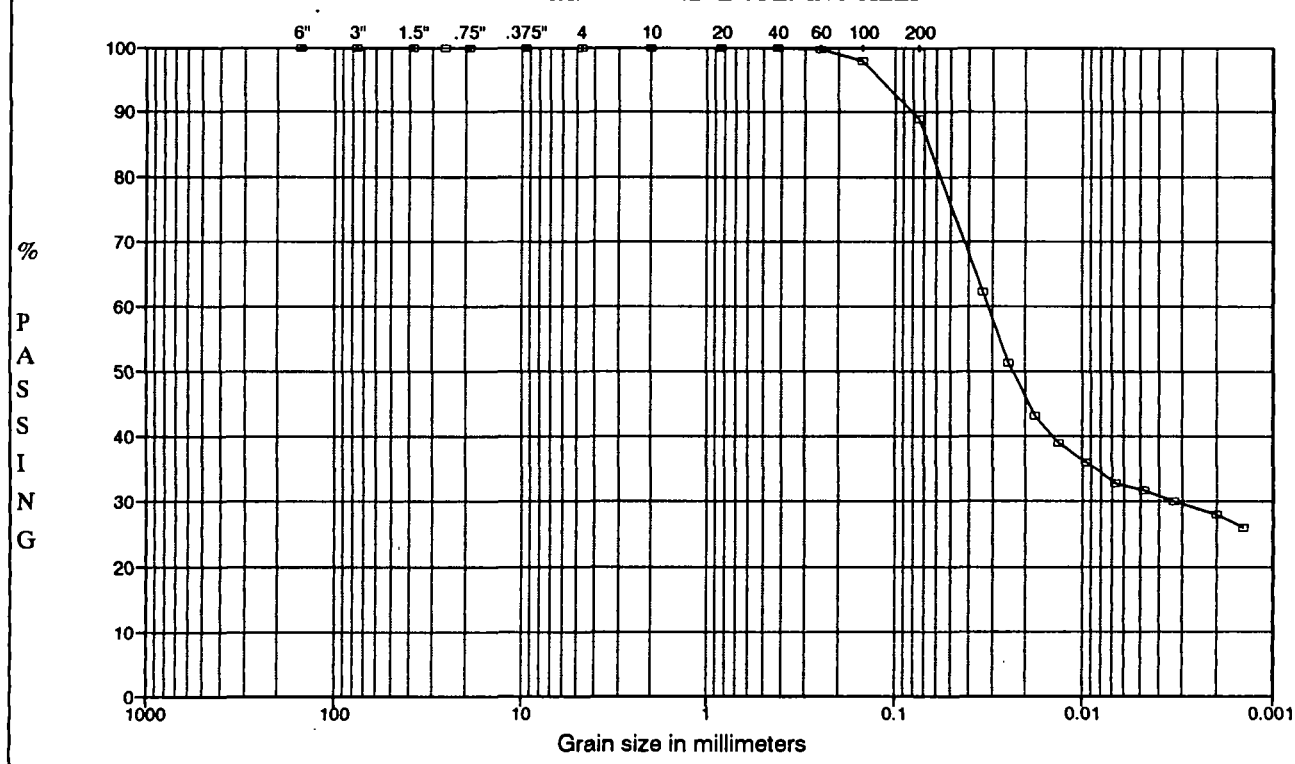
LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848191

GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

PARTICLE SIZE DISTRIBUTION ASTM D421 AND D422

US STANDARD SIEVE OPENING SIZES



USCS

COBBLES	Coarse	Fine	Cor	Med	Fine	FINES (Silt and Clay)
	GRAVEL		SAND			

SAMPLE ID		W%	LL	PL	PI	Gs	DESCRIPTION
BOREHOLE			40	24	16	2.62	Silty CLAY with little fine sand
SAMPLE NO.	PZ-100-KS						
DEPTH	4-6,6-8						

Sample Type: Date Tested: 4/9/95 USCS: CL

TECH: GI
DATE: 07/11/95
CHECKED: ASF
REVIEWED:

LAIDLAW/OU2 RIFS/MO
943-2848.202

FILENAME: 2848100

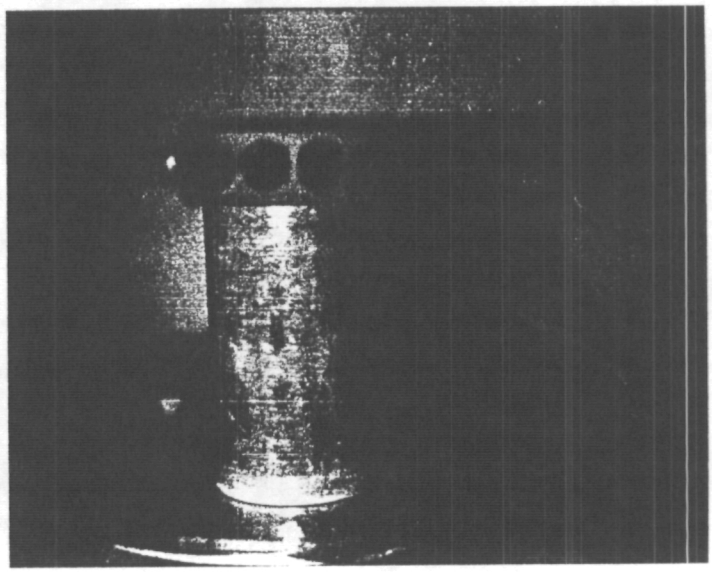
GOLDER ASSOCIATES INC.
LAKEWOOD, COLORADO

ADVANCED TERRA TESTING inc

833 Parfet Street
Lakewood Colorado 80215
(303) 232 8308

TRIAXIAL, BACK PRESSURE PERMEABILITY, TX/PBP

ASTM D 5084



Golder Assoc. 3003-51

STS-1 PZ-106-RS Tailpipe

201.9 - 202.5' 23010 ASF

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT Golder Assoc. JOB NO. 2003-51

BORING NO.	GTS-1	SAMPLED	3-15-95 BT
DEPTH	201.9-202.5'	TEST STARTED	4-22-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	5-1-95 CJW/CAL
SOIL DESCR.		CELL NUMBER	1N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	23040		

MOISTURE/DENSITY DATA		BEFORE TEST	AFTER TEST
Wt. Soil + Moisture	(g)	307.6	311.5
Wt. Wet Soil & Pan	(g)	315.0	319.0
Wt. Dry Soil & Pan	(g)	301.9	301.9
Wt. Lost Moisture	(g)	13.1	17.1
Wt. of Pan Only	(g)	7.4	7.4
Wt. of Dry Soil	(g)	294.5	294.5
Moisture Content %		4.5	5.8
Wet Density PCF		158.6	157.3
Dry Density PCF		151.9	148.6

Init. Diameter	(in)	1.770	(cm)	4.496
Init. Area	(sq in)	2.461	(sq cm)	15.876
Init. Height	(in)	3.002	(cm)	7.625
Vol. Bef. Consol.	(cu ft)	0.00427		
Vol. After Consol.	(cu ft)	0.00437		
Porosity %		13.81		
Constant Head	(PSI)	0.00	(cm)	0.00

FLOW PUMP CALCULATIONS

Pump Setting	1.0
Velocity (cm/s)	7.44E-06
Q (cc/s)	2.38E-07
Height	2.996
Diameter	1.791
Pressure (psi)	13.990
Area after consol. (cm*cm)	16.252
Gradient	129.255
Permeability k (cm/s)	1.1E-10
Back Pressure (psi)	98.0
Cell Pressure (psi)	258.0
Ave. Effective Stress (psi)	153.005

Note: Test Terminated at internal pore pressure development of 13.99 psi (machine capacity). Therefore, actual k value is less than that shown.

Data entry by: NAA Date: 5/2/95
Checked by: MGJ Date: 5-3-95
FileName:B:GOYOGTS1 ADVANCED TERRA TESTING, INC.

TRIAXAL COMPRESSION TEST DATA

CLIENT Golder Assoc. JOB NO. 2003-51

BORING NO.	GTS-1	SAMPLED	3-15-95 BT
DEPTH	201.9-202.5'	TEST STARTED	4-22-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	5-1-95 CJW/CAL
SOIL DESCR.		SETUP NO.	1N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	23040		

SATURATION DATA

Cell Pres. (PSI)	Back Pres. (PSI)	Burette Reading (CC)		Pore Pressure (PSI)		Change	B
		Close	Open	Close	Open		
40.0	38.0	7.2	16.4				
50.0	48.0	17.0	17.7	38.4	45.3	6.9	0.69
60.0	58.0	18.0	18.7	48.4	56.1	7.7	0.77
70.0	68.0	19.0	19.8	59.1	67.2	8.1	0.81
80.0	78.0	19.8	20.4	68.5	76.9	8.4	0.84
90.0	88.0	20.6	21.2	78.2	86.9	8.7	0.87
100.0	98.0	21.1	21.8	88.1	96.8	8.7	0.87
110.0		22.0	22.1	98.3	106.9	8.6	0.86

CONSOLIDATION DATA

Elapsed Time (Min)	SQRT Time (Min)	Burette Reading (CC)	Volume Defl. (cc)
0.00	0.00	23.50	0.00
0.25	0.50	33.40	-9.90
0.5	0.71	33.45	-9.95
1	1.00	33.50	-10.00
2	1.41	33.55	-10.05
4	2.00	33.65	-10.15
9	3.00	33.70	-10.20
16	4.00	33.85	-10.35
30	5.48	34.00	-10.50
60	7.75	34.10	-10.60
120	10.95	34.30	-10.80
240	15.49	34.50	-11.00
360	18.97	34.55	-11.05

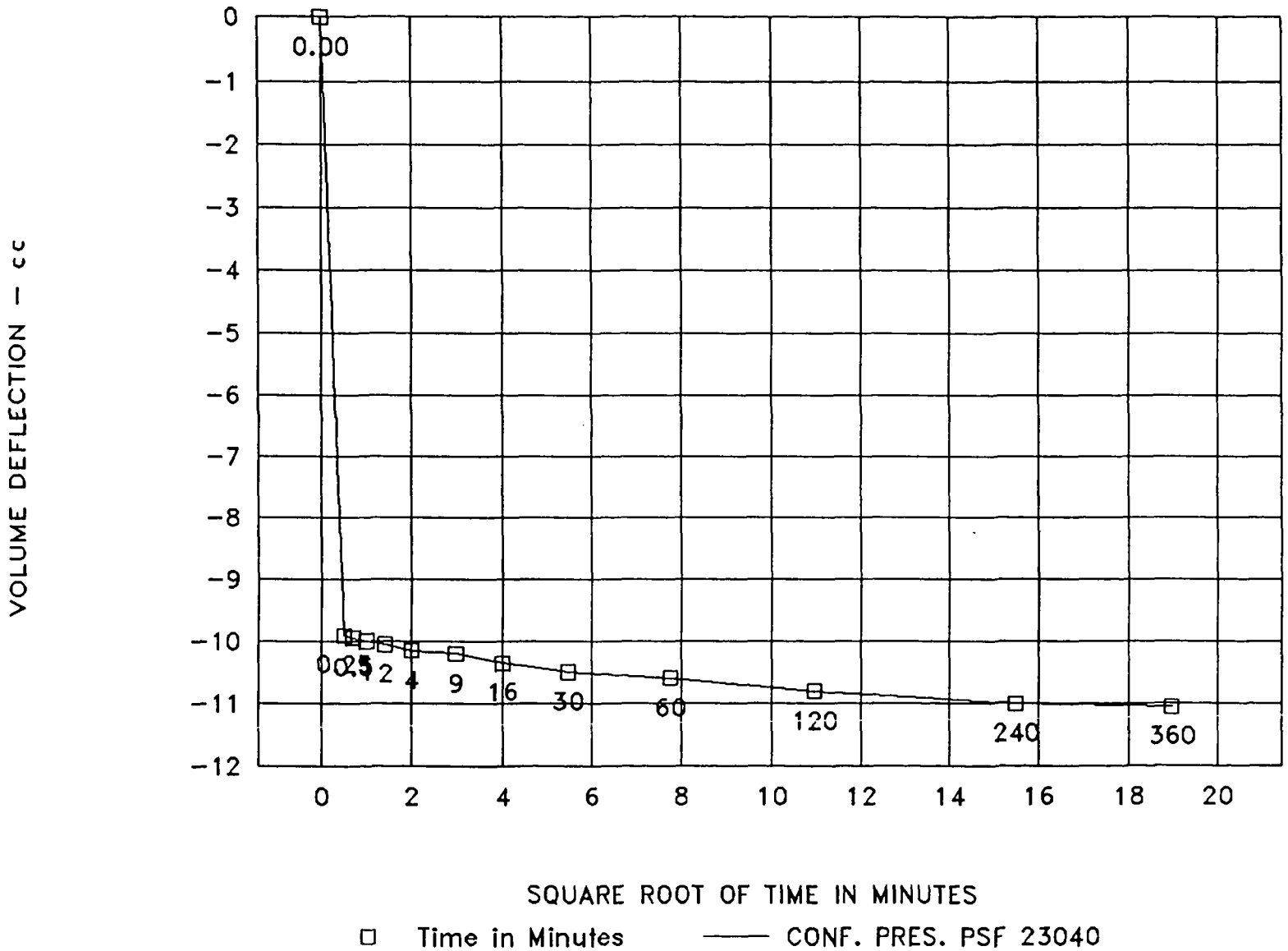
Initial Height	(in)	3.002	Init. Vol.	(CC)	121.07
Height Change	(in)	0.006	Vol. Change	(CC)	27.20
Ht. After Cons.	(in)	2.996	Cell Exp.	(CC)	29.83
Initial Area	(sq in)	2.461	Net Change	(CC)	-2.63
Area After Cons.	(sq in)	2.519	Cons. Vol.	(CC)	123.70

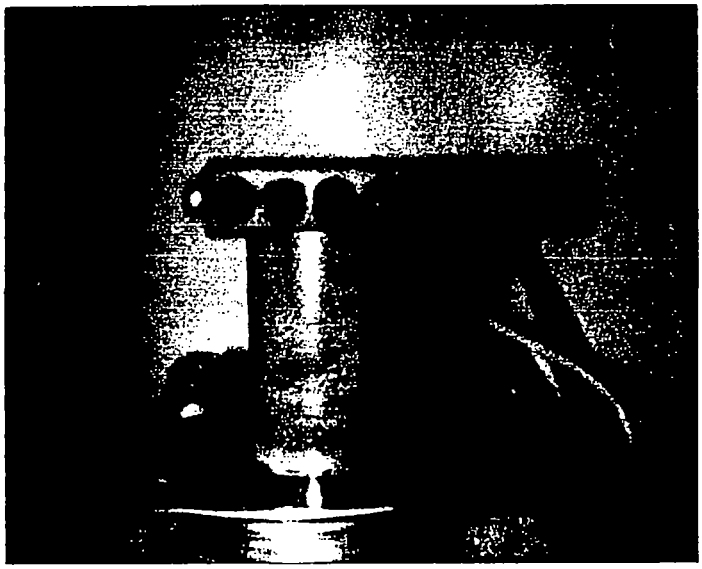
Data entry by: NAA Date: 5/2/95
Checked by: MGJ Date: 5-3-95
FileName:B:GOYOGTS1

ADVANCED TERRA TESTING, INC.

CONSOLIDATION DATA

GTS-1, 201.9-202.5', PZ-106-KS





Golder Assoc.
GTS-2 PZ-106-KS
229.6 - 230.1'

2003-51
Tx/Php
25200 PSF

PERMEABILITY TEST - BACK PRESSURE SATURATED - FLOW PUMP METHOD
ASTM D 5084

CLIENT	Golder Assoc.	JOB NO.	2003-51
BORING NO.	GTS-2	SAMPLED	3-15-95 BT
DEPTH	229.6-230.1'	TEST STARTED	4-21-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	4-30-95 DCW
SOIL DESCR.		CELL NUMBER	3N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	25200		

MOISTURE/DENSITY DATA		BEFORE TEST	AFTER TEST
Wt. Soil + Moisture	(g)	297.0	303.9
Wt. Wet Soil & Pan	(g)	300.7	307.6
Wt. Dry Soil & Pan	(g)	288.1	288.1
Wt. Lost Moisture	(g)	12.6	19.5
Wt. of Pan Only	(g)	3.7	3.7
Wt. of Dry Soil	(g)	284.4	284.4
Moisture Content %		4.4	6.9
Wet Density PCF		154.5	143.3
Dry Density PCF		148.0	134.1

Init. Diameter	(in)	1.758	(cm)	4.465
Init. Area	(sq in)	2.427	(sq cm)	15.661
Init. Height	(in)	3.016	(cm)	7.661
Vol. Bef. Consol.	(cu ft)	0.00424		
Vol. After Consol.	(cu ft)	0.00468		
Porosity %		14.73		
Constant Head	(PSI)	0.00	(cm)	0.00

FLOW PUMP CALCULATIONS

Pump Setting	1.0
Velocity (cm/s)	7.44E-06
Q (cc/s)	2.38E-07
Height	3.005
Diameter	1.850
Pressure (psi)	10.210
Area after consol. (cm*cm)	17.346
Gradient	94.049
Permeability k (cm/s)	1.5E-10
Back Pressure (psi)	88.0
Cell Pressure (psi)	263.0
Ave. Effective Stress (psi)	169.895

Data entry by: NAA Date: 5/2/95
Checked by: MGJ Date: 5-3-95
FileName:B:GOYOGTS2

ADVANCED TERRA TESTING, INC.

TRIAXAL COMPRESSION TEST DATA

CLIENT Golder Assoc. JOB NO. 2003-51

BORING NO.	GTS-2	SAMPLED	3-15-95 BT
DEPTH	229.6-230.1'	TEST STARTED	4-21-95 DCW
SAMPLE NO.	PZ-106-KS	TEST FINISHED	4-30-95 DCW
SOIL DESCR.		SETUP NO.	3N
TEST TYPE	TX/Pbp	SATURATED TEST	Yes
CONF. PRES. PSF	25200		

SATURATION DATA

Cell Pres. (PSI)	Back Pres. (PSI)	Burette Reading (CC)		Pore Pressure (PSI)		Change	B
		Close	Open	Close	Open		
40.0	38.0	6.7	13.0				
50.0	48.0	12.1	12.8	38.3	46.2	7.9	0.79
60.0	58.0	12.7	13.3	48.7	56.8	8.1	0.81
70.0	68.0	13.4	14.0	58.9	67.1	8.2	0.82
80.0	78.0	14.3	14.9	68.9	78.1	9.2	0.92
90.0	88.0	14.8	15.3	78.5	87.9	9.4	0.94
100.0		15.6	15.7	88.1	97.6	9.5	0.95

CONSOLIDATION DATA

Elapsed Time (Min)	SQRT Time (Min)	Burette Reading (CC)	Volume Defl. (cc)
0.00	0.00	0.80	0.00
0.25	0.50	10.90	-10.10
0.5	0.71	11.30	-10.50
1	1.00	11.83	-11.02
2	1.41	11.95	-11.15
4	2.00	12.05	-11.25
9	3.00	12.10	-11.30
16	4.00	12.33	-11.52
30	5.48	12.53	-11.73
60	7.75	12.70	-11.90
120	10.95	13.03	-12.23
240	15.49	13.03	-12.23
360	18.97	13.10	-12.30

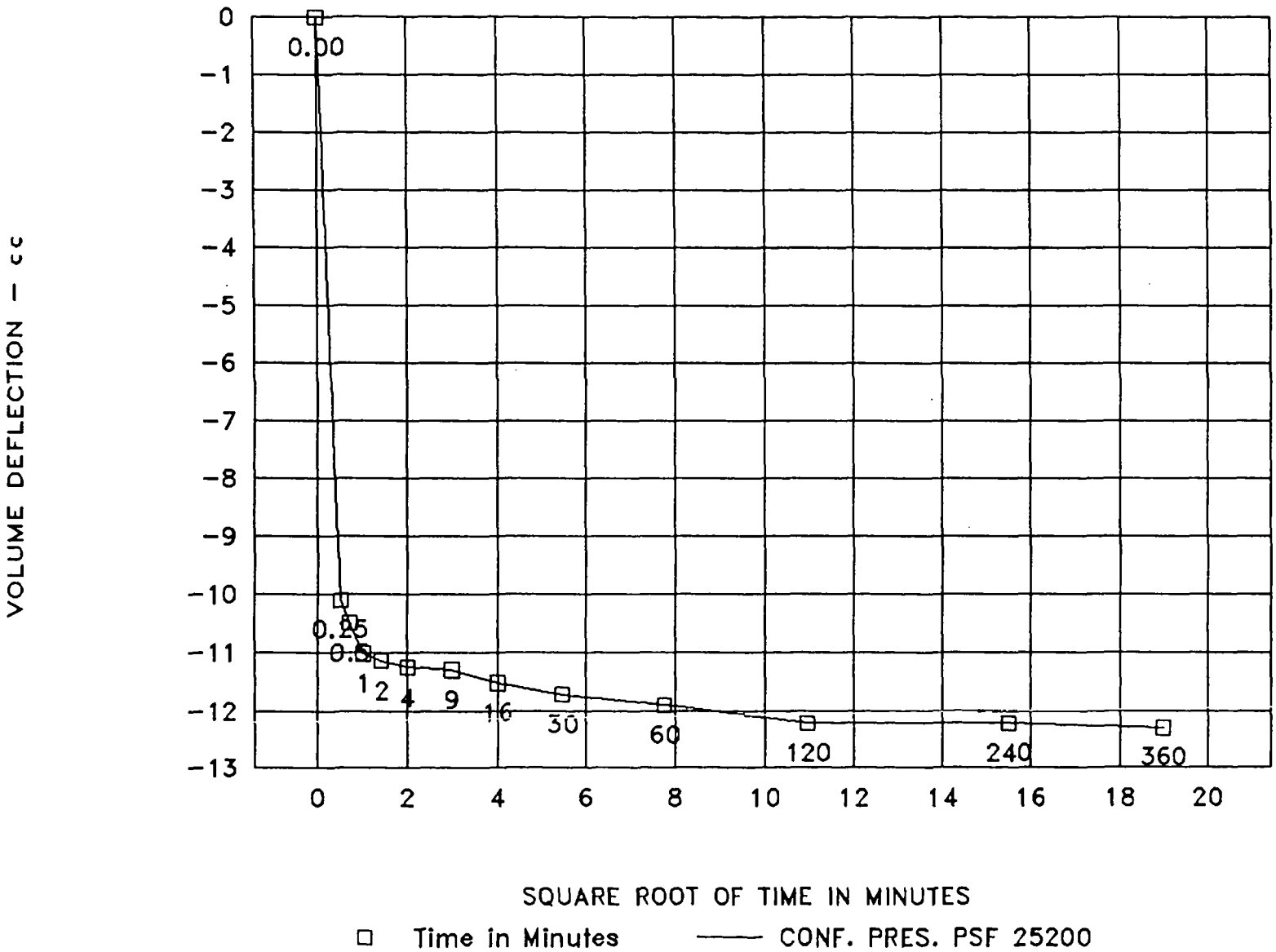
Initial Height	(in)	3.016	Init. Vol.	(CC)	119.99
Height Change	(in)	0.011	Vol. Change	(CC)	21.30
Ht. After Cons.	(in)	3.005	Cell Exp.	(CC)	33.73
Initial Area	(sq in)	2.427	Net Change	(CC)	-12.43
Area After Cons.	(sq in)	2.689	Cons. Vol.	(CC)	132.42

Data entry by: NAA Date: 5/2/95
Checked by: MGJ Date: 5-3-95
FileName:B:GOYOGTS2

ADVANCED TERRA TESTING, INC.

CONSOLIDATION DATA

GTS-2, 229.6-230.1', PZ-106-KS



APPENDIX E

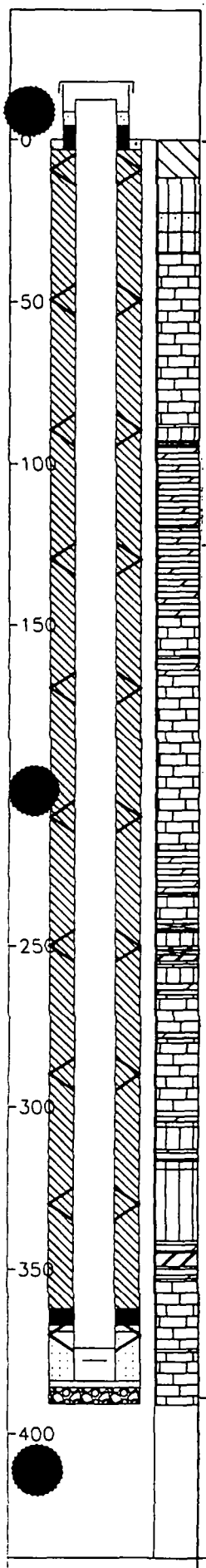
CONSTRUCTION SUMMARIES

APPENDIX E-1

PIEZOMETER CONSTRUCTION SUMMARIES

Well No. PZ-100-KS
Boring No. X-Ref: PZ-100-KS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068842 ft.
Easting: 517212 ft.

Elevation Ground Level 483.8 ft. NGVD
Top of PVC Casing 485.64 ft. NGVD

Drilling Summary:

Total Depth 390.0 ft.
Borehole Diameter 10 1/4 in. (0.0-34.0 ft.) 5 7/8 in. (34.0-391.0 ft.)
Casing Stickup Height 1.88 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	1/25/95	13:20	2/9/95	15:15
Schramm Rotary	2/11/95	11:00	2/13/95	15:30
Geophys.Logging:	2/9/95	16:15	2/9/95	18:15
Casing:	2/17/95	7:55	2/17/95	11:00
Filter Placement:	2/17/95	11:00	2/17/95	13:30
Cementing:				
Development				
Bentonite Grout	2/20/95	7:30	2/20/95	11:30
Bentonite Seal	2/17/95	13:30	2/17/95	13:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.88	-	374.00	C1	485.64	-	109.76
374.00	-	383.80	S1	109.76	-	99.96
383.80	-	384.13	C2	99.96	-	99.63

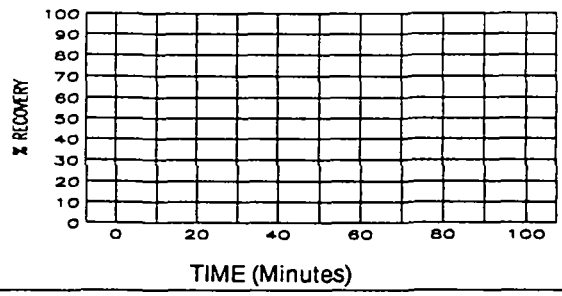
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 369.0-384.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 367.0-369.0 ft. and 384.0-386.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-362.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 362.0-367.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



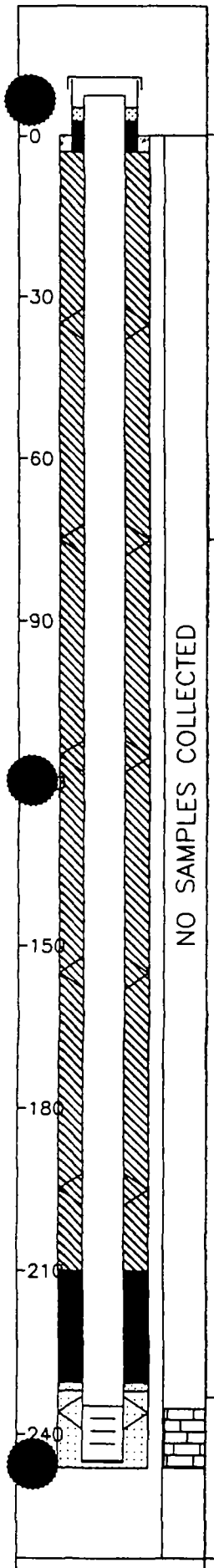
Comments: Prior to well installation, there was about 4 ft. of slough at base of borehole which could not be removed.

Not to Scale

Supervised by W. Herst
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ100KS

Well No. PZ-100-SD
Boring No. X-Ref: PZ-100-SD

PIEZOMETER WELL CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068852 ft.
Easting: 517195 ft.

Elevation Ground Level 484.4 ft. NGVD
Top of PVC Casing 485.82 ft. NGVD

Drilling Summary:

Total Depth 246.0 ft.
Borehole Diameter 10 1/4 in. (0.0-51.0 ft.) 5 7/8 in. (51.0-246.0 ft.)
Casing Stickup Height 1.47 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	1/25/95	14:00	1/25/95	14:45
Schramm Rotary	2/21/95	8:30	2/22/95	15:00
Geophys.Logging:				
Casing:	2/23/95	9:50	2/23/95	10:15
Filter Placement:	2/23/95	10:35	2/23/95	11:40
Cementing:				
Development				
Bentonite Grout	2/23/95	13:45	2/23/95	15:30
Bentonite Seal	2/23/95	13:15	2/23/95	13:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.47	-	234.80	C1	485.82	-	249.55
234.80	-	244.60	S1	249.55	-	239.75
244.60	-	244.93	C2	239.75	-	239.42
	-				-	
	-				-	
	-				-	

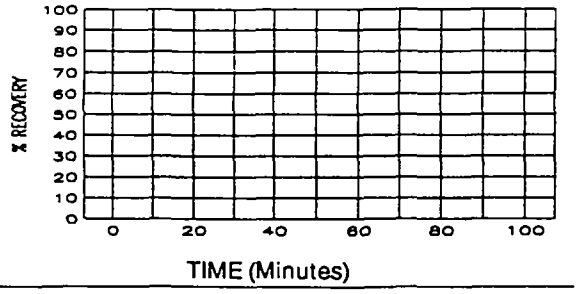
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 232.0-246. ft.
Filter Pack: Less than 50 mesh Silica Sand, 230.5-232.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-210.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 210.0-230.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

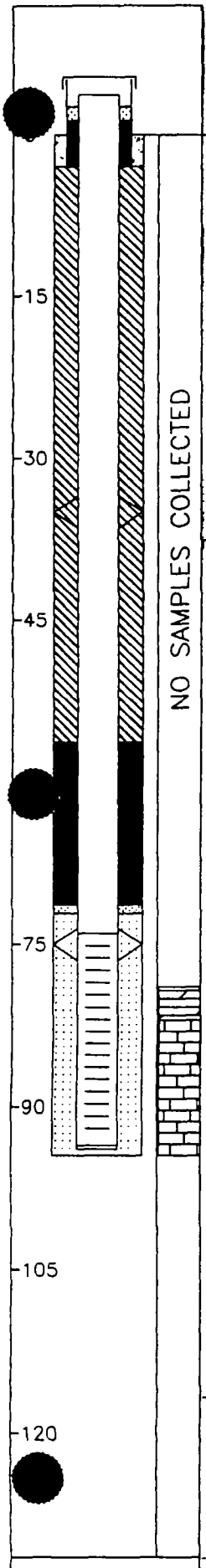


Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ100SD

Well No. PZ-100-SS
Boring No. X-Ref: PZ-100-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068868 ft.
Easting: 517175 ft.

Elevation Ground Level 484.4 ft. NGVD
Top of PVC Casing 485.84 ft. NGVD

Drilling Summary:

Total Depth 94.5 ft.
Borehole Diameter 10 1/4 in. (0.0-51.0 ft.) 5 7/8 in. (51.0-94.5 ft.)
Casing Stickup Height 1.49 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/20/95	16:00	2/20/95	16:40
Schramm Rotary	2/24/95	7:30	2/25/95	11:30
Geophys.Logging:				
Casing:	2/25/95	11:30	2/25/95	11:45
Filter Placement:	2/25/95	11:45	2/25/95	12:30
Cementing:				
Development				
Bentonite Grout	2/25/95	12:50	2/25/95	14:00
Bentonite Seal	2/25/95	12:30	2/25/95	12:50

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.49	-	73.96	C1	485.84	-	410.39
73.96	-	93.60	S1	410.39	-	390.75
93.60	-	93.93	C2	390.75	-	390.42

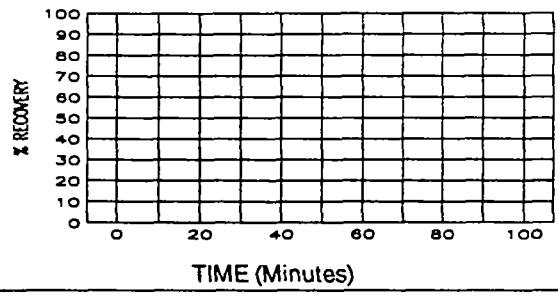
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 72.1-94.5 ft.
Filter Pack: Less than 50 mesh Silica Sand, 71.3-72.1 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-56.3 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 56.3-71.3 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

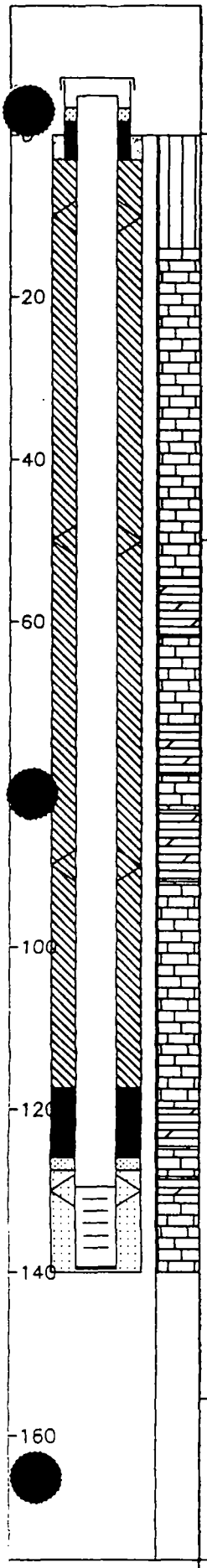


Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ100SS

Well No. PZ-101-SS
Boring No. X-Ref: PZ-101-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1068473 ft.	Elevation Ground Level	474.9 ft. NGVD
	Easting: 516623 ft.	Top of PVC Casing	476.68 ft. NGVD

Drilling Summary:

Total Depth 140.0 ft.
Borehole Diameter 10 1/4 in. (0.0-14.0 ft.) 5 7/8 in. (14.0-140.0 ft.)
Casing Stickup Height 1.79 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/23/95	13:35	2/23/95	14:30
Schramm Rotary	3/6/95	8:15	3/6/95	9:45
Geophys.Logging:				
Casing:	3/6/95	9:50	3/6/95	10:10
Filter Placement:	3/6/95	10:20	3/6/95	10:50
Cementing:				
Development				
Bentonite Grout	3/6/95	11:30	3/6/95	12:30
Bentonite Seal	3/6/95	10:50	3/6/95	11:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.79	-	129.48	C1	476.68	-	345.41
129.48	-	139.28	S1	345.41	-	335.61
139.28	-	139.61	C2	335.61	-	335.28
	-				-	
	-				-	
	-				-	

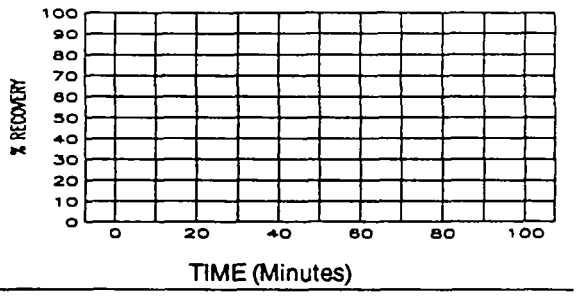
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 127.5-140.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 126.0-127.5 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-117.5 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 117.5-126.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



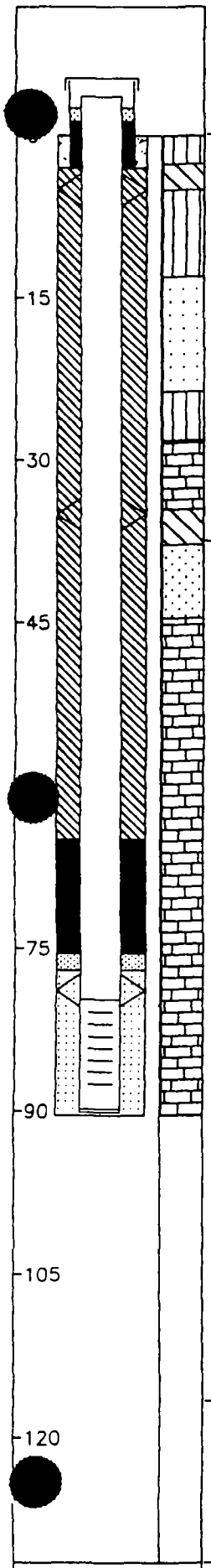
Comments:

Supervised by	B. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ101SS

Well No. PZ-102-SS

Bor[illegible]No. X-Ref: PZ-102-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068088 ft. Easting: 516888 ft.

Elevation Ground Level 482.1 ft. NGVD

Top of PVC Casing 483.85 ft. NGVD

Drilling Summary:

Total Depth 90.4 ft.

Borehole Diameter 10 1/4 in. (0.0–37.0 ft.) 5 7/8 in. (37.0–90.4 ft.)

Casing Stickup Height 1.80 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/13/95	15:21	2/13/95	14:25
Schramm Rotary	3/12/95	12:45	3/12/95	13:45
Geophys.Logging:				
Casing:	3/12/95	13:40	3/12/95	13:50
Filter Placement:	3/12/95	13:55	3/12/95	14:10
Cementing:				
Development				
Bentonite Grout	3/12/95	14:15	3/12/95	14:30
Bentonite Seal	3/12/95	14:30	3/12/95	15:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.80	-	79.70	C1	483.85	-	402.35
79.70	-	89.50	S1	402.35	-	392.55
89.50	-	90.83	C2	392.55	-	391.22

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 77.0-90.4 ft.

Filter Pack: Less than 50 mesh Silica Sand, 75.5-77.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-65.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 65.0-75.5 ft.

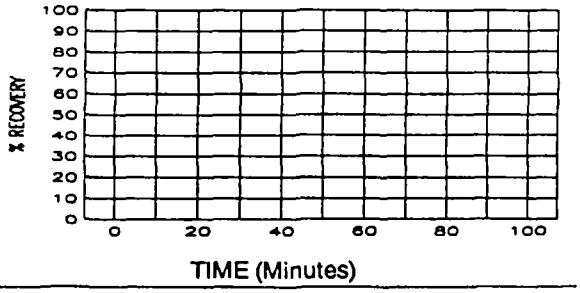
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

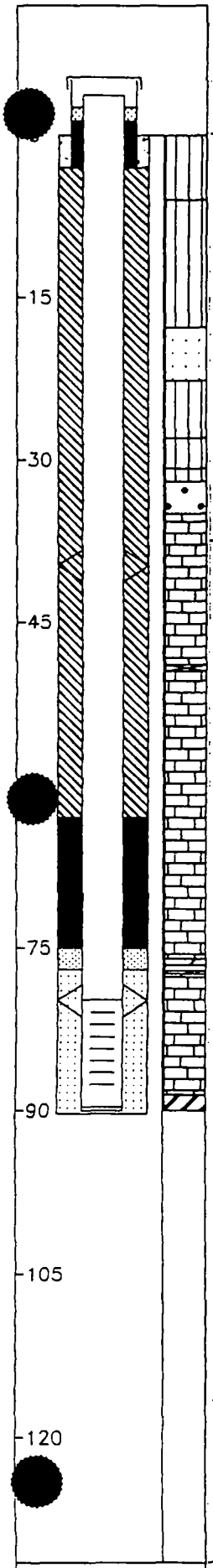
Site LAIDLAW/OU2 RI-FS/MO

File Name PZ102SS

Well No. PZ-102R-SS

Bo[illegible] No. X-Ref: PZ-102R-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1068132 ft.	Elevation Ground Level	484.5 ft. NGVD
	Easting: 516859 ft.	Top of PVC Casing	485.62 ft. NGVD

Drilling Summary:

Total Depth	90.3 ft.
Borehole Diameter	10 1/4" (0.0-35.0') 5 7/8" (35.0-90.3')
Casing Stickup Height	1.12 ft.
Driller	Layne-Western St. Louis, MO
Rig	CME 75, Schramm Portadrill T660H
Bit(s)	6 1/4" ID Hollow Stem Auger Bit, NX Core, 5 7/8" Button Bit for Reaming
Drilling Fluid	Auger-None, NX Core Water, Air Rotary
Protective Casing	8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	6/15/95	8:30	6/16/95	13:00
Schramm Rotary	6/18/95	13:00	6/18/95	13:45
Geophys.Logging:				
Casing:				
Filter Placement:	6/18/95	13:45	6/18/95	14:30
Cementing:				
Development				
Bentonite Grout	6/18/95	14:50	6/18/95	15:15
Bentonite Seal	6/18/95	14:35	6/18/95	14:55

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.12	-	79.83	C1	485.62	-	404.67
79.83	-	89.63	S1	404.67	-	394.87
89.63	-	89.96	C2	394.87	-	394.54

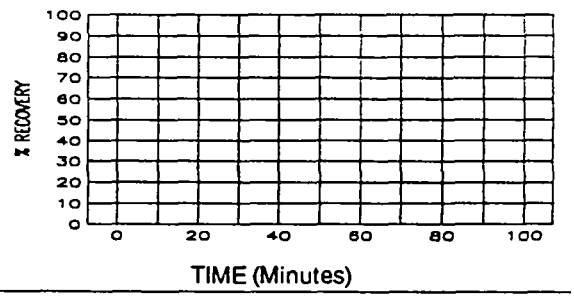
Casing:	C1	2 in. dia. Schedule 80 PVC, flush threaded with O-rings
	C2	2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen:	S1	2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack:		16-35 mesh Silica Sand, 77.0-90.3 ft.
Filter Pack:		Less than 50 mesh Silica Sand, 75.0-77.0 ft.
Grout Seal:		Wyo-Ben Grout Well Bentonite Slurry, 3.0-63.0 ft.
Bentonite Seal:		Extra high yield Wyo-Ben (100%) Slurry, 63.0-75.0 ft.
Concrete:		0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



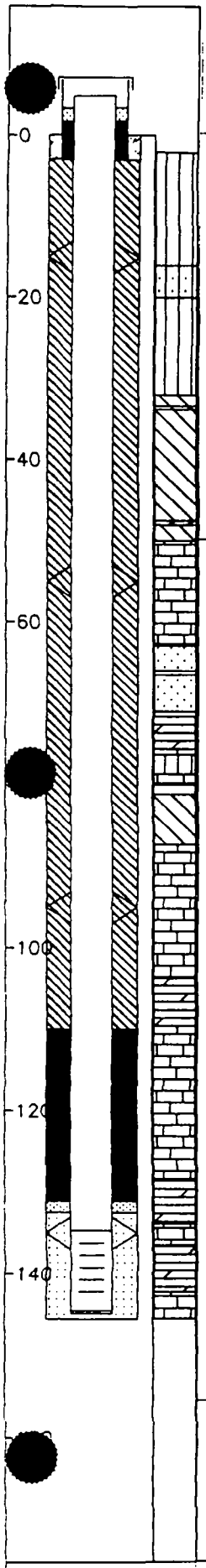
Comments:

Supervised by	B. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ102RSS

Well No. PZ-103-SS

Boring No. X-Ref: PZ-103-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067660 ft. Easting: 516724 ft.

Elevation Ground Level 477.8 ft. NGVD

Top of PVC Casing 480.17 ft. NGVD

Drilling Summary:

Total Depth 145.5 ft.

Borehole Diameter 10 1/4 in. (0.0-51.0 ft.) 5 7/8 in. (51.0-145.5 ft.)

Casing Stickup Height 2.39 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/21/95	7:30	2/23/95	9:45
Schramm Rotary	2/26/95	9:30	2/26/95	11:20
Geophys.Logging:				
Casing:	2/26/95	11:20	2/26/95	11:40
Filter Placement:	2/26/95	11:45	2/26/95	12:00
Cementing:				
Development				
Bentonite Grout	2/26/95	13:30	2/26/95	14:30
Bentonite Seal	2/26/95	12:30	2/26/95	13:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.39	-	134.70	C1	480.17	-	343.08
134.70	-	144.50	S1	343.08	-	333.28
144.50	-	144.83	C2	333.28	-	332.95

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 132.5-145.5 ft.

Filter Pack: Less than 50 mesh Silica Sand, 131.1-132.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-35.0 ft. and 60.0-110.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 110.0-131.1 ft.

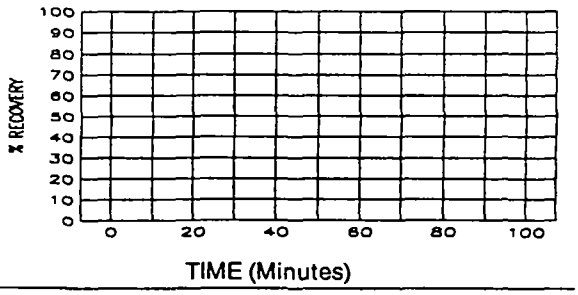
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Due to grout slurry lose above 60.0 ft., bentonite chips were placed from 35.0-60.0 ft. to seal borehole. The chips were hydrated at 1 ft. intervals during placement and were monitored with a weighted tape measure.

Not to Scale

Supervised by B. Tilton

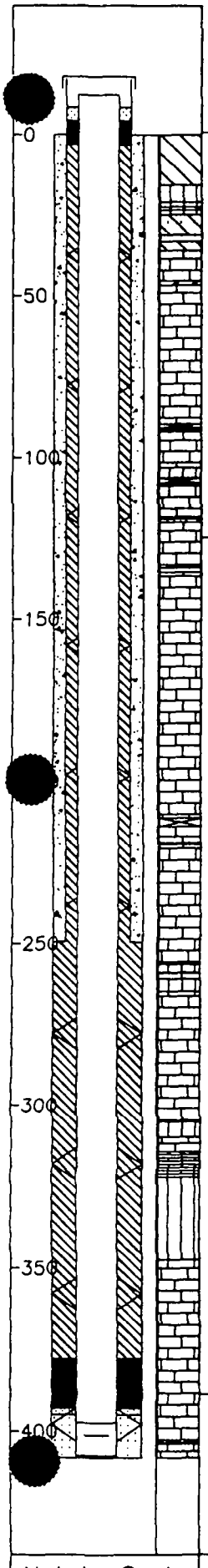
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ103SS

Well No. PZ-104-KS
Boring No. X-Ref: PZ-104-KS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066993 ft.
Easting: 516821 ft.

Elevation Ground Level 482.3 ft. NGVD
Top of PVC Casing 484.04 ft. NGVD

Drilling Summary:

Total Depth 408.0 ft.
Borehole Diameter 10 in. (0.0-249.0 ft.) 5 7/8 in. (249.0-408.0 ft.)
Casing Stickup Height 1.72 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. and 10 in. Button Bits
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (augers)	2/21/95	15:40	2/21/95	17:58
CME 75 (core)	5/22/95	14:00	5/22/95	14:45
Schramm Rotary	6/7/95	7:15	6/7/95	11:30
Geophys.Logging:	6/8/95	10:30	6/8/95	12:15
Casing:				
2" PVC	6/19/95	9:30	6/19/95	11:00
6" Steel	5/25/95	12:30	5/25/95	13:30
Filter Placement:	6/19/95	11:05	6/19/95	13:00
Cementing:				
Development				
Bentonite Grout	6/19/95	13:15	6/19/95	17:00
Bentonite Seal	6/19/95	13:00	6/19/95	13:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.72	-	397.37	C1	484.04	-	84.95
397.37	-	407.17	S1	84.95	-	75.15
407.17	-	407.50	C2	75.15	-	74.82
+ 1.00	-	249.00	C3	483.30	-	233.32
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC,
flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap
(4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in.
machine cut slot, flush threaded with
O-rings
Sand Pack: 16-35 mesh Silica Sand, 395.0-408.0 ft.

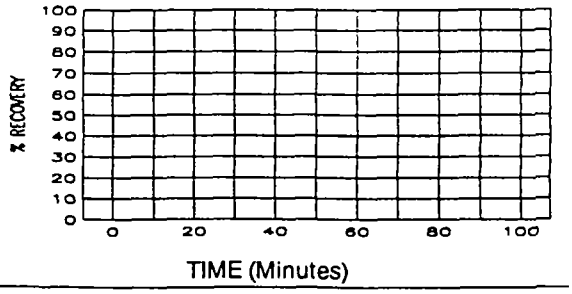
Filter Pack: Less than 50 mesh Silica Sand,
393.0-395.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry,
3.0-378.0 ft., Neat cement, 3.0-249.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%)
Slurry, 378.0-393.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

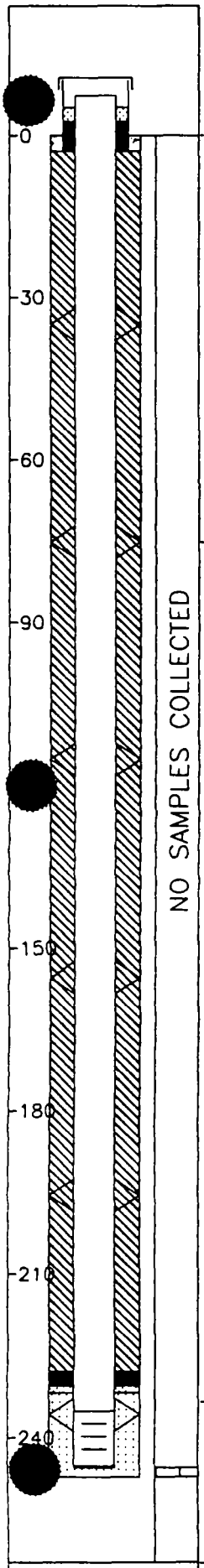


Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ104KS

Well No. PZ-104-SD
Boring No. X-Ref: PZ-104-SD

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067013 ft. Easting: 516834 ft.

Elevation Ground Level 482.1 ft. NGVD
Top of PVC Casing 483.69 ft. NGVD

Drilling Summary:

Total Depth 252.5 ft.
Borehole Diameter 10 1/4 in. (0.0-38.0 ft.) 5 7/8 in. (38.0-252.5 ft.)
Casing Stickup Height 1.59 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	5/5/95	15:00	5/6/95	14:00
Geophys.Logging:	6/8/95	12:30	6/8/95	15:00
Casing:	6/17/95	12:10	6/17/95	12:30
Filter Placement:	6/17/95	12:30	6/17/95	13:00
Cementing:				
Development				
Bentonite Grout	6/17/95	13:20	6/17/95	15:00
Bentonite Seal	6/17/95	13:00	6/17/95	13:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.59	-	235.20	C1	483.69	-	246.90
235.20	-	245.00	S1	246.90	-	237.10
245.00	-	245.33	C2	237.10	-	236.77
	-				-	
	-				-	
	-				-	

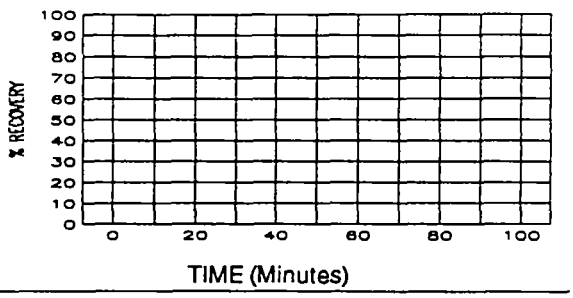
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 231.8-247.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 230.5-231.8 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-220.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 220.0-230.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

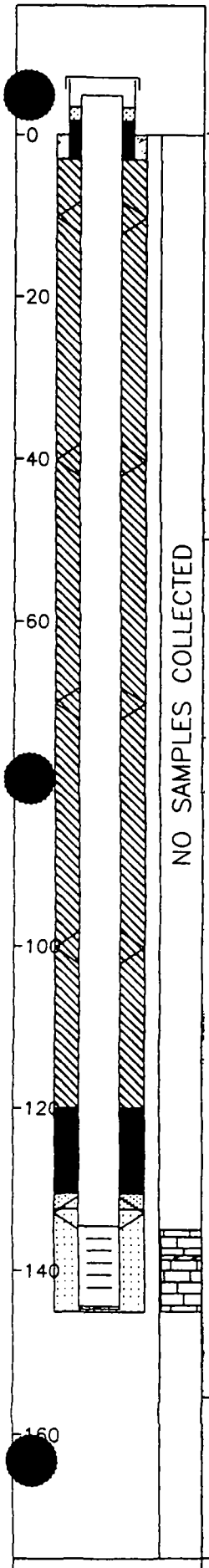


Comments: When PVC casing was installed, it was observed that there was about 5.0 ft. of sluff in borehole from 247.5-252.5 ft. It did not appear that the sluff could be removed from the borehole since the borehole had remained open to allow for geophysical logging and packer testing and slaking of shale units and argillaceous limestones in the borehole. Two feet of sand pack was used to seperate the bottom of the piezometer from the sluff at the bottom of the borehole.

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ104SD

Well No. PZ-104-SS
Boring No. X-Ref: PZ-104-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067028 ft.
Easting: 516847 ft.

Elevation Ground Level 481.6 ft. NGVD
Top of PVC Casing 483.63 ft. NGVD

Drilling Summary:

Total Depth 145.0 ft.
Borehole Diameter 10 1/4" (0.0-37.0') 5 7/8" (37.0-145.0')
Casing Stickup Height 2.07 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4" ID Hollow Stem Auger Bit,
NX Core, 5 7/8" Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	6/3/95	12:30	6/4/95	11:45
Geophys.Logging:				
Casing:	6/4/95	11:45	6/4/95	12:00
Filter Placement:	6/4/95	12:00	6/4/95	12:45
Cementing:				
Development				
Bentonite Grout	6/4/95	13:05	6/4/95	13:25
Bentonite Seal	6/4/95	12:45	6/4/95	13:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.07	-	134.50	C1	483.63	-	347.06
134.50	-	144.30	S1	347.06	-	337.26
144.30	-	144.63	C2	337.26	-	336.93

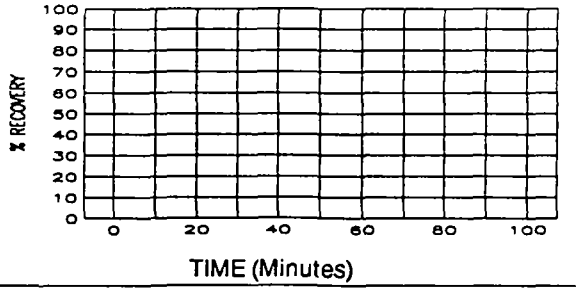
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 132.5-145.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 130.5-132.5 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-120.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 120.0-130.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

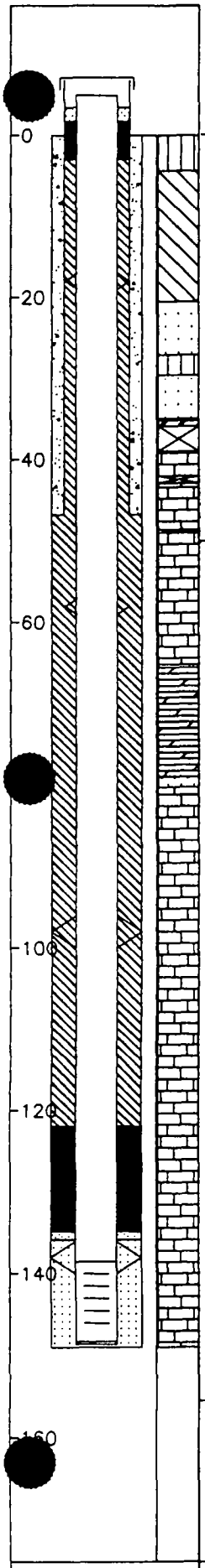


Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ104SS

Well No. PZ-105-SS
Boring No. X-Ref: PZ-105-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066421 ft.
Easting: 516230 ft.

Elevation Ground Level 481.2 ft. NGVD
Top of PVC Casing 483.61 ft. NGVD

Drilling Summary:

Total Depth 149.0 ft.
Borehole Diameter 9 7/8 in. (0.0-45.0 ft.) 5 7/8 in. (45.0-149.0 ft.)
Casing Stickup Height 2.39 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 7 7/8 in. Tricone Bit
Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/19/95	14:20	5/21/95	10:30
Schramm Rotary	5/24/95	7:45	5/24/95	12:00
Geophys.Logging:				
Casing:				
2" PVC	5/24/95	12:00	5/24/95	12:20
6" Steel	5/23/95	7:30	5/23/95	13:00
Filter Placement:	5/24/95	12:30	5/24/95	13:05
Cementing:				
Development				
Bentonite Grout	5/24/95	14:15	5/24/95	15:00
Bentonite Seal	5/24/95	14:00	5/24/95	14:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.39	-	138.50	C1	483.61	-	342.72
138.50	-	148.30	S1	342.72	-	332.92
148.30	-	148.63	C2	332.92	-	332.59
+ 1.50	-	45.00	C3	482.70	-	436.22
	-				-	
	-				-	

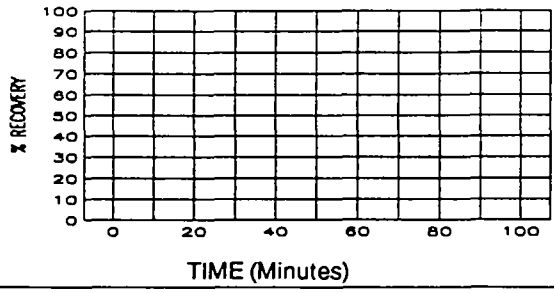
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 135.8-149.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 134.8-135.8 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-122.0 ft., Neat cement, 3.0-45.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 122.0-134.8 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

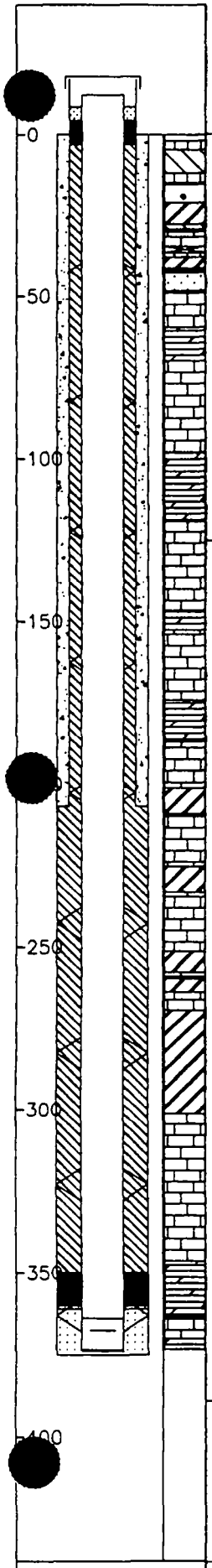


Comments: Surface Casing C3: 6 1/2 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ105SS

Well No. PZ-106-KS
Boring No. X-Ref: PZ-106-KS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1066704 ft.	Elevation Ground Level	461.8 ft. NGVD
	Easting: 515432 ft.	Top of PVC Casing	464.26 ft. NGVD

Drilling Summary:

Total Depth 375.0 ft.
Borehole Diameter 9 7/8 in. (0.0-204.0 ft.) 5 7/8 in. (204.0-375.0 ft.)
Casing Stickup Height 2.49 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. and 9 7/8 in. Button Bits
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/28/95	10:30	3/6/95	17:30
Schramm Rotary	3/20/95	7:30	3/20/95	11:30
Geophys.Logging:	3/20/95	12:45	3/20/95	18:30
Casing:				
2" PVC	3/23/95	8:30	3/23/95	9:40
6" Steel	3/9/95	11:45	3/10/95	9:00
Filter Placement:	3/23/95	9:40	3/23/95	10:45
Cementing:	3/9/95	14:15	3/9/95	9:00
Development				
Bentonite Grout	3/23/95	11:15	3/23/95	13:15
Bentonite Seal	3/23/95	10:45	3/23/95	11:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.49	-	363.75	C1	464.26	-	98.02
363.75	-	373.57	S1	98.02	-	88.20
373.57	-	373.90	C2	88.20	-	87.87
+ 1.50	-	204.00	C3	463.30	-	257.77
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC,
flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap
(4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in.
machine cut slot, flush threaded with
O-rings
Sand Pack: 16-35 mesh Silica Sand, 361.0-375.0 ft.

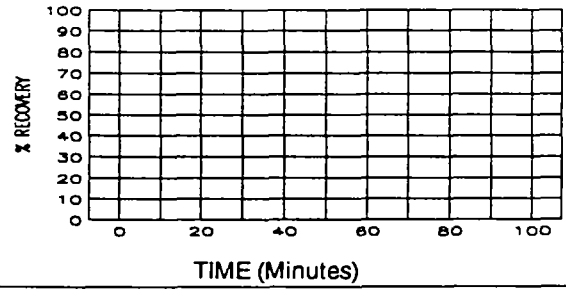
Filter Pack: Less than 50 mesh Silica Sand,
360.0-361.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry,
3.0-350.0 ft., Neat cement, 3.0-204.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%)
Slurry, 350.0-360.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

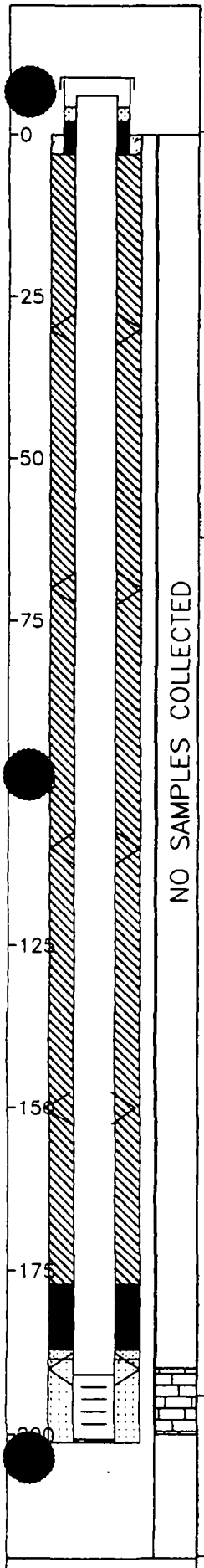


Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 OD Steel Casing

Supervised by	B. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ106KS

Well No. PZ-106-SD
Boring No. X-Ref: PZ-106-SD

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1066715 ft.	Elevation Ground Level	461.5 ft. NGVD
	Easting: 515416 ft.	Top of PVC Casing	463.42 ft. NGVD

Drilling Summary:

Total Depth 201.1 ft.
Borehole Diameter 10 1/4 in. (0.0-26.0 ft.) 5 7/8 in. (26.0-201.1 ft.)
Casing Stickup Height 1.97 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	3/23/95	16:15	3/24/95	13:00
Geophys.Logging:	3/24/95	16:15	3/24/95	18:30
Casing:	3/24/95	12:40	3/24/95	13:00
Filter Placement:	3/24/95	13:10	3/24/95	13:40
Cementing:				
Development				
Bentonite Grout	3/24/95	14:00	3/24/95	14:45
Bentonite Seal	3/24/95	13:40	3/24/95	13:55

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.97	-	190.79	C1	463.42	-	270.66
190.79	-	200.59	S1	270.66	-	260.86
200.59	-	200.93	C2	260.86	-	260.52

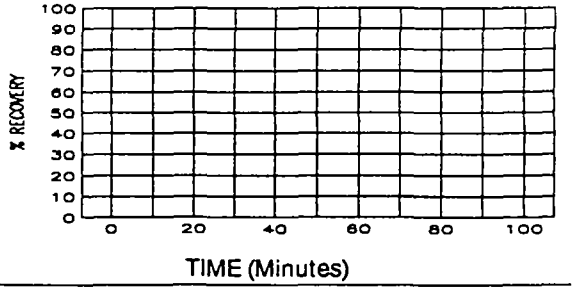
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 188.5-201.1 ft.
Filter Pack: Less than 50 mesh Silica Sand, 187.0-188.5 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-177.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 177.0-187.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

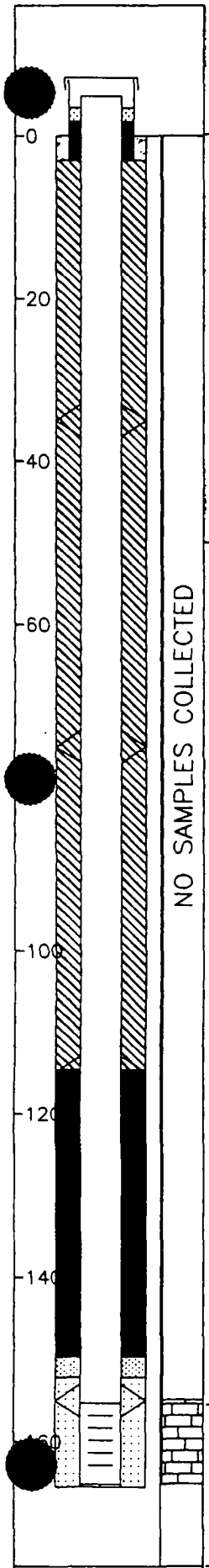


Comments:

Supervised by	W. Herst	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ106SD

Well No. PZ-106-SS
Boring No. X-Ref: PZ-106-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1066726 ft.
Easting: 515400 ft.

Elevation Ground Level 461.0 ft. NGVD
Top of PVC Casing 462.70 ft. NGVD

Drilling Summary:

Total Depth 165.4 ft.
Borehole Diameter 10 1/4 in. (0.0-23.0 ft.) 5 7/8 in. (23.0-165.4 ft.)
Casing Stickup Height 1.75 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	4/4/95	8:25	4/5/95	10:00
Geophys.Logging:				
Casing:	4/5/95	11:45	4/5/95	12:10
Filter Placement:	4/5/95	12:15	4/5/95	12:30
Cementing:				
Development				
Bentonite Grout	4/5/95	13:05	4/5/95	13:41
Bentonite Seal	4/5/95	12:30	4/5/95	13:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.75	-	155.30	C1	462.70	-	305.65
155.30	-	165.10	S1	305.65	-	295.85
165.10	-	165.43	C2	295.85	-	295.52

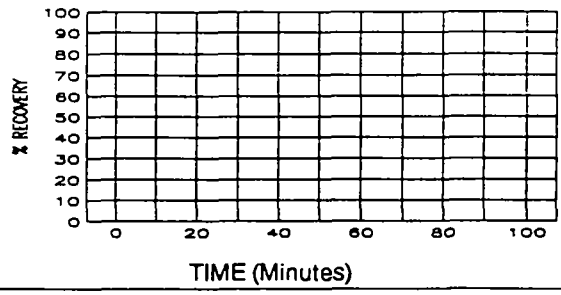
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 152.2-165.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 149.7-152.2 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-114.7 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 114.7-149.7 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

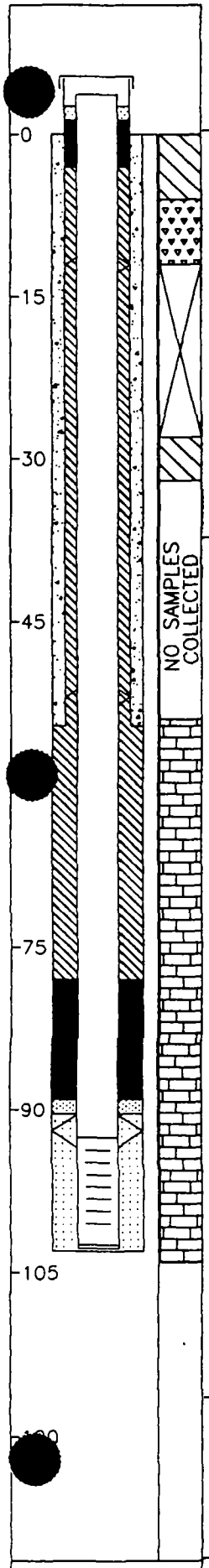


Comments:

Supervised by J. Miller
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ106SS

Well No. PZ-107-SS
Boring No. X-Ref: PZ-107-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1067183 ft.	Elevation Ground Level	462.6 ft. NGVD
	Easting: 515255 ft.	Top of PVC Casing	464.66 ft. NGVD

Drilling Summary:

Total Depth 103.0 ft.
Borehole Diameter 14 1/4 in. (0.0-32.0 ft.) 5 7/8 in. (32.0-103.0 ft.)
Casing Stickup Height 2.03 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (augers)	3/26/95	13:00	3/26/95	16:25
CME 75 (core)	5/21/95	15:30	5/22/95	8:30
Schramm Rotary	5/22/95	11:00	5/22/95	11:30
Geophys.Logging:				
Casing:				
2" PVC	5/22/95	11:30	5/22/95	11:35
6" Steel	5/18/95	9:00	5/18/95	14:00
Filter Placement:	5/22/95	11:40	5/22/95	11:55
Cementing:				
Development				
Bentonite Grout	5/22/95	12:10	5/22/95	12:45
Bentonite Seal	5/22/95	11:55	5/22/95	12:10

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.03	-	92.60	C1	464.66	-	370.03
92.60	-	102.40	S1	370.03	-	360.23
102.40	-	102.73	C2	360.23	-	359.90
+ 1.00	-	55.00	C3	463.60	-	407.63
	-				-	
	-				-	

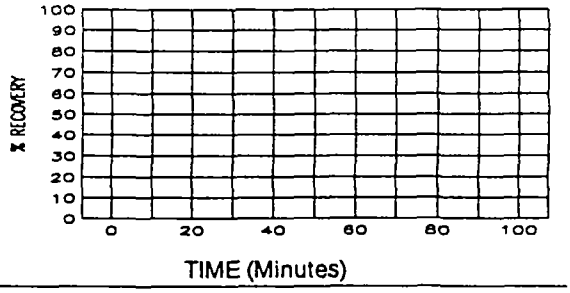
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 90.4-103.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 89.0-90.4 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-78.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 78.0-89.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



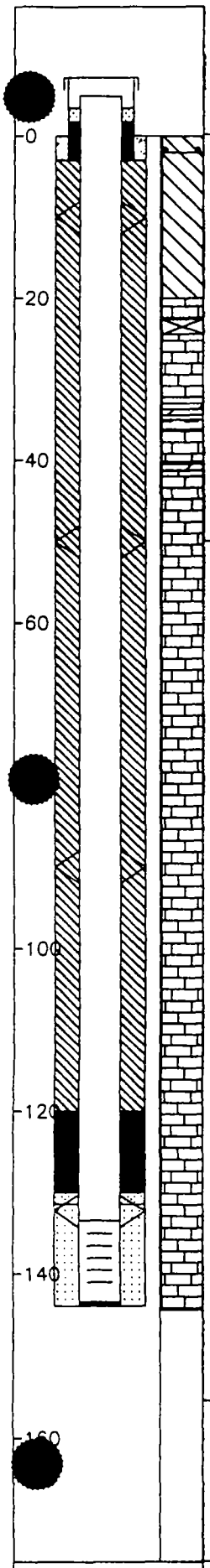
Comments:

Surface Casing C3: 6 1/8 ID / 6 5/8 in. OD Steel Casing

Supervised by	B. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ107SS

Well No. PZ-108-SS
Boring No. X-Ref: PZ-108-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1067678 ft.	Elevation Ground Level	454.1 ft. NGVD
	Easting: 515973 ft.	Top of PVC Casing	456.20 ft. NGVD

Drilling Summary:

Total Depth	143.9 ft.
Borehole Diameter	10 1/4 in. (0.0-20.0 ft.) 5 7/8 in. (20.0-143.9 ft.)
Casing Stickup Height	2.08 ft.
Driller	Layne-Western, St. Louis, MO
Rig	CME 75, Schramm Portadrill T660H
Bit(s)	6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid	Auger-None, NX Core Water, Air Rotary
Protective Casing	8x in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/21/95	16:30	3/23/95	16:35
Schramm Rotary	3/29/95	7:30	3/29/95	9:15
Geophys.Logging:				
Casing:	3/29/95	9:30	3/29/95	9:45
Filter Placement:	3/29/95	9:50	3/29/95	10:15
Cementing:				
Development				
Bentonite Grout	3/29/95	11:00	3/29/95	13:15
Bentonite Seal	3/29/95	10:20	3/29/95	11:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.08	-	133.54	C1	456.20	-	320.58
133.54	-	143.35	S1	320.58	-	310.77
143.35	-	143.68	C2	310.77	-	310.44

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 131.5-143.9 ft.

Filter Pack: Less than 50 mesh Silica Sand, 130.0-131.5 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-120.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 120.0-131.5 ft.

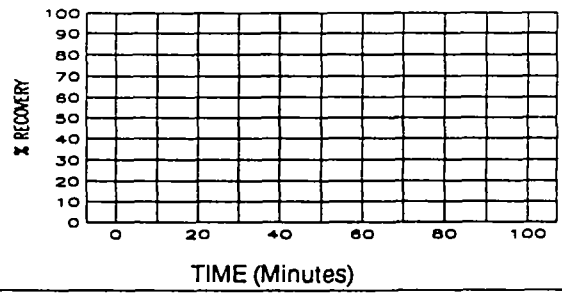
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

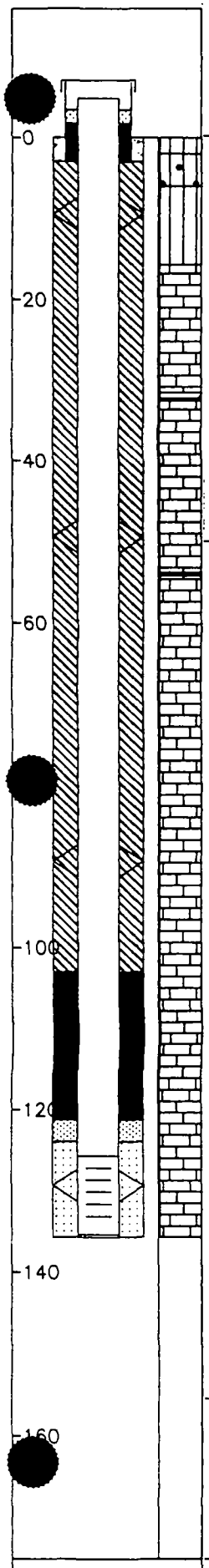


Comments:

Supervised by	B. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ108SS

Well No. PZ-109-SS
Boring No. X-Ref: PZ-109-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068012 ft.
Easting: 516144 ft.

Elevation Ground Level 456.8 ft. NGVD
Top of PVC Casing 458.50 ft. NGVD

Drilling Summary:

Total Depth 135.7 ft.
Borehole Diameter 10 1/4 in. (0.0-15.0 ft.) 5 7/8 in. (15.0-135.7 ft.)
Casing Stickup Height 1.73 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/7/95	7:48	4/8/95	15:30
Schramm Rotary	4/25/95	9:30	4/25/95	11:40
Geophys.Logging:				
Casing:	4/25/95	12:00	4/25/95	12:10
Filter Placement:	4/25/95	12:10	4/25/95	12:20
Cementing:				
Development				
Bentonite Grout	4/25/95	12:45	4/25/95	13:15
Bentonite Seal	4/25/95	12:20	4/25/95	12:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.73	-	125.70	C1	458.50	-	331.07
125.70	-	135.50	S1	331.07	-	321.27
135.50	-	135.83	C2	321.27	-	320.94

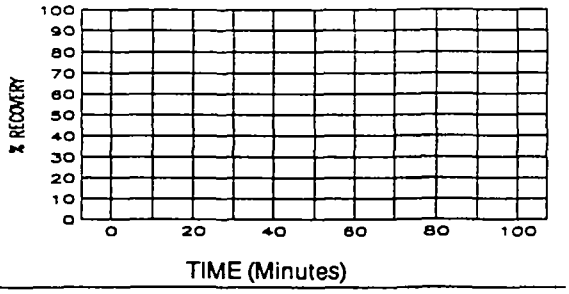
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 124.0-135.7 ft.
Filter Pack: Less than 50 mesh Silica Sand, 121.3-124.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-103.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 103.0-121.3 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

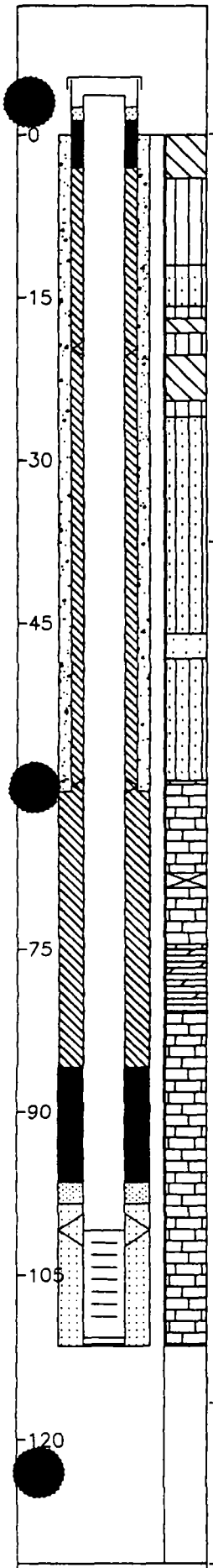


Comments:

Supervised by D. Alloway
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ109SS

Well No. PZ-110-SS
Boring No. X-Ref: PZ-110-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068336 ft.
Easting: 515920 ft.

Elevation Ground Level 456.8 ft. NGVD
Top of PVC Casing 458.91 ft. NGVD

Drilling Summary:

Total Depth 111.5 ft.
Borehole Diameter 10 in. (0.0-61.0 ft.) 5 7/8 in. (61.0-111.5 ft.)
Casing Stickup Height 2.07 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits, NX Core, 5 7/8 in. and 10.0 in. Button Bits
Drilling Fluid Auger-None, NX Core Water, Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
Schramm (augers)	3/13/95	13:30	3/13/95	14:00
CME 75 (Core)	3/24/95	15:25	3/23/95	13:15
Schramm Rotary	5/20/95	7:50	5/20/95	8:45
Geophys.Logging:				
Casing:				
2" PVC	5/20/95	9:05	5/20/95	9:15
6" Steel	5/19/95	11:30	5/19/95	15:00
Filter Placement:	5/20/95	9:20	5/20/95	10:05
Cementing:				
Development				
Bentonite Grout	5/20/95	10:15	5/20/95	10:45
Bentonite Seal	5/20/95	10:45	5/20/95	11:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.07	-	100.90	C1	458.91	-	355.94
100.90	-	110.70	S1	355.94	-	346.14
110.70	-	111.30	C2	346.14	-	345.54
+ 0.50	-	61.00	C3	457.30	-	395.84
	-				-	
	-				-	

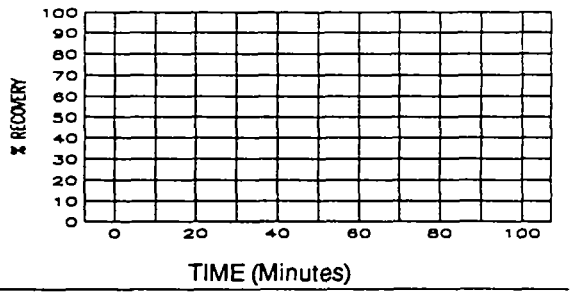
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 98.5-111.5 ft.
Filter Pack: Less than 50 mesh Silica Sand, 96.5-98.5 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-86.0 ft., Neat cement, 3.0-61.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 86.0-96.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

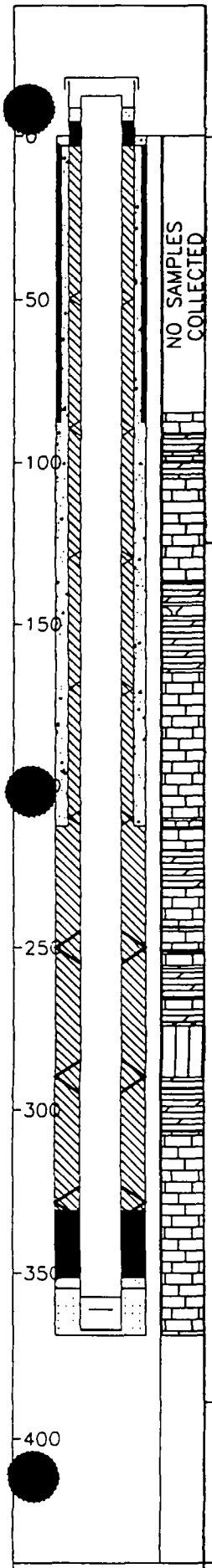


Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ110SS

Well No. PZ-111-KS
Boring No. X-Ref: PZ-111-KS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1068621 ft.	Elevation Ground Level	459.2 ft. NGVD
	Easting: 515850 ft.	Top of PVC Casing	460.87 ft. NGVD

Drilling Summary:

Total Depth 368.8 ft.
Borehole Diameter See comments
Casing Stickup Height 1.69 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 14 3/4 in. Tricone Bit, 10 in. and 5 7/8 in. Button Bits
Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/15/95	7:45	4/24/95	18:45
Schramm Rotary	4/26/95	8:20	4/26/95	10:30
Geophys.Logging:				
Casing:				
2" PVC	5/6/95	7:30	5/6/95	9:00
6" Steel	4/9/95	11:00	4/9/95	15:15
10" Steel	4/8/95	8:00	4/8/95	11:00
Filter Placement:	5/6/95	9:00	5/6/95	10:15
Cementing:				
Development				
Bentonite Grout	5/6/95	10:30	5/6/95	12:30
Bentonite Seal	5/6/95	10:15	5/6/95	10:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.69	-	357.15	C1	460.87	-	102.03
357.15	-	366.96	S1	102.03	-	92.22
366.96	-	367.30	C2	92.22	-	91.88
+ 0.50	-	83.80	C3	459.70	-	375.38
+ 1.00	-	215.30	C4	460.20	-	243.88
	-				-	

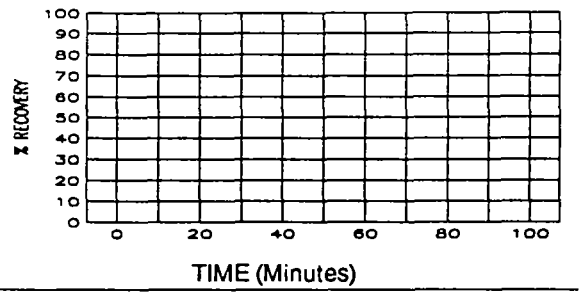
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3&C4-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 354.7-368.8 ft.
Filter Pack: Less than 50 mesh Silica Sand, 351.4-354.7 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-330.97 ft., Neat cement, 3.0-215.3 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 330.97-351.4 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

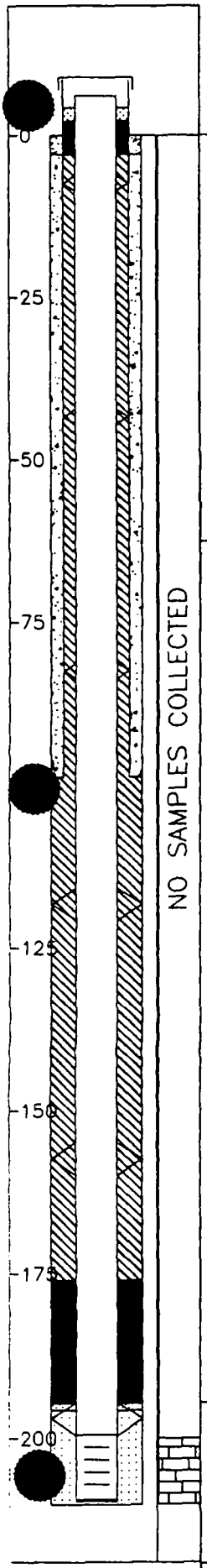


Comments: 14 3/4 in. (0.0-84.0 ft.), 10 in. (84.0-215.5 ft.), 5 7/8 in. (215.5-368.8 ft.)
Surface Casing C3: 10 in. ID / 10 7/8 in. OD Steel Casing
Surface Casing C4: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by	D. Alloway	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ111KS

Well No. PZ-111-SD
Boring No. X-Ref: PZ-111-SD

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1068638 ft.	Elevation Ground Level	459.2 ft. NGVD
	Easting: 515835 ft.	Top of PVC Casing	461.55 ft. NGVD

Drilling Summary:

Total Depth 210.0 ft.
Borehole Diameter 10 in. (0.0-98.0 ft.) 5 7/8 in. (98.0-210.0 ft.)
Casing Stickup Height 2.33 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core
5 7/8 in. Button Bit and 9 7/8 in. Tricone Bit
Drilling Fluid Auger-None, NX Core Water,
Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	4/10/95	9:45	4/11/95	13:38
Geophys.Logging:	4/14/95	13:00	4/14/95	16:00
Casing:				
2" PVC	4/21/95	8:00	4/21/95	8:18
8" Steel	4/10/95	14:05	4/10/95	16:21
Filter Placement:	4/21/95	8:32	4/21/95	9:12
Cementing:				
Development				
Bentonite Grout	4/21/95	9:20	4/21/95	9:50
Bentonite Seal	4/21/95	9:15	4/21/95	9:18

Well Design & Specifications

Basis: Geologic Log X Geophysical Log X
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.33	-	199.40	C1	461.55	-	259.82
199.40	-	209.20	S1	259.82	-	250.02
209.20	-	209.50	C2	250.02	-	249.72
+ 0.50	-	98.00	C3	459.70	-	361.22
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 195.8-210.0 ft.

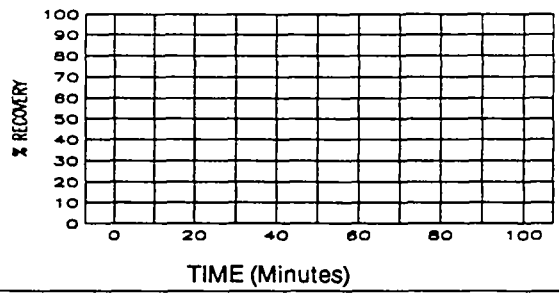
Filter Pack: Less than 50 mesh Silica Sand, 194.7-195.8 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-176.0 ft., Neat cement, 3.0-98.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 176.0-194.7 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



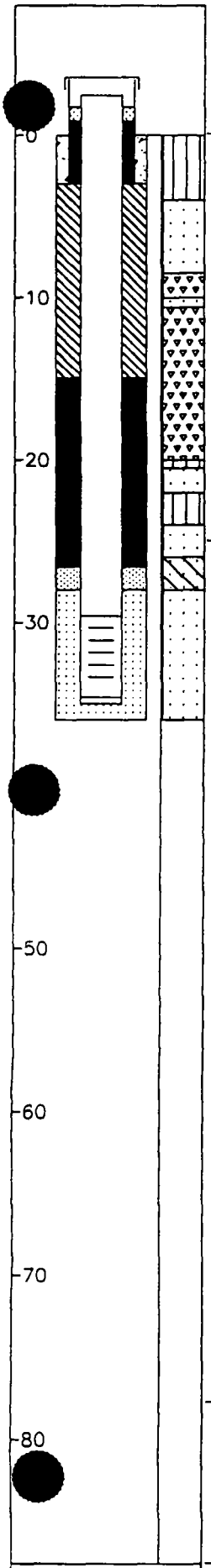
Comments:

Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by	J. Miller	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ111SD

Well No. PZ-112-AS
Boring No. X-Ref: PZ-112-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1069002 ft.
Easting: 515674 ft.

Elevation Ground Level 457.9 ft. NGVD
Top of PVC Casing 459.83 ft. NGVD

Drilling Summary:

Total Depth 36.0 ft.
Borehole Diameter 8 1/4 in.
Casing Stickup Height 1.90 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75
Bit(s) 4 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/10/95	13:20	4/10/95	15:45
Schramm Rotary				
Geophys.Logging:				
Casing:	4/10/95	16:30	4/10/95	16:40
Filter Placement:	4/10/95	16:40	4/10/95	16:59
Cementing:				
Development				
Bentonite Grout	4/10/95	17:15	4/10/95	17:40
Bentonite Seal	4/10/95	17:12	4/10/95	17:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.90	-	29.60	C1	459.83	-	428.33
29.60	-	34.40	S1	428.33	-	423.53
34.40	-	34.73	C2	423.53	-	423.20

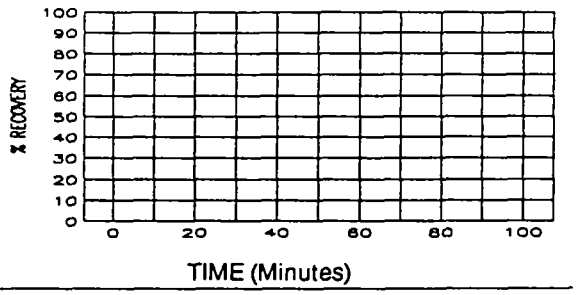
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 28.0-36.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 26.6-28.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-15.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 15.0-26.6 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

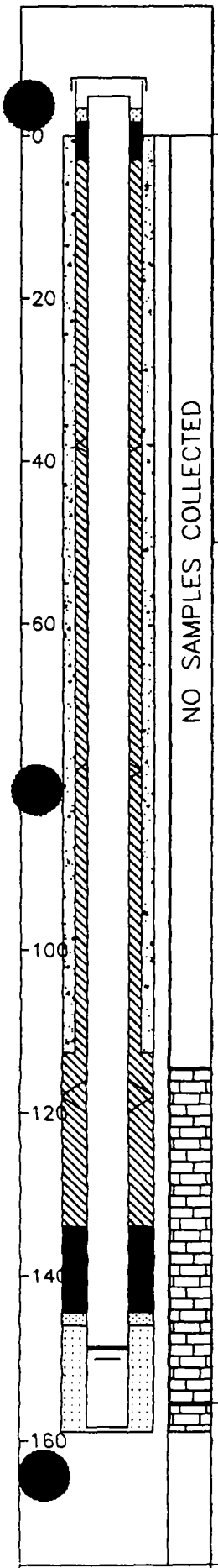


Comments:

Supervised by S. Cosio
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ112AS

Well No. PZ-113-SS
Boring No. X-Ref: PZ-113-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1069242 ft. Easting: 515777 ft.

Elevation Ground Level 460.0 ft. NGVD
Top of PVC Casing 461.77 ft. NGVD

Drilling Summary:

Total Depth 159.0 ft.
Borehole Diameter 9 3/4 in. (0.0-115.0 ft.) 5 7/8 in. (115.0-159.0 ft.)
Casing Stickup Height 1.81 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 3/4 in. Tricone Bit
Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/9/95	9:30	5/9/95	15:40
Schramm Rotary	5/20/95	13:30	5/20/95	14:30
Geophys.Logging:				
Casing:				
2" PVC	5/20/95	14:35	5/20/95	14:45
6" Steel	5/7/95	7:30	5/7/95	16:00
Filter Placement:	5/20/95	14:50	5/20/95	15:40
Cementing:				
Development				
Bentonite Grout	5/20/95	16:05	5/20/95	16:30
Bentonite Seal	5/20/95	15:55	5/20/95	16:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.81	-	148.57	C1	461.77	-	311.39
148.57	-	158.37	S1	311.39	-	301.59
158.37	-	158.70	C2	301.59	-	301.26
+ 0.50	-	115.00	C3	460.40	-	344.96
	-				-	
	-				-	

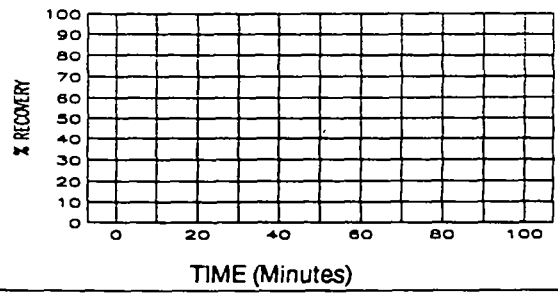
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 146.0-159.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 144.5-146.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-134.0 ft., Neat cement, 3.0-115.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 134.0-144.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



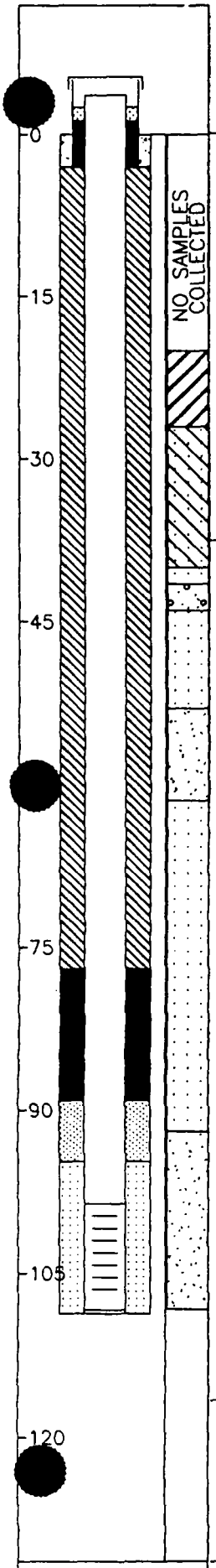
Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Not to Scale

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ113SS

Well No. PZ-113-AD
Boring No. X-Ref: PZ-113-AD

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1069233 ft.	Elevation Ground Level	459.9 ft. NGVD
	Easting: 515760 ft.	Top of PVC Casing	461.46 ft. NGVD

Drilling Summary:

Total Depth 108.7 ft.
Borehole Diameter 10 1/4 in.
Casing Stickup Height 1.60 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/3/95	8:00	5/3/95	9:30
Schramm Rotary				
Geophys.Logging:				
Casing:	5/3/95	13:20	5/3/95	13:30
Filter Placement:	5/3/95	13:30	5/3/95	15:10
Cementing:				
Development				
Bentonite Grout	5/3/95	15:30	5/3/95	18:30
Bentonite Seal	5/3/95	15:10	5/3/95	15:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.60	-	98.60	C1	461.46	-	361.26
98.60	-	108.40	S1	361.26	-	351.46
108.40	-	108.73	C2	351.46	-	351.13

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 94.7-108.7 ft.

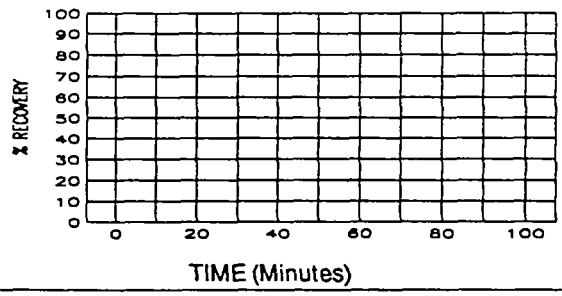
Filter Pack: Less than 50 mesh Silica Sand, 89.1-94.7 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-77.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 77.0-89.1 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



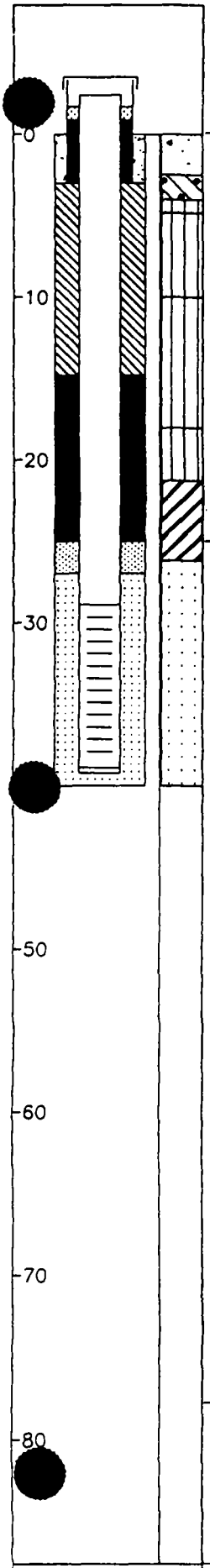
Comments:

Supervised by	D. Alloway	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ113AD

Well No. PZ-113-AS

Boring No. X-Ref: PZ-113-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1069224 ft. Easting: 515748 ft.

Elevation Ground Level 459.9 ft. NGVD

Top of PVC Casing 461.42 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.

Borehole Diameter 8 1/4 in.

Casing Stickup Height 1.50 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75

Bit(s) 4 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/11/95	11:07	4/11/95	14:58
Schramm Rotary				
Geophys.Logging:				
Casing:	4/11/95	15:00	4/11/95	15:10
Filter Placement:	4/11/95	15:12	4/11/95	15:29
Cementing:				
Development				
Bentonite Grout	4/11/95	15:48	4/11/95	16:20
Bentonite Seal	4/11/95	15:40	4/11/95	15:48

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.50	-	28.90	C1	461.42	-	431.02
28.90	-	38.70	S1	431.02	-	421.22
38.70	-	39.03	C2	421.22	-	420.89

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 27.0-40.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 25.0-27.0 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-15.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 15.0-25.0 ft.

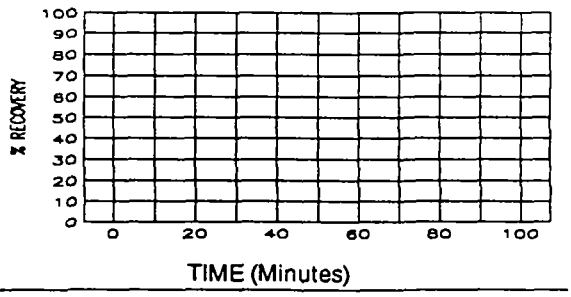
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by S. Cosio

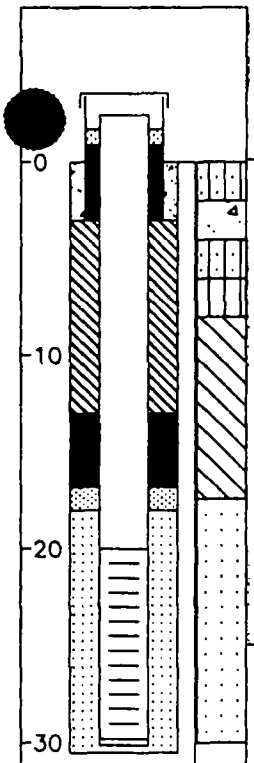
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ113AS

Well No. PZ-114-AS
Boring No. X-Ref: PZ-114-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1069419 ft.	Elevation Ground Level	449.8 ft. NGVD
	Easting: 516768 ft.	Top of PVC Casing	451.31 ft. NGVD

Drilling Summary:

Total Depth 30.5 ft.
Borehole Diameter 10 1/4 in.
Casing Stickup Height 1.53 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/20/95	11:50	4/20/95	12:40
Schramm Rotary				
Geophys.Logging:				
Casing:	4/20/95	13:00	4/20/95	13:30
Filter Placement:	4/20/95	13:15	4/20/95	14:00
Cementing:				
Development				
Bentonite Grout	4/20/95	13:45	4/20/95	14:45
Bentonite Seal	4/20/95	13:30	4/20/95	13:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.53	-	19.90	C1	451.31	-	429.88
19.90	-	29.70	S1	429.88	-	420.08
29.70	-	30.03	C2	420.08	-	419.75

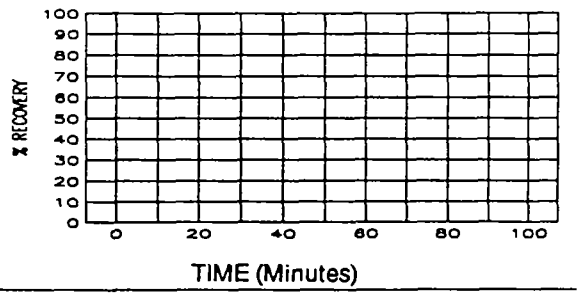
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 18.0-30.5 ft.
Filter Pack: Less than 50 mesh Silica Sand, 16.8-18.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-13.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 13.0-16.8 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

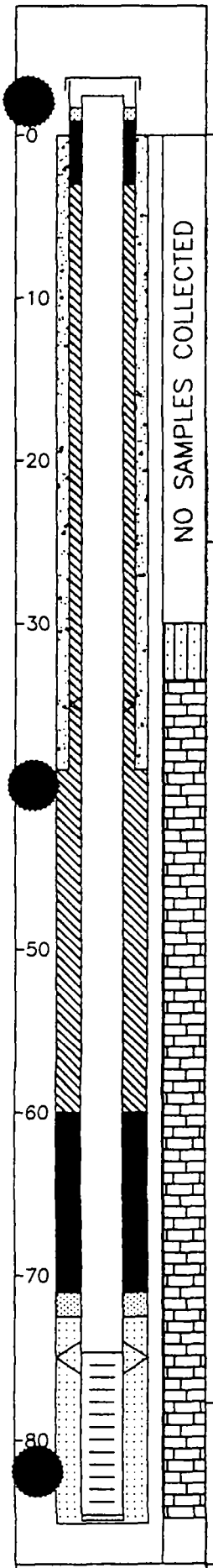


Comments:

Supervised by	D. Alloway	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ114AS

Well No. PZ-115-SS
Boring No. X-Ref: PZ-115-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1069409 ft.	Elevation Ground Level	450.6 ft. NGVD
	Easting: 516755 ft.	Top of PVC Casing	452.30 ft. NGVD

Drilling Summary:

Total Depth 85.0 ft.
Borehole Diameter 9 7/8 in. (0.0-39.0 ft.) 5 7/8 in. (39.0-85.0 ft.)
Casing Stickup Height 1.69 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 7/8 in. Tricone Bit
Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/5/95	8:30	5/5/95	10:00
Schramm Rotary	5/21/95	8:30	5/21/95	10:00
Geophys.Logging:				
Casing:				
2" PVC	5/21/95	10:15	5/21/95	10:20
6" Steel	5/9/95	9:15	5/9/95	12:00
Filter Placement:	5/21/95	10:40	5/21/95	11:00
Cementing:				
Development				
Bentonite Grout	5/21/95	11:10	5/21/95	11:30
Bentonite Seal	5/21/95	11:00	5/21/95	11:10

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.69	-	74.68	C1	452.30	-	375.93
74.68	-	84.48	S1	375.93	-	366.13
84.48	-	84.81	C2	366.13	-	365.80
+ 1.00	-	39.00	C3	451.60	-	411.61
	-				-	
	-				-	

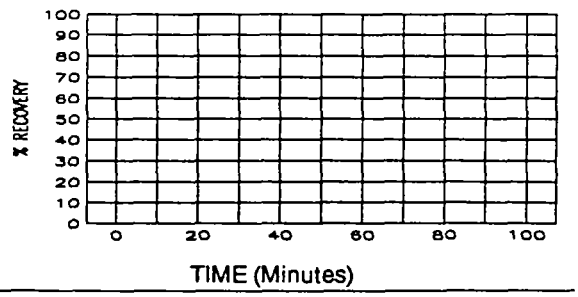
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 72.5-85.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 71.0-72.5 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-60.0 ft., Neat cement, 3.0-39.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 60.0-71.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

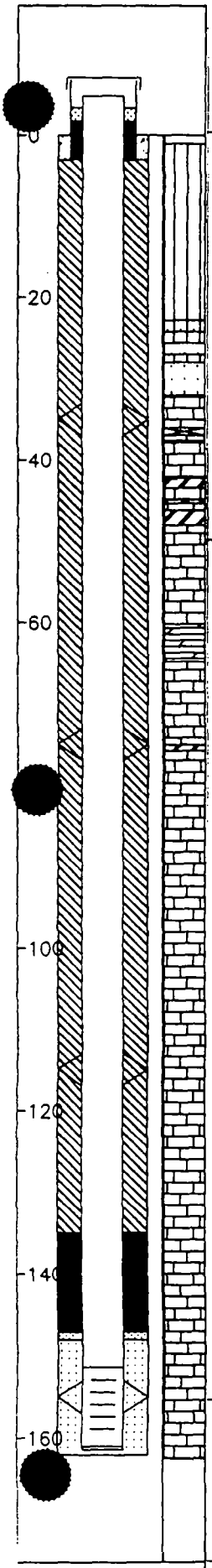


Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by	B. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ115SS

Well No. PZ-116-SS
Boring No. X-Ref: PZ-116-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1066410 ft.
Easting: 515844 ft.

Elevation Ground Level 483.1 ft. NGVD
Top of PVC Casing 484.87 ft. NGVD

Drilling Summary:

Total Depth 162.0 ft.
Borehole Diameter 10 1/4 in. (0.0–33.0 ft.) 5 7/8 in. (33.0–162.0 ft.)
Casing Stickup Height 1.80 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	6/5/95	7:30	6/14/95	13:25
Schramm Rotary	6/20/95	8:00	6/20/95	11:45
Geophys.Logging:				
Casing:	6/20/95	12:30	6/20/95	12:50
Filter Placement:	6/20/95	12:55	6/20/95	13:00
Cementing:				
Development				
Bentonite Grout	6/20/95	13:30	6/20/95	15:30
Bentonite Seal	6/20/95	13:15	6/20/95	13:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.80	-	151.40	C1	484.87	-	331.67
151.40	-	161.00	S1	331.67	-	322.07
161.00	-	161.33	C2	322.07	-	321.74

Casing: C1 2 in. dia. Schedule 80 PVC,
flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap
(4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in.
machine cut slot, flush threaded with
O-rings
Sand Pack: 16-35 mesh Silica Sand, 148.0-162.0 ft.

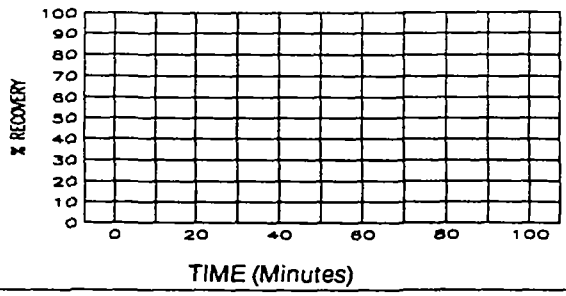
Filter Pack: Less than 50 mesh Silica Sand,
147.0-148.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry,
3.0-135.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%)
Slurry, 135.0-147.0 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

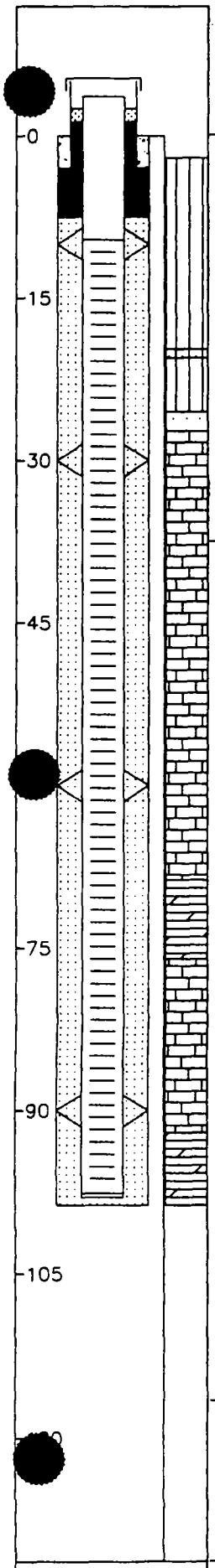


Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ116SS

Well No. PZ-200-SS
Boring No. X-Ref: PZ-200-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068496 ft.
Easting: 516972 ft.

Elevation Ground Level 483.6 ft. NGVD
Top of PVC Casing 485.63 ft. NGVD

Drilling Summary:

Total Depth 98.7 ft.
Borehole Diameter 10 1/4 in. (0.0-27.5 ft.) 5 7/8 in. (27.5-98.3 ft.)
Casing Stickup Height 2.02 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/10/95	10:56	2/10/95	14:05
Schramm Rotary	2/28/95	7:30	2/28/95	9:30
Geophys.Logging:				
Casing:	2/28/95	9:45	2/28/95	10:10
Filter Placement:	2/28/95	10:30	2/28/95	11:30
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	2/28/95	11:30	2/28/95	11:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.02	-	9.62	C1	485.63	-	473.99
9.62	-	97.64	S1	473.99	-	385.97
97.64	-	97.97	C2	385.97	-	385.64
	-				-	
	-				-	
	-				-	

Casing: C1 2 in. Schedule 80 PVC,
flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap
(4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in.
machine cut slot, flush threaded with
O-rings
Sand Pack: 16-35 mesh Silica Sand, 7.5-98.7 ft.

Filter Pack:

Grout Seal:

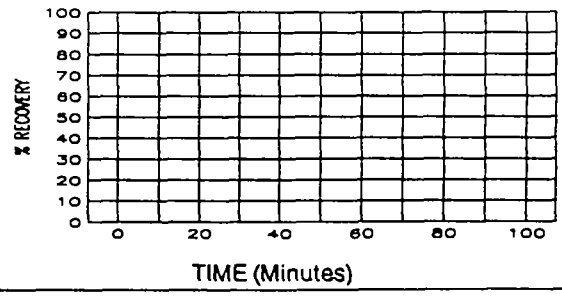
Bentonite Seal: Medium Bentonite Chips,
3.0-7.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

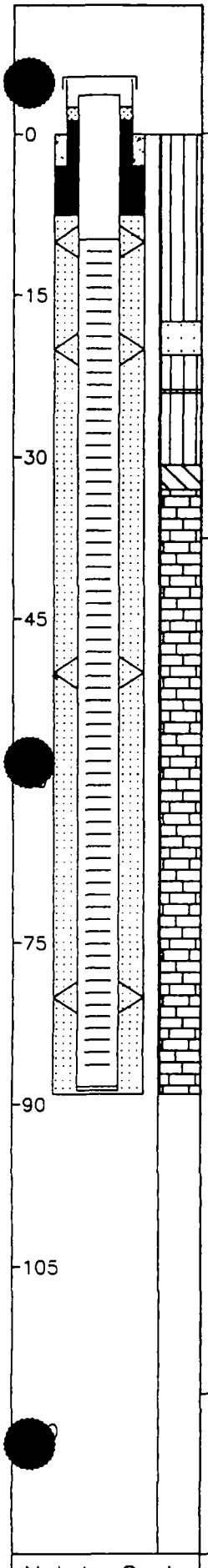


Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ200SS

Well No. PZ-201-SS
Boring No. X-Ref: PZ-201-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067820 ft.
Easting: 516862 ft.

Elevation Ground Level 478.0 ft. NGVD
Top of PVC Casing 480.33 ft. NGVD

Drilling Summary:

Total Depth 89.0 ft.
Borehole Diameter 10 1/4 in. (0.0-33.0 ft.) 5 7/8 in. (33.0-39.0 ft.)
Casing Stickup Height 2.32 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/15/95	8:30	2/15/95	10:30
Schramm Rotary	3/6/95	15:00	3/6/95	16:00
Geophys.Logging:				
Casing:	3/6/95	16:00	3/6/95	16:15
Filter Placement:	3/6/95	16:00	3/6/95	17:40
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	3/6/95	17:40	3/6/95	17:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.32	-	9.75	C1	480.33	-	468.26
9.75	-	88.31	S1	468.26	-	389.70
88.31	-	88.64	C2	389.70	-	389.37

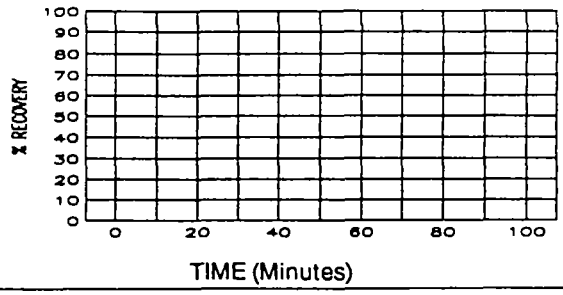
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 7.5-89.0 ft.
Filter Pack:
Grout Seal:
Bentonite Seal: Medium Bentonite Chips, 3.0-7.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

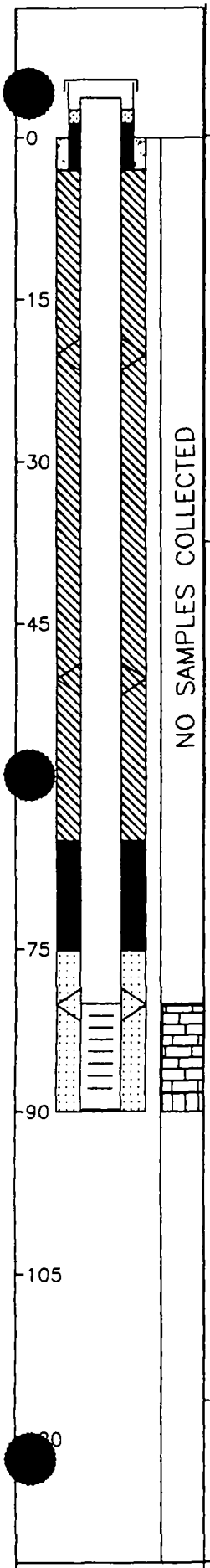


Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ201SS

Well No. PZ-201A-SS
Boring No. X-Ref: PZ-201A-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067832 ft. Easting: 516746 ft.

Elevation Ground Level 478.4 ft. NGVD
Top of PVC Casing 480.16 ft. NGVD

Drilling Summary:

Total Depth 90.0 ft.
Borehole Diameter 10 1/4 in. (0.0-33.0 ft.) 5 7/8 in. (33.0-90.0 ft.)
Casing Stickup Height 1.81 ft.
Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water, Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	4/22/95	11:00	4/23/95	7:45
Geophys.Logging:				
Casing:	4/23/95	7:50	4/22/95	8:00
Filter Placement:	4/23/95	8:00	4/23/95	9:10
Cementing:				
Development				
Bentonite Grout	4/23/95	9:20	4/23/95	11:00
Bentonite Seal	4/23/95	9:00	4/23/95	9:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.81	-	80.00	C1	480.16	-	398.35
80.00	-	89.80	S1	398.35	-	388.55
89.80	-	90.13	C2	388.55	-	388.22

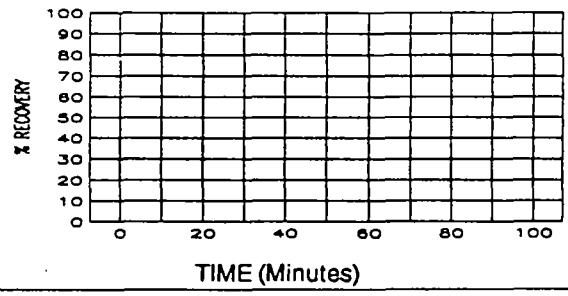
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 75.1-90.0 ft.
Filter Pack:
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-65.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 65.0-75.1 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



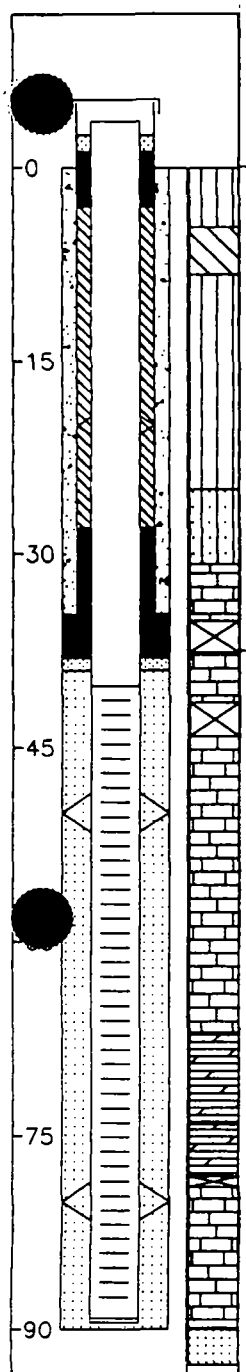
Comments:

Supervised by D. Alloway
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ201ASS

Well No. PZ-202-SS

Boring No. X-Ref: PZ-202-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067320 ft. Easting: 517102 ft.

Elevation Ground Level 479.0 ft. NGVD

Top of PVC Casing 481.17 ft. NGVD

Drilling Summary:

Total Depth 90.0 ft.

Borehole Diameter 10 1/4 in. (0.0–33.5 ft.) 5 7/8 in. (33.5–90.0 ft.)

Casing Stickup Height 2.16 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	2/26/95	7:50	2/27/95	11:05
Schramm Rotary	3/11/95	10:30	3/12/95	8:00
Geophys.Logging:				
Casing:				
2" PVC	3/12/95	8:10	3/12/95	8:30
6" Steel	3/11/95	14:15	3/11/95	14:30
Filter Placement:	3/12/95	8:35	3/12/95	9:10
Cementing:				
Development				
Bentonite Grout	3/12/95	9:35	3/12/95	10:30
Bentonite Seal	3/12/95	9:20	3/12/95	9:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.16	-	40.20	C1	481.17	-	438.81
40.20	-	89.10	S1	438.81	-	389.91
89.10	-	89.43	C2	389.91	-	389.58
+ 1.00	-	34.00	C3	480.00	-	445.01
	-				-	
	-				-	

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 39.0-90.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 38.0-39.0ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-28.0 ft., Neat cement, 3.0-34.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 28.0-38.0 ft.

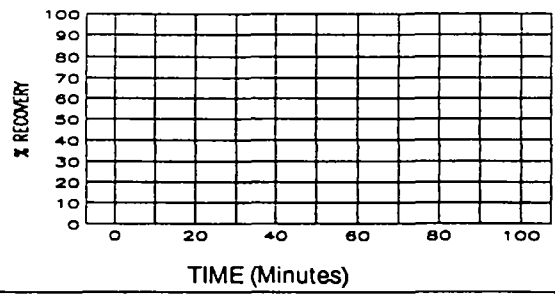
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Not to Scale

Supervised by B. Tilton

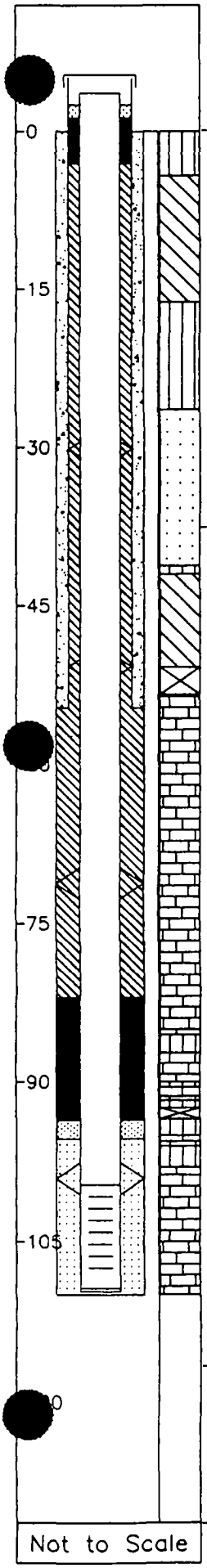
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ202SS

Well No. PZ-203-SS
Boring No. X-Ref: PZ-203-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066662 ft. Easting: 516608 ft.

Elevation Ground Level 484.2 ft. NGVD
Top of PVC Casing 486.59 ft. NGVD

Drilling Summary:

Total Depth 110.0 ft.
Borehole Diameter 10 1/4 in. (0.0-56.0 ft.) 5 7/8 in. (56.0-110.0 ft.)
Casing Stickup Height 2.41 ft.
Driller Layne-Western St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 7/8 in. Tricone Bit
Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/25/95	15:00	5/25/95	11:00
Schramm Rotary	6/3/95	7:20	6/3/95	8:30
Geophys.Logging:				
Casing:				
2" PVC	6/3/95	8:20	6/3/95	8:50
6" Steel	6/2/95	10:30	6/2/95	13:00
Filter Placement:	6/3/95	8:50	6/3/95	9:40
Cementing:				
Development				
Bentonite Grout	6/3/95	10:30	6/3/95	11:00
Bentonite Seal	6/3/95	9:40	6/3/95	10:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.41	-	99.60	C1	486.59	-	384.58
99.60	-	109.40	S1	384.58	-	374.78
109.40	-	109.70	C2	374.78	-	374.48
+ 0.50	-	56.10	C3	484.70	-	428.08
	-				-	
	-				-	

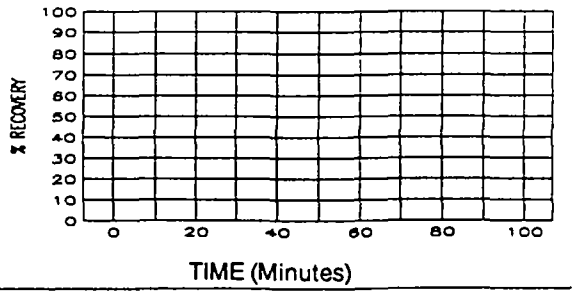
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 95.3-110.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 93.5-95.3 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-82.0 ft., Neat cement, 3.0-56.1 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 82.0-93.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



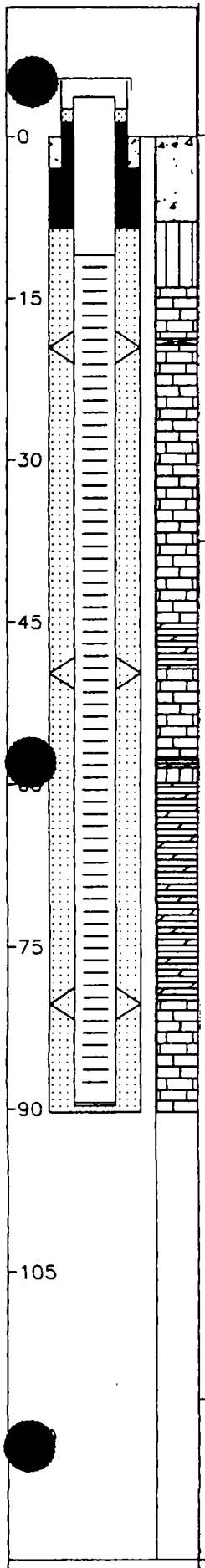
Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by E. Swanson
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ203SS

Well No. PZ-204-SS

Boring No. X-Ref: PZ-204-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1066427 ft. Easting: 515533 ft.

Elevation Ground Level 467.0 ft. NGVD

Top of PVC Casing 469.63 ft. NGVD

Drilling Summary:

Total Depth 90.3 ft.

Borehole Diameter 10 1/4 in. (0.0-14.0 ft.) 5 7/8 in. (14.0-90.3 ft.)

Casing Stickup Height 2.60 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/7/95	15:50	3/8/95	7:45
Schramm Rotary	3/10/95	12:15	3/10/95	14:15
Geophys.Logging:				
Casing:	3/10/95	14:15	3/10/95	14:35
Filter Placement:	3/10/95	14:35	3/10/95	15:05
Cementing:				
Development				
Bentonite Grout Bentonite Seal	3/10/95	15:05	3/10/95	15:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.60	-	10.95	C1	469.63	-	456.08
10.95	-	89.35	S1	456.08	-	377.68
89.35	-	89.68	C2	377.68	-	377.35

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 8.5-90.3 ft.

Filter Pack:

Grout Seal:

Bentonite Seal: Medium Bentonite Chips, 3.0-8.5 ft.

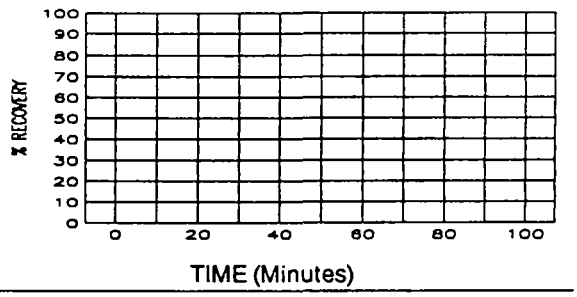
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by B. Tilton

Job Number 943-2848

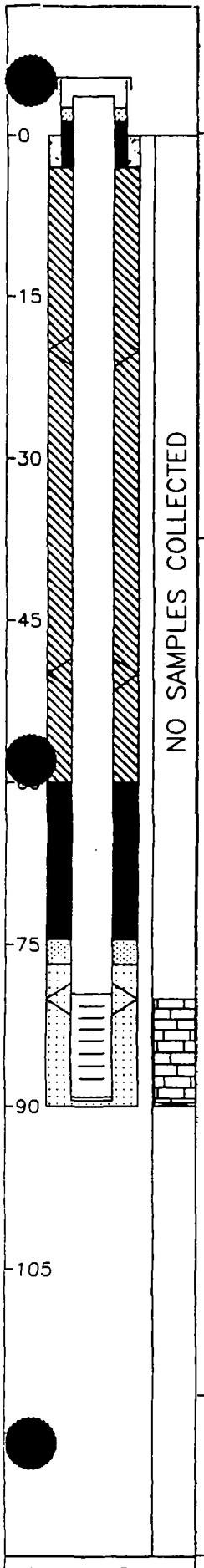
Site LAIDLAW/OU2 RI-FS/MO

File Name PZ204SS

Well No. PZ-204A-SS

Boring No. X-Ref: PZ-204A-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1066430 ft.	Elevation Ground Level	466.7 ft. NGVD
	Easting: 515556 ft.	Top of PVC Casing	468.16 ft. NGVD

Drilling Summary:

Total Depth 90.0 ft.

Borehole Diameter 10 1/4 in. (0.0-14.0 ft.) 5 7/8 in. (14.0-90.0 ft.)

Casing Stickup Height 1.50 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming

Drilling Fluid Auger-None, NX Core Water, Air Rotary

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75				
Schramm Rotary	6/21/95	8:00	6/21/95	14:00
Geophys.Logging:				
Casing:	6/22/95	7:30	6/22/95	7:35
Filter Placement:	6/22/95	7:35	6/22/95	7:45
Cementing:				
Development				
Bentonite Grout	6/22/95	8:00	6/22/95	9:00
Bentonite Seal	6/22/95	7:45	6/22/95	8:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.50	-	79.50	C1	468.16	-	387.16
79.50	-	89.10	S1	387.16	-	377.56
89.10	-	89.43	C2	377.56	-	377.23

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings

C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 76.8-90.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 74.5-76.8 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-60.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 60.0-74.5 ft.

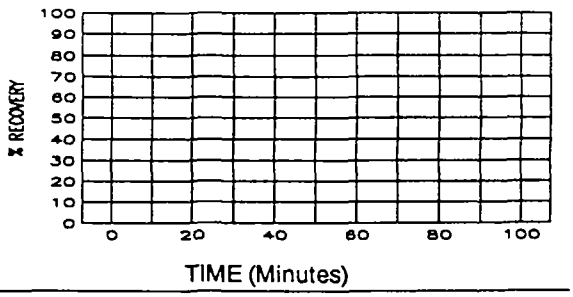
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

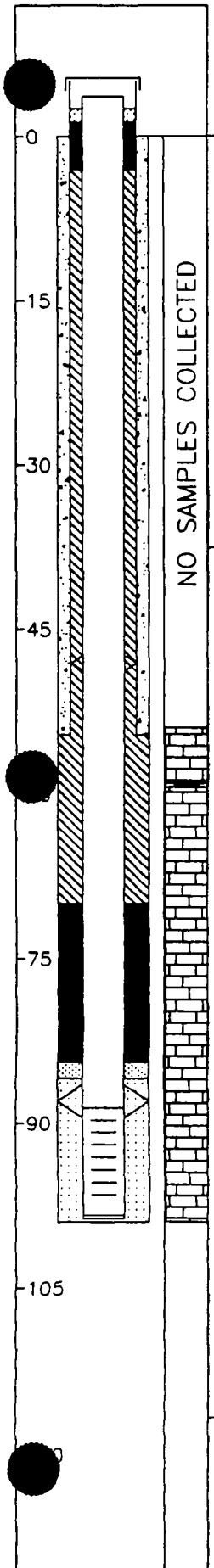


Comments:

Supervised by	B.. Tilton	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ204ASS

Well No. PZ-205-SS
Boring No. X-Ref: PZ-205-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1067484 ft.	Elevation Ground Level	459.5 ft. NGVD
	Easting: 515478 ft.	Top of PVC Casing	461.78 ft. NGVD

Drilling Summary:

Total Depth 99.0 ft.
Borehole Diameter 9 3/4 in. (0.0-54.0 ft.) 5 7/8 in. (54.0-99.0 ft.)
Casing Stickup Height 1.66 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit and 9 3/4 in. Tricone Bit
Drilling Fluid Auger-None, NX Core Water, Air and Mud Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	5/18/95	8:15	5/19/95	11:30
Schramm Rotary	5/21/95	13:30	5/21/95	14:30
Geophys.Logging:				
Casing:				
2" PVC	5/21/95	14:25	5/21/95	14:30
6" Steel	5/11/95	7:30	5/11/95	11:00
Filter Placement:	5/21/95	14:40	5/21/95	15:15
Cementing:				
Development				
Bentonite Grout	5/21/95	15:20	5/21/95	15:35
Bentonite Seal	5/21/95	15:15	5/21/95	15:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.66	-	88.57	C1	461.78	-	370.96
88.57	-	98.37	S1	370.96	-	361.16
98.37	-	98.70	C2	361.16	-	360.83
+ 1.00	-	54.00	C3	460.50	-	405.53
	-				-	
	-				-	

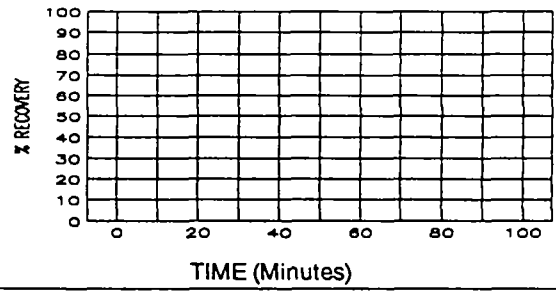
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 86.0-99.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 84.5-86.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-70.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 70.0-84.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



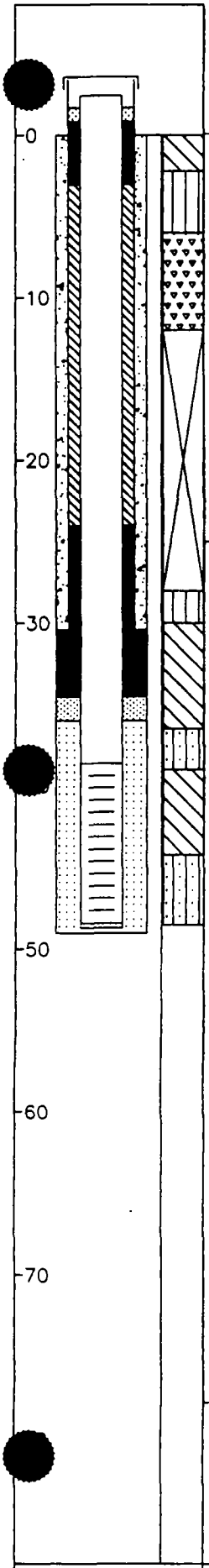
Comments:

Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by	W. Herst	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ205SS

Well No. PZ-205-AS
Boring No. X-Ref: PZ-205-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067464 ft. Easting: 515463 ft.

Elevation Ground Level 459.3 ft. NGVD
Top of PVC Casing 460.99 ft. NGVD

Drilling Summary:

Total Depth 49.0 ft.
Borehole Diameter 14 1/4 in. (0.0-29.0 ft.) 8 1/4 in. (29.0-49.0 ft.)
Casing Stickup Height 1.66 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits
Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/25/95	16:35	3/25/95	11:00
CME 75	4/21/95	14:10	4/21/95	15:30
CME 75	5/5/95	13:30	5/5/95	15:30
Geophys.Logging:				
Casing:				
2" PVC	5/5/95	16:00	5/5/95	16:05
10" Steel	4/21/95	15:29	4/21/95	16:30
Filter Placement:	5/5/95	16:05	5/5/95	16:45
Cementing:				
Development				
Bentonite Grout	5/5/95	17:00	5/5/95	17:30
Bentonite Seal	5/5/95	16:45	5/5/95	17:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.66	-	38.55	C1	460.99	-	420.78
38.55	-	48.35	S1	420.78	-	410.98
48.35	-	48.68	C2	410.98	-	410.65
+ 0.70	-	29.00	C3	460.00	-	430.33

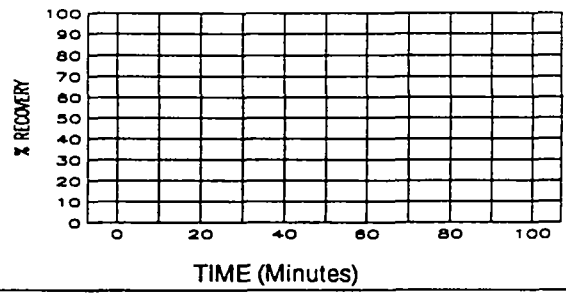
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 36.0-49.0 ft.
Filter Pack: Less than 50 mesh Silica Sand, 34.5-36.0 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-24.0 ft., Neat cement, 3.0-29.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 24.0-34.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

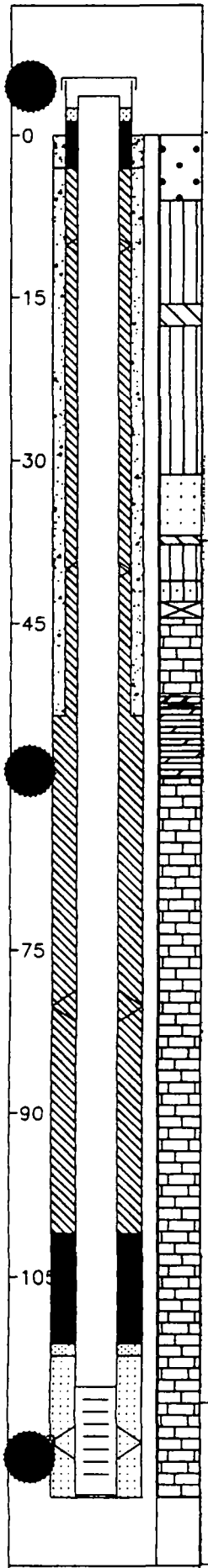


Comments: Surface Casing C3: 10 in. ID / 10 7/8 in. OD Steel Casing

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ205AS

Well No. PZ-206-SS
Boring No. X-Ref: PZ-206-SS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068031 ft. Easting: 515809 ft.

Elevation Ground Level 458.4 ft. NGVD
Top of PVC Casing 460.20 ft. NGVD

Drilling Summary:

Total Depth 125.5 ft.
Borehole Diameter 10 in. (0.0-52.0 ft.) 5 7/8 in. (52.0-125.5 ft.)
Casing Stickup Height 1.82 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits, NX Core, 5 7/8 in. and 10 in. Button Bits
Drilling Fluid Auger-None, NX Core Water, Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	3/9/95	14:30	3/10/95	11:05
Schramm Rotary	4/24/95	11:30	4/24/95	13:30
Geophys.Logging:				
Casing:				
2" PVC	4/24/95	13:45	4/24/95	14:02
6" Steel	3/27/95	9:30	3/23/95	10:15
Filter Placement:	4/24/95	14:00	4/24/95	14:15
Cementing:				
Development				
Bentonite Grout	4/24/95	14:20	4/24/95	15:30
Bentonite Seal	4/24/95	14:10	4/24/95	14:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.82	-	115.00	C1	460.20	-	343.38
115.00	-	124.80	S1	343.38	-	333.58
124.80	-	125.00	C2	333.58	-	333.38
+ 0.70	-	52.00	C3	459.10	-	406.38

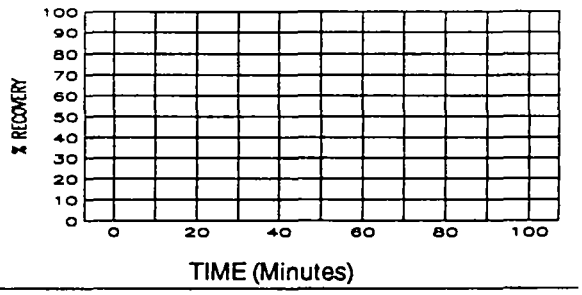
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 112.2-125.5 ft.
Filter Pack: Less than 50 mesh Silica Sand, 111.1-112.2 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-101.0 ft., Neat cement, 3.0-52.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 101.0-111.1 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



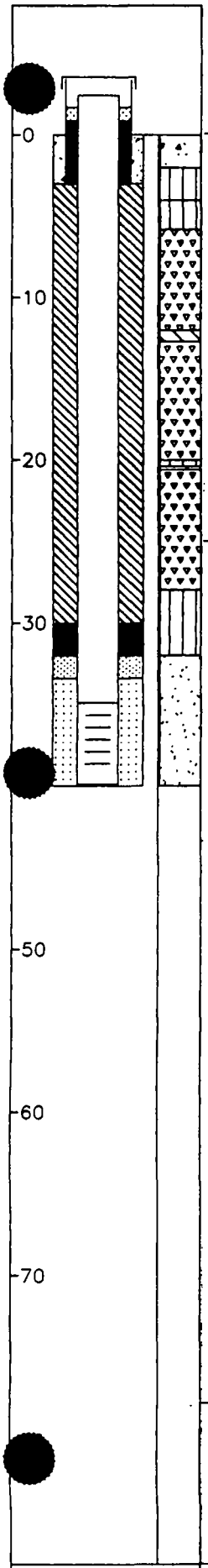
Comments: Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by D. Alloway
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ206SS

Well No. PZ-207-AS

Boring No. X-Ref: PZ-207-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords:	Northing: 1069645 ft.	Elevation Ground Level	461.9 ft. NGVD
	Easting: 516038 ft.	Top of PVC Casing	463.57 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.
Borehole Diameter 8 1/4 in.
Casing Stickup Height 1.69 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,

Drilling Fluid Auger-None

Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	4/9/95	12:35	4/9/95	17:45
Schramm Rotary				
Geophys.Logging:				
Casing:	4/10/95	9:45	4/10/95	10:00
Filter Placement:	4/10/95	10:00	4/10/95	10:17
Cementing:				
Development				
Bentonite Grout	4/10/95	10:35	4/10/95	11:10
Bentonite Seal	4/10/95	10:32	4/10/95	10:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.69	-	34.90	C1	463.57	-	428.98
34.90	-	39.70	S1	428.98	-	422.18
39.70	-	40.03	C2	422.18	-	421.85

Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.)

Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand, 33.4-40.0 ft.

Filter Pack: Less than 50 mesh Silica Sand, 32.0-33.4 ft.

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-20.0 ft.

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 20.0-32.0 ft.

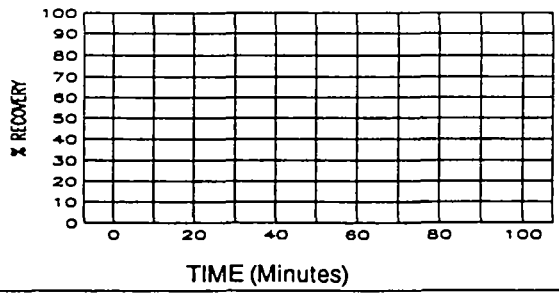
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

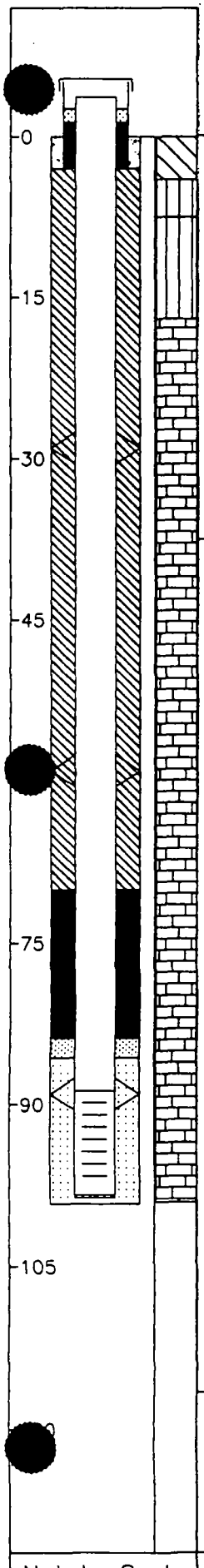


Comments:

Supervised by	S. Cosio	Site	LAIDLAW/OU2 RI-FS/MO
Job Number	943-2848	File Name	PZ207AS

Well No. PZ-208-SS
Boring No. X-Ref: PZ-208-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1069219 ft.
Easting: 517169 ft.

Elevation Ground Level 472.5 ft. NGVD
Top of PVC Casing 474.25 ft. NGVD

Drilling Summary:

Total Depth 99.2 ft.
Borehole Diameter 10 1/4 in. (0.0–17.0 ft.) 5 7/8 in. (17.0–99.2 ft.)
Casing Stickup Height 1.72 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit,
NX Core, 5 7/8 in. Button Bit for Reaming
Drilling Fluid Auger-None, NX Core Water,
Air Rotary
Protective Casing 8x8 in. Square Steel, by 5 ft. long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	6/17/95	8:15	6/17/95	17:35
Schramm Rotary	6/18/95	8:50	6/18/95	10:00
Geophys.Logging:				
Casing:	6/18/95	10:10	6/18/95	10:20
Filter Placement:	6/18/95	10:30	6/18/95	10:55
Cementing:				
Development				
Bentonite Grout	6/18/95	11:15	6/18/95	14:00
Bentonite Seal	6/18/95	11:05	6/18/95	11:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.72	-	88.70	C1	474.25	-	383.83
88.70	-	98.50	S1	383.83	-	374.03
98.50	-	98.83	C2	374.03	-	373.70

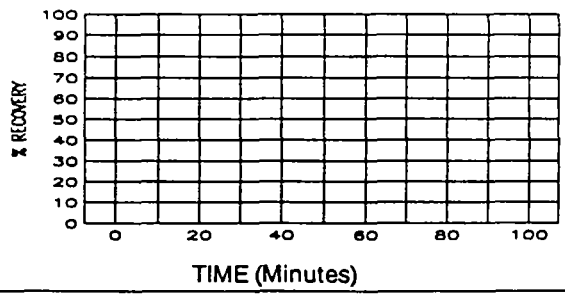
Casing: C1 2 ft. dia. Schedule 80 PVC,
flush threaded with O-rings
C2 2 ft. dia. threaded PVC end cap
(4 in. long or 0.33 ft.)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in.
machine cut slot, flush threaded with
O-rings
Sand Pack: 16-35 mesh Silica Sand, 85.65-99.2 ft.
Filter Pack: Less than 50 mesh Silica Sand,
83.90-85.65 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry,
3.0-70.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%)
Slurry, 70.0-83.90 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

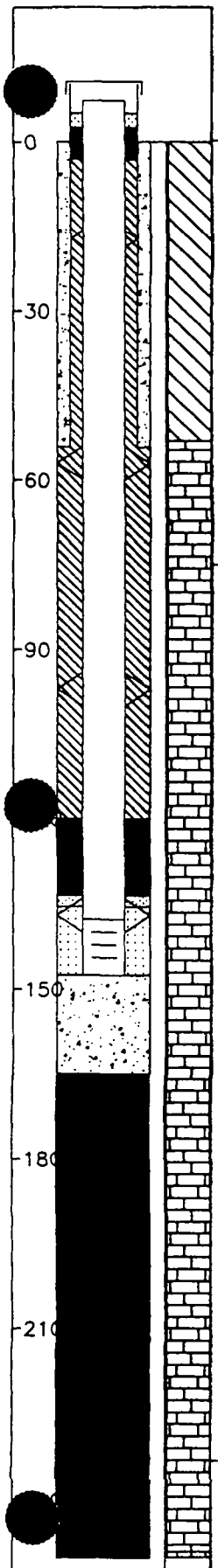


Comments:

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ208SS

Well No. PZ-1201-SS
Boring No. X-Ref: PZ-1201-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067302 ft. Easting: 516904 ft.

Elevation Ground Level 480.4 ft. NGVD
Top of PVC Casing 482.42 ft. NGVD

Drilling Summary:

Total Depth 250.0 ft.
Borehole Diameter Unknown (0.0-53.0 ft.) 5 7/8 in. (53.0-250.0 ft.)
Casing Stickup Height 2.01 ft.
Driller Drilling Service Company/Layne-Western St. Louis, MO

Rig Unknown
Bit(s) Unknown

Drilling Fluid Unknown

Protective Casing Surface Casing (C3-see comments)

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	3/11/85	11:30	3/11/85	19:00
CME 75				
Schramm Rotary				
Geophys.Logging:	6/8/95	15:00	6/8/95	17:30
Casing:	7/7/95	8:15	7/7/95	8:30
Filter Placement:	7/7/95	8:30	7/7/95	8:50
Cementing:				
Development				
Bentonite Grout	7/7/95	9:15	7/7/95	11:00
Bentonite Seal	7/7/95	8:50	7/7/95	9:15

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.01	-	137.70	C1	482.42	-	342.71
137.70	-	147.30	S1	342.71	-	333.11
147.30	-	147.63	C2	333.11	-	332.78
+ 2.60	-	53.00	C3	483.00	-	427.41

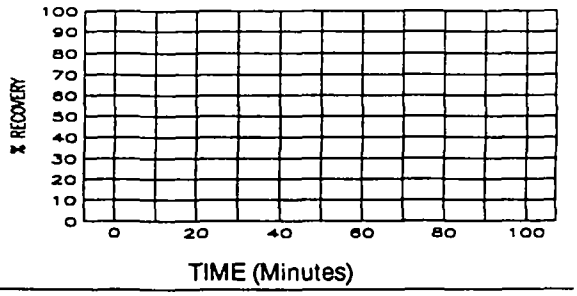
Casing: C1 2 in. dia. Schedule 80 PVC, flush threaded with O-rings
C2 2 in. dia. threaded PVC end cap (4 in. long or 0.33 ft.) (C3-see comments)
Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings
Sand Pack: 16-35 mesh Silica Sand, 135.5-147.5 ft.
Filter Pack: Less than 50 mesh Silica Sand, 133.5-135.5 ft.
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-120.0 ft.
Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 120.0-133.5 ft.
Concrete: 0.0-3.0 ft.

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



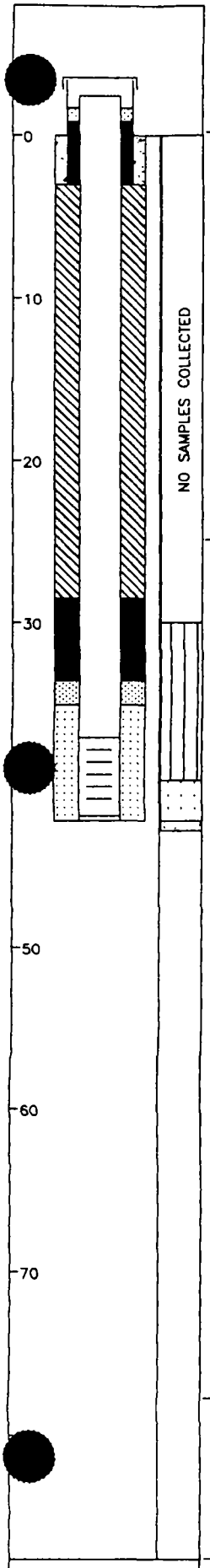
Comments:

The borehole was originally drilled by Drilling Service Company in 1985 to a total depth of 250.0 ft. The borehole remained open from below the surface casing to total depth until the bottom of the borehole was sealed with bentonite grout from 165.0-250.0 ft., and neat cement from 148.5-165.0 ft. A piezometer was then constructed within the remainder of the borehole. The grout seals and well installation were performed by Layne-Western Drilling of St. Louis, MO, in July, 1995. Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing

Supervised by B. Tilton
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ1201SS

Well No. PZ-300-AD
Boring No. X-Ref: PZ-300-AD

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1065214 ft. Easting: 513828 ft.

Elevation Ground Level 448.1 ft. NGVD
Top of PVC Casing 449.62 ft. NGVD

Drilling Summary:

Total Depth 42.2 ft.
Borehole Diameter 8 1/4" (0.0-42.2')
Casing Stickup Height 1.52 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/24/95	13:00	9/24/95	16:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/24/95	17:05	9/24/95	17:10
Filter Placement:	9/24/95	17:10	9/24/95	18:15
Cementing:				
Development				
Bentonite Grout	9/24/95	18:20	9/24/95	18:45
Bentonite Seal	9/24/95	18:15	9/24/95	18:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.52	-	37.10	C1	449.62	-	411.00
37.10	-	41.90	S1	411.00	-	406.20
41.90	-	42.20	C2	406.20	-	405.90

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 35.1-42.2'

Filter Pack: 100 mesh Silica Sand 33.6-35.1'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-28.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 28.5-33.6'

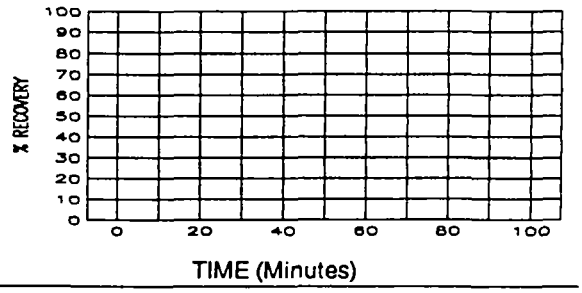
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:

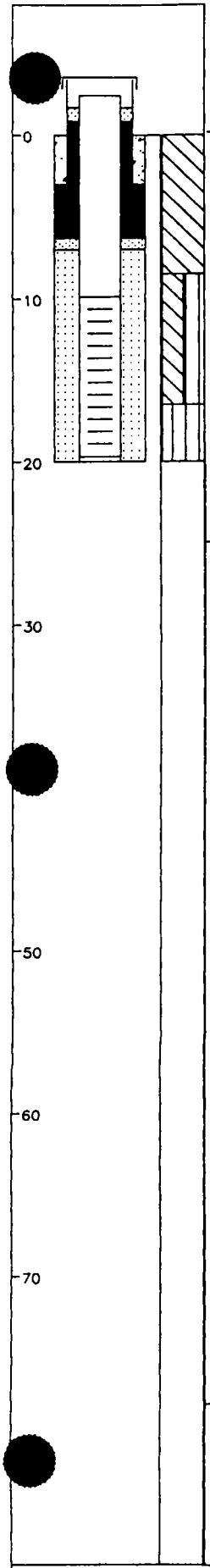


Comments:

Supervised by B. Harrington
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ300AD

Well No. PZ-300-AS
Boring No. X-Ref: PZ-300-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1065198 ft.
Easting: 513868 ft.

Elevation Ground Level 448.5 ft. NGVD
Top of PVC Casing 450.66 ft. NGVD

Drilling Summary:

Total Depth 20.0 ft.
Borehole Diameter 8 1/4" (0.0-20.0')
Casing Stickup Height 2.16 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/26/95	16:15	9/26/95	17:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/26/95	17:00	9/26/95	17:05
Filter Placement:	9/26/95	17:05	9/26/95	17:15
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	9/26/95	17:15	9/26/95	17:25

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.16	-	9.90	C1	450.66	-	438.60
9.90	-	19.70	S1	438.60	-	428.80
19.70	-	20.00	C2	428.80	-	428.50
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 7.0-20.0'

Filter Pack: 100 mesh Silica Sand 6.3-7.0'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%)
Slurry 3.0-6.3'

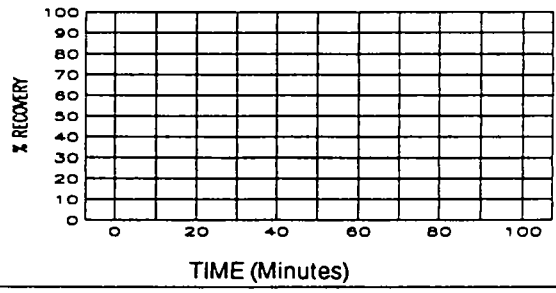
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



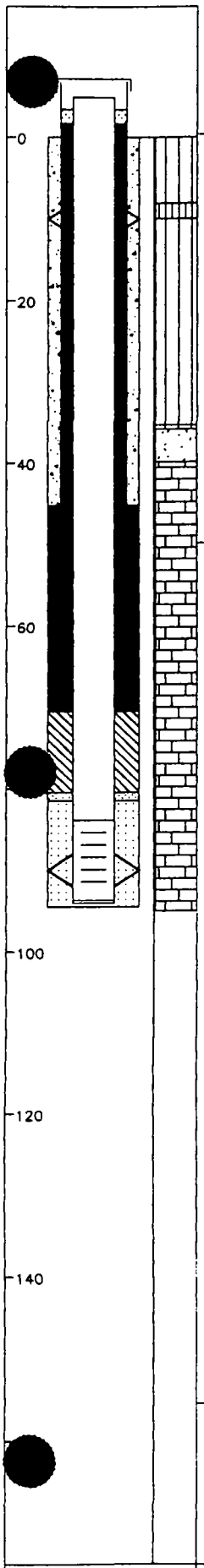
Comments:

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ300AS

Well No. PZ-300-SS
Boring No. X-Ref: PZ-300-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1065205 ft.
Easting: 513850 ft.

Elevation Ground Level 448.4 ft. NGVD
Top of PVC Casing 449.60 ft. NGVD

Drilling Summary:

Total Depth 94.5 ft.
Borehole Diameter 9 7/8" (0.0-46.0') 5 7/8" (46.0-93.0')
Casing Stickup Height 1.20 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750 Schramm Rotadrill T660H
Bit(s) 4 1/4" ID Hollow Stem Auger Bit,
NX Core, 5 7/8" Button Bit for Reaming
Drilling Fluid NX Core Water, Air and Bentonite
Mud Rotary
Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (Auger)	9/22/95	16:30	9/23/95	10:30
Schramm Rotary	9/25/95	10:30	9/25/95	13:00
CME 75 (Core)	9/23/95	13:05	9/23/95	9:15
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/26/95	10:45	9/26/95	10:55
6" I.D. Steel	9/25/95	13:00	9/25/95	16:00
Filter Placement:	9/26/95	10:50	9/26/95	11:00
Cementing:				
Development				
Bentonite Grout	9/26/95	11:30	9/26/95	12:35
Bentonite Seal	9/26/95	11:00	9/26/95	11:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.20	-	83.88	C1	449.60	-	364.52
83.88	-	93.70	S1	364.52	-	354.70
93.70	-	94.00	C2	354.70	-	354.40
+ 0.80	-	46.00	C3	447.60	-	402.40
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33') (C3-see comments)
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 81.5-94.5'

Filter Pack: 100 mesh Silica Sand 80.5-81.5'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 70.5-81.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-70.5'

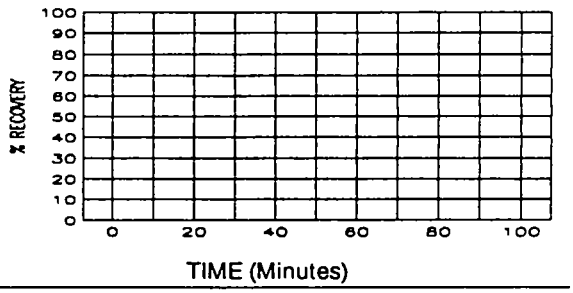
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

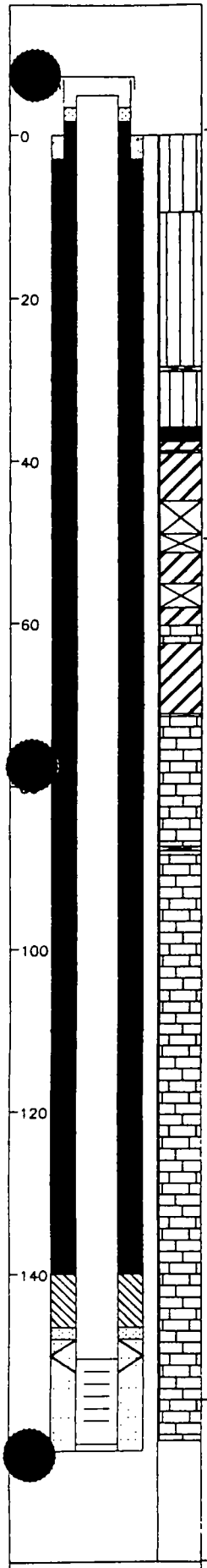
Surface Casing C3: 6 1/8 in. ID / 6 5/8 in. OD Steel Casing
Neat cement grout used to seal annulus between 6 7/8 in. OD steel casing and 9 7/8 in. diameter

Supervised by B. Tilton
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ300SS

Well No. PZ-301-SS
Boring No. X-Ref: PZ-301-SS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1064802 ft.
Easting: 515517 ft.

Elevation Ground Level 513.1 ft. NGVD
Top of PVC Casing 514.71 ft. NGVD

Drilling Summary:

Total Depth 161.5 ft.
Borehole Diameter 8 1/4" (0.0-19.0') 5 7/8" (19.0-161.5')
Casing Stickup Height 1.61 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 75, Schramm Portadrill T660H
Bit(s) 4 1/4" ID Hollow Stem Auger Bit,
NX Core, 5 7/8" Button Bit for Reaming
Drilling Fluid NX Core Water, Air Rotary

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75 (Auger)	9/19/95	11:30	9/19/95	14:15
Schramm Rotary	9/22/95	9:15	9/23/95	11:30
CME 75 (Core)	9/19/95	16:00	9/21/95	12:35
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/23/95	12:00	9/23/95	12:15
Filter Placement:	9/23/95	12:15	9/23/95	13:00
Cementing:				
Development				
Bentonite Grout	9/23/95	13:15	9/23/95	13:45
Bentonite Seal	9/23/95	13:45	9/23/95	15:30

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.61	-	150.90	C1	514.71	-	362.20
150.90	-	160.70	S1	362.20	-	352.40
160.70	-	161.00	C2	352.40	-	352.10
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC,
flush threaded with O-rings
C2 2" dia. threaded PVC end cap
(4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine
cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 148.0-161.5'

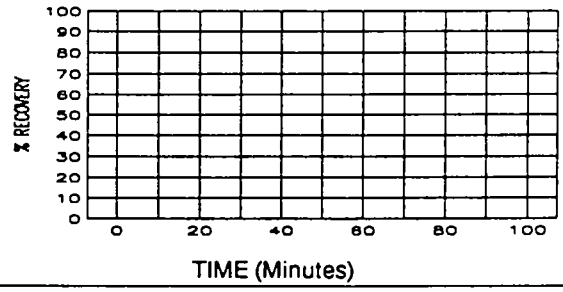
Filter Pack: Less than 50 mesh Silica Sand
146.5-148.0'
Grout Seal: Wyo-Ben Grout Well Bentonite Slurry
140.0-146.5'
Bentonite Seal: Extra high yield Wyo-Ben (100%)
Slurry 3.0-140.0'
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



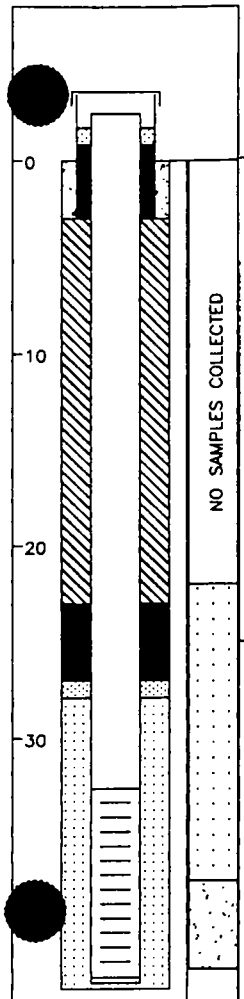
Comments:

Supervised by B. Tilton
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ301SS

Well No. PZ-302-AI
Boring No. X-Ref: PZ-302-AI

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067210 ft.
Easting: 514720 ft.

Elevation Ground Level 450.0 ft. NGVD
Top of PVC Casing 451.15 ft. NGVD

Drilling Summary:

Total Depth 43.0 ft.
Borehole Diameter 8 1/4" (0.0-43.0')
Casing Stickup Height 1.15 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit,
3 5/8" Tricone Bit
Drilling Fluid Bentonite Drilling Mud (20.0-42.0')

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/26/95	8:15	9/26/95	11:30
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/26/95	12:50	9/26/95	12:55
Filter Placement:	9/26/95	13:05	9/26/95	13:40
Cementing:				
Development				
Bentonite Grout	9/26/95	14:00	9/26/95	14:15
Bentonite Seal	9/26/95	13:40	9/26/95	13:50

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.15	-	32.60	C1	451.15	-	417.40
32.60	-	42.40	S1	417.40	-	407.60
42.40	-	42.70	C2	407.60	-	407.30

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 27.9-43.0'

Filter Pack: 100 mesh Silica Sand 27.0-27.9'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-23.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 23.0-27.0'

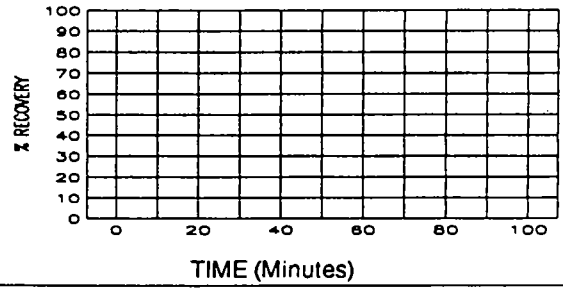
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

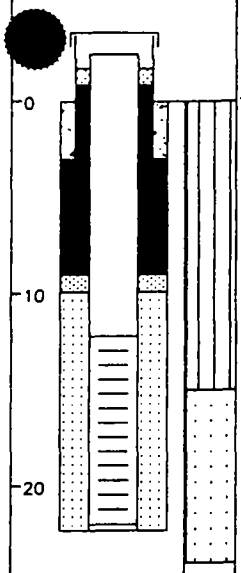
Not to Scale

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ302AI

Well No. PZ-302-AS
Boring No. X-Ref: PZ-302-AS

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067198 ft.
Easting: 514737 ft.

Elevation Ground Level 449.5 ft. NGVD
Top of PVC Casing 451.42 ft. NGVD

Drilling Summary:

Total Depth 22.3 ft.
Borehole Diameter 8 1/4" (0.0-22.3')
Casing Stickup Height 1.92 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/25/95	11:45	9/25/95	14:35
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/25/95	14:55	9/25/95	15:00
Filter Placement:	9/25/95	15:00	9/25/95	15:40
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	9/25/95	15:40	9/25/95	15:50

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.92	-	12.20	C1	451.42	-	437.30
12.20	-	22.00	S1	437.30	-	427.50
22.00	-	22.30	C2	427.50	-	427.20

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 9.9-22.3'

Filter Pack: 100 mesh Silica Sand 9.0-9.9'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-9.0'

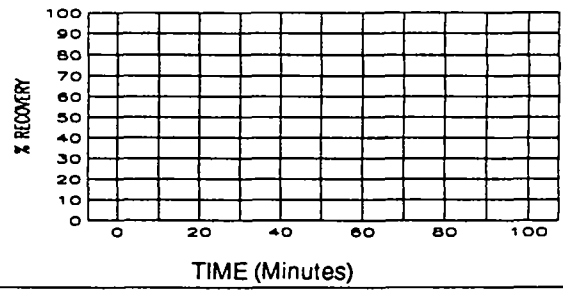
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

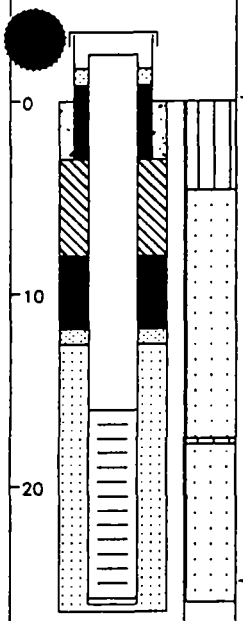
Not to Scale

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ302AS

Well No. PZ-303-AS
Boring No. X-Ref: PZ-303-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067763 ft.
Easting: 514426 ft.

Elevation Ground Level 450.8 ft. NGVD
Top of PVC Casing 453.18 ft. NGVD

Drilling Summary:

Total Depth 26.5 ft.
Borehole Diameter 8 1/4" (0.0-26.5')
Casing Stickup Height 2.38 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/4/95	16:45	10/5/95	8:45
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/5/95	9:00	10/5/95	9:05
Filter Placement:	10/5/95	9:05	10/5/95	9:55
Cementing:				
Development				
Bentonite Grout	10/5/95	10:15	10/5/95	10:20
Bentonite Seal	10/5/95	9:55	10/5/95	10:05

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.38	-	16.00	C1	453.18	-	434.80
16.00	-	25.80	S1	434.80	-	425.00
25.80	-	26.10	C2	425.00	-	424.70

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 12.6-26.5'

Filter Pack: Less than 50 mesh Silica Sand 11.8-12.6'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-8.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 8.0-11.8'

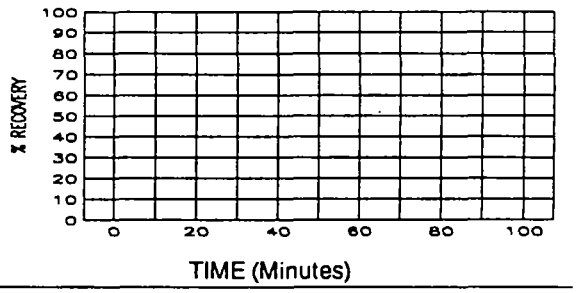
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



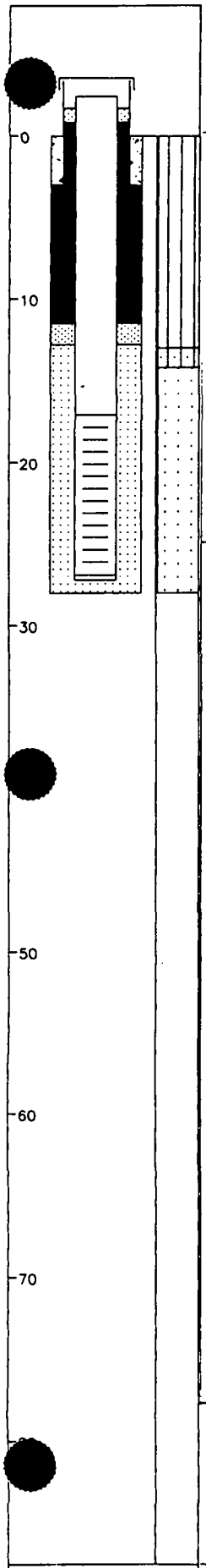
Comments:

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ303AS

Well No. PZ-304-AS
Boring No. X-Ref: PZ-304-AS

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068146 ft.
Easting: 514435 ft.

Elevation Ground Level 451.4 ft. NGVD
Top of PVC Casing 453.71 ft. NGVD

Drilling Summary:

Total Depth 28.0 ft.
Borehole Diameter 8 1/4" (0.0-28.0')
Casing Stickup Height 2.31 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	9/27/95	10:10	9/27/95	12:10
Geophys.Logging:				
Casing:				
2" I.D. PVC	9/27/95	13:40	9/27/95	13:45
Filter Placement:	9/27/95	13:45	9/27/95	14:30
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	9/27/95	14:30	9/27/95	14:45

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.31	-	17.10	C1	453.71	-	434.30
17.10	-	26.90	S1	434.30	-	424.50
26.90	-	27.20	C2	424.50	-	424.20
	-				-	
	-				-	
	-				-	

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 12.8-28.0'

Filter Pack: 100 mesh Silica Sand 11.5-12.8'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-11.5'

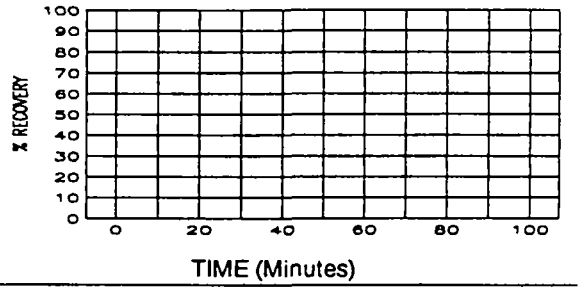
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

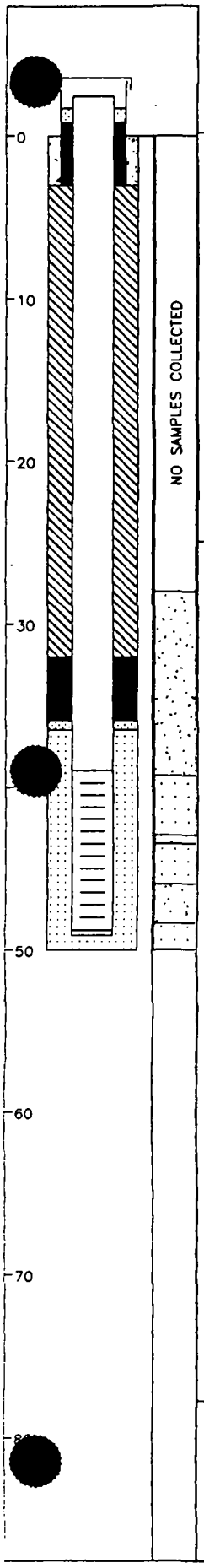
Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name PZ304AS

Well No. PZ-304-AI

Boring No. X-Ref: PZ-304-AI

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068126 ft. Easting: 514435 ft.

Elevation Ground Level 451.6 ft. NGVD

Top of PVC Casing 454.02 ft. NGVD

Drilling Summary:

Total Depth 50.0 ft.

Borehole Diameter 8 1/4" (0.0-50.0')

Casing Stickup Height 2.42 ft.

Driller Layne-Western, St. Louis, MO

Rig CME 75, Schramm Portadrill T660H

Bit(s) 4 1/4" ID Hollow Stem Auger Bit; 3/8" Tricone Bit

Drilling Fluid Bentonite Drilling Mud (23.0-50.0')

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/2/95	8:00	10/2/95	14:15
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/2/95	14:20	10/2/95	14:25
Filter Placement:	10/2/95	14:25	10/2/95	15:10
Cementing:				
Development				
Bentonite Grout	10/2/95	15:45	10/2/95	16:45
Bentonite Seal	10/2/95	15:15	10/2/95	15:20

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.42	-	39.00	C1	454.02	-	412.60
39.00	-	48.80	S1	412.60	-	402.80
48.80	-	49.10	C2	402.80	-	402.50

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings

C2 2" dia. threaded PVC end cap (4" long or 0.33')

Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 36.5-50.0'

Filter Pack: 100 mesh Silica Sand 35.9-36.5'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-32.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 32.0-35.9'

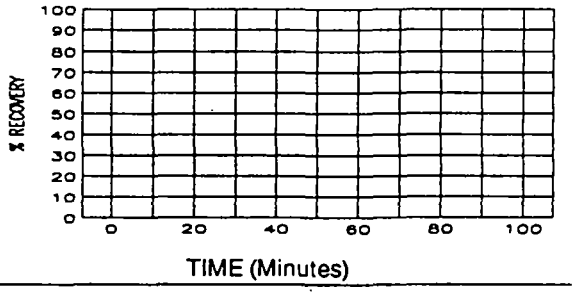
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Not to Scale

Supervised by B. Harrington

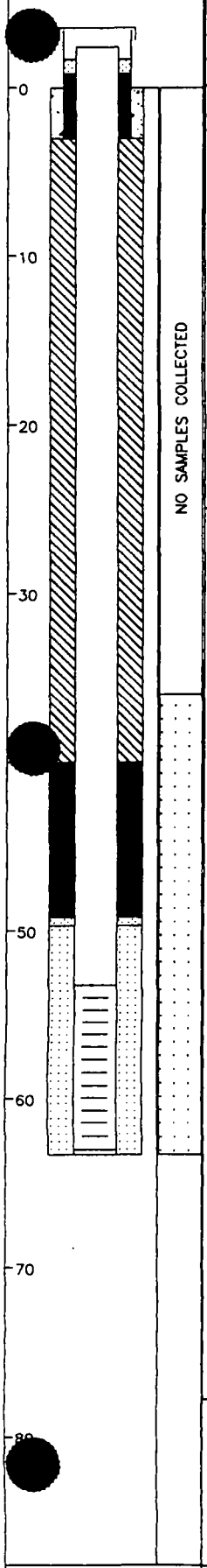
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO

File Name PZ304AI

Well No. PZ-305-AI
Boring No. X-Ref: PZ-305-AI

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068065 ft. Easting: 515634 ft.

Elevation Ground Level 457.6 ft. NGVD
Top of PVC Casing 459.28 ft. NGVD

Drilling Summary:

Total Depth 64.0 ft.
Borehole Diameter 8 1/4" (0.0-64.0')
Casing Stickup Height 1.68 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit
3/8" Tricone Bit
Drilling Fluid Bentonite Mud below 28.0'

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/18/95	11:00	10/19/95	8:30
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/19/95	10:22	10/19/95	10:30
Filter Placement:	10/19/95	10:39	10/19/95	10:24
Cementing:				
Development				
Bentonite Grout	10/19/95	10:32	10/19/95	11:15
Bentonite Seal	10/19/95	10:24	10/19/95	10:32

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.68	-	53.20	C1	459.28	-	404.40
53.20	-	63.00	S1	404.40	-	394.60
63.00	-	63.30	C2	394.60	-	394.30

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 49.7-63.3'

Filter Pack: 100 mesh Silica Sand 49.2-49.7'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-40.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 40.0-49.2'

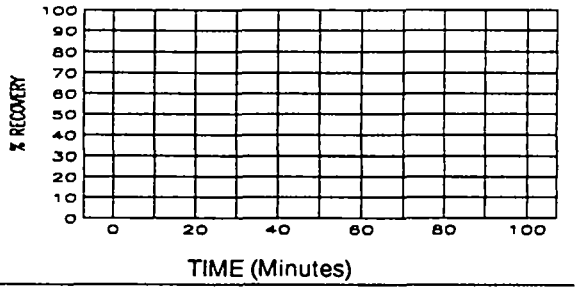
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

Supervised by M. Sandfort
Job Number 943-2848

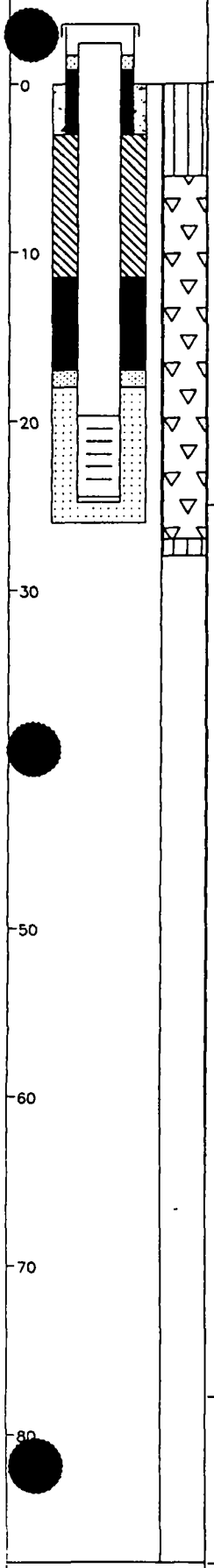
Site LAIDLAW/OU2 RI-FS/MO
File Name PZ305AI

APPENDIX E-2

LEACHATE RISER CONSTRUCTION SUMMARIES

Well No. LR-100
Boring No. X-Ref: LR-100

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1067294 ft. Easting: 514894 ft.

Elevation Ground Level 467.2 ft. NGVD
Top of PVC Casing 469.12 ft. NGVD

Drilling Summary:

Total Depth 26.0 ft.
Borehole Diameter 8 1/4" (0.0-26.0')
Casing Stickup Height 1.92 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/4/95	7:30	10/4/95	11:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/4/95	12:00	10/4/95	12:10
Filter Placement:	10/4/95	12:10	10/4/95	13:05
Cementing:				
Development				
Bentonite Grout	10/4/95	14:45	10/4/95	14:55
Bentonite Seal	10/4/95	14:30	10/4/95	14:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.92	-	19.70	C1	469.12	-	447.50
19.70	-	24.50	S1	447.50	-	442.70
24.50	-	24.80	C2	442.70	-	442.40

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 18.0-26.0'

Filter Pack: 100 mesh Silica Sand 17.0-18.0'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-11.5'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 11.5-16.0'; Chips 16.0-17.0'

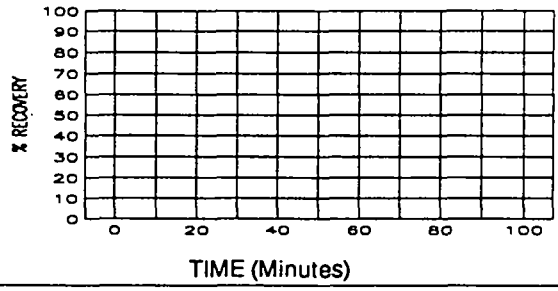
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



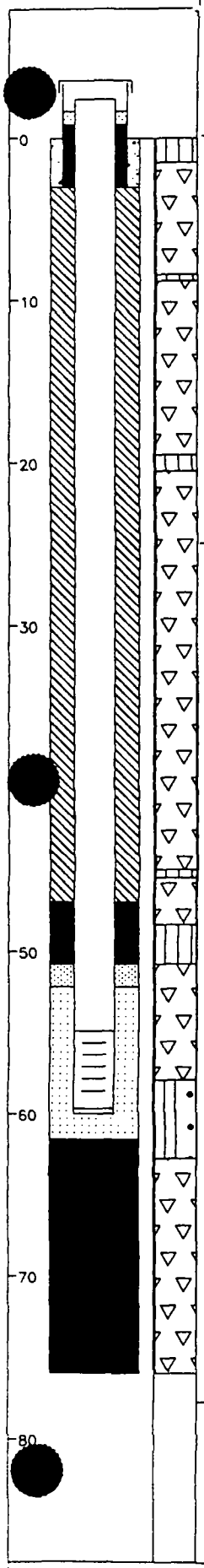
Comments:

Drilled to 26.0 ft. then collected split spoon sample from 26.0-28.0 ft.

Supervised by B. Harrington
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name LR100

Well No. LR-102
Boring No. X-Ref: LR-102

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1068937 ft.
Easting: 514788 ft.

Elevation Ground Level 512.0 ft. NGVD
Top of PVC Casing 513.52 ft. NGVD

Drilling Summary:

Total Depth 76.0 ft.
Borehole Diameter 8 1/4" (0.0-76.0')
Casing Stickup Height 1.52 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/6/95	11:55	10/7/95	14:30
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/8/95	14:30	10/8/95	15:05
Filter Placement:	10/8/95	12:50	10/8/95	15:45
Cementing:				
Development				
Bentonite Grout	10/8/95	16:20	10/8/95	
Bentonite Seal	10/8/95	15:45	10/8/95	15:55

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.52	-	54.90	C1	513.52	-	457.10
54.90	-	59.70	S1	457.10	-	452.30
59.70	-	60.00	C2	452.30	-	452.00

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 52.2-61.6'

Filter Pack: Less than 50 mesh Silica Sand 50.8-52.2'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-47.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 47.0-50.8', Chips 61.6-76.0'

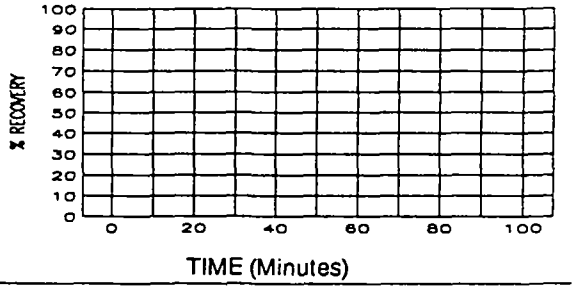
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments:

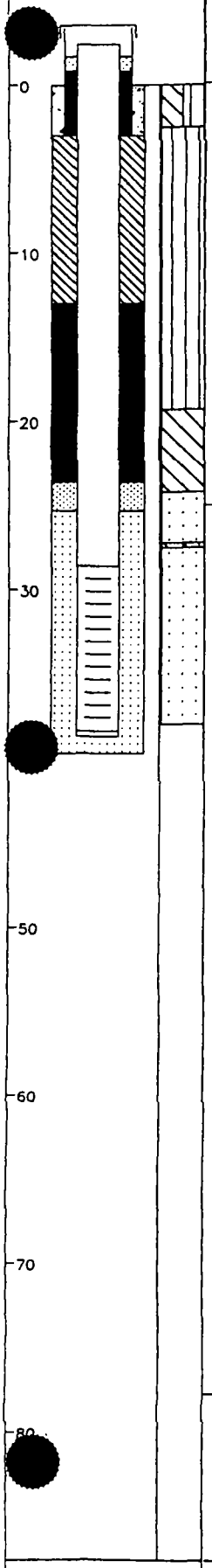
Not to Scale

Supervised by B. Harrington
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name LR102

Well No. LR-103
Boring No. X-Ref: LR-103

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068527 ft.
Easting: 515217 ft.

Elevation Ground Level 460.1 ft. NGVD
Top of PVC Casing 461.28 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.
Borehole Diameter 8 1/4" (0.0-40.0')
Casing Stickup Height 1.10 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID/8 1/4" O.D. Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 75	10/19/95	14:00	10/20/95	9:00
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/20/95	8:55	10/20/95	8:59
Filter Placement:	10/20/95	9:10	10/20/95	10:25
Cementing:				
Development				
Bentonite Grout	10/20/95	10:35	10/20/95	10:50
Bentonite Seal	10/20/95	10:28	10/20/95	10:35

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.10	-	28.60	C1	461.28	-	431.50
28.60	-	38.40	S1	431.50	-	421.70
38.40	-	38.70	C2	421.70	-	421.40

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 25.3-39.7'

Filter Pack: 100 mesh Silica Sand 23.6-25.3'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-13.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 13.0-23.6'

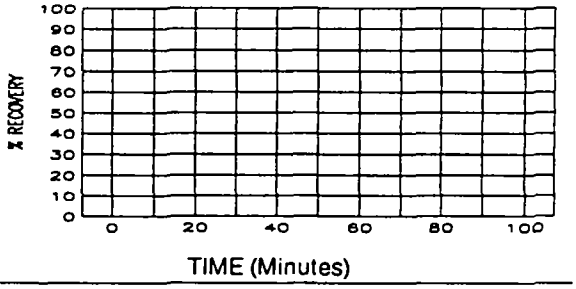
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



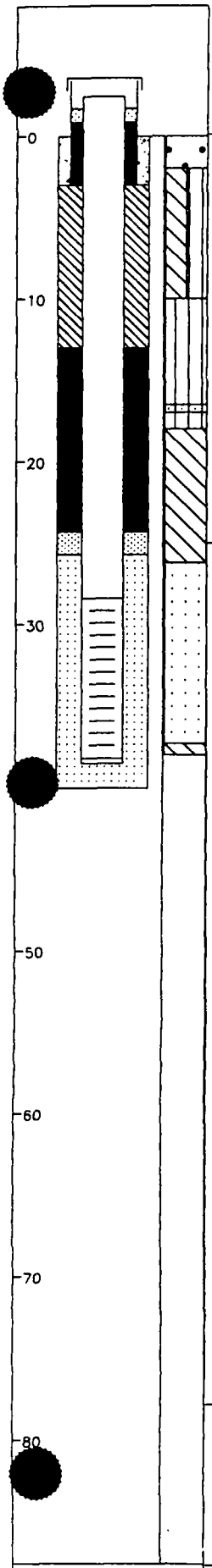
Comments:

Supervised by M. Sandfort
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name LR103

Well No. LR-104
Boring No. X-Ref: LR-104

PIEZOMETER CONSTRUCTION SUMMARY



Not to Scale

Survey Coords: Northing: 1068079 ft.
Easting: 515623 ft.

Elevation Ground Level 458.0 ft. NGVD
Top of PVC Casing 459.73 ft. NGVD

Drilling Summary:

Total Depth 40.0 ft.
Borehole Diameter 8 1/4" (0.0-40.0')
Casing Stickup Height 1.73 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/17/95	13:00	10/17/95	15:25
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/18/95	7:45	10/18/95	7:48
Filter Placement:	10/18/95	7:52	10/18/95	8:48
Cementing:				
Development				
Bentonite Grout	10/18/95	8:44	10/18/95	8:56
Bentonite Seal	10/18/95	8:56	10/18/95	11:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 1.73	-	28.40	C1	459.73	-	429.60
28.40	-	38.20	S1	429.60	-	419.80
38.20	-	38.50	C2	419.80	-	419.50

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 25.7-40.0'

Filter Pack: 100 mesh Silica Sand 24.3-25.7'

Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-13.0'

Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 13.0-24.3'

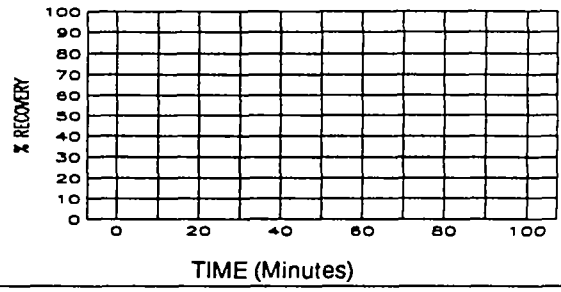
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



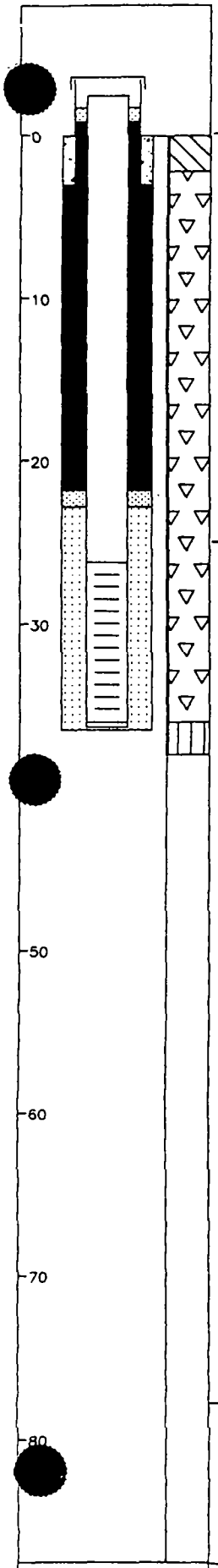
Comments:

Supervised by M. Sandfort
Job Number 943-2848

Site LAIDLAW/OU2 RI-FS/MO
File Name LR104

Well No. LR-105
Boring No. X-Ref: LR-105

PIEZOMETER CONSTRUCTION SUMMARY



Survey Coords: Northing: 1067710 ft.
Easting: 514525 ft.

Elevation Ground Level 484.2 ft. NGVD
Top of PVC Casing 486.79 ft. NGVD

Drilling Summary:

Total Depth 38.0 ft.
Borehole Diameter 8 1/4" (0.0-38.0')
Casing Stickup Height 2.59 ft.
Driller Layne-Western
St. Louis, MO

Rig CME 750
Bit(s) 4 1/4" ID Hollow Stem Auger Bit

Drilling Fluid None

Protective Casing 8x8" Square Steel, by 5' long

Construction Time log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling				
CME 750	10/3/95	9:45	10/3/95	14:45
Geophys.Logging:				
Casing:				
2" I.D. PVC	10/3/95	15:00	10/3/95	15:05
Filter Placement:	10/3/95	15:10	10/3/95	16:00
Cementing:				
Development				
Bentonite Grout				
Bentonite Seal	10/3/95	16:00	10/3/95	16:40

Well Design & Specifications

Basis: Geologic Log X Geophysical Log
Casing string(s): C = Casing S = Screen

Depth			String(s)	Elevation		
+ 2.59	-	26.20	C1	486.79	-	458.00
26.20	-	36.00	S1	458.00	-	448.20
36.00	-	36.30	C2	448.20	-	447.90

Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings
C2 2" dia. threaded PVC end cap (4" long or 0.33')
Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings

Sand Pack: 16-35 mesh Silica Sand 22.8-36.5'

Filter Pack: Less than 50 mesh Silica Sand 21.8-22.8'

Grout Seal:

Bentonite Seal: Extra high yield Wyo-Ben (100%) Chips 3.0-21.8'

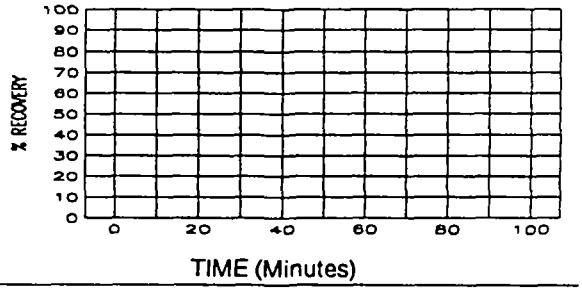
Concrete: 0.0-3.0'

Well Development

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (°C)

Recovery Data:



Comments: Drilled to 36.0' and collected split spoon sample from 36.0-38.0'

Not to Scale

Supervised by B. Harrington
Job Number 943-2848
Site LAIDLAW/OU2 RI-FS/MO
File Name LR105

APPENDIX F

MONITORING WELL CERTIFICATION RECORDS

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115082	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-100-35	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-341-3710	
ADDRESS: 1238 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

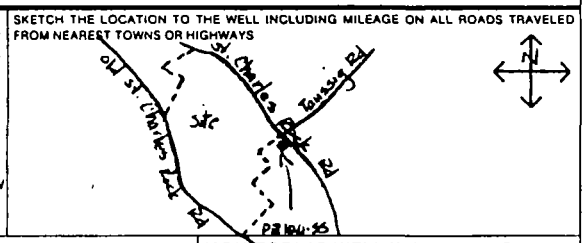
COUNTY: ST. LOUIS
ELEVATION: 434.35
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

LAT. 38 ° 46 ' 09 " LONG. 90 ° 20 ' 23 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
2-25-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001256 WIA DATE 4-11-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001256 WIA DATE 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 435.84

Ground Surface Elevation: 434.35 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-31 Silty clay
Depth to bottom of Protective Casing Seal:	3	
		31-51 Sand & gravel
Depth to Base of Annular Seal:	56.3	
		51-71.5 Limestone
Depth to Base of Bentonite Seal:	71.5	
Depth to Base of Secondary Filter Pack:	72.1	
Depth to Top of the Screen:	73.6	
Depth to Bottom of the Screen:	93.6	
Plug Back Total Depth:		
Original Total Depth:	94.5	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 9'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 75.09'
Diameter: 2"
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 9 7/8 in.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 15 FL

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR
Length: 0.8

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 20/40
Length: 22.4

WELL SCREEN
Length: 20'
Slot Size: 0.010
Type: SCH80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115081	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-100-3D	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

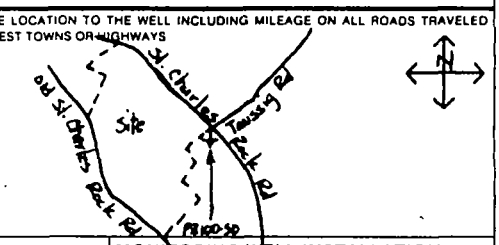
COUNTY: ST. LOUIS
ELEVATION: 484.35
AREA NO

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG. 5 (E) OR W

LAT. 38° 46' 09" LONG. 90° 26' 23"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 5 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
2-28-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM DATE 4-11-95
SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM DATE 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 485.82

LOCKING CAP - (Y) N (Circle one)
CAP VENT (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10.25"

WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 484.35 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-13 Clay
Depth to bottom of Protective Casing Seal:	3	
		13-36 Silt
		36-88 Limestone
		88-94 Shale
		94-143 Dolomite
		143-159 Limestone
		159-165 Dolomite
		165-210 Limestone
Depth to Base of Annular Seal:	210.0	
		210-234 Dolomite
Depth to Base of Bentonite Seal:	230.5	
Depth to Base of Secondary Filter Pack:	232.0	
Depth to Top of the Screen:	234.8	
		234-246 Limestone
Depth to Bottom of the Screen:	244.8	
Plug Back Total Depth:		
Original Total Depth:	246.0	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 236.27'
Diameter: 2"
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 20.5 FL

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR
Length: 1.5'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 2x40
Length: 14'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH.80 PVC

SUMP DETAILS
Length: 0.3 FL
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO 115080	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LANDLAW BRIDGETON SANITARY LANDFILL	WELL NUMBER: PZ-100-KS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK ROAD	BRIDGETON	MO	63044

NAME	TELEPHONE
LANDLAW WASTE SYSTEMS, INC	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

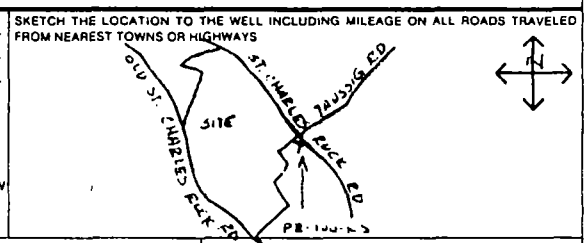
COUNTY: ST. LOUIS
ELEVATION: 493.76
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG. 5 (E) OR W

LAT. 38 ° 46 ' 09 " LONG. 90 ° 26 ' 22 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 495.64'

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ HSA ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 8 TOTAL ☒ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 3-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: UC1256WM DATE: 4-11-95
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: UC1256WM DATE: 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 495.64

LOCKING CAP - (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 493.76 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-13 Clay
Depth to bottom of Protective Casing Seal:	3	
		13-36 Silt
		36-88 Limestone
		88-94 Shale
		94-143 Dolomite
		143-154 Limestone
		154-165 Dolomite
		165-210 Limestone
		210-234 Dolomite
Depth to Base of Annular Seal:	366	234-246 Limestone
		246-262 Shale
		262-267 Dolomite
Depth to Base of Bentonite Seal:	367	267-302 Limestone
Depth to Base of Secondary Filter Pack:	369	302-307 Dolomite 307-314 Shale
Depth to Top of the Screen:	374	314-317 Dolomite
		317-343 Shale
		343-346 Dolomite
		346-351 Shale
		351-354 Dolomite
Depth to Bottom of the Screen:	354.5	354-371 Limestone
Plug Back Total Depth		
Original Total Depth:	371	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 375.88'
Diameter: 3"
Type of Material: PVC SCH. 80

BOREHOLE DIAMETER: 5⅞ In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 5 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR
Length: 2'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 15

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 3 In.
Type: PVC

TYPE OF BACKFILL: SAND/SLURRY

MO 780-1415 (2-94) DISTRIBUTION: WHITE: DIVISION CANARY: MONITORING WELL CONTRACTOR PINK: OWNER

66574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115086	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: D2-101-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1335 N DEMAZONY	CITY: ST LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

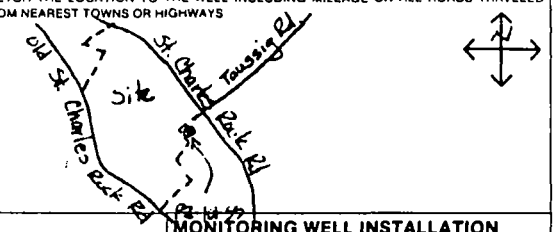
COUNTY: St. Louis
ELEVATION: 474.7
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38 - 46 - 06 LONG. 90 - 26 - 30

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER D01256WM1 DATE 4-11-95
SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER D01256WM1 DATE 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 477.4

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 474.7 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-14 Silt
Depth to bottom of Protective Casing Seal	3	
		14-55 Limestone
		55-62 Dolomite
		62-73 Limestone
		73-79 Dolomite
Depth to Base of Annular Seal	117.5	79-84 Limestone
		84-93 Dolomite
Depth to Base of Bentonite Seal	126	93-120 Limestone
Depth to Base of Secondary Filter Pack	127.5	120-125 Dolomite
Depth to Top of the Screen	129.5	
		125-142 Limestone
Depth to Bottom of the Screen	137.5	
Plug Back Total Depth		
Original Total Depth	142.0	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 132
Diameter: 2
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5⅞ In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 8.5 FL

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR
Length: 1.5

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 12.5

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: 2"/120 PVC

SUMP DETAILS
Length: 0.3 FL
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115088	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-102-35	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-341-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

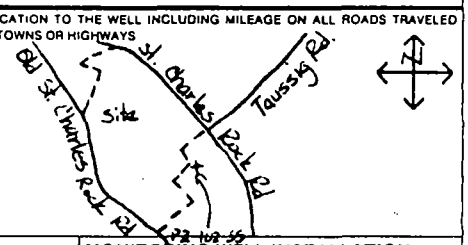
COUNTY: ST. LOUIS
ELEVATION: 482.0
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

LAT. 38° 46' 02" LONG. 90° 26' 27"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 484.6

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

Ground Surface Elevation: 482.0 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-2.5 Silt
Depth to bottom of Protective Casing Seal:	3	2.5-5 clay
		5-13 Silt
		13-24 Sandstone
		24-28 Silt
Depth to Base of Annular Seal:	65.0	28-35 Limestone
		35-38 Clay
Depth to Base of Bentonite Seal:	75.5	
Depth to Base of Secondary Filter Pack:	77.0	38-45 Sandstone
Depth to Top of the Screen:	79.75	
		45-90 Limestone
Depth to Bottom of the Screen:	89.75	
Plug Back Total Depth:		
Original Total Depth:	90.4	

PROTECTIVE CASING
Type: STEEL
Size: 8" x 3" x 5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 82.35'
Diameter: 2
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR
Length: 1.5'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 13.4'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
[ ] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 3 TOTAL
[ ] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-12-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 4-11-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 4-11-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122513	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-102-R-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1938 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

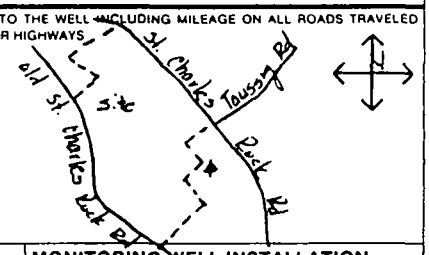
COUNTY: ST. LOUIS
ELEVATION: 484.46
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST

SEC. ____ TWN. 47 N,RNG 5 E OR W

LAT 38° 46' 01" LONG. 90° 36' 27"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., Inc.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., Inc.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 485.58

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 2 TOTAL ☒ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 6-18-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WIA DATE: 7-07-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WIA DATE: 7-7-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 485.58

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10¼"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 484.46 Ft

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	0-17 Silt
Depth to bottom of Protective Casing Seal: 3.0	
	17-22 Sand
	22-32 Silt
	32-35 Sand
Depth to Base of Annular Seal: 63.0	
	35-75 Limestone
Depth to Base of Bentonite Seal: 75.0	75-77
Depth to Base of Secondary Filter Pack: 77.0	Dolomite
Depth to Top of the Screen: 79.4	
	77-87 Limestone
	87-90.3 Shale
Depth to Bottom of the Screen: 89.4	
Plug Back Total Depth	
Original Total Depth: 90.3	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 82'
Diameter: 8"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5⅞ In.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 12 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: < 50
Length: 2'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13.3'

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115083	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-103-SS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO.	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

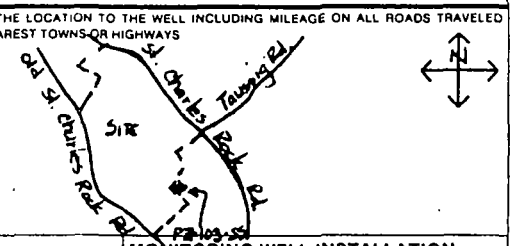
COUNTY ST. LOUIS
ELEVATION 477.78
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. TWN 47 N.RNG. 5 E OR W

LAT. 38 ° 45 ' 57 " LONG. 90 ° 36 ' 29 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
2-27-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WMA DATE 4-11-95
SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WMA DATE 4-11-95

NOTE. Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 480.17

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"

WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 477.78 Ft

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	0-15 Silt
Depth to bottom of Protective Casing Seal: 3	
	15-20 Sandy silt
	20-32 Silt
	32-51 Clay
	51-64 Limestone
Depth to Base of Annular Seal: 110.0	64-72 Sandy silt
	72-78 Shale
Depth to Base of Bentonite Seal: 131.1	78-87 Limestone
Depth to Base of Secondary Filter Pack: 132.5	87-111 Dolomite
Depth to Top of the Screen: 134.5	
	111-128 Limestone
	128-135 Dolomite
Depth to Bottom of the Screen: 144.5	135-137 Limestone
	137-143 Dolomite
Plug Back Total Depth	143-144.5 Limestone
Original Total Depth: 145.5	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 136.67'
Diameter: 2"
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 21.1 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR
Length: 1.4'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 20/40
Length: 13'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122511	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-104-35	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

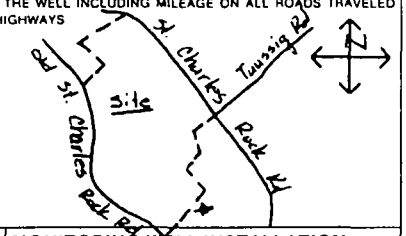
COUNTY: ST. LOUIS
ELEVATION: 481.6
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38° 45' 50" LONG. 90° 26' 27"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 483.6

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y / (N) (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10 1/4"
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 481.6

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	120.0	
Depth to Base of Bentonite Seal:	130.5	
Depth to Base of Secondary Filter Pack:	132.5	
Depth to Top of the Screen:	134.5	
Depth to Bottom of the Screen:	144.5	
Plug Back Total Depth:		
Original Total Depth:	145.0	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 136.6'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10.5 Ft

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: <50
Length: 3'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 12.5'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
483.6

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6 1/4 I.D. S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 5 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-04-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 7-07-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 7-07-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122512	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LANDFILL BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-104-SD	
SITE ADDRESS: 31 CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LANDFILL WASTE SYSTEMS, INC.		TELEPHONE: 314-241 3110	
ADDRESS: 1838 N BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

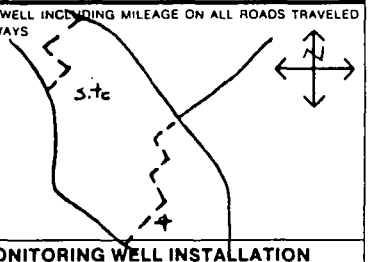
COUNTY: ST LOUIS
ELEVATION: 493.64
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. TWN. 47 N,RNG 5 E OR W

LAT. 38° 45' 50" LONG. 90° 26' 27"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 493.64

Ground Surface Elevation: 493.14 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	228.0	
Depth to Base of Bentonite Seal:	230.5	
Depth to Base of Secondary Filter Pack:	231.8	
Depth to Top of the Screen:	235.0	
Depth to Bottom of the Screen:	245.0	
Plug Back Total Depth		
Original Total Depth:	252.5	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8' x 5'
Bore Hole Diameter: 10¼"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 237'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5 1/8 In.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 2.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: 2-50
Length: 1.3'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 227'

WELL SCREEN
Length: 10
Slot Size: 0.010"
Type: PVC

SUMP DETAILS
Length: 0.5 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: NATIVE

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
493.64

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 6 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-17-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256 W.M.	7-07-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256 W.M.	7-07-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122504	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-104-KS	
SITE ADDRESS: ST. CHARLES ROCK RD	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

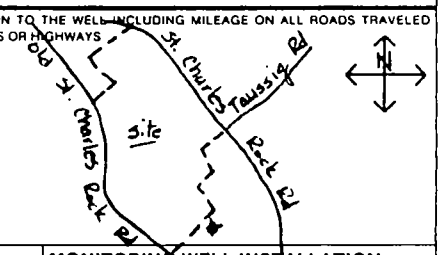
COUNTY: ST. LOUIS
ELEVATION: 482.32
AREA NO.:

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG 5 (E) OR W

LAT. 38° 45' 50" LONG. 90° 36' 27"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 484.04

LOCKING CAP - (Y) / N (Circle one)
CAP VENT - Y / (N) (Circle one)
PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 482.32 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-37 No sampling
Depth to bottom of Protective Casing Seal:	3.0	
		37-100 Limestone
		100-105 Shale
		105-250 Limestone
		250-253 Shale
		253-256 Limestone
		256-259 Shale
		259-266 Limestone
Depth to Base of Annular Seal:	378.0	266-270 Dolomite
		270-297 Limestone
		297-304 Shale
Depth to Base of Bentonite Seal:	343.0	304-317 Limestone
		317-342 Shale
Depth to Base of Secondary Filter Pack:	345.0	342-408 Limestone
Depth to Top of the Screen:	347.5	
Depth to Bottom of the Screen:	407.5	
Plug Back Total Depth		
Original Total Depth	408.0	

PROTECTIVE CASING SEAL
Type: (X) Concrete ( ) Cement Slurry

RISER PIPE
Length: 349.2'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 9 7/8 in.

ANNULAR SEAL
Type: (X) Bentonite Slurry 245-378 (X) Cement Slurry 3-245 ( ) Non Slurry Bentonite

BENTONITE SEAL
Type: (X) Bentonite Slurry ( ) Non Slurry Bentonite
Length of Seal: 15 Ft.

SECONDARY FILTER PACK (Optional)
Type: (X) Sand ( ) Manufactured
Grain Size: < 50
Length: 2.0'

PRIMARY FILTER PACK
Type: (X) Sand ( ) Manufactured
Grain Size: 16-35
Length: 13.0'

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.5 Ft.
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION
(X) ABOVE GROUND ( ) FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
484.04

MEASURING POINT IS
(X) TOP OF RISER PIPE
( ) OTHER

DRILLING EQUIPMENT
(X) AIR ROTARY (X) AUGER TYPE 6 1/4 H.S.A.
( ) REVERSE ROTARY ( ) OTHER

CENTRALIZERS USED
(X) YES, AT 9 TOTAL
(X) STAINLESS STEEL
( ) OTHER
( ) NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-19-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256 WM DATE 7-07-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256 WM DATE 7-07-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122510	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-10555	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 10 SE N BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

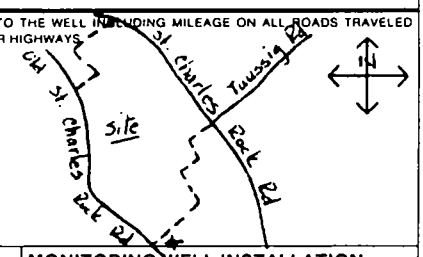
COUNTY: ST. LOUIS
ELEVATION: 481.2
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG 5 E OR W

LAT. 38° 45' 44" LONG. 90° 38' 35"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
483.6

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 4 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-24-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001296WIM DATE 7-07-95

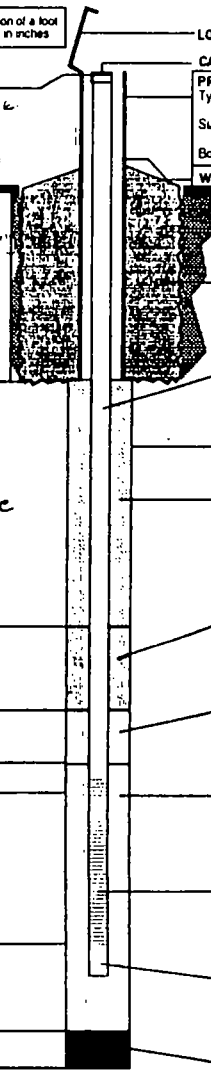
SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001256WIM DATE 7-07-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 485.6

Ground Surface Elevation: 481.2 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-35 No samples
Depth to bottom of Protective Casing Seal:	3.0	
		35-144 Limestone
Depth to Base of Annular Seal:	122.0	
Depth to Base of Bentonite Seal:	134.8	
Depth to Base of Secondary Filter Pack:	135.8	
Depth to Top of the Screen:	138.3	
Depth to Bottom of the Screen:	148.3	
Plug Back Total Depth		
Original Total Depth:	144.0	



LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 6" x 6" x 5'
Bore Hole Diameter: 9⅞
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 140.7'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5⅞ In.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 12.8 FL

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: < 50
Length: 1'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13.2'

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.5 FL
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122480	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-106-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

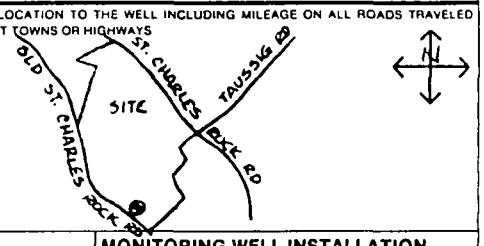
COUNTY: ST. LOUIS
ELEVATION: 460.9
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG. 5 E OR W

LAT. 38 ° 45 ' 47 " LONG. 90 ° 26 ' 46 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 462.70

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 15', 35', 75', 115', 155' ☒ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-05-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 5-10-95

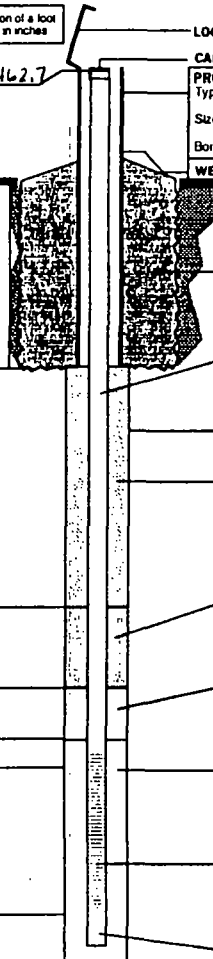
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 5-10-95

NOTE. Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 462.7

Ground Surface Elevation: 460.9 Ft.

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	114.7	
Depth to Base of Bentonite Seal:	147.7	
Depth to Base of Secondary Filter Pack:	152.2	
Depth to Top of the Screen:	155.1	
		Limestone
Depth to Bottom of the Screen:	165.1	
Plug Back Total Depth		
Original Total Depth:	165.4	



LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10.25'
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 156.9'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 35 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR < 50
Length: 2.5'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13.2'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-91) DISTRIBUTION: WHITE DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO. 115091	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-106-SD	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

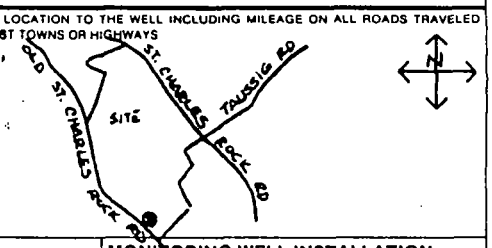
COUNTY: ST. LOUIS
ELEVATION: 461.4
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38° 45' 47" LONG. 90° 26' 46"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



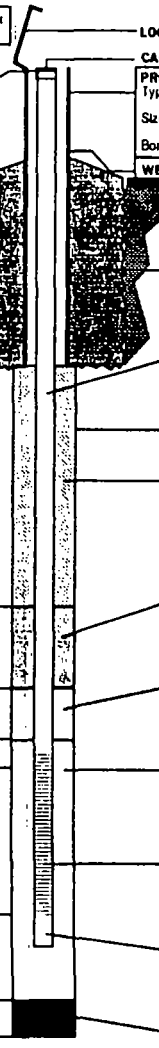
DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 463.4

Ground Surface Elevation: 461.4 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	177.0	
Depth to Base of Bentonite Seal:	187.0	
Depth to Base of Secondary Filter Pack:	188.5	
Depth to Top of the Screen:	190.6	Limestone
Depth to Bottom of the Screen:	200.6	
Plug Back Total Depth:		
Original Total Depth:	201.1	



LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"

WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 192.6'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10 FL

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR (50
Length: 1.5'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 12.6'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 FL
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 463.42

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6 1/4 H.S.A. [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 6 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 8-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 5-10-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 5-10-95

MO 780-1415 (2 94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 115092	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME		WELL NUMBER	
LAIDLAW BRIDGETON SANITARY LANDFILL		PZ-106-KS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

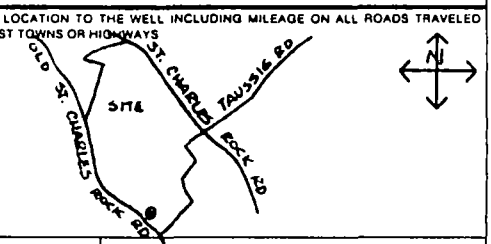
COUNTY: ST. LOUIS
ELEVATION: 461.8
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38 · 45 · 47 " LONG. 90 · 26 · 45 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 464.3

Ground Surface Elevation: 461.8 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	2.5	
Depth to Base of Annular Seal:	350.0	
Depth to Base of Bentonite Seal:	360.0	
Depth to Base of Secondary Filter Pack:	361.0	
Depth to Top of the Screen:	363.6	
		Limestone
Depth to Bottom of the Screen:	373.6	
Plug Back Total Depth:		
Original Total Depth:	375.0	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8x3"x5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 366.1
Diameter: 2"
Type of Material: PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR
Length: 1'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 14'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
464.26

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6 1/4" I.D.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 10 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-23-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001256WM DATE 5-10-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001256WM DATE 5-10-95

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122508	RECEIVED
ROUTE	CHECK NO
STATE WELL NUMBER	TRANSMITTAL NO
CHECKED BY	CROSS REFERENCE NO
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: P2-10755	
SITE ADDRESS: ST CHARLES ROCK RD	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

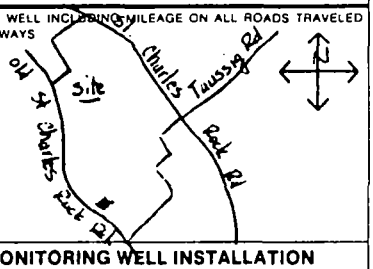
COUNTY: ST. LOUIS
ELEVATION: 452.6
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. ___ TWN. 47 N,RNG. 5 E OR W

LAT. 38° 45' 52" LONG. 90° 16' 48"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, Inc.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, Inc.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 464.7

Ground Surface Elevation: 462.6

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	0-5 Clay
Depth to bottom of Protective Casing Seal: 3.0	
	5-28 Trash
	28-54 Not sampled
	54-78 Limestone
Depth to Base of Annular Seal: 78.0	
Depth to Base of Bentonite Seal: 89.0	
Depth to Base of Secondary Filter Pack: 90.4	
Depth to Top of the Screen: 92.6	
Depth to Bottom of the Screen: 102.6	
Plug Back Total Depth	
Original Total Depth: 103.0	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x8'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 94.6
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 11 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: < 50
Length: 1.4'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 12.6'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.5 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SLURRY

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 464.7

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6" HSA [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 4 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-22-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO. 115090	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	P2-108-SS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	Mo	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1938 N. BROADWAY	ST. LOUIS	Mo.	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

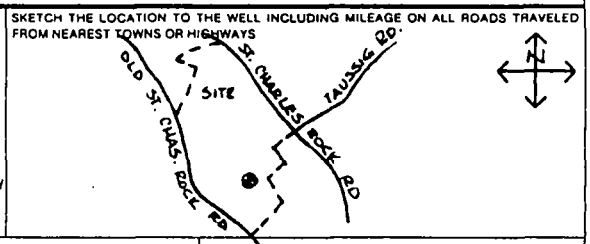
COUNTY: ST. LOUIS
ELEVATION: 484.1
AREA NO:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG. 5 (E) OR W

LAT. 38 ° 45 ' 57 " LONG. 90 ° 26 ' 39 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

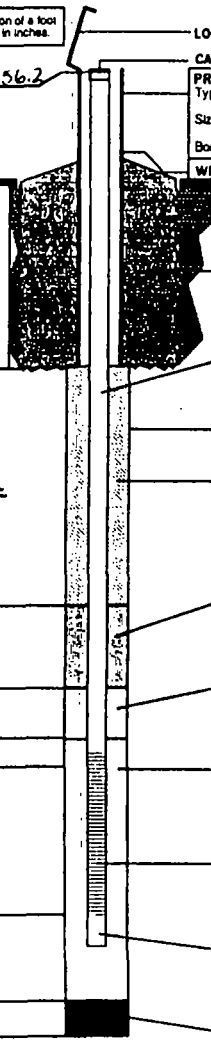
DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 456.2

Ground Surface Elevation: 454.1 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-2 Gravel
		2-20 clay
Depth to bottom of Protective Casing Seal:	3.0	
		20-143.4 Limestone
Depth to Base of Annular Seal:	120.0	
Depth to Base of Bentonite Seal:	130.0	
Depth to Base of Secondary Filter Pack:	131.5	
Depth to Top of the Screen:	133.4	
Depth to Bottom of the Screen:	143.4	
Plug Back Total Depth:		
Original Total Depth:	143.4	



LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 3'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 135.5'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10 Ft

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR < 50
Length: 1.5'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 12.4'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 456.2

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6 1/4 H.S.A. [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 4 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 3-29-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 5-10-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 5-10-95

61574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122485	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-109-SS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

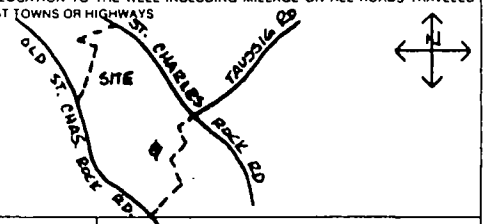
COUNTY: ST. LOUIS
ELEVATION:
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38° 46' 00" LONG 90° 26' 36"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS: [ ] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A. [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 4 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-25-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 6-02-95

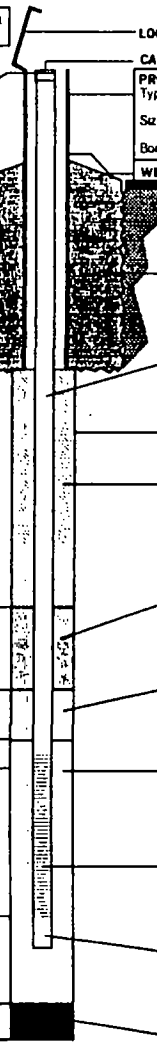
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation:

LOCKING CAP - (Y) N (Circle one)
CAP VENT (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10"
WEEP HOLE - Y / N (Circle one)



Ground Surface Elevation: Ft	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		0-2' silt
		2'-6' Silt & gravel
Depth to bottom of Protective Casing Seal:	3.0	
		6'-14' Silt
		6'-135.7' Limestone
Depth to Base of Annular Seal:	103	
Depth to Base of Bentonite Seal:	121.3	
Depth to Base of Secondary Filter Pack:	124.0	
Depth to Top of the Screen:	125.4	
Depth to Bottom of the Screen:	135.4	
Plug Back Total Depth		
Original Total Depth:	135.7	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 127.1'
Diameter: 2"
Type of Material: Sch. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 18.3 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: < 50
Length: 2.7'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16/35
Length: 11.7

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: Sch. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO 115097	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: P2-110-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

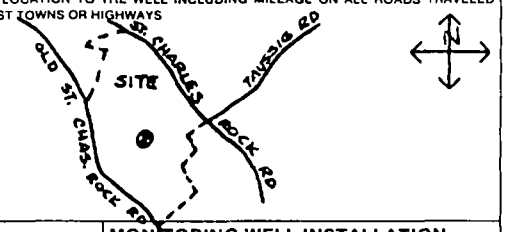
COUNTY: ST. LOUIS
ELEVATION: MSL 456.8
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38 · 46 · 03 " LONG. 90 · 26 · 34 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



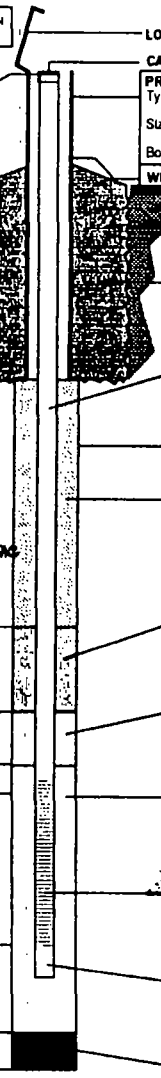
DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 458.9

Ground Surface Elevation: 456.8 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-4' Clay
Depth to bottom of Protective Casing Seal	3.0	
		4'-12' Silt
		12'-61' Sand
		61'-111' Limestone
Depth to Base of Annular Seal	86.0	
Depth to Base of Bentonite Seal	96.5	
Depth to Base of Secondary Filter Pack	98.5	
Depth to Top of the Screen	101.2	
Depth to Bottom of the Screen	101.2	
Plug Back Total Depth		
Original Total Depth	111.5	



LOCKING CAP - (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length:
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5⅞ in.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: <50
Length: 2

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16/35
Length: 13'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
458.7

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 4 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM DATE 6-02-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM DATE 6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122482	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-111-SD	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: Mo	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: Mo.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN *SECTION PLAT*

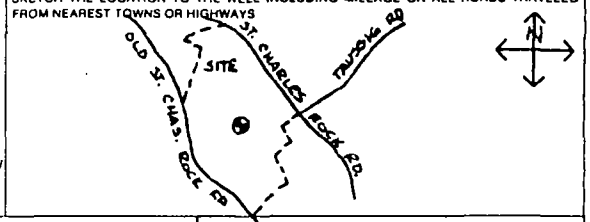
COUNTY: ST. LOUIS
ELEVATION: 459.2
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC ____ TWN. 47 N, RNG. 5 E OR W

LAT. 38 · 46 · 06 " LONG. 90 · 26 · 39 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



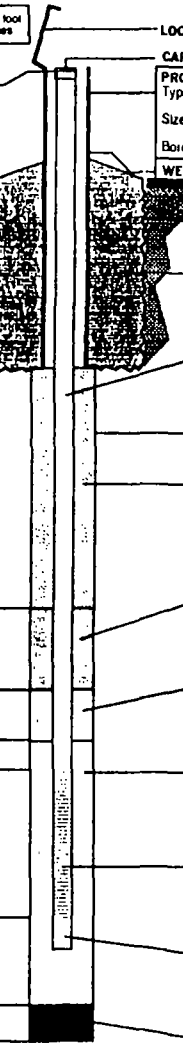
DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation 461.6

Ground Surface Elevation: 459.2

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column.	
Depth to bottom of Protective Casing Seal: 2.5	
Depth to Base of Annular Seal: 176.0	
Depth to Base of Bentonite Seal: 144.7	
Depth to Base of Secondary Filter Pack: 195.8	
Depth to Top of the Screen: 199.2	Limestone
Depth to Bottom of the Screen: 209.2	
Plug Back Total Depth:	
Original Total Depth: 210	



LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 201.5'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 18.7 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR 4-50
Length: 1.1'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 14.2'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.55

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [ ] AUGER
TYPE
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 3 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-21-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE
001256WM	5-10-95

SIGNATURE (DRILLING CONTRACTOR)
Michael P. Vogt

PERMIT NUMBER	DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122481	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME		WELL NUMBER	
LAIDLAW BRIDGETON SANITARY LANDFILL		P2-111-KS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL SHOW LOCATION IN SECTION PLAT

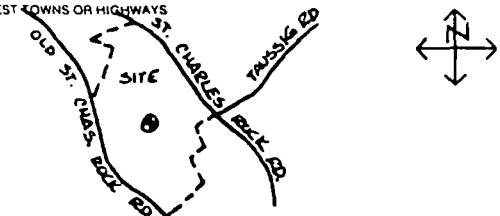
COUNTY: ST. LOUIS
ELEVATION: 459.2
AREA NO:

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38° 46' 06" LONG. 90° 26' 40"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 460.87

LOCKING CAP - (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 15"
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 457.0

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		
Depth to bottom of Protective Casing Seal:	3.0	
		84-272 ~~Shale~~ Limestone
		272-300 Shale
		300-302 Limestone
Depth to Base of Annular Seal:	331.0	
		302-329 Shale
Depth to Base of Bentonite Seal:	351.4	
Depth to Base of Secondary Filter Pack:	354.7	329-368.8 Limestone
Depth to Top of the Screen:	357.0	
Depth to Bottom of the Screen:	367.0	
Plug Back Total Depth		
Original Total Depth:	368.8	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 368.7'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 in.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 20.4 FL

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: <50
Length: 3.3

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 14.1'

WELL SCREEN
Length: 10
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3FL
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 460.87

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A. [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 10 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256WM DATE: 6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO DEPARTMENT OF NATURAL RESOURCES - P.O. BOX 250 ROLLA, MO 65401

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122489	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: P2-112-AS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

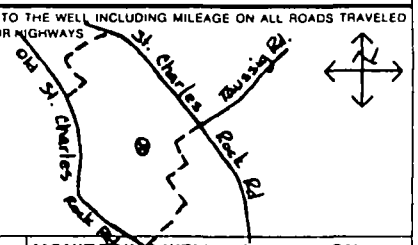
COUNTY: ST. LOUIS
ELEVATION: 457.9
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. TWN. 47 N,RNG. 5 (E) OR W

LAT. 38° 46' 10" LONG. 90° 26' 42"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
457.83

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☐ YES, AT
☐ STAINLESS STEEL
☐ OTHER
☒ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-10-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
PERMIT NUMBER 001258WPM1 DATE 5-10-95

SIGNATURE (DRILLING CONTRACTOR)
PERMIT NUMBER 001258WPM1 DATE 5-10-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 459.8

Ground Surface Elevation: 457.4 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	24.6	
Depth to Base of Bentonite Seal	26.6	
Depth to Base of Secondary Filter Pack:	28.0	
Depth to Top of the Screen:	29.6	
		Alluvium
Depth to Bottom of the Screen:	34.6	
Plug Back Total Depth		
Original Total Depth:	34.0	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 31.5'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 8 In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 2 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: 3/4-#4 CSO
Length: 14'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 8'

WELL SCREEN
Length: 5'
Slot Size: 0.010'
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122488	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: P2-113-AS	
SITE ADDRESS: ST CHARLES ROCK RD	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1938 N BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

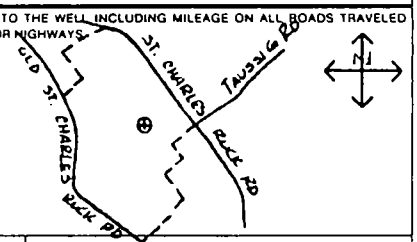
COUNTY: ST. LOUIS
ELEVATION: 454.4
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG 5 E OR W

LAT. 38° 46' 12" LONG. 90° 26' 41"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 461.42

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☐ YES, AT ☐ STAINLESS STEEL ☐ OTHER ☒ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-11-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Terrence A. Tilahuselm Jr.
PERMIT NUMBER: 001258WPIA DATE: 5-10-95

SIGNATURE (DRILLING CONTRACTOR): Terrence A. Tilahuselm Jr.
PERMIT NUMBER: 001258WPIA DATE: 5-10-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 461.4

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING
Type: STEEL
Size: 8"x6"x5'
Bore Hole Diameter: 8"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 457.1 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	23.0	
Depth to Base of Bentonite Seal:	25.0	
Depth to Base of Secondary Filter Pack:	27.0	
Depth to Top of the Screen:	28.7	
		Alluvium
Depth to Bottom of the Screen:	38.7	
Plug Back Total Depth:		
Original Total Depth:	40.0	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 30.4'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 8 In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 2 Ft

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR < 50
Length: 2'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

REF. NO 122527	CHECK NO.
ROUTE	TRANSMITTAL N
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: P2-113-AD	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3700	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

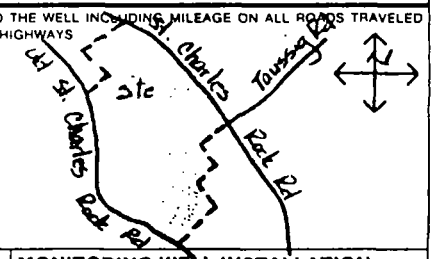
COUNTY: ST. LOUIS
ELEVATION: 459.9
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. TWN. 47 N.RNG. 5 (E) OR W

LAT. 38° 46' 12" LONG. 90° 26' 41"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 461.46

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y / (N) (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 10¼"
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 459.9 Ft.

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-20 No Sample
Depth to bottom of Protective Casing Seal:	3.0	
		20-37 Clay
		37-39 Clay w/ sand
		39-41 Sand
		41-44 Sand and gravel
Depth to Base of Annular Seal:	77.0	44-53 Sandstone
		53-66 Sand
Depth to Base of Bentonite Seal:	89.1	
Depth to Base of Secondary Filter Pack:	94.7	66-91 Sandstone
Depth to Top of the Screen:	98.6	
		91-108.7 Sand
Depth to Bottom of the Screen:	108.6	
Plug Back Total Depth:		
Original Total Depth:	108.7	

PROTECTIVE CASING SEAL
Type: (X) Concrete ( ) Cement Slurry

RISER PIPE
Length: 100.2'
Diameter: 2"
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 10¼ in.

ANNULAR SEAL
Type: (X) Bentonite Slurry ( ) Cement Slurry ( ) Non Slurry Bentonite

BENTONITE SEAL
Type: (X) Bentonite Slurry ( ) Non Slurry Bentonite
Length of Seal: 12.1 Ft.

SECONDARY FILTER PACK (Optional)
Type: (X) Sand ( ) Manufactured
Grain Size: < 50
Length: 5.6'

PRIMARY FILTER PACK
Type: (X) Sand ( ) Manufactured
Grain Size: 16-35
Length: 14'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 3 in.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION
(X) ABOVE GROUND ( ) FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.46

MEASURING POINT IS
(X) TOP OF RISER PIPE
( ) OTHER

DRILLING EQUIPMENT
( ) AIR ROTARY (X) AUGER TYPE 6¼ H.S.A.
( ) REVERSE ROTARY ( ) OTHER

CENTRALIZERS USED
(X) YES, AT 2 TOTAL
(X) STAINLESS STEEL
( ) OTHER
( ) NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-03-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Lemon H. Mahurin Jr.
PERMIT NUMBER: 001258 WPM DATE: 7-31-95

SIGNATURE (DRILLING CONTRACTOR): Lemon H. Mahurin Jr.
PERMIT NUMBER: 001358 WPM DATE: 7-31-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65401

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122509	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW WASTE SYSTEMS SANITARY LANDFILL		WELL NUMBER: PZ-113SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

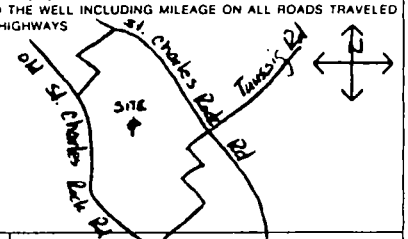
COUNTY: ST. LOUIS
ELEVATION: 459.4
AREA NO:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38° 46' 12" LONG. 90° 36' 41"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 461.8

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 9 7/8
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 459.4

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
		111-159 Limestone
Depth to Base of Annular Seal:	134.0	
Depth to Base of Bentonite Seal:	144.5	
Depth to Base of Secondary Filter Pack:	146.0	
Depth to Top of the Screen:	148.4	
Depth to Bottom of the Screen:	158.4	
Plug Back Total Depth:	159.7	
Original Total Depth:	159.0	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 150.2'
Diameter: 3"
Type of Material: PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: < 50
Length: 1.5'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16/35
Length: 13'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: PVC

SUMP DETAILS
Length: 0.5 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.8

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 5 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122487	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-114-AS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 13.9E N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

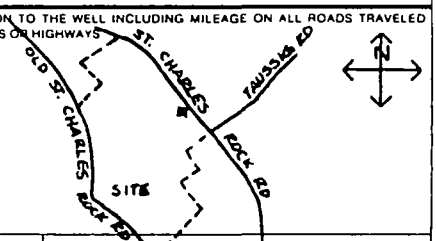
COUNTY: ST. LOUIS
ELEVATION: 447.8
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG 5 E OR W

LAT. 38° 46' 14" LONG. 90° 26' 28"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 451.3

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 8"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 447.8 ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-12.0 Fill
Depth to bottom of Protective Casing Seal:	3.0	
		12-17.5 Clay
Depth to Base of Annular Seal:		
Depth to Base of Bentonite Seal:	16.8	
Depth to Base of Secondary Filter Pack:	18.0	17.5-18.5 Sandy silt
Depth to Top of the Screen:	19.7	
		18.5-30 Sand
Depth to Bottom of the Screen:	29.7	
Plug Back Total Depth		
Original Total Depth:	30.0	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 21.2'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 8 in.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 13.8 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR 250
Length: 1.2'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 12'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 451.31

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [ ] AIR ROTARY [X] AUGER TYPE 8 1/4 HSA [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [ ] YES, AT [ ] STAINLESS STEEL [ ] OTHER [X] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): [signature]
PERMIT NUMBER: 001259 WPM DATE: 5-10-95

SIGNATURE (DRILLING CONTRACTOR): [signature]
PERMIT NUMBER: 001259 WPM DATE: 5-18-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65401

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 122507	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-11555	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

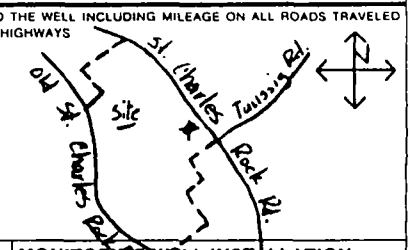
COUNTY: ST. LOUIS
ELEVATION: 450.6
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN 47 N,RNG. 5 E OR W

LAT. 38° 46' 14" LONG. 90° 26' 29"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 452.3

MEASURING POINT IS: ☒ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☒ YES, AT 3 TOTAL ☒ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-21-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 WM DATE: 6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 452.3

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 450.6

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
		33-85 Limestone
Depth to Base of Annular Seal:	60.0	
Depth to Base of Bentonite Seal:	71.0	
Depth to Base of Secondary Filter Pack:	72.5	
Depth to Top of the Screen:	74.7	
Depth to Bottom of the Screen:	84.7	
Plug Back Total Depth		
Original Total Depth:	85.0	

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 76.4'
Diameter: 2"
Type of Material: Sch. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 11 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☐ Sand ☐ Manufactured
Grain Size: < 50
Length: 1.5

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16/35
Length: 12.5

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: Sch. 80 PVC

SUMP DETAILS
Length: 0.5 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122519	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME		WELL NUMBER	
LAIDLAW BRIDGETON SANITARY LANDFILL		P2-116-55	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1238 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

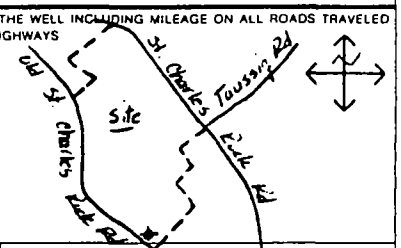
COUNTY: ST LOUIS
ELEVATION: 483.07
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG. 5 E OR W

LAT 38° 45' 44" LONG. 90° 26' 40"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 484.87

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10¼"

WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 483.07 Ft

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		0-24 Silt
Depth to bottom of Protective Casing Seal:	3.0	
		24-28 Silt w/sand
		28-30 Silt
		30-34 Sand
		34-61 Limestone
		61-65 Dolomite
Depth to Base of Annular Seal:	135.0	65-162 Limestone
Depth to Base of Bentonite Seal	147.0	
Depth to Base of Secondary Filter Pack:	148.0	
Depth to Top of the Screen:	151.0	
Depth to Bottom of the Screen:	161.0	
Plug Back Total Depth		
Original Total Depth	162.0	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 153'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 12 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: 2.50
Length: 1'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 14'

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., Inc.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co., Inc

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
484.87

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 5 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-30-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM1 DATE 7-27-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256WM1 DATE 7-27-95

DISTRIBUTION: WHITE DNR/GSL CANARY MONITORING WELL CONTRACTOR PINK/OWNER

661574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115084	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: ~~[illegible]~~ PZ-200-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1136 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

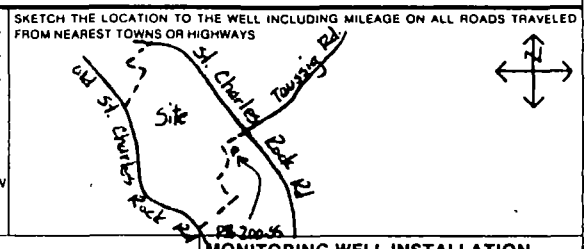
COUNTY: ST. LOUIS
ELEVATION: 433.61
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

LAT. 38° 46' 07" LONG. 90° 26' 26"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS: ☐ TOP OF RISER PIPE ☐ OTHER

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED: ☐ YES, AT 4 TOTAL ☐ STAINLESS STEEL ☐ OTHER ☐ NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 2-28-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256 WIA DATE: 4-11-95
SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256 WIA DATE: 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 435.63

Ground Surface Elevation: 433.61 Ft

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		0-27 Silt
Depth to bottom of Protective Casing Seal:	3	
Depth to Base of Annular Seal:	3	
Depth to Base of Bentonite Seal:	7.5	
Depth to Base of Secondary Filter Pack:		
Depth to Top of the Screen:	9.6	
		27-27 Sandstone
		27-68 Limestone
Depth to Bottom of the Screen:	97.6	68-76 Dolomite
		76-93 Limestone
Plug Back Total Depth		93-95.7 Dolomite
Original Total Depth	95.7	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: Size: Bore Hole Diameter:
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL Type: ☒ Concrete ☐ Cement Slurry
RISER PIPE Length: 11.62' Diameter: 2" Type of Material: SCH80 PVC
BOREHOLE DIAMETER: 5 7/8 In.
ANNULAR SEAL Type: ☐ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite
BENTONITE SEAL Type: ☐ Bentonite Slurry ☒ Non Slurry Bentonite Length of Seal: 4.5 Ft.
SECONDARY FILTER PACK (Optional) Type: ☐ Sand ☐ Manufactured Grain Size: Length:
PRIMARY FILTER PACK Type: ☒ Sand ☐ Manufactured Grain Size: 16-35 Length: 91.2
WELL SCREEN Length: 48' Slot Size: 0.010" Type: SCH80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: SAND

MO 780-1415 (2 94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

66 1574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115085	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-201-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

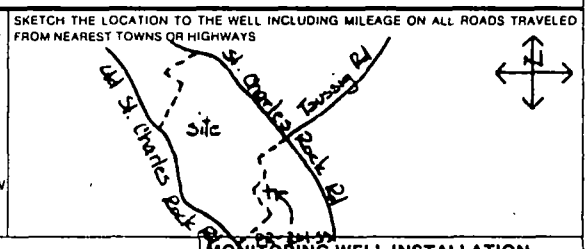
COUNTY: ST. LOUIS
ELEVATION: 478.0
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 E OR W

LAT. 38 ° 45 ' 59 " LONG. 90 ° 26 ' 27 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001256WM DATE 4-11-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogl
PERMIT NUMBER 001256WM DATE 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 491.05

Ground Surface Elevation: 478.01 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-17.5 Silt
Depth to bottom of Protective Casing Seal:	3	
Depth to Base of Annular Seal:	3	
Depth to Base of Bentonite Seal:	7.5	
Depth to Base of Secondary Filter Pack:		
Depth to Top of the Screen:	9.75	
		17.5-21 Sandstone 21-31 Silt 31-33.5 Clay 33.5-89.5 Limestone
Depth to Bottom of the Screen:	88.25	
Plug Back Total Depth		
Original Total Depth:	91.5	

LOCKING CAP (Y) N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 12.71
Diameter: 2
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5.7/8 in.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☐ Bentonite Slurry ☒ Non Slurry Bentonite
Length of Seal: 4.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☐ Sand ☐ Manufactured
Grain Size:
Length:

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 82'

WELL SCREEN
Length: 78.5'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.5 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

66574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 122484	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-201-A-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1538 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

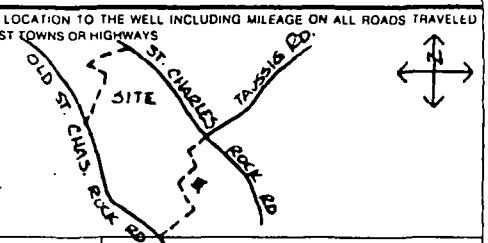
COUNTY: ST. LOUIS
ELEVATION: 478.4
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E) OR W

LAT. 38° 45' 58" LONG 90° 26' 28"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 480.5

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)
PROTECTIVE CASING Type: STEEL Size: 8" x 5" x 5' Bore Hole Diameter: 10.5"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 478.4 Ft

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		0-18' Silt
Depth to bottom of Protective Casing Seal:	3.0	
		18'-21' Sand
		21'-23.5' Silt
		23.5'-24' Sand
Depth to Base of Annular Seal:	65.0	24'-33' Silt
Depth to Base of Bentonite Seal:	75.1	33'-34' Clay
Depth to Base of Secondary Filter Pack:		34'-90' Limestone
Depth to Top of the Screen:	79.7	
Depth to Bottom of the Screen:	89.7	
Plug Back Total Depth		
Original Total Depth:	90'	

PROTECTIVE CASING SEAL Type: [X] Concrete [ ] Cement Slurry
RISER PIPE Length: 81.8' Diameter: 2" Type of Material: SCH. 80 PVC
BOREHOLE DIAMETER: 5 7/8 In.
ANNULAR SEAL Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite
BENTONITE SEAL Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite Length of Seal: 9.9 Ft.
SECONDARY FILTER PACK (Optional) Type: [ ] Sand [ ] Manufactured Grain Size: ____ Length: ____
PRIMARY FILTER PACK Type: [X] Sand [ ] Manufactured Grain Size: 16/35 Length: 14.9'
WELL SCREEN Length: 10' Slot Size: 0.010" Type: SCH. 80 PVC
SUMP DETAILS Length: 0.3 Ft. Diameter: 2 In. Type: PVC
TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS: [ ] TOP OF RISER PIPE [ ] OTHER ____

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6.25" HSA, NX CORE [ ] REVERSE ROTARY [ ] OTHER ____

CENTRALIZERS USED: [X] YES, AT 3 TOTAL [X] STAINLESS STEEL [ ] OTHER ____ [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-23-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 00125LWM DATE: 6-03-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER

601574

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115089	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-302-SS	
SITE ADDRESS: ST. CHARLES ROCK ROAD	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1538 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

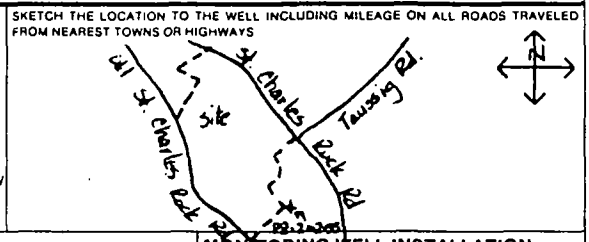
COUNTY: ST. LOUIS
ELEVATION: 474.0
AREA NO:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N. RNG. 5 E OR W

LAT. 38° 45' 54" LONG 90° 26' 24"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
☐ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☐ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-12-75

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael J. Vogl
PERMIT NUMBER 001256 WM DATE 4-11-95
SIGNATURE (DRILLING CONTRACTOR) Michael J. Vogl
PERMIT NUMBER 001256 WM DATE 4-11-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 481.8

Ground Surface Elevation: 474.0 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-3 Silt
Depth to bottom of Protective Casing Seal:	3	
		3-22 Clay
		22-32 Silt
Depth to Base of Annular Seal:	38.0	
		32-67 Limestone
Depth to Base of Bentonite Seal	38.0	
Depth to Base of Secondary Filter Pack:	39.0	
Depth to Top of the Screen:	40.2	
		67-78 Dolomite
Depth to Bottom of the Screen:	90.2	78-90.2 Limestone
Plug Back Total Depth		
Original Total Depth	90.2	

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 6" x 5'
Bore Hole Diameter: 10.25"

WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 43'
Diameter: 2
Type of Material: SCH80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 10' Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR
Length: 1'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 51.2'

WELL SCREEN
Length: 50'
Slot Size: 0.010"
Type: SCH80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MO 780-1415 (2-94)

DISTRIBUTION: WHITE-DIVISION CANARY-MONITORING WELL CONTRACTOR PINK-OWNER
(FAX WHITE COPY TO DEPARTMENT OF NATURAL RESOURCES, ROLLA, MO 65401)

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122505	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-203-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

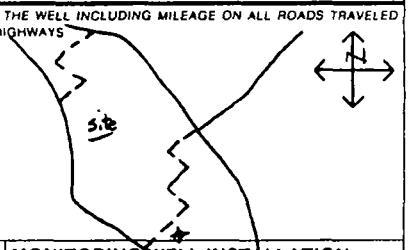
COUNTY: ST. LOUIS
ELEVATION: 484.2
AREA NO:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG. 5 (E) OR W

LAT 38° 45' 47" LONG. 90° 26' 30"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 486.6

Ground Surface Elevation: 484.2

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
		0-44 No sample
Depth to bottom of Protective Casing Seal:	3.0	
		44-51 Silt
		51-67 Dolomite
		67-110 Limestone
Depth to Base of Annular Seal:	82.0	
Depth to Base of Bentonite Seal:	43.5	
Depth to Base of Secondary Filter Pack:	95.3	
Depth to Top of the Screen:	99.6	
Depth to Bottom of the Screen:	109.6	
Plug Back Total Depth		
Original Total Depth:	110.0	

LOCKING CAP - (Y) N (Circle one)
CAP VENT - Y / (N) (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 9 7/8
WEEP HOLE - Y / (N) (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 102'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 11.5 FL

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: <50
Length: 1.0'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 14.7

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3FL
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
486.6

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6 1/4 H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 4 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-23-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256WM	7-07-95

SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256 WM	7-07-95

MO 780 1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

66157

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 115087	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-204-SS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE:	
ADDRESS: 1338 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

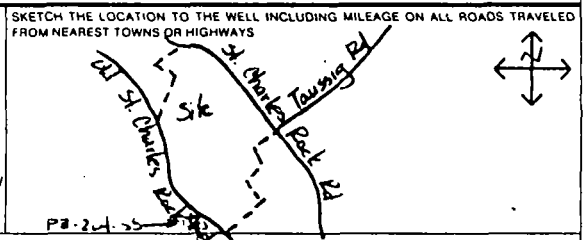
COUNTY: ST. LOUIS
ELEVATION: 467.0
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG 5 (E) OR W

LAT. 38° 45' 45" LONG. 90° 36' 44"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 470.25

LOCKING CAP: (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 8" x 5'
Bore Hole Diameter: 10.25"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 467.0 Ft

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	0-7 Fill
Depth to bottom of Protective Casing Seal: 3	
Depth to Base of Annular Seal: 3	
	7-14 Silt
Depth to Base of Bentonite Seal: 3.5	
Depth to Base of Secondary Filter Pack:	
Depth to Top of the Screen: 10	
	14-64 Limestone
	64-81 Dolomite
Depth to Bottom of the Screen: 90	
	81-90.3 Limestone
Plug Back Total Depth	
Original Total Depth: 90.3	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 13.25'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: 5 1/8 In.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [ ] Cement Slurry [X] Non Slurry Bentonite

BENTONITE SEAL
Type: [ ] Bentonite Slurry [X] Non Slurry Bentonite
Length of Seal: 5.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: [ ] Sand [ ] Manufactured
Grain Size:
Length:

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 81.3

WELL SCREEN
Length: 80'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT

MEASURING POINT IS
[ ] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[X] AIR ROTARY [X] AUGER TYPE 6¼ H.S.A.
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 4 TOTAL
[ ] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
3-10-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 4-11-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogl
PERMIT NUMBER: 001256WM DATE: 4-11-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO. 122518	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: Laidlaw Bridgeton Sanitary Landfill		WELL NUMBER: PZ-204H-55	
SITE ADDRESS: St. Charles Rock Rd.	CITY: Bridgeton	STATE: Mo	ZIP CODE: 63044
NAME: Laidlaw Waste Systems, Inc		TELEPHONE: 314-241-3710	
ADDRESS: 1034 N. Broadway	CITY: St Louis	STATE: Mo	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

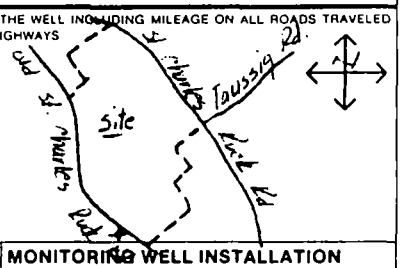
COUNTY: St. Louis
ELEVATION: 466.66
AREA NO

SMALLEST ¼ LARGEST ¼

SEC. ____ TWN 47 N, RNG 5 E OR W

LAT. 30 45 44 LONG 90 26 44

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE able TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
Layne Western Co., Inc

DRILLING CONTRACTOR'S NAME
Layne Western Co., Inc.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
468.16

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☒ AIR ROTARY ☒ AUGER TYPE 6¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 3 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
6-22-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

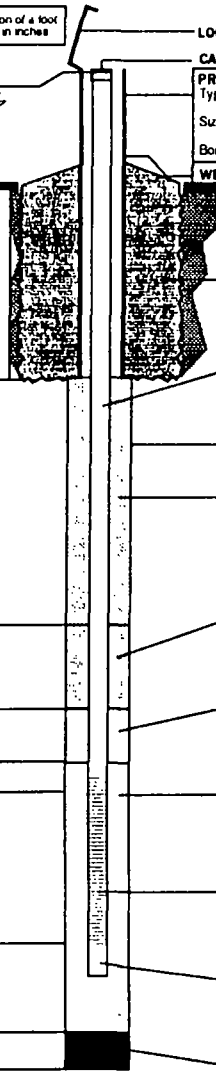
SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256 WM DATE 7-07-95
SIGNATURE (DRILLING CONTRACTOR) Michael P. Vogt
PERMIT NUMBER 001256 WM DATE 7-07-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 468.16

Ground Surface Elevation: 466.66 Ft

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	60.0	
Depth to Base of Bentonite Seal:	74.5	
Depth to Base of Secondary Filter Pack:	76.8	
Depth to Top of the Screen:	79.5	
Depth to Bottom of the Screen:	89.5	
Plug Back Total Depth		
Original Total Depth:	90.0	



LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: Steel
Size: 5"x5"x5'
Bore Hole Diameter: 10¼"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 81'
Diameter: 2"
Type of Material: Sch 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 14.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: <50
Length: 2.3'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13.2'

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: Sch 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: Sand

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122496	CHECK NO
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-205AS	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

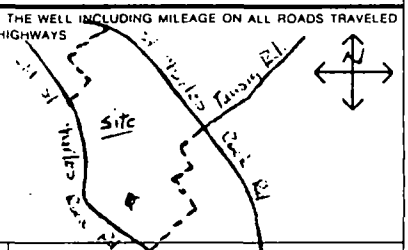
COUNTY: ST. LOUIS
ELEVATION: 454.3
AREA NO.:

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N, RNG. 5 (E) OR W

LAT. 38° 45' 35" LONG. 90° 26' 45"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
461.0

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 2 TOTAL
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
5-06-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
Thomas H. Hekmann Jr.

PERMIT NUMBER	DATE
WI1258WPM	6-02-95

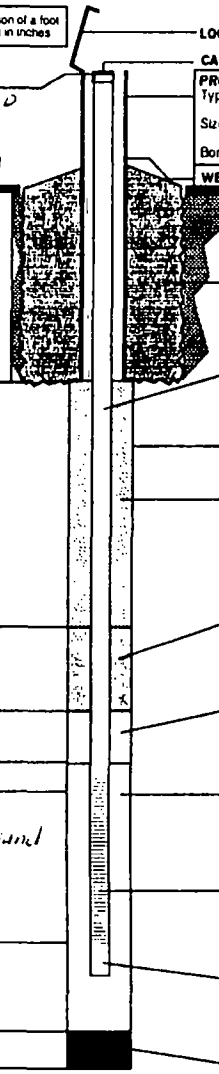
SIGNATURE (DRILLING CONTRACTOR)
Thomas H. Hekmann Jr.

PERMIT NUMBER	DATE
WI1258WAM-1	6-02-95

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 461.0

Ground Surface Elevation: 454.3 Ft



Description of Formation	Feet from Surface
Information in this column to be supplied in the Feet from Surface column	
0-2 Clay	
2-6 Silt	
Depth to bottom of Protective Casing Seal:	4.0
6-27 Trash	
Depth to Base of Annular Seal:	24.0
27-31 Silt	
Depth to Base of Bentonite Seal:	34.5
Depth to Base of Secondary Filter Pack:	36.0
31-38 Clay	
Depth to Top of the Screen:	38.4
38-44 Silt w/ sand	
Depth to Bottom of the Screen:	48.4
Plug Back Total Depth	
Original Total Depth:	44.0

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 14"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 40.1'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 8 In.

ANNULAR SEAL
Type: ☐ Bentonite Slurry ☒ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 10.5 FL

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: < 50
Length: 1.5'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 13'

WELL SCREEN
Length: 10
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 FL
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122506	CHECK NO
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-30555	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

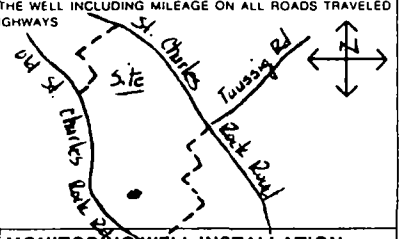
COUNTY: ST. LOUIS
ELEVATION: 454.5
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. TWN. 47 N.RNG. 5 E OR W

LAT. 38° 45' 35" LONG. 90° 36' 45"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE: Record the fraction of a foot in decimal, not in inches.

Top of Riser Elevation: 461.8

Ground Surface Elevation: 457.5

Information in this column to be supplied in the Feet from Surface column	Feet from Surface	Description of Formation
Depth to bottom of Protective Casing Seal:	3.0	
		30.85 Limestone
Depth to Base of Annular Seal:	60.0	
Depth to Base of Bentonite Seal:	71.0	
Depth to Base of Secondary Filter Pack:	72.5	
Depth to Top of the Screen:	74.7	
Depth to Bottom of the Screen:	84.7	
Plug Back Total Depth		
Original Total Depth:	85.3	

LOCKING CAP - (Y) N (Circle one)
CAP VENT - (Y) N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 3" x 8' x 5'
Bore Hole Diameter: 9 7/8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 77'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 11 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: <50
Length: 1.5'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16/35
Length: 12.5

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 461.8

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [ ] AIR ROTARY [ ] AUGER TYPE [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 4 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 5-21-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 VIIM DATE: 6-02-95

SIGNATURE (DRILLING CONTRACTOR): Michael P. Vogt
PERMIT NUMBER: 001256 VIIM DATE: 6-02-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF NO 115096	CHECK NO.
ROUTE	TRANSMITTAL NO.
STATE WELL NUMBER	CROSS REFERENCE NO.
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LAIDLAW BRIDGETON SANITARY LANDFILL		WELL NUMBER: PZ-206-55	
SITE ADDRESS: ST. CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO.	ZIP CODE: 63044
NAME: LAIDLAW WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1808 N. BROADWAY	CITY: ST. LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

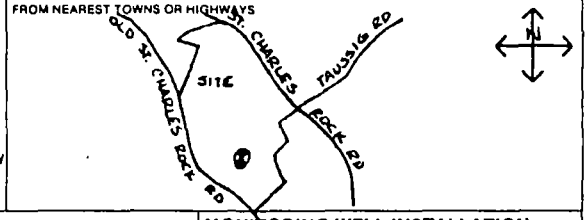
COUNTY: ST. LOUIS
ELEVATION: 458.4
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 E OR W

LAT. 38 · 46 · 00 · LONG. 90 · 26 · 40 ·

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN CO., INC.

NOTE Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 460.2

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8" x 5" x 5'
Bore Hole Diameter: 10.75"
WEEP HOLE - Y / N (Circle one)

Ground Surface Elevation: 458.4 Ft

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		0-6 Fill
Depth to bottom of Protective Casing Seal:	3.0	
		6-16 Clayey silt
		16-32 Sand
		32-37.5 Sandy clay
		37.5-41 Silt
		41-43.5 Sandy silt
Depth to Base of Annular Seal:	101.0	43.5-125.5 Limestone
Depth to Base of Bentonite Seal:	111.1	
Depth to Base of Secondary Filter Pack:	112.2	
Depth to Top of the Screen:	115.2	
Depth to Bottom of the Screen:	125.2	
Plug Back Total Depth:		
Original Total Depth:	125.5	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 117.0'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 5 7/8 In.

ANNULAR SEAL
Type: [X] Bentonite Slurry [ ] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 10.1 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: SUGAR < 50
Length: 1.1'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 13.3'

WELL SCREEN
Length: 10'
Slot Size: 0.010"
Type: SCH. 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: SAND

TYPE OF INSTALLATION: [X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT: 460.20

MEASURING POINT IS: [X] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [X] AIR ROTARY [X] AUGER TYPE 6 1/4 HSA [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [X] YES, AT 4 TOTAL [X] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 4-24-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Richard P. Vogt
PERMIT NUMBER: 001256WM1 DATE: 5-10-95

SIGNATURE (DRILLING CONTRACTOR): Richard P. Vogt
PERMIT NUMBER: 001256WM1 DATE: 5-10-95

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO 122486	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME		WELL NUMBER	
LANDLAWN BRIDGETON SANITARY LANDFILL		PZ-207-AS	
SITE ADDRESS: 501 CHARLES ROCK RD.	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LANDLAWN WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1000 N. BROADWAY	CITY: ST LOUIS	STATE: MO	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

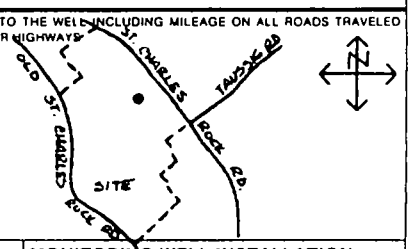
COUNTY: ST. LOUIS
ELEVATION: 460.9
AREA NO.

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN 47 N. RNG. 5 E OR W

LAT. 38 ° 46 ' 06 " LONG 90 ° 26 ' 38 "

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

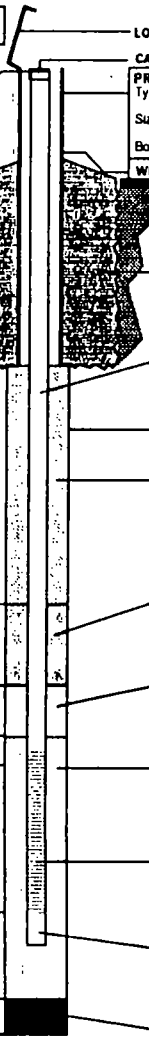
NOTE. Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 463.6

LOCKING CAP - Y / N (Circle one)
CAP VENT - Y / N (Circle one)

Ground Surface Elevation: 460.9 Ft

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	
Depth to bottom of Protective Casing Seal:	
Depth to Base of Annular Seal: 30.0	
Depth to Base of Bentonite Seal: 31.0	
Depth to Base of Secondary Filter Pack: 33.4	
Depth to Top of the Screen: 34.7	
	Alluvium
Depth to Bottom of the Screen: 39.7	
Plug Back Total Depth	
Original Total Depth: 40.2	



PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter: 8"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: ☒ Concrete ☐ Cement Slurry

RISER PIPE
Length: 36.6'
Diameter: 2"
Type of Material: SCH. 80 PVC

BOREHOLE DIAMETER: 8 in.

ANNULAR SEAL
Type: ☒ Bentonite Slurry ☐ Cement Slurry ☐ Non Slurry Bentonite

BENTONITE SEAL
Type: ☒ Bentonite Slurry ☐ Non Slurry Bentonite
Length of Seal: 2 FL

SECONDARY FILTER PACK (Optional)
Type: ☒ Sand ☐ Manufactured
Grain Size: SUGAR SAND
Length: 1.4'

PRIMARY FILTER PACK
Type: ☒ Sand ☐ Manufactured
Grain Size: 16-35
Length: 6.8'

WELL SCREEN
Length: 5'
Slot Size: 0.010"
Type: SCH80 PVC

SUMP DETAILS
Length: 0.3 FL
Diameter: 2 in.
Type: PVC

TYPE OF BACKFILL: GRAV

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

DRILLING CONTRACTOR'S NAME
LAYNE WESTERN Co, INC.

TYPE OF INSTALLATION
☒ ABOVE GROUND ☐ FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
463.57

MEASURING POINT IS
☒ TOP OF RISER PIPE
☐ OTHER

DRILLING EQUIPMENT
☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A.
☐ REVERSE ROTARY ☐ OTHER

CENTRALIZERS USED
☒ YES, AT 1 PER
☒ STAINLESS STEEL
☐ OTHER
☐ NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
4-10-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR)
[signature]
PERMIT NUMBER 001258 WMM — DATE 5-10-95

SIGNATURE (DRILLING CONTRACTOR)
[signature]
PERMIT NUMBER 001258 WMM — DATE 5-10-95

MO 780-1415 (2-94)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122514	RECEIVED
ROUTE	CHECK NO
STATE WELL NUMBER	TRANSMITTAL NO
CHECKED BY	CROSS REFERENCE NO
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3
	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: Laidlaw Bridgeton Sanitary Landfill	WELL NUMBER: P2-208-SS
SITE ADDRESS: St. Charles Rock Rd	CITY: Bridgeton; STATE: Mo; ZIP CODE: 63044
NAME: Laidlaw Waste Systems, Inc.	TELEPHONE: 314-241-3710
ADDRESS: 1055 N. Brentwood	CITY: St. Louis; STATE: Mo; ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

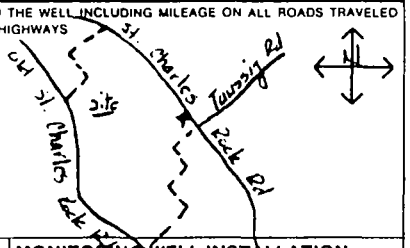
COUNTY: St. Louis
ELEVATION: 474.23
AREA NO:

SMALLEST ¼: ___ ¼ ___ ¼ ___ ¼ LARGEST ¼

SEC. ___ TWN. 47 N. RNG 5 (E) OR W

LAT. 38° 46' 12" LONG. 90° 26' 22"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
Layne Western Co., Inc.

DRILLING CONTRACTOR'S NAME
Layne Western Co., Inc.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 474.25

Ground Surface Elevation: 471.52 Ft.

Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column	0-4 Fill; 4-16 Silt; 16-47.2 Limestone
Depth to bottom of Protective Casing Seal: 3.0	
Depth to Base of Annular Seal: 70.0	
Depth to Base of Bentonite Seal: 53.7	
Depth to Base of Secondary Filter Pack: 35.7	
Depth to Top of the Screen: 38.7	
Depth to Bottom of the Screen: 48.7	
Plug Back Total Depth	
Original Total Depth: 47.2	

LOCKING CAP - (Y) / N (Circle one)
CAP VENT - Y / N (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x5"x5'
Bore Hole Diameter: 10¼"
WEEP HOLE - Y / N (Circle one)

PROTECTIVE CASING SEAL
Type: [x] Concrete [ ] Cement Slurry

RISER PIPE
Length: 40.5'
Diameter: 2"
Type of Material: Sch 80 PVC

BOREHOLE DIAMETER: 5⅛ In.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [x] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [x] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 13.7 Ft.

SECONDARY FILTER PACK (Optional)
Type: [x] Sand [ ] Manufactured
Grain Size: 20
Length: 1.8'

PRIMARY FILTER PACK
Type: [x] Sand [ ] Manufactured
Grain Size: 16-35
Length: 13.5'

WELL SCREEN
Length: 10
Slot Size: 0.010
Type: Sch 80 PVC

SUMP DETAILS
Length: 0.3 Ft.
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: Sand

TYPE OF INSTALLATION: [x] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL: FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL:

ELEVATION OF MEASURING POINT: 474.25

MEASURING POINT IS: [x] TOP OF RISER PIPE [ ] OTHER

DRILLING EQUIPMENT: [x] AIR ROTARY [x] AUGER TYPE 6¼ HSA [ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED: [x] YES, AT 3 TOTAL [x] STAINLESS STEEL [ ] OTHER [ ] NO

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED: 6-18-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR): Michael F. Vogt
PERMIT NUMBER: 001256 WM1 DATE: 7-07-95

SIGNATURE (DRILLING CONTRACTOR): Michael F. Vogt
PERMIT NUMBER: 001256 WM1 DATE: 7-07-95

MO 780-1415 (2-94) DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

(MODIFICATION TO EXISTING)

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO 122517	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CROSS REFERENCE NO
CHECKED BY	ENTERED Ph 1 Ph 2 Ph 3
APPROVED BY	DATE APPROVED

INFORMATION SUPPLIED BY OWNER

SITE NAME: LANDLAND BRIDGETON SANITARY LANDFILL		WELL NUMBER: MW-1301	
SITE ADDRESS: ST. CHARLES ROCK RD	CITY: BRIDGETON	STATE: MO	ZIP CODE: 63044
NAME: LANDLAND WASTE SYSTEMS, INC.		TELEPHONE: 314-241-3710	
ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS	STATE: MO.	ZIP CODE: 63102

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT

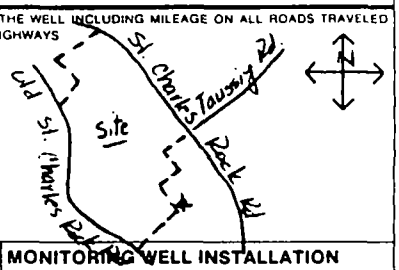
COUNTY: ST. LOUIS
ELEVATION: 482.41
AREA NO.

SMALLEST ¼ LARGEST ¼

SEC. TWN 47 N,RNG. 5 (E OR W)

LAT. 38° 45' 53" LONG. 90° 26' 26"

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT

OPEN BORE HOLE, ORIGINALLY DRILLED IN 1995 BY DRILLING SERVICE WAS GROUTED TO 148.5' AND MONITORING WELL MATERIALS WERE INSTALLED BY LAYNE WESTERN 7/95.

MONITORING WELL INSTALLATION CONTRACTOR'S NAME
LAYNE WESTERN Co., INC.

DRILLING CONTRACTOR'S NAME
DRILLING SERVICE Co.

NOTE: Record the fraction of a foot in decimal, not in inches

Top of Riser Elevation: 482.42

LOCKING CAP - (Y) / N (Circle one)
CAP VENT - Y / (N) (Circle one)

PROTECTIVE CASING
Type: STEEL
Size: 8"x8"x5'
Bore Hole Diameter:
WEEP HOLE - Y / (N) (Circle one)

Ground Surface Elevation: 430.44

	Feet from Surface	Description of Formation
Information in this column to be supplied in the Feet from Surface column		
Depth to bottom of Protective Casing Seal:	3.0	
Depth to Base of Annular Seal:	120.0	
Depth to Base of Bentonite Seal:	133.5	
Depth to Base of Secondary Filter Pack:	135.5	
Depth to Top of the Screen:	137.7	
Depth to Bottom of the Screen:	147.7	
Plug Back Total Depth	148.5	
Original Total Depth	250.0	

PROTECTIVE CASING SEAL
Type: [X] Concrete [ ] Cement Slurry

RISER PIPE
Length: 139.7'
Diameter: 2"
Type of Material: SCH 80 PVC

BOREHOLE DIAMETER: In.

ANNULAR SEAL
Type: [ ] Bentonite Slurry [X] Cement Slurry [ ] Non Slurry Bentonite

BENTONITE SEAL
Type: [X] Bentonite Slurry [ ] Non Slurry Bentonite
Length of Seal: 13.5 Ft.

SECONDARY FILTER PACK (Optional)
Type: [X] Sand [ ] Manufactured
Grain Size: <50
Length: 2.0'

PRIMARY FILTER PACK
Type: [X] Sand [ ] Manufactured
Grain Size: 16-35
Length: 13'

WELL SCREEN
Length: 10'
Slot Size: 0.010
Type: SCH 80 PVC

SUMP DETAILS
Length: 0.3 FL
Diameter: 2 In.
Type: PVC

TYPE OF BACKFILL: GROUT

TYPE OF INSTALLATION
[X] ABOVE GROUND [ ] FLUSH MOUNT

STATIC WATER LEVEL
FEET FROM MEASURING POINT

DATE OF STATIC WATER LEVEL

ELEVATION OF MEASURING POINT
482.42

MEASURING POINT IS
[X] TOP OF RISER PIPE
[ ] OTHER

DRILLING EQUIPMENT
[ ] AIR ROTARY [ ] AUGER
TYPE
[ ] REVERSE ROTARY [ ] OTHER

CENTRALIZERS USED
[X] YES, AT 3 TOTAL
[X] STAINLESS STEEL
[ ] OTHER
[ ] NO

MULTIPLE CASED WELLS
SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DATE WELL CONSTRUCTION WAS COMPLETED
7-07-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE (MONITORING WELL CONTRACTOR) Michael P. Vogt

PERMIT NUMBER	DATE
001256 WM	7-07-95

SIGNATURE (DRILLING CONTRACTOR)

PERMIT NUMBER	DATE

DISTRIBUTION: WHITE DIVISION CANARY MONITORING WELL CONTRACTOR PINK/OWNER

MISSOURI DEPARTMENT OF
NATURAL RESOURCES
DIVISION OF GEOLOGY AND
LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	RECEIVED
REF. NO. 145095	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-300AS

SITE ADDRESS: ST. CHARLES ROCK ROAD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3700

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
1100' S.W. OF BANK OF LEACHATE RETENSION POND, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 448.5
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E OR W)
LAT. 38 . 45 . 32 . LONG. 90 . 27 . 05 .

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. — PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. — PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5' FT. | DIAMETER OF CASING 8"x8" IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 20 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 2.5 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 12 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH. 40 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☐ BENTONITE SLURRY ☒ NON SLURRY BENTONITE TYPE: MED. CHIPS ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL
BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS
LENGTH OF SEAL: 3.8
BENTONITE SEAL INSTALLED IN: ☒ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16/35 | LENGTH OF FILTER PACK 13 FT. | METHOD OF INSTALLATION POURED THRU H.S.A.

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE 100 | LENGTH OF FILTER PACK 0.7 FT. | METHOD OF INSTALLATION POURED THRU H.S.A.

WELL SCREEN: LENGTH OF SCREEN 10 FT. | DIAMETER 2 IN. | SLOT SIZE 0.010 | WEIGHT OR SDR # SCH.40 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED | LENGTH OF BACK FILLED BORE HOLE

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
		0-20 Silty clay
Depth to bottom of Protective Casing Seal:	2.5	
Depth to Base of Annular Seal:	6.3	
Depth to Base of Bentonite Seal:	6.3	
Depth to Top of Primary Filter Pack:	7.0	
Depth to Top of the Screen:	10	
Depth to Bottom of the Screen:	20	
Total Depth:	20	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 450.66

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL, AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED: 9-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Simon M. Mehrmann	11-14-95	Lennon M. Mechmann Jr.	11-14-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	RECEIVED
REF. NO. 145096	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-300AD

SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3700

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
1120' SOUTHWEST OF BANK OF LEACHATE RETENSION ~~POND~~ POND, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 448.1
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 · 45 · 32 - LONG. 90 · 27 · 06-

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: D01258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. DIAMETER OF CASING 8x8 IN. WEIGHT OR SDR #: 0.188" DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 42.2 FT. JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED:

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 38.7 FT. DIAMETER OF RISER PIPE 2 IN. WEIGHT OR SDR # SCH 80 DIAMETER OF DRILL HOLE 8¼ IN. JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS
LENGTH OF SEAL: 5.1
BENTONITE SEAL INSTALLED IN: ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	7.1 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.5 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-30 Not sampled
WELL SCREEN	LENGTH OF SCREEN 5 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80; MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	28.5	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP		MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER	Depth to Base of Bentonite Seal:	33.6	30-38 Silt
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	35.1	
					Depth to Top of the Screen:	37.2	
					Depth to Bottom of the Screen:	42.2	38-42.2 Silty sand
					Total Depth:	42.2	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 449.62

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED: 9-24-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lorraine S. Mahurin Jr.	11-14-95	Lorraine S. Mahurin Jr.	11-14-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145097	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL	WELL NUMBER: PZ-300SS

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	Mo	63044

OWNER NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

OWNER ADDRESS	CITY	STATE	ZIP CODE
1828 N. BROADWAY	ST. LOUIS	Mo	63102

VARIANCE ISSUED: ☐ YES ☒ NO — DATE ISSUED: — VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT: 1110' SOUTHWEST OF BANK OF LEACHATE RETENSION POND, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT

COUNTY: ST. LOUIS
SURFACE ELEVATION: 448.4

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N.RNG. 5 (E OR W)

LAT. 38 · 45 · 32 · LONG. 90 · 27 · 05 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME	LAYNE WESTERN Co., INC.	PERMIT NUMBER	001258 WPM
DRILLING CONTRACTOR'S NAME	LAYNE WESTERN Co., INC.	PERMIT NUMBER	001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. — DIAMETER OF CASING 8x8 IN. — WEIGHT OR SDR # 0.188" — DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 46 FT. — JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ — LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO — WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: ____

CENTRALIZER USED ON RISER: ☐ NO ☒ YES — LOCATED AT 10', 50', 90' — MATERIAL ☒ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 84.9 FT. — DIAMETER OF RISER PIPE 2 IN. — WEIGHT OR SDR # SCH 80 — DIAMETER OF DRILL HOLE 6⅞ IN. — JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL 11' — BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	13 FT.	TREMIE			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.0 FT.	TREMIE	Depth to bottom of Protective Casing Seal:	3.0	0-35.5 Silt
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10 — WEIGHT OR SDR # SCH80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	70.5	35.5-39.5 Sand
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____		Depth to Base of Bentonite Seal:	80.5	39.5-94.5 Limestone
BACK FILL	WAS THE WELL BACK FILLED? ☒ YES ☐ NO	MATERIAL USED 16-35 SAND	LENGTH OF BACK FILLED BORE HOLE 0.8'		Depth to Top of Primary Filter Pack:	81.5	
					Depth to Top of the Screen:	83.7	
					Depth to Bottom of the Screen:	93.7	
					Total Depth:	94.5	

STATIC WATER LEVEL — FEET FROM MEASURING POINT: ____
DATE OF STATIC WATER LEVEL: ____

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

ELEVATION OF MEASURING POINT: 449.60

DATE WELL DRILLING WAS COMPLETED: 9-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lorna A. Maher, M.	11-14-95	Lorna A. Maher, M.	11-14-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO. 145098	D[redacted]VED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL	WELL NUMBER: PZ-30155

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

OWNER NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

OWNER ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

VARIANCE ISSUED: ☐ YES ☒ NO — DATE ISSUED: — VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT: 1750' SOUTH OF SOUTH ENTRANCE TO LANDFILL, SOUTH OF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT

COUNTY: ST. LOUIS
SURFACE ELEVATION: 513.1

SMALLEST ¼ ___ ¼ ___ ¼ ___ ¼ LARGEST ¼
SEC. ___ TWN. 47 N, RNG. 5 (E OR W)
LAT. 38 · 45 · 28 · LONG. 90 · 26 · 44 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME	LAYNE WESTERN CO, INC.	PERMIT NUMBER	001258 WPM
DRILLING CONTRACTOR'S NAME	LAYNE WESTERN CO. INC.	PERMIT NUMBER	001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ___

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ___ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. — DIAMETER OF CASING 8x8 IN. — WEIGHT OR SDR # 0.188" — DIAMETER AND DEPTH OF DRILL HOLE 8.25 IN. 19 FT. — JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ — MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ___ — LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO — WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ___ — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: ___

CENTRALIZER USED ON RISER: ☐ NO ☒ YES LOCATED AT 30', 70', 110', 150' — MATERIAL ☒ STAINLESS STEEL ☐ OTHER ___

RISER PIPE DETAILS: LENGTH 152.8 FT. — DIAMETER OF RISER PIPE 2 IN. — WEIGHT OR SDR # SCH. 80 — DIAMETER OF DRILL HOLE 5 7/8 IN. — JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ___ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ___ % BENTONITE USED ___ WATER USED/BAG ___ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL 6.5' — BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

					Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL	GRAIN SIZE 16-35	LENGTH OF FILTER PACK 13.5 FT.	METHOD OF INSTALLATION TREMIE			
SECONDARY FILTER PACK	TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE	GRAIN SIZE 16-35	LENGTH OF FILTER PACK 1.5 FT.	METHOD OF INSTALLATION TREMIE	Depth to bottom of Protective Casing Seal:	3.0	0-10 silt
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80 — MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	140.0	10-28.5 Siltstone 28.5-59.5 Claystone 59.5-62 Limestone
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___		Depth to Base of Bentonite Seal:	146.5	62-70.5 Claystone 70.5-161.5 Limestone
BACK FILL	WAS THE WELL BACK FILLED? ☒ YES ☐ NO	MATERIAL USED 16-35 SAND	LENGTH OF BACK FILLED BORE HOLE 0.5'		Depth to Top of Primary Filter Pack:	148.0	
					Depth to Top of the Screen:	161.0	
					Depth to Bottom of the Screen:	161.0	

STATIC WATER LEVEL — FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ___
ELEVATION OF MEASURING POINT: 514.71

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☒ AIR ROTARY ☒ AUGER TYPE 4.25 H.S.A. ☐ REVERSE ROTARY ☐ OTHER ___

Total Depth: 161.5'

DATE WELL DRILLING WAS COMPLETED

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lemuel T. Malvern Jr.	11-15-95	Lemuel T. Malvern Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF NO. 145099	DATE RECEIVED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-302AS

SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
20' INSIDE FENCE LINE, 700' NORTHWEST OF SOUTH ENTRANCE OFF OLD ST CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 449.2
SMALLEST ¼ ___ ¼ ___ ¼ ___ ¼ LARGEST ¼
SEC. ___ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 · 45 · 52 · LONG. 90 · 26 · 54 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ___
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ___ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 22.3 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ___ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ___
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED:

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ___
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ___

RISER PIPE DETAILS: LENGTH 14.2 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ___ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ___ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ___ % BENTONITE USED ___ WATER USED/BAG ___ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS
LENGTH OF SEAL: 6.0
BENTONITE SEAL INSTALLED IN: ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	12.4 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	0.9 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-15 Silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80 / MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	9.0	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ___		Depth to Base of Bentonite Seal:	9.0	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	9.9	
					Depth to Top of the Screen:	12.3	
					Depth to Bottom of the Screen:	22.3	15-22.3 Silty sand
					Total Depth:	22.3	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ___
ELEVATION OF MEASURING POINT: 451.42

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ___
DATE WELL DRILLING WAS COMPLETED: 9-25-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lomar D. Mahurin Jr.	11-15-95	Lomar D. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 145100	DATE RECEIVED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME	WELL NUMBER
LAIDLAW BRIDGETON SANITARY LANDFILL	PZ-302AI

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD.	BRIDGETON	MO	63044

OWNER NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

OWNER ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

VARIANCE ISSUED ☐ YES ☒ NO — DATE ISSUED — VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
15' INSIDE FENCE LINE, 720' NORTHWEST OF SOUTH ENTRANCE OFF OLD ST. CHARLES ROCK RD.

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 450.0
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N, RNG. 5 (E) OR W
LAT. 38 . 45 . 52 - LONG. 90 . 26 . 54 -

MONITORING WELL INSTALLATION CONTRACTOR'S NAME	PERMIT NUMBER
LAYNE WESTERN CO, INC.	001258 WPM

DRILLING CONTRACTOR'S NAME	PERMIT NUMBER
LAYNE WESTERN CO, INC.	001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. — DIAMETER OF CASING 8 x 8 IN. — WEIGHT OR SDR # 0.188" — DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 43 FT. — JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ — LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO — WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT. — TYPE OF SURFACE COMPLETION ☒ ABOVE GROUND ☐ FLUSH MOUNT — DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER ☒ NO ☐ YES LOCATED AT ____ — MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 34.2 FT. — DIAMETER OF RISER PIPE 2 IN. — WEIGHT OR SDR # SCH 80 — DIAMETER OF DRILL HOLE 8¼ IN. — JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL 4.0 — BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	15.1 FT.	HSA POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	0.9 FT.	HSA POUR	Depth to bottom of Protective Casing Seal:	3.0	0-15 Silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT. — DIAMETER 2 IN. — SLOT SIZE 10 — WEIGHT OR SDR # SCH 80 — MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER				Depth to Base of Annular Seal:	23.0	15-43 Silty sand
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____		Depth to Base of Bentonite Seal:	27.0	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	27.9	
					Depth to Top of the Screen:	33.0	
					Depth to Bottom of the Screen:	43.0	
					Total Depth:	43.0	

STATIC WATER LEVEL — FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 451.15

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED 9-26-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lorman H. Mahaffey Jr.	11-15-95	Lorman H. Mahaffey Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 145101	DATE RECEIVED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-303AS

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1839 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
AT FENCE LINE, 360' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY:
SURFACE ELEVATION: 450.8
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N, RNG. 5 E OR W
LAT. 38 . 45 . 58 . LONG. 90 . 26 . 58 .

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ L.U.S.T. ☐ OTHER
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5.0 FT. DIAMETER OF CASING 8x8 IN. WEIGHT OR SDR # 0.185" DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 26.5 FT. JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER

RISER PIPE DETAILS: LENGTH 18.9 FT. DIAMETER OF RISER PIPE 2 IN. WEIGHT OR SDR # SCH80 DIAMETER OF DRILL HOLE 8¼ IN. JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS LENGTH OF SEAL 3.8 BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	13.9 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	<50	0.8 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-4.5 Silty clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80 / MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	8.0	4.5-26.5 Silty sand
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER		Depth to Base of Bentonite Seal:	11.8	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	12.6	
					Depth to Top of the Screen:	16.5	
					Depth to Bottom of the Screen:	26.5	
					Total Depth:	26.5	

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER
ELEVATION OF MEASURING POINT 453.18

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER

DATE WELL DRILLING WAS COMPLETED 10-05-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lomanzi J. Mahurin M.	11-15-95	Lomanzi J. Mahurin M.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 145102	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-304AS

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
AT WEST FENCE LINE, 740' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 451.4
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N, RNG. 5 E OR W
LAT. 38 · 46 · 01 · LONG. 90 · 26 · 58 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ L.U.S.T. ☐ OTHER ____

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED):
- LENGTH: 5 FT.
- DIAMETER OF CASING: 8x8 IN.
- WEIGHT OR SDR #: 0.188"
- DIAMETER AND DEPTH OF DRILL HOLE: 8¼ IN. 28 FT.
- JOINTS: ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____
- MATERIAL: ☒ STEEL ☐ THERMO PLASTIC ☐ FLUORO POLYMER TYPE ____
- LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS:
- MATERIAL: ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
- DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
- TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
- DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED:

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS:
- LENGTH: 20.3 FT.
- DIAMETER OF RISER PIPE: 2 IN.
- WEIGHT OR SDR #: SCH 80
- DIAMETER OF DRILL HOLE: 8¼ IN.
- JOINTS: ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____
- MATERIAL: ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL:
- MATERIAL: BENTONITE ☒ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS
- LENGTH OF SEAL: 8.5
- BENTONITE SEAL INSTALLED IN: ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	15.2 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.3 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-13 Silt
WELL SCREEN	LENGTH OF SCREEN: 10 FT.	DIAMETER: 2 IN	SLOT SIZE: 10	WEIGHT OR SDR #: SCH80	MATERIAL: ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal: 11.5	
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP		MATERIAL: ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____	Depth to Base of Bentonite Seal:	11.5	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	12.8	
					Depth to Top of the Screen:	18.0	13-28 Sand
					Depth to Bottom of the Screen:	28.0	
					Total Depth:	28.0	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

ELEVATION OF MEASURING POINT: 453.71

DATE WELL DRILLING WAS COMPLETED: 9-27-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lorman D. Mahurin Jr.	11-15-95	Lorman D. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145103	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-304AI

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1538 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
AT WEST FENCE LINE, 720' NORTH OF SOUTHWEST FENCE CORNER.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 451.6
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N, RNG. 5 E OR W
LAT. 38. 46. 01. LONG. 90. 26. 58.

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ L.U.S.T. ☐ OTHER ____
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED):
LENGTH: 5 FT.
DIAMETER OF CASING: 8x8 IN.
WEIGHT OR SDR #: 0.188"
DIAMETER AND DEPTH OF DRILL HOLE: 8¼ IN. 50 FT.
JOINTS: ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____
MATERIAL: ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____
LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS:
MATERIAL: ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED:

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS:
LENGTH: 42.4 FT.
DIAMETER OF RISER PIPE: 2 IN.
WEIGHT OR SDR #: SCH 80
DIAMETER OF DRILL HOLE: 8¼ IN.
JOINTS: ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____
MATERIAL: ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL:
☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____
☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL:
MATERIAL: BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS
LENGTH OF SEAL: 3.9
BENTONITE SEAL INSTALLED IN: ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK:
TYPE: ☒ SAND ☐ MANUFACTURED ☐ NATURAL
GRAIN SIZE: 16-35
LENGTH OF FILTER PACK: 13.5 FT.
METHOD OF INSTALLATION: H.S.A. POUR

SECONDARY FILTER PACK:
TYPE: ☒ SAND ☐ MANUFACTURED ☐ NONE
GRAIN SIZE: 100
LENGTH OF FILTER PACK: 0.6 FT.
METHOD OF INSTALLATION: H.S.A. POUR

WELL SCREEN:
LENGTH OF SCREEN: 10 FT.
DIAMETER: 2 IN.
SLOT SIZE: 10
WEIGHT OR SDR #: SCH 80
MATERIAL: ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS:
LENGTH OF SUMP:
DIAMETER OF SUMP:
MATERIAL: ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL:
WAS THE WELL BACK FILLED? ☐ YES ☒ NO
MATERIAL USED:
LENGTH OF BACK FILLED BORE HOLE:

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL:
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 454.02

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-15 Gray silty clay
Depth to Base of Annular Seal:	32.0	15-18 Silty sand 18-28 Sand & gravel
Depth to Base of Bentonite Seal:	35.9	28-50 Sand
Depth to Top of Primary Filter Pack:	36.5	
Depth to Top of the Screen:	40.0	
Depth to Bottom of the Screen:	50.0	
Total Depth:	50.0	

DATE WELL DRILLING WAS COMPLETED: 10-02-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: Lorman D. Mahurin Jr. DATE: 11-15-95
SIGNATURE DRILLER/PERMIT #: Lorman D. Mahurin Jr. DATE: 11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

MISSOURI DEPARTMENT OF
NATURAL RESOURCES
DIVISION OF GEOLOGY AND
LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	RECEIVED
REF. NO. 145104	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: PZ-305AI

SITE ADDRESS: ST. CHARLES ROCK RD. | CITY: BRIDGETON | STATE: MO | ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC. | TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY | CITY: ST. LOUIS | STATE: MO | ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO | DATE ISSUED: | VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
SOUTH OF OVERHEAD CONVEYOR, 90' SOUTHEAST OF ROADWAY, 150' WEST OF SMALL BUILDING.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 457.6
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N, RNG. 5 E OR W
LAT. 38 ° 46 ' 01 " LONG. 90 ° 26 ' 44 "

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. | PERMIT NUMBER: 001258 VIPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. | PERMIT NUMBER: 001258 VIPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T. ____
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8X8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO | WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ | DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ | MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 55.7 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 9.2 | BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL | GRAIN SIZE 16-35 | LENGTH OF FILTER PACK 14.3 FT. | METHOD OF INSTALLATION TREMIE

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE | GRAIN SIZE 100 | LENGTH OF FILTER PACK 0.5 FT. | METHOD OF INSTALLATION TREMIE

WELL SCREEN: LENGTH OF SCREEN 10 FT. | DIAMETER 2 IN. | SLOT SIZE 10 | WEIGHT OR SDR # SCH80 | MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP | DIAMETER OF SUMP | MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO | MATERIAL USED | LENGTH OF BACK FILLED BORE HOLE

STATIC WATER LEVEL FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 459.28

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-2 Gravel 2-10 Silty clay
Depth to Base of Annular Seal:	40.0	10-18 Silt 18-25 Silty clay
Depth to Base of Bentonite Seal:	49.2	25-64 Sand
Depth to Top of Primary Filter Pack:	49.7	
Depth to Top of the Screen:	54.0	
Depth to Bottom of the Screen:	64.0	
Total Depth:	64.0	
DATE WELL DRILLING WAS COMPLETED	10-19-95	

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lyman H. Malwin Jr.	11-15-95	Lyman H. Malwin Jr.	11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

MISSOURI DEPARTMENT OF
NATURAL RESOURCES
DIVISION OF GEOLOGY AND
LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	RECEIVED
REF. NO. 145105	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-100

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
200' NORTHEAST OF SOUTH FENCE AND 380' NORTHWEST OF WESTERN MOST BUILDING AT SOUTH ENTRANCE OFF OLD ST CHARLES ROCK RD.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 467.2
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N,RNG. 5 (E) OR W
LAT. 38 . 45 . 53 . LONG. 90 . 26 . 52 .

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ L.U.S.T. ☐ OTHER ____
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 26 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 22.9 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☐ SLURRY ☒ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 1.0 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	80 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.0 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-6 Clayey silt
WELL SCREEN	LENGTH OF SCREEN 5 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	16.0	6-25.5 Trash
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP		MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____	Depth to Base of Bentonite Seal:	17.0	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED		LENGTH OF BACK FILLED BORE HOLE	Depth to Top of Primary Filter Pack:	18.0	
					Depth to Top of the Screen:	21.0	
					Depth to Bottom of the Screen:	26.0	25.5-28 Clay
					Total Depth:	26.0	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 469.12
MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.
DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____
DATE WELL DRILLING WAS COMPLETED: 10-04-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT#	DATE
Lorman D. Malurin Jr.	11-15-95	Lorman D. Malurin Jr.	11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

REGISTRATION RECORD

OFFICE USE ONLY		
REF. NO. 131862	DATE RECEIVED	
ROUTE	P.W.S. NUMBER	CHECK NUMBER
STATE WELL NUMBER	TRANSMITTAL NO.	
CHECKED BY	CROSS REFERENCE NO.	
APPROVED BY / DATE	ENTERED Ph 1 Ph 2 Ph 3	

INFORMATION SUPPLIED BY OWNER

NAME: LANDLAW WASTE SYSTEMS, INC. — TELEPHONE: 314-241-3710

ADDRESS: 1234 BROADWAY — CITY: ST. LOUIS — STATE: MO — ZIP CODE: 63102

SITE NAME: LANDLAW SANITARY LANDFILL — WELL NUMBER: LR-101 — ADDRESS OF WELL SITE OR SITE NAME (IF DIFFERENT THAN ABOVE): ST. CHARLES ROCK RD

OWNER STATUS: ☐ BUILDER ☐ PRIVATE HOME OWNER ☐ DEVELOPER ☒ OTHER (SPECIFY) LANDFILL — CITY: BRIDGETON — STATE: MO — ZIP CODE: 63044

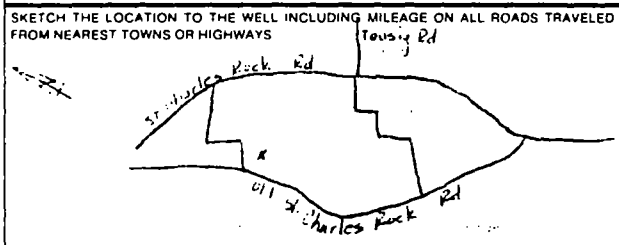
PURPOSE OF REGISTRATION FORM: ☐ ABANDONED WELL ☐ MINERAL EXPLORATORY ☐ WELL RECONSTRUCTION TEST HOLE ☒ OTHER ABANDONED PIEZOMETER

VARIANCE ISSUED? ☐ YES ☒ NO — VARIANCE NUMBER: — WELL CERTIFICATION NUMBER: — DATE ORIGINALLY DRILLED: 10-10-95

SIGNATURE (WELL OWNER) — DATE

INFORMATION SUPPLIED BY CONTRACTOR

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



LOCATION OF WELL

SHOW LOCATION IN SECTION PLAT — QUAD ____ COUNTY ST. LOUIS — ELEV ____ AREA NO. ____

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ — LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 55 E OR W

LAT. 38 · 46 · 02 · LONG. 90 · 26 · 53 ·

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL
175' NORTH OF SOUTHWEST FENCE CORNER AND 390' EAST OF FENCE
HOLE WAS DRILLED AND THEN ABANDONED BEFORE WELL WAS ACTUALLY SET

CONTRACTOR'S NAME ▶ LANNE WESTERN CO., INC. — PERMIT NUMBER 00258

DRILLERS NAME ▶ DALE MANURIN — PERMIT NUMBER C-01259 WPM

ABANDONMENT OF WELLS

FORMER USE OF WELL: ☐ HAND DUG ☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ MULTI-FAMILY ☐ HEAT PUMP ☐ IRRIGATION ☐ SOIL BORING ☐ PUBLIC WATER SUPPLY ☐ MINERAL EXPLORATORY TEST HOLE ☒ MONITORING ☐ OTHER ____

ORIGINAL DRILLER (IF KNOWN): LANNE WESTERN — DATE ORIGINALLY DRILLED: 10-10-95

DATE PLUGGED: 10-10-95 — STATIC WATER LEVEL: FT — PUMP REMOVED FROM WELL? ☐ YES N/A ☐ NO

DEPTH OF THE WELL: 55' — LENGTH OF CASING: N/A — ~~CASING DIAMETER~~/WELL DIA.: 8 1/4"

GROUT INSTALLATION METHOD: ☐ GRAVITY ☒ TREMIE — CASING CUT OFF THREE FEET BELOW SURFACE? ☒ YES ☐ NO N/A — TYPE OF CASING: ☐ STEEL ☐ PLASTIC ☐ OTHER N/A

GROUT MATERIAL USED: NEAT CEMENT ☐ HI-EARLY ☒ PORTLAND TYPE 1 ☐ OTHER ____ — ☒ BENTONITE SLURRY ☐ OTHER ____ — BENTONITE ☒ POWDER ☐ GRANULAR ☐ CHIPS ☐ PELLETS — NUMBER OF BAGS OF GROUT USED: 20.5 — POUNDS OF GROUT PER BAG: 47

IF NEAT CEMENT USED, HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT: 5

TYPE OF FILL MATERIAL USED: CEMENT / BENTONITE GROUT

AMOUNT OF FILL MATERIAL USED: 0.75 CU. YDS.

DEPTH TO TOP OF FILL MATERIAL: 3'

WELL DISINFECTED BEFORE PLUGGING? ☐ YES ☒ NO — NUMBER USED FOR DISINFECTION: GALLONS OF CHLORINE ____ POUNDS OF CHLORINE ____ TABLETS OF CHLORINE ____

WAS THE WELL ABANDONED BECAUSE OF HOOKING UP TO A PUBLIC OR RURAL WATER SUPPLY DISTRICT? ☐ YES ☒ NO

IF YES, WHAT IS THE NAME OF THE WATER DISTRICT:

WELL RECONSTRUCTION

TYPE OF REPAIR: ☐ RAISED CASING ☐ DEEPENING OF WELL ☐ LINING OF WELL ☐ OTHER ____

USE OF WELL: ☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ MULTI-FAMILY ☐ HEAT PUMP ☐ IRRIGATION ☐ PUBLIC WATER SUPPLY ☐ MONITORING ☐ OTHER ____

DIA. OF WELL CASING: IN. — WAS WELL DISINFECTED AFTER RECONSTRUCTION? ☐ YES ☐ NO — DATE RECONSTRUCTION COMPLETED

RAISED CASING INFORMATION: LENGTH OF CASING ADDED: FT. — MATERIAL: ☐ STEEL ☐ PLASTIC — METHOD OF ATTACHMENT: ☐ THREADED ☐ WELDED ☐ COUPLED ☐ FUSED ☐ GLUED

LINER DETAILS: PURPOSE OF LINER: ☐ USED ONLY TO HOLD BACK FORMATION ☐ USED TO SEAL OUT CONTAMINATION OR OTHER CONDITIONS — DIAMETER OF LINER: IN. — WEIGHT OR SDR #

DEPTH TO THE TOP OF LINER FROM SURFACE: FT. — MATERIAL: ☐ PLASTIC ☐ STEEL

AMOUNT OF LINER USED: FT. — JOINTS: ☐ GLUED ☐ WELDED ☐ OTHER ____

LINER PACKER DETAILS: TYPE USED: ☐ NONE ☐ RUBBER BOOT — DEPTH(S) SET

LINER GROUT DETAILS: POSITION OF SEAL: ☐ FULL LENGTH ☐ BETWEEN PACKERS — MATERIAL: CEMENT: ☐ PORTLAND TYPE 1 ☐ HI EARLY; BENTONITE: ☐ CHIPS ☐ PELLETS ☐ SLURRY ☐ GRANULAR

DEPTH PUMP WAS SET ____ FT. GPM ____ — DEPTH FROM SURFACE TO TOP OF THE GROUT SEAL: FT. — DEPTH FROM SURFACE TO BOTTOM OF THE GROUT SEAL: FT.

CHECK THE BOX WHICH APPLIES

☒ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS ABANDONED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE ABANDONMENT OF WELLS.

☐ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS REPAIRED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE REPAIR OF WELLS.

CONTRACTOR'S SIGNATURE — DATE: 11-15-95

DEEPENING OF WELL INFORMATION

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION	YIELD

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	RECEIVED
REF. NO. 145106	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-102

SITE ADDRESS: ST. CHARLES ROCK RD
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
WEST SIDE OF SITE, 390' EAST OF FENCE LINE AND 1580' NORTH OF SOUTHWEST FENCE CORNER. (ON TOP OF HILL)

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 512.0
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N.RNG. 5 (E OR W)
LAT. 38 . 46 . 09 - LONG. 90 . 26 . 53 -

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO, INC.
PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC.
PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. | DIAMETER OF CASING 8x8 IN. | WEIGHT OR SDR # 0.188" | DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 76 FT. | JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ | LOCKING CAP? ☒ YES ☐ NO

CAP VENTED: ☒ YES ☐ NO
WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____
DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL: 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED:

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____
MATERIAL: ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 56.5 FT. | DIAMETER OF RISER PIPE 2 IN. | WEIGHT OR SDR # SCH 80 | DIAMETER OF DRILL HOLE 8¼ IN. | JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ | MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS | LENGTH OF SEAL 3.8 | BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	9.4 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.4 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-1.5 Clayey silt 1.5-76 Trash
WELL SCREEN	LENGTH OF SCREEN 5 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH80	MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	47.0
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____		Depth to Base of Bentonite Seal:	50.8	
BACK FILL	WAS THE WELL BACK FILLED? ☒ YES ☐ NO	MATERIAL USED: MED. BENT. CHIPS	LENGTH OF BACK FILLED BORE HOLE 14.4'		Depth to Top of Primary Filter Pack:	52.2	
					Depth to Top of the Screen:	55.0	
					Depth to Bottom of the Screen:	60.0	
					Total Depth:	76.0	

STATIC WATER LEVEL: FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT: 513.52

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED: 10-08-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Leman H. Mahurin Jr.	11-15-95	Leman H. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	RECEIVED
REF. NO 145107	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL	WELL NUMBER: LR-103

SITE ADDRESS	CITY	STATE	ZIP CODE
ST. CHARLES ROCK RD	BRIDGETON	MO	63044

OWNER NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

OWNER ADDRESS	CITY	STATE	ZIP CODE
1838 N. BROADWAY	ST. LOUIS	MO	63102

VARIANCE ISSUED: ☐ YES ☒ NO — DATE ISSUED: — VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT: AT WEST BASE OF GRAVEL PILE FOR ASPHALT PLANT

LOCATION OF WELL — SHOW LOCATION IN SECTION PLAT

COUNTY: ST. LOUIS
SURFACE ELEVATION: 460.1

SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼

SEC. ____ TWN. 47 N,RNG. 5 (E) OR W

LAT. 38 · 46 · 05 · LONG. 90 · 26 · 48 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME	LAYNE WESTERN CO., INC.	PERMIT NUMBER	001258 WPM
DRILLING CONTRACTOR'S NAME	LAYNE WESTERN CO, INC.	PERMIT NUMBER	001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. — DIAMETER OF CASING 8x8 IN. — WEIGHT OR SDR # 0.188 — DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 40 FT. — JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ — LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO — WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: ____

CENTRALIZER USED ON RISER ☒ NO ☐ YES LOCATED AT ____ — MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 31.2 FT. — DIAMETER OF RISER PIPE 2 IN. — WEIGHT OR SDR # SCH80 — DIAMETER OF DRILL HOLE 8¼ IN. — JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL 10.6 — BENTONITE SEAL INSTALLED IN ☐ UNSATURATED ZONE ☒ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	14.7 FT.	H.S.A. POUR
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.7 FT.	H.S.A. POUR

WELL SCREEN: LENGTH OF SCREEN 10 FT. — DIAMETER 2 IN. — SLOT SIZE 10 — WEIGHT OR SDR # SCH 80 — MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP ____ — DIAMETER OF SUMP ____ — MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO — MATERIAL USED ____ — LENGTH OF BACK FILLED BORE HOLE ____

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-7 Gravelly clay
Depth to Base of Annular Seal:	13.0	7-26 Silty clay
Depth to Base of Bentonite Seal:	23.6	
Depth to Top of Primary Filter Pack:	25.3	
Depth to Top of the Screen:	30.0	26-40 Silty sand
Depth to Bottom of the Screen:	40.0	
Total Depth:	40.0	

STATIC WATER LEVEL ____ FEET FROM MEASURING POINT — DATE OF STATIC WATER LEVEL ____

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____

ELEVATION OF MEASURING POINT 461.28

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

DATE WELL DRILLING WAS COMPLETED 10-20-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lorman S. Mahurin Jr.	11-15-95	Lorman S. Mahurin Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145108	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL
WELL NUMBER: LR-104

SITE ADDRESS: ST. CHARLES ROCK RD.
CITY: BRIDGETON
STATE: MO
ZIP CODE: 63044

OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.
TELEPHONE: 314-241-3710

OWNER ADDRESS: 1838 N. BROADWAY
CITY: ST. LOUIS
STATE: MO
ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO
DATE ISSUED:
VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT
SOUTH OF OVERHEAD CONVEYOR, MIDWAY BETWEEN ROAD AND BUILDING.

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 458.0
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N. RNG. 5 (E OR W)
LAT. 38 . 46 . 01 . LONG. 90 . 26 . 43 .

MONITORING WELL INSTALLATION CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. — PERMIT NUMBER: 001258 WPM

DRILLING CONTRACTOR'S NAME: LAYNE WESTERN CO., INC. — PERMIT NUMBER: 001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____
TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ OTHER ____ ☐ L.U.S.T.
MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. — DIAMETER OF CASING 8x8 IN. — WEIGHT OR SDR # 0.188 — DIAMETER AND DEPTH OF DRILL HOLE 8¼ IN. 40 FT. — JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER TYPE ____ — LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO — WEEP HOLE? ☒ YES ☐ NO
CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.
TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT
DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ — MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 30.2 FT. — DIAMETER OF RISER PIPE 2 IN. — WEIGHT OR SDR # SCH80 — DIAMETER OF DRILL HOLE 8¼ IN. — JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.
BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL 11.3 WPM — BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

PRIMARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NATURAL — GRAIN SIZE 16-35 — LENGTH OF FILTER PACK 14.3 FT. — METHOD OF INSTALLATION H.S.A. POUR

SECONDARY FILTER PACK: TYPE ☒ SAND ☐ MANUFACTURED ☐ NONE — GRAIN SIZE 100 — LENGTH OF FILTER PACK 1.4 FT. — METHOD OF INSTALLATION H.S.A. POUR

WELL SCREEN: LENGTH OF SCREEN 10 FT. — DIAMETER 2 IN. — SLOT SIZE 10 — WEIGHT OR SDR # SCH80 — MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER

SUMP DETAILS: LENGTH OF SUMP — DIAMETER OF SUMP — MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

BACK FILL: WAS THE WELL BACK FILLED? ☐ YES ☒ NO — MATERIAL USED — LENGTH OF BACK FILLED BORE HOLE

STATIC WATER LEVEL — FEET FROM MEASURING POINT
DATE OF STATIC WATER LEVEL
MEASURING POINT FOR STATIC WATER LEVEL IS ☒ TOP OF RISER PIPE ☐ OTHER ____
ELEVATION OF MEASURING POINT 459.73

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
Depth to bottom of Protective Casing Seal:	3.0	0-2 Gravel 2-10 Silty clay
Depth to Base of Annular Seal:	13.0	10-18 Silt
Depth to Base of Bentonite Seal:	24.3 WPM	18-26.5 Clay
Depth to Top of Primary Filter Pack:	25.7	
Depth to Top of the Screen:	28.5	26.5 39.3 Sand
Depth to Bottom of the Screen:	38.5	39.3-40 Clay
Total Depth:	40.0	

DATE WELL DRILLING WAS COMPLETED: 10-18-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #: William J. Mahurin Jr. — DATE 11-15-95
SIGNATURE DRILLER/PERMIT #: William J. Mahurin Jr. — DATE 11-15-95

MO 780-1415 (7-95)
DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION
RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL CERTIFICATION RECORD

OFFICE USE ONLY	
REF. NO. 145109	RECEIVED
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED Ph 1 Ph 2 Ph 3

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR

SITE/FACILITY NAME: LAIDLAW BRIDGETON SANITARY LANDFILL	WELL NUMBER: LB-105
SITE ADDRESS: ST. CHARLES ROCK RD	CITY: BRIDGETON; STATE: Mo; ZIP CODE: 63044
OWNER NAME: LAIDLAW WASTE SYSTEMS, INC.	TELEPHONE: 314-241-3710
OWNER ADDRESS: 1838 N. BROADWAY	CITY: ST. LOUIS; STATE: Mo; ZIP CODE: 63102

VARIANCE ISSUED: ☐ YES ☒ NO — DATE ISSUED: — VARIANCE NUMBER: V

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT:
90' EAST OF WEST FENCE LINE AND 320' NORTH OF SOUTHWEST FENCE CORNER

LOCATION OF WELL
SHOW LOCATION IN SECTION PLAT
COUNTY: ST. LOUIS
SURFACE ELEVATION: 424.2
SMALLEST ¼ ____ ¼ ____ ¼ ____ ¼ LARGEST ¼
SEC. ____ TWN. 47 N. RNG. 5 E OR W
LAT. 38 · 45 · 57 · LONG. 90 · 26 · 57 ·

MONITORING WELL INSTALLATION CONTRACTOR'S NAME	LAYNE WESTERN CO., INC.	PERMIT NUMBER	001258 WPM
DRILLING CONTRACTOR'S NAME	LAYNE WESTERN CO., INC.	PERMIT NUMBER	001258 WPM

WELL CONSTRUCTION INFORMATION

TYPE OF WELL: ☐ MONITORING WELL ☒ PIEZOMETER ☐ OTHER ____

TYPE OF POTENTIAL SITE: ☐ HAZARDOUS MATERIAL ☒ LANDFILL ☐ L.U.S.T. ☐ OTHER ____

MONITORING FOR: (CHECK ALL THAT APPLY) ☒ V.O.C. ☐ METALS ☐ PETROLEUM PRODUCT ☐ OTHER ____ ONLY

PROTECTIVE CASING DETAILS (IF USED): LENGTH 5 FT. — DIAMETER OF CASING 8x8 IN. — WEIGHT OR SDR # 0.188" — DIAMETER AND DEPTH OF DRILLHOLE 8¼ IN 38 FT. — JOINTS ☐ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☐ THERMO PLASTIC ☒ STEEL ☐ FLUORO POLYMER TYPE ____ — LOCKING CAP? ☒ YES ☐ NO

CAP VENTED ☒ YES ☐ NO — WEEP HOLE? ☒ YES ☐ NO

CASING GROUT DETAILS: MATERIAL ☐ CEMENT ☒ CONCRETE ☐ OTHER ____ — DEPTH FROM THE SURFACE TO THE BOTTOM OF THE CASING GROUT SEAL 3.0 FT.

TYPE OF SURFACE COMPLETION: ☒ ABOVE GROUND ☐ FLUSH MOUNT

DESCRIBE HOW THE FLUSH MOUNT WAS CONSTRUCTED: ____

CENTRALIZER USED ON RISER: ☒ NO ☐ YES LOCATED AT ____ — MATERIAL ☐ STAINLESS STEEL ☐ OTHER ____

RISER PIPE DETAILS: LENGTH 28.9 FT. — DIAMETER OF RISER PIPE 2 IN. — WEIGHT OR SDR # SCH 80 — DIAMETER OF DRILL HOLE 8¼ IN. — JOINTS ☒ THREADED ☐ MECHANICAL ☐ WELDED ☐ OTHER ____ — MATERIAL ☒ THERMO PLASTIC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____

ANNULAR SEAL: ☐ CEMENT SLURRY ☒ BENTONITE SLURRY ☐ NON SLURRY BENTONITE TYPE: ____ ☐ CEMENT/BENTONITE SLURRY BAGS OF CEMENT USED ____ % BENTONITE USED ____ WATER USED/BAG ____ GAL.

BENTONITE SEAL: MATERIAL BENTONITE ☒ SLURRY ☐ CHIPS ☐ GRANULAR ☐ PELLETS — LENGTH OF SEAL 18.8 — BENTONITE SEAL INSTALLED IN ☒ UNSATURATED ZONE ☐ SATURATED ZONE

	TYPE	GRAIN SIZE	LENGTH OF FILTER PACK	METHOD OF INSTALLATION	Information in this column to be supplied in the Feet from Surface column	FEET FROM SURFACE	FORMATION DESCRIPTION
PRIMARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NATURAL	16-35	15.2 FT.	H.S.A. POUR			
SECONDARY FILTER PACK	☒ SAND ☐ MANUFACTURED ☐ NONE	100	1.0 FT.	H.S.A. POUR	Depth to bottom of Protective Casing Seal:	3.0	0-2 Clay
WELL SCREEN	LENGTH OF SCREEN 10 FT.	DIAMETER 2 IN.	SLOT SIZE 10	WEIGHT OR SDR # SCH 80 — MATERIAL ☒ PLASTIC ☐ STEEL ☐ FLUORO POLYMER	Depth to Base of Annular Seal:	21.8	2-36 Trash
SUMP DETAILS	LENGTH OF SUMP	DIAMETER OF SUMP	MATERIAL ☐ PVC ☐ STEEL ☐ FLUORO POLYMER ☐ OTHER ____		Depth to Base of Bentonite Seal:	21.8	
BACK FILL	WAS THE WELL BACK FILLED? ☐ YES ☒ NO	MATERIAL USED	LENGTH OF BACK FILLED BORE HOLE		Depth to Top of Primary Filter Pack:	22.8	
					Depth to Top of the Screen:	26.3	
					Depth to Bottom of the Screen:	36.3	36-38 Silt
					Total Depth:	38.0	

STATIC WATER LEVEL — FEET FROM MEASURING POINT — DATE OF STATIC WATER LEVEL

MULTIPLE CASED WELLS: SUBMIT ADDITIONAL AS BUILT DIAGRAM SHOWING WELL CONSTRUCTION DETAILS INCLUDING TYPE AND SIZE OF ALL CASING, HOLE DIAMETERS, AND GROUT USED.

MEASURING POINT FOR STATIC WATER LEVEL IS: ☒ TOP OF RISER PIPE ☐ OTHER ____

DRILLING EQUIPMENT: ☐ AIR ROTARY ☒ AUGER TYPE 4¼ H.S.A. ☐ REVERSE ROTARY ☐ OTHER ____

ELEVATION OF MEASURING POINT 486.79

DATE WELL DRILLING WAS COMPLETED 10-03-95

I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS.

SIGNATURE PRIMARY CONTRACTOR/PERMIT #	DATE	SIGNATURE DRILLER/PERMIT #	DATE
Lorman D. Malwitz Jr.	11-15-95	Lorman D. Malwitz Jr.	11-15-95

MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE $35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

RECYCLED PAPER

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

REGISTRATION RECORD

OFFICE USE ONLY		
REF. NO. 131863	DATE RECEIVED	
ROUTE	P.W.S. NUMBER	CHECK NUMBER
STATE WELL NUMBER	TRANSMITTAL NO.	
CHECKED BY	CROSS REFERENCE NO.	
APPROVED BY / DATE	ENTERED Ph 1 Ph 2 Ph 3	

INFORMATION SUPPLIED BY OWNER

NAME	TELEPHONE
LAIDLAW WASTE SYSTEMS, INC.	314-241-3710

ADDRESS	CITY	STATE	ZIP CODE
1635 N BROADWAY	ST. LOUIS	MO	63102

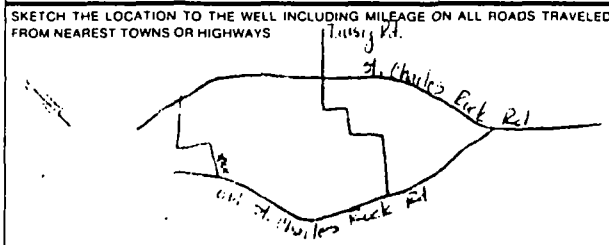
SITE NAME	WELL NUMBER	ADDRESS OF WELL SITE OR SITE NAME (IF DIFFERENT THAN ABOVE)
LAIDLAW SANITARY LANDFILL	SOIL BORINGS	ST. CHARLES ROCK RD.

OWNER STATUS	CITY	STATE	ZIP CODE
☐ BUILDER ☐ PRIVATE HOME OWNER ☐ DEVELOPER ☒ OTHER (SPECIFY) LANDFILL	BRIDGETON	MO	63044

PURPOSE OF REGISTRATION FORM	VARIANCE ISSUED?	VARIANCE NUMBER	WELL CERTIFICATION NUMBER	DATE ORIGINALLY DRILLED
☐ ABANDONED WELL ☐ MINERAL EXPLORATORY ☐ WELL RECONSTRUCTION TEST HOLE ☐ OTHER	☐ YES ☒ NO	SIGNATURE (WELL OWNER)	DATE	10-5, 11-1-75

INFORMATION SUPPLIED BY CONTRACTOR

SKETCH THE LOCATION TO THE WELL INCLUDING MILEAGE ON ALL ROADS TRAVELED FROM NEAREST TOWNS OR HIGHWAYS



LOCATION OF WELL

SHOW LOCATION IN SECTION PLAT

QUAD _____ COUNTY ST LOUIS

ELEV _____ AREA NO. _____

SMALLEST ¼ _____ ¼ _____ ¼ _____ ¼ LARGEST ¼

SEC. _____ TWN. 47 N.RNG. 5 E OR W

LAT. 38 · 45 · 59 · LONG. 90 · 26 · 50 ·

DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT THE WELL

ALONG WEST FENCE OF PROPERTY NEAR SOUTH CORNER

CONTRACTOR'S NAME	PERMIT NUMBER	DRILLERS NAME	PERMIT NUMBER
LAINE WESTERN CO. INC	00135E WAM	DALE MAHURIN	00125E WAM

ABANDONMENT OF WELLS

FORMER USE OF WELL
☐ HAND DUG ☒ SOIL BORING
☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY
☐ MULTI-FAMILY ☐ MINERAL EXPLORATORY TEST HOLE
☐ HEAT PUMP ☐ MONITORING
☐ IRRIGATION ☐ OTHER _____

ORIGINAL DRILLER (IF KNOWN)	DATE ORIGINALLY DRILLED
DALE MAHURIN	10-05-75/10-04-75

DATE PLUGGED	STATIC WATER LEVEL	PUMP REMOVED FROM WELL?
11-15-75	FT	☐ YES N/A ☐ NO

DEPTH OF THE WELL	LENGTH OF CASING	~~CASING DIAMETER~~/WELL DIA.
49'-50'	N/A	8 1/4"

GROUT INSTALLATION METHOD	CASING CUT OFF THREE FEET BELOW SURFACE?	TYPE OF CASING
☐ GRAVITY ☒ TREMIE	☐ YES ☐ NO N/A	☐ STEEL ☐ PLASTIC ☐ OTHER N/A

GROUT MATERIAL USED
NEAT CEMENT ☒ BENTONITE SLURRY
☐ HI-EARLY
☒ PORTLAND TYPE 1 ☐ OTHER
☐ OTHER _____

BENTONITE ☒ POWDER ☐ GRANULAR ☐ CHIPS ☐ PELLETS

NUMBER OF BAGS OF GROUT USED: 12

POUNDS OF GROUT PER BAG: 47

IF NEAT CEMENT USED, HOW MANY GALLONS OF WATER MIXED PER BAG OF CEMENT: 80

TYPE OF FILL MATERIAL USED: CEMENT / BENTONITE GROUT

AMOUNT OF FILL MATERIAL USED: 0.23 CU. YDS.

DEPTH TO TOP OF FILL MATERIAL: 2'

WELL DISINFECTED BEFORE PLUGGING?	NUMBER USED FOR DISINFECTION
☐ YES ☒ NO	GALLONS OF CHLORINE _____ POUNDS OF CHLORINE _____ TABLETS OF CHLORINE _____

WAS THE WELL ABANDONED BECAUSE OF HOOKING UP TO A PUBLIC OR RURAL WATER SUPPLY DISTRICT? ☐ YES ☒ NO

IF YES, WHAT IS THE NAME OF THE WATER DISTRICT:

CHECK THE BOX WHICH APPLIES

☒ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS ABANDONED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE ABANDONMENT OF WELLS.

☐ I HEREBY CERTIFY THAT THE WELL HEREIN DESCRIBED WAS REPAIRED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE REPAIR OF WELLS.

CONTRACTOR'S SIGNATURE	DATE
[illegible]	11-15-75

WELL RECONSTRUCTION

TYPE OF REPAIR
☐ RAISED CASING ☐ LINING OF WELL
☐ DEEPENING OF WELL ☐ OTHER _____

USE OF WELL
☐ DOMESTIC (1 TO 3 CONNECTIONS) ☐ PUBLIC WATER SUPPLY
☐ MULTI-FAMILY ☐ MONITORING
☐ HEAT PUMP ☐ OTHER _____
☐ IRRIGATION

DIA. OF WELL CASING	WAS WELL DISINFECTED AFTER RECONSTRUCTION	DATE RECONSTRUCTION COMPLETED
IN.	☐ YES ☐ NO	

RAISED CASING INFORMATION

LENGTH OF CASING ADDED FT.

MATERIAL	METHOD OF ATTACHMENT
☐ STEEL ☐ PLASTIC	☐ THREADED ☐ FUSED ☐ WELDED ☐ GLUED ☐ COUPLED

LINER DETAILS

PURPOSE OF LINER
☐ USED ONLY TO HOLD BACK FORMATION
☐ USED TO SEAL OUT CONTAMINATION OR OTHER CONDITIONS

DIAMETER OF LINER IN.

WEIGHT OR SDR #

DEPTH TO THE TOP OF LINER FROM SURFACE FT.

MATERIAL ☐ PLASTIC ☐ STEEL

AMOUNT OF LINER USED FT.

JOINTS ☐ GLUED ☐ WELDED ☐ OTHER _____

LINER PACKER DETAILS

TYPE USED ☐ NONE ☐ RUBBER BOOT

DEPTH(S) SET

LINER GROUT DETAILS

POSITION OF SEAL
☐ FULL LENGTH
☐ BETWEEN PACKERS

MATERIAL
CEMENT: ☐ PORTLAND TYPE 1 ☐ HI EARLY
BENTONITE: ☐ CHIPS ☐ PELLETS ☐ SLURRY ☐ GRANULAR

DEPTH PUMP WAS SET FT.	DEPTH FROM SURFACE TO TOP OF THE GROUT SEAL	DEPTH FROM SURFACE TO BOTTOM OF THE GROUT SEAL
GPM _____	FT.	FT.

DEEPENING OF WELL INFORMATION

DEPTH FROM	DEPTH TO	FORMATION DESCRIPTION	YIELD

MO 780-1414 (1-95)

DISTRIBUTION: WHITE/CONTRACTOR CANARY/DIVISION PINK/OWNER

MAIL CANARY COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65401 RECORD MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION DATE

APPENDIX G

PIEZOMETER DEVELOPMENT DATA

TABLE G-1
PIEZOMETER DEVELOPMENT SUMMARY

PIEZOMETER	DATE	pH Std. Units	TEMPERATURE (degrees F) Std. Units	CONDUCTIVITY (µS/cm) Std. Units	COLOR	TOTAL VOLUME REMOVED (GALLONS)
PZ-100-SS	6/16/95	7.55	68.9	734	FAIRLY CLEAR	51.5
PZ-100-SD	6/3/95	6.90	68.5	598	DARK BROWN	38.5
PZ-100-KS	6/2/95	6.50	73.8	1180	FAIRLY CLEAR	90.0
PZ-101-SS	5/18/95	11.70	68.5	1258	FAIRLY CLEAR	28.0
PZ-102-SS	6/1/95	6.20	64.0	1077	FAIRLY CLEAR	23.0
PZ-102R-SS	6/23/95	NA	NA	NA	FAIRLY CLEAR	15.0
PZ-103-SS	7/15/95	6.68	71.0	692	CLOUDY	31.0
PZ-104-SS	7/14/95	6.87	71.5	573	FAIRLY CLEAR	26.0
PZ-104-SD	6/22/95	NA	NA	NA	FAIRLY CLEAR	40.0
PZ-104-KS	6/22/95	NA	NA	NA	CLOUDY	45.0
PZ-105-SS	7/27/95	7.69	67.7	568	FAIRLY CLEAR	25.0
PZ-106-SD	8/3/95	8.33	70.0	1102	FAIRLY CLEAR	22.5
PZ-106-KS	5/7/95	NA	NA	NA	LT. BROWN	50.0
PZ-106-SS	8/10/95	6.84	68.0	717	FAIRLY CLEAR	37.0
PZ-107-SS	6/29/95	6.06	75.4	1735	CLEAR	87.0
PZ-108-SS	8/4/95	8.00	67.2	586	FAIRLY CLEAR	14.0
PZ-109-SS	8/8/95	6.35	75.0	750	LT. BROWN	10.5
PZ-110-SS	6/21/95	7.42	64.5	1005	CLEAR	52.0
PZ-111-SD	8/4/95	70.40	70.4	823	FAIRLY CLEAR	72.5
PZ-111-KS	6/28/95	NA	NA	NA	FAIRLY CLEAR	85.0
PZ-112-AS	8/4/95	6.91	71.3	2620	LIGHT BLACK	90.0
PZ-113-AS	5/31/95	7.29	64.5	1360	LIGHT BROWN	120.0
PZ-113-AD	6/7/95	6.85	72.0	1510	FAIRLY CLEAR	105.0
PZ-113-SS	6/7/95	NA	NA	NA	LIGHT GREY	85.0
PZ-114-AS	6/6/95	6.90	63.4	2680	LIGHT GRAY	260.0
PZ-115-SS	6/13/95	6.54	68.8	817	FAIRLY CLEAR	48.5
PZ-116-SS	8/3/95	NA	NA	NA	NA	20.0
PZ-200-SS	6/13/95	6.50	68.0	713	FAIRLY CLEAR	126.5
PZ-201-SS	6/1/95	6.39	68.0	738	FAIRLY CLEAR	209.5
PZ-201A-SS	5/8/95	NA	NA	NA	LIGHT GRAY	16.0

Notes provided on page 2

TABLE G-1
PIEZOMETER DEVELOPMENT SUMMARY

PIEZOMETER	DATE	pH Std. Units	TEMPERATURE (degrees F) Std. Units	CONDUCTIVITY (µS/cm) Std. Units	COLOR	TOTAL VOLUME REMOVED (GALLONS)
PZ-202-SS	8/4/95	8.01	52.1	1173	CLOUDY	155.0
PZ-203-SS	6/22/95	NA	NA	NA	DRY	NA
PZ-204-SS	6/13/95	6.13	67.0	2120	FAIRLY CLEAR	123.0
PZ-204A-SS	7/14/95	7.18	72.4	1328	FAIRLY CLEAR	29.0
PZ-205-AS	7/5/95	5.92	75.9	812	LIGHT BLACK	350.0
PZ-205-SS	6/27/95	7.20	69.5	699	CLEAR	47.0
PZ-206-SS	5/31/95	7.07	67.3	961	CLEAR	47.5
PZ-207-AS	7/11/95	5.70	81.6	1980	FAIRLY CLEAR	79.0
PZ-208-SS	8/4/95	7.90	69.0	1094	FAIRLY CLEAR	27.0
PZ-1201-SS	6/28/95	NA	NA	NA	FAIRLY CLEAR	25.0
PZ-300-AS	10/14/95	8.15	58.6	1376	LT. BROWN	150.0
PZ-300-AD	10/14/95	6.95	55.3	1398	FAIRLY CLEAR	87.5
PZ-300-SS	10/7/95	7.39	61.0	780	FAIRLY CLEAR	76.0
PZ-301-AS	10/14/95	7.35	58.7	888	FAIRLY CLEAR	38.0
PZ-302-AS	10/8/95	6.73	60.9	1558	LT. BROWN	22.0
PZ-302-AI	10/8/95	7.05	67.1	1221	FAIRLY CLEAR	110.0
PZ-303-AS	10/6/95	NA	NA	NA	CLOUDY	40.0
PZ-304-AS	11/8/95	7.01	54.0	2290	LT. BROWN	40.0
PZ-304-AI	11/8/95	7.39	52.1	966	FAIRLY CLEAR	100.5
PZ-305-AI	10/20/95	NA	NA	NA	CLEAR	55.0
LR-100	10/17/95	NA	NA	NA	LIGHT GREY	35.0
LR-102	10/17/95	NA	NA	NA	MUDDY	0.5
LR-103	10/22/95	NA	NA	NA	LIGHT GREY	60.0
LR-104	10/22/95	NA	NA	NA	LIGHT GREY	35.0
LR-105	11/8/95	7.13	59.9	1036	LIGHT GREY	40.0

Notes:

F = Fahrenheit
mS/cm = micro siemens per centimeter
NA = not available

APPENDIX H

WATER LEVEL MONITORING DATA

APPENDIX H-1

GROUNDWATER, LEACHATE, AND SURFACE WATER MONITORING DATA

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 28, 1995	Nov. 18, 1995	Dec. 14, 1995
	Groundwater Elevation						
Shallow Alluvial Piezometers							
PZ-112-AS	436.12	435.12	434.67	432.84	432.13	431.84	431.15
PZ-113-AS	435.64	435.30	434.63	432.91	432.19	431.81	431.18
PZ-114-AS	435.94	435.35	434.90	433.06	432.11	431.93	431.23
PZ-205-AS	434.41	434.33	434.06	432.52	431.90	431.66	431.19
PZ-207-AS	435.94	435.41	434.91	433.02	432.29	431.87	431.19
PZ-300-AS	NA	NA	NA	NA	436.41	435.50	434.94
PZ-302-AS	NA	NA	NA	NA	432.34	432.08	431.86
PZ-303-AS	NA	NA	NA	NA	432.19	432.01	431.74
PZ-304-AS	NA	NA	NA	NA	432.19	431.91	431.63
Intermediate Alluvial Piezometers							
PZ-302-AI	NA	NA	NA	NA	432.16	432.00	431.73
PZ-304-AI	NA	NA	NA	NA	432.19	431.98	431.66
PZ-305-AI	NA	NA	NA	NA	431.10	431.80	431.34
Deep Alluvial Piezometers							
PZ-113-AD	435.68	435.13	433.74	432.89	432.28	431.82	431.18
PZ-300-AD	NA	NA	NA	NA	432.89	432.78	432.41
St. Louis/Upper Salem Hydrologic Unit Piezometers							
PZ-100-SS	405.36	416.06	415.23	414.35	414.04	413.85	413.68
PZ-101-SS	393.23	394.58	393.37	390.00	388.96	387.58	386.76
PZ-102-SS	413.54	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive

Notes provided on pages 4 and 8

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 28, 1995	Nov. 18, 1995	Dec. 14, 1995
	Groundwater Elevation						
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued							
PZ-102R-SS	403.09	424.30	424.87	422.80	421.99	421.63	420.78
PZ-103-SS	363.03	373.02	363.73	360.95	360.69	361.05	360.15
PZ-104-SS	340.67	360.04	366.22	361.01	360.34	360.41	360.55
PZ-105-SS	336.26	339.83	352.45	346.80	343.23	342.76	342.53
PZ-106-SS	359.72	357.60	364.20	349.41	350.41	350.01	342.64
PZ-107-SS	434.52	434.30	434.00	432.36	431.91	431.57	431.12
PZ-108-SS	368.99	368.99	367.02	352.14	355.88	356.78	347.44
PZ-109-SS	370.70	373.74	360.45	359.20	354.64	355.12	351.80
PZ-110-SS	413.76	433.53	433.27	431.57	430.93	430.58	430.11
PZ-113-SS	435.70	435.23	434.79	433.00	432.29	431.94	427.33
PZ-115-SS	426.75	424.83	424.18	417.06	413.09	411.71	407.86
PZ-116-SS	NA	346.79	356.46	338.17	333.08	331.43	330.07
PZ-200-SS	415.05	415.45	415.59	414.38	413.34	412.78	412.91
PZ-201-SS	456.42	455.53	454.86	453.55	453.14	452.98	452.80
PZ-201A-SS	415.03	414.63	414.38	412.94	412.85	412.57	412.12
PZ-202-SS	444.36	444.78	444.14	441.33	440.20	439.70	439.13
PZ-203-SS	(Dry)	(Dry)	(Dry)	(Dry)	(Dry)	(Dry)	(Dry)
PZ-204-SS	442.82	441.49	438.10	431.82	429.64	430.57	429.71
PZ-204A-SS	NA	405.65	405.53	404.05	403.82	403.55	403.45
PZ-205-SS	424.46	424.04	423.45	421.75	421.69	421.28	420.50

Notes provided on pages 4 and 8

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 28, 1995	Nov. 18, 1995	Dec. 14, 1995
	Groundwater Elevation						
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued							
PZ-206-SS	420.04	419.04	418.22	415.49	415.34	415.19	NA
PZ-208-SS	NA	436.44	435.60	431.63	429.86	428.83	426.97
PZ-300-SS	NA	NA	NA	NA	428.62	428.32	427.80
PZ-301-SS	NA	NA	NA	NA	358.09	357.19	384.19
PZ-1201-SS	NA	392.33	365.30	377.98	375.25	374.88	374.88
MW-1206	368.19	367.12	367.86	351.67	361.31	362.46	348.15
Deep Salem Piezometers							
PZ-100-SD	394.61	370.68	381.79	366.35	363.78	364.43	356.68
PZ-104-SD	359.05	356.64	362.97	344.33	341.68	341.90	339.05
PZ-106-SD	358.64	353.52	361.98	348.44	346.40	347.38	340.60
PZ-111-SD	373.70	423.87	428.55	432.22	431.90	431.47	430.93
MW-1204	333.83	330.01	357.27	305.57	324.30	303.18	309.24
MW-1205	352.28	357.38	296.81	341.10	347.04	317.88	337.07
Keokuk Piezometers							
PZ-100-KS	438.17	438.93	437.84	434.72	433.90	433.67	432.84
PZ-104-KS	444.63	444.74	444.27	441.98	440.99	440.77	440.42
PZ-106-KS	442.18	442.51	442.48	440.30	439.47	439.02	438.82
PZ-111-KS	441.58	441.91	442.01	440.39	439.68	439.14	438.85

Notes provided on pages 4 and 8

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date						
	June 27, 1995	July 26, 1995	Aug. 26, 1995	Sept. 30, 1995	Oct. 28, 1995	Nov. 18, 1995	Dec. 14, 1995
	Leachate Elevation						
Leachate Risers							
LR-100	NA	NA	NA	NA	450.68	450.42	449.90
LR-102	NA	NA	NA	NA	454.07	452.38	452.31
LR-103	NA	NA	NA	NA	432.10	431.86	431.32
LR-104	NA	NA	NA	NA	432.04	432.20	431.35
LR-105	NA	NA	NA	NA	451.81	452.44	452.38
	Surface Water Elevation						
Staff Gauges							
SG-8	NA	NA	NA	NA	433.92	433.54	432.75
SG-9	NA	NA	NA	NA	433.92	433.54	432.75

NOTES:

NA = Not available. Water level data was not collected on the indicated date either because the piezometer, leachate riser, or staff gauge had not yet been installed, or development was not yet completed. An equipment malfunction prevented measurement of the water level in PZ-206-SS on December 14, 1995.

PZ-102-SS was replaced by PZ-102R-SS, and is inactive.

LR-101 was not installed because leachate was not present.

All elevations provided in feet above Mean Sea Level (MSL)

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Groundwater Elevation				
Shallow Alluvial Piezometers					
PZ-112-AS	431.05	430.46	429.80	429.53	430.73
PZ-113-AS	431.07	430.47	429.93	429.48	430.79
PZ-114-AS	431.20	430.67	430.09	429.93	431.60
PZ-205-AS	430.98	430.54	431.04	429.85	430.68
PZ-207-AS	431.10	430.52	429.97	429.66	431.12
PZ-300-AS	434.11	434.03	433.72	434.02	****
PZ-302-AS	431.34	430.80	430.27	430.03	431.26
PZ-303-AS	431.28	430.64	430.03	429.77	430.99
PZ-304-AS	431.13	430.52	429.93	429.59	431.07
Intermediate Alluvial Piezometers					
PZ-302-AI	431.27	430.66	430.08	426.75	431.10
PZ-304-AI	431.16	430.57	429.96	429.62	431.13
PZ-305-AI	431.03	430.56	429.93	429.79	430.65
Deep Alluvial Piezometers					
PZ-113-AD	431.03	430.44	429.92	429.62	430.81
PZ-300-AD	432.12	431.44	430.73	430.63	****
St. Louis/Upper Salem Hydrologic Unit Piezometers					
PZ-100-SS	413.63	413.46	413.20	412.87	412.83
PZ-101-SS	387.48	385.28	385.58	385.24	385.09
PZ-102-SS	Inactive	Inactive	Inactive	Inactive	Inactive

Notes provided on page 8

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Groundwater Elevation				
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued					
PZ-102R-SS	420.59	404.70	404.61	418.91	418.24
PZ-103-SS	361.47	362.30	362.01	362.85	363.71
PZ-104-SS	361.53	365.31	362.92	362.99	376.44
PZ-105-SS	343.21	357.52	350.46	356.22	376.83
PZ-106-SS	343.70	359.94	347.42	357.55	371.56
PZ-107-SS	430.90	430.24	429.58	429.35	430.34
PZ-108-SS	346.47	351.88	346.25	356.00	359.97
PZ-109-SS	350.40	350.84	350.87	350.78	352.41
PZ-110-SS	429.87	429.09	428.31	427.51	428.65
PZ-113-SS	431.16	430.58	430.06	429.65	430.89
PZ-115-SS	414.34	413.23	406.34	414.31	423.51
PZ-116-SS	330.68	351.62	346.13	337.96	353.41
PZ-200-SS	412.73	412.42	412.14	412.03	412.05
PZ-201-SS	452.45	452.24	452.21	451.88	451.69
PZ-201A-SS	412.13	411.92	411.92	412.06	412.03
PZ-202-SS	438.64	441.28	440.27	441.20	441.81
PZ-203-SS	(Dry)	(Dry)	(Dry)	(Dry)	377.56
PZ-204-SS	431.58	440.83	439.74	440.02	441.19
PZ-204A-SS	403.78	405.38	405.15	405.46	406.69
PZ-205-SS	420.28	419.93	419.10	419.11	420.13

Notes provided on page 8

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Groundwater Elevation				
St. Louis/Upper Salem Hydrologic Unit Piezometers--Continued					
PZ-206-SS	414.13	413.86	413.53	413.80	414.81
PZ-208-SS	428.60	428.93	426.41	428.87	432.54
PZ-300-SS	427.50	427.88	426.56	426.58	****
PZ-301-SS	395.65	407.66	415.13	420.17	423.94
PZ-1201-SS	376.00	378.52	372.92	379.44	NM
MW-1206	348.17	359.29	350.53	359.27	****
Deep Salem Piezometers					
PZ-100-SD	355.04	363.01	357.73	372.88	367.82
PZ-104-SD	343.15	361.88	348.24	360.25	370.88
PZ-106-SD	341.52	356.82	346.26	350.17	364.81
PZ-111-SD	430.63	430.06	429.43	428.90	429.00
MW-1204	306.96	356.52	318.98	332.51	344.32
MW-1205	339.32	350.89	314.15	342.90	****
Keokuk Piezometers					
PZ-100-KS	432.69	435.10	433.96	435.71	435.56
PZ-104-KS	440.22	443.10	441.74	442.94	443.35
PZ-106-KS	438.61	440.70	439.91	440.50	440.68
PZ-111-KS	438.77	440.04	439.92	440.13	440.16

Notes provided on page 8

TABLE 4-2
WATER LEVEL ELEVATION SUMMARY
WEST LAKE LANDFILL

Monitoring Location	Date				
	Jan. 4, 1996	Feb. 6, 1996	Mar. 4, 1996	Apr. 3, 1996	May 3, 1996
	Leachate Elevation				
Leachate Risers					
LR-100	449.77	450.14	450.60	450.61	451.64
LR-102	452.28	452.18	452.22	452.51	452.30
LR-103	431.00	430.58	429.98	429.71	430.75
LR-104	431.01	430.56	429.95	429.82	430.59
LR-105	453.39	453.40	453.61	453.70	453.43
	Surface Water Elevation				
Staff Gauges					
SG-8	433.68	433.98	(Dry)	433.99	433.07
SG-9	433.68	433.98	(Dry)	433.97	433.02

NOTES:

NA = Not available. Water level data was not collected on the indicated date either because the piezometer, leachate riser, or staff gauge had not yet been installed, or development was not yet completed. An equipment malfunction prevented measurement of the water level in PZ-206-SS on December 14, 1995.

PZ-102-SS was replaced by PZ-102R-SS, and is inactive.

LR-101 was not installed because leachate was not present.

All elevations provided in feet above Mean Sea Level (MSL)

**** = Wells decommissioned in May.

APPENDIX H-2

PRECIPITATION MONITORING DATA

APPENDIX H-2
SITE DAILY PRECIPITATION MONITORING
WEST LAKE LANDFILL

	1995							1996				
Date	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May
1	0.00		0.00			0.001						0.18
2	0.43				0.00	0.305				0.21	2.18	0.00
3	0.00		1.89		0.75	0.055						0.02
4	0.00		0.62		0.02	0.00						
5	0.00	0.24			0.00	0.00	0.00					
6	0.02	0.18			0.00	0.00						
7	0.03	0.00			0.00	0.04	0.02					
8	0.04		1.95		0.00	0.00						
9	0.22		0.00	0.20	0.00	0.00						
10		0.00	0.00		0.00							
11		0.00	0.00		0.13	0.44	0.00					
12		0.00										
13						0.025						
14	0.42	0.00	0.00		0.07	0.00						
15	0.00	0.00	0.12					0.20				
16			0.30		0.00		0.05					
17	0.00	0.065			0.00		0.00					
18	0.00	0.00			0.00							
19	0.00	0.00			0.00							
20	0.00	0.00			0.83	0.00	1.10					
21	0.04	0.66	0.18	0.00	0.04			0.80				
22	0.00		0.00	0.06	0.00	0.00						
23	0.00		0.00	0.00	0.00		0.00					
24		0.10		0.00	0.08		0.00					
25		0.02		0.00	0.00							
26	0.075	0.50	0.00		0.00		0.00					
27	0.335	0.00		0.00	0.47	0.00			0.80			
28	0.775	0.00			0.00							3.95
29	0.02											
30	0.00			0.00	0.00						5.68	
31		0.00			0.115		0.11					
Total	**2.405**	**1.77**	**5.06**	**0.26**	**2.51**	**0.87**	**1.28**	**1.00**	**0.80**	**0.21**	**7.86**	**4.15**

NOTES: Blank space = data not recorded.
Data collected through May 28, 1996.

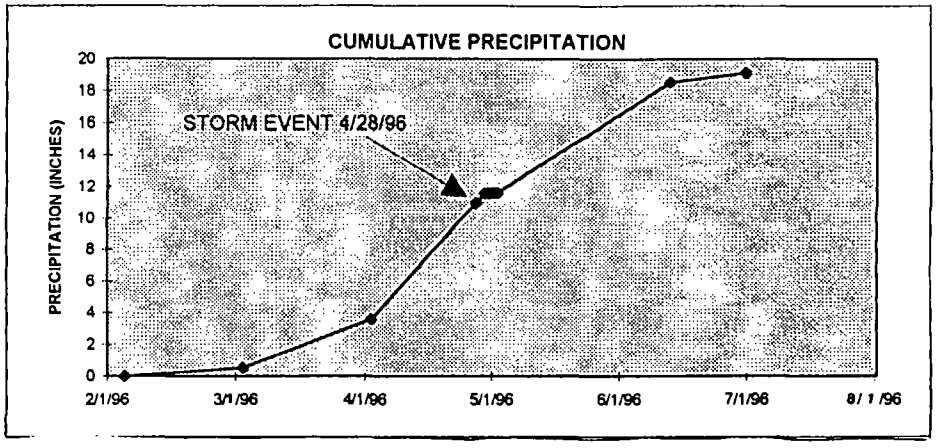
APPENDIX H-2
DAILY PRECIPITATION DATA - LAMBERT/ST. LOUIS INTERNATIONAL AIRPORT
WEST LAKE LANDFILL

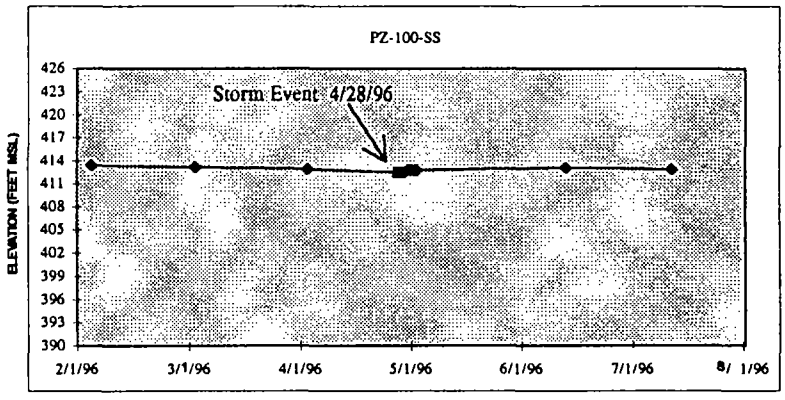
	1995							1996					
Date	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
1	0.60	0.00	0.56	T	0.00	0.23	0.00	0.02	0.01	0.00	0.00	0.00	0.35
2	0.09	0.00	1.13	0.00	0.39	0.02	0.00	0.84	0.00	0.00	0.00	0.04	0.00
3	0.00	0.15	T	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
4	0.00	0.12	0.21	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.79	0.00
5	0.00	T	T	0.00	T	0.01	0.00	0.09	0.00	0.50	0.00	0.17	0.05
6	0.06	0.13	1.28	T	0.00	0.02	0.04	0.06	0.00	0.02	0.00	0.03	0.63
7	T	0.00	0.05	0.17	0.00	T	0.00	T	0.00	0.01	0.01	0.39	0.00
8	0.17	0.00	0.00	0.03	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.04	0.00
9	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.08
10	0.28	0.00	T	0.00	0.07	0.94	0.00	0.00	0.00	0.00	0.00	0.04	0.41
11	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.13	T	0.00	0.00	0.00	0.12
12	0.00	0.00	0.00	T	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.04	0.01
13	0.00	0.00	0.00	0.00	0.02	0.00	T	0.00	0.00	0.00	0.00	0.01	0.00
14	0.00	0.00	0.50	0.00	0.00	T	0.00	0.00	0.03	0.00	0.48	0.73	0.00
15	0.00	0.00	0.10	0.00	0.00	0.00	0.05	T	0.10	0.00	0.03	0.00	0.43
16	0.00	0.01	0.02	0.16	0.00	0.00	0.00	T	T	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.03	0.00	0.00	0.00	0.00	0.15
18	0.00	0.00	0.00	0.00	0.00	0.00	0.95	1.08	T	0.00	0.01	0.00	0.00
19	0.00	0.00	0.66	0.17	0.72	0.00	1.11	T	0.00	0.00	0.00	0.00	0.00
20	0.05	0.56	T	T	0.02	0.00	T	0.12	0.00	0.06	0.00	0.11	0.00
21	T	0.00	0.00	0.04	T	0.00	T	0.00	T	0.00	0.49	0.16	0.00
22	0.00	0.19	0.00	0.00	0.00	T	0.01	0.11	T	0.00	1.77	0.00	0.00
23	T	0.01	0.00	0.00	0.07	0.00	T	0.68	0.00	0.46	0.00	0.00	0.00
24	0.00	0.05	0.00	0.00	0.00	0.00	T	0.01	0.00	0.90	0.00	0.00	0.00
25	0.07	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00
26	0.91	0.06	0.00	0.00	0.49	0.00	0.00	0.06	0.25	0.00	0.00	0.00	0.00
27	0.49	0.00	0.00	0.00	T	T	T	T	0.13	0.00	0.11	1.33	0.00
28	0.13	0.00	0.00	0.00	T	0.00	0.00	0.00	T	0.04	4.46	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00
30	0.00	0.00	0.00	0.17	0.08	0.00	0.10	0.01		0.12	0.25	0.00	0.00
31		0.00	0.01		0.02		T	0.00		0.95		0.00	
Total	**2.96**	**2.16**	**4.52**	**0.74**	**2.01**	**1.28**	**2.85**	**3.27**	**0.52**	**3.06**	**7.97**	**4.34**	**3.23**

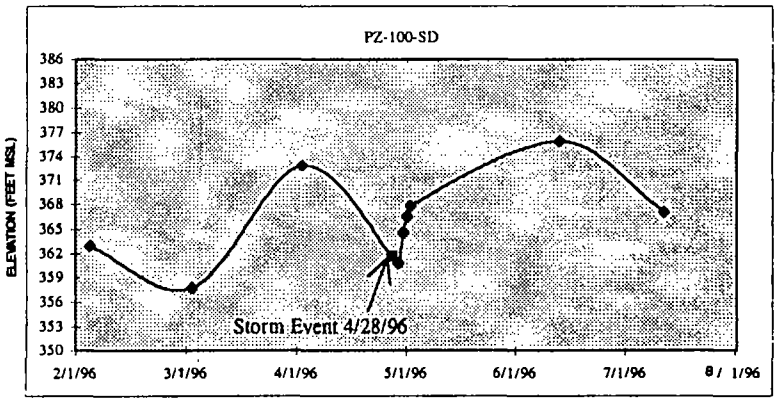
Note: Blank space = data not recorded.

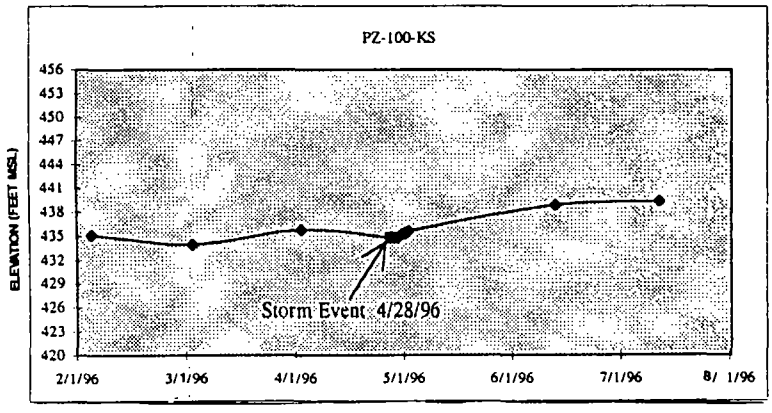
APPENDIX H-2

PRECIPITATION VERSUS PIEZOMETER WATER LEVEL ELEVATION









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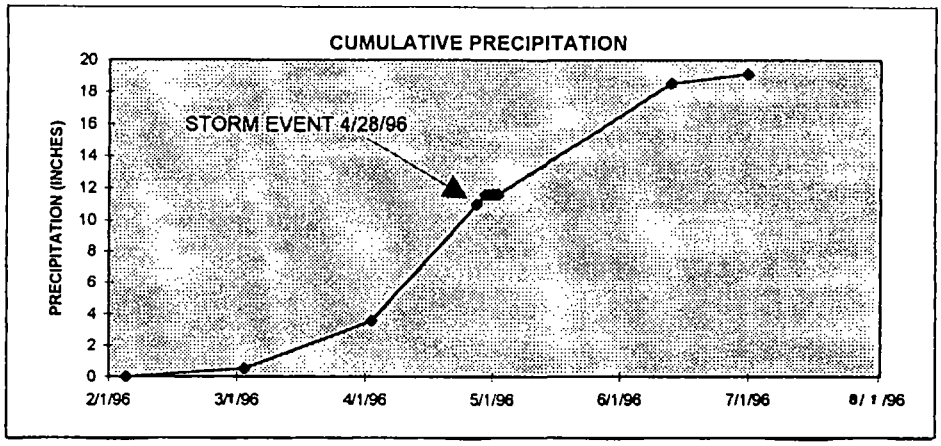

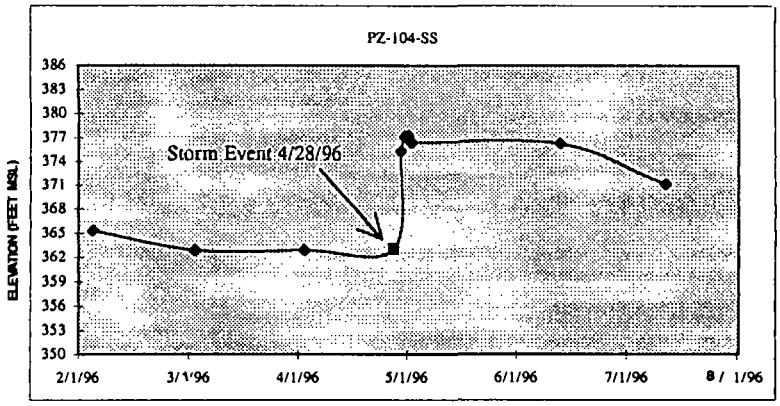

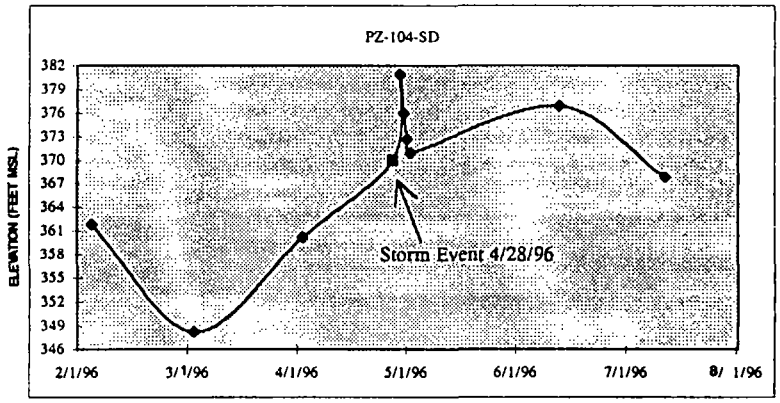

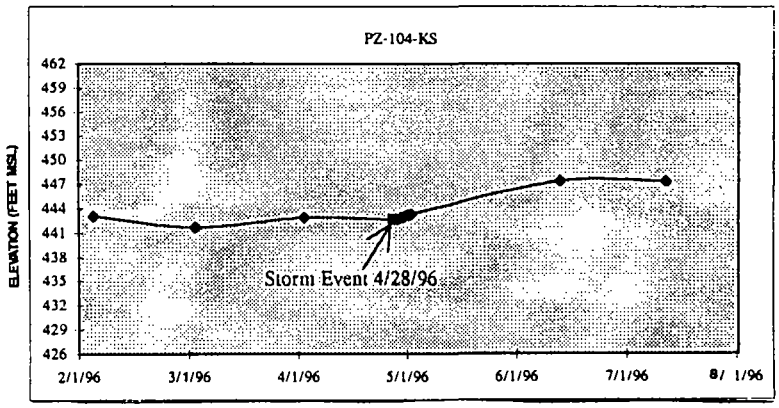

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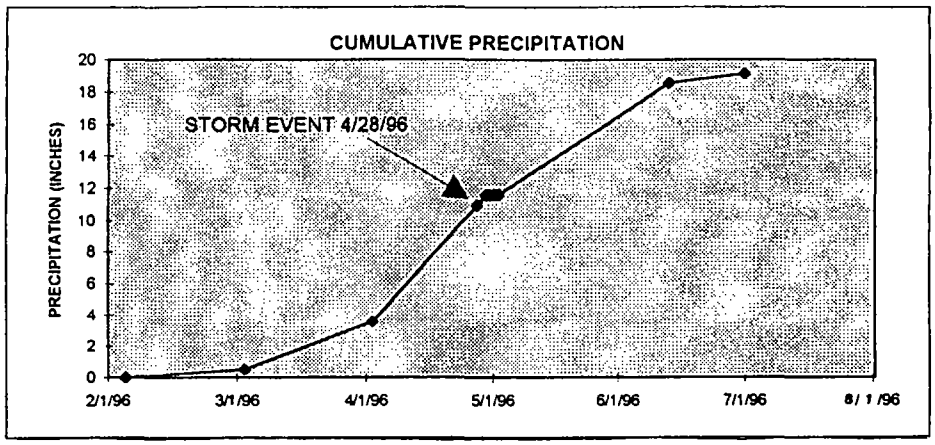

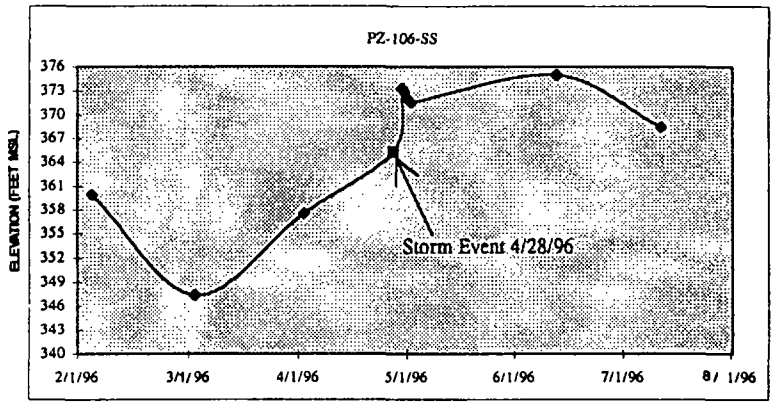

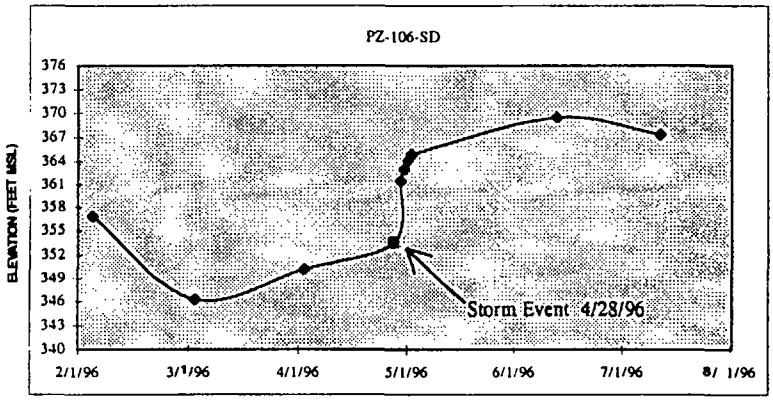

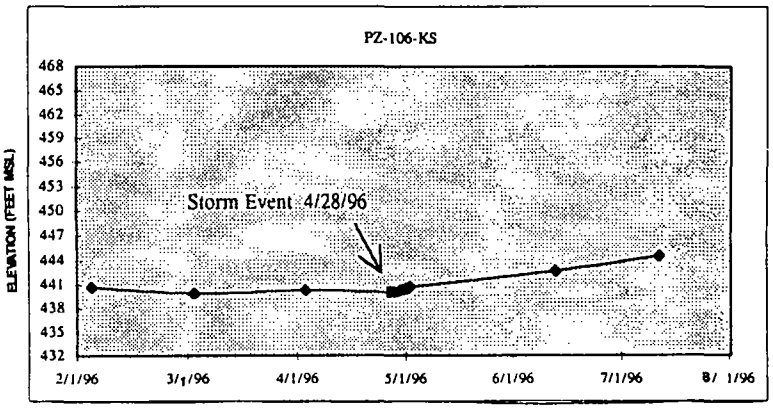

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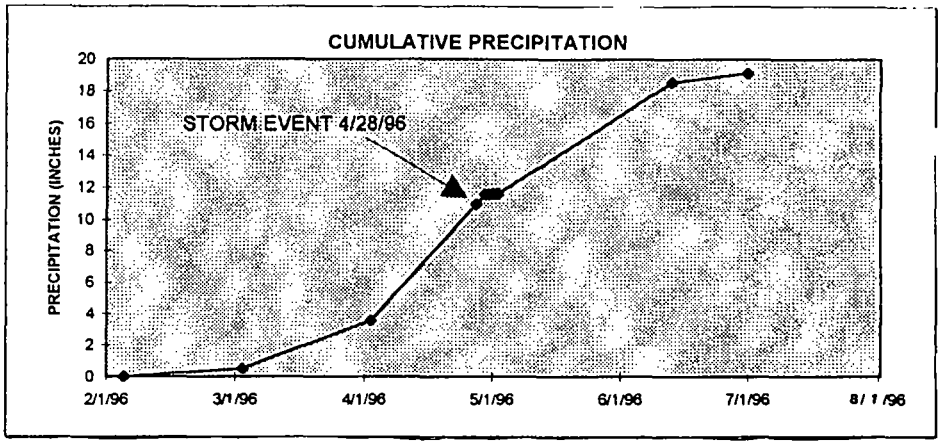

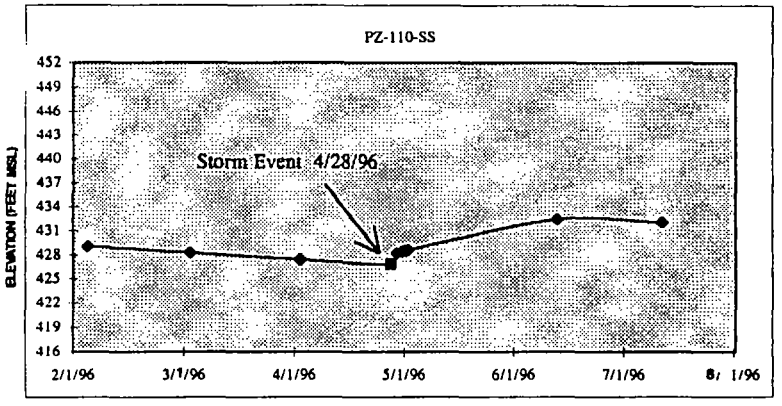

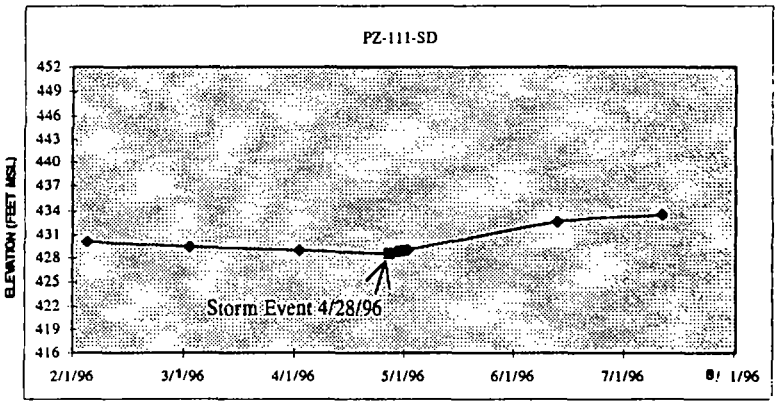

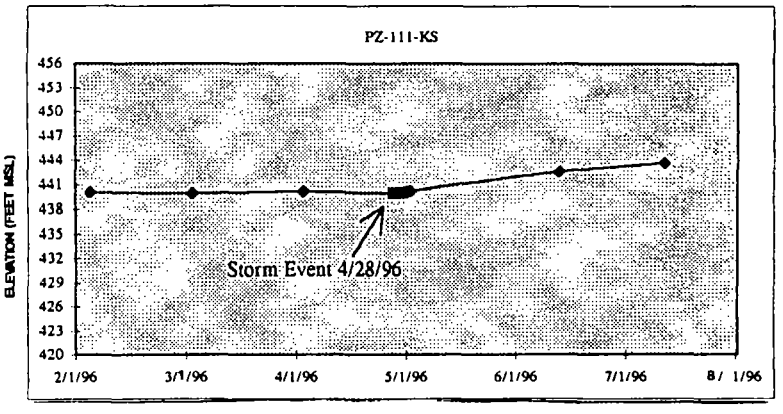

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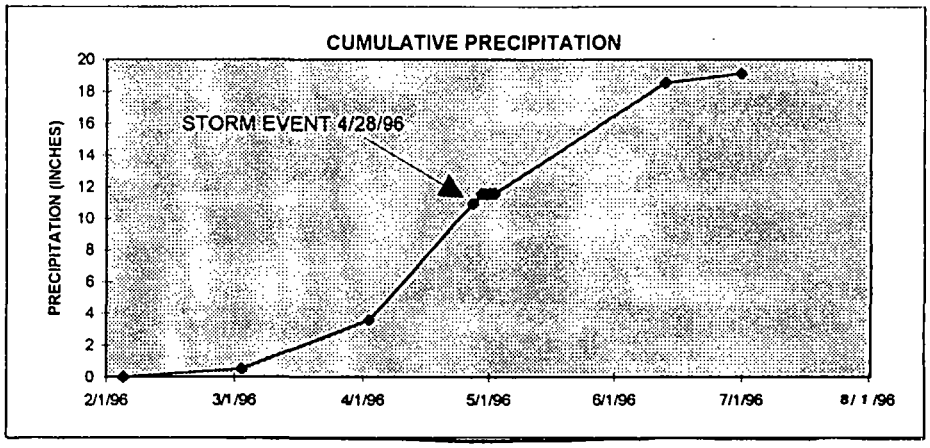

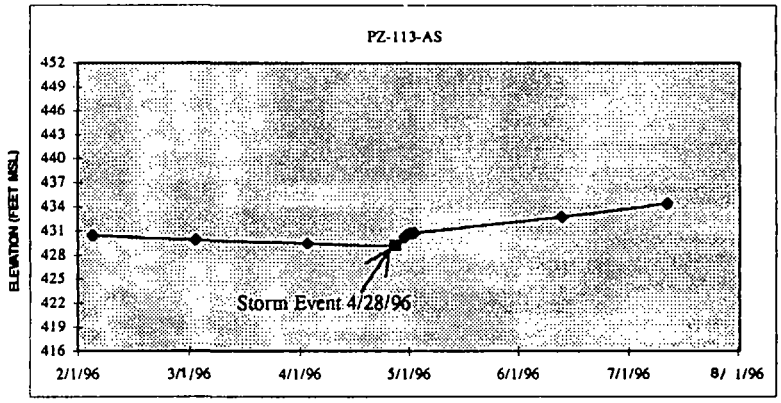

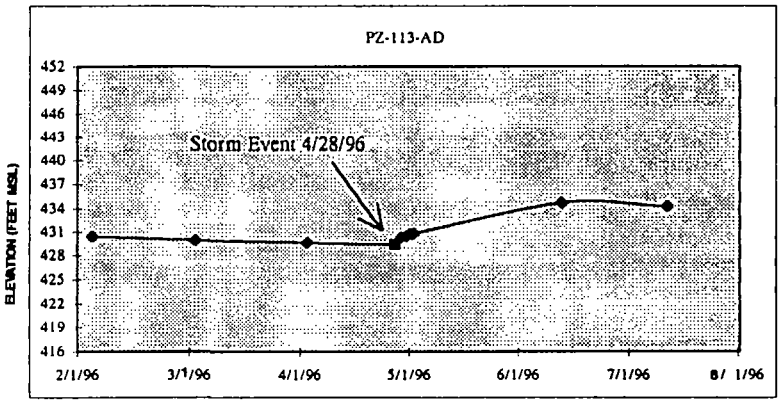

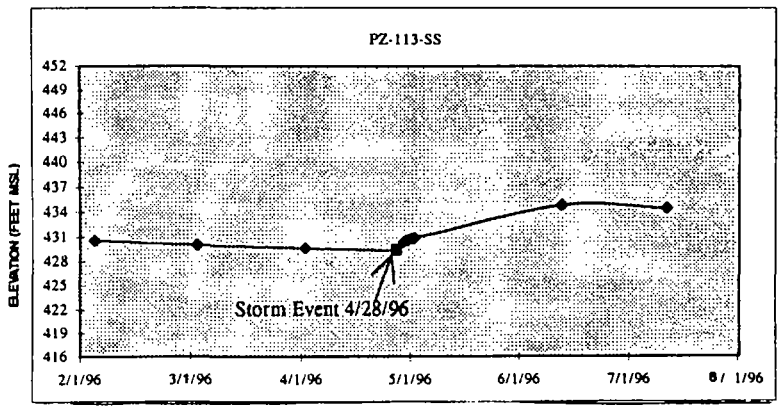

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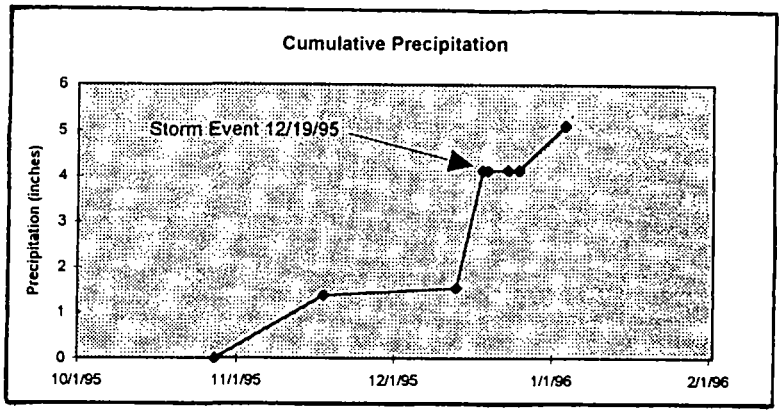

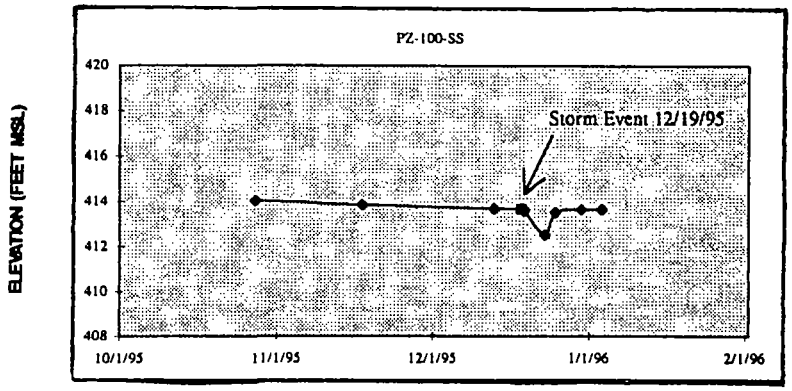

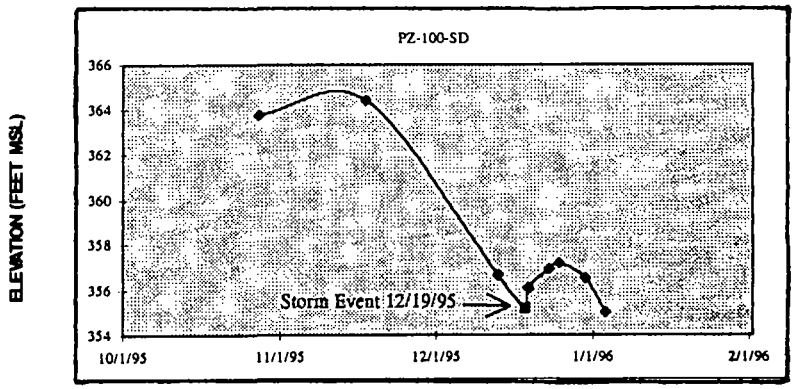

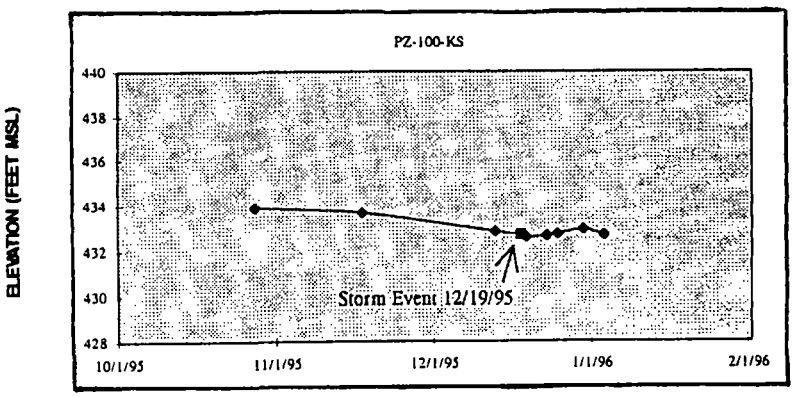

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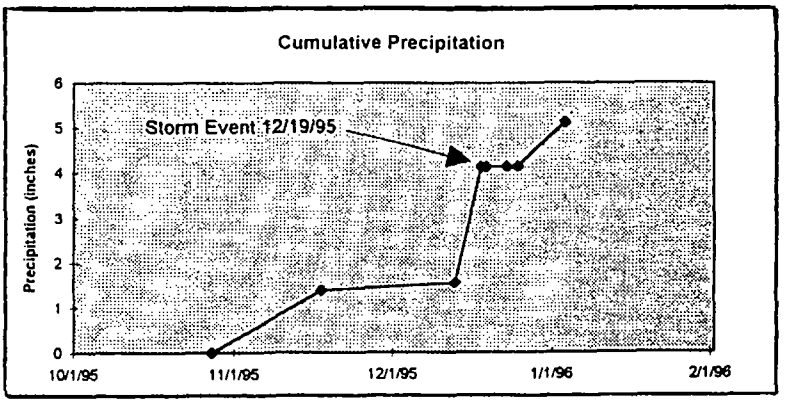

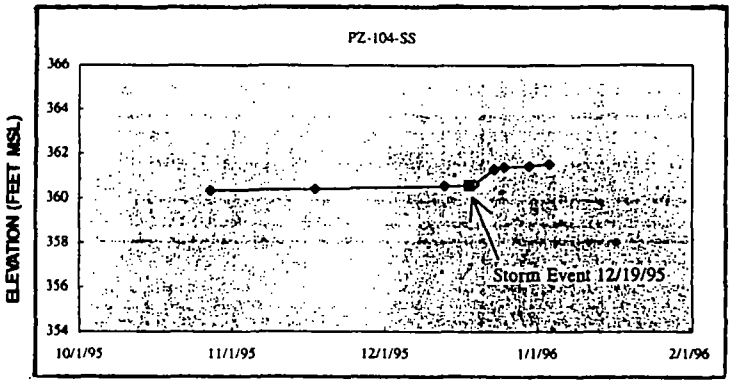

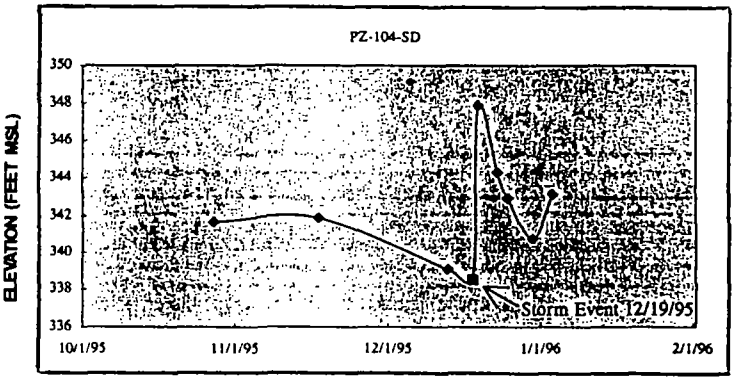

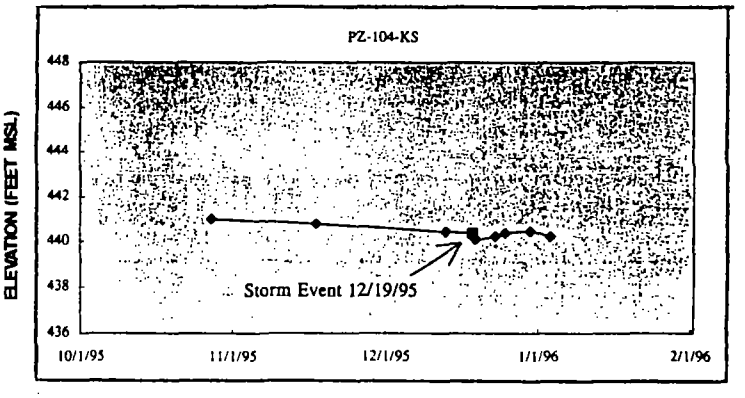

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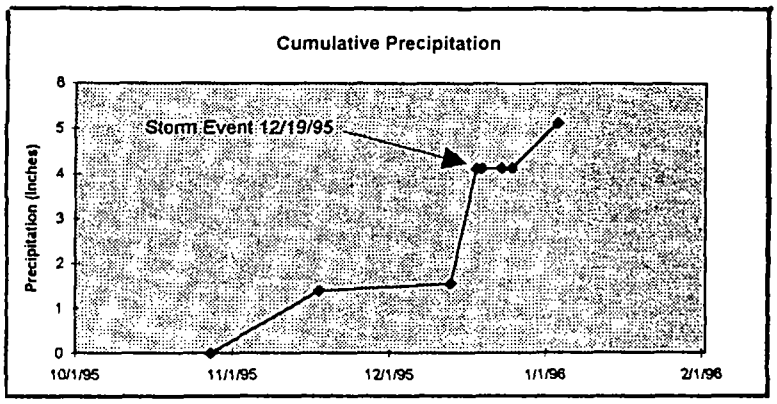

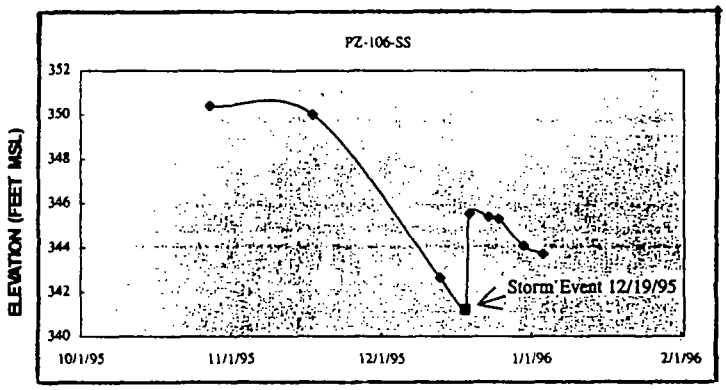

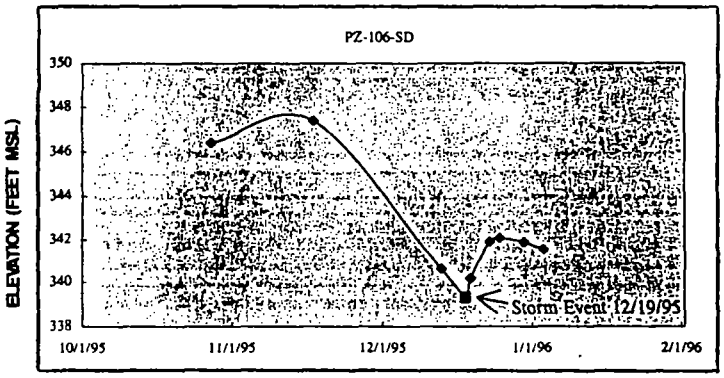

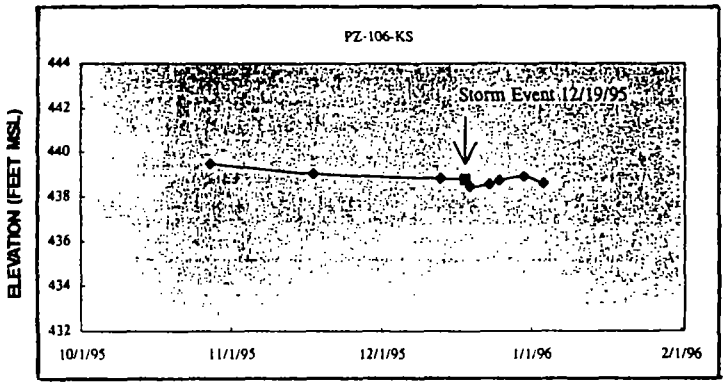

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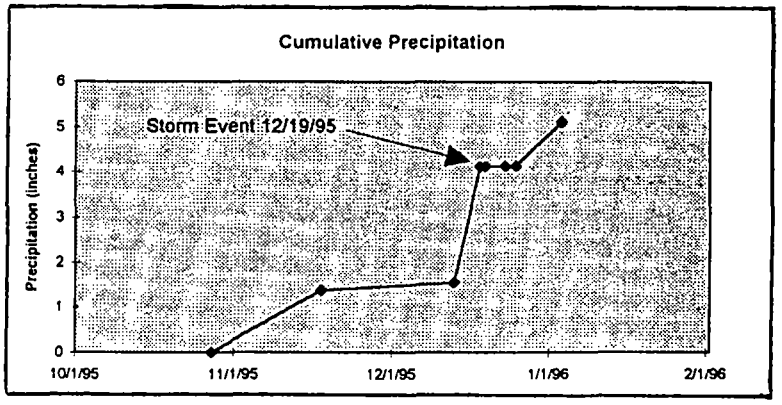

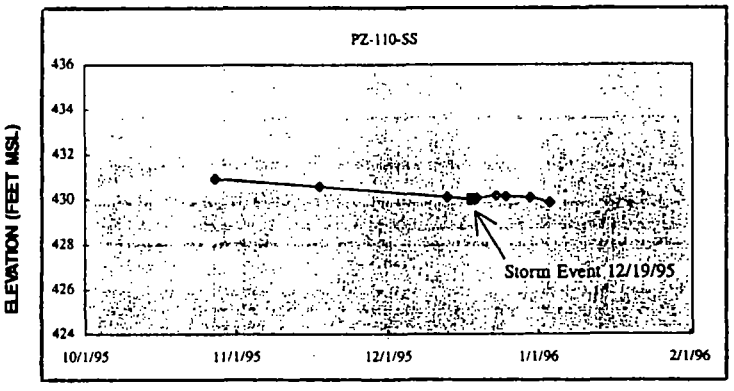

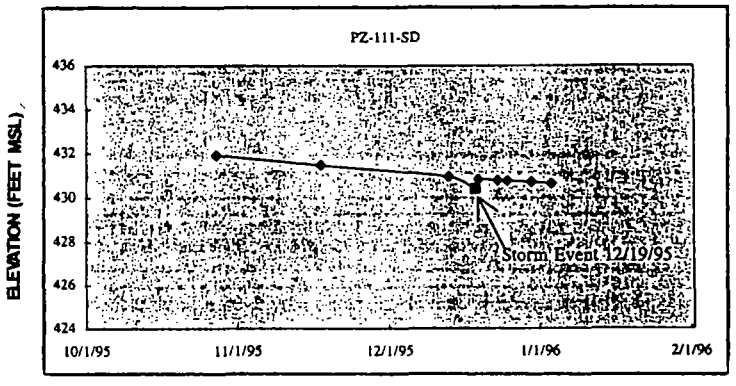

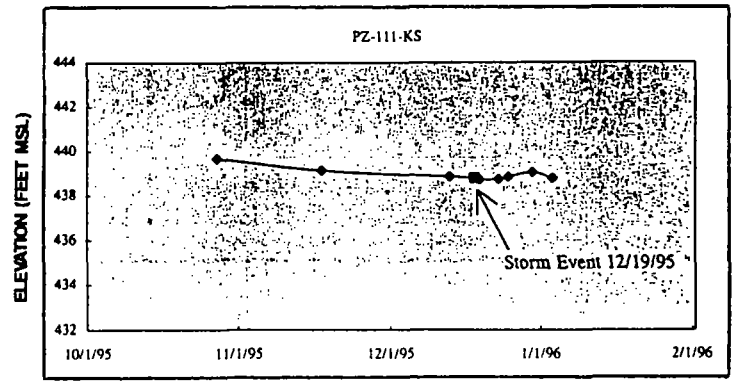

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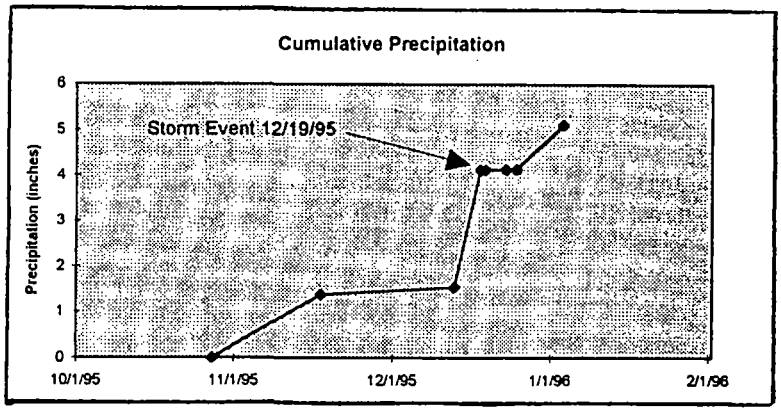

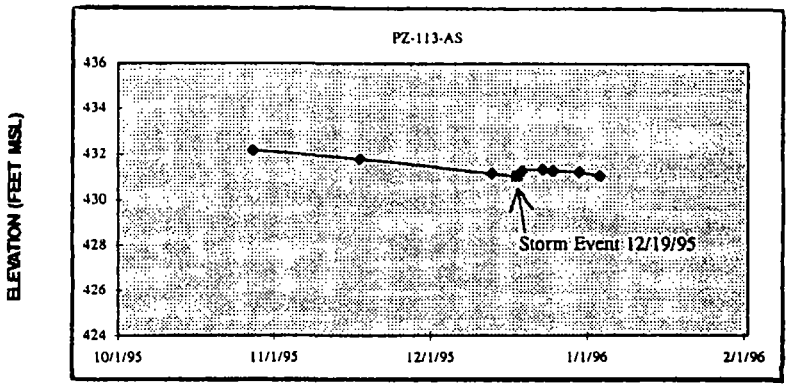

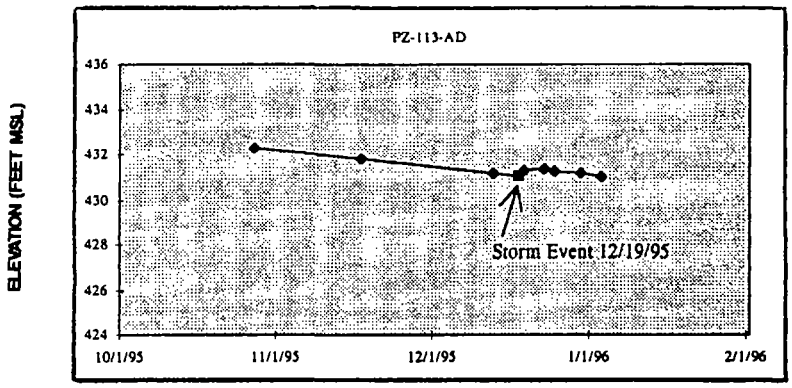

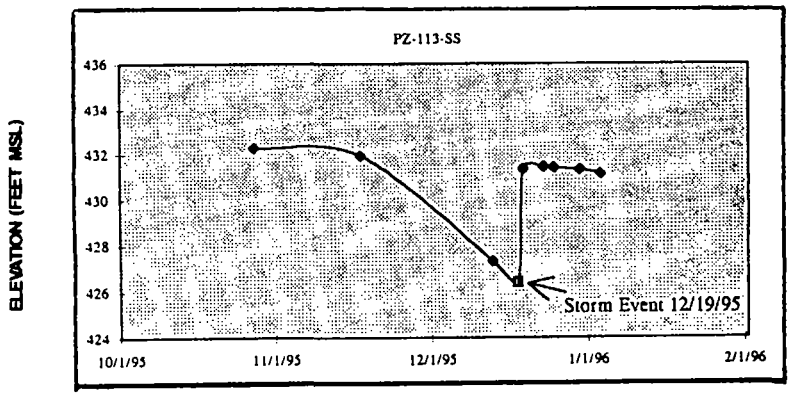

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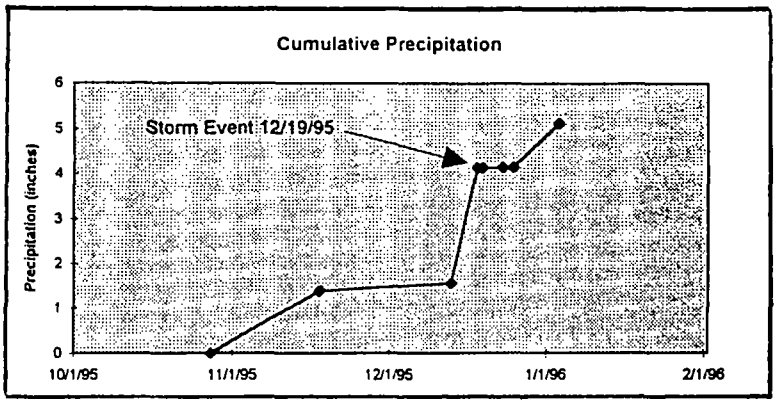

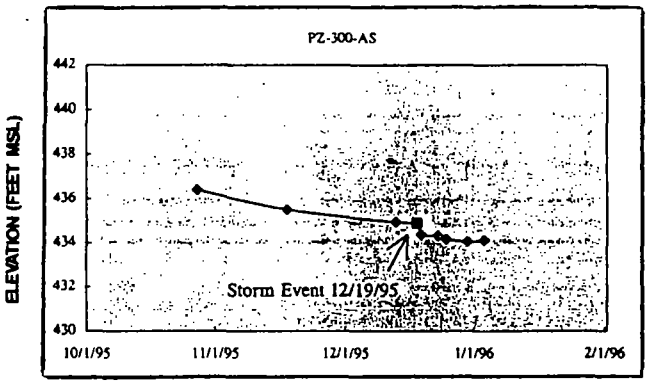

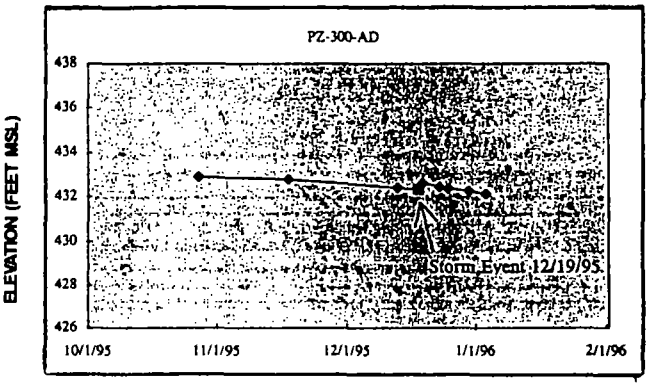

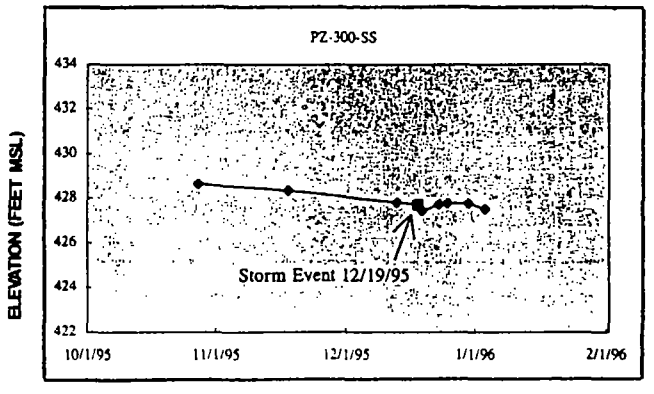

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The Weather Almanac

A Reference Guide to Weather, Climate, and Air Quality in the United States and Its Key Cities, Comprising Statistics, Principles, and Terminology. Provides Weather/Health Information and Safety Rules for Environmental Hazards Associated with Storms, Weather Extremes, Earthquakes, and Volcanoes. Also Includes World Climatological Highlights and Special Features on Weather, Climate, and Society

SIXTH EDITION

Frank E. Bair
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Saint Louis is located at the confluence of the Missouri and Mississippi Rivers and near the geographical center of the United States. Thus, with a somewhat modified continental climate, it is in the enviable position of being able to enjoy the changes of a four-season climate without the undue hardship of prolonged periods of extreme heat or high humidity. To the south is the warm, moist air of the Gulf of Mexico, and to the north, in Canada, is a favored region of cold air masses. The alternate invasion of Saint Louis by air masses from these sources, and the conflict along the frontal zones where they come together, produce a variety of weather conditions, none of which are likely to persist to the point of monotony.

Winters are brisk and stimulating, seldom severe. Records since 1870 show that temperatures drop to zero or below an average of two or three days per year. Temperatures remain as cold as 32 degrees or lower less than 25 days in most years. Snowfall has averaged a little over 18 inches per winter season. Snowfall of an inch or more is received on five to ten days in most years.

The long-term record for Saint Louis (since 1870) indicates that temperatures of 90 degrees or higher occur on about 35-40 days a year. Extremely hot days of 100 degrees or more are expected on no more than five days per year.

Normal annual precipitation for the Saint Louis area, is a little less than 34 inches. The three winter months are the driest, with an average total of about 6 inches of precipitation. The spring months of March through May are normally the wettest with normal total precipitation of just under 10 1/2 inches. It is not unusual to have extended dry periods of one to two weeks during the growing season.

Thunderstorms occur normally on between 40 and 50 days per year. During any year, there are usually a few of these that can be classified as severe storms with hail and damaging winds. Tornadoes have produced extensive damage and loss of life in the Saint Louis area.

TABLE 1 NORMALS, MEANS AND EXTREMES

ST. LOUIS, MISSOURI

LATITUDE: 38°45'N LONGITUDE: 90°22' W ELEVATION: FT. GRND 535 BARO 565 TIME ZONE: CENTRAL WBAN: 13994

	(a)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:														
Normals														
-Daily Maximum		37.6	43.1	53.4	67.1	76.4	85.2	89.0	87.4	80.7	69.1	54.0	42.6	65.5
-Daily Minimum		19.9	24.5	33.0	45.1	54.7	64.3	68.8	66.6	58.6	46.7	35.1	25.7	45.3
-Monthly		28.8	33.8	43.2	56.1	65.6	74.8	78.9	77.0	69.7	57.9	44.6	34.2	55 4
Extremes														
-Record Highest	32	76	85	89	93	93	102	107	107	104	94	85	76	107
-Year		1970	1972	1985	1989	1989	1988	1980	1984	1984	1963	1989	1970	AUG 1984
-Record Lowest	32	-18	-10	-5	22	31	43	51	47	36	23	1	-16	-18
-Year		1985	1979	1960	1975	1976	1969	1972	1986	1974	1976	1964	1989	JAN 1985
NORMAL DEGREE DAYS:														
Heating (base 65°F)		1122	874	676	279	110	12	0	0	40	258	612	955	4938
Cooling (base 65°F)		0	0	0	12	128	306	431	372	181	38	0	0	1468
% OF POSSIBLE SUNSHINE	30	52	52	54	57	60	66	69	64	63	59	47	43	57
MEAN SKY COVER (tenths)														
Sunrise - Sunset	41	6.7	6.6	6.8	6.4	6.2	5.9	5.5	5.3	5.1	5.1	6.2	6.8	6.1
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	41	7.6	6.9	6.6	7.2	7.5	7.5	9.5	10.4	11.6	12.2	8.8	7.2	102.9
-Partly Cloudy	41	6.5	6.5	8.1	8.3	9.9	10.9	11.4	10.9	8.2	7.7	6.7	6.6	101.6
-Cloudy	41	16.9	14.9	16.3	14.5	13.6	11.6	10.1	9.7	10.3	11.1	14.6	17.1	160.8
Precipitation .01 inches or more	32	8.3	8.2	11.3	11.0	10.5	9.4	8.5	8.0	8.0	8.4	9.4	9.4	110.4
Snow, Ice pellets 1.0 inches or more	32	1.9	1.5	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.3	6.3
Thunderstorms	32	0.7	0.8	3.3	5.6	6.4	7.1	7.1	6.5	3.8	2.5	1.7	0.7	46 2
Heavy Fog Visibility 1/4 mile or less	32	2.1	1.6	1.5	0.5	0.5	0.3	0.3	0.4	0.6	0.8	1.2	1.9	11.5
Temperature °F														
-Maximum														
90° and above	29	0.0	0.0	0.0	0.3	1.4	7.9	15.0	11.7	4.3	0.2	0.0	0.0	40.9
32° and below	29	11.8	7.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	7.0	28.1
-Minimum														
32° and below	29	27.0	21.8	13.6	2.8	0.1	0.0	0.0	0.0	0.0	1.7	11.3	23.4	101.7
0° and below	29	2.3	0.6	0.*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	4.0
AVG. STATION PRESS. (mb)	17	1000.1	999.1	995.4	994.5	994.0	994.7	996.0	996.7	997.5	998.6	997.9	999.4	997.0
RELATIVE HUMIDITY (%)														
Hour 00	29	77	77	74	70	75	77	77	80	81	76	77	80	77
Hour 06 (Local Time)	29	82	82	81	78	82	83	85	88	89	85	83	83	83
Hour 12	29	66	64	59	54	55	55	56	56	58	56	63	68	59
Hour 18	29	69	66	60	53	55	55	56	58	60	60	68	73	61
PRECIPITATION (inches):														
Water Equivalent														
-Normal		1.72	2.14	3.28	3.55	3.54	3.73	3.63	2.55	2.70	2.32	2.53	2.22	33.91
-Maximum Monthly	32	5.38	4.68	6.67	9.09	7.25	9.43	10.71	6.44	8.88	7.12	9.95	7.82	10.71
-Year		1975	1986	1978	1970	1961	1985	1981	1970	1984	1984	1985	1982	JUL 1981
-Minimum Monthly	32	0.10	0.25	1.09	0.99	1.02	0.47	0.60	0.08	T	0.21	0.44	0.32	T
-Year		1986	1963	1966	1977	1972	1959	1970	1971	1979	1975	1969	1958	SEP 1979
-Maximum in 24 hrs	32	2.43	2.56	2.95	4.91	2.94	3.29	3.47	2.66	3.50	2.70	3.71	4.03	4.91
-Year		1975	1959	1977	1979	1974	1960	1982	1974	1986	1986	1985	1982	APR 1979
Snow, Ice pellets														
-Maximum Monthly	53	23.9	12.9	22.3	6.5	T	0.0	0.0	0.0	0.0	T	11.3	26.3	26.3
-Year		1977	1961	1960	1971	1944					1989	1951	1973	DEC 1973
-Maximum in 24 hrs	53	13.9	8.3	10.7	6.1	T	0.0	0.0	0.0	0.0	T	10.3	12.0	13.9
-Year		1982	1966	1989	1971	1944					1989	1951	1973	JAN 1982
WIND:														
Mean Speed (mph)	40	10.6	10.8	11.8	11.4	9.5	8.8	7.9	7.6	8.1	8.8	10.1	10.4	9.7
Prevailing Direction through 1963		NW	NW	WNW	WNW	S	S	S	S	S	S	S	WNW	S
Fastest Obs. 1 Min.														
-Direction (!!!)	10	29	30	27	27	17	27	36	31	25	28	11	29	28
-Speed (MPH)	10	40	45	48	49	35	48	46	40	41	52	41	39	52
-Year		1984	1980	1984	1982	1986	1982	1987	1987	1986	1981	1987	1985	OCT 1981
Peak Gust														
-Direction (!!!)	6	NW	W	W	SW	W	N	N	S	W	NW	W	SW	W
-Speed (mph)	6	51	49	66	58	49	48	62	53	49	58	64	55	66
-Date		1985	1988	1984	1984	1988	1984	1987	1985	1986	1988	1984	1984	MAR 1984

See reference Notes to this table on the following page.

TABLE 2 PRECIPITATION (inches) ST LOUIS, MISSOURI

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1961	0.39	2.06	4.75	3.47	7.25	3.67	6.20	1.88	4.01	2.67	2.90	1.95	41.20
1962	3.56	2.53	3.00	2.52	2.44	4.75	5.49	2.29	2.63	2.70	0.71	1.99	34.61
1963	0.74	0.25	5.54	1.98	4.77	3.87	1.37	2.55	1.13	2.85	2.90	0.67	28.62
1964	1.70	2.30	3.84	4.99	2.68	2.73	4.25	2.39	1.47	0.73	3.84	1.24	32.16
1965	2.51	1.16	2.34	3.67	1.38	3.03	3.17	3.59	3.00	0.46	0.78	3.17	28.26
1966	0.65	4.12	1.09	6.03	4.59	1.59	1.26	3.72	2.15	2.18	2.47	2.49	32.34
1967	2.89	1.72	2.77	3.40	4.73	4.46	3.84	1.36	4.33	3.45	2.15	6.20	41.30
1968	1.86	1.09	2.06	1.48	6.78	0.90	3.92	1.60	3.74	0.69	5.74	2.63	32.49
1969	3.61	2.04	2.47	4.01	2.11	8.65	7.08	0.52	5.03	5.77	0.44	1.99	43.72
1970	0.22	0.64	2.17	9.09	2.04	5.08	0.60	6.44	5.54	2.21	0.77	1.40	36.20
1971	0.66	3.08	1.81	1.65	5.66	2.43	4.70	0.08	3.98	1.51	1.67	6.50	33.73
1972	0.77	0.74	2.93	4.49	1.02	1.19	3.10	2.69	6.21	1.47	5.59	3.54	33.74
1973	1.40	1.04	5.81	4.25	3.92	4.23	2.85	2.46	3.52	2.33	3.65	4.36	39.82
1974	3.51	4.17	2.58	2.40	5.90	3.45	0.90	5.05	2.50	1.51	3.15	1.71	36.83
1975	5.38	3.59	4.08	4.56	3.23	3.78	2.56	5.44	2.48	0.21	2.62	2.28	40.21
1976	0.83	1.08	4.28	1.37	3.90	2.32	2.28	1.27	0.90	3.37	0.73	1.13	23.46
1977	2.38	2.47	6.28	0.99	2.13	5.47	4.28	5.34	3.64	3.76	4.33	2.34	43.41
1978	1.70	1.60	6.67	3.21	3.69	2.39	6.03	0.76	3.10	2.28	4.47	1.81	37.71
1979	1.95	1.48	3.63	7.47	1.62	1.67	3.67	2.26	T	1.81	2.07	1.85	29.48
1980	0.63	1.54	3.98	1.54	3.40	2.19	3.56	2.72	3.12	2.89	1.25	0.66	27.48
1981	0.64	2.18	2.97	3.40	6.79	5.82	10.71	3.31	1.17	3.81	2.71	2.01	45.52
1982	4.90	1.37	2.88	2.55	4.85	5.96	7.91	5.27	5.27	2.30	3.89	7.82	54.97
1983	0.72	0.95	3.54	7.30	6.32	4.32	1.23	2.24	1.24	5.40	7.79	3.75	44.80
1984	0.84	3.43	5.37	6.29	5.19	2.74	0.76	0.64	8.88	7.12	5.50	4.89	51.65
1985	0.53	3.77	5.18	3.60	3.30	9.43	5.23	3.66	0.43	1.96	9.95	3.69	50.73
1986	0.10	4.68	1.22	1.23	2.42	4.43	2.61	2.22	7.99	5.34	1.58	1.06	34.88
1987	1.98	1.40	2.16	1.74	2.00	3.59	5.04	5.56	1.62	1.74	4.09	7.46	38.38
1988	3.30	2.27	4.73	1.15	1.44	1.97	3.02	2.31	1.99	1.86	6.65	3.24	33.93
1989	2.58	1.43	4.53	2.10	4.11	2.34	4.59	3.00	1.69	0.95	0.59	0.69	28.60
1990	1.42	3.53	2.66	3.07	9.59	3.02	3.34	2.84	0.78	4.96	3.36	6.52	45.09
Record Mean	2.14	2.29	3.35	3.67	4.11	4.06	3.41	2.95	3.14	2.72	2.80	2.36	37.02

TABLE 3 AVERAGE TEMPERATURE (deg. F) ST. LOUIS, MISSOURI

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1961	28.3	35.9	45.5	50.0	58.3	70.1	76.2	75.4	71.1	59.2	44.1	32.0	53.8
1962	24.7	36.6	39.6	53.1	72.1	74.0	75.8	75.6	66.4	61.0	44.9	31.2	54.6
1963	21.3	28.5	48.8	58.2	63.9	75.4	77.3	74.9	68.5	66.9	45.7	22.2	54.3
1964	34.7	34.3	42.3	58.7	69.6	74.8	78.5	76.5	69.3	54.0	47.3	31.9	56.0
1965	31.9	33.8	34.5	58.4	70.5	75.1	76.8	75.8	69.1	56.4	48.5	41.7	56.1
1966	25.0	32.1	46.7	51.7	61.7	73.7	82.9	74.2	65.6	54.2	47.1	34.8	54.1
1967	34.7	31.3	48.3	58.5	60.8	74.0	74.9	72.4	66.5	57.5	42.0	34.8	54.7
1968	28.6	29.3	46.1	55.6	61.9	77.0	77.6	77.5	68.0	56.9	43.5	32.3	54.5
1969	29.2	35.3	37.8	56.9	65.7	72.5	80.5	77.0	69.3	56.1	43.4	32.1	54.7
1970	24.8	33.0	40.6	58.0	69.3	72.3	77.9	76.3	71.8	56.1	43.6	37.0	55.1
1971	27.4	33.9	41.7	55.9	62.3	78.9	75.4	75.7	72.5	63.7	46.0	40.6	56.2
1972	29.9	34.3	45.0	56.1	66.4	73.4	77.5	76.3	71.1	54.8	39.8	30.4	54.6
1973	32.6	34.5	50.9	53.7	61.7	74.6	78.7	76.9	70.0	60.7	47.0	30.0	55.9
1974	29.8	36.1	48.1	57.5	65.0	69.5	79.8	74.5	62.3	57.8	44.0	34.0	54.9
1975	33.2	32.0	39.0	53.4	67.6	74.9	77.8	77.9	64.7	59.0	48.3	35.5	55.3
1976	28.1	43.5	48.8	56.5	60.8	72.7	79.5	74.3	68.2	50.9	37.0	28.5	54.1
1977	15.1	34.8	49.6	60.8	71.1	74.7	81.2	76.4	70.7	55.5	44.7	30.6	55.4
1978	19.6	21.1	37.9	56.2	63.6	74.4	78.5	76.4	73.1	55.6	47.5	35.0	53.2
1979	16.6	23.1	44.1	52.9	65.5	76.5	79.2	78.4	70.8	59.2	44.5	38.7	54.1
1980	31.4	27.9	41.0	54.5	66.9	75.5	85.0	83.5	72.5	55.9	46.4	36.6	56.4
1981	31.2	36.8	46.7	63.1	60.7	75.7	78.7	76.1	69.2	55.7	48.7	31.1	56.1
1982	22.5	28.6	45.3	51.5	70.7	70.6	79.3	75.2	68.0	58.3	46.3	41.6	54.9
1983	32.3	38.1	44.5	50.3	62.3	75.3	83.5	84.2	72.0	59.7	48.2	20.5	55.9
1984	28.3	40.4	37.1	54.1	63.2	79.5	78.3	80.7	68.2	61.8	44.3	40.7	56.4
1985	22.6	30.5	49.5	60.4	67.6	71.6	79.3	74.7	70.9	61.4	46.5	27.3	55.2
1986	34.9	34.5	49.2	60.8	68.2	78.3	82.8	74.0	73.3	58.3	41.5	35.4	57.6
1987	30.6	40.1	48.6	56.9	72.6	77.9	81.0	78.9	70.5	53.8	49.1	38.0	58.2
1988	29.2	30.5	45.2	57.1	69.0	77.7	81.6	82.7	72.5	53.9	47.2	37.2	57.0
1989	41.2	28.2	45.0	57.7	64.3	74.8	79.3	77.8	67.4	61.3	47.1	24.1	55.7
1990	42.9	41.3	49.8	55.7	63.6	77.2	80.2	77.9	74.1	58.1	52.7	34.7	59.0
Record Mean	31.2	34.6	44.4	56.1	65.9	75.2	79.5	77.6	70.2	58.8	45.4	35.0	56.2
Max	39.5	43.2	53.7	65.8	75.5	84.5	88.8	87.0	79.9	68.6	54.0	42.8	65.3
Min	22.9	26.0	35.1	46.4	56.3	65.8	70.1	68.1	60.4	48.9	36.8	27.3	47.0

REFERENCE NOTES FOR TABLES 1, 2, 3 and 6 (ST. LOUIS, MO)

GENERAL

T - TRACE AMOUNT
BLANK ENTRIES DENOTE MISSING/UNREPORTED DATA.
# INDICATES A STATION OR INSTRUMENT RELOCATION.

SPECIFIC

TABLE 1

(a) - LENGTH OF RECORD IN YEARS, ALTHOUGH INDIVIDUAL MONTHS MAY BE MISSING.

< LESS THAN .05

NORMALS — BASED ON THE 1951-1980 RECORD PERIOD.
EXTREMES — DATES ARE THE MOST RECENT OCCURRENCE.
WIND DIR. — NUMERALS SHOW TENS OF DEGREES CLOCKWISE FROM TRUE NORTH. "00" INDICATES CALM.
RESULTANT WIND DIRECTIONS ARE GIVEN TO WHOLE DEGREES.

TABLE 3
MAX AND MIN ARE LONG-TERM MEAN DAILY MAXIMUM AND MEAN DAILY MINIMUM TEMPERATURES.

EXCEPTIONS

TABLES 2, 3, and 6

RECORD MEANS ARE THROUGH THE CURRENT YEAR, BEGINNING IN 1873 FOR TEMPERATURE
1871 FOR PRECIPITATION
1937 FOR SNOWFALL

TABLE 4 HEATING DEGREE DAYS Base 65 deg F — ST. LOUIS, MISSOURI

SEASON	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL
1961-62	0	0	52	211	623	1015	1242	792	783	370	25	1	5114
1962-63	0	0	62	194	595	1041	1347	1016	507	247	103	3	5115
1963-64	0	11	33	74	574	1320	932	884	696	216	41	6	4787
1964-65	0	2	55	333	526	1019	1016	869	938	250	19	0	5027
1965-66	0	7	49	286	489	717	1233	915	570	397	156	4	4823
1966-67	0	0	78	336	534	931	932	940	530	257	188	12	4738
1967-68	3	7	67	268	682	928	1121	1031	587	290	137	2	5123
1968-69	0	2	14	293	640	1008	1106	826	834	247	85	15	5070
1969-70	0	0	27	313	644	1013	1241	893	751	257	55	20	5214
1970-71	0	0	24	287	635	863	1159	866	718	303	122	0	4977
1971-72	0	0	47	97	574	751	1081	884	619	295	80	10	4438
1972-73	2	0	29	317	751	1069	997	849	430	348	121	0	4913
1973-74	0	0	31	182	538	1077	1083	804	539	253	101	21	4629
1974-75	0	0	127	242	625	954	979	919	803	353	48	1	5051
1975-76	2	0	110	228	498	910	1137	619	505	288	158	0	4455
1976-77	0	0	24	456	832	1125	1541	839	471	190	36	3	5517
1977-78	0	0	11	291	601	1059	1401	1223	840	275	158	5	5864
1978-79	0	0	24	292	528	923	1496	1167	644	364	80	0	5518
1979-80	0	0	16	223	610	810	1035	1071	740	331	54	0	4890
1980-81	0	0	30	305	553	877	1039	784	569	127	168	0	4452
1981-82	0	0	35	298	483	1048	1308	1015	603	407	9	11	5217
1982-83	0	0	49	261	569	721	1008	745	632	437	117	7	4546
1983-84	0	0	58	192	498	1376	1133	705	860	342	115	0	5279
1984-85	0	0	103	151	616	746	1308	960	487	200	42	10	4623
1985-86	0	0	64	145	550	1159	929	850	506	194	44	0	4441
1986-87	0	11	12	221	699	910	1062	691	501	267	10	0	4384
1987-88	0	0	12	346	490	830	1102	995	610	241	17	3	4646
1988-89	0	0	5	354	528	854	730	1029	625	293	128	4	4550
1989-90	0	0	73	183	536	1261	679	657	496	327	85	9	4306
1990-91	3	0	24	250	375	934							

TABLE 5 COOLING DEGREE DAYS Base 65 deg. F — ST. LOUIS, MISSOURI

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	TOTAL
1969	0	0	0	9	113	246	486	381	162	43	0	0	1440
1970	0	0	0	54	195	247	410	360	236	17	0	0	1519
1971	0	0	2	35	45	427	326	340	279	62	10	0	1526
1972	0	0	5	35	129	268	394	358	219	9	0	0	1417
1973	0	0	1	17	25	294	435	375	187	57	4	0	1395
1974	0	0	24	36	109	164	463	300	52	25	2	0	1175
1975	0	0	2	12	133	308	405	406	110	51	4	0	1431
1976	0	0	8	38	34	239	458	298	129	25	0	0	1229
1977	0	0	2	69	231	302	509	360	190	4	0	0	1667
1978	0	0	7	17	120	295	426	360	276	10	8	0	1519
1979	0	0	2	9	102	354	446	420	195	50	0	0	1578
1980	0	0	0	23	120	320	626	580	262	31	2	0	1964
1981	0	0	7	77	42	327	431	353	166	13	1	0	1417
1982	0	0	0	7	191	186	453	322	146	63	15	4	1387
1983	0	0	3	3	41	322	578	603	274	36	2	0	1862
1984	0	0	0	24	67	442	423	493	202	57	2	1	1711
1985	0	0	14	70	128	214	451	310	245	43	2	0	1477
1986	0	0	25	75	150	407	561	298	267	21	0	0	1804
1987	0	0	0	32	251	393	501	439	183	5	20	0	1824
1988	0	0	4	10	144	389	521	556	238	16	0	0	1878
1989	0	0	11	80	111	305	450	403	151	75	6	0	1592
1990	0	0	30	55	47	382	480	408	304	41	12	0	1759

TABLE 6 SNOWFALL (inches) — ST. LOUIS, MISSOURI

SEASON	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL
1961-62	0.0	0.0	0.0	0.0	4.7	3.7	13.2	3.6	0.6	T	0.0	0.0	25.8
1962-63	0.0	0.0	0.0	0.0	0.0	0.8	3.5	1.8	1.2	T	0.0	0.0	7.3
1963-64	0.0	0.0	0.0	0.0	T	6.4	8.1	8.8	8.2	T	0.0	0.0	31.5
1964-65	0.0	0.0	0.0	0.0	3.1	0.3	7.3	5.7	8.7	0.0	0.0	0.0	25.1
1965-66	0.0	0.0	0.0	0.0	T	0.1	2.5	7.1	0.9	T	0.0	0.0	10.6
1966-67	0.0	0.0	0.0	0.0	T	0.1	1.4	0.9	1.2	0.0	0.0	0.0	3.6
1967-68	0.0	0.0	0.0	T	1.6	4.2	6.9	0.4	7.7	0.0	0.0	0.0	20.8
1968-69	0.0	0.0	0.0	0.0	T	1.3	2.3	5.8	2.7	0.0	0.0	0.0	12.1
1969-70	0.0	0.0	0.0	0.0	T	10.2	2.1	3.7	5.0	1.0	0.0	0.0	22.0
1970-71	0.0	0.0	0.0	0.0	T	0.9	0.4	1.4	0.2	6.5	0.0	0.0	9.4
1971-72	0.0	0.0	0.0	0.0	1.3	0.0	4.1	1.9	0.3	T	0.0	0.0	7.6
1972-73	0.0	0.0	0.0	0.0	5.2	1.0	2.2	3.0	0.2	0.2	0.0	0.0	11.8
1973-74	0.0	0.0	0.0	0.0	0.0	26.3	4.2	4.5	7.4	0.0	0.0	0.0	42.4
1974-75	0.0	0.0	0.0	0.0	1.2	1.5	4.1	12.1	6.3	T	0.0	0.0	25.2
1975-76	0.0	0.0	0.0	0.0	7.6	3.9	4.5	4.5	4.8	0.0	0.0	0.0	25.3
1976-77	0.0	0.0	0.0	0.0	0.3	5.2	23.9	6.7	0.1	0.1	0.0	0.0	36.3
1977-78	0.0	0.0	0.0	0.0	6.7	11.7	22.9	9.3	15.4	0.0	0.0	0.0	66.0
1978-79	0.0	0.0	0.0	0.0	0.0	1.4	18.4	4.8	2.0	0.0	0.0	0.0	26.6
1979-80	0.0	0.0	0.0	0.0	0.3	T	4.2	7.4	8.7	5.0	0.0	0.0	25.6
1980-81	0.0	0.0	0.0	0.0	8.0	1.1	0.6	8.2	0.2	0.0	0.0	0.0	18.1
1981-82	0.0	0.0	0.0	0.0	T	7.9	16.6	9.0	0.4	2.7	0.0	0.0	36.6
1982-83	0.0	0.0	0.0	0.0	T	T	3.3	0.3	1.4	2.4	0.0	0.0	7.4
1983-84	0.0	0.0	0.0	0.0	T	6.5	2.3	9.9	5.2	0.0	0.0	0.0	23.9
1984-85	0.0	0.0	0.0	0.0	1.7	1.8	5.1	1.3	T	0.0	0.0	0.0	9.9
1985-86	0.0	0.0	0.0	0.0	T	5.7	1.0	6.1	0.2	T	0.0	0.0	13.0
1986-87	0.0	0.0	0.0	0.0	T	T	23.6	0.6	T	0.0	0.0	0.0	24.2
1987-88	0.0	0.0	0.0	0.0	T	7.3	1.4	6.7	2.8	0.0	0.0	0.0	18.2
1988-89	0.0	0.0	0.0	0.0	2.9	5.9	0.1	3.9	11.0	0.0	0.0	0.0	23.8
1989-90	0.0	0.0	0.0	T	T	9.1	0.2	6.9	8.4	T	T	T	24.6
1990-91	0.0	0.0	0.0	0.0	T	13.2							
Record Mean	0.0	0.0	0.0	T	1.4	4.0	5.3	4.5	4.3	0.4	T	T	19.9

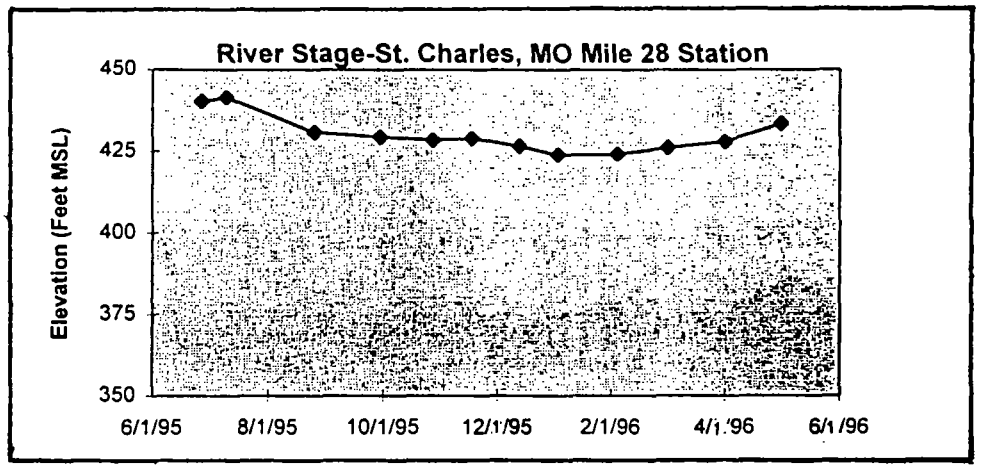
See Reference Notes, relative to all above tables, on preceding page.

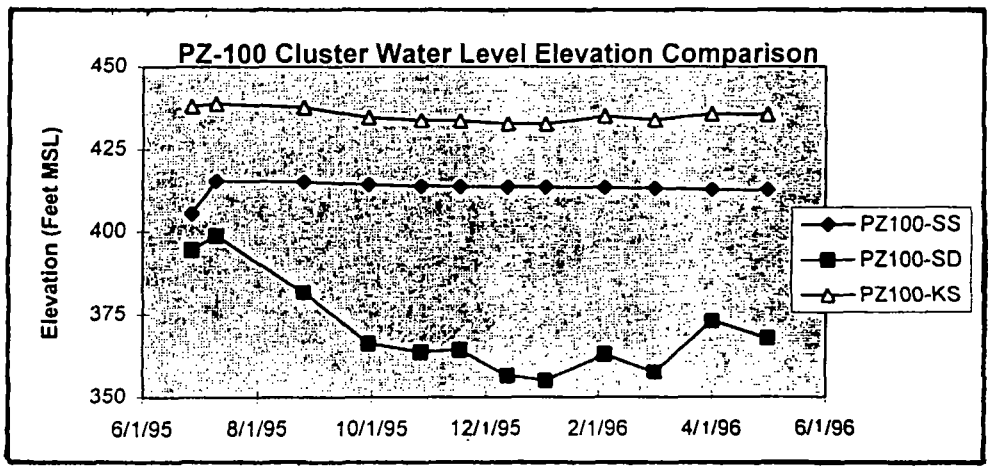
APPENDIX H-3

RIVER STAGE MONITORING DATA

APPENDIX H-3

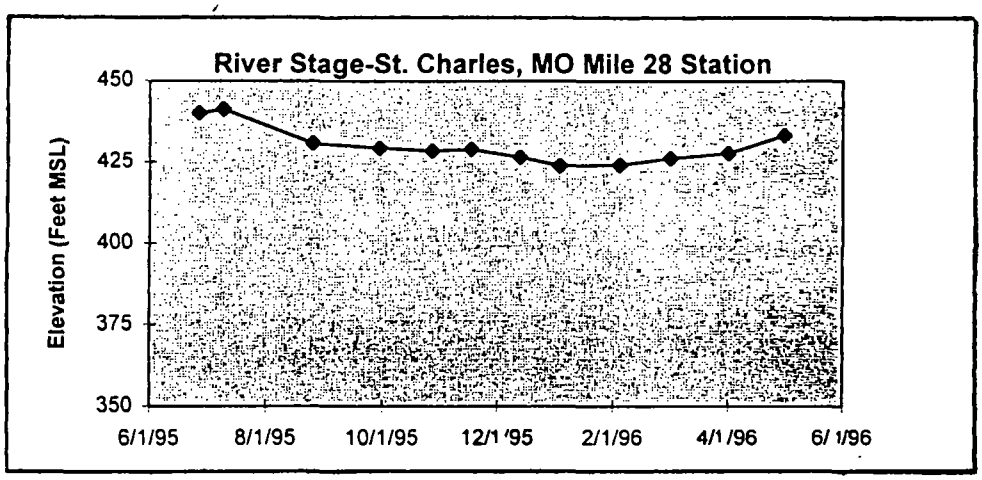
RIVER STAGE VERSUS PIEZOMETER WATER LEVEL ELEVATION

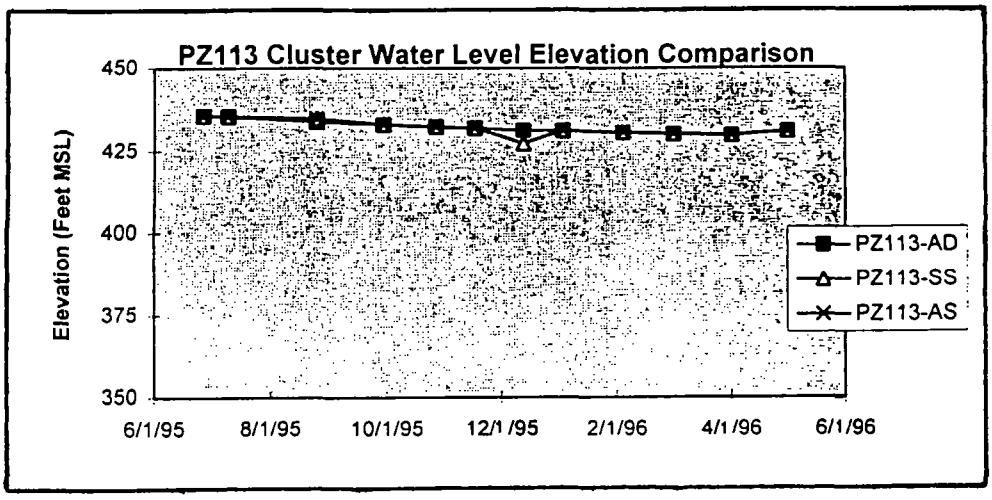




APPENDIX H-3

RIVER STAGE VERSUS PIEZOMETER WATER LEVEL ELEVATION





UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI
STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS
LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985
DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14.24	---	17.59	24.34	12.08	31.65	24.57	19.49	18.93	18.73	13.25	17.62
2	14.25	---	16.96	25.65	12.39	29.19	23.37	21.67	20.20	18.71	13.16	17.30
3	14.20	26.03	16.27	24.32	12.32	26.09	23.45	22.26	19.86	18.66	13.80	16.32
4	14.22	25.99	15.54	22.30	11.40	24.22	23.51	21.58	19.19	18.90	14.43	15.60
5	14.17	24.11	15.24	20.00	10.55	26.88	23.07	20.93	22.35	18.59	14.15	15.28
6	14.08	23.03	15.23	18.97	10.52	29.03	22.57	20.13	23.23	18.37	13.87	14.66
7	13.99	22.21	15.01	17.65	10.85	30.12	21.92	19.49	24.95	18.19	14.23	14.08
8	13.98	20.71	14.86	16.69	11.15	29.80	21.56	19.31	24.80	18.20	15.04	14.06
9	14.20	19.36	14.25	17.16	10.71	28.80	20.93	19.23	23.58	18.02	15.43	14.02
10	13.98	18.10	13.59	17.52	10.96	27.24	20.14	18.87	23.38	17.68	14.74	13.21
11	13.97	17.17	13.18	17.05	10.94	24.85	19.82	18.49	24.07	16.61	15.31	12.86
12	14.12	16.16	12.77	16.70	10.80	23.91	20.13	18.07	24.25	15.20	16.47	12.67
13	14.12	15.76	12.88	16.53	10.67	23.88	19.85	17.31	22.70	15.05	16.12	12.52
14	14.52	15.61	12.84	16.34	11.90	24.65	19.91	17.07	21.19	14.72	16.45	12.35
15	14.69	15.86	14.02	16.14	12.28	23.48	19.56	20.11	20.36	14.35	17.41	12.46
16	15.48	15.96	14.33	15.93	12.44	22.75	19.23	20.85	19.58	14.03	18.13	12.53
17	---	16.02	16.09	15.64	12.51	22.09	19.23	20.92	20.32	13.28	17.59	12.73
18	---	16.31	16.28	15.41	12.41	21.74	19.16	20.08	26.35	13.19	17.29	13.34
19	---	16.23	16.42	15.27	11.70	21.31	18.95	20.10	27.61	13.16	16.62	14.30
20	---	16.09	16.06	9.20	12.10	20.92	18.85	20.28	25.70	12.57	15.90	14.46
21	---	16.55	17.84	15.16	14.13	20.91	18.70	19.93	23.50	12.38	15.88	14.14
22	---	17.08	18.41	14.94	16.77	20.89	18.48	18.89	21.87	12.45	16.51	13.70
23	---	17.16	17.93	14.75	25.65	20.82	18.39	18.17	20.58	12.79	17.86	13.51
24	---	16.44	18.71	14.55	29.65	20.82	18.57	17.86	20.33	14.54	18.20	13.81
25	---	16.00	18.69	13.78	32.91	20.74	18.61	17.90	20.76	15.81	18.25	17.12
26	---	15.96	17.68	12.58	33.56	20.64	18.85	17.92	21.48	15.21	18.88	18.42
27	---	16.20	16.01	11.89	33.90	20.49	18.97	17.22	21.10	13.79	17.80	17.69
28	---	18.80	15.26	11.50	33.16	20.56	19.71	16.63	20.16	13.65	17.66	17.10
29	---	17.80	14.40	11.39	---	20.50	21.22	16.46	19.44	13.86	18.81	17.04
30	---	17.56	16.17	11.21	---	23.00	20.61	17.93	19.11	13.49	18.17	16.42
31	---	---	21.05	11.65	---	24.79	---	18.77	---	13.34	17.87	---
MEAN	---	---	15.86	16.20	16.09	24.09	20.40	19.16	22.03	15.40	16.30	14.71
MAX	---	---	21.05	25.65	33.90	31.65	24.57	22.26	27.61	18.90	18.88	18.42
MIN	---	---	12.77	9.20	10.52	20.49	18.39	16.46	18.93	12.38	13.16	12.35

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI
STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS
LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986
DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15.83	18.09	22.30	---	12.20	14.40	15.16	16.48	22.56	16.02	17.07	15.19
2	18.66	18.51	25.80	---	13.52	14.74	15.06	18.47	21.43	16.05	16.39	15.16
3	21.81	18.58	24.80	---	16.59	16.30	15.27	20.74	20.57	16.45	16.23	14.94
4	20.46	17.82	22.00	---	21.03	16.87	15.56	20.22	19.83	16.74	15.63	14.73
5	19.61	16.69	19.00	---	22.67	15.47	16.58	19.53	19.32	20.52	15.28	---
6	18.92	15.99	19.50	---	21.02	14.78	18.62	18.85	18.75	20.39	14.57	---
7	18.39	16.02	19.80	---	19.99	13.79	22.12	18.08	18.44	19.22	14.94	---
8	17.92	15.79	20.00	14.83	20.11	13.22	22.61	17.88	18.74	18.87	14.42	---
9	17.17	15.75	20.20	14.33	20.35	13.86	22.07	18.33	20.25	21.76	14.49	---
10	16.46	15.50	20.40	14.12	19.60	13.56	21.56	18.76	19.74	24.57	14.65	14.33
11	16.72	14.81	23.40	13.51	18.68	12.82	21.35	19.08	19.50	24.59	14.84	14.29
12	23.89	14.48	26.60	13.41	17.87	12.76	21.43	18.71	19.06	24.22	15.01	14.66
13	25.76	14.34	24.50	12.57	17.07	13.20	20.64	20.52	18.96	24.95	15.00	14.60
14	26.43	15.83	23.80	11.76	16.67	15.28	19.89	21.84	18.72	25.27	15.00	16.65
15	26.18	22.14	21.30	11.73	16.17	15.91	19.54	21.59	18.49	25.93	15.03	17.43
16	26.31	24.44	20.30	12.36	15.72	16.31	19.17	20.15	18.09	27.09	15.70	16.52
17	25.13	25.46	19.60	12.73	14.41	17.00	19.02	21.75	18.06	27.07	19.86	15.63
18	24.71	25.73	19.00	12.77	14.70	18.12	19.00	24.26	18.58	26.34	19.07	15.23
19	22.44	28.33	18.80	12.97	14.93	17.35	18.88	26.54	19.09	25.69	17.87	15.65
20	21.89	29.13	18.20	13.26	15.13	16.55	18.33	27.84	18.98	25.39	17.40	16.10
21	22.30	29.27	17.20	13.52	15.64	16.74	17.64	28.11	18.47	23.54	16.98	19.15
22	22.12	8.97	17.00	14.05	15.58	18.14	16.82	27.81	17.81	21.28	16.65	18.68
23	21.93	6.59	16.80	14.73	15.15	20.94	17.00	28.73	16.90	20.11	16.35	20.87
24	20.92	5.14	---	15.02	14.12	19.59	17.88	28.25	16.13	19.54	15.73	21.30
25	20.24	4.19	---	14.72	13.37	18.43	17.71	26.59	16.57	19.36	15.25	24.28
26	20.38	3.89	---	14.09	13.84	17.70	17.20	24.67	17.87	18.86	15.46	26.40
27	20.44	4.16	---	13.30	14.64	17.38	16.66	24.27	17.31	18.32	16.18	26.02
28	19.48	4.41	---	12.24	14.59	16.80	16.22	24.06	16.98	17.81	16.08	26.17
29	19.09	3.87	---	12.26	---	16.59	15.92	23.75	16.50	17.10	15.69	25.29
30	19.23	3.85	---	12.74	---	16.20	15.75	23.26	16.19	16.64	15.33	25.36
31	18.48	---	---	12.24	---	15.72	---	22.53	---	16.73	15.21	---
MEAN	20.95	15.26	---	---	16.62	16.02	18.36	22.31	18.60	21.17	15.91	---
MAX	26.43	29.27	---	---	22.67	20.94	22.61	28.73	22.56	27.09	19.86	---
MIN	15.83	3.85	---	---	12.20	12.76	15.06	16.48	16.13	16.02	14.42	---

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI

STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS

LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

PROVISIONAL D SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27.66	26.56	20.50	16.09	16.70	15.70	25.35	19.41	24.91	16.87	14.62	19.56
2	30.59	25.91	22.03	15.95	16.94	16.04	24.41	19.73	23.95	16.59	14.27	18.60
3	31.91	25.41	24.11	15.78	16.65	20.83	23.27	19.47	22.62	16.11	13.96	17.41
4	34.62	24.74	24.92	15.55	16.13	22.93	23.33	19.29	21.78	16.04	13.71	16.61
5	35.37	24.51	24.33	15.64	16.01	22.02	23.34	19.65	21.50	15.94	13.29	16.13
6	36.61	24.14	23.34	15.65	16.09	20.55	23.37	22.52	20.70	15.16	13.27	15.26
7	36.94	23.89	22.34	15.59	16.04	20.09	23.40	22.95	20.00	15.72	13.00	14.61
8	36.22	23.74	21.86	15.35	16.08	19.35	23.06	22.81	19.46	16.32	12.74	14.33
9	35.11	23.59	23.26	15.35	15.68	18.64	22.00	22.04	19.35	16.23	12.89	14.29
10	34.28	23.36	24.34	15.36	15.43	18.25	21.78	21.46	19.35	19.84	13.06	14.19
11	33.73	23.34	24.59	15.27	15.62	17.96	21.62	20.41	19.19	20.66	13.15	13.99
12	32.50	23.27	23.92	14.94	15.61	17.90	21.36	19.16	18.55	20.77	12.72	13.79
13	31.12	23.15	22.75	14.56	15.14	17.73	21.33	18.64	18.29	21.44	14.04	13.85
14	29.14	23.06	21.64	14.50	14.78	17.46	23.74	18.74	18.11	21.01	16.57	13.90
15	29.47	22.96	20.23	15.12	14.00	17.47	26.74	19.15	17.53	22.01	15.29	14.22
16	30.11	22.68	19.49	15.94	13.27	17.24	26.74	19.66	17.52	21.73	15.50	13.96
17	29.90	22.67	19.71	16.27	12.93	17.01	27.32	18.92	17.13	21.64	17.49	14.32
18	29.28	22.25	20.02	16.25	13.10	16.95	26.95	18.46	16.91	21.35	17.77	14.72
19	28.61	22.17	19.69	16.19	15.41	17.24	27.49	18.28	16.73	20.59	18.03	14.56
20	27.94	22.17	20.00	15.65	17.05	18.94	26.24	18.49	16.41	---	17.45	16.87
21	27.49	21.89	20.23	14.88	16.92	24.84	25.04	19.27	15.97	17.77	16.26	17.35
22	27.16	21.20	20.05	14.39	16.74	25.54	24.13	18.94	15.82	16.72	15.42	16.08
23	26.92	20.94	19.92	14.37	16.69	24.91	23.70	19.30	16.50	16.42	15.03	15.36
24	25.99	20.82	19.49	14.60	16.64	23.55	23.29	19.82	17.77	16.30	14.79	15.13
25	25.82	20.82	18.28	14.76	16.51	22.59	22.67	19.59	17.16	15.76	14.55	14.92
26	25.77	20.29	17.05	14.60	16.39	22.52	22.81	18.74	17.34	15.61	14.06	14.57
27	26.39	21.56	16.60	13.81	16.45	23.73	22.51	18.11	17.25	15.19	13.77	14.30
28	27.75	21.79	16.49	13.89	16.40	26.12	21.42	17.80	16.35	14.67	13.44	14.11
29	28.33	21.39	16.37	14.36	---	26.13	20.85	18.84	16.39	14.57	19.19	13.94
30	27.95	20.76	16.20	14.55	---	26.17	19.74	21.52	16.65	14.73	21.44	13.71
31	27.53	---	16.16	15.88	---	25.29	---	24.34	---	14.57	20.64	---
MEAN	30.26	22.83	20.64	15.20	15.76	20.70	23.63	19.86	18.57	---	15.21	15.15
MAX	36.94	26.56	24.92	16.27	17.05	26.17	27.49	24.34	24.91	---	21.44	19.56
MIN	25.77	20.29	16.16	13.81	12.93	15.70	19.74	17.80	15.82	---	12.72	13.71

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI

ATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS

LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

PROVISIONAL D SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13.67	11.74	16.57	19.69	12.58	14.48	19.69	16.32	12.17	9.88	10.30	10.46
2	13.52	11.74	17.55	18.12	15.44	15.22	19.08	16.27	12.18	9.93	10.42	9.97
3	13.25	11.86	16.52	17.03	15.51	15.46	19.73	16.27	12.11	9.85	10.74	9.78
4	13.15	11.95	15.55	16.53	15.95	17.11	21.21	16.36	11.87	9.89	10.71	9.70
5	13.35	12.17	14.92	16.01	15.44	19.21	---	16.39	11.58	10.45	10.41	10.98
6	13.08	14.45	14.37	15.51	14.69	18.76	21.31	16.11	11.49	11.36	10.19	10.34
7	12.92	14.86	13.32	15.15	13.86	18.40	20.70	15.56	11.61	11.34	10.13	9.77
8	12.77	13.71	13.27	14.74	12.91	18.53	19.66	15.43	11.51	10.60	10.18	9.57
9	12.73	13.16	13.45	14.79	11.66	17.49	18.76	14.35	---	10.34	10.06	9.69
10	12.73	12.83	14.17	14.37	11.21	16.87	18.35	13.18	11.26	10.19	9.85	10.08
11	12.71	12.64	14.65	14.30	12.93	16.51	18.10	13.32	11.18	10.09	10.18	10.33
12	12.65	12.46	14.16	14.41	13.37	16.25	17.81	13.86	11.07	10.16	10.73	10.19
13	12.60	12.53	12.87	14.46	12.84	16.37	17.53	14.00	10.93	10.20	10.93	10.15
14	12.42	12.63	12.43	13.95	12.47	15.84	17.50	13.61	10.92	10.31	10.73	10.05
15	12.34	12.48	12.71	13.28	12.03	15.76	17.38	13.69	11.17	10.44	10.21	11.00
16	12.52	12.27	12.90	11.74	11.39	15.45	17.22	13.92	11.43	10.73	10.08	10.61
17	12.61	12.20	14.03	11.25	11.62	15.16	17.08	13.51	11.11	10.93	10.00	10.38
18	12.47	12.24	13.69	10.88	12.21	15.00	17.08	12.73	10.83	10.68	10.81	10.42
19	12.29	12.25	13.82	10.34	13.68	14.80	17.28	13.24	10.90	10.55	11.04	11.58
20	12.29	12.29	15.40	11.48	15.99	14.65	17.56	12.83	10.71	10.63	11.14	13.48
21	12.41	12.39	19.49	13.44	17.47	13.87	17.44	12.73	10.44	10.39	10.40	12.03
22	12.42	12.71	21.98	13.71	17.45	12.89	16.83	12.91	10.34	10.39	9.96	11.30
23	12.41	12.79	21.95	13.58	17.46	12.07	16.82	12.78	10.84	10.86	9.94	11.31
24	12.42	12.62	20.97	14.08	17.38	12.76	16.62	12.17	10.56	11.07	9.81	11.19
25	12.29	13.17	20.86	14.26	17.81	12.93	16.57	11.94	10.23	11.08	10.32	11.47
26	12.28	15.80	20.20	14.03	18.13	12.88	16.48	12.07	10.31	11.05	10.79	10.82
27	12.18	16.99	19.60	13.37	17.03	13.45	16.32	12.69	10.13	10.85	10.79	10.42
28	12.06	17.38	22.59	13.27	16.11	13.56	16.37	13.55	9.98	10.53	10.31	10.42
29	12.05	17.09	22.86	12.66	15.40	12.79	16.36	13.46	9.89	10.37	10.05	10.42
30	12.24	16.30	21.50	11.34	---	19.98	16.38	12.78	9.87	10.39	10.24	10.43
31	12.01	---	20.79	10.91	---	21.18	---	12.42	---	10.30	10.64	---
MEAN	12.61	13.32	16.75	13.96	14.55	15.67	---	13.89	---	10.51	10.39	10.61
MAX	13.67	17.38	22.86	19.69	18.13	21.18	---	16.39	---	11.36	11.14	13.48
MIN	12.01	11.74	12.43	10.34	11.21	12.07	---	11.94	---	9.85	9.81	9.57

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI

STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS

LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

PROVISIONAL D SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1988 TO SEPTEMBER 1989

DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11.05	10.65	12.85	12.19	8.43	8.03	10.26	10.40	12.87	14.74	12.81	20.81
2	11.70	10.62	11.81	11.33	9.88	8.70	11.33	11.04	14.70	13.00	11.91	20.66
3	12.36	10.44	10.94	10.08	11.10	9.49	12.72	11.20	13.93	12.00	11.41	18.80
4	11.53	10.40	11.15	8.81	10.67	9.76	16.14	10.35	13.05	11.57	11.20	16.52
5	11.37	10.28	9.93	8.34	10.50	9.66	17.03	10.64	12.91	11.25	10.94	14.99
6	11.69	10.30	8.59	11.85	10.30	9.60	16.56	10.37	12.00	11.35	11.58	13.94
7	11.28	10.26	8.09	13.28	9.99	8.99	16.66	10.21	11.46	11.35	12.03	12.91
8	10.86	10.26	8.39	12.38	9.61	8.99	15.63	10.14	13.39	11.02	11.47	12.57
9	10.64	10.34	8.10	10.49	10.03	9.16	14.61	10.23	13.65	11.03	10.37	15.20
10	10.48	10.56	8.01	9.13	9.01	11.00	13.70	10.99	13.57	11.14	10.20	18.78
11	10.39	10.60	8.55	8.34	8.28	11.67	12.31	10.36	13.11	10.75	10.04	22.19
12	10.29	10.62	8.03	8.90	7.93	12.65	12.08	10.11	12.36	10.39	9.81	24.14
13	10.32	10.77	7.48	9.41	7.77	11.74	12.92	9.98	11.16	10.67	9.73	24.72
14	10.30	11.24	7.25	8.65	7.53	10.80	12.48	9.91	11.23	11.17	9.70	24.33
15	8.65	11.32	8.37	9.35	7.39	10.77	12.53	9.86	12.59	10.66	9.70	22.00
16	7.32	11.07	9.14	9.17	6.97	14.87	12.24	9.70	13.37	10.17	9.63	20.60
17	6.77	10.40	8.33	8.12	8.78	16.69	11.90	9.55	12.91	10.03	9.56	20.03
18	5.26	10.24	7.68	7.22	11.39	16.89	10.90	9.45	12.48	10.17	9.67	18.41
19	3.61	10.50	7.32	7.88	11.08	15.46	10.63	9.51	12.16	10.09	9.52	17.46
20	10.35	10.89	6.88	8.15	10.24	14.08	11.47	9.60	11.15	11.16	9.38	16.89
21	10.37	11.09	6.52	7.57	9.58	14.62	12.12	9.64	11.05	11.38	9.51	16.66
22	10.46	10.99	6.31	7.58	9.31	16.44	11.65	10.07	12.23	11.23	9.57	15.74
23	10.66	10.87	6.67	7.82	9.13	15.15	10.86	11.55	12.11	11.12	10.77	15.16
24	10.58	11.87	9.27	7.31	9.13	13.83	10.86	11.53	11.47	11.37	15.13	14.57
25	10.57	11.22	9.54	6.83	10.06	13.34	10.59	11.11	11.32	11.34	14.32	13.78
26	10.53	10.08	8.55	8.28	10.52	12.69	10.31	13.73	11.18	11.38	15.09	12.83
27	10.65	10.49	7.95	8.99	9.82	11.92	10.02	14.89	10.54	11.20	15.13	12.10
28	10.62	12.05	8.32	8.85	8.57	10.70	10.09	14.21	10.57	10.82	15.34	11.62
29	10.54	12.03	11.25	9.40	---	9.47	11.04	13.72	12.00	11.45	15.79	11.34
30	10.40	12.25	13.55	9.75	---	10.67	11.24	13.30	14.34	11.65	16.86	11.07
31	10.41	---	13.05	8.95	---	10.32	---	12.13	---	11.75	17.16	---
MEAN	10.06	10.82	8.96	9.17	9.39	11.88	12.43	10.95	12.36	11.24	11.78	17.03
MAX	12.36	12.25	13.55	13.28	11.39	16.89	17.03	14.89	14.70	14.74	17.16	24.72
MIN	3.61	10.08	6.31	6.83	6.97	8.03	10.02	9.45	10.54	10.03	9.38	11.07

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI
STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS
LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189
PROVISIONAL DATA SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990
DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10.90	11.20	6.08	---	7.34	12.80	16.53	18.56	24.38	21.28	18.69	12.32
2	10.72	12.58	6.00	---	8.18	12.87	16.74	18.13	22.39	20.47	17.35	12.16
3	10.63	14.37	5.90	---	8.24	12.30	16.95	17.56	21.01	20.00	16.33	11.52
4	10.50	13.38	5.79	---	8.68	11.81	16.68	16.93	20.67	19.71	15.80	11.23
5	10.41	12.01	5.76	14.76	9.02	11.64	16.59	20.40	20.41	19.33	16.12	11.02
6	10.53	11.76	5.79	11.39	8.80	10.76	---	21.73	19.99	19.01	16.03	11.24
7	10.41	11.23	5.79	7.85	8.38	10.84	16.30	22.14	22.01	19.09	15.74	12.04
8	10.38	10.41	5.96	6.96	8.34	11.34	16.12	21.52	25.18	18.69	15.63	11.94
9	11.08	10.24	5.77	6.79	9.65	12.18	15.81	20.24	26.55	18.37	15.82	11.81
10	10.82	9.95	5.65	6.56	9.36	13.72	15.70	18.61	27.94	18.09	15.10	11.63
11	10.35	9.39	5.92	6.38	8.80	12.96	15.69	17.56	28.38	17.67	14.71	11.81
12	10.68	8.75	5.87	6.30	8.75	13.16	15.91	17.07	28.18	16.54	14.18	11.82
13	10.88	7.98	5.80	6.33	8.23	12.95	16.21	18.58	---	16.21	13.85	11.86
14	10.59	7.48	5.78	6.42	8.13	14.65	16.81	20.47	23.50	17.60	13.34	11.84
15	10.89	7.23	6.08	6.44	8.62	20.44	18.80	20.57	22.06	17.29	13.43	11.77
16	11.27	7.00	6.11	6.38	9.51	25.65	17.93	24.34	22.20	15.69	13.60	11.83
17	10.61	6.92	6.16	6.40	11.82	25.94	17.55	31.47	24.46	---	14.66	11.82
18	10.27	6.88	5.94	6.42	13.31	25.02	17.15	34.16	26.14	14.37	17.80	11.82
19	10.83	7.13	---	6.49	13.42	23.56	16.72	34.18	26.64	14.14	16.63	11.82
20	11.46	7.05	---	6.85	12.27	22.70	16.57	33.60	26.91	14.32	16.22	11.82
21	11.56	6.59	---	7.11	10.93	20.64	16.78	31.38	27.31	13.96	16.59	11.82
22	10.75	6.26	---	7.13	10.38	18.84	16.68	27.55	27.19	13.72	15.47	11.82
23	10.60	6.12	---	8.02	12.20	17.59	15.89	24.39	26.75	15.33	14.83	11.82
24	10.47	6.14	---	9.05	14.50	16.77	15.48	23.02	26.15	17.75	14.32	11.82
25	10.26	6.32	---	8.97	15.76	16.10	15.64	23.13	25.33	18.46	14.08	11.82
26	10.27	6.34	---	8.57	14.82	15.62	14.81	23.49	24.57	16.99	14.38	11.82
27	10.29	6.24	---	8.25	14.14	15.49	14.58	24.93	23.77	15.28	13.89	11.80
28	10.17	6.14	---	8.22	13.29	15.79	13.82	27.96	23.43	14.38	12.89	11.83
29	10.18	6.13	---	9.37	---	16.06	13.37	28.79	22.89	14.94	12.61	11.82
30	10.03	6.14	---	8.13	---	16.54	16.12	28.32	21.98	18.61	13.10	11.83
31	10.20	---	---	7.20	---	---	---	26.59	---	20.01	12.59	---
MEAN	10.61	8.51	---	---	10.53	---	---	23.79	---	---	15.03	11.78
MAX	11.56	14.37	---	---	15.76	---	---	34.18	---	---	18.69	12.32
MIN	10.03	6.12	---	---	7.34	---	---	16.93	---	---	12.59	11.02

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI

STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS

LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

PROVISIONAL DATA SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	9.91	8.44	11.91	11.09	10.42	---	18.63	18.51	13.11	9.94	9.39
2	---	9.85	8.43	11.72	11.04	10.20	---	20.39	18.15	12.71	9.83	9.36
3	---	9.62	8.39	12.04	10.24	9.36	---	19.79	17.92	12.71	9.72	9.39
4	---	9.39	8.41	11.74	9.56	8.89	---	19.32	19.89	13.02	9.70	9.65
5	---	9.36	9.96	8.68	9.18	8.84	---	19.60	19.71	12.30	9.68	9.63
6	---	8.92	10.76	7.89	9.35	12.22	---	20.19	18.73	11.88	9.89	9.80
7	---	8.57	9.65	8.21	14.08	12.21	---	22.36	---	11.73	9.87	10.03
8	---	8.36	8.41	7.40	16.17	10.68	---	22.27	18.53	11.46	9.68	9.87
9	---	8.67	7.63	6.85	15.55	10.28	---	21.80	17.32	11.33	9.90	9.70
10	---	8.85	7.01	7.25	14.71	11.21	---	21.71	18.55	12.68	9.95	9.52
11	---	8.34	6.73	7.22	13.23	9.93	---	21.08	18.86	14.69	10.02	9.50
12	---	7.78	6.54	7.42	11.77	8.77	---	20.08	17.74	13.26	---	9.57
13	11.89	7.43	6.37	9.22	11.12	8.21	---	18.31	16.86	12.05	9.95	9.62
14	11.25	7.34	6.17	10.32	11.37	8.10	---	19.12	16.26	14.14	9.79	10.56
15	10.80	7.32	6.09	10.10	11.12	8.32	---	20.32	16.34	17.45	9.84	11.22
16	10.60	7.16	6.14	9.71	10.38	8.03	---	21.11	15.98	15.91	10.14	10.62
17	10.64	6.96	6.35	12.00	10.93	7.81	---	20.33	15.71	14.54	10.23	10.28
18	10.85	6.78	6.53	15.29	11.28	8.81	19.21	20.29	15.55	13.52	10.19	10.61
19	11.29	6.84	6.52	15.75	9.93	9.60	20.17	19.11	20.29	12.62	9.96	10.72
20	10.88	6.92	7.03	15.89	9.18	9.97	21.77	17.53	19.83	11.88	10.02	10.50
21	10.70	6.64	8.03	15.54	9.11	10.03	22.69	16.76	18.42	11.31	9.78	10.33
22	10.60	6.53	8.88	13.80	10.32	11.72	22.51	16.61	17.18	11.04	9.69	10.23
23	10.41	6.31	8.46	13.02	10.54	---	21.69	16.23	16.14	10.74	9.72	10.52
24	10.19	6.23	7.83	14.43	10.12	---	20.68	16.35	15.26	10.47	9.82	10.82
25	10.14	6.09	7.55	13.69	9.60	---	19.83	16.64	14.59	10.61	9.73	10.36
26	10.13	5.99	7.31	13.01	8.97	---	17.97	17.81	15.15	10.64	9.55	10.05
27	10.10	6.05	6.96	12.35	8.97	---	16.55	20.20	15.76	10.31	9.48	9.93
28	10.41	6.66	6.43	11.50	9.82	---	16.09	19.71	14.66	10.28	9.39	9.90
29	11.32	6.68	6.99	9.93	---	---	15.66	18.88	14.04	10.31	9.35	9.83
30	10.61	7.66	10.93	8.97	---	---	15.70	18.94	13.73	10.07	9.34	9.73
31	10.07	---	11.59	10.31	---	---	---	18.78	---	9.88	9.39	---
MEAN	---	7.64	7.82	11.07	11.03	---	---	19.36	---	12.21	---	10.04
MAX	---	9.91	11.59	15.89	16.17	---	---	22.36	---	17.45	---	11.22
MIN	---	5.99	6.09	6.85	8.97	---	---	16.23	---	9.88	---	9.36

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI

STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS

LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

PROVISIONAL DATA SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.53	9.91	7.60	9.77	8.84	13.11	15.49	18.48	11.72	11.57	---	11.69
2	9.45	10.48	8.08	9.05	8.27	11.88	16.04	17.23	11.61	11.10	---	11.67
3	9.36	11.65	9.04	9.02	7.73	10.35	16.52	16.47	11.54	11.22	---	11.82
4	9.38	11.48	10.79	8.89	7.52	9.66	15.47	15.67	11.24	12.37	---	12.45
5	10.05	10.92	10.93	9.85	7.47	9.25	14.82	14.89	11.41	11.34	---	12.10
6	10.01	10.36	10.53	10.33	7.53	8.99	14.02	14.24	11.40	11.14	---	12.47
7	10.33	10.13	10.82	9.45	8.15	8.79	13.02	14.25	11.06	10.74	---	14.76
8	11.31	9.20	10.18	9.22	9.96	8.99	12.73	14.49	12.29	10.59	---	14.44
9	11.16	8.36	9.19	9.76	8.54	10.12	13.18	13.55	12.18	11.22	---	13.97
10	10.56	7.77	8.55	10.03	8.06	10.22	12.89	12.89	11.34	12.86	---	16.39
11	10.09	7.39	8.03	9.94	7.76	13.06	12.43	12.42	11.08	14.70	---	17.63
12	9.86	7.07	7.99	9.93	7.33	14.51	12.24	12.19	12.01	14.74	---	17.04
13	9.69	6.77	8.01	10.03	7.38	13.56	12.73	12.03	13.14	15.82	18.45	15.59
14	9.54	6.40	8.34	9.39	7.97	12.78	13.21	12.17	13.58	15.37	18.12	14.64
15	9.47	6.14	8.74	8.82	9.90	12.34	14.36	12.01	14.48	14.48	17.86	14.23
16	9.37	6.01	8.23	8.59	15.12	11.50	15.17	11.95	13.32	20.64	17.35	14.34
17	9.36	6.02	8.27	9.73	13.55	10.75	14.63	11.81	12.47	23.20	17.06	14.29
18	9.31	5.98	8.67	10.17	11.89	10.90	13.96	11.90	12.89	21.67	16.73	13.87
19	9.15	6.57	9.43	9.73	13.09	11.31	15.30	12.06	13.23	20.96	16.40	15.50
20	9.13	8.95	10.01	8.64	12.73	11.53	16.64	11.71	13.28	20.05	16.36	18.30
21	9.22	10.60	11.29	8.40	16.48	13.22	16.74	11.59	13.74	18.85	15.56	18.37
22	9.18	10.80	14.76	8.21	16.58	18.88	19.35	12.05	14.15	18.79	15.09	17.84
23	9.25	11.11	13.34	7.91	15.64	18.57	22.60	12.26	14.46	19.32	14.57	18.50
24	9.55	10.60	12.24	7.59	14.03	17.01	23.54	13.77	13.91	19.17	13.88	17.95
25	9.53	10.04	12.79	9.02	12.48	15.47	22.95	14.48	12.93	18.67	13.25	16.13
26	9.53	8.92	13.58	10.17	12.12	14.49	23.50	13.66	13.33	18.66	12.77	14.51
27	9.34	8.27	13.81	9.85	13.43	14.23	22.52	13.28	13.52	19.72	13.36	13.37
28	9.26	8.23	13.62	8.75	13.86	13.23	21.19	13.16	13.34	22.84	13.32	12.94
29	9.65	7.81	12.39	8.31	13.91	13.28	20.17	12.94	12.35	25.41	12.73	12.36
30	9.78	7.64	11.67	8.56	---	13.61	19.43	12.65	11.89	24.90	12.37	11.96
31	9.77	---	10.61	8.92	---	16.07	---	12.24	---	---	11.96	---
MEAN	9.68	8.72	10.37	9.23	10.94	12.63	16.56	13.37	12.63	---	---	14.70
MAX	11.31	11.65	14.76	10.33	16.58	18.88	23.54	18.48	14.48	---	---	18.50
MIN	9.13	5.98	7.60	7.59	7.33	8.79	12.24	11.59	11.06	---	---	11.67

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI

STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS

LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

PROVISIONAL DATA SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11.66	10.13	20.76	18.12	17.22	15.32	20.54	21.50	22.29	23.13	39.50	23.74
2	11.52	9.73	20.00	18.36	16.78	14.18	23.11	22.24	22.33	25.12	39.44	23.52
3	11.61	9.60	19.36	18.28	16.31	14.82	24.99	21.30	21.73	28.13	39.68	23.66
4	12.28	9.86	19.05	---	16.11	19.50	26.04	20.38	21.58	29.25	38.50	24.23
5	12.14	10.65	18.13	---	16.49	24.26	25.47	22.41	21.63	30.09	37.72	24.89
6	11.32	10.75	17.28	---	16.76	26.09	24.74	25.19	21.94	30.45	36.90	24.17
7	10.95	11.11	16.68	---	16.67	26.47	25.43	25.54	25.23	31.51	36.00	24.13
8	10.87	12.29	16.58	---	16.52	26.47	25.10	24.88	27.30	34.92	35.20	23.84
9	10.75	12.14	17.02	19.70	16.17	25.85	23.39	25.82	27.34	34.95	34.31	23.46
10	10.69	11.19	17.88	18.57	16.80	24.61	23.59	27.04	27.18	35.77	33.64	23.35
11	10.54	10.73	17.86	16.96	17.13	23.71	24.23	27.37	26.12	35.58	33.24	23.70
12	10.79	11.43	17.42	16.61	16.99	23.18	23.17	27.66	---	35.04	32.83	23.97
13	11.19	14.80	19.68	16.31	16.77	23.81	22.38	28.54	---	34.47	33.40	23.67
14	14.34	18.06	28.21	16.35	17.73	23.79	25.61	29.26	---	34.30	33.95	23.58
15	15.23	18.26	29.23	16.27	18.25	23.07	27.93	29.90	22.22	34.91	33.23	27.61
16	14.63	16.91	29.05	16.24	17.87	22.13	30.03	29.92	22.36	36.58	32.35	28.61
17	14.16	15.31	28.09	16.31	17.42	21.22	30.02	29.05	22.19	37.18	31.64	28.38
18	14.01	14.20	---	16.13	17.41	19.95	29.07	27.54	22.85	37.71	30.97	27.26
19	13.62	13.63	---	15.81	17.48	19.11	28.29	27.15	22.08	37.00	30.06	26.26
20	13.26	13.49	---	15.58	17.09	18.71	27.57	26.53	21.76	36.32	28.83	25.76
21	13.08	---	---	16.45	16.75	18.51	26.90	25.29	21.81	35.78	27.39	27.06
22	13.27	---	25.03	17.29	15.96	18.18	26.00	24.20	21.47	35.24	26.98	27.13
23	12.77	---	22.63	17.33	15.26	17.93	25.05	23.57	22.22	34.76	26.45	29.15
24	12.26	29.32	21.10	17.67	15.06	19.27	24.28	23.14	22.81	34.43	26.02	31.34
25	11.90	29.36	20.20	18.41	15.18	19.75	24.45	22.88	21.64	34.15	26.64	32.92
26	11.49	27.12	19.67	18.50	15.45	19.73	24.70	22.62	25.83	34.03	26.18	33.80
27	11.01	25.63	19.23	17.91	15.43	19.57	23.01	22.72	23.89	34.05	25.15	33.93
28	10.62	23.88	18.99	17.18	15.29	19.78	22.51	22.67	22.80	34.39	25.06	34.25
29	10.62	23.01	18.76	16.59	---	18.78	22.23	22.11	23.52	35.35	24.19	34.12
30	10.40	21.68	18.63	16.71	---	18.80	21.60	21.83	23.46	37.22	24.04	35.21
31	10.18	---	18.25	17.08	---	19.43	---	21.90	---	38.86	23.38	---
MEAN	12.04	---	---	---	16.58	20.84	25.05	24.91	---	33.89	31.38	27.22
MAX	15.23	---	---	---	18.25	26.47	30.03	29.92	---	38.86	39.68	35.21
MIN	10.18	---	---	---	15.06	14.18	20.54	20.38	---	23.13	23.38	23.35

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI

STATION NUMBER 06935965 MISSOURI RIVER AT ST. CHARLES, MO STREAM SOURCE AGENCY USGS

LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189

PROVISIONAL DATA SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34.69	20.30	18.80	15.64	14.14	18.84	---	27.92	19.18	19.43	12.98	11.78
2	34.64	20.30	18.79	15.38	14.11	18.41	---	29.07	19.26	19.08	12.81	12.31
3	32.87	20.31	19.39	14.65	15.16	18.11	---	29.51	19.30	18.40	12.63	12.79
4	33.55	20.26	19.80	13.78	15.22	17.88	---	29.11	19.19	17.24	12.57	12.63
5	---	20.28	19.72	13.60	15.08	17.93	---	27.92	19.13	16.72	12.67	12.77
6	26.08	20.27	19.70	14.45	14.94	18.43	---	24.69	19.87	17.25	12.80	12.29
7	23.70	20.27	19.42	13.36	14.40	19.62	---	22.63	21.01	17.75	13.17	12.53
8	23.05	20.27	18.91	13.95	12.98	---	---	22.91	20.76	17.22	13.06	12.23
9	22.45	20.27	18.77	14.18	12.76	---	---	23.66	20.23	17.02	13.02	12.09
10	22.83	---	17.36	13.71	13.69	---	---	24.27	20.96	17.15	12.82	12.95
11	22.04	---	17.21	13.51	13.41	---	---	24.24	21.19	16.69	12.95	13.35
12	21.57	---	17.02	13.39	13.21	---	---	23.68	21.00	17.21	12.79	13.35
13	21.89	---	16.69	14.02	12.75	---	---	22.37	20.49	17.33	12.47	13.02
14	21.83	---	16.16	14.22	12.06	---	---	21.76	20.13	16.91	12.47	12.88
15	21.56	---	17.05	13.74	11.54	---	---	21.85	19.97	16.50	12.73	13.05
16	21.33	---	18.51	13.25	11.27	---	---	22.17	20.04	16.16	12.86	13.06
17	21.53	---	18.69	13.00	11.37	---	---	22.15	20.00	15.86	12.40	12.72
18	21.52	---	18.90	12.87	---	---	---	22.23	19.47	15.38	12.04	12.56
19	21.79	---	18.69	12.85	11.54	---	---	22.02	19.19	15.35	---	12.03
20	22.08	---	17.67	13.07	11.51	---	---	21.62	18.96	15.84	---	11.24
21	22.23	---	16.72	14.14	11.70	---	---	21.04	18.77	16.33	12.94	10.99
22	21.94	---	16.39	13.95	14.53	---	---	20.79	18.67	16.08	12.83	10.91
23	21.75	---	16.74	13.04	20.47	---	---	20.60	18.94	15.75	12.24	11.04
24	21.51	---	16.37	12.10	24.30	---	---	20.40	19.51	15.55	11.98	11.36
25	21.27	19.83	15.98	11.58	23.09	---	---	20.22	19.05	15.34	11.77	11.54
26	21.09	19.61	15.29	11.83	21.74	---	---	19.99	18.82	15.09	11.55	11.21
27	20.87	19.49	14.84	12.46	20.62	---	---	20.03	20.02	---	12.06	11.09
28	20.83	19.34	14.70	12.72	19.56	---	---	19.76	21.13	---	12.23	11.11
29	20.82	19.28	14.58	13.16	---	---	---	19.54	20.47	13.96	11.97	11.33
30	20.56	19.09	15.45	13.79	---	---	26.29	19.37	19.74	13.48	12.15	11.53
31	20.35	---	15.44	14.61	---	---	---	19.25	---	13.18	11.75	---
MEAN	---	---	17.41	13.55	---	---	---	22.80	19.81	---	---	12.12
MAX	---	---	19.80	15.64	---	---	---	29.51	21.19	---	---	13.35
MIN	---	---	14.58	11.58	---	---	---	19.25	18.67	---	---	10.91

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI
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LATITUDE - 384659 LONGITUDE - 0902832 DRAINAGE AREA 0.00 DATUM STATE 29 COUNTY 189
PROVISIONAL DATA SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1994 TO SEPTEMBER 1995
DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11.88	---	---	10.21	16.43	12.01	16.07	23.88	32.73	---	19.72	16.33
2	11.88	---	---	9.74	16.33	13.23	15.63	25.18	32.73	---	19.67	16.19
3	11.38	---	---	9.61	15.97	13.90	14.83	25.29	32.57	27.37	19.83	16.07
4	11.02	---	---	9.64	17.12	13.41	14.35	24.22	32.18	26.39	21.21	16.11
5	11.00	---	---	9.60	18.11	12.78	13.93	23.78	31.76	25.34	22.21	16.03
6	11.04	---	---	11.25	16.72	12.11	13.50	23.83	31.27	24.93	24.46	15.94
7	10.92	---	---	11.47	15.68	12.26	13.34	23.51	30.87	26.26	26.41	15.90
8	11.42	---	---	10.78	15.18	13.83	13.32	22.72	30.43	27.05	25.15	16.02
9	12.10	---	---	9.75	14.85	13.17	12.87	25.06	30.14	27.36	22.38	16.06
10	11.79	---	---	9.26	14.79	13.55	12.74	27.32	30.17	27.88	19.89	16.10
11	11.44	---	---	9.11	14.50	14.33	13.43	28.21	30.26	28.19	---	15.87
12	11.39	---	---	8.85	11.53	13.35	13.89	29.09	30.35	28.03	19.37	15.65
13	11.37	---	---	8.63	12.39	12.04	17.06	29.79	30.51	27.53	19.75	15.53
14	11.31	---	---	10.97	11.77	11.38	19.13	29.86	---	26.28	19.38	15.59
15	11.18	---	---	17.22	11.26	10.29	19.22	29.73	30.78	24.63	18.35	15.62
16	11.04	---	---	17.35	12.16	9.78	18.38	29.17	30.49	23.58	18.17	15.63
17	10.98	---	---	15.95	12.51	9.66	17.33	29.99	29.83	22.97	18.53	15.63
18	10.94	---	---	14.80	12.36	10.95	17.22	33.09	29.20	22.53	18.61	15.59
19	11.11	---	---	14.88	12.10	14.73	19.17	34.62	28.64	22.14	19.73	15.30
20	11.11	---	---	14.48	10.72	13.98	21.02	35.83	28.18	21.92	20.26	15.22
21	10.91	---	---	14.08	9.65	12.93	21.43	36.54	27.72	21.92	19.49	15.19
22	---	---	---	---	9.34	12.42	20.65	35.32	27.38	21.75	18.70	---
23	11.72	---	11.46	14.07	9.39	12.18	20.10	34.19	27.10	22.06	---	15.34
24	11.65	---	11.10	12.53	9.60	12.08	19.52	33.51	26.89	22.14	---	---
25	11.46	---	10.69	12.92	9.81	12.35	19.62	33.13	26.70	22.00	---	---
26	---	---	10.50	13.05	9.60	12.64	19.95	33.08	26.57	21.84	17.32	---
27	---	---	10.60	12.48	10.15	12.77	20.08	32.96	26.65	---	17.09	16.13
28	11.21	---	10.12	13.10	10.98	13.37	19.82	32.64	27.09	20.93	17.14	15.95
29	---	---	10.35	15.37	---	13.28	19.74	32.93	27.60	20.53	17.01	---
30	---	---	10.83	16.86	---	13.68	---	32.96	---	20.27	17.11	---
31	---	---	10.72	16.75	---	15.12	---	32.90	---	19.98	16.83	---
MEAN	---	---	---	---	12.89	12.70	---	29.82	---	---	---	---
MAX	---	---	---	---	18.11	15.12	---	36.54	---	---	---	---
MIN	---	---	---	---	9.34	9.66	---	22.72	---	---	---	---

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MISSOURI
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PROVISIONAL DATA SUBJECT TO REVISION

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1995 TO SEPTEMBER 1996
DAILY OBSERVATION AT 08:00 VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15.60	15.15	14.75	10.76	---	12.82	13.46	23.60	---	---	---	---
2	15.60	15.24	14.67	10.72	---	12.83	14.09	21.22	---	---	---	---
3	15.39	15.31	14.67	10.59	8.19	12.67	14.43	19.87	---	---	---	---
4	15.40	15.42	14.50	10.40	9.17	12.19	14.48	18.09	---	---	---	---
5	15.20	15.91	14.44	10.27	10.61	11.91	14.48	18.64	---	---	---	---
6	15.20	16.06	14.40	10.24	10.40	11.99	14.47	19.50	---	---	---	---
7	15.20	15.88	14.42	10.30	9.93	11.99	14.26	23.36	---	---	---	---
8	15.20	15.83	14.47	10.36	10.64	12.53	14.02	24.42	---	---	---	---
9	15.30	15.82	14.39	10.35	9.98	13.52	13.78	26.67	---	---	---	---
10	15.40	15.82	14.16	10.32	9.29	---	13.63	---	---	---	---	---
11	15.60	15.88	14.08	10.24	9.07	---	13.45	---	---	---	---	---
12	15.80	11.68	13.98	9.90	9.44	11.41	13.41	26.43	---	---	---	---
13	16.00	15.78	13.70	9.42	10.23	11.09	13.34	26.94	---	---	---	---
14	15.90	15.70	13.13	9.13	11.19	10.97	13.33	---	---	---	---	---
15	---	15.57	12.50	8.93	12.92	---	13.30	---	---	---	---	---
16	15.60	15.63	11.95	8.78	14.22	---	13.17	---	---	---	---	---
17	15.40	15.60	11.49	8.87	13.61	10.50	13.18	---	---	---	---	---
18	15.30	15.56	11.24	9.15	12.70	10.81	13.21	---	---	---	---	---
19	15.10	15.51	11.42	10.06	12.08	11.38	13.34	---	---	---	---	---
20	15.40	15.51	11.30	12.33	11.78	11.65	13.41	---	---	---	---	---
21	15.30	15.58	11.10	12.52	11.71	11.82	13.43	---	---	---	---	---
22	15.20	14.50	11.10	12.78	11.61	11.72	---	---	---	---	---	---
23	15.03	15.45	11.23	12.44	11.50	11.88	15.31	---	---	---	---	---
24	15.05	9.79	11.47	11.86	11.50	12.01	16.37	---	---	---	---	---
25	14.97	15.25	11.58	12.23	11.60	12.46	16.12	---	---	---	---	---
26	14.95	15.10	11.56	12.87	11.91	12.97	16.23	---	---	---	---	---
27	15.07	15.10	11.43	11.89	12.53	12.85	16.22	---	---	---	---	---
28	15.07	15.01	11.21	10.29	12.99	13.11	15.77	---	---	---	---	---
29	15.01	8.81	11.07	9.22	---	13.16	22.73	---	---	---	---	---
30	15.11	14.81	11.01	---	---	13.23	26.04	---	---	---	---	---
31	15.15	---	10.86	---	---	13.21	---	---	---	---	---	---
MEAN	---	14.94	12.69	---	---	---	---	---	---	---	---	---
MAX	---	16.06	14.75	---	---	---	---	---	---	---	---	---
MIN	---	8.81	10.86	---	---	---	---	---	---	---	---	---