115840

ORIGINAL (RED)

Engineering Report

REMEDIAL CLEANUP TREATABILITY STUDY MILLCREEK SUPERFUND SITE ERIE, PENNSYLVANIA

VOLUME 2: APPENDICES

U.S. Army Corps of Engineers
Omaha District

August 1989

Project: 0285-23-1

MALCOLM PIRNIE

ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

AR001686

ORIGINAL (RED)

APPENDIX A

SOIL BORING LOGS

AR001687

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-2 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 60° °F STARTED 9 40 M. 5/10 19 88

LOCATION Erie PA DIP _____ ° FINISHED 10 30 M. _____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 10
Split Spoons = 6

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Dk Brn Lse topsoil						15	HNU = 0 PPM spoon
	Rust F. SND, w. srt	1	FL	1		12"	20	
	lt Rubble, Pbls, Slag						10	
	Dry	2					7	
	lt. grey - Brn broken						5	HNU = 1-2 PPM spoon
	brick slt-SND sized	3	FL	2		8"	55	
	cinders dry						47	
		4					96	
	Same As Above						22	
		5	FL	3		8	60	Hard Drilling
							13	
		6					14	
								Auger refusal
								Move r'g 5'
	Blk + Orange F. SND	6					5	HNU = ~1 PPM is section
	(Foundry) Lse Dry	7	FL	4		18"	6	of spoon
	Few solid Chunks of						10	
	Foundry SND	8					12	
	Same As Above		FL	5		18"	3	
	moist @ 10'	9					5	
							6	
		10	▽				6	
	Blk F. SND, lt Orn SND							
	~11' Blk slt grading	11	OL	6		8"		
NAT	to gry grn Cl + slt w/		CL					
	lt SND	12						

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Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-3 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sun/clouds INSPECTOR T. Murtagen

SITE Millcreek Superfund Site TEMP. 60° °F STARTED 11/15 M 5/10 19 88

LOCATION Erie PA DIP ____ ° FINISHED 11/20 M ____ 19 ____

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Auger = 4
Split Spoons = 3

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn w/Lt tan + Orn						46	Split spoon refusal
	Lse F. SND	1	FL	1		18"	36	@ A Few locations
	Dry						20	on surface
		2					20	
	Rust - Red, tan - Brn						2	
	Lse F. SND Dry	3	FL	2		16"	10	
							40	
		4					26	
	Dk Brn Lse F. SND		FL				2	
	moist 4-5', @ 5.-5.6'	5	▽	3		18"	1	
	Blk F SND wet						1	
WAT	5.6'-6' Blk Slts grading	6	OL				1	
	to gry grn F. SND + Slt		ML					
	moist							

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Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-4 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER clearing/Wind INSPECTOR T Muitaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 3:30 M. 5/9 19 88

LOCATION Erie PA DIP ___ ° FINISHED 4:20 M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 12'
split spoons = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn - Blk SND, slt		FL				16	HNU = 0
	Pbls	1		1		18"	17	
	Dry						6	
		2					9	
	Lt Brn - Blk F. SND		FL				2	Additional spoon
	Pbls	3		2		16"	6	collected 2-4'
							13	
		4					13	
	Poor Recovery		▽				2	Additional spoon
	Brn - Blk SND + Slt	5		3		4"	2	collected 4-6'
	moist to wet @ Tip		FL				4	
	F. Blk SND, Cinders	6					6	
	Blk Lse SND +		FL				4	
	Slt wet	7		4		8"	3	
							4	
		8					6	
Nat	Blk Slt (stained)		CL				2	
	Brn, gry + grn cly, slt	9		5		17"	6	
	grading to poorly srtd		SM				8	
	Snd + Slt moist - wet	10					8	

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MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-1 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 8 AM M: 5/10 19 88

LOCATION Erie PA DIP ___ ° FINISHED 9 AM M: ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 10'
Split Spoons = 6'

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	BlK F. SND, pieces white brick Lse Dry	1	FL	1		17"	4, 36, 24, 18	
		2						
	BlK F. SND, Tan + Rust Lse Dry	3	FL	2		24"	7, 3, 4, 5	
		4						
	Tan + BlK, Lse, F. SND Foundry Sand, w. slt Dry	5	FL	3		20"	2, 2, 4, 6	
		6						
	Same As Above	7	FL	4		18"	2, 1, 1, 1	
		8	▽					
	BlK SFt, SLt w/ reworked Native slt + F. SND w/ cl moi - wet	9	FL	5		8"	2, 1, 1, 1	
		10						
Nat	Orange Brn F. SND slt, ltl C. SND wet		ML	6		12"	8, 13, 12, 9	

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Field Borehole Log

(RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-5 SHEET NO. 1 OF 3

PROJECT Remedial Cleanup Treatability Study WEATHER Rain INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 50° °F STARTED 12:05 M 4/29 1988

LOCATION Erie PA DIP _____ ° FINISHED 2:15 M _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 15'
Split spoons = 11

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn-Blk Lse Fill topsoil slty w/Blk Foundry snds + slt Dry Hl Pbls sized brick	1	Fill	1		24"	3, 14, 15, 6	
	Brn, Red, Grey, Tan Lse w/pieces of brick Dry moist @ tip of spoon	2, 3, 4	Fill	2		22"	2, 3, 3, 5	
	Water perched in Fill	5	▽	3			2, 50/.1	Spoon Refusal + Auger refusal @ ~4
	Move 5' West							
	Same As Above	1, 2		4		20"	6, 10, 10, 10	
	Same As Above	3, 4		5		20"	4, 2, 4, 25	
		5	▽					Drill through hard brick zone 4-5'
	Blk Frm F. SND Foundry snd, slt w/blue green brick or cobble in tip moist-wet	6, 7	Fill	6		12"	23, 33, 39, 25	

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ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-5 SHEET NO. 2 OF 3

PROJECT Remedial Cleanup Treatability Study WEATHER Rain + Wind INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. _____ °F STARTED 12:00 M 4/29 19 88

LOCATION Erie PA DIP _____ ° FINISHED 2:15 M _____ 19 ____

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4" ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk SND moist						10	
		6		7			8	
							9	
		7	▽				12	
	Blk F SND, wet						14	
	True water level	8		8			16	
	@ 7'						27	
		9					25	
	Poor Recovery		Fill				17	
	Blk SND, metal	10		9			19	
	banding							Spoon bouncing on
		11						metal strapping
		12		10				
NAT	Grn Frm Clay		CL					
	Native @ 12'	13						
								Additional spoon
								from 4'-6'

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Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-5 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 8 00 M. 5/2 19 88

LOCATION Erie PA DIP ___ ° FINISHED 9 05 M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS: Attempt to Push 5' Shelby tube
Push 2' Shelby tube, Attempt Another 5'; wont Push

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
		1						
		2	2' Shelby					
	4' Augering							2' Shelby Pushed
	2' Shelby							From 2'-3.6 1' of
	5' Shelby							sample recoverd
								5' Shelby bends
								After a couple of
								Attempts
								New 5' Shelby cannot
								be advanced through
								rubble

AR001694

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-6 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 60° °F STARTED 10:00 AM 5/11 1988

LOCATION Erie PA DIP ____ ° FINISHED 11:00 AM ____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4" ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 10'
Split spoons = 6

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Beige-Blk Lse						8	HNU = 3-5 PPM spoon
	F. SND w/ C. SND	1	FL	1		14"	57	
	Pbls, Pieces brick						50	
	Cinders Dry	2					14	
	Blk Lse F. SND						7	3 Additional spoons
	w/Pbls + Grl Cinders	3	FL	2		18"	7	collected 2-4'
	Dry						2	
		4					2	
	Blk + Plus F. SND		▽				4	Move over three
	some solid pieces	5	FL	3		16"	3	times; Auger to 2'
	Foundry SND wet						3	and Sample 2-4'
WAT	Blk Frm organic slt	6	OL				7	
	+ cl moist							
	@ 5.8' Grn Frm		CL					
	Slty Clay Moist							

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Field Borehole Log

ORIGINAL (RED)

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-7 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 1:30 M 5/10 1988

LOCATION Erie PA DIP ___ ° FINISHED 2:15 M _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 8'
Split Spoons = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse SND Pieces						21	HNU = .5 PPM spoon
	Firebrick, cinders +	1	FL	1		10"	35	
	rubble Dry						22	Additional sample
							16	collected 0-2'
	Blk-rust Lse, F. SND	2	FL				8	HNU = ~1. PPM spoon
	Foundry Snd, w[illegible]	3		2		7"	8	
	Dry [illegible] @4						6	2 Additional samples
							9	Attempted 2-4
	Lt-Dk Brn SND	4	FL					
	F. [illegible] SND	5	▽	3		6"		
	wet ~ [illegible]							
		6						
	Gry Grn Stly		ML				2	
	F. SND moist			4			2	
Nat	Native @ 7	7					7	
							12	
		8						

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MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. ____ HOLE NO. SB-8 SHEET NO. ____ OF ____
PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ____ °F STARTED 3:50 .M. 5/11 19 88
LOCATION Erie PA DIP ____ ° FINISHED 4:50 .M. ____ 19 ____
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM ____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. ____
ROCK ____ GROUND SURFACE ____
CORE DIAM. ____ WATER LEVELS ____

REMARKS:
Augers = 10'
Split Spoon = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk Lse F. SND						25	2 Additional spoons
	(Foundry) Pieces of	1	FL	1		20"	27	collected
	Brick, Pieces of Slag						18	
	Dry	2					18	
	Blk Lse F. SND		FL	2		6"	6	HNU = 1-2 PPM spoon
	Dry	3					4	Additional spoon collected
							2	
		4					2	
	Blk Lse F. SND		FL	3		5"	5	
	Cinders moist-wet	5					2	
							3	
		6	~▽				5	
	Blk, sft, F. SND, wet		FL	4		8"	3	
		7					3	
Nat	Grn Frm F. SND + slt		ML				11	
	stained Blk in zones	8					18	

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ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-9 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 2 35 M. 5/10 19 88

LOCATION Erie PA DIP ___ ° FINISHED 3 25 M. _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 6'
Split Spoons = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn-Orn Lse						3	Additional spoon
	F. SND (Foundry)	1	FL	1		20"	3	collected 0-2'
	Dry						5	
		2					7	
	Brn, tan + Blk Lse		FL				2	HNU = 1-2 PPM
	F. SND Few cinders	3		2		18"	5	Additional spoon
	Dry, solid pieces of						6	collected 2-4'
	Foundry snd	4					8	
	Brn, Blk + Rust F. SND						4	Additional spoon
	Wet @ ~5'		▽	3		8"	3	Collected 4-6'
		5	FL				4	
		6					3	
NAT	Blk Organic Slts + Cl		OL					
	Roots, (6.5-7')	7		4				
	(7-8') Grn SLt w/some		ML					
	F. SND Coarsening @ 8'	8						

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Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-10 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Partly Sunny INSPECTOR T Murtaugh
SITE Millcreek Superfund Site TEMP. 60 °F STARTED 8:25 AM 5/11 1988
LOCATION Erie PA DIP ___ ° FINISHED 10:00 AM ___ 19__
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 12
split spoons = 9

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Dk Brn + Blk F SND						8	HNU = 1 PPM spoon
	Slt, Pbls + Gvl Cinders	1	FL	1		18"	55	Additional spoon
	Lse Dry						32	collected 0-2'
		2					23	
	Dk Brn - Blk		FL				10	HNU = 1-2 PPM spoon
	Lse w/ yellow F SND	3		2		18"	16	
	Cinders Dry						10	4 Additional spoon
		4					18	collected
	Blk Sft Slt Plastic		▽				2	
	stained Br wet	5	FL	3		14"	5	Note: sample has
	Greasy						10	oil soaked
	Native soils @ 5.8'	6					4	
NAT	Brn - Blk Organic Slt		OL				4	
	Grn Slty Clay grading	7		4		18"	4	
	to green slty F SND		ML				4	
	moist	8					6	

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ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-11 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtagan

SITE Millcreek Superfund Site TEMP. 60° °F STARTED 1:50 M. 5/9 19 82

LOCATION Erie PA DIP ____ ° FINISHED 2:55 M. ____ 19 ____

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 10
Split spoons = 6

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Tan Brn + Blk Lse SND, w/Pbls, Gvl, Dry	1	FL	1		18"	14	HNU = 0 PPM spoon
							40	
							14	
		2					17	
	Hary tan (Beige) Lse F. SND + Slt w/C SND, Pbls	3	FL	2		20"	30	HNU = Slight Deflection
							40	spoon
	Blk asphalt Dry						30	Additional spoon
		4					42	Collected 2-4'
	(Beige, Itar, tan) Blk + Rust SND, Slt, Pbls	5	FL	3		12"	6	
							26	
	Dry moist @ 6'						6	
		6	▽				11	
	Brn - Blk Rust + Grn F. SND, Gvl, Lse	7	FL	4		14"	6	HNU = 0 PPM spoon
							30	
	Pieces Fire brick, Blk slt in tip, soft, wood	wet					7	
		8					6	
	White Fire brick, thin Blk oily SND + Slt Above Native	9	FL	5		9"	2	
							3	
Nat	Grn, stained Blkish Frm tan + Grn mottled slty	10	CL				5	
							7	
	Clay moist stain blk in places							

AR001700

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-12 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 1030 M. 5/4 19 8

LOCATION Erie PA DIP ___ ° FINISHED 1107 M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Auger = 6'
Split-spoons = 4

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk Lse F SND		Fill				4	HNU = 1 PPM in tip
	Foundry Dry	1		1		24"	11	of spoon
							11	
		2					15	
	Blk Lse F SND		Fill				5	
		3		2		24"	7	
	Rust Lse F-M SND						6	
	in tip Wet @ ~3.8'	4	▽				5	
	Poor Recovery						2	
	Blk + Rust SND wet	5		3		3"	2	
							4	
		6					5	
Nat	@ 6' Red SND w/Plastic	Fill					4	
	@ 6.2' Gry Slt, F SND	7	ML	4		16"	5	
	6.5-7' Tan-Grn Slt						7	
	w/ cl dry	8					10	
	7-8' Tan F-M SND							
	w/ slt moist - wet							

ARC01701

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-13 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Overcast/Drizzle INSPECTOR T. Murtagan

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 10 Nov M: 5/9 19 88

LOCATION Erie PA DIP ___ ° FINISHED 11 Nov M: ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 8'
Split spoons = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn - DK Brn Lse						2	HNU = .5 - 1 PPM spoon
	F, M + C SND, Slt	1	FL	1		12"	22	
							17	Additional spoon collected
		2					20	0-2'
	Blk F SND Lse,		FL				3	
	White brick Frags	3		2		18"	4	3 Additional spoons
							4	collected 2-4'
	Wet @ 4'	4	▽				8	
	Blk SND 4-4.3' wet						2	
Nat	@ 4.3-5.5' DK Grn	5	CL	3		20"	4	
	Silty Clay + Clay						5	
	grading to tan + Grn	6	ML				7	
	Slt + Cl moist-wet							

ARO01702

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-14 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ____ °F STARTED 9:07 .M. 5/4 19 88

LOCATION Erie PA DIP ____ ° FINISHED 10:00 .M. _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers =
Split Spoons =

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk, Lse, F. SND Itl Rubble, Dry	1	Fill	1		24"	4 13	
		2						
	Blk, Lse, F. SND Itl Rubble Dry wet @ Tip Rust colored SND in tip	3	Fill	2		23"		HNU = 1-2 PPM in Au[illegible] + cuttings
		4	▽					
	Poor Recovery Grey Hard cinders/slag Dk Brn - Rust F. SND	5	Fill	3		4"		HNU = 10 PPM + 30 PPM in sections of spoon Tar Odor Rust F. SND + Plastic Around Au[illegible]
		6						
	Blk - Rust F. SND wet Oily @ 7.5' Nat soil Horizon, Grn slt, W/Cl + F SND	7 8	OL + ML	4		15"		HNU = 7 PPM in spoon tar or Creasote like ODOR
Nat								
		2						
	Blk F. SND, Roofing shingles, weathered Firebrick in tip	3		5			4 50/.5	Move Location 4' West HNU = .2 PPM Auger, Hard Augering 3-4'
		4						
	Blk - Rust F. SND Slt, Dk grey C. SND wet @ 4.5	5	▽	6				HNU = 7 PPM in saturate section of spoon 30 PPM in vadose zone just above vadose zone
		6						

AR001703

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-15 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 70° °F STARTED 4 05 .M. 5/10 19 88

LOCATION Erie PA DIP ____ ° FINISHED 4 45 .M. ____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 8'
Split Spoons = 6

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk + Orn Lse F SND						3	
	(Foundry) Dry	1	FL	1		16"	8	Additional spoon
							8	collected 0-2'
		2					10	
	Blk + Orn Lse		FL				2	
	F. SND Dry	3		2		14"	6	
							12	
		4					7	
	Poor Recovery		FL				6	
	Blk SNDs wet @ 5.5'	5		3		1"	9	
			▽				6	
		6					9	
	Poor sample, wood,		FL				40	
	Itl reworked Native	7		4		8"	24	
	Slt + Cl						8	
	wet	8					12	
	Blk Slt + SND		SW				4	
	Native material @ 9'	9		5			6	
NAT	Grn Frm F-M		SW				6	
	SND, mod W.srt	10					8	
	Few C. SND grains							
	some slt wet							

ARDU1704

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-16 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 8 25 M 5/6 1988
LOCATION Erie PA DIP ___ ° FINISHED 9 17 M ___ 19___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 6'
Split Spoons = 4'

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	DK Brn + Blk F. SND						4	
	Slt, Rubble, lse	1	FL	1			44	
	Foundry SND, Organics						36	
	+ Topsoil on Surface Dry	2					24	
	Blk Lse F. SND						6	
	Foundry SND wet @ 3'	3	▽	2			8	
			FL				4	
		4					14	
	Blk Lse F. SND		FL				11	
	Poor Recovery	5		3			4	
	@ ~5.5 Grn Frm.						4	
Nat.	F. SND, Slt wet	6	SM				7	
								Move 5' North west to collect more sample
	Blk + Tan Lse F SND	2	FL				10	
	wet @ ~3'	3	▽	4			14	
							10	
		4					14	

AR001705

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-17 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtagan

SITE Millcreek Superfund Site TEMP. LOW 60° °F STARTED 3:50 M. 5/4 19 88

LOCATION Erie PA DIP _____ ° FINISHED 4:22 M. _____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Auger = 6'
Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	DK Brn Lse F. SND						10	HNU = 0 PPM spoon
	Dry	1	Fl	1		24"	15	
							25	Additional spoon
		2					25	taken 0-2'
	DK Brn Lse F. SND						6	HNU = 0 PPM spoon
	1+1 Pieces brick	3	Fl	2		12"	6	
	Dry						4	
		4					4	
	DK Brn Lse F+						1	HNU = 0 PPM spoon
	Med SND, some	5	▽	3		10"	6	
	gry snd, wet in tip						1	
	of spoon	6					2	
	Brn Lse, SND 6-7'						2	HNU = 0 PPM spoon
	wet	7		4		22"	4	
Nat	@7' Gry Grn, F. SND		OL				5	
	+ Slt grading to a		ML				7	
	tan V.F. SND + Slt	8						
	moist roots							

AR001706

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-18A SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Martano

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 11:32 M. 5/4 19 88

LOCATION Erie PA DIP ___ ° FINISHED 12:00 M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4" ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Auger = 6
split spoons = 4

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	BLK Lse F. SND						2	
	Dry	1	F1	1		24"	5	
							8	
		2					8	
	BLK + Tan F. SND						5	
	Dry	3	F1	2		22"	7	
	3-4' Blk Roofing						24	
	Shingles (Asphalt) Dry	4					34	
	BLK Asphalt shingles						12	
	Dry	5	F1	3		21"	15	
							25	
		6					17	
	same Blk shingles						10	
		7	F1	4		8"	50/.5	
		8						
	@ 12:00 Move Rig							
	10' south							

AR001707

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-18B SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny + Breezy INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 1:45 .M. 5/4 19 88

LOCATION Erie PA DIP ___ ° FINISHED 2:40 .M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM ___

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. ___

ROCK ___ GROUND SURFACE ___

CORE DIAM. ___ WATER LEVELS ___

REMARKS:
Augers = 7'
Split Spoons = 4

Note: SB-18B 10' South of SB-18A

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk Lse F SND						11	HNU = .5 PPM in section
	Foundry SND, Dry	1	Fl	1		24"	13	of spoon
							11	
		2					15	
	Blk, med, F. SND						7	
	Roof Shingles 3-4'	3	Fl	2		12"	5	
							4	
		4					4	
	Poor Recovery, Blk						2	
	SND, Piece of slag/rock	5	Fl	3		7"	50/.2	
								Hard Drilling 5-6'
		6						
								5'-7' Drill Through
		7						something solid
Nat	Dk Brn topsoil,		OL					300 PPM in Augers
	organic slt roots	8		4		18"		
	@ 7.7 Grn Frm F.SND							HNU = ~300 PPM
	Slt w/ ltl Cl	9						in Native topsoils +
	moist in tip of							150 PPM in F. SND
	spoon							

ARU01708

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-19 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ____ °F STARTED 8:20 AM 5/4 19 88

LOCATION Erie PA DIP ____ ° FINISHED 8:30 AM ____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4¼ ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 6'
Split spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	BlK Lse F SND		Fill				4	HNU = 2 PPM spoon hole
	Foundery	1		1		24"	11	
	Topsoil on surface						15	Additional split spoon
	Dry	2					19	collected 0-2'
	BlK, Lse, F SND						11	HNU = 0 PPM Borehole
	moist - wet @ 4'	3		2		22"	24	+ cuttings
	wood						15	HNU = 3 PPM in one
		4	▽				19	section spoon
	BlK, Lse F SND		Fill				3	HNU = 0 PPM spoon
	wet	5		3		22"	3	
	@ 5.8 BlK-Brn						4	
	soil Horizon, Roots	6					3	
NAT	Brn frm soil Horizon		ML					
	V.F SND + Slt, ltl Cl	7		4		16"		
	Cl zone ~7.-7.3' + tan							
	F. SND 7.8-8'	8						
	Dry - moist							

AR001709

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-20 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 3 50 .M. 5/4 19 8

LOCATION Erie PA DIP ___ ° FINISHED 4 50 .M. _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 16'
Split Spoons = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Frm SND, Slt		Fill				4	
	Brick w/ Blk F. SND	1		1		16"	13	
	Foundry in tip						17	
	Dry	2					16	
	Blk Lse F. SND		Fill				4	Odor From sampl
	Dry	3		2		12"	4	
							50/.6	
	Wood in tip moist	4						
	No Recovery		Fill				8	
	Rubber Hose + wood	5		3		0	9	
	in tip of spoon						5	
		6					8	
	Poor Recovery, wood		Fill				6	
	Plastic, Blk SND	7		4		6"	24	
	wet @ 8'						50/.1	Move boring Location
		8	▽					west
							2	
	Poor Recovery	5	Fill	5		2"	5	
	Bricks, Blk SND						6	
		6					3	
	Poor Recovery		Fill				3	
	Blk SND + Brick	7		6		4"	10	
							5	
		8	▽				5	
	Blk Lse SND Slt wet			7		"	1	
	Nat @ 9.5' Brn Frm	9					1	
	topsoil, Slt, Grn F. SND		OL				1	
NAT	, Slt	10	SM				1	

AR001710

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-21 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 4:50 M 5/4 19 88

LOCATION Erie PA DIP ___ ° FINISHED 5:35 M ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ CORE DIAM. _____ GROUND SURFACE _____ WATER LEVELS _____

REMARKS:
Augers = 10'
Split Spoon = 6

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Dk Brn Lse, F SND						5	HNU = 5 PPM spoon
	Slt, Few Pbls	1	Fl	1		18"	17	Bricks in upper Fill
	Dry						11	
		2					5	
	Poor Recovery						3	HNU = 3 PPM spoon
	Dk Brn SND	3	Fl	2		5"	3	
	White Fire brick						5	
	in tip	4					1	
	Brn Lse SND						2	HNU = 1.2 PPM spoon
		5	▽	3		12"	3	
	@5' Blk F SND +						5	
	Slt wet	6					2	
NAT	Tan + Grey Mtld V.F SND						5	
	+ Slt, moist, roots,	7	SM	4		18"	6	
	ltl cl						6	
		8					10	
								Move 5'
		2						
	see Above						6	Additional samples
		3	Fl	5		15"	6	collected
							7	
		4					10	
	see Above		Fl				5	
		5	▽	6			8	
							10	
		6					11	
	Native SND + Slt		SM					
	see Above							

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-22 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Variable INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 50° °F STARTED 4:00 M. 7/27 19 88

LOCATION Erie PA DIP ____ ° FINISHED 4:00 M. ____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 4'
Split Spoons = 4'

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn - Blk Lse, F. SND						3	HNU = Spoons 0
FL	Blk Foundry sands	1		1		20"	3	Borehole 0
							3	Auger cuttings 0
	Wet @ 2'	2	▽				1	
	Brn - Blk Lse, F SND						2	
FL	White Ash ~2.8-3.6'	3		2		19"	3	
	Slag Ash, 3.6-4'						4	
	Blk f. SND Wet	4					2	
	DK Gry Lse F SND						1	
Nat	@ 4.7 Blk Frm Organic	5		3		17"	4	
	silts, moist, @ 3.9		OL				4	
	Grn Slt Clay, Plastic	6					4	
	@ 6' Grn SND w/		ML					
	Slt, wet							

AR001712

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-23 SHEET NO. 1 OF 2
PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ____ °F STARTED 3:35 M 5/2 19 8
LOCATION Erie PA DIP ____ ° FINISHED 5:35 M ____ 19 __
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 16'
Split spoons = 9

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse topsoil						1	HNU = 5 PPM spoon
	F. SND, Slt, yellow	1	Fill	1		13"	6	HNU = 5 PPM in top
	tred cemented foundry						5	section of split spoon
	snds Dry	2					6	
	Blk F. SND, Slt, Lse						1	
	Cinders, slag, yellow	3	Fill	2		24"	3	
	cemented Snd Dry						3	
		4					3	
	Blk Lse F. SND, Slt						2	
	yellow, tan pieces	5	Fill	3		14"	2	
	Dry						2	
		6					2	
	Blk, Lse, F. SND						2	
	Slt, Cinders Dry	7	Fill	4		5"	2	
							3	
		8					3	
	Blk Lse, F SND						2	HNU = 5 PPM in spoon
	Slt, yellow + white	9	Fill	5		24"	4	
	Pieces brick, moist in						5	
	in tip of spoon	10					7	
	Blk Slt + Cl, Lse,						3	HNU = 300 PPM in spoon
	plastic, Red F-M Snd	11	Fill	6		12"	5	
	w/solid pieces of Snd						15	
	wet	12	▽				17	
	Blk Lse Slt + Cl							
	plastic, some red snd	13	Fill	7				
	Lse + solid wet							HNU = 300 PPM in spoon
		14						

AR001713

MALCOLM PIRNIE

Field Borehole Log

JOB NO. _____ HOLE NO. SB-23 SHEET NO. 2 OF 3

	Tan, Blk, Lse F SND						2	HNU = ~300 PPM in
	ltl slt, ltl oil sheen	15		8		10"	3	sfoon
	in H_2O wet						3	
							4	
		16						
	Brn Lse, Slt+SND wet						2	High HNU levels in
NAT	@ 16.5' Gry Grn F SND	17		9		10"	2	Fill ~150 PPM
	wet, ltl oil sheen		SM				3	20-50 PPM in NAT
	in H_2O	18					3	SND

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-29 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Partly sunny INSPECTOR J. Murtaugh

SITE Millcreek Superfund Site TEMP. ____ °F STARTED 11:20 AM 5/2 19 88

LOCATION Erie PA DIP ____ ° FINISHED 12:30 AM ____ 19 ____

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers =
Split Spoons =

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	Brn, Lse Topsoil		Fill				6	HNU = 1PPM spoon
	SND, Slt, Dry	1		1		4"	16	2 Additional samples
							50/4	Collect from 0-2
		2						
FL	Brn + Blk Lse F SND		Fill				6	
	1+1 Slt Dry	3		2		17"	10	
							8	
		4					10	
FL	Blk Lse F. SND		-				3	HNU = ~2 PPM spoon
	Foundry SND, some	5		3		18"	3	
	solidified SND, cemented						4	
	Dry	6					3	
FL	Blk, Lse, F SND		Fill				3	
	w/white brick, some	7		4		14"	7	
	solid chucks of						6	
	SND	8	▽				4	
FL	Brn, White, Blk, Poor		Fill					Hard Augering
	sample, SND, Slt, wet	9		5		3"		
								Rubber + Plastic comes
		10						up in Auger Flights w/
FL	Poor Recovery, SND		Fill				38	Blk SND
	Brick, Rubber, Plastic	11		6		3"	5	
	Fill wet						7	
		12					9	
Nat	Grn, Frm med F-M SND							
	Slt, Slt Layers, 1+1 CL	13	SM	7		8"		
	Wet							

AR001715

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-25 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Mustaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 7:50 AM 5/3 19 88

LOCATION Erie PA DIP ___ ° FINISHED 8:55 AM ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 8'
Split Spoons = 8

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Tan-Blk Lse F SND Slt, 1+1 Cl		Fill				3	HNU = .5 PPM spoon hole
	moist	1		1		16"	12	
							10	2 Additional spoons
		2					5	Collected 0-2'
	Tan-Blk Lse F SND Slt, oily						5	
	wet @ 3'	3	▽	2		18"	6	2 Additional spoons
							8	collected 2-4'
		4					3	HNU = 60 PPM in 3rd sp.
	Poor Recovery		Fill				1	
	Blk FL, Cardboard	5		3		3"	1	
							2	
		6					3	
	Brn + Blk FL, SND.						2	Move ~5 South and
	Pbls wet (Poor Recovery)	7		4		7"	2	Collect Additional spoon
Nat	@ ~7' Grn Frm F SND		ML				3	
	Slt moist	8					5	
	Native F SND has odor and is slightly stained near its uppermost portion in contact w/ Fill							

AR001716

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-26 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Cloudy INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 1 30 M. 5/11 19 88
LOCATION Erie PA DIP ___ ° FINISHED 2 50 M. ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM ___
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. ___
ROCK ___ GROUND SURFACE ___
CORE DIAM. ___ WATER LEVELS ___

REMARKS:
Augers = 9
Split Spoons = 9

Attempted SB-26 on 4/28 @ 830
unable to penetrate surface w/ split spoon
return on this date + complete soil boring

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse F-C SND		FL					could not sample 0-1'
	Cinders, bricks	1						because of hardpan, Auger to 1'
	Dry						44	HNU = 0PPM borehole
		2	FL	1		12"	46	
	No Recovery 1st Attempt						23	4 Additional spoons
	Brn Lse F-C SND	3					7	collected 1-3'
	Cinders + brick						3	
		4		2		0	11	2 Additional spoons
							5	collected 3-5'
		5	▽				12	
	Rust C. SND Sized		FL				14	Moved location
	Cinders moist-wet	6		3		9"	5	4 times to get
NAT	@ 6' DK Brn Slts		OL				4	Adaguate sample
	6.5 Grn + tan mottled	7	CL				7	
	cl slt w/ HI F. SND							
	moist							

ARU01717

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-27 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Cloudy/Drizzle INSPECTOR T. Muctaugh

SITE Millcreek Superfund Site TEMP. 50° °F STARTED 2:00 .M. 4/27 19 88

LOCATION Erie PA DIP _____ ° FINISHED 5:00 .M. _____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 8'
Split Spoons = 6

Too many landfilled Bricks to collect shelby tube sample from this area

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE LUSCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn-Buff Lse Med SND Pbls aggregate of Bricks, Dry	1		1		7"	3 5 15 18	Many bricks, Move Location AWAY from Bric Yards.
		2						
	Move boring Location 50' East							
	Blk Lse SND silt bricks, moist -wet in tip of spoon	1		2		9"	8 13 14 7	Hard drilling
		2						
	Blk Lse Sandy Fill Bricks, wet in tip	3	▽	3		3"	1 2 1 2	
		4						
	Blk Lse C. SND w/ F-M Gry SND in tip of spoon, wet oil scheen seen in	5		4		5"	9 2 1 9	Additional spoons collected
		6						
	H_2O Nat @ 6'		OL					

ARQ01718

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SC-28 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 9:45 .M. 5/6 19 88

LOCATION Erie PA DIP ___ ° FINISHED 10:20 .M. _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Auger = 4'
Split Spoons = 3

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	DK Brn, Htl Blk						12	HNU = 0 PPM
	Lse F-M SND	1	Fl	1		17"	11	
	Cinders Dry						9	Drillers cant Adance
		2					17	Augers, Move 5' North
	Blk Lse F. SND		Fl				10	East
	Foundry Bricks	3		2		11"	16	
							8	
		4					7	
Nat	@ 4' DK Brn Soil		▽				3	
	Horizon, peat, roots	5	OL	3		18"	5	
	wet @ 4.5', Gry Grn						8	
	Stf Slty Clay	6	CL				8	
	Dry @ 5.5 Gry Grn		Ml					Picture taken of
	Slt w/ SND + Cl, Frm							4-6' Spoon Peat ⇒ Clay
	Slightly Plastic wet							⇒ Sandy Silt

AR001719

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-29 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Overcast INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ____ °F STARTED 9:33 AM 5/9 19 83

LOCATION Erie PA DIP ____ ° FINISHED 10:00 AM ____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 2'
Split Spoons = 4

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk Fine F. SND		FL				2	HNU = 0 PPM spoon
	Few cinders Dry	1		1		18"	6	
							8	Additional spoon
	Mois - to wet @ 2'	2	▽				12	collected 0-2'
	Blk, Rust + white		FL				3	
	F. SND 2'-3'	3		2		16"	2	
Wat	3-4' Brn Frm		OL				2	Thin clay layer in
	organic slt roots	4					5	Brn organic slts
	Grn slt @ 4'		ML					
	wet	5						
		6						

AR001720

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. ____ HOLE NO. SB-30 SHEET NO. ____ OF ____

PROJECT Remedial Cleanup Treatability Study WEATHER Overcast/Drizzle INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ____ °F STARTED 9:10 AM 4/28 19 88

LOCATION Erie PA DIP ____ ° FINISHED 10:24 AM 4/28 19 88

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM ____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. ____

ROCK ____ GROUND SURFACE ____

CORE DIAM. ____ WATER LEVELS ____

REMARKS:
Augers = 6'
Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse F. SND, Slt						32	HNU = 0 Spoon
	w/Cinders Dry	1	Fill	1		5"	15	HNU = 0 Borehole
							2	
		2					3	
	Blk Lse C. SND		Fill				4	HNU = 1. PPM Spoon
	Sized Cinders	3		2		6"	9	HNU = 4. PPM Augers
	Camp						43	
		4	▽				33	
	Blk Lse Pbly		Fill				6	Hard Augering For Full
	Cinders wet	5		3		3"	3	length of Boring
	discolored + scheen						4	
	observed on ground wtr	6					9	
	6-6.5' Blk Lse Cinders						5	
Nat	6.5-6.7' Brn Frm, Organic	7	OL	4		24"	6	Native @ 6.5'
	Slt, Soil Horizon, moist						7	
	6.7-6.9' Grn, Frm, F SND	8					15	
	+ Slt, moist 6.9-7.2'							
	Grn, Frm, SLT CL, F Snd							
	7.2-8' Brn w/grn, Stf							
	SLT, SND, CL, Plastic							
	moist							

AR001721

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-31 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Partialy Cloudy INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 930 M 5/2 19 88

LOCATION Erie PA DIP ___ ° FINISHED 10 57 M ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 10
split spoons = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	Blk Lse F. SND w/Cinders, ltl slt Dry	1	Fill	1		14"	6 11 14 16	HNU = 4 PPM spoon ho HNU = .5 PPM spoon
FL	Brn-Blk F SND w/silver grey cinders, slag Dry	3	Fill	2		12"	8 10 18 18	
FL	Dk Red Brn-Blk F SND cinders Dry, moist @ 6'	5	Fill	3		18"	2 4 3 4	HNU = 2 PPM Augers HNU = 8 PPM spoon
FL	Blk SND/slt wet w/oil sheen	7	Fill	4/5		0/2"	1 1 1 1	1st Spoon No Recovery 2nd Spoon Poor Recovery
FL	Blk SND soupy wet (6-9') Lse, wet Blk SND + slt	9 10	Fill	6		1"	2 50/4	Spoon refusal, bouncing on rubble, augers drill hard bricks HNU = 10-20 PPM while pulling Augers
FL	Blk cinders slt Dry	2 3 4	Fill	7		16"	15 23 25 26	Additional spoon 2-4' HNU = 2 PPM in spoon

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-33 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F. STARTED 3:00 M. 4/28 19 88
LOCATION Erie PA DIP ___ ° FINISHED ___ M. ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 11
Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse top soil						2	HNU = 60 PPM in borehol
FL	Slt, SND, Brick in	1	Fill	1		24"	7	HNU = 12 PPM in spoon
	tip of Spoon Dry						4	
		2					1	
FL	Blk Lse SND, Slt		Fill				3	1 PPM in Augers
	w/ Hd. White + Grn Resin	3		2		24"	16	
	or slag in tip						15	
		4					16	
				3		5"	7	Spoon Refusal @ 5'
		5					50/.6	Auger refusal
	Move 10' S., rig unable							
	to Auger past 4'							
	Move Again, 10' S.							
		5						
FL	Blk, Lse, SND, wood		Fill				4	
	moist - wet	6		4		5"	3	
							8	
		7	~▽				4	
FL	Poor Sample, wood						2	
	in spoon	8		5		3"	2	
							2	
		9					2	

AR001723

MALCOLM PIRNIE

Field Borehole Log

ORIG (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-33 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 2 40 M. 5/3 19 88
LOCATION Erie PA DIP ___ ° FINISHED 3 30 M. ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 4'
Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	DK Brn - Blk Lse		Fill				1	2 Additional spoons
	F. SND, Foundery SND	1		1			2	collected
	mod-w.srt Dry						3	
		2	▽				4	
	DK Brn - Blk, Lse						1	
	F. SND wet @ 2.2'	3	Fill	2			1	HNU = Slight De Flection
	@ ~3.5 Blk Cl like						1	over spoon
	material, plastic, greasy	4					1	
	Blk Lse F. SND						4	
	Slt + Cl wet	5		3			5	
Nat	Dk Brn - Blk Frm		OL				11	
	Slt, topsoil Horizon	6					16	
	@ 5.5 Grn Frm VF-F		ML					
	SND, Slt, Pbls moist							
	Grey grn + mottled							

AR001724

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-34 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER overcast INSPECTOR T. Murtagh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 11:00 M 4/28 19 88
LOCATION Erie PA DIP ___ ° FINISHED 2:35 M ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM: ___
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. ___
ROCK ___ GROUND SURFACE ___
CORE DIAM. ___ WATER LEVELS ___

REMARKS:
Augers = 10
split spoons = 8 Shelby tubes 2' + 5'

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	Brn-Blk Lse, F. SND + Slt, Few cinders, Yellow brick in tip Dry	1	Fill	1		12"	6 9 20 17	HNU = 0
FL	Blk SND, Lse, Dry	2 3	Fill	2		6"	6 5 4 3	
FL	Blk Lse F. SND, Slt wet	4 5	Fill	3		6"	2 2 2 2	
FL	Blk, Lse, F. SND wet @ 6.8' Brn-Blk Frm	6 7		4		17"	5 6 7 9	Note: @ SB-34 and other Soil boring Locations upper most Native soil has been stained blk From overlyi
Nat	organic slt, Soil Horizon roots, moist	8	OL					
	7.5-8.0' Lt. Grn, StF Slt w/ ltl F. Snd, Cl		ML	Shelby's 2'	5'			Blk Fill
	Plastic Dry - Moist	1						Move rig 5' N + Collect 2' Shelby + 5' Shelby 2' Shelby = 1.4' Recovery 5' Shelby = 1.4' Recovery
								Move rig N. 5' + Collect Additional split spoon

AR001725

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-35 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR J. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 8:15 M. 5/9 19 88

LOCATION Erie PA DIP ___ ° FINISHED 9:45 M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4" ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 4'
Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Dk Brn - Blk Lse SND, Slt, Cinders						15	HNU = 0 PPM spoon
		1	FL	1		24"	10	
	pieces bricks						15	2 Additional samples
	Dry	2					10	Collected 0-2'
	Dk Brn Lse SND		▽				2	
	Slt, C. SND Fill wet	3	FL	2		6"	3	
							3	
		4					4	
Nat	Soil Horizon 4-4.5'		OL				5	
	Brn Organic Slt Peat	5		3		23"	5	
	Roots, 4.5-5.5 Grn						5	
	Frm Cl + Slt grading	6	ML				7	
	to Sandy Pbly, Grn							
	F-M+C SND, Poorly Slt,		SW					
	pbls w. rnd, 5.5-6							
	Tan + Grn Sndy, Pbly		SW					
	Slt moist-wet							

AR001726

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-36 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 12-19 M 5/6 19 88
LOCATION Erie PA DIP ___ ° FINISHED 1 30 M ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 4'
split spoons = 3

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Dk Brn-Blk, F-M SND, bricks moist	1	Fl	1		17"	60/.4	Spoon refusal @ 3 spots, Auger to 1
		2						
	Dk Brn-Blk F-M SND Pieces brick moist-wet, wet in tip	3	Fl ▽	2		8"	23 3 4 7	Bricks + Rubble 1-3'
Nat	~4' Gry Grn Frm Slt, F-C SND Pbls w/ Cl Dry	4 5	ML	3		8"	10 22 7 9	
		6						

AR001727

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-37 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Sunny Fair INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 11:00 AM 5/6 19 88
LOCATION Erie PA DIP ___ ° FINISHED 11:55 AM ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM ___
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. ___
ROCK ___ CORE DIAM. ___ GROUND SURFACE ___ WATER LEVELS ___

REMARKS:
Augers = 8
Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	BLK - Dk Brn Lse, topsoil						6	
	Slt, Blk Lse F SND, cinders	1	FL	1		24"	23	
	Fire bricks @ 1.0' Dry						43	
		2					10	
Wat.	@ 2.2 Dk Brn Soil		OL				2	No HNU Readings
	Horizon @ 2.5 Cl	3		2		24"	4	Above background
	Slt w/some SND		ML				5	
	Sft - Frm moist	4					7	
	Grn + tan Mottled Slt,		ML				4	
	Cl, SND moist, Few Pbls	5		3		20"	2	
	grading to F M C SND,						2	
	Slt w/ ltl Cl	6					5	
	@ 6' Lse Grn + Tan		SM				3	
	F-C SND, Sm Pbls,	7		4		17"	3	
	Slt, ltl Cl wet						3	
	@ 7.5 Gry Lse F-C SND	8					4	
	Slt Pbls ltl Cl wet							
								Move 5' East
								Collect Additional spoon
		2						
	See Above						7	
		3		5			7	
							7	
							7	
		4						

AR001728

MALCOLM PIRNIE

Field Borehole Log

CLIENT C.O.E
PROJECT
SITE Millcreek
LOCATION Erie PA
CONTRACTOR PA Drilling
METHOD OF BORING: SOIL Auger + Split spoons
ROCK

JOB NO. HOLE NO. SB-38 SHEET NO. OF
WEATHER Overcast INSPECTOR T. Murtaugh
TEMP. °F STARTED 10 50 .M 5/5 19 8
DIP ° FINISHED 11 24 .M 19
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: Augers = 8'
Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk Lse F. SND						3	5-7 PPM in Spoon
	Top soil @ Surface	1		1		24"	12	
	Dry						17	
	Few Pieces Gvl	2					16	
	Blk Lse F. SND						5	2-3 PPM in Sp
	Dry	3		2		24	6	
							6	
							5	
		4						
	Blk Lse F. SND						2	1 PPM
		5		3		12	3	
							3	
	Moist - wet in tip		▽				4	
		6						
	Blk F. SND sft						1	
	Plastic Wet	7		4		6"	1	
							1	
							1	
		8						
	Blk Lse F. SND					0/	WOR	1st Try No Recover
	sft wet	9		5		7"	WOR	2nd Try 7"
	Grn Plastic Cl, sft						WOR	
	w/ slt wet	0					1	

AR001729

MALCOLM PIRNIE

Field Borehole Log

CLIENT C.O.E.
PROJECT
SITE Millcreek
LOCATION Erie PA.
CONTRACTOR PA Drilling
METHOD OF BORING: SOIL Shelby Tube
ROCK

JOB NO. HOLE NO. Shelby @ SB-38 SHEET NO. OF
WEATHER Foggy + Break INSPECTOR T. Mustang
TEMP. °F STARTED 7:45 M 5/6 19 83
DIP ° FINISHED 8:05 M 19
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS:

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
								Auger 1'
		1						Push 5' Shelby
								To 3', refusal
		2						1.8' Recovery
		3						
		4						

AR001730

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-39 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Overcast INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 9:00 M: 5/5 19 88
LOCATION Erie PA DIP ___ ° FINISHED 9:40 M: ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 I.D. Auger + 2" Split Spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 6'
Split Spoons = 4'

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk Lse F. SND						2	HNU = Slight Deflection
	Wood	1	Fl	1		18"	11	
	Dry						4	
		2					4	
	Blk Lse F. SND		Fl				5	
		3		2		14"	20	
Nat	@ 3' Nat Tan Frm						5	
	Slt w/ Cl Dry	4	Ml				7	
	Tan + Peddish Slt w/		Ml				5	
	1tl F. Snd Frm	5		3		20"	6	
	moist - Dry						7	
		6					8	
	Peddish tan Slt		Ml				3	
	+ Cl, 1tl SND	7		4		24"	3	
	@ 7.5' Grn Slt +		▽				4	
	SND wet, Few Pbls	8	SM				4	

ARCU1731

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-40 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Overcast INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 7:50 AM 5/5 19 88
LOCATION Erie PA DIP ___ ° FINISHED 8:39 AM ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 6
Split Spoons = 4

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	Blk Lse Topsoil						1	HNU = 1 PPM spoon
	Blk Lse F. SND	1	FI	1		24"	3	
	Dry						16	
		2					22	
FL	Brn-Blk Lse, F.MC.						11	Additional spoon
	SND, glass, wood,	3	FI	2		18"	4	collected
	cinders, moist wet						4	
	in tip	4	▽				4	
FL	Blk Lse F. SND		FI				2	
	moist-wet @ 4.3'	5		3		22"	5	
WAT	Nat Topsoil Dk Brn Slt		OL				8	
	@ 5.5 Grn Slty Clay	6	CL				10	
	Plastic, grading to tan		ML					
	Tan mottled slt +							
	F. SND, Frm							

AR001732

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-41 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 2:55 M. 5/5 19 88

LOCATION Erie PA DIP ___ ° FINISHED 4:10 M. _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 12
Split Spoon = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	DK Brn Topsoils Lse SND, SLt, Rubbish, glass, Pieces of Brick Dry	1	Fl	1		14"	3, 8, 12, 6	HNU = 1 PPM spoon
	DK Brn Lse Rubbish Brick, C. SND sized particals	2, 3	Fl	2		11"	5, 5, 6, 4	HNU = 5 PPM spoon
	Blk Lse F. SND White Frm, Slt + SND sized Fill, plastic Dry	4, 5, 6	Fl	3		10"	4, 4, 3, 6	HNU = 2-3 PPM spoon
Nat	@ ~6.2' Native topsoil Horizon DK Brn Lse, moist, @ 6.5' Tan mottled Cly, ltl Slt, moist	7, 8	OL CL	4		24"	8, 11, 9, 10	
	Poor Recovery Tan Cly, Sample pulls out of spoon	9	CL	5		3"	1, 1, 2, 3	Sample interpreted to be clay same as 6-8'
	Grey F-C SND Wet	10, 11, 12	SW	6		22"	1, 1, 1, 1	Running Sand Flows up, Fine snd on top Coarse SND on bottom of spoon

AR001733

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-42 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Feasibility Study WEATHER Drizzle INSPECTOR Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 10:50 AM 4/27 19 8

LOCATION Erie PA DIP ___ ° FINISHED 11:45 AM 4/27 19 8

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 4'
Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	DK Brn Lse F. SND.						8	HNU = 0 spoons
	Topsoil, Bricks	1		1		16"	20	
	DK Brn F SND. Dry						15	Hard drilling through
		2					20	bricks
FL	DK Brn Lse F SND						4	
	w/ Brick Dry	3		2		10"	4	Additional spoon collected
NAT	Grn. frm SLT w/ Lt		ML				4	
	Cly. Mtld	4					5	
	Gry + Tan Frm Mtld		ML				4	
	Slt grading to V.F.	5		3		18"	4	
	+ F. SND w/ Slt moist						4	
	wet @ 6' @ 6' C. SND.	6	▽				6	
	Pbls, SND + Slt							

AR001734

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-43 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Overcast INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 8:10 M: 4/27 19 88
LOCATION Erie PA DIP ___ ° FINISHED 9:15 M: ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 9'
Split spoons = 5 Shelby tube = 5'

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse SND, Topsoil						4	
	(.5-1.) Blue, white + Red	1	Fill	1		18"	4	
	SND, Slt (1-2') Red tan-						2	
Fl	Blk F-M. SND Fill, Blk, Dusty	2					3	
	F SND, Dry						6	5 PPM in borehole
	2-3' Blk Lse F SND Dry	3		2		18"	9	
Wat	Grn - Tan, Stf, Slt		ML				9	Native @ 3.3'
	Cl, F Snd, Dry	4					11	
	Tan w/ ltl grn, Med,		SM				2	Additional split spoon
	F SND + Slt moist	5		3		15"	2	sample collected 5' we
							3	of SB-43
		6	▽				4	
	Tan - Gry, Med F SND		SM				4	
	Pbls w/ Slt wet	7		4		9"	4	
							4	
		8					5	
	Move rig ~5 and							
	Sample w/ 5' Shelby							
	tube	0						
		1						
	First attempt bends							
	bottom of tube @							
		2						
	refusal, cut off							Shortened Shelby = 4.3'
	bottom of tube							total Length
	Second attempt =							22" Recov + 21 clean sand = 4.3'
	22" Recovery, Remainder							
	of tube filled with							
	Clean Sand + Sealed							

AR001735

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-4/4 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Rain INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 50° F STARTED 10:15 .M. 4/29 19 8

LOCATION Erie PA DIP ____ ° FINISHED ____ .M. ____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 7'
split spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse topsoil		Fill	1		10"	23	
	w/purple + yellow brick	1					35	
	Snd, Dry						43	
		2					25	
	Brn Lse Slty + Sdy		Fill	2		11"	7	
	Fill, Red brick	3					7	
	Cinders Dry						19	
		4					23	
				3				Spoon Refusal
		5						
		6						
	Move boring 5' West							
	Brn Lse topsoil		Fill	4		10"	13	
	Snd + bricks Dry	1					15	
							15	
		2					8	
	Poor Recovery		Fill	5		8"	42	
	Wood in spoon	3					23	
	1+1 Snd + brick						3	
		4					3	

AR001736

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-45 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Overcast INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 60° °F STARTED 3:40 M. 4/26 19 88

LOCATION Erie PA DIP _____ ° FINISHED 4:45 M _____ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 6
Split Spoons = 8

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	Tan-Blk Lse, F. SND ltl Slt, Dry-moist some silver grey slag	1		1		17"	5 6 4 5	HNU = 1. PPM spoon HNU = 5. PPM borehole
FL	Red-Blk Lse, F. SND yellow staining, Piece of coal Dry	2 3		2		12"	4 9 6 8	HNU 6 PPM spoon
FL	Red stained F. SND W. Srted Fill	4 5		3		10"	2 2 4 2	HNU 15 PPM spoon
	Wet @ 5.8'	6	▽					
FL	Blk, Lse F SND + Slt, wet soupy	7		4		16"	2 2 4 10	HNU ~12 PPM borehole Water appears to be perched in fill above Native material
Nat	@7' Grn CL, SFT, Plastic w/root hairs, @7.5-8.0' Brn Organic Slt, moist grading to Grn Slt + CL w/ w. rnd Pbls Dry-moist	8	CL OL ML					

AR001737

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-46 SHEET NO. 1 OF 2

PROJECT Remedial Cleanup Treatability Study WEATHER 50's Sunny INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. 50° °F STARTED 10 05 .M. 4/26 19 88

LOCATION Erie PA DIP _____ ° FINISHED 12 00 .M. _____ 19__

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____ GROUND SURFACE _____

ROCK _____ CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 8'
Split Spoons = 10

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	DK Brn - Blk F. SND, Slt, Few yellow specks Lse, Dry	1'	Fill	1		20"	2, 6, 9, 9	HNU = .5 PPM spoon
FL	DK Brn - Blk, Lse, F.SND Slt, Few yellow specks Dry	2, 3, 4	Fill	2		14"	4, 3, 3, 5	HNU = .5 PPM spoon No volitles detected in breathing zone
FL	Same, with reddish tint, wet @ 5.5'	5, 6	Fill ▽	3		13"	2, 3, 3, 1	HNU = 2 PPM spoon
FL	DK Brn - Blk Lse F. SND Slt, Wet	7		4		17"	2, 5	HNU = .6 spoon
Nat	DK Brn, Frm SLt, CL topsoil horizon @ 7.2'	8	OL				6, 6	
	Grnish - gry StF, SLT ltl Cl, ltl F. SND, tight @ 9.5 Grey C. SND Ang Gvl, Slt moist	9, 10	ML	5		19"	2, 4, 10, 18	HNU = .2 spoon

AR001738

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB 46/(S) SHEET NO. 2 OF 2
PROJECT Remedial Cleanup Treatability Study WEATHER Drizzle INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ____ °F STARTED 1:00 M. 4/26 19 88
LOCATION Erie PA DIP ____ ° FINISHED 3:00 M. ____ 19 ____
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ CORE DIAM. _____ GROUND SURFACE _____ WATER LEVELS _____

REMARKS: Shelby Tube Location (S) 5' North of SB-46

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SIZE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	DK-Brn-Bl. F. SND Fill (see SB-46)	1				40.5"	11	5' Shelby tube 40.5"/60" = 66% Rec
		2						
		3						
		4						
		5						
		1						2' Shelby tube 95% Recovery 8' North of SB-46
		2						
	See SB-46 similar fill	3		1				2 additional split spoons driven below 2' shelby hole for Chemical Analysis
		4						
	See SB-46 similar fill	5		2				
		6						
								3 additional split spoons driven for chemical Analysis
	0-2			1			2,5,7,8	
	2-4			2			4,4,4,4	
	4-6			3			4,4,4,3	

AR001739

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-47 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 9:35 AM 5/12 19 88
LOCATION Erie PA DIP ___ ° FINISHED 10:00 AM ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____
ROCK _____ CORE DIAM. _____ GROUND SURFACE _____ WATER LEVELS _____

REMARKS:
Augers = 0'
Split Spoons = 5

Note: SB-47 moved NW see updated survey

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk, Lse F. SND		FL				wor	HNU = 0 PPM spoon
	Foundry SND	1	▽	1			wor	Additional spoon
	wet @ 1'						wor	collected
		2	FL				1	
	Blk, Lse, F. SND		FL				1	HNU = 0 PPM spoon
	2'-3' wet	3		2			1	Additional spoon
Nat	Dk Brn Organic Slt		OL				4	collected
	3.0'-3.3' Moist	4	▽				7	
	Grn F. SND + Slt		SM					
	Dry - Moist							Water Perched in
	wet again @ 4'							Fill, upper natural
								material Dry - moist

AR001740

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-48 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 9 40 AM 5/3 19 88
LOCATION Erie PA DIP ___ ° FINISHED 11 00 AM ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____
ROCK _____ CORE DIAM. _____ GROUND SURFACE _____ WATER LEVELS _____

REMARKS:
Augers = 12'
Split Spoons = 7

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn - Blk Lse, F SND Slt, topsoil on surface Dry	1	Fill	1		17"	16 11 5 6	HNU = 0 PPM spoon
	Poor Recovery Blk F SND + Slt, Frm moist to wet, plastic cinders in tip	3 4	▽	2		6"	4 26 50/5	HNU = 1 PPM spoon Water @ 4' Perched
	Lt Brn - Blk, SND Slt Brick Dr - moist	5	Fill	3		6"	16 8 10 9	HNU = 1 PPM spoon
	Blk - Brn Lse, F SND Slt, moist some chunks of cemented SND, zone of white SND	7 8	Fill	4		16"	4 4 5 7	HNU = 0 PPM spoon
	Blk - lt Redish Brn F SND, mod-w, srt Dry - moist	9	Fill	5		19"	1 1 1 1	HNU = 12 PPM spoon
	Blk F SND Lse, 11-12' stained Blk oil or tar binding SND	10 11 12	Fill ▽	6		16"	1 5 5 7	HNU = 4 PPM spoon
	Blk F SND (Foundery) 12-12.5 12.5-13' Wet oily Gul + SND shiney	13		7		20	2 2	HNU = 4 PPM spoon
Wat	@ 13' Blk Frm Slt, topsoil Horizon stained Blk	14	OL				3 5	
	@ 13.5 Grn Slt, F SND + Cl Moist		ML					

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-49 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR T. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 11 20 .M 5/3 19 88

LOCATION Erie PA DIP ___ ° FINISHED 12 25 .M ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 4
Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Blk Lse F. SND		Fill				4	HNU = 1 PPM in spoon
	Foundry SND. Dry	1		1		16"	16	
							9	Additional spoons
		2					3	collected 0-2', 2-4'
	Poor Recovery						1	HNU = 0 PPM spoon
	Blk SND + Slt	3	▽	2		3"	1	
	moist - wet						1	
		4					1	
	Blk Lse SND + Slt						1	HNU = 0 PPM spoon
	Fill to 5' wet	5		3		15"	2	
Nat	@ 5'-5.2' Brn - Blk, Fm		OL				3	
	Slt, organics, topsoil	6					4	
	Horizon roots							
	@ 5.2-6' Grn, Grn +							
	tan mottled, Slt, F. SND		ML					
	Cl in zones, slighty							
	plastic in spots							
	Cl w/ slt @ 6'							

AR001742

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-50 SHEET NO. ___ OF ___
PROJECT Remedial Cleanup Treatability Study WEATHER Overcast INSPECTOR T. Murtough
SITE Millcreek Superfund Site TEMP. ___ °F STARTED 7:40 M 4/29 19 88
LOCATION Erie PA DIP ___ ° FINISHED 8:20 M ___ 19 ___
CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____
METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____
ROCK _____ GROUND SURFACE _____
CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 8'
Split Spoons = 6

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FL	Brn - DK Brn Lse		Fill				2	HNU = 0 Borehole
	F. SND, SLt, Cinders	1		1		22"	24	
	Dry						24	
		2					10	
FL	Brn - BlK Lse SNDy		Fill					HNU = 0 Borehole
	Fill, Slt Dry	3		2		10"		
		4						
	No representative						1	
	Recovery	5		3		2"	1	
							1	
		6					1	
	Moved boring							
	5' S.W.							
FL	DK Brn - BlK, Lse		Fill				4	HNU = 1-2 PPM spoon
	F. SND, Slt, Few	1		4		20"	10	HNU = ~.5 PPM Borehole
	white specks, Bluish						10	
	Chunks. Dry	2					10	
	Skiped							
		3						
		4						
FL	Brn Lse SNDy		Fill				2	Additional 0-2
	Slty Fill wood	5		5			3	spoon collected
	Native Brn, Organic						3	
	Slt moist	6					2	
NAT			OL					

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-51 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR J. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 2:50 M. 5/2 19 88

LOCATION Erie PA DIP ___ ° FINISHED 3:5 M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" split spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 2
Split spoons = 2

SB-51 Sample Blank From Ball Field

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Lt Brn - Dk Brn Frm						5	HNU = 0 spoon
	Slt, Cl, F. Snd, ltl	1	SC	1		24"	6	
	C. Snd, slighty plastic						6	
	Dry	2					6	
	Tan - Brn Frm, Slt						2	HNU = 0 spoon
	+ Cl ltl Snd moist	3	SC	2		6"	2	
							6	
		4					6	

AR001744

MALCOLM PIRNIE

Field Borehole Log

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-51 SHEET NO. ___ OF ___

PRO Remedial Cleanup Treatability Study WEATHER overcast/windy INSPECTOR T. Murtaugh

S Millcreek Superfund Site TEMP. ___ °F STARTED 8 40 .M. 5/13 19 88

ON Erie PA DIP ___ ° FINISHED 9 20 .M. ___ 19 ___

RACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS:
Augers = 0'
Split spoons = 3

SB-51 Offsite Location @ Base ball Field
Far western boundry of site

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	lt Brn-tan Frm SLt,						7	
	ltl Cl, ltl SND, Few Pbls	1	ML + sm	1		16"	18	Additional spoon
	Dry						10	collected
		2					6	
	Poor Recovery						3	
		3	ML + sm	2		4"	7	
	DK Grn-Gry Frm						5	
	F-C SND in tip wet	4					7	

AR001745

MALCOLM PIRNIE

Field Borehole Log

ORIGINAL (RED)

CLIENT U.S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-52 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER _____ INSPECTOR J. Murtaugh

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 9:35 M. 5/13 19 88

LOCATION Erie PA DIP ___ ° FINISHED 10:20 M. ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS: OFF site Location Stephany's Catering parking

Augers = 0'

Split Spoons = 4

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Brn Lse M-C						7	
	SND, Pbles, Gvl, Itl	1	SM	1		12"	11	2 Additional Samples
	F. SND Dry						10	Collected
		2					7	
	Brn Lse Gvl +		SM				8	
	SND Dry	3		2		8"	10	
							12	
		4					16	

AR001746

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT U. S. Army Corps of Engineers JOB NO. _____ HOLE NO. SB-52 SHEET NO. ___ OF ___

PROJECT Remedial Cleanup Treatability Study WEATHER Sunny INSPECTOR T. Mustaua

SITE Millcreek Superfund Site TEMP. ___ °F STARTED 1:40 M: 5/3 19 88

LOCATION Erie PA DIP ___ ° FINISHED 2:30 M: ___ 19 ___

CONTRACTOR Pennsylvania Drilling ELEVATIONS: DATUM _____

METHOD OF BORING: SOIL 4 1/4 ID Auger + 2" Split Spoon CASING DIAM. _____

ROCK _____ GROUND SURFACE _____

CORE DIAM. _____ WATER LEVELS _____

REMARKS: SB-52 Sample Blank From Stephany's Catering Parking lot. OFF OF Michigan Boulevard

Split Spoons = 5

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Tan - lt Brn F-C SND						4	2 Additional
	Slt, Pbls, topsoil	1	SM	1		6"	14	spoons collected 0-2'
	ltl CL Dry						36	
		2					24	
	Same As Above						10	Additional spoon
	lt Brn Frm, SND, Slt	3	SM	2		10"	10	collected 2-4'
	Pbls Dry						6	
		4					8	

AR001747

ORIGINAL (RED)

APPENDIX B

MONITORING WELL BORING LOGS

ORIG. (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT: US ARMY COE
PROJECT:
SITE: MILLCREEK
LOCATION: ERIE, PA
CONTRACTOR: PENN. DRILLING
METHOD OF BORING: SOIL: 4 1/4" ID AUGER
ROCK:

JOB NO. 0285-23-1 HOLE NO. PW-P SHEET NO. 1 OF
WEATHER: RAIN INSPECTOR: RHO
TEMP. 50 °F STARTED 10 45 A.M. 4/29 19
DIP: ° FINISHED 2 30 P.M. 4/29 19
ELEVATIONS: DATUM:
CASING DIAM.:
GROUND SURFACE:
CORE DIAM.: WATER LEVELS:

REMARKS: HNU Bked 0.2 PPM

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE LISCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	2" TOPSOIL						3	HNU 0.2 PPM
	10" Mixed FILL, Black Sand	1		1		12/24	9	
	Pink Sand, Brn/Red Slag						12	
		2					48	Difficult Augering
	Mixed Fill, Black						66	Black Slag Fragments
	Foundry Sand;	3		2		12/24	24	on Auger Flights
	Fire Brick						7	HNU 0.2 ppm
		4					5	
	10" Green SAND (m-f)	5					11	tr Plant fragments in
	tr Clay/Silt, some Grvl		SM	3		23/24	17	Lower 13" - Grading to Gray
	Damp to WET	6					14	in Lower 2"
	13" Sand/Grvl little f Sand						14	SATURATED
		7					6	Gravelly Balled Clay on
	1" Clayey Gravel			4		3/24	9	Augers from 5' to 10'
	WET	8					11	
							4	
	WASH	9	GP	5		4/24	3	
							4	Pea Gravel - flat Shale
	WET	10					9	fragments in Cuttings
	4" GRN CLAY little Silt		CH				7	
	little f. Grvl. 6" M	11	SM	6		22/24	8	HNU 0 PPM
	SAND, tr Silt 8" Grvl		GP				12	Downgrade to Level D
	little m Sand 4" f/m Sand	12	SM				30	
	tr Silt							AR001749
		13						

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-23-1 HOLE NO. PW-P SHEET NO. 2 OF 3

	15						Water w/ Cuttings at 15'
Grey f/vf SAND tr SILT laminated w/ occ. clay Lamina	16		7		6/24		
	17						
SAME occ. Black Organic lamina	18		8		8/24	10 17 15 14	
	19						
	20						
7" Gry f/vf SAND tr SILT Laminated WET	21		9		8/24	9 5 5 13	Dry in Spoon (1")
~~WET~~	22	SM					
	23						
	24						
	25						
SAME	26		10			3 13 22 48	
	27						
	28						
	29						
	30						
Gry f. SAND, some silt	31		11		16/24	6 12 12 57	Strong Dilation
WET	32						
	33						ARDU1750
	34						

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

JOB NO. ..... HOLE NO. ..... SHEET NO. 2 OF ....

	35						
19" Gry f/v f SAND tr Silt tr Grvl 1/16"-3/8"	36	SM	12	24/24	3 17	Rounded Gravel	
5" SILT, Some f. Sand tr 1/16" C. Sand to 1/2" Grvl WET	37				20 18	Uniform Sands/silts w/ Glacial Dropstones	
	38					NOTE: Rounded f. Grvl becomes more abundant in Uniform Sands/silts ≈ 5 ft from Till/Lacustrine contact	
	39						
	40						
7" f-m SAND, Some Silt tr Grvl, tr C. Sand.	41		13	20/24	6 10		
13" m-SAND, some Silt Little Grvl WET	42				13 7	A very loose Till-like Sand w/ occ. Red Clay lamina	
SILT AND FINE SAND, Some m Sand, tr to little Grvl Sub Angular to well rounded tr Clay MOIST TILL	43 44		14	16/24	27 28 30 44		
	45	GC/SC					
f-m SAND, Some Silt little Grvl. tr Clay MOIST TILL	46		15	12/24		Abundant Shale Green/Gry Shale - local NOTE: Till has a Sandy Matrix	
	47						
	48						
	49						
	50						

ARU01751

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT COE
PROJECT REMEDIAL DESIGN
SITE MILLCREEK
LOCATION ERIE PA
CONTRACTOR PENN DRILLING
METHOD OF BORING: SOIL 6 1/4" Hollow Stem Auger
ROCK

JOB NO. 0285-23-1 HOLE NO. 26A SHEET NO. 1 OF
WEATHER Foggy 50's INSPECTOR RHO
TEMP. 55 STARTED A.M. 5/6 1988
DIP FINISHED M 19
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: Location adj. to Soil Boring #32

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FILL	Black Foundry SAND		FILL	1		20/24	4	BEGIN AT LEVEL C
		1					10	
							8	
		2					13	
	Red Brick in Shoe			2		1/24	14	
		3					8	
							13	
		4					14	
	Wood Splinters in Shoe			3		0/24	10	Lead Auger Plugged by
		5					5	Iron and Bricks - Pulled
	Black Sand-						3	Augers to clear - and sampled
		6					2	flights
	Wood Splinters, Limestone Fragments, Black Sand, Slag in Shoe	7		4		2/24		
	MOIST	8						
	Wood Splinters, Slag and Green Silty CLAY in Shoe	9		5		0/24	WR	
							6	
							3	
	WET	10					3	
	6" Black SAND N. WOOD						2	
	WET 3" Black Organic	11		6		22/24	3	
	Topsoil 4" Green SAND little		SC	2 SAP			6	
	Clay 9" Grey f-m SAND	12					12	MOIST
			SM					
		13						

ARU01753

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-234 HOLE NO. 66A SHEET NO. 2 OF 3

	15							
8" Gry/Grn f/m SAND								
9" f/vf SAND	16	SM	7		22/24			
5" f GRAVEL, Some C. Sand								
WET	17							
	18							
	19							
	20							
f. GRAVEL (1/16"-1/8") some								1" Silty Sand Layer
c. Sand grading to Pea	21	GW	8		20/24			
Gravel								
WET	22							
								HNU 0 PPM in Borehole
	23							and Cuttings - Remove
								Respirators
	24							
	25							
11" Grey f/vf SAND						5		
3" f GRAVEL some Silt	26	SM	9		14/24	7		
and Sand						10		Hard Till in Shoe
WET	27	GP				47		Dry to Damp
	28							Hard Augering
	29							
	30							
Silt, little Sand and						24		Hard Augering
f. Gravel, tr Clay	31		10		2/24	25		
DAMP						24		
TILL	32					26		
	33							
	34							

TILL

AR001754

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-23-1 HOLE NO. 26A SHEET NO. 3 OF 3

	35						
SILT, little Sand and f. Gravel, tr Clay	36		11		6/24	68 100/1"	Hard Augering
TILL							
DAMP	37						
	38						
	39						
	40						
Hard, Grey SILT, little Sand, tr Gravel, tr Clay	41		12		12/24	47 116 100/1"	
Dry to Damp TILL	42						
	43						
	44						NOTE: VOLUME OF AUGER CUTTINGS LESS THAN (1) FT³ - PROBABLY FORCED INTO GRAVEL ZONES ALONG BOREHOLE WALL
	45						
							At completion wl at 14'
							As Auger pulled above Till water rose to 10 ft.

ORIG. (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT: COE
PROJECT: REMEDIAL DESIGN
SITE: MILLCREEK
LOCATION: ERIE, PA
CONTRACTOR: PENN DRILLING
METHOD OF BORING: SOIL 6 1/4" ID AUGERS; ROCK

JOB NO. 0285-23 / HOLE NO. 26B SHEET NO. 1 OF 1
WEATHER: INSPECTOR: RHO
TEMP. °F STARTED 2:45 P.M. 5/9 1988
DIP ° FINISHED 3:45 P.M. 5/9 1988
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: BOREHOLE LOCATED 10 FT FROM 26A

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
								AUGER TO 12 FT
		1						WITHOUT SAMPLING
		2						
		3						
		4						
		5						
		6						
		7						
		8						
		9						
		10						
		11						
		12						
	Grey M/F SAND						9	
	tr C. Sand	13		1		6/24	11	ARD01756
	WET						9	

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285.23-1 HOLE NO. 26S SHEET NO. 2 OF 2

7" Grey m/f Sand tr C. Sand						• SAMPLE Thru same hole
4 Brown f/vf SAND	15		2		13/24	w/o auger-ing down
3 Grey f GRAVEL w/						• Flat gravels are imbricated
f/vf Sand	16					are in Contact - Voids
						infilled by sand
	17					
						WATER AT 11.2 FT
	18					
	19					
	20					

AR001757

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT ~~BE~~ US ARMY COE
PROJECT REMEDIAL DESIGN
SITE MILLCREEK
LOCATION ERIE, PA
CONTRACTOR PENN DRILLING
METHOD OF BORING: SOIL 6 1/4" ID Auger
ROCK

JOB NO. 0285-23-1 HOLE NO. 26C SHEET NO. 1 OF
WEATHER Clear INSPECTOR RHC
TEMP. 70 °F STARTED 1 PM M. 6/8 198
DIP ° FINISHED 2 PM M. 6/8 198
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: Refer Boring Log for MW-26A

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
								Auger to 8 ft
	Black Foundry Sand and Wood Splinters Dry Cuttings	1						
		2						
		3						
		4						
		5						
		6						
		7						
		8						
	Wood in Shoe						5	
		9		1		9/24	2	
							2	
							6	
		10						
	BLACK FOUNDRY SAND to 10.5'			2		3/24	5	
	MOIST to WET	11						Driller clean-out 6 1/4" Auger
	CLAYEY SAND							w/ 6" OD Auger to 11.2 ft
	MOIST							Came up w/ 6" of Clayey
								Sand on Auger Head
								WATER AT 10.65 below
								Ground in MW 26B

AR001758

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT: ARMY COE
PROJECT: REMEDIAL DESIGN
SITE: MILLCREEK
LOCATION: ERIE, PA
CONTRACTOR: PENN DRILLING
METHOD OF BORING: SOIL: 6 1/4" ID AUGERS; ROCK:

JOB NO.: HOLE NO.: 27A SHEET NO.: OF:
WEATHER: INSPECTOR:
TEMP.: °F STARTED: 10:10 A.M. 19
DIP: ° FINISHED: .M 19
ELEVATIONS: DATUM:
CASING DIAM.:
GROUND SURFACE:
CORE DIAM.: WATER LEVELS:

REMARKS:

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	4" BLACK SAND						40	
	3" SLAG FRAGMENTS	1		1		15/24	90	
	8" MIXED SLAG, FIREBRICK						31	
	SILTY SAND FILL	2					70	
	DENSE, ~~tr~~ MIXTURE of						36	
	BLACK SAND; BRN SILTY	3	FILL	2		15/24	38	
	SAND w/tr GRAVEL; Fire Brick						27	
	and Slag FILL	4					33	
							4	
	Loose, SAME	5		3		3/24	12	
							16	
	MOIST FILL	6					16	
	Loose, GREEN/GRAY M to						3	
	F. SAND tr Gravel tr Silt	7	SW	4		6/24	2	
							3	
	WET	8					5	
	8" Green M to f SAND tr Gravel						3	NOTE: Lithologic Sequence
	4" BROWN f/vf Sand tr SILT	9		6		14/24	3	from 8' to 12' was also
	Laminated WET						3	observed At Loc 26.A 14'-16'
	2" f Gravel w/ BRN SILT ~~Mottled~~	10					11	
	14" M to F. GRAVEL		GW	5	~~6~~	14/24	9	
	some C Sand tr m Sand	11					10	
							16	
	WET	12					12	
		13						AR001759
		14						

MALCOLM PIRNIE

Field Borehole Log

JOB NO. ..... HOLE NO. ..... SHEET NO. ... OF ...

		15	GW					(2) FT GRAVEL CLEANOUT OF AUGER AT 15 FT
	6" M to F. GRAVEL little C. sand. tr Cobbles 6" M to f SAND, 6" vf/vf SAND tr Silt WET	16 17	SM	7		18/24	7 15 22 31	Clean-out Auger became Jammed SANDS ~~[illegible]~~ are weakly laminated
		18						
		19						
		20						≈ 10 FT of water in the hole at 20 FT
	Grey f/vf SAND ~~tr S~~ w/ Black Organic? laminations WET	21 22		8		12/24	6 8 10 19	Strong dilation
		23						Perform Vertical Permeability ~~Stag~~ Falling Head Test at 23 ft
	f Gravel & C-Sand	24 25		9		24/24	1 1 1 5	~~Re~~ sampled thru hole in & wash made by Testing Pipe wash caved
	12" f GRAVEL & C Sand 12" f ~~[illegible]~~ Sand tr M Sand	26 22 28 29 30		10		24/24	8 28 70 112	~~Believe that~~ Gravel may be wash - high blow cts derive from driving a full spoon
GREY	6" f GRAVEL/C. SAND grading to M SAND little Gravel WET 12" f/vf SAND MOIST 6" SILT Hard DRY	31 32 33 34		11		24/24	28 30 130 100	SILT is Brn/wht Rock Flour Hard Augering at 33'

AR001760

ORIG. (RED)

MALCOLM PIRNIE

Field Borehole Log

JOB NO. _____ HOLE NO. _____ SHEET NO. ___ OF ___

	35						
~~HARD Grey SILT~~		ML	12		20/24	21	Silt has distinct
Hard Grey Silt,	36					81	laminations
little Gravel 4"						100	
16" Hard Gry Silt tr	37					95	WL 16.6' 7:30 AM 5/11
Gravel Dry							
	38						
	39						
	40						
Hard Grey Silt,		ML				45	Very hard Lodgement
tr Gravel tr Sand tr Clay	41		13			100/5"	Till
Dry	42						
							9 Am 5/11
	43					-	WL w/ Augers at 40': 14.7
							Raise Augers to 30', WL
	44						rises to 8.7'
	45						

AR001761

MALCOLM PIRNIE

Field Borehole Log

CLIENT: ARMY COE
PROJECT: REMEDIAL DESIGN
SITE: MILLCREEK
LOCATION: ERIE, PA
CONTRACTOR: PA. DRILLING
METHOD OF BORING: SOIL: 6 1/4" ID AUGER
ROCK:

JOB NO. 0865-23-1 HOLE NO. 27B SHEET NO. 1 OF 2
WEATHER: Cool, Clear INSPECTOR: RHO
TEMP. °F STARTED 2:30 P.M. 5/11 19 88
DIP ° FINISHED .M. 5/12 19 88
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: see Boring Log for MW 27A
Submitted Gravel Cuttings (10'-16') for Physical Testing

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
								Auger to 11 ft. and
		1						Perform Falling Head
								Borehole Permeability Test
		2						
		3						
		4						
		5						
		6						
		7						
		8						
		9						
		10						
								2FT of f→C Gravel cleaned
		11						out of auger at 11 ft
	2" f SAND					6	3	f sand settled out of Pipe
	6" m-f Gravel tr f-C Sand	12	GW	1		24	4	during Falling Head Test.
	tr Cobbles						6	
		13					7	
	6" m-f Gravel some m-c		GW	2			9	9AK001762
	Sand tr Cobbles	14				24	10	

MALCOLM PIRNIE

Field Borehole Log

JOB NO. _____ HOLE NO. _____ SHEET NO. ____ OF ____

8" m-f GRAVEL Some C-f						10	Silt fraction of Gravels
Sand tr Silt 6" m-f Sand	15					13	is Variable thru-out Spoon
	16						Drilled to 16 ft w/ 6¼" ID Auger. Cleaned out w/ 6" OD Auger at 16 ft.
	17						Approx 1 cu yd of
	18						m-f Gravel tr Cobbles
							some m-C Sand was
							produced while attemptin to clean-out auger at 16
							Sand & Gravel may be
							traveling down the flights of the stationary 6¼" auger
							and ~~see~~ supplying the 6" auger.
							Source of Gravel is the
							10 to 16 ft Interval

AR001763

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT C.O.E.
PROJECT Millcreek
SITE
LOCATION Erie, PA
CONTRACTOR Penn Drill
METHOD OF BORING: SOIL 6 1/4" ID HS augers ROCK

JOB NO. 0285-231 HOLE NO. 28A SHEET NO. 1 OF
WEATHER Sunny INSPECTOR DLA
TEMP. 55/60 °F STARTED 8:30 A.M. 5/3 1988
DIP 0 ° FINISHED 8:45 A.M. 5/4 1988
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS:

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
or	4" dk br organic silts		OL			13	7	
	9" foundry sands / Fill	1		1	2	/24	26	
	moist at bottom		Fill				21	
		2					27	
Fill	broken gravel and sand / Fill little silt			2	2	6	7	
		3				/24	11	
?	Saturated *		?				4	
		4	CL				3	
	10" SILT + CLAY, tr f			3	2	18	4	
	sand, moist to damp	5				/24	3	
	7" mixed SANDS, wet →		SW				5	tr gravel + silt
	1" f SAND, little silt, grey	6	?				7	
	f SAND, grey color,		SP	4	2	15	5	
	little silt, saturated	7				/24	7	
	2" f GRAVEL, subrounded						7	
			GP				8	
		8						
	f subrounded GRAVEL			5	2	14	1	
	saturated	9				/24	1	
							1	
							4	
		10						
		11						
?		12	?					
								AR001764
		13	SP					

Glaciolacustrine

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-231 HOLE NO. 28A SHEET NO. 2 OF

GLACIOLACUSTRINE	f SAND, tr silt saturated	15–16	SP varies to SM	6	2"	12/24	5, 5, 5, 10	
		17–19						
	11" vf SAND, some silt moist to wet; 2" m/f SAND, tr silt saturated	20–21		7	2"	13/24	5, 10, 10, 15	
		22–24						
	f/m SAND, tr f subR gravel, wet to saturated	25–26		8	2"	22/24	7, 10, 11, 25	
		27–29						
	f/vf SAND, tr of silt and subR f gravel, saturated	30–31		9	2"	20/24	6, 16, 40, 54	
		32–34						

AR001765

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-231 HOLE NO. 28A SHEET NO. 3 OF

		35	↑					
	12" f/vf SAND saturated			10	2"	24/24	20 16	
		36						
	12" f/m subR GRAVEL saturated		GP				24 22	
		37						SANDS running up auger from 35 to 40 ft depth
		38						
			?					
		39						
			GW					
		40						
GLACIOFLUVIAL	14" f/m subR GRAVEL			11	2"	24/24	6	Gravel coming up from
	2" f SAND, saturated	41					20	augers at 48 ft; subR
	5" f GRAVEL, some sand mixed; saturated						20	f/m, tr of coarse,
		42	ML				42	appeared to be 'clean',
	2" SILT, stratified, dry							though may contain some
	1" SILT, uniform, damp.	43						sands. Material is non-
								uniform. Note: Water poured
		44						out of hole prior to gravel
								coming up.
		45						
	19 inches - Gravel Wash						40	
TILL	5" Dense, Gry, SILT, some	46		12	2"	5/24	100/5"	Green to Gry Shale fragments noted in Till
	C-f Sand, little Rock Fragments,							
	tr. Rounded Grvl. tr Clay, TILL	47						damp to dry
		48						Auger to 48 ft to stop
								inflow of running sands,
		49						Very Difficult augering below
								45 ft - Due to dense TILL
		50						

AR001766

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT C.O.E.
PROJECT REMEDIAL DESIGN
SITE MILLCREEK
LOCATION EIRE, PA
CONTRACTOR PENN. DRILL
METHOD OF BORING: SOIL 6 1/4" Hollow Stem Auger
ROCK

JOB NO. 0285-23-1 HOLE NO. 28B SHEET NO. 1 OF 1
WEATHER RAIN INSPECTOR RHO
TEMP. 50 °F STARTED ..... .M ..... 19...
DIP ..... ° FINISHED ..... .M ..... 19...
ELEVATIONS: DATUM .....
CASING DIAM. .....
GROUND SURFACE .....
CORE DIAM. ..... WATER LEVELS .....

REMARKS: Adjacent to Borehole 28A

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
								Auger to 10 ft
		1						
		2						
		3						
		4						
		5						
		6						
		7						
		8						
		9						
		10						
	24" of Fine Gravel						6	
	C. SAND WASH	11		1		24/24	7	
							10	
		12					9	
	2" F. GRAVEL, Some C. Sand		GP				9	
	6" Olive F-M SAND, tr. SILT	13		2		14/24	11	AR001767
	4" Grey f/vf SAND		SP				18	f/vf Sand - laminated
	2" Olive f-M SAND tr Silt tr Gravel	14					24	Gravelly Sand in Shoe

MALCOLM PIRNIE

Field Borehole Log

CLIENT: ARMY COE
PROJECT: REMEDIAL DESIGN
SITE: MILLCREEK
LOCATION: ERIE, PA
CONTRACTOR: PENN DRILLING
METHOD OF BORING: SOIL: 6 1/4" ID AUGER
ROCK:

JOB NO. 0285-23 / HOLE NO. 29 SHEET NO. 1 OF 2
WEATHER: cool cloudy INSPECTOR: RHO
TEMP. 55 °F STARTED 9:30 A.M. 5/17 1988
DIP: ° FINISHED 11:00 A.M. 5/17 1988
ELEVATIONS: DATUM:
CASING DIAM.:
GROUND SURFACE:
CORE DIAM.: WATER LEVELS:

REMARKS:

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	Loose, Brown C to m SAND						2	
	some Silt, little to tr Clay	1		1		20/24	2	
	tr Gravel						3	
		2					6	
		3						Gravelly loam w/ 2"-3" cobbles in cuttings to 5'
		4						
		5						
	Loose Brown C-M SAND						5	
	some Silt tr Gravel to 6"	6				14/24	5	
	WET, Same, but Grey		SW	2			3	
	to 14" MOIST	7					4	
		8						Tr Clay in Cuttings at 7 ft
		9	GM					
		10						Brown, f Gravel, well Rounded WET at 9'
	SAME, Grey w/ inter-						4	
	bedded Silt, and f Sand	11	SW	3		18/24	4	
	tr C. Sand						4	
	SATURATED	12					8	
		13						
		14						

AR001768

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-23-1 HOLE NO. 29 SHEET NO. 2 OF 2

	15						
Grey M. SAND, some f Sand, tr Gravel	16	SP	4		12/24	10 8 7 17	
	17						
	18						
	19						
	20						
9" SAME 9" Silt Some f/vf SAND w/ Black, organic laminatio	21 22	ml/SP	5		18/24	7 19 27 32	w.l. at 15.5' below Grd

AR001769

ORIG (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT: ARMY COE
PROJECT: REMEDIAL DESIGN
SITE: MILLCREEK
LOCATION: ERIE, PA
CONTRACTOR: PENN. DRILLING
METHOD OF BORING: SOIL: 6 1/4" ID AUGER; ROCK:

JOB NO. 0285-23 HOLE NO. 30 SHEET NO. 1 OF 2
WEATHER: Clear INSPECTOR: RHO
TEMP. 65 °F STARTED 7:45 M 5/23 1988
DIP: ° FINISHED 9:30 M 5/23 1988
ELEVATIONS: DATUM:
CASING DIAM.:
GROUND SURFACE:
CORE DIAM.: WATER LEVELS:

REMARKS:

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
GLACIOFLUVIAL	DRK Brn Organic Topsoil						2	
		1		1		4/24	3	
							2	
		2					1	
								Dark Brn - grading to Light
		3						Brn SAND some Silt ~~trace~~ Clay
								tr Gravel in Cuttings to 5 ft
		4						MOIST
		5						
	BRN SAND (m-f) some						8	
	Gravel (1/8-1/2") ~~&~~ tr	6		2		12/24	14	Shoe Pushed Large Cobble
	Silt over Gry C-M SAND		SP				6	
	Some Gravel ~~WET~~	7					4	WATER IN SAMPLE HOLE
	SATURATED							
		8						HARD DRILLING AT 8 FT
								Encountered large cobbles
		9						w/Significant % fines at 8 ft
								in Cuttings
		10						
	Gray GRAVEL (1/8-1")						4	
	little Sand tr Silt	11	GW	3		6/24	4	WATER AT 5.5 ft
	Grvl ~~sub~~rounded to						7	
	subangular SATURATED	12					3	
		13						Cobbles (to 2" Long)
								in Cuttings to 15 ft
		14						

AR001770

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-23-1 HOLE NO. 30 SHEET NO. 2 OF 2

GLACIOFLUVIAL		15	SP					
	Gray m-f SAND little Subangular Gravel -	16		4		6/24	6 4 3 7	all Gravel is a Gray Shale
	SATURATED	17						
		18						
		19						
		20						
		21		5		0/24	40 51 44 39	Pushed a Large Cobble Attempted to resample same depth.
		22						
	9" Gray C-m SAND little GRAVEL little SILT - DENSE	23		6		19/24	22 41 33 50	Spoon went to 22 ft w/out augering
TILL	10" Hard Gray SILT Some C-f Sand little Gravel tr CLay - DAMP	24	ML/SM					ONLY (4) Augers steamed
		25						
		26						TILL is very Sandy - Typical of uppermost till in MW-33A/28A/27A
LODGEMENT		27						
								Gravel is well rounded, flat, shaley, to silty Probably a local source.

ABOD177L

MALCOLM PIRNIE

Field Borehole Log

CLIENT ARMY COE
PROJECT REMEDIAL DESIGN
SITE MILLCREEK
LOCATION EIRE, PA
CONTRACTOR PENN. DRILLING
METHOD OF BORING: SOIL 6 1/4" ID AUGER
ROCK

JOB NO. 0285-23-1 HOLE NO. 31 SHEET NO. 2 OF 2
WEATHER Cloudy INSPECTOR RHO
TEMP. 50 °F STARTED 8 A.M. 5/18 1988
DIP ° FINISHED 10 A.M. 5/18 1988
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: SAMPLES RETAINED IN ONE JAR FROM 10-12', 15-17', and cuttings FROM 12-15'

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	3" Loose Dk Brn TOPSOIL						9	
	8" HARD SILT little Grvl.	1		1		17/24	13	~~[illegible]~~
	6" Brown m. SAND tr						13	FRAGIPAN SOIL HORIZON
	fine Sand	2	SP				10	
		3						GREEN CLAYEY SILT w/ fine
								GRAVEL IN CUTTINGS to
		4						5 ft.
		5						
	4" GREEN CLAYEY SILT,		ML				3	Cd Plant Fragments, and
	little m-f Gravel, plant	6		2		12/24	4	locally black due to organic
	8" f-m GRAVEL, little to		GM				4	staining. - Damp
	tr Silt, f. Sand SATURATED	7					3	
								Water Entered Augers
		8						thru Samplinghole - rose to
								4 ft. - some confining Pres
		9						
								Gry f. to m Gravel w/ tr to
		10						little fines in Cuttings, WET
	8" Clean f-m. GRAVEL w/		GW/GM				7	
	1" layers of Silty Gravel.	11		3		16/24	6	
	6" m SAND - Grey		SP/SM				5	
	2" f/vf SAND SATURATED	12					4	
								Abundant Gravel in Cuttings
		13						to 15 ft. 2 flat, well
								rounded, siltstone 1/2"
		14						to 2" in diameter

AR001772

AR001772

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-23-1 HOLE NO. 31 SHEET NO. 2 OF 2

	15						
Gravel 1/8" - 3/8" tr Sand	16	GP	4		4/24	7 10 13 7	Clean - free of fines
	17						
	18						Harder Drilling at 18 ft
	19						
	20						
Grey m to f SAND tr Silt	21	SP	5		20/24	4 6 12 13	well sorted
	22						
	23						
	24						
	25						
9" SAME w/tr Gravel 5" f/vf Grey SAND tr Silt	26	SW/ML	6		14/24	4 9 9 12	Top of Lacustrine fine Sands
	27						
							water level at completion of borehole 7.5 ft below Ground

AR001773

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT ARMY COE
PROJECT REMEDIAL DESIGN
SITE MILLCREEK
LOCATION EIRE, PA
CONTRACTOR PENN DRILLING
METHOD OF BORING: SOIL 6 1/4" ID Augers
ROCK

JOB NO. 0285-23-1 HOLE NO. 32 SHEET NO. 1 OF 2
WEATHER Cloudy INSPECTOR RHO
TEMP. 45 °F STARTED 11:10 A.M. 5/25 1988
DIP ° FINISHED 12:05 P.M. 5/25 1988
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: ON SNAP-TITE INC PROPERTY

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
ABLATION TILL	2" TOPSOIL 6" GRAVEL/SAND						12	
	FILL 4" ~~CLAYE~~ SILT some	1		1		12/24	9	
	Si/vf Sand, Tr Clay tr Gravel						4	
	Hard FRAGIPAN 2" PEAT	2					8	
		3						@ Gray Brown Dry to Damp
								Clayey Silt some f. Sand
		4						tr rounded Gravel in Cuttin
								to 5 ft - TILL?
		5						
	BRN mottled Red GRAVEL					10/24	5	Water in Sample hole
	~~Som~~ AND C SAND, some	6	GM/SM	2			5	
	SILT						5	Easier Drilling at 6-7 f
	SATURATED	7					2	
		8						Same material in Cuttin
								to 10 ft
		9						
		10	GP/SP				4	fine gravel in 2" of
		11		3		0/24	2	wash
							1/NR	Resampled to 13 ft
		12				4/24	1/NR	
	2" Silty Clayey Gravel			4			1	
	2" GRAVEL some C SAND	13					7	
	LOOSE SATURATED							~~AR001774~~
		14						

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285-23-1 HOLE NO. 32 SHEET NO. 2 OF 2

	15						
Angular to Rounded GRAVEL, little m-f Sand Grvl (1/8 - 2") SATURATED	16	GP/SP	5	5/24	5 6 15 29		
	17						
	18						
	19						
	20						
1" f Gravel 2" Silty GRAVEL 2" Clean Gravel 8" SAND and GRAVEL 2" m. SAND SATURATED	21		6	15/24	5 6 11 11	This interval is believed to representive of the section from ≈ 10-20 ft	
	22						
	23				-	Water at completion 8.4 ft 12:05 pm 6.3 ft 12:52 pm	

AR001775

MALCOLM PIRNIE

Field Borehole Log

CLIENT COE
PROJECT MILLCREEK REM. DESIGN
SITE MILLCREEK
LOCATION ERIE PA
CONTRACTOR PA DRILLING
METHOD OF BORING: SOIL 6¼" ID AUGERS
ROCK

JOB NO. ____ HOLE NO. 33A SHEET NO. 1 OF 3
WEATHER SUNNY INSPECTOR RHO
TEMP. 65 °F STARTED 10:30 A.M. 4/26 1988
DIP — ° FINISHED ____ .M ____ 19__
ELEVATIONS: DATUM ____
CASING DIAM. ____
GROUND SURFACE ____
CORE DIAM. ____ WATER LEVELS ____

REMARKS: HNU Bkgrd. 0.2 ppm
SUBMIT SAMPLES S-11 AND S-12 (COMPOSITE) for PHYSICAL TESTING

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FILL	Black Sand Fill w/ concrete	1	SM	1		18/24		0.4-0.6 ppm
		2						
	Red Brick, Black Sand	3	SM	2		6/24		0.8-1.0 ppm
		4						
	Black Sand w/ clay organic material	5	SM/CL	3		14/24		0.4-0.6 ppm
	MOIST	6						
	Black Sand w/ Clay FILL over Grey CLAYEY SILT little Gravel ⅛" ~9" Poorly Graded MOIST	7	CL	4		14/24		0.4-0.6 ppm
		8						
NEAR SHORE LACUSTRINE	Grey to Black GRAVEL little Sand tr Silt Well Graded WET	9	GW	5		18/24		.2 ppm ≈ Background DRILL CHATTER AT 8-9 FT COARSE 1"-2" GRAVEL in cuttings
		10						
	10" Gry Well Graded SAND/GRAVEL		GW				4	1:40 PM Static WL at 6.0 ft
	5" Grey SILT	11	ML	6		19/24	5	
	4" Grey CLAYEY SILT w/ Black laminea WET	12	CL				9 13	
		13						
		14						

AR001776

MALCOLM PIRNIE

Field Borehole Log

JOB NO. _____ HOLE NO. 33A SHEET NO. 2 OF 3

NEAR SHORE LACUSTRINE		15						
	14' Gry GRAVEL (Fine) Grades to Med SAND Tr Silt over 10" SILT tr Sand WET	16	GP/SP	7		24/24	9 12 14 14	Water Rises Outside Auger
		17						
		18						
		19						
		20						5' Running Sands up Auger Clean 6" Auger w/ 3" Auger
	Grey Fine SAND tr Silt VO APPARENT LAYERING WET	21	SM	8		24/24	WR 4 8 7	5' HNU 0 to 0.4 PPM ERRATIC Strong Dilation
		22						
		23						
		24						
		25						Spoon Dropped Down Hole Before Driving
OFF SHORE LACUSTRINE	Very Dense Fine SAND tr Silt WET	26	SM	9		24/24	24 50/5"	Strong Dilation
		27						
		28						
		29						
		30						
	16" Grey Dense Fine SAND Grading to C to M SAND Some Fine Gravel over 8" Fine SAND Some SILT	31	SM	10		24/24	62 120 100/1"	7" C. SAND/F GRAVEL lens IN Fine SAND unit
		32						WET
		33						
		34						

AR001777

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

JOB NO. _____ HOLE NO. 33A SHEET NO. 3 OF 3

GLACIOLACUSTRINE (OFF SHORE)		35						
	Grey Very Dense F. to M. SAND little Silt, tr C. Sand	36	SM	11		24/24	12, 110, 100/L"	SAND IS up Augers: high blow counts due to driving a partially full spoon
	WET	32						
		38						
		39						Cuttings coming up as a slurry - very Wet
		40						
	Grey Dense F to M SAND little SILT. WET	41	SM	#1 12		24/24	11, 21	
	4" Grey SILT little SAND tr Gravel TILL	42		#2			28, 36	
TILL	12" Fine/Med SAND - WASH 12" Grey SILT AND SAND Tr to little Gravel - well rounded to subangular MOIST TILL	43, 44	ML	13		12/24	16, 24, 28, 50	Water level 13 ft 7:15AM 4/27 Augered w/ 6" OD to 42' to clean-out Hole - But hole filled in to ≈ 41 ft
	Grey Green Dense SILT and CLAY, little Gravel - Sub-Angular Shale Fragments to Well Rounded Sd St. Pebbles DRY	45, 46	ML	14		15/24	8, 28, 32, 34	AUGER w/ 10" OD To 44' for confirmation
		47						Water level 4/28/88 9:50 AM 5.4' below Ground Surface
		48						
		49						
		50						
		51						
		52						
		53						AR001778

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT: ARMY COE
PROJECT: REM. DESIGN
SITE: MILLCREEK
LOCATION: ERIE, PA
CONTRACTOR: PENN DRILLING
METHOD OF BORING: SOIL 6½ ID AUGER; ROCK

JOB NO. 285-23-1 HOLE NO. 33B SHEET NO. 1 OF 1
WEATHER: COLD INSPECTOR: RHG
TEMP. °F STARTED 10 A.M. 4/28 19
DIP ° FINISHED 11 A.M. 4/28 19
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: Submit samples 1 and 2 (composite) for Physical testing.

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D. (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
		1						
		2						
		3						
		4						
		5						
		6						
		7						
		8						
NEAR SHORE LACUSTRINE	3" Brown SAND and GRAVEL well Graded - grading to Med SAND tr Gravel tr Silt w occ Cobble WET	9	GW	1		18/24		
		10						
	6" Grey Fine Gravel and Sand w Some Silt - over 7" Med SAND w/ 1" Muddy Gravel and 1" →	11	GC/SP	2		13/24		Muddy Gravel
		12						laminated Clay layer
	10" Muddy Gravel over 2" Fine Sand	13	GC/SM	3		12/12		
		14						

AR001779

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT: ARMY COE
PROJECT: REMEDIAL DESIGN
SITE: MILLCREEK
LOCATION: ERIE PA
CONTRACTOR: PENN DRILL
METHOD OF BORING: SOIL 6 1/4" ID AUGER; ROCK
JOB NO. 0285-23-1 HOLE NO. 34 SHEET NO. 1 OF 2
WEATHER: CLEAR INSPECTOR: RNO
TEMP: WARM °F STARTED: 3 PM M: 5/12 19 88
DIP: ° FINISHED: M: 19
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: SEE SOIL BORING LOG SB-46 FOR 0-5 FT.

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FILL		1						• DRILL TO 5 FT w/out SAMPLING
		2						
		3						
		4	SP					
		5						
	Black Foundry Sand 18"			1		18/24	1	There is a 2" Saturated
		6					3	Layer in the Sand at 18"
	Black Silty Clay (in Shoe)						2	
		7					2	
	7" Black Foundary Sand			2		16/24	4	Contact at 7' 7"
	3" BRN/BLK Topsoil	8					6	
	Clayey Sandy Silt						4	f. Sand, little Clay tr.
	6" GREEN SILT, some	9	ML				6	c Sand.
	6" Same						4	Saturated zones
	3" Same - mottled BRN	10		3		16/24	5	~~Moist~~ in Sandy, w/in
	7" GRAVEL Some C-f		GM				13	Green Silt - Saturated
	Sand little Silt	11					11	~~Moist~~ in Gravel
	8" Green Clayey Silt		ML				8	Plant Fragments & brown
	~~Some~~ tr Sand/f Gravel w/	12		4			10	oxidation haloes around ?
	13" f-m Gravel Some		GW			21/24	10	Dirty Gravel w/ significant
	C-m Sand tr Silt	13					13	fines WET to Saturated
	Mod. Dense M SAND:		SP	5		24/24	5	
	little to tr Gravel, tr f Sand	14					9	well Sorted

AR001700

MALCOLM PIRNIE

Field Borehole Log

JOB NO. ..... HOLE NO. 34 SHEET NO. ... OF ...

						3	
SATURATED	15					9	
7" Same grading to					16/24	9	
3" Clean f-m Gravel tr	16	SM/GM	6			10	
Sand over 3" Gravel some						9	3" vf/vf Sand
Sand, little Silt over	17					11	SAturated
10" Clean m-f Gravel						16	WET to Saturated
grading to m-f Gravel	18		7		16/24	20	
some Sand tr Silt over						19	f/vf Sand in Shoe
6" m Sand tr f Sand	19					16	MOIST
f/vf SAND		SM/ML			16/24	7	laminated w/
little Silt	20		8			8	occ. Silts or organics
						10	
SATURATED	21					9	
	22						

AR001781

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT ARMY COE
PROJECT REMEDIAL DESIGN
SITE MILLCREEK
LOCATION EIRE, PA
CONTRACTOR PENNA. DRILLING
METHOD OF BORING: SOIL 6 1/4" ID AUGERS
ROCK

JOB NO. 0285-23-1 HOLE NO. 35 SHEET NO. 1 OF 2
WEATHER Cloudy, WET INSPECTOR RHO
TEMP. 55 °F STARTED 1:00 P.M. 5/24 19 8
DIP ° FINISHED M 19
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: In Front of # 1217 Harper Dr.

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
PEAT	Brn Black Silty Sand w/						2	
	tr wood fragments - appears	1		1		10/24	4	Highly Organic - Sand
	natural - 2" Gravelly fragipan						4	Almost a Peat
ABLATION TILL	2" Same as above in Shoe	2					6	
								~~Lg~~ Dk Brown grading to Lt Brn
		3						fine Gravel ~~So~~ and Sand
								Some Silt in Cuttings to 5'
		4						~~M~~
								Mottled Grn/Red/Brn Clayey
		5						Silt Cleaned out from Auger at 5'
Fluvial or Beach Gravels	Grn/Mottled Gray Gravel						8	
	and m. Sand - grading to	6		2		10/24	9	Water in Sample hole
	Gray m SAND - little Grvl						6	
	SATURATED	7					7	
		8						
								2" to 3" cobbles in Dk Brn
		9						Silty Sand in Cuttings to 10'
								A cobbly sand
		10						
	Brn C to m SAND little						1	~~At~~ NO Recovery 1st Attempt
	f Sand tr Gravel	11		3		1"/24	1	1" ~~on~~ Rec. on 2ND Attempt
	Loose Wash						1	
	SATURATED	12	GP				1	
	Brn GRAVEL (to 1/2")						1	
	little f-m Sand - Loose	13		4		6/24	2	
	wash						3	
	SATURATED	14					2	

AR001782

MALCOLM PIRNIE

Field Borehole Log

JOB NO. 0285 23-1 HOLE NO. 35 SHEET NO. 2 OF 2

Glacio fluvial	6" M. SAND Some Gravel	15						
	6" BRN m. SAND some Grvl. tr f Sand. over 7" Med. SAND little f Sand. Dense SATURATED	16		5		13/24	40 15 11 12	Water at 8.0 ft
		17						
		18						
		19						Abundant 2"-3" flat shaped cobbles in Cuttings Probably from 10' to 15' Very Clean - free of fines
		20						
	10" Gray M to vf SAND tr Grvl 2" m SAND some Grvl 3" f/vf SAND 3" f GRVL. little C-m Sand SATURATED	21		6		18/24	6 6 12 9	Approaching top of Lacustrine fine Sands.
		22						
		23						Screen Gravel zone at 10-15 ft
		24						
		25						Water at completion 4.9 feet below Grd
		26						
		27						

AR001783

ORIGINAL (RED)

MALCOLM PIRNIE

Field Borehole Log

CLIENT: U.S. ARMY COE
PROJECT: REMEDIAL DESIGN
SITE: MILLCREEK
LOCATION: ERIE PA
CONTRACTOR: PENN DRILLING
METHOD OF BORING: SOIL: 6 1/4" I.D. AUGERS; ROCK:

JOB NO. 0285-23-1 HOLE NO. 36 SHEET NO. 1 OF
WEATHER: Clear INSPECTOR: RHG
TEMP. 70 °F STARTED 3:00 P.M. 6/1/88 19
DIP ° FINISHED 4:00 P.M. 6/1/88 19
ELEVATIONS: DATUM
CASING DIAM.
GROUND SURFACE
CORE DIAM. WATER LEVELS

REMARKS: Loc. is 15 ft SE of MW-15A
SEE BORING LOG FOR 15A

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE USCS	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FILL	Black Foundry Sand in Cuttings	1	SM					DRILL TO 8'
	↓	2						
	↓	3						
	Wood Splinters and Plastic w/ Sand in Cuttings	4						
	↓	5						
		6						
		7						
	↓	8						
	3" Brown Sand w/ Brick Fragments 3" Wood Splinters	9		1	2"	6/24	5, 4, 4, 3	
		10						
	Wood Splinters w/ Sand	11		2	2"	2/24	7, 5, 5, 8	Cuttings from 10 ft are moist Black (Foundry) Sand m-f Sand
		12						
	3" BRN Sand 2" Wood 1" BLK Foundry Sand 2" BRN BLK Clayey	13		3	2"	18/24	5, 6, 5	upper 2" of Natural Soil is stained Black - Clay is mottled & very Plastic w/
MARSH	Silt w/ Roots 10" Grn Brn Gry Silty CLAY - moist - Plant Frags	14					5	Abundant Plant Frags

AR001784

AR001784

ORIGINAL (RED)

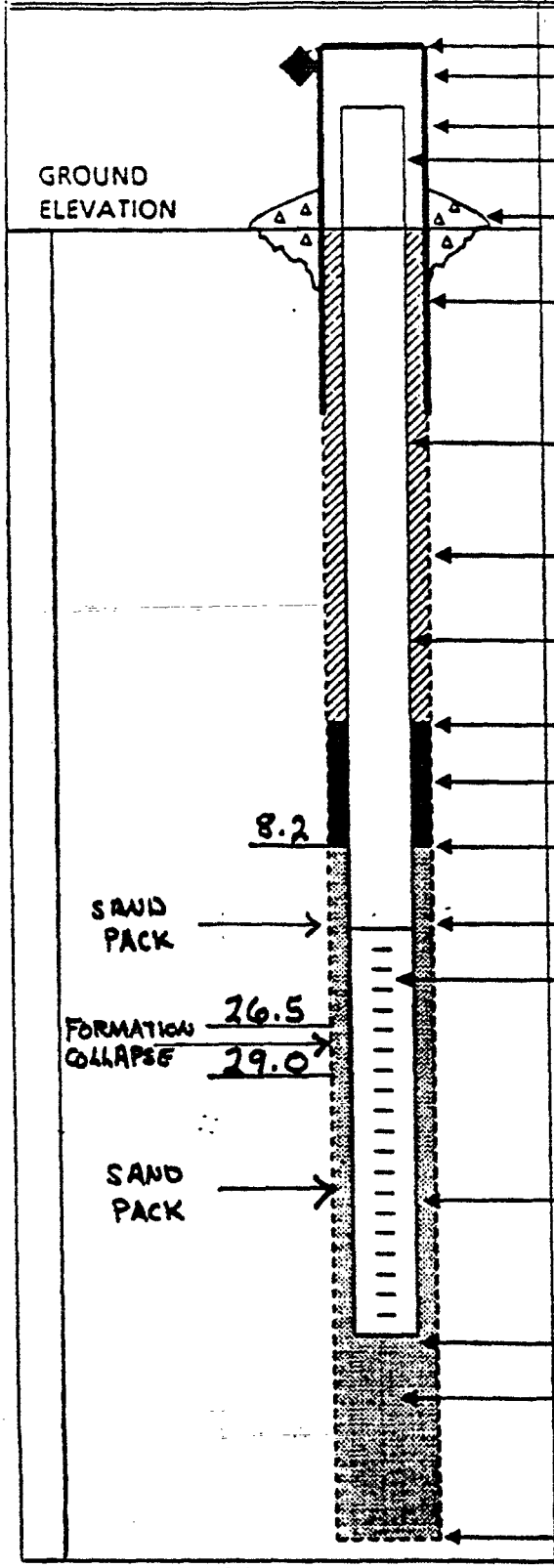
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 713.87
FIELD GEOLOGIST: RH O'LASKEY

LOCATION: ERIE PA
BORING: PW
DATE: 6-7-88

DRILLER: EARL DYE
DRILLING METHOD: 8¼" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL



ELEVATION OF TOP OF SURFACE CASING: 716.47
ELEVATION OF TOP OF RISER PIPE: 716.11
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: 2.24
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 8"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 6"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC
BOREHOLE DIAMETER: 12"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 5.3
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 8.2
DEPTH TOP OF SCREEN: 12.0
TYPE OF SCREEN: CONTINUOUS WRAP PVC
SLOT SIZE x LENGTH: .010" x 30 ft
I.D. OF SCREEN: 6" NOT FLUSH THREADED
TYPE OF SAND PACK: #1 Q-ROC
DEPTH BOTTOM OF SCREEN: 42.0
DEPTH BOTTOM OF SAND PACK: 44.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: #1 Q-ROC
ELEVATION / DEPTH OF HOLE: 44.0

AR001785

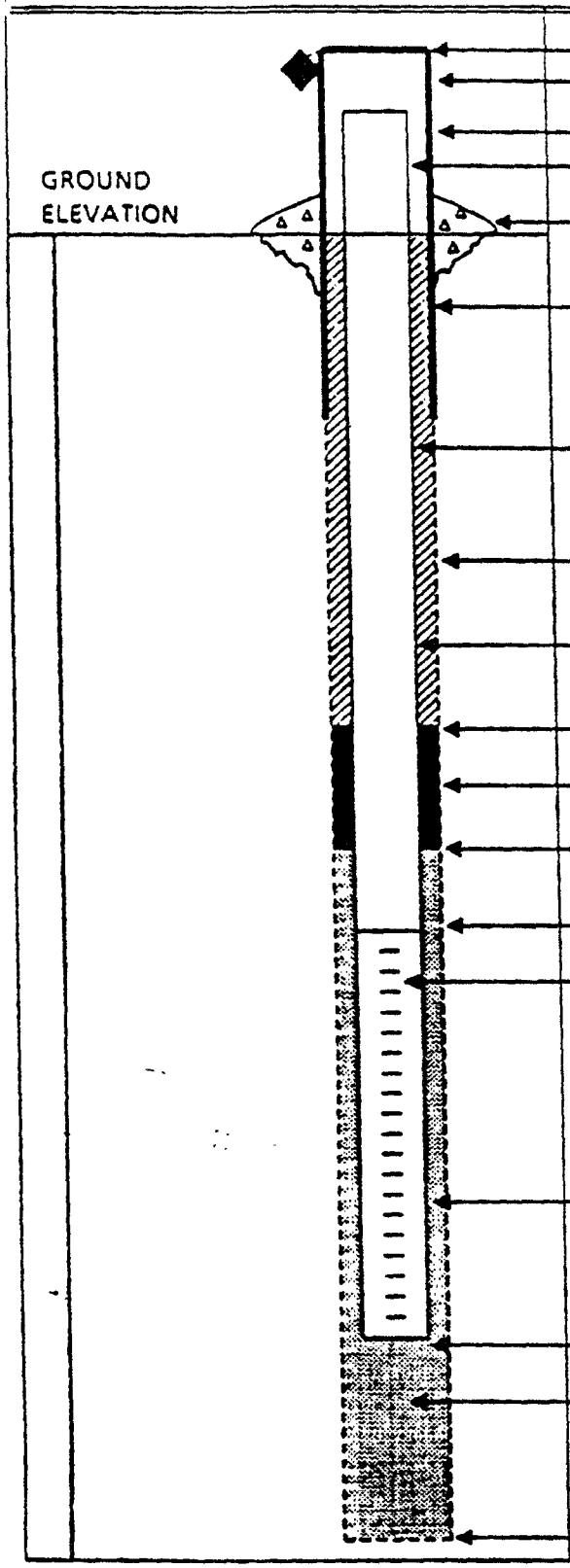
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT Millcreek
PROJECT NO. 0285-23-1
ELEVATION
FIELD GEOLOGIST D. Aloysius

LOCATION Erie, PA
BORING OW #1
DATE 6/2/88 (installed)

DRILLER Penn Drill
DRILLING METHOD 6 1/4" HSA
DEVELOPMENT METHOD Surge / Bail + Air Lift



ELEVATION OF TOP OF SURFACE CASING: 716.41
ELEVATION OF TOP OF RISER PIPE: 716.21
STICK - UP TOP OF SURFACE CASING: 2.3'
STICK - UP RISER PIPE: ~2'
TYPE OF SURFACE SEAL: Cement / Bentonite Grout
I.D. OF SURFACE CASING: 4-inch
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2-inch
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 10"
TYPE OF BACKFILL: Cement / Bentonite Grout
DEPTH TOP OF SEAL: 4.5'
TYPE OF SEAL: Bentonite pellet
DEPTH TOP OF SAND PACK: 7.5'
DEPTH TOP OF SCREEN: 12'
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: 10 Slot / 30'
I.D. OF SCREEN: 2-inch
TYPE OF SAND PACK: #2 Q-ROK med Sand
DEPTH BOTTOM OF SCREEN: 42'
DEPTH BOTTOM OF SAND PACK: 42'
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: 42'

ARU01786

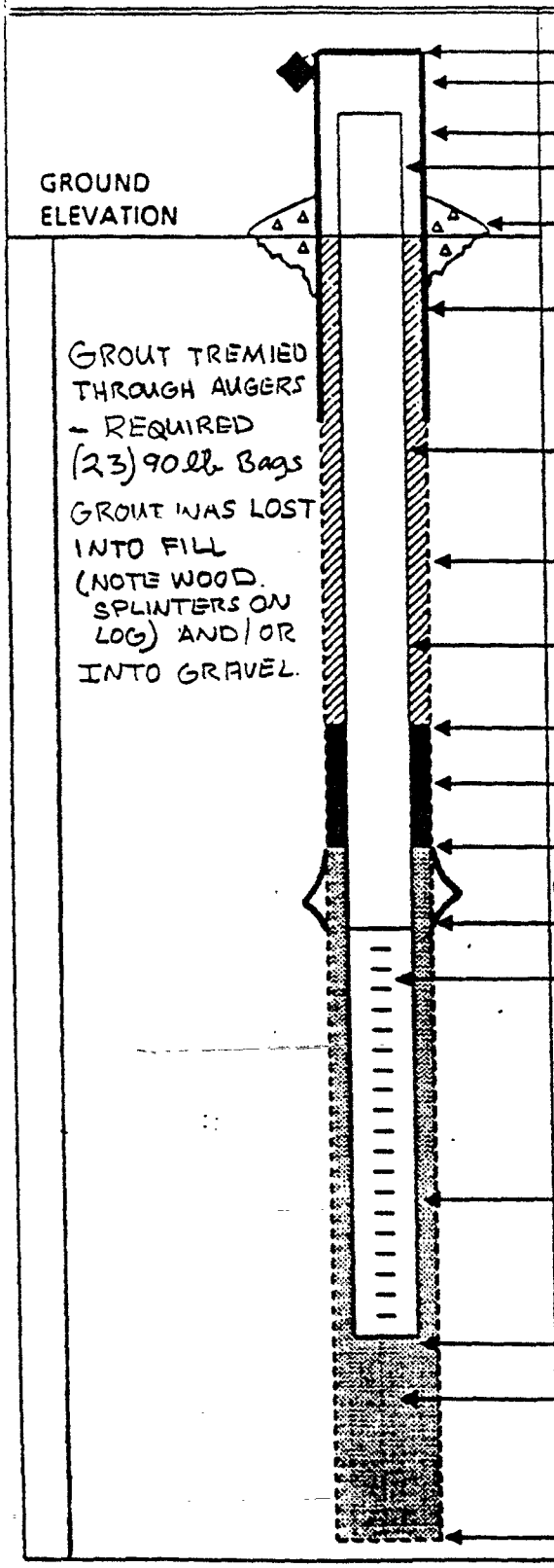
ORIGINAL (RED)

MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 721.81
FIELD GEOLOGIST: R H O'LASKEY
LOCATION: BIRG PA
BORING: 26A
DATE: 5-9-88

DRILLER: EARL DYE
DRILLING METHOD: 6¼" ID AUGER
DEVELOPMENT METHOD: SURGE / BAIL / AIR



ELEVATION OF TOP OF SURFACE CASING: 724.31
ELEVATION OF TOP OF RISER PIPE: 724.01
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: 2.20'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: PVC
BOREHOLE DIAMETER: 10¼"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 19.0'
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 20.5'
DEPTH TOP OF SCREEN: 22.0'
TYPE OF SCREEN: 4" ID PVC
SLOT SIZE x LENGTH: 10 SLOT x 5 FT
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #2 Q-ROC
DEPTH BOTTOM OF SCREEN: 27.0'
DEPTH BOTTOM OF SAND PACK: 28.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: 1' PELLTS 3' #2 Q-ROC 8' CAVED FORMATION
ELEVATION / DEPTH OF HOLE: 40'

AR001787

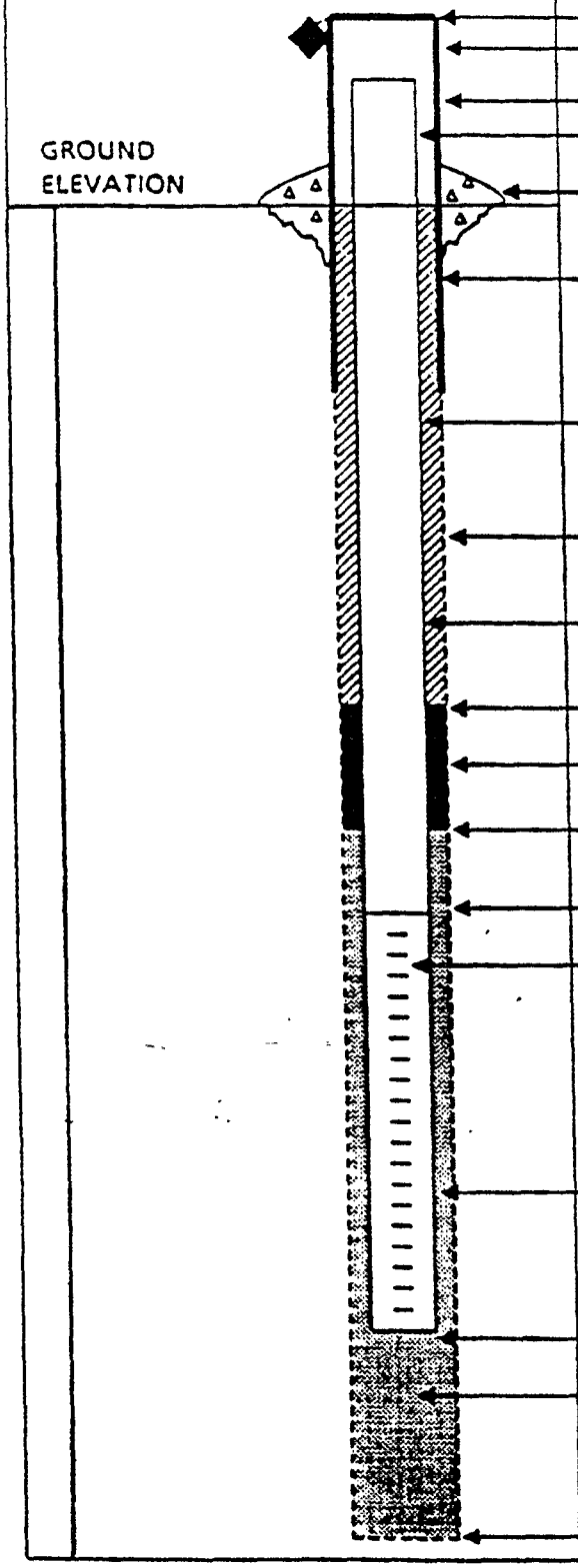
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT MILLCREEK
PROJECT NO. 0285-23-1
ELEVATION 721.90
FIELD GEOLOGIST R H O'ASKEY

LOCATION ERIE - PA
BORING 26B
DATE 5-9-88

DRILLER EARL DYE
DRILLING METHOD 6 1/4" ID AUGER
DEVELOPMENT METHOD SURGE/BAIL



ELEVATION OF TOP OF SURFACE CASING: 724.25
ELEVATION OF TOP OF RISER PIPE: 723.92

STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: 2.02'

TYPE OF SURFACE SEAL: CEMENT

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 4"
TYPE OF RISER PIPE: SCH 40 PVC

BOREHOLE DIAMETER: 10 1/2

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

DEPTH TOP OF SEAL: 7.0'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 9.1'

DEPTH TOP OF SCREEN: 10.25'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 SLOT x 5 ft

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: # 2 Q-ROC

DEPTH BOTTOM OF SCREEN: 15.25'

DEPTH BOTTOM OF SAND PACK: 16.0

TYPE OF BACKFILL BELOW OBSERVATION WELL: # 2 Q-ROC

AR001788

ELEVATION / DEPTH OF HOLE: 16.0'

ORIGINAL (RED)

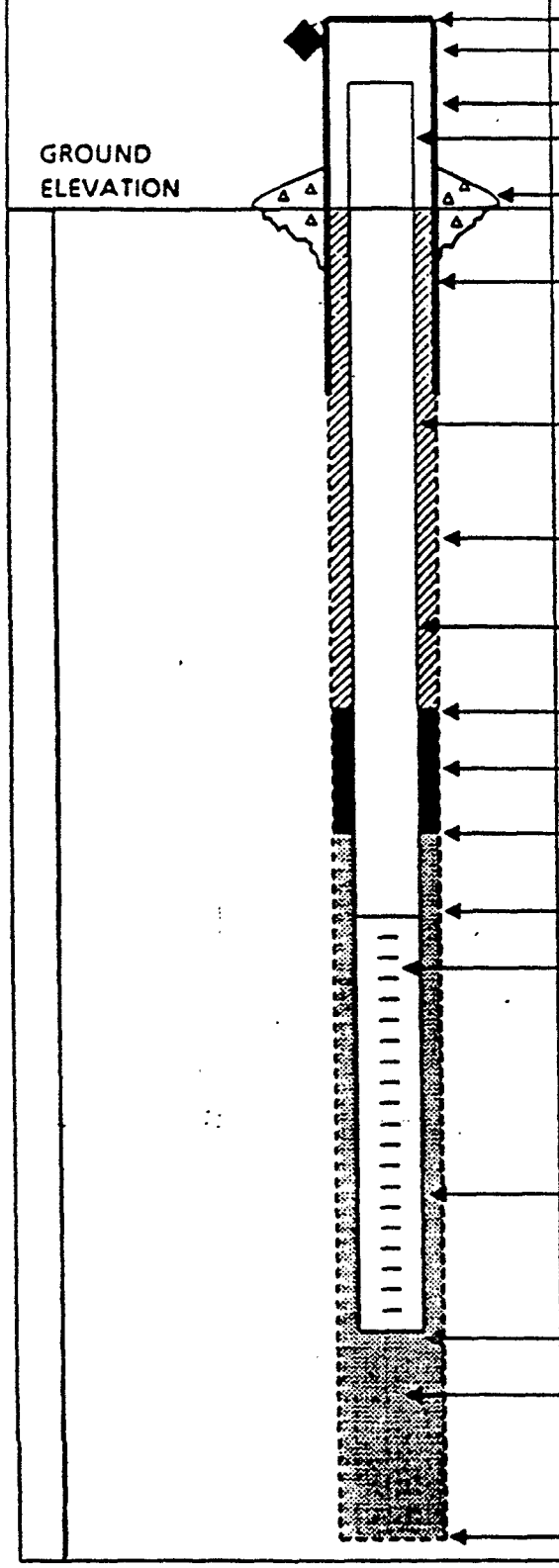
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION:
FIELD GEOLOGIST: RH O'ASKEY

LOCATION: ERIE - PA
BORING: 26C
DATE: 6-8-88

DRILLER: EARL DYE
DRILLING METHOD: 6 1/4" ID AUGER
DEVELOPMENT METHOD: NONE



ELEVATION OF TOP OF SURFACE CASING: 724.53
ELEVATION OF TOP OF RISER PIPE: 723.92
STICK - UP TOP OF SURFACE CASING: ~2.7'
STICK - UP RISER PIPE: ~2.1'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: SCH 40 PVC
BOREHOLE DIAMETER: 10 1/2"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 5.5'
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 6.5'
DEPTH TOP OF SCREEN: 7.5'
TYPE OF SCREEN: SCH 40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 2.9 FT
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #2 Q-ROC
DEPTH BOTTOM OF SCREEN: 10.4'
DEPTH BOTTOM OF SAND PACK: 10.4'
TYPE OF BACKFILL BELOW OBSERVATION WELL: BENTONITE PELLETS
ELEVATION / DEPTH OF HOLE: 11.2'

AR001789

ORIGINAL (RED)

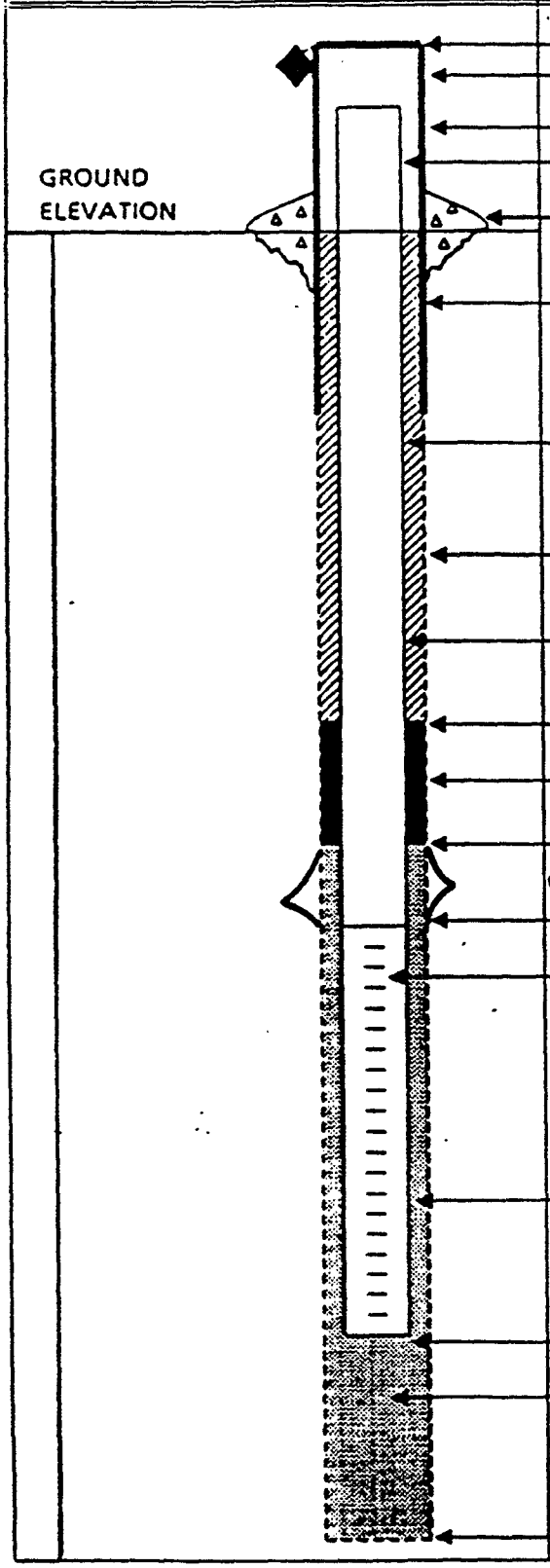
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 717.28
FIELD GEOLOGIST: RH O'ASKEY

LOCATION: ERIE, PA
BORING: 27A
DATE: 5-11-88

DRILLER: EARL DYE
DRILLING METHOD: 6 1/4" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 720.13
ELEVATION OF TOP OF RISER PIPE: 719.58
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: 2.30'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: SCH 40 PVC
BOREHOLE DIAMETER: 10 1/2"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 20.5'
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 22.8'
DEPTH TOP OF SCREEN: 25.0'
TYPE OF SCREEN: SCH 40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 5 ft
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: # 2 - Q-ROC
DEPTH BOTTOM OF SCREEN: 30.0'
DEPTH BOTTOM OF SAND PACK: 36.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: 6' #2 Q-ROC
4' CAVED FORMATION
ELEVATION / DEPTH OF HOLE: 40.0'

AR001790

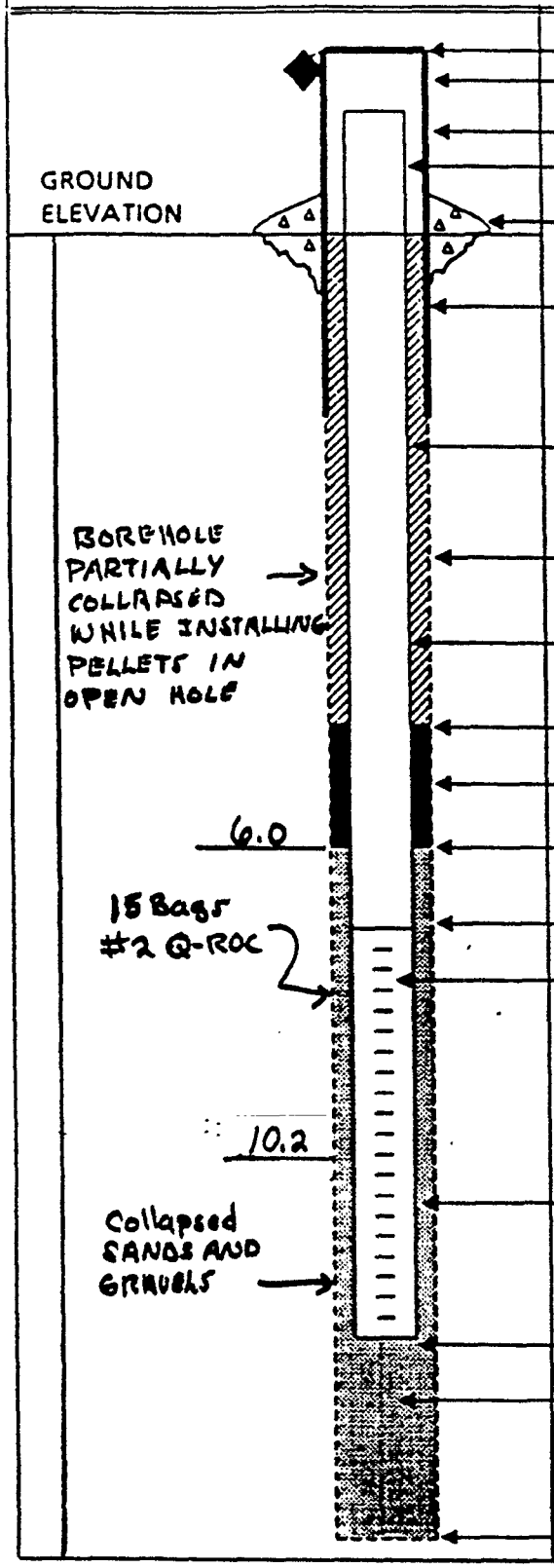
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 717.60
FIELD GEOLOGIST: RH O'ASKEY

LOCATION: ERIE PA
BORING: 27 B
DATE: 5-12-88

DRILLER: EARL DYE
DRILLING METHOD: 6¼" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 720.05
ELEVATION OF TOP OF RISER PIPE: 719.65

STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: 2.05

TYPE OF SURFACE SEAL: CEMENT

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 4"
TYPE OF RISER PIPE: SCH 40 PVC

BOREHOLE DIAMETER: 10½"

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

DEPTH TOP OF SEAL: 5' to 4'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 6.0'

DEPTH TOP OF SCREEN: 7.30'

TYPE OF SCREEN: SCH 40 PVC

SLOT SIZE x LENGTH: 10 SLOT x 5 ft

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #2 Q-ROC
NOTE: 15.5 bags of sand pack added from 10.2' to 6.0'.

DEPTH BOTTOM OF SCREEN: 12.3'

DEPTH BOTTOM OF SAND PACK: 10.2'

TYPE OF BACKFILL BELOW OBSERVATION WELL: FORMATION CAVED FROM 10.2' to 15.5'

ELEVATION / DEPTH OF HOLE: 15.5'

AR001791

ORIGINAL (RED)

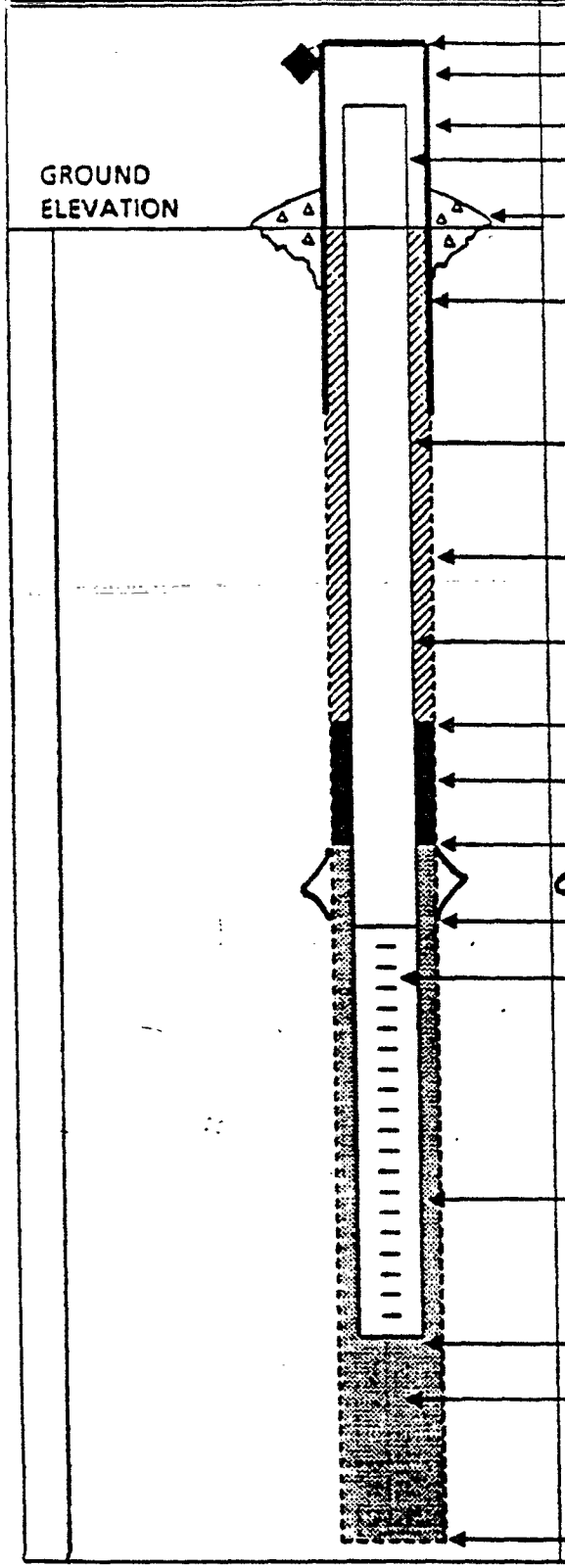
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 713.64
FIELD GEOLOGIST: R H OLASKEY

LOCATION: ERIE, PA
BORING: 28A
DATE: 5-4-88

DRILLER: EARL DYE
DRILLING METHOD: 6 1/4" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 715.69
ELEVATION OF TOP OF RISER PIPE: 715.57

STICK - UP TOP OF SURFACE CASING: ____
STICK - UP RISER PIPE: 1.93'

TYPE OF SURFACE SEAL: CEMENT

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 4"
TYPE OF RISER PIPE: SCH 40 PVC

BOREHOLE DIAMETER: 10 1/2"

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

DEPTH TOP OF SEAL: 31.5'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 33.4'

DEPTH TOP OF SCREEN: 35.6'

TYPE OF SCREEN: SCH 40 PVC

SLOT SIZE x LENGTH: 10 SLOT x 10 ft

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #2 Q-ROC

DEPTH BOTTOM OF SCREEN: 45.7'

DEPTH BOTTOM OF SAND PACK: 43.4'

TYPE OF BACKFILL BELOW OBSERVATION WELL: FORMATION CAVED FROM 43.4 to 48.0

ELEVATION / DEPTH OF HOLE: 48.0'

AR001792

AR001792

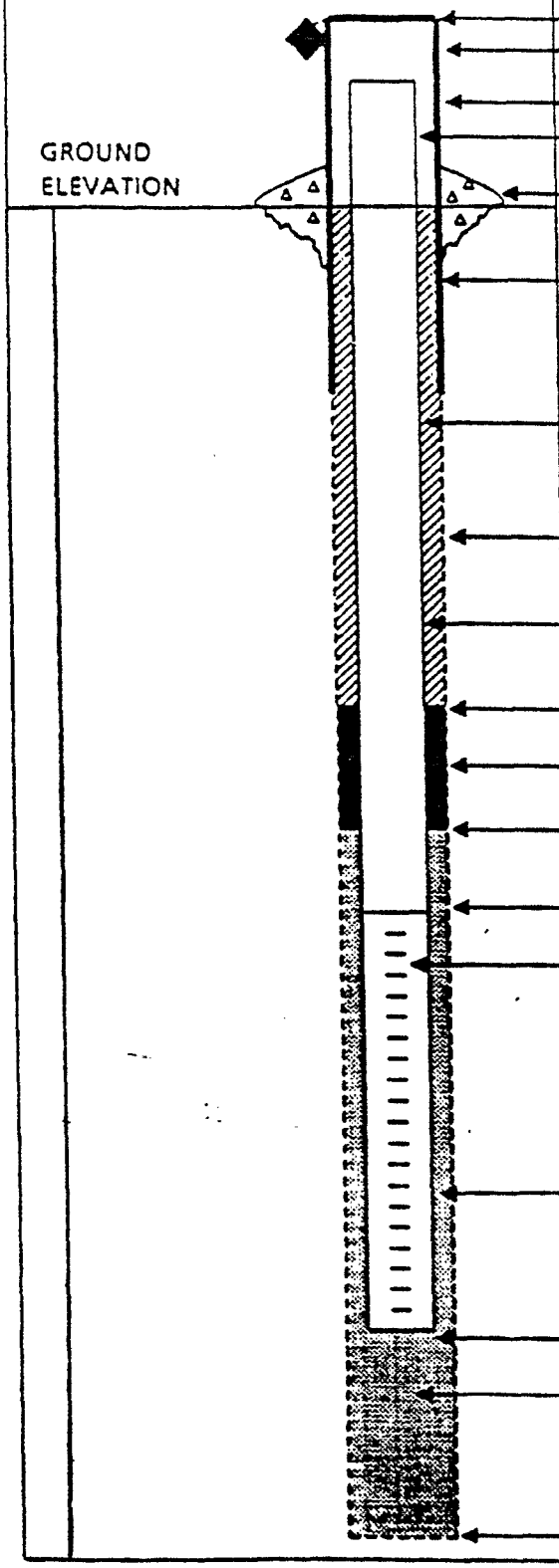
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 713.51
FIELD GEOLOGIST: RH O'LASKEY

LOCATION: ERIE PA
BORING: 28B
DATE: 5-5-88

DRILLER: EARL DYE
DRILLING METHOD: 6 1/4" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 716.01
ELEVATION OF TOP OF RISER PIPE: 715.70

STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: 2.19'

TYPE OF SURFACE SEAL: CEMENT

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH JOINT SCH 40 PVC

BOREHOLE DIAMETER: 10 1/2"

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

DEPTH TOP OF SEAL: 4.0'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 5.5'

DEPTH TOP OF SCREEN: 7.0'

TYPE OF SCREEN: Flush Joint Sch 40 PVC

SLOT SIZE x LENGTH: 10 SLOT x 5 ft

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #2-ROC

DEPTH BOTTOM OF SCREEN: 12.0'

DEPTH BOTTOM OF SAND PACK: 9.5

TYPE OF BACKFILL BELOW OBSERVATION WELL: FORMATION CAVED FROM 9.5' to 13.0'

ELEVATION / DEPTH OF HOLE: 13.0'

AR001793

ORIGINAL (RED)

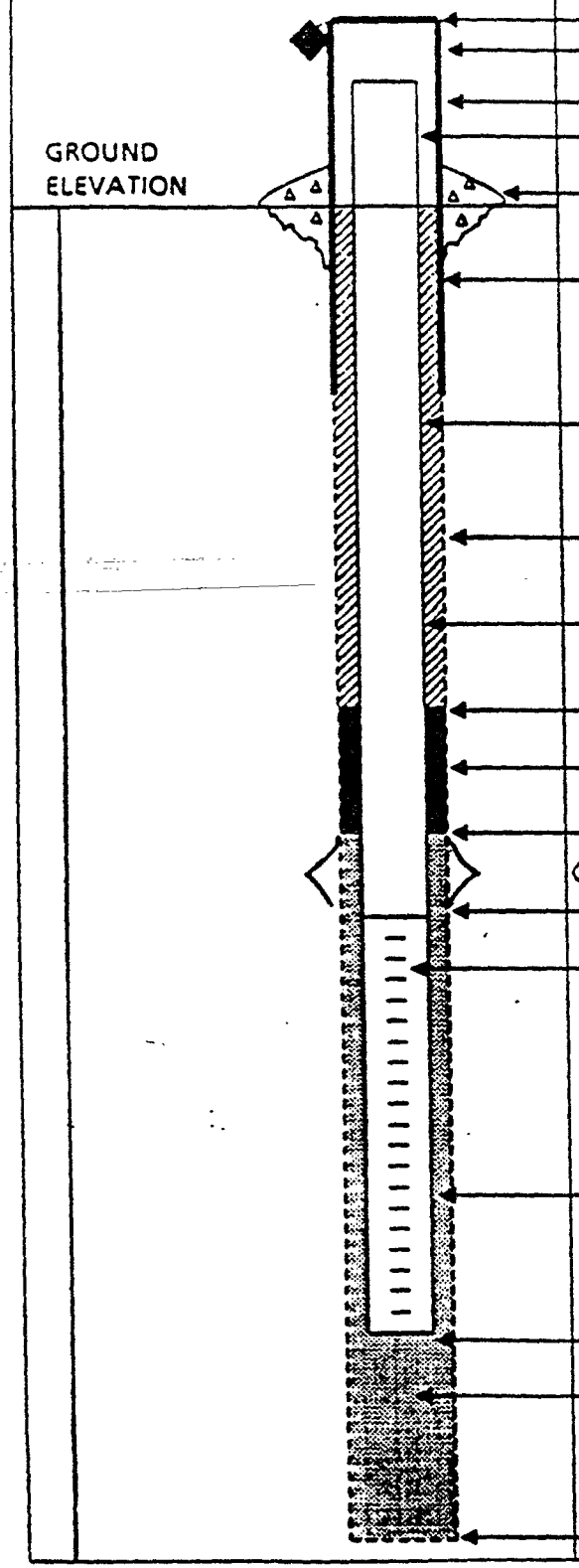
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 715.01
FIELD GEOLOGIST: RH O'LASKEY

LOCATION: FIRE PA
BORING: 29
DATE: 5-17-88

DRILLER: EARL DYE
DRILLING METHOD: 6 1/4" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 715.01
ELEVATION OF TOP OF RISER PIPE: 714.70

STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: -0.31'

TYPE OF SURFACE SEAL: CEMENT

I.D. OF SURFACE CASING: 8"
TYPE OF SURFACE CASING: AT GRADE STEEL WATER BOX

RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC

BOREHOLE DIAMETER: 10 1/2"

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

DEPTH TOP OF SEAL: 6.0'

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 8.0'

DEPTH TOP OF SCREEN: 10.5'

TYPE OF SCREEN: FLUSH THREAD SCH 40 PVC

SLOT SIZE x LENGTH: 10 SLOT x 10 ft

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #2 Q-ROC

DEPTH BOTTOM OF SCREEN: 20.5'

DEPTH BOTTOM OF SAND PACK: 20.0'

TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE

AR001794

ELEVATION / DEPTH OF HOLE: 20.5'

AR001794

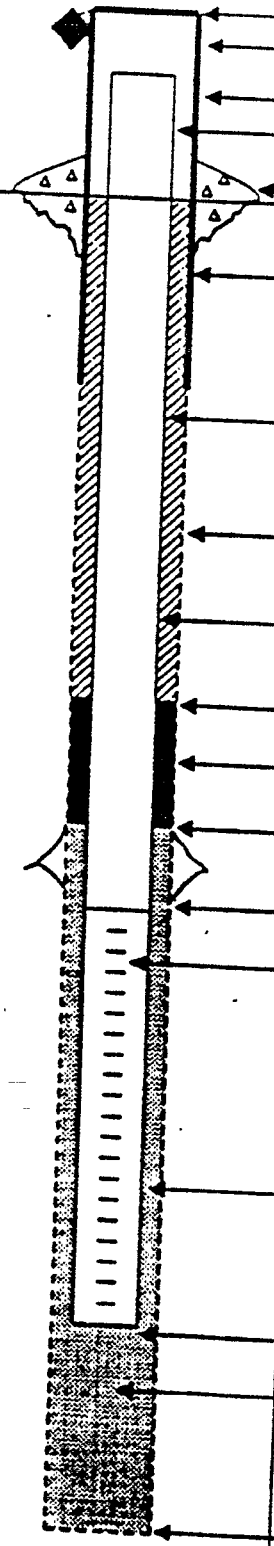
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT MILLCREEK
PROJECT NO. 0285-23-1
ELEVATION 705.41
FIELD GEOLOGIST RH O'LASKEY

LOCATION FIRE - PA
BORING 30
DATE 5-23-88

DRILLER EARL DYE
DRILLING METHOD 6¼" ID AUGER
DEVELOPMENT METHOD SURGE/BAIL/ AIR



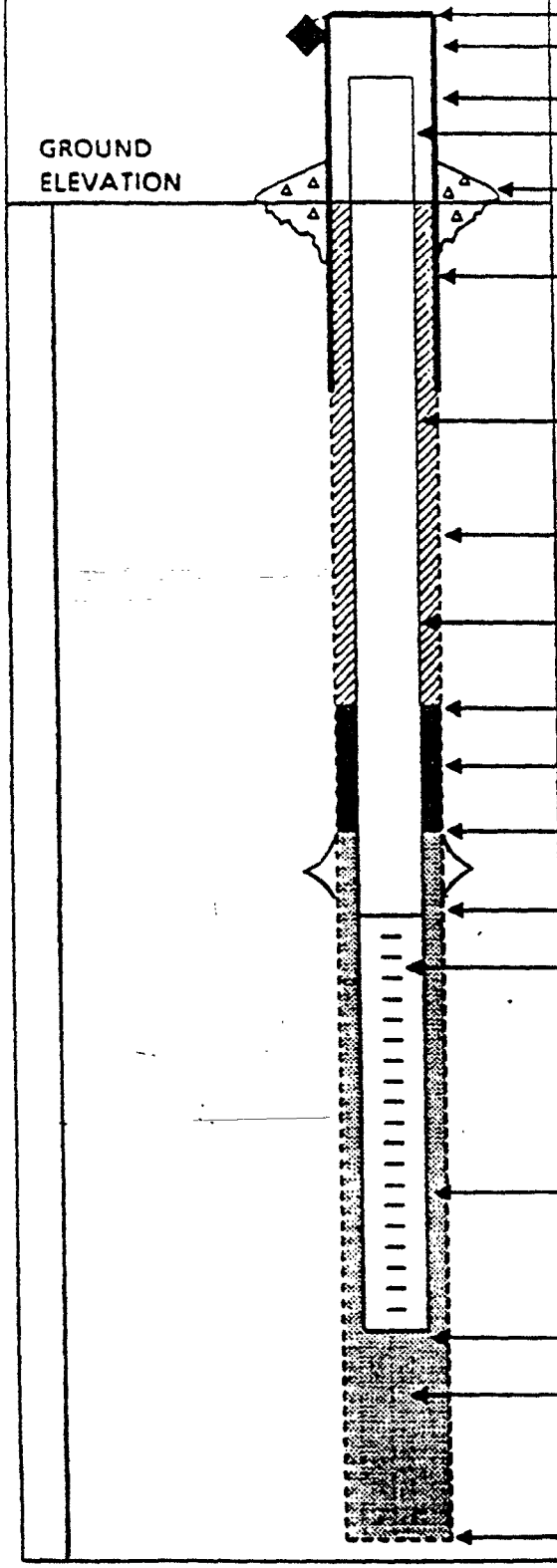
ELEVATION OF TOP OF SURFACE CASING: 705.41
ELEVATION OF TOP OF RISER PIPE: 705.11
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: -0.30'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 8"
TYPE OF SURFACE CASING: AT GRADE STEEL WATER BOX
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC
BOREHOLE DIAMETER: 10½"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 4.2'
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 6.0'
DEPTH TOP OF SCREEN: 10.5'
TYPE OF SCREEN: FLUSH THREAD SCH 40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 10 ft
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: PREDOMINANTLY COLLAPSED SANDS AND GRAVELS FROM FORMATION WITH MINOR Q-ROC.
DEPTH BOTTOM OF SCREEN: 20.5'
DEPTH BOTTOM OF SAND PACK: —
TYPE OF BACKFILL BELOW OBSERVATION WELL: NONE
ELEVATION / DEPTH OF HOLE: 20.5'

AR001795

MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 711.50
FIELD GEOLOGIST: RH O'LASKEY
LOCATION: ERIE, PA
BORING: 31
DATE: 5-18-88
DRILLER: EARL DYE
DRILLING METHOD: 6¼" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 711.50
ELEVATION OF TOP OF RISER PIPE: 711.20
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: -0.30'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 8"
TYPE OF SURFACE CASING: AT GRADE STEEL WATER BOX
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC
BOREHOLE DIAMETER: 10½"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 4.5'
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 6.0'
DEPTH TOP OF SCREEN: 9.4'
TYPE OF SCREEN: FLUSH THREAD SCH 40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 10 ft
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: FORMATION ALLOWED TO COLLAPSE FROM 25.0' TO 6.0'
DEPTH BOTTOM OF SCREEN: 19.4'
DEPTH BOTTOM OF SAND PACK: —
TYPE OF BACKFILL BELOW OBSERVATION WELL: MEDIUM SANDS FROM FORMATION
ELEVATION / DEPTH OF HOLE: 25.0'

AR001796

ORIGINAL (RED)

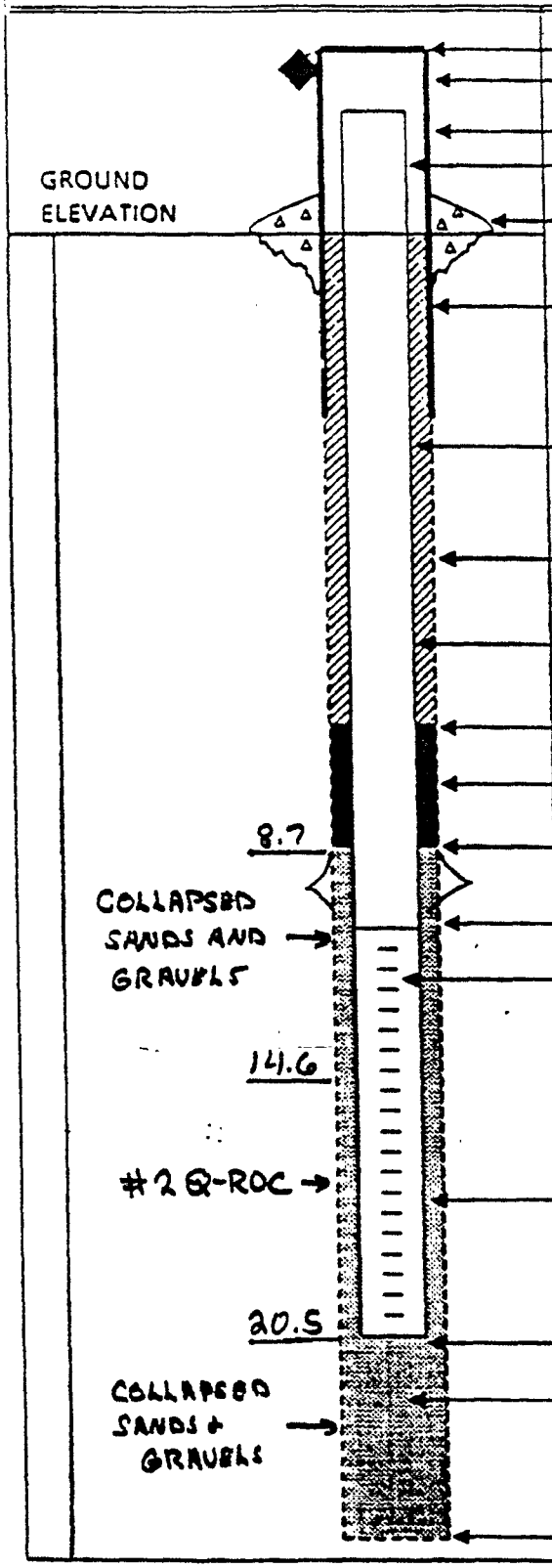
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 711.41
FIELD GEOLOGIST: RH O'LASKEY

LOCATION: ERIE, PA
BORING: 32
DATE: 5-25-88

DRILLER: EARL DYE
DRILLING METHOD: 6¼" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 711.41
ELEVATION OF TOP OF RISER PIPE: 711.09

STICK-UP TOP OF SURFACE CASING:
STICK-UP RISER PIPE: -0.32'

TYPE OF SURFACE SEAL: CEMENT

I.D. OF SURFACE CASING: 10"
TYPE OF SURFACE CASING: AT GRADE STEEL WATER BOX

RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC

BOREHOLE DIAMETER: 10½"

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

DEPTH TOP OF SEAL: 6.5'

TYPE OF SEAL: BENTONITE PELLETS
DEPTH BASE OF SEAL: 8.7

DEPTH TOP OF SAND PACK: 14.6'

CENTRALIZER

DEPTH TOP OF SCREEN: 10.5'

TYPE OF SCREEN: FLUSH THREAD SCH40 PVC

SLOT SIZE x LENGTH: 10 SLOT x 10 ft

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #2 · Q-ROC

DEPTH BOTTOM OF SCREEN: 20.5'

DEPTH BOTTOM OF SAND PACK: 20.5'

TYPE OF BACKFILL BELOW OBSERVATION WELL: COLLAPSED SAND/GRAVEL FORMATION

ELEVATION / DEPTH OF HOLE: 22.0'

AR001797

AR001797

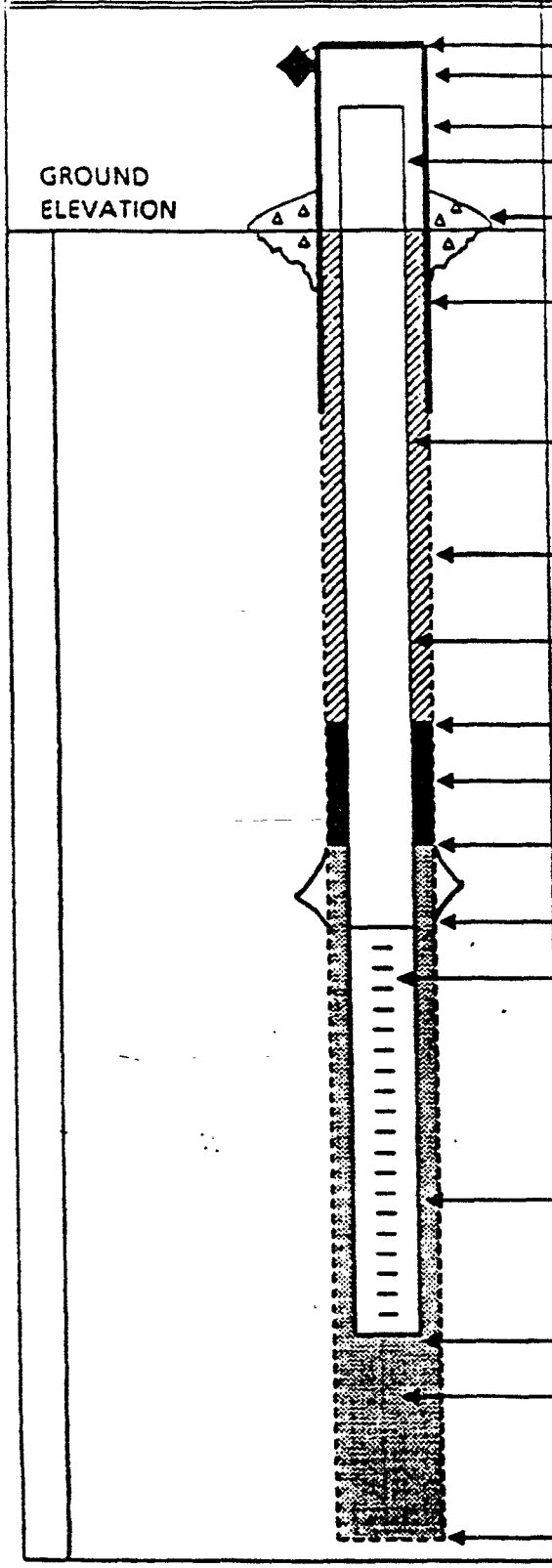
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILL CREEK
PROJECT NO.: 0285-23-1
ELEVATION: 715.52
FIELD GEOLOGIST: RH O'LASKEY

LOCATION: ERIE, PA
BORING: 33A
DATE: 4-27-88

DRILLER: EARL DYE
DRILLING METHOD: 6 1/4" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



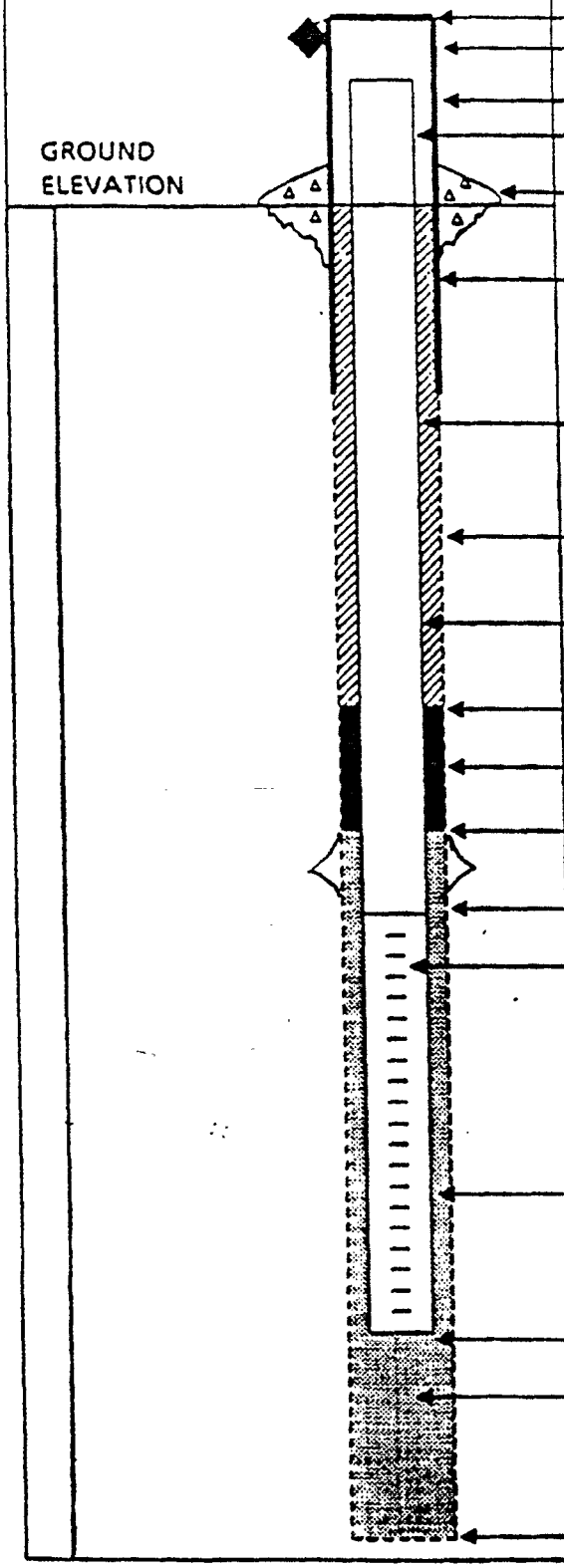
ELEVATION OF TOP OF SURFACE CASING: 718.02
ELEVATION OF TOP OF RISER PIPE: 717.68
STICK-UP TOP OF SURFACE CASING:
STICK-UP RISER PIPE: 2.16'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC
BOREHOLE DIAMETER: 10 1/2"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 27.0'
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 28.5'
DEPTH TOP OF SCREEN: 31.2'
TYPE OF SCREEN: FLUSH JOINT SCH40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 10 ft
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #2 Q-ROC
DEPTH BOTTOM OF SCREEN: 41.2'
DEPTH BOTTOM OF SAND PACK: 42.2'
TYPE OF BACKFILL BELOW OBSERVATION WELL: COLLAPSED FORMATION FROM 42.4' to 44.0'
ELEVATION / DEPTH OF HOLE: 44.0'

MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 715.55
FIELD GEOLOGIST: T. MURTAUGH
LOCATION: ERIE PA
BORING: 33B
DATE: 5-12-88

DRILLER: BERNIE GOLLIHUE
DRILLING METHOD: 6¼" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 717.81
ELEVATION OF TOP OF RISER PIPE: 717.57
STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: 2.11'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC
BOREHOLE DIAMETER: 10½"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 7.0'
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 8.7'
DEPTH TOP OF SCREEN: 11.0'
TYPE OF SCREEN: FLUSH THREAD SCH 40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 5 ft
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #2 Q-ROC AND FORMATION SAND
DEPTH BOTTOM OF SCREEN: 16.0'
DEPTH BOTTOM OF SAND PACK: 17.0'
TYPE OF BACKFILL BELOW OBSERVATION WELL: FORMATION SAND AND #2 Q-ROC
ELEVATION / DEPTH OF HOLE: 17'

AR001799

ORIGINAL (RED)

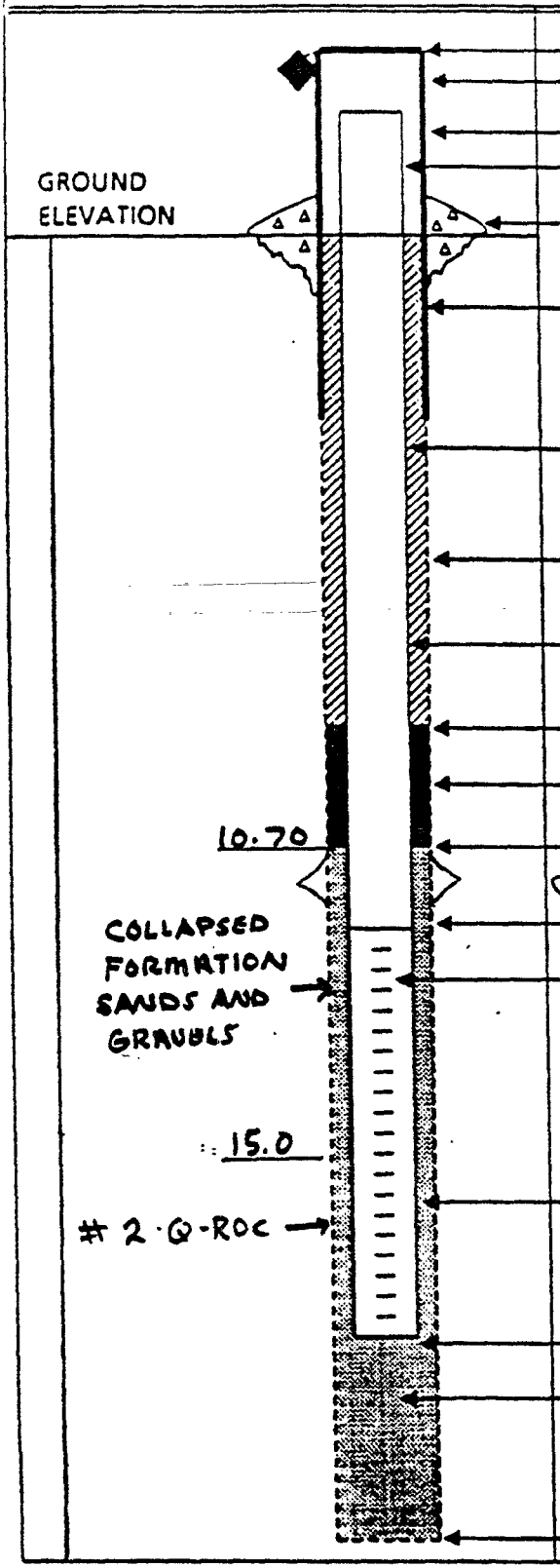
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 717.64
FIELD GEOLOGIST: RH O'LASKEY

LOCATION: ERIE, PA
BORING: 34
DATE: 5-13-88

DRILLER: EARL DYE
DRILLING METHOD: 6¼" ID AUGER
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 720.29
ELEVATION OF TOP OF RISER PIPE: 719.91
STICK-UP TOP OF SURFACE CASING:
STICK-UP RISER PIPE: 2.27'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC
BOREHOLE DIAMETER: 10½"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 8.0'
TYPE OF SEAL: BENTONITE PELLETS
BASE OF SEAL 10.70'
DEPTH TOP OF SAND PACK: 15.0'
DEPTH TOP OF SCREEN: 12.20'
TYPE OF SCREEN: FLUSH THREAD SCH 40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 5 ft
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #2 Q-ROC
DEPTH BOTTOM OF SCREEN: 17.20
DEPTH BOTTOM OF SAND PACK: 19.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: #2 Q-ROC FROM 15.0 to 19.0
ELEVATION / DEPTH OF HOLE: 19.0

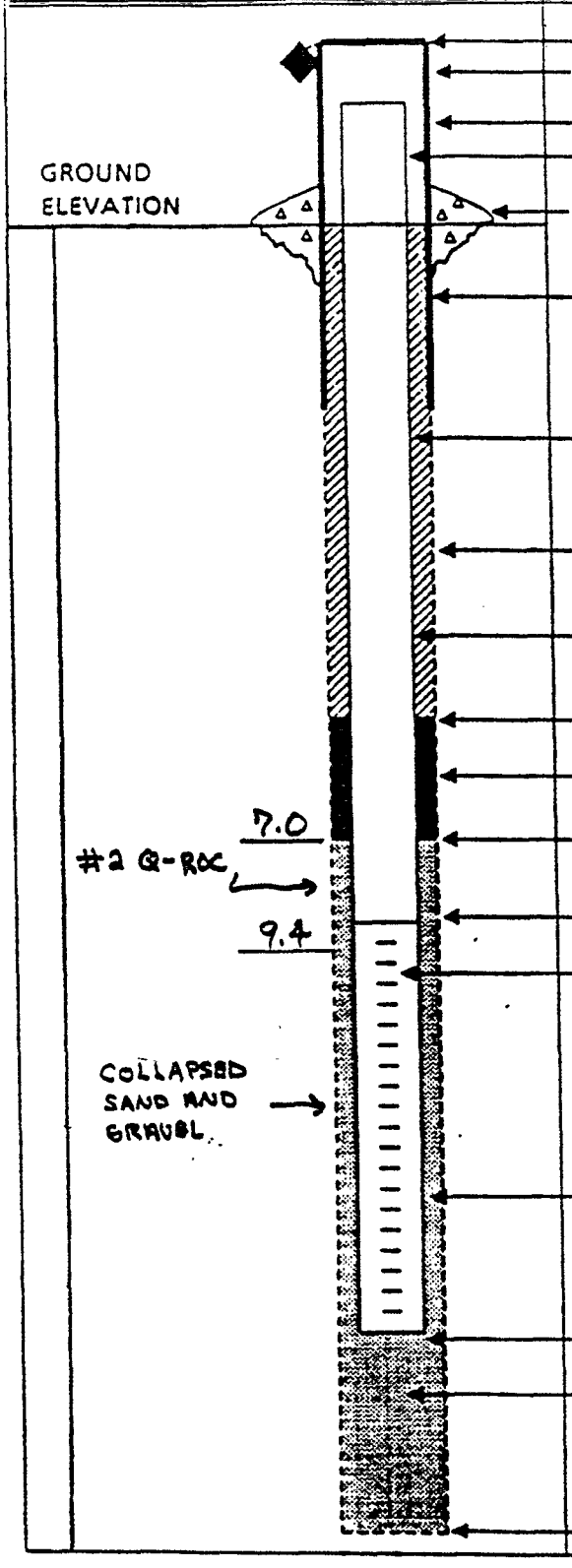
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT: MILLCREEK
PROJECT NO.: 0285-23-1
ELEVATION: 711.30
FIELD GEOLOGIST: RH O'LASKEY

LOCATION: ERIE PA
BORING: 35
DATE: 5-24-88

DRILLER: EARL DYE
DRILLING METHOD: 6 1/4" ID AUGERS
DEVELOPMENT METHOD: SURGE/BAIL/AIR



ELEVATION OF TOP OF SURFACE CASING: 711.30
ELEVATION OF TOP OF RISER PIPE: 710.90

STICK - UP TOP OF SURFACE CASING:
STICK - UP RISER PIPE: -0.40'

TYPE OF SURFACE SEAL: CEMENT

I.D. OF SURFACE CASING: 10"
TYPE OF SURFACE CASING: AT GRADE STEEL WATER BOX

RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC

BOREHOLE DIAMETER: 10 1/2"

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

DEPTH TOP OF SEAL: 5.0

TYPE OF SEAL: BENTONITE PELLETS

DEPTH TOP OF SAND PACK: 7.0

DEPTH TOP OF SCREEN: 8.9

TYPE OF SCREEN: FLUSH THREAD SCH 40 PVC

SLOT SIZE x LENGTH: 10 SLOT x 5 ft

I.D. OF SCREEN: 4"

TYPE OF SAND PACK: #2 Q-ROC
FORMATION SANDS AND GRAVELS COLLAPSED FROM 9.4' to 20.0'
#2 Q-ROC PLACED FROM 9.4' to 7.0'

DEPTH BOTTOM OF SCREEN: 13.9

DEPTH BOTTOM OF SAND PACK: 9.4

TYPE OF BACKFILL BELOW OBSERVATION WELL: COLLAPSED FORMATION

ELEVATION / DEPTH OF HOLE: 20.0'

AR001801

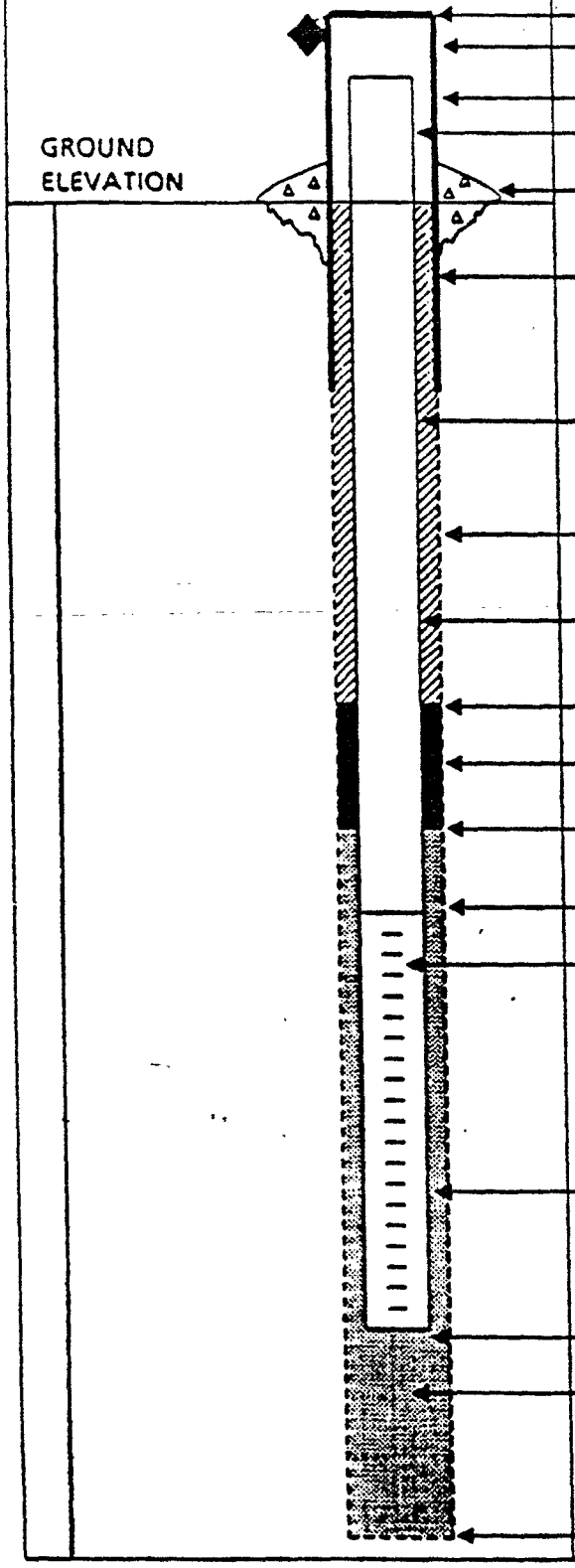
MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

PROJECT MILLCREEK
PROJECT NO. 0285-23-1
ELEVATION
FIELD GEOLOGIST R.H. O'LASKEY

LOCATION ERIE, PA
BORING 36
DATE 6-8-88

DRILLER EARL DYE
DRILLING METHOD 6¼" ID AUGERS
DEVELOPMENT METHOD NONE



ELEVATION OF TOP OF SURFACE CASING: 729.00
ELEVATION OF TOP OF RISER PIPE: 728.69
STICK - UP TOP OF SURFACE CASING: ~2.6'
STICK - UP RISER PIPE: ~2.2'
TYPE OF SURFACE SEAL: CEMENT
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 4"
TYPE OF RISER PIPE: FLUSH THREAD SCH 40 PVC
BOREHOLE DIAMETER: 10½"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
DEPTH TOP OF SEAL: 5.3
TYPE OF SEAL: BENTONITE PELLETS
DEPTH TOP OF SAND PACK: 7.0
DEPTH TOP OF SCREEN: 8.0
TYPE OF SCREEN: FLUSH THREAD SCH 40 PVC
SLOT SIZE x LENGTH: 10 SLOT x 5 ft
I.D. OF SCREEN: 4"
TYPE OF SAND PACK: #2 Q-ROC
DEPTH BOTTOM OF SCREEN: 13.0
DEPTH BOTTOM OF SAND PACK: 13.0
TYPE OF BACKFILL BELOW OBSERVATION WELL: BENTONITE PELLETS
ELEVATION / DEPTH OF HOLE: 13.7

AR001802

HYDRAULIC CONDUCTIVITY DATA
AND
CALCULATIONS

0285-23-1

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE [illegible] SHEET NO. ..... OF .....

CHKD. BY ..... DATE ..... JOB NO. .....

SUBJECT MILLCREEK

ORIGINAL (RED)

OW-1 6-29-93

$r_c = 1'' = .0833'$

$L = 42.00 - 8.00 = 34.00$

$R = 6\text{ in} = 0.5'$

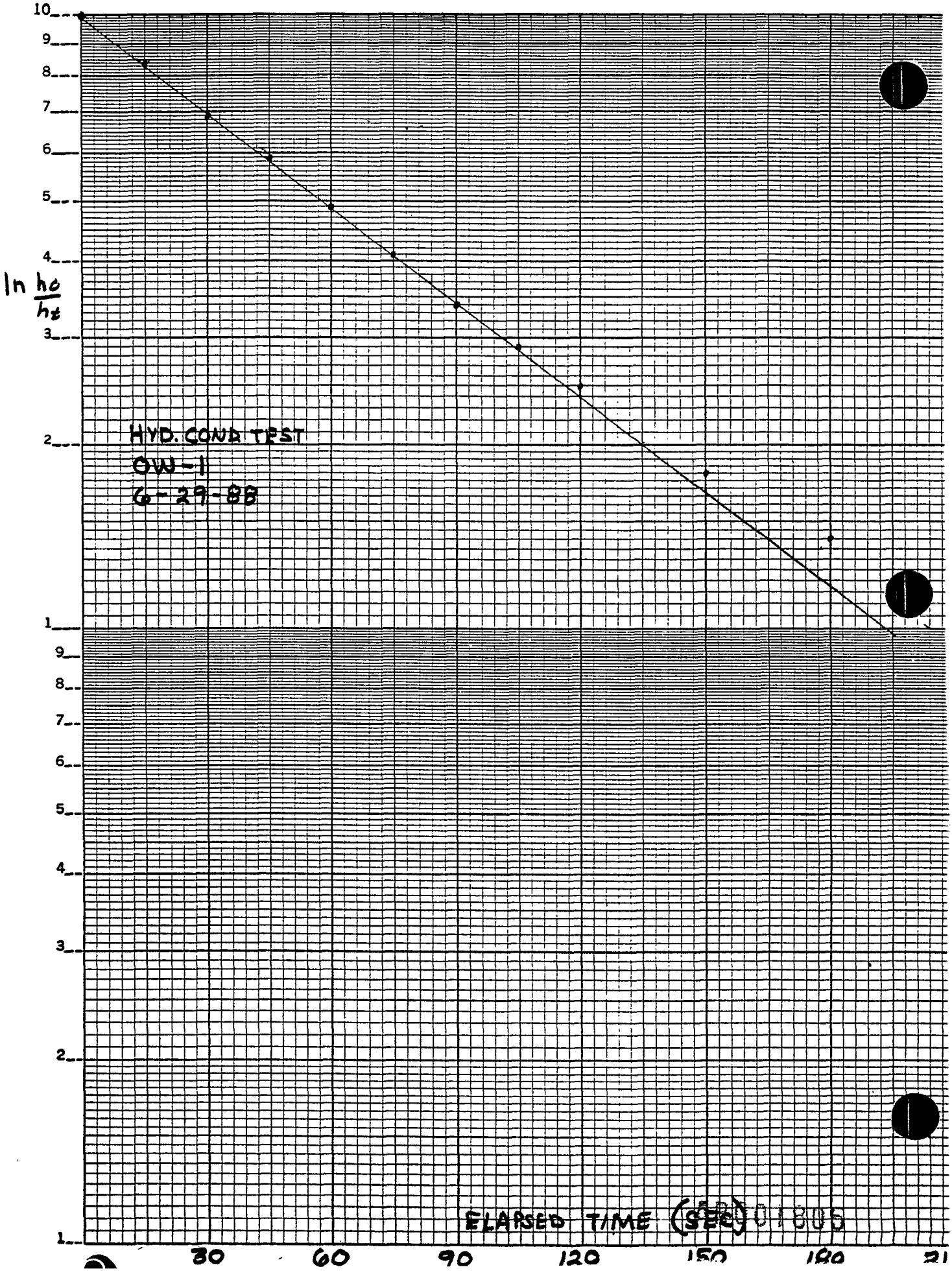
$h_1 = .70 \quad t_1 = 30 \text{ sec}$

$h_2 = .20 \quad t_2 = 135 \text{ sec}$

$$K = \frac{(r_c)^2 \ln L/R}{2L\,(t_2 - t_1)} \cdot \ln \frac{h_1}{h_2}$$

$$= \frac{(.0833)^2 (\ln 34.00/.5)}{2\,(34.00)\,(135 - 30 \text{ sec})} \cdot \ln \frac{.70}{.20} = 5.137 \times 10^{-6} \frac{ft}{sec}$$

$$\times \frac{12 \text{ in}}{ft} \times \frac{2.54 \text{ cm}}{in} = 1.6 \times 10^{-4} \text{ cm/sec}$$


HYD. COND TEST
OW-1
6-29-88
ln ho/ht
ELAPSED TIME (SEC)
30
60
90
120
150
180
10
9
8
7
6
5
4
3
2
1

01806

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 COE	MILLCREEK	6-27-99	OW-1

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
Rising Head	Pump to limit of Centrifical Pump. — M-SCOPE	8.39 top of STEEL	RHO/DJD

CLOCK TIME	ELAPSED TIME (t) Units: SEC	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
11:15:00	0	23.8	15.41	1.0	
:15	15	21.4	13.01	.84	
:30	30	19.0	10.61	.69	
:45	45	17.43	9.04	.59	
11:16:00	60	16.00	7.61	.49	
:15	75	14.73	6.34	.41	
:30	90	13.67	5.28	.34	
:45	105	12.90	4.51	.29	
11:17:00	120	12.22	3.83	.25	
:30	150	11.22	2.83	.18	
:45	165	10.79			
11:18:00	180	10.49	2.10	.14	
:15	195	10.21			
:30	210	9.98	1.59	.10	
:45	225	9.78			
11:19:00	240	9.60	1.14	.07	
:15	255	9.46			
:30	270	9.33	0.94	.06	
:45	285	9.23			
11:20:00	300	9.13	0.74	.05	
:15		9.08			
:30		8.98			
:45		8.91			
11:21:00		8.85			

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:

CLOCK TIME	ELAPSED TIME (t) Units: _____	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
11:21:15		8.80			
:30		8.76			
11:22:00		8.69			
11:23:00		8.58			

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY ..... DATE ..... SHEET NO. ..... OF .....

CHKD. BY ..... DATE ..... JOB NO. .....

SUBJECT .....

OW-1 6-29-33

$H = 42.00 + 2.36 - 8.39 = 35.97$

$D = \qquad = H$

$L = 42.00 - 8.2 = 33.80$

$r_c = 1\text{ in} = .0833'$

$r_w = 6\text{ in.} = .5'$

$R_e/r_w = \frac{38.80}{.5} = 67.60$

$C = 3.25$

$t = 120\text{ sec}$

$y_0 = 15.41$

$y_t = 3.83$

$$\ln R_e/r_w = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1}$$

$$= \left(\frac{1.1}{4.2758} + \frac{3.25}{67.60}\right)^{-1}$$

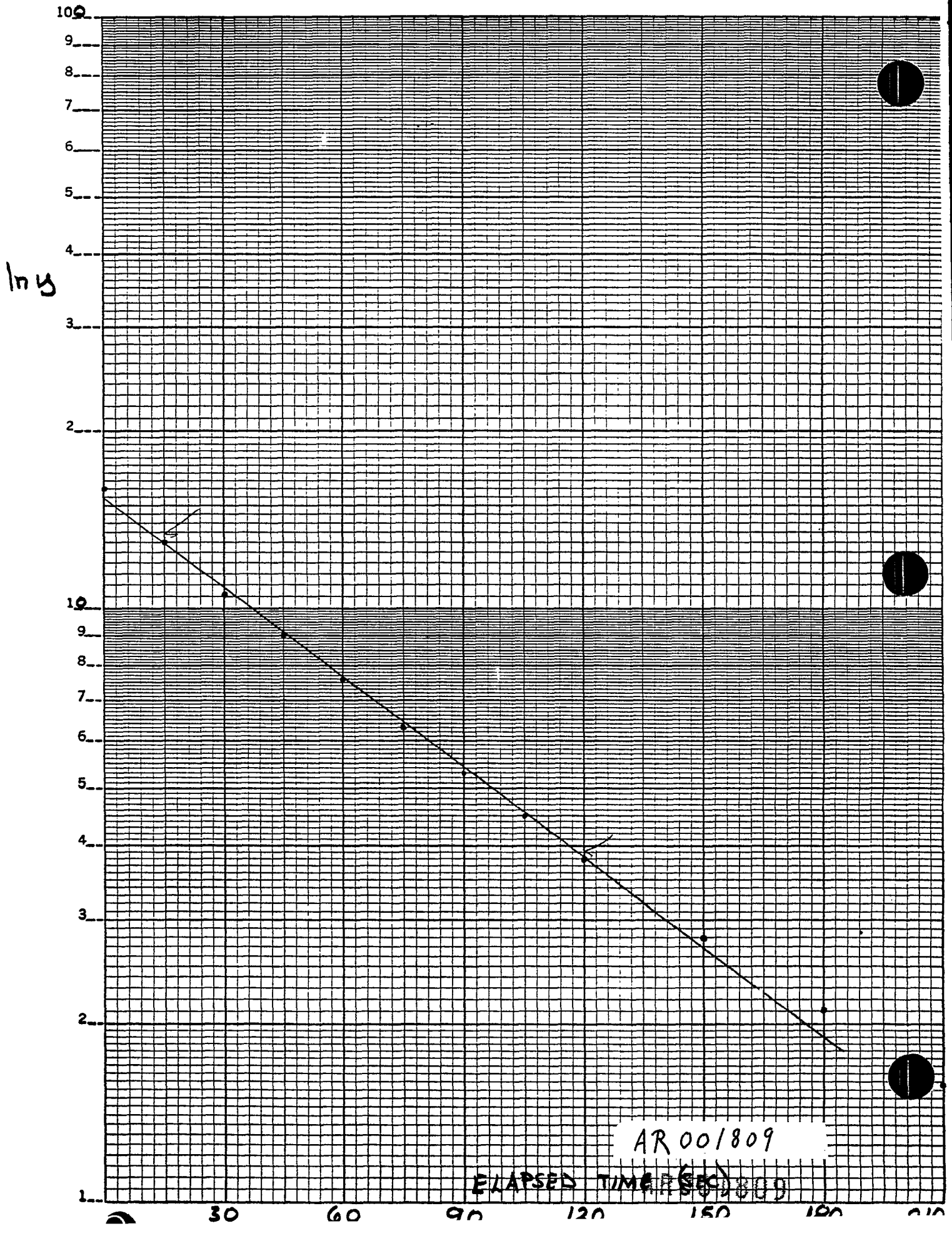
$$= (0.2339 + 0.0481) = 3.5464$$

$$K = \frac{r_c^2 \ln R_e/r_w}{2L} \cdot \frac{1}{t} \cdot \ln \frac{y_0}{y_t}$$

$$= \frac{(.0833)^2 (3.5464)}{2\ (33.80)} \cdot \frac{1}{120\text{ sec}} \cdot \ln \frac{15.41}{3.83} = 4.223 \times 10^{-6} \frac{ft}{sec}$$

$$\times \frac{12\text{ in}}{ft} \times 2.54 \frac{cm}{in} = 1.3 \times 10^{-4}\ cm/sec$$

AR001808



AR 001809

MALCOLM PIRNIE

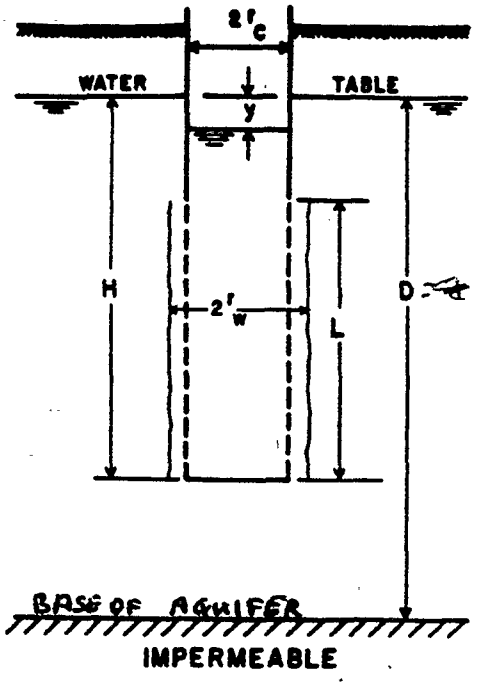
MALCOLM PIRNIE, INC.

BY RHO DATE 7 SHEET NO. ..... OF .....

CHKD. BY RHP DATE 2/17/11 JOB NO. .....

SUBJECT MW-26A (6-15-88)

ORIGINAL (RED)



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER)
= H
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 27.00 + 2.20 − 14.02 = 15.18'
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 7.5'

r_c = WELL ϕ = = 0.167'
y_0 = INITIAL DRAWDOWN = 1.98
y_t = DRAWDOWN AT TIME (t) = 0.82
t = TIME t sec = 10

L/r_w = 15.0
A =
B =
C = 1.5

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

=

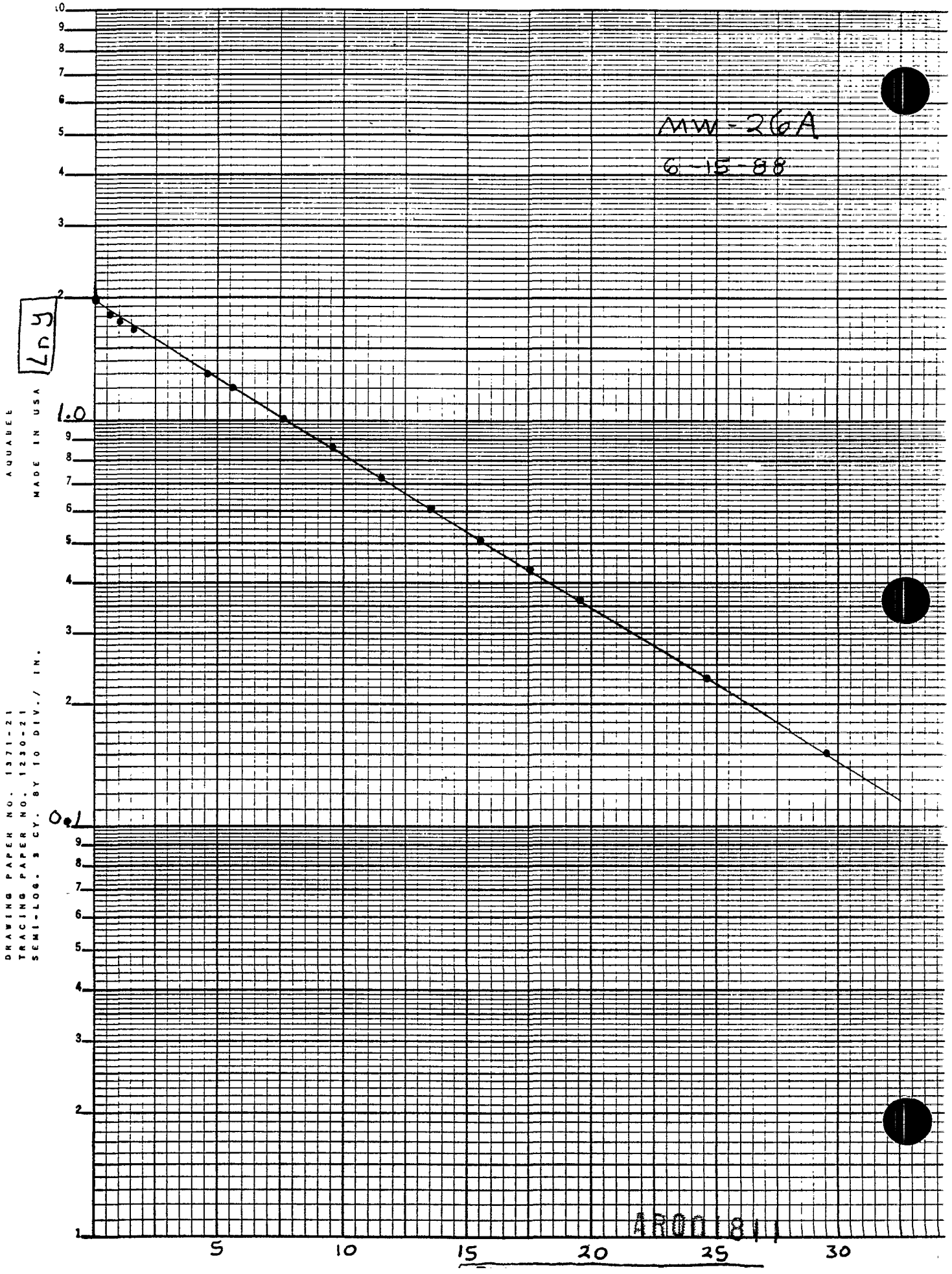
$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1} = \left(\frac{1.1}{3.413} + \frac{1.5}{15.0}\right)^{-1} = 2.368$$

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L}\left(\frac{1}{t}\right)\ln\frac{y_0}{y_t} = \frac{(.167)^2(2.368)}{2(7.50)} \cdot \frac{1}{10} \cdot \ln\frac{1.98}{.82}$$

$$= .0003881 \text{ ft/sec} \times \frac{12 \text{ in}}{\text{ft}} \times \frac{2.54 \text{ cm}}{\text{in}} = 1.2 \times 10^{-2} \text{ cm/sec}$$

.0038814

AR001810


MW-26A
6-15-88
Ln y
1.0
0.1
5
10
15
20
25
30
AQUABEL
MADE IN USA
DRAWING PAPER NO. 1371-21
TRACING PAPER NO. 1230-21
SEMI-LOG. 3 CY. BY 10 DIV./ IN.

AR001811

ORIG. (RED)

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 ARMY COE	MILLCREEK	6/15/88	26A

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	REMOVE 2" DIAM SOLID SLUG – MONITOR WATER LEVEL W/ TRANSDUCER	14.02 TOC	RNO

CLOCK TIME	ELAPSED TIME (t) Units: SEC.	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	0	16.00	1.98	1.0	✓
	0.2	15.91	1.89		
	0.4	15.89	1.87		
	0.6	15.85	1.83	.92	
	0.8	15.81	1.79		
	1.0	15.78	1.76	.89	✓
	1.2	15.75	1.73	.87	
	1.4	15.72	1.70		
	1.6	15.70	1.68	.85	
	2.6	15.56	1.54	.78	
	3.6	15.44	1.42		
	4.6	15.32	1.30	.66	✓
	5.6	15.22	1.20	.61	
	6.6	15.13	1.11		
	7.6	15.04	1.02	.52	
	8.6	14.96	.94		
	9.6	14.88	.86	.43	✓
	10.6	14.81	.79		
	11.6	14.75	.73	.37	
	12.6	14.69	.67		
	13.6	14.63	.61	.31	✓
	14.6	14.58	.56		
	15.6	14.53	.51	.26	
	16.6	14.49	.47		

ORIGINAL (RED)

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
		6/15/88	26A

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD		14.02 TOC	RHO

CLOCK TIME	ELAPSED TIME (t) Units: sec	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	17.6	14.45	.43	.22	
	18.6	14.42	.40		
	19.6	14.38	.36	.18	
	24.6	14.25	.23	.12	
	29.6	14.17	.15	.08	
	34.6	14.11	.09		
	39.6	14.08	.06		
	44.6	14.06	.04		
	49.6	14.05	.03		
	54.6	14.04	.02		
	59.6	14.03	.01		

MALCOLM PIRNIE

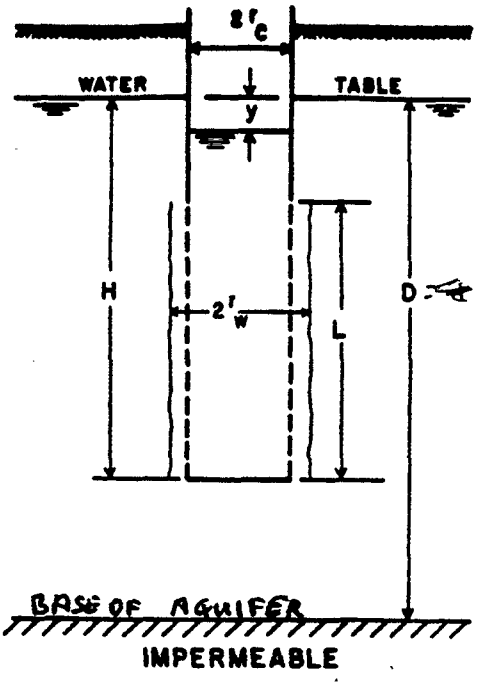
MALCOLM PIRNIE, INC.

BY RHO DATE SHEET NO. OF

CHKD. BY RHF DATE 2/89 JOB NO.

SUBJECT MW-26B (5-31-88)

ORIGINAL (RED)



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER)
= 27.0 + 2.02 − 12.65 = 16.37
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 15.25 + 2.02 − 12.65 = 4.62
=

r_w = BOREHOLE ϕ = .5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 16.0 − 9.1 − 1.20* = 5.7'
* Unsaturated length of Sand Pack

r_c = WELL ϕ = = .167'
y_0 = INITIAL DRAWDOWN = 2.12'
y_t = DRAWDOWN AT TIME (t) = 0.71'
t = TIME t MIN = 16

L/r_w	=	11.40
A	=	1.95
B	=	1.25
C	=	

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

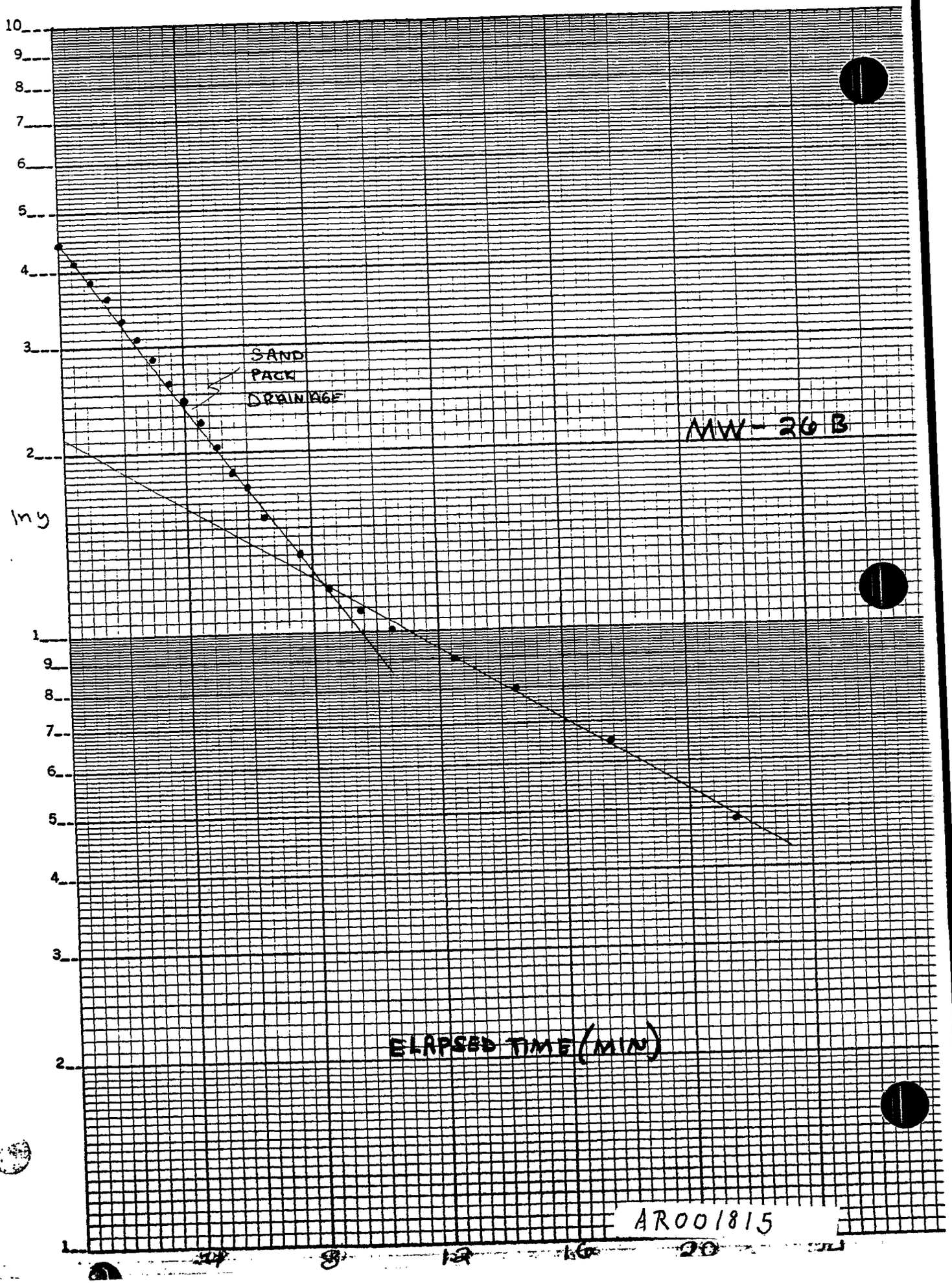
$$= \left(\frac{1.1}{2.2235} + \frac{1.95 + 1.25\,(3.1570)}{11.40}\right)^{-1} = .9882$$

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1}$$

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\left(\frac{1}{t}\right) \ln \frac{y_0}{y_t} = \frac{(.167)^2\,(.9882)}{2\,(5.70)} \cdot \frac{1}{16} \cdot \ln \frac{2.12}{.71}$$

$$= 1.6529 \times 10^{-4}\ \frac{ft}{min} \times \frac{1\ min}{60\ sec} \times 12\ \frac{in}{ft} \times 2.54\ \frac{cm}{in} = 8.4 \times 10^{-5}\ \frac{cm}{sec}$$

AR001814


10
9
8
7
6
5
4
3
2
ln y
1
9
8
7
6
5
4
3
2
1
SAND PACK DRAINAGE
MW-26B
ELAPSED TIME (MIN)
4
8
12
16
20

AR001815

FIELD DATA SHEET

IN SITU HYDRAULIC CONDUCTIVITY TEST

ORIGINAL (RED)

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
Millcreek	Eire	5/31/88	26B

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF.	TESTED BY
Rising Head	Bail 4gal	ℓ_i (ft) 12.65' Below Steel	RHO

CLOCK TIME	ELAPSED TIME ( )	WATER LEVEL BELOW REF. AT TIME t (ℓ_t) (ft)	HEAD AT TIME t (h_t) $h_t = \ell_t - \ell_i$	Head Ratio h_t/h_o	REMARKS
1:02:30	0	17.10	4.45		
03:00	.50	16.80	4.15		
3:30	1.00	16.50	3.35		
4:00	1.50	16.25	3.60		
4:30	2.00	15.98	3.33		
5:00	2.50	15.73	3.08		
5:30	3.00	15.50	2.85		
6:00	3.50	15.25	2.60		
6:30	4.0	15.07	2.42		
7:00	4.50	14.87	2.22		
7:30	5.00	14.68	2.03		
8:00	5.50	14.51	1.86		
8:30	6.00	14.36	1.71		
9:00	6.50	14.22	1.57		
10:00	7.50	14.00	1.35		
11:00	8.50	13.84	1.19		
12:00	9.50	13.74	1.09		
13:00	10.50	13.66	1.01		
15:00	12.50	13.55	0.90		
17.00	14.50	13.45	0.80		
20:00	17.50	13.30	0.65		
24:00	21.50	13.13	0.48		
32:00	29.50	12.88	0.23		

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
7235-23-1 COE	MILLCREEK	2-17-98	26B

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
Falling Head	Add 3gal of Water	13.12	

CLOCK TIME	ELAPSED TIME (t) Units: _____	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
402:20 ↓ 402:30	Add 3gals	Flow thru screen into rapid and audible		sandpack	was
402:50		12.10			
403:10		12.15			
403:20		12.20			
403:50		12.25			
404:30		12.30			
05:30		12.35			
07:05		12.40			
08:00		12.42			
10:00		12.48			
12:00		12.51			
15:30		12.57			
17:00		12.62			
18:45		12.70			
20:45		12.80			
22:05		12.85			
24:05		12.90			
26:45		12.95			
30:00		13.00			

MALCOLM PIRNIE

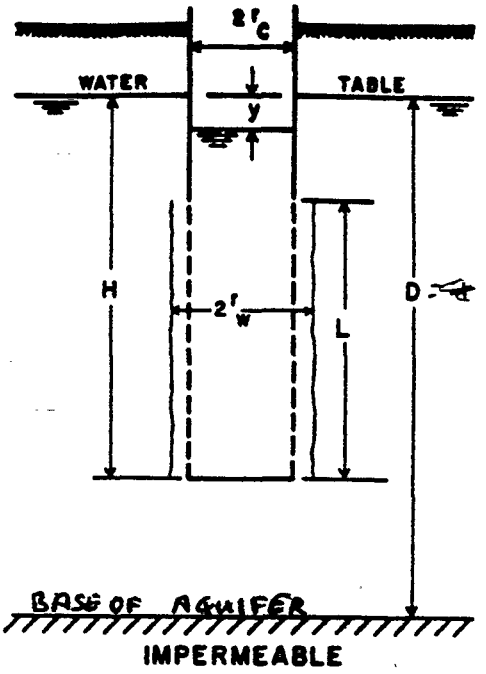
MALCOLM PIRNIE, INC.

BY RHO DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 2/89 JOB NO. .....

SUBJECT MW-27A (5-16-88)

ORIGINAL (RED)



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER)
= H
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 30.0 + 2.3 − 10.46 = 21.84'
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 31.0 − 22.8 = 8.2'

r_c = WELL ϕ =	= .167'	L/r_w	=	16.4
y_0 = INITIAL DRAWDOWN	= 3.46'			
y_t = DRAWDOWN AT TIME (t)	= .53'	A	=	
t = TIME t min	= 14	B	=	
		C	=	1.75

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

=

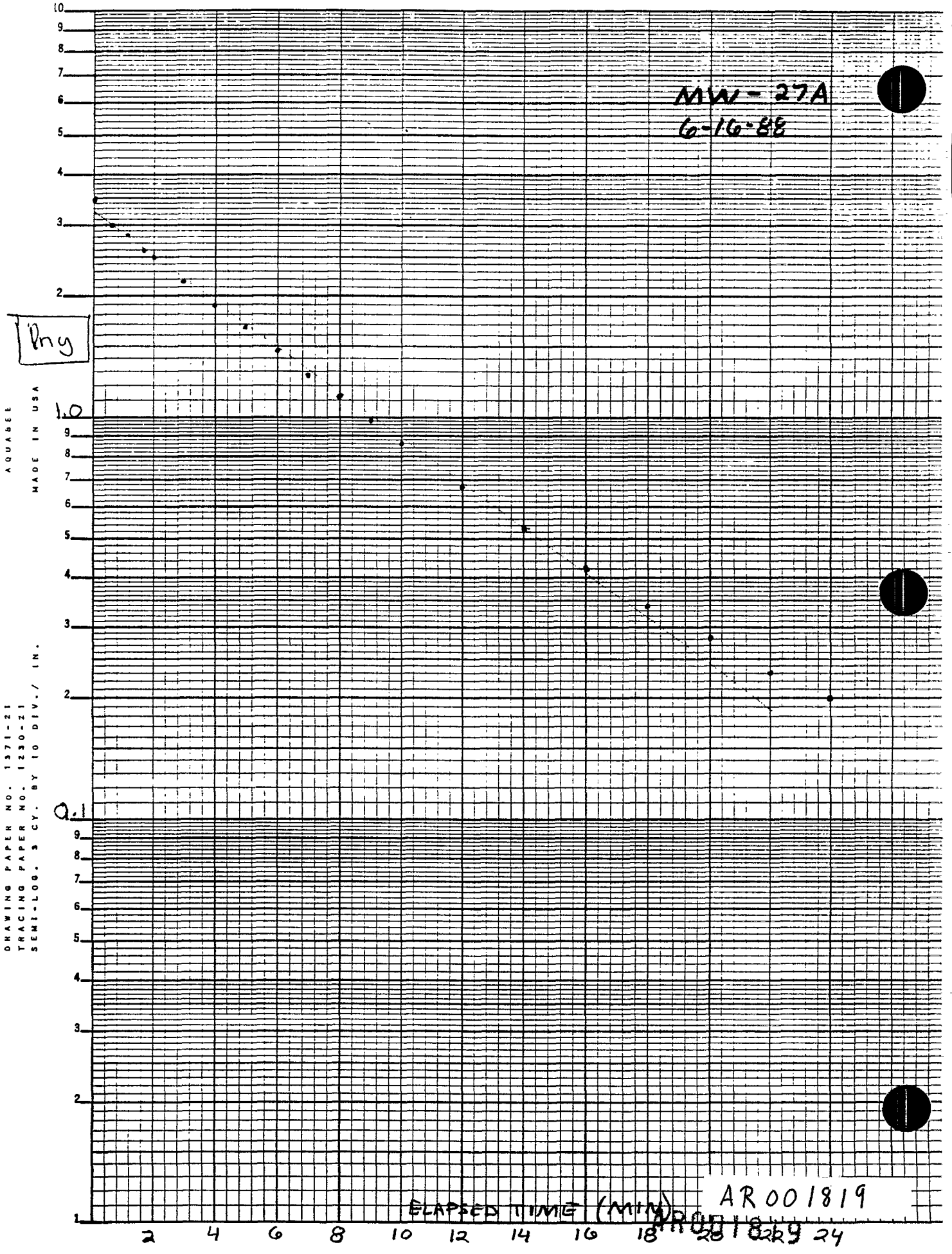
$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1} = \left(\frac{1.1}{3.78} + \frac{1.75}{16.4}\right)^{-1} = 2.514$$

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\left(\frac{1}{t}\right) \ln \frac{y_0}{y_t} = \frac{(.167)^2(2.514)}{2(8.2')} \cdot \frac{1}{14} \cdot \ln \frac{3.46}{.53}$$

(.00428) — NO EFFECT

$$= 5.729 \times 10^{-4} \frac{ft}{min} \times 12 \frac{in}{ft} \times 2.54 \frac{cm}{in} \times \frac{1 min}{60 s} = 2.9 \times 10^{-4} cm/sec$$

AR001818


MW-27A
6-16-88
Dry
1.0
0.1
ELAPSED TIME (MIN)
2
4
6
8
10
12
14
16
18
20
22
24
AR001819
AQUABEE
MADE IN USA
DRAWING PAPER NO. 1371-21
TRACING PAPER NO. 1230-21
SEMI-LOG. 3 CY. BY 10 DIV./ IN.

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 COE	MILLCREEK	6-16-88	27 A

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	2" PVC SLUG & Transducer	10.46	RHO

CLOCK TIME	ELAPSED TIME (t) Units: min	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	0	13.92	3.46 ✓		
	.157	13.70	3.24		
	.307	13.62	3.16		
	.64	13.47	3.01		
	.89	13.37	2.91		
	1.14	13.27	2.81		
	1.39	13.17	2.71		
	1.72	13.05	2.59		
	1.97	12.96	2.50		
	2.97	12.64	2.18		
	3.97	12.36	1.90		
	4.97	12.12	1.66		
	5.97	11.92	1.46		
	6.97	11.73	1.27		
	7.97	11.58	1.12		
	8.97	11.44	.98		
	9.97	11.32	.86		
	11.97	11.13	.67		
	✓13.97	10.99	.53 ✓		
	15.97	10.88	.42		
	17.97	10.80	.34		
	19.97	10.74	.28		
	21.97	10.69	.23		
	23.97	10.66	.20		

MALCOLM PIRNIE

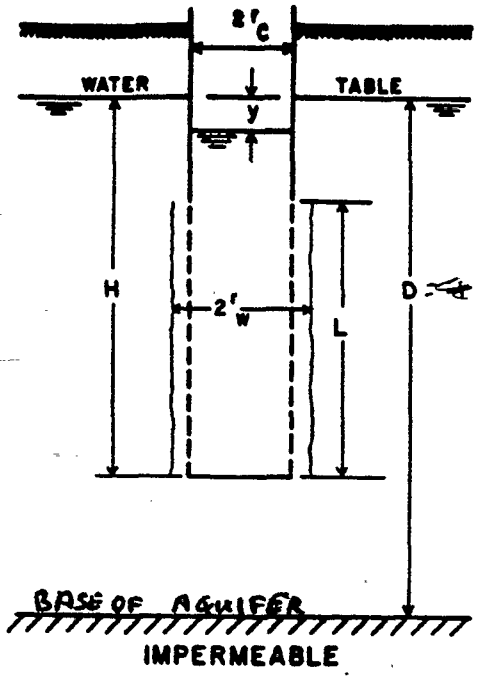
MALCOLM PIRNIE, INC.

BY RHO DATE ..... SHEET NO. ..... OF .....

CHKD. BY AF DATE 2/91 JOB NO. .....

SUBJECT MW-27B (6-15-88)

ORIGINAL (RED)



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER)
= 15.5 + 2.05 − 10.55 = 7.00'
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 12.65 + 2.05 − 10.55 = 4.15'
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 12.3 − 6.0 − 2.1* = 4.2'
* Non Sat. Section of Sand Pack

r_c = WELL ϕ = .167'
y_0 = INITIAL DRAWDOWN = 1.35' *
y_t = DRAWDOWN AT TIME (t) = .35'
t = TIME t sec = 27

L/r_w	=	8.4
A	=	1.95
B	=	1.25
C	=	

*NOTE: IS ½ BAGS OF SAND PACK ADDED TO STABILIZE GRAVEL LENS ∴ USED EARLY TIME DATA AS MORE REPRESENTATIVE OF PERMEABLE GRAI

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

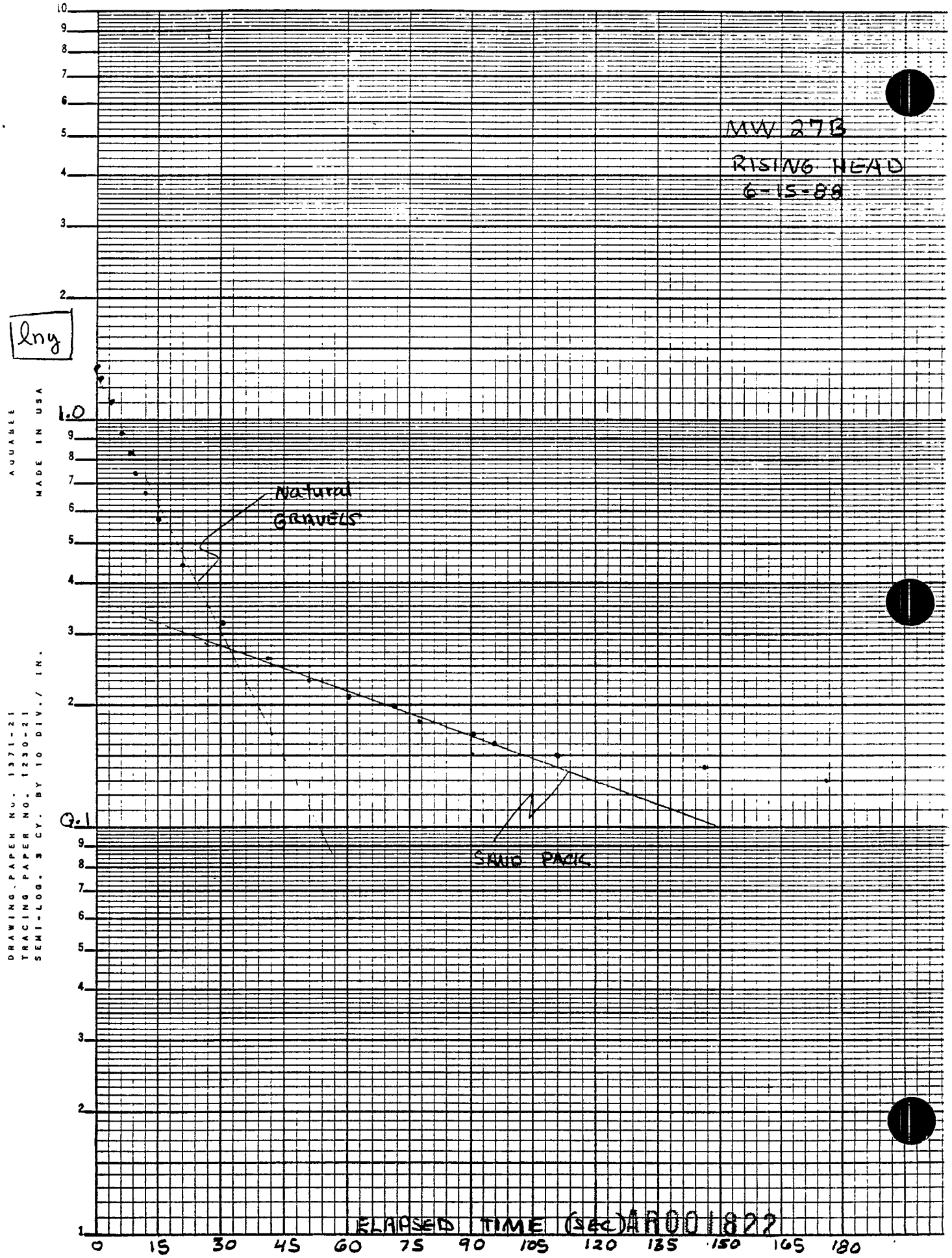
$$= \left(\frac{1.1}{2.1163} + \frac{1.95 + 1.25\,(1.7405)}{8.4}\right)^{-1} = .9892$$

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1}$$

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\left(\frac{1}{t}\right) \ln \frac{y_0}{y_t} = \frac{(.167)^2\,(.9892)}{2\,(4.2)}\,\frac{1}{27}\,\ln \frac{1.35}{.35}$$

$$= 1.642 \times 10^{-4}\ \frac{ft}{sec} \times \frac{12\ in}{ft} \times \frac{2.54\ cm}{in} = 5.0 \times 10^{-3}\ \frac{cm}{sec}$$

AR001821


MW 27B
RISING HEAD
6-15-88
lny
1.0
0.1
Natural
GRAVELS
SAND PACK
ELAPSED TIME (SEC)
0
15
30
45
60
75
90
105
120
135
150
165
180
AQUABEE
MADE IN USA
DRAWING PAPER NO. 1371-21
TRACING PAPER NO. 1230-21
SEMI-LOG. 3 CY. BY 10 DIV./ IN.

ORIGINAL (RED)

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 COE	MILLCREEK	6-15-88	27B

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	2" PVC SLUG & TRANSDUCER	10.55 STEEL	RHO

CLOCK TIME	ELAPSED TIME (t) Units: sec	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	0	11.90	1.35		
	1	11.81	1.26		
	2	11.72	1.17		
	3	11.65			
	4	11.58	1.10		
	5	11.52			
	6	11.47	0.92		
	7	11.42			
	8	11.38	0.83		
	9	11.33			
	10	11.29	0.74		
	11	11.25			
	12	11.21	0.66		
	13	11.18			
	14	11.15			
	15	11.12	0.57		
	16	11.09			
	21	10.99	0.44		
	26	10.92			
	31	10.87	0.32		
	36	10.83			
	41	10.81	0.26		
	46	10.79			
	51	10.78	0.23		
	56	10.77			
	61	10.76	0.21		
	66	10.75			
	71	10.75	0.20		
	76	10.73	0.18		
	91	10.72	0.19		
	96	10.71	0.16		
	111	10.70	0.15		
	146	10.69	0.14		
	176	10.68	0.13		

** VARIABLE HEAD PERMEABILITY TEST **

PROJECT NAME: MILLCREEK

PROJECT NUMBER: 0285-23-1

DATE TESTED: 5-20-88

WELL NUMBER: MW-28A

INITIAL WATER LEVEL (Li): 5.42 FT TOC

ELAPSED TIME (MIN)	WATER LEVEL AT TIME t (Lt) (FT)	HEAD AT TIME t (Ht) Ht = Lt (FT)	HEAD RATIO Ht/Ho
0.0	16.00	10.6	1.00
0.3	15.69	10.3	0.97
0.8	15.17	9.8	0.92
1.3	14.69	9.3	0.88
1.8	14.27	8.9	0.84
2.3	13.86	8.4	0.80
2.8	13.47	8.1	0.76
3.3	13.09	7.7	0.72
3.8	12.72	7.3	0.69
4.3	12.40	7.0	0.66
4.8	12.05	6.6	0.63
5.3	11.75	6.3	0.60
5.8	11.43	6.0	0.57
6.3	11.15	5.7	0.54
6.8	10.87	5.4	0.52
7.3	10.60	5.2	0.49
7.8	10.31	4.9	0.46
8.3	10.07	4.6	0.44
9.3	9.60	4.2	0.40
10.3	9.20	3.8	0.36
11.3	8.80	3.4	0.32
12.3	8.47	3.1	0.29
13.3	8.17	2.8	0.26
14.3	7.85	2.4	0.23
16.3	7.33	1.9	0.18
18.3	6.62	1.2	0.11
20.3	6.58	1.2	0.11
23.5	6.18	0.8	0.07
27.3	5.84	0.4	0.04
30.3	5.68	0.3	0.02

WELL RADIUS (r) = 2 INCHES
SAND PACK RADIUS (R) = 6 INCHES
LENGHTH OF SAND PACK (L) = 12.3 FT

FIRST HEAD RATIO (H1) 0.66 ELAPSED TIME IN MINUTES (T1) 4.3
SECOND HEAD RATIO (H2) 0.23 ELAPSED TIME IN MINUTES (T2) 14.3

$$K = \frac{r^2 * Ln (L/R) * Ln (H1/H2)}{2 (L) * (T2 - T1) * 60 \text{ SEC/MIN}}$$

** K = 1.927034E-04 CM/SEC **

AR001824

NOTE: DATA IS CONVERTED FROM ENGLISH TO METRIC UNITS

ORIG. (RED)

** VARIABLE HEAD PERMEABILITY TEST **

PROJECT NAME: [illegible] PROJECT NUMBER: [illegible]-23-1

DATE TESTED: 5-[illegible] WELL NUMBER: MW-28B

INITIAL WATER LEVEL (Li): 5.1 FT TOC

ELAPSED TIME (MIN)	WATER LEVEL AT TIME t (Lt) (FT)	HEAD AT TIME t (Ht) Ht = Lt (FT)	HEAD RATIO Ht/Ho
0.0	11.10	6.0	1.00
0.5	9.92	4.8	0.80
0.8	9.45	4.3	0.72
1.0	9.05	4.0	0.67
1.5	8.40	3.3	0.55
2.0	7.85	2.8	0.46
2.5	7.37	2.3	0.38
3.0	7.00	1.9	0.32
3.5	6.68	1.6	0.26
4.0	6.42	1.3	0.22
4.5	6.18	1.1	0.18
5.0	6.00	0.9	0.15
5.5	5.87	0.8	0.13
6.0	5.74	0.6	0.11
6.5	5.65	0.6	0.09
7.0	5.55	0.5	0.08
7.5	5.47	0.4	0.06
8.0	5.42	0.3	0.05

WELL RADIUS (r) = 2 INCHES
SAND PACK RADIUS R) = 6 INCHES
LENGHTH OF SAND PACK (L) = 5.5 FT

FIRST HEAD RATIO (H1) 0.80 ELAPSED TIME IN MINUTES (T1) 0.5
SECOND HEAD RATIO (H2) 0.15 ELAPSED TIME IN MINUTES (T2) 5.0

$$K = \frac{r^2 * Ln\ (L/R) * Ln\ (H1/H2)}{2\ (L) * (T2 - T1) * 60\ SEC/MIN}$$

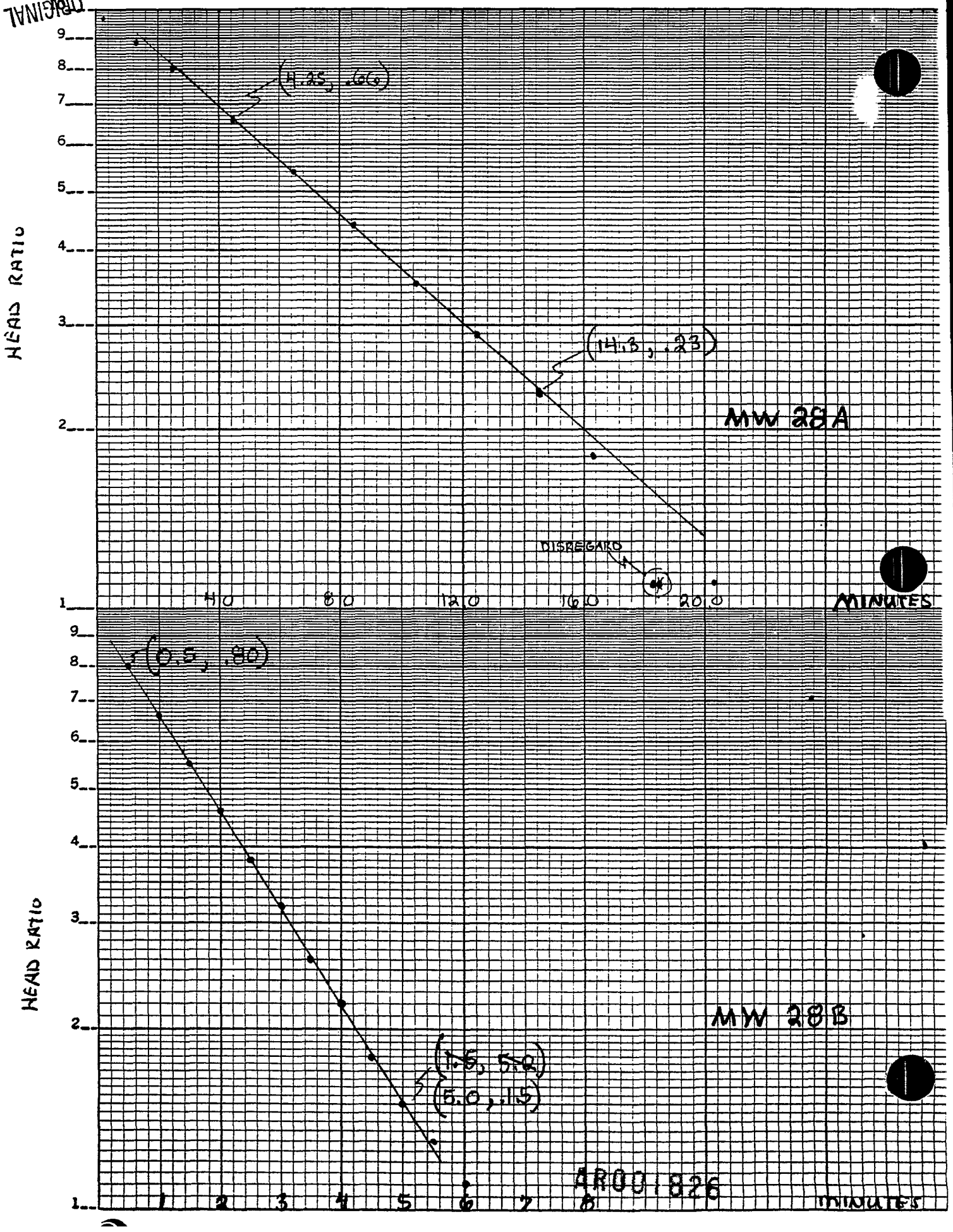
** K = 1.035699E-03 CM/SEC **

NOTE: DATA IS CONVERTED FROM ENGLISH TO METRIC UNITS

OK RHi

AR001825

ORIGINAL (RED)



AR001826

ORIG (RED)

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
ARMY COE 0285-23-1	MILLCREEK	5/20/88	MW-28A

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	BAILED	5.42 TOC	RHO

CLOCK TIME	ELAPSED TIME (t) Units: min	WATER LEVEL BELOW REF. AT TIME t(l_t)(Ft)	HEAD AT TIME t(h_t) $h_t = l_t - l_i$	HEAD RATIO h_t/h_o	REMARKS
10:59:45	~~.25~~ 0	16.00	10.58	1.0	
11:00:00	.25	15.69	10.27	.97	
00:30	.75	15.17	9.75		
1:00	1.25	14.69	9.27	.88	
1:30	1.75	14.27			
2:00	2.25	13.86	8.44	.80	
2:30	2.75	13.47			
3:00	3.25	13.09	7.67		
3:30	3.75	12.72			
4:00	4.25	12.40	6.98	.66	
4:30	4.75	12.05			
5:00	5.25	11.75	6.33		
5:30	5.75	11.43			
6:00	6.25	11.15	5.73	.54	
6:30	6.75	10.87			
7:00	7.25	10.60	5.18		
7:30	7.75	10.31			
8:00	8.25	10.07	4.65	.44	
9:00	9.25	9.60			
10:00	10.25	9.20	3.78	.36	
11:00	11.25	8.80			
12:00	12.25	8.47	3.05	.29	

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 ARMY COE	MILLCREEK	5/20/88	MW-28A

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	BAILED	5.42 TOC	RHO

CLOCK TIME	ELAPSED TIME (t) Units: min	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
13:00	13.25	8.17			
14:00	14.25	7.85	2.43	.23	
16:00	16.25	7.33			
18:00	18.25	6.62	1.20	.11	
20:00	20.25	6.58			
23:15	23.50	6.18	.76		
27:00	27.25	5.84			
30:00	30.25	5.68			

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
ARMY COE 0285-23-1	MILLCREEK	5/20/88	MW-28B

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	BAILED	5.10 TOC	RHO

CLOCK TIME	ELAPSED TIME (t) Units: min	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
10:40:30	0	11.10	6.00	1.0	
41:00	.50	9.92	4.82	.80	
41:15	.75	9.45	4.35	.73	
41:30	1.00	9.05	3.95	.66	
42:00	1.50	8.40	3.30	.55	
42:30	2.0	7.85	2.75	.46	
43:00	2.50	7:37	2.27	.38	
43:30	3.00	7.00	1.90	.32	
44:00	3.50	6.68	1.58	.26	
44:30	4.00	6.42	1.32	.22	
45:00	4.50	6.18	1.08	.18	
45:35	5.00	6.00	.90	.15	
46:00	5.50	5.87	.77	.13	
46:30	6.00	5.74	.64	.11	
47:00	6.50	5.65	.55	.09	
47.30	7:00	5.55			
48:00	7.50	5.47			
48:30	8.00	5.42			

MALCOLM PIRNIE

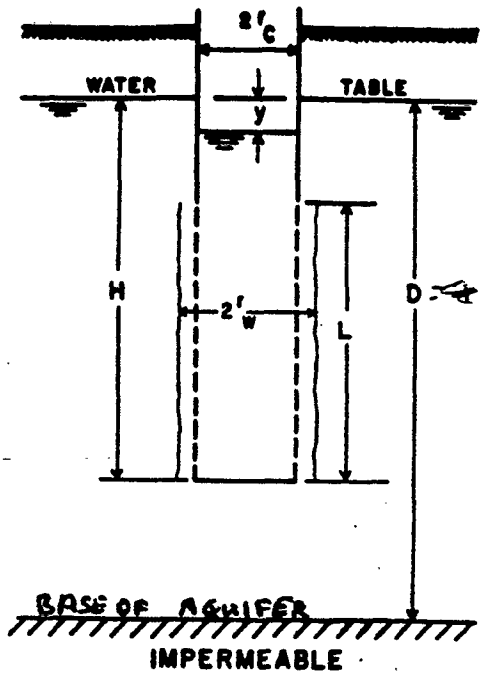
MALCOLM PIRNIE, INC.

BY RHO DATE SHEET NO. OF

CHKD. BY RHC DATE 2/89 JOB NO.

SUBJECT MW-29 (5-31-88)

ORIGINAL (RED)



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER)
= H
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 20.5 − 0.3 − 8.80 = 11.40'
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 20.0 − 8.0 − 1.1* = 10.90

* NON-SAT. PORTION OF SAND PACK

r_c = WELL ϕ = .167'
y_o = INITIAL DRAWDOWN = 4.50'
y_t = DRAWDOWN AT TIME (t) = 0.55
t = TIME t min = 4.2

L/r_w = 21.80
A =
B =
C = 1.90

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

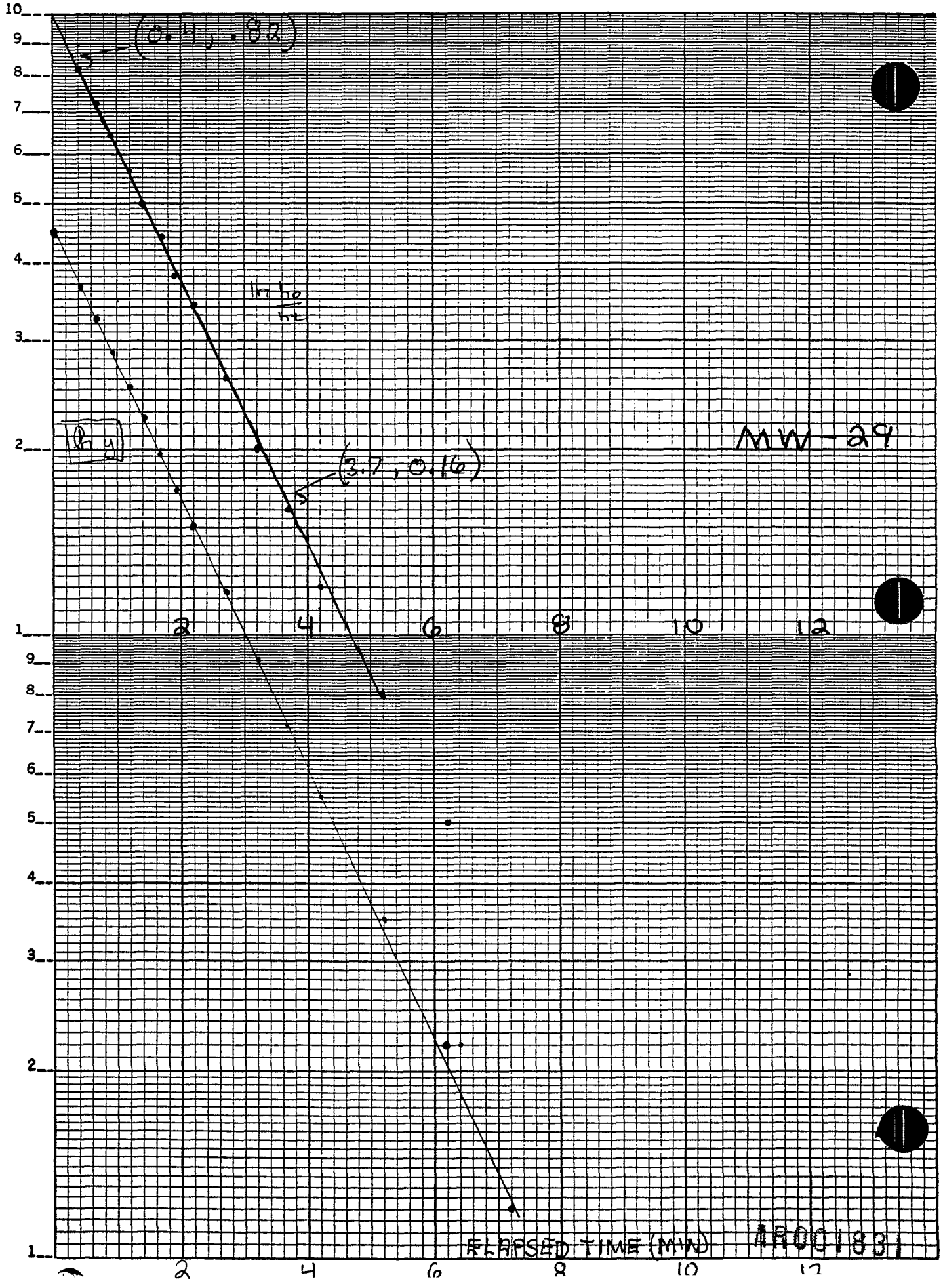
=

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1} = \left(\frac{1.1}{3.1268} + \frac{1.90}{21.80}\right)^{-1} = 2.2781$$

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\left(\frac{1}{t}\right)\ln\frac{y_o}{y_t} = \frac{(.167)^2(2.2781)}{2(10.90)}\cdot\frac{1}{4.2}\cdot\ln\frac{4.50}{.55}$$

$$= 1.4585 \times 10^{-3}\ \frac{ft}{min} \times 12\frac{in}{ft} \times 2.54\frac{cm}{in} \times 1\frac{min}{60sec} = 7.4\times10^{-4}\ \frac{cm}{sec}$$

AR001830


(0.11, .82)
ln he/ht
ln y
(3.7, 0.16)
MW-29
ELAPSED TIME (MIN)
AR001831

FIELD DATA SHEET

IN SITU HYDRAULIC CONDUCTIVITY TEST

ORIGINAL (RED)

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
Millcreek	Erie, PA	5/31/88	29

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF.	TESTED BY
Rising Head	Bail 5gal	l_i (ft) 8.80 TOC	RHO

CLOCK TIME	ELAPSED TIME (min)	WATER LEVEL BELOW REF. AT TIME t (l_t) (ft)	HEAD AT TIME t (h_t) $h_t = l_t - l_i$	Head Ratio h_t/h_o	REMARKS
2:42:50	0	13.30	4.50		
43:15	.42	12.47	3.67		
43:30	.67	12.04	3.24		
43:45	.92	11.67	2.87		
44:00	1.17	11.32	2.52		
44:15	1.42	11.05	2.25		
44:30	1.67	10.77	1.97		
44:45	1.92	10.52	1.72		
45:00	2.17	10.32	1.52		
45:30	2.67	9.98	1.18		
46:00	3.17	9.72	0.92		
46:30	3.67	9.52	0.72		
47:00	4.17	9.35	0.55		
48:00	5.17	9.15	0.35		
49:00	6.17	9.02	0.22		
50:00	7.17	8.92	0.12		
52:00	9.17	8.86	0.06		
56:00	13.17	8.82	0.02		
~~:00:00~~		~~8.82~~			

AR001832

ORIGINAL (RED)

VARIABLE HEAD PERMEABILITY TEST

PROJECT NAME: MILLCREEK PROJECT NUMBER: 0188-23-1

DATE TESTED: 5-31-88 WELL NUMBER: MW-29

INITIAL WATER LEVEL (Li): 8.8 FT TOC

ELAPSED TIME (MIN)	WATER LEVEL AT TIME t (Lt) (FT)	HEAD AT TIME t (Ht) Ht = Lt (FT)	HEAD RATIO Ht/Ho
0.0	13.30	4.5	1.00
0.4	12.47	3.7	0.82
0.7	12.04	3.2	0.72
0.9	11.67	2.9	0.64
1.2	11.32	2.5	0.56
1.4	11.05	2.3	0.50
1.7	10.77	2.0	0.44
1.9	10.52	1.7	0.38
2.2	10.32	1.5	0.34
2.7	9.98	1.2	0.26
3.2	9.72	0.9	0.20
3.7	9.52	0.7	0.16
4.2	9.35	0.6	0.12
5.2	9.15	0.3	0.08
6.2	9.02	0.2	0.05
7.2	8.92	0.1	0.03
9.2	8.86	0.1	0.01
13.2	8.82	0.0	0.00

WELL RADIUS (r) = 2 INCHES
SAND PACK RADIUS (R) = 6 INCHES
LENGHTH OF SAND PACK (L) = 12.5 FT

FIRST HEAD RATIO (H1) 0.82 ELAPSED TIME IN MINUTES (T1) 0.4
SECOND HEAD RATIO (H2) 0.16 ELAPSED TIME IN MINUTES (T2) 3.7

$$K = \frac{r^2 * Ln (L/R) * Ln (H1/H2)}{2 (L) * (T2 - T1) * 60 \text{ SEC/MIN}}$$

** K = 8.997011E-04 CM/SEC **

NOTE: DATA IS CONVERTED FROM ENGLISH TO METRIC UNITS

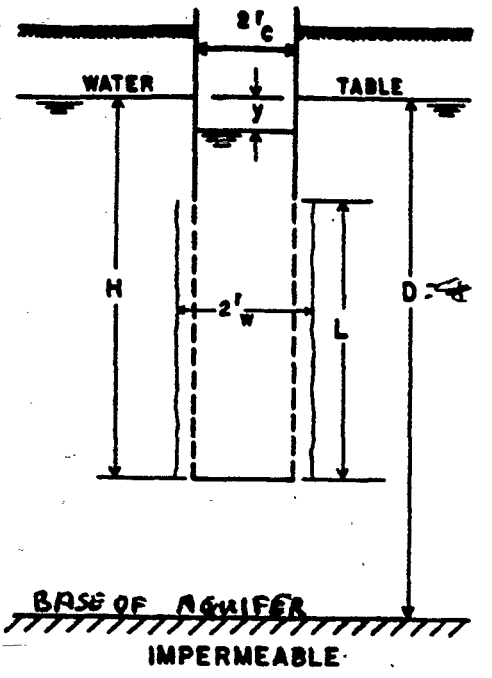
MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 3/89 JOB NO. .....

SUBJECT MW-30 (5-31-88)



D = ELEV(WATER LEVEL) − ELEV(BASE OF AQUIFER)
= 22.8 − 0.30 − 4.85 = 17.65'
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 20.5 − 0.30 − 4.85 = 15.35'
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 20.5 − 6.0 = 14.50'

r_c = WELL ϕ =	= 0.167'	L/r_w =	29.00
y_0 = INITIAL DRAWDOWN	= 5.55'		
y_t = DRAWDOWN AT TIME (t)	= 0.62'	A =	2.20
t = TIME t min	= 5.50	B =	1.37
		C =	

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

$$= \left(\frac{1.1}{3.4243} + \frac{2.20 + 1.37(1.5261)}{29.0}\right)^{-1} = 2.1311$$

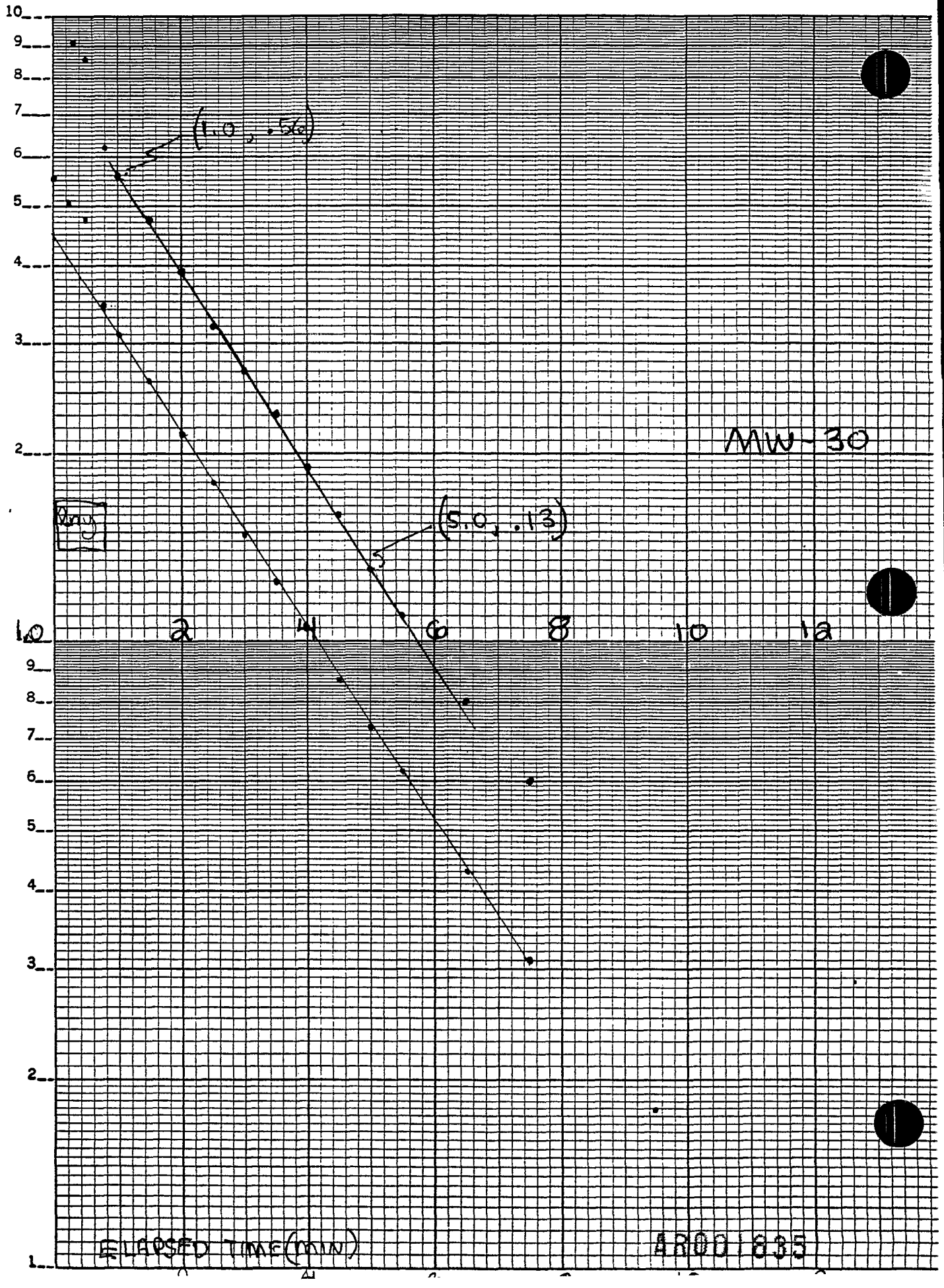
$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1}$$

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L}\left(\frac{1}{t}\right)\ln\frac{y_0}{y_t} = \frac{(.167)^2(2.1311)}{2\,(14.50)}\cdot\frac{1}{5.5\,\text{min}}\cdot\ln\frac{5.55}{.62}$$

$$K = 8.1624 \times 10^{-4}\ \frac{ft}{min} \times \frac{12\,in}{ft} \times \frac{2.54\,cm}{in} \times \frac{1\,min}{60\,sec} = 4.1 \times 10^{-4}\ \frac{cm}{sec}$$

82

AR001834


(1.0, .56)
(5.0, .13)
MW-30
2
4
6
8
10
12
ELAPSED TIME (min)
AR001835

FIELD DATA SHEET

IN SITU HYDRAULIC CONDUCTIVITY TEST

OR (RED)

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMB
Millcreek	Erie, PA	5/31/88	30

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF.	TESTED B
Rising Head	Bail 5gal	ℓ_i (ft) 4.85' TOC	RHO

CLOCK TIME	ELAPSED TIME (min)	WATER LEVEL BELOW REF. AT TIME t (ℓ_t) (ft)	HEAD AT TIME t (h_t) $h_t = \ell_t - \ell_i$	Head Ratio h_t/h_o	REMARKS
2:19:30	0	10.4	5.55		
19:45	.25	9.9	5.05		
20:00	.50	9.6	4.75		
20:15	.75	8.3	3.45		
20:30	1.00	7.95	3.10		
21:00	1.50	7.44	2.59		
21:30	2.00	7.0	2.15		
22:00	2.50	6.65	1.80		
22:30	3.00	6.33	1.48		
23:00	3.50	6.10	1.25		
23:30	4.00	5.90	1.05		
24:00	4.50	5.72	0.87		
24:30	5.00	5.58	0.73		
25:00	5.50	5.47	0.62		
26:00	6.50	5.28	0.43		
27:00	7.50	5.16	0.31		
29:00	9.50	5.03	0.18		

AR001836

** VARIABLE HEAD PERMEABILITY TEST **

PROJECT NAME: MILLCREEK PROJECT NUMBER: 0285-23-3

DATE TESTED: 5-31-88 WELL NUMBER: MW-30

INITIAL WATER LEVEL (Li): 4.85 FT TOC

ELAPSED TIME (MIN)	WATER LEVEL AT TIME t (Lt) (FT)	HEAD AT TIME t (Ht) Ht = Lt (FT)	HEAD RATIO Ht/Ho
0.0	10.40	5.5	1.00
0.3	9.90	5.0	0.91
0.5	9.60	4.8	0.86
0.8	8.30	3.5	0.62
1.0	7.95	3.1	0.56
1.5	7.44	2.6	0.47
2.0	7.00	2.2	0.39
2.5	6.65	1.8	0.32
3.0	6.33	1.5	0.27
3.5	6.10	1.3	0.23
4.0	5.90	1.1	0.19
4.5	5.72	0.9	0.16
5.0	5.58	0.7	0.13
5.5	5.47	0.6	0.11
6.5	5.28	0.4	0.08
7.5	5.16	0.3	0.06
9.5	5.03	0.2	0.03

WELL RADIUS (r) = 2 INCHES
SAND PACK RADIUS (R) = 6 INCHES
LENGHTH OF SAND PACK (L) = 14.5 FT

FIRST HEAD RATIO (H1) 0.56 ELAPSED TIME IN MINUTES (T1) 1.0
SECOND HEAD RATIO (H2) 0.13 ELAPSED TIME IN MINUTES (T2) 5.0

$$K = \frac{r^2 * Ln (L/R) * Ln (H1/H2)}{2 (L) * (T2 - T1) * 60 \text{ SEC/MIN}}$$

** K = 5.982146E-04 CM/SEC **

NOTE: DATA IS CONVERTED FROM ENGLISH TO METRIC UNITS

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE SHEET NO. OF

CHKD. BY RHF DATE 7/89 JOB NO.

SUBJECT

ORIGINAL (RED)

MW - 31 6-17-88

$r_c = 2'' = .167'$

$r_w = 6'' = .5'$

Sand Pack Length (L) = 19.40 - 6.0 = 13.40'

t_1: 7 sec H: 0.56

t_2: 29 sec H: 0.14

$$K = \frac{(r_c)^2 \ln(L/r_w)}{2(L)(t_2 - t_1)} \cdot \ln(H_1/H_2)$$

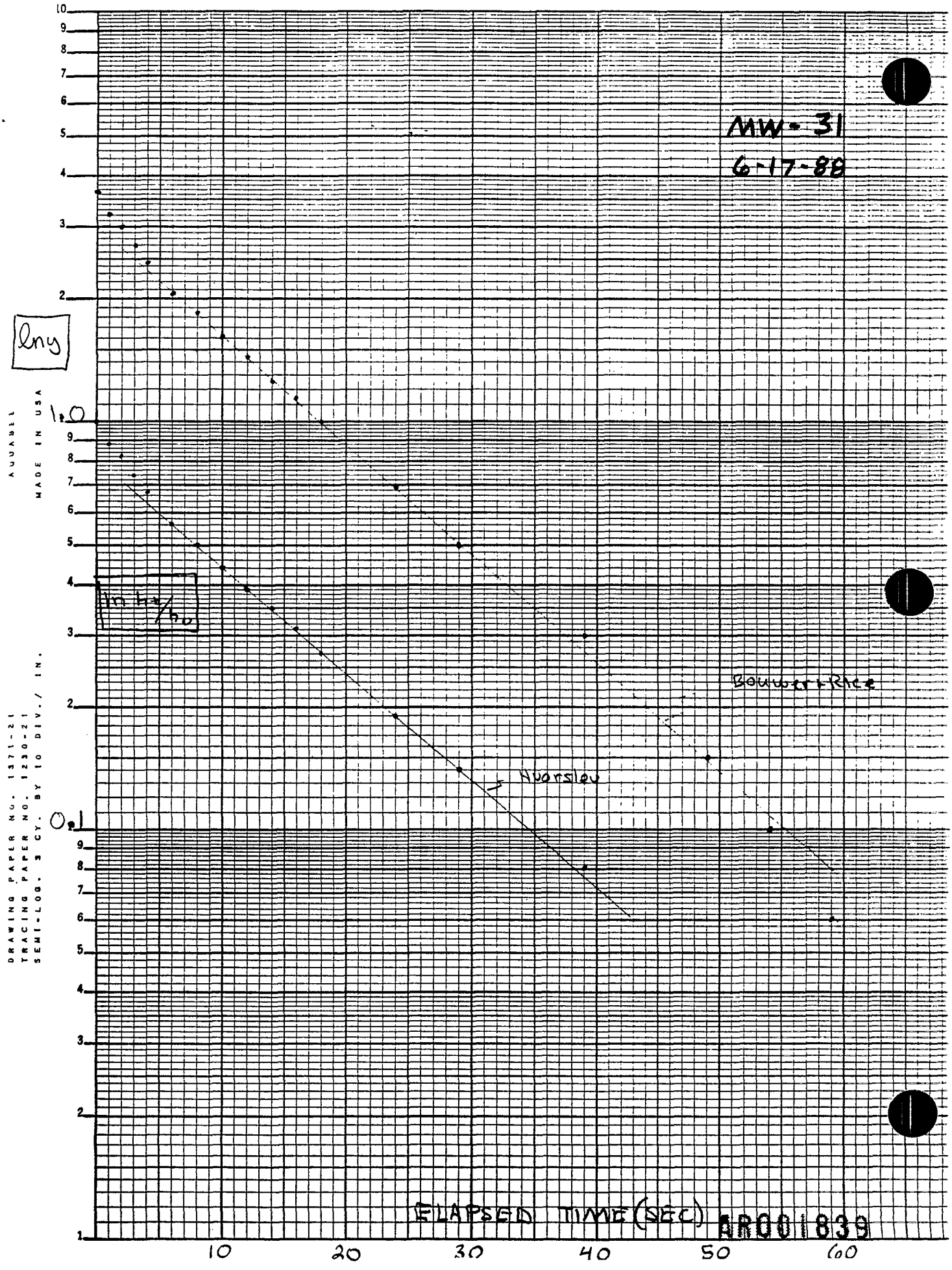
$$= \frac{(.167)^2 \ln(13.40/.5)}{2(13.40)(29-7)} \cdot \ln \frac{.56}{.14}$$

$$= \frac{(.167)^2 (3.2884)}{2(13.40)(29-7)} \cdot (1.3863) = .0002156 \text{ ft/sec}$$

$$\times \frac{12 \text{ in}}{\text{ft}} \times 2.54 \frac{\text{cm}}{\text{in}} = 6.6 \times 10^{-3} \text{ cm/sec}$$

checked w/ computer - 6.558E-3

AR001838


MW-31
6-17-88
ln y
ln h/h0
Bouwer+Rice
Hvorslev
ELAPSED TIME (SEC)
10
20
30
40
50
60
1.0
0.1
DRAWING PAPER NO. 1371-21
TRACING PAPER NO. 1230-21
SEMI-LOG. 3 CY. BY 10 DIV./ IN.
AVUABEL
MADE IN USA

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 COE	MILLCREEK	6-17-88	31

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	2" PVC SLUG & transducer	4.71 TOC	RHO

CLOCK TIME	ELAPSED TIME (t) Units: sec	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	0	8.36	3.65	1.0	
	0.2	8.16			
	0.4	8.09			
	0.6	8.04			
	1.0	7.93	3.22	.88	
	2.0	7.70	2.99	.82	
	3.0	7.42	2.71	.74	
	4.0	7.17	2.46	.67	
	5.0	6.94			
	6.0	6.77	2.06	.56	
	7.0	6.67			
	8.0	6.55	1.84	.50	
	9.0	6.43			
	10.0	6.32	1.61	.44	
	11.0	6.24			
	12.0	6.14	1.43	.39	
	13.0	6.05			
	14.0	5.98	1.27	.35	
	15.0	5.91			
	16.0	5.84	1.13	.31	
	17.0	5.77			
	18.0	5.71	1.00	.27	
	19.0	5.65			
	24.0	5.40	0.69	.19	
	29.0	5.21	0.50	.14	

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1	MILLCREEK	6-17 88	31

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
		4.71 TOC	

CLOCK TIME	ELAPSED TIME (t) Units: Sec	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	34	5.11			
	39	5.01	0.30	.08	
	44	4.93			
	49	4.86	0.15		
	54	4.81	0.10		
	59	4.77	0.06		
	64	4.73	0.02		
	69	4.71	0		

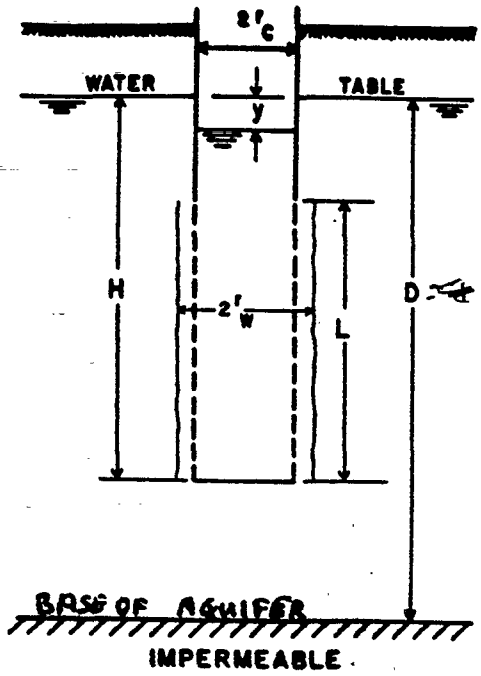
MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 2/89 JOB NO. .....

SUBJECT MW-32 (6-17-88)



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER) *
= 22.0 − 0.32 − 5.97 = 15.70'
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 20.5 − 0.32 − 5.97 = 14.21'
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 20.5 − 8.7 = 11.80'

r_c = WELL ϕ = = 0.167'
y_0 = INITIAL DRAWDOWN = 4.40'
y_t = DRAWDOWN AT TIME (t) = 0.20'
t = TIME t sec = 66

L/r_w	=	23.60
A	=	2.20
B	=	1.37
C	=	

* Assumes f/v f lacustrine Sands bec at 22 ft as one would extrapolate from MW-35 and MW-31

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

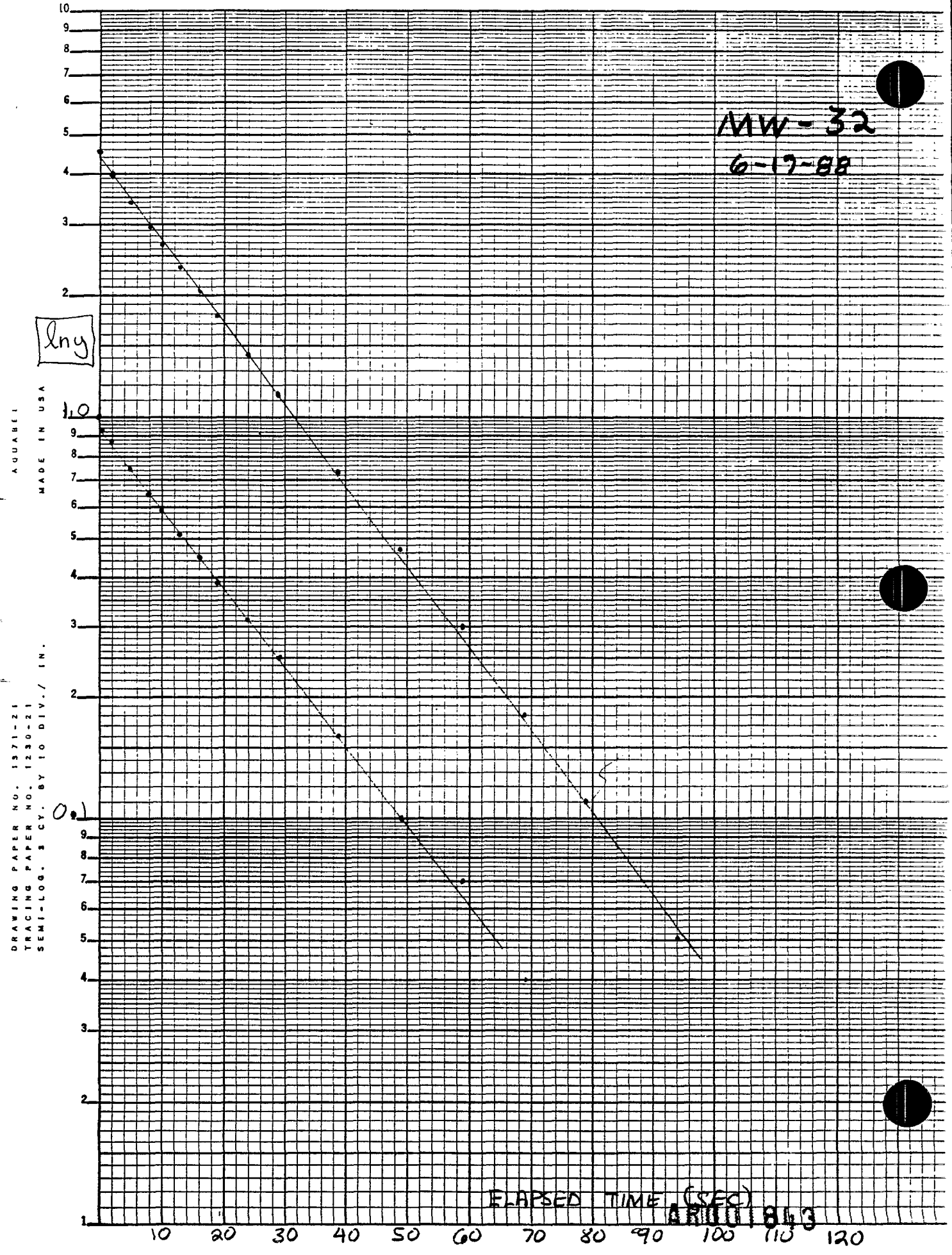
$$= \left(\frac{1.1}{3.3471} + \frac{2.20 + 1.37\,(1.0986)}{23.60}\right)^{-1} = 2.0593$$

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1}$$

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L}\left(\frac{1}{t}\right)\ln\frac{y_0}{y_t} = \frac{(.167)^2(2.0593)}{2\,(11.80)} \cdot \frac{1}{66\text{ sec}} \cdot \ln\frac{4.40}{0.20}$$

$$= 1.1397 \times 10^{-4}\ \frac{ft}{sec} \times \frac{12''}{ft} \times \frac{2.54\text{ cm}}{in} = 3.5 \times 10^{-3}\ \frac{cm}{sec.}$$

AR001842


MW-32
6-17-88
lny
1.0
0.1
ELAPSED TIME (SEC)
10
20
30
40
50
60
70
80
90
100
110
120
DRAWING PAPER NO. 1371-21
TRACING PAPER NO. 1230-21
SEMI-LOG. 3 CY. BY 10 DIV./ IN.
AQUABEL
MADE IN USA

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 COE	MILLCREEK	6-17-88	32

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	2" PVC SLUG and transducer	5.97	RHO

CLOCK TIME	ELAPSED TIME (t) Units: sec.	WATER LEVEL BELOW REF. AT TIME t(l_t)(Ft)	HEAD AT TIME t(h_t) $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	0	10.53	4.56	1.0	
	.6	10.23	4.26	.93	
	1.8	9.93	3.96	.87	
	4.8	9.38	3.41	.75	
	7.8	8.92	2.95	.65	
	9.8	8.65	2.68	.59	
	12.8	8.31	2.34	.51	
	15.8	8.02	2.05	.45	
	18.8	7.75	1.78	.39	
	23.8	7.39	1.42	.31	
	28.8	7.11	1.14	.25	
	38.8	6.70	0.73	.16	
	48.8	6.44	0.47	.10	
	58.8	6.27	0.30	.07	
	68.8	6.15	0.18	.04	
	78.8	6.08	0.11		
	93.8	6.02	0.05		
	118.8	5.97	0		

MALCOLM PIRNIE

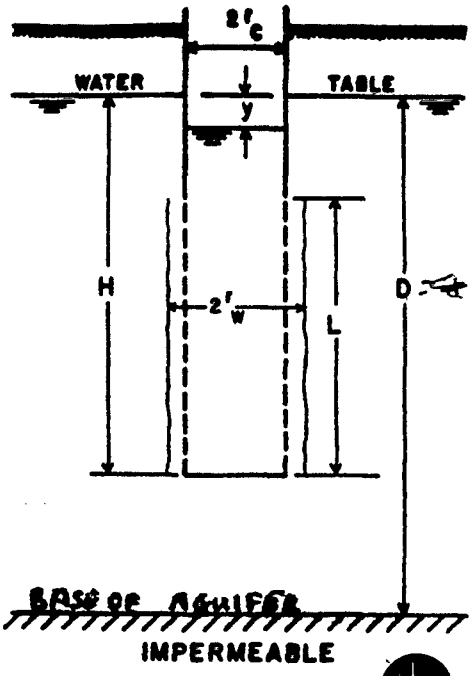
MALCOLM PIRNIE, INC.

BY RHO DATE ..... SHEET NO. ..... OF .....

CHKD. BY ..... DATE ..... JOB NO. .....

SUBJECT MW-32 (6-17-88)

Method Not Used



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER)
= H *
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 20.5 − 0.32 − 5.97 = 14.21
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 20.5 − 8.7 = 11.80'

r_c = WELL ϕ = = 0.167'
y_0 = INITIAL DRAWDOWN = 4.40'
y_t = DRAWDOWN AT TIME (t) = 0.20'
t = TIME t sec = 66

L/r_w	=	23.60
A	=	
B	=	
C	=	1.90

* NO f/vf [illegible] sands where log[illegible] to 22 ft. ∴ D may be > H

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

=

** 10^{-4} cm/se seems l[illegible] considering sands + grav[illegible] logged during drilling [illegible] results from other well[illegible] w/ abundant gravels. ∴ use D > H

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1} = \left(\frac{1.1}{3.3471} + \frac{1.90}{23.60}\right)^{-1} = .4091$$

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L}\left(\frac{1}{t}\right)\ln\frac{y_0}{y_t} = \frac{(.167)^2(.4091)}{2(11.80)} \cdot \frac{1}{66\text{ sec}} \cdot \ln \frac{[illegible]}{12[illegible]}$$

$$= 2.264 \times 10^{-5}\ \frac{ft}{sec} \times 12\ \frac{in}{ft} \times 2.54\ \frac{cm}{in} = 6.9 \times 10^{-4}\ \frac{cm}{sec}\ **$$

AR001845

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY ..... DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 2/81 JOB NO. .....

SUBJECT .....

ORIGINAL (RED)

MW-32 6-17-88 Hvorslev

$r_c = .167$
$r_w = .5'$
$L = 11.80'$

$t_1 = 10$ sec $H_1 = .59$
$t_2 = 49$ sec $H_2 = .10$

$$K = \frac{r_c^2 \ln L/r_w}{2L\,(t_2 - t_1)} \cdot \ln \frac{H_1}{H_2}$$

$$= \frac{(.167)^2\,(3.1612)}{2(11.80)\,(49-10)} \cdot (1.7775) \cdot .0001700 \text{ ft/sec}$$

$$\times \frac{12 \text{ in}}{\text{ft}} \times \frac{2.54 \text{ cm}}{\text{in}} = 5.2 \times 10^{-3} \text{ cm/sec}$$

checked w/computer

** VARIABLE HEAD PERMEABILITY TEST **

PROJECT NAME: MILLCREEK

PROJECT NUMBER: 0235-23-1

DATE TESTED: 5-16-88

WELL NUMBER: MW-33A

INITIAL WATER LEVEL (Li): 7.9 FT TOC

ELAPSED TIME (MIN)	WATER LEVEL AT TIME t (Lt) (FT)	HEAD AT TIME t (Ht) Ht = Lt (FT)	HEAD RATIO Ht/Ho
0.0	13.90	6.0	1.00
0.5	12.80	4.9	0.82
1.0	12.00	4.1	0.68
1.5	11.30	3.4	0.57
2.0	10.75	2.8	0.48
2.5	10.30	2.4	0.40
3.0	9.95	2.0	0.34
3.5	9.60	1.7	0.28
4.0	9.35	1.5	0.24
4.5	9.10	1.2	0.20
5.0	8.95	1.0	0.17
5.5	8.78	0.9	0.15
6.0	8.64	0.7	0.12
6.5	8.55	0.7	0.11
7.0	8.45	0.5	0.09
7.5	8.38	0.5	0.08
9.0	8.22	0.3	0.05
10.0	8.15	0.2	0.04
12.0	8.05	0.2	0.03
14.0	7.99	0.1	0.01
16.0	7.96	0.1	0.01

WELL RADIUS (r) = 2 INCHES
SAND PACK RADIUS (R) = 6 INCHES
LENGHTH OF SAND PACK (L) = 13.7 FT

FIRST HEAD RATIO (H1) 0.57 ELAPSED TIME IN MINUTES (T1) 1.5
SECOND HEAD RATIO (H2) 0.17 ELAPSED TIME IN MINUTES (T2) 5.0

$$K = \frac{r^2 * Ln (L/R) * Ln (H1/H2)}{2 (L) * (T2 - T1) * 60 \text{ SEC/MIN}}$$

** K = 5.893442E-04 CM/SEC **

NOTE: DATA IS CONVERTED FROM ENGLISH TO METRIC UNITS

** VARIABLE HEAD PERMEABILITY TEST **

PROJECT NAME: MILLCREEK PROJECT NUMBER: 7785-23-1

DATE TESTED: 5-16-88 WELL NUMBER: MW-33B

INITIAL WATER LEVEL (Li): 7.45 FT TOC

ELAPSED TIME (MIN)	WATER LEVEL AT TIME t (Lt) (FT)	HEAD AT TIME t (Ht) Ht = Lt (FT)	HEAD RATIO Ht/Ho
0.0	14.65	7.2	1.00
0.4	14.00	6.6	0.91
0.8	13.50	6.1	0.84
1.3	12.90	5.4	0.76
1.8	12.30	4.9	0.67
2.3	11.77	4.3	0.60
2.8	11.30	3.9	0.53
3.3	10.85	3.4	0.47
3.8	10.49	3.0	0.42
4.3	10.16	2.7	0.36
4.8	9.85	2.4	0.33
5.3	9.60	2.2	0.30
5.8	9.37	1.9	0.27
6.3	9.15	1.7	0.24
6.8	8.98	1.5	0.21
7.8	8.66	1.2	0.17
8.8	8.40	0.9	0.13
9.8	8.21	0.8	0.11
11.8	7.93	0.5	0.07
13.8	7.75	0.3	0.04
15.8	7.64	0.2	0.03

WELL RADIUS (r) = 2 INCHES
SAND PACK RADIUS (R) = 6 INCHES
LENGHTH OF SAND PACK (L) = 8.1 FT 8.3'

FIRST HEAD RATIO (H1) 0.84 ELAPSED TIME IN MINUTES (T1) 0.8
SECOND HEAD RATIO (H2) 0.21 ELAPSED TIME IN MINUTES (T2) 6.8

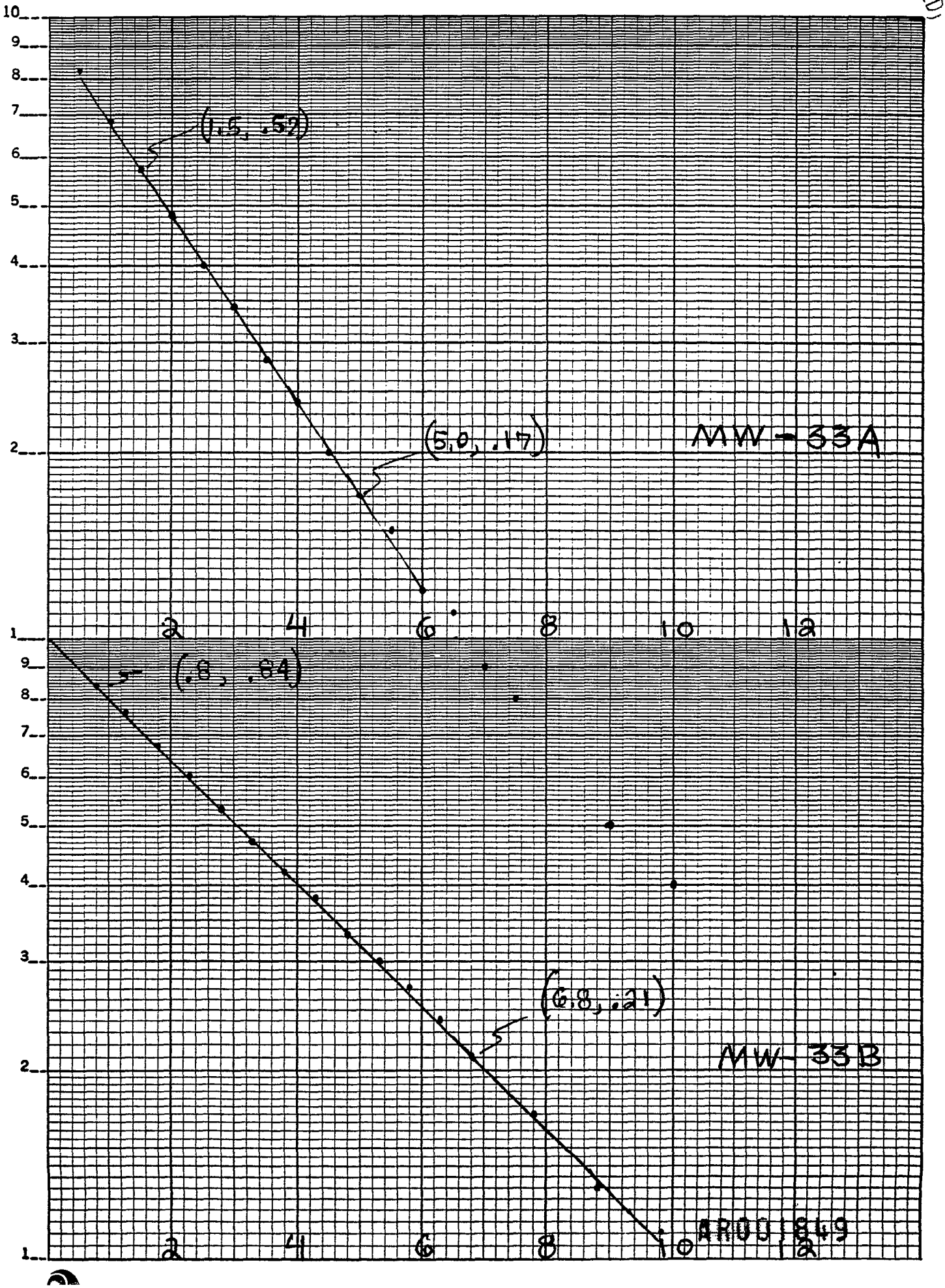
2.203

$$K = \frac{r^2 * Ln (L/R) * Ln (H1/H2)}{2 (L) * (T2 - T1) * 60 \text{ SEC/MIN}}$$

** K = 5.605022E-04 CM/SEC **

NOTE: DATA IS CONVERTED FROM ENGLISH TO METRIC UNITS

AR001848



ORIG. (RED)

AR001849

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 ARMY COE	MILLCREEK	5/18/88	33A

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	BAILER	7.90 TOC	RHO

CLOCK TIME	ELAPSED TIME (t) Units: _____	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
10:01	0	13.90			
:01:30	.50	12.80			
:02:00	1.00	12:00			
:02:30	1.50	11:30			
:03:00	2.00	10.75			
:03:30	2.50	10.30			
:04:00	3.00	9.95			
04:30	3.50	9.60			
05:00	4.00	9.35			
05:30	4.50	9.10			
06:00	5.00	8.95			
:06:30	5.50	8.78			
:07:00	6.00	8.64			
:07:30	6.50	8.55			
:08:00	7.00	8.45			
:08:30	7.50	8.38			
:10:00	9.00	8.22			
:11:00	10.00	8.15			
13:00	12.00	8.05			
15:00	14.00	7.99			
17:00	16.00	7.96			

FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 ARMY COE	MILLCREEK	5/16/88	33B

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	BAIL - 8 gal	7.45' TOC	RHO

CLOCK TIME	ELAPSED TIME (t) Units: MIN	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t = l_t - l_i$	HEAD RATIO h_t/h_o	REMARKS
3:32:15	0	14.65			
32:40	.42	14.00			
33:00	.75	13.50			
33:30	1.25	12.90			
34:00	1.75	12.30			
34:30	2.25	11.77			
35:00	2.75	11.30			
35:30	3.25	10.85			
36:00	3.75	10.49			
36:30	4.25	10.16			
37:00	4.75	9.85			
37:30	5.25	9.60			
38:00	5.75	9.37			
38:30	6.25	9.15			
39:00	6.75	8.98			
40:00	7.75	8.66			
41:00	8.75	8.40			
42:00	9.75	8.21			
44:00	11.75	7.93			
46:00	13.75	7.75			
48:00	15.75	7.64			

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 2/81 JOB NO. .....

SUBJECT .....

MW-34 6-16-83

r_c = 2 inches = .167'

r_w = 6 inches = .5'

L = 8.3'

t_1 = 4.6 sec (.077 min) h_1 = .85

t_2 = 49.6 sec (.827 min) h_2 = .25

$$K = \frac{(r_c)^2 \ln L/R_w}{2L\,(t_2 - t_1)} \cdot \ln \frac{h_1}{h_2}$$

$$= \frac{(.167)^2 \ln 8.3/.5}{2\,(8.3)\,(49.6-4.6)} \cdot \ln \frac{.85}{.25} = .00012836 \text{ ft/sec}$$

.8094

$$\times \frac{12 \text{ in}}{\text{ft}} \times \frac{2.54 \text{ cm}}{\text{in}} = 3.9 \times 10^{-3} \text{ cm/sec} \ *$$

Computer 3.896×10^{-3} cm/sec

AR001852

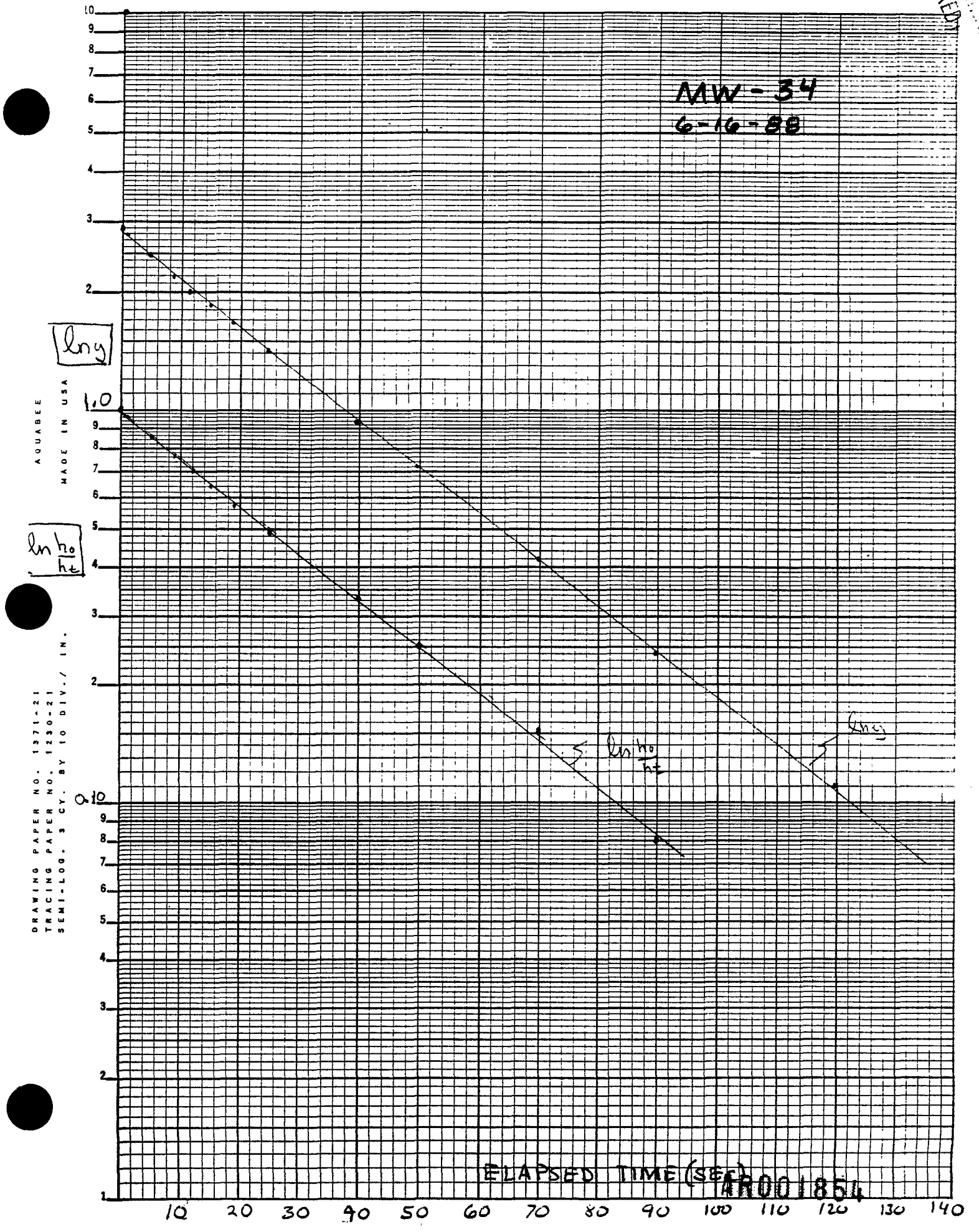
FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-23-1 COE	MILLCREEK	6-16-83	34

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	2" PVC SLUG + transducer	10.91	RHO

CLOCK TIME	ELAPSED TIME (t) Units: sec	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	0	13.80	2.89	1.00	
	1	13.69	2.78	.96	
	4.6	13.38	2.47	.85	
	8.6	13.11	2.20	.76	
	11.6	12.93	2.02	.70	
	14.6	12.77	1.86	.64	
	18.6	12.57	1.66	.57	
	24.6	12.32	1.41	.49	
	39.6	11.85	0.94	.33	
	49.6	11.63	0.72	.25	
	69.6	11.33	0.42	.15	
	89.6	11.15	0.24	.08	
	119.6	11.02	0.11	.04	
	149.6	10.96			
	179.6	10.94			


MW-34
6-16-88
ln y
ln h0/ht
ln y
ln h0/ht
ELAPSED TIME (SEC)
10
20
30
40
50
60
70
80
90
100
110
120
130
140
1.0
0.10
AQUABEE
MADE IN USA
DRAWING PAPER NO. 1371-21
TRACING PAPER NO. 1230-21
SEMI-LOG. 3 CY. BY 10 DIV./ IN.

AR001854

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHD DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 2/87 JOB NO. .....

SUBJECT .....

MW - 34

$H = 17.55 - 2.27 - 10.91 = 8.21'$ D>H

$D = 19.0 + 2.27 - 10.91 = 10.36$

$r_w = 6\,in = .5'$ $-/r_w = 13.70$

$L = 17.55 - 10.70 = 6.85'$

$r_c = 2\,in = .167'$ $A = 1.95$

$t = 69.6\,sec$ $B = 1.25$

$y_0 = 2.89$

$y_t = 0.42$

$$\ln(R_e/r_w) = \left(\frac{1.1}{\ln H/r_w} + \frac{A + B\ln(D-H)/r_w}{D/r_w}\right)^{-1}$$

$$= \frac{1.1}{2.8803} + \frac{1.95 + 1.25(1.0647)}{13.70}$$

$$= (0.3819 + 0.2395)^{-1} = 1.6093.$$

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L} \frac{1}{t} \ln \frac{y_0}{y_t}$$

$$= \frac{(.167)^2(1.6093)}{2(6.85)} \frac{1}{69.6\,sec} \ln \frac{2.89}{.42} = .00009079\ ft/sec$$

$$\times \frac{12\,in}{ft} \times \frac{2.54\,cm}{in} = 2.8 \times 10^{-3}\ cm/sec$$

2.76×10^{-3}

AR001855

MALCOLM PIRNIE

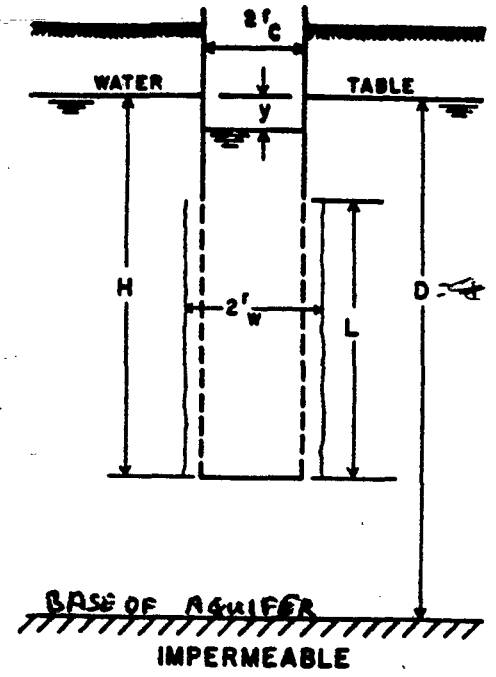
MALCOLM PIRNIE, INC.

BY RHO DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 2/89 JOB NO. .....

SUBJECT MW-35 (6-17-88)

MW-35



D = ELEV(WATER LEVEL) − ELEV.(BASE OF AQUIFER)
= 21.0 − .40 − 5.15 = 15.45'
=

H = ELEV(WATER LEVEL) − ELEV(BASE OF WELL)
= 13.90 − .40 − 5.15 = 8.35'
=

r_w = BOREHOLE ϕ = 0.5'

L = SCREEN LENGTH (OR SATURATED SCREENED INTERVAL IF SMALLER)
= 13.9 − 7.0 = 6.9'

r_c = WELL ϕ =	= .167'	L/r_w =	13.80
y_0 = INITIAL DRAWDOWN	= 2.5'		
y_t = DRAWDOWN AT TIME (t)	= .54	A =	2.0
t = TIME t (sec)	= 22	B =	1.30
		C =	

$$\ln \frac{R_e}{r_w} = \left[\frac{1.1}{\ln H/r_w} + \frac{A + B\ln[(D-H)/r_w]}{L/r_w}\right]^{-1} =$$

$$= \left[\frac{1.1}{2.8154} + \frac{2.0 + 1.30\,(2.6532)}{13.80}\right]^{-1} = (0.3907 + 0.3949)^{-1} = 1.273$$

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln H/r_w} + \frac{C}{L/r_w}\right)^{-1}$$

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L}\left(\frac{1}{t}\right)\ln\frac{y_0}{y_t} = \frac{(.167)^2\,(1.273)}{2\,(6.90)}\cdot\frac{1}{22\,(\text{sec})}\cdot\ln\frac{2.5}{.54}$$

.000116

13.8

$$= 1.792 \times 10^{-4}\ \frac{ft}{sec} \times \frac{12\,in}{ft} \times 2.54\,\frac{cm}{in} = 5.5 \times 10^{-3}\ cm/sec$$

.064

5.4

AR001856

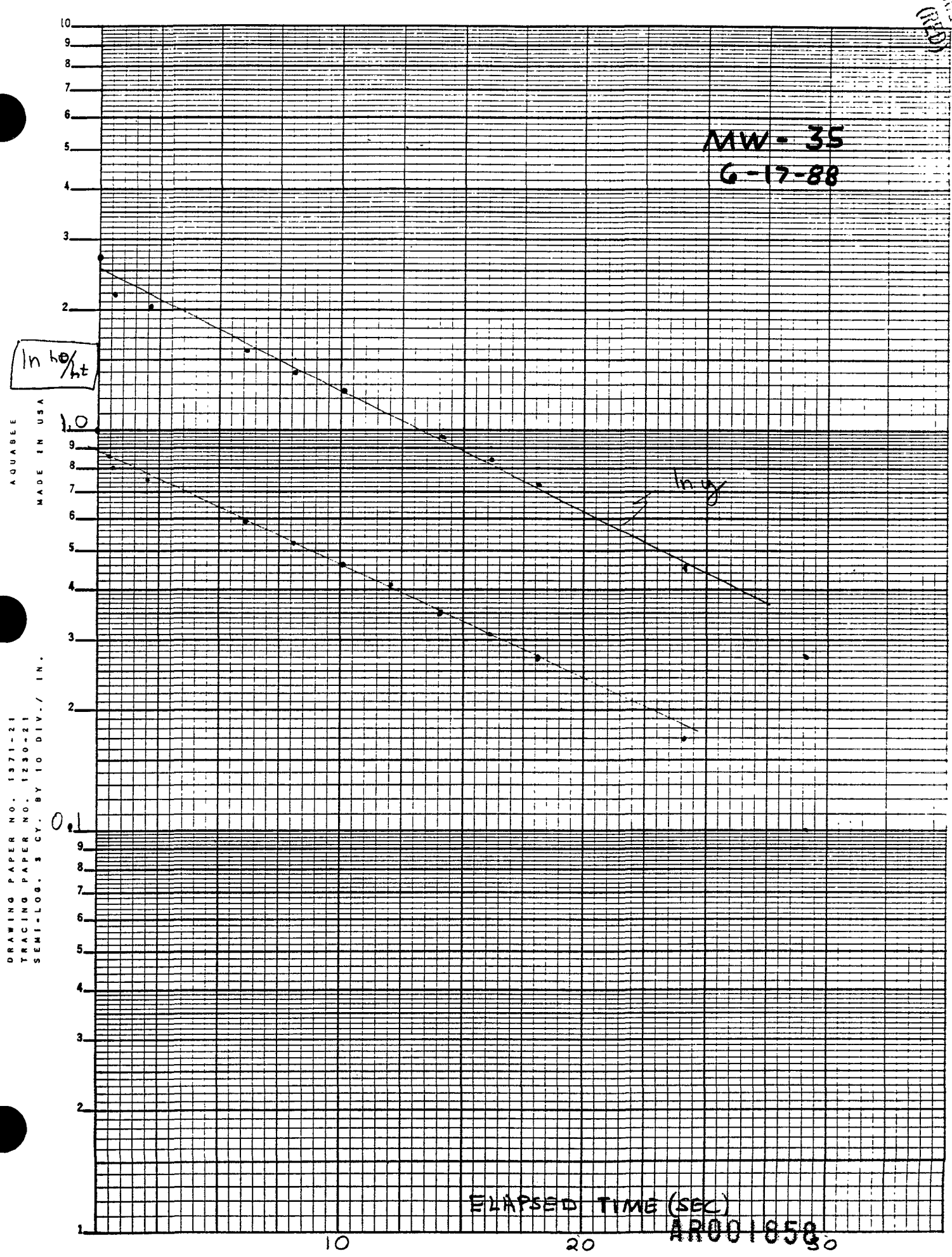
FIELD DATA SHEET

IN-SITU HYDRAULIC CONDUCTIVITY TEST

PROJECT NUMBER AND CLIENT NAME	LOCATION	DATE OF TEST	WELL NUMBER
0285-22-1 COE	MILLCREEK	6-17-88	35

TEST TYPE	TEST METHOD (EQUIP.)	INITIAL WATER LEVEL BELOW REF. l_i (ft.)	TESTED BY:
RISING HEAD	2" PVC SLUG Transducer	5.15	RHO

CLOCK TIME	ELAPSED TIME (t) Units: Sec	WATER LEVEL BELOW REF. AT TIME $t(l_t)$(Ft)	HEAD AT TIME $t(h_t)$ $h_t=l_t-l_i$	HEAD RATIO h_t/h_o	REMARKS
	0	7.86	2.71	1.0	
	.2	7.56	2.41	.89	
	.4	7.49	2.34	.86	
	.6	7.32	2.17	.80	
	2.2	7.18	2.03	.75	
	4.2	6.94			
	6.2	6.74	1.59	.59	
	8.2	6.55	1.40	.52	
	10.2	6.40	1.25	.46	
	12.2	6.25		.41	
	14.2	6.11	0.96	.35	
	16.2	5.99	.34	.31	
	18.2	5.88	0.73	.27	
	24.2	5.60	.45	.17	
	29.2	5.42	0.27	.10	
	34.2	5.28		.05	
	39.2	5.18	0.02		



ORIGINAL (RED)

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RKO DATE ..... SHEET NO. ..... OF .....

CHKD. BY RHF DATE 2/89 JOB NO. .....

SUBJECT .....

MW - 35 6-17-88 Hvorslev

$r_c = 2'' = .167'$

$R = 6' = .5'$

Sand Pack length (L) = 6.9'

$t_1 = 5$ sec $H_1 = .64$

$t_2 = 20$ sec $H_2 = .24$

$$K = \frac{(r_c)^2 \ln(L/r_w)}{2L(t_2 - t_1)} \cdot \ln \frac{H_1}{H_2}$$

$$= \frac{(.167)^2 \ln(6.9/.5)}{2(6.9)(20-5)} \cdot \ln \frac{.64}{.24} = .0003468 \text{ ft/sec}$$

$$* \frac{12 \text{ in}}{\text{ft}} \times \frac{2.54 \text{ cm}}{\text{in}} = 1.1 \times 10^{-2} \text{ cm/sec}$$

Reasonable for gravels as logged but no indicence of confined conditions. So used Bouwer & Rice

OK

AR001859