54385

Volume II

Extra

Appendices, Exhibits

Remedial Investigation National Smelting of New Jersey, Inc./ NL Industries, Inc. Site

Pedricktown, New Jersey

NL Industries, Inc.
Hightstown, New Jersey

October 1990

O'BRIEN & GERE

NLI 001 1674

TABLE OF CONTENTS
(Volume II)

APPENDICES

A Well Construction Diagrams
B Well Bore Logs
C Continuous Monitoring Graphs
D Gamma Ray Logs
E Ground Water Quality - 1988
F Ground Water Quality - 1989
G Ground Water Organic Analyses
H Landfill Leachate Organic Analyses
I Effects of Lead on Wildlife
J Federal REgister - Lead Attainment Area
K Lead Uptake by Plants
L Air Model
M Environmental Fate of Metals
N Assessing Dermal Exposure Risks
O Dermal Absorption of Lead
P ECAO Response
Q Calculation of Slope Factor

EXHIBITS

A Previous Analyses of Landfill Leachate
B Previously Installed Wells Bore Logs and Ground Water Data
C Adjacent Property Bore Logs
D NJDEP Well Search
E Topographic Surveys
F Natural Sources of Environmental Radiation
G Site Photographs
H NL Slag EP Toxicity Results
I EPA Results of Private Potable Wells
J USEPA and State of New Jersey Standards and Guidance
K Summary of USEPA Removal Activities at the Site
L Landfill Construction Plans and Specifications
M Soil and Marsh Cleanup of the Site

Appendices

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A Well Construction Diagrams
B Well Bore Logs
C Continuous Monitoring Graphs
D Gamma Ray Logs
E Ground Water Quality - 1988
F Ground Water Quality - 1989
G Ground Water Organic Analyses
H Landfill Leachate Organic Analyses
I Effects of Lead on Wildlife
J Federal Register - Lead Attainment Area
K Lead Uptake by Plants
L Air Model
M Environmental Fate of Metals
N Assessing Dermal Exposure Risks
O Dermal Absorption of Lead
P ECAO Response
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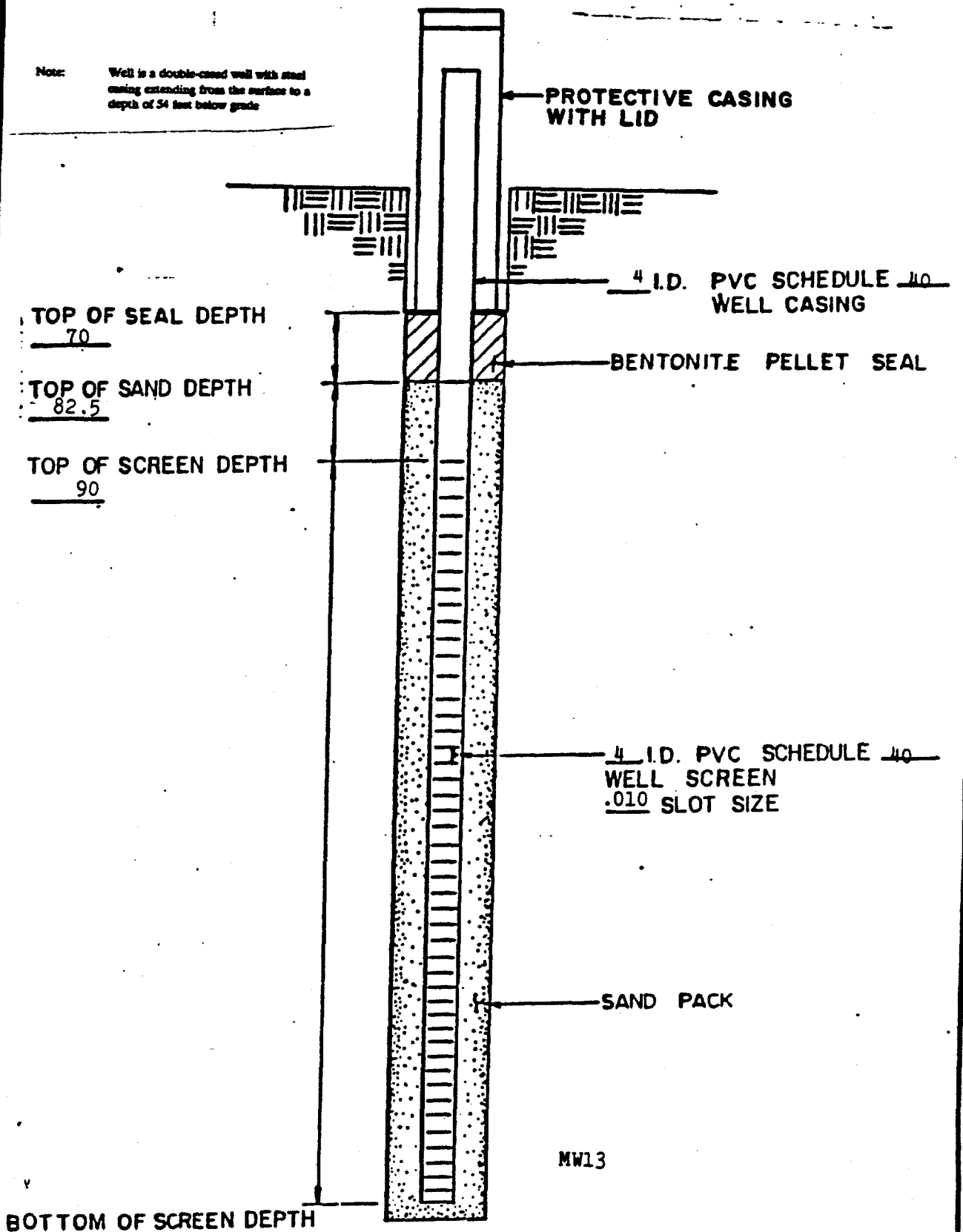
NLI 001 1678

APPENDIX A

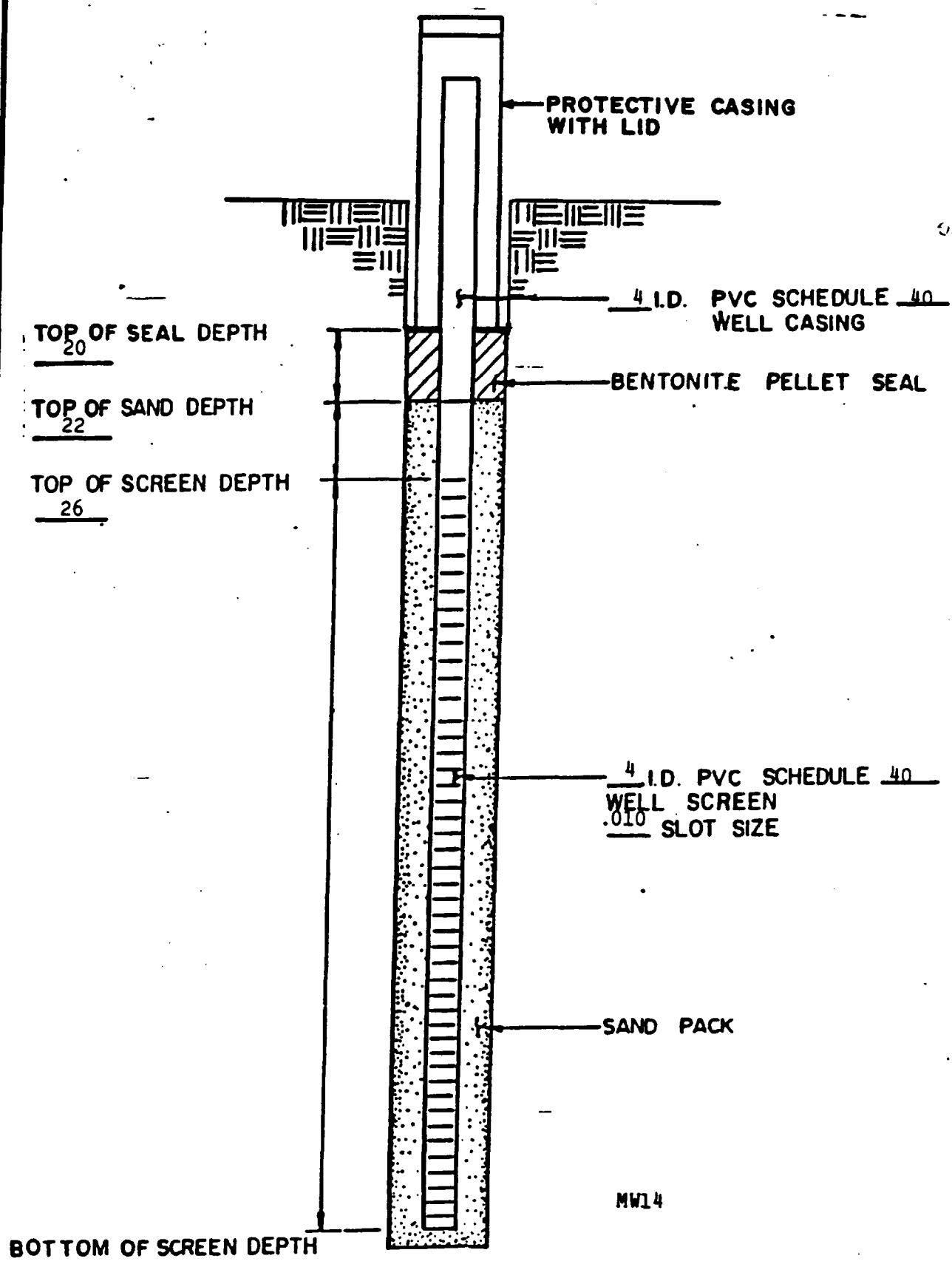
Note: Well is a double-cased well with steel casing extending from the surface to a depth of 54 feet below grade



MONITORING WELL SPECIFICATIONS

N.T.S.

NLI 001 1680



MONITORING WELL SPECIFICATIONS

N.T.S.

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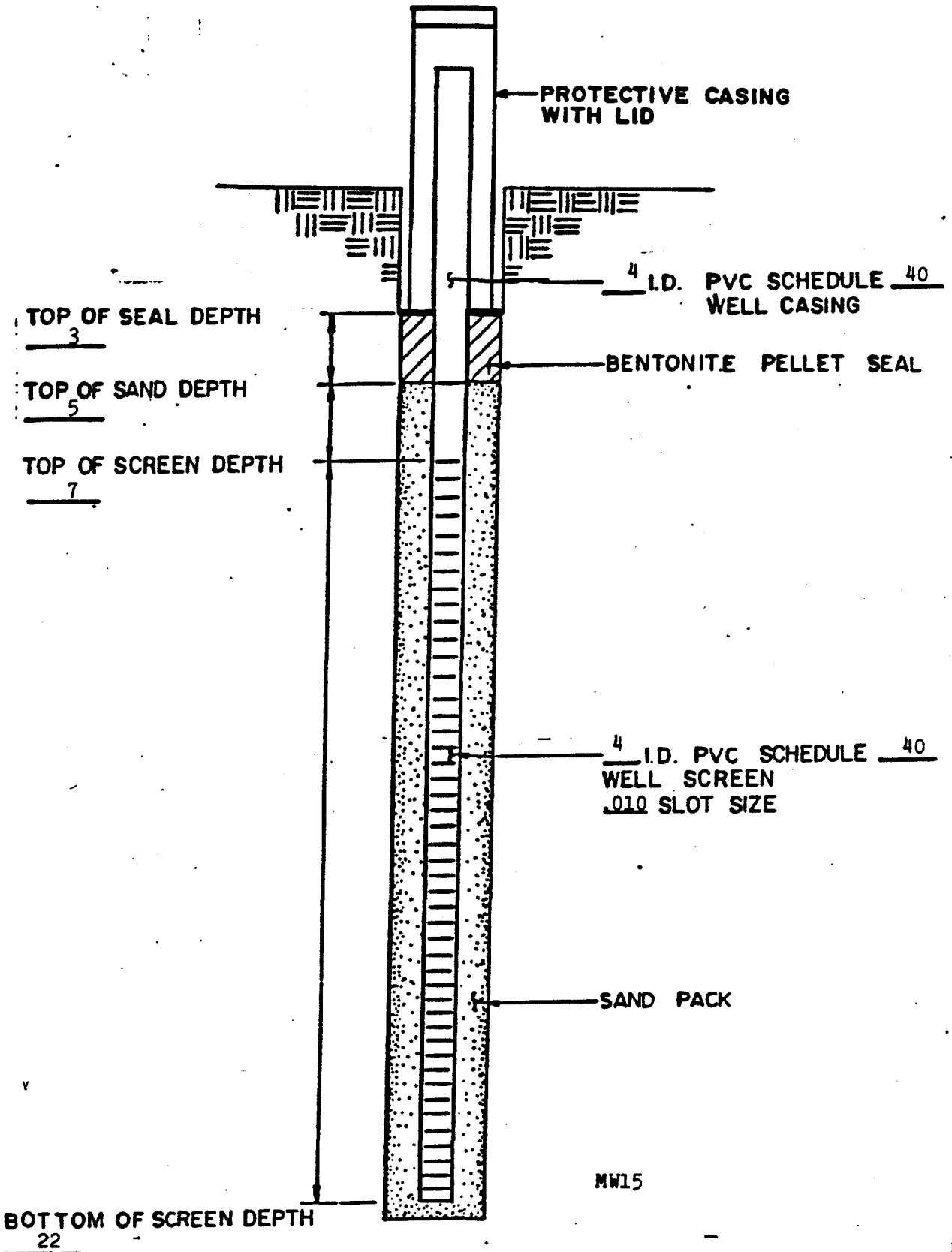

MONITORING WELL SPECIFICATIONS

N.T.S.

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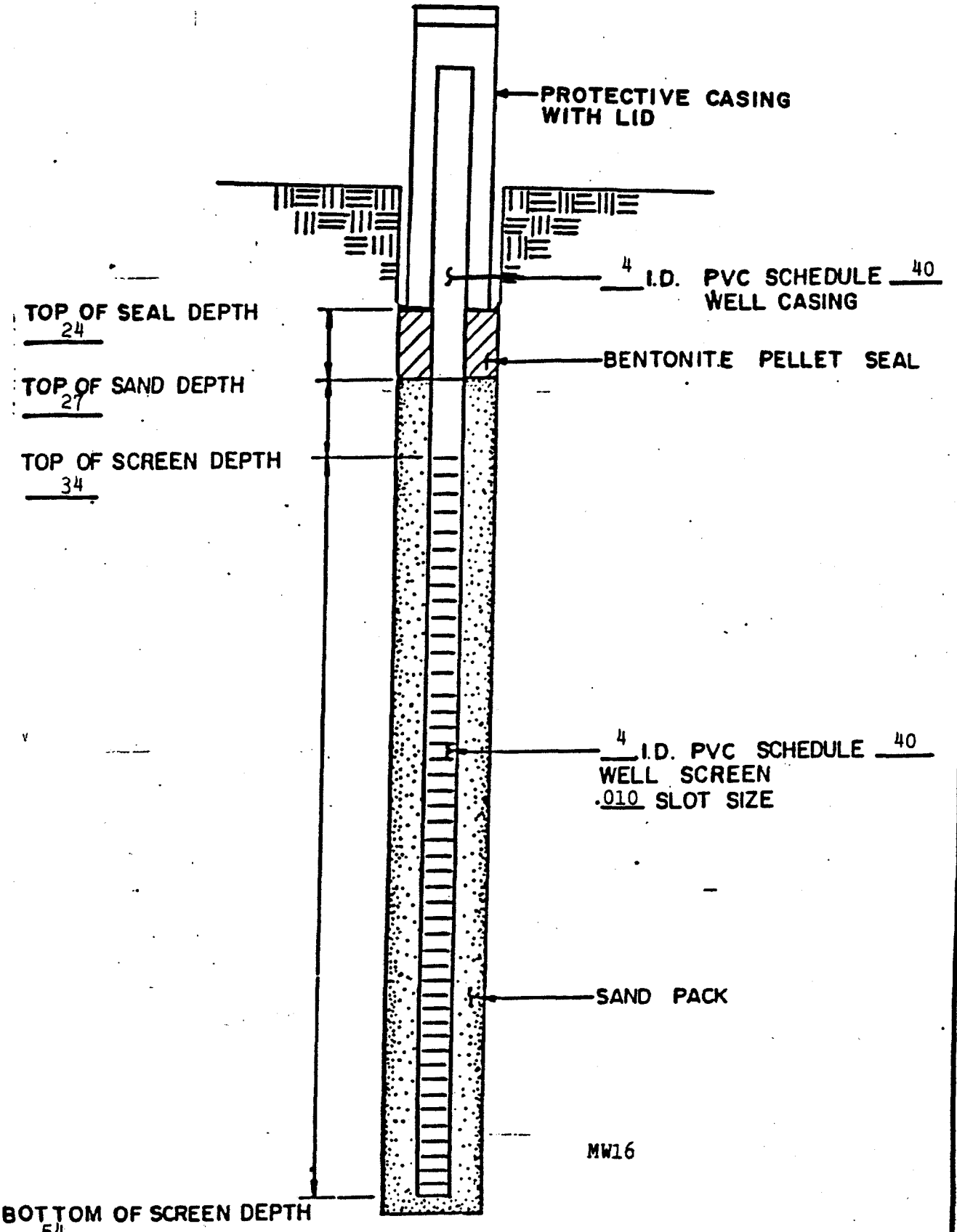

MONITORING WELL SPECIFICATIONS

N.T.S.

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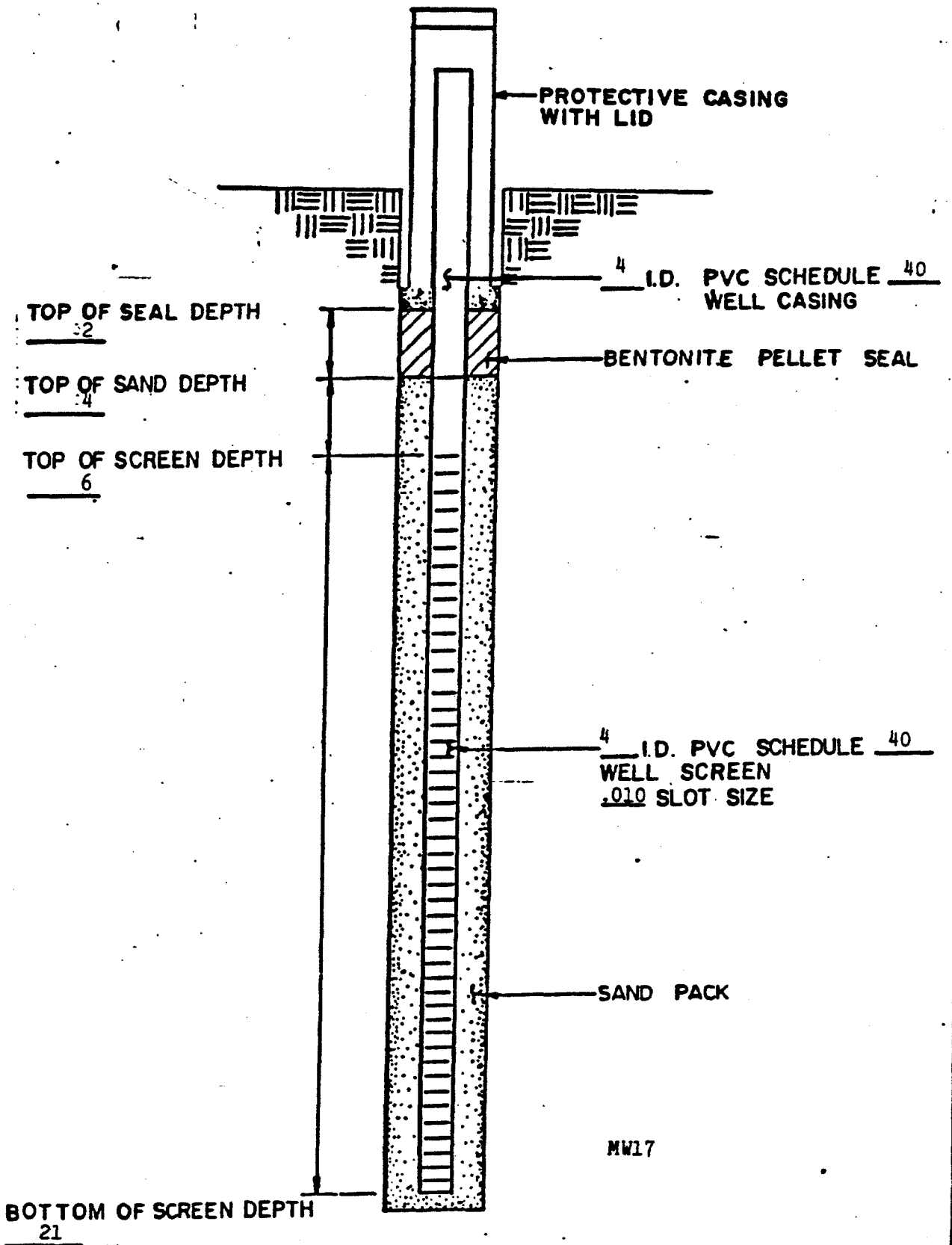

MONITORING WELL SPECIFICATIONS

N.T.S.

NLI 001 1684

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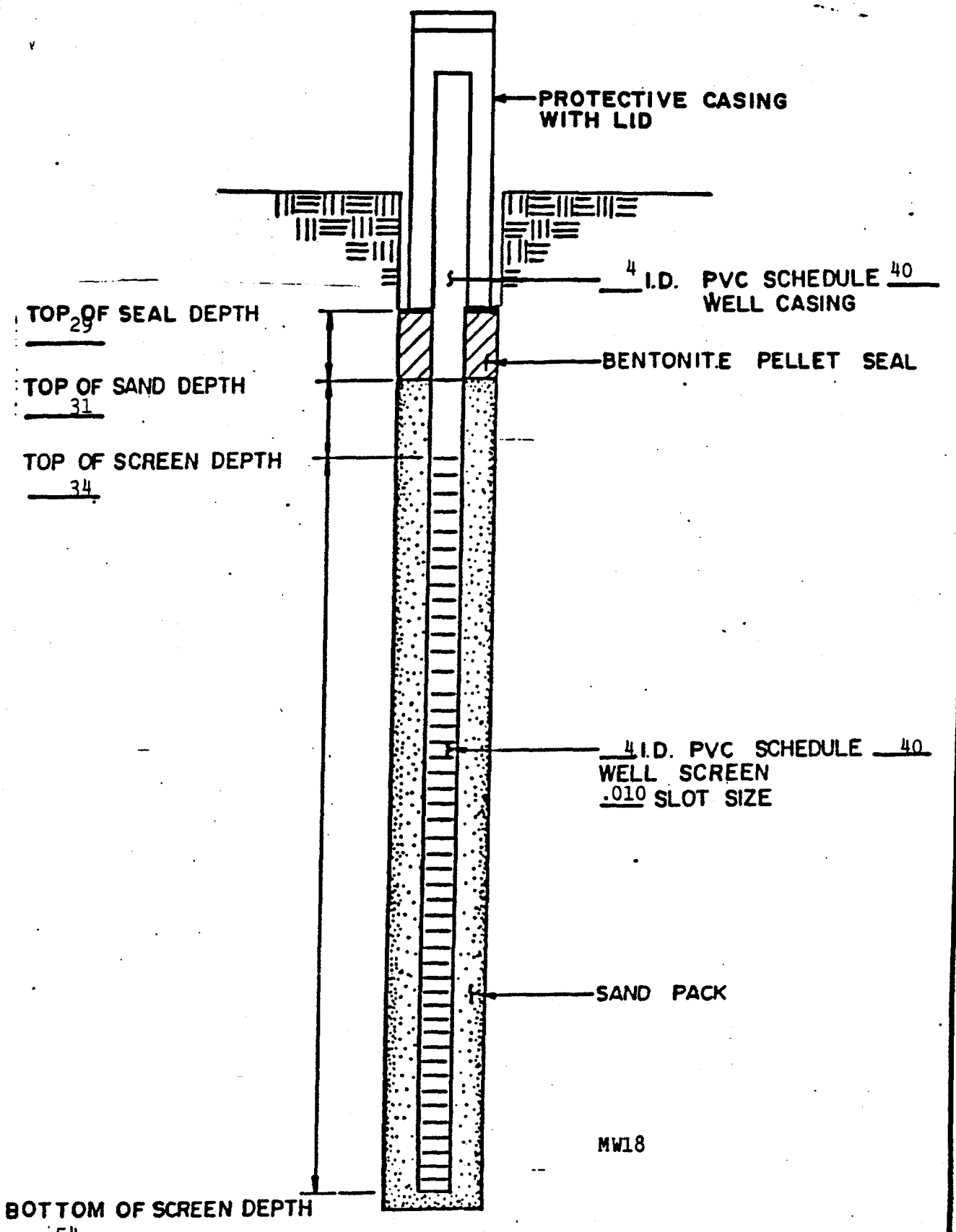


MONITORING WELL SPECIFICATIONS

N.T.S.

NLI 001 1685

APPENDIX D
APPENDIX B

GAMMA RAY LOG

LOCATION MW CR2 | TIME CONSTANT | TYPE OF FLUID

O'BRIEN & GERE ENGINEERS, INC. | LOGGED BY | RANGE | Report of Boring No. 7 | BORE HOLE TYPE

DATE/TIME | DEPTH TO FLUID | PROBE TYPE

Project Location: National Smelting of NJ

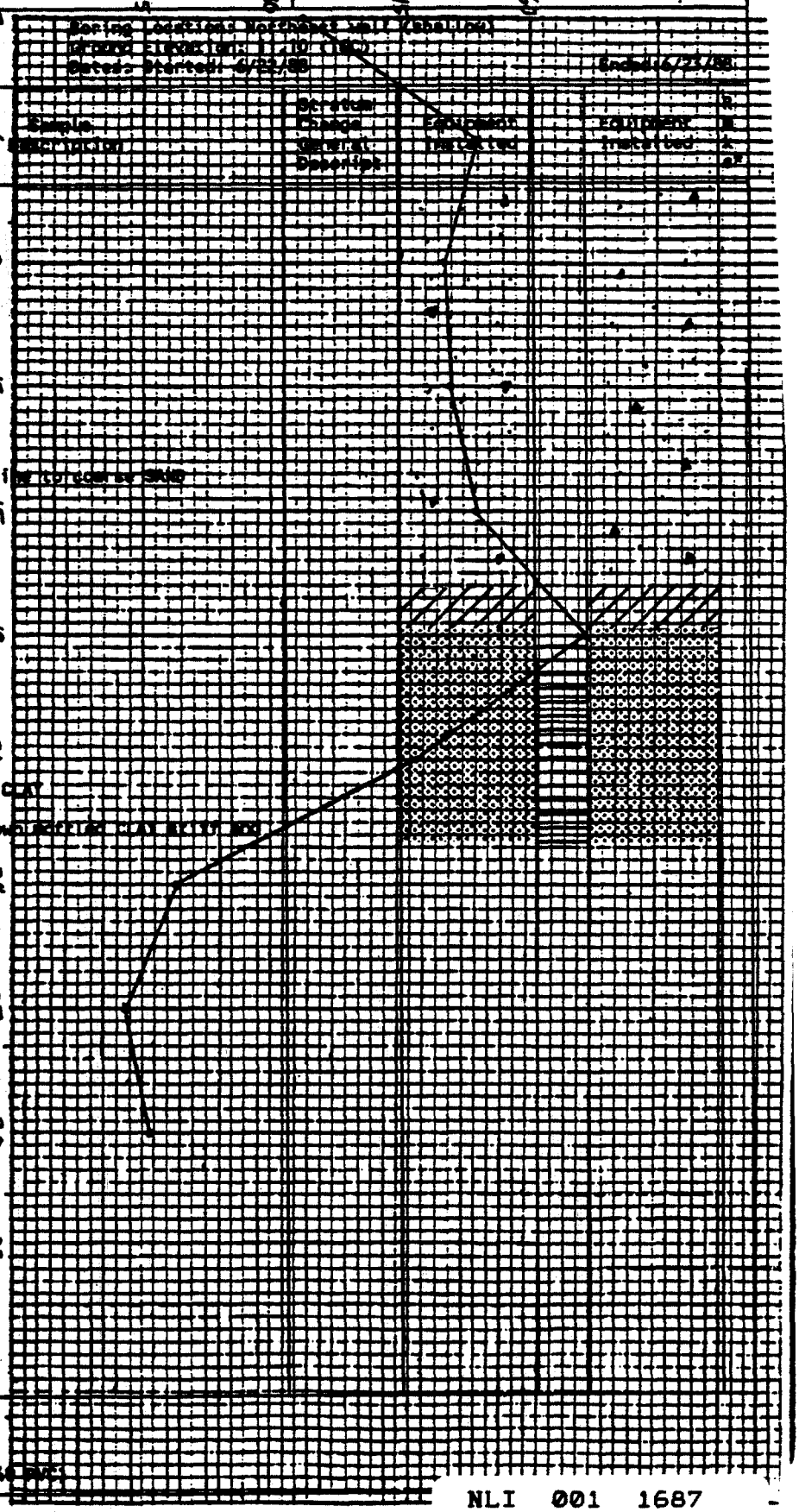
Client: NL Industries

Boring Co. [illegible]
Foreman: Bill [illegible]
Geologist: Chris Young

SAMPLER
Type: 2 inch split spoon
Hammer: 140 lbs. Fall: 30 inches

Ground Water Depth | Date
Depth | Date
File No. [illegible]

Depth	No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Description
						CLAY, GRAY
10						
	1	22.5-24.5	NR	24/24		White clean fine to coarse SAND
						CLAY, RED AND WHITE, HARD, IMPERMIABLE
30						
47.5	2	47.5-49.5	NR	24/24		Brown orange CLAY
[illegible].5	3	49.5-51.5	NR	24/24		Red/white/brown mottled CLAY [illegible] laminated.
						SAND, BROWN, FINE
						CLAY, LIGHT GRAY WHITE, SILTY
						(37-41) SAND, VERY FINE, WITH SILT AND CLAY



Note:
NR- Not recorded
Bottom of well set at 47.8 ft
10 ft of .010 slot screen and 40 ft riser (4", sch 40 PVC)

NLI 001 1687

GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS, INC.

LOCATION MW JD

LOGGED BY

TIME CONSTANT

RANGE TEST BORING LOG

DEPTH TO FLUID

TYPE OF FLUID

BORE HOLE TYPE

Report of Boring No. 12

Sheet 1 of 2

Project Location: National Smelting of NJ

Client: NL Industries

Type: 2 inch split spoon

Hammer: 140 lbs. Fall: 30 inches

Boring Co.: Mathes Drilling

Foreman: George Voloski & Bill Shen

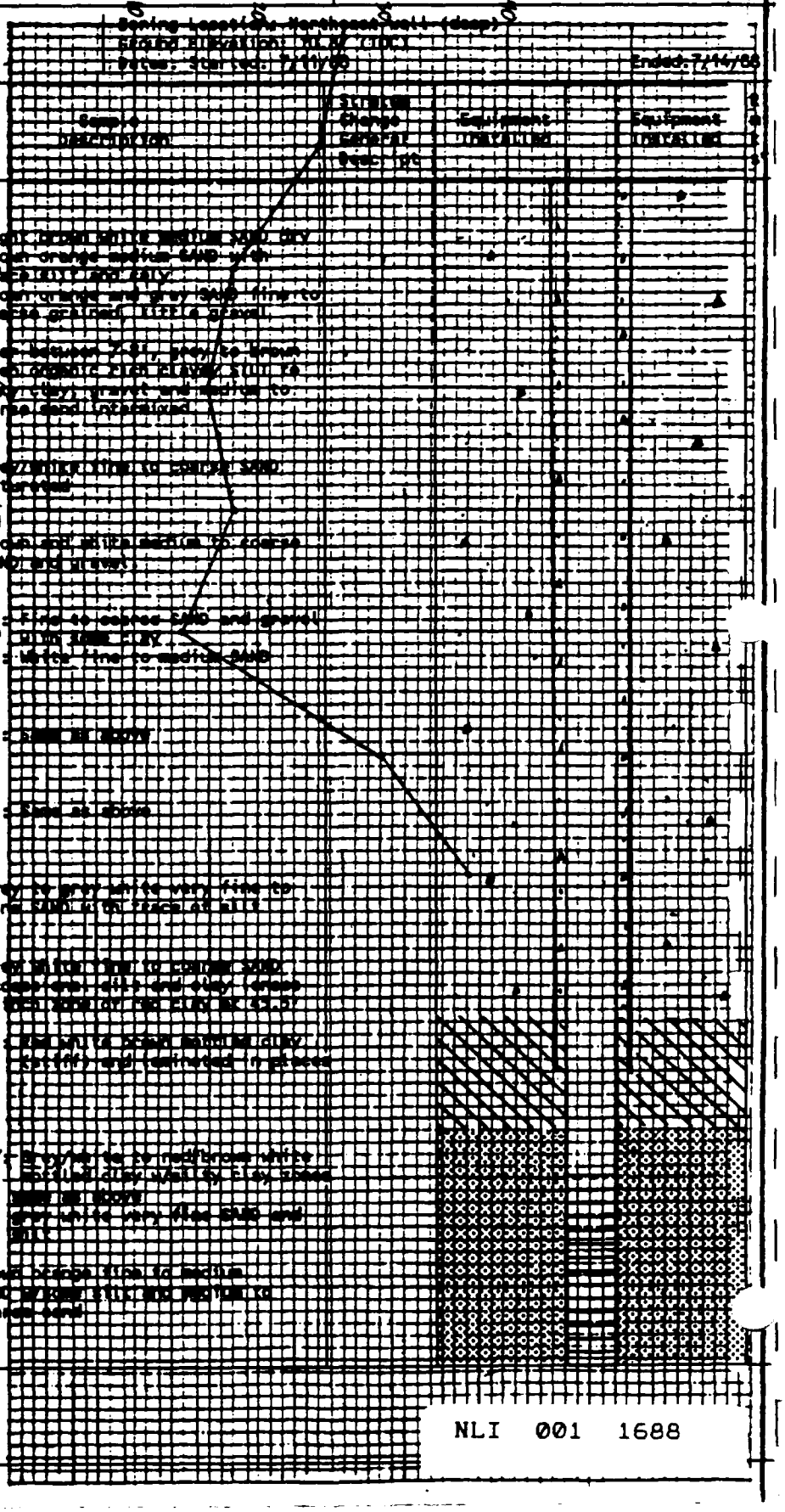
OBG Geologist: Chris Young

Boring Location: Northeast wall (deep)

Ground Elevation: NL 87 (TOC)

Dates: Started: 7/11/88 Ended: 7/14/88

Depth	Sample	Blows	Penetr. Recovr.	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Equipment Installed
0	SAND, GRAY WHITE, FINE TO MEDIUM, WITH SILT AND OCCASIONAL LENSES OF CLAYEY SAND							
4	1	5/7/11	24/24		4-4.6: light brown white medium SAND dry 4.6-5: Brown orange medium SAND with trace silt and clay 5-6: Brown orange and gray SAND fine to coarse grained, little gravel			
9	2	9-11	3/3/6/12	24/24	9-11: Water between 7-8', grey to brown green organic rich clayey silt to silty clay, gravel and medium to coarse sand intermixed			
14	3	14-16	67/27/23/28	24/24	14-16: grey/white fine to coarse SAND saturated			
19	4	19-21	27/23/26/28	24/24	19-21: Brown and white medium to coarse SAND and gravel			
22.5	5	22.5-24.5	33/38/38/45	24/12	22.5-23.8: Fine to coarse SAND and gravel with some clay 23.8-24.5: White fine to medium SAND			
27.5	6	27.5-29.5	4/6/14/16	24/24	27.5-29.5: Same as above			
32.5	7	32.5-34.5	wph/wph/10/10	24/24	32.5-34.5: Same as above			
38	8	38-40	38/40/40/40		38-40: grey to grey white very fine to fine SAND with trace of silt			
44	9	44-46	25/25/26/25	24/24	44-46: Grey white fine to coarse SAND occasional silt and clay lenses 2 inch zone of red clay at 45.5'			
47.5	10	47.5-49.5	19/19/17/18	24/24	47.5-49.5: Red white brown mottled clay (stiff) and laminated in places			
49.5	11	49.5-50.5		NR				
50.5	12	50.5-51.5		NR				
	13	52.1-53.7	NR	18/18	52.1-53.7: Grey/white to red/brown white mottled clay w/silty clay zones			
54	14	54-56		18/24	54-54.25: Same as above 54.25-56: grey white very fine SAND and silt			
59	15	59-61	NR	18/24	59-61: Brown orange fine to medium SAND w/some silt and medium to coarse sand			



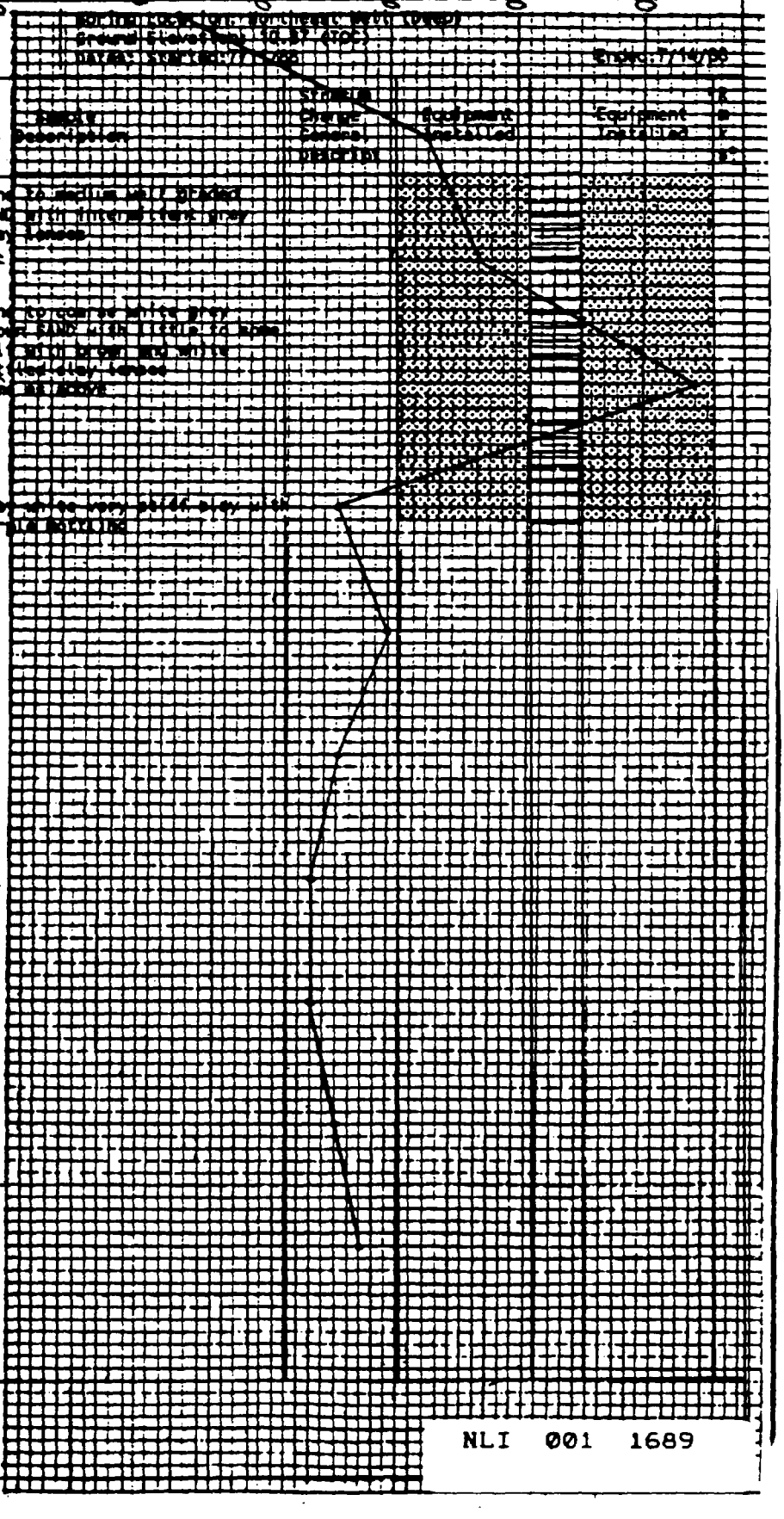
NLI 001 1688

GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS, INC	LOCATION MD	TIME CONSTANT
	LOGGED BY	RANGE BORING LOG
	DATE/TIME	DEPTH TO FLUID
Project Location: National Smelting of NJ		SAMPLER
Client: NL Industries		Type: 2 inch split spoon
Boring Co.: Mathes Drilling		Hammer: 140 lbs. Fall: 30 inches
Foreman: George Voloski & Bill Shen		
Geologist: Chris Young		

TYPE OF FLUID
Report of Boring No. 12
BORE HOLE TYPE
Sheet 2 of 2
PROBE TYPE
Ground Water Depth Date
Depth Date
STRATIGRAPHIC COLUMN
RANGE (COUNTS PER MINUTE)

Depth	No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Description
		SAND, LIGHT BROWN, FINE, WITH SILT				
64.5	16	64.5-66.5	NR	18/24		64.5-66.5: Fine to medium well graded SAND with intermittent grey clay lenses
68.5	17	68.5-70.5	NR	24/24		68.5-70.5: fine to coarse white grey brown SAND with little to some silt with brown and white mottled clay lenses
70.8	18	70.8-72.8	NR	24/24		70.8-72.8: Same as above
		SILT, GRAY, WITH VERY FINE SAND AND SOME CLAY				
76.4	19	76.4-78.4	NR	24/24		76.4-78.4: Grey white very stiff clay with purple mottling
		SAND, BROWN, FINE, WITH SILT				
		SAND, YELLOW BROWN, FINE TO MEDIUM, WITH SOME SILT				
		SILT, RED PINK, WITH SOME CLAY AND VERY FINE SAND				



Note: NR not recorded
20 ft of 10 slot sch 40 PVC 4" screen
60 ft of sch 40 PVC 4" riser pipe
Bottom of well set at 76.4 ft

NLI 001 1689

GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS LOCATION MW OD | TIME CONSTANT LOG | Report of Boring No.: 13 TYPE OF FLUID of 2

Project Lot: LOGGED BY: Freehold, NJ | RANGE SAMPLER | Ground Water Depth Date | BORE HOLE TYPE Date

Client: NL DATE & TIME | Type: 2" O.D. Split Spoon Hammer: 140# DEPTH TO FLUID Fall: 30" | Elev. Depth Date | PROBE TYPE

Boring Co.: Mathes Environmental | Boring Location: | Ground Elevation: | Dates: Started: 9/20/89 Ended: 9/28/89

Foreman: Jake Hilbinger

OBG Geologist: John D. Conway

Depth	Sample Blows	Penetr/Recovery	"N" Value	Sample Description	Stratigraphic Column
				SAND, LIGHT BROWN MOISTED MEDIUM,	
0				SOME SILT	
					Refer to boring log for well sk
				SAND, BROWN, FINE	7.5
45				TO COARSE, WITH A	Red, mottled pebbles with a little coarse sand grains, sub-rounded to rounded. Tip of spoon has a small amount of medium gray mottled clay
				GRAY VIOLET SILT	
				LENSE	
47	47-49	NR	24/NR		Red-white-tan mottled CLAY
					14.5
	49-51	NR	24/NR		Red-white-tan mottled CLAY with some coarse sand.
				SAND, GRAY WHITE,	24/NR
				FINE TO MEDIUM,	
	54-56	3/6/9/14	24/12	WITH SOME SILT	Red-white-speckled CLAY.
				AND OCCASIONAL	
	56-58	3/4/6/9	24/12	LENSES OF SANDY CLAY	Red-gray mottled CLAY
	58-60	13/20/27/31	24/24		0-6 Reddish-tan fine SAND. 6-12 Red-white mottled CLAY with fine sand. 12-24 Red-gray mottled CLAY.
	60-62	7/16/21/24	24/24		
	62-64	11/8/10/11	24/24		24 Red-gray mottled CLAY
64	64-66	6/6/15/23	24/12	SAND, GRAY WHITE,	Red-gray mottled CLAY.
	66-68	3/6/7/14	24/24	FINE TO COARSE WITH SOME FINE GRAVEL	
				AND LENSES OF SANDY	Red-gray mottled CLAY with a little tan coloration.
		3/6/8/17 330	24/24	CLAY	
	70-72	4/5/45/47	24/24		Red-gray mottled CLAY with some fine medium quartz sand, with sub-angular to sub-rounded grains.
				CLAY, RED PINK, WITH	35
				SOME SILT	

Scale: 0 20 40 60 80 100 120 140 160 180 200 (COUNTS PER MINUTE)

DEPTH: 0 5 10 15 20 25 30 35 40

NLI 001 1690

GAMMA RAY LOG

G'BRIEN & GERE ENGINEERS, INC.	LOCATION MW3R	TIME CONSTANT
	LOGGED BY	TEST BORING LOG RANGE
Project Location: Redricktown, NJ	DATE/TIME	SAMPLER DEPTH TO FLUID
ent: NL Industries		Type: 2" O.D. Split Spoon Hammer: 40# Fall: 30"
Boring Co.: Mathe[illegible]al Services		
Foreman: Jake Hitblerger		
DBG Geologist: John D. Conway		

Report of Boring No. 13 Sheet 2 of 2

TYPE OF FLUID

BORE HOLE TYPE

Ground Water Depth Date

PROBE TYPE Depth Date

File No.:

STRATIGRAPHIC COLUMN

RANGE (COUNTS PER MINUTE)

Boring Location:

Ground Elevation:

Dates: Started 9/20/89 Ended 9/28/89

Depth	No	Depth	Blows/6"	Penetr/Recovry	"N" Value	Sample Description
		SAND, FINE TO MEDIUM, LIGHT BROWN, SILTY				
		72-74	32/35/40/47	24/24		Red-gray mottled CLAY.
		74-76	32/58/68/100	24/20		
		SAND, FINE TO MEDIUM, WITH SOME FINE GRAVEL				
		76-78	5/13/20/46	24/18		Red-gray mottled CLAY. Tip of spoon has a gray, very fine, quartz sand with 1-2% heavy minerals.
		78-80	25/37/35/27	24/NR		0-7 Red-gray-yellow mottled CLAY. 7-15 Black-gray-yellow-red mottled CLAY with some very fine quartz sand.
		SAND, FINE TO MEDIUM, LIGHT BROWN, WITH				
		80-82	9/14/20/9	24/24		Yellow-red medium, sandy CLAY.
		SOME FINE GRAVEL, SILT				
		82-84	7/9/8/14	24/12		Gray, fine, quartz SAND with 5% heavy minerals.
		SAND, FINE TO MEDIUM,				
		87-89	8/17/58/	24/12		0-6 Red, medium, quartz, well rounded SAND with 5% heavy minerals, with very little silt.
		BROWN, WITH WHITE CLAY LENSES				
						6-12 Clean, snow white, very fine, well rounded, quartz SAND with <1% feldspar and approximately 1% heavy minerals.
		CLAY, TAN, FINE SANDY				
92		92-94	4/4/21/35	24/24		0-12 Red, medium, quartz SAND with 1-3% heavies with a little silt. 12-24 Orange/yellow, fine to medium SAND with 5-10% heavy minerals with white, soft clay laminae.
		SAND, FINE TO MEDIUM,				
		97-99	7/8/15/22	24/12		White, sub-rounded, coarse, quartz SAND with thin laminae of white clay (1-2 cm).
		BROWN, WITH GRAVEL, FINE AND LITTLE SILT				
		102-104	8/7/19/19	24/14		White-red, fine to coarse SAND with some silt grading into a coarse quartz sand with some very fine, quartz sand.
		SAND CLAY				
		**				
		SAND, MEDIUM TO COARSE,				
		107-109	4/10/20/22	24/12		White to gray, medium to coarse quartz SAND with 15-20% heavy minerals.
		REDDISH TAN, SOME FINE GRAVEL, WITH WHITE CLAY LENSES				
		110-112	4/10/20/22	24/24		0-6 Yellow white-red mottled CLAY. 6-24 White with a very little red CLAY, very little, very fine sand.
		CLAY, RED BROWN, WITH SANDY LENSES				

** (22-28) SAND, MEDIUM TO COARSE, TAN, SOME FINE GRAVEL

NLI 001 1691

GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS, INC.

LOCATION 8R | TIME CONSTANT | TYPE OF BLOW | Hole No.: 14

TEST BORING LOG — Sheet 1 of 2

LOGGED BY | RANGE | BORE HOLE TYPE

Project Location: Pedricktown, NJ | SAMPLER | Ground Water Depth | Date

DATE/TIME | DEPTH TO FLOW | PROBE DEPTH | Date

Client: NL Industries | Type: 2" O.D. Split Spoons | Hammer: 140# | Fall: 30" | File No.: 2844.014

Boring Co.: M[illegible] Environmental Servi[illegible] | Boring Location: | Ground Elevation: | Date: Started 9/12/[illegible] | Finished: 9/12/[illegible]

Foreman: Jake Hitblerger

OBG Geologist: John D. Conway

STRATIGRAPHIC COLUMN — RANGE (COUNTS PER MINUTE)

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Description
						BROWN SAND
0						BROWN AND RED MEDIUM SAND
8				24/24		Saturated tan to light brown, medium to coarse, quartz SAND with 10% heavies typical NJ Beach. A little silty SAND.
		7-9	3/8/11			MEDIUM - FINE SAND
			11			AND STREAKS OF WHITE
		9-11	1/7/11	24/24		CLAY
			13			
						0-12 Saturated tan to light brown, medium to coarse, quartz SAND with 10% heavies typical NJ Beach. A little silty SAND.
						12-15 Quartz pebbles 1-2mm, rounded. Approx. 10% in coarse SAND.
						15-24 Quartz pebbles 1-2mm, rounded. Approx. 10% in coarse SAND.
						RED AND GRAY CLAY
		11-13	woh/6/7	24/22		Quartz pebbles 1-2mm rounded. Approx. 10% in coarse SAND.
			8			
		13-15	4/woh/10	24/12		Quartz pebbles 1-2mm, rounded. Approx. 10% in coarse SAND. Sand a little coarser than the previous spoon.
			14			
						FINE TO MEDIUM SAND
		16-19	5/5/9	24/22		Quartz pebbles 1-2mm rounded. Approx. 10% in coarse SAND. A few quartz pebbles scattered throughout the spoon.
			15			
		19-21	3/6/6	24/18		Quartz pebbles 1-2mm rounded. Approx. 10% in coarse SAND.
21						RED AND WHITE CLAY
22		22-24	1/3/9	24/24	25	Quartz pebbles 1-2mm rounded. Approx. 80% in coarse SAND.
			14			
						RED, BLUE, GRAY AND
				24/14	15P	0-6 Quartz pebbles 1-2mm rounded. Approx. 10% in coarse SAND.
						PURPLE CLAY
						6-14 Coarse sand and pebbles of quartz and feldspar in various color shades to a garden red with some of a gray. Subangular to subrounded grains.
						FINE SAND AND SOME
						SAND STONE
						RED AND WHITE CLAY
						(116-122) SILTY GRAY CLAY

No spoon taken from 17-20' below grade.

WOH = Weight of Hammer.

Station | Elevation | Kind | Tests | Change | Equipment | Sp. Cond. | Deviation | Used | pH | Cond | HNO | Gamma

NLI 001 1692

GAMMA RAY LOG

LOCATION MW 10R | TIME CONSTANT | TYPE OF FLUID

O'BRIEN & GERE ENGINEERS, INC. | LOGGED BY | RANGE | BORE HOLE TYPE

Report of Boring No.: 14

Project Location: Perth Amboy, NJ | DATE/TIME | DEPTH TO FLUID | PROBE TYPE

Ground Water Depth | Date | Depth | Date

Client: NL Industries | Type: 2" O.D. Split Spoons | Fall: 30" | RANGE (COUNTS PER MINUTE)

Boring Co.: SANDS Brownsville, Ky. | Boring Location: | Ground Elevation:

Foreman: JAKE HILT. | Date Started: 7/12/89 | Ended: / /

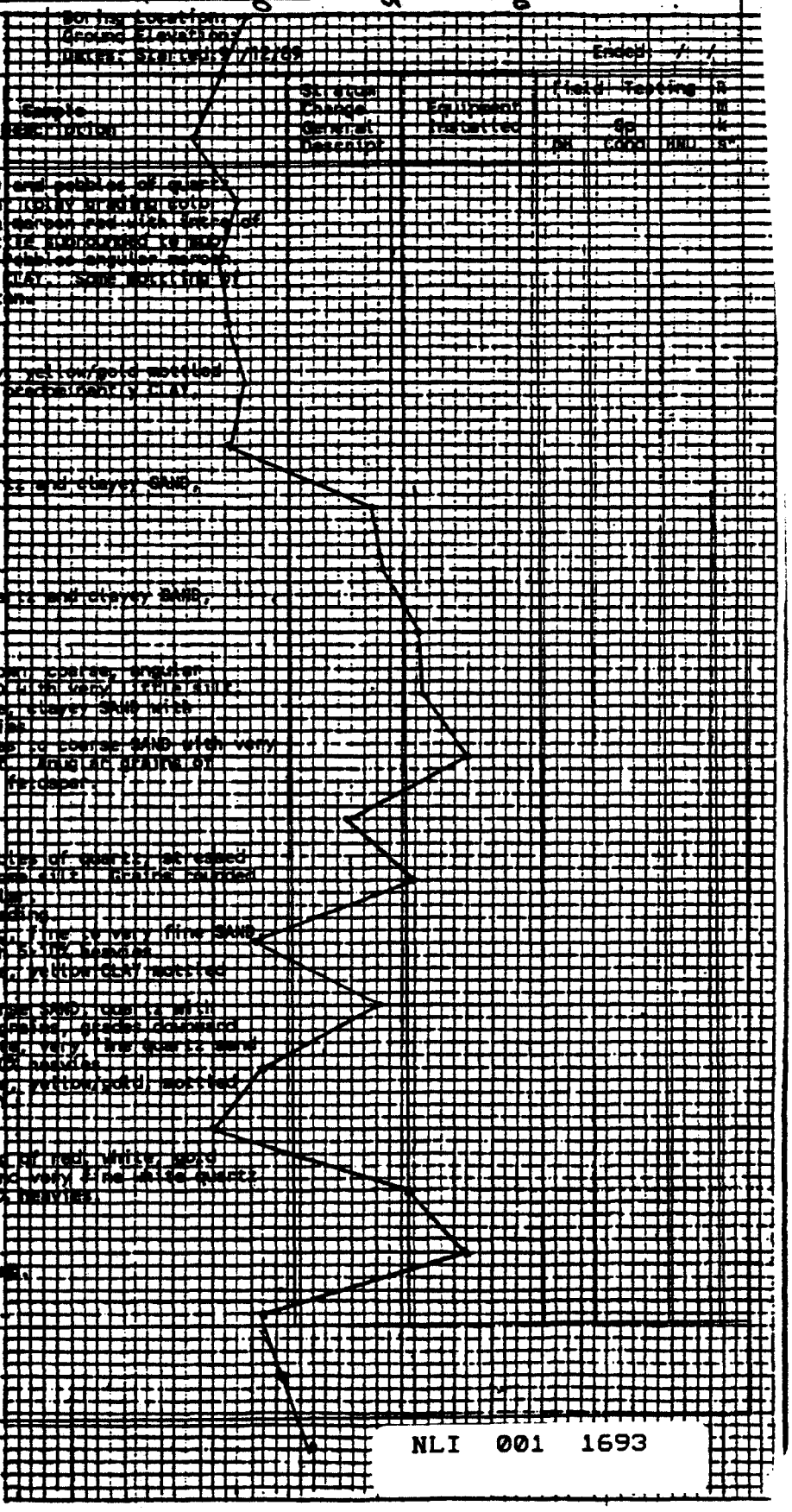
OBG Geologist: SANDY GRAY, FINE.

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Stratigraphic Column	Description	Stratum Change General Descript	Equipment Installed	Field Testing PID	Gas Conc	HNU	R M K S
		26-28	4/5/9	24/12			0-2 Coarse SAND and pebbles of quartz and feldspar (very brownish-gray) color change to a darker red with streak of clay (a little subrounded to sub angular) pebbles angular smooth.						
			11				2-12 Red stiff CLAY. SOME MOTTLING of yellow to tan.						
		SAND, GRAY, FINE TO COARSE.											
		32-34	4/5/5	24/12			Red, white, gray, yellow/gold mottled mottled, stiff, predominantly CLAY. gray, white.						
			14										
		SAND, GRAY-WHITE, FINE TO COARSE; W/ SILT, CLAY AND OCCASIONAL LENSES OF CLAYEY SAND.											
		36-38	4/7/8	24/12			White, fine quartz and clayey SAND, 5-10% heavies.						
			12										
		CLAY, RED-PINK, WHITE MOTTLED; W/ SILT.											
		38-40	woh/5/17	24/8			White, fine quartz and clayey SAND, 5-10% heavies.						
		SILT, WHITE; W/ SOME CLAY AND VERY FINE SAND.					0-5 Reddish-brown coarse, angular quartz SAND with very little silt. 5-7 White, fine, clayey SAND with 5-10% heavies. 7-10 Fine pebbles to coarse SAND with very little silt. Angular grains of quartz and feldspar.						
		SAND, GRAY-WHITE, VERY FINE; WITH SILT AND OCCASIONAL LENSES OF SILTY CLAY.					0-4 Medium pebbles of quartz, stressed quartz. Some silt. Grains rounded to subangular. 4-6 Reverse grading. 6-7 Tarnish red, fine to very fine SAND. Quartz with 5-10% heavies.						
		42-44	8/8/6										
			14										
		SAND, RED-BROWN, FINE TO MEDIUM; W/OCCASIONAL GRAY-WHITE LENSES OF SANDY SILT.					7-7.5 Red, white, yellow clay mottled stringer. 7.5-11 Red, coarse SAND, quartz with angular grains, grades downward to a white, very fine quartz sand with 5-10% heavies. 11-12 Red, white, yellow/gold, mottled stiff CLAY.						
		44-46	5/8/16	24/15			Inter-fingering of red, white, yellow mottled CLAY and very fine white quartz sand with 5-10% heavies.						
			24										
		CLAY, RED-PINK, WHITE, MOTTLED; W/ SILT.					Bottom of boring.						
		SAND, RED-BROWN, FINE COARSE.											

No [illegible] taken from 28-32' below grade.

[illegible] Weight of Hammer.

CLAY, RED, BROWN AND WHITE, MOTTLED; W/ SILT.



NLI 001 1693

GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS, INC.

LOCATION Well 11 | TIME CONSTANT | TYPE OF FLUID

LOGGED BY | RANGE | BORE HOLE TYPE

TEST BORING LOG

Report of Boring No.: 15
Sheet 1 of 1

Project Location: Pedricktown, NJ | DEPTH TO FLUID | Ground Water Depth | Date

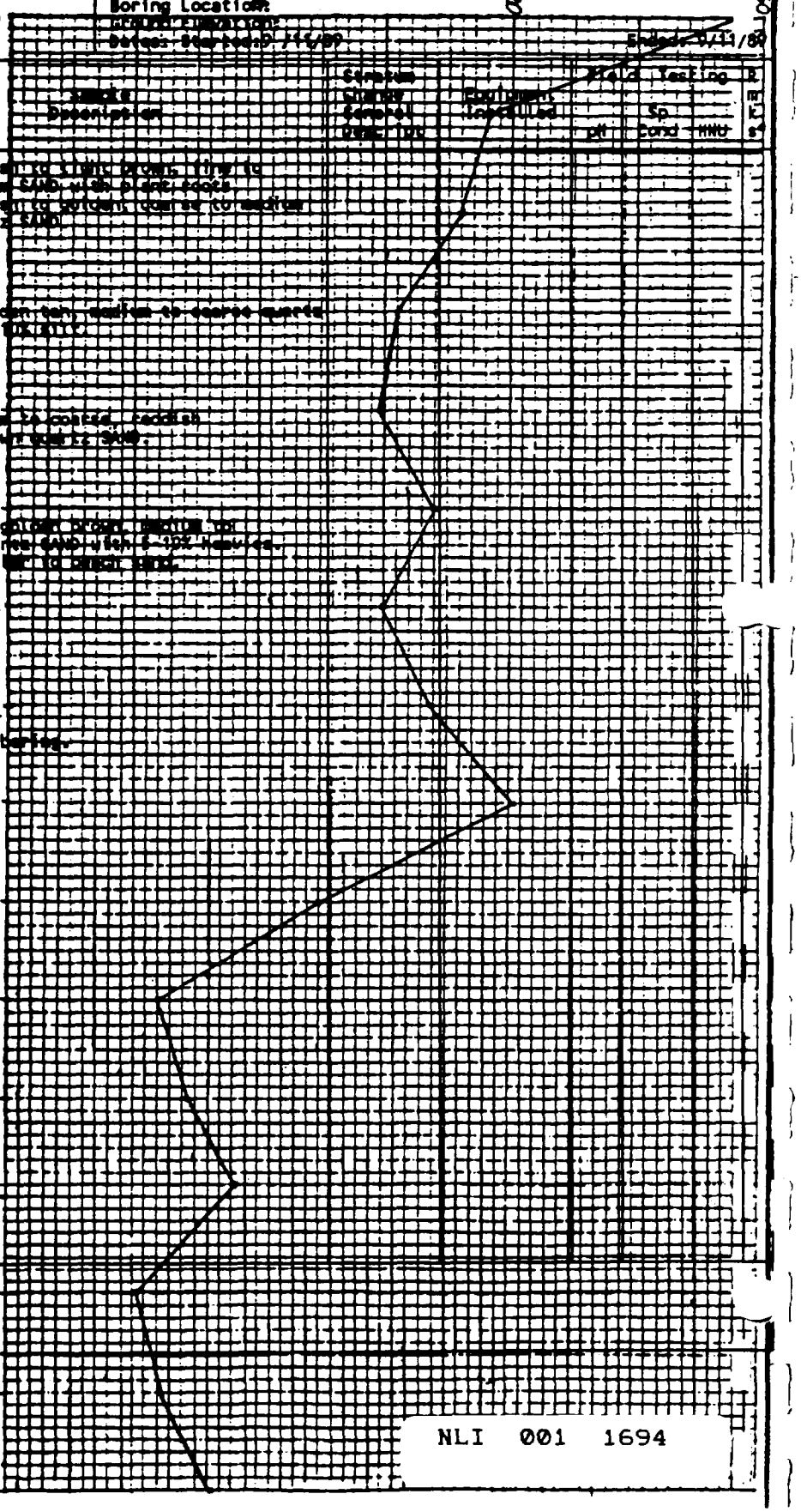
DATE / TIME | SAMPLER | PROBE TYPE | Depth | Date

Client: NL Industries | Type: 2" O.D. Split Spoons | Hammer: 140# | Fall: 30" | File No.: 2844.016

Boring Co.: Mathes Environmental Services
Foreman: Jake Hiyzblerger
OBG Geologist: John D. Conway

Boring Location:
Ground Elevation:
Dates: Started: 9/11/89 Ended: 9/11/89

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change Sample Description	Equipment Installed	Field Testing pH	Sp Cond	HNU	Rmks
0		0-2	3/6/7/6	24/20		0-18 Tannish to light brown, fine to medium SAND with plant roots. 18-20 Tannish to golden, coarse to medium quartz SAND.						
		Bore Log										
		2/4 or	3/3/4/6	24/16		Moist, golden tan, medium to coarse quartz SAND with 10% silt.						
		available.										
		4-6	6/9/11/11	24/12		Wet, medium to coarse, reddish golden brown quartz SAND.						
		6-8	11/14/15/ 16	24/24		Saturated golden brown, medium to coarse quartz SAND with 5-10% heavies. Looks similar to beach sand.						
25						Bottom of boring.						



NLI 001 1694

GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS, INC.

LOCATION: MW 11-R
LOGGED BY:
DATE/TIME:
TIME CONSTANT:
RANGE:
DEPTH:
TYPE OF FLUID:
BORE HOLE TYPE:
PROBE TYPE:

Report of Boring No.: 16
BORING LOG
Sheet of
SAMPLE FLUID:
Ground Water Depth: Date
Depth: Date

Project Location: Paterson, NJ
Client: NL Industries
Drilling Co.: Mathes Environmental Services
Foreman: Joe Mabrey
OBG Geologist: John D. Conway

Type: 2" O.D. Split Spoons
Hammer: 140#
Fall: 30"

STRATIGRAPHIC COLUMN

DESCRIPTION

Boring Location:
Ground Elevation:
Dates: Started: 9/15/89 Finished: 9/15/89

RANGE (COUNTS PER MINUTE) 0 35 70 105

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Surface Change General Description	Equipment Installed	Field Testing GM	Sp. Cond.	RMI	Pb
		SAND MEDIUM FINE BROWN										
		0-2	1/5/7/15	24/18		0-9.5 Brown, fine to medium quartz SAND topsoil						
						9.5-18 Black, medium to coarse quartz SAND. Dry, high organic odor, very little silt/clay.						
		2-4	15/21/30/ 41	24/24		Reddish dark brown, chocolate brown, medium to coarse quartz SAND with some silt. Dry.						
		SAND COARSE-MEDIUM BROWN W/ TRACE OF GRAVEL.										
		4/6	12/26/34 24	24/24		Golden brown, medium to coarse quartz SAND with 5-10% heavies. Moist.						
		6-8	15/20/25 34	24/24		Saturated coarse quartz SAND No fine pebbles. Tannish brown. Interpedded with lens of very fine quartz sand. Tannish brown with 5-10% heavies. Lens range. 5-1 cm thick, also thin 1-3 cm thick stringers of heavy minerals. 90-100% heavies.						
		SAND FINE-MEDIUM BROWN W/ TRACE OF GRAVEL										
		8-10	6/8/9/9	24/24		Saturated, tannish gray grading to a gray fine to coarse quartz SAND with 5-10% heavies. Very little silt.						
		10-12	5/7/8/13	24/24		0-20 Saturated, tannish gray grading to a gray fine to coarse quartz SAND with 5-10% heavies. Very little silt. 20-24 Medium to large pebbles in a matrix of sandy CLAY. Sand is fine to medium quartz, medium gray. Some silt.						
		12-14	3/5/7/15	24/18		0-8 Coarse SAND to medium pebbles. Quartz, stacked quartz feldspar, with some silt, medium gray. 8-10 Medium gray, very fine to fine quartz 10-15.5 Color grading to brown, very fine quartz 15.5-18 White, gray sandy CLAY. Sand is very fine with 5-10% heavies.						
		SAND MEDIUM-COARSE										
		19-21	5/11/16/8	24/12		CLAY. Red, white, yellow mottled, stiff clay.						
		SAND, MEDIUM-COARSE W/ TRACE OF FINE GRAVEL										

NLI 001 1695

NL INDUSTRIES
WELL 12 GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS, INC.

TEST BORING LOG

Report of Boring No.: 16
Sheet 2 of 3

Project Location: Pedricktown, NJ

Client: NL Industries

SAMPLER Type: 2" O.D. Split Spoon
Hammer: 140# Fall: 30"

Ground Water Depth Date
Depth Date
File No.: 2844.014

Boring Co.: Mathes Environmental Services
Foreman: Jake Hitzblerger
OBG Geologist: John D. Conway

INSTRUMENT READING
RANGE = 20 TC=10

Boring Location:
Ground Elevation:
Dates: Started: 9/13/89 Ended: 9/13/89

WELL 12 GRAPHIC BORING LOG

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Sp Cond	HNU	Rmks*
		24-26	8/16/24	24/		CLAY. Red, white, yellow, stiff.						
		27-29	WOR	24/12		Very fine to fine, white quartz SAND. No silt. 5-10% heavies.						
		30-32	WOR/8	24/6		0-4 Coarse quartz SAND, brown, with some silt. 4-6 Stiff CLAY.						
		34-36	4/4/8/13	24/24		Coarse quartz SAND with a little clay, reddish gray color. 5-10% heavies.						
		36-38	24/25/15	24/15		0-10 Reddish gray, fine to medium quartz SAND. No silt, rounded grains. 5-10% heavies, a few (1-2%) pebbles of quartz. 10-15 Reddish coarse, quartz SAND with some silt and a clay glob/ball.						
		39-41	6/19/27/			0-5 Reddish gray, fine to medium quartz SAND. No silt, rounded grains. 5-13 White-gray SAND, silty clay. 13-15 Very fine, white quartz SAND with a little silt.						
		42-41	5/8/16/22	24/22		0-11 Pinkish, coarse quartz SAND with fine 5-10% heavies. 11-12 Sandy, silty white CLAY.						
		44-46	7/12/35	24/		Fine white quartz SAND with some silt and several lamina of heavies <1cm thick.						
12												
		46-48	NR	24/24		0-20 Medium to coarse SAND, tannish brown, angular grains of quartz, 10% heavies. 20-24 Fine, white quartz SAND with little silt.						
		49-51	NR	24/6		Reddish tan, medium quartz SAND, sub-rounded grains, some silt.						

DEPTH BELOW GRADE (FT.)

0 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 75.5

WOR = Weight of Rods

NLI 001 1696

O'BRIEN & GERE ENGINEERS, INC.

GAMMA RAY LOG

13

BRIEN & GERE ENGINEERS INC — LOCATION — TIME CONSTANT — TYPE OF FLUID — Report of Boring Hole 46

LOGGED BY — RANGE — BORE HOLE TYPE — Sheet 3 of 3

TEST BORING LOG

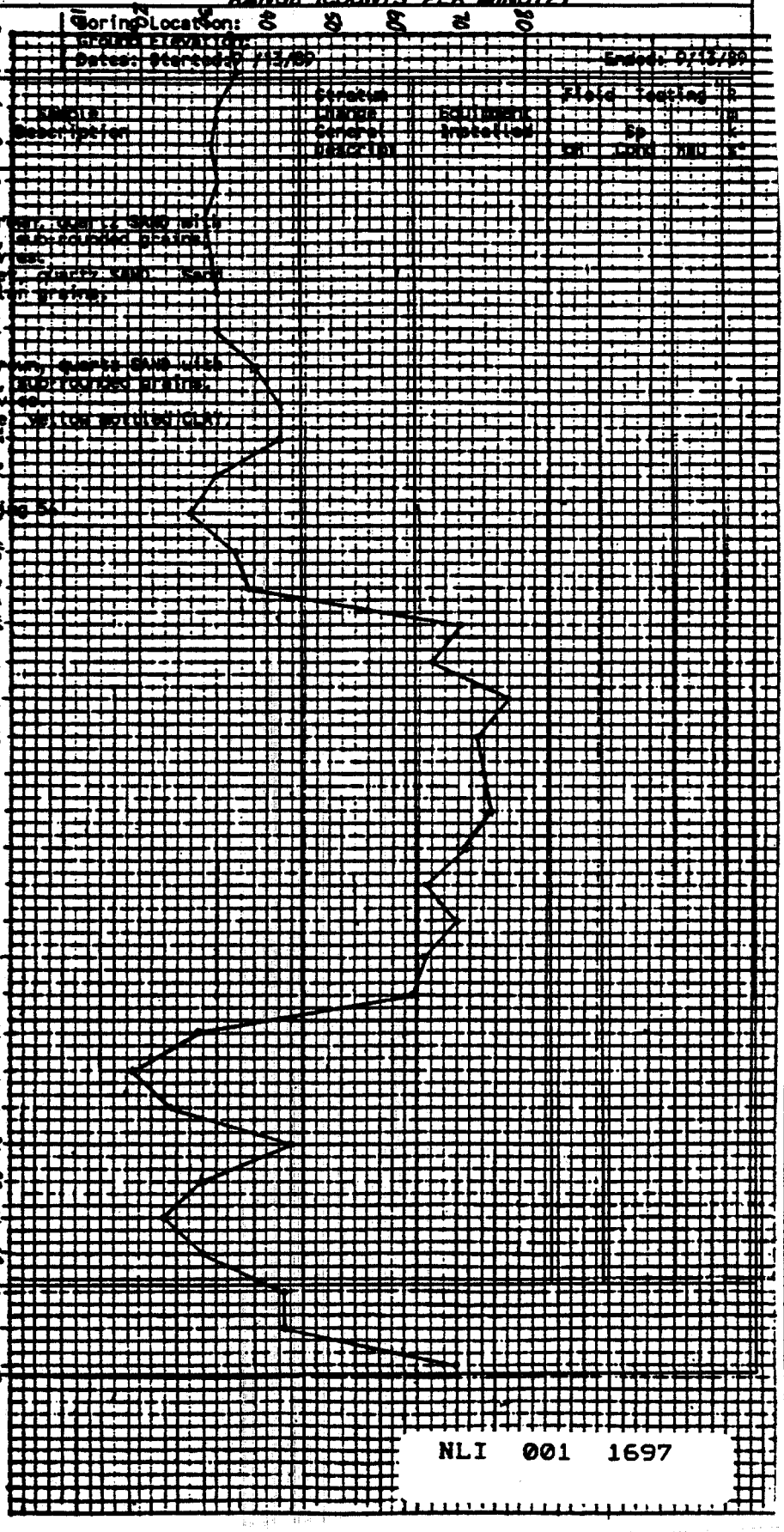
Project Location: Bedminster, NJ — DATE/TIME — DEPTH — SAMPLED FLUID — Ground Water Depth — PROJECT TYPE — Date

Client: NL Industries — Type: 2" O.D. Split Spoon — Hammer: 140# — Fall: 30" — File No.: 2866.016 — Depth — Date

Boring Co.: Mathes Environmental Services — Foreman: Jake Hitzblerger — OBG Geologist: John D. Conway

Boring Location: — Ground Elevation: — Dates: Started: 8/13/80 — Ended: 8/13/80

Depth	Sample No	DESCRIPTION COURSE, QUARTZ SAND	Blows	Penetr/ Recovery	Value	STRATIGRAPHIC COLUMN	Stratum Change Sensitivity	Equipment Installed	Field Testing Sp Cond	RANGE (COUNTS PER MINUTE)
		52-54	NR	24/18		0-12 Greyish brown, quartz SAND with some silt, subrounded grains, 5-10% heavies. 12-18 Red clayey quartz SAND. Sand has angular grains.				
		COURSE SAND; RED CLAY				24				
		54-56	NR	24/10		0-5 Greyish brown, quartz SAND with some silt, subrounded grains, 5-10% heavies. 5-10 Red, white, yellow mottled CLAY at 44.				
		RED, WHITE, GRAY YELLOW/ GOLD, MOTTLED, STIFF CLAY				34				
54		CLAYEY SAND, SAND				Bottom of boring 54				
		RED-WHITE-TAN MOTTLED CLAY				44				
						51				
		RED-GRAY MOTTLED CLAY								
		RED-GRAY CLAY WITH SOME SAND (70-72)				70				
		RED-GRAY CLAY (72-76)				72				
		RED-GRAY CLAY WITH SOME FINE SAND (76-80)				76				
		QUARTZ SAND				80				
		QUARTZ SAND WITH LAMINA OF WHITE CLAY				91				
						99				
		COARSE QUARTZ SAND								
		YELLOW-WHITE-RED MOTTLED CLAY				112				



NLI 001 1697

GAMMA RAY LOG

O'BRIEN & GERE ENGINEERS, INC.

LOCATION MW 16

LOGGED BY

DATE/TIME

TIME CONSTANT

TEST BORING LOG

RANGE

SAMPLER

DEPTH TO FLUID

Type:

Hammer: Auger Flight Fall:

TYPE OF FLUID

Report of Boring No.: 17

Sheet 1 of 1

BORE HOLE TYPE

Ground Water Depth Date

PROBE TYPE Depth Date

File No.: 2844.014

Project Location: Pedricktown, NJ

Client: NL Industries

Boring Co.: Mathes Environmental Services

Foreman Jake Hitzblerger

OBG Geologist: John D. Conway

Boring Location:

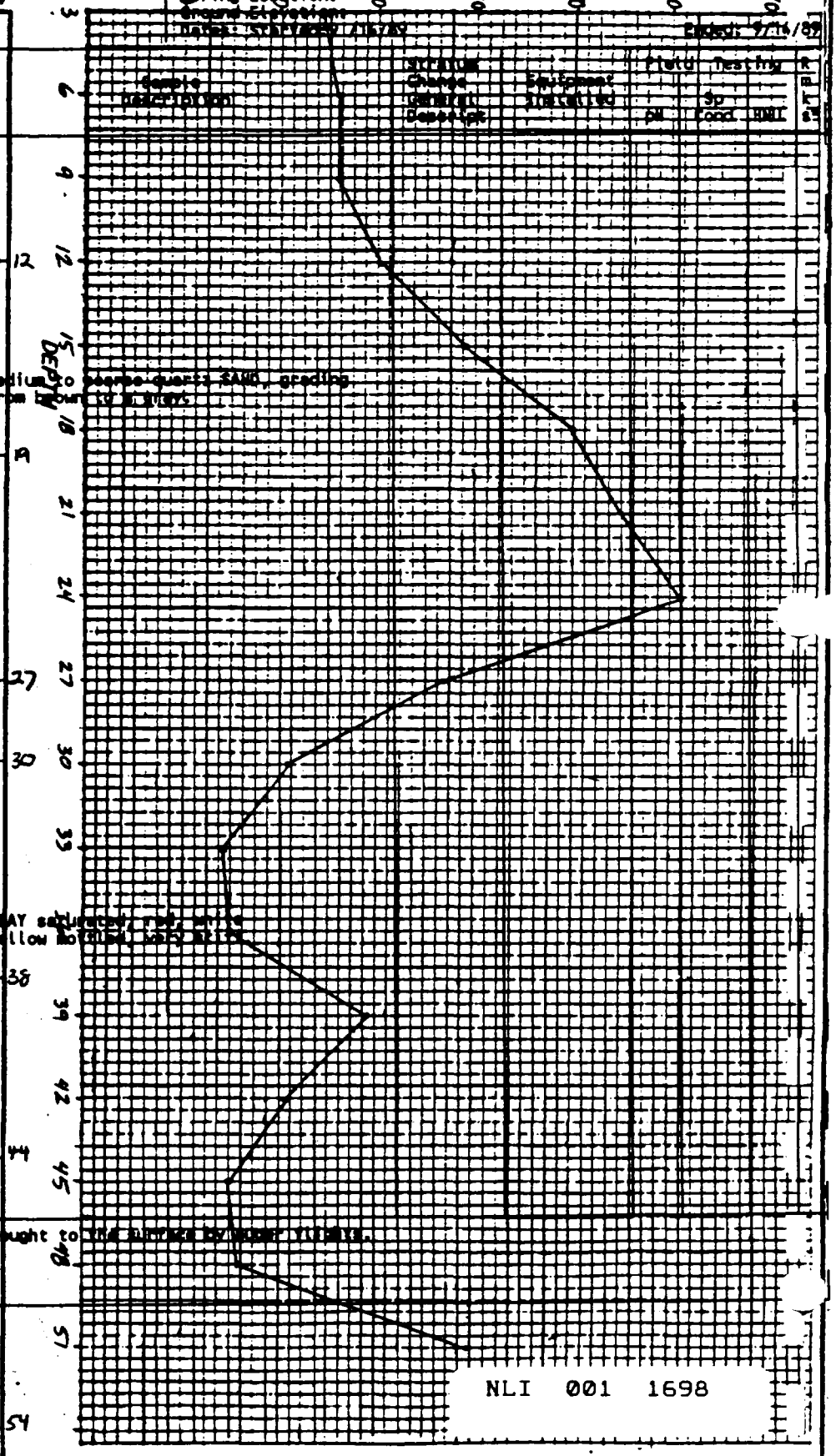
Ground Elevation:

Dates: Started 9/16/89 Ended: 9/16/89

Depth	Sample No	Depth	Blows /6"	Penetr/ Recovry	"N" Value	Depth	Sample Description	Stratum Change General Descript	Equipment Installed	Field Testing pH	Sp Cond	HNU	Rmks
0													
						12							
							COARSE SAND, GRAY SANDY CLAY						
						19							
							CLAY. RED, WHITE, YELLOW, MOTTLED, STIFF CLAY						
						27	QUARTZ SAND						
						30							
							COARSE QUARTZ SAND WITH SOME CLAY						
		21-23	10/10/21	24/18									
			30			38							
22							SAND, SILTY CLAY						
						44							
							SAND						
						54	(54-56) RED WHITE YELLOW MOTTLED CLAY						

STRATIGRAPHIC COLUMN

RANGE (COUNTS PER MINUTE)



Subsurface descriptions based on materials brought to the surface by auger flights.

NLI 001 1698

GAMMA RAY LOG

LOCATION WEIN 18 | TIME CONSTANT | TYPE OF FLUID

BRIEN & GERE ENGINEERS INC | LOGGED BY | RANGE | BORE SIZE | TYPE

Report of Boring No.: 18 Sheet 1 of 1

Project Location: Parsippany, NJ | DATE/TIME | DEPTH TO FLUID | PROBE TYPE

Ground Water Depth Date | Depth Date

Client: NL Industries | Type: Auger Flight | Fall: | RANGE (COUNTS PER MINUTE)

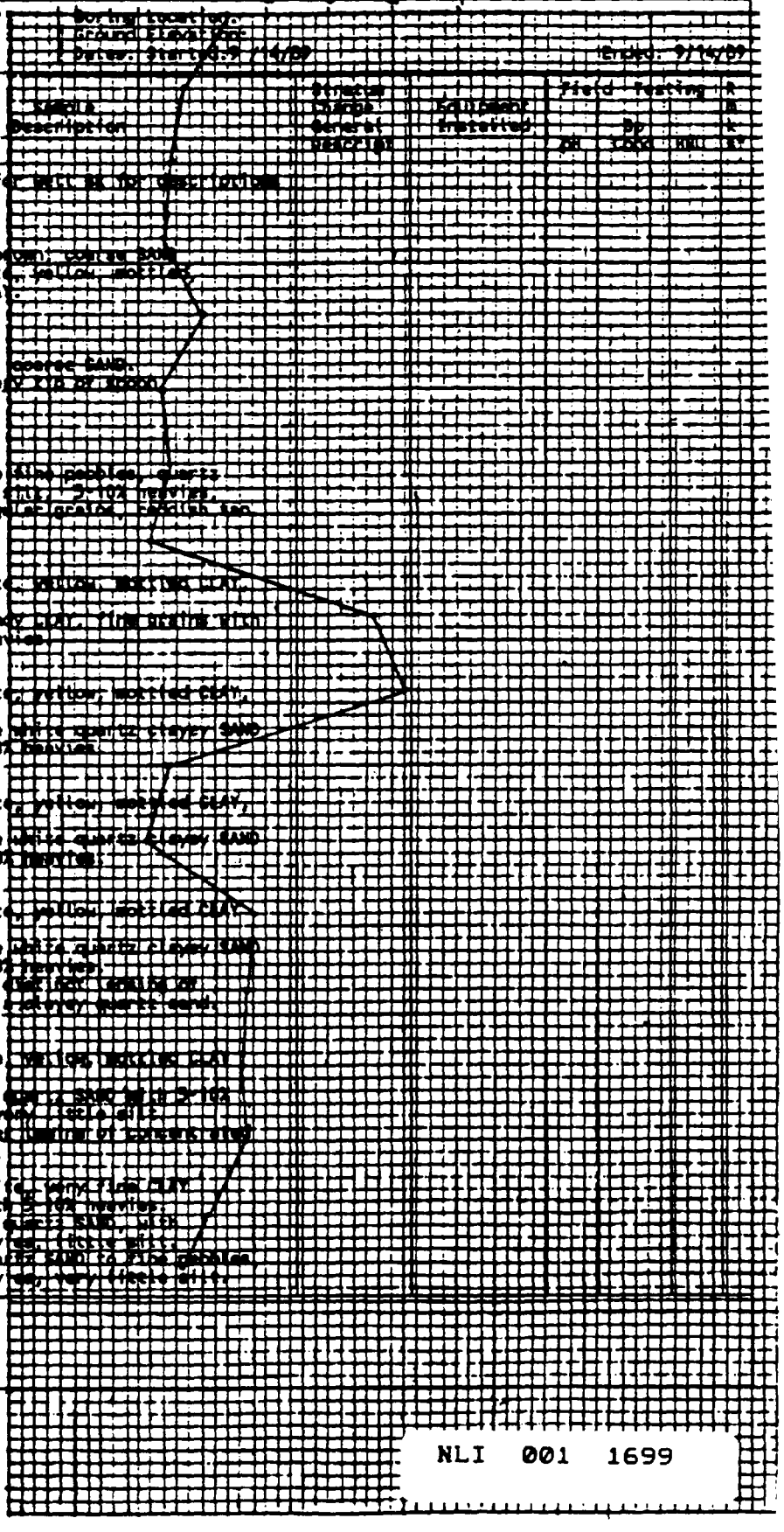
Drilling Co.: Mathes Environmental Services

Foreman: Jake Nitzblerger

DBG Geologist: John D. Conway

Boring Location:
Ground Elevation:
Dates: Started: 9/14/89 Ended: 9/16/89

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Stratigraphic Description	Structural Sample General Description	Equipment Installed	Field Testing PH	Dp Cond	Rdg Rate
						See well log for well ck for description					
		SAND, BROWN, MEDIUM									
30		29-31 COARSE	1/12	24/12		0-3 Tannish brown, coarse SAND 3-12 Red, white, yellow, mottled, stiff CLAY.					
		32-34	20/35/39	24/12		Tannish brown, coarse SAND. No recovery very big or broken					
			25								
		34-36	WOH/4	24/20		Coarse SAND to fine pebble, quartz with a little silt, 5-10% heavies, rounded to angular grains, reddish tan					
		41-43	WOR/6/18	24/18		0-3 Red, white, yellow, mottled CLAY, stiff. 3-18 White sandy clay, fine grains with 5-10% heavies.					
		SANDY CLAY 43-45	13/18/36	24/18		0-15 Red, white, yellow, mottled CLAY, stiff. 15-18 Very fine white quartz clayey SAND with 5-10% heavies.					
			50								
		45-47	23/35/33	24/24		0-15 Red, white, yellow, mottled CLAY, stiff. 15-18 Very fine white quartz clayey SAND with 5-10% heavies.					
		SAND, BROWN, COARSE	3"-45								
		48-50	14/20/32	18/18		0-15 Red, white, yellow, mottled CLAY, stiff. 15-18 Very fine white quartz clayey SAND with 5-10% heavies. Slightly more distinct looking of clay lens and clayey quartz sand.					
		52-54	WOH/32/	18/9		0-2 Red, white, yellow, mottled CLAY, stiff. 2-1 Very fine quartz SAND with 5-10% heavies, very little silt. Several small bands of coarser stuff heavies.					
		RED, WHITE YELLOW CLAY,	75/ spoon refusal	SAND							
		54-56	10/15/34/	24/11		0-3 Sandy, white, very fine CLAY quartz with 5-10% heavies. 3-4 Very fine quartz SAND, with 5-10% heavies, little silt. 4-11 Coarse quartz SAND to fine pebbles 5-10% heavies, very little silt.					
			30								
						54					



NLI 001 1699

APPENDIX C

APPENDIX C

Continuous ground water level monitoring was conducted on October 19 through 26, 1988 of wells 9R2, 10, 11, ID, KD, OD, PD, and BR. During that week 1.6 inches of precipitation was recorded on October 22 and 0.15 inches were recorded on October 24.

Hydrographs for the wells during the first week of monitoring show an almost immediate increase of 0.4 feet in ground water elevations occurring during the 1.6 inch precipitation event on October 21-22 with the exception of wells 10 and 9R2. The first confined Well 10 demonstrated a delayed response of less magnitude during the rain event. Well 9R2 (first confined) data included several fluctuations which could not be related to precipitation. These results indicate that the unconfined aquifer wells respond rapidly to recharge from precipitation. Well 10, previously considered confined, exhibits a delayed response and appears to have limited hydraulic connection to water table wells. The hydrographs for wells BR, 11 and PD demonstrate coincidental increases in water elevation in response to the precipitation event on October 21.

Well 11 was previously considered to be screened in the first confined aquifer, however, the rapid response of well 11 and the similarity of the hydrographs of BR and PD to well 11, indicates that these wells are hydraulically connected within the unconfined aquifer.

The hydrographs also suggest that water levels of the confined aquifer wells may have responded to a low pressure system associated with the precipitation event on October 21, 1988. Changes in atmospheric pressure can produce large water level fluctuations in wells screened in confined aquifers. The relationship between barometric pressure and water level change is an inverse relationship. As barometric pressure decreases, the water level in the well would be expected to increase. When the lows on the barometric pressure plots (Figures 13 and 14) are compared to the hydrographs (Appendix C), the water levels in confined aquifer wells appear to increase slightly while those in the unconfined aquifer appear to be responding more to the direct infiltration of the rain water. However, fluctuations in the hydrographs of the confined aquifer wells suggest other factors are of more importance in determining hydraulic potential levels in the confined aquifer.

There are four tidal changes (Figures 11 and 12) over a twenty-four hour period of time in the Delaware River at Oldmans Creek (two high tides and two low tides) occurring at roughly six hour intervals (NOAA, 1988). A neighboring industrial facility, BF Goodrich, conducted a study of their facility. As part of their study, they investigated tidal impacts on the East Stream and concluded that the East Stream did not respond to tidal changes (Woodward-Clyde, 1989). Comparing the well hydrographs (Appendix C) with the appropriate plot of tidal changes, the hydrographs were

inconsistent with the tidal period and wavelength of Oldmans Creek and do not demonstrate significant tidal impacts on hydraulic potential.

The application of a downward load on the subsurface material, such as a very heavy weight, can cause ground water elevations in wells screened in a confined aquifer to increase. If such a load were applied instantaneously for a short duration, the hydrograph may show a sharp increase and decrease in water levels immediately during and after the event. If the load is maintained, the increase in water levels induced by the load should eventually recover to close to normal status conditions as pressure equilibrium is achieved. With this in mind, the hydrographs generated for monitoring wells at the Pedricktown facility could possibly be influenced to some extent by the daily passing of trains through the center of the facility. The data is limited and obviously repetitive trends coincident with the daily train passage are not apparent.

Some of the responses observed in the water level data for the seven wells may be the result of electrical surges in the monitoring unit. Of particular note are the similar spiked responses observed in all of the hydrographs on October 23 and 25.

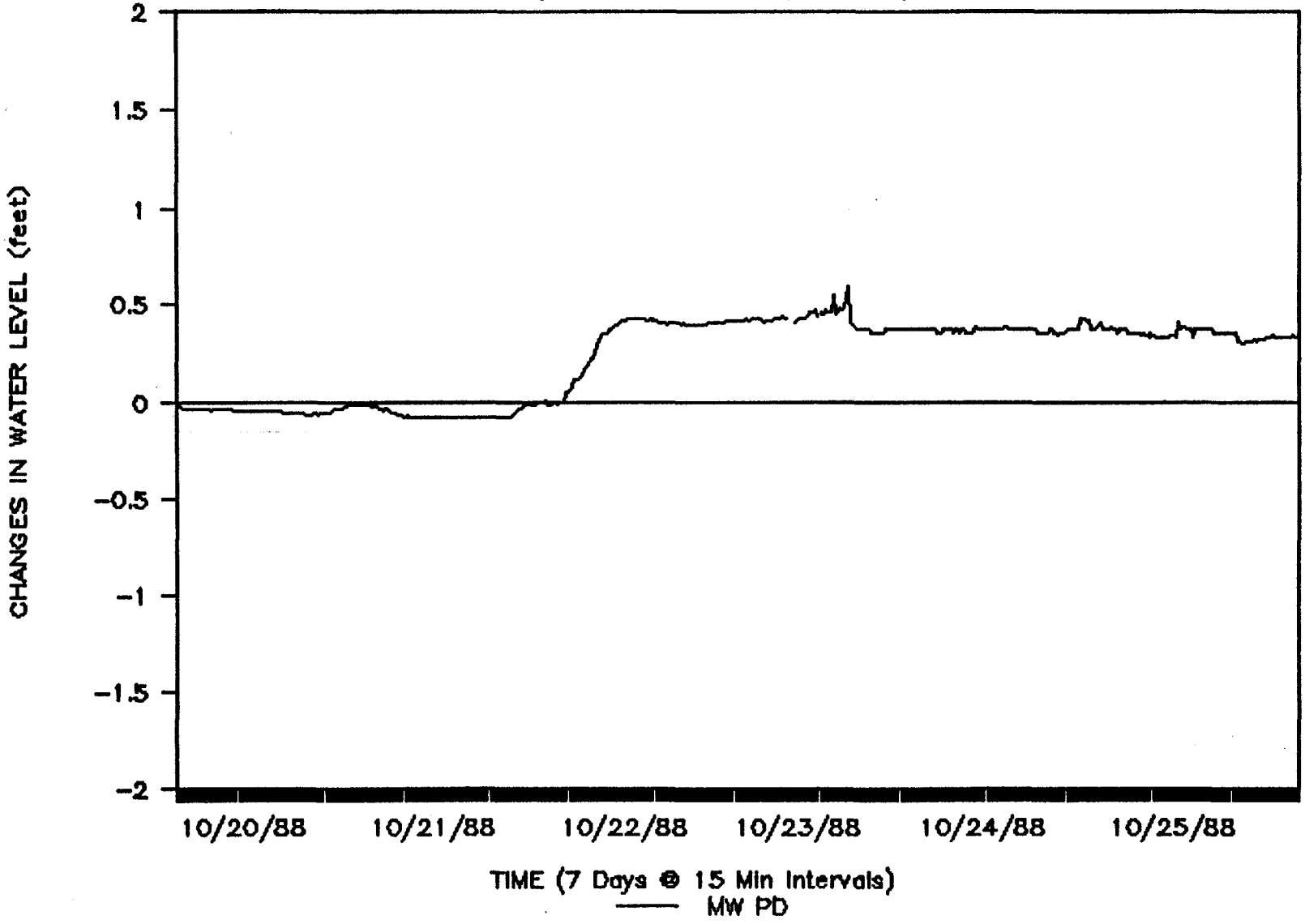
Eight wells (9R2, 10, 12, 7, 2R2, 4R, LD, and MD) were monitored during the second week of continuous ground water level monitoring (November 8-16, 1988). Precipitation was recorded on November 11 totaling 0.1 inches and November 13 totaling 0.4 inches. The hydrographs do not reflect any response which can be correlated to the November 11 or November 13 event.

Water levels in monitoring wells 7 and LD respond in a manner which appears to be the result of a repetitive mid-day pumping event. The maximum water level change observed in Well 7 is 0.8 feet while the maximum change noted in Well LD is generally less than 0.1 feet.

Hydrographs for the three wells monitoring the first confined aquifer (9R2, 10 and 12) also show water level responses which may be the result of local ground water pumping. Water level responses in Well 12 and 10 are similar. Well 9R2 produced hydrographs indicating cyclical fluctuations in water level which are slightly different than those observed at Well 10 or 12. The data suggest that flow in the first confined aquifer is controlled by withdrawal wells.

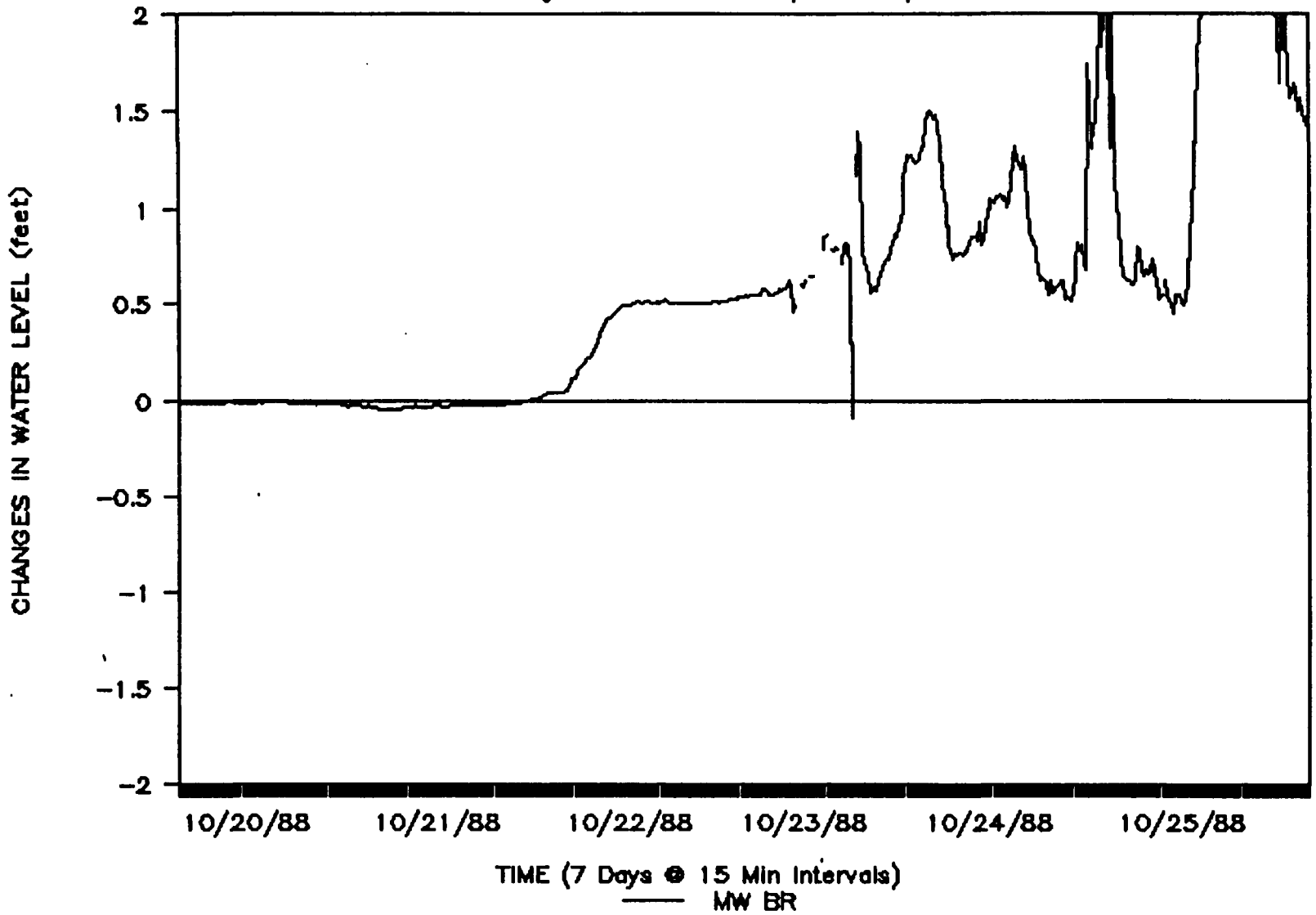
NL INDUSTRIES WATER LEVEL DATA

Changes In Water Levels (1st Week)



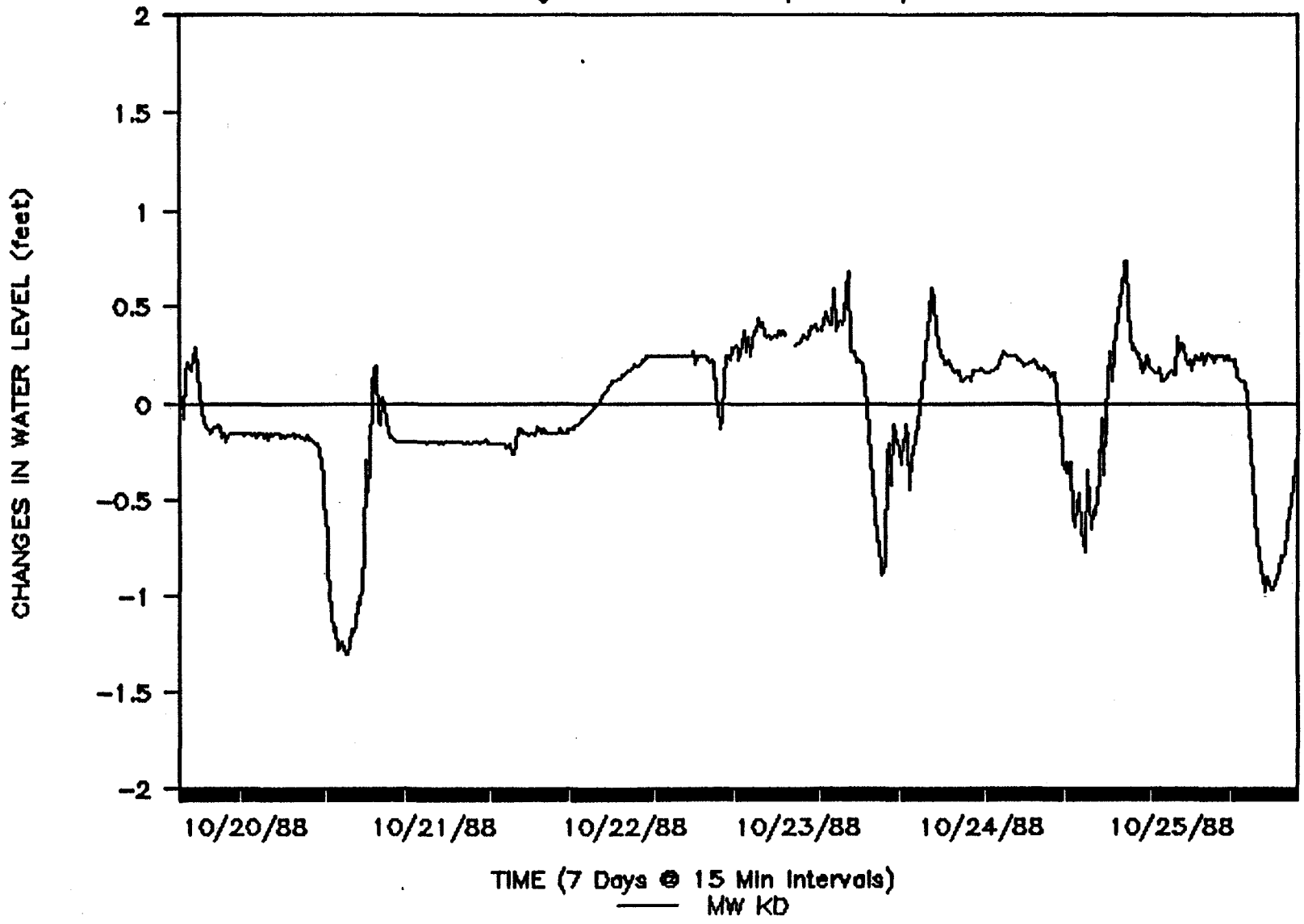
NL INDUSTRIES WATER LEVEL DATA

Changes In Water Levels (1st Week)



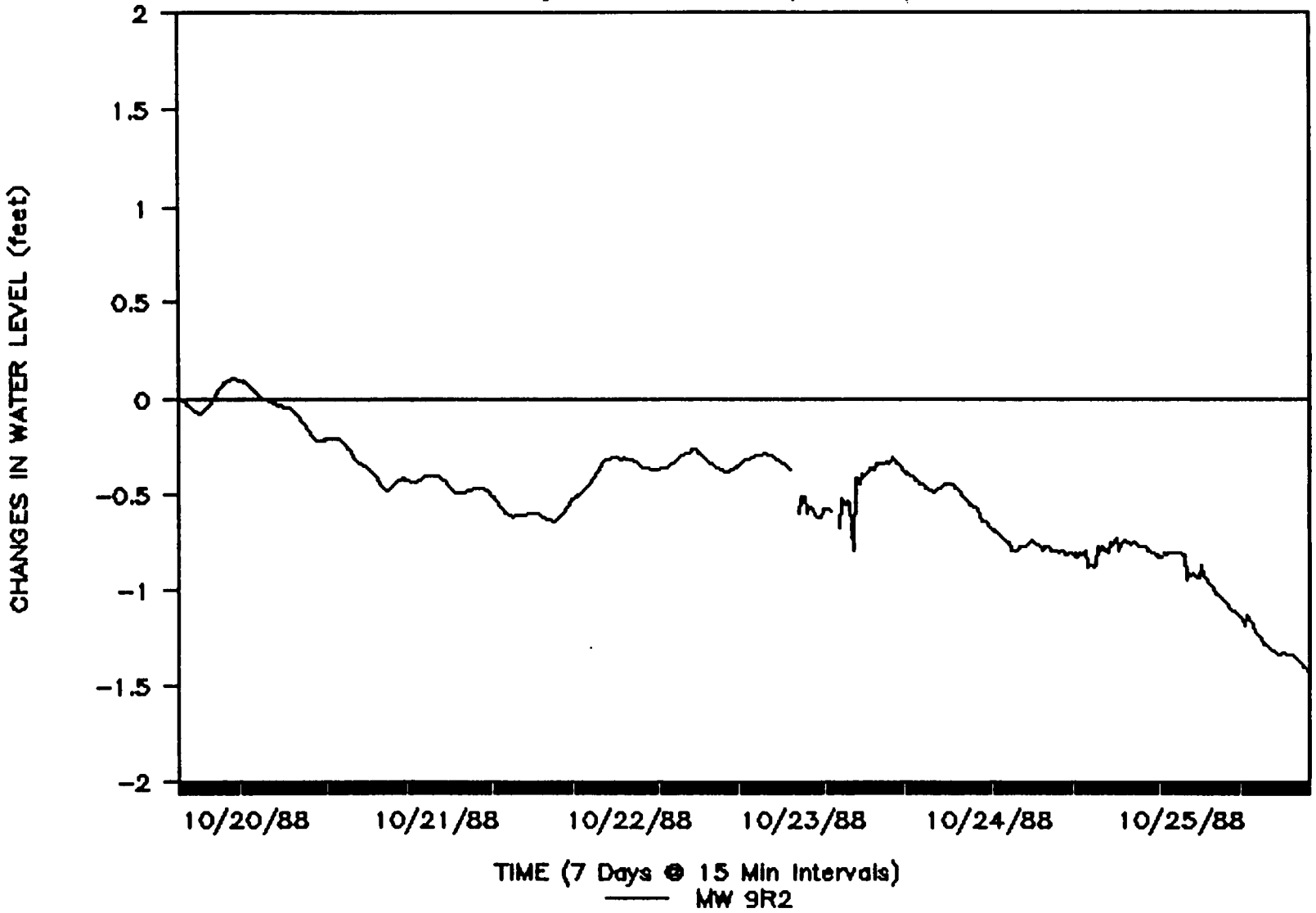
NL INDUSTRIES WATER LEVEL DATA

Changes In Water Levels (1st Week)



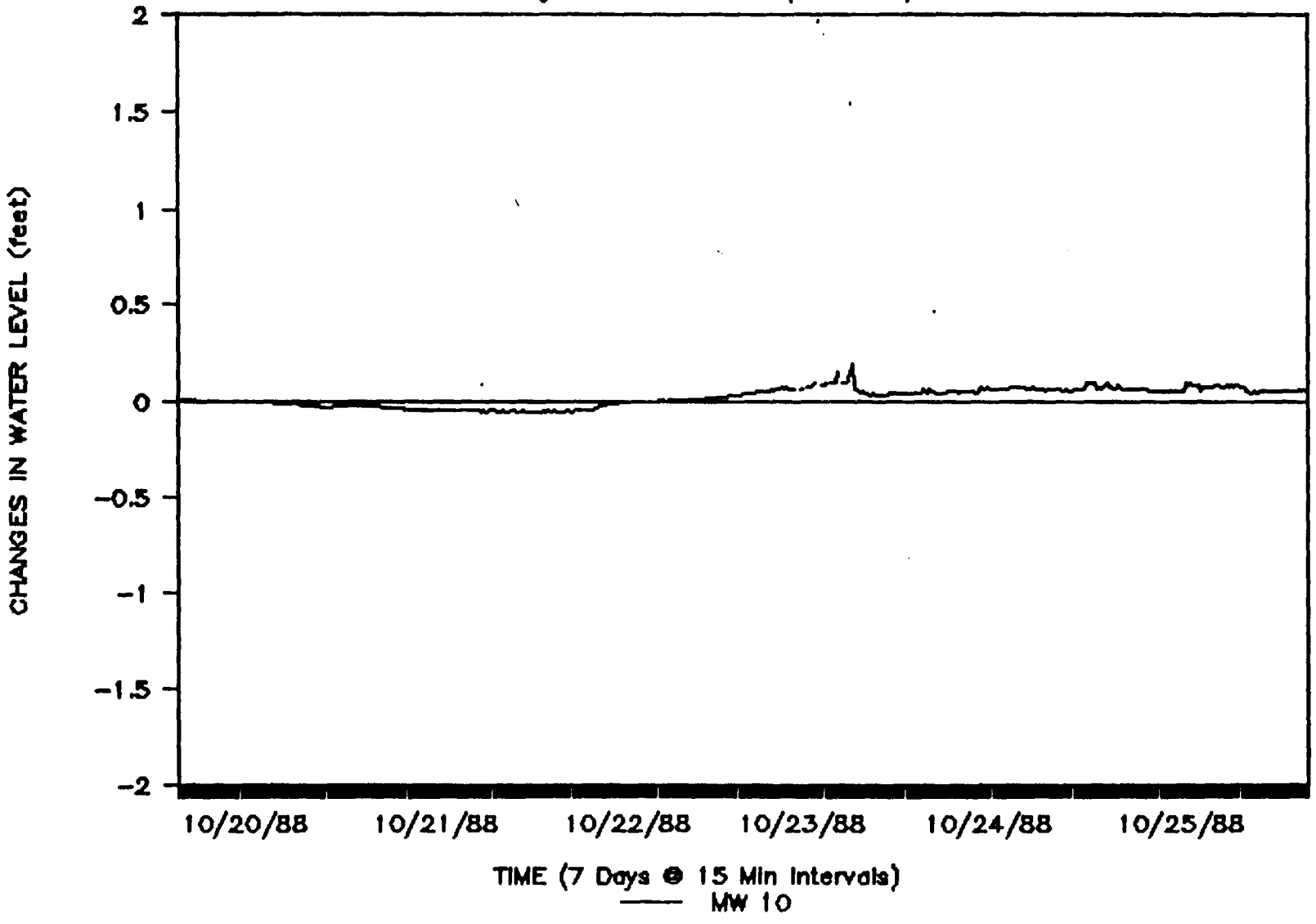
NL INDUSTRIES WATER LEVEL DATA

Changes In Water Levels (1st Week)



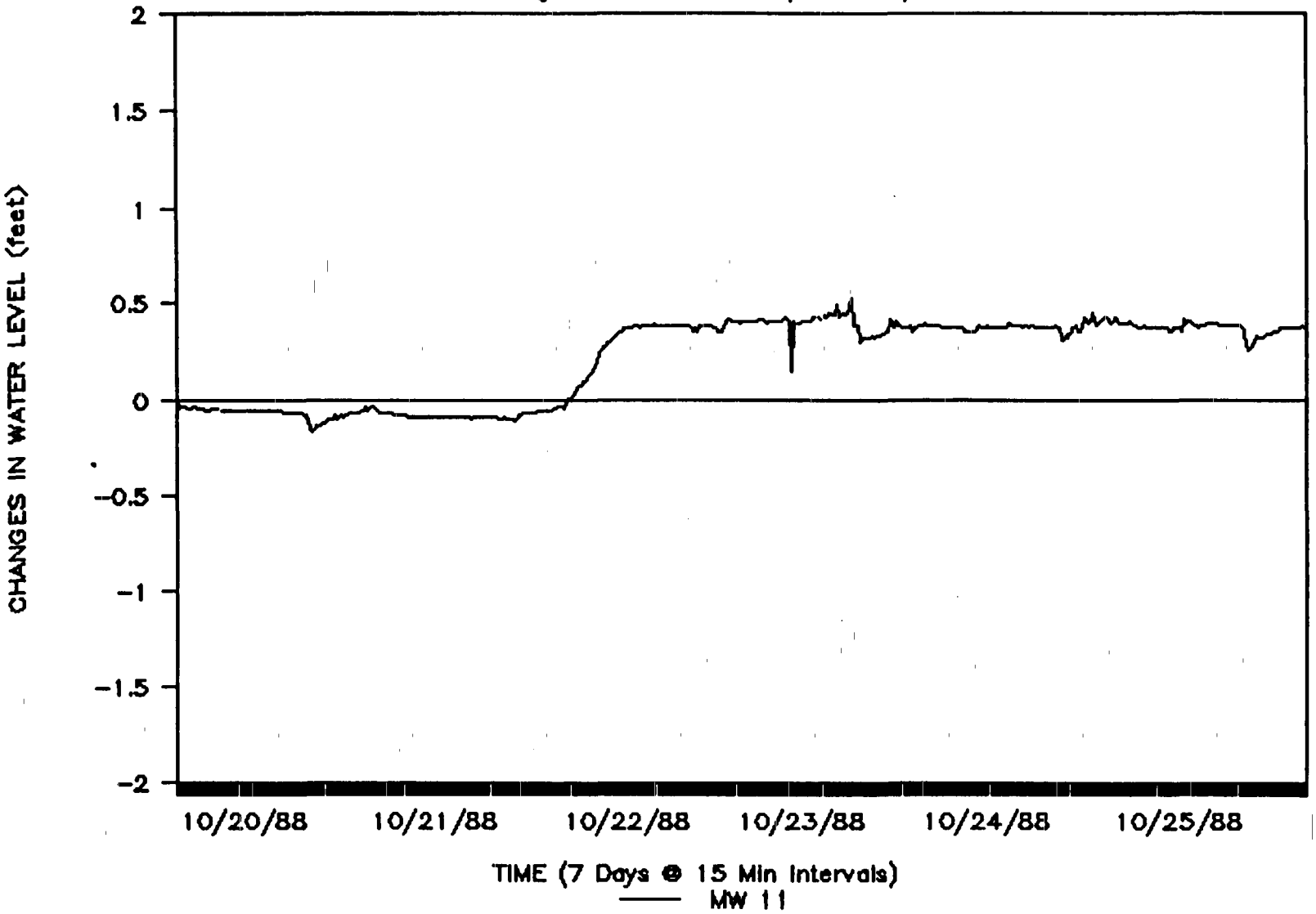
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (1st Week)



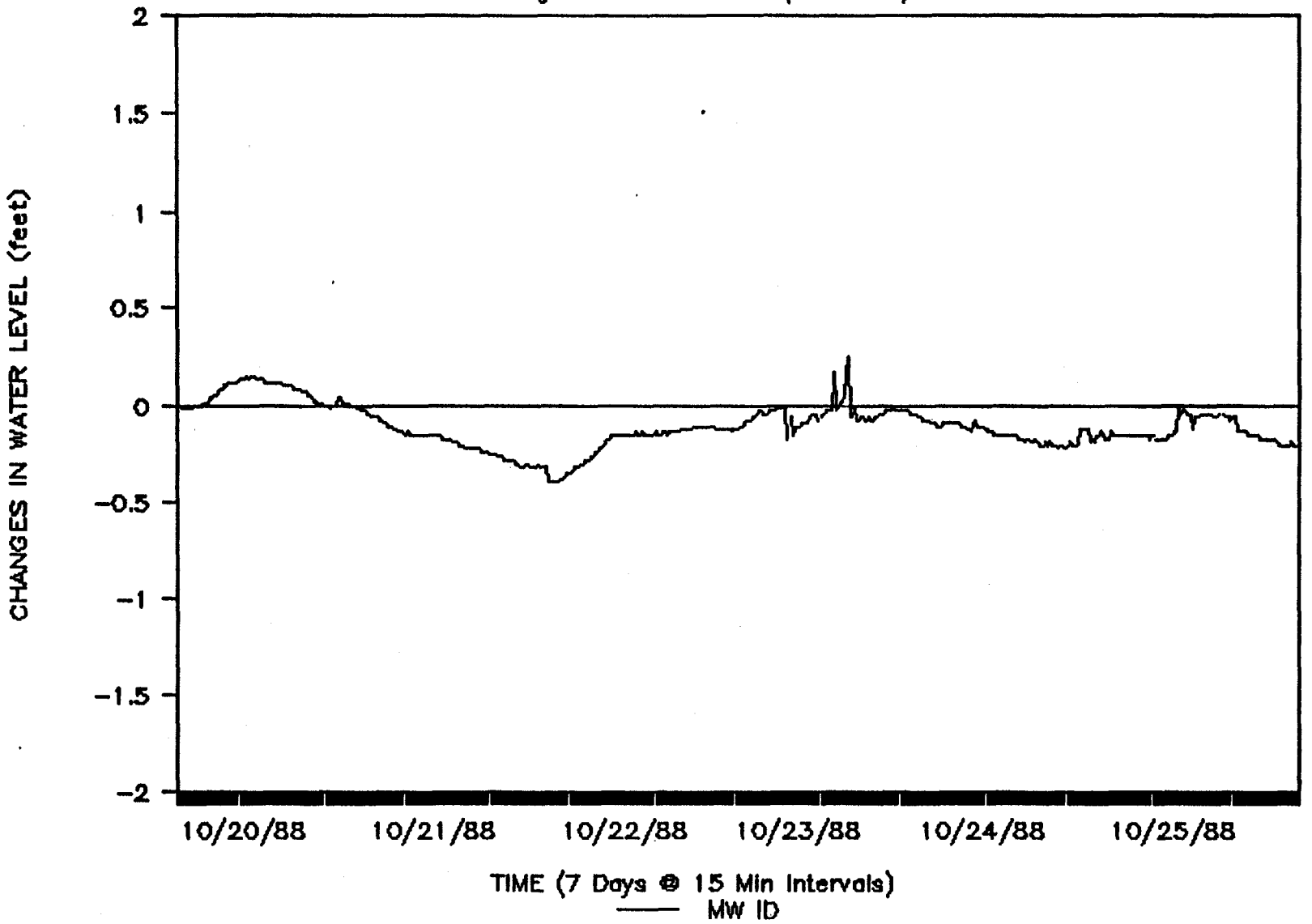
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (1st Week)



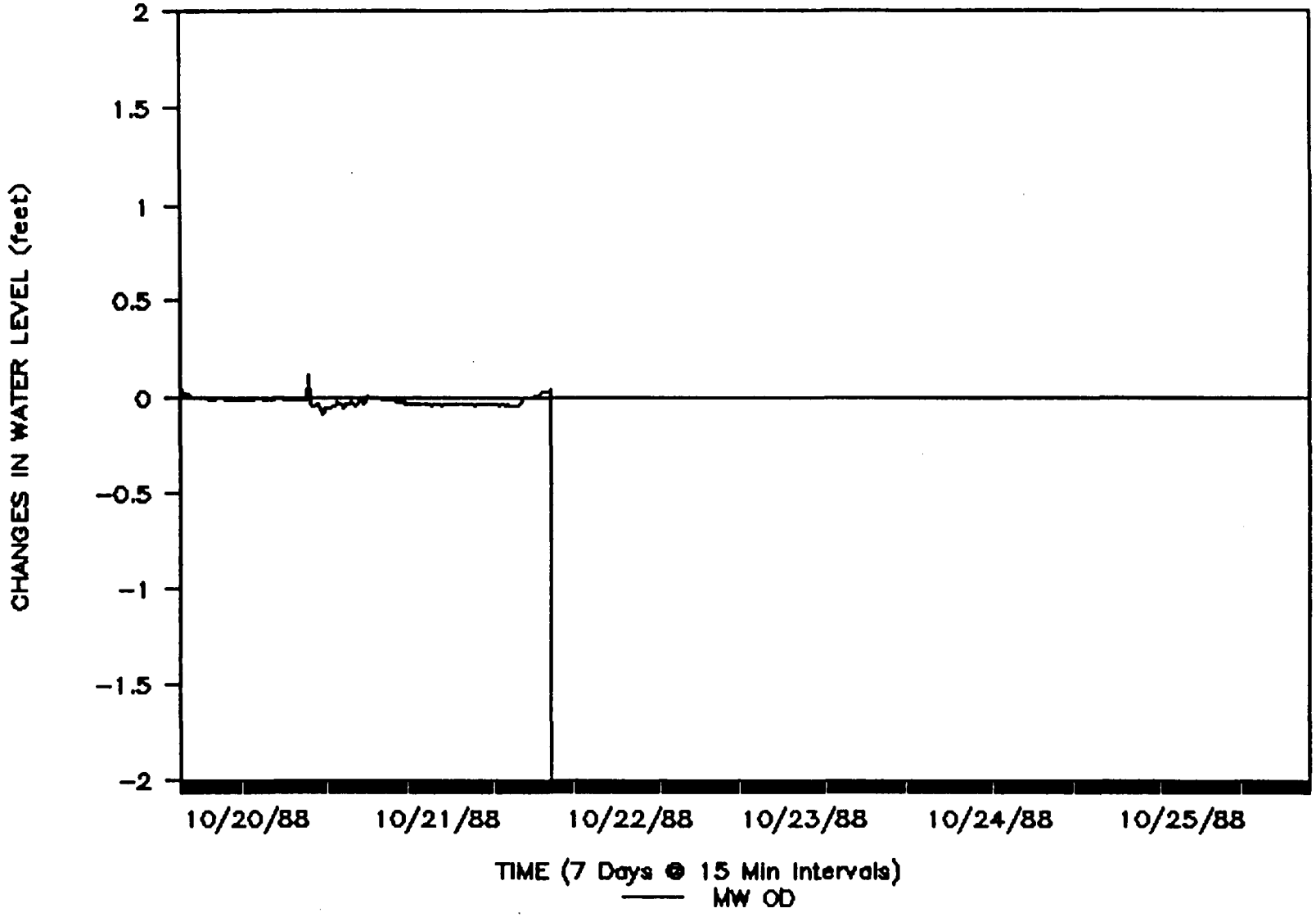
NL INDUSTRIES WATER LEVEL DATA

Changes In Water Levels (1st Week)



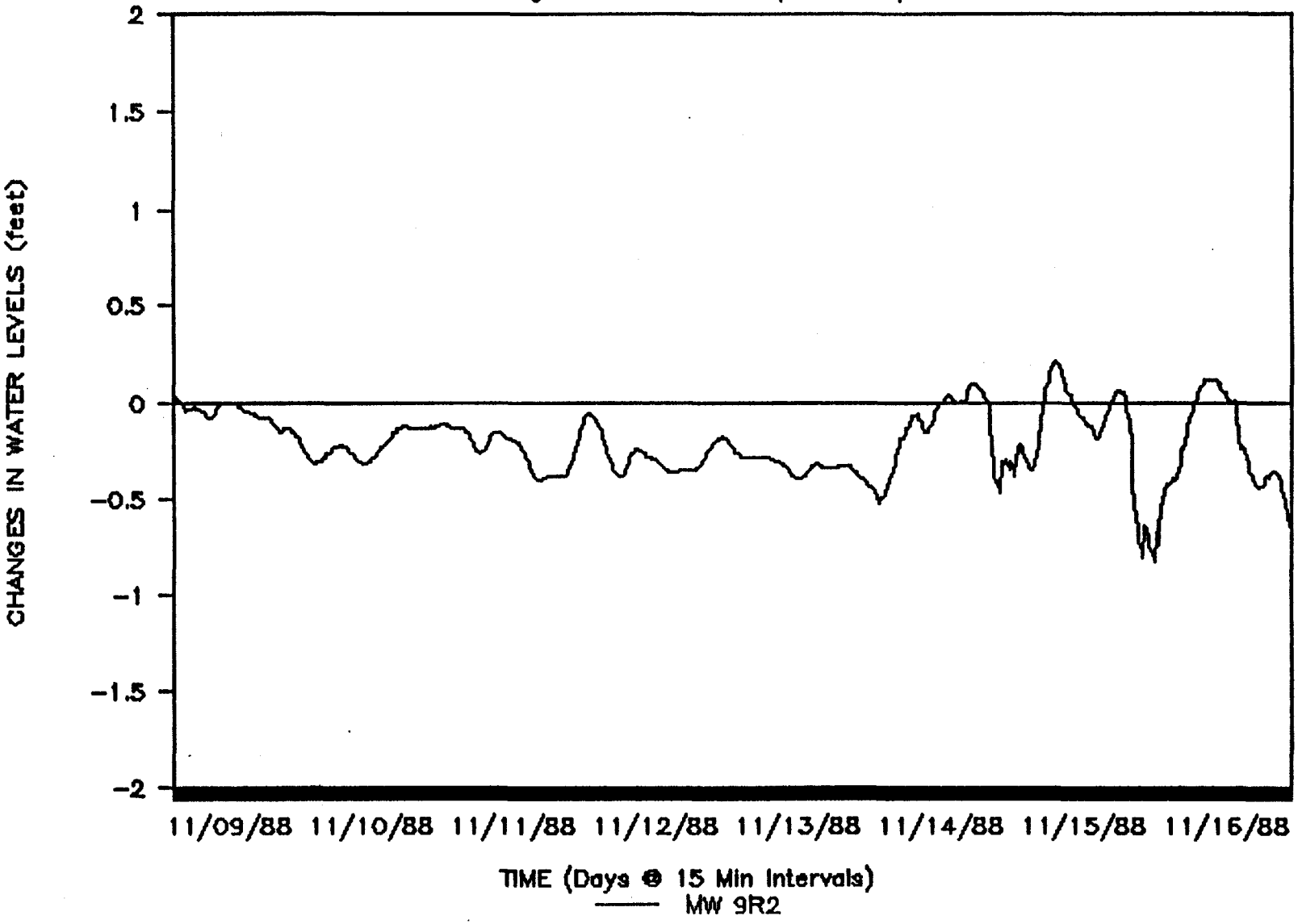
NL INDUSTRIES WATER LEVEL DATA

Changes In Water Levels (1st Week)



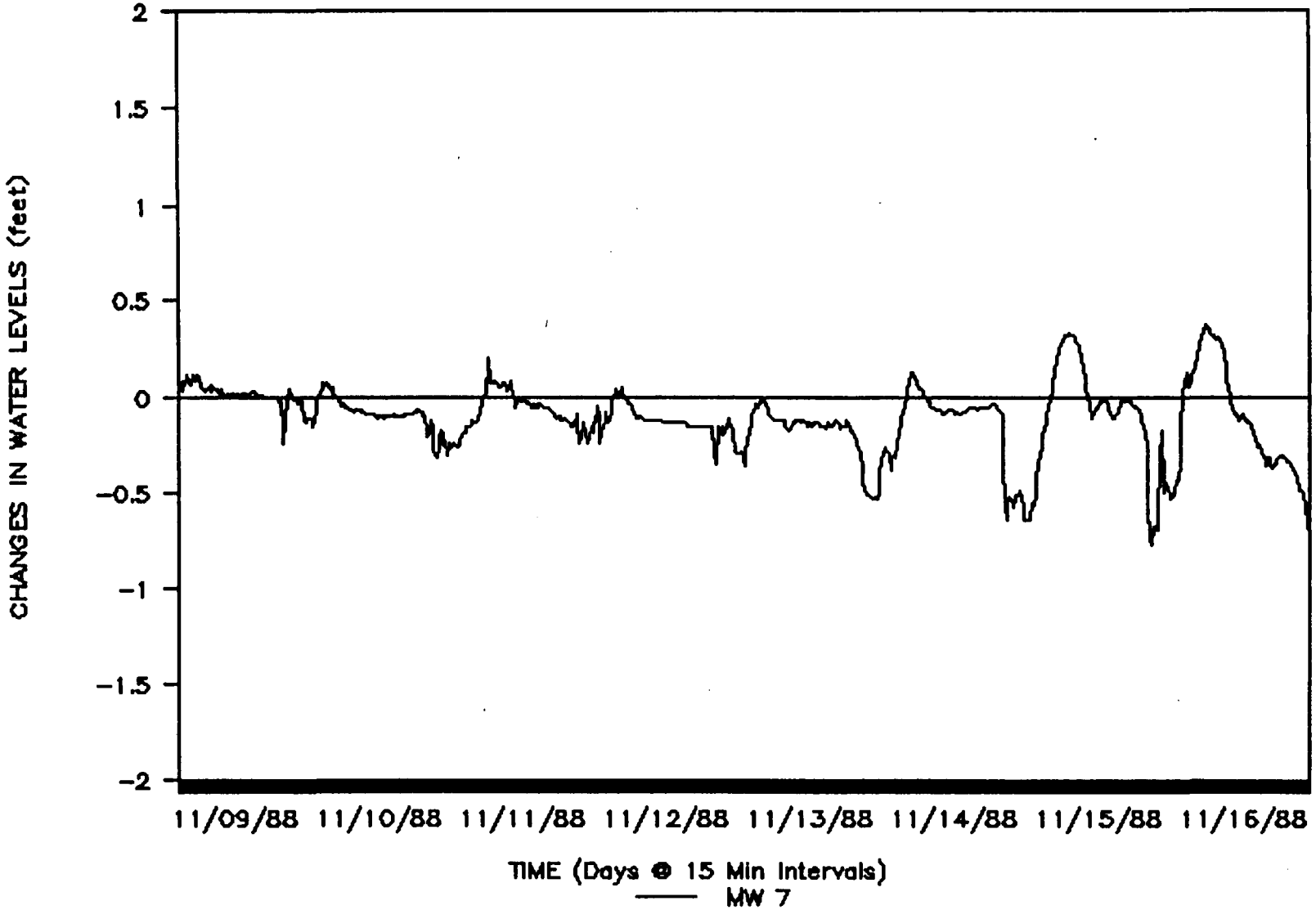
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (2nd week)



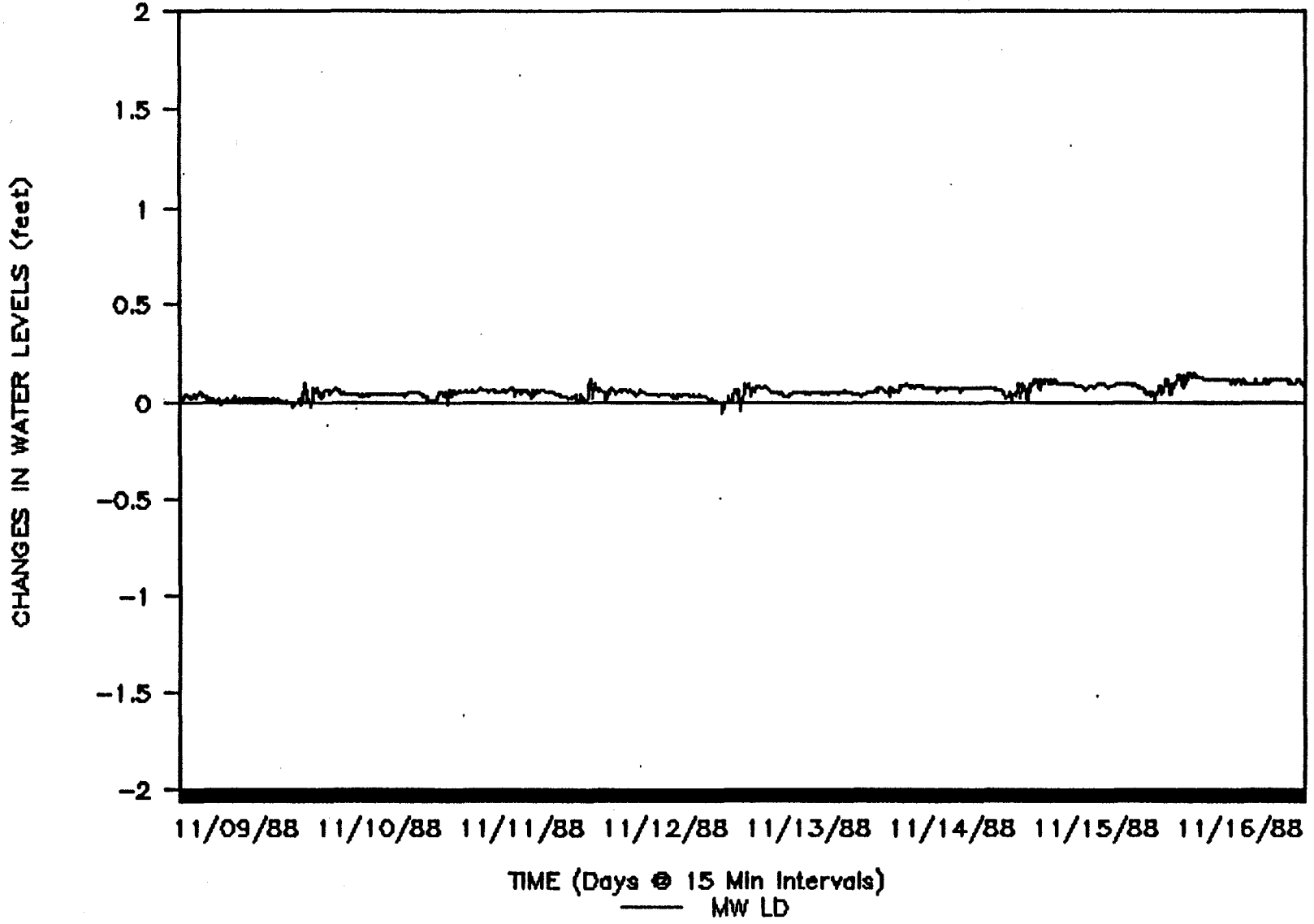
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (2nd week)



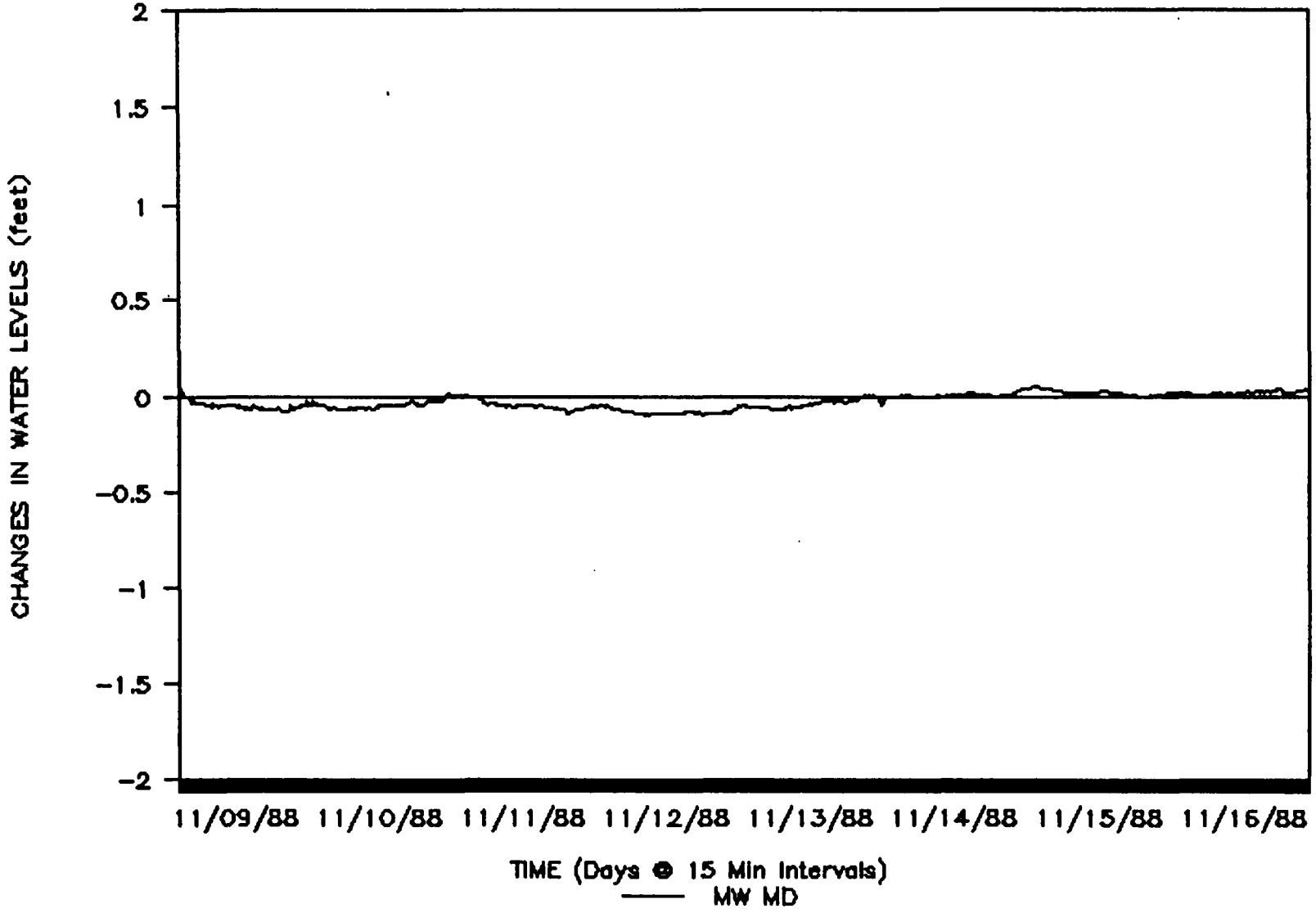
NL INDUSTRIES WATER LEVEL DATA

Changes In Water Levels (2nd week)



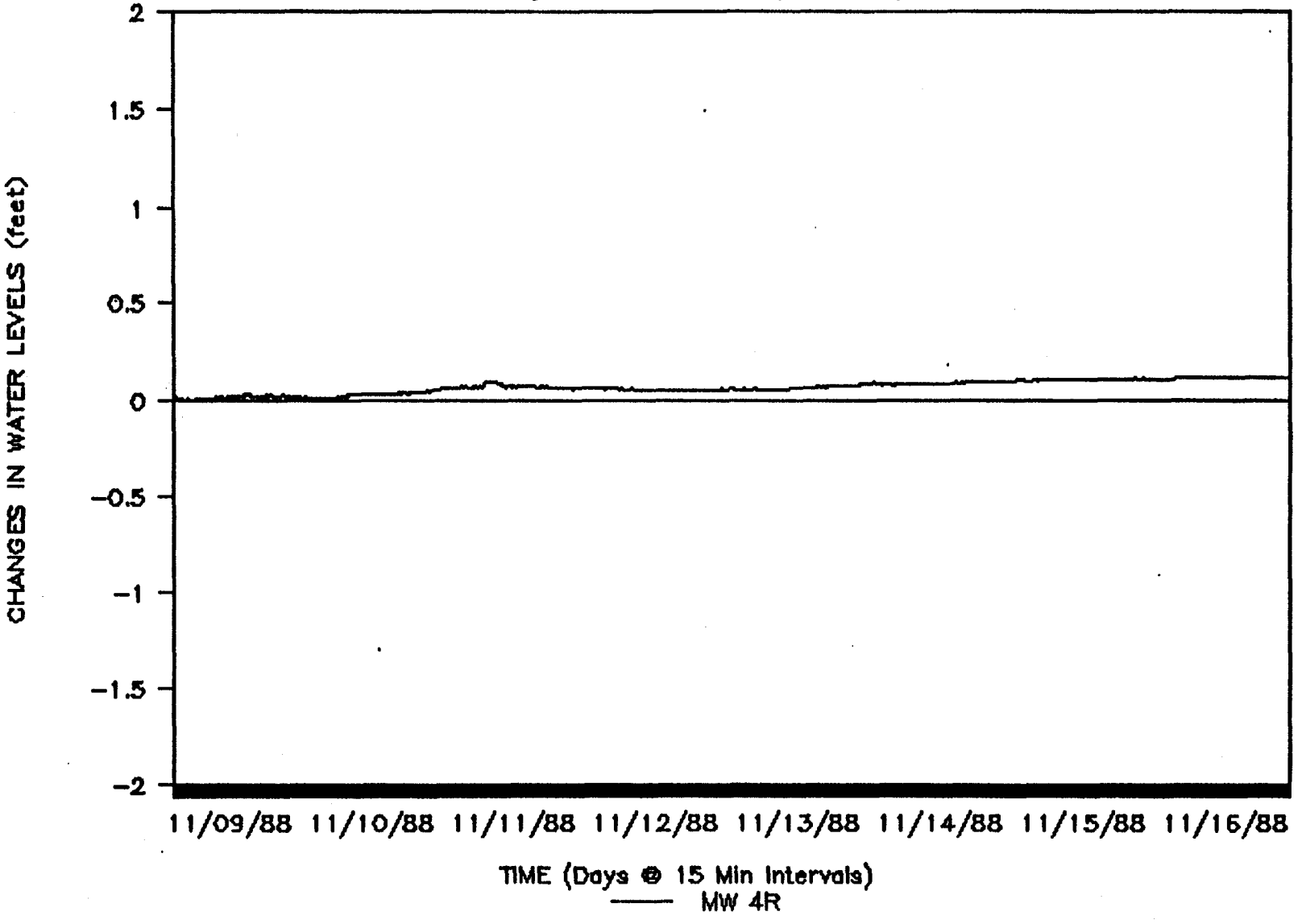
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (2nd week)



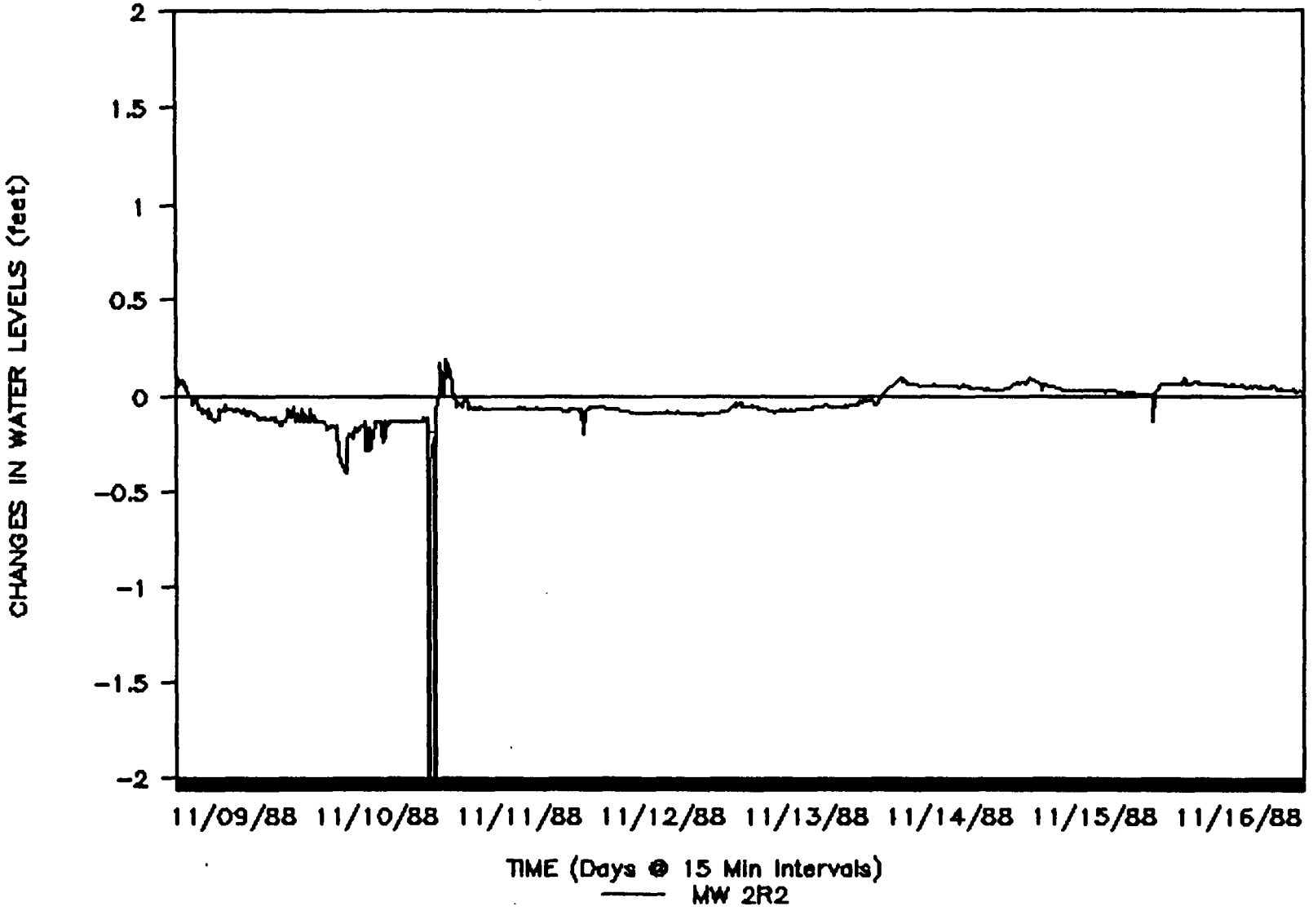
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (2nd week)



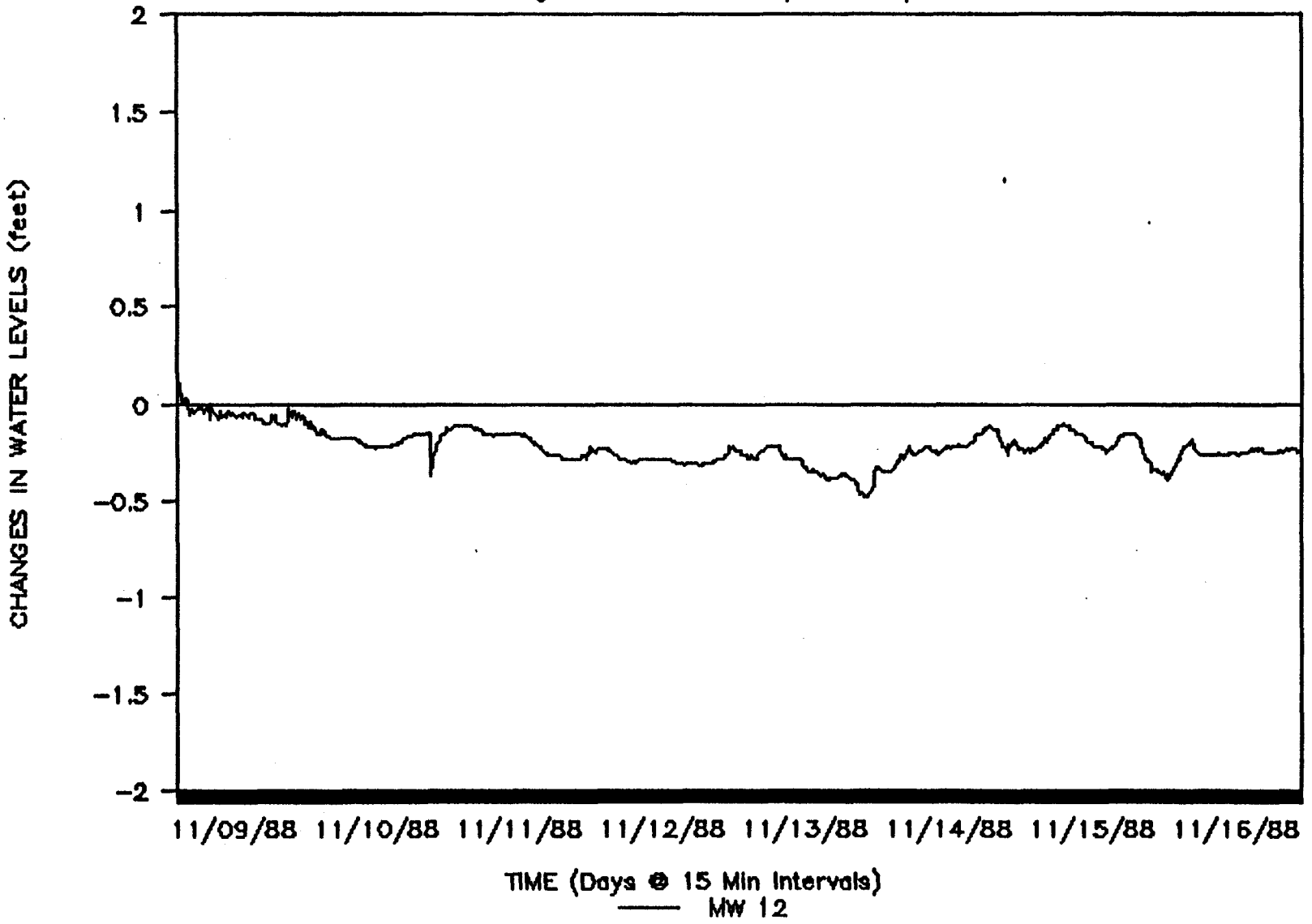
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (2nd week)



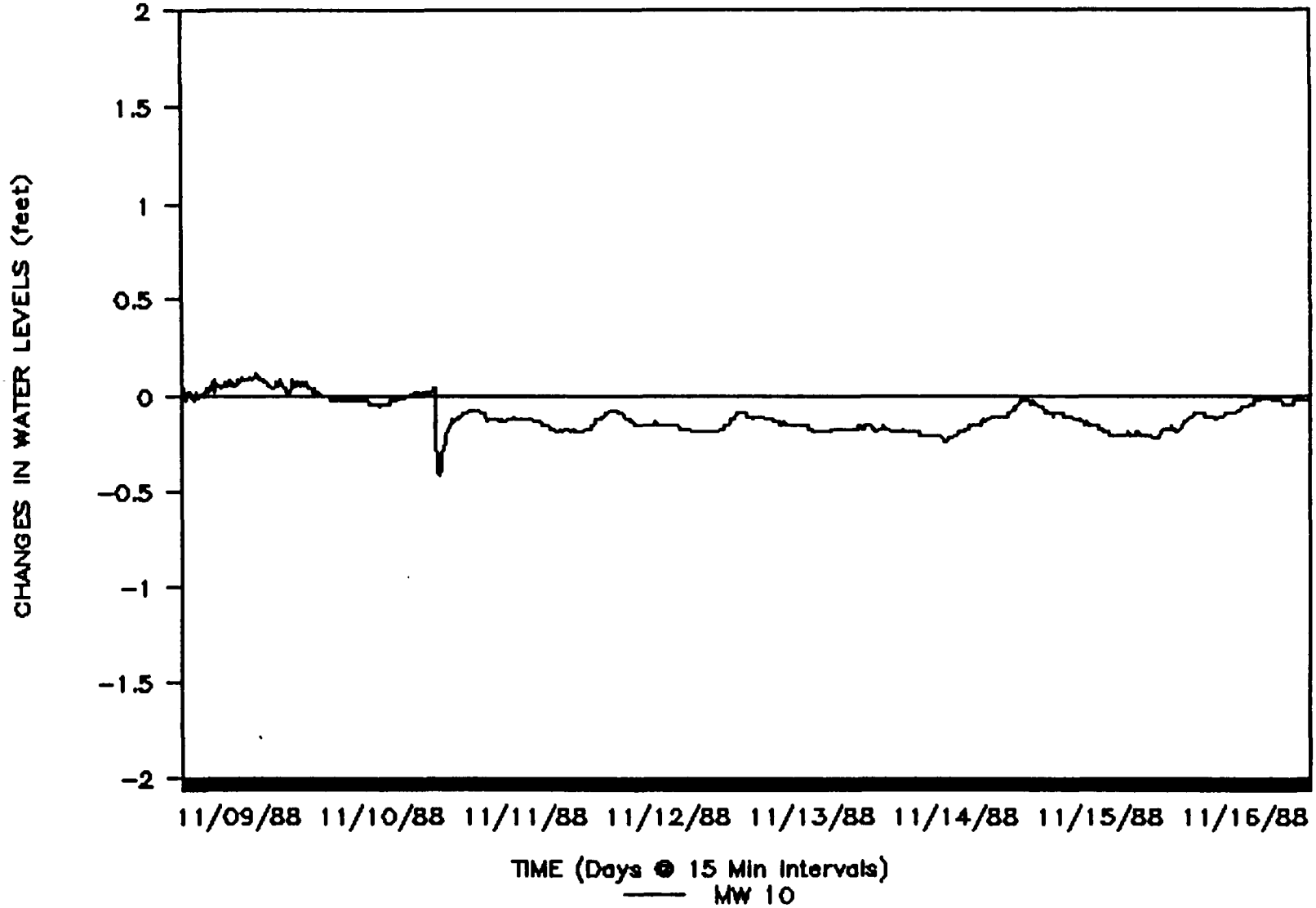
NL INDUSTRIES WATER LEVEL DATA

Changes in Water Levels (2nd week)



NL INDUSTRIES WATER LEVEL DATA

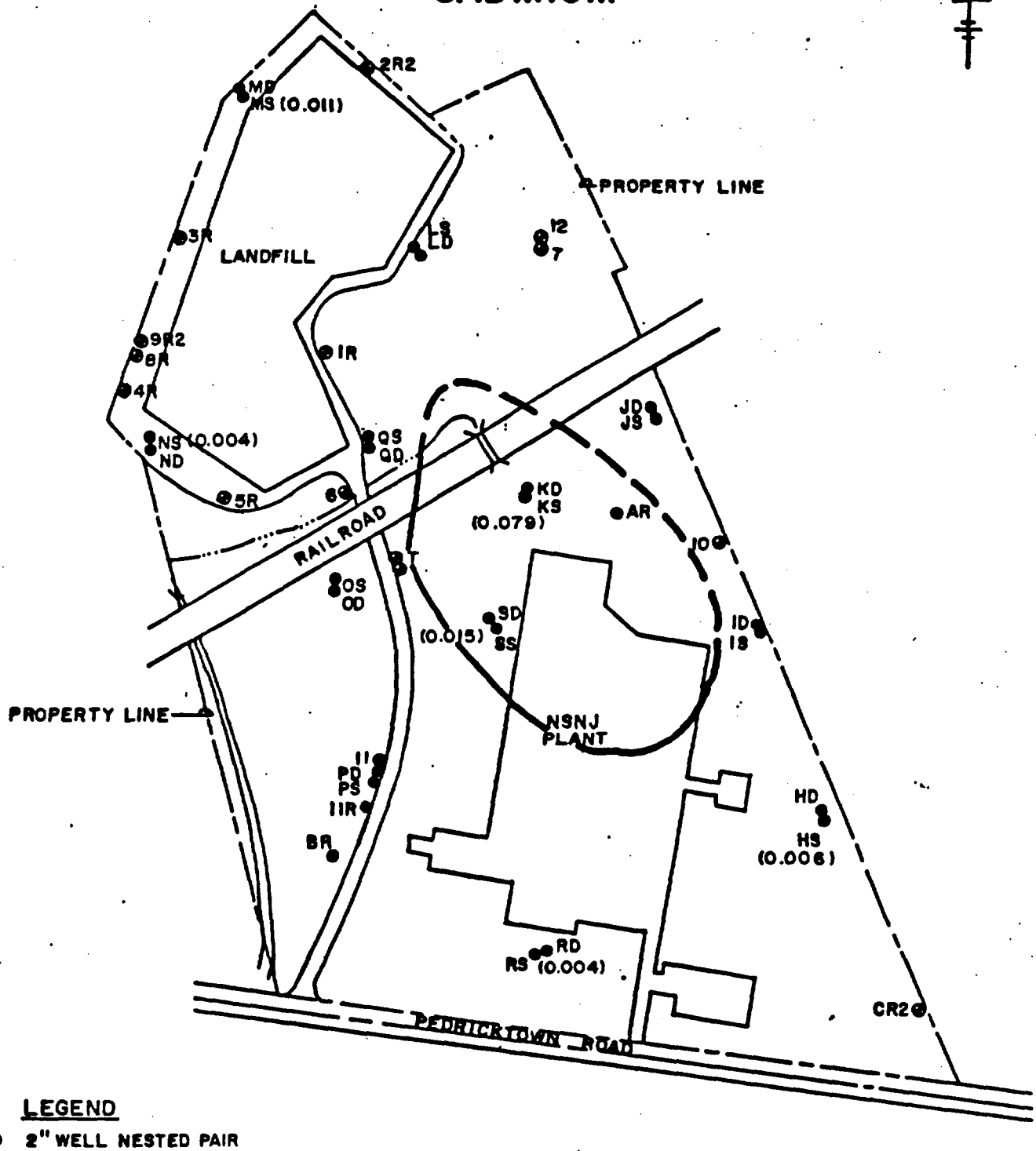
Changes in Water Levels (2nd week)



APPENDIX E

FIGURE E-1

NSNJ INC / NL SITE
UNCONFINED AQUIFER
SHALLOW ZONE
GROUND WATER QUALITY 1988
CADMIUM



LEGEND

- ● 2" WELL NESTED PAIR
- ● 4" WELL
- ( ) CADMIUM (mg/l) UNCONFINED - SHALLOW
- ~ PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990

SCALE IN FEET

300 100 0 100 500

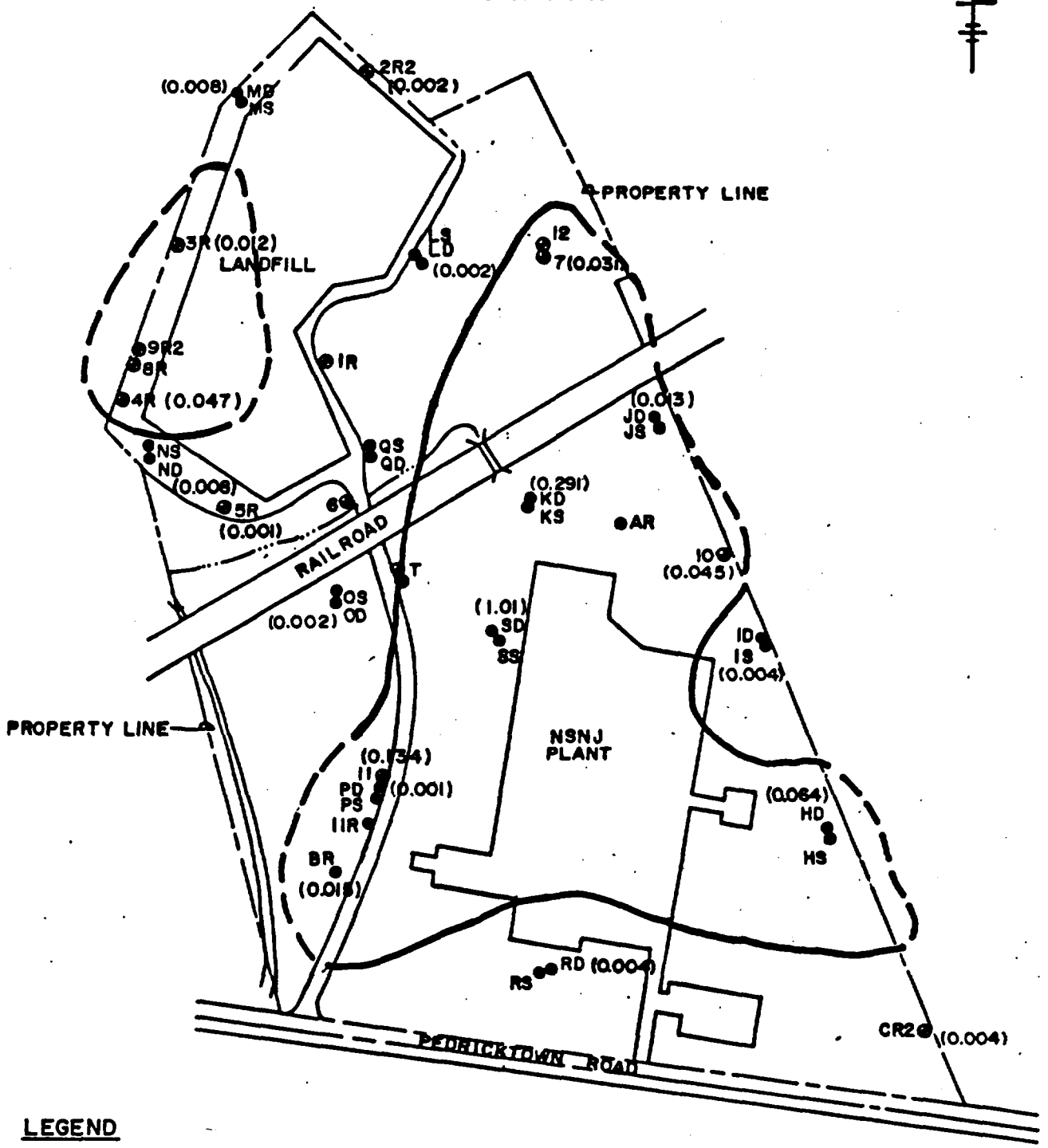
1" = 300'

NLI 001 1722

O'BRIEN & GERE

FIGURE E-2

NSNJ INC/ NL SITE
UNCONFINED AQUIFER
DEEP ZONE
GROUND WATER QUALITY 1988
CADMIUM



LEGEND

- 2" WELL NESTED PAIR
- 4" WELL
- ( ) CADMIUM (mg/l) UNCONFINED-DEEP
- PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990

SCALE IN FEET

300 100 0 100 300

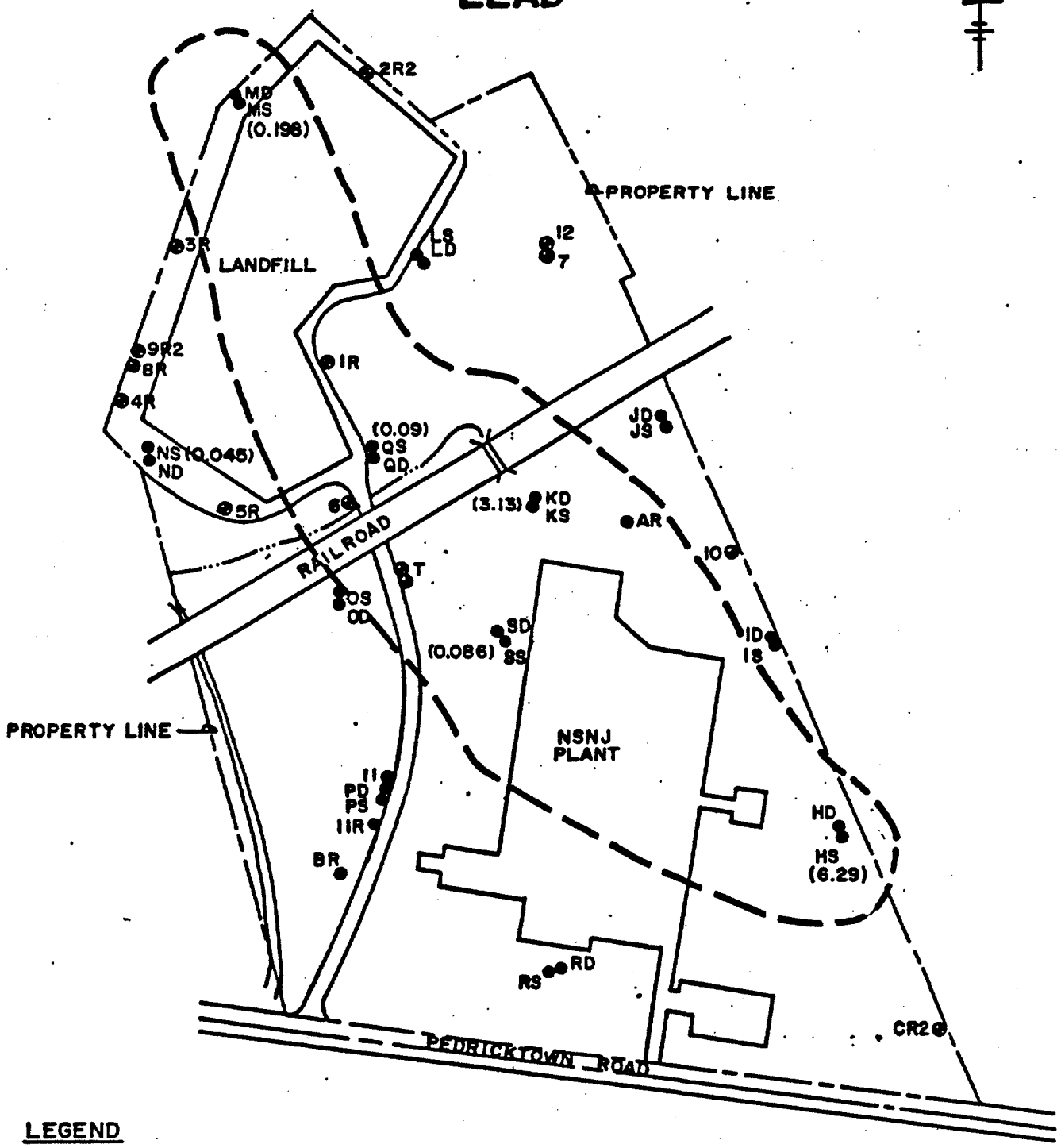
1" = 300'

NLI 001 1723

O'BRIEN & GERE

FIGURE E-3

NSNJ INC / NL SITE
UNCONFINED AQUIFER
SHALLOW ZONE
GROUND WATER QUALITY 1988
LEAD



LEGEND

- ● 2" WELL NESTED PAIR
- ● 4" WELL
- ( ) LEAD (mg/l) UNCONFINED - SHALLOW
- ~ PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990

SCALE IN FEET

300 100 0 100 300

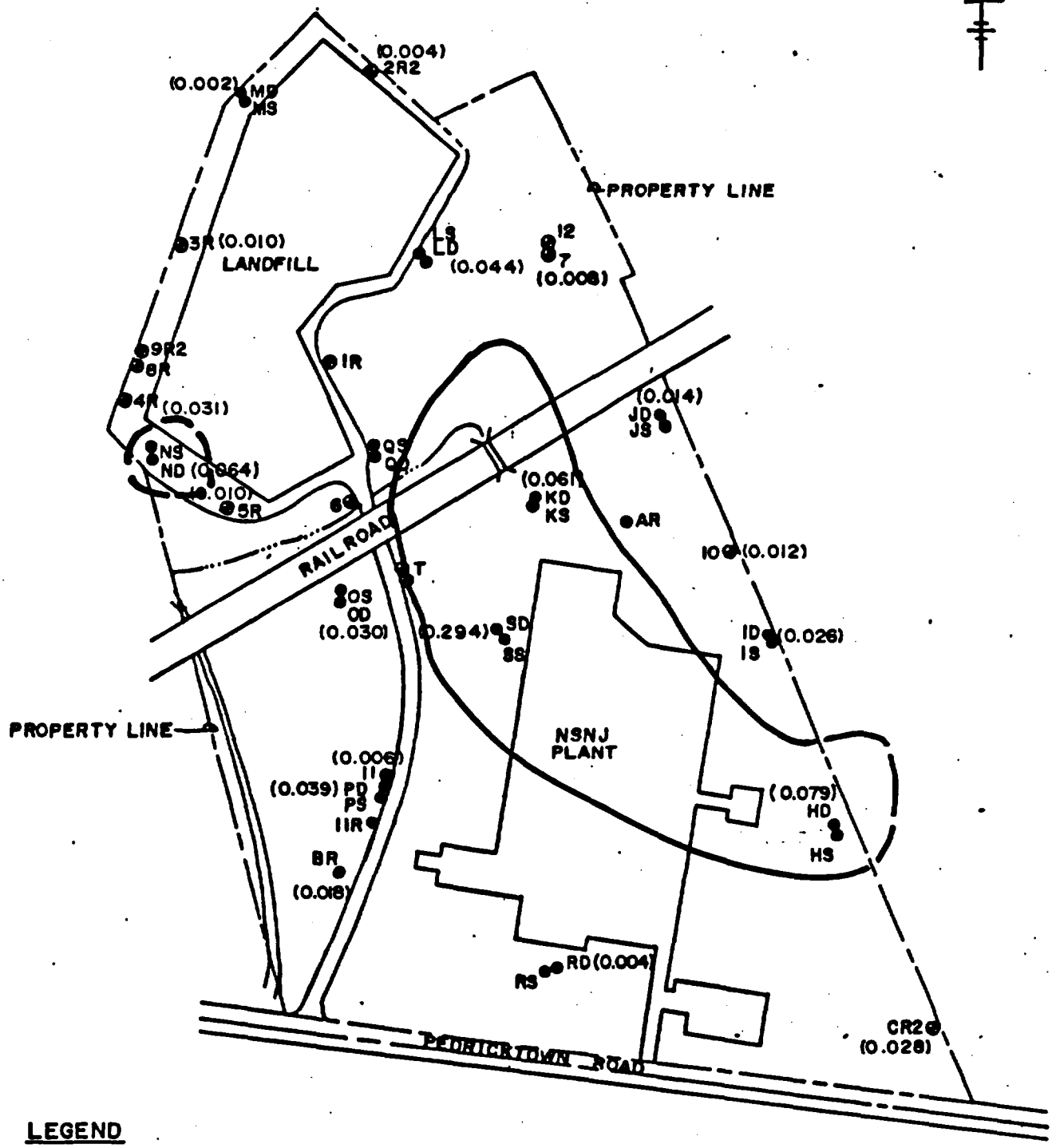
1" = 300'

NLI 001 1724

O'BRIEN & GERE

FIGURE E-4

NSNJ INC / NL SITE
UNCONFINED AQUIFER
DEEP ZONE
GROUND WATER QUALITY 1988
LEAD



LEGEND

- 2" WELL NESTED PAIR
- 4" WELL
- ( ) LEAD (mg/l) UNCONFINED -DEEP
- PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990

SCALE IN FEET

300 100 0 100 300

1" = 300'

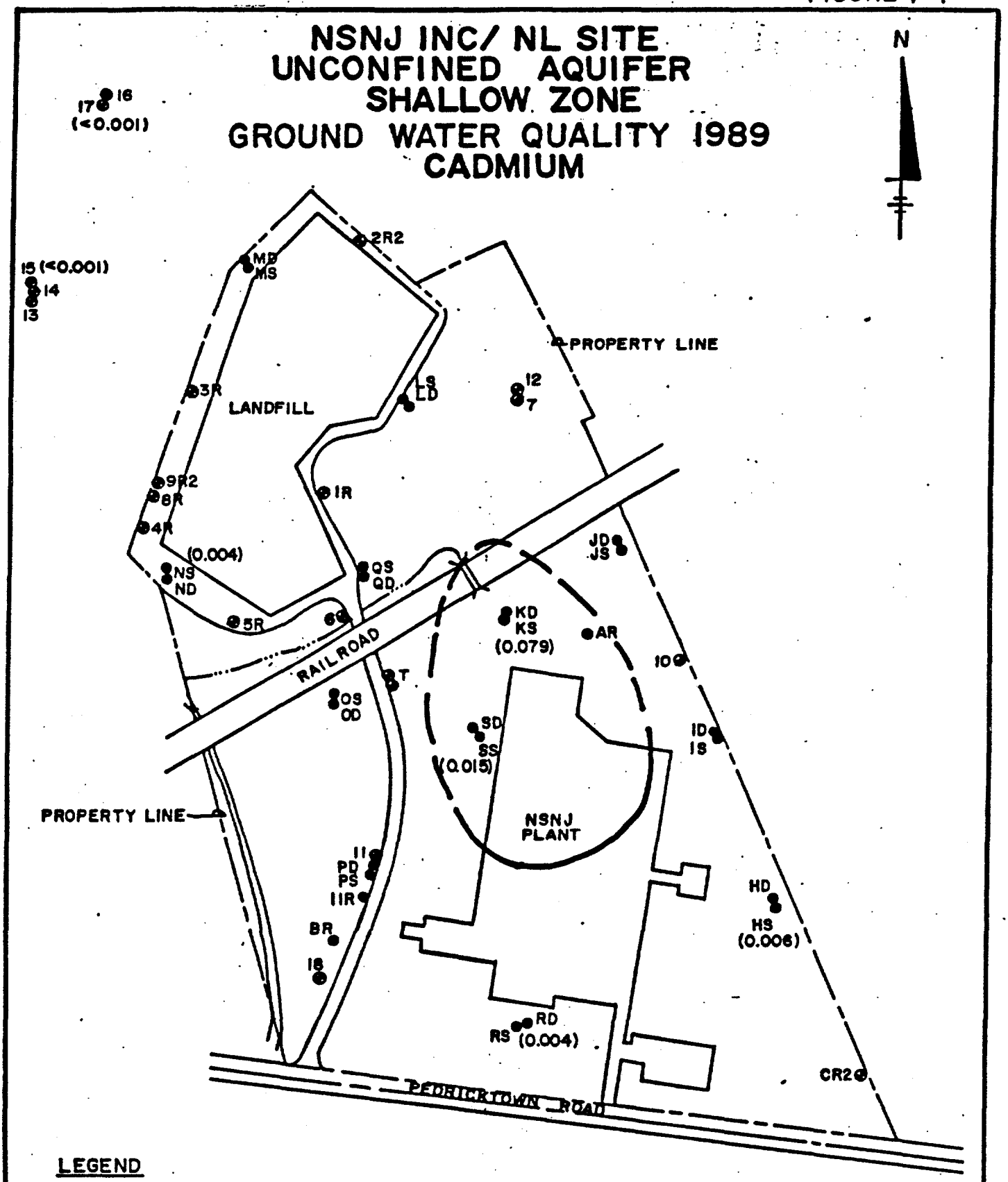
NLI 001 1725

O'BRIEN & GERE ENGINEERS INC.

APPENDIX F

FIGURE F-1

NSNJ INC/ NL SITE
UNCONFINED AQUIFER
SHALLOW ZONE
GROUND WATER QUALITY 1989
CADMIUM



LEGEND

- 2" WELL NESTED PAIR
- 4" WELL
- PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990
- ( ) CADMIUM (mg/l) UNCONFINED -SHALLOW

SCALE IN FEET

300 100 0 100 300

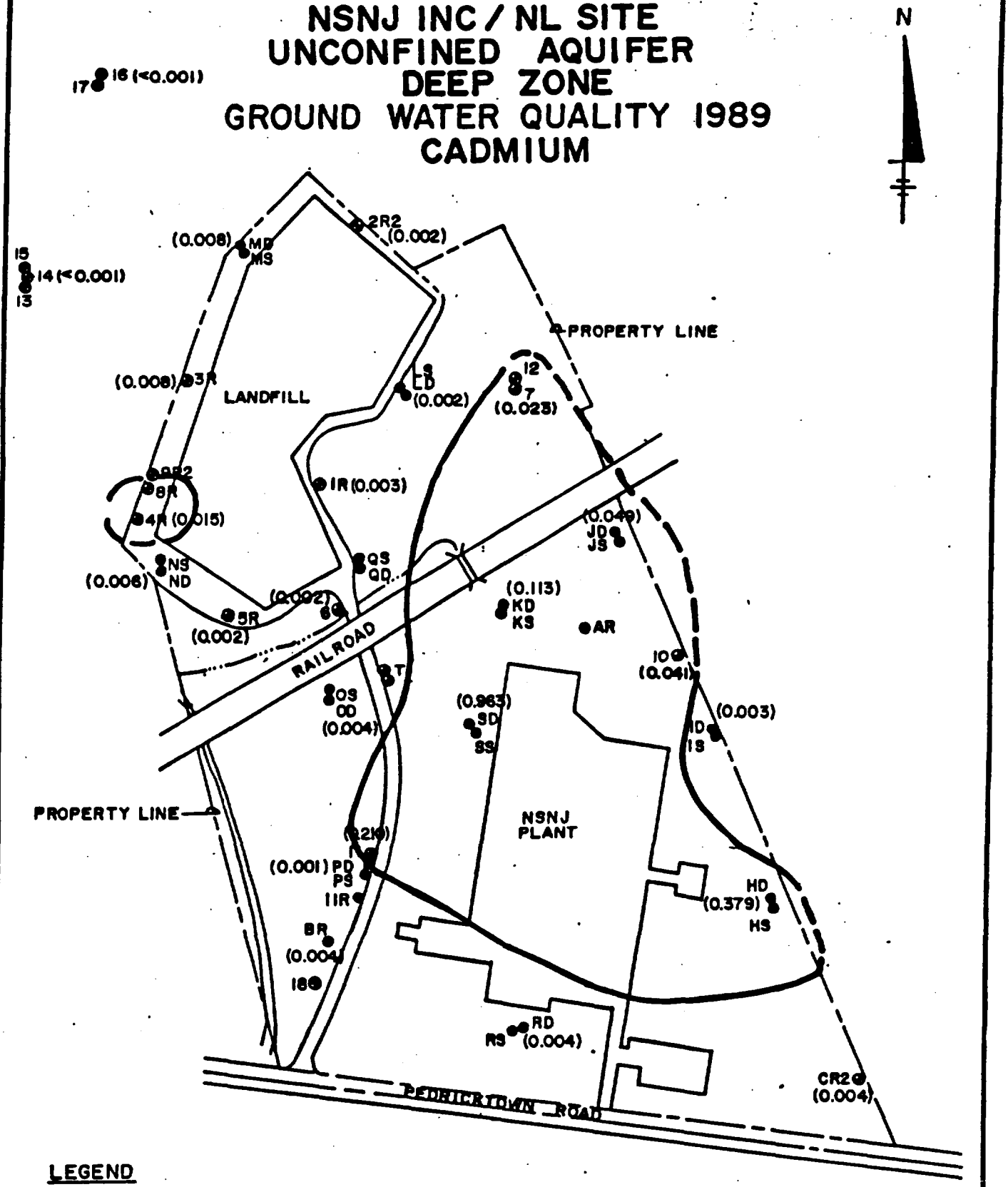
1" = 300'

NLI 001 1727

O'BRIEN & GERE ENGINEERS INC

FIGURE F-2

NSNJ INC / NL SITE
UNCONFINED AQUIFER
DEEP ZONE
GROUND WATER QUALITY 1989
CADMIUM



LEGEND

- 2" WELL NESTED PAIR
- 4" WELL
- PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990
- ( ) CADMIUM (mg/l) UNCONFINED – DEEP

SCALE IN FEET

1" = 300'

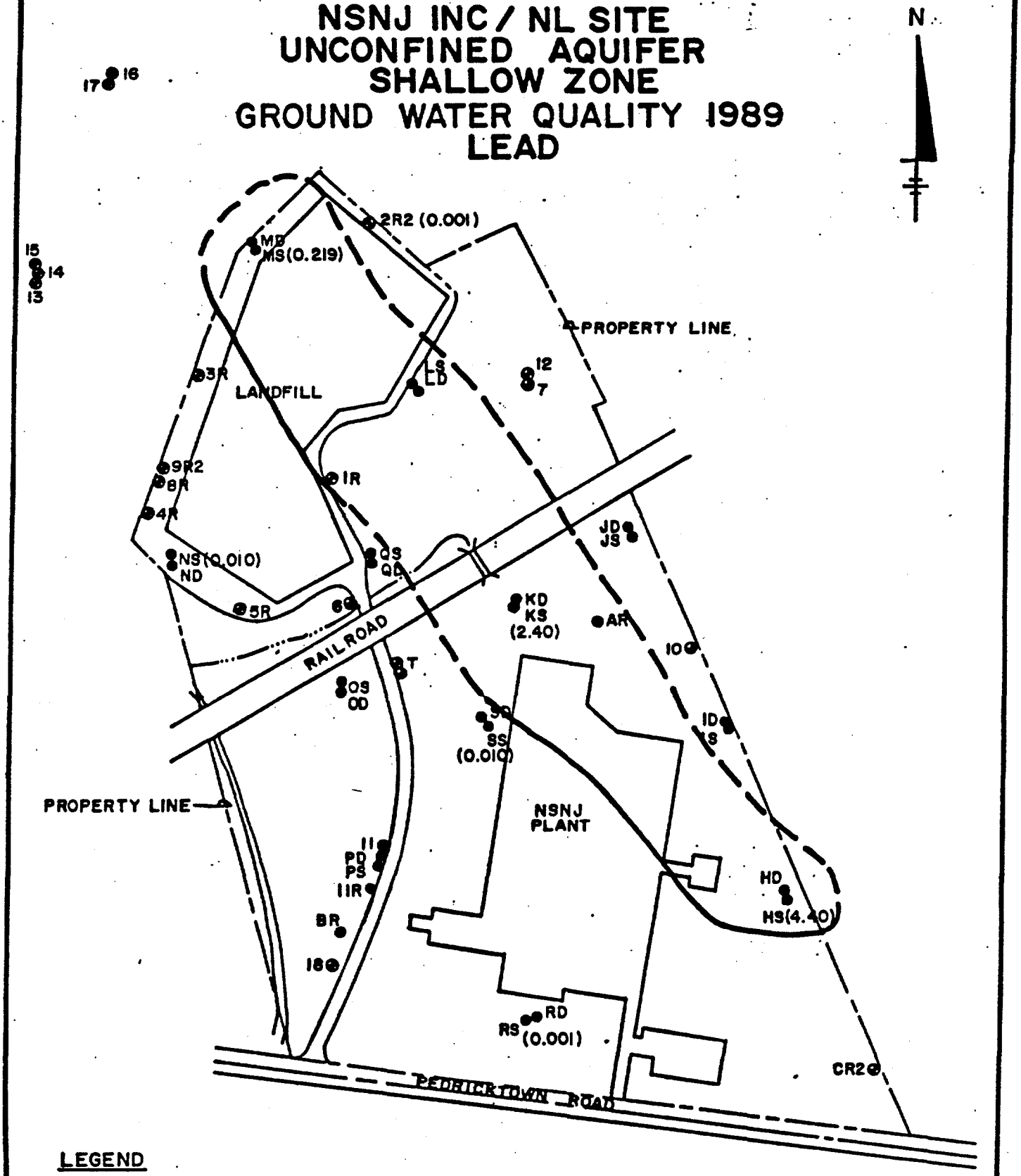
300 100 0 100 300

NLI 001 1728

O'BRIEN & GERE ENGINEERS INC.

FIGURE F-3

NSNJ INC / NL SITE
UNCONFINED AQUIFER
SHALLOW ZONE
GROUND WATER QUALITY 1989
LEAD



LEGEND

- ● 2" WELL NESTED PAIR
- ● 4" WELL
- ~ PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990
- ( ) LEAD (mg/l) UNCONFINED -SHALLOW

SCALE IN FEET

300 100 0 100 500

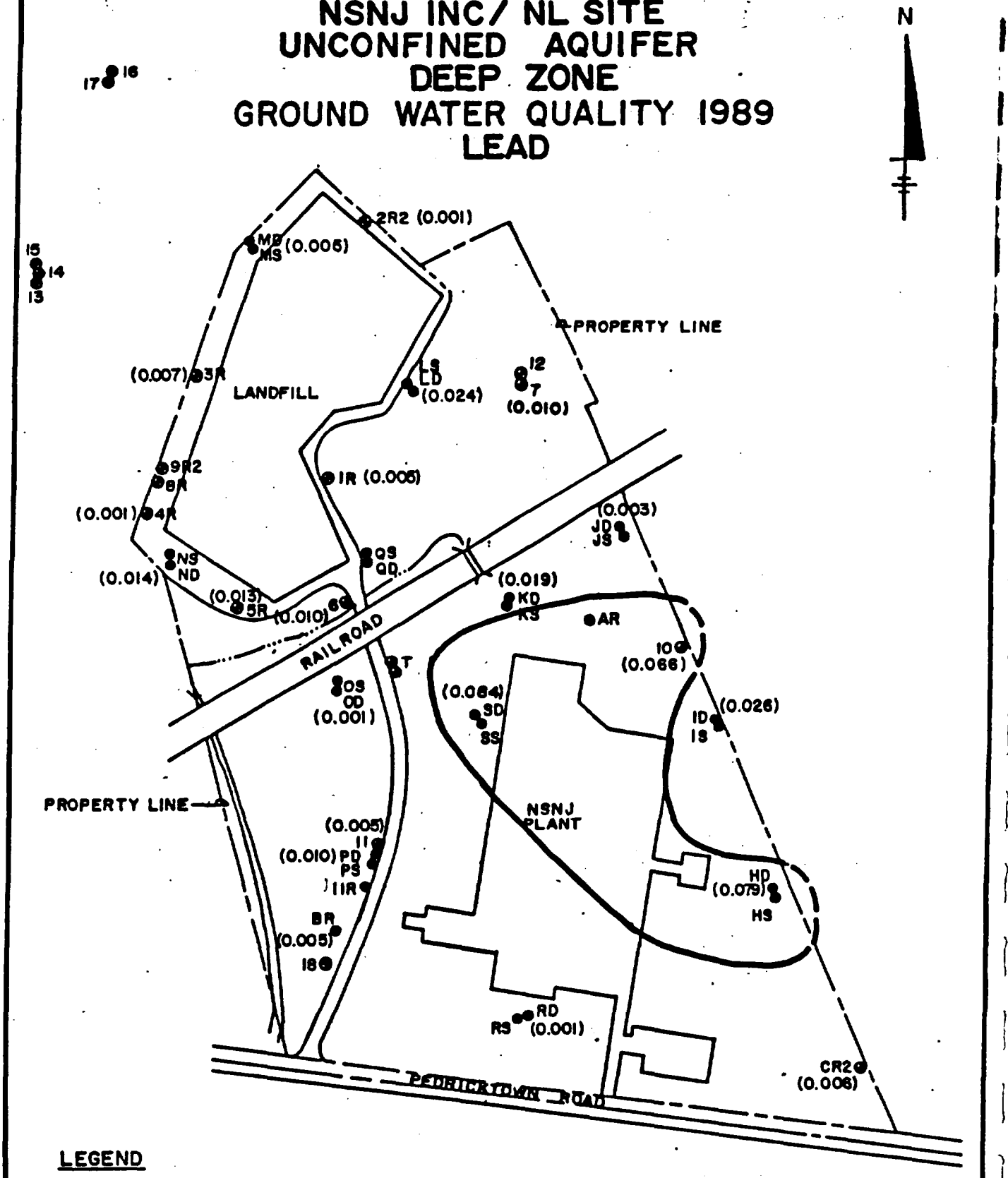
1" = 300'

NLI 001 1729

O'BRIEN & GERE ENGINEERING

FIGURE F-4

NSNJ INC/ NL SITE
UNCONFINED AQUIFER
DEEP ZONE
GROUND WATER QUALITY 1989
LEAD



LEGEND

- 2" WELL NESTED PAIR
- 4" WELL
- PLUME DELINEATION BASED ON US EPA MCL AS OF JAN 1990
- ( ) LEAD (mg/l) UNCONFINED – DEEP

SCALE IN FEET

1" = 300'

300 100 0 100 500

NLI 001 1730

O'BRIEN & GERE ENGINEERS, INC.

APPENDIX G

OBG LABORATORIES, INC.

Volatile Organics
Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well 2R2

SAMPLE NO. I9080 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-18-89

	ppb		ppb
Benzene	<2.5	4-Chlorotoluene	<2.5
Trichloroethene	↓	Bromobenzene	↓
Toluene	↓	sec-Butylbenzene	↓
Tetrachloroethene	↓	1,3,5-Trimethylbenzene	↓
Ethylbenzene	↓	4-Isopropyltoluene	↓
p-Xylene	↓	1,2,4-Trimethylbenzene	↓
Chlorobenzene	↓	1,4-Dichlorobenzene	↓
m-Xylene	↓	1,3-Dichlorobenzene	↓
o-Xylene	↓	n-Butylbenzene	↓
Isopropylbenzene	↓	1,2-Dichlorobenzene	↓
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene	↓	1,2,4-Trichlorobenzene	↓
tert-Butylbenzene	↓	Naphthalene	↓
2-Chlorotoluene	↓	1,2,3-Trichlorobenzene	↓

Comments: Elevated detection limit due to matrix interference

Authorized: Michael N. Pettitt

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well MD

SAMPLE NO. I9081 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-21-89

	ppb		ppb
Benzene	<0.5	4-Chlorotoluene	<0.5
Trichloroethene	↓	Bromobenzene	↓
Toluene	↓	sec-Butylbenzene	↓
Tetrachloroethene	↓	1,3,5-Trimethylbenzene	↓
Ethylbenzene	↓	4-Isopropyltoluene	↓
p-Xylene	↓	1,2,4-Trimethylbenzene	↓
Chlorobenzene	↓	1,4-Dichlorobenzene	↓
m-Xylene	↓	1,3-Dichlorobenzene	↓
o-Xylene	↓	n-Butylbenzene	↓
Isopropylbenzene	↓	1,2-Dichlorobenzene	↓
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene	↓	1,2,4-Trichlorobenzene	↓
tert-Butylbenzene	↓	Naphthalene	↓
2-Chlorotoluene	↓	1,2,3-Trichlorobenzene	↓

Comments:

NLI 001 1733

Authorized: Michael N. Pettolli

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Volatile Organics Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water Rinse Blank

SAMPLE NO. I9084 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-21-89

	ppb		ppb
Benzene	<0.5	4-Chlorotoluene	<0.5
Trichloroethene	↓	Bromobenzene	↓
Toluene	↓	sec-Butylbenzene	↓
Tetrachloroethene	↓	1,3,5-Trimethylbenzene	↓
Ethylbenzene	↓	4-Isopropyltoluene	↓
p-Xylene	↓	1,2,4-Trimethylbenzene	↓
Chlorobenzene	↓	1,4-Dichlorobenzene	↓
m-Xylene	↓	1,3-Dichlorobenzene	↓
o-Xylene	↓	n-Butylbenzene	↓
Isopropylbenzene	↓	1,2-Dichlorobenzene	↓
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene	↓	1,2,4-Trichlorobenzene	↓
tert-Butylbenzene	↓	Naphthalene	↓
2-Chlorotoluene	↓	1,2,3-Trichlorobenzene	↓

Comments:

Authorized: Michael N. Pettwell

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
QC Trip Blank

SAMPLE NO. I9087 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-21-89

	ppb		ppb
Benzene	<0.5	4-Chlorotoluene	<0.5
Trichloroethene	↓	Bromobenzene	↓
Toluene	↓	sec-Butylbenzene	↓
Tetrachloroethene	↓	1,3,5-Trimethylbenzene	↓
Ethylbenzene	↓	4-Isopropyltoluene	↓
p-Xylene	↓	1,2,4-Trimethylbenzene	↓
Chlorobenzene	↓	1,4-Dichlorobenzene	↓
m-Xylene	↓	1,3-Dichlorobenzene	↓
o-Xylene	↓	n-Butylbenzene	↓
Isopropylbenzene	↓	1,2-Dichlorobenzene	↓
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene	↓	1,2,4-Trichlorobenzene	↓
tert-Butylbenzene	↓	Naphthalene	↓
2-Chlorotoluene	↓	1,2,3-Trichlorobenzene	↓

Comments:

NLI 001 1735

Authorized: Michael N. Pettitt

Date: October 16, 1989

OBG Laboratories, Inc.
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OBG LABORATORIES, INC.

Volatile Organics
Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water Well SD

SAMPLE NO. I9250 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-21-89

	ppb		ppb
Benzene	<0.5	4-Chlorotoluene	<0.5
Trichloroethene	↓	Bromobenzene	↓
Toluene	1.3	sec-Butylbenzene	
Tetrachloroethene	<0.5	1,3,5-Trimethylbenzene	
Ethylbenzene	0.5	4-Isopropyltoluene	
p-Xylene	<0.5	1,2,4-Trimethylbenzene	
Chlorobenzene	<0.5	1,4-Dichlorobenzene	
m-Xylene	0.9	1,3-Dichlorobenzene	
o-Xylene	0.6	n-Butylbenzene	
Isopropylbenzene	<0.5	1,2-Dichlorobenzene	
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene		1,2,4-Trichlorobenzene	
tert-Butylbenzene		Naphthalene	
2-Chlorotoluene		1,2,3-Trichlorobenzene	

Comments:

Authorized: Michael A. Pettinelli

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well SD - Duplicate

SAMPLE NO. I9251 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-21-89

	ppb		ppb
Benzene	<0.5	4-Chlorotoluene	<0.5
Trichloroethene	↓	Bromobenzene	↓
Toluene	1.5	sec-Butylbenzene	
Tetrachloroethene	<0.5	1,3,5-Trimethylbenzene	
Ethylbenzene	0.5	4-Isopropyltoluene	
p-Xylene	<0.5	1,2,4-Trimethylbenzene	
Chlorobenzene	<0.5	1,4-Dichlorobenzene	
m-Xylene	0.9	1,3-Dichlorobenzene	
o-Xylene	0.5	n-Butylbenzene	
Isopropylbenzene	<0.5	1,2-Dichlorobenzene	
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene		1,2,4-Trichlorobenzene	
tert-Butylbenzene		Naphthalene	
2-Chlorotoluene		1,2,3-Trichlorobenzene	

Comments:

Authorized: Michael W. Pettell

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well 11

SAMPLE NO. I9256 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-22-89

	ppb		ppb
Benzene	<5.	4-Chlorotoluene	<5.
Trichloroethene	↓	Bromobenzene	↓
Toluene	↓	sec-Butylbenzene	↓
Tetrachloroethene	180.	1,3,5-Trimethylbenzene	↓
Ethylbenzene	<5.	4-Isopropyltoluene	↓
p-Xylene	↓	1,2,4-Trimethylbenzene	↓
Chlorobenzene	↓	1,4-Dichlorobenzene	↓
m-Xylene	↓	1,3-Dichlorobenzene	↓
o-Xylene	↓	n-Butylbenzene	↓
Isopropylbenzene	↓	1,2-Dichlorobenzene	↓
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene	↓	1,2,4-Trichlorobenzene	↓
tert-Butylbenzene	↓	Naphthalene	↓
2-Chlorotoluene	↓	1,2,3-Trichlorobenzene	↓

Comments:

Authorized: Michael W. Pettwell

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Volatile Organics Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well 11 - Duplicate

SAMPLE NO. I9257 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-22-89

	ppb		ppb
Benzene	<5.	4-Chlorotoluene	<5.
Trichloroethene	↓	Bromobenzene	↓
Toluene	↓	sec-Butylbenzene	↓
Tetrachloroethene	180.	1,3,5-Trimethylbenzene	↓
Ethylbenzene	<5.	4-Isopropyltoluene	↓
p-Xylene	↓	1,2,4-Trimethylbenzene	↓
Chlorobenzene	↓	1,4-Dichlorobenzene	↓
m-Xylene	↓	1,3-Dichlorobenzene	↓
o-Xylene	↓	n-Butylbenzene	↓
Isopropylbenzene	↓	1,2-Dichlorobenzene	↓
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene	↓	1,2,4-Trichlorobenzene	↓
tert-Butylbenzene	↓	Naphthalene	↓
2-Chlorotoluene	↓	1,2,3-Trichlorobenzene	↓

Comments:

Authorized: Michael N. Pettoli

Date: October 16, 1989

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Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Volatile Organics
Method 503

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Q C Trip Blank

SAMPLE NO. I9258 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-22-89

	ppb		ppb
Benzene	<0.5	4-Chlorotoluene	<0.5
Trichloroethene	↓	Bromobenzene	↓
Toluene	↓	sec-Butylbenzene	↓
Tetrachloroethene	↓	1,3,5-Trimethylbenzene	↓
Ethylbenzene	↓	4-Isopropyltoluene	↓
p-Xylene	↓	1,2,4-Trimethylbenzene	↓
Chlorobenzene	↓	1,4-Dichlorobenzene	↓
m-Xylene	↓	1,3-Dichlorobenzene	↓
o-Xylene	↓	n-Butylbenzene	↓
Isopropylbenzene	↓	1,2-Dichlorobenzene	↓
Styrene	↓	Hexachlorobutadiene	↓
n-Propylbenzene	↓	1,2,4-Trichlorobenzene	↓
tert-Butylbenzene	↓	Naphthalene	↓
2-Chlorotoluene	↓	1,2,3-Trichlorobenzene	↓

Comments:

Authorized: Michael R. Pettell

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well 2R2

SAMPLE NO. I9080 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<2.5	Trichlorethene	<2.5
Bromomethane		1,3-Dichloropropane	
Dichlorodifluoromethane		Dibromochloromethane	
Vinyl chloride		1,1,2-Trichloroethane	
Chloroethane		1,2-Dibromoethane	
Methylene chloride		Bromoform	
Trichlorofluoromethane		1,1,1,2-Tetrachloroethane	
1,1-Dichloroethene		1,2,3-Trichloropropane	
Bromochloromethane		1,1,2,2-Tetrachloroethane	
1,1-Dichloroethane		Tetrachloroethene	
trans-1,2,-Dichloroethene		Pentachloroethane	
cis-1,2-Dichloroethene		Chlorobenzene	
Chloroform		1,2-Dibromo-3-chlororpropane	
1,2-Dichloroethane		Bromobenzene	
Dibromomethane		2-Chlorotoluene	
1,1,1-Trichloroethane		4-Chlorotoluene	
Carbon tetrachloride		bis-2-Chloroisopropyl ether	
Bromodichloromethane		1,3-Dichlorobenzene	
1,2-Dichloropropane		1,2-Dichlorobenzene	
2,2-Dichloropropane		1,4-Dichlorobenzene	
1,1-Dichloropropene		trans-1,3-Dichloropropene	
		cis-1,3-Dichloropropene	

Comments: Elevated detection limit due to matrix interference

NLI 001 1741

Authorized: Michael N. Petteuli

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well MD

SAMPLE NO. I9081 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<0.5	Trichlorethene	<0.5
Bromomethane		1,3-Dichloropropane	
Dichlorodifluoromethane		Dibromochloromethane	
Vinyl chloride		1,1,2-Trichloroethane	
Chloroethane		1,2-Dibromoethane	
Methylene chloride		Bromoform	
Trichlorofluoromethane		1,1,1,2-Tetrachloroethane	
1,1-Dichloroethene		1,2,3-Trichloropropane	
Bromochloromethane		1,1,2,2-Tetrachloroethane	
1,1-Dichloroethane		Tetrachloroethene	
trans-1,2,-Dichloroethene		Pentachloroethane	
cis-1,2-Dichloroethene		Chlorobenzene	
Chloroform		1,2-Dibromo-3-chlororpropane	
1,2-Dichloroethane		Bromobenzene	
Dibromomethane		2-Chlorotoluene	
1,1,1-Trichloroethane		4-Chlorotoluene	
Carbon tetrachloride		bis-2-Chloroisopropyl ether	
Bromodichloromethane		1,3-Dichlorobenzene	
1,2-Dichloropropane		1,2-Dichlorobenzene	
2,2-Dichloropropane		1,4-Dichlorobenzene	
1,1-Dichloropropene		trans-1,3-Dichloropropene	
		cis-1,3-Dichloropropene	

Comments:

Authorized: Michael W. Pettelli

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Volatile Organics
Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Rinse Blank

SAMPLE NO. I9084 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<0.5	Trichlorethene	<0.5
Bromomethane		1,3-Dichloropropane	
Dichlorodifluoromethane		Dibromochloromethane	3.0
Vinyl chloride		1,1,2-Trichloroethane	<0.5
Chloroethane		1,2-Dibromoethane	
Methylene chloride		Bromoform	
Trichlorofluoromethane		1,1,1,2-Tetrachloroethane	
1,1-Dichloroethene		1,2,3-Trichloropropane	
Bromochloromethane		1,1,2,2-Tetrachloroethane	
1,1-Dichloroethane		Tetrachloroethene	
trans-1,2,-Dichloroethene		Pentachloroethane	
cis-1,2-Dichloroethene		Chlorobenzene	
Chloroform	12.6	1,2-Dibromo-3-chlororpropane	
1,2-Dichloroethane	<0.5	Bromobenzene	
Dibromomethane		2-Chlorotoluene	
1,1,1-Trichloroethane		4-Chlorotoluene	
Carbon tetrachloride		bis-2-Chloroisopropyl ether	
Bromodichloromethane	6.3	1,3-Dichlorobenzene	
1,2-Dichloropropane	5.6	1,2-Dichlorobenzene	
2,2-Dichloropropane	<0.5	1,4-Dichlorobenzene	
1,1-Dichloropropene		trans-1,3-Dichloropropene	
		cis-1,3-Dichloropropene	

Comments:

NLI 001 1743

Authorized: Michael R. Pettitt

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water

QC Trip Blank

SAMPLE NO. I9087 DATE COLLECTED 8-14-89 DATE REC'D. 8-15-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<0.5	Trichlorethene	<0.5
Bromomethane		1,3-Dichloropropane	
Dichlorodifluoromethane		Dibromochloromethane	
Vinyl chloride		1,1,2-Trichloroethane	
Chloroethane		1,2-Dibromoethane	
Methylene chloride		Bromoform	
Trichlorofluoromethane		1,1,1,2-Tetrachloroethane	
1,1-Dichloroethene		1,2,3-Trichloropropane	
Bromochloromethane		1,1,2,2-Tetrachloroethane	
1,1-Dichloroethane		Tetrachloroethene	
trans-1,2,-Dichloroethene		Pentachloroethane	
cis-1,2-Dichloroethene		Chlorobenzene	
Chloroform		1,2-Dibromo-3-chlororpropane	
1,2-Dichloroethane		Bromobenzene	
Dibromomethane		2-Chlorotoluene	
1,1,1-Trichloroethane		4-Chlorotoluene	
Carbon tetrachloride		bis-2-Chloroisopropyl ether	
Bromodichloromethane		1,3-Dichlorobenzene	
1,2-Dichloropropane		1,2-Dichlorobenzene	
2,2-Dichloropropane		1,4-Dichlorobenzene	
1,1-Dichloropropene		trans-1,3-Dichloropropene	
		cis-1,3-Dichloropropene	

Comments:

Authorized: Michael N. Pelletelli

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Volatile Organics Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water Well SD

SAMPLE NO. I9250 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<0.5	Trichlorethene	<0.5
Bromomethane		1,3-Dichloropropane	
Dichlorodifluoromethane		Dibromochloromethane	
Vinyl chloride		1,1,2-Trichloroethane	
Chloroethane		1,2-Dibromoethane	
Methylene chloride		Bromoform	
Trichlorofluoromethane		1,1,1,2-Tetrachloroethane	
1,1-Dichloroethene		1,2,3-Trichloropropane	
Bromochloromethane		1,1,2,2-Tetrachloroethane	
1,1-Dichloroethane		Tetrachloroethene	
trans-1,2,-Dichloroethene		Pentachloroethane	
cis-1,2-Dichloroethene		Chlorobenzene	
Chloroform	2.7	1,2-Dibromo-3-chlororpropane	
1,2-Dichloroethane	<0.5	Bromobenzene	
Dibromomethane		2-Chlorotoluene	
1,1,1-Trichloroethane		4-Chlorotoluene	
Carbon tetrachloride		bis-2-Chloroisopropyl ether	
Bromodichloromethane		1,3-Dichlorobenzene	
1,2-Dichloropropane		1,2-Dichlorobenzene	
2,2-Dichloropropane		1,4-Dichlorobenzene	
1,1-Dichloropropene		trans-1,3-Dichloropropene	
		cis-1,3-Dichloropropene	

Comments:

NLI 001 1745

Authorized: Michael D. Pettirelli

Date: October 16, 1989

OBG Laboratories, Inc.
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OBG LABORATORIES, INC.

Volatile Organics Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water Well SD Duplicate

SAMPLE NO. I9251 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<0.5	Trichlorethene	<0.5
Bromomethane		1,3-Dichloropropane	
Dichlorodifluoromethane		Dibromochloromethane	
Vinyl chloride		1,1,2-Trichloroethane	
Chloroethane		1,2-Dibromoethane	
Methylene chloride		Bromoform	
Trichlorofluoromethane		1,1,1,2-Tetrachloroethane	
1,1-Dichloroethene		1,2,3-Trichloropropane	
Bromochloromethane		1,1,2,2-Tetrachloroethane	
1,1-Dichloroethane		Tetrachloroethene	
trans-1,2,-Dichloroethene		Pentachloroethane	
cis-1,2-Dichloroethene		Chlorobenzene	
Chloroform	4.5	1,2-Dibromo-3-chlororpropane	
1,2-Dichloroethane	<0.5	Bromobenzene	
Dibromomethane		2-Chlorotoluene	
1,1,1-Trichloroethane		4-Chlorotoluene	
Carbon tetrachloride		bis-2-Chloroisopropyl ether	
Bromodichloromethane		1,3-Dichlorobenzene	
1,2-Dichloropropane		1,2-Dichlorobenzene	
2,2-Dichloropropane		1,4-Dichlorobenzene	
1,1-Dichloropropene		trans-1,3-Dichloropropene	
		cis-1,3-Dichloropropene	

Comments:

Authorized: Michael N. Pettell

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Volatile Organics
Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well #11

SAMPLE NO. 19256 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<50.	Trichlorethene	<50.
Bromomethane	↓	1,3-Dichloropropane	↓
Dichlorodifluoromethane	↓	Dibromochloromethane	↓
Vinyl chloride	↓	1,1,2-Trichloroethane	↓
Chloroethane	↓	1,2-Dibromoethane	↓
Methylene chloride	↓	Bromoform	↓
Trichlorofluoromethane	↓	1,1,1,2-Tetrachloroethane	↓
1,1-Dichloroethene	170.	1,2,3-Trichloropropane	↓
Bromochloromethane	<50.	1,1,2,2-Tetrachloroethane	↓
1,1-Dichloroethane	74.	Tetrachloroethene	74.
trans-1,2,-Dichloroethene	<50.	Pentachloroethane	<50.
cis-1,2-Dichloroethene	↓	Chlorobenzene	↓
Chloroform	↓	1,2-Dibromo-3-chlororpropane	↓
1,2-Dichloroethane	↓	Bromobenzene	↓
Dibromomethane	↓	2-Chlorotoluene	↓
1,1,1-Trichloroethane	4700.	4-Chlorotoluene	↓
Carbon tetrachloride	<500.	bis-2-Chloroisopropyl ether	↓
Bromodichloromethane	<500.	1,3-Dichlorobenzene	↓
1,2-Dichloropropane	<50.	1,2-Dichlorobenzene	↓
2,2-Dichloropropane	↓	1,4-Dichlorobenzene	↓
1,1-Dichloropropene	↓	trans-1,3-Dichloropropene	↓
		cis-1,3-Dichloropropene	↓

Comments:

Authorized: Michael U. Pettitt

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

OBG LABORATORIES, INC.

Volatile Organics
Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
Well #11 Duplicate

SAMPLE NO. I9257 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<50.	Trichlorethene	<50.
Bromomethane	↓	1,3-Dichloropropane	↓
Dichlorodifluoromethane	↓	Dibromochloromethane	↓
Vinyl chloride	↓	1,1,2-Trichloroethane	↓
Chloroethane	↓	1,2-Dibromoethane	↓
Methylene chloride	↓	Bromoform	↓
Trichlorofluoromethane	↓	1,1,1,2-Tetrachloroethane	↓
1,1-Dichloroethene	150.	1,2,3-Trichloropropane	↓
Bromochloromethane	<50.	1,1,2,2-Tetrachloroethane	↓
1,1-Dichloroethane	70.	Tetrachloroethene	69.
trans-1,2,-Dichloroethene	<50.	Pentachloroethane	<50.
cis-1,2-Dichloroethene	↓	Chlorobenzene	↓
Chloroform	↓	1,2-Dibromo-3-chlororpropane	↓
1,2-Dichloroethane	↓	Bromobenzene	↓
Dibromomethane	↓	2-Chlorotoluene	↓
1,1,1-Trichloroethane	4700.	4-Chlorotoluene	↓
Carbon tetrachloride	<500.	bis-2-Chloroisopropyl ether	↓
Bromodichloromethane	<500.	1,3-Dichlorobenzene	↓
1,2-Dichloropropane	<50.	1,2-Dichlorobenzene	↓
2,2-Dichloropropane	↓	1,4-Dichlorobenzene	↓
1,1-Dichloropropene	↓	trans-1,3-Dichloropropene	↓
		cis-1,3-Dichloropropene	↓

Comments:

Authorized: Michael N. Pettinelli

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Volatile Organics
Method 502

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Water
QC Trip Blank

SAMPLE NO. I9258 DATE COLLECTED 8-16-89 DATE REC'D. 8-17-89 DATE ANALYZED 8-24-89

	ppb		ppb
Chloromethane	<0.5	Trichlorethene	<0.5
Bromomethane		1,3-Dichloropropane	
Dichlorodifluoromethane		Dibromochloromethane	
Vinyl chloride		1,1,2-Trichloroethane	
Chloroethane		1,2-Dibromoethane	
Methylene chloride		Bromoform	
Trichlorofluoromethane		1,1,1,2-Tetrachloroethane	
1,1-Dichloroethene		1,2,3-Trichloropropane	
Bromochloromethane		1,1,2,2-Tetrachloroethane	
1,1-Dichloroethane		Tetrachloroethene	
trans-1,2,-Dichloroethene		Pentachloroethane	
cis-1,2-Dichloroethene		Chlorobenzene	
Chloroform		1,2-Dibromo-3-chlororpropane	
1,2-Dichloroethane		Bromobenzene	
Dibromomethane		2-Chlorotoluene	
1,1,1-Trichloroethane		4-Chlorotoluene	
Carbon tetrachloride		bis-2-Chloroisopropyl ether	
Bromodichloromethane		1,3-Dichlorobenzene	
1,2-Dichloropropane		1,2-Dichlorobenzene	
2,2-Dichloropropane		1,4-Dichlorobenzene	
1,1-Dichloropropene		trans-1,3-Dichloropropene	
		cis-1,3-Dichloropropene	

Comments:

NLI 001 1749

Authorized: Michael N. Pettrell

Date: October 16, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

LABORATORIES, INC.

Laboratory Report

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.015.517

DESCRIPTION Pedricktown, NJ - Water Samples

DATE COLLECTED 10-16,17-89 DATE REC'D. 10-19-89 DATE ANALYZED 10-24-89

Description	Well Br	Well 11	Well 11R-AP	Well 11R-BP	Well 18	Field Blank
Sample #	J2628	J2629	J2630	J2631	J2632	J2635
Dichlorodifluoromethane	<1.	<10.	<1.	<1.	<1.	<1.
Trichlorofluoromethane	↓	↓	↓	↓	↓	↓
1,2-Dichlorobenzene	↓	↓	↓	↓	↓	↓
1,3-Dichlorobenzene	↓	↓	1.	↓	↓	↓
1,4-Dichlorobenzene	↓	↓	<1.	↓	↓	↓

UNITS: µg/1

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/l (ppm) unless otherwise noted

Comments:

000109

Authorized: Michael H. Pettenati

Date: December 14, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

NLI 001 1750

LABORATORIES, INC.

Purgeable Priority Pollutants

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.015.517

DESCRIPTION Pedricktown, NJ - Water Samples

DATE COLLECTED 10-16,17-89 DATE REC'D. 10-19-89 DATE ANALYZED 10-24-89

DESCRIPTION:	Well Br	Well 11	Well 11R-AP	Well 11R-BP	Well 18	Field Blank
SAMPLE NO.:	J2628	J2629	J2630	J2631	J2632	J2635
Chloromethane	<1.	<10.	<1.	<1.	<1.	<1.
Bromomethane	<1.					
Vinyl chloride	9.					
Chloroethane	<1.					
Methylene chloride						
1,1-Dichloroethene		160.				
1,1-Dichloroethane		50.				
t-1,2-Dichloroethene		<10.				
Chloroform						
1,2-Dichloroethane						
1,1,1-Trichloroethane		1900.	5.			
Carbon tetrachloride		<100.	<1.			
Bromodichloromethane		<100.				
1,2-Dichloropropane		<10.				
t-1,3-Dichloropropene						
Trichloroethene						
Benzene						
Dibromochloromethane						
1,1,2-Trichloroethane						
c-1,3-Dichloropropene						
2-Chloroethylvinyl ether	<10.	<100.	<10.	<10.	<10.	<10.
Bromoform	<10.	<100.	<10.	<10.	<10.	<10.
1,1,2,2-Tetrachloroethane	<1.	<10.	<1.	<1.	<1.	<1.
Tetrachloroethene		57.				
Toluene		<10.				
Chlorobenzene						
Ethylbenzene						
Xylenes						

UNITS: µg/l

Methodology: Federal Register—40 CFR, Part 136, October 26, 1984

Units: µg/l (ppb) unless otherwise noted

Comments:

000108

Authorized: Michael N. Pellatt

Date: December 14, 1989

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

APPENDIX H

OBG LABORATORIES, INC.

Laboratory Report

CLIENT NL INDUSTRIES, INC. JOB NO. 2844.014.517

DESCRIPTION Pedricktown, NJ - Waters
TOX Summary

DATE COLLECTED 8-15-89 DATE REC'D. 8-16-89 DATE ANALYZED 8-18 to 8-23, 1989

Description		Primary A	Secondary A		
Sample #		I9185*	I9186*		
TOTAL ORGANIC HALIDES					
Initial Run		<2000.	<2000.		
Duplicate Run		<2000.	<2000.		
			UNITS:	µg/l	

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/l (ppm) unless otherwise noted

Comments: * Elevated detection limits due to the presence of matrix interferences.

Authorized: Michael N. Pettitt

Date: October 16, 1989

OBG Laboratories, Inc., an O'Brien & Gere Limited Company
Box 4942 / 1304 Buckley Rd. / Syracuse, NY 13221 / (315) 457-1494

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SITE

Primary B

Lab Name: OBG Laboratories, Inc. Contract: 2844.014.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Water Lab Sample ID: I9175

Sample wt/vol: 800 (g/mL) mL Lab File ID: _____

Level: (low/med) Low Date Received: 8-16-89

% Moisture: not dec. _____ dec. _____ Date Extracted: 8-21-89

Extraction: (Sep F/Cont/Sonc) SepF Date Analyzed: 8-25-89

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.0

CONCENTRATION UNITS: (µg/L or µg/Kg) µg/L

CAS NO.	COMPOUND		Q
319-84-6	alpha-BHC	0.05	U
319-85-7	beta-BHC		
319-86-8	delta-BHC		
58-89-9	gamma-BHC (Lindane)		
76-44-8	Heptachlor		
309-00-2	Aldrin		
1024-57-3	Heptachlor epoxide		
959-98-8	Endosulfan I		
60-57-1	Dieldrin		
72-55-9	4,4'-DDE	0.10	
72-20-8	Endrin		
33213-65-9	Endosulfan II		
72-54-8	4,4'-DDD		
1031-07-8	Endosulfan sulfate		
50-29-3	4,4'-DDT		
72-43-5	Methoxychlor	0.50	
53494-70-5	Endrin ketone	0.10	
5103-71-9	alpha-Chlordane	0.50	
5103-74-2	gamma-Chlordane	0.50	
8001-35-2	Toxaphene	1.0	
12674-11-2	Aroclor-1016	0.50	
11104-28-2	Aroclor-1221		
11141-16-5	Aroclor-1232		
53469-21-9	Aroclor-1242		
12672-29-6	Aroclor-1248		
11097-69-1	Aroclor-1254	1.0	
11096-82-5	Aroclor-1260	1.0	

FORM I PEST 1/87 Rev.

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SITE: Secondary B

Lab Name: OBG Laboratories, Inc. Contract: 2844.014.517

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) Water Lab Sample ID: I9177

Sample wt/vol: 700 (g/mL) mL Lab File ID: _____

Level: (low/med) Low Date Received: 8-16-89

% Moisture: not dec. _____ dec. _____ Date Extracted: 8-21-89

Extraction: (Sep F/Cont/Sonc) SepF Date Analyzed: 8-25-89

GPC Cleanup: (Y/N) N pH: 6.0 Dilution Factor: 1.0

CONCENTRATION UNITS: (µg/L or µg/Kg) µg/L

CAS NO.	COMPOUND		Q
319-84-6	alpha-BHC	0.05	U
319-85-7	beta-BHC	↓	↓
319-86-8	delta-BHC	↓	↓
58-89-9	gamma-BHC (Lindane)	↓	↓
76-44-8	Heptachlor	↓	↓
309-00-2	Aldrin	↓	↓
1024-57-3	Heptachlor epoxide	↓	↓
959-98-8	Endosulfan I	↓	↓
60-57-1	Dieldrin	↓	↓
72-55-9	4,4'-DDE	0.10	↓
72-20-8	Endrin	↓	↓
33213-65-9	Endosulfan II	↓	↓
72-54-8	4,4'-DDD	↓	↓
1031-07-8	Endosulfan sulfate	↓	↓
50-29-3	4,4'-DDT	↓	↓
72-43-5	Methoxychlor	0.50	↓
53494-70-5	Endrin ketone	0.10	↓
5103-71-9	alpha-Chlordane	0.50	↓
5103-74-2	gamma-Chlordane	0.50	↓
8001-35-2	Toxaphene	1.0	↓
12674-11-2	Aroclor-1016	0.50	↓
11104-28-2	Aroclor-1221	↓	↓
11141-16-5	Aroclor-1232	↓	↓
53469-21-9	Aroclor-1242	↓	↓
12672-29-6	Aroclor-1248	↓	↓
11097-69-1	Aroclor-1254	1.0	↓
11096-82-5	Aroclor-1260	1.0	↓

FORM I PEST 1/87 Rev.

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Primary B
I9175

Lab Name: OBG Laboratories Inc. Contract: 2884.014.517

Lab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

Matrix: (soil/water) WATER Lab Sample ID: I9175

Sample wt/vol: 540 (g/mL) mL Lab File ID: >B0971

Level: (low/med) LOW Date Received: 08/16/89

% Moisture: not dec.____ dec. ____ Date Extracted: 08/21/89

Extraction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 09/01/89

GPC Cleanup: (Y/N) N pH: --.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
108-95-2	Phenol	19.	U
111-44-4	bis(2-Chloroethyl)Ether	19.	U
95-57-8	2-Chlorophenol	19.	U
541-73-1	1,3-Dichlorobenzene	19.	U
106-46-7	1,4-Dichlorobenzene	19.	U
100-51-6	Benzyl alcohol	19.	U
95-50-1	1,2-Dichlorobenzene	19.	U
95-48-7	2-Methylphenol	19.	U
39638-32-9	bis(2-chloroisopropyl)ether	19.	U
106-44-5	4-Methylphenol	19.	U
621-64-7	N-Nitroso-Di-n-propylamine	19.	U
67-72-1	Hexachloroethane	19.	U
98-95-3	Nitrobenzene	19.	U
78-59-1	Isophorone	19.	U
88-75-5	2-Nitrophenol	19.	U
105-67-9	2,4-Dimethylphenol	19.	U
65-85-0	Benzoic acid	93.	U
111-91-1	bis(2-Chloroethoxy)methane	19.	U
120-83-2	2,4-Dichlorophenol	19.	U
120-82-1	1,2,4-Trichlorobenzene	19.	U
91-20-3	Naphthalene	19.	U
106-47-8	4-Chloroaniline	19.	U
87-68-3	Hexachlorobutadiene	19.	U
59-50-7	4-Chloro-3-methylphenol	19.	U
91-57-6	2-Methylnaphthalene	19.	U
77-47-4	Hexachlorocyclopentadiene	19.	U
88-06-2	2,4,6-Trichlorophenol	19.	U
95-95-4	2,4,5-Trichlorophenol	93.	U
91-58-7	2-Chloronaphthalene	19.	U
88-74-4	2-Nitroaniline	93.	U
131-11-3	Dimethylphthalate	19.	U
208-96-8	Acenaphthylene	19.	U
606-20-2	2,6-Dinitrotoluene	19.	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Primary B
I9175

b Name: OBG Laboratories Inc. Contract: 2884.014.517

Code: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

tr : (soil/water) WATER Lab Sample ID: I9175

mple wt/vol: 540 (g/mL) mL Lab File ID: >B0971

ve (low/med) LOW Date Received: 08/16/89

Moisture: not dec.____ dec. ____ Date Extracted: 08/21/89

ctraction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 09/01/89

PC Cleanup: (Y/N) N pH: --.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
99-09-2	3-Nitroaniline	93.	U
83-32-9	Acenaphthene	19.	U
51-28-5	2,4-Dinitrophenol	93.	U
100-02-7	4-Nitrophenol	93.	U
132-64-9	Dibenzofuran	19.	U
121-14-2	2,4-Dinitrotoluene	19.	U
84-66-2	Diethylphthalate	19.	U
7005-72-3	4-Chlorophenyl-phenylether	19.	U
86-73-7	Fluorene	19.	U
100-01-6	4-Nitroaniline	93.	U
534-52-1	4,6-Dinitro-2-methylphenol	93.	U
86-30-6	N-Nitrosodiphenylamine (1)	19.	U
101-55-3	4-Bromophenyl-phenylether	19.	U
118-74-1	Hexachlorobenzene	19.	U
87-86-5	Pentachlorophenol	93.	U
85-01-8	Phenanthrene	19.	U
120-12-7	Anthracene	19.	U
84-74-2	Di-n-butylphthalate	19.	U
206-44-0	Fluoranthene	19.	U
129-00-0	Pyrene	19.	U
85-68-7	Butylbenzylphthalate	19.	U
91-94-1	3,3'-Dichlorobenzidine	37.	U
56-55-3	Benzo(a)anthracene	19.	U
218-01-9	Chrysene	19.	U
117-81-7	bis(2-Ethylhexyl)phthalate	12.	JB
117-84-0	Di-n-octylphthalate	19.	U
205-99-2	Benzo(b)fluoranthene	19.	U
207-08-9	Benzo(k)fluoranthene	19.	U
50-32-8	Benzo(a)pyrene	19.	U
193-39-5	Indeno(1,2,3-cd)pyrene	19.	U
53-70-3	Dibenzo(a,h)anthracene	19.	U
191-24-2	Benzo(g,h,i)perylene	19.	U

(1) - Cannot be separated from Diphenylamine

FORM I SV-2 1/87 Rev.

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Primary B
I9175

ɔ Name: OBG Laboratories Inc. Contract: 2884.014.517

ɔ Code: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

trix: (soil/water) WATER Lab Sample ID: I9175RE

nple wt/vol: 540 (g/mL) mL Lab File ID: >B0988

vel: (low/med) LOW Date Received: 08/16/89

Moisture: not dec.____ dec. ____ Date Extracted: 08/21/89

traction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 9/02/89

C Cleanup: (Y/N) N pH: --.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
108-95-2	Phenol	19.	U
111-44-4	bis(2-Chloroethyl)Ether	19.	U
95-57-8	2-Chlorophenol	19.	U
541-73-1	1,3-Dichlorobenzene	19.	U
106-46-7	1,4-Dichlorobenzene	19.	U
100-51-6	Benzyl alcohol	19.	U
95-50-1	1,2-Dichlorobenzene	19.	U
95-48-7	2-Methylphenol	19.	U
39638-32-9	bis(2-chloroisopropyl)ether	19.	U
106-44-5	4-Methylphenol	19.	U
621-64-7	N-Nitroso-Di-n-propylamine	19.	U
67-72-1	Hexachloroethane	19.	U
98-95-3	Nitrobenzene	19.	U
78-59-1	Isophorone	19.	U
88-75-5	2-Nitrophenol	19.	U
105-67-9	2,4-Dimethylphenol	19.	U
65-85-0	Benzoic acid	93.	U
111-91-1	bis(2-Chloroethoxy)methane	19.	U
120-83-2	2,4-Dichlorophenol	19.	U
120-82-1	1,2,4-Trichlorobenzene	19.	U
91-20-3	Naphthalene	19.	U
106-47-8	4-Chloroaniline	19.	U
87-68-3	Hexachlorobutadiene	19.	U
59-50-7	4-Chloro-3-methylphenol	19.	U
91-57-6	2-Methylnaphthalene	19.	U
77-47-4	Hexachlorocyclopentadiene	19.	U
88-06-2	2,4,6-Trichlorophenol	19.	U
95-95-4	2,4,5-Trichlorophenol	93.	U
91-58-7	2-Chloronaphthalene	19.	U
88-74-4	2-Nitroaniline	93.	U
131-11-3	Dimethylphthalate	19.	U
208-96-8	Acenaphthylene	19.	U
606-20-2	2,6-Dinitrotoluene	19.	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Primary B
I9175

Na e:OBG Laboratories Inc. Contract:2884.014.517

ode: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

i (soil/water) WATER Lab Sample ID: I9175RE

le wt/vol: 540 (g/mL) mL Lab File ID: >B0988

l: (low/med) LOW Date Received: 08/16/89

ist ure: not dec.____ dec. ____ Date Extracted:08/21/89

raction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 9/02/89

Cl anup: (Y/N) N pH:--.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
99-09-2	3-Nitroaniline	93.	U
83-32-9	Acenaphthene	19.	U
51-28-5	2,4-Dinitrophenol	93.	U
100-02-7	4-Nitrophenol	93.	U
132-64-9	Dibenzofuran	19.	U
121-14-2	2,4-Dinitrotoluene	19.	U
84-66-2	Diethylphthalate	19.	U
7005-72-3	4-Chlorophenyl-phenylether	19.	U
86-73-7	Fluorene	19.	U
100-01-6	4-Nitroaniline	93.	U
534-52-1	4,6-Dinitro-2-methylphenol	93.	U
86-30-6	N-Nitrosodiphenylamine (1)	19.	U
101-55-3	4-Bromophenyl-phenylether	19.	U
118-74-1	Hexachlorobenzene	19.	U
87-86-5	Pentachlorophenol	93.	U
85-01-8	Phenanthrene	19.	U
120-12-7	Anthracene	19.	U
84-74-2	Di-n-butylphthalate	19.	U
206-44-0	Fluoranthene	19.	U
129-00-0	Pyrene	19.	U
85-68-7	Butylbenzylphthalate	19.	U
91-94-1	3,3'-Dichlorobenzidine	37.	U
56-55-3	Benzo(a)anthracene	19.	U
218-01-9	Chrysene	19.	U
117-81-7	bis(2-Ethylhexyl)phthalate	13.	JB
117-84-0	Di-n-octylphthalate	19.	U
205-99-2	Benzo(b)fluoranthene	19.	U
207-08-9	Benzo(k)fluoranthene	19.	U
50-32-8	Benzo(a)pyrene	19.	U
193-39-5	Indeno(1,2,3-cd)pyrene	19.	U
53-70-3	Dibenzo(a,h)anthracene	19.	U
191-24-2	Benzo(g,h,i)perylene	19.	U

(1) - Cannot be separated from Diphenylamine

FORM I SV-2 1/87 Rev.

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Secondary B
I9177

ame: OBG Laboratories Inc. Contract: 2884.014.517

ode: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

x: (soil/water) WATER Lab Sample ID: I9177

e wt/vol: 810 (g/mL) mL Lab File ID: >B0974

.: (low/med) LOW Date Received: 08/16/89

sture: not dec.____ dec. ____ Date Extracted: 08/21/89

ıction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 9/01/89

:leanup: (Y/N) N pH: --.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
108-95-2	Phenol	12.	U
111-44-4	bis(2-Chloroethyl)Ether	12.	U
95-57-8	2-Chlorophenol	12.	U
541-73-1	1,3-Dichlorobenzene	12.	U
106-46-7	1,4-Dichlorobenzene	12.	U
100-51-6	Benzyl alcohol	12.	U
95-50-1	1,2-Dichlorobenzene	12.	U
95-48-7	2-Methylphenol	12.	U
39638-32-9	bis(2-chloroisopropyl)ether	12.	U
106-44-5	4-Methylphenol	12.	U
621-64-7	N-Nitroso-Di-n-propylamine	12.	U
67-72-1	Hexachloroethane	12.	U
98-95-3	Nitrobenzene	12.	U
78-59-1	Isophorone	12.	U
88-75-5	2-Nitrophenol	12.	U
105-67-9	2,4-Dimethylphenol	12.	U
65-85-0	Benzoic acid	62.	U
111-91-1	bis(2-Chloroethoxy)methane	12.	U
120-83-2	2,4-Dichlorophenol	12.	U
120-82-1	1,2,4-Trichlorobenzene	12.	U
91-20-3	Naphthalene	12.	U
106-47-8	4-Chloroaniline	12.	U
87-68-3	Hexachlorobutadiene	12.	U
59-50-7	4-Chloro-3-methylphenol	12.	U
91-57-6	2-Methylnaphthalene	12.	U
77-47-4	Hexachlorocyclopentadiene	12.	U
88-06-2	2,4,6-Trichlorophenol	12.	U
95-95-4	2,4,5-Trichlorophenol	62.	U
91-58-7	2-Chloronaphthalene	12.	U
88-74-4	2-Nitroaniline	62.	U
131-11-3	Dimethylphthalate	12.	U
208-96-8	Acenaphthylene	12.	U
606-20-2	2,6-Dinitrotoluene	12.	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Secondary B
I9177

ab Name: OBG Laboratories Inc. Contract: 2884.014.517

ab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

atrix: (soil/water) WATER Lab Sample ID: I9177

ample wt/vol: 810 (g/mL) mL Lab File ID: >B0974

evel: (low/med) LOW Date Received: 08/16/89

% Moisture: not dec.____ dec. ____ Date Extracted: 08/21/89

Extraction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 9/01/89

GPC Cleanup: (Y/N) N pH: --.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
99-09-2	3-Nitroaniline	62.	U
83-32-9	Acenaphthene	12.	U
51-28-5	2,4-Dinitrophenol	62.	U
100-02-7	4-Nitrophenol	62.	U
132-64-9	Dibenzofuran	12.	U
121-14-2	2,4-Dinitrotoluene	12.	U
84-66-2	Diethylphthalate	12.	U
7005-72-3	4-Chlorophenyl-phenylether	12.	U
86-73-7	Fluorene	12.	U
100-01-6	4-Nitroaniline	62.	U
534-52-1	4,6-Dinitro-2-methylphenol	62.	U
86-30-6	N-Nitrosodiphenylamine (1)	12.	U
101-55-3	4-Bromophenyl-phenylether	12.	U
118-74-1	Hexachlorobenzene	12.	U
87-86-5	Pentachlorophenol	62.	U
85-01-8	Phenanthrene	12.	U
120-12-7	Anthracene	12.	U
84-74-2	Di-n-butylphthalate	12.	U
206-44-0	Fluoranthene	12.	U
129-00-0	Pyrene	12.	U
85-68-7	Butylbenzylphthalate	12.	U
91-94-1	3,3'-Dichlorobenzidine	25.	U
56-55-3	Benzo(a)anthracene	12.	U
218-01-9	Chrysene	12.	U
117-81-7	bis(2-Ethylhexyl)phthalate	8.	JB
117-84-0	Di-n-octylphthalate	12.	U
205-99-2	Benzo(b)fluoranthene	12.	U
207-08-9	Benzo(k)fluoranthene	12.	U
50-32-8	Benzo(a)pyrene	12.	U
193-39-5	Indeno(1,2,3-cd)pyrene	12.	U
53-70-3	Dibenzo(a,h)anthracene	12.	U
191-24-2	Benzo(g,h,i)perylene	12.	U

(1) - Cannot be separated from Diphenylamine

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Secondary B
I9177

Name: OBG Laboratories Inc. Contract: 2884.014.517

Code: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

rix: (soil/water) WATER Lab Sample ID: I9177RE

ple wt/vol: 810 (g/mL) mL Lab File ID: >B0991

el: (low/med) LOW Date Received: 08/16/89

oisture: not dec.____ dec. ____ Date Extracted: 08/21/89

traction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 9/02/89

C Cleanup: (Y/N) N pH: --.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
108-95-2	Phenol	12.	U
111-44-4	bis(2-Chloroethyl)Ether	12.	U
95-57-8	2-Chlorophenol	12.	U
541-73-1	1,3-Dichlorobenzene	12.	U
106-46-7	1,4-Dichlorobenzene	12.	U
100-51-6	Benzyl alcohol	12.	U
95-50-1	1,2-Dichlorobenzene	12.	U
95-48-7	2-Methylphenol	12.	U
39638-32-9	bis(2-chloroisopropyl)ether	12.	U
106-44-5	4-Methylphenol	12.	U
621-64-7	N-Nitroso-Di-n-propylamine	12.	U
67-72-1	Hexachloroethane	12.	U
98-95-3	Nitrobenzene	12.	U
78-59-1	Isophorone	12.	U
88-75-5	2-Nitrophenol	12.	U
105-67-9	2,4-Dimethylphenol	12.	U
65-85-0	Benzoic acid	62.	U
111-91-1	bis(2-Chloroethoxy)methane	12.	U
120-83-2	2,4-Dichlorophenol	12.	U
120-82-1	1,2,4-Trichlorobenzene	12.	U
91-20-3	Naphthalene	12.	U
106-47-8	4-Chloroaniline	12.	U
87-68-3	Hexachlorobutadiene	12.	U
59-50-7	4-Chloro-3-methylphenol	12.	U
91-57-6	2-Methylnaphthalene	12.	U
77-47-4	Hexachlorocyclopentadiene	12.	U
88-06-2	2,4,6-Trichlorophenol	12.	U
95-95-4	2,4,5-Trichlorophenol	62.	U
91-58-7	2-Chloronaphthalene	12.	U
88-74-4	2-Nitroaniline	62.	U
131-11-3	Dimethylphthalate	12.	U
208-96-8	Acenaphthylene	12.	U
606-20-2	2,6-Dinitrotoluene	12.	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Secondary B
I9177

Lab Name: OBG Laboratories Inc. Contract: 2884.014.517

Lab Code: ----- Case No.: ----- SAS No.: ----- SDG No.: ------

Matrix: (soil/water) WATER Lab Sample ID: I9177RE

Sample wt/vol: 810 (g/mL) mL Lab File ID: >B0991

Level: (low/med) LOW Date Received: 08/16/89

% Moisture: not dec.____ dec. ____ Date Extracted: 08/21/89

Extraction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 9/02/89

GPC Cleanup: (Y/N) N pH: --.- Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
99-09-2	3-Nitroaniline	62.	U
83-32-9	Acenaphthene	12.	U
51-28-5	2,4-Dinitrophenol	62.	U
100-02-7	4-Nitrophenol	62.	U
132-64-9	Dibenzofuran	12.	U
121-14-2	2,4-Dinitrotoluene	12.	U
84-66-2	Diethylphthalate	12.	U
7005-72-3	4-Chlorophenyl-phenylether	12.	U
86-73-7	Fluorene	12.	U
100-01-6	4-Nitroaniline	62.	U
534-52-1	4,6-Dinitro-2-methylphenol	62.	U
86-30-6	N-Nitrosodiphenylamine (1)	12.	U
101-55-3	4-Bromophenyl-phenylether	12.	U
118-74-1	Hexachlorobenzene	12.	U
87-86-5	Pentachlorophenol	62.	U
85-01-8	Phenanthrene	12.	U
120-12-7	Anthracene	12.	U
84-74-2	Di-n-butylphthalate	12.	U
206-44-0	Fluoranthene	12.	U
129-00-0	Pyrene	12.	U
85-68-7	Butylbenzylphthalate	12.	U
91-94-1	3,3'-Dichlorobenzidine	25.	U
56-55-3	Benzo(a)anthracene	12.	U
218-01-9	Chrysene	12.	U
117-81-7	bis(2-Ethylhexyl)phthalate	9.	JB
117-84-0	Di-n-octylphthalate	12.	U
205-99-2	Benzo(b)fluoranthene	12.	U
207-08-9	Benzo(k)fluoranthene	12.	U
50-32-8	Benzo(a)pyrene	12.	U
193-39-5	Indeno(1,2,3-cd)pyrene	12.	U
53-70-3	Dibenzo(a,h)anthracene	12.	U
191-24-2	Benzo(g,h,i)perylene	12.	U

(1) - Cannot be separated from Diphenylamine

APPENDIX I

EFFECTS OF LEAD ON WILDLIFE

The following information is excerpted from "Lead Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review", published by the Fish and Wildlife Service:

Ecological and toxicological aspects of lead (Pb) and its compounds in the environment have been extensively reviewed. There is agreement by all authorities that: Pb is toxic in most of its chemical forms and can be incorporated into the body by inhalation, ingestion, dermal absorption, and placental transfer to the fetus; and Pb is an accumulative poison that affects behavior, as well as the hematopoietic, vascular, nervous, renal, and reproductive systems.

Pb is one of the most common causes of accidental poisoning in domestic animals. Pb demonstrably and adversely affects weight, survival, behavior, litter size, and skeletal development, and induces teratogenic and carcinogenic responses in some species of experimental animals.

Absorption and retention of Pb from the gastrointestinal tract, the major pathway of intake, varies widely because of the age, sex, and diet of the organism. Diet is the major modifier of Pb absorption and of toxic effects in many species of domestic and laboratory animals, waterfowl, and aquatic organisms.

NLI 001 1765

LETHAL AND SUBLETHAL EFFECTS

Pb adversely affects survival, growth, reproduction, development, and metabolism of most species under controlled conditions, but is effects are substantially modified by numerous physical, chemical, and biological variables. In general, organolead compounds are more toxic than inorganic Pb compounds, food chain biomagnification of Pb is negligible, and the younger, immature organisms are most susceptible. Uptake of Pb by terrestrial plants is limited by the low bioavailability of Pb from soils; adverse effects seem to occur only at total concentrations of several hundred mg Pb/kg soil.

A. AQUATIC BIOTA

In general, the responses of aquatic species to Pb intakes differed markedly. Among sensitive species, however, several trends were evident: 1) dissolved waterborne Pb was more toxic than total Pb; 2) organic Pb compounds were more toxic than inorganic forms; 3) adverse effects on daphnid reproduction were evident at 1.0 ug Pb^{2+}/l; 4) high bioconcentrations were measured in oysters at 1.0 ug Pb^{2+}/l and in freshwater algae at 5.0 ug Pb^{2+}/l; 5) tetramethyllead was acutely toxic to rainbow trout at 3.5 ug/l; 6) growth inhibition of a marine alga was reported at 5.1 ug Pb^{2+}/l; and 7) for all species, effects were most pronounced at elevated water temperatures and reduced pH, in comparatively soft waters, in younger life stages, and after long exposures.

Pb is toxic to all phyla of aquatic biota, but its toxic

NLI 001 1766

action is modified by species and physiological state, and by physical and chemical variables.

Lethal solutions of Pb cause increased mucus formation in fishes. The excess coagulates over the entire body and is particularly prominent over the gills, interfering with respiratory function and resulting in death by anoxia. Increasing waterborne concentrations of Pb over 10 ug/l are expected to provide increasingly severe long-term effects on fish and fisheries. Fish that are continuously exposed to toxic concentrations of waterborne Pb show various signs of Pb poisoning: spinal curvature; anemia; darkening of the dorsal tail region; degeneration of the caudal fin; destruction of spinal neurons; ALAD inhibition in erythrocytes, spleen, liver, and renal tissues; reduced ability to swim against a current; destruction of the respiratory epithelium; basophilic stippling of erythrocytes; elevated Pb concentrations in blood, bone, gill, liver, and kidney; muscular atrophy; paralysis; renal pathology; growth inhibition; retardation of sexual maturity; altered blood chemistry; testicular and ovarian histopathology; and death. The prevalence of signs is closely correlated with duration of exposure to Pb and to its uptake. Toxic effects of Pb uptake in fishes are increased under conditions favoring their rapid growth.

Median bioconcentration factor (BCF) values in aquatic biota exposed to various concentrations of Pb^{2+} for 14 to 140 days varied from about 42 in fish to 2570 in mussels; intermediate values were 536 for oysters, 500 for insects, 725 for algae, and 1700 for

NLI 001 1767

snails. Variations in Pb concentrations in aquatic biota probably reflect the ability of individual species to adsorb waterborne Pb, and may be a direct function of the ratio of surface to body weight.

Although Pb is concentrated by biota from water, there is no convincing evidence that it is transferred through food chains. Pb concentrations tended to decrease markedly with increasing trophic level in both detritus-based and grazing aquatic food chains.

B. AMPHIBIANS AND REPTILES

Pb poisoning in adult leopard frogs is indicated by a series of signs: sloughing of integument; sluggishness; decreased muscle tone; decreases in red blood cells, white blood cells, neutrophils, and monocytes; erosion of the gastric mucosa; and excitement, salivation, and muscular twitching. The 30-day LC-50 value for *R. pipiens* was 105 mg Pb/l, but some deaths and elevated liver residues were noted at water concentrations as low as 25 mg/l. At about 1.0 mg/l, Pb blocked synaptic transmission by competitive inhibition of calcium in the bullfrog. At 0.5 mg Pb/l, tadpoles of *Rana utricularia* required additional time to metamorphose; and at 1.5 mg Pb/l, thyroid histopathology was recorded and the delay in metamorphosis was more pronounced.

No data were available on toxic or sublethal effects of Pb to reptiles under controlled conditions.

NLI 001 1768

C. BIRDS

Absorbed Pb causes a variety of effects leading to death, including damage to the nervous system, muscular paralysis, inhibition of heme synthesis, and damage to kidneys and liver. Pb poisoning in waterfowl is a debilitating disease in which death follows exposure by an average of 2 to 3 weeks. During this time, affected birds lose mobility, tend to avoid other birds, and become increasingly susceptible to predation and other causes of mortality. Susceptibility is markedly influenced by species, amount of Pb ingested, and by the types of foods eaten.

The effect of diet on vulnerability to Pb makes interpretation of published information on experimental Pb poisoning in waterfowl extremely difficult.

Among sensitive species of birds, survival was reduced at doses of 50 to 75 mg Pb^{2+}/kg body weight (BW) or 28 mg organolead/kg BW, reproduction was impaired at dietary levels of 50 mg Pb^{2+}/kg, and signs of poisoning were evident at doses as low as 2.8 mg organolead/kg BW.

Toxic and sublethal effects of Pb and its compounds on birds held under controlled conditions vary widely with species, age, and sex, and with form and dose of administered Pb. Several generalizations are possible: decreased blood ALAD and increased protoporphyrin IX activity levels are useful early indicators of Pb exposure; nestlings are more sensitive than older stages; and tissue Pb concentrations and pathology both increase in birds given multiple doses over extended periods.

NLI 001 1769

4. MAMMALS

Signs of Pb poisoning in domestic and laboratory animals, which are similar to those in humans, have been well documented. There is general agreement on several details: significant differences occur between species in response to Pb insult; effects of Pb are more pronounced with organolead than inorganic Pb compounds; younger developmental stages are the most sensitive; and the effects are exacerbated by elevated temperatures, and by diets deficient in minerals, fats, and proteins. In severe cases, death is usually preceded by impairment of normal functions of the central nervous system, the gastrointestinal tract, and the muscular and hematopoietic systems. Signs include vomiting, lassitude, loss of appetite, uncoordinated body movements, convulsions, stupor, and coma. Pb crosses the placenta and is passed in milk, producing early intoxication of the fetus during pregnancy and the newborn during lactation. High Pb doses in mammals induce abortions, reduce or terminate pregnancy, or can result in stillbirths or an increase in skeletal malformations.

Pb adversely affected the survival of sensitive mammals tested at different concentrations: survival was reduced at acute oral doses as low as 5 mg/kg GW in the rat, at chronic oral doses of 0.3 mg/kg BW in dogs, and at dietary levels of 1.7 mg Pb/kg BW in horses. Adverse sublethal effects were noted in monkeys given doses as low as 0.1 mg Pb/kg BW daily (impaired learning two years postadministration), or fed diets containing 0.5 mg Pb/kg (abnormal social behavior); in rabbits given >0.005 mg Pb/kg BW (reduced

NLI 001 1770

blood ALAD activity) or 0.03 mg Pb/kg BW (elevated blood Pb levels); in mice at 0.05 mg Pb/kg GW (reduced ALAD activity); or in sheep at 0.05 mg Pb/kg BW (tissue accumulations).

Although Pb is undeniably toxic at high levels of exposure, the implications of lower levels of exposure are poorly defined. Behavioral effects such as hyperactivity, distractability, and decreased learning ability, as well as certain peripheral neuropathies, have been ascribed to subclinical Pb exposure. No data are currently available on effects of Pb-induced altered parent-offspring relationships, impaired learning ability, or abnormal social behavior for any population of free-ranging wildlife.

NLI 001 1771

APPENDIX J

longitude 118°28'32" W.; thence southwesterly to latitude 33°26'53.5 N., longitude 118°28'35" W.

(b) No vessel may anchor in this area.

(c) For the purposes of this section, "vessel" means every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water.

(33 U.S.C. 1225, 1231; 49 CFR 1.46(n) (4))

Dated: February 20, 1985.

F.P. Schubert,

Rear Admiral, U.S. Coast Guard, Commander, Eleventh Coast Guard District.

[FR Doc. 85-4525 Filed 2-22; 8:45 am]

BILLING CODE 4910-14-M

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 52

[Region II Docket No. 42; A-2-FRL-2783-6]

Approval and Promulgation of Implementation Plans; New Jersey Lead Plan

AGENCY: Environmental Protection Agency.

ACTION: Supplemental notice of proposed rulemaking.

SUMMARY: This notice announces receipt by the Environmental Protection Agency (EPA) of supplemental information submitted by the State of New Jersey with regard to its State Implementation Plan (SIP) for attainment and maintenance of the national ambient air quality standard for lead in all areas of the State. It also reproposes approval of the State's lead SIP, which was submitted under the requirements of the Clean Air Act.

EPA has carried out its review of the New Jersey lead SIP concurrently with the State's SIP development process under the terms of "parallel processing" (this procedure is discussed in a June 23, 1982 Federal Register notice (47 FR 27073)). "Parallel processing" is designed to expedite EPA actions on SIP revisions.

The need for New Jersey's current submittal was identified by EPA in its December 29, 1983 Federal Register notice (48 FR 57331) proposing to approve the New Jersey lead SIP. In determining the nature of its final rulemaking on the New Jersey lead SIP, EPA will consider, along with the public comments it receives, the State's future submittals and actions in response to issues that are identified in today's Federal Register notice.

DATES: Interested persons are invited to submit comments on this proposed action on or before April 26, 1985.

ADDRESSES: All comments should be addressed to: Christopher J. Daggett, Regional Administrator, Environmental Protection Agency, Regional II Office, Jacob K. Javits Federal Building, 26 Federal Plaza, New York, New York 10278.

Copies of the proposed revision, including the supplemental information, are available for public inspection during normal business hours at:

Environmental Protection Agency, Region II, Jacob K. Javits Federal Building, 26 Federal Plaza, Room 1005, New York, New York 10278

New Jersey Department of Environmental Protection, Labor and Industry Building, John Fitch Plaza, Trenton, New Jersey 08625.

FOR FURTHER INFORMATION CONTACT: William S. Baker, Chief, Air Programs Branch, Environmental Protection Agency, Region II, Jacob K. Javits Federal Building, 26 Federal Plaza, New York, New York 10278, 212-264-2517.

SUPPLEMENTARY INFORMATION:

I. Background

On October 6, 1983, as required by section 110 of the Clean Air Act, New Jersey submitted to the Environmental Protection Agency (EPA) a draft State Implementation Plan (SIP) for attainment and maintenance of the national ambient air quality standard for lead. After review of the draft SIP, on December 29, 1983 (48 FR 57331) EPA proposed to approve it. However, in its Federal Register notice of proposed rulemaking, EPA stated that final approval would be contingent upon EPA's receipt of certain supplemental information for the State. EPA also indicated that if this supplemental information showed that significant changes had been made to the SIP, EPA would have to repropose action on the SIP in order to provide the public with the opportunity to comment on the revised SIP, as well as on EPA's evaluation of it.

A. New Jersey's Lead SIP Development Process

In response to the requirements set forth in EPA's December 29, 1983 notice of proposed rulemaking, New Jersey issued a proposed lead SIP, dated January 1984, and conducted a public hearing on this SIP on February 22, 1984. Based on the public comments that State received on this proposed SIP, and on a March 21, 1984 letter from EPA to the State requesting additional information on several of its elements, New Jersey decided to make substantial additions and revisions to its January 1984 document. Consequently, a reproposed, June 1984, SIP document was issued and a second public hearing was held on August 2, 1984.

B. EPA's Processing of New Jersey's Lead SIP

Information supplementing New Jersey's original October 6, 1983 draft SIP has been submitted to EPA on May 1, June 18, and August 15, 1984, and on February 7, 1985. Due to the substantive nature of this supplemental information, EPA has determined that today's supplemental notice of proposed rulemaking on the New Jersey lead SIP is warranted.

The purpose of today's notice is to provide the public with an opportunity to comment on the contents of this supplemental information and on EPA's analysis of it. The public is also being provided with an additional opportunity to comment on EPA's proposed approval of the New Jersey lead SIP. All public comments received on EPA's December 29, 1983 notice of proposed rulemaking, today's notice, and comments received by EPA during the course of the comment periods established by the State will be addressed in EPA's notice of final rulemaking on the New Jersey lead SIP.

II. Results of EPA Review

Today's Federal Register notice provides a summary of the supplemental information submitted by the State and the results of EPA's review of it. The analysis is presented under the following headings:

A. Attainment Demonstration: Urban Areas
B. Attainment Demonstration: Significant Point Sources
C. Fugitive Emissions
D. Control Measures

More detailed information concerning EPA's review of this supplemental information is contained in a Technical Support Document to today's notice. This document is available for public inspection at the locations identified in the ADDRESSES section of this notice.

A. Attainment Demonstration: Urban Areas

In its December 29, 1983 notice of proposed rulemaking, EPA required the State to submit attainment demonstrations for the cities of Newark, Jersey City, and Trenton, three urban areas in New Jersey which have experienced recent violations of the air quality standard for lead. In its supplemental submittal, the State addressed this requirement by providing

a statistical analysis of the relationship between decreases in lead in the ambient air and the reduction of lead in gasoline in these cities. The quantity of lead in gasoline and ambient air concentrations of lead were found to be closely related. Since the quantity of lead in gasoline in 1990 will be only 28.4% of its 1982 value, the State expects that the average ambient lead concentration in 1990 will be reduced by the same percentage. In 1982 no urban areas in New Jersey experienced violations of the lead standard. Thus, the ambient lead concentration is presently below the standard and will continue to decrease to well below the standard in the future. It also should be noted that in an August 2, 1984 Federal Register notice (49 FR 31032), EPA proposed additional reductions to the lead content of gasoline. These additional reductions are not reflected in the State's analysis.

EPA has determined that this demonstration of attainment and maintenance of the lead standard in urban areas is adequate, and finds it approvable.

B. Attainment Demonstration: Significant Point Sources

EPA's December 29, 1983 notice of proposed rulemaking required the State to submit a demonstration of attainment and maintenance of the lead standard in the vicinity of certain "significant" point sources. (A "significant" point source is any source which emits at least 25 tons of lead per year or, in the case of certain specified lead industrial source categories, five tons per year.) The significant sources requiring review and evaluation were:

- Delco-Remy, Division of General Motors Corporation (New Brunswick)
- National Smelting of New Jersey, Inc. (Pedricktown)
- Federated Metals, Inc. (Newark)
- U.S. Metals Refining Co. (Carteret), and
- E.I. Dupont de Nemours & Co., Inc. (Deepwater)

In addition, the State identified the following two point sources of lead which, although not "significant," are considered to have the potential to emit greater than five tons of lead per year.

- Heubach, Inc. (Newark)
- Rollins Environmental Services, Inc. (Logan Township)

According to EPA regulations the State is not required to demonstrate attainment in the vicinity of these sources because they do not emit 25 or more tons per year of lead.

The seven sources just identified comprise all the point sources of lead in New Jersey. These sources have been (or will be) evaluated by the State according to the following procedure:

- A field investigation was conducted to identify fugitive emissions.
- The total lead emission rate was calculated using appropriate fugitive emission factors coupled with control efficiencies and operating parameters, and allowable stack emission rates contained in the source's operating permit.
- The source was modeled using EPA-approved dispersion modeling methods.
- If the modeling results predicted a violation of the ambient lead standard, stack testing was performed.
- The source was remodeled using the stack test results. If a violation was predicted using actual stack emission rates, then an air quality monitor was installed in the vicinity of the source to verify the modeling results.
- If the violation is verified by the monitoring results, then the State will take mitigating action, usually in the form of an administrative consent order containing an enforceable schedule under which the source causing the violation implements control measures to eliminate the contravention of the ambient standard.

Table 1 provides a summary of the status of the attainment demonstrations for all major lead point sources in the State. The following sections discuss the attainment demonstration for each source.

TABLE 1.—SUMMARY OF THE ATTAINMENT DEMONSTRATIONS PERFORMED FOR MAJOR POINT SOURCES OF LEAD IN NEW JERSEY

Source	Fugitive emissions found?	Modeled attainment?	Stack testing conducted?	Monitored attainment?	Compliance measures
Delco-Remy, New Brunswick	No	No	Yes	No	Consent order (if necessary-see discussion).
National Smelting, Pedricktown	Yes	Yes	Yes	Yes	Plant closed (Permits revoked).
Federated Metals, Newark	Yes	Yes	No	Not necessary	None necessary.
U.S. Metals, Carteret	Yes	Yes	Yes	Monitoring requested by EPA	Consent order.
Dupont, Deepwater	No	Yes (marginal)	Yes	Monitoring requested by EPA	None necessary.
Heubach, Newark	Yes	Inconclusive	Yes	Monitoring to be conducted	Consent order (if necessary-see discussion).
Rollins Env. Services, Logan Township	No	Yes	Yes	Not necessary	None necessary.

Delco-Remy, Division of General Motors Corporation, New Brunswick

In its December 29, 1983 notice of proposed rulemaking, EPA found that New Jersey's demonstration of attainment in the vicinity of Delco-Remy (lead-acid storage battery manufacturer and secondary lead smelter) was inconclusive. This was because the emission rates used in the modeling of this source had not been verified by stack testing.

In its supplemental submittal, the State provided the results of revised dispersion modeling of Delco-Remy's lead emissions. Emission inputs to the model were based on updated lead emission data supplied by the company when applying for a revised permit. The revised modeling predicted a marginal violation of the ambient standard (1.6 $\mu g/m^3$ compared to a standard of 1.5 $\mu g/m^3$). However, EPA considers the analysis inconclusive due the uncertainty in the lead emission rates employed in the model. These emission estimates are therefore currently being verified by stack testing.

Following the revised modeling a high volume air sampler (ambient monitor) was sited by the State near the location of the modeled violation. Contraventions of the quarterly lead standard have been measured by this monitor. However, it cannot be concluded that the measured violation is solely attributable to the emissions of Delco-Remy.

Given the inconclusive nature of the modeling analysis, and considering the potential impacts of nearby industrial facilities and rail lines, further investigation appears called for. In cases, such as Delco-Remy, where an ambient violation is measured even though the source has "reasonably available control technology" (RACT) applied to all process and non-process emission points, EPA guidelines allow a "RACT plus studies" approach to lead SIP development. Under this approach,

in lieu of an attainment demonstration a State may submit as part of its SIP a workplan for investigating and ultimately correcting the violation. EPA judges the adequacy of such workplans based on the following criteria:

- A justification, which has been verified by EPA, that the level of emission controls in place constitutes RACT.
- A detailed study protocol to identify individual emission points which may be contributing to the violation, potential measures for their further control, and a legally enforceable schedule for the implementation of the control measures.
- Establishment of an air quality monitoring network around the source(s) suspected of contributing to the violation of the lead standard.

New Jersey has employed the "RACT plus studies" approach in addressing the situation regarding Delco-Remy. As a part of its supplemental submittal the State provided a workplan for a special study of this facility and EPA has found that the workplan meets all of EPA's criteria. Phase III of this workplan describes a plan for requiring the installation of beyond-RACT control measures if they are found to be necessary in order to prevent violations of the ambient lead standard. The schedule calls for such control measures to be selected by January 1986, and appropriate actions based on existing State legal authority to be implemented by March, 1986.

In a separate part of its supplemental submittal, the State included a description of how the New Jersey Administrative Code, Title 7, Chapter 27, Subchapter 6, "Control and Prohibition of Particles from Manufacturing Processes" (N.J.A.C. 7:27-6) could be revised in order to incorporate maximum allowable emission rates for lead. The State has not committed to making these revisions to Subchapter 6 for controlling lead emissions in the State. Instead, New Jersey has chosen to rely on the authority of other portions of N.J.A.C. 7:27, including Subchapter 5, "Prohibition of Air Pollution," Subchapter 8, "Permits and Certificates," Subchapter 13, "Ambient Air Quality Standards," and Subchapter 18, "Control and Prohibition of Air Pollution from New or Altered Sources Affecting Ambient Air Quality in Nonattainment Areas." However, if it is determined that any control measure required under Phase III of the "RACT plus studies" workplan requires supplemental regulatory authority by means of specific lead emission limitations, the State should revise Subchapter 6 or develop and adopt other regulations, as appropriate, to incorporate such limitations.

EPA finds that the "RACT plus studies" workplan for Delco-Remy is adequate and approvable as an element of the SIP, provided that the State submits, as it has agreed to, a plan for expeditiously adopting new authorities within the time frame of Phase III of the "RACT plus studies" workplan, in case implementation of the "RACT plus studies" workplan indicates that such authorities are necessary.

National Smelting of New Jersey, Inc., Pedricktown

In its December 29, 1983 notice of proposed rulemaking, EPA found that the demonstration of attainment for National Smelting (lead smelter) was incomplete and inconclusive since the State had not completed the development of necessary control measures. In addition, a nearby monitor had measured repeated violations of the lead standards. Since the time of EPA's December 29, 1983 notice of proposed rulemaking, National Smelting of New Jersey has permanently ceased operations, and all of the company's operating permits have been revoked by the State. The only remaining source is one of fugitive emissions of dust from open slag storage piles at the abandoned plant site.

In its supplemental submittal, the State presented dispersion modeling data which showed no predicted violations of the ambient lead standard from the slag pile emissions. The entire plant site, including the slag storage piles, has been placed on a priority list for cleanup under the provisions of the federal Comprehensive Emergency Response, Compensation, and Liability Act. EPA finds this demonstration of attainment at the former National Smelting of New Jersey site approvable.

Federated Metals Inc., Newark

An attainment demonstration for Federated Metals (secondary lead smelter) was included in the October 6, 1983 draft SIP evaluated by EPA in its December 29, 1983 notice of proposed rulemaking. The October 1983 draft SIP presented results of a modeling analysis of Federated Metals Inc. (then known as ASARCO, Inc.) which predicted no violations of the ambient standard as a result of the facility's lead emissions. In performing its analysis, the State did not consider the potential impact of fugitive emissions from the facility.

EPA requested in its December 29, 1983 notice of proposed rulemaking that the State revise its attainment demonstration to include fugitive emissions in the calculation of total lead emissions from the facility. The State, in its supplemental submittal, presented the results of revised dispersion modeling of Federated Metal's lead emissions, including fugitive emission estimates based on visual observation and the use of emission factors.

The updated modeling, which took into account fugitive and stack emissions from the facility's reverberatory furnaces, predicts no violation of the ambient standard in the vicinity of the facility. Furthermore, in a June 8, 1984 letter from the State to EPA it was indicated that these furnaces have been shut down and taken out of service. While the conclusion of the attainment demonstration for Federated Metals is not affected by this information, in order to clarify the status of the Federated Metals' furnaces, the State must either revoke the operating permits for this equipment and submit evidence of such revocation to EPA prior to EPA's final approval of the lead SIP, or alternatively, submit more definitive information on the current and projected operating status of the furnaces.

Therefore, EPA finds the attainment demonstration for the Federated Metals Inc. facility to be approvable, provided that the State clarifies the operating status of the reverberatory furnaces, as it has agreed to do.

U.S. Metals Refining Co., Carteret

Modeling of the U.S. Metals facility (secondary copper smelter) without including the effect of fugitive emission controls showed a violation of the ambient standard. However, modeling of this facility was also performed under the assumption that fugitive emissions would be controlled, as a result of a State administrative consent order applicable to this facility. This order requires a 90 percent reduction in fugitive emissions, and has been made a part of the SIP. Modeling of U.S. Metals' lead emissions, incorporating the projected 90 percent reduction in fugitive emissions, predicts attainment of the standard in the vicinity of the facility.

However, in view of the uncertainty in the quantification of the expected reduction in fugitive emissions, EPA believes that site-specific ambient monitoring in the vicinity of the U.S. Metals facility is essential in order to confirm that execution of the control program required by the consent order will result in compliance with the ambient standard. Included in the State's supplemental information was a draft protocol for an ambient air sampling program for lead in the vicinity

APPENDIX K

In support of the statement that plant uptake of lead is expected to be small, the following article was reviewed: "The Potential for Heavy Metal Exposure From Urban Gardens and Soils", Chaney et. al (Proc. Symp. Heavy Metals in Urban Gardens, University of District Columbia Extension Service, Washington, D.C., pp. 37-84). A summary of this article follows:

The accumulation of different elements has been reviewed extensively in the above article, specifically with uptake of trace metals following sewage sludge application on cropland (Logan and Chaney, 1984). In short, some elements are easily absorbed and translocated to food chain plant tissues, while others are not. Based on this review article, it is presented that lead is strongly bound or precipitated in the soil, or in the fibrous plant roots, and is not translocated to plant foliage in injurious amounts even when soils are greatly enriched in lead.

APPENDIX L

Fugitive Dust Exposure Evaluation

In order to evaluate the ambient concentrations of indicator chemicals released in fugitive emissions through wind scour, the following stepwise approach was used:

1) Total soil loss ($kg/m^2/day$) due to wind erosion is estimated.
2) The fraction of these emissions expected to remain suspended in the air column is estimated.
3) The volume of air into which soil emissions are released is estimated, to calculate a release rate per unit volume ($kg/m^3/day$)
4) The residence time (days) of air over the site is calculated
5) The average incremental airborne concentration of soil from on-site fugitive dust emissions is estimated (mg soil/m^3 air).
6) The on-site ambient air concentration of indicator chemicals released through fugitive dust emissions is estimated (mg chemical/m^3 air)

Each of these steps is described below.

1 - *Calculation of Total Soil Loss Due to Wind Scour (E)*

The United States Soil Conservation Service (SCS) has developed a Technical Guide for estimating total loss of soil from a site due to wind scour (USDA 1987). This method is recommended by the United States Environmental Protection Agency in the Superfund Exposure Assessment Manual (EPA 1988) for use in evaluating airborne contaminant levels. Variables and assumptions used in the application of this method to the NSNJ Site are presented in Figure 1.

According to the SCS Wind Erosion Technical Guide, the estimated total soil loss (E) due to wind erosion is:

$$E = 4.7 \text{ tons/acre/year} = 2.88 \times 10^{-3} \text{ kg/m}^2\text{/day}$$

(value obtained from Figure 1)

2 - *Calculation of Suspended Particulate Emissions (E_s)*

The following equation (EPA 1985) is used to calculate the suspended particulate fraction (E_s) of total wind erosion losses (E).

$E_s = E \times A$ where A = the portion of total wind erosion losses that would be measured as suspended particulates; estimated to be 0.025 (EPA 1985)

$$E_s = (2.88 \times 10^{-3} \text{ kg/m}^2\text{/day}) \times (0.025) = 7.2 \times 10^{-5} \text{ kg/m}^2\text{/day}$$

3 - *Calculation of Volumetric Emission Rate (E_v^1)*

It is assumed for this estimate that dust emissions will be limited to a 2-meter height above the site. Therefore, dust emissions (E_v) will be suspended into 2 m^3air/m^2 area.

$$E_v^1 = (7.2 \times 10^{-5}\ kg/m^2/day) \times (1m^2/2m^3) = 3.6 \times 10^{-5}\ kg/m^3/day$$

---

4 - *Calculation of Air Mass Residence Time Over the Site (RT)*

Residence time of air over the site is estimated as follows:

$$RT = L \div AWS$$

Where:

RT = Residence time of the air mass over the site (days)
L = Length of the area of concern along the axis of predominant wind direction (m)
AWS = Average Wind Speed (m/day)

It was assumed that the average wind speed (AWS) in the area is 10 knots (5.14 m/sec or 4.4×10^5 m/day; the predominant wind direction is along a southwest/northeast axis (see Figure 2). Length of the site along the southwest-northeast axis is approximately 320 m (1050 ft).

$$RT = 320 \div 4.4 \times 10^5 = 7.27 \times 10^{-4}\ days$$

---

5 - *Calculation of Incremental Fugitive Dust Concentration in On-Site Air (C_{soil})*

The estimated average airborne concentration of fugitive dusts from on-site soils in air is estimated as follows:

$$C_{soil} = E_v^1 \times RT$$

$$C_{soil} = (36\ mg/m^3/day) \times (7.27 \times 10^{-4}\ days) = 2.61 \times 10^{-2}\ mg\ soil/m^3\ air$$

---

6 - *Calculation of Estimated Chemical Concentration in On-Site Air ($C_{chemical}$)*

The estimated average chemical concentration in air due to fugitive dust emissions from the site through wind scour is estimated as follows:

$$C_{chemical} = C_{soil} \times CS$$

Where:

$C_{chemical}$ = estimated concentration of chemical in air (mg chemical/m^3 air)
C_{soil} = calculated concentration of soil in air (mg soil/m^3 air)
CS = concentration of chemical in soils (mean concentration + 2 standard deviations observed in on-site soils) (mg chemical/kg soil).

(see calculations in Table 1)

TABLE 1

CALCULATION OF CHEMICAL CONCENTRATIONS IN AIR

Chemical	Conc. of Soil in Air (mg Soil/m^3)	X	Conc. of Chemical in Soil (mg Chem/kg Soil)	X	Conversion Factor (1 kg/10^6 mg)	=	Conc. of Chem. in Air (mg Chem/m^3)
Antimony	2.61E-02		96		1E-06		2.51E-06
Arsenic	2.61E-02		11.8		1E-06		3.08E-07
Cadmium	2.61E-02		3.5		1E-06		9.14E-08
Chromium	2.61E-02		18.91		1E-06		4.94E-07
Copper	2.61E-02		24.2		1E-06		6.32E-07
Lead	2.61E-02		6636		1E-06		1.73E-04
Zinc	2.61E-02		56.5		1E-06		1.47E-06

Figure 1

Estimation of Total Soil Loss (E) Due to Wind Erosion

A "Wind Erosion Equation" has been developed by the United States Department of Agriculture Soil Conservation Service (USDA 1987). The equation is expressed symbolically as follows:

$$E = f(I, K, C, L, V)$$

Where:

- E = The potential avarage annual soil loss in tons/acre/yr
- f = A function of
- I = The soil erodibility index (tons/acre/yr). It is related to the percentage of non-erodible soil aggregates larger than 0.84 mm in diameter.
- K = The surface roughness factor. (dimensionless)
- C = Climatic factor (dimensionless). It is based on the average wind velocity and soil moisture.
- L = Field length along the prevailing wind direction (feet)
- V = Vegetative cover factor (dimensionless)

The above primary wind erosion variables are actually aggregate factors which are themselves functions of other variables. The Soil Conservation Service (SCS) Wind Erosion Equation Technical Guide (USDA 1985) allows each variable to be accessed via graphs, tables, or nomographs (EPA 1984). The factors that determine the values of the five primary variables used in the SCS equation are identified in Figure 3.

Based on site-specific conditions at the NSNJ Site (*e.g.* site location, meterology, soil type), the following variable values were selected from the SCS Technical Guide:

- I = 134 tons/acre/yr, based on characterization of surface soil as loamy sand (SCS 1990)
- C = 3, region-specific value provided by Soil Conservation Service (SCS 1990)
- K = 1, assumes flat terrain, with no wind shielding or obstructions
- L = 1050 feet; assumes prevailing wind direction is along a southwest/northeast axis (NWS 1990, Figure 2)
- V = 0, specified by USEPA for remedial investigations and feasibility studies (EPA 1988)

The value of the function (E), expressed in tons/acre/year, is presented within the Wind Erosion Equation Technical Guide for the each possible combination of variable values. The applicable table for the above values is presented below for reference.

(E)* SOIL LOSS FROM WIND EROSION IN TONS PER ACRE PER YEAR JANUARY,1981

C = 6

I = 134

SURFACE - K = 1.0

(V)** - FLAT SMALL GRAIN RESIDUE IN POUNDS PER ACRE

(L) UNSHELTERED DISTANCE IN FEET	0	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
10000	5.4	4.2	2.7	1.5	0.6								
8000	5.4	4.2	2.7	1.5	0.6								
6000	5.4	4.2	2.7	1.5	0.6								
4000	5.4	4.2	2.7	1.5	0.6								
3000	5.4	4.2	2.7	1.5	0.6								
2000	5.4	4.2	2.7	1.5	0.6								
1000	4.7	3.7	2.3	1.2	0.5								
800	4.5	3.5	2.2	1.2	0.5								
600	3.9	3.1	1.9	0.9									
400	3.3	2.5	1.6	0.7									
300	2.7	2.1	1.3	0.6									
200	1.9	1.4	0.8										
150	1.5	1.2	0.6										
100	1.2	0.9	0.5										
80	0.9	0.8											
60	0.7	0.4											
50	0.5	0.3											
40													
30													
20													
10													

Based on this table, the estimated total soil loss from the NSNJ Site due to wind erosion is:

$$E = 4.7 \text{ tons/acre/year}$$

REFERENCES

EPA 1985. United States Environmental Protection Agency (EPA), Dust Control at Hazardous Waste Sites, Handbook, EPA/540/2-85/003, November 1985.

EPA 1988. United States Environmental Protection Agency (EPA), Superfund Exposure Assessment manual, EPA/540/1-88/001, April 1988.

NWS 1990. National Weather Service. National Weather Service. Wind Rose for Philadelphia, PA for the period January 1966 to December 1975.

SCS 1990. Telephone conversation between Mr. Sy Goodman (Soil Conservation Service, New Jersey) and Mrs. Barrie Selcoe (O'Brien & Gere Engineers, Inc.) on September 12, 1990.

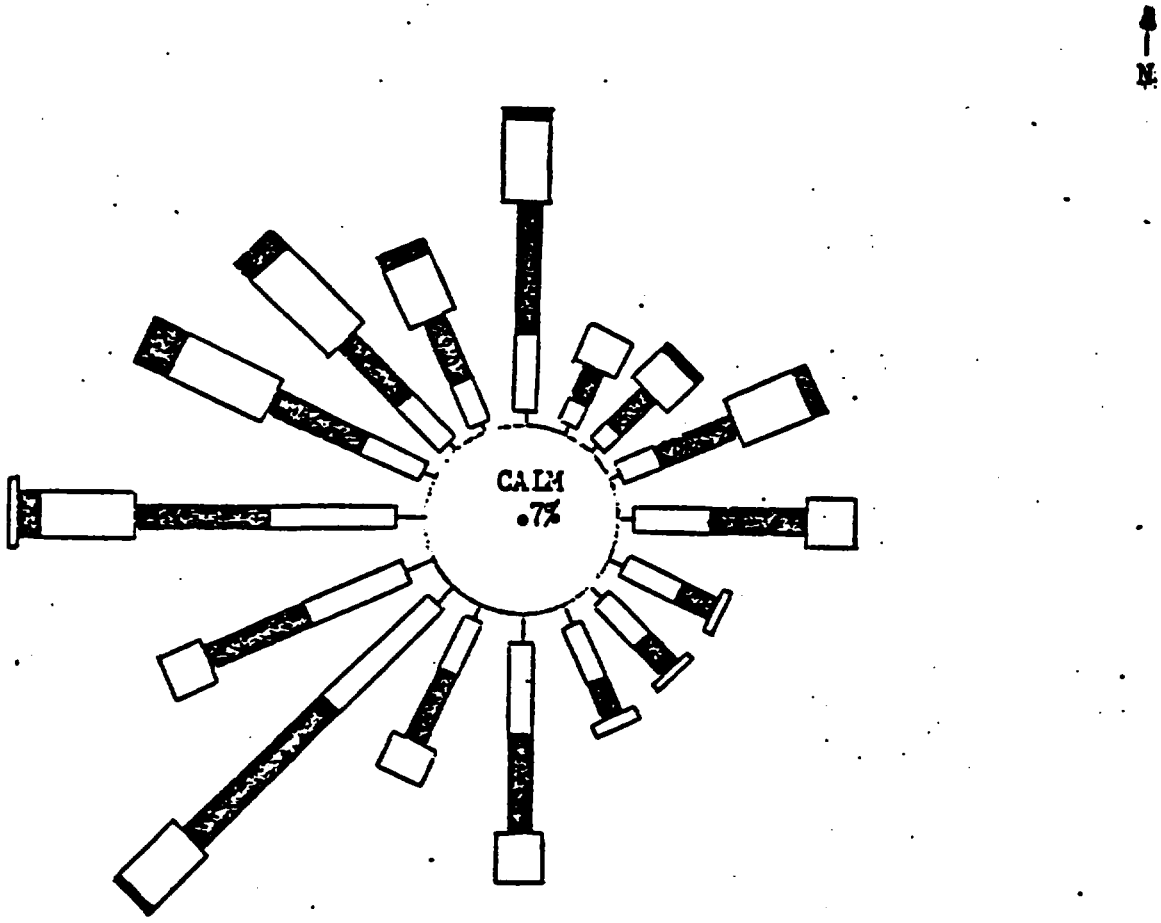
USDA 1987, United States Department of Agriculture (USDA), Soil Conservation Service, Wind Erosion Equation Technical Guide, 1987.

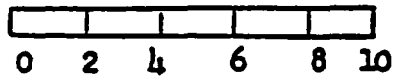
Versar 1984. Superfund Exposure Assessment Manual, Final Draft, Versar Inc., Springfield VA, August 1984.

WIND ROSE
PHILADELPHIA, PENNSYLVANIA
JANUARY 1966 THROUGH DECEMBER 1975

SPEED CLASSES(KNOTS)

0-3 4-6 7-10 11-16 17-21 >21





0 2 4 6 8 10

SCALE (%)

NLI 001 1784

APPENDIX M

ARSENIC

6.3 ENVIRONMENTAL FATE

6.3.1 Atmosphere

Arsenic released to the atmosphere as a gas vapor or adsorbed to particulate matter may be transported to other media via wet or dry deposition, making the atmosphere an important route of arsenic transfer to other media. Trivalent arsenic may undergo oxidation in the air, and arsenic in the atmosphere is usually a mixture of the trivalent and pentavalent forms (EPA 1984a).

Most arsenic in air is adsorbed to particulate matter, especially small diameter particles (e.g., less than 2 μm in diameter) (Coles et al. 1979, as cited in EPA 1982b). The residence time of particulate-bound arsenic in the air depends on particle size, but a typical value is about 9 days (Walsh et al. 1979, as cited in EPA 1982b). Arsenic may persist longer under conditions of limited atmospheric mixing or low precipitation.

Photolysis is not considered an important fate process for arsenic compounds (Callahan et al. 1979).

6.3.2 Surface Water

Arsenic in surface water can undergo a complex pattern of transformations, including oxidation-reduction reactions, ligand exchange, biotransformation, precipitation, and adsorption (Callahan et al. 1979). This complexity results in extremely mobile behavior in aquatic systems, with much of the arsenic entering rivers and eventually transported to oceans (Callahan et al. 1979). Rate constants for these various reactions are not readily available, but the factors most strongly influencing intramedium fate processes in surface water include: Eh, pH, metal sulfide and sulfide ion concentrations, iron concentration, presence of phosphorus minerals, temperature, salinity, and distribution and composition of biota (Callahan et al. 1979).

Sorption onto clays, iron oxides, manganese compounds, and organic material is an important fate of arsenic in surface water (Callahan et al. 1979, EPA 1982b), and sediment serves as a reservoir for much of the arsenic entering surface waters. Sediment-bound arsenic (arsenate/arsenite) which has been methylated by aerobic and anaerobic microorganisms may be released back to the water column (EPA 1982b).

6.3.3 Groundwater

Soluble forms of arsenic interact with soil and travel with the groundwater mass with which they are associated. Shifts in oxidation state may occur in either direction, depending on the particular physical and chemical characteristics of the soil and groundwater.

Volatilization of methylated forms from groundwater is possible. Nonporous soil and heavy vegetation cover are expected to impede volatilization, and oxidation may transform volatile forms into nonvolatile species or species that will adsorb to clay, organic matter, and iron and aluminum complexes.

6.3.4 Soil

Arsenic occurs in soil predominantly in an insoluble, adsorbed form (EPA 1982b). Clay with high anion exchange capacity (e.g., high kaolinite content) is particularly effective at adsorbing arsenate via anion exchange. Complexation and chelation by organic material, iron, or calcium are also important processes fixing arsenic in insoluble form (Cooper et al. 1932, as cited in EPA 1982b).

Red and yellow podzols, latosols, arid and limestone soils, and subsoils high in clay and iron oxides have greater holding capacity for arsenic than other types of soil (Hiltbold et al. 1974, as cited in EPA 1982b). A rise in pH in high iron soil, a drop in pH in lime soil, or a change in redox potential may lead to resolubilization of fixed arsenic.

Leaching of arsenic is usually important only in the top 30 cm of soil (EPA 1982b). Leaching carries arsenic deeper in sandy soils than in clay or loam soils, although EPA (1982b) reports that no leached arsenic could be detected below 90 cm in any of the studies.

While arsenate dominates in aerobic soils, arsenite is the predominant form in slightly reduced soils (e.g., temporarily flooded soil), and arsine, methylated arsenic, and elemental arsenic predominate in very reduced conditions (e.g., swamps and bogs) (EPA 1982b).

6.3.5 Biota

As noted above, arsenic in water and soil may be reduced and methylated by fungi, yeasts, algae, and bacteria, and these forms may volatilize and escape into the air (Wood 1974). The rate of volatilization may vary considerably, depending on soil conditions (oxygenated or anaerobic). The pH value of the soil and microbes present also influence the rate of volatilization. For example, a report by the PAX company (1973) estimated that 50% of an applied dose might volatilize in one year, while Woolson (1976) reported only 1 to 2% volatilization over a period of several months.

Bioconcentration of arsenic occurs in aquatic organisms, primarily in algae and lower inverebrates. Biomagnification in aquatic food chains does not appear to be significant (EPA 1982b, Callahan et al. 1979), although some fish and invertebrates contain high levels of arsenic compounds which are relatively inert toxicologically (EPA 1984a).

Plants may accumulate arsenic via root uptake from soil solution, and certain species may accumulate substantial levels (EPA 1982b). In addition to species differences, the amount of arsenic taken up depends on soil arsenic concentration, soil characteristics, and other factors.

BERYLLIUM

NLI 001 1789

6.3 ENVIRONMENTAL FATE

Because most atmospheric beryllium results from coal combustion, it is likely that the chemical form would be beryllium oxide (EPA 1986a). Conversion to ionized salts may be possible but has not been reported. Beryllium oxide is relatively insoluble and would not be mobilized in soil or surface water at normal pH ranges of 5 to 8.

Soluble beryllium salts are hydrolyzed to form insoluble beryllium hydroxide (Cotton and Wilkinson 1972), which would have a low solubility in the pH range of most natural waters (Callahan et al. 1979). Complexing with hydroxide ions may increase solubility somewhat, but it is likely that in most natural environments beryllium is present in particulate form rather than dissolved from (Hem n.d.). This is substantiated by empirical data which indicate that, even in polluted rivers, dissolved beryllium levels are very low (Callahan et al. 1979).

In most types of soil, beryllium is expected to be tightly adsorbed because it displaces divalent cations which share common sorption sites (Fishbein 1981). Due to its geochemical similarity to aluminum, beryllium may be expected to adsorb onto clay surfaces at low pH and be complexed into some insoluble compounds at high pH (Callahan et al. 1979).

Removal of beryllium from the atmosphere results from wet and dry deposition (EPA 1986a). The rate of dry deposition of aerosol particles is a function of particle size, windspeed, and surface roughness. A study of stack emissions from coal combustion found that most beryllium is found on particles smaller than 1 μm (Gladney and Owens 1976); particles of this size remain aloft for ~10 days. By analogy to other elements, a typical dry deposition rate for beryllium particles over a vegetative surface would be 0.25 cm/sec (EPA 1986a).

The amount of beryllium particles removed from the atmosphere by wet deposition has not been determined experimentally. Rainwater in Australia has been found to have an average beryllium concentration of 0.05 to 0.08 $\mu g/L$ (Meehan and Smyth 1967), which indicates that wet deposition occurs.

No evidence was found that any environmental process results in the volatilization of beryllium into the atmosphere from water or soil.

No data were found regarding the aquatic or soil biotransformation of beryllium or its compounds.

A measured bioconcentration factor of 19 was reported for beryllium, using bluegill fish (EPA 1980). Chapman et al. (1968) reported a bioconcentration factor (BCF) of 100 for freshwater and marine plants, invertebrates, and fish. According to Kenaga (1980), chemicals with BCFs < 1000 will not bioaccumulate significantly. According to Fishbein (1981), there is no evidence that beryllium is significantly biomagnified within food chains.

CHROMIUM

6.3 ENVIRONMENTAL FATE

Chromium is primarily removed from the atmosphere by fallout and precipitation. Atmospheric chromium removed by physical processes predominantly enters surface water or soil; however, prior to their removal, chromium particles of aerodynamic diameter <20 μm may remain airborne for long periods and may be transported long distances. Roughly half of the total chromium in the ferrochrome smelter dust may be bioavailable. About 40% of the bioavailable part may exist as chromium(VI), mostly in the form of $Cr_2O_7(-2)$ or $CrO_4(-2)$. About 75% of the total chromium(VI) particles have diameters <10 μm. The remainder of chromium particles are primarily present as insoluble Cr_2O_3 particles of diameter >10 μm. There is no evidence in the literature to indicate that chromium particles are transported from the troposphere to the stratosphere. This is not surprising since, by analogy with the residence time of atmospheric copper, the residence time of atmospheric chromium is expected to be <10 days (Nriagu 1979, EPA 1984a, Pacyna and Ottar 1985, Cox et al. 1985). In the atmosphere, chromium(VI) may be reduced to chromium(III) at a significant rate by vanadium (V^{2+}, V^{3+}, and VO_2^+), Fe^{2+}, HSO_3^-, and As^{3+} (EPA 1987). Conversely, chromium(III), if present as a salt other than Cr_2O_3, may be oxidized to chromium(VI) in the atmosphere in the presence of ≥1% MnO_2 (EPA 1987). This reaction appears very unlikely under most environmental conditions.

Because there are no known chromium compounds that can volatilize from water, transport of chromium from water to the atmosphere is not likely other than by transport by windblown sea sprays. Most of the chromium(III) is eventually expected to precipitate in sediments. Small amounts of chromium(III) may remain in solution as soluble complexes. Chromium(VI) will predominantly be present in soluble form. These soluble forms of chromium may be stable enough to undergo intramedia transport; however, chromium(VI) will eventually be reduced to chromium(III) by organic matters present in water. It has been estimated that the residence time of chromium in lake water is in the range of 4.6 to 18 years. The bioconcentration factor for chromium(VI) in rainbow trout (*Salmo gairdneri*) is ~1. In bottom-feeder species, such as the oyster (*Crassostrea virginica*), blue mussel (*Mytilus edulis*), and soft shell clam (*Mya arenaria*), the BCF values for chromium(III) and chromium(VI) may range from 86 to 192 (1980, 1984a; Schmidt and Andren 1984; Fishbein 1981).

Chromium probably occurs as insoluble $Cr_2O_3 \cdot nH_2O$ in soil, since the organic matter in soil is expected to convert soluble chromate to insoluble Cr_2O_3. Chromium in soil may be transported to the atmosphere in the form of aerosol, while runoff and leaching may transport chromium from soil to surface waters and groundwaters. Runoff could remove both soluble and bulk precipitate with final deposition on either a different land area or a water body. Flooding of soils and the subsequent anaerobic decomposition of plant matters may increase mobilization of chromium in soils due to formation of soluble complexes. The half-life of chromium in soils may be several years (EPA 1984a, 1985c).

COPPER

NLI 001 1793

5.3 ENVIRONMENTAL FATE

It is not always possible to separate the environmental fate processes related to transport and partitioning from those related to transformation and degradation for a metal, its various compounds and complexes. Part of this problem is that the form of copper is rarely identified. It is also difficult to determine when a process such as adsorption should be treated as partitioning or transformation, since the formation of strong bonds to an adsorbent may be construed as a transformation to new molecular species. Separating weak and strong adsorption is awkward and not always possible. Deposition and general adsorption of copper are discussed in Section 5.3.1. Speciation, compound formation, and oxidation-reduction are examined in Section 5.3.2.

5.3.1 Transport and Partitioning

Copper is released to the atmosphere in the form of particulate matter or adsorbed to particulate matter. It is removed by gravitational settling (bulk deposition), dry deposition (inertial impaction characterized by a deposition velocity), washout by rain (attachment to droplets within clouds), and rainout (scrubbing action below clouds) (Schroeder et al. 1987). The removal rate and distance traveled from the source will depend on source characteristics, particle size, and wind velocity.

Gravitational settling governs the removal of large particles (>5 μm), whereas smaller particles are removed by the other forms of dry and wet deposition. The importance of wet to dry deposition generally increases with decreasing particle size. The scavenging ratio [ratio of the Cu concentration in precipitation (ppm) to its air concentration ($\mu g/m^3$)] for large particles displays a seasonal dependence that reflects their more effective scavenging by snow than by rain (Chan et al. 1986). Copper from combustion sources is associated with sub-micron particles. These particles remain in the troposphere for an estimated 7-30 days. In that time, some copper may be carried far from its source (Perwack et al. 1980).

Metal deposition is characterized by large temporal and spatial variability. Estimated copper deposition rates in urban areas are 0.119 and 0.164 kg/ha/yr for dry and wet deposition, respectively (Schroeder et al. 1987). Bulk deposition reportedly ranges from 0.002-3.01 kg/ha/yr. For rural areas, bulk deposition reportedly ranges from 0.018-0.5 kg/ha/yr, and wet deposition 0.033 kg/ha/yr. The washout ratio is 114,000-612,000 ($\mu g/m^3$ rain)/($\mu g/m^3$ air) [(140-751 μg/kg rain)/(μg/kg air)]. In southern Ontario, Canada, where the average concentration of copper in rain was 1.57 ppb during 1982, 1.36 mg of copper was deposited annually per square meter as a result of wet deposition (Chan et al. 1986). For central and northern Ontario, the mean concentrations of copper in rain were 1.36 and 1.58 ppb, respectively, and the annual wet depositions averaged in both instances 1.13 mg/m^2.

Most copper deposited in soil from the atmosphere, agricultural use, and solid waste and sludge disposal will be strongly adsorbed and remain in the upper few centimeters of soil. Copper's movement in soil is determined by a host of physical and chemical interactions of copper with the soil components. In general, the copper will adsorb to organic matter, carbonate minerals, clay minerals, or hydrous iron and manganese oxides (Callahan et al. 1979; Fuhrer 1986; Tyler and McBride 1982). Sandy soils with low pH have the greatest potential for leaching. In most temperate soil, the pH, organic matter, and ionic strength of the soil solutions are the key factors affecting adsorption (Fuhrer 1986; Gerritse and Van Driel 1984; Elliot et al 1986; Tyler and McBride 1982). The ionic strength and pH of the soil solution affect the surface charge of soils and thereby influence ionic interaction. When the amount of organic matter is low, the mineral content or Fe, Mn and Al oxides become important in determining the adsorption of copper. Fuhrer (1986) reported that, in oxidized estuarine sediment, adsorption of copper is dominated both by amorphous iron oxide and estuarine humic material.

Copper binds to soil much more strongly than other divalent cations, and the distribution of copper in the soil solution is less affected by pH than other metals are (Gerritse and Van Driel 1984). In a study of competitive adsorption and leaching of metals in soil columns of widely different characteristics, copper eluted much more slowly and in much lower quantities than Zn, Cd, and Ni from two mineral soils and not at all from peat soil, which contained the greatest amount of organic matter (Tyler and McBride 1982). Elliot et al. (1986) looked at pH-dependent adsorption of the bivalent transition metal cations (Cd, Cu, Pb, and Zn) in two mineral soils and two soils containing considerable organic matter. Adsorption increased with pH, and Cu and Pb were much more strongly retained than Cd and Zn. Reduction in absorptivity after removal of the organic matter demonstrated the importance of organic matter in binding copper.

To determine the factors affecting copper solubility in soil, Hermann and Neumann-Mahlkau (1985) performed a study in the industrial Ruhr district of West Germany which has a high groundwater table (10-80 cm from the surface) and a history of heavy metal pollution. Groundwater samples were taken from six locations and two horizons of soil, an upper oxidizing loam and a lower reducing loam. Total copper concentrations were high in the upper soil horizons and low in the lower horizons. Copper showed a pronounced solubility only in the oxidizing environment; in the reducing environment, solubility was low, possibly due to the formation of the sulfide.

The form of copper at polluted and unpolluted sites may affect its leachability, particularly by acid rain. The leaching of heavy metals by simulated acid rain (pH 2.8-4.2) was measured by applying rainwater to columns containing humus layers from sites in a Swedish spruce forest both near to and far from a brass mill (Strain et al. 1984). Leaching of copper increased considerably when water with a pH <3.4 was applied to soil from polluted sites.

Since 25 to 75% of copper entering POTWs is removed in sludge, much of which is disposed of by spreading on land, it is important to ascertain whether copper in sludge is apt to leach into soil. This does not appear to be the case; leachate collected from sludge-amended soil contained <12 ppb of copper (Perwack et al. 1980). In laboratory experiments, three sludges containing 51, 66, and 951 ppm (dry weight) of copper were applied to soil columns containing four coastal plain soils. The columns were subsequently leached with distilled water at a rate of 2.5 cm/day for a total column application of 25.4 cm of water. Only small amounts (<0.01-0.87 ppm) of copper were found in the leachate (Ritter and Eastburn 1978). This indicates that hazardous amounts of copper should not leach into groundwater from sludge, even from sandy soils. In another study, soil cores taken after sewage sludge was applied to grassland for 4 years showed that 74% and 80% of copper remained in the top 5 cm of a sandy loam and calcareous loam soil (Davis et al. 1988).

Similarly, copper remains in the surface layer when it is applied to soil as a liquid. Secondary sewage effluent spiked with 0.83 ppm of copper was applied weekly to four different soils. After 1 year of treatment, the concentration of copper in the surface horizons increased greatly; 50-76% of applied copper was found in the upper 2.5 cm and 91-138% was found in the upper 12.7 cm (Brown et al. 1983). In a study of accumulation and movement of metal in sludge-amended soils, field plots received massive amounts of sewage over a period of 6 years. Two sludges (one containing industrial waste), with average copper contents of 0.29 ppm and 23 ppm were incorporated into the top 20 cm of soil in the spring; barley was grown, and after harvest, core samples of soil taken down to 1 m. Some movement of copper into the 22.5-25 cm layer of soil was observed, but little, if any, below this zone. The availability of the copper in soil, as determined by its extractability with diethylenetriamine pentaacetic acid (DTPA) and nitrate, remained constant over a 4-year period at all depths.

Much of the copper discharged into waterways is in particulate matter and settles out, precipitates out, or adsorbs to organic matter, hydrous iron and manganese oxides, and clay in sediment or in the water column. A significant fraction of the copper is adsorbed within the first hour, and in most cases, equilibrium is obtained within 24 hours (Harrison and Bishop 1984). Copper in wastewater discharged into a river leading into Chesapeake Bay, MD, contained 53 ppb of copper, of which 36 ppb were in the form of settleable solids (Helz et al. 1975). The concentration of copper rapidly decreased downstream of the outfall; 2-3 km from the outfall, the copper concentration had fallen to 7 ppb. The concentration of copper in sediment downstream from the outfall was about a factor of 10 higher than in uncontaminated areas.

Copper binds primarily to organic matter in estuarine sediment, unless the sediment is organically poor. A study evaluated the importance of different nonlithogenic components of aerobic estuarine sediment to copper by determining copper's adsorptivity to model sedimentary phases from artificial seawater (Davies-Colley et al. 1984). These phases included hydrous iron and manganese oxides, clay, aluminosilicates, and organic matter. The binding affinities varied by over a factor of 10,000 and were in the following order: hydrous manganese oxide > organic matter > hydrous iron oxide > aluminosilicates > clay (montmorillonite). The partition coefficients at pH 7 for the more strongly bound phases (manganese oxide, iron oxide, and estuarine humic material), were 6300, 1300, and 2500, respectively. The affinity increased somewhat with pH but did not vary appreciably when salinity was reduced. Considering the compositional characteristics of estuarine sediment, the results indicate that copper binds predominantly to organic matter (humic material) and iron oxides. Manganese oxide contributes only ~1% to the binding because of its low concentration in sediment; the other phases are generally unimportant. These findings concur with results of selective extraction experiments (Badri and Aston 1984) and the association of copper with humic material (Raspor et al. 1984).

The bioconcentration factor (BCF) of copper in fish obtained in field studies is 10-100, indicating a low potential for bioconcentration. The BCF is higher in molluscs, especially oysters, where it may reach 30,000 (Perwack et al. 1980). However, there is abundant evidence that there is no biomagnification of copper in the food chain (Perwack et al. 1980). A study was conducted with white suckers and bullheads, both bottom-feeding fish, in two acidic Adirondack, NY, lakes (Heit and Klusek 1985). These lakes were known to have received elevated loadings of copper, but the suckers and bullhead had average copper levels of only 0.85 and 1.2 ppm (dry weight) in their muscle tissue. The biomagnification ratio (the concentration of

copper in the fish to that in potential food) was <1, indicating no biomagnification in the food chain. Similarly, the copper content of muscle tissue of fish from copper-contaminated lakes near Sudbury, Ontario, did not differ significantly from that of fish in lakes far from this source (Bradley and Morris 1986).

Diks and Allen (1983) added copper to four sediment/water systems and studied the distribution of copper among five geochemical phases. The investigators then attempted to correlate the concentration in each phase with the copper uptake by tubificid worms. Only copper extracted from the manganese oxide/easily-reducible phase correlated with the copper content of worms at the 95% confidence level.

No evidence of bioaccumulation was obtained from a study of pollutant concentrations in the muscle and livers of 10 mammal species in Donana National Park in Spain (Hernandez et al. 1985). The animals were classified into three categories (herbivorous, omnivorous, and carnivorous) to ascertain if the pollutants were showing biomagnification in higher tropic levels of animals. No evidence of copper biomagnification in the food chain was observed. A study of heavy metals in cottontail rabbits on mined land treated with sewage sludge showed that, while the concentration of copper in surface soil was 130% higher than in a control area, the elevation was relatively little in foliar samples. No significant increase in copper was observed in rabbit muscle, femur, kidney, or liver, indicating that copper was not bioaccumulating in the food chain (Dressler et al. 1986). Even at the lowest levels of the food chain, there is little evidence of copper bioaccumulation. In a study of earthworms and soil from 20 diverse sites in Maryland, Pennsylvania, and Virginia, copper concentrations in earthworms poorly correlated with that in soil (Beyer and Cromartie 1987).

5.3.2 Transformation and Degradation

5.3.2.1 Air

Few data are available regarding the chemical forms of copper in the atmosphere and their transformations. In the absence of specific information, it is generally assumed that metals of anthropogenic origin, especially those from combustion sources, exist as oxides. Metallic species are attacked by atmospheric oxidants in the atmosphere, resulting in the formation of oxides. As these oxides age, sulfatization may occur. For example, in Arizona, atmospheric copper originating from smelters was strongly correlated with sulfur (Schroeder et al. 1987).

5.3.2.2 Water

The Cu(I) ion is unstable in aqueous solution, tending to disproportionate to Cu(II) and copper metal unless a stabilizing ligand is present (Kust 1978; Callahan et al. 1979). The only cuprous compounds stable in water are insoluble ones such as Cu_2S, CuCN, and CuF. In its

Cu(II) state, copper forms coordination compounds or complexes with both inorganic and organic ligands. Ammonia and chloride ions are examples of species or ligands that form stable ligands with copper. Copper also forms stable complexes with organic ligands such as humic acids, binding to $-NH_2$ and -SH groups and, to a lesser extent, with -OH groups. Natural waters contain varying amounts of inorganic and organic species; this affects the complexing and binding capacity of the water and the types of complexes formed. In seawater, organic matter is generally the most important complexing agent (Coale and Bruland 1988). The formation of ligands may affect other physicochemical processes such as adsorption, precipitation, and oxidation-reduction in water (Callahan et al. 1979).

The major species of soluble copper found in freshwater, seawater, and a combination of the two over a range of pHs is Cu^{2+}, $Cu(HCO_3)^+$, and $Cu(OH)_2$ (Long and Angino 1977). At the pH values and carbonate concentrations characteristic of natural waters, most dissolved Cu(II) exists as carbonate complexes rather than as free (hydrated) cupric ions (Stiff 1971).

The concentration of dissolved copper depends on factors such as pH, the oxidation-reduction potential of the water, and the presence of competing cations (Ca^{2+}, Fe^{2+}, Mg^{2+}, etc.), anions of insoluble cupric salts (OH^-, S^{2-}, $PO4^{3-}$, $CO3^{2-}$), and organic and inorganic complexing agents. If the concentration of a particular anion is high enough to exceed the solubility of a copper salt, precipitation of that salt will occur. The most significant precipitate formed in natural waters is malachite [$Cu_2(OH)_2CO_3$]; other important precipitates are $Cu(OH)_2$ (and ultimately CuO), and azurite [$Cu_3(OH)_2(CO_3)_2$] (Sylva 1976). In anaerobic waters, Cu_2S, Cu_2O, and metallic copper forms and settles out (Callahan et al. 1979). The combined processes of complexation, adsorption, and precipitation control the level of free Cu(II). The chemical conditions in most natural water are such that, even at relatively large copper concentrations, these processes will reduce the free Cu(II) concentration to extremely low values.

As a result of all the aforementioned physico-chemical processes, copper in water may be dissolved or associated with colloidal or particulate matter. Copper in particulate form includes precipitates, insoluble organic complexes, and copper adsorbed to clay and other mineral solids. In a survey of nine rivers in the United Kingdom, 43-88% of the copper was in the particulate fraction (Stiff 1971). A study using suspended solids from the Flint River in Michigan found that the fraction of adsorbed copper increased sharply with pH, reaching a maximum pH of 5.5-7.5 (McIlroy et al. 1986).

The colloidal fraction may include hydroxides and complexes with amino acids. The soluble fraction is usually defined as that which will pass through a 0.45 μm filter; it includes free copper and soluble complexes as well as fine particulates and colloids. The soluble fraction may be divided according to the lability of the copper forms in the water. Categories range from the very labile (e.g., free metal ion) to nonlabile (e.g.,

colloidally bound) metal (Tan et al. 1988). Various techniques may be used to classify the lability of different fractions of soluble copper; these techniques include solvent extraction, ion-specific electrodes, ion exchange, ultrafiltration, electrochemical methods such as anodic stripping voltammetry, and gel filtration chromatography (Harrison and Bishop 1984). The resulting classification depends on the specific procedure employed; therefore, it is not possible to compare the results of different researchers, except in general terms. In a typical study, 18-70% of dissolved copper in river water was moderately labile and 13-30% slowly labile (Tan et al. 1988).

The importance of copper's association with inorganic and organic ligands will vary depending on the pH and concentration of competing ligands in the body of water. In river water from the northwestern United States that had a relatively high pH (7.0-8.5) and alkalinity (24-219 ppm as $CaCO_3$), inorganic species like CO_3^{2-} and OH^- were the most important ligands at high copper concentrations. However, other species were important at low copper concentrations. On the other hand, samples from lakes and rivers in southern Maine with a relatively low pH (4.6-6.3) and alkalinity (1-30 ppm as $CaCO_3$) were largely associated with organic matter. After a period of rain in southeastern New Hampshire, inorganic constituents contributed more to the copper binding in lakes and rivers than dissolved organic matter did (Truitt and Weber 1981). Runoff induced by the rain had added to the inorganic load of the rivers and lakes, as was evidenced by their pH (5.7-7.4) and alkalinity (1.7-43.4 ppm as $CaCO_3$). A green precipitate, confirmed to be malachite [$Cu_2(OH)_2CO_3$] formed in river water in Exeter; this water had the highest pH and alkalinity. A computer simulation of the copper species in pond water and artesian well water that fed the pond predicted that 98% of the copper in the artesian well water would be bound to organic matter, whereas 88 and 63% of the copper in pond water would be bound to organics in spring and fall, respectively (Giesy et al. 1983).

Seawater samples obtained in a transect of uppermost Narragansett Bay in August 1980 were analyzed for dissolved, particulate, and organically-bound copper to investigate the geochemistry of copper-organic complexes (Mills and Quinn 1984). Narragansett Bay is a partly mixed estuary in Massachusetts and Rhode Island that receives organic matter and metals from rivers, municipal and industrial effluents, and runoff. Dissolved copper represented 60% of the total copper and ranged from 16.4 μg/kg in the Providence River to 0.23 μg/kg in Rhode Island Sound. Analysis of the data indicated that ≈75% of this copper is removed within the Providence River. Particulate copper concentrations ranged from 2.42-0.06 μg/kg and generally comprised 40% of the total copper. Fourteen to 70% (0.12-2.30 μg/kg) of the dissolved copper was complexed with organic matter.

Organic ligands may contain a variety of binding sites and the strength of the resulting copper complexes will vary accordingly. Over 99.7% of the total dissolved copper in surface ocean water from the

northeast Pacific was associated with organic ligands (Coale and Bruland 1988). The dominant organic complex, limited to surface water, was a strong ligand of biogenic origin. A second, weaker class of organic ligand was of geologic origin. An independent study showed the copper binds to humic material at a number of sites; the binding strength of the sites varied by 2 orders of magnitude (Giesy et al. 1986). The humic material in the study was derived from nine surface waters in the southeastern United States. Soluble copper in water discharged from a nuclear power station was primarily complexed with organic matter in the 1000-100,000 molecular weight range (Harrison et al. 1980). Ten to 75% of the discharged copper was in particulate form.

The bioavailability of Cu(I) has been largely ignored since soluble or complexed forms of copper in this oxidation state have not been thought to occur in significant amounts in aerobic environments. Investigators have recently speculated on the possibility that Cu(II) can be directly or indirectly reduced to Cu(I) by photochemical processes (Moffett and Zika 1987). If this should occur, it would be more likely to occur in seawater, where chloride ions might stabilize the Cu(I) through complex formation. Cu(II)-organic complexes absorb radiation >290 nm and can undergo charge transfer reactions where the Cu(II) is reduced and the ligand oxidized. Photochemically-generated reducing agents such as O_2^- and H_2O_2 could also reduce Cu(II) to Cu(I).

Experiments performed in synthetic seawater and water from Biscayne Bay, FL, showed that a reaction occurred, the rate of which was first-order in Cl^- and second-order in H_2O_2. The chloride ion is thought to be required for forming stable $CuClOH^-$. Experiments showed that as much as 15% of copper in seawater was as Cu(I). Additionally, sunlight increases the percentage of free Cu(II). The photochemical reduction mechanism is supported by the observation that the Cu(I) concentration is highest in the surface layer of seawater and that the hydrogen peroxide concentration increases in parallel to that of Cu(I) (Moffett and Zika 1987). In addition the percentage of free Cu(II) is highest on the surface.

Once Cu(I) is formed, its lifetime is determined by its rate of oxidation to Cu(II). After Biscayne Bay water was exposed to sunlight for 5 hours, the Cu(I) formed was oxidized to Cu(II); the half-life of the Cu(I) was 12 hours. Dissolved oxygen is primarily responsible for this reaction. Since the oxidation of Cu(I) by O_2 in distilled water occurs in <6 minutes, the Cu(I) apparently is stabilized in seawater by the formation of complexes. In the presence of humic acids, the oxidation of Cu(I) occurs very rapidly. In coastal water off the Everglades in Florida, no Cu(I) was detected, due to the tying up of Cu(II) in organic complexes and the high concentration of radical oxidants in the water. Sharma and Millero (1988) measured the rate of Cu(I) oxidation in seawater as a function of pH, temperature, and salinity. The rate of reaction increased with pH and temperature, and decreased with increasing ionic strength (or salinity).

The results suggested that the rates are controlled by Mg^{2+}, Ca^{2+}, Cl^{-}, and HCO^{3-} through their involvement in complex formation and ligand exchange.

5.3.2.3 Soil

The adsorption of copper to soil and sediment has been discussed in Section 5.3.1 under transport and partitioning, even though adsorption may really be complexation and transformation. At alkaline pH, specific copper compounds may precipitate in soil (Perwack et al. 1980). Copper binding in soil may be correlated with pH, cation exchange capacity, and the organic content of the soil, the presence of iron oxides, and even the presence of inorganic carbon such as carbonates. Copper may also be incorporated in mineral lattices where it is unlikely to have ecological significance. Broad generalizations are not possible since the situation will differ among different soils. In soils with a high organic carbon content, however, copper will be tightly bound to organic matter.

The form of copper in soil is determined by measuring the extractability of the copper with different solvents. This extractability is determined by the nature of the soil and the form of copper deposited in the soil. If a relatively labile form of copper is applied, binding to inorganic and organic ligands may occur, as well as other transformations. On the other hand, if a mineral form is deposited, it would be unavailable for binding. The capacity of soil to remove copper and the nature of the bound copper were evaluated by incubating 70 ppm of copper with 5 g samples of soil for 6 days (King 1988). Thirteen soils (21 samples) from the southeastern United States, 10 mineral and 3 organic, were included in the study. Some soil samples were taken from the subsoil as well as the surface. The amount of adsorbed copper ranged from 36-100%, of which 13-100% was nonexchangeable when extracted with KCl. Removal of copper from solution was much higher with surface soils than with subsurface sandy soils; 95-100% of the copper was removed by five mineral surface soils and all three organic soils. The percentage of copper that was nonexchangeable was relatively high in all but some of the acid subsoils. While the fraction of exchangeable copper was not dependent on pH in surface soils, 96% of the variation in exchangeability was correlated with pH in subsoils. The soil/water partition coefficient for copper was >64 for mineral soils and >273 for organic soils. Of the eight heavy metals in the study, only Pb and Sb had higher partition coefficients than copper. Most of the copper in Columbia River estuary sediment and soil was correlated with inorganic carbon (e.g., carbonate), but not with the amount of extractable Fe or the organic carbon content of the sediment (Fuhrer 1986).

The amount of ammonium acetate- and DTPA-extractable copper in wetland soil/sediment resulting from atmospheric deposition from smelters in Sudbury, Ontario, showed the same pattern as total copper, despite random variations in soil pH, redox potential, and organic carbon (Taylor and Crowder 1983). Therefore, in this case soil characteristics were not the dominant factors determining extractability and availability, but rather the

form of copper that was deposited. The median concentrations of total copper, ammonium acetate-extractable copper, and DTPA-extractable copper at 25 sample sites were 371, 49, and 98 ppm, respectively.

Within the estuarine environment, anaerobic sediments are known to be the main reservoir of trace metals. Under anaerobic conditions, cupric salts will reduce to cuprous salts. The precipitation of cuprous sulfide and the formation of copper bisulfide and/or polysulfide complexes determine copper's behavior in these sediments (Davies-Colley et al. 1985). In the more common case where the free sulfide concentration is low due to the controlling coexistence of iron oxide and sulfide, anaerobic sediment acts as a sink for copper. However, in the unusual situation where the free sulfide concentration is high, soluble cuprous sulfide complexes may form, and the copper concentration in sediment pore water may then be high.

In sediment, copper is generally associated with mineral matter or tightly bound to organic material. As is common when a metal is associated with organic matter, copper is generally associated with fine, as opposed to coarse, sediment. Badri and Aston (1984) studied the association of heavy metals in three estuarine sediments with different geochemical phases. The phases were identified by their extractability with different chemicals and termed: easily or freely leachable and exchangeable, oxidizable-organic (bound to organic matter), acid-reducible (Mn and Fe oxides and possibly carbonates), and resistant (lithogenic). In the three sediments, the non-lithogenic fraction accounted for ~14-18% of the total copper, and the easily exchangeable component was 5% of the total copper. Sediment samples taken from western Lake Ontario were similarly analyzed in regard to the compositional associations of copper by a series of sequential extractions (Poulton et al. 1988). The mean (SD) percentages of copper in the various fractions were: exchangeable, 0 (0); carbonate, 0.1 (0.3); iron or manganese oxide-bound, 0.2 (0.3); organic-bound, 40 (11); and residual, 60 (8). Another study found that 10-20% of the copper in Lake Ontario sediment samples was bound to humic acids, and virtually all the copper was bound to organic matter (Nriagu and Coker 1980). The concentration of copper associated with humic acids was 21-40 times greater than in the sediment as a whole.

LEAD

NLI 001 1803

6.3 ENVIRONMENTAL FATE

6.3.1 Air

In the atmosphere, lead exists primarily in the particulate form. Upon release to the atmosphere, lead particles are dispersed, transformed by physical and/or chemical processes, and ultimately removed from the atmosphere by wet or dry deposition. An important factor in determining the atmospheric transport of lead is particle size distribution. Large particles, particularly those with aerodynamic diameters >2 μm, settle out of the atmosphere fairly rapidly and are deposited relatively close to emission sources, whereas smaller particles may be transported thousands of kilometers. The dry deposition velocity for lead particles with aerodynamic diameters of 0.6 to 2.0 μm was estimated to range between 0.2 and 0.5 cm/s. The amount of lead scavenged from the atmosphere by wet deposition varies widely; wet deposition can account for 20 to 80% of lead deposition depending on such factors as geographic location and amount of emissions in the area (NSF 1977, EPA 1986a). Larger amounts of lead are expected to be removed by wet deposition in areas of acid rain (e.g., northeastern United States), because acid rain has a tendency to solubilize lead (McDonald 1985). The average residence time of lead particles in the atmosphere is expected to range between 7 and 30 days (EPA 1986a).

Information available regarding the chemistry of lead in air is limited. Lead particles are emitted to the atmosphere from automobiles as lead halides (e.g., $PbBrCl$) and as double salts with ammonium halides (e.g., $2PbBrCl\ NH_4Cl$); lead particles are emitted from mines and smelters primarily in the form of $PbSO_4$, $PbO \cdot PbSO_4$, and PbS (EPA 1986a). In the atmosphere, lead exists primarily in the form of $PbSO_4$, $PbCO_3$, and $2PbBrCl\ NH_4Cl$ (NSF 1977). It is not completely clear how the chemical composition of lead changes during dispersion (EPA 1986a, NSF 1977).

Based on the vapor pressure of tetraethyl and tetramethyl lead, these two compounds are expected to exist almost entirely in the vapor phase in the atmosphere (Eisenreich et al. 1981). When exposed to sunlight, they decompose rapidly to trialkyl and dialkyl lead compounds by a combination of direct photolysis, reaction with hydroxyl radicals, and reaction with ozone. The half-life of tetraethyl lead in brightly sunlit atmospheres is expected to be ~1 h, while the half-life for tetramethyl lead will be on the order of several hours. Trialkyl compounds are expected to occur almost entirely in the vapor phase, whereas dialkyl compounds are expected to occur almost entirely in particulate form. Because of the relatively high water solubility of trialkyl and dialkyl lead compounds, washout is probably a major process for these compounds. In addition, the latter species may be significantly removed by dry deposition. Adsorption of tetraethyl and tetramethyl lead to atmospheric particles is not expected to be an important environmental sink (EPA 1985a, DeJonghe and Adams 1986).

6.3.2 Water

The chemistry of lead in aqueous solution is highly complex because this element can be found in a multiplicity of forms. Lead has a tendency to form compounds of low solubility with the major anions of natural water. In the natural environment, the divalent form (Pb^{2+}) is the stable ionic species of lead. Hydroxide, carbonate, sulfide, and, more rarely, sulfate may act as solubility controls in precipitating lead from water (Callahan et al. 1979). Tetraalkyl leads may also form by a combination of chemical/biological alkylation of inorganic lead compounds under appropriate conditions (EPA 1985a).

The amount of lead that remains in solution depends upon the pH of the water and the dissolved salt content. Equilibrium calculations show that at pH >5.4, the total solubility of lead is ~30 μg/L in hard water and ~500 μg/L in soft water. Sulfate ions, if present in soft water, limit the lead concentration in solution through the formation of lead sulfate. Above pH 5.4, $PbCO_3$ and $Pb_2(OH)_2CO_3$ limit the concentration. The carbonate concentration is in turn dependent upon the partial pressure of CO_2, pH, and temperature (EPA 1986a).

A significant fraction of lead carried by river water is expected to be in an undissolved form, which can consist of colloidal particles or larger undissolved particles of lead carbonate, lead oxide, lead hydroxide, or other lead compounds incorporated in other components of surface particulate matters from runoff. Lead may occur either as sorbed ions or surface coatings on sediment mineral particles, or it may be carried as a part of suspended living or nonliving organic matter in water. The ratio of lead in suspended solids to lead in dissolved form has been found to vary from 4:1 in rural streams to 27:1 in urban streams (EPA 1986a).

Except for some shellfish (e.g., mussels), lead does not appear to bioaccumulate significantly in most fish (HSDB 1987).

In water, tetraethyl and tetramethyl lead are susceptible to significant hydrolysis, with the rate of degradation accelerated by seawater. Removal of tetraalkyl lead compounds from seawater occurs at rates that provide half-lives measurable in days (DeJonghe and Adams 1986). Degradation proceeds from trialkyl lead to dialkyl lead to inorganic lead; in seawater, the initial degradation product is trialkyl chloride. Tetraethyl and tetramethyl lead are also susceptible to significant photolytic decomposition in water. Photolysis of tetraethyl lead can produce triethyl lead, which may be more persistent in the environment than tetraethyl lead. In aqueous solution, tetraethyl and tetramethyl lead can be adsorbed by suspended particulate matter and sediment, which may extend the length of their persistence in water. Bioaccumulation of tetraethyl lead in aquatic organisms has been demonstrated (EPA 1985a).

6.3.3 Soil

The accumulation of lead in most soils is primarily a function of the rate of deposition from the atmosphere. Most lead is retained strongly in soil, and very little is transported into surface water or groundwater (EPA 1986a, NSF 1977). The fate of lead in soil is affected by the specific or exchange adsorption at mineral interfaces, the precipitation of sparingly soluble solid phases, and the formation of relatively stable organic-metal complexes or chelates with soil organic matter. These processes are dependent on such factors as soil pH, organic content of soil, the presence of inorganic colloids and iron oxides, ion-exchange characteristics, and the amount of lead in soil (NSF 1977). There is evidence that atmospheric lead enters the soil as lead sulfate, or it is converted rapidly to lead sulfate at the soil surface. Lead sulfate is relatively soluble, and thus could leach through soil if it were not transformed. In soils with pH of ≥5 and with at least 5% organic content, atmospheric lead is retained in the upper 2 to 5 cm of undisturbed soil. Because many plants commonly take up lead from soil, unless plants are harvested or removed, lead may eventually be returned to soil when these plants decay (EPA 1986a).

Limited data indicate that tetraethyl and tetramethyl lead are converted into water soluble lead compounds in soil. Although tetraethyl and tetramethyl lead are not expected to leach significantly through soil, their water soluble metabolites may be subject to leaching (EPA 1985a).

NICKEL

6.3 ENVIRONMENTAL FATE

In the atmosphere, nickel exists predominantly in the aerosol form (Schmidt and Andren 1980). Airborne nickel particles will remain aloft in the atmosphere for varying periods of time depending upon such factors as the concentration of nickel in the atmosphere, the density and size of the particles, and precipitation. The average residence time of nickel in air is 7 days, with typical residence times ranging from 1 to 21 days (Nriagu 1980a). Larger-size aerosols are expected to settle out relatively quickly and deposit near the emission source; however, smaller particles may be transported for hundreds or even thousands of kilometers before being removed from the atmosphere (Davidson 1980). Physical removal of nickel by wet or dry deposition is expected to be the primary fate process in air (Cupitt 1980). The dry deposition flux of nickel has been measured to range from 0.5 to 12 $ng/cm^2/day$ onto artificial surfaces in semiurban and rural areas (Davidson 1980). Dry deposition accounts for 30 to 60% of the total or bulk depostion of nickel. Wet deposition rates of 2.4 to 114 $\mu g/L$ in urban areas (median 12 $\mu g/L$) have been measured (EPA 1986a).

Little information is available on the chemistry of nickel in air. Nickel species probably present in the atmosphere include soil minerals, oxides, and sulfates. Nickel carbonyl has been shown to form under certain conditions, but it is very unstable with a half-life of approximately ~100 s (Schmidt and Andren 1980, EPA 1986a).

Nickel persists in water with an estimated residence time of 23,000 years in deep oceans and 19 years in near-shore coastal waters (Nriagu 1980a). Nickel exists in numerous soluble and insoluble forms depending upon chemical and physical properties of the water. The transport of nickel in the major rivers of the world is estimated as follows: 0.5% in solution, 3.1% adsorbed, 47% as a precipitated coating, 14.9% in organic solids, and 34.4% as crystalline material (Snodgrass 1980). The mobility of nickel in aquatic media is controlled by complexation, precipitation/dissolution, adsorption/desorption, and oxidation/reduction reactions (Richter and Theis 1980). Limited data suggest that in pristine environments nickel may exist primarily as hexahydrate ions that are subsequently coprecipitated or sorbed by hydrous oxides of iron, silica, and manganese, leading to decreases in mobility and bioavailability. In more organo-rich polluted waters, organic materials will keep nickel solubilized by complexation, and approximately half may exist as simple inorganic salts and half as stable organic complexes, e.g., with humic acids. In water where anaerobic conditions exist, nickel will precipitate out of solution as nickel sulfide in the presence of sulfides (Callahan et al. 1979, Sunderman and Oskarsson 1987). The results of one study indicate that although amorphous oxides of iron and manganese generally control the mobility of nickel in aqueous media, variation in such properties as sulfate concentration, pH, and iron oxide surface area could affect the mobility of nickel (Richter and Theis 1980).

No data have been found which would suggest that nickel compounds volatilize from water (Callahan et al. 1979).

It has been shown that the free aqua species of nickel [$Ni(H_2O)_6^{2+}$] predominates at pH 9 in most aerobic waters, and soluble nickel compounds will form as a result of nickel complexation with naturally occurring ligands ($OH^- > SO_4^{2-} > Cl^- > NH_3$) (Richter and Theis 1980). In aerobic environments at pH ≤9, these nickel compounds are sufficiently soluble to maintain aqueous Ni^{2+} concentrations at $>10^{-6}$ *M* (Callahan et al. 1979). At pH >9, the hydroxide and/or carbonate species will precipitate out of solution (Callahan et al. 1979). Under anaerobic conditions, sulfide ions present in water will control the solubility of nickel (Richter and Theis 1980). A fuller discussion of the fate of nickel in water can be found in Nriagu (1980b) and EPA (1986a).

No data have been found which suggest that nickel undergoes any biological transformation process by microorganisms in water (Callahan et al. 1979).

Nickel is significantly bioaccumulated in some, but not all, aquatic organisms. Typical bioconcentration factors (BCFs) for some organisms are as follows: marine phytoplankton, <20-8000; freshwater plants, 100; freshwater fish, 40; seaweeds, 550-2000; algae, 2000-40,000; marine fish, 100; and skipjack tuna, 50 (Callahan et al. 1979). A BCF of <1000 suggests that bioaccumulation would not be significant (Kenaga 1980).

The average residence time of nickel in soil is estimated to be 2400 to 3500 years (Nriagu 1980a, Grandjean 1984). Although nickel is extremely persistent in soil, it also has the potential to leach through soil and subsequently enter groundwater (Tyler and McBride 1982). The sorption of nickel in soils has been found to correlate with suspension pH, total iron, and surface area (Sadiq and Enfield 1984a,b). Organic complexing agents in soil appear to restrict the movement and availability of nickel in soil by forming organo-nickel complexes (Tyler and McBride 1982). Nickel may also be immobilized in soil as nickel ferrite since carbonate, sulfates, and halides of nickel are too soluble to precipitate out of solution in soil (Sadiq and Enfield 1984a,b). There is no evidence which suggests that nickel compounds volatilize from soil surfaces.

The speciation of nickel in soil is expected to be similar to that in water (Richter and Theis 1980). Nickel ferrite ($NiFe_2O_4$) appears to be the most probable nickel species to precipitate in soil (Sadiq and Enfield 1984a,b).

Nickel is reasonably mobile in low pH and cation exchange capacity mineral soils, but less mobile in basic mineral soils and soils with high organic content. Nickel present in dump sites will have higher mobility under acid rain conditions and will be more likely to contaminate the aquifer. The extractable nickel content of soil affects its uptake by plant roots. This extractability is influenced by physical factors (e.g., soil texture, temperature, and water content), chemical factors (e.g., pH, organic content, and redox potential), and biological factors (e.g., plant species variability and microbial activity). In soil derived from serpentine rocks (which contain higher concentrations of nickel), the extractable nickel concentration can reach 70 mg/kg, which is toxic to most plants. Alkalization of such soils decreases the nickel uptake by plants and reduces the likelihood of their exhibiting nickel toxicity (Sunderman and Oskarsson 1978, Tyler and McBride 1982).

Nickel is an essential constituent in such urease-rich plants as Jack beans and soybeans; the concentration of nickel in these plants is very high. Numerous species of nickel-accumulating plants have been identified. One such plant, *Sebertia acuminata*, native to nickel-rich New Caledonia, contains an exceptionally high concentration of nickel (10 g/kg dry weight in leaves and 250 g/kg in latex). Such plants usually contain elevated concentrations of citric acid and malic acids. The solubilization of nickel due to complexation may be involved in the transport and storage of nickel in these plants (Sunderman and Oskarsson 1987).

No data pertaining to the biodegradation of nickel in soil were found in the available literature.

A fuller discussion of the fate of nickel in soil can be found in EPA (1986a) and Nriagu (1980b).

ZINC

5.3 ENVIRONMENTAL FATE

Zinc occurs in the environment in the +2 oxidation state (Lindsay 1979). Sorption is the dominant reaction of zinc, resulting in enrichment of zinc in suspended and bed sediments (Callahan et al. 1979). Zinc in aerobic waters is partitioned into sediments through sorption onto hydrous iron and manganese oxides, clay minerals, and organic material. The efficiency of these materials in removing zinc from solution varies according to their concentrations, pH, Eh, salinity, concentrations of complexing ligands, and the concentration of zinc. Precipitation of zinc compounds appears to be important only in reducing or highly polluted environments. Generally, at lower pH values, zinc will remain as the free ion. The free ion (Zn+2) tends to be adsorbed and transported by suspended solids in unpolluted waters. These solids tend to settle out in polluted waters (pH values above 8.0) where reducing conditions prevail and zinc complexes with carbonates (CO_3^{-2}), hydroxides (OH^{-1}), and organic ligands are formed and incorporated into the sediments (Callahan et al. 1979). In reducing environments, precipitation of zinc sulfide limits the mobility of zinc. The relative mobility of zinc in soil is determined by the same factors affecting its transport in aquatic systems (i.e., solubility of the compound, soil type, and pH and salinity of soil) (Clement Associates 1985).

Zinc is an essential nutrient and is bioaccumulated by biota. Although biota appear to be a minor reservoir of zinc relative to the sediments, biological activity can affect the mobility of zinc in the aquatic environment (Callahan et al. 1979).

Zinc concentrations in air are relatively low except near industrial sources such as smelters. Volatilization does not appear to be an important process for zinc. No estimate for the atmospheric lifetime of zinc is available at this time.

5.3.1 Transport and Partitioning

The tendency of a chemical to partition between soil, water, sediment, air and biota can be inferred from its physical/chemical properties. Zinc occurs in the environment primarily in the +2 oxidation state. It dissolves in acids to form hydrated Zn(+2) cations and in strong bases to form zincate anions ($Zn(OH)_4^{-2}$). In most unpolluted waters, the majority of zinc will exist as the hydrated divalent cation, Zn^{+2}. In polluted waters, the metal will often form complexes with a variety of organic and inorganic ligands (Callahan et al. 1979; EPA 1984b, 1987c).

Zinc can occur in both suspended and dissolved forms in surface water. Dissolved zinc may occur as the free (hydrated) zinc ion or as dissolved complexes and compounds with varying degrees of stability. Suspended (undissolved) zinc may be dissolved following minor changes in water chemistry or may be sorbed to suspended matter.

Sorption of zinc is the dominant fate of zinc in the aquatic environment. Zinc partitions to sediments or suspended solids in surface waters through sorption onto hydrous iron and manganese oxides, clay minerals and organic material. Pita and Hyne (1975) found that reservoirs located downstream from lead-zinc mining and milling areas contained higher concentrations of zinc than reservoirs in other areas and that the zinc was concentrated in reservoir bottom sediments relative to surrounding soils. In addition, the zinc content was closely correlated to depth of water, organic content, and percentage of clay-sized sediments. Houba et al. (1983) found that phosphates and iron hydroxides play an important role in the transfer of heavy metals from river water to the sediments. In this study, zinc was found to bind predominantly to carbonate and amorphous matter (iron, aluminum, and manganese hydroxides). In addition, mobile components of naturally occurring organic matter partially contributed to the increase in the amorphous-bound fraction.

The transport of zinc in the aquatic environment is controlled by the speciation of the ion. In natural waters, two reactions can occur: the competition for complexation sites between metal ions, and the competition between different ligands for the same metal ion (Guy and Chakrabarti 1976). The divalent zinc ion substitutes to some extent for magnesium in the silicate minerals of igneous rocks and gives rise to Zn^{+2} in solution as a result of weathering of the zinc-containing bedrock. The hydrated cation is the dominant form at pH values of about 9 and below (Callahan et al. 1979). Although it appears that in most unpolluted waters zinc exists mainly as a divalent cation and is easily adsorbed to suspended solids, the presence of organic material in polluted areas can result in increased solubility due to the formation of humic and fulvic acid complexes (Guy and Chakrabarti 1976; Callahan et al. 1979).

The tendency of zinc to be sorbed is affected not only by the nature and concentration of the sorbent but by pH and salinity as well (Callahan et al. 1979). Zinc tends to be more readily sorbed at higher pH (pH>7) than lower pH (Callahan et al. 1979). Desorption of zinc from sediments occurs as salinity increases (Helz et al. 1975). This is apparently due to displacement of the adsorbed zinc ions by alkali and alkaline earth cations which are abundant in brackish and saline waters (Callahan et al. 1979).

A small fraction of the zinc may be partitioned into the aquatic phase through speciation into soluble zinc compounds. Compounds of zinc with the organic and inorganic ligands of surface waters are soluble in neutral and acidic solutions, so that zinc is readily transported in most unpolluted natural waters and is one of the most mobile of the heavy metals (Callahan et al. 1979). Zinc chloride and sulfate are very soluble in water, but hydrolyze in solution and reduce pH (NRC 1977). If the pH is maintained by the presence of an excess of bicarbonates and other anions normally present in natural water, the solubility of zinc is likely to be controlled by the solubility of its carbonate ($ZnCO_3$) and hydroxide [$Zn(OH)_2$] (NRC 1977). Patterson et al. (1977) studied the precipitation of $Zn(OH)_2$ and $ZnCO_3$ and found that $Zn(OH)_2$ precipitates faster than $ZnCO_3$. Zinc carbonate is soluble in pure water at 25°C up to 107 mg Zn/L. The hydroxide is soluble only to 0.2 mg Zn/L. However, the pH at which zinc might precipitate as hydroxide is probably not reached in the presence of excess carbon dioxide in solution (NRC 1977c).

Precipitation of zinc compounds appears to be important only in reducing environments or highly polluted environments (Callahan et al. 1979). Precipitation of the sulfide is an important control on the mobility of zinc in reducing environments, and precipitation of the hydroxide, carbonate, or basic sulfate may occur at high zinc concentration. The hydroxides and hydrous oxides of iron and manganese are often components of the clay fraction of sediments and often exist as coatings on the surfaces of other minerals (NRC 1977). Coprecipitation of zinc with hydrous oxides may occur when reduced iron or manganese oxides are oxidized. As the new solids are formed, they can trap various ions into their crystal lattice (Callahan et al. 1979).

Zinc is likely to be strongly sorbed in soil. Schalscha et al. (1982) found little water soluble and exchangeable heavy metal in soil irrigated with raw wastewater. Although considerable amounts of metals were added to the soil in soluble and exchangeable forms during wastewater irrigation, they were converted into the chemically less active forms (organically bonded and inorganic precipitates). Further examinations showed that soil zinc accumulation resulting from waste disposal occurred primarily in inorganic precipitates.

The mobility of zinc in soil depends on the solubility of the speciated forms of the compound and on soil properties such as sorption potential, pH and salinity; under anaerobic conditions, ZnS is the controlling species (EPA 1980d; Kalbasi et al. 1978). Soil conditions will thus affect the tendency of zinc to be sorbed. In a study of the effect of suspension on zinc solubility, Saeed and Fox (1977) show for acid soils that below pH 7 a linear relationship exists between pH and the amount of zinc in solution. As negative charges on soil surfaces increase with increasing pH, additional sites for zinc adsorption are activated and subsequently zinc in solution decreases. Sanders and Kherbawy (1987) report that the active zinc species in adsorption is single charged (e.g., $Zn(OH)^+$). As pH increases above 7, a general increase in the amount of zinc in solutions for the soils high in organic matter occurs. This is probably due to dispersion of organic matter, which either releases complexed zinc or provides chelating agents for added zinc and reduces adsorption or precipitation (Saeed and Fox 1977). For calcareous soils, the relationship between zinc solubility and pH is nonlinear. At higher pH, zinc in solutions is precipitated as $Zn(OH)_2$, $ZnCO_3$, or Ca-zincate (Saeed and Fox 1977). Clay and metal oxides are capable of sorbing zinc and tend to retard its mobility in soil. Gerritse et al. (1982) report a soil sorption coefficient (Kd) of 939 ml/g in sandy loam soil and 12.7 ml/g in sandy soils. Baes and Sharp (1983) report a range in Kds of 0.1 and 8,000 ml/g. An average Kd of 40 ml/g was reported by Baes et al. (1984).

Zinc in a soluble form, such as zinc sulfate, is fairly mobile in most soils. However, relatively little land disposed zinc is in the soluble form, and mobility will therefore be limited by a slow rate of dissolution. Consequently, movement towards groundwater is expected to be slow unless zinc is applied to soil in soluble form (such as in agricultural applications) or accompanied by corrosive substances (such as in mine tailings) (EPA 1980d). Yet soil conditions not amenable for the sorption of zinc may lead to the leaching of zinc. Decreased pH (<7) and increased soil salinity favor desorption (EPA 1987c; Saeed and Fox 1977). According to EPA's CLP statistical data base (EPA 1988b), zinc has been detected in groundwater of approximately 97% of the 2,783 hazardous waste sites contained in the data base. This indicates that leaching of zinc from soil occurs at these sites. The transport of soil zinc may also result from entrainment of particles into the atmosphere (EPA 1980d).

Zinc is an essential nutrient and is often concentrated in the tissues of organisms even in the absence of abnormally high ambient media concentrations. Zinc was found to bioaccumulate in freshwater animal tissues from 51 to 1,130 times the concentration present in the water (EPA 1987c). Microcosm studies generally indicate that zinc is not biomagnified (Callahan et al. 1979). Further, although zinc is actively bioaccumulated in aquatic systems, the biota appear to represent a relatively minor sink compared to the sediments.

Steady-state zinc bioconcentration factors (BCFs) for twelve aquatic species range from approximately 4 to 24,000 (EPA 1987c). Crustaceans and fish can accumulate zinc from both water and food. Fishbein (1981) reported BCFs in aquatic and terrestrial environments for zinc. Values of 1,000 were reported for both aquatic plants and fish. A value of 10,000 was reported for aquatic invertebrates. For bioconcentration from soil by terrestrial plants, invertebrates, and mammals, values of 0.4, 8, and 0.6, respectively, were reported. Bioconcentration of soil zinc by plants is dependent on the plant species and soil pH.

Atmospheric transport of zinc is possible; however, the atmospheric fate of zinc has not been comprehensively studied. Callahan et al. (1979) state that volatilization is not an important transport process for zinc. Volatile methylated forms analogous to those of mercury, arsenic, antimony, lead, and selenium are probably not formed in aquatic environments (Callahan et al. 1979). Except near sources such as smelters, zinc concentrations in air are relatively low and fairly constant (Clement Associates 1985). Any chemical interaction of zinc compounds in the atmosphere may result in change in the speciation (i.e., form) of zinc.

5.3.2 Transformation and Degradation

Transformation of zinc can occur as a result of chemical speciation, that is, conversion of zinc into a more stable species, such as, the formation of zinc oxide in the atmosphere, hydrolysis of hydrated zinc cations, or oxidation/reduction of organic and inorganic zinc complexes.

5.3.2.1 Air

Chemical interaction of zinc compounds in the atmosphere may result in a change in the speciation of the compound. Atmospheric interactions are greatest for particles with smaller aerodynamic diameters (Fishbein 1981). Zinc is found in the atmosphere at the highest concentrations in smallest particles (Fishbein 1981) and as a result, is probably highly reactive. Atmospheric emissions of zinc, consisting primarily of zinc sorbed to submicron particulate matter and the oxide of zinc are expected to be short-lived, due to surface deposition (EPA 1980d).

Zinc is attacked by moist air, carbon dioxide (CO_2), and sulfur dioxide (SO_2), resulting chiefly in a coating of hydrated basic carbonate of variable composition; some hydrogen peroxide (H_2O_2) may be formed in the process. Zinc is resistant to attack by dry fluorine (F_2), chlorine (Cl_2), and bromine (Br_2), but combines rapidly in presence of water vapor. Zinc is attacked by acid gases and acids. (Stokinger 1981).

5.3.2.2 Water

As mentioned previously, zinc is in the +2 form in aqueous solution and exhibits amphoteric properties, dissolving in acids to form hydrated Zn(+2) cations and in strong bases to form zincate anions (probably $Zn(OH)_4^{-2}$) (Callahan et al. 1979).

Hydrated zinc cations may be hydrolyzed to form $Zn(OH)_2$ or zinc oxide (ZnO). Zinc is not directly affected by changes in Eh (redox potential); however the valences and reactivity of ligands reacting with zinc are affected by Eh. Zinc is an active reducing agent for many ions such as iron (Fe^{+3}), manganese oxide (MnO_4^-), and chromate (CrO_4^-) (Stokinger 1981).

Because alkyl zinc compounds are unstable to water and oxygen, biomethylation of zinc in aquatic ecosystems probably does not occur (Callahan et al. 1979). No evidence was found that photolysis in the aquatic environment significantly affects the fate of zinc compounds.

As mentioned previously, a small part of the available zinc may be partitioned into the aquatic phase through formation of soluble zinc chloride and sulfate compounds. These compounds will hydrolyze in solution and reduce pH. If the pH is maintained by the presence of an excess of bicarbonates and other anions normally present in natural water, the solubility of zinc is likely to be controlled by the solubility of its carbonate and hydroxide. Precipitation of $Zn(OH)_2$ is kinetically favored over $ZnCO_3$ (Patterson et al. 1977).

5.3.2.3 Soil

No information specifically related to transformation and degradation in soil was identified in the available literature; however, chemical speciation of zinc in soil is probably affected by the same factors affecting its fate in water. As stated previously, the soil chemistry of zinc is governed primarily by the pH of the soil. In acidic soils, cation exchange processes will influence the fate of zinc. When there are mobile metals, competition for the binding sites will probably occur, and zinc may be mobilized (ICF 1986). In alkaline soils, the chemistry of zinc is dominated by interactions with organic ligands.

APPENDIX N

Assessing Risk from Dermal Exposure at Hazardous Waste Sites

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ABSTRACT

The current methodology for estimating body dose levels from dermal contact with contaminated soils is to use an absorption factor of unity when empirically derived absorption factors are unavailable[1]. Using a value of 100% is an overly conservative approach which leads to the gross overestimation of the dermal absorption of most compounds. This paper provides one approach for refining dermal absorption factors based on the current toxicology literature and chemical and physical considerations of the contaminants. Absorption factors are developed for the three major chemical classes; volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs) including pesticides; and inorganic compounds.

INTRODUCTION

Estimating the potential human health risks posed by contaminants at hazardous waste sites requires an assessment of all the possible routes of contaminant exposure. This process can be very complex, as a large number of chemicals often are present and there often are multiple exposure pathways involving oral, dermal and inhalation routes of entry. Traditionally, when performing a public health risk assessment, the major emphasis has been on evaluating the ingestion of contaminated groundwater, as this route of exposure tends to generate the greatest public concern and is often the easiest to evaluate. However, there are many sites where the potential public health risks from direct contact with contaminated soils or sediments need to be evaluated. These sites include areas with unrestricted or limited restriction to access and/or sites where sensitive populations, such as children, may come into contact with contaminated soils.

Soil and sediment contamination is a common problem at most hazardous waste sites resulting from the indiscriminate disposal practices or direct dumping of contaminants onto surface soils. Subsequent contaminant migration and contaminant transformation and fate processes often result in contamination to both the surface and subsurface soils and sediments. Exposure to this medium may result from one or more of the following routes of exposure: soil ingestion due either to inadvertent ingestion or pica, inhalation of fugitive dusts and direct contact through dermal exposure to soils.

Although each of these three routes of exposure is important, the focus of this paper is on assessing risk from dermal exposure only. This route of exposure poses some unique challenges to risk assessors as the toxicology literature rarely provides information on the health effects caused by dermal exposure. In addition, bioavailability considerations often complicate the estimation of incurred human doses posed by contact with contaminants in soil or sediments. Because of these limitations, some risk assessors are reluctant to quantitatively evaluate exposure from direct contact. We, however, feel that it is possible to refine certain exposure parameters using the available toxicity information to provide sound risk estimates that can be used to make risk management decisions.

The subsequent sections of this paper provide an overview of the information needed to assess risk from dermal contact with soils and a discussion of how the available information can be used to derive absorption factors for contaminants in a soil matrix.

NECESSARY AND AVAILABLE INFORMATION

The actual risk from dermal contact with contaminated soils will be a function of the contaminant concentration in the soil, the amount of soil contacted, the frequency of contact and the amount of contaminant absorbed through the skin. To provide a quantitative estimate of the risk from this route of exposure, numerical values must be assigned to each of these exposure parameters. When combined, these parameters yield the body dose level of a contaminant expressed in mg/kg-day. The body dose level can either be averaged over a lifetime and multiplied by the cancer potency factor to provide an estimate of the incremental cancer risk or divided by the most appropriate standard, criterion or guideline to provide a non-carcinogenic risk ratio.

While values for contaminant concentrations can be easily obtained from analytical data, the other exposure parameters are more difficult to quantify as these parameters often are based on site specific factors such as the assumed activity and behavior patterns of the exposed population and/or the physical site conditions. Researchers such as Renate Kimbrough, John Hawley and John Schaum have developed methodologies for quantifying many of these exposure parameters including the amount and frequency of soil contacted per exposure. However, the literature contains little human or animal toxicology data on the dermal absorption of contaminants from a soil matrix. Dermal absorption information is available for only a few of the many contaminants expected to be present at a hazardous waste site, and much of the available information is based on a contaminant's absorptive behavior in a liquid or vapor phase.

The limited quantitative data available indicate that dermal absorption of contaminants in a liquid phase occurs at rates less than 100%. The data also show large variations in the estimated absorption values of most contaminants tested due to the many factors which influence the absorption of contaminants across the skin including location of application, skin condition, concentra-

NLI 001 1818

tion and bio-availability[2,3]. While this information is useful for providing qualitative information regarding a contaminants absorption potential, it does not provide the information needed for assessing dermal absorption of contaminants in soils. Values based on the absorption of a contaminant in a liquid or vapor phase will overestimate the absorption of the same contaminant in a soil matrix as the absorption value does not account for the adsorption/desorption processes which govern the contaminants bio-availability. In addition, the contaminant may be in a different chemical form in a soil matrix than in a liquid or vapor phase, thereby altering its propensity to be absorbed.

Since data generally are not available for studies of contaminants adsorbed to soils, scientific judgments must be used to assess the potential for such contaminants to enter the body and cause adverse health effects. The following discussion details an approach for assessing dermal absorption and deriving appropriate absorption factors.

METHODOLOGY

McLaughlin[2] discusses two approaches which can be used to estimate the dermal absorption of different contaminants. The first approach uses a total absorption factor (e.g., 70% or 80%) to modify the exposure concentration. These factors are estimated based on the toxicology literature and the chemical and physical characteristics of the contaminant. This approach does not account for contact time or the particular kinetics that may apply to contaminant transport across the skin.

The second approach uses an absorption rate which is coupled with a contact time to provide an estimate of the amount of contaminant penetrating the skin. The absorption rate is either measured directly or estimated based on the chemical properties of the contaminant (i.e., Kow, Koc and diffusion constants). Because of the limitations and uncertainties inherent in determining the contact time, kinetics and/or other variables required for deriving an absorption rate, this methodology is considered to be limited in its usefulness for assessing dermal absorption. As such, the focus of this paper is on assessing dermal absorption using total percentages or absorption factors.

The most conservative approach for determining body dose levels in the absence of empirically derived absorption factors is to assume complete absorption of a contaminant across the skin barrier. The rationale for this approach is that it will provide the most conservative estimate of the incurred body dose level and thus produce the most conservative risk estimate. However, our experience indicates that assuming 100% absorption leads to a gross overestimation of the actual dermal absorption of most compounds and thus does not provide a realistic estimate of risk even under worst-case exposure conditions. A more reasonable approach for determining body dose levels is to develop an absorption factor based on the contaminants' physical and chemical properties. This estimation can be accomplished by extrapolating from applicable scientific and pharmacokinetic data. Using this approach, it has been possible to assign more realistic estimates of the dermal absorption of a contaminant and thus decrease the uncertainty of the estimated body dose level used to assess risk.

The methodology proposed here does not assign chemical specific absorption factors but rather provides a range of values for the three major chemical classes. These ranges are considered to encompass the actual dermal absorption of a specific contaminant occurring under various exposure conditions. Using a range of values provides a limited sensitivity analysis by which uncertainties can later be evaluated.

Absorption factors are developed for the three major chemical classes; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and inorganic compounds. Grouping and assigning absorption ranges by chemical class implies that these compounds will behave similarly both environmentally (bio-availability) and in their propensity to diffuse through the skin barrier. While this is an oversimplification, the limited amount of chemical specific absorption information precludes further refinement even if chemicals were classified in a more specific manner (i.e., by Kow, Koc, molecular weight, etc.). The absorption fac rs proposed here are used by Jordan when chemical specific data not available. These factors are expected to become more refin as more pharmacokinetic data become available.

The proposed absorption rates for each chemical class are b d on reviews of the current literature and refined based on the p s-ical and chemical properties of the contaminant. For volatile organic compounds, a range of 10-25 % dermal absorption is c n-sidered to be representative of the absorption potential of t e compounds bound in a soil matrix. This range is based on phar a-cokinetic data which show that some volatile compounds have high percutaneous absorption when applied on the skin in solutio[2,3]. Analytical data for selected VOCs show the dermal absorptio to be as high as 50% of the total exposed concentration[3]. T se studies, however, are based on the absorption of a contaminant exposed to the skin in a pure or dilute solution. The der al absorption of these chemicals from a soil matrix is expected t be lower than that observed in a liquid phase as a result of he decreased bio-availability of the contaminant. However, the decreased bio-availability is not considered that great as VOC do not demonstrate a strong adsorption to soil particulates. This t, combined with the relatively high lipid solubility, suggests that se compounds may be bio-available in a soil matrix. Absorption factors between 10 and 25% are therefore considered to be app a-ble for this class of compounds.

Some limited chemical specific information is available fo he absorption of some semi-volatile compounds. For example, the dermal absorption of 2,3,7,8-TCDD in soil has been observ in animal models to be between 0.07 and 3 % of the total soil-b nd TCDD[4]. Kimbrough et al.,[5] concluded that between 1 and 1 % of TCDD present in soil that comes in contact with human skin may be absorbed. An absorption factor of 5 % has been re mended by the U.S. EPA for assessing dermal exposure to F in soils[6].

Studies based on the topical administration of pesticides show dermal absorption percentages ranging from 0.3 (Diquat) to % (Carbaryl) with most compounds being between 5 and 15%[2]. he dermal absorption of these pesticides contained in a soil matrix are expected to be lower. The physical and chemical properties of SVOCs and pesticides indicate that these compounds are ti tly bound to soils and thus are not readily bio-available. Alth gh many of these compounds are lipid soluble, the low bio-availability of these compounds in a soil matrix suggests that the dermal absorption will be low. An absorption range of 1 to 10% is n-sidered representative of the absorption of these compoun .

Inorganic contaminants are considered to have the lowest dermal absorption potential of the three chemical classes. These compounds bind strongly to soils, greatly reducing their bio-availa ity. In addition, their ionic speciation and/or formation of hydr ide or large organic complexes further inhibits their absorption potential. A range of absorption factors considered appropriate for assessing exposure to inorganic compounds is 0.1 to 1%.

The literature reports absorption ranges for various met s in solution up to several percent. Metal behavior in solution differs greatly from its behavior in a soil matrix as the transformation and fate processes are much more complex in a soil system. lost metals form strong, stable bonds with other soil constituents uch effectively reduces the concentration of the dissolved metal. For example, arsenic is known to form tight bonds with three commonly occurring metals in soils; iron, manganese and aluminum. The m-plex, iron-arsenate, is poorly soluble in water and at equili um the concentration of soluble arsenic is only 1×10^{-11} mole/l. The presence of iron or other complexing agents such as and fulvic acids, will greatly decrease the bio-availability of st inorganic compounds as long as the environmental conditions vor the complex formation. These factors support the relatively low range of absorption factors presented above.

We have found that in addition to the toxicology literature analytical data can be used to refine absorption factors for inorganic compounds. The results from the U.S. EPA's EP-Toxicity test can be used to provide chemical and site-specific information regarding the bio-availability of certain inorganic compounds (arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, selenium and zinc). This test provides a measure of the amount of metal present in an acid extractable fraction[7]. Because the test conditions are much more rigorous than actual exposure conditions, the EP-Toxicity results provide an upper bound of the amount of contaminant which is potentially bio-available for dermal absorption.

The test results can be used to modify the exposure concentration used in calculating incurred body dose levels by providing the concentration of the contaminant in solution and/or the bio-available fraction. The dermal absorption factor applied to this exposure scenario does not need to account for the bio-availability of the contaminant as is necessary to assess exposure to contaminants bound to soils. Instead, the absorption factors can be based directly on analytical results. The scientific literature shows that between 1 and 5 % of inorganic compounds can be dermally absorbed when exposure occurs in the liquid phase. Thus, this range of values can be used to estimate the dermal absorption of inorganic compounds in this bio'available form.

CONCLUSION

Ranges of absorption factors suitable for assessing the incurred body dose levels of contaminants resulting from dermal contact with contaminated soils are presented for the three major chemical classes. These values are derived based on the available toxicology data and reflect the contaminants' physical and chemi properties. For volatile organic compounds, the absorption fact range from 10 to 25%; for semi-volatile organic compou including pesticides, the absorption factors range from 1 to 10 and for inorganic compounds, the absorption factors range fr 0.1 to 1%.

These ranges provide a means for more accurately estimati direct contact exposure with soils. As more information on co taminant absorption becomes available, these absorption facto could be further refined. Eventually it is hoped that more resear will be performed in this area to provide chemical specific abso tion factors for the contaminants most commonly found hazardous waste sites.

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NLI 001 1820

APPENDIX O

Food and Cosmetics Toxicology

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THE PERCUTANEOUS ABSORPTION OF LEAD-203 IN HUMANS FROM COSMETIC PREPARATIONS CONTAINING LEAD ACETATE, AS ASSESSED BY WHOLE-BODY COUNTING AND OTHER TECHNIQUES

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Abstract—The percutaneous absorption of lead from two hair-darkening cosmetic preparations containing lead acetate has been measured by radioisotopic tracer techniques, using lead-203 acetate, in eight normal human male subjects. Spiked preparations were applied in fluid and dried forms to each subject's forehead (with periods of 1 month between each application) and the quantity of lead absorbed was calculated from blood counts, whole-body counts and urine radioactivity. Results were normalized for each subject by administration of an iv tracer dose of lead-203 chloride, from which absorption was calculated. It was found that absorption of lead through the skin was essentially zero, with results ranging between 0 and 0·3% of the dose applied to whole skin. Slight absorption was found when the skin was broken. The potential hazard of the use of such cosmetic preparations is therefore considered to be insignificant.

INTRODUCTION

When substances are applied to the skin, they may be absorbed and reach the dermal microcirculation by three routes—by passage through the epidermal cells, by passing between the epidermal cells and by passing through hair follicles and sweat glands. The rate-limiting step of this process is thought to lie at the level of the stratum corneum (Scheuplein & Blank, 1971). On the basis of compartmental models, Wallace & Barnett (1978) have been able to explain the penetration of the drug methotrexate through the skin at various pH values, showing that as the pH value rose a greater proportion of the drug passed through the skin by way of the hair follicles and sweat glands.

It has been suggested (Blank, Scheuplein & MacFarlane, 1967) that polar molecules will pass through the skin by way of the aqueous regions between the epidermal cell membranes, and this is the region of greatest interest with respect to the highly polar salt, lead acetate. Some problems do exist in the measurement of the rate of absorption of lead compounds, not the least of which is the great capability of lead ions to form complexes with anionic ligands such as sulphydryl groups in protein structures. It is on the basis of such bond formation that lead acetate is used as a hair dye, in which circumstance the lead combines with available organic SH groups to form dark grey or black insoluble lead sulphides and thus darken the hair. Other reactions, such as reduction of sulphur, usually present as an ingredient in the hair dyes, and subsequent reaction with the lead acetate probably contribute also to the dyeing process.

In evaluating the relative contributions of environmental sources of lead to total human lead exposure, most emphasis must be placed upon the major sources of intake as alimentary or pulmonary exposure. At any one time, considerable quantities of lead are in continuous contact with the skin from sources such as water, clothing and the air. To date it has been generally accepted that percutaneous absorption of lead is only of importance in the case of organic compounds of lead, naphthenates and alkyl-lead compounds (Rastogi & Clausen, 1976; Waldron & Stöfen, 1974). The available evidence on the cutaneous absorption of inorganic lead compounds is small and has in all cases been derived from animals. Laug & Kunze (1948) found that lead acetate could be absorbed through the skin of the rat, and they demonstrated a rise in the concentrations of lead in the kidney after such applications. They also noted that when the skin was damaged there was a three- to fourfold increase in the quantity of lead found in the kidneys, although they were unable to find an increase in urinary lead after seven daily applications of lead oleate to the skin of the back, hands and feet of four human subjects. Later experiments (Rastogi & Clausen, 1976) confirmed this. These studies, however, concentrated upon the effects of lead in the rat, in which animal the skin structure is quite different from that found in man.

The study described here examined, in a group of eight human volunteers, the rate of uptake of lead acetate through the skin from two cosmetic preparations.

EXPERIMENTAL

Test materials. Two forms of commercially-available lead acetate preparations were used in these

NLI 001 1823

NLI 001 1824

studies, both being designed to darken greying hairs through formation of a lead–sulphur compound within the hair. The first was a hydroalcoholic solution of lead acetate containing colloidal sulphur (alcoholic strength 6%; 6 mmol lead acetate/litre). The second was a cream containing 9 mmol lead/kg. For the experiment each of these preparations was spiked with lead-203 (^{203}Pb) acetate supplied either by the MRC Cyclotron Unit at the Hammersmith Hospital, London (Horlock, Thakur & Watson, 1975) or by New England Nuclear (Boston, MA), 0·74 mBq (20 μCi) ^{203}Pb being added to either 0·1 ml of lotion or 0·1 g of cream. The activity of this isotope (half-life 52·1 hr) was checked upon receipt by reference to a calibrated ionization counter.

Test subjects. The eight volunteer subjects used in this study were fully informed of the procedures to be carried out. These procedures had been assessed by the Research and Ethical Committee of Stobhill Hospital and by the Department of Health and Social Security Isotopes Advisory Panel. All the subjects were male. None of them handled radioactive material, had excessive environmental exposure to lead, drank excessive quantities of alcoholic beverages, took any form of drug, suffered from porphyria, had any form of skin pathology, especially in the area of the forehead to be used, had any other form of systemic pathology, or had any history of allergy. All of them were able to conform to all the required conditions of the study over the 6-month experimental period.

Basic experimental procedure. The basic procedure was as follows: lead acetate-containing lotion or cream spiked with 0·74 mBq (20 μCi) ^{203}Pb acetate as tracer was placed on the subject's forehead for a 12-hr period, after which it was washed off. Percentage absorption of the preparation was estimated by measuring the ^{203}Pb activity in blood samples taken over the 12-hr application period, by counting over the subject's calf region and also by counting 0–24- and 0–48-hr urine collections using a whole-body monitor.

Counting procedures. Gamma counting of aliquots of whole blood was carried out on a Wallac 7·5 cm (3 in.) sodium iodide crystal auto gamma counter (Wallac, Finland) and on a Selo DS7/B rectilinear scanner (Selo, Milan, Italy). This consists of two opposed 127 mm-diameter sodium iodide crystals/photomultiplier tubes. Blood for counting was placed in an 11 cm-diameter container and the two heads were brought together to enclose the pot completely. Additional 2 mm-thick lead shielding was then placed round the head to protect it from further background radiation. The counting channel chosen ranged from 60 to 420 keV to include both of the principal photopeaks, at 80 and 280 keV.

Counting of the human subjects was carried out using two pieces of equipment. The first was a single probe counter consisting of a 51 mm sodium iodide crystal/photomultiplier tube (Ekco Ltd., England) fitted with a lead collimator. This was used to count the amount of ^{203}Pb acetate solution applied to the subject's forehead. A narrow channel centred on the gamma-ray emission at 280 keV was used in this apparatus. To determine the mean ratio between the single probe counts and Selo counts a standard forehead application was made up by pippetting an aliq of ^{203}Pb on to absorbent paper. The counts tl obtained were compared with the counts obtai from an equal aliquot used in a container filled w 150 ml water in the Selo counter. This gave a g metry conversion factor (container in Selo/sin probe counter) of 94·5 ± 11·6.

Whole-body monitoring was carried out in whole-body counter in the Southern General Hos tal, Glasgow. The detection apparatus consisted of 153 mm-diameter/102 mm-thick sodium iodide cr tals, which were held stationary in a ring around calves of the subjects during the counting period: shield the counting heads from scattered backgrou radiation from the forehead of the subject a lead c lar was constructed and placed round the neck each of the subjects during counting and a sheet 6 mm-thick lead was mounted between the collim tors and the subject's forehead, to diminish furth any scattered radiation.

Clinical chemistry. Blood-lead levels were measur by flameless atomic absorption spectrophotome with deuterium background correction (Perkin-Elm 306 with HGA 72; Meredith, Moore & Goldbe 1977). Similar techniques were used for the measu ment of lead concentrations in the cosmetic pre arations. Erythrocyte δ-aminolaevulinic acid (AL dehydratase was measured by the Commission of European Communities' standardized method (Ber & Schaller, 1974), while the concentrations of urina ALA were determined by the method of Mauzerall Granick (1956) and the concentrations of porphyr in urine and in blood by the method of Rimingt (1971).

Treatment cells. Each of the subjects was assign to the five treatment cells in a random fashion from table of random numbers. During the progress of study the subjects were given careful directions on importance of avoiding cross-contamination from forehead to any other part of the body. The app cations were as follows:

(1) The control application, in which each of items under investigation was examined to establ baseline conditions.
(2) The wet cell, in which a corn plaster (a circu plastic foam ring of interior area 8 sq. cm) had interior surface sealed with three coats of nail v nish and was fixed to the forehead of the subje The test application was then placed in the cen well, and the whole of the well was sealed with layers of impermeable tape.
(3) The dry and scratch cell, in which the forehe of the subject was cleaned and a line 2 cm long wiped with a swab containing 70% isoproprar This was allowed to dry and the skin was ligh scratched using a sterile hypodermic needle, avo ing the drawing of any blood. Over this scrat 0·1 ml of the test application was placed and spre over a total circular area of 10 sq. cm, which then dried with a hair dryer and lightly cove with a thin layer of gauze and permeable tape.
(4) The cream application cell, in which 0·1 g cream was put on to the skin surface and ag spread out in a circular area of 10 sq. cm. This was then occluded with impervious adhesive

(5) The dry cell, in which the procedure was identical to that for the scratch/dry cell without the skin being scratched. Following drying, the skin was lightly covered with a thin layer of gauze and permeable tape.

In each of the experiments the subsequent procedure was as follows: On the first day of the experiment a background whole-body count was taken, together with a 24-hr collection of urine and withdrawal of blood for measurement of blood lead concentration, porphyrins and ALA dehydratase. On the day of the application the subjects had blood removed and then the material was applied to the skin and at the same time a 24-hr urine collection was started. Blood samples were taken at 1, 2, 4, 8 and 12 hr, and a further sample was taken 24 hr after the test material had been applied. Immediately after administration of the material the forehead was counted using the single probe counter. This was repeated 12 hr later, at which time the application was removed from the head, and the forehead was carefully cleaned using Count-off (New England Nuclear), followed by two washes with soap and ten rinses with warm water. The forehead was dried and lightly covered with gauze and tape, and was then recounted on the single probe counter. The subjects were taken for whole-body counting in the whole-body monitor 12 and 24 hr after the application. Each of the blood aliquots taken over the day was counted and at the same time measurements were made of blood lead and blood ALA dehydratase activity. On the initial sample for each of the days, blood protoporphyrin was also determined. The aliquots collected during the day were then pooled in a container and counted for between 6 and 14 hr overnight in the Selo counter. The proportion of the dose present in the total blood volume was then given by:

$$\%\ \text{dose in total blood volume} = \frac{\text{sample counts} - \text{background}}{\text{counts in applied dose} \times C} \times \frac{\text{blood volume}}{\text{volume of sample}} \times 100$$

The background count used was the mean of the counts recorded on the days before and after the day when the sample was counted. The counts in the dose applied to the forehead were obtained from the single probe measurements. C is a factor to convert from single probe to Selo counts; this was obtained from an experiment in which a known aliquot of ^{203}Pb was counted on the Selo and also on the single probe counter. Lead was measured in each of the 24-hr urine collections, together with urinary ALA and urinary coproporphyrin. Each of the 24-hr urine collections was also counted in the whole-body monitor. For each cell of the study, haematological measurements were carried out, together with a total biochemical screen of serum and urine. One month was allowed to elapse between each of the cells to allow total half-life decay of residual lead on the foreheads of the subjects.

Intravenous studies. At the end of the study, the blood volume of each subject was calculated. Each subject was then injected iv with 2 ml of ^{203}Pb chloride of activity between 2·7 and 5·4 kBq (100 and 200 nCi). The subjects were counted in the whole-body monitor 15 min and 8 and 24 hr after the injection. Urine samples were also counted in the whole-body monitor.

Radiation dose to subjects. ^{203}Pb has three principal gamma emissions—81% at 280 keV, 5% at 400 keV and 0·9% at 608 keV. There are in addition 72 and 83 keV thallium X-rays. The whole-body dose from the gamma emission was calculated to be 4·94 mrad per application and the surface application dose was calculated as being between 0·58 and 0·12 rad at between 0·01 and 1 cm depth into the skin.

RESULTS

Sensitivity of methods

Using calibrated sources supplied by the Medical Research Council Cyclotron Unit, it was calculated that for a dose of 0·74 mBq (20 μCi) of ^{203}Pb, sensitivity of the whole-body counting technique would be in the region of 37 Bq (1 nCi) for the whole body, with a similar sensitivity for the urinary collections. For the Selo counter similar calculations gave a detection limit of 289 mBq (7·8 pCi) per sample. The counting of whole blood in the Wallac counter was optimized by counting 10-ml aliquots of blood for 1 hr.

ALA dehydratase can measure most efficiently when blood-lead levels are less than 2 μmol/litre (Meredith & Moore, 1979). Each of the subjects in the study fell into this range where the rate of change of ALA dehydratase with respect to blood lead was 23 units/mol blood lead. Blood-lead measurement had a limit of accuracy of 0·1 μmol/litre.

General data

The initial concentrations of lead and related indices are shown in Table 1 for each of the subjects. All were within normal limits, as defined by our laboratories. None of the cells showed any change other than normal diurnal variation in the concentrations of blood lead, blood protoporphyrin, urinary ALA or urinary coproporphyrin, or in the activity of ALA dehydratase. No change was observed between the cells in haematological or biochemical indices.

Selo and single probe monitor data

The single probe count showed that the percentage dose remaining on the head following the wash-off procedure was generally low—in the region of 1% of the applied dose—but in some cases it rose to as high as 7%. The percentages of the dose present in the blood and whole body and excreted in the urine are shown in Table 2. It is of note that for each of these measurements the highest mean figure is that for the dry and scratch cell, in which the greatest trauma to the skin, and therefore the highest rate of intake of lead into the blood, is likely to have occurred.

Intravenous data

These data established the relationship between the count-rate recorded over the calf region for each of the subjects and the activity injected (Table 3). This

NLI 001 1825

Table 1. *Data on percutaneous lead absorption in volunteers*

Data	Values for subject no. 1	2	3	4	5	6	7	8
Age (yr)	33	27	35	35	25	23	20	23
Height (m)	1·73	1·76	1·67	1·79	1·67	1·76	1·67	1·74
Weight (kg)	82·0	69·2	67·3	60·0	55·7	87·0	62·6	72·0
Blood measurements								
Total volume (litres)	5·143	4·831	4·479	4·639	4·105	5·404	4·328	4·861
Lead concn (μM)	1·3	1·2	1·1	1·2	1·2	1·0	0·9	1·0
ALA dehydratase (μmol/min/litre)	30·6	38·7	24·6	26·9	27·8	30·1	44·8	43·2
Protoporphyrin (nM)	485	632	364	354	493	365	472	497
Haemoglobin (μg/100 ml)	14·4	17·3	16·0	14·5	15·7	13·6	15·5	14·6
Urine analyses								
ALA (μM)	4·8	18·0	9·0	8·3	7·9	12·0	9·5	20·0
Coproporphyrin (nM)	72	70	65	70	111	127	80	170

ALA = δ-Aminolaevulinic acid.

relationship was then used to establish the whole-body uptake of ^{203}Pb from the results of calf count-rate obtained for each of the cells. In addition, blood samples were collected at 4 and 24 hr. The percentage of the initial dose in 10 ml of blood was calculated and thence the percentage dose in the whole blood volume was determined.

Whole-body monitor data

The net calf count for each subject following ro background subtraction and subject-background traction was converted to whole-body activity in using the factor obtained for each subject from th studies (Table 3). Percentage absorption was

Table 2. *The percutaneous absorption of lead-203 acetate as assessed by three techniques*

Treatment: Cell no.	Treatment: Application	Subject no.	Radioactivity in: Blood (% of dose/100 ml)	Whole body (% of dose): 12 hr	Whole body (% of dose): 24 hr	Urine (% of dose): 24 hr	Urine (% of dose): 48 hr
2	Wet	1	0·00053	0·017	−0·006	0	0
		2	0·00086	0·100	0·245	0·020	0·025
		3	0·0043	0·092	0·252	0·004	0·008
		4	0·00082	0·189	0·40	0·032	0·036
		5	0·00040	0·103	0·285	0·003	0·007
		6	0·00013	0·012	0·020	0·001	0·001
		7	0·00015	0·006	0·040	0·010	0·011
		8	0·00006	0·037	0·179	0·008	0·013
3	Dry + scratch	1	0·00039	0·060	0·080	0·006	0·012
		2	0·00029	0·003	0·058	0·002	0·003
		3	0·00221	0·385	0·507	0·021	
		4	0·00658	0·958	1·33	0·198	
		5	0·00173	−0·03	−0·01	0·010	
		6	0·00037	0·037	0·050	0·002	
		7	0·00042	−0·01	−0·002	0·007	0·007
		8	0·00028	0·037	0·050	0·005	0·006
4	Cream	1	0·00227	0·024	0·018	0·001	0·004
		2	0·00040	0·002	0·025	0·002	0·002
		3	0·00038	0·061	0·08	0·003	0·003
		4	0·00020	0·008	0·010	0·0002	0·003
		5	0·00008	0·011	0·020	0·001	0·001
		6	0·00045	0·001	0·02	0·0005	
		7	0·00093	0·038	0·064	0·004	0·004
		8	0·00098	0·028	0·057	0·001	0·001
5	Dry	1	0·00029	0·074	0·30	0·019	0·027
		2	0·00042	−0·022	−0·014	0·00	0·004
		3	0·00004	0·069	0·044	0·004	0·011
		4	0·00005	−0·004	−0·040	0·007	0·013
		5	0·00040	0·205	0·389	0·046	0·073
		6	0·00017	0·325	0·353	0·011	0·022
		7	−0·00009	0·010	0·013	0·001	0·001
		8	0·00043	0·008	0·011	0·009	0·009

NLI 001 1826

Table 3. *Levels of radioactivity excreted in the urine and retained in the body after iv injection of volunteers with lead-203 chloride*

Subject no.	Dose (nCi)	Activity in urine (nCi)			Urinary excretion of activity over 0–48 hr (% of dose)	Calf counts (nCi)/2400 sec at	
		0–24 hr	24–48 hr	0–48 hr		5 hr	24 hr
1	132	5·1	1·4	6·5	5·0	288	296
2	124	2·8	—	—	—	252	256
3	118	4·8	1·9	6·7	5·7	258	248
4	132	5·6	1·7	7·3	5·6	220	205
5	196	8·3	2·2	10·5	5·4	175	170
6	196	7·2	2·6	9·8	4·9	191	205
7	215	9·6	2·9	12·5	4·9	211	214
8	215	3·8	2·6	6·4	3·0	257	241

easily obtained as the applied activity was known. To avoid contamination of urine-sample containers, all urines were transferred to fresh containers before counting in the whole-body monitor. The counts per 2400 sec were corrected for room background and for contamination from naturally occurring potassium-40 on the assumption that each subject excreted 1·05 mequiv. potassium/kg body weight/day. The percentage of applied dose excreted was converted to the percentage absorption by multiplying by the factor 100/% iv dose excreted. This was a crude approximation since the transit time of lead from the skin to the bloodstream is not known and since there is the possibility that the mechanical trauma of the washing procedure would alter the skin sufficiently to allow the post-wash residual lead to diffuse more easily into the blood. However, when one correlates the urine activity for 0–48 hr as a function of whole-body activity in 24 hr, the correlation coefficient is 0·71 ($P < 0·01$), which leads to a regression equation of:

activity in 0–48-hr urine = 0·055 whole-body activity in 24 hr + 0·51.

This is very similar to that predicted from the iv studies, in which:

activity in 0–48-hr urine = 0·049 whole-body activity at 24 hr (Fig. 1).

The regression of absorption at 24 hr was calculated against absorption at 12 hr (Table 4). For each application this correlation was statistically significant. This suggests that contamination was not a reason for the higher absorption at 24 hr as compared to 12 hr. The most likely explanation is that ^{203}Pb on the forehead continues to be absorbed for some time after the wash-off procedures have been completed, as a function, in part, of the trauma associated with this wash-off. It is of interest to note that the greatest gradient of 2·12 occurs with the wet application. In all other cases the gradient lies near to the ideal value of 1, which would imply that on average there was no further significant absorption between 12 and 24 hr. Thus it appears that the absorption at 12 hr is at the lower limit and with the exception of the wet application the true absorption will not be more than 40% above the 12-hr value. Urine activity at 48 hr correlates significantly with the whole-body activity shown in Fig. 1. The assumptions used in translating urinary absorption are not sufficiently valid, however, to allow great reliance to be placed on these values.

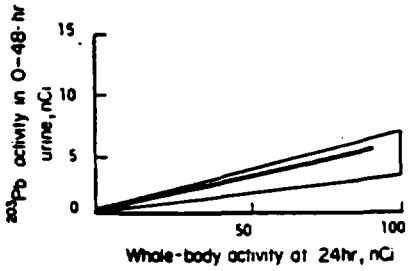

Fig. 1. The regression of activity in the 0–48 hr urine, and whole-body activity at 24 hr; showing the best fit regression line obtained from the data and the predicted behaviour envelope obtained from iv data (mean ± 2SD).

Table 4. *The regression of percentage absorption at 24 hr against the percentage absorption at 12 hr for each cell**

Treatment		m (gradient)	c (intercept)	r (regression coefficient)	Significance ($P <$)
Cell no.	Application				
2	Wet*	2·12	0·02	0·95	0·05
3	Dry + scratch	1·36	0·01	0·99	0·05
4	Cream	1·11	0·01	0·89	0·05
5	Dry	1·19	0·05	0·85	0·05

*Absorption at 24 hr = m × absorption at 12 hr + c.

NLI 001 1827

NLI 001 1828

Table 5. *The mean percutaneous uptake of lead-203 acetate as assessed by blood, whole-body and urine countin*

	Mean uptake of ^{203}Pb activity (% of dose) in				
		Whole body at		Urine at	
Treatment	Total blood volume	12 hr	24 hr	12 hr	24 hr
Wet	0·023 ± 0·016	0·069 ± 0·063	0·177 ± 0·146	0·0097 ± 0·0110	0·0144 ± 0·012(
Dry + scratch	0·070 ± 0·099	0·180 ± 0·339	0·257 ± 0·464	0·042 ± 0·005	0·007 ± 0·004
Cream	0·035 ± 0·037	0·022 ± 0·021	0·037 ± 0·026	0·0022 ± 0·0017	0·0026 ± 0·001:
Dry	0·010 ± 0·009	0·083 ± 0·121	0·142 ± 0·173	0·012 ± 0·015	0·020 ± 0·023

Values are means ± 1SD for eight subjects except where indicated otherwise in parenthesis.

Examination of empty plastic urine bottles demonstrated that these were free of activity, with a mean count of 4 ± 171 counts/2400 sec. The mean percentage uptake of ^{203}Pb acetate in each of the cells is shown in Table 5.

DISCUSSION

These experiments have shown that one form of inorganic lead, lead acetate, may be absorbed through the skin in infinitessimal quantities. This is the most soluble lead salt in aqueous solution and will therefore represent the opposite situation to the highly lipophilic alkyllead compounds which have been shown to be absorbed relatively easily (Waldron & Stöfen, 1974). In view of the very small uptake, it is not surprising that no change was observed in any of the basic measures of lead exposure—blood lead, ALA dehydratase, blood porphyrin, urinary ALA and coproporphyrin—since the predictive accuracy of these measures is inadequate to detect such change (Meredith & Moore, 1979; Moore & Meredith, 1979). Equally, in the initial assessment of the experiments it was concluded that the most reliable figures would be those obtained from whole blood counted in the Selo counter, followed by whole-body counting and, finally, the urinary count data. The results confirm this assessment.

The counting of larger volumes of blood provided a very sensitive means of assessment of uptake into the total blood volume. The quantity of blood used varied between 140 and 200 ml, and was counted for periods of not less than 6 hr and in some cases for as long as 18 hr. This blood represented an integrated sample of early and late specimens taken throughout the day. The absorption figure thus obtained represents a midpoint measurement of lead uptake into the body over the 12-hr sampling period.

Differences were observed in the whole-body counts taken at 12 and 24 hr. These ranged from little or no change to a tenfold increase after 24 hr. These differences may be ascribed to two features: firstly overnight contamination, especially when subject compliance was not as good as expected, and secondly, the lead gradient established across the skin continued to allow lead to be absorbed over the second 12-hr period. This second probability is made more likely by the mechanical damage that took place on the epidermal surface of the skin during the cleaning procedure. It was therefore considered that the 12-hr whole-body count was the more reliable (two taken.

Although the whole-body count and the t counts gave equivalent figures, counts in urine di give values in such good agreement with the o One might ascribe this to contamination but i not appear to come from the bottles used in cour An alternative explanation is that excess lead sorbed following wash-off was rapidly cleared int urine.

Some of the features of these experiments ma difficult to compare the different treatments. First areas of skin differed. Secondly, it was noted th standardized scratch in the dry and scratch cell very difficult to achieve without drawing blood this in part accounted for the very much gre variability in this cell. Equally, in the wet applica excessive hydration of the skin over 12 hr influe the results and in both the wet application and cream application there was loss of material from skin on to the cover or support, which effecti meant that the quantity of material continuing touch the skin was less than that for the dry ap cation.

In view of the potential hazard associated with l absorption, it is of interest to consider the likely p tical implications of the use of such lead-contain hair dyes in man. In the following calculations, mean absorption rate was calculated from three the cells, the dry and scratch cell being exclu The mean absorption (± standard deviation) calculated to be 0·023 ± 0·021% of the dose the total blood volume, and for the whole b 0·058 ± 0·081% of the dose. Since 6 ml of cosmeti normally applied, of which 0·18 ml will reach scalp, 612 μg of lead will reach the scalp for e application and become available for absorption. the whole body, the amount absorbed would r resent 0·058% of this dose, which equals 0·355 Similarly, for blood 0·023% will be absorbed, whic equivalent to 0·135 μg in the whole blood volume. the initial stages of absorption, 50% of absorbed l lies in the blood (Moore, Meredith, Campbell & W son, 1979). Thus, extrapolating to the 12-hr abs tion figure in whole blood, one arrives at a t absorption of 0·337 μg in the whole body. Th figures are thus in good general agreement and discrepancy could be accounted for on the basis temporal differences in counting time.

It is then of consequence to consider these f in the context of likely lead absorption from

sources. It has been estimated that there are 170 μg lead in food eaten daily (Ministry of Agriculture, Fisheries and Food, 1975). Of this, 18% will be absorbed from the gut (Moore *et al.* 1979). Thus, around 30 μg lead/day is taken into the body in the diet. There will in addition be some absorption of lead from the air, estimated as 7·5 μg/day, following exposure to 1 μg/m^3 and assuming a total respired volume of 15 m^3 and an absorption rate of 50% (Chamberlain, Heard, Little, Newton, Wells & Wiffen, 1978). Following such exposure, metabolic balance is maintained, i.e. the output of lead in urine and faeces accounts nearly totally for the oral and respiratory input. This total quantity of absorbed lead, 38 μg/day or 266 μg/wk, must therefore be balanced against a maximal twice weekly use of cosmetics giving a total potential absorption of 0·7 μg/wk. The overall quantity of lead absorbed is thus 380-fold greater than the likely absorption from the cosmetic use of the lead acetate compound.

The challenge of these experiments was to measure nearly undetectable quantities of lead by isotopic tracer techniques. These techniques have arrived at answers which lie at the limits of sensitivity of the methods used. No conventional chemical or biochemical technique could measure this intake, which by any measure is exceedingly small, and the final conclusion must be that the overall percutaneous absorption of lead acetate except where skin damage had taken place is negligible.

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NLI 001 1829

The following is a summary of "The Percutaneous Absorption of Lead-203 in Humans From Cosmetic Preparations Containing Lead Acetate, as Assessed By Whole-Body Counting and other Techniques", Moore et. al (Food and Cosmetics Toxicology, Pergamon Press, Volume 18 1980, pp. 399-405):

The percutaneous absorption of lead from two hair-darkening cosmetic preparations containing lead acetate has been measured by radioisotopic tracer techniques, using lead-203 acetate, in eight normal human male subjects. Spiked preparations were applied in fluid and dried forms to each subject's forehead (with periods of 1 month between each application) and the quantity of lead absorbed was calculated from blood counts, whole-body counts, and urine radioactivity. Results were normalized for each subject by administration of an iv tracer dose of lead-203 chloride, from which absorption was calculated. It was found that absorption of lead through the skin was essentially zero, with results ranging between 0 and 0.3% of the dose applied to whole skin. The mean absorption (± standard deviation) was calculated to be 0.058 ± 0.081% of the dose for the whole body.

APPENDIX P

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE
CINCINNATI, OHIO 45268

OCT 0 1 1990

Subject: Toxicity Values (NL Industries Superfund Site/Pedricktown, NJ)

From: Pei-Fung Hurst
Coordinator
Superfund Health Risk Technology Support Center
Chemical Mixtures Assessment Branch

To: Michael Gilbert
U.S. EPA
Region II

Thru: W. Bruce Peirano
Acting Chief
Chemical Mixtures Assessment Branch

This memo is in response to a request from your contractor, Barrie Selcoe of O'Brien and Gere, regarding toxicity values for chemicals found at NL Industries Superfund Site.

Toxicity values were searched for the chemicals listed on the attached table. To locate these values, IRIS was first checked. For those chemicals under review, RfD meeting notes were examined. Regarding chemicals not located on IRIS, the HEA summary table (HEAST) was checked. If the table did not have the requested information, copies of EPA documents (e.g., HEAs, HEEPs, RQs and WQCDs) were also located and checked. One-day Health Advisories were obtained from the Drinking Water Regulations and Health Advisories document (April, 1990). At the present time, the Agency is not calculating dermal RfDs. Therefore, chemicals on the original list which requested only a dermal RfD and no other values have been deleted and do not appear in the attached table.

There were five types of information requested: chronic oral, subchronic oral, chronic inhalation, subchronic inhalation and One-day Health Advisory (1-Day HA). These categories were listed horizontally in abbreviated form across the table. The chemicals were then listed vertically on the left side of the paper, with the requested information entered into the appropriate columns.

When a particular type of information was not requested for a chemical a double dash (--) was entered in the column. When information requested was not available, NA was placed in the column.

Superscript numbers indicate that additional information is located in the footnotes found at the end of the table.

Please do not hesitate to contact me at FTS 684-7300 if I can be of further assistance.

Attachment

cc: C. DeRosa (ECAO-Cin)
P. Grevatt (Region II)
B. Means (OS-230)
T. O'Bryan (OS-230)
B. Selcoe (O'Brien and Gere)

Table 1. Reference Dose and 1-Day Health Advisory

Compound	Chronic Oral (mg/kg/day)	Subchronic Oral (mg/kg/day)	Chronic Inhalation (mg/cu.m)	Subchronic Inhalation (mg/cu.m)	1-Day H.A. (ug/L)	Ref.
1,1-Dichloroethene	--	--	1.7E-2	NA	--	
Vinyl Chloride	NA	NA	NA	NA	--	
Antimony	--	--	--	--	15	U.S. EPA, 1990
Arsenic	--	--	--	--	NA	U.S. EPA, 1990
Cadmium	--	NA[1]	--	--	40	U.S. EPA, 1990
Copper	NA[2]	NA[2]	--	--	NA	
Lead	--	--	--	--	NA	
Selenium	--	--	--	--	NA	

Table 1 Cont'd.

Compound	Chronic Oral (mg/kg/day)	Subchronic Oral (mg/kg/day)	Chronic Inhalation (mg/cu.m)	Subchronic Inhalation (mg/cu.m)	1-Day H.A. (ug/L)	Ref.
Tin	--	--	--	--	NA	
Zinc	--	--	--	--	NA	
Tetrachloro-ethene	--	--	NA	NA	2,000	U.S. EPA, 1990

NA= Not available
[1]= HEAST- Because of background dietary exposure, an oral RfD was not estimated.
[2]= HEAST- Current Drinking Water Standard equals 1.3 mg/L; DWCD concluded the toxicity data were inadequate for calculation of an RfD (5.3 mg single dose in humans causes local GI irritation).

REFERENCES

U.S. EPA. 1990. Drinking Water Regulations and Health Advisories. Office of Drinking Water, Washington, DC.

APPENDIX Q

1. ARSENIC

Using EPA methodology, a carcinogenic slope factor was calculated for arsenic. The slope factor was based on the proposed unit risk presented in the IRIS database (5×10^{-5} [ug/l]$^{-1}$). The following equation was used to calculate the slope factor:

unit risk = slope x (1/70 kg) x (2 L/day)

Therefore:

$(5 \times 10^{-5}$ L)/ug = slope x (1/70 kg) x (2 L/day)

0.05/mg = (slope x 2) / (70 kg x day)

0.05/mg = (slope x 0.029) / (kg x day)

(0.05 kg x day) / mg = slope x 0.029

(0.05 kg x day) / (mg x 0.029) = slope

1.72 (mg/kg-day)$^{-1}$ = slope

Exhibits

Exhibits

O'BRIEN & GERE

EXHIBITS

A	Previous Analyses of Landfill Leachate
B	Previously Installed Wells Bore Logs and Ground Water Data
C	Adjacent Property Bore Logs
D	NJDEP Well Search
E	Topographic Surveys
F	Natural Sources of Environmental Radiation
G	Site Photographs
H	NL Slag EP Toxicity Results
I	EPA Results of Private Potable Wells
J	USEPA and State of New Jersey Standards and Guidance
K	Summary of USEPA Removal Activities at the Site
L	Landfill Construction Plans and Specifications
M	Soil and Marsh Cleanup of the Site

EXHIBIT A

NSNJ Pedricktown
Landfill Leachate

Parameter	Phase "A" Primary Sump n	Phase "A" Primary Sump Max	Phase "B" Primary Sump n	Phase "B" Primary Sump Max	Phase "A" Secondary Sump n	Phase "A" Secondary Sump Max	Phase "B" Secondary Sump n	Phase "B" Secondary Sump Max
Antimony Sb	7	6.6	7	0.48	1	0.49		
Arsenic As	3	38.3	1	227	1	0.006	7	0.49
Arsenic Filt.	2	2.7	1	72.1	1	0.007	1	91.7
Barium Ba	1	1					1	60.6
Cadmium Cd	4	0.31	1	0.06	1	0.01	1	0.06
Cadmium Filt.	2	0.3	1	0.05	1	0.01	1	0.05
Chloride Cl	7	19300	7	630	1	164	6	525
Iron Fe	8	12300	7	184	1	1.1	7	9.5
Iron Filt.	1	8100						
Lead Pb	9	12.3	8	24.6	2	0.49	8	2.95
Lead Filt.	1	0.04	1	0.38	1	0.5	1	0.33
Manganese Mn	4	15.8	1	7.5	1	23	1	0.67
Manganese Filt.	2	13	1	0.07	1	22	1	0.67
Selenium Se	4	0.27	1	0.58	1	0.009	1	0.75
Selenium Filt.	2	0.041	1	0.44	1	0.011	1	0.61
Sulfate SO4	4	39100	1	20000	1	2730	1	33300
Tin Sn	6	13	7	1.4	1	0.5	7	2
T.O.C.	1	150	1	2170	1	27	1	2520
B.O.D.	6	9200	7	210	1	3	7	6
C.O.D.	6	17100	7	560	1	49	7	97
Hardness	6	584	7	1625	1	790	6	1100
pH	10	12.7(1.7)	8	11 (4.6)	2	6.3(5.2)	8	9.4(5.3)
Phenols	6	16.1	7	0.78	1	0.002	7	0.128
T.D.S.	10	169000	8	66400	2	4300	8	64700
Turbidity	10	920	8	250	2	31	8	170

Notes:
- If two pH values are recorded, the first value is the maximum pH and the second, in parentheses, is the minimum value expressed in S.U.
- Samples collected by NL Industries, Inc.; analysis conducted by Century Environmental Labs, Inc., Thorofare, NJ.

Units are mg/l except for pH (S.U.), Turbidity (NTU)

NSNJ PEDRICKTOWN RCRA LANDFILL SUMP ELEVATIONS

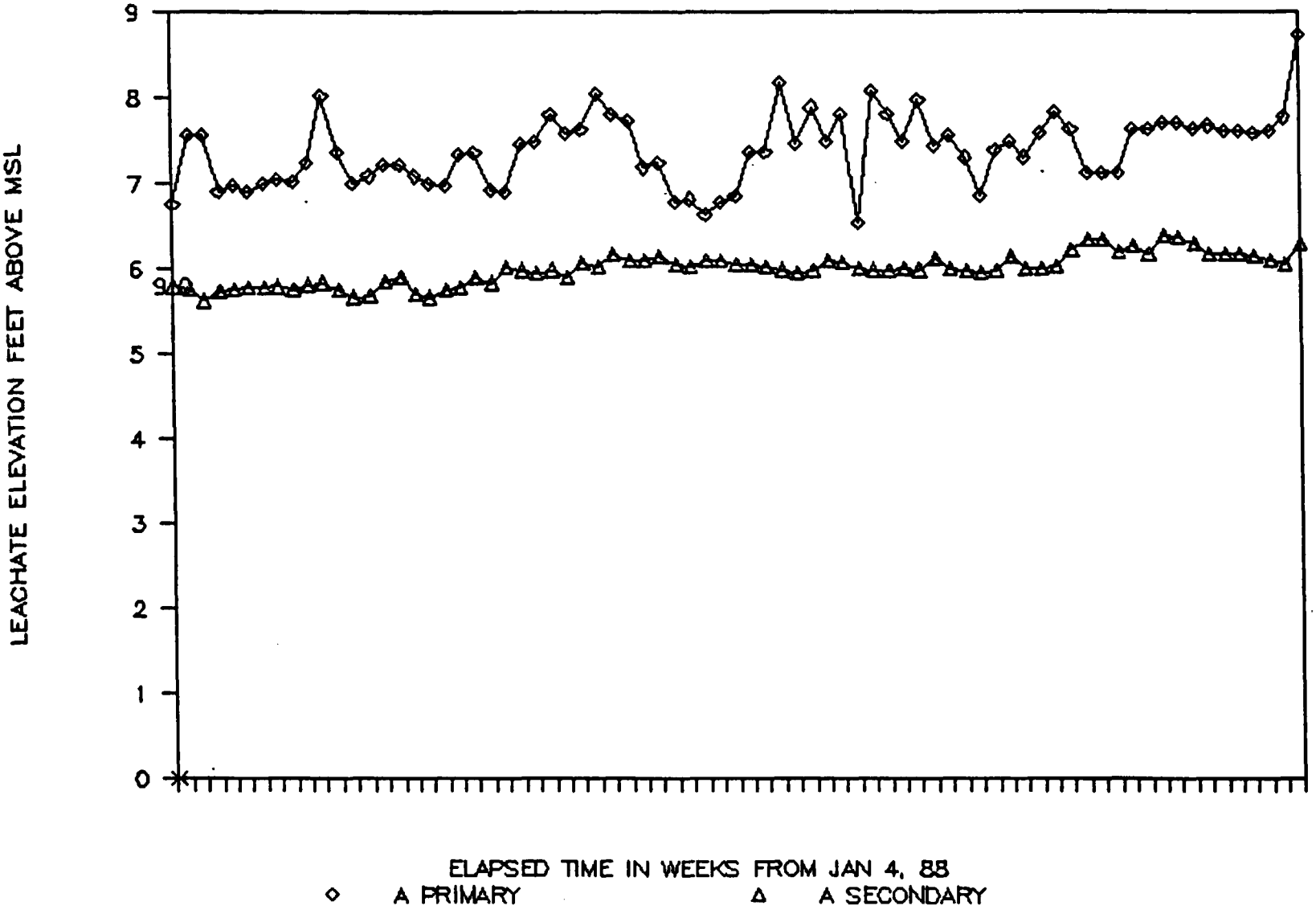
DATE	A PRIM WET FT	A SEC DRY FT	B PRIM WET FT	B SEC DRY FT	A PRIM USGS FT	A SEC USGS FT	B PRIM USGS FT	B SEC USGS FT
JAN 4, 88	1.9	28.0	5.6	22.8	6.8	5.8	9.1	8.1
JAN 11, 88	4.5	28.2	5.3	23.6	7.6	5.8	9.0	7.9
JAN 18, 88	4.5	28.8	7.6	23.4	7.6	5.6	9.4	8.0
JAN 25, 88	2.4	28.3	7.3	22.3	6.9	5.7	9.4	8.1
FEB 1, 88	2.6	28.2	8.1	22.3	7.0	5.8	9.5	8.1
FEB 8, 88	2.4	28.1	7.9	22.2	6.9	5.8	9.5	8.1
FEB 15, 88	2.7	28.1	10.8	20.6	7.0	5.8	10.0	8.4
FEB 22, 88	2.9	28.0	9.9	20.0	7.1	5.8	9.8	8.5
FEB 29, 88	2.8	28.2	12.1	19.7	7.0	5.8	10.2	8.5
MAR 7, 88	3.5	27.9	9.3	21.5	7.3	5.8	9.7	8.2
MAR 14, 88	6.0	27.8	12.8	20.0	8.0	5.8	10.4	8.5
MAR 21, 88	3.9	28.2	7.6	23.3	7.4	5.8	9.4	8.0
MAR 28, 88	2.7	28.6	9.9	23.2	7.0	5.7	9.8	8.0
APR 4, 88	3.0	28.5	15.7	21.8	7.1	5.7	10.9	8.2
APR 11, 88	3.4	27.7	7.6	20.0	7.2	5.9	9.4	8.5
APR 18, 88	3.4	27.5	7.2	21.4	7.2	5.9	9.4	8.3
APR 25, 88	3.0	28.4	5.5	22.8	7.1	5.7	9.1	8.1
MAY 2, 88	2.7	28.6	5.2	23.5	7.0	5.7	9.0	7.9
MAY 9, 88	2.6	28.2	5.0	22.4	7.0	5.8	9.0	8.1
MAY 16, 88	3.8	28.1	7.9	22.2	7.3	5.8	9.5	8.1
MAY 23, 88	3.9	27.5	13.9	17.3	7.4	5.9	10.5	8.9
MAY 30, 88	2.5	27.8	11.1	22.6	6.9	5.8	10.1	8.1
JUNE 6, 88	2.4	26.9	7.1	23.6	6.9	6.0	9.4	7.9
JUNE 13, 88	4.2	27.1	5.7	24.7	7.5	6.0	9.1	7.8
JUNE 20, 88	4.3	27.3	7.8	24.5	7.5	5.9	9.5	7.8
JUNE 27, 88	5.3	27.1	6.9	24.2	7.8	6.0	9.3	7.8
JULY 5, 88	4.6	27.5	6.8	25.4	7.6	5.9	9.3	7.7
JULY 12, 88	4.8	26.7	7.0	24.3	7.7	6.1	9.3	7.8
JULY 19, 88	6.1	26.9	6.8	24.3	8.1	6.0	9.3	7.8
JULY 26, 88	5.3	26.2	6.7	21.0	7.8	6.2	9.3	8.3
AUG 2, 88	5.1	26.6	6.9	21.8	7.7	6.1	9.3	8.2
AUG 9, 88	3.3	26.6	7.1	22.1	7.2	6.1	9.4	8.2
AUG 16, 88	3.5	26.4	7.7	22.9	7.3	6.1	9.5	8.0
AUG 23, 88	2.0	26.8	7.5	23.6	6.8	6.1	9.4	7.9
AUG 30, 88	2.1	26.9	7.3	23.1	6.8	6.0	9.4	8.0
SEPT 6, 88	1.5	26.6	7.2	21.7	6.6	6.1	9.4	8.2
SEPT 13, 88	2.0	26.6	9.1	22.7	6.8	6.1	9.7	8.1
SEPT 20, 88	2.2	26.8	7.8	23.4	6.8	6.1	9.5	8.0
SEPT 26, 88	3.9	26.8	8.9	23.2	7.4	6.1	9.7	8.0
OCT 3, 88	3.9	26.9	8.4	24.1	7.4	6.0	9.6	7.9
NOV 8, 88	6.5	27.1	6.7	23.3	8.2	6.0	9.3	8.0
NOV 14, 88	4.2	27.3	6.4	24.9	7.5	5.9	9.2	7.7
NOV 21, 88	5.6	27.2	13.1	23.5	7.9	6.0	10.4	7.9
NOV 28, 88	4.3	26.6	6.3	20.5	7.5	6.1	9.2	8.4
DEC 5, 88	5.3	26.7	7.6	22.6	7.8	6.1	9.4	8.1
DEC 14, 88	1.2	27.0	6.2	24.5	6.5	6.0	9.2	7.8
DEC 19, 88	6.2	27.1	6.1	24.5	8.1	6.0	9.2	7.8
DEC 27, 88	5.3	27.2	7.5	25.8	7.8	6.0	9.4	7.6
JAN 2, 89	4.3	27.0	6.2	24.5	7.5	6.0	9.2	7.8
JAN 9, 89	5.9	27.1	6.7	24.3	8.0	6.0	9.3	7.8
JAN 16, 89	4.1	26.5	7.2	21.5	7.4	6.1	9.4	8.2
JAN 23, 89	4.5	27.0	6.8	24.1	7.6	6.0	9.3	7.9
FEB 6, 89	3.7	27.2	6.9	25.2	7.3	6.0	9.3	7.7
FEB 14, 89	2.2	27.3	6.5	25.2	6.8	5.9	9.3	7.7
FEB 20, 89	4.0	27.2	6.7	21.0	7.4	6.0	9.3	8.3
FEB 27, 89	4.3	26.4	12.9	20.5	7.5	6.1	10.4	8.4
MAR 6, 89	3.7	27.0	6.7	22.3	7.3	6.0	9.3	8.1
MAR 13, 89	4.6	27.0	6.4	20.9	7.6	6.0	9.2	8.3
MAR 20, 89	5.4	26.9	6.4	21.3	7.8	6.0	9.2	8.3
MAR 27, 89	4.8	26.0	6.4	16.7	7.7	6.2	9.2	9.0
APR 3, 89	3.1	25.4	7.2	18.4	7.1	6.4	9.4	8.7
APR 10, 89	3.1	25.4	6.4	16.7	7.1	6.4	9.2	9.0
APR 17, 89	3.1	26.1	6.6	18.0	7.1	6.2	9.3	8.8
APR 24, 89	4.8	25.8	7.2	19.7	7.7	6.3	9.4	8.5
MAY 1, 89	4.8	26.2	8.4	21.5	7.7	6.2	9.6	8.2
MAY 5, 89	5.0	25.2	8.0	15.6	7.7	6.4	9.5	9.1
MAY 18, 89	5.0	25.3	9.3	16.1	7.7	6.4	9.7	9.1
MAY 22, 89	4.8	25.7	8.4	20.4	7.7	6.3	9.6	8.4
MAY 29, 89	4.9	26.2	8.1	21.7	7.7	6.2	9.5	8.2
JUN 5, 89	4.7	26.2	8.5	22.9	7.6	6.2	9.6	8.0
JUN 12, 89	4.7	26.2	8.5	21.5	7.6	6.2	9.6	8.2

MSNJ PEDRICKTOWN RCRA LANDFILL SUMP ELEVATIONS

DATE	A PRIM WET FT	A SEC DRY FT	B PRIM WET FT	B SEC DRY FT	A PRIM USGS FT	A SEC USGS FT	B PRIM USGS FT	B SEC USGS FT
JUN 19, 89	4.6	26.4	8.6	23.3	7.6	6.1	9.6	8.0
JUN 26, 89	4.7	26.6	12.7	25.2	7.6	6.1	10.3	7.7
JUL 3, 89	5.2	26.8	19.5	25.8	7.8	6.1	11.5	7.6
JUL 10, 89	8.3	25.7		20.3	8.7	6.3		8.4

NSNJ PEDRICKTOWN

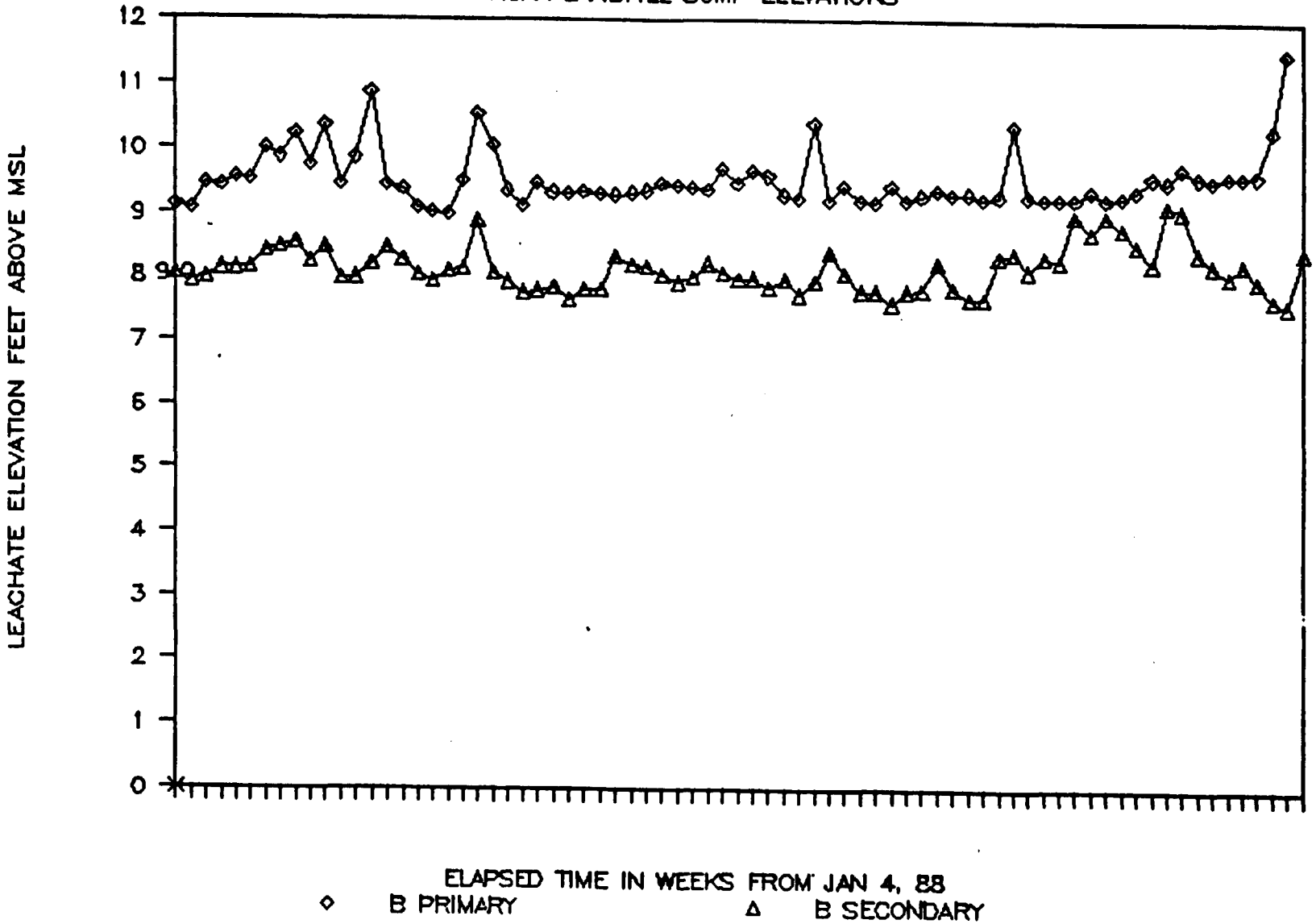
RCRA LANDFILL SUMP ELEVATIONS

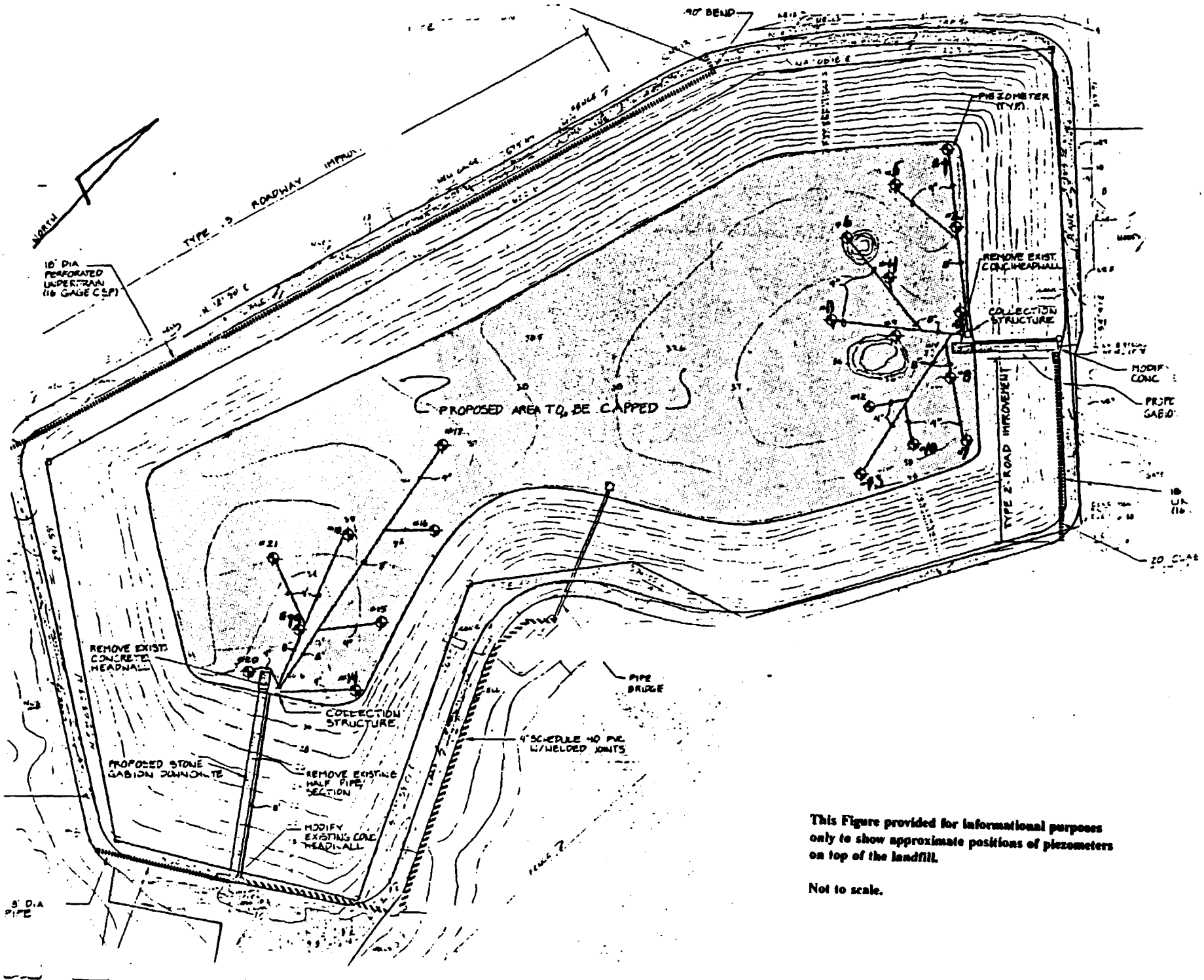


NLI 001 1845

NSNJ PEDRICKTOWN

RCRA LANDFILL SUMP ELEVATIONS





This Figure provided for informational purposes only to show approximate positions of piezometers on top of the landfill.

Not to scale.

NLI 001 1847

EXHIBIT B

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, brown, medium to fine, trace medium to fine gravel and silt	16	16
Sand, brown, medium to coarse, some medium to fine gravel, trace silt	3	19
Sand, Tan, fine to coarse, some medium to fine gravel, trace silt	8	27
Sand, tan, fine to medium and clay, white, sandy	2	29
Sand, tan-brown, fine to medium	1½	30½
Clay, red-brown, with sandy clay streaks	4	34½

OWNER: N/L Industries, Inc.

LOCATION: Pedricktown, NJ

WELL NO.: A (Replacement)*

DATE COMPLETED: December 12-13, 1979

DRILLING COMPANY: Craig Testing Labs, Inc

DRILLING METHOD: Mud rotary (bentonite)

SAMPLING METHOD: Ditch & 1 split spoon

SAMPLED EXAMINED BY: Lee N. Grubman

REFERENCE POINT: Land surface

ELEVATION OF R. P.:

CASING:

SCREEN TYPE: Slotted PVC

DIAM.: 4 inches SLOT NO. 20

SETTING: 2.5-32.5 feet

PUMPING TESTS DATE:

DURATION:

STATIC WATER LEVEL: 3.0 feet(12/17/79)

PUMPING WATER LEVEL:

YIELD: ±8 gpm(airlift) during development

REMARKS:

* Replacement ±10 feet east of original well A now destroyed.

NLI 001 1849

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Topsoil	1	1
Sand, brown, medium to coarse	25	26
Sandy clay	1	27
Sand, brown, coarse	11	38
Clay, sandy, tan	7	45

OWNER: NL Industries, Inc.

LOCATION: Pedricktown, NJ

WELL NO.: BR

DATE COMPLETED: April 1, 1980

DRILLING COMPANY: A. C. Schultes & Sons

DRILLING METHOD: Water rotary

SAMPLING METHOD: Ditch

SAMPLES EXAMINED BY: Lee Grubman

REFERENCE POINT: Grade

ELEVATION OF R. P.:

CASING:

SCREEN: TYPE: PVC

DIAM.: 4-inch SLOT NO. 0.020 in

SETTING: 31-37

PUMPING TEST: DATE:

DURATION:

STATIC WATER LEVEL: 4.1 feet*

PUMPING WATER LEVEL:

YIELD: >15 gpm

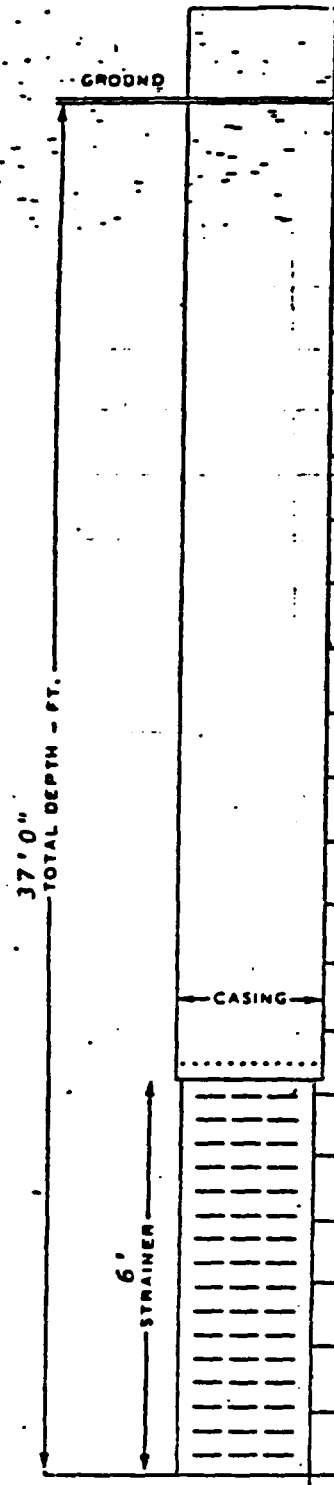
REMARKS:

* below top of 4-inch PVC casing

NLI 001 1850

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL

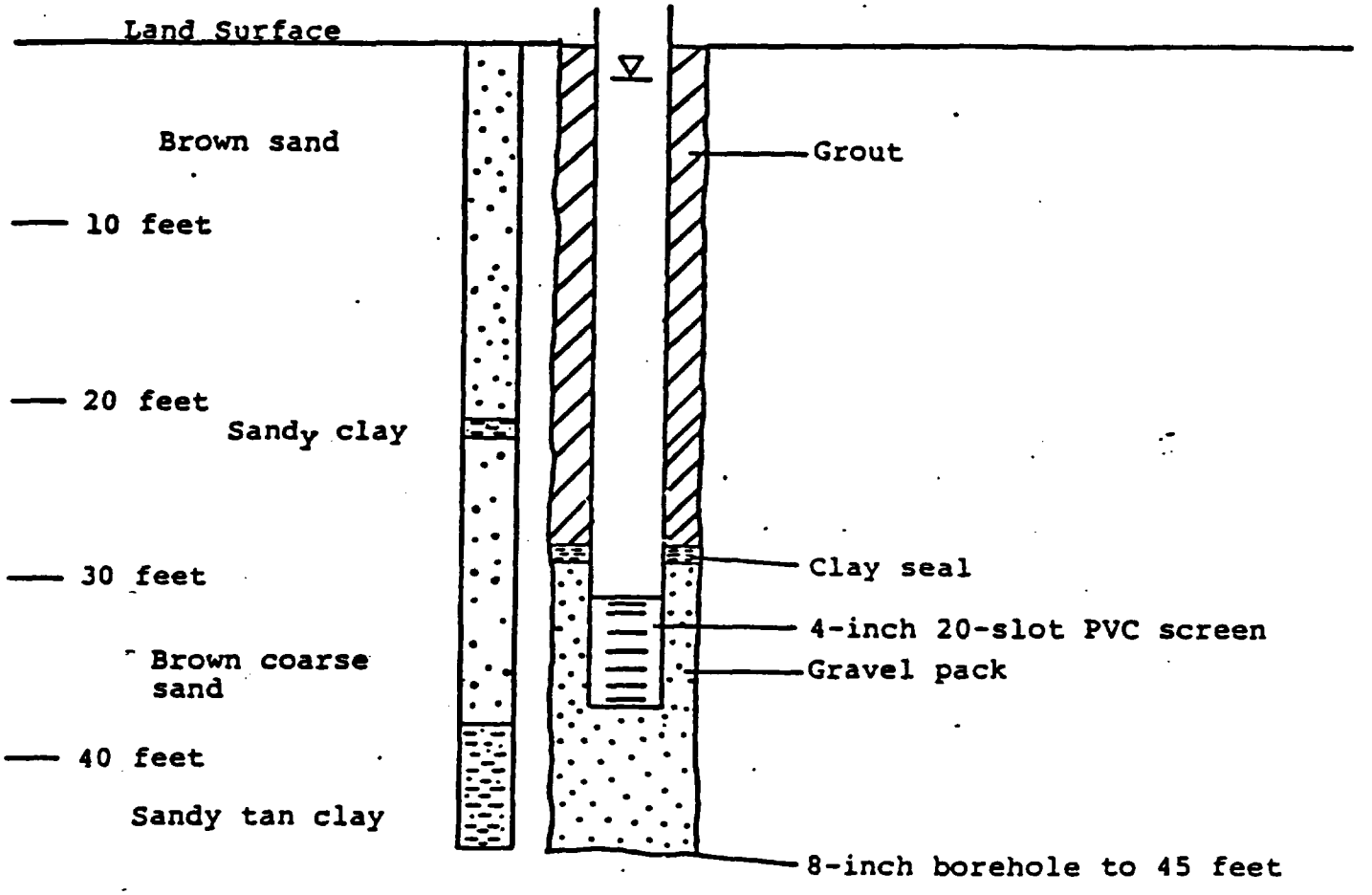


WELL LOG	FEET FROM GROUND SURFACE 0 TO	NAME OF OWNER
Top Soil	1	National Lead
Brown Sand-Coarse to Medium	1 - 26	Job # 18411
Clay	26 - 27	Location Pedricktown, N
Coarse Brown Sand	27 - 38	Well No. B-R
Clayish	38 - 45	Hrs. Pumped Air Devel. 2
		Capacity G.P.M. 30
		Static Level 4'
		Pumping Level --
		Specific Capacity --
		Diameter of Well 4"
		Depth of Well (ground) 37'0"
		Length of Casing 33'
		Distance to Top of Packer (gr.) --
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 6'0"
		Top Screen Fitting PVC Socke
		Bottom Screen Fitting Cap
		Blank --
		Slot Size .018
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #1
		Bags of Cement 10
		Date Well Completed 1/1/80

Rotary Table approx. 3' above ground level

NLI 001 1851

N/L INDUSTRIES, INC.
Pedricktown, New Jersey
Completion Diagram for Well BR



Well completed April 1 1980

▽ SWL = 1.9 feet below grade, April 3 1980

Leggette, Brashears & Graham, Inc. April 1980

NLI 001 1852

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, gray, fine to medium	4	4
Clay, gray	4	8
Clay, red and white, hard, impermeable	15	23
Sand, brown, fine	10	33
Clay, light gray-white, silty	4	37
Sand, very fine, with silt & clay	5	42
Clay, white, silty	3	45

OWNER: NL Industries, Inc.

LOCATION: Pedricktown, NJ

WELL NO.: CR2

DATE COMPLETED: March 29, 1980

DRILLING COMPANY: A. C. Schultes & Sons

DRILLING METHOD: Water rotary

SAMPLING METHOD: Ditch

SAMPLES EXAMINED BY: Sandy Strausberg

REFERENCE POINT: grade

ELEVATION OF R. P.:

CASING: 4-inch

SCREEN TYPE: Slotted PVC

DIAM.: 4-inch SLOT NO.: 20

SETTING: 25-31

PUMPING TEST DATE:

DURATION:

STATIC WATER LEVEL: 8.0 feet*

PUMPING WATER LEVEL:

YIELD: 15 gpm

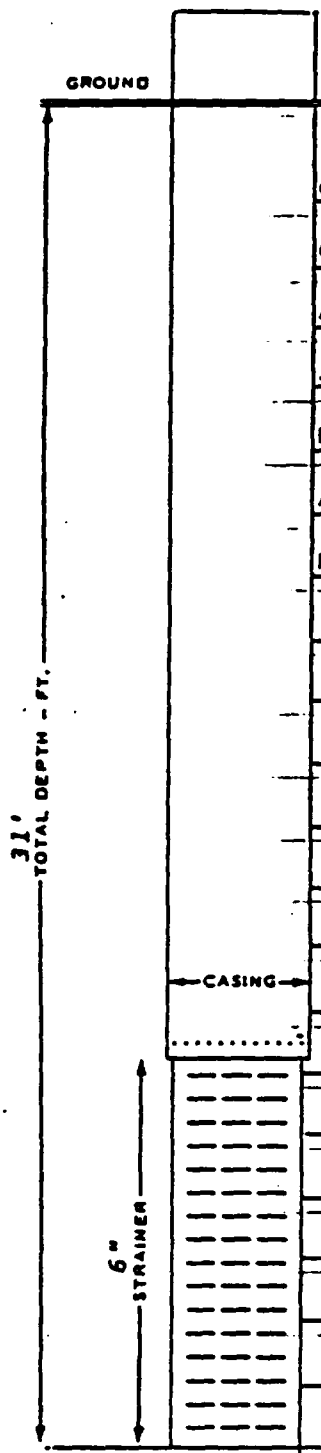
REMARKS:

* below top of 4-inch PVC casing

NLI 001 1853

A.C. SCHULTES & SONS, INC.

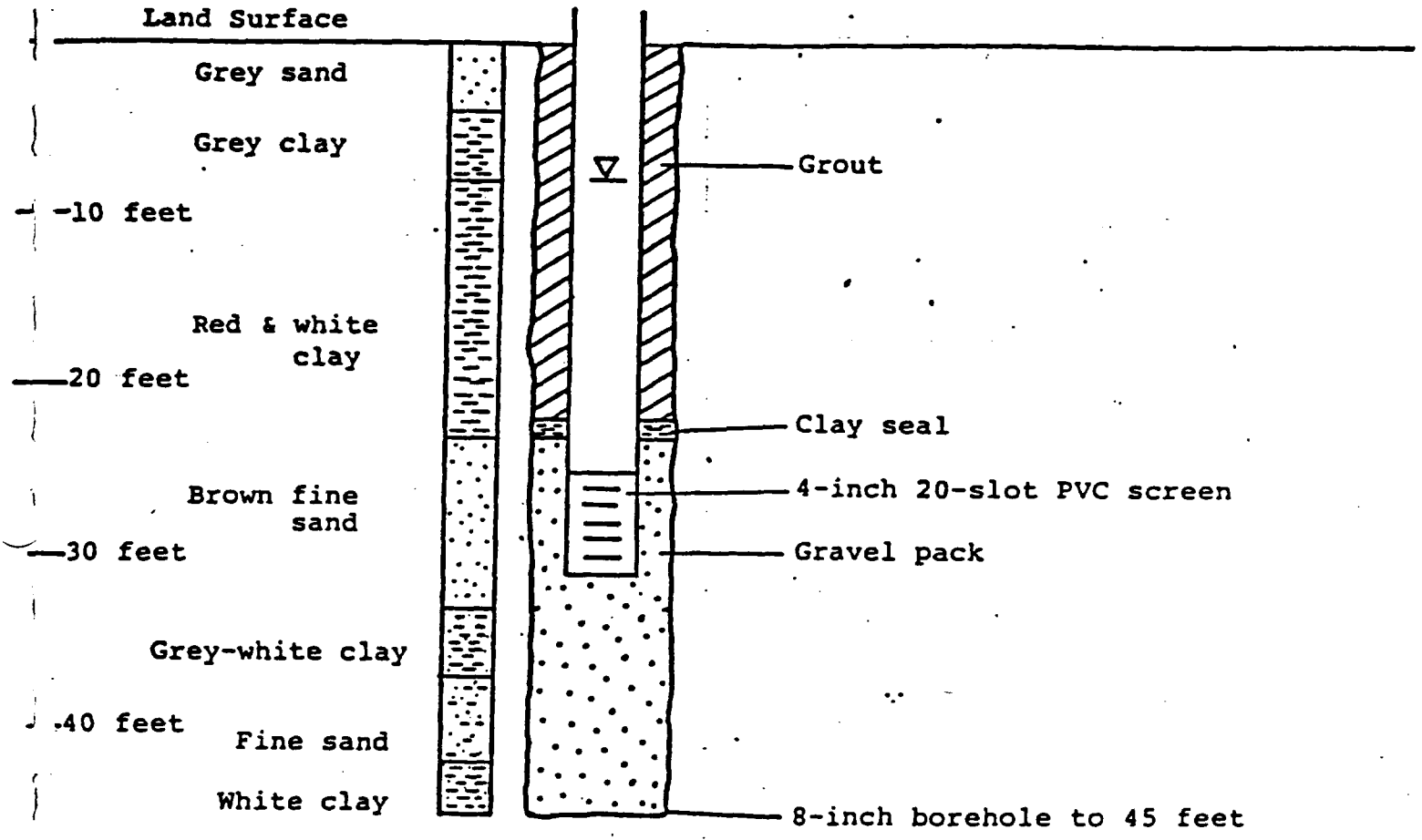
SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
Gray Sand-Med. to Fine	0 TO 4	National Lead
Gray Clay	4 - 8	Job # 18411
Red & White Clay	8 - 23	Location Pedricktown,
Fine Brown Sand	23 - 33	Well No. C2R
White Clay	33 - 37	Hrs. Pumped Air Devel. 3
Fine Brown Sand	37 - 42	Capacity G.P.M. 20
White Clay	42 - 45	Static Level --
		Pumping Level --
		Specific Capacity --
		Diameter of Well 4"
		Depth of Well (ground) 31'0"
		Length of Casing 27'0"
		Distance to Top of Packer (gr.) --
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 6'0"
		Top Screen Fitting PVC Socke
		Bottom Screen Fitting Cap
		Blank --
		Slot Size .018
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #1
		Bags of Cement 10
		Date Well Completed 3/29/80
		NLI 001 1854

Rotary Table approx. 3' above ground level

N/L-INDUSTRIES, INC.
Pedricktown, New Jersey
Completion Diagram for Well CR2



Well completed March 29 1980

▽ SWL = 7.9 feet below grade, April 3 1980

Leggette, Brashears & Graham, Inc. April 1980

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

PAGE 1 OF 1 PAGE

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, medium, light brown, fill	1.5	1.5
Sand, fine, brown-black, silty, with wood	3.0	4.5
Sand, fine to medium, brown-black, with organic material	7.5	12
Sand, fine, silty	1	13
Silt, clayey, brown-black, with gravel	2	15
Sand, fine to medium, brown-black, with silty clay lumps	5	20
Sand, medium, tan-black, some fine sand and silt	5	25
Sand, medium to coarse, tan, some fine gravel	4	29
Clay, white, with sand, medium to coarse and gravel, fine	3	32
Clay, red, sandy	3.5	35.5

OWNER: N/L Industries, Inc.

LOCATION: Pedricktown, NJ

WELL No.: 1 (Replacement)*

DATE COMPLETED: December 14, 1979

DRILLING COMPANY: Craig Testing Labs, I

DRILLING METHOD: Mud rotary (benton te

SAMPLING METHOD: Ditch and 1 split -pc

SAMPLES EXAMINED BY: Lee Grubman

REFERENCE POINT: Land surface

ELEVATION OF R. P.:

CASING:

SCREEN TYPE: Slotted PVC

DIAM.: 4 inch SLOT No.: 20

SETTING: 4-32 feet

PUMPING TEST DATE:

DURATION:

STATIC WATER LEVEL: 3.6feet (12/17/79)

PUMPING WATER LEVEL:

YIELD: ±11 gpm(airlift) during development

REMARKS:

* Located ±25 feet east-southeast of original well #1

NLI 001 1856

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, brown, fine to medium, some coarse	7	7
Sand, fine to medium, with much coarse to very coarse sand and some fine gravel	11	18
Gravel, brown, fine, subrounded, some medium gravel and fine to very coarse sand	3	21
Clay, red and white, silty	4	25

OWNER: NL Industries, Inc.

LOCATION: Pedricktown, NJ

WELL NO.: 2R2

DATE COMPLETED: October 15, 1980

DRILLING COMPANY: A. C. Schultes & Sons, Inc

DRILLING METHOD: water rotary

SAMPLING METHOD: ditch

SAMPLES EXAMINED BY: Sandy Strausberg

REFERENCE POINT: Land surface

ELEVATION OF R. P.: ± 7.2 feet MSL

CASING:

SCREEN-TYPE: PVC

DIAM.: 4-inch SLOT NO. 20

SETTING: 13-20 feet

PUMPING TEST-DATE: October 16, 1980

DURATION: 4 hours

STATIC WATER LEVEL: 5.52 feet below grade

PUMPING WATER LEVEL: 7.79 feet below grade

YIELD: 6 gpm

REMARKS:

Hole to 25 feet
Gravel pack (Morie #1) 7-25 feet

Bentonite 7 feet to surface

Casing ID = 4 inches

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, fine, light brown, silty	3	3
Sand, fine to medium, light brown, silty	4	7
Sand, fine to medium, with some fine gravel and silt	4½	11½
Sand, fine to medium, light brown, with some fine to medium gravel	4	15½
Sand, fine to medium, brown, with white clay lenses	5	20½
Clay, tan, fine sandy	2½	23
Sand, fine to medium, brown, with gravel, fine and little silt and clay	4	27
Sand, medium to coarse, tan, some fine gravel	1	28
Sand, medium to coarse, reddish-tan, some fine gravel, with white clay lenses	2½	31½
Clay, red-brown, with sandy lenses	1½	33
(A sample of red clay was taken from the drill bit)		

OWNER: N/L Industries, Inc.

LOCATION: Pedricktown, NJ

WELL No.: 3 (Replacement)*

DATE COMPLETED: December 17, 1979

DRILLING COMPANY: Craig Testing Labs,

DRILLING METHOD: Mud rotary (bentor it

SAMPLING METHOD: Ditch

SAMPLED EXAMINED BY: Lee Grubman

REFERENCE POINT: Land surface

ELEVATION OF R. P.:

CASING:

SCREEN: TYPE: Slotted PVC

DIAM.: 4 inch SLOT No.: 20

SETTING: 4-33 feet

PUMPING TEST: DATE:

DURATION:

STATIC WATER LEVEL: ±4 feet after drill.

PUMPING WATER LEVEL:

YIELD: ±4 gpm during development

REMARKS:

* Located ±15 feet south west of original well

NLI 001 1858

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

PAGE ____ OF ____ PAGES

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, brown, fine to medium, little coarse sand	15	15
Sand, brown, fine to coarse, silty	6	21
Sand, silty, grey	1	22
Clay, white and tan, some red, sandy	4	26
Clay, red, with occasional rounded white small cobbles	3	29

OWNER: NL Industries, Inc.

LOCATION: Pedricktown, NJ

WELL NO.: 4R

DATE COMPLETED: 7-21-80

DRILLING COMPANY: A.C. Schultes & Sons, Inc.

DRILLING METHOD: water rotary

SAMPLING METHOD: ditch

SAMPLES EXAMINED BY: Lee Grubman

REFERENCE POINT: land surface

ELEVATION OF R. P.:

CASING: 4-inch PVC

SCREEN-TYPE: PVC

DIAM.: 4-inch SLOT NO. 20

SETTING: 9-21 feet below grade

PUMPING TEST-DATE:

DURATION:

STATIC WATER LEVEL: 8.9 feet below gra

PUMPING WATER LEVEL: 10.6 feet below grad

YIELD: 7.9 gpm

REMARKS:

PVC stickup=3.0 feet
sand pack 7-25 feet
bentonite 4-7 feet
grout to surface

NLI 001 1859

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING GROUND-WATER GEOLOGISTS

72 DANBURY ROAD
WILTON, CT. 06897

PAGE ____ OF ____ PAGES

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, dark brown, fine to coarse,	0	3
with silt and decayed plant		
material		
Sand, tan, fine to medium	3	4
Sand, grey to white, medium, some		
coarse sand, little fine gravel	4	20
Sand, white, medium, and white		
clay bits, some coarse sand and		
fine gravel	20	22
Sand, grey to white, medium	22	29
Sand, grey to white, fine with		
white clay	29	32
Clay, tan to white	32	34
Clay, tan grading to solid red		
clay with occasional rounded		
white small cobbles	34	35½

OWNER: NL Industries, Inc.

LOCATION: Pedricktown, NJ

WELL NO.: 5R

DATE COMPLETED: 7-22-80

DRILLING COMPANY: A.C. Schultes & Sons, Inc.

DRILLING METHOD: water rotary

SAMPLING METHOD: ditch

SAMPLED EXAMINED BY: Lee Grubman

REFERENCE POINT: Land surface

ELEVATION OF R. P.:

CASING: 4-inch PVC

SCREEN TYPE: PVC

DIAM.: 4-inch SLOT NO. 20

SETTING: 7-16 feet

PUMPING TEST DATE:

DURATION:

STATIC WATER LEVEL: 3.5 feet below grad

PUMPING WATER LEVEL: 7.9 feet below gra

YIELD: 7.9 gpm

REMARKS:

PVC stickup=25 feet
Sand pack 5-28 feet
Bentonite 2½-5 feet

NLI 001 1860

LEGGETTE, BRASHEARS & GRAHAM
CONSULTING GROUND-WATER GEOLOGISTS
55 WEST STATE STREET
WESTPORT, CONNECTICUT

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, brown, fine to medium;		
5% dark minerals	5.0	5.0
CORE 5.0' to 6.5' ±1.0' recovery		
Sand, as above	1.5 b/	6.5
CORE 10.0' to 11.5' ±1.5' recovery		
Sand, brown, fine to medium;		
±5% dark minerals (upper 1.0')		
Sand, grey, fine to medium with		
½-inch chert nodules, fine		
quartz gravel (lower 0.5')	1.5 b/	11.5
CORE 15.0' to 16.5' ±1.5' recovery		
Sand, white, very coarse; gravel,		
medium, immature; feldspar,		
angular and rounded quartz, some		
¼-inch quartz granules	1.5 b/	16.5
CORE 20.0' to 21.5' ±1.5' recovery		
Sand, white, coarse to very		
coarse; gravel, fine; ¼-inch		
quartz granules (upper 0.7')		
Clay, red with white streaks,		
plastic; very few quartz		
granules (lower 0.8')	1.5 b/	21.5

OWNER: N.L. Industries
LOCATION: Pedricktown, N. J.
WELL NO.: 6
DATE COMPLETED: October 8, 1976
DRILLING COMPANY: Craig Testing Labs.
DRILLING METHOD: 8-inch auger
SAMPLING METHOD: Split spoon
SAMPLES EXAMINED BY: M. R. Burke
REFERENCE POINT: Land surface
ELEVATION OF R. P.: ±10 feet above MSL
CASING: 13 feet of 4-inch P.
SCREEN TYPE: P.V.C.
DIAM.: 4-inch SLOT NO. 0.040-
SETTING: 11 ft. to 21 ft.
PUMPING TEST DATE:
DURATION:
STATIC WATER LEVEL: 6.52 feet below of casing a/
PUMPING WATER LEVEL:
YIELD: 2 gpm c/

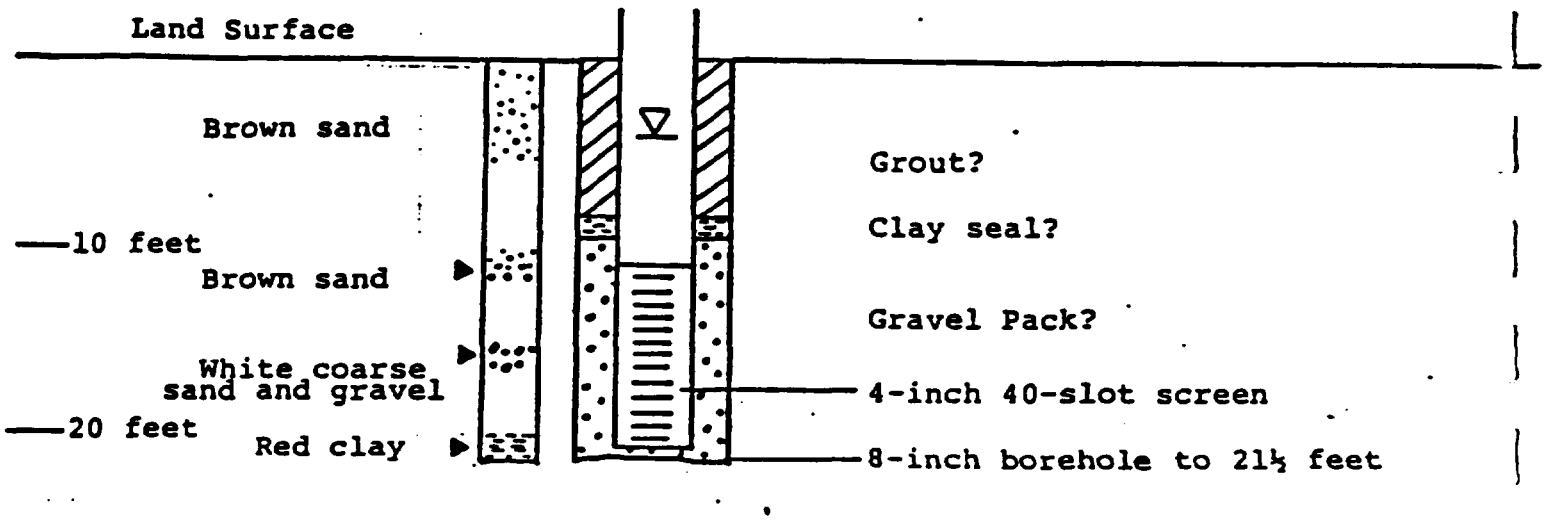
REMARKS:
a/ 2.30 ft. stick up
b/ Penetration in feet
c/ Discharge milky with no sand.

Water at 3.5 feet below land surface

NLI 001 1861

N/L INDUSTRIES, INC.
Pedricktown, New Jersey

Completion Diagram for Well 6



▶ Split spoon sample

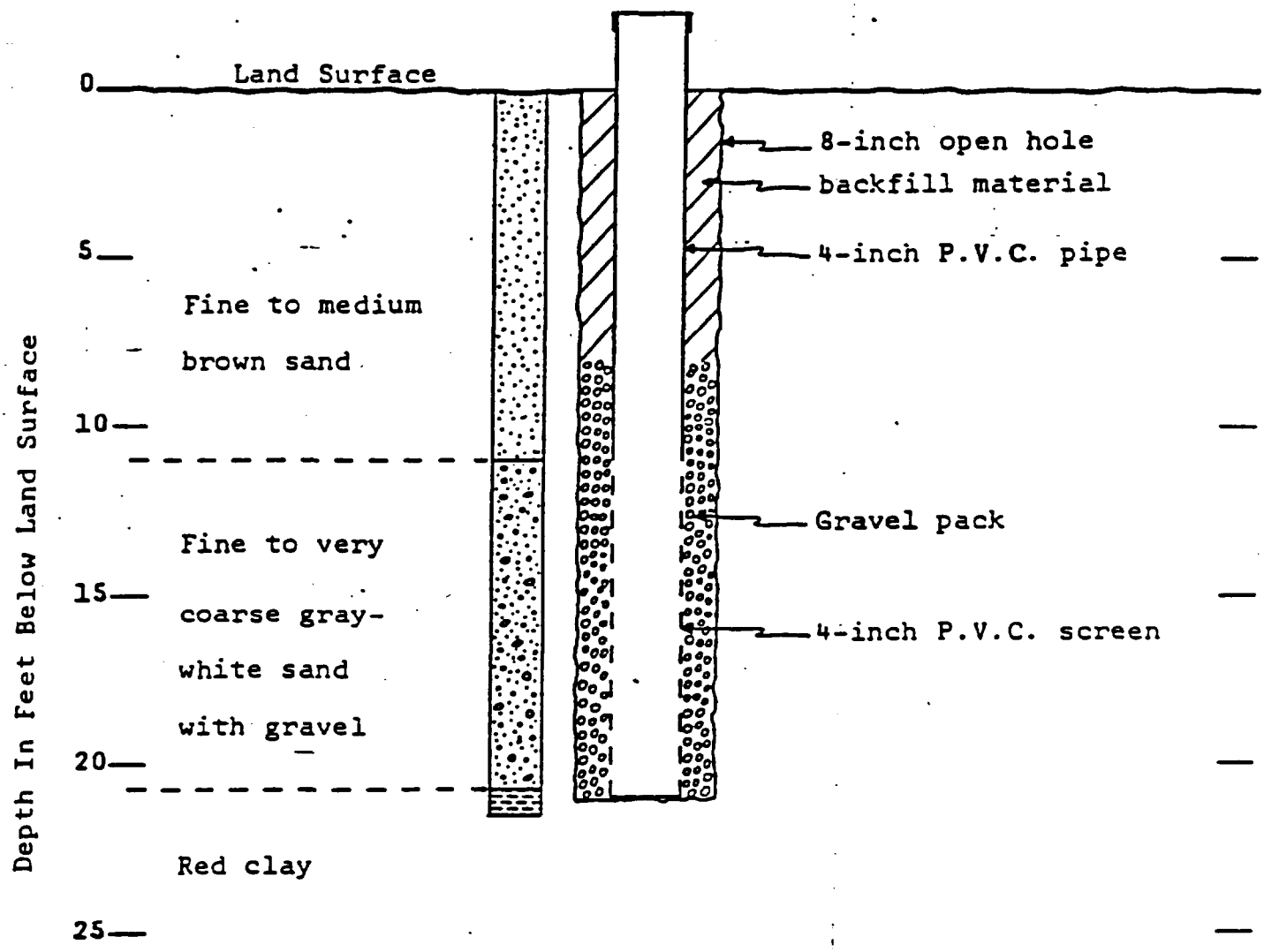
Well completed October 8 1976

▽ SWL = 4.2 feet below grade, April 3 1980

Leggette, Brashears & Graham, Inc. April 1980

N.L. INDUSTRIES
Pedricktown, New Jersey

Completion Diagram for Observation Well 6.



Leggette, Brashears & Graham, Inc.
October, 1976

NLI 001 1863

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

Description	Thickness (feet) of core recovery	Depth (feet) Interval of core drive
To save time the driller was instructed		
to begin split spoon sampling at 10		
feet below grade. Upper materials		
based on landfill cut are brown sand,		
plastic fill, and some clay lenses		0-10
Sand, fine to medium, brown	.5	10-11.5
Sand, medium, some fine, red and		
brown; trace clay	.5	15-16.5
Sand, very fine to coarse, brown;		
trace clay	.5	
Sand, very coarse, and clay, white	.2	20-21.5
Sand, fine, white	.8	25-26.5
Sand, fine-medium, brown	.6	
Sand, fine-medium, white, with streaks		
of clay, white; few ¼ inch gravel	.25	30-31.5
Driller reported formation change to		
clay		32
Clay, gray, some yellow streaks, very		
stiff	1.0	35-36.5
Clay, predominantly red and brown,		
some gray, mixed with sand, coarse	1.0	40-41.5
Sand, fine, clayey, light gray, yellow		
streaks	1.0	45-46.5
Clay, with fine sand, light gray,		
yellow streaks	1.0	50-51.5
(Continued)		

Owner: NL Industries, Inc.

Location: Pedricktown, NJ

Well No.: 8R (Replacement)

Date Completed: March 19, 1980

Drilling Company: A. C. Schultes & Sc s

Drilling Method: Mud Rotary

Sampling Method: Split spoon

Samples Examined By: R. Lamonica

Reference Point: Grade

Elevation of R. P.:

Casing: 4-inch PVC Plastic

Screen Type: Slotted PVC Plastic

Diam.: 4-inch Slot No.: 020 i c

Setting: 101-108 feet

Pumping Test Date:

Duration:

Static Water Level: 20.35 feet below T

Pumping Water Level:

Yield: 1 gpm

Remarks:

NLI 001 1864

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, fine, clayey, light gray	1.0	55-56.5
Sand, fine to medium, light gray; trace clay	.25	60-61.5
Clay, plastic, white; trace sand, medium	.10	64.5-66
Clay, plastic, red, some white	1.0	66-67.5
Clay, stiff, red, some light gray	1.0	70-71.5
Clay, stiff, mottled red and light gray	1.5	75-76.5
Clay, stiff, mottled red and light gray	1.0	80-81.5
Clay, stiff, mottled red and purple, some light gray	1.0	84.5-86
Clay, very stiff, mottled, mostly light gray with red, purple and yellow	1.0	90-91
Driller reported possible change of formation		92
Clay, very stiff, mottled, mostly light gray with red, purple and yellow	.2	
Sand, fine, clayey, bright yellow	.4	95-96
Sand, fine to medium, light gray and yellow	.5	100-101
SAMPLES FROM HERE ON ARE SHELBY TUBE		
Sand, fine to coarse, yellow, trace		

OWNER: NL Industries, Inc.
LOCATION: Pedricktown, NJ
WELL No.: 8R (Replacement)
DATE COMPLETED:
DRILLING COMPANY:
DRILLING METHOD:
SAMPLING METHOD:
SAMPLES EXAMINED BY:
REFERENCE POINT:
ELEVATION OF R. P.:
CASING:
SCREEN: TYPE:
DIAM.: SLOT No.:
SETTING:
PUMPING TEST: DATE:
DURATION:
STATIC WATER LEVEL:
PUMPING WATER LEVEL:
YIELD:
REMARKS:

NLI 001 1865

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

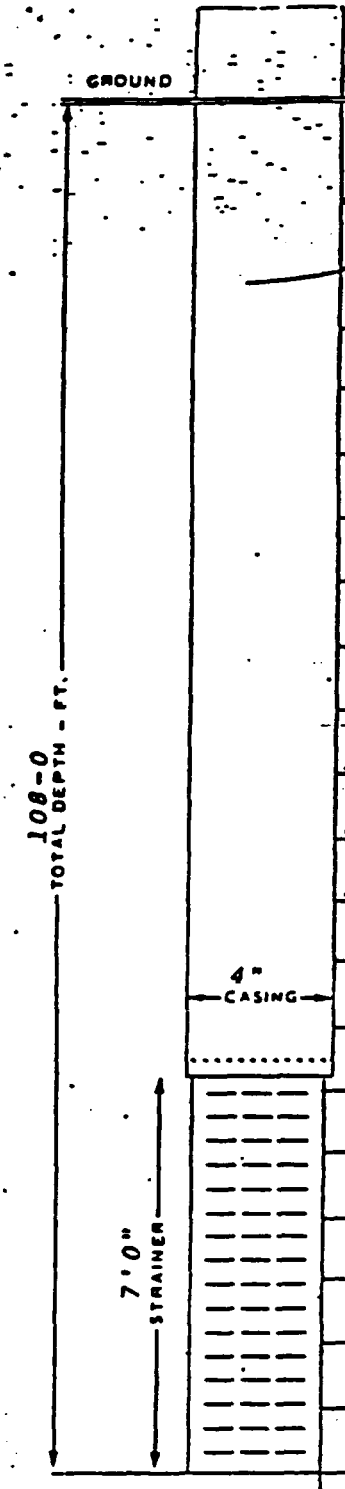
DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
clay: chips of sandstone, brown	1.5	104.5-106
Driller reported change to harder material		108
Sand, fine, silt, yellow; lenses of sandy clay, white, and clay, white and red	.8	110-111.5
Sand, fine to medium, light gray; some sand, fine to very coarse, light gray; few gravel; traces of white clay throughout	.8	114.5-116
Driller reported change to harder material		116
Silty clay, light gray, very hard	1.0	118-119
DRILLED SAME AS ABOVE TO 122 FEET BELOW GRADE; TOOLS THEN DROPPED VERY QUICKLY TO 124 FEET STOPPED DRILLING.		
Sand, fine to coarse, yellow, with clay	.5	124-124.5
ADDED 20 GALLONS (300 pounds) OF CEMENT TO THE BOTTOM OF THE 12-INCH HOLE TO CLOSE OFF LOWER SAND ZONE		

OWNER: NL Industries, Inc.
LOCATION: Pedricktown, NJ
WELL No.: 8R(Replacement)
DATE COMPLETED:
DRILLING COMPANY:
DRILLING METHOD:
SAMPLING METHOD:
SAMPLES EXAMINED BY:
REFERENCE POINT:
ELEVATION OF R. P.:
CASING:
SCREEN: TYPE:
DIAM.: SLOT No.:
SETTING:
PUMPING TESTS: DATE:
DURATION:
STATIC WATER LEVEL:
PUMPING WATER LEVEL:
YIELD:
REMARKS:

NLI 001 1866

A.C. SCHULTES & SONS, INC.

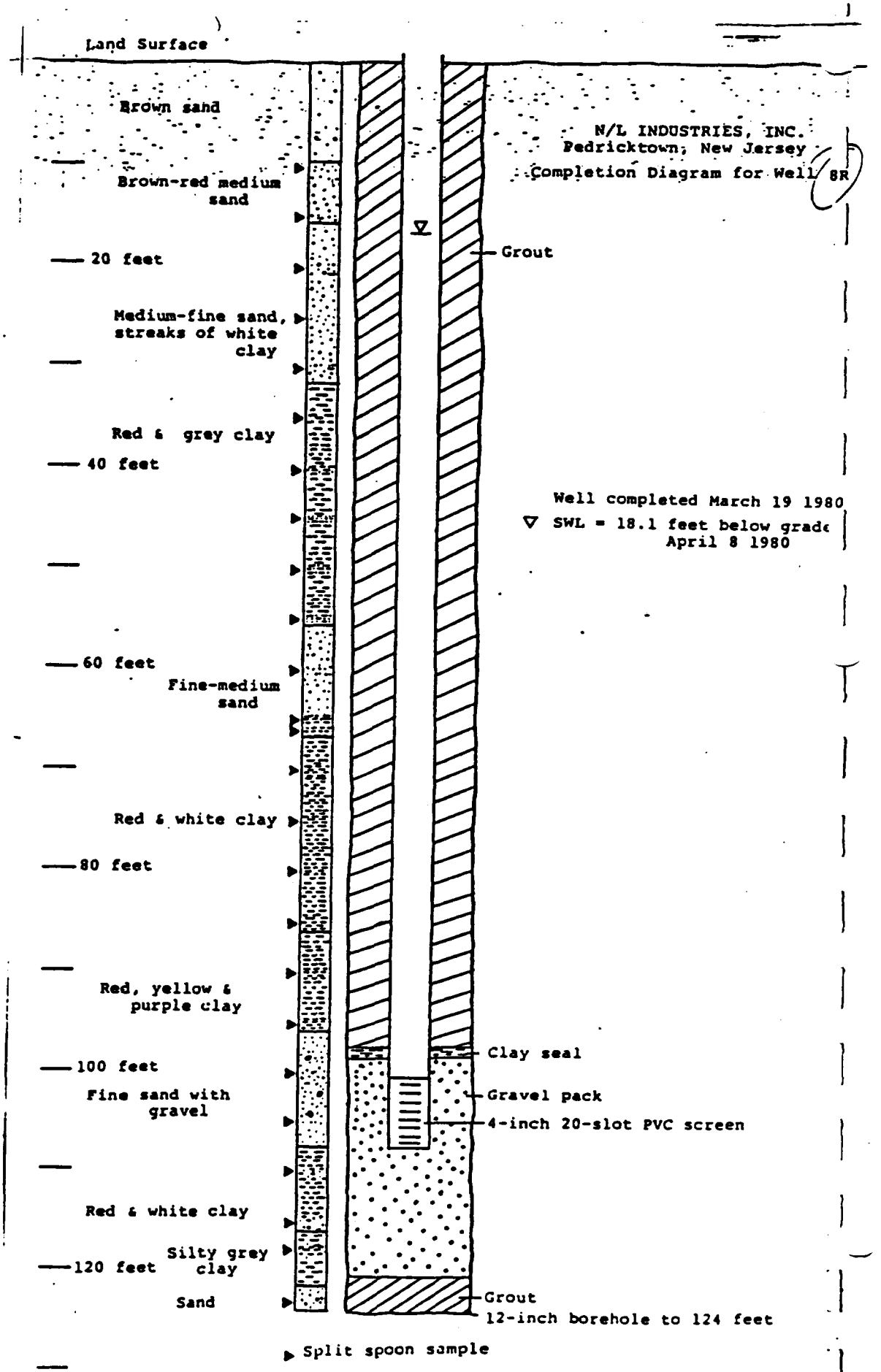
SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
Brown Sand	0 TO 10	National Lead
Brown & Red Med. Sand	10 - 16	Job # 18411
Med. - Fine Sand and	16 - 32	Location Pedricktown, N
streaks of white clay		Well No. 8R
Red & Gray Clay	32 - 56	Hrs. Pumped 8 hrs.
Fine to Med. Sand	56 - 67	Capacity G.P.M. 9 gal.
Red & White Clay	67 - 86	Static Level 18'
Red, Yellow & Purple	86 - 96	Pumping Level 93'
Clay Fine Sand & Some Sand-	96 - 108	Specific Capacity --
stone Red & White Clay	108 - 116	Diameter of Well 4"
Silty Gray Clay	116 - 122	Depth of Well (ground) 108-0
Sand	122 - 124	Length of Casing 101-8
		Distance to Top of Packer (gr.) --
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 7'0"
		Top Screen Fitting PVC Socke
		Bottom Screen Fitting Cap
		Blank --
		Slot Size .018
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #1
		Bags of Cement 100
		Date Well Completed 3/20/80

Rotary Table approx. 3' above ground level

NLI 001 1867


Land Surface
Brown sand
Brown-red medium sand
20 feet
Medium-fine sand, streaks of white clay
Red & grey clay
40 feet
60 feet
Fine-medium sand
Red & white clay
80 feet
Red, yellow & purple clay
100 feet
Fine sand with gravel
Red & white clay
Silty grey clay
120 feet
Sand
N/L INDUSTRIES, INC.
Pedricktown, New Jersey
Completion Diagram for Well 8R
Grout
Well completed March 19 1980
SWL = 18.1 feet below grade
April 8 1980
Clay seal
Gravel pack
4-inch 20-slot PVC screen
Grout
12-inch borehole to 124 feet
Split spoon sample
Lowcotic, Brashears & Graham, Inc.
April 1980

WELL LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.
CONSULTING GROUND-WATER GEOLOGISTS
72 DANBURY ROAD
WILTON, CT. 06897

DESCRIPTION	THICKNESS (FEET)	DEPTH (FEET)
Sand, brown	26	26
Sand, clayey	5	31
Clay, white, sandy	7	38
Sand, red, silty, and red sandy clay	13	51
Sand, with silt and clay	3	54
Sand, fine	14	68
Clay, tan and red	5	73

OWNER: NL Industries, Inc.

LOCATION: Pedricktown, NJ

WELL NO.: 9R2

DATE COMPLETED: April 2, 1980

DRILLING COMPANY: A. C. Schultes & Sons

DRILLING METHOD: Water rotary

SAMPLING METHOD:

SAMPLED EXAMINED BY: Lee Grubman

REFERENCE POINT: grade

ELEVATION OF R. P.:

CASING: 4-inch

SCREEN TYPE: Slotted PVC

DIAM.: 4-inch SLOT NO.: 20

SETTING: 53-61

PUMPING TEST DATE:

DURATION:

STATIC WATER LEVEL: 17.1 feet*

PUMPING WATER LEVEL:

YIELD: 10 gpm

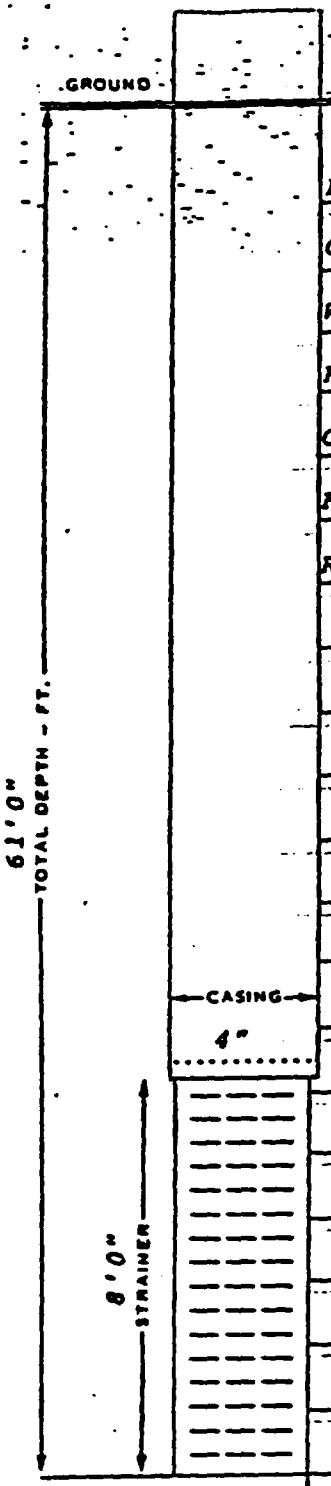
REMARKS:

*below top of 4-inch PVC casing.

NLI 001 1869

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL

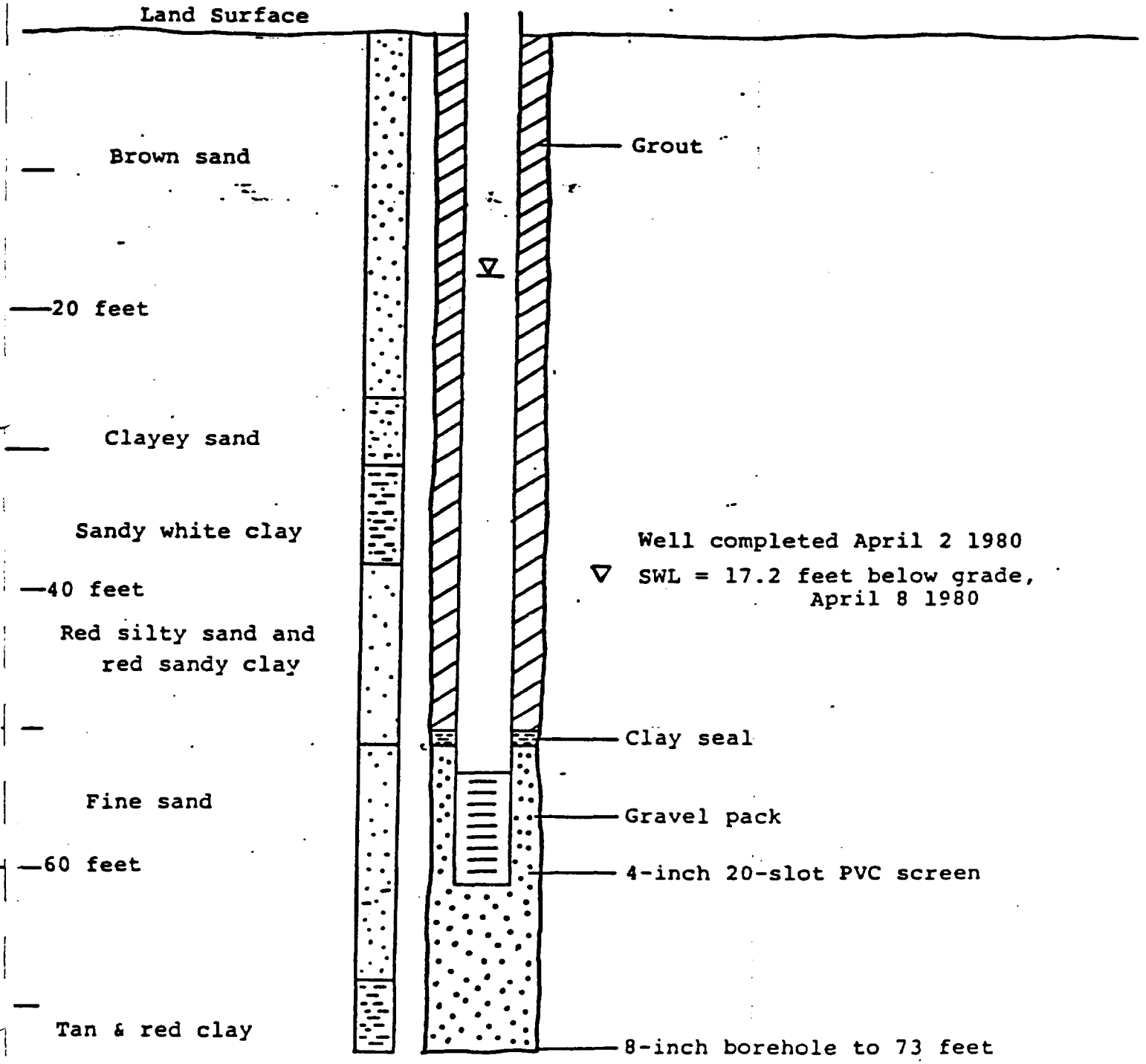


WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
Brown Sand	0 TO 26	National Lead
Clayish Sand	26 - 31	Job # 18411
White Clay	31 - 38	Location Pedricktown, N
Red Silty Sand & Clay	38 - 51	Well No. 92R
Clayish Silty Sand	51 - 54	Hrs. Pumped 8 hrs. +
Fine Sand	54 - 68	Capacity G.P.M. 9
Red & White Clay	68 - 73	Static Level 16'
		Pumping Level 45
		Specific Capacity --
		Diameter of Well 4"
		Depth of Well (ground) 61'0"
		Length of Casing 55'
		Distance to Top of Packer (gr.)
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 8'0"
		Top Screen Fitting PVC Soc
		Bottom Screen Fitting Cap
		Blank --
		Slot Size .018
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #1
		Bags of Cement 25
		Date Well Completed 1/2/80

Rotary Table approx. 3' above ground level

NLI 001 1870

N/L INDUSTRIES, INC.
Pedricktown, New Jersey
Completion Diagram for Well 9R2



Leggette, Brashears & Graham, Inc. April 1980

Geologic Logs

Description	Depth (feet below land surface)	Thickness (feet)
Well 10		
Sand, brown, fine; with a trace of silt	0 - 4	4
Sand, gray, fine	4 - 14	10
Sand, gray, fine to coarse	14 - 20	6
Sand, gray-white, fine to coarse; with silt, clay and occasional lenses of clayey sand	20 - 28	8.0
Clay, red-pink, white, mottled; with silt	28 - 33	5
Silt, white; with some clay and very fine sand	33 - 41	8
Sand, gray-white, very fine; with silt and occasional lenses of silty clay	41 - 49	8
Sand, red-brown, fine to medium; with occasional gray-white lenses of sandy silt	49 - 63	14
Clay, red-pink, white, mottled; with silt	63 - 66	3
Sand, red-brown, fine to coarse	66 - 73.5	7.5
Clay, red, brown and white, mottled; with silt	73.5 - 79	5.5
Sand, red-brown, fine to medium; with lenses of silt, clay and gray sand	79 - 82	3

Date 10-14-83

MORETRENCH AMERICAN WELL REPORT #11R

Rig No.: 0475

Contractor:

Job No.: 1-4235

Job Address: M.L. - PEDRICKTOWN WV

Date: 10-14-83

Job Phone:

Comments:

Branch No.:

No. of wells installed today:

Depth of hole: 60' 6"

Dia of borehole: 12"

Length of well: 25'

Dia. of well: 4"

Length of screen: 20'

Type, dia., slot of screen .016

Well yield:

Travel Hours

Stand by Hours

Revert used:

Man Hours Regular: 8

Drill Hours Reg.: 8

Total footage drilled today: 50' 6"

Overtime: 4

O.T.: 4

Delays—Explain: WAITING FOR DEPTH TO SET WELL

Delay Hours: 2

Mileage				
State	WV			

Fuel Supplied By:(check one)

☑ Driller

☐ Contractor

WELL LOG

Depth	Formation	Depth	Formation
0'-1'	T.P. SOIL		
1'-6'	FINE-MED. BRN. SAND		
6'-12'	MED-FIND BRN. SAND		
12'-18'	COARSE-MED. BRN. SAND		
	TRACE OF GRAVEL		
18'-26'	FINE-MED. BRN. SAND		
	TRACE OF GRAVEL		
26'-38'	MED-COARSE SAND		
38'-44'	MED-COARSE SAND		
	TRACE-FINE GRAVEL		
44'-48'	COARSE-MED BRN. SAND		
48'-56'	MED-COARSE TAN SAND		
56'-60'6"	MED-COARSE TAN SAND		
	TRACE FINE GRAVE		
	LENSES GREY CLAY		

W Watters

Driller

NLI 001 1873

Verified Contractor

Rev. 5-81

Copy to: Rockaway (White), Branch (Canary), Contractor (Pink), Driller (Goldenrod)

Table 1. Construction Details of Official Monitoring Wells at NL Industries, Pedricktown New Jersey, Plant Site.

Well No.	Elevation of Measuring Point (feet above mean sea level)	Total Depth Drilled (feet below land surface)	Screened Interval (feet below land surface)	Height of Measuring Point (feet above land surface)	Screen Slot Size (thousandths of an inch)
1R	13.32	35.5	4 - 32	4.0	20
2R2	9.14	25	13 - 20	2.2	20
3R	14.10	33	4 - 33	2.7	20
4R	14.80	29	9 - 21	2.7	20
5R	10.03	35.5	7 - 16	2.0	20
6	12.23	21.5	11 - 21	2.5	40
8R	16.55	124.5	101 -108	2.9	18
9R2	16.73	73	53 - 61	2.8	18
AR	11.39	34.5	2.5- 32.5	2.5	20
8R	8.88	45	31 - 37	2.3	18
CR2	15 96	45	25 - 31	2.8	20
10	13.72	82	42.0-72.0	2.0	20
11	9.25	59	33.2-53.2	1.8	20

Note: All wells are 4-inch diameter.

Table 2. Construction Details of Observation Wells Installed in November-December 1982, at NL Industries, Pedricktown, New Jersey Plant Site.

Well No.	Elevation of Measuring Point (feet above mean sea level)	Total Depth Drilled (feet below land surface)	Screened Interval (feet below land surface)	Height of Measuring Point (feet above land surface)
HD	16.73	41	23.8 - 38.8	2.6
HS	16.83	25	9.4 - 24.4	2.6
ID	15.24	42	18.6 - 33.6	2.6
IS	15.41	16	5.5 - 15.5	2.5
JD	12.08	27	15.1 - 25.1	2.9
JS	11.95	15	4.4 - 14.4	2.6
KD	10.70	29	15.4 - 25.4	2.6
KS	10.51	16	5.5 - 15.5	2.5
LD	10.89	19	9.7 - 16.7	2.3
LS	10.74	11	3.9 - 10.9	2.1
MD	8.37	19	9.6 - 17.6	2.0
MS	9.83	10	3.2 - 10.2	2.8
ND	10.35	22	11.9 - 21.9	2.1
NS	11.30	14	4.2 - 14.2	2.6
OD	11.44	37	19.5 - 34.5	3.0
OS	10.92	20	3.8 - 18.8	2.2
PD	10.25	30	16.8 - 26.8	3.2
PS	9.14	18	7.9 - 17.9	2.1
QD	10.19	25	11.5 - 21.5	2.5
QS	10.52	13	2.4 - 12.4	2.6
RD	13.62	41	25.0 - 35.0	2.0
RS	13.84	20	5.0 - 20.0	2.0
SD	11.45	30	15.0 - 27.0	2.5
SS	10.76	15	5.0 - 15.0	2.0
T2	11.34	27	7.6 - 22.6	2.4
T4*	11.09	23	8.0 - 23.0	2.0

*) 4-inch diameter schedule 80 PVC screened with 20 slot.

Description	Depth (feet below land surface)	Thickness (feet)
Well HD		
Sand, brown, fine; with silt	0 - 4	4
Sand, gray-white, fine to medium; with silt	4 - 7	3
Silt, gray-white; with lenses of pink-red, white, mottled silty clay, gray-white silty fine sand and red-brown silty fine sand	7 - 21.5	14.5
Sand, yellow-brown, fine; with silt	21.5 - 29	7.5
Sand, gray-white, fine to medium; with silt and occasional gray silty clay lenses	29 - 38	9
Silt, gray-white, brown, mottled; with clay	38 - 41	3
Well ID		
Sand, brown, fine; with silt	0 - 3	3
Sand, light brown, fine; with silt and lenses of fine silty sand	3 - 8	5
Sand, gray-white, fine to medium; with silt	8 - 11.5	3.5
Silt, dark gray; with clay and lenses of fine sand	11.5 - 19	7.5
Sand, gray-white, fine to medium	19 - 24	5
Sand, gray-white, fine to coarse; with some silt and clay	24 - 28	4
Sand, gray-white, fine to medium; with some silt and clay lenses	28 - 37.5	9.5
Clay, red-pink and brown, mottled; with silt	37.5 - 41.5	4

Description	Depth (feet below land surface)	Thickness (feet)
Well JD		
Sand, light brown, fine to medium	0 - 4	4
Sand, gray-white, fine to medium; with silt and occasional lenses of clayey sand	4 - 9	5
Sand, gray-white, fine to coarse; with silt, and occasional lenses of sandy clay	9 - 20	11
Sand, gray-white, fine to coarse; with silt, occasional lenses of sandy clay and fine gravel	20 - 23	3
Sand, white, brown, mottled, very fine; with clay, and lenses of sandy clay, with silt	23 - 25	2
Clay, red-pink, white, mottled; with silt	25 - 27	2
Well KD		
Silt, dark brown; with fine sand and organic matter	0 - 5.5	5.5
Sand, gray, fine; with some silt	5.5 - 8.5	3
Sand, gray-white, fine to coarse; with a lense of green-brown mottled very fine clayey sand with some silt	8.5 - 18	9.5
Sand, gray-white, fine to medium; with occasional lenses of sandy silt	18 - 26.5	8.5
Clay, red-pink, white, mottled; with some silt	26.5 - 29	2.5
Well LD		
Topsoil	0 - 0.5	0.5
Sand, light brown, fine	0.5 - 4	3.5
Sand, brown, fine; with some silt	4 - 9	5
Sand, gray-white, fine to medium; with silt and lenses of sandy clay	9 - 17	8
Clay, red-pink, brown, white, mottled; with some silt	17 - 19	2

Description	Depth (feet below land surface)	Thickness (feet)
Well MD		
Topsoil	0 - 0.5	0.5
Sand, light brown, fine; with silt	0.5 - 6	5.5
Silt, gray; with very fine sand and some clay	6 - 10.5	4.5
Sand, brown, fine; with silt	10.5 - 14	3.5
Sand, yellow-brown, fine to medium; with some silt	14 - 17	3
Silt, red-pink; with come clay and very fine sand	17 - 19	2
Well ND		
Topsoil	0 - 0.5	0.5
Sand, light brown, fine to medium; with a trace of silt	0.5 - 5	4.5
Sand, gray-brown, fine to medium; with a trace of silt	5 - 9	4
Sand, gray-white, fine; with silt and clay and lenses of sandy clay	9 - 14	5
Sand, gray-white, fine to coarse; with silt and clay and occasional lenses of sandy clay	14 - 21.5	7.5
Clay, red-pink and white, mottled; with silt	21.5 - 22	0.5
Well OD		
Topsoil	0 - 0.5	0.5
Sand, light brown, fine to medium; with some silt	0.5 - 7.5	7
Sand, brown, fine to coarse; with a gray-violet silt lense	7.5 - 11.5	4
Sand, gray-white, fine to medium; with some silt and occasional lenses of sandy clay	11.5 - 24	12.5
Sand, gray-white, fine to coarse; with some fine gravel and lenses of sandy clay	24 - 35.5	11.5
Clay, red-pink; with some silt	35.5 - 37	1.5

Description	Depth (feet below land surface)	Thickness (feet)
Well PD		
Topsoil	0 - 0.5	0.5
Sand, brown, fine to medium; with silt	0.5 - 3	2.5
Silt, gray; with very fine sand and some clay	3 - 4.5	1.5
Sand, brown, fine to medium; with silt and a lense of coarse sand with occasional fine gravel	4.5 - 9	4.5
Sand, red-brown, medium to coarse; with lenses of sandy clay	9 - 15.5	6.5
Sand, gray, fine to medium; with a trace of fine gravel	15.5 - 19	3.5
Sand, white-gray, fine to medium; with silt and occasional lenses of clayey silt with fine sand	19 - 28	9
Clay, red-pink, white, mottled	28 - 30	2
Well QD		
Sand, brown, fine to medium; with silt	0 - 8	8
Sand, gray-white, fine to medium; with silt	8 - 14	6
Sand, gray-white, fine to coarse; with silt	14 - 22	8
Clay, red-pink, white, mottled; with silt	22 - 25	3
Well RD		
Topsoil	0 - 0.5	0.5
Sand, light brown, fine to medium; with a trace of silt	0.5 - 9	8.5
Sand, gray, fine to medium; with a trace of silt	9 - 16.5	7.5
Clay, gray; with some silt and occasional lenses of fine silty sand	16.5 - 34	17.5
Silt, red, with some white mottling; sand, very fine and some clay	34 - 40.5	6.5

Description	Depth (feet below land surface)	Thickness (feet)
Well SD		
Sand, brown very fine; with some silt, trace of clay	0 - 3	3
Sand, brown, fine to medium; with some silt, plastic debris from battery casing	3 - 14	11
Sand, gray-white, fine to coarse; with silt	14 - 20	6
Sand, gray-white, fine to coarse; with occasional lenses of silty clay	20 - 28	8
Clay, red-pink, white, mottled; with some silt	28 - 30	2
Well T2		
Fill, sand, brown, fine to medium; silt, black, with plastic pieces from batteries	0 - 3	3
Sand, brown, fine to medium	3 - 9	6
Sand, gray, fine to medium; with some silt and a trace of fine gravel	9 - 14	5
Sand, gray, fine; with some silt and a trace of fine gravel	14 - 22	8
Sand, gray-white, fine to coarse; with some fine gravel	22 - 23	1
Clay, red-pink, white, mottled; with silt	23 - 27	4

Table 7. Laboratory Results for Well Sampling Program, January 1983, NL Industries, Pedricktown, New Jersey.

Well No.	Random No.	Dissolved Solids (mg/l)	pH	Sulfate (mg/l)	Turbidity (NTU)	Unfiltered Lead (mg/l)	Filtered Lead (mg/l)
HS	630	373	7.3	186	70	3.86	3.62
HD	242	5,600	5.0	4,490	3.8	0.07	0.07
IS	985	272	6.9	58	73	0.17	0.06
IS*	638	267	7.0	53	30	0.16	0.08
ID	261	11,300	4.2	8,550	16	0.24	0.24
JS	856	855	6.3	483	250	0.02	<0.01
JD	665	5,320	5.1	3,520	34	0.39	0.23
KS	406	8,250	4.6	6,000	>1,000	2.56	1.99
KD	504	15,800	4.4	11,000	180	0.27	0.22
LS	415	644	6.1	398	1.4	0.03	0.02
LD	522	428	6.0	289	30	0.29	0.22
MS	412	1,730	6.0	1,080	62	0.74	0.58
MS*	417	1,690	6.0	1,080	32	0.70	0.62
MD	254	2,510	5.8	1,560	5.5	0.06	0.06
NS	226	713	6.0	466	550	1.18	0.51
ND	984	3,090	5.5	2,150	33	0.12	0.09
OS	545	5,870	5.6	4,140	95	0.65	0.19
OD	131	10,500	5.5	8,650	20	0.66	0.54
PS	988	910	7.0	536	6.8	0.02	0.02
PD	140	1,880	7.1	1,230	5	0.27	0.14
QS	372	2,450	6.6	1,690	62	0.08	0.08
QD	557	20,700	5.6	14,500	85	0.20	0.14
QD*	287	19,700	5.6	13,500	150	0.19	0.13
RS	584	202	7.2	70	22	0.01	<0.01
RS*	785	180	7.1	67	30	0.01	<0.01
RD	890	215	7.2	63	>1,000	0.17	<0.01
SS	349	485	6.8	303	150	0.20	0.13
SD	246	35,100	4.2	26,800	125	2.96	2.52
T2	978	11,200	5.2	8,150	66	1.38	1.25
T4	567	10,700	5.6	8,650	70	1.11	0.13
1R	892	10,700	5.5	8,850	83	0.28	<0.01
2R2	102	11,200	6.8	6,500	95	0.06	0.06
3R	626	2,730	5.4	1,580	25	0.15	0.15
4R	787	1,380	5.8	560	1.0	<0.01	<0.01
5R	473	1,120	6.1	656	15	0.03	0.02

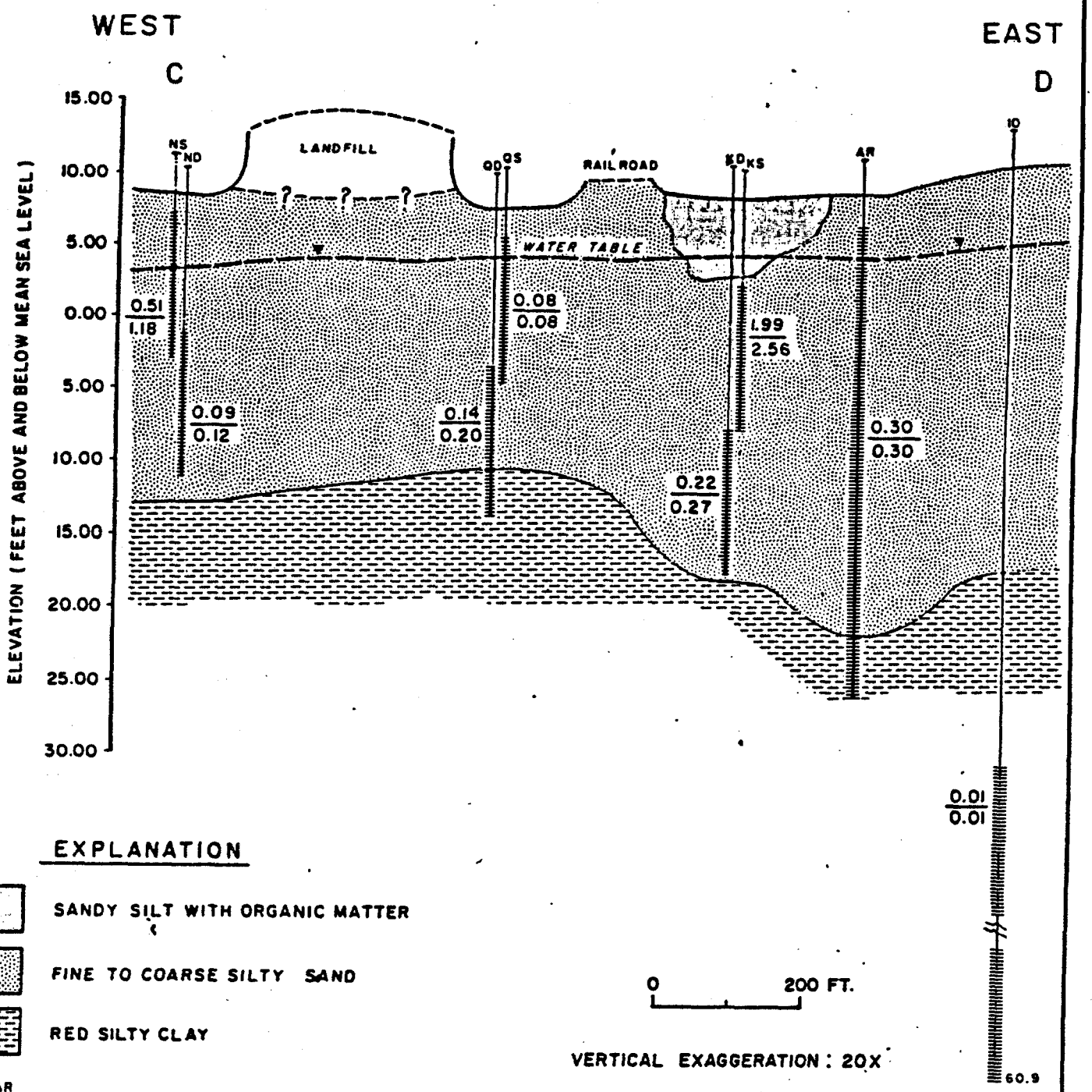
* Replicate Sample

Table 7. (Continued)

Well No.	Random No.	Dissolved Solids (mg/l)	pH	Sulfate (mg/l)	Turbidity (NTU)	Unfiltered Lead (mg/l)	Filtered Lead (mg/l)
6	512	7,380	5.5	6,920	30	0.02	<0.01
8R	230	58	7.5	3	3.8	<0.01	<0.01
8R*	139	83	7.6	4	3.5	0.02	<0.01
9R2	441	51	7.5	3	4.5	0.01	<0.01
10	965	146	7.6	26	1.8	<0.01	<0.01
11	186	22,100	5.7	14,700	6.5	0.46	0.40
11*	599	20,200	5.6	14,800	5.8	0.40	0.36
AR	918	10,300	4.0	7,250	2.1	0.30	0.30
BR	903	14,700	5.8	11,400	3.8	0.25	0.25
CR2	940	190	7.3	23	125	0.07	0.07

* Replicate Sample

Analyses were performed by Century Environmental Testing Labs., Inc., Thorofare, New Jersey.



EXPLANATION

SANDY SILT WITH ORGANIC MATTER

FINE TO COARSE SILTY SAND

RED SILTY CLAY

AR — MONITORING WELL NO.

WATER TABLE DECEMBER 21, 1982

WELL SCREEN

0 — 200 FT.

VERTICAL EXAGGERATION : 20X

LEAD CONCENTRATION, mg/L

0.14 FILTERED
0.20 UNFILTERED

SUBJECT

VERTICAL DISTRIBUTION OF LEAD IN GROUNDWATER

SECTION C - D

PREPARED FOR

N.L. INDUSTRIES, INC.
PEDRICKTOWN, N.J.

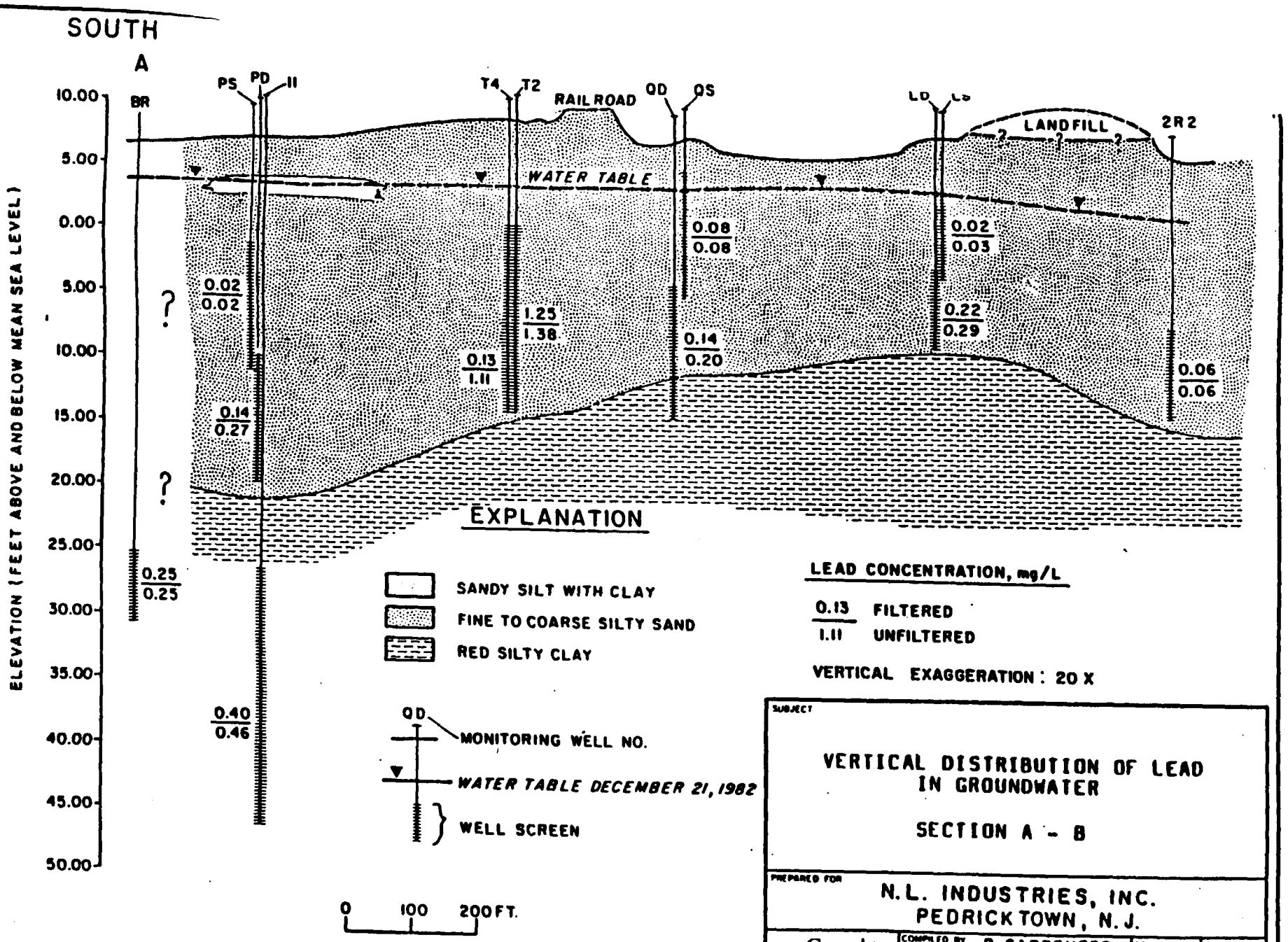
Geraghty & Miller, Inc.

COMPILED BY B. CARPENTER
PREPARED BY R. PADULA
PROJECT MGR K. ATOBRAH

SCALE SHOWN
DATE 4-83

FIGURE 26

NLI 001 1883


SOUTH
A
BR
PS
PD
II
T4
T2
RAILROAD
OD
OS
LD
LS
LANDFILL
2R2
WATER TABLE
ELEVATION (FEET ABOVE AND BELOW MEAN SEA LEVEL)
10.00
5.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
0.02
0.02
0.14
0.27
0.25
0.25
0.40
0.46
1.25
1.38
0.13
1.11
0.08
0.08
0.14
0.20
0.02
0.03
0.22
0.29
0.06
0.06
EXPLANATION
SANDY SILT WITH CLAY
FINE TO COARSE SILTY SAND
RED SILTY CLAY
OD
MONITORING WELL NO.
WATER TABLE DECEMBER 21, 1982
WELL SCREEN
0
100
200 FT.
LEAD CONCENTRATION, mg/L
0.13 FILTERED
1.11 UNFILTERED
VERTICAL EXAGGERATION: 20 X
SUBJECT
VERTICAL DISTRIBUTION OF LEAD IN GROUNDWATER
SECTION A - B
PREPARED FOR
N.L. INDUSTRIES, INC.
PEDRICKTOWN, N.J.
Geraghty & Miller, Inc.
COMPILED BY B. CARPENTER
PREPARED BY R. PADULA
PROJECT MGR K. ATOBRAH
SCALE SHOWN
DATE 4-83
FIGURE 25

NLI 001 1884

EXHIBIT C

DWR-138A
1/88

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-05689
APPLICATION NO. _____
COUNTY Salem
COORD. 30-23 454

WELL RECORD

1. OWNER Exxon Chemical Company ADDRESS Pennsgrove Pedricktown Rd Pedricktown N.J.
   Owner's Well No. Replacement 9 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Tomah Products - same address
3. DATE COMPLETED 3/16/89 DRILLER H.P. Drilling Inc.
4. DIAMETER: Top 6 inches Bottom 6 inches TOTAL DEPTH 30 Feet
5. CASING: Type PVC Diameter 6 Inches Length 15 Feet
6. SCREEN: Type Cont. Slot Size of Opening .020 Diameter 6 Inches Length 15 Feet
   Range in Depth { Top 15 Feet / Bottom 30 Feet } Geologic Formation _____
   Tail Piece: Diameter — Inches Length — Feet
7. WELL FLOWS NATURALLY — Gallons per minute at — Feet above surface
   Water rises to — Feet above surface
8. RECORD OF TEST: Date 3/16/89 Yield 60 Gallons per minute
   Static water level before pumping 2.9 Feet below surface
   Pumping level 13.2 feet below surface after 1 hours pumping
   Drawdown 10.3 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped Cent. Pump How measured Orc measured Cont.
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Recovery Replacement AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA H.P. Drilling Inc.
14. DATA OBTAINED BY Ron Barber Date 3/17/89

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1886

Form DWR- 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-03258-1

APPLICATION NO. _____

COUNTY Salem

30-23.446

WELL RECORD

1. OWNER Tomah Products inc ADDRESS Milton N.J.

Owner's Well No. 6 D SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Tomah Products Pedricktown N.J.

3. DATE COMPLETED 2-8-84 DRILLER R Harrison

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 70 Feet

5. CASING: Type PVC Diameter 4 Inches Length 52 Feet

6. SCREEN: Type Cont Slot Size of Opening .020 Diameter 4 Inches Length 20 Feet

Range in Depth { Top 50 Feet / Bottom 70 Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 2-9-84 Yield 20 Gallons per minute

Static water level before pumping 13.8 Feet below surface

Pumping level 20 feet below surface after — hours pumping

Drawdown 6.2 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal Pump How measured Pipe installed cont

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG attached Are samples available? yes
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA H. P Drilling Inc

14. DATA OBTAINED BY R. Harrison Date 2-8-84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1887

30-23446 30-3258

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client: Geraghty & Miller, Inc. Date: 2-3-84

Project: Ramah Products Job No. 747

Boring No. [illegible] Sheet No. 1 of 2 Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	[illegible]	[illegible] TO [illegible]
[illegible]				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
					Brn. F/C sand & F/M gravel. [illegible]	[illegible]
					[illegible] silty F/C sand (fill?)	[illegible]
					Wet gray F/M clayey silty sand	
5'						[illegible]
10'					Wet brn. F/M sand, tr. silt	
15'					Wet brn. F/C sand, tr. silt tr. gray clay	
20'						
25'					Wet gray & tan F/M sand tr. silt	[illegible]
30'					Wet tan & gray F/C sand, tr. silt	32'
35'						
[illegible]					Gray & brn. silty clay, some F/C	37' 40'

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller _____

Helper _____

NLI 001 1888

Hp Drilling, Inc.

30-23-446
30-3258

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client: [illegible] & Miller, Inc.
Date:
Project: [illegible] Products
Job No.: 747
Boring No.: [illegible]
Sheet No.: 2 of [illegible]
Ground Surface Elev.:

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE		TO
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
					[illegible] gray [illegible] sand	
[illegible]		[illegible]	[illegible]	[illegible]	Very dense [illegible]	
[illegible]					[illegible] gravel, tr. silt tr. [illegible]	
[illegible]		[illegible]	[illegible]	[illegible]	[illegible] gray silty clay, tr. to some [illegible] sand	
					Test Boring Complete at 70'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
– - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller: [illegible]
Helper:

NLI 001 1889

Form DWR- 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-03259-8

APPLICATION NO. _____

COUNTY Salem

30-23-446

WELL RECORD

1. OWNER Tomah Products inc ADDRESS Milton N.J.

Owner's Well No. 8 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Tomah Products Pedricktown N J

3. DATE COMPLETED 2-7-84 DRILLER M. Pratt

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 12 Feet

5. CASING: Type Steel Diameter 2 Inches Length 10 Feet

6. SCREEN: Type 948 Super Size of Opening .020 Diameter 2 Inches Length 4 Feet

Range in Depth { Top 8 Feet / Bottom 12 Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 2-9-84 Yield .25 Gallons per minute

Static water level before pumping 2 Feet below surface

Pumping level 12 feet below surface after 1 hours pumping

Drawdown 10 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal pump How measured Pre measured cont.

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Mon. Testing AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG No log - Hand driven well point Are samples available? No
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA H.P. Drilling Inc

14. DATA OBTAINED BY M Pratt Date 2-9-84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1890

NLI 001 1891

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

30-23-446

PERMIT NO. 30-03260-1

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Tomah Products Inc ADDRESS Milton N.J.
   Owner's Well No. 9 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Tomah Products Pedricktown N.J.
3. DATE COMPLETED 2-9-84 DRILLER R. Harrison
4. DIAMETER: Top 6 inches Bottom 6 inches TOTAL DEPTH 30 Feet
5. CASING: Type Steel Diameter 6 Inches Length 17 Feet
6. SCREEN: Type wire round Size of Opening .020 Diameter 6 Inches Length 15 Feet
   Range in Depth { Top 15 Feet / Bottom 30 Feet } Geologic Formation _____
   Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 2-10-84 Yield 60 Gallons per minute
   Static water level before pumping 2.9 Feet below surface
   Pumping level 13 feet below surface after _____ hours pumping
   Drawdown 10.1 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped Centrifugal pump How measured Pre measured cont.
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Mon. Testing AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG attached Are samples available? yes
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA H.P. Drilling Inc
14. DATA OBTAINED BY R. Harrison Date 2-10-84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30-23446

30-3260

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client Gernanty & Miller, Inc. **Date** 2-9-84

Project Terah Products **Job No.** 747

Boring No. 3 **Sheet No.** 1 **of** 1 **Ground Surface Elev.**

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	A Rotary	TO
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
					Brn. damp M/F sand, some silt tr. M/F gravel (fill)	5'
5'					Med. dense dark gr. brn. to lt. brn. M/F sand, some silt, tr. clay	
		S-1	5-7	10-15-12-10		7'
					Tan to white silty clay	8.5'
10'					Dense wet white to gray M/F sand tr. coarse sand/fine gravel, tr. silt	
		S-2	10-12	12-15-12-10		13'
					Med. dense wet white fine sand tr. to some silt	
15'						
		S-3	15-17	6-7-12-14		17'
20'						
		S-4	20-22	14-13-17-20	Dense wet white F/C sand tr. silt	
25'						
		S-5	25-27	16-27-29-31	Dense wet tan to brn. C/F sand tr. silt	
30'						
		S-6	30-32	16-17-13-8	Dense wet layered tan and white C/F sand	32'
35'					Test Boring Complete at 32'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller R. Barber

Helper _____ NLI 001 1892

NLI 001 1893

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-03261-0

APPLICATION NO. _____

COUNTY Salem

30-23-446

WELL RECORD

1. OWNER Tomah Products Inc. ADDRESS Milton N.J.

Owner's Well No. 10 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Tomah Products Pedricktown N.J.

3. DATE COMPLETED 2-9-84 DRILLER M. Pratt

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 30 Feet

5. CASING: Type PVC Diameter 2 Inches Length 22 Feet

6. SCREEN: Type Cont. Slot Size of Opening .020 Diameter 2 Inches Length 10 Feet

Range in Depth { Top 20 Feet / Bottom 30 Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 2-9-84 Yield 20 Gallons per minute

Static water level before pumping 3.4 Feet below surface

Pumping level 9 feet below surface after 1 hours pumping

Drawdown 5.6 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal Pump How measured Air measured Cont.

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG attached Are samples available? yes
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA H.P. Drilling Inc.

14. DATA OBTAINED BY M. Pratt Date 2-9-84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30 23446

30-3261

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS — WATER WELLS — PERCOLATION TESTS — MONITORING WELLS

Client [illegible] & Miller, Inc. Date 2-7-[illegible]

Project [illegible] Products Job No. [illegible]

Boring No. Sheet No. [illegible] of [illegible] Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	[illegible]	TO
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		[illegible]-1	[illegible]-2	[illegible]	Loose moist brn. [illegible] tr. silt	[illegible]
[illegible]					Very dense [illegible] brn. [illegible] F/C sand, tr. [illegible] gravel & silt	
		[illegible]-2	5-7	[illegible]		
[illegible]					Clay layers [illegible] dense wet tan brn. [illegible] sand M/F gravel, tr. silt, [illegible] clay	
		[illegible]-3	10-12	[illegible]		
[illegible]						
		[illegible]-4	15-17	[illegible]	[illegible] dense wet	
					[illegible] dense wet [illegible] containing M/F sand [illegible]	
		[illegible]-5	20-22	[illegible]		
[illegible]					Dense moist tan to white [illegible] sand, tr. silt	
		[illegible]-6	25-27	[illegible]		
		[illegible]-7	30-32	[illegible]	[illegible] dense wet	
[illegible]		[illegible]-8	32-34	[illegible]	Dense wet brn. & tan clay w/tr. [illegible] sand & m.f gravel	[illegible]
					Test Boring Complete at [illegible]	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller [illegible]

Helper NLI 001 1894

30.23.446

NLI 001 1895

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3262-8

APPLICATION NO. _____

COUNTY Salem

30.23.446

WELL RECORD

1. OWNER Tomah Products INC ADDRESS Milton NJ
   Owner's Well No. 11 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Tomah Products Pedricktown N.J.
3. DATE COMPLETED 2-6-84 DRILLER M Pruitt
4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 24 Feet
5. CASING: Type PVC Diameter 2 Inches Length 17 Feet
6. SCREEN: Type Cont Slot Size of Opening 0.20 Diameter 2 Inches Length 10 Feet
   Range in Depth { Top 14 Feet / Bottom 24 Feet } Geologic Formation _____
   Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 2-9-84 Yield 1.5 Gallons per minute
   Static water level before pumping 5.1 Feet below surface
   Pumping level 24 feet below surface after 1 hours pumping
   Drawdown 18.9 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped Centrifugal Pump How measured Pre measured well
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG attached Are samples available? yes see back
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA H.P. Drilling INC.
14. DATA OBTAINED BY M Pruitt Date 2-9-84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30-23.446

30-3262

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client: Geraghty & Miller, Inc. Date: 2-6-84

Project: Terra Products Job No. 747

Boring No. 12 Sheet No. 1 of 1 Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	Hollow Stem Auger	TO
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S-1	0-2	3-3-4-3	Loose moist brn. M/F sand, tr. silt Dr. brn. M/F sand, tr. silt	
5'		S-2	5-7	6-10-15-1[illegible]	Med. dense damp dr. brn. M/F sand & F/C gravel, tr. silt	
10'		S-3	10-12	5-9-12-1[illegible]	Med. dense wet gray w/lit. brown f/c sand, tr. M/F gravel, tr. silt	
15'		S-4	15-17	6-9-11-10	Med. dense wet	
20'		S-5	20-22	13-1[illegible]-1[illegible]-13	Dense wet gray M/F sand, tr. silt	
25'		S-6	25-27	1-5-12-13	Stiff moist dr. gray clay	
30'					Test Boring Complete at 27'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller: M. Tracht

Helper: NLI 001 1896

NLI 001 1897

30.23.446

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

30.23.446

PERMIT NO. 30-03274

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Tomah Products Inc ADDRESS Milton N.J.

   Owner's Well No. 12-S SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Tomah Products Pedricktown N.J.

3. DATE COMPLETED 2-8-84 DRILLER R. Harrison

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 40 Feet

5. CASING: Type PVC Diameter 2 Inches Length 23 Feet

6. SCREEN: Type Cont Slot Size of Opening .020 Diameter 2 Inches Length 20 Feet

   Range in Depth { Top 20 Feet / Bottom 40 Feet } Geologic Formation _____

   Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 2-9-84 Yield 20 Gallons per minute

   Static water level before pumping 2.6 Feet below surface

   Pumping level 6.4 feet below surface after 1 hours pumping

   Drawdown 3.8 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

   How pumped Centrifugal Pump How measured Pre Measured Cont.

   Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

   Type _____ Mfrs. Name _____

   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No _____

    Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG attached Are samples available? yes see back

    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA H.P. Drilling Inc.

14. DATA OBTAINED BY R. Harrison Date 2-9-84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23 44 6 30-3274

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS — WATER WELLS — PERCOLATION TESTS — MONITORING WELLS

Client Geraghty & Miller, Inc. Date 2-8-84

Project Tomah Products Job No. 747

Boring No. 12-5 Sheet No. 1 of 2 Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	A Rotary	0 TO 41'
[illegible]				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
					Brn. F/C sand & M/F gravel. Fill	2'
					Blk. silty F/C sand (sludge)	3'
5'					Wet gray F/M clayey silty sand	
		S-1	5-7	5-8-8-12		[illegible]
10'					Wet brn. F/M sand. tr. silt	
		S-2	10-12	5-10-14-20		
15'						15'
		S-3	15-17	4-7-11-13	Wet brn. F/C sand, tr. silt tr. gray clay	
20'						
		S-4	20-22	6-10-20-27	Same	
25'						25'
		S-5	25-27	5-10-15-16	Wet gray & tan F/M sand Tr. silt	
30'						30'
		S-6	30-32	15-27-35-33	Wet tan & gray F/C sand, tr. silt	
35'						
		S-7	35-37	4-15-15-14		
						39'
40'					Gray & brn. silty clay, some f/c sand	40'

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller R. Harrison

Helper NLI 001 1898

30.23.446

30-3274

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS — WATER WELLS — PERCOLATION TESTS — MONITORING WELLS

Client: [illegible] & Miller, Inc. Date:

Project: [illegible] Products Job No. 747

Boring No. [illegible] Sheet No. [illegible] of 2 Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE		TO
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					Test Boring Complete at [illegible]	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller: [illegible]

Helper: NLI 001 1899

Coord: 3023446

Form DWR-138
11/80

FOR MONITORING PURPOSES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3657

APPLICATION NO.

COUNTY Salem

WELL RECORD

1. OWNER TOMAH PRODUCTS, INC. ADDRESS 1012 TERRA DRIVE

Owner's Well No. OW-13 SURFACE ELEVATION _____ Feet (Above mean sea level)

Lot: RA Block: 37 Municipality: Oldmans

2. LOCATION _____

3. DATE COMPLETED 4-10-85 DRILLER HP Drilling, Inc.

4. DIAMETER: Top 4" inches Bottom 4" inches TOTAL DEPTH 28' Feet

5. CASING: Type Sch 40 P.V.C. Threaded Diameter 4" Inches Length 5 Feet

6. SCREEN: Type Sch 40 Threaded Cont. Slot Size of Opening .015 Diameter 4" Inches Length 25 Feet

Range in Depth { Top 3' Feet / Bottom 28' Feet } Geologic Formation _____

Tail Piece: Diameter N.A. Inches Length N.A. Feet

7. WELL FLOWS NATURALLY No Gallons per minute at N.A. Feet above surface

Water rises to N.A. Feet above surface

8. RECORD OF TEST: Date 4-10-85 Yield 50 Gallons per minute

Static water level before pumping 5.0 Feet below surface

Pumping level 13' feet below surface after 2 hrs. hours pumping

Drawdown 8' Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal How measured Premeasured Container

Observed effect on nearby wells No

9. PERMANENT PUMPING EQUIPMENT:

Type None Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG See Attached Are samples available? yes (see Attached)

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA H.P. Drilling Inc

14. DATA OBTAINED BY Ronnen Barber. Date 4-10-85

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.

NLI 001 1900

30-23-446

30-3657

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client Geraghty & Miller, Inc. Date 4/10/85

Project Tomah Job No. 920

Boring No. OM 13 Sheet No. 1 of 1 Ground Surface Elev.

GROUND WATER DATA				METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE		A Rotary	0 TO 32'
					TO
					TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S-1	0-2'	3-3-6-5	Med dense moist brn. changing to gray M/F sand, some silt	
5'		S-2	5-7'	5-11-12-14	Med. dense wet gray interbedded layers of gray fine sand and silt	3'
10'		S-3	10-12'	13-18-19-20	Brn. C/F sand 8-9', tr. to some M/F gravel Dense wet gray M/F sand, some silt	
15'		S-4	15-17'	9-10-15-22	Med dense wet gray M/F sand, some silt, tr. clay with small lenses of clayey silt ¼-½"	
20'		S-5	20-22'	10-9-16-21	Med dense wet gray C/F sand, tr. M/F gravel, some silt, tr. clay tr. fine clayey silt lenses	
25'		S-6	25-27'	17-25-30-40	Dense wet lt. gray to white M/F sand	29'
30'		S-7	30-32'	10-10-11-15	Hard damp tan clayey silt, tr. lenses very fine sand tr. fine sand	32'
35'					Test Boring Complete 32'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller P. Barber

Helper

NLI 001 1901

30-23-412 / /
30-1136

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1136
Application No. _____
County _____

WELL RECORD

NLI 001 1902

1. OWNER B.F. GOODRICH Co. ADDRESS 3135 EUCLID AVE, CLEVELAND OHIO
   Owner's Well No. TEST WELL #1 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION CLIMANS TWP, SALEM COUNTY, N.J.
3. DATE COMPLETED 5-11-67 DRILLER LAYNE NEW YORK Co INC
4. DIAMETER: top 8 Inches Bottom 6 Inches TOTAL DEPTH 182 Feet
5. CASING: Type STEEL Diameter 8 Inches Length 157 Feet
6. SCREEN: Type AZMCO Size of Opening SHUTTER Diameter 6 Inches Length 20 Feet
   Range in Depth { Top 157 172 Feet / Bottom 167 182 Feet } SPLIT SCREEN Geologic Formation SEE REVERSE SIDE
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 5-26-67 Yield 151 Gallons per minute
   Static water level before pumping 22 Feet below surface
   Pumping level 79 feet below surface after 8 hours pumping
   Drawdown 57 Feet Specific Capacity 2.65 Gals. per min. per ft. of drawdown
   How Pumped TURBINE How measured ORIFICE
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR TEST AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temp. _____ °F
12. LOG SEE REVERSE SIDE Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA LAYNE NEW YORK Co. INC
14. DATA OBTAINED BY LAYNE NEW YORK Co INC Date 8/8/67

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special [illegible])

30-23-412
30-1136

0-2	RED SAND
2-5	BROWN SAND
5-11	YELLOW MUDDY SAND
11-12	WHITE CLAY
12-16	YELLOW SAND
16-19	YELLOW SAND, BLUE CLAY & BOULDERS
19-68	BLUE & BROWN CLAY FINE SANDY STKS
68-88	COARSE WHITE SAND SOME LARGE GRAVEL
88-89	WHITE CLAY
89-105	FINE TO MEDIUM SAND & LIGHT STKS OF WHITE CLAY
105-134	RED CLAY & STKS OF WHITE SANDY CLAY
134-139	SANDY CLAY
139-170	FINE TO COARSE SAND MIXED LIGHT GRAVEL
170-172	WHITE CLAY
172-182	FINE TO COARSE SAND MIXED LIGHT GRAVEL
182-193	CLAY
193-194	HARD STK (NOT BOULDERS)
194-216	WEATHERED ROCK
216-234	SAND & GRAVEL
234-241	WEATHERED YELLOW SCHIST
241-247	WEATHERED GREEN SCHIST

NLI 001 1903

(3)

30.23.412

30.23.412 — 30-1137

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1137
Application No. _____
County _____

WELL RECORD

NLI 001 1904

1. OWNER B.F. GOODRICH ADDRESS 3135 EUCLID AVE, CLEVELAND OHIO
   Owner's Well No. TEST WELL #2 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION OLDMANS TWP, SALEM COUNTY, N.J.
3. DATE COMPLETED 5/20/67 DRILLER LAYNE-NEW YORK CO. INC.
4. DIAMETER: top 8 Inches Bottom 6 Inches TOTAL DEPTH 154 Feet
5. CASING: Type STEEL Diameter 8 Inches Length 134 Feet
6. SCREEN: Type ARMCO Size of Opening SHUTTER Diameter 6 Inches Length 20 Feet
   Range in Depth { Top 134 Feet, Bottom 154 Feet } Geologic Formation SEE REVERSE SIDE
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 5/25/67 Yield 201 Gallons per minute
   Static water level before pumping 17 Feet below surface
   Pumping level 35 feet below surface after 8 hours pumping
   Drawdown 18 Feet Specific Capacity 11.15 Gals. per min. per ft. of drawdown
   How Pumped TURBINE How measured ORIFICE
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR TEST WELL AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temp. _____ °F
12. LOG SEE REVERSE SIDE Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA LAYNE NEW YORK CO. INC.
14. DATA OBTAINED BY LAYNE NEW YORK CO. INC. Date 8/7/67

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of ...)

Geo... (3)

30-23.412
30-1137

0-5	BROWN SAND
5-14	YELLOW SAND
14-15	RED CLAY
15-19	SAND STKS OF CLAY & BOULDERS
19-25	BLUE CLAY
25-35	WHITE SAND & STKS OF WHITE CLAY
35-38	BROWN CLAY & SAND
38-86	RED & WHITE SANDY CLAY
86-102	FINE TO MED. SAND W/LIGHT STKS CLAY
102-152	FINE TO COARSE SAND W/ONE LIGHT STKS OF CLAY
152-160	SANDY CLAY & GRAVEL
160-164	CLAY
164-180	FINE TO MED. SAND
180-184	CLAY
184-201	FINE TO MED. SAND & VERY HEAVY GRAVEL
201-209	WEATHERED YELLOW MICA SCHIST
209-220.5	YELLOW GRAY & GREEN MICA SCHIST (HARD @ 220.5')

NLI 001 1905

30-23.~~412~~ 1-1 3c 1138
4-2

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-113
Application No. _____
County _____

WELL RECORD

NLI 001 1906

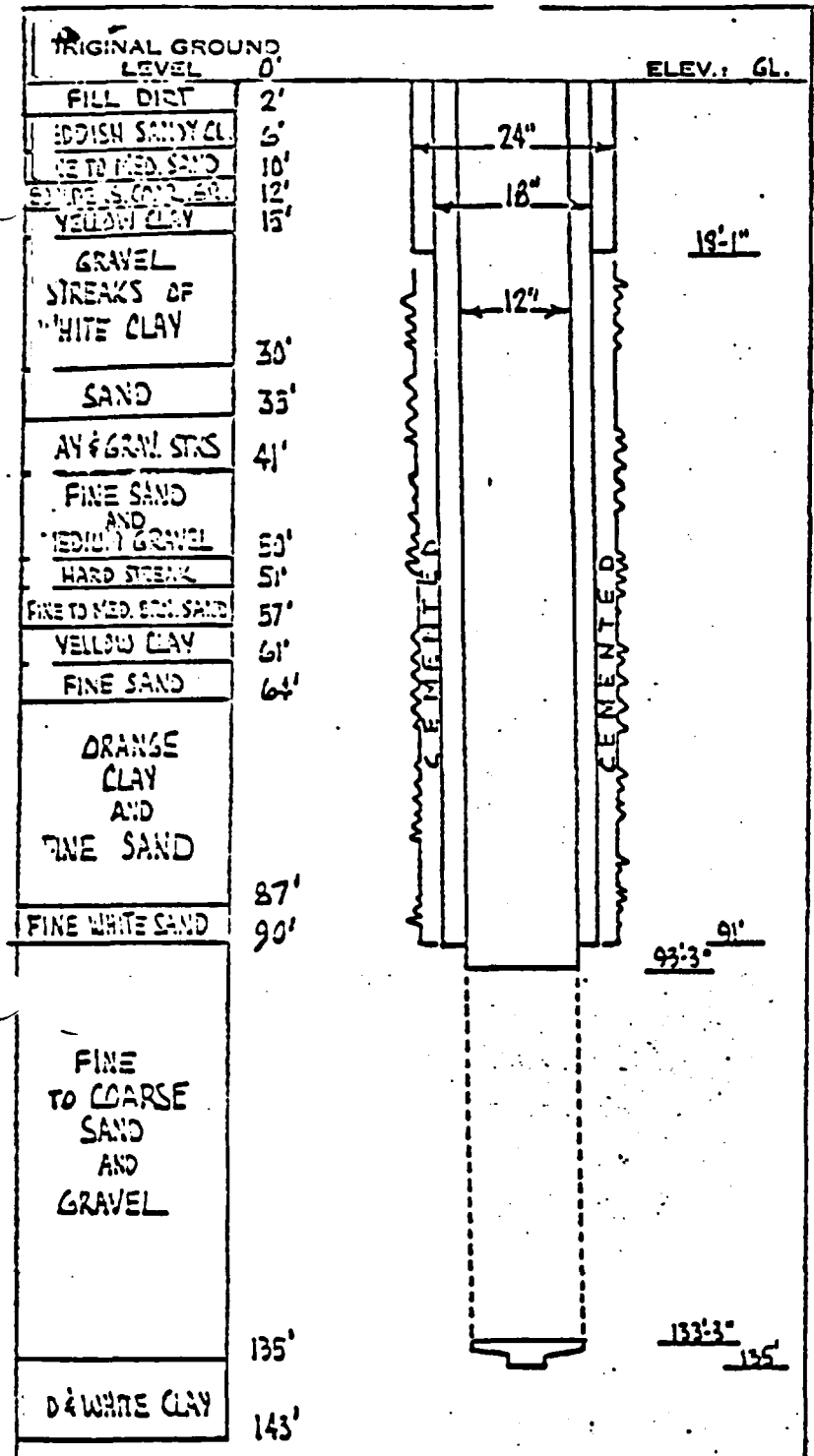
1. OWNER B.F. GOODRICH CO. ADDRESS 3135 EUCLID AVE, CLEVELAND, OHIO
   Owner's Well No. TEST WELL #3 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION ALLOWAYS TWP, SALEM COUNTY, N.J.
3. DATE COMPLETED 5-22-67 DRILLER LAYNE NEW YORK CO. INC
4. DIAMETER: Top 8 Inches Bottom 6 Inches TOTAL DEPTH 95 Feet
5. CASING: Type STEEL Diameter 8 Inches Length 85 Feet
6. SCREEN: Type ARMCO Size of Opening SLOTTED Diameter 6 Inches Length 10 Feet
   Range in Depth { Top 85 Feet, Bottom 95 Feet } Geologic Formation SEE REVERSE SIDE
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 6-3-67 Yield 151 Gallons per minute
   Static water level before pumping 11 Feet below surface
   Pumping level 55 feet below surface after 8 hours pumping
   Drawdown 44 Feet Specific Capacity 3.43 Gals. per min. per ft. of drawdown
   How Pumped TURBINE How measured ORIFICE
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR TEST AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temp. _____ °F
12. LOG SEE REVERSE Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA LAYNE NEW YORK CO. INC
14. DATA OBTAINED BY LAYNE NEW YORK CO. INC Date 8-8-67

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special equipment.)

30.23412
30-1138

0-2	RED SAND
2-5	BROWN SAND
5-11	YELLOW MUDDY SAND
11-12	WHITE CLAY
12-16	YELLOW SAND
16-21	YELLOW SAND, BLUE CLAY & BOULDERS
21-30	GRAY SAND STKS OF LIGNITE & BLUE CLAY
30-64	BLUE CLAY & STKS OF GRAY SAND
64-88	WHITE FINE TO COARSE SAND & GRAVEL
88-89	CLAY
89-105	FINE TO MEDIUM WHITE SAND & LIGHT STKS OF CLAY
105-111	RED & WHITE CLAY

NLI 001 1907



30-1136
30-1137
30-1138

Loc 30-23-4-1-2

MATERIAL

PIPE: 135' OF 24" DIAM x 3/8" WALL BLACK STEEL PIPE WELDED
93' OF 18" DIAM x 3/8" WALL BLACK STEEL PIPE WELDED
93'-3" OF 12" DIAM x 3/8" WALL BLACK STEEL PIPE T&C

SCREEN: 40' OF 12" DIAM LAYNE STAINLESS STEEL SHUTTER #6

PLUG: NLI 001 1908

GRAVEL: 11 TONS OF 3-6

SEAL: CEMENT GROUT TO 91'

PUMP

SIZE 10"	NUMBER 60201
STAGES 4	TYPE RKHC
SETTING 94'-2" TO SF.	COLUMN 6" x 5' & 10' CPLD.
TUBING NONE W.L.	SHAFTING 1 3/16"
BOWLS CAST IRON ENAMELLED	IMPELLERS BRONZE
IMP. SHAFT 303 STAINLESS	SUCTION 9'-3" OF 6"
STRAINER NONE	PRESS. B.P.
HEAD TF-618	AIR LINE 89'-SP

MOTOR

MAKE GE	TYPE K-VHS
VOLTS 230/460	CYCLE 60
PHASE 3	AMP. 75/38
H. P. 30	RPM 1760
FRAME B286TP12	NON REV. YES
MODEL 5K6238X818	SERIAL NO. AEJ115468
UPPER BRG. 540349 3P11	LOWER BRG. 629A310AEP1

GEAR DRIVE

MFG.	MODEL
RATIO	SERIAL NO.
HVY. THRUST	NON-REV.

ENGINE

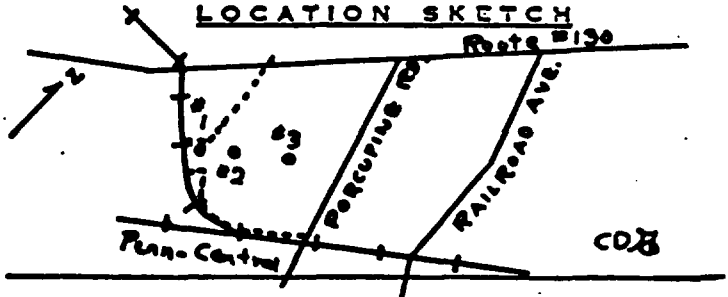
MFG.	MODEL
RPM	CONTINUOUS H. P.
FUEL	SERIAL NO.

WELL

STARTED 8-16-68	CLEAR DEPTH
FIRST TEST 8-21-68	METHOD STD. ROTARY
FINAL TEST	GUAR. CAP.
ACCEPTED	GUAR. PRESS.
B. P. ELEV.	FORMATION
DIST. TO G.W.	DRILLER J. DRAGA

DATE	8-25-68				
STATIC LEV.	8'				
PRODUCTION	402 GPM				
PUMP. LEVEL	60'				
WATER TEMP.					

LOCATION SKETCH



LAYNE-NEW YORK CO. INC. - LINDEN, N. J.
WATER SUPPLY CONTRACTORS
B.F. GOODRICH CO. PEDRICKTOWN, N.J.

DRAWN BY NM
LAYNE WELL # 1
STATE #
CUSTOMER WELL # 1

FORM 87

30-23-~~179~~ 412 ☐ 30-1139

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1139
Application No. _____
County _____

WELL RECORD

NLI 001 1909

1. OWNER B.F. GOODRICH ADDRESS 3135 EUCLID AVE, CLEVELAND OHIO
   Owner's Well No. TEST WELL #4 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION THOROFARE TWP, SALEM COUNTY, N.J.
3. DATE COMPLETED 6-10-67 DRILLER LAYNE NEW YORK CO. INC
4. DIAMETER: top 8 Inches Bottom 6 Inches TOTAL DEPTH 189 Feet
5. CASING: Type STEEL Diameter 8 Inches Length 169 Feet
6. SCREEN: Type ARMCO Size of Opening SHUTTER Diameter 6 Inches Length 20 Feet
   Range in Depth { Top 169 Feet / Bottom 189 Feet } Geologic Formation SEE REVERSE SIDE
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR TEST WELL _____ AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temp. _____ °F
12. LOG SEE REVERSE SIDE Are Samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA LAYNE NEW YORK CO. INC
14. DATA OBTAINED BY LAYNE NEW YORK CO. INC Date 8/21/67

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

30.23.412
30-1139

0-1	TOP SOIL
1-5	RED SAND
5-12	WHITE MUDDY SANDY CLAY
12-15	ROCKS GRAVEL & RIVER MUD
15-17	BROWN CLAY
17-37	GREY CLAY & LIGNITE
37-44	FINE TO COARSE GRAY SAND
44-63	FINE TO COARSE GRAY SAND & STKS OF GRAY & WHITE CLAY
63-67	SANDY WHITE CLAY
67-72	SAND FINE TO COARSE (BROWNISH)
72-77	SANDY CLAY
77-78	RED CLAY
78-86	FINE TO COARSE SAND (BROWNISH)
86-90	WHITE CLAY
90-109	FINE TO COARSE SAND (BROWNISH)
109-140	CLAY RED & WHITE SANDY
140-151	SANDY CLAY MIXED WITH GRAVEL
151-161	TOUGH RED CLAY WITH SAND STKS
161-179	FINE TO COARSE YELLOW SAND
179-180	CLAY
180-191	FINE TO COARSE YELLOW SAND
191-193	CLAY
193-194	WHITE SAND & GRAVEL
194-196	CLAY
196-200	WHITE SAND & GRAVEL
200-209	CLAY
209-231	WEATHERED SCHIST & GRAVEL
231-233	HARD ROCK

30-23-~~179~~ 412 32-1146

Form 87.

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1140
Application No. _____
County _____

WELL RECORD

NLI 001 1911

1. OWNER B.F. GOODRICH Co ADDRESS 3135 EUCLID AVE, CLEVELAND, OHIO
   Owner's Well No. TEST WELL #5 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION ALDMANS TWP, SALEM COUNTY, N.J.
3. DATE COMPLETED 6-14-67 DRILLER LAYNE NEW YORK Co. INC
4. DIAMETER: top _____ Inches Bottom _____ Inches TOTAL DEPTH 223 Feet
5. CASING: Type _____ Diameter _____ Inches Length _____ Feet
6. SCREEN: Type _____ Size of Opening _____ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR TEST WELL AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temp. _____ °F
12. LOG SEE REVERSE SIDE Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA LAYNE-NEW YORK Co. INC
14. DATA OBTAINED BY LAYNE-NEW YORK Co. INC Date 8-8-67

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

30.23.412
30-1140

0-1	TOP SOIL
1-4	FINE TO MED. YELLOW SAND
4-8	SANDY YELLOW CLAY
8-18	FINE TO COARSE SAND, GRAVEL, STKS WHITE CLAY
18-24	BLUE & BROWN CLAY
24-43	FINE TO COARSE SAND, GRAVEL, STKS WHITE CLAY
43-65	FINE TO COARSE SAND, GRAVEL, STKS YELLOW & WHITE CLAY
65-145	TOUGH RED & WHITE CLAY, STKS CEMENTED SAND, GRAVEL
145-165	MULTI COLOR CLAYS, STKS CEMENTED SAND, GRAVEL
165-186	MULTI COLOR SANDY CLAYS, SAND & GRAVEL
186-201	MULTI COLOR SANDY CLAYS, STKS CEMENTED SAND, GRAVEL
201-223	MULTI COLOR SANDY CLAYS (WEATHERED ROCK)

30-23-[illegible] 412

AM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1141
Application No. _____
County _____

WELL RECORD

NLI 001 1913

1. OWNER B F Goodrich Co ADDRESS 3135 Euclid Ave, Cleveland, Ohio
Owner's Well No. Test Well #6 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Oldmans Twp Salem County, N.J.

3. DATE COMPLETED 6-14-67 DRILLER Layne New York Co. Inc.

4. DIAMETER: top 8 Inches Bottom 6 Inches TOTAL DEPTH _____ Feet

5. CASING: Type Steel Diameter 8 Inches Length 168 Feet

6. SCREEN: Type Armco Size of Opening Shutter Diameter 6 Inches Length 20 Feet
Range in Depth { Top 107 Feet, Bottom 127 Feet } Geologic Formation See Remarks Side
Tail piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 6-26-67 Yield 304 Gallons per minute
Static water level before pumping 10 Feet below surface
Pumping level 57 feet below surface after 48 hours pumping
Drawdown 47 Feet Specific Capacity 6.47 Gals. per min. per ft. of drawdown
How Pumped Turbine How measured Orifice
Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:
Type _____ Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inche

10. USED FOR Test Well AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
Taste _____ Odor _____ Color _____ Temp. _____ °F

12. LOG See Remarks Side Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA Layne New York Co. Inc.

14. DATA OBTAINED BY Layne New York Co. Inc. Date 8-8-67

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

30.23.412
30-1141

0-5	RED SAND
5-28	WHITE & GRAY CLAY, STRS OF COARSE SAND & GRAVEL
28-32	COARSE WHITE SAND
32-38	WHITE SANDY CLAY
38-43	FINE TO COARSE WHITE SAND
43-47	WHITE & YELLOW CLAY, LIGHT STRS OF SAND
47-64	FINE TO COARSE PACKED SAND
64-89	RED & WHITE CLAY
89-96	SAND
96-98	CLAY
98-130	FINE TO COARSE BROWN SAND
130-165	RED & WHITE SANDY CLAY
165-175	FINE TO COARSE BROWN SAND
175-179	SANDY CLAY
179-200	FINE TO COARSE BROWN SAND
200-204	MULTICOLORED SANDY CLAY
204-229	YELLOW & GREEN WEATHERED ROCK
229-231	HARD ROCK

NLI 001 1914

Form [illegible] 4-138
11

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3023176

PERMIT NO. ~~30-3729~~

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER B.F. GOODRICH CO. CHEMICAL ADDRESS PEDRICKTOWN FACILITY
   Owner's Well No. OW 7 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION ~~Lot: 15 Block: 38 Municipality: Oldmans Twp.~~
3. DATE COMPLETED 6/19/85 DRILLER HP Drilling, Inc.
4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 28 Feet
5. CASING: Type PVC Diameter 4 Inches Length 20 Feet
6. SCREEN: Type Cont. Slot Size of Opening .020 Diameter 4 Inches Length 10 Feet
   Range in Depth { Top 18 Feet / Bottom 28 Feet } Geologic Formation _____
   Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 6/19/85 Yield 20 Gallons per minute
   Static water level before pumping 4 Feet below surface
   Pumping level 11 feet below surface after 1 hours pumping
   Drawdown 7 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped Cent. Pump How measured Pic measured Cont.
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA HP Drilling Inc.
14. DATA OBTAINED BY R. Barber Date 6/19/85

NLI 001 1915

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23 176 30 3729

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client B. F. Goodrich — Date 6/19/85

Project Pedricktown Facility — Job No. 947

Boring No. CW-7 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE		
[illegible]			1 Rotary	0 TO 32'
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S-1	0-2'	4-3-12-25	Brn. M/F sand, some blk. M/F sand (fill) Med. dense	2'
5'		S-2	5-7'	7-9-9-11	Brn. M/F sand, tr. silt Med. dense wet brn. M/F sand, tr. coarse sand, silt	
10'		S-3	10-12'	8-13-14-22	Med. dense wet	
15'		S-4	15-17'	12-15-16-20	Dense wet tan M/F sand, tr. silt	17.5'
					White silty clay	18.5'
20'		S-5	20-22'	10-15-21-25	Dense wet C/F shite to tan sand, some silt, tr. clay	
						21.5'
25'		S-6	25-27'	4-6-22-25	Stiff moist white sandy silty cl.	26'
					White fine to M/F sand, some silt with silty clay layers	28'
30'		S-7	30-32'	18-24-37-40		
35'					Dense moist lt. gray to off white very fine sand and silt with silty clay layers	32'
					Test Boring Complete At 32'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller R. Barber

Helper _____ NLI 001 1916

Form DWR-'38
11/90

Coord: 3023176

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3730

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER B.F. GOODRICH CO. CHEMICAL ADDRESS PEDRICKTOWN FACILITY

Owner's Well No. OW 8 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 15 Block: 38 Municipality: Oldmans Twp.

3. DATE COMPLETED 6/20/85 DRILLER HP Drilling, Inc.

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 27 Feet

5. CASING: Type PVC Diameter 4 Inches Length 19 Feet

6. SCREEN: Type Cont. Slot Size of Opening .020 Diameter 4 Inches Length 10 Feet

Range in Depth { Top 17 Feet / Bottom 27 Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 6/20/85 Yield 30 Gallons per minute

Static water level before pumping 5.5 Feet below surface

Pumping level 10 feet below surface after _____ hours pumping

Drawdown 4.5 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Cent. Pump How measured Pipe measured cont.

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type N.A Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No _____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1917

13. SOURCE OF DATA H.P. Drilling Inc.

14. DATA OBTAINED BY R. Barker Date 6/20/85

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30-23176 30-3730

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client B. F. Goodrich — Date 6/20/35

Project Fedricktown Facility — Job No. 947

Boring No. OW-3 — Sheet No. 1of1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	A Rotary	0 TO 32'
3.5'				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S-1	0-2'	4-13-10-7	Med. dense damp brn. F/M sand, some silt	
5'						
		S-2	5-7'	4-7-9-9	Med dense wet gray fine sand, some silt	
10'						10'
		S-3	10-12'	4-4-5-6	Tough moist gray fine sandy silty clay	
						14'
15'		S-4	15-17'	4-4-11-21	Brn fine sand & silt with clay, med. dense lenses ~~Gray F/M sand, tr. coarse sand,~~ silt	16.5'
20'		S-5	20-22'	12-21-31-40	Dense wet gray F/coarse sand, tr. to some silt	
25'		S-6	25-27'	10-16-20-26	Dense wet white F/M sand, tr. silt	
30'		S-7	30-32'	10-14-17-22	Dense wet white F/M sand, some silt	32'
35'					Test Boring Complete At 32'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller R. Barber

Helper NLI 001 1918

Form DWR - 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3023176

PERMIT NO. 30-3731

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER B.F. GOODRICH CO. CHEMICAL ADDRESS PEDRICKTOWN FACILITY

Owner's Well No. OW9 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 15 Block: 38 Municipality: Oldmans Twp.

3. DATE COMPLETED 6/19/85 DRILLER HP Drilling, Inc.

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 30 Feet

5. CASING: Type PVC Diameter 4 Inches Length 22 Feet

6. SCREEN: Type Cont. Slot Size of Opening .020 Diameter 4 Inches Length 10 Feet

Range in Depth { Top 20 Feet / Bottom 30 Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 6/19/85 Yield 35 Gallons per minute

Static water level before pumping 5.83 Feet below surface

Pumping level 13 feet below surface after 1 hours pumping

Drawdown 7.17 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Cent. Pump How measured Pre measured Cont

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type N.A Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1919

13. SOURCE OF DATA HP Drilling Inc.

14. DATA OBTAINED BY R. Barber Date 6/19/85

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.176 30-3731

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client B. F. Goodrich — Date 6/19/85

Project Pedricktown Facility — Job No. 947

Boring No. MW-9 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	A. Rotary	0 TO 32'
5.33'				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S-1	0-2'	3-9-13-14	Med. dense moist dk. brn. F/M sand, tr. silt	
5'						
		S-2	5-7'	4-7-7-8	Med. dense wet (6.5') dk. brn. F/C sand, tr. silt	
10'						
		S-3	10-12'	9-17-22-21	Dense wet brn. F/C sand, some silt, tr. clay, F/M gravel	
15'						
		S-4	115-17'	10-15-19-25	Dense wet white to tan F/C sand, some silt	
20'						
		S-5	20-22'	4-8-18-22	Med. dense wet white F/M sand, tr. to some coarse sand, silt	
25'						
		S-6	25-27'	7-12-17-19	Med. dense wet white F/M sand, tr. silt, tr. to some coarse sand, silt	
30'						
		S-7	30-32'	13-32-32-41	Very dense wet white sand, tr. clay lenses	32'
35'					Test Boring Complete at 32'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller R. Barber

Helper ____ NLI 001 1920

Form DW - 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3023176

PERMIT NO. 30-3732

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER B.F. GOODRICH CO. CHEMICAL ADDRESS PEDRICKTOWN FACILITY
   Owner's Well No. OW 10 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Lot: 15 Block: 38 Municipality: Oldmans Twp.
3. DATE COMPLETED 6/20/85 DRILLER HP Drilling, Inc.
4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 27 Feet
5. CASING: Type PVC Diameter 4 Inches Length 19 Feet
6. SCREEN: Type Cont Slot Size of Opening .020 Diameter 4 Inches Length 10 Feet
   Range in Depth { Top 17 Feet / Bottom 27 Feet } Geologic Formation _____
   Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 6/20/85 Yield 5 Gallons per minute
   Static water level before pumping 5.83 Feet below surface
   Pumping level 21 feet below surface after _____ hours pumping
   Drawdown 15.17 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped Cent Pump How measured Pre measured Cont
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
    NLI 001 1921
13. SOURCE OF DATA H.P. Drilling Inc
14. DATA OBTAINED BY R. Barber Date 6/20/85

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.176 30 3732

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client B. F. Goodrich — Date 6/20/85

Project Pedricktown Facility — Job No. 947

Boring No. [illegible]-10 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA				METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE		A Rotary	0 TO 32'
5.91'					TO
					TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S-1	0-2'	2-6-8-11	Med. dense damp brn. F/M sand, tr. to some silt	
5'		S-2	5-7'	6-6-6-10	Med. dense moist dk. gray to blk. fine sand some silt	
10'		S-3	10-12'	5-2-3-3	Loose wet brn. fine sand, some silt	
15'		S-4	15-17'	9-12-17-21	Med. dense wet gray C/F sand, tr. to some silt	
20'		S-5	20-22'	5-4-9-10	Med. dense wet dk. gray F/M sand, tr. to some silt	24'
25'		S-6	25-27'	5-8-11-12	Very tough moist beige to gray silty clay	29'
30'		S-7	30-32'	18-19-21-23	Dense wet gray very fine sand, tr. silt	32'
35'					Test Boring Complete At 32'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller R. Barber

Helper

NLI 001 1922

Form DWR- 138
11/85

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3023176

PERMIT NO. 30-3733

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER B.F. GOODRICH CO. CHEMICAL ADDRESS PEDRICKTOWN FACILITY

   Owner's Well No. OW11 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 15 Block: 38 Municipality: Oldmans Twp.

3. DATE COMPLETED 6/21/85 DRILLER HP Drilling, Inc.

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 37 Feet

5. CASING: Type PVC Diameter 4 Inches Length 29 Feet

6. SCREEN: Type Cont Slot Size of Opening .020 Diameter 4 Inches Length 10 Feet

   Range in Depth { Top 27 Feet / Bottom 37 Feet } Geologic Formation _____

   Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 6/21/85 Yield 30 Gallons per minute

   Static water level before pumping 11.25 Feet below surface

   Pumping level 16 feet below surface after 1 hours pumping

   Drawdown 4.75 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

   How pumped Cent. Pump How measured Pre Measured Cont

   Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

   Type N.A. Mfrs. Name _____

   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

    Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

    NLI 001 1923

13. SOURCE OF DATA H.P. Drilling Inc.

14. DATA OBTAINED BY R. Butler Date 6/21/85

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.176 30-3733

Hp Drilling, Inc.

4 Temple Place • P.O. Box 57
National Park, New Jersey 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client B. F. Goodrich — Date 6/20/85

Project Pedricktown Facility — Job No. 947

Boring No. GW-11 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	A Rotary	0 TO 37'
11.[illegible]				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S-1	0-2'	5-5-10-15	Med dense brn. fine sand, some silt	
5'		S-2	5-7'	5-6-8-10	Med. dense moist brn. to tan fine sand and silt	
10'		S-3	10-12'	6-10-5-7	Tough moist brn. silty clay, some C/F sand mixed in	8'
15'		S-4	15-17'	2-3-3-4	Stiff moist gray green clayey silt	
20'		S-5	20-22'	3-4-4-4	Stiff Moist	
25'		S-6	25-27'	4-5-8-9	Tough moist sandy clayey silt	29'
30'		S-7	30-32'	18-22-29-41	Dense wet tan C/F sand, tr. to some silt	
35'		S-8	35-37'	26-41-65-80	Very dense wet	37'
40'					Test Boring Complete At 37'	

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller R. Barber

Helper ____ NLI 001 1924

30.23.178

Form 87-5M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

Permit No. 30-225
Application No. _____
County 30.23.1.7.8

1. OWNER Pan American Refining Corp. ADDRESS 122 East 42nd St., N.Y.C., N.Y.
   Owner's Well No. Formation Test #5 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldmans Township, Salem County
3. DATE COMPLETED June 10, 1953 DRILLER Layne-New York Co. Inc.
4. DIAMETER: Top 5 Inches Bottom 5 Inches TOTAL DEPTH 240 Feet
5. CASING: Type None Diameter _____ Inches Length _____ Feet
6. SCREEN: Type None Size of Opening _____ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece. Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date None Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: None
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR Formation test AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temperature _____ °F
12. LOG See reverse side (Give details on back of sheet or on separate sheet) Are samples available? _____
13. SOURCE OF DATA Layne-New York Co. Inc.,
14. DATA OBTAINED BY Layne-New York Co. Inc. DATE October 2, 1953

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1925

30.23.178
30-225

Each Stratum	Depth of Strata	Formation Found each Stratum
8'	8'	Dark brown sand
14	22	Light brown sand
46	68	Blue clay - streaks gravel
7	75	Coarse white sand & gravel (mixed with clay)
18	93	Coarse white sand & gravel
43	136	Red clay - streaks of sand & gravel
33	169	Coarse brown sand & gravel
59	228	Red clay - mixed with sand & gravel
12	240	Grey sand & mica rock

RECEIVED
OCT 13 1953
Department of Conservation
& Economic Development
Geologic & Top. Survey

NLI 001 1926

(2) 30-23-178 30-23-178

? Per p#30-225

LAYNE-NEW YORK CO., INC.

92 LIBERTY STREET, NEW YORK CITY

LOG OF WELL

Formation #105

Log of Well for: Ford, Bacon & Davis Test No.

Address: Pedricktown, N. J.

Well located at: Pedricktown in County, State of: New Jersey

Date Drilling started: June 3, 1953 Date Test Hole Completed: June 10, 1953

Total depth to bottom of Well: 240' Diameter Test Hole: 5"

Water stands when not pumping: feet inches from the surface of the ground

EACH STRATUM	DEPTH OF STRATA	FORMATION FOUND EACH STRATUM	EACH STRATUM	DEPTH OF STRATA	FORMATION FOUND EACH STRATUM
8'	8'	Dark Brown Sand			
14'	22'	Light Brown Sand			Cape May
46'	68'	Blue Clay - Streaks Gravel			
7'	75'	Coarse White Sand & Gravel (Mixed with Clay)			
18'	93'	Coarse White Sand & Gravel.		Good Formation	Rar
43'	136'	Red Clay - Streaks of Sand & Gravel			
33'	169'	Coarse Brown Sand & Gravel.		Good Formation	
59'	228'	Red Clay - Mixed with Sand & Gravel			
12'	240'	Grey Sand & Mica - Rock			Wis.
		Note: This is only test with no bottom formation just above rock.			

Remarks and opinion of Test

Joe Housh
Driller

NLI 001 1927

30-23-179 Red #

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1137
Application No. P-612
County _____

WELL RECORD

1. OWNER B.F. GOODRICH ADDRESS 3135 EUCLID AVE, CLEVELAND OHIO
Owner's Well No. TEST WELL #2 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION OLDMANS TWP, SALEM COUNTY, N.J.

3. DATE COMPLETED 5/20/67 DRILLER LAYNE-NEW YORK CO. INC

4. DIAMETER: top 8 Inches Bottom 6 Inches TOTAL DEPTH 154 Feet

5. CASING: Type STEEL Diameter 8 Inches Length 134 Feet

6. SCREEN: Type ARMCO Size of Opening SHUTTER Diameter 6 Inches Length 20 Feet

Range in Depth { Top 134 Feet, Bottom 154 Feet } Geologic Formation SEE REVERSE SIDE

Tail piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 5/25/67 Yield 201 Gallons per minute

Static water level before pumping 17 Feet below surface

Pumping level 35 feet below surface after 8 hours pumping

Drawdown 18 Feet Specific Capacity 11.15 Gals. per min. per ft. of drawdown

How Pumped TURBINE How measured ORIFICE

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR TEST WELL AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No. _____

Taste _____ Odor _____ Color _____ Temp. _____ °F

12. LOG SEE REVERSE SIDE Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please forward copy)

13. SOURCE OF DATA LAYNE NEW YORK CO. INC

DATA OBTAINED BY LAYNE NEW YORK CO. INC Date 8/8/67

NLI 001 1928

30.23.179

30-1137

0-5	BROWN SAND
5-14	YELLOW SAND
14-15	RED CLAY
15-19	SAND STKS OF CLAY & BOULDERS
19-25	BLUE CLAY
25-35	WHITE SAND & STKS OF WHITE CLAY
35-38	BOG IRON & SAND
38-86	RED & WHITE SANDY CLAY
86-102	FINE TO MED. SAND W/ LIGHT STKS CLAY
102-152	FINE TO COARSE SAND W/ONE LIGHT STKS OF CLAY
152-160	SANDY CLAY & GRAVEL
160-164	CLAY
164-180	FINE TO MED SAND
180-184	CLAY
184-201	FINE TO MED. SAND & VERY HEAVY GRAVEL
201-209	WEATHERED YELLOW MICA SCHIST
209-220.5	YELLOW GRAY & GREEN MICA SCHIST (HARD @ 220.5')

NLI 001 1928A

30-23-179

Red # 30-1140
30-1140
P-610

DIVISION OF WATER POLICY & SUPPLY

WELL RECORD

County _____

1. OWNER B.F. GOODRICH Co ADDRESS 3135 EUCLID AVE, CLEVELAND, OHIO

Owner's Well No. TEST WELL #5 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION OLDMANS TWP, SALEM COUNTY, N.J.

3. DATE COMPLETED 6-14-67 DRILLER LAYNE NEW YORK Co INC

4. DIAMETER: top _____ Inches Bottom _____ Inches TOTAL DEPTH _____ Feet

5. CASING: Type _____ Diameter _____ Inches Length _____ Feet

6. SCREEN: Type _____ Size of Opening _____ Diameter _____ Inches Length _____ Feet

Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____

Tail pipe: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute

Static water level before pumping _____ Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR TEST WELL AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No. _____

Taste _____ Odor _____ Color _____ Temp. _____ °F

12. LOG SEE REVERSE SIDE Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA LAYNE-NEW YORK Co INC

14. DATA OBTAINED BY LAYNE-NEW YORK Co INC Date 8-8-67

(NOTE: Use other side of this sheet for additional information such as log of strata, analysis of the water, sketch map, diagram of apparatus, drawdown, measurements, etc.)

NLI 001 1929

30.23.179

30-1140

0-1'	TOP SOIL
1-4	FINE TO MED. YELLOW SAND
4-8	SANDY YELLOW CLAY
8-18	FINE TO COARSE SAND, GRAVEL, STKS WHITE CLAY
18-24	BLUE & BROWN CLAY
24-43	FINE TO COARSE SAND, GRAVEL, STKS WHITE CLAY
43-65	FINE TO COARSE SAND, GRAVEL, STKS YELLOW & WHITE CLAY
65-145	TOUGH RED & WHITE CLAY, STKS CEMENTED SAND GRAVEL
145-165	MULTI COLOR CLAYS, STKS CEMENTED SAND, GRAVEL
165-186	MULTI COLOR SANDY CLAYS, SAND & GRAVEL
186-201	MULTI COLOR SANDY CLAYS, STKS CEMENTED SAND, GRAVEL
201-223	MULTI COLOR SANDY CLAYS (WEATHERED ROCK)

NLI 001 1930

30-23-179 Red#

30-114
P42

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

County _____

WELL RECORD

1. OWNER B.F. GOODRICH CO. ADDRESS 3135 EUCLID AVE CLEVELAND, OHIO
Owner's Well No. TEST WELL #6 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION OLDMANS TWP, SALEM COUNTY, N.J.

3. DATE COMPLETED 6-14-67 DRILLER LAYNE NEW YORK CO INC

4. DIAMETER: Top 8 Inches Bottom 6 Inches TOTAL DEPTH _____ Feet

5. CASING: Type STEEL Diameter 8 Inches Length 169 Feet

6. SCREEN: Type ARMCO Size of Opening SHUTTER Diameter 6 Inches Length 20 Feet

Range in Depth { Top 107 Feet, Bottom 127 Feet } Geologic Formation See REVERSE SIDE

Tail piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 6-26-67 Yield 304 Gallons per minute
Static water level before pumping 10 Feet below surface
Pumping level 57 feet below surface after 48 hours pumping
Drawdown 47 Feet Specific Capacity 6.48 Gals. per min. per ft. of drawdown
How Pumped TURBINE How measured ORIFICE
Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:
Type _____ Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR TEST WELL AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
Taste _____ Odor _____ Color _____ Temp. _____ °F

12. LOG SEE REVERSE SIDE Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA LAYNE NEW YORK CO INC

14. DATA OBTAINED BY LAYNE NEW YORK CO INC Date 8-8-67

(Return other side of this sheet for additional information such as list of water bearing zones, type of the water, static and pumping levels, and specific capacity data.)

NLI 001 1931

30.23.17
30-1141

0-5	RED SAND
5-28	WHITE & GRAY CLAY, STKS OF COARSE SAND & GRAVEL
28-32	COARSE WHITE SAND
32-38	WHITE SANDY CLAY
38-43	FINE TO COARSE WHITE SAND
43-47	WHITE & YELLOW CLAY, LIGHT STKS. OF SAND
47-64	FINE TO COARSE PACKED SAND
64-89	RED & WHITE CLAY
89-96	SAND
96-98	CLAY
98-130	FINE TO COARSE BROWN SAND
130-165	RED & WHITE SANDY CLAY
165-175	FINE TO COARSE BROWN SAND
175-179	SANDY CLAY
179-200	FINE TO COARSE BROWN SAND
200-204	MULTICOLORED SANDY CLAY
204-229	YELLOW & GREEN WEATHERED ROCK
229-231	HARD ROCK

NLI 001 1932

30·23·428

FORM 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2145
Application No. _____
County Salem

WELL RECORD

1. OWNER Browning Ferris Co, ADDRESS Drower C, Pedrictown, NJ 08067
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pennsgrove - Pedrictown Rd
3. DATE COMPLETED 2/14/80 DRILLER David Mattus
4. DIAMETER: top 8 inches Bottom 8 inches TOTAL DEPTH 16 Feet
5. CASING: Type PVC Diameter 4 inches Length 6 Feet
6. SCREEN: Type PVC Size of Opening slot Diameter 4 inches Length 10 Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date Did not test Yield _____ Gallons per minute
   Static water level before pumping 3 Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: Did not install
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes _____ No. _____
    Taste Good Odor _____ Color _____ Temp. _____ °F
12. LOG _____ Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
    NLI 001 1933
13. SOURCE OF DATA D'Agostino Well Drilling Inc.
14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

30-23-428

Form 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2146

Application No. _____

County Salem

WELL RECORD

1. OWNER Browning Ferris Co. ADDRESS Drawer C, Iedricktown, NJ 08067

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pennsgrove - pedricktown Rd.

3. DATE COMPLETED 2/14/80 DRILLER David Mattus

4. DIAMETER: top 8 Inches Bottom 8 Inches TOTAL DEPTH 16 Feet

5. CASING: Type Pvc Diameter 4 Inches Length 6 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 4 Inches Length 10 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date Did not test Yield _____ Gallons per minute

Static water level before pumping 5 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT: Did not install

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes _____ No. _____

Taste Good Odor _____ Color _____ Temp. _____ °F

12. LOG _____ Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

NLI 001 1934

13. SOURCE OF DATA D'Agostino Well Drilling

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

30·23·428

Form DW 138
1/80

FOR MONITORING PURPOSES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2558

APPLICATION NO. _____

COUNTY SALEM

WELL RECORD

1. OWNER Browning Ferris Ind. ADDRESS Porcupine Rd P.O Box C Pedricktown, N.J. 08067
2. Owner's Well No. B-19 SURFACE ELEVATION _____ Feet (Above mean sea level)
3. LOCATION Pedricktown, NJ
4. DATE COMPLETED 10-29-81 DRILLER M. Pratt
5. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 17' Feet
6. CASING: Type PVC Diameter 2 Inches Length 9' Feet
7. SCREEN: Type Cont. Slot Size of Opening .012 Diameter 2 Inches Length 5' Feet

   Range in Depth { Top 7' Feet / Bottom 12' Feet } Geologic Formation _____

   Tail Piece: Diameter NA Inches Length _____ Feet
8. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

   Water rises to _____ Feet above surface
9. RECORD OF TEST: Date 10-29-81 Yield 1 Gallons per minute

   Static water level before pumping 5' Feet below surface

   Pumping level 12' feet below surface after _____ hours pumping

   Drawdown 7' Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

   How pumped Centrifugal Pump How measured Are measured Cont.

   Observed effect on nearby wells NA
9. PERMANENT PUMPING EQUIPMENT:

   Type _____ Mfrs. Name _____

   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____

    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG Attached Are samples available? See back
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1935

13. SOURCE OF DATA H.P. Drilling, Inc
14. DATA OBTAINED BY M. Pratt Date 10-29-81

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.428
30-2558

Hp Drilling, Inc.

804 Princeton Avenue • National Park, N.J. 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client: Wehran Engineering — Date: 10-29-81

Project: E.F.I. Chemical Services — Job No. 460

Boring No. B-19 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA				METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	4"	Drilled In Casing	0 TO 17'
					TO
					TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S1	0-2	1-2-2-3	Loose Damp Gray Sandy Top Soil 18" Brn. Fine Sand	3'
5'		A S2	5 7	10-16 15-19	Dense Wet Brn. F/M Sand Little Silt	6'
					Dense Wet Light Gray Green to Dan Brn. Fine Sand Little Clay & Clay Varves	
10'		A S3	10 12	15-7 6-13	Med Dense Wet Light Gray Green Fine Sand Tr. Clay	11.5'
					Stiff Damp Red & White Clay	
15'		S4	15-17	6-16-16-21	Hard Damp	17'
20'					Test Borings Complete at 17'	
25'						
30'						
35'						
40'						

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller: Michael Pratt

Helper: _____

NLI 001 1936

30·23·428

Form DWR-13d
'90

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2559

APPLICATION NO. _____

COUNTY SALEM

FOR MONITORING PURPOSES ONLY

WELL RECORD

1. OWNER Browning Ferris Ind. ADDRESS Porcupine Rd P.O Box C Pedricktown, NJ

Owner's Well No. B-20 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown, NJ

3. DATE COMPLETED 10-29-81 DRILLER M Pratt

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 16 Feet

5. CASING: Type PVC Diameter 2 Inches Length 5 Feet

6. SCREEN: Type Cont. Slot Size of Opening .012 Diameter 2 Inches Length 5 Feet

Range in Depth { Top 3 Feet / Bottom 8 Feet } Geologic Formation _____

Tail Piece: Diameter NA Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 10-29-81 Yield 1 Gallons per minute

Static water level before pumping 2' Feet below surface

Pumping level 7.5 feet below surface after 2 hours pumping

Drawdown 5.5 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal Pump How measured Are measured Cont.

Observed effect on nearby wells NA

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG Attached Are samples available? See back
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1937

13. SOURCE OF DATA H.P. Drilling, Inc

14. DATA OBTAINED BY M. Pratt Date 10-29-81

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.428
30-2559

Hp Drilling, Inc.

804 Princeton Avenue • National Park, N.J. 08063
609-845-6780

TEST BORINGS — WATER WELLS — PERCOLATION TESTS — MONITORING WELLS

Client Wehran Engineering — Date 10-29-81

Project B.F.I. Chemical Services — Job No. 460

Boring No. B20 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	4" Drilled In Casing	0 TO 16'
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S1	0-2	1-0-1-1	Humous (Blk)	5'
5'					Loose Wet Gray Fine Sand Tr. Clay	
		S2	5-7	2-3-4-3		9'
10'					Tough Damp Red & White Clay	
		S3	10-12	2-3-5-8		
		S4	12	10-12		13'
		S4	14	13-17	White Clay Hard Damp	14'
15'		S5	14-16	Push 24"	Tough Damp Red & White Clay	16'
					Test Borings Complete at 16'	
20'						
25'						
30'						
35'						
40'						

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller Michael Pratt

Helper

NLI 001 1938

30·23·428

Form DWR-138
11/80

MONITORING
FOR USES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2560

APPLICATION NO. _____

COUNTY SALEM

WELL RECORD

1. OWNER BROWNING FERRIS IND. ADDRESS PORCUPINE RD P.O BOX C PEDRICKTOWN, NJ 08067

Owner's Well No. B-21 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION PEDRICKTOWN, NJ

DATE COMPLETED 11-2-81 DRILLER M Pratt

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 14' Feet

CASING: Type PVC Diameter 2 Inches Length 7'2" Feet

6. SCREEN: Type Cont. Slot Size of Opening .012 Diameter 2 Inches Length 5.166 Feet

Range in Depth { Top 5 Feet / Bottom 10 Feet } Geologic Formation _____

Tail Piece: Diameter NA Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 11-2-81 Yield .5 Gallons per minute

Static water level before pumping 4.2 Feet below surface

Pumping level 9.5 feet below surface after 2 hours pumping

Drawdown 5.3 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal Pump How measured Air measured Cont.

Observed effect on nearby wells N.A.

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

LOG Monitoring Are samples available? See back
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1939

3. SOURCE OF DATA H.P DRILLING, INC

DATA OBTAINED BY M. PRATT Date 11-2-81

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.428
30-2560

Hp Drilling, Inc.

804 Princeton Avenue • National Park, N.J. 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client Mehran Engineering Date 11-2-81

Project B.F.I. Chemical Services Job No. 460

Boring No. B21 Sheet No. 1 of 1 Ground Surface Elev.

GROUND WATER DATA				METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	4"	Drilled In Casing	0 TO 14'
					TO
					TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S1	0-2	1-0-0-1	Brn Humous & Silt Soft & Moist	3'
5'					Grey White Silty Clay	4.5'
		S2	5-7	6-6-4-3	Loose Wet Grey Fine Sand Tr.Clay & Clay Lenses	9'
10'		S3	10-12	6-7-5-4	Med. Dense Wet Brn. M/F Sand Tr. Coarse Sand Little Silt	12'
		S4	12-14	2-2-3-6	Soft Moist Red & White Clay	14'
15'					Test Boring Complete at 14'	
20'						
25'						
30'						
35'						
40'						

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
– Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller Michael Pratt

Helper

NLI 001 1940

30·23·428

Form DWR: 38
11/70

MONITORING WELLS ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2561

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

OWNER Browning Ferris Ind. ADDRESS Porcupine Rd. PO Box C Pedrick Town N.J. 08067

Owner's Well No. B-17 SURFACE ELEVATION _____ Feet (Above mean sea level)

LOCATION Pedrick Town N.J.

3. DATE COMPLETED 10-29-81 DRILLER M. Pratt

DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 17' Feet

5. CASING: Type PVC Diameter 2 Inches Length 12'2" Feet

SCREEN: Type Cont. Slot Size of Opening .012 Diameter 2 Inches Length 5' Feet

Range in Depth { Top 10 Feet / Bottom 15 Feet } Geologic Formation _____

Tail Piece: Diameter N.A. Inches Length _____ Feet

WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

RECORD OF TEST: Date 10-29-81 Yield 3 Gallons per minute

Static water level before pumping 4'9" Feet below surface

Pumping level 14.5 feet below surface after _____ hours pumping

Drawdown 9.75 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal pump How measured Pre measured Container

Observed effect on nearby wells NA

. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

. LOG Attached Are samples available? See back
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1941

. SOURCE OF DATA H. P. Drilling Inc

14. DATA OBTAINED BY M. Pratt Date 10-29-81

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.428
30-2561

Hp Drilling, Inc.

804 Princeton Avenue • National Park, N.J. 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client Wehran Engineering — Date 10-29-81

Project T.F.I. Chemical Services — Job No. 460

Boring No. B-17 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	4" Drilled In Casing	0- TO 17
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S1	0-2	2-15-17-1[illegible]	Dense Damp Gray Sandy Top Soil 8" Brn. Fine Sand Little Silt	2.5'
5'					Brn. Fine Sand Tr. Some Cobbles Tr. M/F Gravel	5'
		S2	5-7	16-15-18-23	Dense Wet Tan Brn. Fine Sand Tr. M/F Gravel Little Silt	9'
10'		S3	10-12	9-21-21-1[illegible]	Dense Moist Tan Brn. Fine Sand Tr. Clay & White Clay Varves	14
15'		S4	15-17	3-5-10-1[illegible]	Hard Damp Red & White Clay	17
20'					Test Borings Completed at 17'	
25'						
30'						
35'						
40'						

NLI 001 1942

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
– - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller Michael Pratt

Helper

30·23·428

Form DWR-138
1/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2562

APPLICATION NO. _____

COUNTY Salem

FOR MONITORING PURPOSES ONLY

WELL RECORD

OWNER Browning Ferris Ind. ADDRESS P.O. Box C Pecumine Rd. Pedricktown N.J.

Owner's Well No. B 18 SURFACE ELEVATION _____ Feet (Above mean sea level)

LOCATION Pedricktown N.J.

3. DATE COMPLETED 10-28-81 DRILLER M. Pratt

DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 22 Feet

5. CASING: Type PVC Diameter 2 Inches Length 14' Feet

SCREEN: Type Cont. Slot Size of Opening .012 Diameter 2 Inches Length 5' Feet

Range in Depth { Top 12' Feet / Bottom 17' Feet } Geologic Formation _____

Tail Piece: Diameter NA Inches Length _____ Feet

. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

. RECORD OF TEST: Date 10-28-81 Yield .5 Gallons per minute

Static water level before pumping 6'8" Feet below surface

Pumping level 16.5 feet below surface after 2.5 hours pumping

Drawdown 9.84 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal pump How measured Pre measured cont.

Observed effect on nearby wells NA

. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

.. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

. LOG attached Are samples available? See Back
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1943

. SOURCE OF DATA H. P. Drilling Inc.

14. DATA OBTAINED BY M. Pratt Date 10-28-81

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.428
30-2562

Hp Drilling, Inc.

804 Princeton Avenue • National Park, N.J. 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client: Wehran Engineering — Date: 10-28-81

Project: B.F.I. Chemical Services — Job No. 460

Boring No. B-18 — Sheet No. — of — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	4" Drilled In Casing	0 TO 22
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S1	0-2	1-1-1-1	Gray Sandy Top Soil 15" Brn, Fine Sand	
5'		S2	5-7	8-11-16-21	Dense Damp	6.5'
10'		S3	10-12	12-21-24-29	Dense Wet Brn. M/F Sand	14'
15'		S4	15 17	16-21 17-20	Dense Moist Brn Fine Sand W/ Gr White Clay Varves	16.5'
20'		S5	17-19	19-22-30-31	Very Hard Brn. & Red Clay Damp	
		S6	20-22	7-12-15-23	Very Hard Damp	22'
25'					Test Borings Completed at 22'	
30'						
35'						
40'						

NLI 001 1944

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
– - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller: Michael Pratt

Helper:

30·23428

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2569

APPLICATION NO. _____

COUNTY Salem

FOR MONITORING PURPOSES ONLY

WELL RECORD

1. OWNER Browning Ferris Ind. ADDRESS Porcupine Rd P.O. Box C Pedricktown N, NJ 08067
Owner's Well No. B-22 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown, NJ
3. DATE COMPLETED 10-30-81 DRILLER M Pratt
4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 21 Feet
5. CASING: Type PVC Diameter 2 Inches Length 12' Feet
6. SCREEN: Type Cont Slot Size of Opening .012 Diameter 2 Inches Length 5 Feet
Range in Depth { Top 10 Feet, Bottom 15 Feet } Geologic Formation _____
Tail Piece: Diameter NA Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 10-30-81 Yield .5 Gallons per minute
Static water level before pumping 7.15 Feet below surface
Pumping level 14.5 feet below surface after 2.5 hours pumping
Drawdown 7.35 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
How pumped Centrifugal Pump How measured Premeasured Cont
Observed effect on nearby wells NA
9. PERMANENT PUMPING EQUIPMENT:
Type _____ Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG Attached Are samples available? See back
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
NLI 001 1945
13. SOURCE OF DATA H.P. Drilling, Inc
14. DATA OBTAINED BY M. Pratt Date 10-30-81

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.428
30-2569

Hp Drilling, Inc.

804 Princeton Avenue • National Park, N.J. 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELLS

Client: Tehran Engineering — Date: 10-30-81

Project: B.F.I. Chemical Services — Job No. 460

Boring No. B-22 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	4" Drilled In Casing	0 TO 21
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S1	0-2	1-3-3-2	Loose Damp Gray Sandy Top Soil 8" Brn. Fine Sand Little Clay	3'
5'		S2	5-7	18-32-30-26	Dense Wet Light Orange Brn. M/F Sand with Tr. Coarse Sand Tr. Silt	8.5'
10'		S3	10-12	14-18-22-28	Dense Wet Orange Brn. & Gray White M/F Sand Tr. Silt	15'
15'		S4	15-17	7-9-15-18	Hard Damp White Tr. Red Clay	17'
20'		S5	19-21	9-13-21-26	Hard Damp Red & White Clay	21'
					Test Boring Complete at 21'	
25'						
30'						
35'						
40'						

NLI 001 1946

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
— - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller: Michael Pratt

Helper:

30·23·428

Form C R-138
1/80

FOR MONITORING PURPOSES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2570

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Browning Ferris Ind ADDRESS Porcupine RD P.O. Box C Pedricktown, NJ 08067

Owner's Well No. B-23 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown, NJ

3. DATE COMPLETED 10-30-81 DRILLER M. Pratt

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 22' Feet

5. CASING: Type PVC Diameter 2 Inches Length 11' Feet

6. SCREEN: Type Cont slot Size of Opening .012 Diameter 2 Inches Length 5' Feet

Range in Depth { Top 9' Feet / Bottom 14 Feet } Geologic Formation _____

Tail Piece: Diameter NA Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 10-30-81 Yield .5 Gallons per minute

Static water level before pumping 6.23 Feet below surface

Pumping level 13.5 feet below surface after _____ hours pumping

Drawdown 7.27 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped Centrifugal Pump How measured Are measured Cont

Observed effect on nearby wells NA

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG Attached Are samples available? See back
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1947

13. SOURCE OF DATA H.P. Drilling, Inc

14. DATA OBTAINED BY M. Pratt Date 10-30-81

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.428
30-257

Hp Drilling, Inc.

804 Princeton Avenue • National Park, N.J. 08063
609-845-6780

TEST BORINGS – WATER WELLS – PERCOLATION TESTS – MONITORING WELL

Client Wehran Engineering — Date 10-30-81

Project B.F.I. Chemical Services — Job No. 460

Boring No B-23 — Sheet No. 1 of 1 — Ground Surface Elev.

GROUND WATER DATA			METHOD OF ADVANCING BORING	DEPTH
DEPTH	HOUR	DATE	4" Drilled In Casing	0 TO 22
				TO
				TO

DEPTH	CASING BLOWS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE N	SOIL CLASSIFICATION	DEPTH
		S1	0-2	2-3-6-6	Med. Dense Damp Brn. Fine Sandy Top Soil. 12" Brn. Fine Sand	3.5
5'		S2	5-7	13-11-6-8	Med. Dense Wet Gray Fine Sand Tr. Silt	8'
10'		S3	10-12	13-12-15-16	Dense Wet White Fine Some Med. Sand Little Clay	13.
15'		S4A	15	5-11	Hard Damp Red & White Clay	16'
		B	17	17-21	White Clay	17'
20'		S5	17-19	11-22-24-12	Hard Moist White Clay Tr. Some Fine Sand	20'
		S6	20-22	8-9-11-15	Stiff Damp Red & White Clay	22'
25'					Test Boring Complete at 22'	
30'						
35'						
40'						

NLI 001 1948

S - 2" O.D. Split Spoon Sample
U - Undisturbed Sample, 3" Diameter
Ø – - Core Drilling
N - Standard Penetration Resistance per 6" (140# hammer, 30" drop)
N.R. - No Recovery

Driller Michael Pratt

Helper

Form DWR-138
11/

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

30.23.424

WELL RECORD

PERMIT NO. 30-2763
APPLICATION NO.
COUNTY Salem

1. OWNER Browning Feffis Ind. ADDRESS P.O. Box C Porcupine Rd., Pedricktown, N.J. 080
Owner's Well No. 1 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown
3. DATE COMPLETED 3/30/83 DRILLER John O. Murtha, Inc.
4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 87 Feet
5. CASING: Type P.V.C. Diameter 4 Inches Length 77 Feet
6. SCREEN: Type P.V.C. Size of Opening 20 slot Diameter 4 Inches Length 10 Feet
Range in Depth { Top 77 Feet, Bottom 87 Feet } Geologic Formation Cohansey?
Tail Piece: Diameter N/A Inches Length N/A Feet
7. WELL FLOWS NATURALLY N/A Gallons per minute at N/A Feet above surface
Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 3/30/83 Yield 50 Gallons per minute
Static water level before pumping 19 Feet below surface
Pumping level 29 feet below surface after 4 hours pumping
Drawdown 10 Feet Specific Capacity 5 Gals. per min. per ft. of drawdown
How pumped Submersible How measured 50 Gal. drum
Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
Type Submersible Mfrs. Name Flint & Walling
Capacity 50 G.P.M. How Driven Electric H.P. 3 R.P.M. 3600
Depth of Pump in well 63 Feet Depth of Footpiece in well N/A Feet
Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size N/A Inches
10. USED FOR Domestic AMOUNT { Average 3000 Gallons Daily, Maximum 10000 Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes ____ No X
Taste None Odor None Color None Temp. --- °F.
12. LOG See other side Are samples available? No
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
NLI 001 1949
13. SOURCE OF DATA Drillers log
14. DATA OBTAINED BY John O. Murtha Date 5/7/84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

LOG OF WELL:

0	-	13'	Yellow sand & gravel
13	-	16'	White clay
16	-	20'	White sand & some clay
20	-	28'	Coarse yellow sand
28	-	32'	Yellow & white clay
32	-	45'	Red & white clay with sand mixed
45	-	60'	Yellow medium coarse sand
60	-	73'	Red & white clay with some sand
73	-	75'	Coarse sand & gravel
75	-	87'	Coarse orange sand & shale.

RECEIVED

MAY 1 0 1984

N.J. STATE DEPT. OF ENVIRONMENTAL PROTECTION
WATER SUPPLY & WATERSHED MGT. ADM.

NLI 001 1950

30.23.424 Coord: 3023424

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11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3322

APPLICATION NO. _____

COUNTY SALEM

WELL RECORD

1. OWNER Browning Ferris Indus. ADDRESS P.O.Box C, Porcupine Rd.

Owner's Well No. B-3a SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 6A & 7 Block: 37 Municipality: Oldmans Twp.

3. DATE COMPLETED 4/30/84 DRILLER John O. Murtha

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 55 Feet

5. CASING: Type P.V.C. - Threaded Diameter 2 Inches Length 50 Feet

6. SCREEN: Type P.V.C. Size of Opening 15 slot Diameter 2 Inches Length 5 Feet

Range in Depth { Top 50 Feet / Bottom 55 Feet } Geologic Formation Cohansey?

Tail Piece: Diameter N/A Inches Length N/A Feet

7. WELL FLOWS NATURALLY N/A Gallons per minute at N/A Feet above surface

Water rises to N/A Feet above surface

8. RECORD OF TEST: Date 4/30/84 Yield 10 Gallons per minute

Static water level before pumping 19 Feet below surface

Pumping level 21 feet below surface after 2 hours pumping

Drawdown 2 Feet Specific Capacity 5 Gals. per min. per ft. of drawdown

How pumped Centrifical Pump How measured 5 Gal. Bucket

Observed effect on nearby wells None

9. PERMANENT PUMPING EQUIPMENT:

Type N/A Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Observation AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER To be tested Sample: Yes ____ No ____

Taste N/A Odor None Color None Temp. ____ °F.

12. LOG See other side Are samples available? No

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 1951

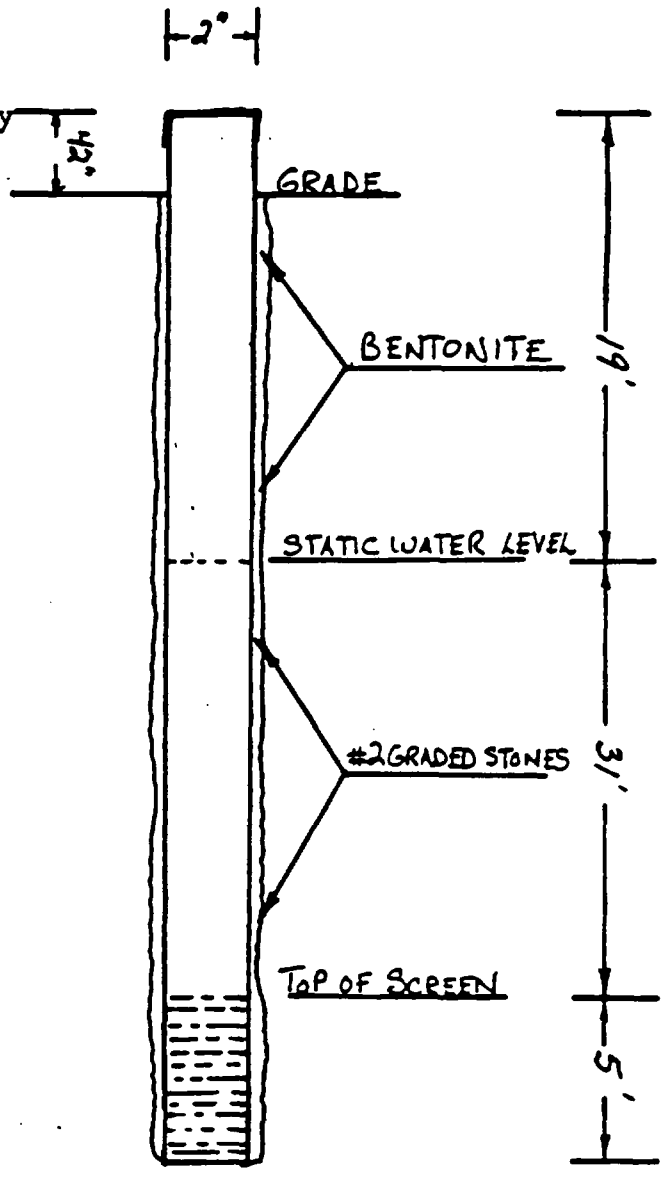
13. SOURCE OF DATA Drillers Log

14. DATA OBTAINED BY John O. Murtha Date 5/7/84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

LOG OF WELL:

0	- 6'	Sand
6	- 11'	Yellow clay
11	- 14'	Coarse white sand
14	- 22'	White sand & white clay
22	- 24'	Medium gravel & clay
24	- 36'	Red & white clay
36	- 41'	White clay
41	- 46'	Yellow clay
46	- 55'	Yellow sand



NLI 001 1952

Form DWR 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3023424

PERMIT NO. 30-3324

APPLICATION NO. _____

COUNTY SALEM

FOR OBSERVATION PURPOSES ONLY

WELL RECORD

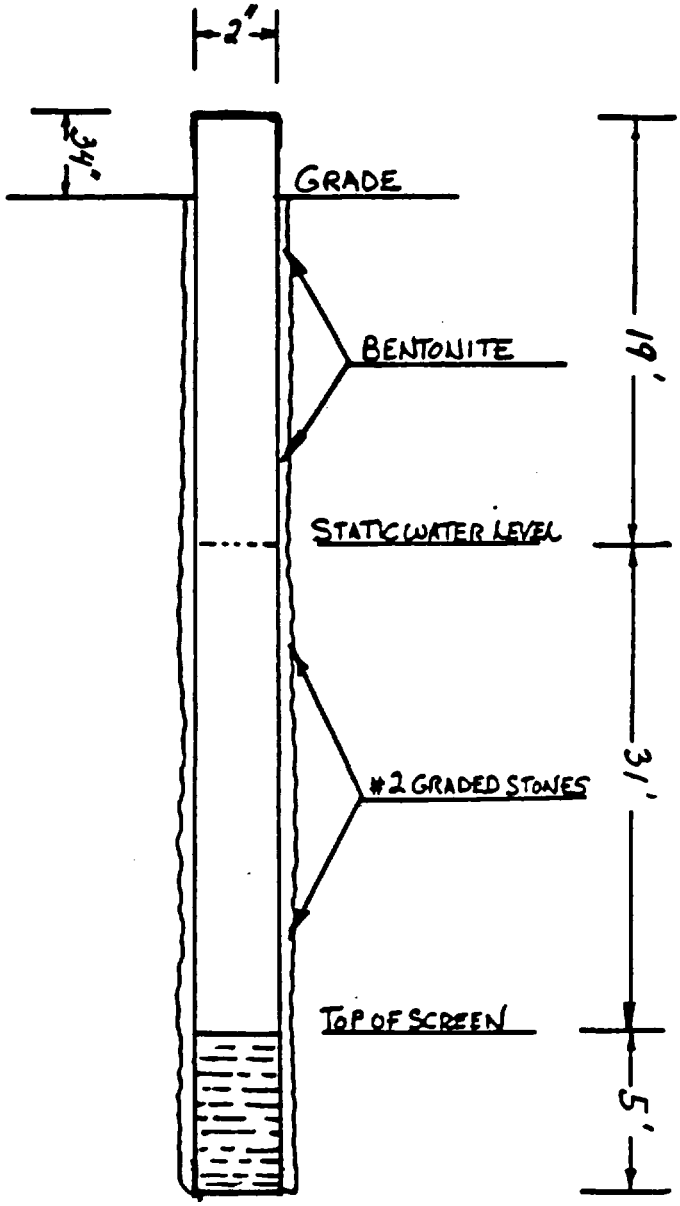
1. OWNER Browning Ferris, Indus. ADDRESS P.O. Box C, Porcupine Rd.
   Owner's Well No. B-2a SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Lot: 6A & 7 Block: 37 Municipality: Oldmans Twsp.
3. DATE COMPLETED 5/2/84 DRILLER John O. Murtha
4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 55 Feet
5. CASING: Type P.V.C. Threaded Diameter 2 Inches Length 50 Feet
6. SCREEN: Type P.V.C. Size of Opening 15 slot Diameter 2 Inches Length 5 Feet
   Range in Depth { Top 50 Feet, Bottom 55 Feet } Geologic Formation Cohansey?
   Tail Piece: Diameter N/A Inches Length N/A Feet
7. WELL FLOWS NATURALLY N/A Gallons per minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 5/2/84 Yield 10 Gallons per minute
   Static water level before pumping 19 Feet below surface
   Pumping level 21 feet below surface after 4 hours pumping
   Drawdown 2 Feet Specific Capacity 5 Gals. per min. per ft. of drawdown
   How pumped Centrifugal Pump How measured 5 Gal. Bucket
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Observation AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER To be tested Sample: Yes ____ No X
    Taste N/A Odor None Color None Temp. _____ °F.
12. LOG Drillers Log - other side Are samples available? No
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Drillers Log
14. DATA OBTAINED BY John O. Murtha Date 5/7/84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1953

LOG OF WELL:

0' - [illegible] sand
55' - [illegible] red & white clay
8'' - 11' yellow clay
11' - 15' sand
15' - 23' coarse sand
23' - 25' sand & clay mixed
25' - 28' sand
28' - 46' red & white clay & sand
46' - [illegible] coarse yellow sand



NLI 001 1954

Coord: 3023424

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3325

APPLICATION NO. _____

COUNTY SALEM

FOR OBSERVATION PURPOSES

WELL RECORD

1. OWNER Browning Ferris Indus. ADDRESS P.O.Box C, Porcupine Rd.

Owner's Well No. B-2Aa SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 6A&7 Block: 37 Municipality: Oldmans Twp.

3. DATE COMPLETED 5-2-84 DRILLER John O. Murtha

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 30 Feet

5. CASING: Type P.V.C. Threaded Diameter 2 Inches Length 20 Feet

6. SCREEN: Type P.V.C. Size of Opening 15 slot Diameter 2 Inches Length 10 Feet

Range in Depth { Top 20 Feet / Bottom 30 Feet } Geologic Formation Cohansey?

Tail Piece: Diameter N/A Inches Length N/A Feet

7. WELL FLOWS NATURALLY N/A Gallons per minute at N/A Feet above surface

Water rises to N/A Feet above surface

8. RECORD OF TEST: Date 5-2-84 Yield 10 Gallons per minute

Static water level before pumping 19 Feet below surface

Pumping level 21 feet below surface after 4 hours pumping

Drawdown 2 Feet Specific Capacity 5 Gals. per min. per ft. of drawdown

How pumped Centrifugal Pump How measured 5 gal. bucket

Observed effect on nearby wells None

9. PERMANENT PUMPING EQUIPMENT:

Type N/A Mfrs. Name N/A

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Observation AMOUNT { Average N/A Gallons Daily / Maximum N/A Gallons Daily }

11. QUALITY OF WATER To be Tested Sample: Yes ____ No X

Taste N/A Odor None Color None Temp. _____ °F.

12. LOG See other side Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

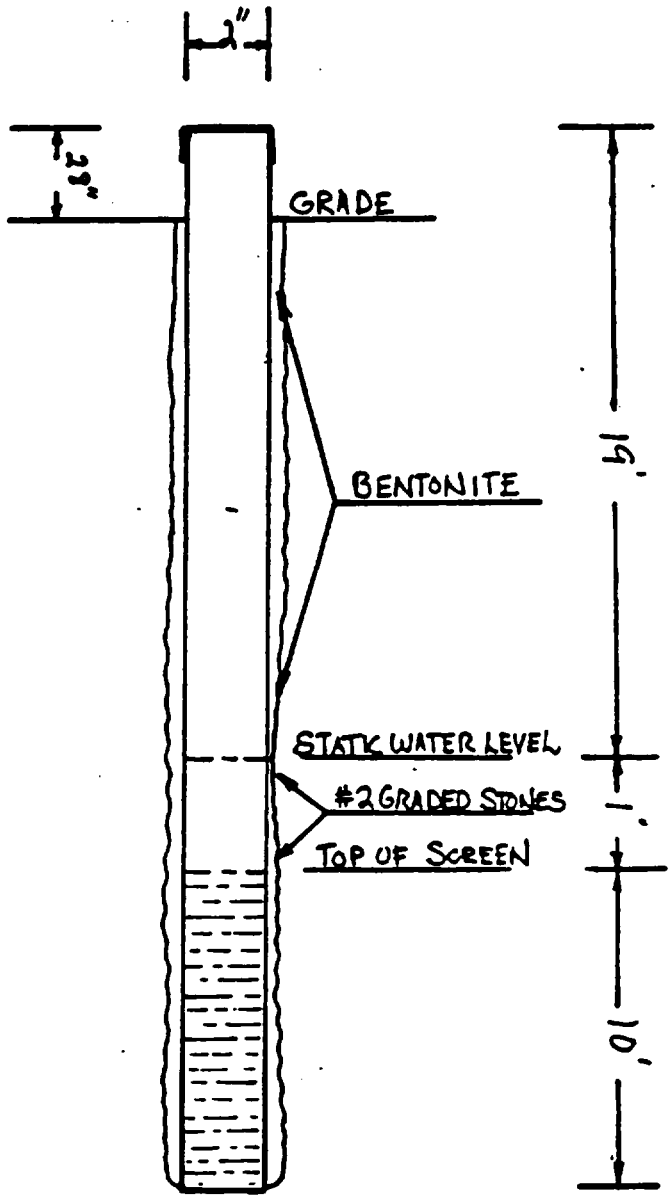
13. SOURCE OF DATA Drillers log NLI 001 1955

14. DATA OBTAINED BY John O. Murtha Date 5/7/84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

LOG OF WELL:

0	-	5'	Sand
5	-	8'	Red & white clay
8	-	11'	Yellow clay
11	-	15'	Sand
15	-	23'	Coarse sand
23	-	25'	Sand & clay mixed
25	-	28'	Coarse sand



NLI 001 1956

DWR-138A
1/88

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 3006064-8
APPLICATION NO. _____
COUNTY _____
COORD. 30-23-4.24

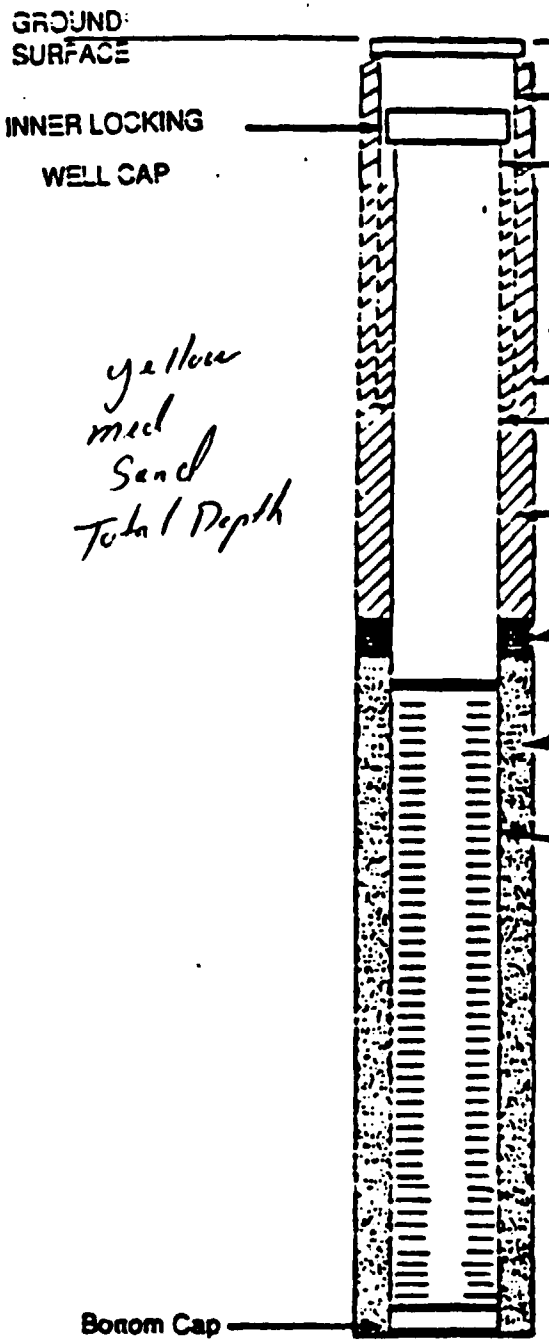
WELL RECORD

1. OWNER NL Industries Inc. ADDRESS P.O. Box 1090 Hightstown, N.J.
   Owner's Well No. MW-16 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pions Grove Rd. Pedricktown, N.J.
3. DATE COMPLETED 9/23/89 DRILLER John Mathes & Assoc. Inc.
4. DIAMETER: Top 10 inches Bottom 10 inches TOTAL DEPTH 55 Feet
5. CASING: Type PVC Diameter 4 Inches Length 45 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 10 Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
   Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 10/3/89 Yield 10 Gallons per minute
   Static water level before pumping 8.5 Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped Submersible How measured Volumetric
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA John Mathes & Assoc. Inc.
14. DATA OBTAINED BY Dermont Dillon Date 11/29/89

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1957

30-06064
30.23.4 4



yellow
med
Sand
Total Depth

Protective Casing 6" Steel Casing

Stickup 2'

Traffic Pad

Well Development 5 KAS

Borehole Diameter 10"

Casing Diameter 4"

Material PVC

Grout Material/Mixture Cement + Bentonite

Setting 0 - 40'

Plug: Material Bentonite Pellets

Setting 40' to 43'

Sandpack: Material Monie

Gradation #2

Setting 43' to 55'

Screen: Material PVC

Length 10

Type Flush Threaded

Opening Size .020

Setting 45' to 55'

Total Boring Depth 55'

NLI 001 1958

DWR-138A
1/88

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 300665-6
APPLICATION NO. _____
COUNTY _____
COORD. 30.23.4.24

WELL RECORD

1. OWNER N.L. Industries Inc. ADDRESS P.O. Box 090 Hightstown N.J.
   Owner's Well No. MW-17 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Ross Grove Rd. Pedricktown, N.J.
3. DATE COMPLETED 7/24/89 DRILLER _____
4. DIAMETER: Top 10 inches Bottom 10 inches TOTAL DEPTH 25 Feet
5. CASING: Type PVC Diameter 4 Inches Length 15 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 10 Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
   Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 10/3/89 Yield 10 Gallons per minute
   Static water level before pumping 8.5 Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped Submersible How measured Volumetric
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA John Mathes & Assoc Inc.
14. DATA OBTAINED BY Dermont Dillon Date 11/29/89

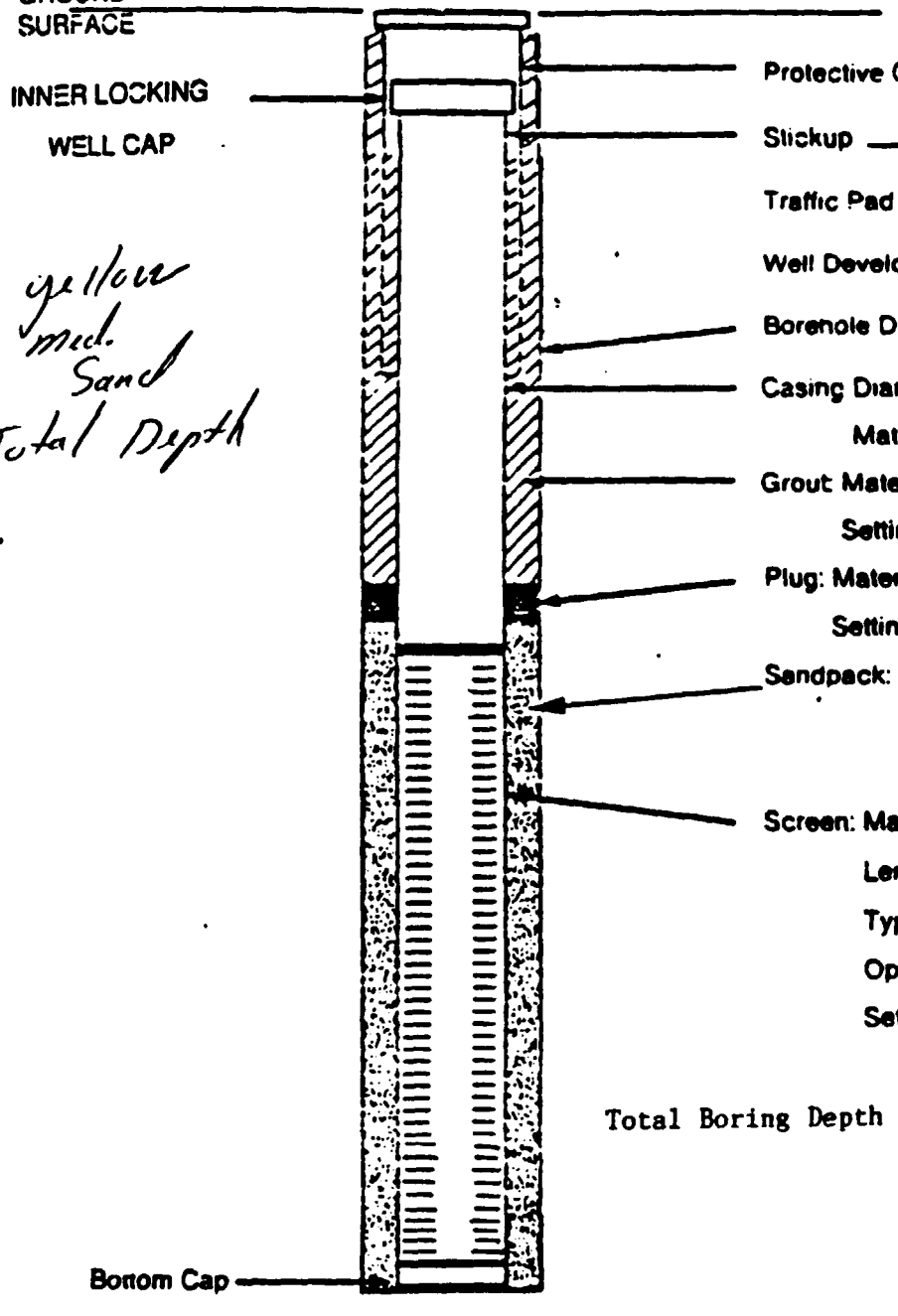
(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1959

30-0606
30.23.42

MONITORING WELL

Mud-17



yellow
med.
Sand
Total Depth

Protective Casing 6" Steel Casing

Stickup 2'

Traffic Pad

Well Development 5 HDS

Borehole Diameter 10"

Casing Diameter 4"

Material PVC

Grout Material/Mixture Cement & Bentonite

Setting 0-11'

Plug: Material Bentonite Pellets

Setting 11' to 13'

Sandpack: Material Morie

Gradation #2

Setting 13' to 25'

Screen: Material PVC

Length 10'

Type Flush Thread

Opening Size .020

Setting 15' to 25'

Total Boring Depth 25'

NLI 001 1960

FORM 07

12/12/78

DEPARTMENT OF ENVIRONMENTAL PROTECTION

30·23·425

Permit No. 30-1870
Application No. _____
County _____

WELL RECORD

1. OWNER Browning Ferris ADDRESS Pedericktown N.J.
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Picerpine Road
3. DATE COMPLETED 12/2/78 DRILLER Robbins Bros.
4. DIAMETER: top 6 inches Bottom 6 inches TOTAL DEPTH 91 Feet
5. CASING: Type Steel Diameter 6 inches Length 81 Feet
6. SCREEN: Type Stainless Steel Size of Opening ___ Diameter 6 inches Length 90 Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation Cohansey
   Tail piece: Diameter _____ inches Length _____ Feet
7. WELL FLOWS NATURALLY NO Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 12/2/78 Yield 15 Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped Air Compressor How measured Meter
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type None Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size ___ inches
10. USED FOR Industrial AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes ___ No. ✓
    Taste None Odor None Color Clear Temp. 54 °F
12. LOG _____ Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA Henry Robbins

NLI 001 1961

14. DATA OBTAINED BY _____ Date 5/9/80

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

EXHIBIT D

SHEET 30
CARPENTER
CLAYMONT
SILVERSIDE
HOLLY OAK
CAARCROFT
BELLEVUE
GORDON HEIGHTS
RIVER SIDE
PEDRICKTOWN
AERO BEACON
FRIENDSHIP
PERKINTOWN
AUBURN
HURCHTOWN
GLENSIDE
39°44'

NLI 001 1963

30-22-615

Form 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2224
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY CORP. OF ENGINEERS ADDRESS 2ND & CHESTNUT STS., PHILA., PA
   Owner's Well No. EHL 1 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ
3. DATE COMPLETED 6/30/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 55 Feet
5. CASING: Type PVC Diameter 4 Inches Length 52 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 5 Feet
   Range in Depth { Top 50' Feet, Bottom 55' Feet } Geologic Formation _____
   Tail pipe: Diameter n/a Inches Length n/a Feet
7. WELL FLOWS NATURALLY n/a Gallons per Minute at n/a Feet above surface
   Water rises to n/a Feet above surface
8. RECORD OF TEST: Date n/a Yield 10 Gallons per minute
   Static water level before pumping n/a Feet below surface
   Pumping level n/a feet below surface after n/a hours pumping
   Drawdown n/a Feet Specific Capacity n/a Gals. per min. per ft. of drawdown
   How Pumped blown How measured bucket
   Observed effect on nearby wells n/a
9. PERMANENT PUMPING EQUIPMENT:
   Type n/a Mfrs. Name n/a
   Capacity n/a G.P.M. How Driven n/a H.P. n/a R.P.M. n/a
   Depth of Pump in well n/a Feet Depth of Footpiece in well n/a Feet
   Depth of Air Line in well n/a Feet Type of Meter on Pump n/a Size ___ Inches
10. USED FOR Observation AMOUNT { Average n/a Gallons Daily, Maximum n/a Gallons Daily }
11. QUALITY OF WATER n/a Sample Yes ___ No. X
    Taste n/a Odor n/a Color n/a Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

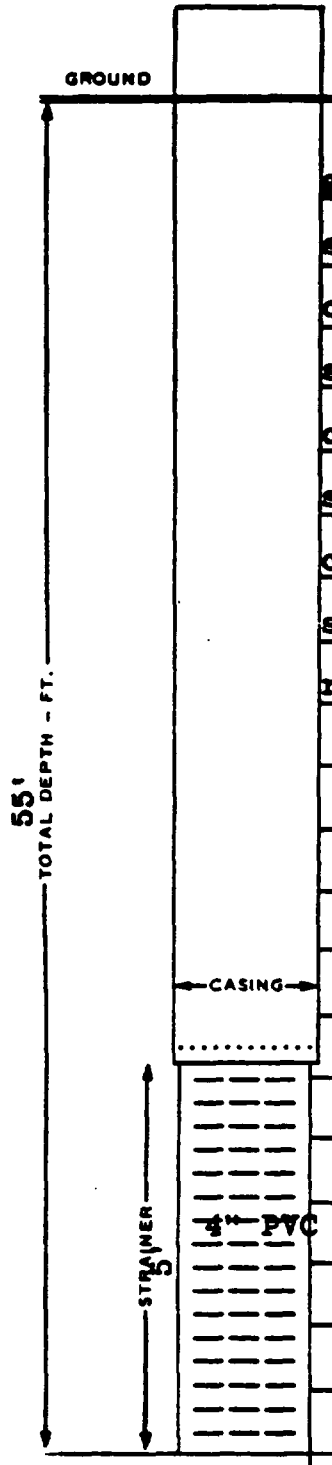
(NOTE: Use other side of this sheet for additional information if needed.)

NLI 001 1964

30-22-615
30-2224

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
gray black clay soft	0 TO 12	U.S. ARMY
sand silty	12 - 16	Job # 18436
clay gray	16 - 24	Location PEDRICKTOWN
sand white	24 - 26	Well No. EHL #1
clay brown	26 - 34	Hrs. Pumped 2 hr. blowed
sand and gravel	34 - 35	Capacity G.P.M. 10#
clay	35 - 44	Static Level 12'0"
sand & gravel, hd.packed	44 - 56	Pumping Level None
river rocks large	56 - 57	Specific Capacity none
		Diameter of Well 4"
		Depth of Well (ground) 55'
		Length of Casing 52'
		Distance to Top of Packer (gr.) non
		Type Screen slotted P C
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting PVC Cplg.
		Bottom Screen Fitting PVC Cap
		Blank None
		Slot Size 20
		Drilling Machine No. 1256 c
		Driller C. Kramer
		Gravel #1
		Bags of Cement 2
		Date Well Completed 6/30/8

NLI 001 1965

Rotary Table approx. 3' above ground level

30-22 615

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2226

Application No. _____

County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY CORP. OF ENGINEERS ADDRESS 2ND & CHESTNUT STS., PHILA., PA

Owner's Well No. EHL 2 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ

3. DATE COMPLETED 7/1/80 DRILLER A. C. SCHULTES & SONS, INC.

4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 25 Feet

5. CASING: Type PVC Diameter 4 Inches Length 20 Feet

6. SCREEN. Type PVC Size of Opening .020 Diameter 4 Inches Length 5 Feet

Range in Depth { Top 20 Feet, Bottom 25 Feet } Geologic Formation _____

Tail piece: Diameter n/a Inches Length n/a Feet

7. WELL FLOWS NATURALLY n/a Gallons per Minute at n/a Feet above surface

Water rises to n/a Feet above surface

8. RECORD OF TEST: Date n/a Yield 10 Gallons per minute

Static water level before pumping n/a Feet below surface

Pumping level n/a feet below surface after n/a hours pumping

Drawdown n/a Feet Specific Capacity n/a Gals. per min. per ft. of drawdown

How Pumped Blown How measured bucket

Observed effect on nearby wells n/a

9. PERMANENT PUMPING EQUIPMENT:

Type n/a Mfrs. Name n/a

Capacity n/a G.P.M. How Driven n/a H.P. n/a R.P.M. n/a

Depth of Pump in well n/a Feet Depth of Footpiece in well n/a Feet

Depth of Air Line in well n/a Feet Type of Meter on Pump n/a Size ___ Inches

10. USED FOR Observation AMOUNT { Average n/a Gallons Daily, Maximum n/a Gallons Daily }

11. QUALITY OF WATER n/a Sample Yes ___ No. X

Taste n/a Odor n/a Color n/a Temp. 58

12. LOG See Attached Are samples available? _____

(Give details of rock or other strata encountered, if electric log see back side)

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

NOTE: Use other side for additional information such as log, etc.

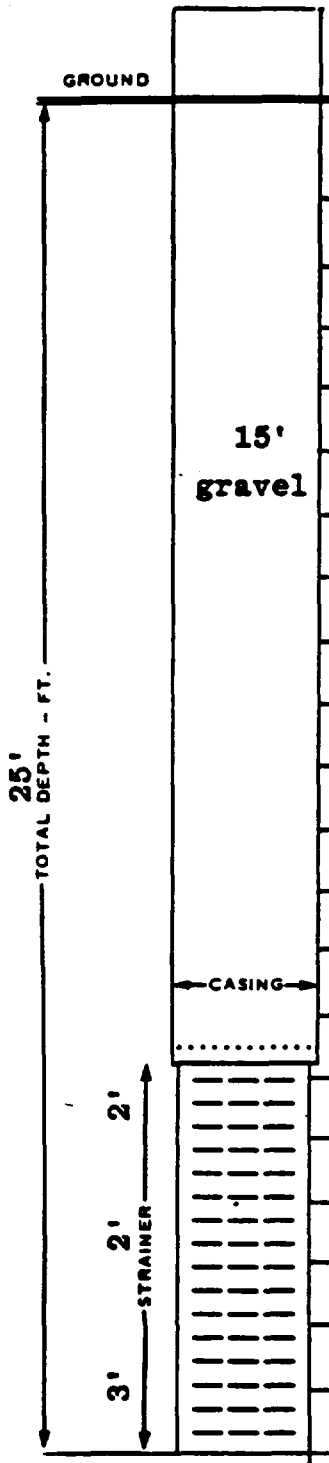
NLI 001 1966

30-22-615

30-2226

R.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
organic material	0 TO 17	U.S. ARMY ENGINEER CORPS.
silty gray sand & clay	17 - 25	Job # 18436
gray silty clay	25 - 42	Location
		Well No. EHL-2
		Hrs. Pumped 4
		Capacity G.P.M.
		Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 25'
		Length of Casing 20'
		Distance to Top of Packer (gr.)
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting PVC
		Bottom Screen Fitting Cap
		Blank 2'
		Slot Size .020
		Drilling Machine No. 6E
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/1/80
		NLI 001 1967

Rotary Table approx. 3' above ground level

30-22-615

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2242
Application No. _____
County _____

WELL RECORD

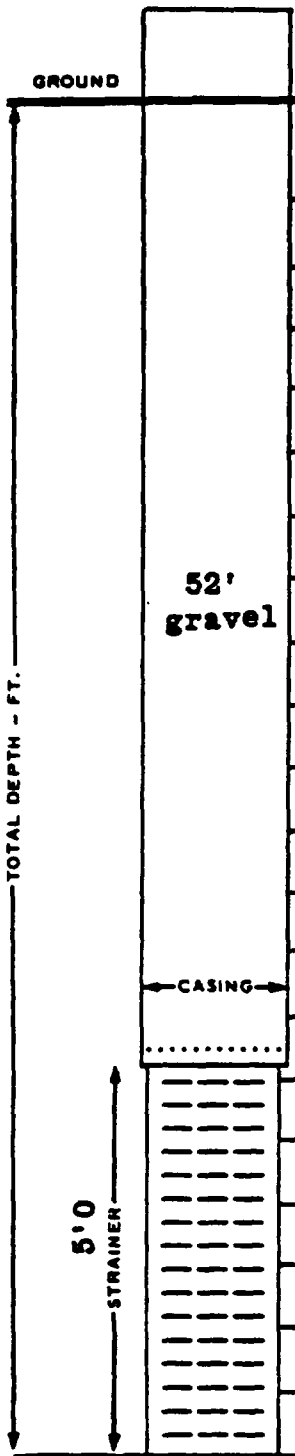
1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut Sts. Phila., Pa.
Owner's Well No. EHW 11 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ Pedricktown
3. DATE COMPLETED 7/10/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 Inches Bottom 4 Inches TOTAL DEPTH ~~82~~ 72 Feet
5. CASING: Type P.V.C. Diameter 4 Inches Length 59' Feet
6. SCREEN: Type P.V.C. Size of Opening ____ Diameter 4 Inches Length 5' Feet
Range in Depth { Top 57' Feet, Bottom 62' Feet } Geologic Formation _____
Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/10/80 Yield 5 Gallons per minute
Static water level before pumping 3' Feet below surface
Pumping level N/A feet below surface after _____ hours pumping
Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
How Pumped Blown How measured Bucket
Observed effect on nearby wells N/A
9. PERMANENT PUMPING EQUIPMENT:
Type N/A Mfrs. Name N/A
Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ____ Inches
10. USED FOR OBSERVATION WELL AMOUNT { Average N/A Gallons Daily, Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ____ No. ____
Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
NLI 001 1968
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

30-22-615
30-2242

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER U.S. ARMY ENGINEERS COR
brown sand	0 TO 8	
red & white clay	8 - 22	Job # 18436
sand	22 - 23	Location Pedricktown
red & white clay	23 - 42	Well No. EHW-11
silty sands	42 - 50	Hrs. Pumped 2-1/2
sand	50 - 67	Capacity G.P.M.
clay	67 - 72	Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 62'0"
		Length of Casing 59'
		Distance to Top of Packer (gr.) -
		Type Screen Plastic
		Size of Screen 4"
		Length of Screen 5'0
		Top Screen Fitting PVC Socket
		Bottom Screen Fitting PVC Ca
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/10/8

Rotary Table approx. 3' above ground level

NLI 001 1969

30-22-6/5

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2236
Application No. _____
County _____

WELL RECORD

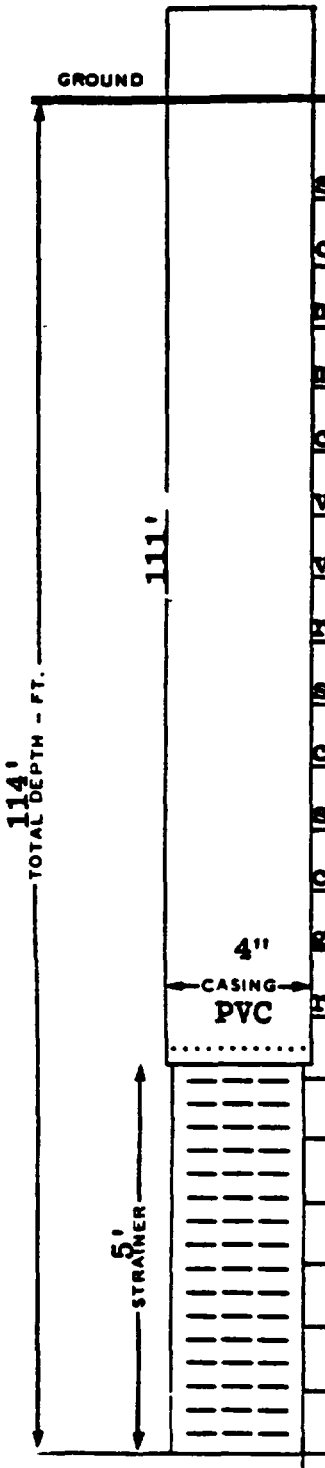
1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG.-2nd & Chestnut Sts. Philadelphia, PA
Owner's Well No. EHW 1 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ
3. DATE COMPLETED 7/16/80 DRILLER A. C. Schultes & Sons, Inc.
4. DIAMETER: top 4" Inches Bottom 4" Inches TOTAL DEPTH 187 Feet
5. CASING: Type P.V.C. Diameter 4" Inches Length 111 Feet
6. SCREEN: Type P.V.C. Size of Opening .20 Diameter 4" Inches Length 5 Feet
Range in Depth { Top 111 Feet, Bottom 116 Feet } Geologic Formation _____
Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/16/80 Yield 10 Gallons per minute
Static water level before pumping 3' Feet below surface
Pumping level N/A feet below surface after _____ hours pumping
Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
How Pumped blown How measured bucket
Observed effect on nearby wells N/A
9. PERMANENT PUMPING EQUIPMENT:
Type N/A Mfrs. Name N/A
Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR Observation AMOUNT { Average N/A Gallons Daily, Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ___ No. X
Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
NLI 001 1970
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. Schultes & Sons, Inc. Date 7/30/80

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

30-22-615
30-22

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
stones, large gravel	0 TO 3	U.S. ARMY
clay greenish	3 - 9	Job # 18436
muck black	9 - 17	Location PEDRICKTOWN
mud gray to black	17 - 75	Well No. EHW #1
clay, some sand	75 - 96	Hrs. Pumped 1 hour
very fine sandy clay	96 - 98	Capacity G.P.M. 10# blowe
very fine sand, gray	98 - 116	Static Level 3'
red and white clay	116 - 122	Pumping Level None
sand fine & clayish	122 - 124	Specific Capacity None
clay, hard	124 - 132	Diameter of Well 4"
sandyish clay	132 - 136	Depth of Well (ground) 187'
clay, red & white weather zone	136 - 178	Length of Casing 111'
gravel & sand weather zone green	178 - 179	Distance to Top of Packer (gr.) None
red weather zone	179 - 193	Type Screen slotted PVC
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting 4" PVC cplg
		Bottom Screen Fitting 4" PVC cpl
		Blank None
		Slot Size 20
		Drilling Machine No. 1256 c
		Driller Alby Hammond
		Gravel #1
		Bags of Cement 2
		Date Well Completed 7/16/80

NLI 001 1971

Rotary Table approx. 3' above ground level

30 - 22 - 615

Form 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2237
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut St Phila, Pa.
   Owner's Well No. EHW 7 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ
3. DATE COMPLETED 7/2/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 42' Feet
5. CASING: Type P.V.C. Diameter 4" Inches Length 39' Feet
6. SCREEN: Type P.V.C. Size of Opening ____ Diameter 4" Inches Length 5' Feet
   Range in Depth { Top 37' Feet, Bottom 42' Feet } Geologic Formation _____
   Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/2/80 Yield 10 Gallons per minute
   Static water level before pumping 3' Feet below surface
   Pumping level N/A feet below surface after _____ hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ____ Inches
10. USED FOR OBSERVATION WELL Average N/A Gallons Daily, Maximum N/A Gallons Daily
11. QUALITY OF WATER N/A Samples for ____ No. XX
    Taste N/A Odor N/A Color N/A Temp. 58
12. LOG See Attached Are samples available? _____
    (Give depth to top of first water bearing zone. If artesian, give depth to top of first water bearing zone)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

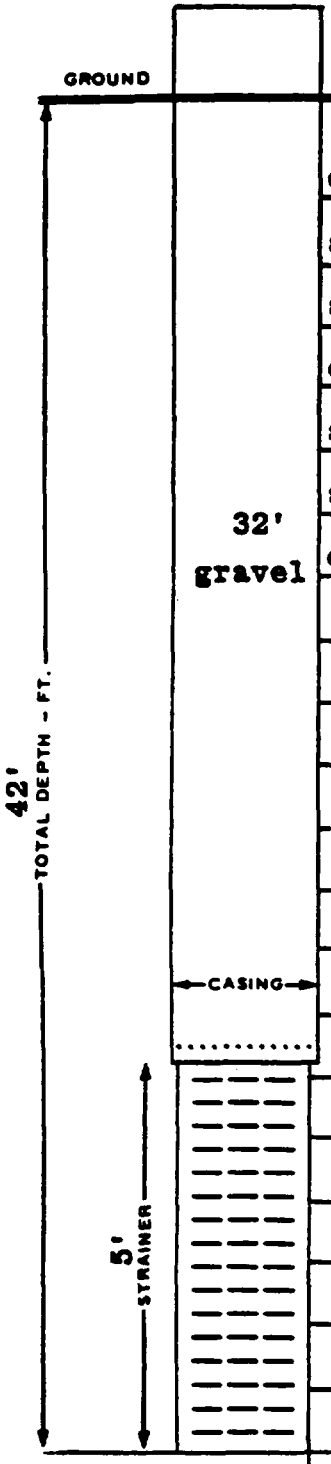
(NOTE: See reverse side for additional information.)

NLI 001 1972

A.C. SCHULTES & SONS, INC.

30-22-615
30-2237

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER U.S. ARMY ENGINEERS COR
organic	0 TO 7	
silty	7 - 12	Job # 18436
silty clay	12 - 17	Location Pedricktc n
clay	17 - 18	Well No. EHW-7
sand & stone	18 - 31	Hrs. Pumped 2
sandish	31 - 43	Capacity G.P.M.
clay	43 - 57	Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 42
		Length of Casing 39'
		Distance to Top of Packer (gr.)
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting PVC Socket
		Bottom Screen Fitting Cap
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/2/80

NLI 001 1973

Rotary Table approx. 3' above ground level

30-22616

Form 57

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2227

Application No. _____

County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY CORP. OF ENGINEERS ADDRESS 2ND & CHESTNUT STS., PHILA., PA

Owner's Well No. EHL 4 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ

3. DATE COMPLETED 7/8/80 DRILLER A. C. SCHULTES & SONS, INC.

4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 37 Feet

5. CASING: Type PVC Diameter 4 inches Length 39 Feet

6. SCREEN: Type PVC Size of Opening .020 Diameter 4 inches Length 5 Feet

Range in Depth { Top 32 Feet, Bottom 37 Feet } Geologic Formation _____

Tail piece: Diameter n/a inches Length n/a Feet

7. WELL FLOWS NATURALLY n/a Gallons per Minute at n/a Feet above surface

Water rises to n/a Feet above surface

8. RECORD OF TEST: Date n/a Yield 10 Gallons per minute

Static water level before pumping n/a Feet below surface

Pumping level n/a feet below surface after n/a hours pumping

Drawdown n/a Feet Specific Capacity n/a Gals. per min. per ft. of drawdown

How Pumped BLOWN How measured BUCKET

Observed effect on nearby wells NONE

9. PERMANENT PUMPING EQUIPMENT:

Type n/a Mfrs. Name n/a

Capacity n/a G.P.M. How Driven n/a H.P. n/a R.P.M. n/a

Depth of Pump in well n/a Feet Depth of Footpiece in well n/a Feet

Depth of Air Line in well n/a Feet Type of Meter on Pump n/a Size _____ Inches

10. USED FOR Observation AMOUNT { Average n/a Gallons Daily, Maximum n/a Gallons Daily }

11. QUALITY OF WATER n/a Sample: Yes ___ No. X

Taste n/a Odor n/a Color n/a Temp. 58

12. LOG See Attached Are samples available? _____

13. SOURCE OF DATA Driller's Log

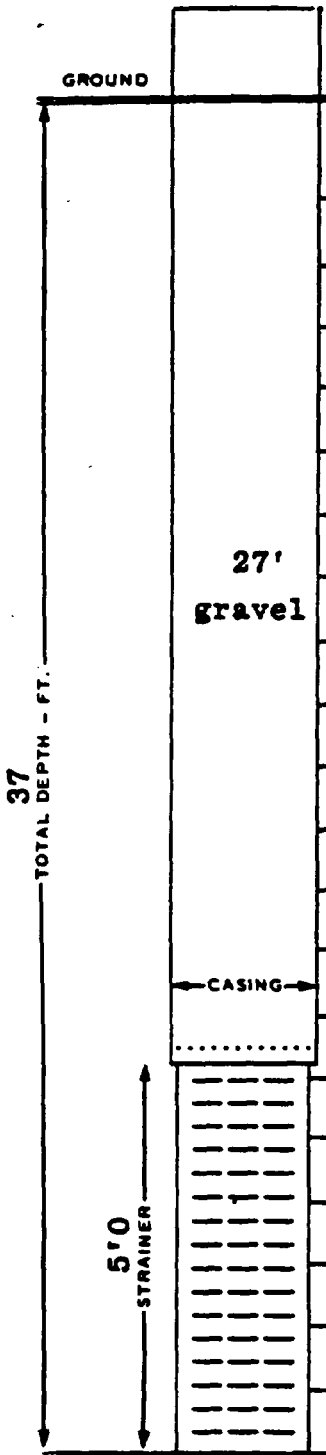
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

NLI 001 1974

30-22-616
30-222

R.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER U.S. ARMY ENGINEERS CORP
sand & peat	0 TO 12	
red clay	12 - 14	Job # 18436
gray clay	14 - 20	Location Pedricktown
sand	20 - 38	Well No. EHL-4
gray clay	38 - 46	Hrs. Pumped 5-1/2
clay & lignite	47 -	Capacity G.P.M.
		Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 37'
		Length of Casing 39'
		Distance to Top of Packer (gr.)
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 50
		Top Screen Fitting PVC Socket
		Bottom Screen Fitting PVC C
		Blank --
		Slot Size .020
		Drilling Machine No. 6
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/8/8
		NLI 001 1975

Rotary Table approx. 3' above ground level

30-22-616

Form 47

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2235
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY CORP. OF ENGINEERS ADDRESS 2ND & CHESTNUT STS. PHILA., PA
   Owner's Well No. EHW 2 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ
3. DATE COMPLETED 7/16/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 Inches Bottom 4 Inches TOTAL DEPTH 68 Feet
5. CASING: Type PVC Diameter 4 Inches Length 63 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 5 Feet
   Range in Depth { Top 63 Feet, Bottom 68 Feet } Geologic Formation _____
   Tail Piece: Diameter N/A Inches Length N/A Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/21/80 Yield 10 Gallons per minute
   Static water level before pumping 8' Feet below surface
   Pumping level N/A feet below surface after N/A hours pumping
   Drawdown N/A Feet Specific Capacity N/A Gals. per min. per ft. of drawdown
   How Pumped blown How measured bucket
   Observed effect on nearby wells none
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR Observation AMOUNT { Average N/A Gallons Daily, Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ___ No. ___
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, attach duplicate copy)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY _____ Date 7/30/80

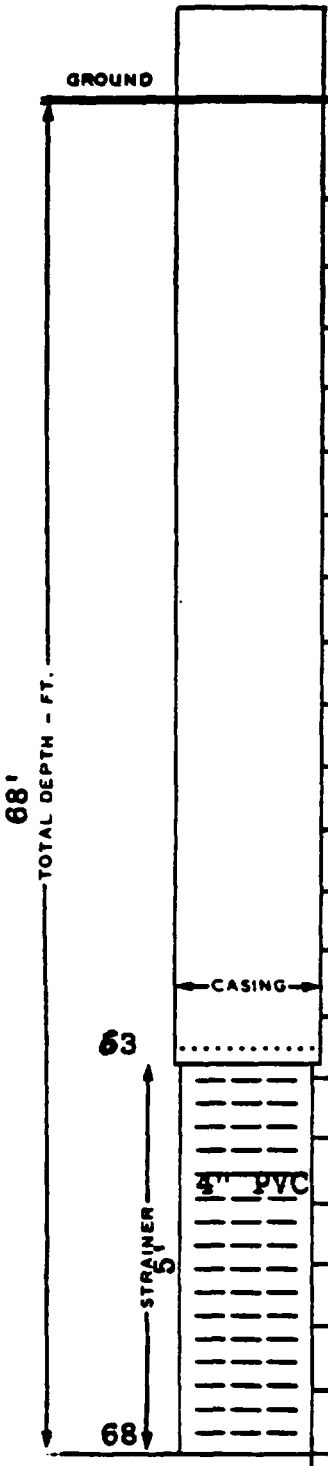
NOTE: Use other side of this sheet for sketch, log, or additional data.

NLI 001 1976

30-22-616
30-2235

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
road fill	0 TO 4	U.S. ARMY
clay red bricks	4 - 6	Job # 18436
plain clay	6 - 9	Location PEDRICKTOWN
mucky clay	9 - 21	Well No. EHW #2
very soft muck	21 - 53	Hrs. Pumped 1½ blowed
sand and stone	53 - 55	Capacity G.P.M. 10#
clay and gravel	55 - 60	Static Level 8'
clay, thin lens of sand	60 - 61	Pumping Level None
clay	61 - 70	Specific Capacity ?
		Diameter of Well 4"
		Depth of Well (ground) 68'
		Length of Casing 65'
		Distance to Top of Packer (gr.) None
		Type Screen slotted PVC
		Size of Screen 4" PVC
		Length of Screen 5'
		Top Screen Fitting PVC Cplg.
		Bottom Screen Fitting PVC Cap
		Blank None
		Slot Size 20
		Drilling Machine No. 1256
		Driller Alby Hammond
		Gravel #1
		Bags of Cement 2
		Date Well Completed 7/21/80
		NLI 001 1977

Rotary Table approx. 3' above ground level

30-22-616

Rev. 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2239
Application No. _____
County _____

WELL RECORD

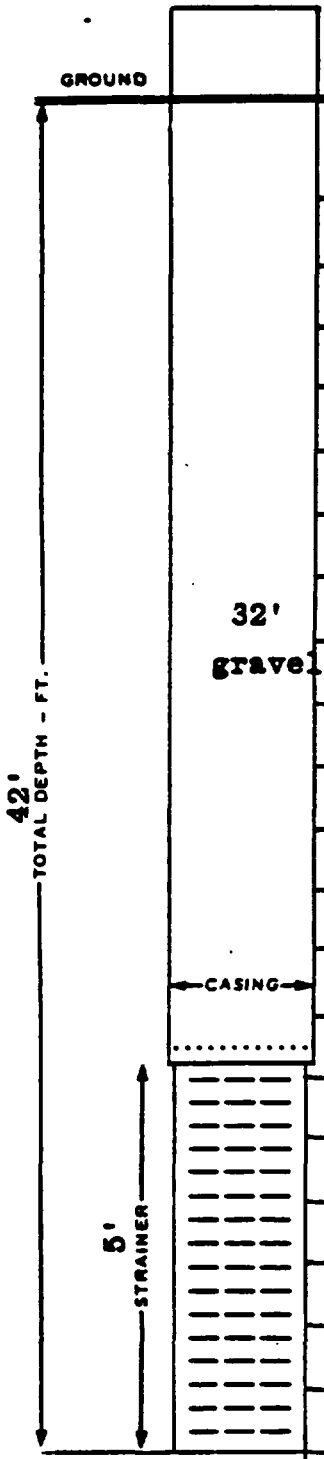
1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut St. Phila., PA
   Owner's Well No. EHW 8 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ
3. DATE COMPLETED 7/3/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 Inches Bottom 4 Inches TOTAL DEPTH 42' Feet
5. CASING: Type P.V.C. Diameter 4" Inches Length 39' Feet
6. SCREEN: Type P.V.C. Size of Opening .020 Diameter 4 Inches Length 5' Feet
   Range in Depth { Top 37 Feet, Bottom 42 Feet } Geologic Formation _____
   Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/3/80 Yield 10 Gallons per minute
   Static water level before pumping 3' Feet below surface
   Pumping level N/A feet below surface after _____ hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells N/A
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR OBSERVATION WELL AMOUNT { Average N/A Gallons Daily, Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ___ No. XX
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
    NLI 001 1978
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

30-22-616
30-2239

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
brown sand	0 TO 7	U.S. ARMY
gravel	7 - 10	Job # 18436
clay	10 - 18	Location Pedricktow
organic & sand	18 - 25	Well No. EHW-8
clay & brown sand	25 - 32	Hrs. Pumped 3
sand	32 - 43	Capacity G.P.M.
red & white clay	43 - 47	Static Level
red clay	47 - 52	Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 42'
		Length of Casing 39'
		Distance to Top of Packer (gr.) --
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting PVC Socket
		Bottom Screen Fitting PVC C[illegible]
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/3/80

NLI 001 1979

Rotary Table approx. 3' above ground level

30 - 22 - 614

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2241
Application No. _____
County _____

WELL RECORD

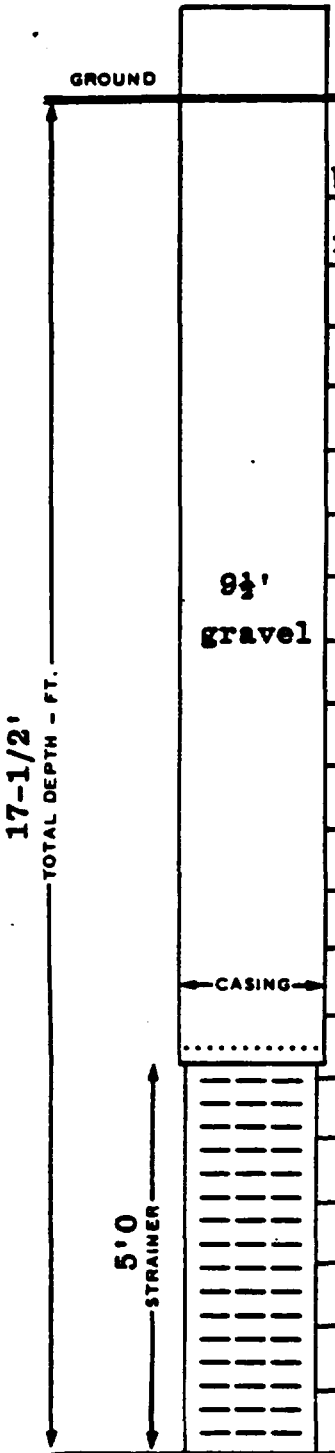
1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut St Phila., PA
   Owner's Well No. EHW 10 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ
3. DATE COMPLETED 7/19/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 18' Feet
5. CASING: Type P.V.C. Diameter 4 inches Length 15 Feet
6. SCREEN: Type P.V.C. Size of Opening ___ Diameter 4 inches Length 5 Feet
   Range in Depth { Top 13 Feet, Bottom 18 Feet } Geologic formation _____
   Tail piece Diameter 0 inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/19/80 Yield 10 Gallons per minute
   Static water level before pumping 4' Feet below surface
   Pumping level N/A feet below surface after _____ hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. Mfr. Driver N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR OBSERVATION WELL Average { N/A Gallons Daily, Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample Taken ___ No. ___
    Taste N/A Odor N/A Color N/A Temp. 58
12. LOG See Attached Are samples available? ___
    (Give details, if more than one aquifer penetrated, attach separate sheet. If electrical log was made, please forward copy.)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80
    (Use reverse side if more space is required.)

NLI 001 1980

A.C. SCHULTES & SONS, INC.

30-22-616
30-224

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER U.S. ARMY ENGINEERS CORP.
brown sand	0 TO 18	
red & white clay	18 - 47	Job # 18436
		Location Pedricktown
		Well No. EHW-10
		Hrs. Pumped 6-1/2
		Capacity G.P.M.
		Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 17-1/2'
		Length of Casing 14-1/2
		Distance to Top of Packer (gr.)
		Type Screen Plastic
		Size of Screen 4"
		Length of Screen 5'0
		Top Screen Fitting PVC Socket
		Bottom Screen Fitting PVC Ca
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/9/8

Rotary Table approx. 3' above ground level

NLI 001 1981

30-22-616

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2243
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut Sts Phila., Pa.
   Owner's Well No. EHW 12 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ
3. DATE COMPLETED 6/26/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4" Inches Bottom 4" Inches TOTAL DEPTH 25' Feet
5. CASING: Type P.V.C. Diameter 4 Inches Length 27' Feet
6. SCREEN: Type P.V.C. Size of Opening .020 Diameter 4 Inches Length 5' Feet
   Range in Depth { Top 20 Feet / Bottom 25 Feet } Geologic Formation _____
   Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 6/26/80 Yield 3 Gallons per minute
   Static water level before pumping 4' Feet below surface
   Pumping level N/A feet below surface after _____ hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells N/A
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A. Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR OBSERVATION WELL AMOUNT { Average N/A Gallons Daily / Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ___ No. X
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet If electric log was made, please furnish copy)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

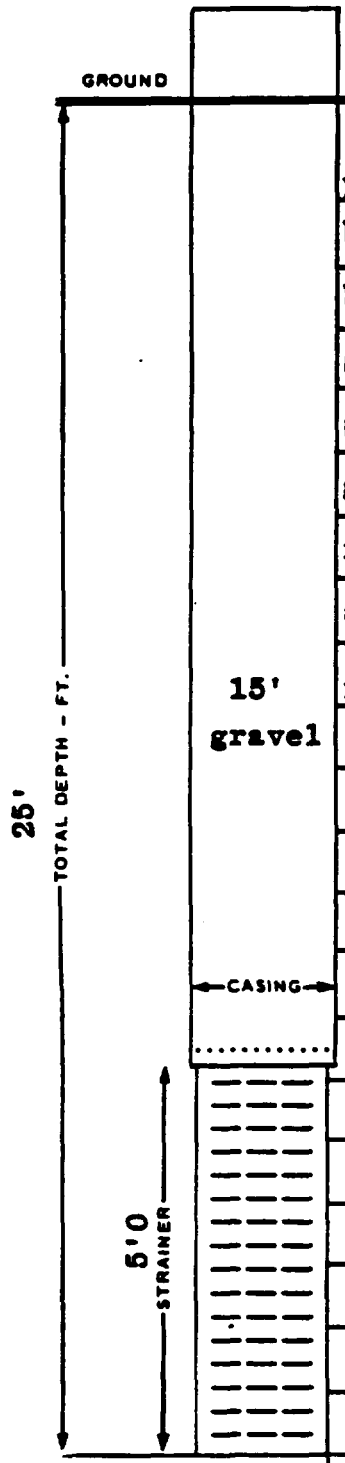
(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

NLI 001 1982

30-22-616
30-2243

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	
yellow sand	0 TO 6	
brown sand & stone	6 - 7	
brown sand	7 - 10	
gray clay	10 - 11	
gray sand	11 - 16	
gravel & sand, clay layers	16 - 25	
red & white clay	25 - 35	
silty sand & red clay layers	35 - 38	
red & white clay	38 - 41	

NAME OF OWNER	U.S. ARMY ENGINEERS CORP.
Job #	18436
Location	Pedricktown
Well No.	EHW-12
Hrs. Pumped	12
Capacity G.P.M.	
Static Level	-
Pumping Level	
Specific Capacity	
Diameter of Well	4"
Depth of Well (ground)	2[illegible]'
Length of Casing	27'
Distance to Top of Packer (gr.)	
Type Screen	Plastic
Size of Screen	4"
Length of Screen	5'
Top Screen Fitting	PVC Socket
Bottom Screen Fitting	PVC Ca
Blank	--
Slot Size	.020
Drilling Machine No.	6B
Driller	Kramer, C.
Gravel	#2
Bags of Cement	
Date Well Completed	6/26/[illegible]

Rotary Table approx. 3' above ground level

NLI 001 1983

30-22-618

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2238
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENGR. - 2nd & Chestnut Sts Phila., Pa.
   Owner's Well No. EHW 6 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ
3. DATE COMPLETED 6/27/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 Inches Bottom 4 Inches TOTAL DEPTH 33' Feet
5. CASING: Type P.V.C. Diameter 4 Inches Length 30' Feet
6. SCREEN: Type P.V.C. Size of Opening .020 Diameter 4 Inches Length 5' Feet
   Range in Depth { Top 30' Feet / Bottom 33' Feet } Geologic Formation _____
   Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 6/27/80 Yield 10 Gallons per minute
   Static water level before pumping 3' Feet below surface
   Pumping level N/A feet below surface after _____ hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells N/A
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size _____ Inches
10. USED FOR OBSERVATION WELL AMOUNT { Average N/A Gallons Daily / Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes _____ No. XX
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

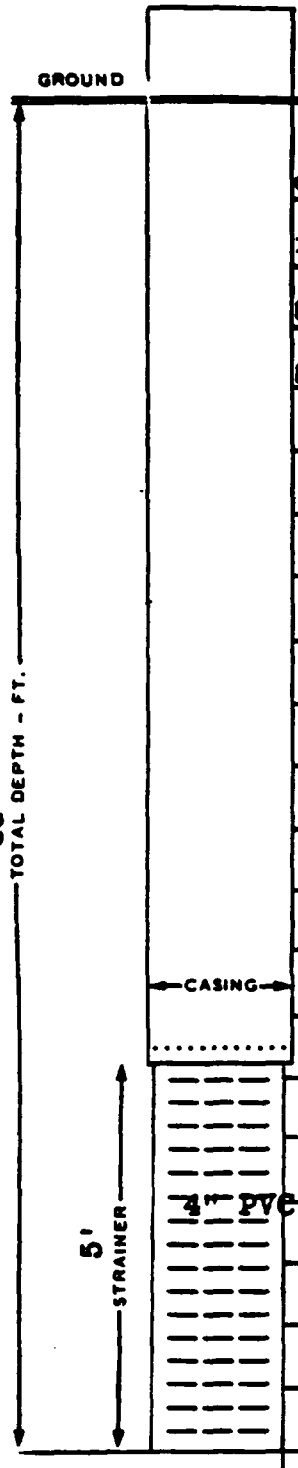
(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, section map, sketch of special casing arrangements etc.)

NLI 001 1984

A.C. SCHULTES & SONS, INC.

30-22-618
30-2238

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
clay silty sand	0 TO 8	U.S. ARMY
fine sand gray	8 - 33	Job # 18436
gravel	33 - 34	Location Pedricktown
green clay	34 - 47	Well No. EHW #06
		Hrs. Pumped 3 hrs. blowed
		Capacity G.P.M. 10
		Static Level 7'2"
		Pumping Level None
		Specific Capacity None
		Diameter of Well 4"
		Depth of Well (ground) 33'
		Length of Casing 30'
		Distance to Top of Packer (gr.) one
		Type Screen slotted PVC
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting PVC Cplg.
		Bottom Screen Fitting PVC Ca
		Blank None
		Slot Size 20
		Drilling Machine No. 1256 c
		Driller C. Kramer
		Gravel #1
		Bags of Cement 2
		Date Well Completed 6/27/8.

Rotary Table approx. 3' above ground level

NLI 001 1985

30 - 22 - 618

FORM 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2240
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut St Phila., PA
   Owner's Well No. EHW 9 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, Pedricktown, NJ
3. DATE COMPLETED 7/16/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4" Inches Bottom 4" Inches TOTAL DEPTH 27' Feet
5. CASING: Type P.V.C. Diameter 4" Inches Length 29' Feet
6. SCREEN: Type P.V.C. Size of Opening .020 Diameter 4" Inches Length 5' Feet
   Range in Depth { Top 22' Feet / Bottom 27' Feet } Geologic Formation _____
   Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/16/80 Yield 10 Gallons per minute
   Static water level before pumping 3' Feet below surface
   Pumping level N/A Feet below surface after _____ hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR OBSERVATION WELL AMOUNT { Average N/A Gallons Daily / Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ___ No. X
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric, please mode, please furnish copy)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/31/80

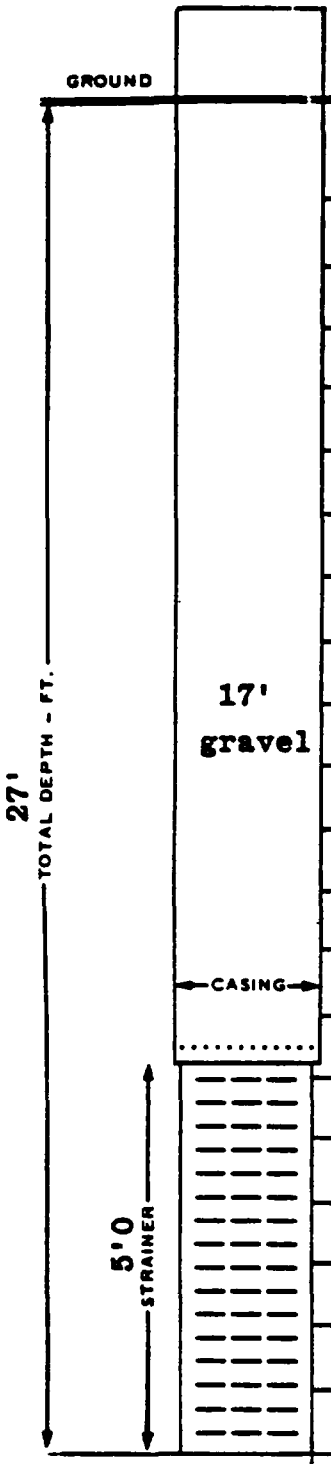
(NOTE: Use other side of this sheet for additional information or [illegible] log of materials penetrated.)

NLI 001 1986

A.C. SCHULTES & SONS, INC.

30-22-618
30-2240

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER U.S. ARMY ENGINEERS COR
brown sand	0 TO 2	
snad & gravel	2 - 7	Job # 18436
sand & brown clay	7 - 12	Location Pedricktown
clay	12 - 20	Well No. EHW-9
sand	20 - 28	Hrs. Pumped 6
silty sand	28 - 31	Capacity G.P.M.
clayish	31 - 37	Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 27
		Length of Casing 29'
		Distance to Top of Packer (gr.) --
		Type Screen Plastic
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting PVC Socket
		Bottom Screen Fitting PVC Ca
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/7/80

Rotary Table approx. 3' above ground level

NLI 001 1987

30-22-618

FORM 47

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2244
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut St Phila., Pa.
   Owner's Well No. EHW 13 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown Disposal Site, P-dricktown, NJ
3. DATE COMPLETED 6/30/80 DRILLER A.C. SCHULTES & SONS, INC.
4. DIAMETER: top 4" Inches Bottom 4" Inches TOTAL DEPTH 187 Feet
5. CASING: Type P.V.C. Diameter 4" Inches Length 111 Feet
6. SCREEN: Type P.V.C. Size of Opening .020 Diameter 4" Inches Length 5 Feet
   Range in Depth { Top 38' Feet / Bottom 43' Feet } Geologic Formation _____
   Tail piece: Diameter 0 Inches Length 0 Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 6/30/80 Yield 7 Gallons per minute
   Static water level before pumping 4' Feet below surface
   Pumping level N/A feet below surface after N/A hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells N/A
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR OBSERVATION WELL AMOUNT { Average N/A Gallons Daily / Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ___ No. XX
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet If electric log was made, please furnish copy)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

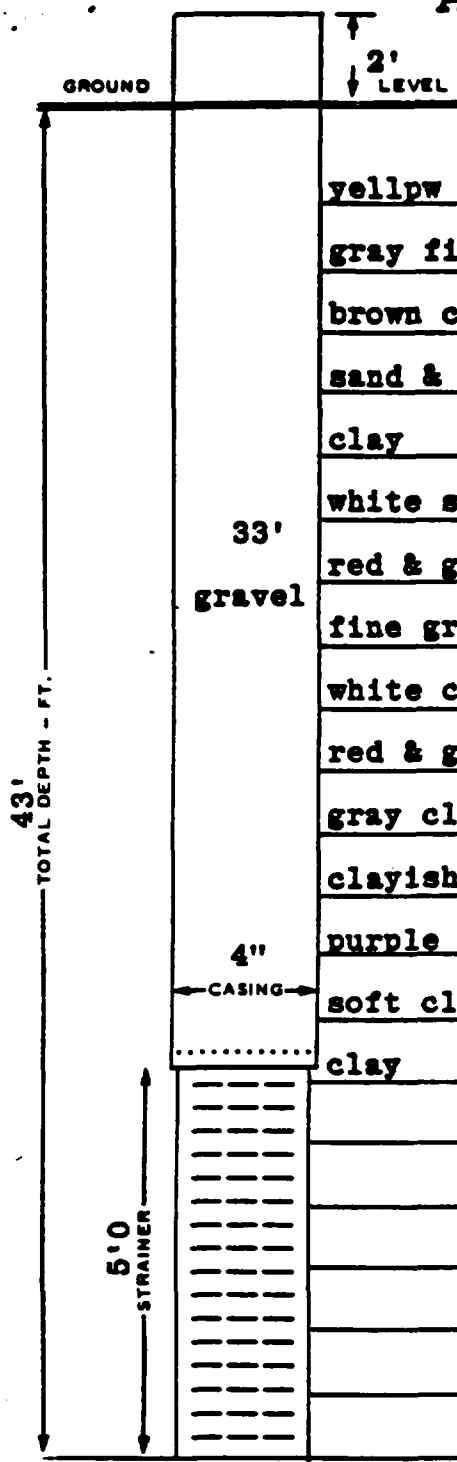
(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

NLI 001 1988

30-22-618
30-2244

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	
yellpw sand	0 TO 16	NAME OF OWNER U.S. ARMY ENGINEERS COR
gray fine sand	16 - 21	Job # 18436
brown clay	21 - 24	Location PEDRICKTOWN
sand & gravel	24 - 43	Well No. EHW-13
clay	43 - 60	Hrs. Pumped 12
white silty sand	60 - 68	Capacity G.P.M. 5
red & gray clay	68 - 79	Static Level
fine gray-white sand	79 - 87	Pumping Level
white clay & sand	87 - 93	Specific Capacity
red & gray clay	93 - 107	Diameter of Well 4"
gray clay	107 - 145	Depth of Well (ground) 43
clayish hard	145 - 166	Length of Casing 40'
purple dense clay	166 - 184	Distance to Top of Packer (gr.)
soft clay	184 - 187	Type Screen Plasti
clay	187 - 202	Size of Screen 4"
		Length of Screen 5'0"
		Top Screen Fitting PVC
		Bottom Screen Fitting Cap
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement --
		Date Well Completed 6/30/

Rotary Table approx. 3' above ground level

NLI 001 1989

30-22-625

Form 57

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2231
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY ADDRESS CORP. OF ENG. - 2nd & Chestnut St Phila., PA
   Owner's Well No. EHL 7 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ
3. DATE COMPLETED 7/18/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 9 Inches Bottom 9 Inches TOTAL DEPTH 65' Feet
5. CASING: Type -- Diameter _____ Inches Length 0 Feet
6. SCREEN: Type -- Size of Opening -- Diameter -- Inches Length - Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date 7/18/80 Yield 10 Gallons per minute
   Static water level before pumping 4' Feet below surface
   Pumping level N/A feet below surface after _____ hours pumping
   Drawdown N/A Feet Specific Capacity 0 Gals. per min. per ft. of drawdown
   How Pumped Blown How measured Bucket
   Observed effect on nearby wells N/A
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size _____ Inches
10. USED FOR OBSERVATION AMOUNT { Average N/A Gallons Daily, Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes N/A No. XX
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, send a duplicate copy.)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A.C. SCHULTES & SONS, INC. Date 7/30/80

(NOTE: Use other side of this sheet for additional information such as log of water-bearing strata.)

NLI 001 1990

30-22-65
30-2231

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL

GROUND LEVEL

TOTAL DEPTH - FT.

NO

CASING

STRAINER

~~NO~~

WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
road gravel & stone	0 TO 3	U.S. ARMY
black muck	3 - 29	Job # 18436
gray clay, very thin layers of sand	29 - 37	Location Pedricktown
fine gray sandish clay	37 - 61	Well No. EHL #7
		Hrs. Pumped None, no pipe
		Capacity G.P.M. No
		Static Level No
		Pumping Level No
		Specific Capacity No
		Diameter of Well No
		Depth of Well (ground) 65'8-3 1" no 5
		Length of Casing No
		Distance to Top of Packer (gr.) No
		Type Screen No
		Size of Screen No
		Length of Screen No
		Top Screen Fitting No
		Bottom Screen Fitting No
		Blank No
		Slot Size No
		Drilling Machine No. 1256
		Driller Alby Hammond
		Gravel No
		Bags of Cement No
		Date Well Completed 7/18/8

Rotary Table approx. 3' above ground level

NLI 001 1991

30-22-628

FORM 1

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2225
Application No. _____
County _____

WELL RECORD

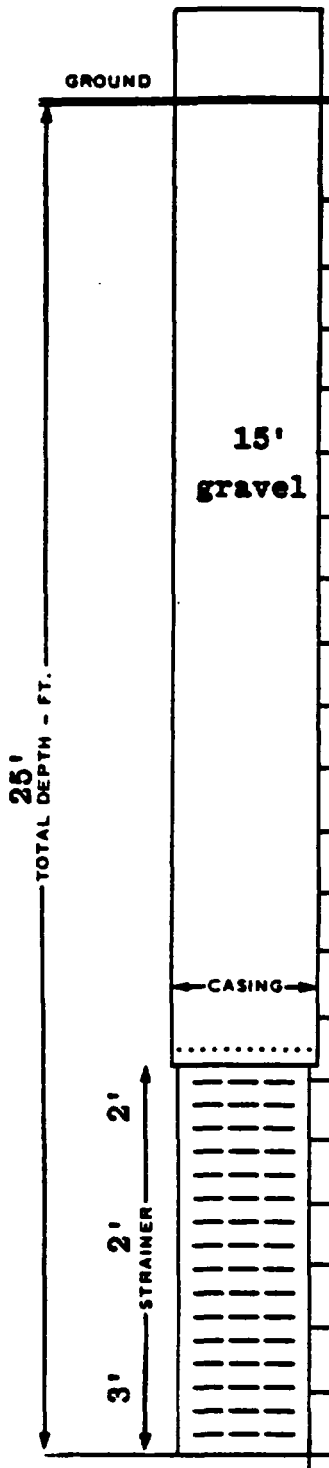
1. OWNER DEPARTMENT OF THE ARMY CORP. OF ENGINEERS ADDRESS 2ND & CHESTNUT STS., PHILA., PA
   Owner's Well No. EHL 2 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ
3. DATE COMPLETED 7/1/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: top 4 Inches Bottom 4 Inches TOTAL DEPTH 25 Feet
5. CASING: Type PVC Diameter 4 Inches Length 20 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 5 Feet
   Range in Depth { Top 20 Feet, Bottom 25 Feet } Geologic Formation _____
   Tail piece: Diameter n/a Inches Length n/a Feet
7. WELL FLOWS NATURALLY n/a Gallons per Minute at n/a Feet above surface
   Water rises to n/a Feet above surface
8. RECORD OF TEST: Date n/a Yield 10 Gallons per minute
   Static water level before pumping n/a Feet below surface
   Pumping level n/a feet below surface after n/a hours pumping
   Drawdown n/a Feet Specific Capacity n/a Gals. per min. per ft. of drawdown
   How Pumped Blown How measured bucket
   Observed effect on nearby wells n/a
9. PERMANENT PUMPING EQUIPMENT:
   Type n/a Mfrs. Name n/a
   Capacity n/a G.P.M. How Driven n/a H.P. n/a R.P.M. n/a
   Depth of Pump in well n/a Feet Depth of Footpiece in well n/a Feet
   Depth of Air Line in well n/a Feet Type of Meter on Pump n/a Size ___ Inches
10. USED FOR Observation AMOUNT { Average n/a Gallons Daily, Maximum n/a Gallons Daily }
11. QUALITY OF WATER n/a Sample: Yes ___ No. X
    Taste n/a Odor n/a Color n/a Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
    NLI 001 1992
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/30/80

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

30-32-628
30-3225

A.C. SCHULTES & SONS, INC.

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
organic material	0 TO 17	U.S. ARMY ENGINEER CORPS.
silty gray sand & clay	17 - 25	Job # 18436
gray silty clay	25 - 42	Location
		Well No. EHL-2
		Hrs. Pumped 4
		Capacity G.P.M.
		Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 25'
		Length of Casing 20'
		Distance to Top of Packer (gr.)
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 5'
		Top Screen Fitting PVC
		Bottom Screen Fitting Cap
		Blank 2'
		Slot Size .020
		Drilling Machine No. 61
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/1/80

Rotary Table approx. 3' above ground level

NLI 001 1993

30-22-628

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2234
Application No. _____
County _____

WELL RECORD

1. OWNER DEPARTMENT OF THE ARMY CORP. OF ENGINEERS ADDRESS 2ND & CHESTNUT STS., PHILA., PA
   Owner's Well No. EHW-4 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ
3. DATE COMPLETED 7/14/80 DRILLER A. C. SCHULTES & SONS, INC.
4. DIAMETER: Top 4 Inches Bottom 4 Inches TOTAL DEPTH 52 Feet
5. CASING: Type PVC Diameter 4 Inches Length 39 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 5 Feet
   Range in Depth { Top 39 Feet, Bottom 44 Feet } Geologic Formation _____
   Tail piece: Diameter N/A Inches Length N/A Feet
7. WELL FLOWS NATURALLY N/A Gallons per Minute at N/A Feet above surface
   Water rises to N/A Feet above surface
8. RECORD OF TEST: Date N/A Yield 10 Gallons per minute
   Static water level before pumping 5' Feet below surface
   Pumping level N/A feet below surface after N/A hours pumping
   Drawdown N/A Feet Specific Capacity N/A Gals. per min. per ft. of drawdown
   How Pumped Blown How measured bucket
   Observed effect on nearby wells none
9. PERMANENT PUMPING EQUIPMENT:
   Type N/A Mfrs. Name N/A
   Capacity N/A G.P.M. How Driven N/A H.P. N/A R.P.M. N/A
   Depth of Pump in well N/A Feet Depth of Footpiece in well N/A Feet
   Depth of Air Line in well N/A Feet Type of Meter on Pump N/A Size ___ Inches
10. USED FOR Observation AMOUNT { Average N/A Gallons Daily, Maximum N/A Gallons Daily }
11. QUALITY OF WATER N/A Sample: Yes ___ No. X
    Taste N/A Odor N/A Color N/A Temp. 58 °F
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet furnish copy) If electric log was made, please

NLI 001 1994

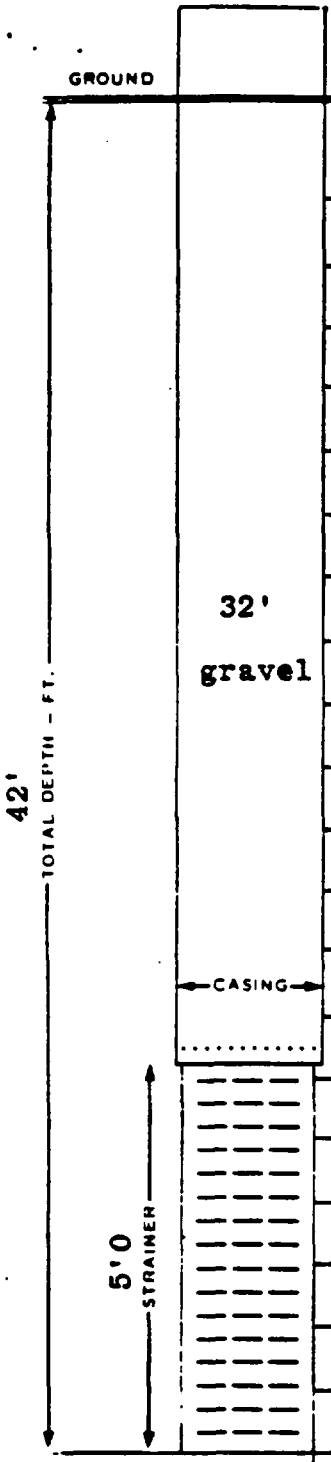
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date 7/31/80

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

A.C. SCHULTES & SONS, INC.

30-22-628
30-2234

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER U.S. ARMY ENGINEERS CORP.
gray clay & peat layers	0 TO 25	
gray sand	25 - 32	Job = 18436
gray sand & gravel	32 - 42	Location Pedricktowr
clayish	42 - 52	Well No. EHW-4
		Hrs. Pumped 1-1/:
		Capacity G.P.M.
		Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 42
		Length of Casing 39'
		Distance to Top of Packer (gr.)
		Type Screen Plastic
		Size of Screen 4"
		Length of Screen 5'0
		Top Screen Fitting PVC Sock t
		Bottom Screen Fitting PVC Ca
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/14/8

Rotary Table approx. 3' above ground level

NLI 001 1995

FRM 300

NLI 001 1996

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05127
Atlas Sheet Coordinates 30 : 22 : 636

OWNER IDENTIFICATION - Owner WISTAR, MICHAEL P. & CARO
Address 26 DELAWARE AVE.
City PENNS GROVE State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No. 1
Address Rt 130
County Salem Municipality OLDMANS TWP. Lot No. 2 Block No. 38

WELL USE Domestic Status

WATER USE Domestic Average 500 gals. daily Maximum 1,000 gals. daily

WELL CONSTRUCTION Date well completed 9 / 6 / 88
BOREHOLE DIMENSIONS Depths: Total 160 ft. Finished 151 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface 1 ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		141	4	
Casing 2				
Casing 3				
Screen 1	141	10	4	PVC 020
Screen 2				
Tail Piece				
Gravel Pack	Yes			
Grout	Cement			
Grouting Method	Termie			

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date 9 / 8 / 88
Static water-level before pumping 26-0 ft. below land surface. Water level 30 ft. below land surface after .5 hrs. of pumping.
Water level was measured using M-Scope Drawdown 4 ft.
Discharge rate measured using 5gal pail Discharge Rate 10 gals. per min.
Well was pumped using sub Specific Capacity 2.5 gals. per min. per ft. of drawdown
Observed effects on nearby wells /
Water Quality (taste, odor, color, etc.) /

PERMANENT PUMPING EQUIPMENT Installed by Eastern Drilling Pump Type Sub
Mfrs. Name Goulds Model 10EJ
CAPACITY: Pump delivers 10 GPM at 60 PSI pressure.
POWER: 1 HP at 3450 RPM Power Source ELE
DEPTHS: Pump 55 ft. Footpiece ft. Airline ft.
FLOW METER: Model installed on 1 in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor EASTERN DRLG. - CHARLES KRAMER
Address P.O. Box 176
City Woodbury Hts State N.J. Zip Code 08097
Name of Driller James Kramer License No. 1260

Signature of Contractor Charles Kramer Date 9 / 13 / 88

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05127
30. 22. 636

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☑ No

Drilling Method Mud Rotary

Type of Rig CF 15

Aquifer/Geo. Fm. P.R.M

DEP USE ONLY

Storet Hydrogeo Code

USGS Hydrogeo Code

Depth to Bedrock ft.

Bedrock Lith. Code

Bedrock Fm. Code

Completed by

Date / /

LOG

		Thick.	Lith.	Fm.
0-2	White Sand			
2-44	Tan Sand + Stones			
44-46	Yellow Clay			
46-67	White Sand Fine			
67-72	Yellow white Clay			
72-90	Sand Yellow / White			
90-123	Sand silty / Green clay			
123-152	White Sand + gravel			

GWPI No. -

NJPDES No. -

Latitude ° ' "

Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code

County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by

Date / /

NLI 001 1997

30-22639

Form 87-5M

Permit No. 30-144

Application No. _____

County _____

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

Division of Water Policy & Supply

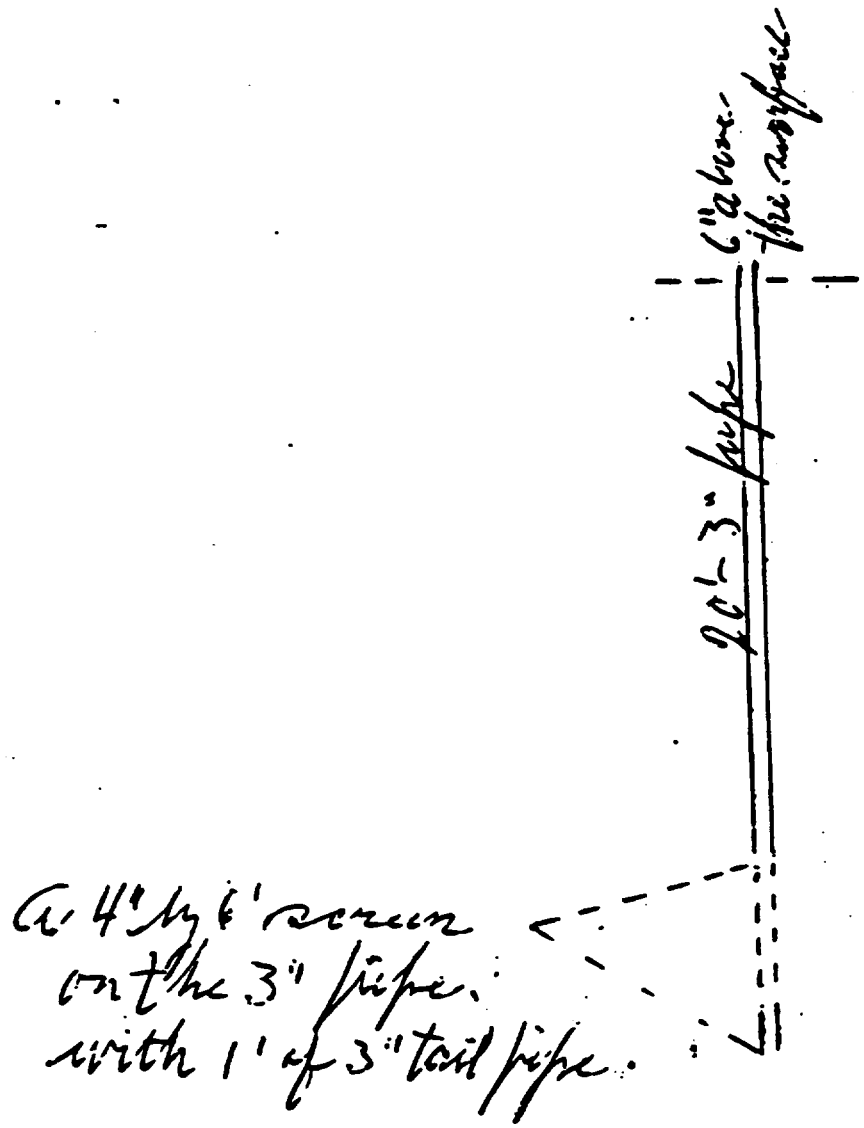
WELL RECORD

1. OWNER E. S. Cunard ADDRESS Pedricktown, N. J.
   Owner's Well No. I SURFACE ELEVATION 20 Feet (Above mean sea level)
2. LOCATION Back of his tenent house on the Pedricktown - Penns Grove Road
3. DATE COMPLETED May 8, 1952 DRILLER Haines & Moore
4. DIAMETER: Top 3 Inches Bottom 3 Inches TOTAL DEPTH 28 Feet
5. CASING: Type bl. steel pipe Diameter 3 Inches Length 20 Feet
6. SCREEN: Type slotted Size of Opening 20 Diameter 3 3/4 Inches Length 6 Feet
   Range in Depth { Top 21 Feet, Bottom 27 Feet } Geologic Formation _____
   Tail piece. Diameter 3 Inches Length 1 Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date May 8, 1952 Yield 20 Gallons per minute
   Static water level before pumping 6 Feet below surface
   Pumping level 10 feet below surface after 2 hours pumping
   Drawdown 4 Feet Specific Capacity 5 Gals. per min. per ft. of drawdown
   How Pumped with portable pump How measured time to fill a 5 gal. pail
   Observed effect on nearby wells no nearby wells
9. PERMANENT PUMPING EQUIPMENT: To be installed by the owner
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR tenent house AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. *
    Taste good Odor none Color clear Temperature 56 °F
12. LOG _____ Are samples available? no
    (Give details on back of sheet or on separate sheet)
13. SOURCE OF DATA Well drillers record
14. DATA OBTAINED BY Earl L. Moore DATE May 14, 1952

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 1998

Log;
Mustly coarse sand with a few layers of clay
solid clay at 28'



30.22.6 39

Form 87-5M

Permit No. 30-232

Application No. _____

County _____

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

1. OWNER Bruce H. Bridge ADDRESS Pedricktown, N. J.
   Owner's Well No. I SURFACE ELEVATION 20 Feet (Above mean sea level)
2. LOCATION Near his new house across from D.O.D. near Pedricktown
3. DATE COMPLETED June 19, '53 DRILLER Haines & Moore
4. DIAMETER: Top 3 Inches Bottom 3 Inches TOTAL DEPTH 18 Feet
5. CASING: Type bl. steel pipe Diameter 3 Inches Length 8 Feet
6. SCREEN: Type slotted Size of Opening 20 Diameter 2 3/ Inches Length 5 Feet
   Range in Depth { Top 12 Feet / Bottom 17 Feet } Geologic Formation _____
   Tail piece. Diameter 3½ Inches Length 1 Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date June 19, '53 Yield 15 Gallons per minute
   Static water level before pumping 8 Feet below surface
   Pumping level 12 feet below surface after 3 hours pumping
   Drawdown 4 Feet Specific Capacity 4 Gals. per min. per ft. of drawdown
   How Pumped with portable pump How measured time to fill a container
   Observed effect on nearby wells No nearby wells
9. PERMANENT PUMPING EQUIPMENT: To be furnished and installed by the plumber
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR House use AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. *
    Taste good Odor none Color clear Temperature 56 °F
12. LOG _____ Are samples available? no
    (Give details on back of sheet or on separate sheet)
13. SOURCE OF DATA Well drillers record
14. DATA OBTAINED BY Earl L. Moore DATE July 6, 1(53

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2000

30 22 649

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2613

APPLICATION NO. _____

COUNTY Salem

FOR MONITORING PURPOSES ONLY

WELL RECORD

1. OWNER Phila. Dist. Corp of Engrs. ADDRESS 2nd & Chestnut Sts., Phila., PA 9:

   Owner's Well No. DGB-100 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown

3. DATE COMPLETED 2-22-82 DRILLER A.C. SCHULTES & SONS, INC.

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 88' Feet

5. CASING: Type PVC Diameter 2 Inches Length 83 Feet

6. SCREEN: Type PVC Size of Opening 016 Diameter 2 Inches Length 5 Feet

   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

   Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute

   Static water level before pumping 11' Feet below surface

   Pumping level _____ feet below surface after _____ hours pumping

   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

   How pumped _____ How measured _____

   Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

   Type N/A Mfrs. Name _____

   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

    Taste None Odor None Color NOne Temp. 58 °F.

12. LOG See attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A C SCHULTES & SONS, INC. Date 3/17/82

    NLI 001 2001

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30-22-649

Form DWR-138
1-80

FOR MONITORING PURPOSES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2614

APPLICATION NO. _____

COUNTY _____

WELL RECORD

1. OWNER Phila. Dist. Corp of Engrs. ADDRESS 2nd & Chestnut Sts Phila., PA 191(

Owner's Well No. DGB-101 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown

3. DATE COMPLETED 3-1-82 DRILLER A.C. SCHULTES & SONS, INC.

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 82 Feet

5. CASING: Type PVC Diameter 2 Inches Length 77 Feet

6. SCREEN: Type PVC Size of Opening 016 Diameter 2 Inches Length 5 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute

Static water level before pumping 3'3" Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER good Sample: Yes ____ No ____

Taste None Odor None Color None Temp. 58 °F.

12. LOG See attached Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 2002

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A.C. SCHULTES & SONS, INC Date 3-17-82

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Form DWR- 138
11/80

FOR MONITORING PURPOSES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30 2615

APPLICATION NO. _____

COUNTY GL

30 22 649

WELL RECORD

1. OWNER Phila. Distr. Corp of Engrs. ADDRESS 2nd & Chestnut Sts. Phila. Pa 19 08

Owner's Well No. DGB-102 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown

3. DATE COMPLETED 3/3/82 DRILLER A.C. SCHULTES & SONS, INC.

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 68 Feet

5. CASING: Type PVC Diameter 2 Inches Length 63 Feet

6. SCREEN: Type PVC Size of Opening .016 Diameter 2 Inches Length 5 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute

Static water level before pumping 3'6" Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste None Odor None Color None Temp. 58 °F.

12. LOG See attached Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 2003

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A.C. SCHULTES & SONS, INC. Date 3-17-82

(NOTE: Use other side of this sheet for additional information such as log of meter : penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

orm DWR- 138
/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2616

APPLICATION NO. _____

COUNTY GL

30-22-649

FOR MONITORING PURPOSES ONLY

WELL RECORD

1. OWNER Phila. Distr. Corp of Engrs. ADDRESS 2nd & Chestnut Sts., Phila., PA 19

   Owner's Well No. DGB-104 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION _____

3. DATE COMPLETED 2-26-82 DRILLER A.C. SCHULTES & SONS, INC.

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 74 Feet

5. CASING: Type PVC Diameter 2 Inches Length 69 Feet

6. SCREEN: Type PVC Size of Opening .016 Diameter 2 Inches Length 5 Feet

   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

   Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute

   Static water level before pumping _____ Feet below surface

   Pumping level _____ feet below surface after _____ hours pumping

   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

   How pumped _____ How measured _____

   Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

   Type _____ Mfrs. Name _____

   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

    Taste None Odor None Color None Temp. 58 °F.

12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Driller's Log NLI 001 2004

14. DATA OBTAINED BY A.C. SCHULTES & SONS, INC. Date 3-17-82

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Form DWR-13
11/80

FOR MONITORING PURPOSES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

30 22 649

PERMIT NO. 30 2617

APPLICATION NO. _____

COUNTY _____

WELL RECORD

1. OWNER Phila. Distr. Corp of Engrs. ADDRESS 2nd & Chestnut Sts., Phila,Pa 1 1C

   Owner's Well No. EAB-8A SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Oldsmans Creek

3. DATE COMPLETED 3-11-82 DRILLER A.C. SCHULTES & SONS, INC.

4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 40 Feet

5. CASING: Type PVC Diameter 2 Inches Length 35 Feet

6. SCREEN: Type PVC Size of Opening .016 Diameter 2 Inches Length 5 Feet

   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

   Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute

   Static water level before pumping 4'8" Feet below surface

   Pumping level _____ feet below surface after _____ hours pumping

   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

   How pumped _____ How measured _____

   Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

   Type _____ Mfrs. Name _____

   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

    Taste None Odor None Color None Temp. 58 °F.

12. LOG See Attached Are samples available? _____

    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

    NLI 001 2005

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A.C. SCHULTES & SONS, INC. Date 3-17-82

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30·22·649

rm DWR-138
1/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 302618

APPLICATION NO. _____

COUNTY _____

FOR MONITORING PURPOSES ONLY

WELL RECORD

1. OWNER Phila, Distr. Corp of Engrs. ADDRESS 2nd & Chestnut Sts., Phila., Pa 19
   Owner's Well No. EAB-8 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldman's Creek
3. DATE COMPLETED 3-11-82 DRILLER A.C. SCHULTES & SONS, INC
4. DIAMETER: Top 2 inches Bottom 2 inches TOTAL DEPTH 100 Feet
5. CASING: Type PVC Diameter 2 Inches Length 95 Feet
6. SCREEN: Type PBC Size of Opening .016 Diameter 2 Inches Length 5 Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
   Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute
   Static water level before pumping 10'3" Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes ____ No ____
    Taste None Odor None Color None Temp. 58 °F.
12. LOG See Attached Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Driller's Log
14. DATA OBTAINED BY A.C. SCHULTES & SONS, INC. Date 3-17-82

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2006

30-22-649

Form 87

30-22-643

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2228

Application No. _____

County Salem

WELL RECORD

NLI 001 2007

1. OWNER DEPARTMENT OF THE ARMY CORP. OF ENGINEERS ADDRESS 2ND & CHESTNUT STS., PHILA., PA

Owner's Well No. EHW 5 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION PEDRICKTOWN DISPOSAL SITE, PEDRICKTOWN, NJ

3. DATE COMPLETED 7/11/80 DRILLER A. C. SCHULTES & SONS, INC.

4. DIAMETER: top 4 Inches Bottom 4 Inches TOTAL DEPTH 37 Feet

5. CASING: Type PVC Diameter 4 Inches Length 34 Feet

6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 5 Feet

Range in Depth { Top 34 Feet, Bottom 37 Feet } Geologic Formation _____

Tail piece: Diameter n/a Inches Length n/a Feet

7. WELL FLOWS NATURALLY n/a Gallons per Minute at n/a Feet above surface

Water rises to n/a Feet above surface

8. RECORD OF TEST: Date n/a Yield 30 Gallons per minute

Static water level before pumping n/a Feet below surface

Pumping level n/a feet below surface after n/a hours pumping

Drawdown n/a Feet Specific Capacity n/a Gals. per min. per ft. of drawdown

How Pumped blown How measured bucket

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type n/a Mfrs. Name n/a

Capacity n/a G.P.M. How Driven n/a H.P. n/a R.P.M. n/a

Depth of Pump in well n/a Feet Depth of Footpiece in well n/a Feet

Depth of Air Line in well n/a Feet Type of Meter on Pump n/a Size _____ Inches

10. USED FOR Observation AMOUNT { Average n/a Gallons Daily, Maximum n/a Gallons Daily }

11. QUALITY OF WATER n/a Sample: Yes _____ No. X

Taste n/a Odor n/a Color n/a Temp. 58 °F

12. LOG See Attached Are samples available? _____

(Give details on back of sheet or on separate sheet. If electrical log see back. Attach furnish copy)

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A. C. Schultes & Sons, Inc. Date 7/31/80

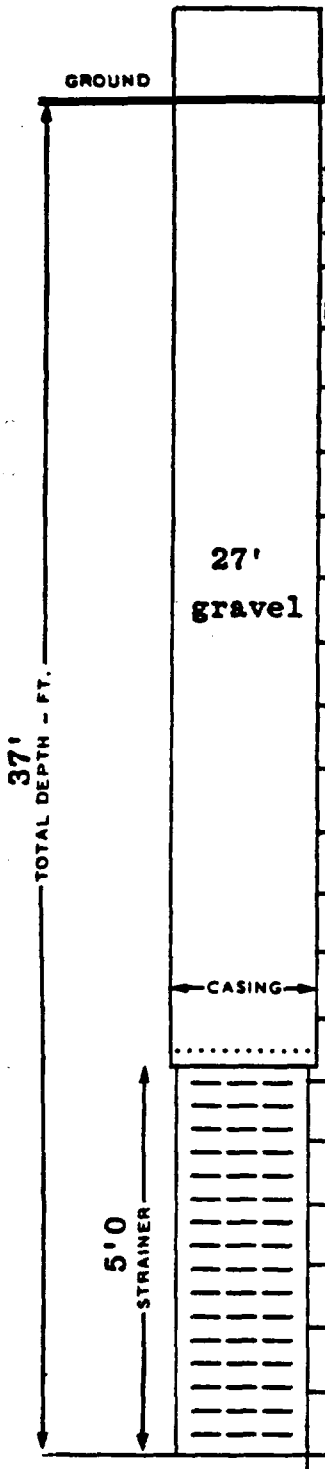
(NOTE: Use other side of this sheet for data and if data is such as log of [illegible] correlated)

A.C. SCHULTES & SONS, INC.

30-22-649

30-2228

SINGLE CASE WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER U.S. ARMY ENGINEERS CORP.
brown sand	0 TO 27	
brown sand & sandstone	27 - 39	Job # 18436
gray clay	39 - 42	Location Pedricktown
		Well No. EHW-5
		Hrs. Pumped 1
		Capacity G.P.M. 30
		Static Level
		Pumping Level
		Specific Capacity
		Diameter of Well 4"
		Depth of Well (ground) 37'
		Length of Casing 34'
		Distance to Top of Packer (gr.) -
		Type Screen PVC
		Size of Screen 4"
		Length of Screen 5'0
		Top Screen Fitting PVC Socket
		Bottom Screen Fitting PVC Cap
		Blank --
		Slot Size .020
		Drilling Machine No. 6B
		Driller C. Sacco
		Gravel #2
		Bags of Cement
		Date Well Completed 7/11/80

Rotary Table approx. 3' above ground level

NLI 001 2008

30-22-652

FORM 87

3/31/80

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-2176

Application No. _____

County Gloucester

WELL RECORD

1. OWNER Monsanto ADDRESS Route 130, Bridgeport, New Jersey

Owner's Well No. 30-2176 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Route 130 Logan Township

3. DATE COMPLETED April 5, 1980 DRILLER F. C. Capel & Son

4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 70 Feet

5. CASING: Type steel Diameter 4 inches Length 65 Feet

6. SCREEN: Type stainless Size of Opening 20 Diameter 4 inches Length 5 Feet

Range in Depth { Top 65 Feet, Bottom 70 Feet } Geologic Formation Raritan

Tail piece: Diameter none inches Length _____ Feet

7. WELL FLOWS NATURALLY not Gallons per Minute at _____ Feet above surface

Water rises to not Feet above surface

8. RECORD OF TEST: Date April 5, 1980 Yield 30 Gallons per minute

Static water level before pumping 15 Feet below surface

Pumping level 15 feet below surface after 6 hours pumping

Drawdown none Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped air lift How measured _____

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type none Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches

10. USED FOR test AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER fair Sample: Yes ____ No. X

Taste brony Odor none Color clear Temp. 56 °F

12. LOG on reverse side Are samples available? no

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

NLI 001 2009

13. SOURCE OF DATA drilling of well

14. DATA OBTAINED BY F. C. Capel & Son Date April 10, 1980

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

DWR-138 M
6/89

New Jersey Department of Environmental Protection
Division of Water Resources

MONITORING WELL RECORD

Well Permit No. 30 - 06418
Atlas Sheet Coordinates 30 : 22 : 658

OWNER IDENTIFICATION - Owner ~~XEROX CORPORATION~~
Address 351 N. VIRGINIA AVE.
City CARNEYS POINT TWP. State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P-7
County SALEM Municipality ~~CARNEY'S POINT~~ Lot No. 4 Block No. 29
Address

TYPE OF WELL (as per Well Permit Categories) ~~PIEZOMETER~~ Date well completed 2/6/90
Regulatory Program Requiring Well ~~ECRA~~ Case I.D. # ~~89184~~
CONSULTING FIRM/FIELD SUPERVISOR (If applicable) DUNN GEO SCIENCE Tele. # 201-299-9001

WELL CONSTRUCTION

Total depth drilled 10'-8" ft.
Well finished to 10'8" ft.
Borehole diameter:
Top 1 1/4 in.
Bottom 1 1/4 in.
Well was finished: ☑ above grade ☐ flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing				
Outer Casing (Not Protective Casing)	0	8'6"	1 1/4	GALVANIZED PIPE
Screen (Note slot size)	8'6"	10'	1 1/4"	60 GAUZE MESH STAINLESS
Tail Piece	10'	10'8"	1 1/4	POINT
Gravel Pack				
Annular Seal/Grout				
Method of Grouting				

Static water level after drilling 5.93 ft.
Water level was measured using M SCOPE
Well was developed for / hours at / gpm
Method of development /
Was permanent pumping equipment installed? ☐ Yes ☑ No
Pump capacity / gpm
Pump type: /
Drilling Method DRIVEN WELL POINT
Drilling Fluid NONE Type of Rig CME 55
Name of Driller CHARLES DAVIDSON
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None (D) C B A
N.J. License No. J 1507
Name of Drilling Company KENDRICK DRILLING, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

CAPE MAY FORMATION

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Charles P Davidson Date 3-1-90

COPIES: White & Green - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2010

NLI 001 2011

DWR-138 M
6/89

New Jersey Department of Environmental Protection
Division of Water Resources

MONITORING WELL RECORD

Well Permit No. 30 - 06419
Atlas Sheet Coordinates 30 : 22 : 658

OWNER IDENTIFICATION - Owner XERXES CORPORATION
Address 351 N. VIRGINIA AVE.
City CARNEYS POINT TWP. State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P-6
County SALEM Municipality ~~CARNEY'S POINT~~ Lot No. ~~4~~ Block No. ~~29~~
Address

TYPE OF WELL (as per Well Permit Categories) ~~PIEZOMETER~~ Date well completed 2/6/90
Regulatory Program Requiring Well ~~RCRA~~ Case I.D. # ~~89184~~
CONSULTING FIRM/FIELD SUPERVISOR (If applicable) AUMM GEO SCIENCE Tele. # 201-299-9001

WELL CONSTRUCTION

Total depth drilled 10'8" ft.
Well finished to 10'8" ft.
Borehole diameter:
Top 1 1/4 in.
Bottom 1 1/4 in.
Well was finished: ☑ above grade ☐ flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? ☐ Yes ☑ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing				
Outer Casing (Not Protective Casing)	0	8'6"	1 1/4"	GALVANIZED PIPE
Screen (Note slot size)	8'6"	10'	1 1/4"	60 GAUZE MESH STAINLESS
Tail Piece	10'	10'8"	1 1/4"	POINT
Gravel Pack				
Annular Seal/Grout				
Method of Grouting				

Static water level after drilling 9.16 ft.
Water level was measured using M. SCOPE
Well was developed for — hours at — gpm
Method of development —
Was permanent pumping equipment installed? ☐ Yes ☑ No
Pump capacity — gpm
Pump type: —
Drilling Method DRIVEN WELL POINT
Drilling Fluid NONE Type of Rig CME-55
Name of Driller
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. J1507
Name of Drilling Company KENDRICK DRILLING, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

CAPE MAY FORMATION

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Charles P Daniels Date 3-1-90

COPIES: White & Green - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2012

DWR-138 M
6/89

New Jersey Department of Environmental Protection
Division of Water Resources

MONITORING WELL RECORD

Well Permit No. 30 - 08420
Atlas Sheet Coordinates 30 : 22 : 658

OWNER IDENTIFICATION - Owner XERXES COPORATION
Address 351 N. VIRGINIA AVE.
City CARNEYS POINT TWP. State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P-5
County SALEM Municipality ~~CARNEY'S POINT~~ Lot No. ~~4~~ Block No. ~~29~~
Address

TYPE OF WELL (as per Well Permit Categories) ~~PIEZOMETER~~ Date well completed 2/6/90
Regulatory Program Requiring Well ECRA Case I.D. # 89184
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) DUNN GEO SCIENCE Tele. # 201-299-9001

WELL CONSTRUCTION

Total depth drilled 10'-8" ft.
Well finished to 10'-8" ft.
Borehole diameter:
Top 1 1/4 in.
Bottom 1 1/4 in.
Well was finished: ☑ above grade ☐ flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing				
Outer Casing (Not Protective Casing)	0	8'-6"	1 1/4	GALVANIZED PIPE
Screen (Note slot size)	8'-6"	10	1 1/4	60 GAUGE MESH STAINLESS
Tail Piece	10	10'-8"	1 1/4	POINT
Gravel Pack				
Annular Seal/Grout				
Method of Grouting				

Static water level after drilling 9-10 ft.
Water level was measured using M. SCOPE
Well was developed for — hours at — gpm
Method of development —
Was permanent pumping equipment installed? ☐ Yes ☑ No
Pump capacity — gpm
Pump type: —
Drilling Method DRIVEN WELL POINT
Drilling Fluid NONE Type of Rig CME 55
Name of Driller CHARLES DAVIDSON
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None (D) C B A
N.J. License No. J 1507
Name of Drilling Company KENDRICK DRILLING, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

CAPE MAY FORMATION

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Charles P Davidson Date 3-1-90

COPIES: White & Green - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2013

DWR-138 M
6/89

New Jersey Department of Environmental Protection
Division of Water Resources

MONITORING WELL RECORD

Well Permit No. 30 - 06421
Atlas Sheet Coordinates 30 : 22 : 658

OWNER IDENTIFICATION - Owner ~~XEROX CORPORATION~~
Address 351 N. VIRGINIA AVE.
City CARNEYS POINT TWP. State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P-4
County SALEM Municipality ~~CARNEY'S POINT~~ Lot No. 4 Block No. 29
Address

TYPE OF WELL (as per Well Permit Categories) PIEZOMETER Date well completed 2/6/90
Regulatory Program Requiring Well RCRA Case I.D. # 80184
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) DUNN GEO SCIENCE Tele. # 201-299-9071

WELL CONSTRUCTION

Total depth drilled 10'-8 ft.
Well finished to 10'-8 ft.
Borehole diameter:
Top 1 1/4 in.
Bottom 1 1/4 in.
Well was finished: ☑ above grade ☐ flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? ☐ Yes ☑ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing				
Outer Casing (Not Protective Casing)	0	8'-6"	1 1/4	GALVANIZED PIPE
Screen (Note slot size)	8'6	10	1 1/4	60 GAUGE MESH STAINLESS
Tail Piece	10	10'-8	1 1/4	POINT
Gravel Pack				
Annular Seal/Grout				
Method of Grouting				

Static water level after drilling 8.74 ft.
Water level was measured using M TAPE
Well was developed for — hours at — gpm
Method of development —
Was permanent pumping equipment installed? ☐ Yes ☑ No
Pump capacity — gpm
Pump type: —
Drilling Method DRIVEN WELL POINT
Drilling Fluid NONE Type of Rig CME 55
Name of Driller CHARLES DAVIDSON
Health and Safety Plan submitted? ☐ Yes ☑ No
Level of Protection used on site (circle one) None (D) C B A
N.J. License No. J 1507
Name of Drilling Company KENDRICK DRILLING, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

CAPE MAY FORMATION

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Charles P Davidson Date 3-1-90

COPIES: White & Green - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2014

DWR-138 M
6/89

New Jersey Department of Environmental Protection
Division of Water Resources

MONITORING WELL RECORD

Well Permit No. 30 - 06422
Atlas Sheet Coordinates 30 : 22 : 658

OWNER IDENTIFICATION - Owner XERXES CORPORATION
Address 351 N. VIRGINIA AVE.
City CARNEYS POINT TWP. State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P-3
County SALEM Municipality ~~CARNEY'S POINT~~ Lot No. ~~4~~ Block No. ~~29~~
Address

TYPE OF WELL (as per Well Permit Categories) ~~PIEZOMETER~~ Date well completed 2/5/90
Regulatory Program Requiring Well ECRA Case I.D. # 89184
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) DUNN GEO SCIENCE Tele. # 201-299-9001

WELL CONSTRUCTION

Total depth drilled 10'8 ft.
Well finished to 10'8 ft.
Borehole diameter:
Top 11/4 in.
Bottom 11/4 in.
Well was finished: ☑ above grade ☐ flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.) [From land surface]	Diameter (inches)	Type and Material
Inner Casing				
Outer Casing (Not Protective Casing)	0	8'6"	1 1/4	GALVANIZED PIPE
Screen (Note slot size)	8'6"	10'0	1 1/4	60 GAUGE MESH STAINLESS
Tail Piece	10'	10'8"	1 1/4"	POINT
Gravel Pack				
Annular Seal/Grout				
Method of Grouting				

Static water level after drilling 9.48 ft.
Water level was measured using M. SCOPE
Well was developed for / hours at / gpm
Method of development /
Was permanent pumping equipment installed? ☐ Yes ☑ No
Pump capacity / gpm
Pump type: /
Drilling Method DRIVEN WELL POINT
Drilling Fluid NONE Type of Rig CME 55
Name of Driller CHARLES DAVIDSON
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. T 1507
Name of Drilling Company KENDRICK DRILLING, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

CAPE MAY FORMATION

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Charles P Davidson Date 3-2-90

COPIES: White & Green - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2015

DWR-138 M
6/89

New Jersey Department of Environmental Protection
Division of Water Resources

MONITORING WELL RECORD

Well Permit No. 30 - 06423
Atlas Sheet Coordinates 30 : 22 : 658

OWNER IDENTIFICATION - Owner ~~HERCULES CORPORATION~~
Address 351 N. VIRGINIA AVE.
City CARNEYS POINT TWP. State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P-2
County SALEM Municipality ~~CARNEY'S POINT~~ Lot No. ~~4~~ Block No. ~~29~~
Address

TYPE OF WELL (as per Well Permit Categories) ~~PIEZOMETER~~ Date well completed 2/5/90
Regulatory Program Requiring Well ~~RCRA~~ Case I.D. # ~~89184~~
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) DUHN GEO SCIENCE Tele. # 201-299-9001

WELL CONSTRUCTION

Total depth drilled 10'8 ft.
Well finished to 10'8 ft.
Borehole diameter:
Top 1 1/4 in.
Bottom 1 1/4 in.
Well was finished: ☑ above grade ☐ flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing				
Outer Casing (Not Protective Casing)	0	8'6"	1 1/4	GALVANIZED PIPE
Screen (Note slot size)	8'6"	10'0	1 1/4	60 GAUGE MESH STAINLESS
Tail Piece	10'	10'8	1 1/4	POINT
Gravel Pack				
Annular Seal/Grout				
Method of Grouting				

Static water level after drilling 10.35 ft.
Water level was measured using M SCOPE
Well was developed for / hours at / gpm
Method of development /
Was permanent pumping equipment installed? ☐ Yes ☒ No
Pump capacity / gpm
Pump type: /
Drilling Method DRIVEN WELL POINT
Drilling Fluid NONE Type of Rig CME-55
Name of Driller CHARLES DAVIDSON
Health and Safety Plan submitted? ☐ Yes ☒ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. J1507
Name of Drilling Company KENDRICK DRILLING, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

CAPE MAY FORMATION

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Charles P. Davidson Date 3-2-90

COPIES: White & Green - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2016

DWR-138 M
6/89

New Jersey Department of Environmental Protection
Division of Water Resources

MONITORING WELL RECORD

Well Permit No. 30 - 06424
Atlas Sheet Coordinates 30 : 22 : 658

OWNER IDENTIFICATION - Owner XEROXES CORPORATION
Address 351 N. VIRGINIA AVE.
City CARNEYS POINT TWP. State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P-1
County SALEM Municipality ~~CARNEY'S POINT~~ Lot No. ~~4~~ Block No. ~~29~~
Address

TYPE OF WELL (as per Well Permit Categories) ~~PIEZOMETER~~ Date well completed 2/5/90
Regulatory Program Requiring Well ~~ECRA~~ Case I.D. # ~~89184~~
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) DUNN GEO SCIENCE Tele. # 201-299-9001

WELL CONSTRUCTION

Total depth drilled 10'8" ft.
Well finished to 10'8" ft.
Borehole diameter:
Top 1 1/4 in.
Bottom 1 1/4 in.
Well was finished: ☑ above grade ☐ flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? ☐ Yes ☑ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing				
Outer Casing (Not Protective Casing)	0	8'6"	1 1/4"	GALVANIZED PIPE
Screen (Note slot size)	8'6"	10'0	1 1/4"	60 GAUGE MESH STAINLESS
Tail Piece	10'	10'8	1 1/4	POINT
Gravel Pack				
Annular Seal/Grout				
Method of Grouting				

Static water level after drilling 9.39 ft.
Water level was measured using M SCOPE
Well was developed for / hours at / gpm
Method of development /
Was permanent pumping equipment installed? ☐ Yes ☑ No
Pump capacity / gpm
Pump type: /
Drilling Method DRIVEN WELL POINT
Drilling Fluid HONE Type of Rig CME-55
Name of Driller CHARLES DAVIDSON
Health and Safety Plan submitted? ☐ Yes ☑ No
Level of Protection used on site (circle one) None (D) C B A
N.J. License No. J 1507
Name of Drilling Company KENDRICK DRILLING, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

CAPE MAY FORMATION

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Charles P. Davidson Date 3-1-90

COPIES: White & Green - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/80

FOR IRRIGATION PURPOSES ONLY

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3022659

PERMIT NO. 30-3359

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER DIETRICH, JAMES B. ADDRESS BOX 100 PERKINTOWN RD.

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 1 Block: 43 Municipality: Oldmans Twp.

3. DATE COMPLETED 6/11/84 DRILLER D'Agostino Well Drilling

4. DIAMETER: Top 10 inches Bottom 10 inches TOTAL DEPTH 60 Feet

5. CASING: Type PVC Diameter 6 Inches Length 40 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 6 Inches Length 20 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date DID NOT TEST Yield _____ Gallons per minute

Static water level before pumping 11 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT: Did not install

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Irrigation AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 2017

13. SOURCE OF DATA D'Agostino Well Drilling, Inc.

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.22.659

30-3359

NE Jim Dietrich LOCATION Pedricktown

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Top Soil		Black	Loose	0"	6"
Sand		Dark Brown	Med to Fine	6"	7'
Sand	Bit of Clay	White	Med. (Hard stones)	7'	22'
Stones		White	Very Coarse	22'	30'
Sand	Bit of clay	Dark Brown	Fine to Med	30'	40'
Sand		Brown	Med to Fine	40'	60'

Distance out from building 0 feet

Distance offset right _____ feet left _____ feet from sides of building

Well depth 60' Casing diameter 6" Screen length 20' 5"

Static level 11'

NLI 001 2018

30-22-662
30-1758

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. ~~31-12443~~
Application No. _____

WELL RECORD

OWNER Calvin Smith ADDRESS Pedricktown

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (above mean sea level)

LOCATION So. Railroad Ave.

DATE COMPLETED 7/14/78 DRILLER Rahlin Bros.

DIAMETER: top 4 Inches Bottom 4 inches TOTAL DEPTH 50 Feet

CASING: Type Steel Diameter 4 inches Length 40 Feet

SCREEN: Type Steel Size of Opening 20 Diameter 4 inches Length 10 Feet

Range in Depth Top _____ Feet Bottom _____ Feet Geologic Formation Cohansey

Tail piece: Diameter 4 inches Length 10 Feet

WELL FLOWS NATURALLY no Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

RECORD OF TEST: Date _____ Yield _____ Gallons per minute

Static water level before pumping _____ Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped Air Compressor How measured Meter

Observed effect on nearby wells None

PERMANENT PUMPING EQUIPMENT: Did not put pump in.

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches

USED FOR Domestic AMOUNT Average _____ Gallons Daily Maximum _____ Gallons Daily

QUALITY OF WATER Good Sample: Yes ___ No. ✓

Taste None Odor None Color Clear Temp. 54 °F

LOG _____ Are samples available? no
(Give details on back of sheet or separate feet. If electric log as made, please furnish copy.)

NLI 001 2019

SOURCE OF DATA Henry Rahlin

DATA OBTAINED BY " " Date 5/11/79

(Note; Use either side of this sheet for additions. Information such as log of mat-

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 04403
Atlas Sheet Coordinates 30 : 22 : 667

OWNER IDENTIFICATION - Owner HART, LARRY PLUMBER
Address R.R.#1, BOX 103
City WOODSTOWN State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No.
Address Straughn's Mill - Porcupine Road
County Salem Municipality OLDMANS TWP Lot No. 4 Block No. 22

WELL USE withdrawal Status in use

WATER USE Domestic Average 500 gals. daily Maximum 1800 gals. daily

WELL CONSTRUCTION Date well completed 11/ 4/ 86
BOREHOLE DIMENSIONS Depths: Total 55 ft. Finished 55 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		44	4	PVC Sch. 40
Casing 2				
Casing 3				
Screen 1	44	10	4	PVC - Slot - .015
Screen 2				
Tail Piece				
Gravel Pack	42	9	8	#1 & #2 Well Gravel
Grout				
Grouting Method				

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date / / NO TEST TAKEN
Static water-level before pumping 17 ft. below land surface. Water level ft. below land surface after hrs. of pumping.
Water level was measured using Drawdown ft.
Discharge rate measured using Discharge Rate gals. per min.
Well was pumped using Specific Capacity gals. per min. per ft. of drawdown
Observed effects on nearby wells
Water Quality (taste, odor, color, etc.) Good

PERMANENT PUMPING EQUIPMENT DID NOT INSTALL Installed by Pump Type
Mfrs. Name Model
CAPACITY: Pump delivers GPM at PSI pressure.
POWER: HP at RPM Power Source
DEPTHS: Pump ft. Footpiece ft. Airline ft.
FLOW METER: Model installed on in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor D'AGOSTINO WELL DRILLING NLI 001 2020
Address RR#8, Box 122
City Bridgeton State NJ Zip Code 08302
Name of Driller Dave Mattus License No. 1005

Signature of Contractor Date 11 / 17 / 86

COPIES: White Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30-04407
30-22667

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method: Mud Rotary

Type of Rig: Cycone Rig

Aquifer/Geo. Fm.

DEP USE ONLY

Storet Hydrogeo Code
USGS Hydrogeo Code
Depth to Bedrock ft.
Bedrock Lith. Code
Bedrock Fm. Code

Completed by
Date / /

LOG

		Thick.	Lith.	Fm.
0" - 10"	Top Soil, Black Loose			
10" - 12'	Gravel Dry			
12' - 24'	Sand, Dark Brown, Medium to Fine			
24' - 35'	Clay fine sand white (fine sticky)			
35' - 45'	Sand, fine with bits of clay			
45' - 55'	Sand, medium to fine white and brown			

GWPI No. -

NJPDES No. -

Latitude ° ' "

Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code

County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by

Date / /

NLI 001 2021

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form LWR-138
1/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3022681 Rec'd

PERMIT NO. 30-3381

APPLICATION NO. ✓

COUNTY Salem

WELL RECORD

1. OWNER DIETRICH, JIM ADDRESS PERKINTOWN RD.

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 1 Block: 43 Municipality: Oldmans Twp.

3. DATE COMPLETED 6/29/84 DRILLER A.C. Schultes & Sons, Inc.

4. DIAMETER: Top 8" inches Bottom 8" inches TOTAL DEPTH 247' Feet

5. CASING: Type Steel Diameter 8" Inches Length 207 Feet

6. SCREEN: Type Steel Size of Opening .045 Diameter 8" Inches Length 20 Feet

Range in Depth { Top 207 Feet / Bottom 244 Feet } Geologic Formation _____

Tail Piece: Diameter 8 Inches Length 3 Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 6/29/84 Yield 100 Gallons per minute

Static water level before pumping 47 Feet below surface

Pumping level 64 feet below surface after 2 hours pumping

Drawdown 17 Feet Specific Capacity 5.8 Gals. per min. per ft. of drawdown

How pumped Vertical Turbine How measured orifice

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type unknown Mfrs. Name unknown

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR irrigation AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor none Color clear Temp. 58 °F.

12. LOG See Attached Are samples available? _____
(Give details on back of sheet or on seperate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A.C. Schultes/Bill Jefferys Date 10/10/84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

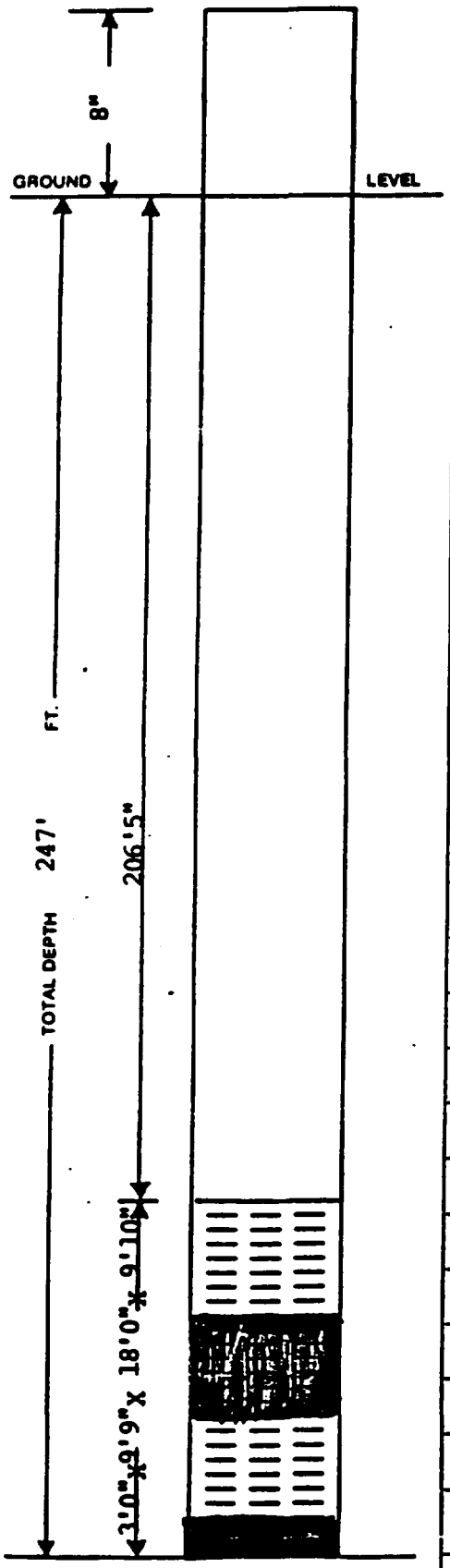
NLI 001 2022

30.22.681 30-3381

A.C. SCHULTES & SONS, INC.

NLI 001 2023

SINGLE CASED WELL



WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
Brown sand	0 to 6	J. Dietrich
White clay	6 - 25	Location Perkintown Rd.
Red clay	25-34	Well No. 1
Brown sand	34-39	State Permit
White & red sandy clay	39-86	Job No. 19986
Sandy red & white clay	86-99	Test Pumped (Hrs.) 2
Sand	99-103	Capacity (GPM) 100
Hard red clay	103-176	Static Level 47'
Red, white clay, silty sand	176-193	Pumping Level 64'
Fine sand	193-203	Datum Ground level
Clay & fine sand	203-209	Specific Capacity 5.8
Med. uniform white sand	209-221	Diameter of Casing 8"
Sandy clay	221-242	Depth of Well (Ground) 247'0"
Med. uniform white sand	242-252	Depth to Gravel 190'
Med. sand	252-278	Gravel Size #2
		Length of Casing & Screen 247'8"
		Screen Material Iron
		Screen Mfg. Johnson
		Screen Dia. 8" pipe size
		Length of Screen 19'7"
		Top of Screen Fitting F.I.P.T.
		Bottom of Screen Fitting M.I.P.T.
		Slot Size .045
		Seal Material None
		Quantity
		Depth of Seal Material
		Drilling Machine 6D
		Date Well Completed 6/29/84
		Driller

30-22-699

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1167
Application No. _____
County _____

WELL RECORD

1. OWNER FRANK E BRITTON ADDRESS 202-CURTIS DRIVE
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION PENNSVILLE PEDRICTOWN
3. DATE COMPLETED AUG-20-1969 DRILLER JOSEF STRAUBER
4. DIAMETER: top 4 Inches Bottom 4 Inches TOTAL DEPTH 130 Feet
5. CASING: Type PVC-160 Diameter 4 Inches Length 120 Feet
3. SCREEN: Type PVC-ROCK Size of Opening 020 Diameter 4 Inches Length 10 Feet
   Range in Depth { Top 120 Feet / Bottom 130 Feet } Geologic Formation _____
   Tail piece: Diameter — Inches Length — Feet
7. WELL FLOWS NATURALLY — Gallons per Minute at — Feet above surface
   Water rises to — Feet above surface
8. RECORD OF TEST: Date AUG 20-1969 Yield 75 Gallons per minute
   Static water level before pumping 15' 7" Feet below surface
   Pumping level 25 feet below surface after 4 hours pumping
   Drawdown 9'3" Feet Specific Capacity 50 Gals. per min. per ft. of drawdown
   How Pumped AIR How measured ELEC.
   Observed effect on nearby wells NO
9. PERMANENT PUMPING EQUIPMENT:
   Type UNKNOWN Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR DOMESTIC AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER VERY GOOD Sample: Yes ____ No. ____
    Taste NO Odor NO Color NO Temp. _____ °F
12. LOG YES Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA CUTTINGS
14. DATA OBTAINED BY Josef Straubar Date AUG 20-1969

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

NLI 001 2024

30-22-699

30-1167

Engineering Drilling Company

PROJECT STATE PERMIT 30-1167
LOCATION PENNSVILLE NJ,
MR. FRANK E BRITTON
BORING Nº _____ GROUND ELEV. _____ B.M. ELEV. _____

BEGIN BORING: DATE _____ TIME _____
FINISH BORING: DATE _____ TIME _____

DRIVE HAMMER: DISTANCE DROP _____ INCHES; WEIGHT _____ POUNDS; CASING SIZE _____

SPOON HAMMER: DISTANCE DROP _____ INCHES; WEIGHT _____ POUNDS; SPOON SIZE _____ INCHES

WATER OBSV. PIPE _____ FT.
CORE BIT SIZE _____
UNDISTURBED SAMPLE SIZE _____ INCHES O.D.
ANGLE OF INCLINATION _____
WATER PRES. TEST _____

GROUND WATER	DATE	HOUR AM	HOUR PM	DEPTH
	Aug-20			15'

* IF NO WATER IS ENCOUNTERED WRITE - "NO"

CASING BLOWS

DEPTH FROM-TO	DESCRIPTION	EARTH: SAMPLE NUMBER	EARTH: DEPTH FROM-TO	EARTH: SPOON BLOWS PER 6 INCHES	REMARKS
0'-15'	BROWN MEDIUM TO FINE SAND,				
15'-35'	LIGHT BROWN COARSE TO FINE SAND				
	TRACE OF VERY FINE SAND IN SILT				
35'-53'	LIGHT BROWN. COARSE TO MEDIUM SAND				
	LEYERS OF WHITE SILTY CLAY				
53-105'	BROWN FINE SAND LEYERS OF				
	BROWN CLAY,				
105'-120'	- BROWN MEDIUM TO FINE SAND				
120-130'	BROWN COARSE TO MEDIUM SAND				
	COMPL, WELL - 130'				

NLI 001 2025

JOB Nº _____ RIG Nº _____ WEATHER _____ TEMP. _____
DRILLER _____ HELPER _____ SHEET _____ OF _____

DWR-128A
1-88

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 3006015
APPLICATION NO. _____
COUNTY Salem
COORD. 30-23.156

Test Boring

WELL RECORD

1. OWNER Atlantic Electric ADDRESS Pleasantville NJ
   Owner's Well No. T-13 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Power Line
3. DATE COMPLETED 10/12/89 DRILLER Mark Soil Investigation
4. DIAMETER: Top 6 inches Bottom 6 inches TOTAL DEPTH 50 Feet

N/A CASING: Type _____ Diameter _____ inches Length _____ Feet

N/A SCREEN: Type _____ Size of Opening _____ Diameter _____ inches Length _____ Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ inches Length _____ Feet

N/A WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

N/A RECORD OF TEST: Date _____ Yield _____ Gallons per minute

Static water level before pumping _____ Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

N/A PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches

10. USED FOR Test Boring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

N/A QUALITY OF WATER _____ Sample: Yes _____ No _____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG 0-25 F-C gravel sand 25-50 gray clay Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Driller

14. DATA OBTAINED BY Doug Walsh Date 12/19/89

(NOTE. Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2026

Form DWR-138
11/80

Coord: 3023162

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-420

APPLICATION NO.

COUNTY Gloucester

WELL RECORD

1. OWNER GOUSE, SCOTT ADDRESS R.D. #2, BOX 178

Owner's Well No. 30-4202 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 11A Block: 4 Municipality: Logan Twp.

3. DATE COMPLETED July 11, 1986 DRILLER F.C. Capel & Son

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 80 Feet

5. CASING: Type PVC Diameter 4 Inches Length 70 Feet

6. SCREEN: Type PVC Size of Opening 20 Diameter 4 Inches Length 10 Feet

Range in Depth { Top 70 Feet, Bottom 80 Feet } Geologic Formation Raritan

Tail Piece: Diameter none Inches Length _____ Feet

7. WELL FLOWS NATURALLY not Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date July 13, 1986 Yield 70 Gallons per minute

Static water level before pumping 15 Feet below surface

Pumping level 15 feet below surface after 3 hours pumping

Drawdown none Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped air lift How measured _____

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type Submersible Mfrs. Name Goulds

Capacity 10 G.P.M. How Driven electric H.P. ½ R.P.M. _____

Depth of Pump in well 50 Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR domestic AMOUNT { Average 400 Gallons Daily, Maximum 500 Gallons Daily }

11. QUALITY OF WATER good Sample: Yes ____ No X

Taste none Odor none Color clear Temp. 56°F.

12. LOG on reverse side Are samples available? No
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA drilling of well

14. DATA OBTAINED BY Frederick C. Capel III Date July 15 1986

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2027

30.23.164

Form 87-5M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

Permit No. 30-223
Application No. _____
County 30.23.164

1. OWNER Pan American Refining Corp. ADDRESS 122 E. 42nd St., N.Y.17, N.Y.
   Owner's Well No. Formation Test Well # SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldmans Township, Salem County
3. DATE COMPLETED May 25,1953 DRILLER Layne-New York Co.Inc.
4. DIAMETER: Top 5 Inches Bottom 5 Inches TOTAL DEPTH 180 Feet
5. CASING: Type None Diameter _____ Inches Length _____ Feet
6. SCREEN: Type None Size of Opening _____ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece. Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date None Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: None
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR Formation Test AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temperature _____ °F
12. LOG See reverse side (Give details on back of sheet or on separate sheet) Are samples available? _____
13. SOURCE OF DATA Layne-New York Co.Inc.,
14. DATA OBTAINED BY Layne-New York Co.Inc. DATE Oct. 2,1953

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2028

30.23.164
30-223

Each Stratum	Depth of Strata	Formation Found
4'	4'	Sand & Boulders
21	25	Blue clay
9	34	Coarse gray sand
10	44	Coarse brown sand
23	67	Red clay & streaks of gravel
21	88	Coarse sand & gravel
15	103	White clay - streaks of sand & gravel
14	117	Red clay mixed with sand & gravel
18	135	Coarse white sand & gravel
23	158	Red & yellow clay & sand
22	180	Coarse sand & boulders

RECEIVED
OCT 13 1953
Department of Conservation
& Economic Development
Geologic & Top. Survey

NLI 001 2029

30-23-166

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-1310
Application No. 1578
County

NOT ON DATA BANK

WELL RECORD

1. OWNER Landtect Corporation ADDRESS 1630 Pine St. Phila., Pa.
Owner's Well No. Obs 6-A SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Harrisonville Rd. Logan Twp. N.J.

3. DATE COMPLETED _____ DRILLER J. Burke

4. DIAMETER: top 12 Inches Bottom 6 Inches TOTAL DEPTH 165 Feet

5. CASING: Type Steel Diameter 6 Inches Length 134 Feet

6. SCREEN: Type Steel Size of Opening #65 Diameter 4 Inches Length 30 Feet

Range in Depth { Top 134 Feet, Bottom 164 Feet } Geologic Formation —

Tail piece: Diameter 4 Inches Length 1 Feet

7. WELL FLOWS NATURALLY 0 Gallons per Minute at — Feet above surface

Water rises to — Feet above surface

8. RECORD OF TEST: Date None (Obs. Well) Yield _____ Gallons per minute

Static water level before pumping _____ Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type None (Obs. Well) Mfrs. Name NONE

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Observation Well AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No. _____

Taste _____ Odor _____ Color _____ Temp. _____ °F

12. LOG See Attached Sheet Are samples available? No
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA Layne New York Co. Inc.

14. DATA OBTAINED BY A. Brown & D. Ward Date 2/5/74

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

NLI 001 2030

30-23-166
cc: [illegible]
30-1310 Sales
Field

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. ..... Job No. 080203 Test No. Observation Well #6A

Log of Well for (Owner) Landtect Corporation (G & M Project)

Address .....

Representative, if any .....

Well Located at Harrisonville Rd., Center Sq. Logan Twp. County, State of N. J.

Furnish sketch of location ..... Date Drilling started 8/14/72 Date Test Hole Completed 2/13/72

Total depth to bottom of Well 165'10" Diameter Test Hole 11-7/8" Elevation at Ground Level, if available .....

Elevation at Ground Level, if available ..... Distance from where measurements were taken to ground level .....

Water stands when not pumping 5 feet 8 inches from the surface of the ground

All Measurements taken from .....

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
7'	7'		Sand				
9'	16'		Sand w/gravel				
10'	26'		Brown & red clay				
15'	41'		Clay w/strks. sandy clay				
26'	67'		Soft sandy clay				
25'	92'		Hard sandy clay w/wood				
14'	106'		Sandy clay w/soft & hard strks.				
17'	123'		Sand w/some strks. of clay				
9'	132'		Hard clay				
3'	135'		Soft sandy clay				
7'	142'		Medium to coarse sand & gravel				
2'	144'		Clay				
19'	163'		Sand w/gravel				
11'	174'		Clay red				

RECEIVED
SEP 5 1972
LAYNE NEW YORK CO., INC.
LINDEN, N.J. 07036

Remarks and opinion of Test

NLI 001 2031

CHECK TYPE OF RIG USED: Reverse Rotary X Cable Tool Wash Other?

Jim Burke
Driller

30·23·166

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-1312
Application No. 1548
County

WELL RECORD

NO DATA BRIDE.

1. OWNER Landtect Corporation ADDRESS 1630 Pine St. Phila. Pa.
Owner's Well No. Obs. 6-C SURFACE ELEVATION — Feet (Above mean sea level)
2. LOCATION Harrisonville Rd. Logan Twp. N.J.
3. DATE COMPLETED DRILLER J. P. Murray
4. DIAMETER: top 6 Inches Bottom 4 Inches TOTAL DEPTH 152 Feet
5. CASING: Type Steel Diameter 6 Inches Length 102 Feet
6. SCREEN: Type S. Steel Size of Opening #40 slot Diameter 4 Inches Length 50 Feet
Range in Depth { Top 102 Feet, Bottom 152 Feet } Geologic Formation —
Tail piece: Diameter — Inches Length — Feet
7. WELL FLOWS NATURALLY Gallons per Minute at Feet above surface
Water rises to Feet above surface
8. RECORD OF TEST: Date NONE - FOR OBS. WELL ONLY Yield Gallons per minute
Static water level before pumping Feet below surface
Pumping level feet below surface after hours pumping
Drawdown Feet Specific Capacity Gals. per min. per ft. of drawdown
How Pumped How measured
Observed effect on nearby wells
9. PERMANENT PUMPING EQUIPMENT:
Type NONE - OBSERVATION WELL ONLY Mfrs. Name NONE
Capacity G.P.M. How Driven H.P. R.P.M.
Depth of Pump in well Feet Depth of Footpiece in well Feet
Depth of Air Line in well Feet Type of Meter on Pump Size Inches
10. USED FOR OBSERVATION WELL AMOUNT { Average Gallons Daily, Maximum Gallons Daily }
11. QUALITY OF WATER Sample: Yes No.
Taste Odor Color Temp. °F
12. LOG SEE ATTACHED SHEET — Are samples available?
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA LAYNE - NEW YORK CO. INC. 1250 W. ELIZ AVE - LINDEN, N.J. 07036
14. DATA OBTAINED BY LAYNE - NEW YORK CO INC. Date 2-5-74

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

NLI 001 2032

30-23-166
30-1312

cc: Linden
Sales
Field

LAYNE-NEW YORK CO., INC.

1250 WEST ELIZABETH AVE., LINDEN, N. J.

LOG OF WELL

Well No. _____ Job No. 080203 Test No. Observation #6C

Log of Well for (Owner) Landtect Corp.

Address _____

Representative, if any _____

Well Located at Pedricktown in Gloucester County, State of N. J.

Furnish sketch of location _____ Date Drilling started _____ Date Test Hole Completed _____

Total depth to bottom of Well 152' Diameter Test Hole 9-7/8" Elevation at Ground Level, if available _____

Elevation at Ground Level, if available _____ Distance from where measurements were taken to ground level _____

Water stands when not pumping _____ feet _____ inches from the surface of the ground

All Measurements taken from _____

THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATA	Length of Core Taken	FORMATION FOUND EACH STRATUM
0-1'	1'		Top soil	150-164'	14'		Tough red white gray clay
1-6'	5'		Sand				
6-7'	1'		Clay strk.				
7-10'	3'		Coarse sand				
10-14'	4'		Clay, white				
14-19'	5'		Med. to coarse sand				
19-22'	3'		Clay, white yellow				
22-24'	2'		Coarse gravel & clay				
24-29'	5'		Fine to med. sand				
29-32'	3'		Coarse gravel				
32-35'	3'		Sandy clay				
35-38'	3'		Clay, white yellow red				
38-61'	23'		Coarse gravel & sand, clay strks.				
61-62'	1'		Clay				
62-78'	16'		Coarse sand, strks. sandy clay				
78-90'	12'		Clay, yellow white red, clay strks.				
90-144'	54'		Fine to coarse sand & gravel				
144-150'	6'		Fine to coarse sand & gravel				

Remarks and opinion of Test

NLI 001 2033

CHECK TYPE OF RIG USED
- Reverse Rotary X
- Cable Tool
- Wash
- Other?

John P. Murray
Driller

30-23-175

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-1530
Application No.
County Salem

WELL RECORD

NLI 001 2034

1. OWNER Getzinger Homes (Villanova) ADDRESS 100 E. Rt. 40 Woodstown
Owner's Well No. SURFACE ELEVATION Feet (Above mean sea level)
2. LOCATION Pennsgrove
3. DATE COMPLETED 3/14/77 DRILLER Joe Majewski
4. DIAMETER: top 8 inches Bottom 8 inches TOTAL DEPTH 31 Feet
5. CASING: Type PVC Diameter 4 inches Length 24 Feet
6. SCREEN: Type PVC Size of Opening slot Diameter 3 inches Length 7 Feet
Range in Depth { Top Feet / Bottom Feet } Geologic Formation
Tail piece: Diameter inches Length Feet
7. WELL FLOWS NATURALLY Gallons per Minute at Feet above surface
Water rises to Feet above surface
8. RECORD OF TEST: Date Did Not Test Yield Gallons per minute
Static water level before pumping 7 Feet below surface
Pumping level feet below surface after hours pumping
Drawdown Feet Specific Capacity Gals. per min. per ft. of drawdown
How Pumped How measured
Observed effect on nearby wells
9. PERMANENT PUMPING EQUIPMENT:
Type Submersible Mfrs. Name Jacuzzi
Capacity 25 G.P.M. How Driven electric H.P. 1 R.P.M. 3450
Depth of Pump in well 22 Feet Depth of Footpiece in well Feet
Depth of Air Line in well Feet Type of Meter on Pump Size inches
10. USED FOR Domestic AMOUNT { Average Gallons Daily / Maximum Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes No
Taste Good Odor Color Temp. °F
12. LOG Are samples available?
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA D'Agostino Well Drilling Co.
14. DATA OBTAINED BY Date

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

3023456

Form DWR- 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3425

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Pedericktown First Aid Squad ADDRESS Salem, N.J.

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot; 5 Block 7 Oldsman Twp.

3. DATE COMPLETED 8/20/84 DRILLER Robbins Brothers

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 85 Feet

5. CASING: Type steel Diameter 4 Inches Length 85 Feet

6. SCREEN: Type x Size of Opening ____ Diameter _____ Inches Length _____ Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation Cohansee

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY x Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 8/20/84 Yield 10 Gallons per minute

Static water level before pumping _____ Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown 3 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped air compressor How measured _____

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type submersible Mfrs. Name Sta-Rite

Capacity 10 G.P.M. How Driven elec. H.P. 1 R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER good Sample: Yes ____ No x

Taste none Odor none Color clear Temp. 54 °F.

12. LOG none Are samples available? no

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 2035

13. SOURCE OF DATA R enry Robbins

14. DATA OBTAINED BY Henry Robbins Date 8/22/84

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30-23-461

Form 87

7/10/78

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. 30-1800

Application No. _____

County Gloucester

WELL RECORD

1. OWNER Eugene Grim ADDRESS Box 209, Pedricktown, New Jersey

Owner's Well No. 30 - 1800 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION New Road O Oldmans Township

3. DATE COMPLETED March 10, 1979 DRILLER F. C. Capel & Son

4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 52 Feet

5. CASING: Type PVC Diameter 4 inches Length 38 42 Feet

6. SCREEN: Type PVC Size of Opening 20 Diameter 4 inches Length 48 10 Feet

Range in Depth { Top 42 Feet, Bottom 52 Feet } Geologic Formation Raritan

Tail piece: Diameter None inches Length _____ Feet

7. WELL FLOWS NATURALLY Not Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date March 10, 1979 Yield 40 Gallons per minute

Static water level before pumping 8 Feet below surface

Pumping level 8 feet below surface after 4 hours pumping

Drawdown None Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped Air lift How measured _____

Observed effect on nearby wells None

9. PERMANENT PUMPING EQUIPMENT:

Type Submersible Mfrs. Name Rancher

Capacity 10 G.P.M. How Driven electric H.P. ½ R.P.M. _____

Depth of Pump in well 25 Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches

10. USED FOR Domestic AMOUNT { Average 300 Gallons Daily, Maximum 400 Gallons Daily }

11. QUALITY OF WATER Fair Sample: Yes _____ No. X

Taste None Odor None Color Clear Temp. 56 °F

12. LOG On reverse side Are samples available? No

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA Drilling of well NLI 001 2036

14. DATA OBTAINED BY F. C. Capel & Son Date March 22, 1979

NOTE: Use other side of this sheet for additional information such as log of materials penetrated

0 - 14 fine to coarse yellow sand
14 - 52 coarse white sand and stones

RECEIVED
APR 6 1 04 PM '79
GEOLOGY
AND
TOPOGRAPHY

NLI 001 2037

30·23·463

Form DWR 148
1.80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2662

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER T. Earl Lindle ADDRESS 74 West Mill Road

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown - Woodstown Road

3. DATE COMPLETED 4/7/82 DRILLER Dave Mattus

4. DIAMETER: Top 8 inches Bottom 8 inches TOTAL DEPTH 55 Feet

5. CASING: Type PVC Diameter 4 Inches Length 45 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 10 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date did not test Yield _____ Gallons per minute

Static water level before pumping 17 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type Submersible Mfrs. Name Jacuzzi

Capacity 12 G.P.M. How Driven electric H.P. 1/2 R.P.M. 3450

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA D'Agostino Well Drilling, Inc.

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2038

30-23.463
30-2662

ME Earl Lindle LOCATION Pedricktown, New Jersey

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
and		brown	medium - fine	0"	10'
lay		black	very sticky	10'	25'
lay	fine	black	very fine - sticky	25'	40'
and	very little clay	black& gray	fine - medium	40'	45'
and		gray	fine - medium	45'	55'
lay	fine sand	white gray	fine - very sticky	55'	65'

Distance out from bldg. 15' ft.

Distance offset right _____ ft. left _____ ft. from sides of bldg.

Well Depth 55' Casing diameter 4" Screen length 10'

Static level 17'

NLI 001 2039

30-23-465

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-1656
Application No. _____

WELL RECORD

OWNER T.W. Hinton ADDRESS Pedricktown

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (above mean sea level)

LOCATION 180 Railroad Ave - Pedricktown

DATE COMPLETED 10/21/77 DRILLER Henry Pallin

DIAMETER: top 4 Inches Bottom 4 inches TOTAL DEPTH 64 Feet

CASING: Type Steel Diameter 4 inches Length 54 Feet

SCREEN: Type Brass Size of Opening 20 slot Diameter 4 inches Length 10 Feet

Range in Depth Top _____ Feet Bottom _____ Feet Geologic Formation Cohansey

Tail piece: Diameter _____ inches Length _____ Feet

WELL FLOWS NATURALLY 10 Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

RECORD OF TEST: Date 10/21/77 Yield _____ Gallons per minute

Static water level before pumping _____ Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped Air Compressor How measured Meter

Observed effect on nearby wells None

PERMANENT PUMPING EQUIPMENT:

Type One Horse Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches

USED FOR Domestic AMOUNT Average _____ Gallons Daily Maximum _____ Gallons Daily

QUALITY OF WATER Good Sample: Yes ____ No. ✓

Taste None Odor None Color Clear Temp. 54 °F

LOG _____ Are samples available? _____

(Give details on back of sheet or separate feet. If electric log as made, please furnish copy.)

SOURCE OF DATA Henry Pallin

DATA OBTAINED BY _____ Date 8/14/78

(Note: Use either side of this sheet for additions. Information such as log of materials penetrated analysis of the water, sketch map, sketch of specific casing arrangements, etc.)

NLI 001 2040

30-23-467

Form 87-10M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-815
Application No. _____
County _____

WELL RECORD

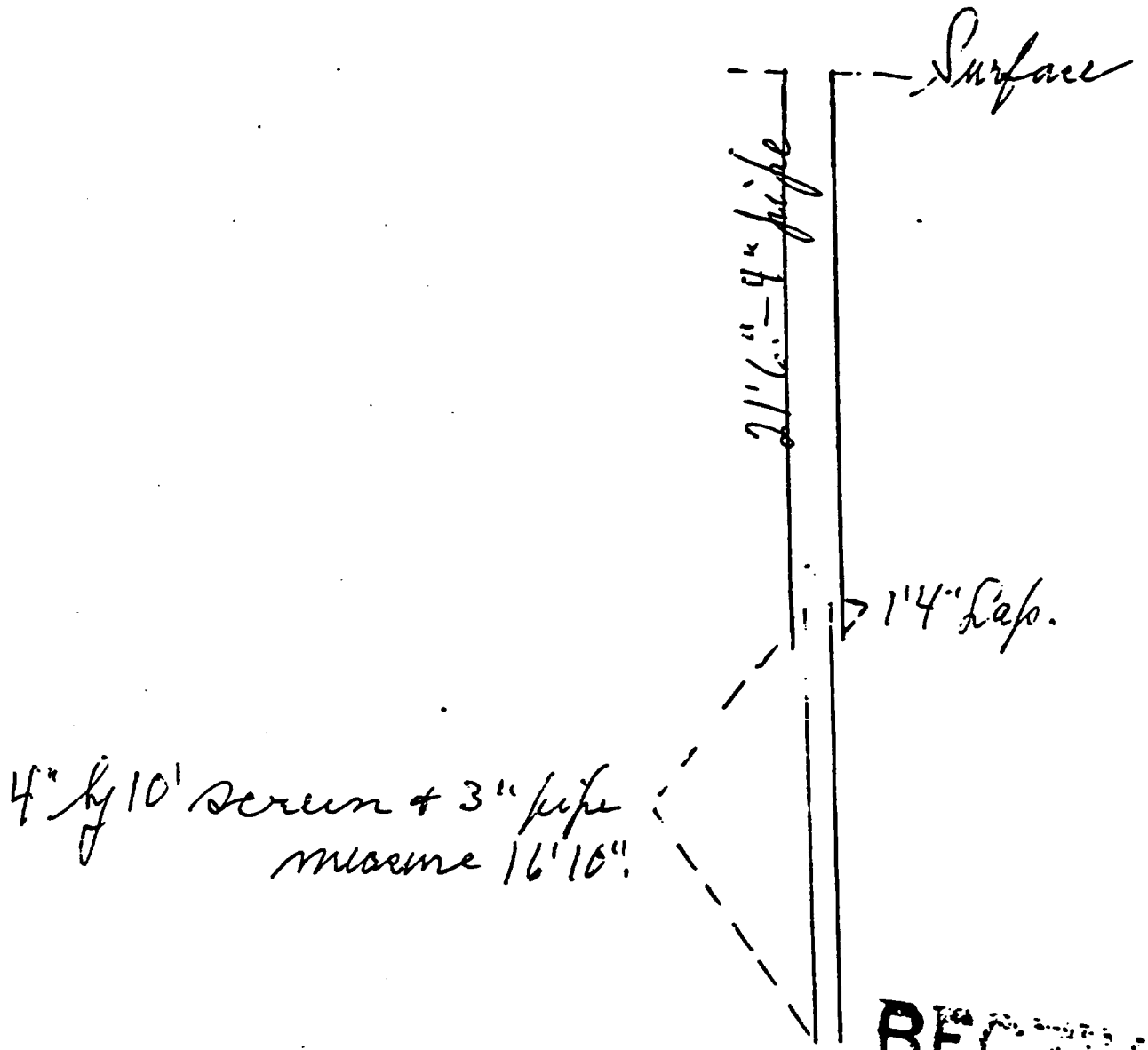
1. OWNER PEDRICKTOWN SWIM CLUB ADDRESS PEDRICKTOWN, N. J.
   Owner's Well No. I SURFACE ELEVATION 20 Feet (Above mean sea level)
2. LOCATION ½ mile from Pedricktown West of the Pedricktown - Auburn road
3. DATE COMPLETED April 29, 1960 DRILLER Haines & Moore
4. DIAMETER: top 4 Inches Botton 4 Inches TOTAL DEPTH 37 Feet
5. CASING: Type bl. steel pipe Diameter 4 Inches Length 21'6" Feet
6. SCREEN: Type slotted Size of Opening 15 Diameter 3 3/4 Inches Length 10 Feet
   Range { Top 26 Feet / Bottom 36 Feet } Geologic Formation _____
   Tail piece. Diameter 3 Inches Length 1 Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date Apr. 29, '60 Yield 25 Gallons per minute
   Static water level before pumping 14 Feet below surface
   Pumping level 24 feet below surface after 2 hours pumping
   Drawdown 10 Feet Specific Capacity 1.5 Gals. per min. per ft. of drawdown
   How Pumped with well machine How measured time to fill a container
   Observed effect on nearby wells No nearby wells
9. PERMANENT PUMPING EQUIPMENT: To be furnished by the Club
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet _____ Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet _____ Depth of Meter on Pump _____
10. USED FOR Swimming Pool AMOUNT Average _____ Gallons Daily
    Maximum _____ Gallons Daily
11. QUALITY OF WATER _____ Sample: Yes ✓ No. ●
    Taste good Odor none Color clear Temp. 56 °F
12. LOG _____ Are samples available No
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
    NLI 001 2041
13. SOURCE OF DATA Well drillers record
14. DATA OBTAINED BY Earl L. Moore Date July 27, '60

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

Log;

Sand & clay to I5'

I5' - 37' Sand gravel & sand.



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DEPT. OF CONSERVATION &
ECONOMIC DEVELOPMENT
GEOLOGICAL & TOP. SURVEY

NLI 001 2042

30-28-467

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3023467

PERMIT NO. 30-3213

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER FRECCIA, PHILLIP ADDRESS BOX 153, CROWN PT. RD.

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 12 Block: 39 Municipality: Oldmans Twp.

3. DATE COMPLETED 8/15/83 DRILLER South Jersey Well Drilling

4. DIAMETER: Top 3 inches Bottom 3 inches TOTAL DEPTH 120 Feet

5. CASING: Type PVC Diameter 3 Inches Length 110 Feet

6. SCREEN: Type P.V.C. Size of Opening .016 Diameter 3 Inches Length 10 Feet

Range in Depth { Top 110 Feet / Bottom 10 Feet } Geologic Formation SAND & CLAY

Tail Piece: Diameter 1 Inches Length 30 Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 8/15/83 Yield 15 Gallons per minute

Static water level before pumping 16 Feet below surface

Pumping level 20 feet below surface after 4 hours pumping

Drawdown 4 Feet Specific Capacity 4 Gals. per min. per ft. of drawdown

How pumped JET PUMP How measured FLOWMETER

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type JET PUMP Mfrs. Name MYERS

Capacity 15 G.P.M. How Driven ELEC H.P. 1/2 R.P.M. 3500

Depth of Pump in well _____ Feet Depth of Footpiece in well 30 Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR DOMESTIC AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER GOOD Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

NLI 001 2043

13. SOURCE OF DATA SOUTH JERSEY WELL DRILLING

14. DATA OBTAINED BY X SOUTH JERSEY WELL DRILLING Date 10/31/83
1061 FIRST RD
HAMMONTON, N.J.

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 04708
Atlas Sheet Coordinates 30 23 475

OWNER IDENTIFICATION - Owner NIPK, ALBERT
Address RD #1, BOX 90
City PADRICKTOWN State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No.
Address
County Salem Municipality OLDMANS TWP. Lot No. 19 Block No. 29

WELL USE withdrawal Status in use

WATER USE Domestic Average 500 gals. daily Maximum 1800 gals. daily

WELL CONSTRUCTION Date well completed 6 / 30 / 87
BOREHOLE DIMENSIONS Depths: Total 62 ft. Finished 56 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		46	4	PVC Sch. 40
Casing 2				
Casing 3				
Screen 1	46	10	4	PVC slot .015
Screen 2				
Tail Piece				
Gravel Pack	44	9	8	#1 & #2 Well Seal
Grout				
Grouting Method				

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date / / NO TEST TAKEN
Static water-level before pumping 16 ft. below land surface. Water level ft. below land surface after hrs. of pumping.
Water level was measured using Drawdown ft.
Discharge rate measured using Discharge Rate gals. per min.
Well was pumped using Specific Capacity gals. per min. per ft. of drawdown
Observed effects on nearby wells
Water Quality (taste, odor, color, etc.) Good

DID NOT INSTALL

PERMANENT PUMPING EQUIPMENT Installed by Pump Type
Mfrs. Name Model
CAPACITY: Pump delivers GPM at PSI pressure.
POWER: HP at RPM Power Source
DEPTHS: Pump ft. Footpiece ft. Airline ft.
FLOW METER: Model installed on in. diameter pipe.

D'AGOSTINO WELL DRILLING

CONTRACTOR - Name of Drilling Contractor
Address RR#8, Box 122
City Bridgeton State NJ Zip Code 08302
Name of Driller Paul Belan License No. 1027

Signature of Contractor Louis D'Agostino Date 8 / 10 / 87

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2044

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30-04708
30.23.475

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method: Mud Rotary

Type of Rig: Cyclone 500 Jr.

Aquifer/Geo. Fm.

DEP USE ONLY

Storet Hydrogeo Code
USGS Hydrogeo Code
Depth to Bedrock ft.
Bedrock Lith. Code
Bedrock Fm. Code

Completed by
Date / /

LOG	Thick.	Lith.	Fm.
0' - 2' top soil brown			
2' -13' clay medium brown to orange brown			
13' -27' sand, fine to medium medium brown			
27' -40' Sand may streaks of white clay fine			
40' -45' Sand fine little medium white			
45' -57' Sand medium little coarse white			
57' -62' Sand medium to fine white			

GWPI No. -

NJPDES No. -

Latitude ° ' "

Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code

County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by

Date / /

NLI 001 2045

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 06183
Atlas Sheet Coordinates 30 : 23 : 4/5

OWNER IDENTIFICATION - Owner SPARKS, ROGER
Address APT. 3270, TWIN BRIDGE
City CARNEY'S POINT State NJ Zip Code 08069

WELL LOCATION - If not the same owner please give address. Owner's Well No. 3006183
Address RR1 Box 65B Pennsville - Pedrick town Rd
County Salem Municipality OLDMANS TWP. Lot No. p/o 18 Block No. 35

WELL USE Withdraw Status In Use

WATER USE Domestic Average 550 gals. daily Maximum 600 gals. daily

WELL CONSTRUCTION Date well completed 12 / 6 / 89
BOREHOLE DIMENSIONS Depths: Total 35 ft. Finished 35 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well 30 ft. Elevation was determined using Topo Map
Casing Height (stick-up) above land surface 16" ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		18'	4"	Sch 40 PVC
Casing 2				
Casing 3				
Screen 1	18'	10'	4"	.020 PVC
Screen 2				
Tail Piece		7'	4"	
Gravel Pack	17'			#2 Ricci
Grout	Surface			Bentonite Slurry
Grouting Method	Tremmie to 17'			

WELL FLOWS NATURALLY _____ gals. per min. at _____ ft. above the land surface.
Water rises to _____ ft. above the land surface.

RECORD OF TEST Test Date 12 / 11 / 90
Static water-level before pumping 8' ft. below land surface. Water level 12 ft. below land surface after 1 hrs. of pumping.
Water level was measured using M-Scope Drawdown 4 ft.
Discharge rate measured using 5gal Pail Discharge Rate 12 gals. per min.
Well was pumped using Submersible Specific Capacity 3 gals. per min. per ft. of drawdown
Observed effects on nearby wells None
Water Quality (taste, odor, color, etc.) Good

PERMANENT PUMPING EQUIPMENT Installed by John Schiavo Pump Type Submersible
Mfrs. Name Myers Model S2J52-J511P
CAPACITY: Pump delivers 10 GPM at 50 PSI pressure.
POWER: 1/2 HP at 3450 RPM Power Source 220 from house
DEPTHS: Pump 20 ft. Footpiece _____ ft. Airline _____ ft.
FLOW METER: Model _____ installed on _____ in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor JOHN SCHIAVO (AQUA TEXT) 42 Robert St Swedesboro
Address
City Swedesboro State NJ Zip Code 08085
Name of Driller John Schiavo License No. M1366

Signature of Contractor John P. Schiavo Date 1 / 26 / 90

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2046

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 06183

30 23 47

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☑ No

Drilling Method Rotary

Type of Rig Failing 1250

Aquifer/Geo. Fm. Raritan (upper)

DEP USE ONLY

Storet Hydrogeo Code _____

USGS Hydrogeo Code _____

Depth to Bedrock _____ ft.

Bedrock Lith. Code _____

Bedrock Fm. Code _____

Completed by _____

Date ___ / ___ / ___

LOG		Thick.	Lith.	Fm.
0-2	Fill			
2-11	Coarse Orange Sand			
11-29	Coarse White Sand			
29-31	White Clay			
31-35	Red Clay			

GWPI No. ___ - _____

NJPDES No. _____ - ___

Latitude ___ ° ___ ' ___ "

Longitude ___ ° ___ ' ___ "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle _____

Drainage Basin Code _____

County/Municipality Code _____

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by _____

Date ___ / ___ / ___

NLI 001 2047

30-23-478

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-1499
Application No. _____
County Salem

WELL RECORD

1. OWNER James Pomponi, III ADDRESS P.O. Box 615, Pennsgrove
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Pedricktown-Perkintown Road
3. DATE COMPLETED 10/25/76 DRILLER Joe Majewski
4. DIAMETER: top 8 Inches Bottom 8 Inches TOTAL DEPTH 32 Feet
5. CASING: Type PVC Diameter 4 Inches Length 22 Feet
6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 10 Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date Did not test Yield _____ Gallons per minute
   Static water level before pumping 7 Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type Submersible Mfrs. Name Jacuzzi
   Capacity 20 G.P.M. How Driven electric H.P. 1 R.P.M. 3450
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes _____ No. _____
    Taste Good Odor _____ Color _____ Temp. _____ °F
12. LOG _____ Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA D'Agostino Well Drilling Co. NLI 001 2048
14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

30-23478

FORM 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-1534
Application No. _____
County Salem

WELL RECORD

1. OWNER Joseph Englett ADDRESS 261 N Broad st. Penn Grove
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldmans Twp
3. DATE COMPLETED 3-10-77 DRILLER Joe Majewski
4. DIAMETER: top 8 Inches Bottom 8 Inches TOTAL DEPTH 38' Feet
5. CASING: Type PVC Diameter 4 Inches Length 31 Feet
6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 7 Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date Did Not Test Yield _____ Gallons per minute
   Static water level before pumping 11 Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type Jet Pump Mfrs. Name Jacuzzi
   Capacity 15 G.P.M. How Driven electric H.P. 3/4 R.P.M. 3450
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes _____ No. _____
    Taste Good Odor _____ Color _____ Temp. _____ °F
12. LOG _____ Are samples available? _____
    (Give details on back of sheet or on seperate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA D'Agostino Well Drilling Co NLI 001 2049
14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05047
Atlas Sheet Coordinates 30 : 23 : 478

OWNER IDENTIFICATION - Owner WYGAND, ROBERT
Address 250 REGIONAL DRIVE
City CARNEYS POINT State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No.
Address Perkintown road
County Salem Municipality ~~OLDMANS TWP.~~ Lot No. ~~29~~ Block No. ~~43~~

WELL USE withdrawal Status in use

WATER USE Domestic Average 500 gals. daily Maximum 1800 gals. daily

WELL CONSTRUCTION Date well completed 6 / 21 / 88
BOREHOLE DIMENSIONS Depths: Total 44 ft. Finished 33 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL *Screens: Note Slot Size(s)*
Casing 1		28	4	PVC Sch. 40
Casing 2				
Casing 3				
Screen 1	28	5	4	PVC slot .015
Screen 2				
Tail Piece				
Gravel Pack	26	7	8	#1 & #2 Well Gravel
Grout				
Grouting Method				

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date / / NO TEST TAKEN
Static water-level before pumping 6 ft. below land surface. Water level ft. below land surface after hrs. of pumping.
Water level was measured using Drawdown ft.
Discharge rate measured using Discharge Rate gals. per min.
Well was pumped using Specific Capacity gals. per min. per ft. of drawdown
Observed effects on nearby wells
Water Quality (taste, odor, color, etc.) good

PERMANENT PUMPING EQUIPMENT Installed by D'Agostino's Pump Type Submersible
Mfrs. Name JACUZZI Model ZZ
CAPACITY: Pump delivers 12 GPM at 40 PSI pressure.
POWER: 1/2 HP at 3450 RPM Power Source electric
DEPTHS: Pump 26 ft. Footpiece ft. Airline ft.
FLOW METER: Model installed on in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor D'AGOSTINO WELL DRILLING NLI 001 2050
Address RR#8, Box 122 Bridgeton, NJ 08302
City State Zip Code
Name of Driller David Mattus License No. 1005

Signature of Contractor David D'Agostino Date 10 / 27 / 88

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05047
30-23-478

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method: Mud Rotary

Type of Rig: Cyclone Jr.

Aquifer/Geo. Fm.

DEP USE ONLY

Storet Hydrogeo Code
USGS Hydrogeo Code
Depth to Bedrock ft.
Bedrock Lith. Code
Bedrock Fm. Code

Completed by
Date / /

LOG		Thick.	Lith.	Fm.
0' - 15'	Clay, Brown Dry			
15' - 33'	Sand, Light Brown, Med. to Fine			
33' - 44'	Sand, White Very Fine			

GWPI No. -

NJPDES No. -

Latitude ° ' "

Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code

County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by

Date / /

NLI 001 2051

DWR-138A
1/88

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-06012
APPLICATION NO. _____
COUNTY _____
COORD. 30.23.478

Test Boring

WELL RECORD

1. OWNER Atlantic Electric ADDRESS Pleasantville NJ
Owner's Well No. T-16 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Power Line
3. DATE COMPLETED 10/12/89 DRILLER M&B Soil Investigation
4. DIAMETER: Top 6 inches Bottom 6 inches TOTAL DEPTH 50 Feet
N/A 5. CASING: Type _____ Diameter _____ Inches Length _____ Feet
N/A 6. SCREEN: Type _____ Size of Opening _____ Diameter _____ Inches Length _____ Feet
Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
Tail Piece: Diameter _____ Inches Length _____ Feet
N/A 7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
Water rises to _____ Feet above surface
N/A 8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute
Static water level before pumping _____ Feet below surface
Pumping level _____ feet below surface after _____ hours pumping
Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
How pumped _____ How measured _____
Observed effect on nearby wells _____
N/A 9. PERMANENT PUMPING EQUIPMENT:
Type _____ Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Test Boring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
N/A 11. QUALITY OF WATER _____ Sample: Yes _____ No _____
Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG 0-25 F-C grayish sand 25-50 gray clay Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Driller
14. DATA OBTAINED BY Doug Walth Date 12/19/89

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2052

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 – 05768
Atlas Sheet Coordinates 30 : 23 : 478

OWNER IDENTIFICATION - Owner CIRIALE, GIUSEPPE
Address 92 RUTGERS RD
City PENNSVILLE State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No.
Address Perkintown road
County Salem Municipality ~~OLDMANS TWP.~~ Lot No. ~~P/O 29~~ Block No. ~~43~~

WELL USE withdrawal Status in use

WATER USE Domestic Average 500 gals. daily Maximum 1800 gals. daily

WELL CONSTRUCTION Date well completed 7 / 19 / 89
BOREHOLE DIMENSIONS Depths: Total 52 ft. Finished 52 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well 28 ft. Elevation was determined using Estimate from map
Casing Height (stick-up) above land surface 1 ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL *Screens: Note Slot Size(s)*
Casing 1		42	4	PVC Sch. 40
Casing 2				
Casing 3				
Screen 1	42	10	4	PVC slot .015
Screen 2				
Tail Piece				
Gravel Pack	40	12	8	#1 & #2 Well Gravel
Grout	0	40		Bentonite Slurry
Grouting Method	Pressure / Tremmie			

WELL FLOWS NATURALLY _____ gals. per min. at _____ ft. above the land surface.
Water rises to _____ ft. above the land surface.

RECORD OF TEST Test Date 7 / 19 / 89
Static water-level before pumping 8 ft. below land surface. Water level 16 ft. below land surface after 1 hrs. of pumping.
Water level was measured using Lift/Pump Drawdown 8 ft.
Discharge rate measured using Bucket/Timer Discharge Rate 18 gals. per min.
Well was pumped using Submersible Specific Capacity 2.25 gals. per min. per ft. of drawdown
Observed effects on nearby wells None
Water Quality (taste, odor, color, etc.) Okay

PERMANENT PUMPING EQUIPMENT Installed by D'Agostino Pump Type Submersible
Mfrs. Name Jacuzzi Model T5S410P8-S2
CAPACITY: Pump delivers 12 GPM at 40 PSI pressure.
POWER: 1/2 HP at 3450 RPM Power Source electric
DEPTHS: Pump 28 ft. Footpiece _____ ft. Airline _____ ft.
FLOW METER: Model _____ Installed on _____ in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor D'AGOSTINO WELL DRILLING NLI 001 2053
Address RR#8, Box 122
City Bridgeton, NJ 08302 State _____ Zip Code
Name of Driller David Mattus License No. 1005

Signature of Contractor Emerio D'Agostino Date 8 / 1 / 89

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-136
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05768
30 23 478

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method Mud Rotary

Type of Rig Cyclone Jr.

Aquifer/Geo. Fm.

DEP USE ONLY

Storet Hydrogeo Code

USGS Hydrogeo Code

Depth to Bedrock ft.

Bedrock Lith. Code

Bedrock Fm. Code

Completed by

Date / /

LOG

	Thick.	Lith.	Fm.
0 ' - 15' sand brown stones bit of clay med. and some coarse			
15' - 30' sand light brown med. to fine			
30' - 40' sand white med. to fine			
40' - 52' sand white and light brown med. to fine			

GWPI No. -

NJPDES No. -

Latitude ° ' "

Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code

County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by

Date / /

NLI 001 2054

30-23.479

Form 87-10m

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-685
Application No. _____
County _____

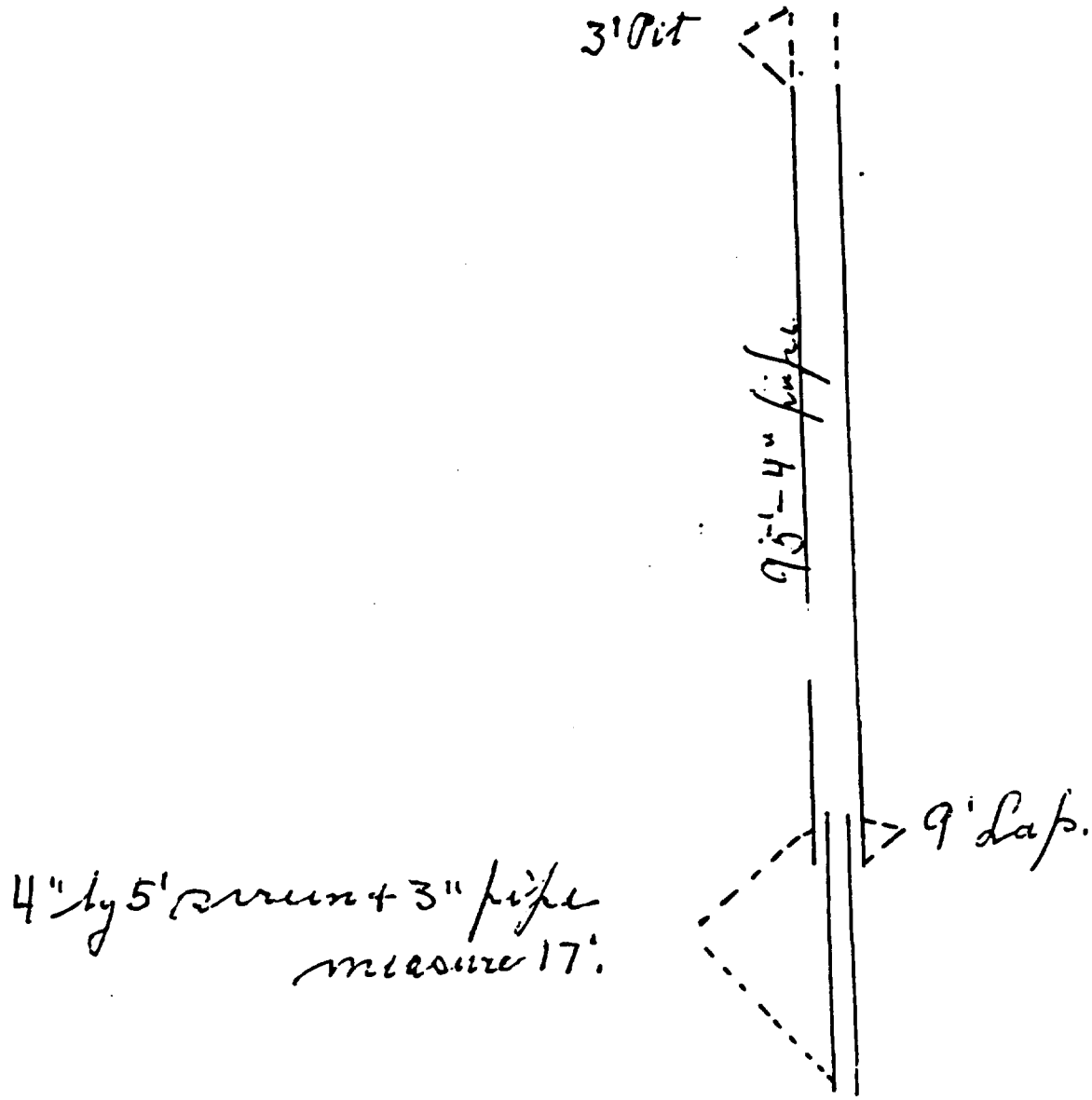
WELL RECORD

1. OWNER La Palomento Bros., ADDRESS Pedricktown, N. J.
   Owner's Well No. I SURFACE ELEVATION 30 Feet (Above mean sea level)
2. LOCATION South side of there farm house at Perkintown
3. DATE COMPLETED Feb. 6, 1958 DRILLER Haines & Moore
4. DIAMETER: top 4 inches Botton 4 inches TOTAL DEPTH 106 Feet
5. CASING: Type bl. steel pipe Diameter 4 inches Length 95 Feet
6. SCREEN: Type slotted Size of Opening 20 Diameter 3 3/4 inches Length 5 Feet
   Range { Top 100 Feet / Bottom 105 Feet } Geologic Formation _____
   Tail piece. Diameter 3 inches Length I Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date Feb. 5, '58 Yield 9 Gallons per minute
   Static water level before pumping 15 Feet below surface
   Pumping level 40 feet below surface after 4 hours pumping
   Drawdown 25 Feet Specific Capacity 1/3 Gals. per min. per ft. of drawdown
   How Pumped with well machine How measured time to fill a container
   Observed effect on nearby wells No nearby wells
9. PERMANENT PUMPING EQUIPMENT: To be supplied by the owners
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet _____ Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet _____ Depth of Meter on Pump _____
10. USED FOR Farm use AMOUNT Average _____ Gallons Daily
    Maximum _____ Gallons Daily
11. QUALITY OF WATER _____ Sample: Yes ____ No. *
    Taste good Odor none Color clear Temp. 56 °F
12. LOG _____ Are samples available no
    (Give details on back of sheet or on seperate sheet. If electric log was made, please furnish copy)
    NLI 001 2055
13. SOURCE OF DATA Well drillers record
14. DATA OBTAINED BY Earl L. Moore Date Feb. 10, 1958

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

Log;

Sand to 6'
6' - 18' sand gravel
18' - 30' clay
30' - 98' sand & clay
98' - 106' medium fine sand.



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MAR 7 1958
Department of Conservation
& Economic Development
Geology & Tec. Survey

NLI 001 2056

Let's protect our earth

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Geology & Topography
P.O. Box 1390
Trenton, NJ 08625

30-23-492

WATER WELL RECORD

Completed record must be returned 60 days after completion of well
(NJSA 58:4A—14 - 15)

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK [X] CORRECT BOX WHERE APPLICABLE

COUNTY	TOWNSHIP, BOROUGH, CITY	LOT	BLOCK	PERMIT NO.
Salem	Oldman Twp.	P/o 17A	42	30-1935

OWNER (LAST NAME FIRST)	ADDRESS	DATE COMPLETED
Tomlin, Arthur W.	Straughms Mill Rd. Pedricktown, N.J.	DAY 25 MO. 6 79

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Sand		Red	Fine	0	30
Clay		Green		30	95
Sand		Yellow	Coarse	45	105
Clay				105	

LOG?
YES [X] NO [ ]
TYPE(S)
DATE
PERFORMED BY

CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
	[X] STEEL [ ] PLASTIC [ ] OTHER [ ] OPEN HOLE	2"	0	105
	[ ] STEEL [ ] PLASTIC [ ] OTHER [ ] OPEN HOLE			
	[ ] STEEL [ ] PLASTIC [ ] OTHER [ ] OPEN HOLE			

BOREH

SCREEN

SIZE OF OPENING (SLOT NO.)	DIAMETER	LENGTH
60	4 INCHES	10 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
Brass	10 FEET

SEIVE ANALYSIS YES [ ] NO [ ]
GRAVEL PACK YES [ ] NO [ ] SIZE

PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC)
		No Plug

LOCATION OF W

DISTANCE OUT FROM BLDG 20 F
SET RIGHT 10 FT. LEFT
PUMP INSTALLER Milton
DATE OF INSTALLATION
TYPE OF PUMPING EQUIPMENT JET
CASING FINISH
DEPTH FROM F
OTHER
PUMP INT
DECTF
DRILLERS REMARKS

CONTRACTOR
NAME OF WELL CONTRACTOR Milton J. Dec
ADDRESS Michaels Lane, P
NAME OF DRILLER Milton J. Dechamps
SIGNATURE OF DRILLER

NLI 001 2057

30-23-494

Form 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30 1599
Application No. _____
County _____

WELL RECORD

1. OWNER Robert Butler ADDRESS Pedricktown
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above ocean sea level)
2. LOCATION Stringham Mill Rd. Pedricktown
3. DATE COMPLETED 8/23/77 DRILLER Barry Rahlin
4. DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 124 Feet
5. CASING: Type Steel Diameter 4 inches Length 114 Feet
6. SCREEN: Type Brass Size of Opening 20 Diameter 3 inches Length 10 Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ inches Length _____ Feet
7. WELL FLOWS NATURALLY No Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping.
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped Air Compressor How measured Meter
   Observed effect on nearby wells None
9. PERMANENT PUMPING EQUIPMENT:
   Type One by owner Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes ___ No. ✓
    Taste None Odor None Color Clear Temp. 54 °F
12. LOG _____ Are samples available? ___
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA Barry Rahlin
14. DATA OBTAINED BY " " Date 9/12/78

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

NLI 001 2058

30:23.4 97

FORM 87-10M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30 844
Application No. _____
County _____

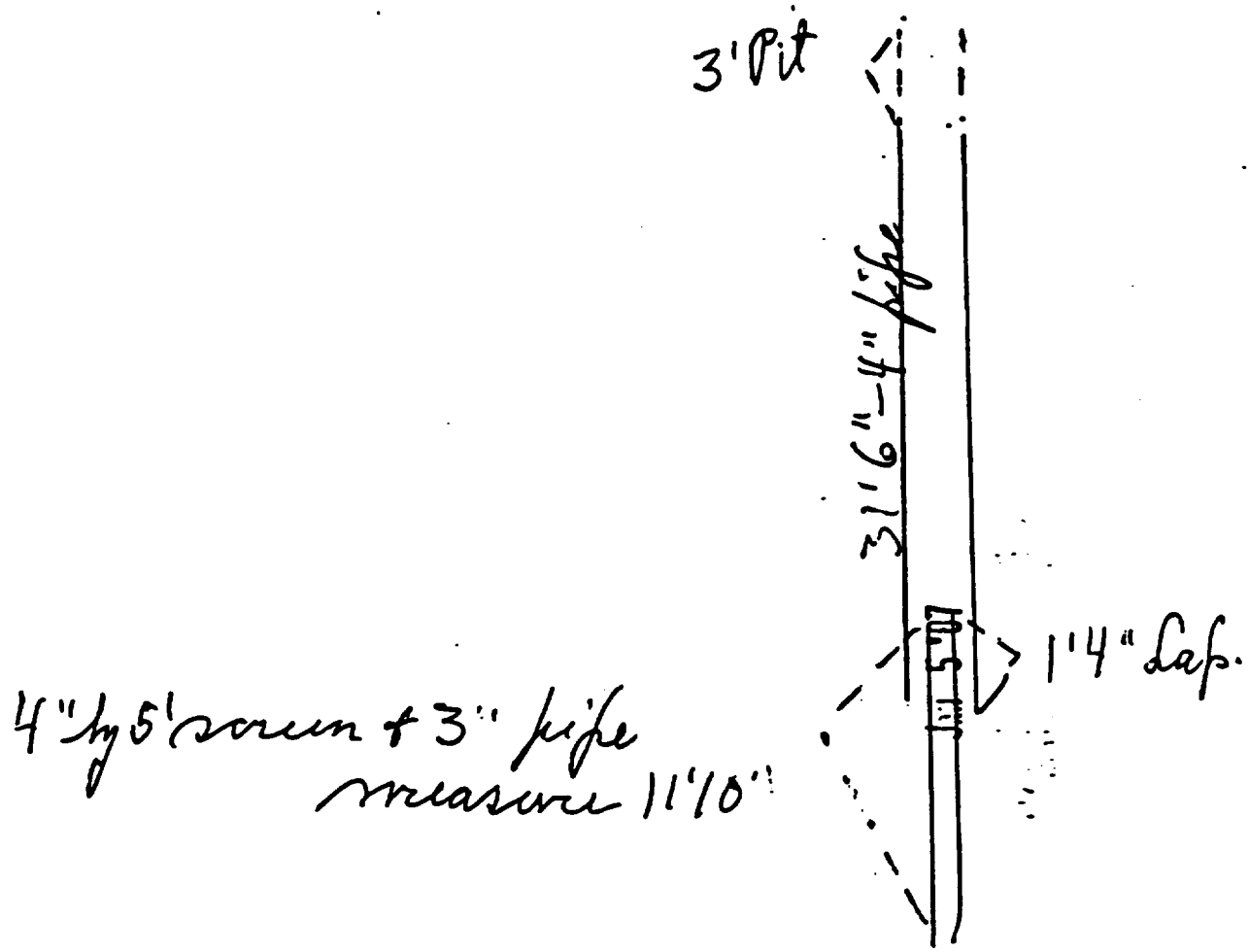
WELL RECORD

1. OWNER William G. Jenkins ADDRESS Pedricktown, N. J. R.D.
   Owner's Well No. I SURFACE ELEVATION 20 Feet (Above mean sea level)
2. LOCATION In front of his farm home off the Straghen Mill Road near Pedricktown
3. DATE COMPLETED Aug. 24, 1960 DRILLER Haines & Moore
4. DIAMETER: top 4 Inches Botton 4 Inches TOTAL DEPTH 45 Feet
5. CASING: Type bl. steel pipe Diameter 4 Inches Length 31'6" Feet
6. SCREEN: Type slotted Size of Opening 20 Diameter 3 3/4 Inches Length 5 Feet
   Range { Top 39 Feet / Bottom 44 Feet } Geologic Formation _____
   Tail piece. Diameter 3 Inches Length 1 Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date Aug. 24, 1960 Yield 16 Gallons per minute
   Static water level before pumping 16 Feet below surface
   Pumping level 20 feet below surface after 2 hours pumping
   Drawdown 4 Feet Specific Capacity 4 Gals. per min. per ft. of drawdown
   How Pumped With well machine How measured Time to fill a container
   Observed effect on nearby wells No nearby wells
9. PERMANENT PUMPING EQUIPMENT: Supplied by the owner
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet _____ Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet _____ Depth of Meter on Pump _____
10. USED FOR Frm home AMOUNT Average _____ Gallons Daily
    Maximum _____ Gallons Daily
11. QUALITY OF WATER _____ Sample: Yes ____ No. *
    Taste good Odor none Color clear Temp. 56 °F
12. LOG _____ Are samples available no
    (Give details on back of sheet or on seperate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA Well drillers record NLI 001 2059
14. DATA OBTAINED BY Earl L. Moore Date ~~Aug. 27, 1960~~

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

Log:

Top & subsoil to 2'
2' - 7' sand
7' - 8' clay
8' - 27' Medium sand & some sandstone
27' - 28' clay
28' - 40' Fine & medium sand
40' - 45' Medium & coarse sand.



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SEP 26 1960
DEPT. OF CONSERVATION &
ECONOMIC DEVELOPMENT
GEOLOGIC & TOP. SURVEY

NLI 001 2060

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 04303
Atlas Sheet Coordinates 30 : 23 : 497

OWNER IDENTIFICATION - Owner LINSKI
Address STRAUGHENS ROAD
City PEDRICKTOWN State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No. 1
Address St Straughens Rd
County Salem Municipality OLDMANS TWP Lot No. 42 Block No. 38

WELL USE Domestic Status Active

WATER USE " Average 500 gals. daily Maximum 700 gals. daily

WELL CONSTRUCTION Date well completed 12 / 10 / 86
BOREHOLE DIMENSIONS Depths: Total 113 ft. Finished 113 ft.
Diameter: Top 8 in. Bottom 8 in.

Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface - 4 ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1			4	PVC 020
Casing 2				
Casing 3				
Screen 1		103		
Screen 2		113		
Tail Piece				
Gravel Pack	100-113			
Grout	0-20			
Grouting Method	Tremie			

WELL FLOWS NATURALLY / gals. per min. at / ft. above the land surface.
Water rises to / ft. above the land surface.

RECORD OF TEST Test Date 12 / 10 / 86
Static water-level before pumping 27 ft. below land surface. Water level 30 ft. below land surface after 1 hrs. of pumping.
Water level was measured using Sgal pal M-Scope Drawdown 3 ft.
Discharge rate measured using 5 gal pal Discharge Rate 10 gals. per min.
Well was pumped using sub Specific Capacity 3.3 gals. per min. per ft. of drawdown
Observed effects on nearby wells
Water Quality (taste, odor, color, etc.) Iron

PERMANENT PUMPING EQUIPMENT Installed by Charles Kramer Pump Type sub
Mfrs. Name Goulds Model 10GJ
CAPACITY: Pump delivers 10 GPM at 60 PSI pressure.
POWER: 1/2 HP at 3450 RPM Power Source ele
DEPTHS: Pump 60 ft. Footpiece — ft. Airline — ft.
FLOW METER: Model / Installed on 1 in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor CHARLES KRAMER NLI 001 2061
Address 30 Somerset Rd
City Mickleton State NJ Zip Code 08056
Name of Driller Charles Kramer License No. 1060

Signature of Contractor Charles Kramer Date 12 / 10 / 86

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 04308
30.23.497

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☑ No

Drilling Method rotary

Type of Rig 1250 Failing

Aquifer/Geo. Fm. Raton

DEP USE ONLY

Storet Hydrogeo Code _____
USGS Hydrogeo Code _____
Depth to Bedrock _____ ft.
Bedrock Lith. Code _____
Bedrock Fm. Code _____

Completed by _____
Date ___ / ___ / ___

LOG	Thick.	Lith.	Fm.
0-1 Top Soil			
1-19 sand yellow			
19-23 clay white & yellow			
23-42 silty sand			
42-95 white & gray clay			
95-115 sand white (med)			

GWPI No. ___ - ___ NJPDES No. ___ - ___

Latitude ___ ° ___ ' ___ " Longitude ___ ° ___ ' ___ "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle _____

Drainage Basin Code _____ County/Municipality Code _____

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by _____ Date ___ / ___ / ___

NLI 001 2062

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

30.23.521

Form 87-5M

Permit No. 30-508

Application No. _____

County _____

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

Division of Water Policy & Supply

WELL RECORD

1. OWNER Lester Searles ADDRESS Swedesboro, N. J. R.D.

   Owner's Well No. I SURFACE ELEVATION 20 Feet (Above mean sea level)

2. LOCATION East side of her house on Oldman's Creek Road

3. DATE COMPLETED Sept. 27, 1955 DRILLER Haines & Moore

4. DIAMETER: Top 4 Inches Bottom 4 Inches TOTAL DEPTH 66 Feet

5. CASING: Type black steel pipe Diameter 4 Inches Length 55 Feet

6. SCREEN: Type slotted Size of Opening 20 Diameter 3 3/4 Inches Length 5 Feet

   Range in Depth { Top 60 Feet, Bottom 65 Feet } Geologic Formation _____

   Tail piece. Diameter 3 Inches Length I Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date Sept. 26, 1955 Yield 15 Gallons per minute

   Static water level before pumping 14 Feet below surface

   Pumping level 18 feet below surface after 3 hours pumping

   Drawdown 4 Feet Specific Capacity 4 Gals. per min. per ft. of drawdown

   How Pumped with well machine How measured time to fill a container

   Observed effect on nearby wells None

9. PERMANENT PUMPING EQUIPMENT:

   Type Jet Capacity 9 Gallons per minute

   How Driven electric motor Horse Power 1/3 R.P.M. 3450

   Depth of pump in well 23 Feet Depth of Foot piece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____

10. USED FOR Household use AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No. *

    Taste fair Odor none Color clear Temperature 56 °F

12. LOG _____ Are samples available? No

    (Give details on back of sheet or on separate sheet)

13. SOURCE OF DATA Well drillers record

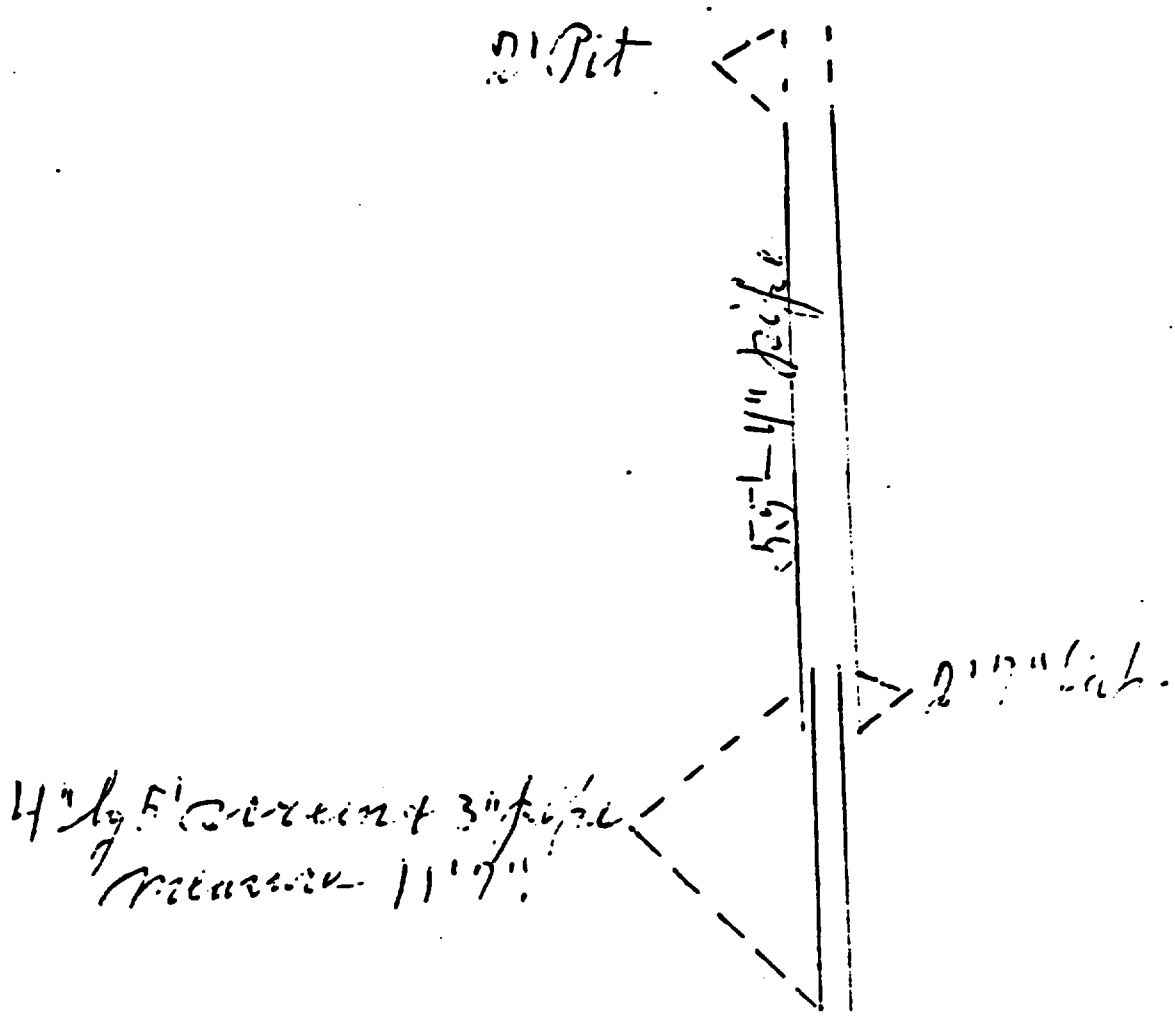
14. DATA OBTAINED BY Earl L. Moore DATE Oct. 10, 1955

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2063

Log;

Sand to 9'
9' - 28' clay
28' - 47' " & some sand
47' - 53' fine sand
53' - 66' Coarse sand.



RECEIVED
OCT 11 1955
Department of Conservation
& Economic Development
Dealaska & Inc. Survey

NLI 001 2064

30-23-54

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30 - 2665

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Willard K. Bond ADDRESS Pedrick-Auburn Rd., Pedricktown, N.J.

Owner's Well No. 30 - 2665 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown-Auburn Road - Oldsman Township

3. DATE COMPLETED May 16, 1982 DRILLER F. C. Capel & Son

4. DIAMETER: Top _____ inches Bottom _____ inches TOTAL DEPTH 59 Feet

5. CASING: Type PVC Diameter 4 Inches Length 49 Feet

6. SCREEN: Type PVC Size of Opening 16 Diameter 4 Inches Length 10 Feet

Range in Depth { Top 49 Feet / Bottom 59 Feet } Geologic Formation Raritan

Tail Piece: Diameter none Inches Length _____ Feet

7. WELL FLOWS NATURALLY not Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date May 16, 1982 Yield 50 Gallons per minute

Static water level before pumping 19 feet Feet below surface

Pumping level 19 feet below surface after 4 hours pumping

Drawdown none Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped air lift How measured _____

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type Submersible Mfrs. Name Gould

Capacity 10 G.P.M. How Driven electric H.P. ½ R.P.M. _____

Depth of Pump in well 40 Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR domestic AMOUNT { Average 400 Gallons Daily / Maximum 500 Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes _____ No X

Taste none Odor none Color clear Temp. 56 °F.

12. LOG on reverse side Are samples available? no

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA drilling of well

14. DATA OBTAINED BY F. C. Capel & Son Date July 23, 1982

NLI 001 2065

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

0 - 1	top woil
1 - 31	fine to coarse yellow sand and stones
31 - 37	white clay
37 - 59	coarse yellow sand and gravel

1.35	Manganese
0.11	Iron
9.7	nitrates
5.8	pH
0	total coliform
8.4	alkalinity
86	carbon dioxide
20	cloride
.05	surfactants
74	sulfate
226	TDS

AUG 5 '82

NLI 001 2066

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. ~~30~~ ~~05567~~
Atlas Sheet Coordinates ~~30~~ : ~~23~~ : ~~544~~

OWNER IDENTIFICATION - Owner ~~MARTIN, WILLIAM~~
Address ~~P.O. BOX 178~~
City ~~PEDRICKTOWN~~ State ~~NJ~~ Zip Code 08067

WELL LOCATION - If not the same owner please give address. Owner's Well No. 30-05567
Address RD 1 Seminole Rd
County Salem Municipality OLDMANS TWP. Lot No. 59 Block No. 28

WELL USE Domestic Status In Use

WATER USE Domestic Average 550 gals. daily Maximum 600 gals. daily

WELL CONSTRUCTION Date well completed 11 / 16 / 88
BOREHOLE DIMENSIONS Depths: Total 100 ft. Finished 100 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well _____ ft. Elevation was determined using _____
Casing Height (stick-up) above land surface _____ ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		85	4	Sched 40 PVC
Casing 2				
Casing 3				
Screen 1	85	10	4	.020 PVC
Screen 2				
Tail Piece		5		
Gravel Pack	70			#2 Ricci
Grout	65			Bentonite Slurry
Grouting Method	Tremmie to 65'			

WELL FLOWS NATURALLY _____ gals. per min. at _____ ft. above the land surface.
Water rises to _____ ft. above the land surface.

RECORD OF TEST Test Date 11 / 16 / 88
Static water-level before pumping 25 ft. below land surface. Water level 30 ft. below land surface after 1 hrs. of pumping.
Water level was measured using M-Scope Drawdown 5 ft.
Discharge rate measured using Five Gal Pail Discharge Rate 10 gals. per min.
Well was pumped using Submersible Specific Capacity 2 gals. per min. per ft. of drawdown
Observed effects on nearby wells None
Water Quality (taste, odor, color, etc.) Good

PERMANENT PUMPING EQUIPMENT Installed by John Schiavo Pump Type Submersible
Mfrs. Name Myers Model 52JC2-J511P
CAPACITY: Pump delivers 10 GPM at 50 PSI pressure.
POWER: 1/2 HP at 3450 RPM Power Source 220 From house
DEPTHS: Pump 50 ft. Footpiece _____ ft. Airline _____ ft.
FLOW METER: Model _____ installed on _____ in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor JOHN SCHIAVO (AQUA TECH)
Address RD1 Box 276
City Titusville State Pa Zip Code 16354
Name of Driller John Schiavo License No. M1369

Signature of Contractor John P. Schiavo Date 11 / 22 / 88

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NLI 001 2067

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05507

30 23 544

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method Mud Rotary

Type of Rig Failing 1250

Aquifer/Geo. Fm. Raritan (Upper)

DEP USE ONLY

Storet Hydrogeo Code _____

USGS Hydrogeo Code _____

Depth to Bedrock _____ ft.

Bedrock Lith. Code _____

Bedrock Fm. Code _____

Completed by _____

Date ____ / ____ / ____

LOG		Thick.	Lith.	Fm.
0-2	Fill			
2-5	Orange Clay			
5-15	Coarse Gravel + Clay			
15-37	Fine Tan Sand			
37-42	White Clay			
42-56	Fine White Sand			
56-75	White + Red Clay			
75-166	Med + Coarse White Sand			

GWPI No. ____ - _____

NJPDES No. _____ - ____

Latitude ____ ° ____ ' ____ "

Longitude ____ ° ____ ' ____ "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle _____

Drainage Basin Code _____

County/Municipality Code _____

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by _____

Date ____ / ____ / ____

NLI 001 2068

30·23·545

F. n DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2467

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Robert Comac ADDRESS RD#1, Box 320, Pedricktown, NJ

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown - Auburn Road, Pedricktown, NJ

3. DATE COMPLETED 8/25/81 DRILLER Dave Mattus

4. DIAMETER: Top 8 inches Bottom 8 inches TOTAL DEPTH 47 Feet

5. CASING: Type PVC Diameter 4 Inches Length 37 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 10 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date did not test Yield _____ Gallons per minute

Static water level before pumping 33. Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type Jet Mfrs. Name Jacuzzi

Capacity 15 G.P.M. How Driven electric H.P. 1/2 R.P.M. 3450

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA D'Agostino Well DRilling, Inc.

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2069

30.23.545 P#39-2467 30.23.545

AME Robert Camus LOCATION Pedrickstown

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH FEET From	DEPTH FEET To
Top Soil		Black	Loose	0"	6"
Sand		Brown	Med	6"	10'
Clay		Black	Packed	10'	25'
Clay		Gray	Packed	25'	35'
Sand		gray	Med. to Fine	35'	47'

Distance out from bldg. 10' ft.

Distance offset right _____ ft. left _____ ft. from sides of bldg.

Well Depth 47' Casing diameter 4" Screen length 10'

Static level 30'

NLI 001 2070

30235 47

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-767
Application No. _____
County _____

WELL RECORD

1. OWNER Leonard A. Moore ADDRESS Pedricktown, N. J.

Owner's Well No. I SURFACE ELEVATION 20 Feet (Above mean sea level)

LOCATION The last house in a group of 6 East of Pedricktown on the Auburn Road.

3. DATE COMPLETED Aug. 22, 1959 DRILLER Haines & Moore

DIAMETER: top 4 inches Bottom 4 inches TOTAL DEPTH 33 Feet

5. CASING: Type bl. steel pipe Diameter 4 inches Length 21' Feet

SCREEN: Type slotted Size of Opening 20 Diameter 3 3/4 inches Length 5 Feet

Range in Depth { Top 27 Feet, Bottom 32 Feet } Geologic Formation _____

Tail piece: Diameter 3 inches Length 1 Feet

WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

7. RECORD OF TEST: Date Aug. 22, 1959 Yield 20 Gallons per minute

Static water level before pumping 15 Feet below surface

Pumping level 18 feet below surface after 2 hours pumping

Drawdown 3 Feet Specific Capacity 7 Gals. per min. per ft. of drawdown

How Pumped with well machine How measured time to fills container

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type Balance Flow Mfrs. Name Gould

Capacity 8 G.P.M. How Driven electric H.P. 1/2 R.P.M. 3450

Depth of Pump in well 21' Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Household use AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No. _____

Taste good Odor none Color clear Temp. 56 °F

12. LOG _____ Are samples available? yes

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

NLI 001 2071

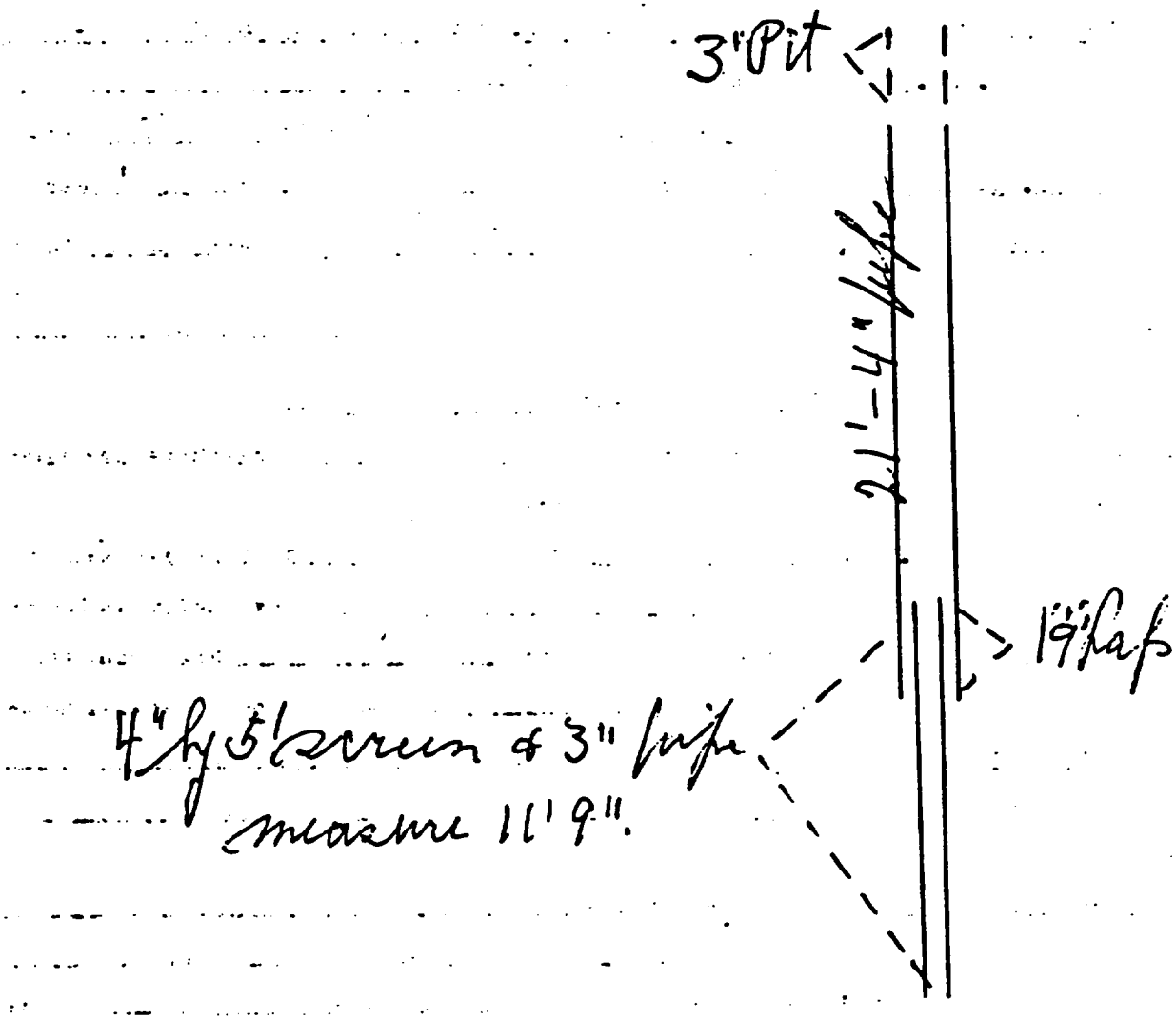
13. SOURCE OF DATA well drillers rec ord

14. DATA OBTAINED BY Earl L. Moore Date Aug. 31, 1959

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

Log:

Top soil & sand to 3'
3' - 9' yellow & grey clay
9' - 17' black clay
17' - 33' Medium & coarse sand.



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SEP 15 1959
Economic Development
Geologic & Tech. Survey

Form 87-5M-8-51

30.23.548

30.23.548 ✓

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply
WELL RECORD

Permit No. 30-93
Application No. _____
County Salem

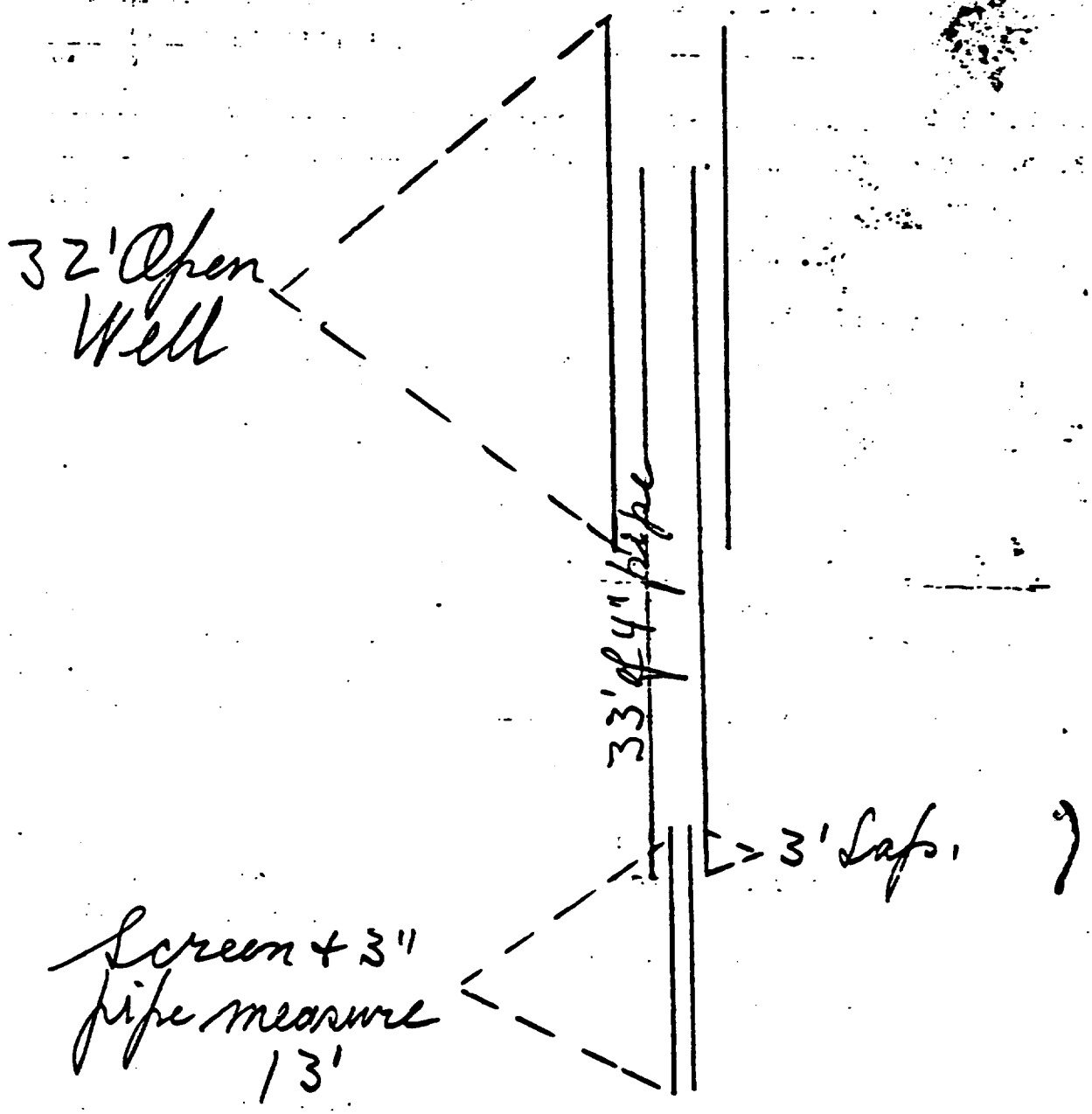
1. OWNER Josiah C. Layton ADDRESS Pedricktown, N. J.
   Owner's Well No. 2 SURFACE ELEVATION 30 Feet (Above mean sea level)
2. LOCATION Through the open well in the farm house
3. DATE COMPLETED Sept. 21, 1951 DRILLER Haines & Moore
4. DIAMETER: Top 4 Inches Bottom 4 Inches TOTAL DEPTH 58 Feet
5. CASING: Type bl. steel pipe Diameter 4 Inches Length 38 Feet
6. SCREEN: Type slotted Size of Opening 30 Diameter 3 3/4 Inches Length 6 Feet
   Range in Depth { Top 51 Feet, Bottom 56 Feet } Geologic Formation Raritan strata Pkf.
   Tail piece. Diameter 3 Inches Length 1 Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date Sept. 21, 1951 Yield 20 Gallons per minute
   Static water level before pumping 33 Feet below surface
   Pumping level 41 feet below surface after 6 hours pumping
   Drawdown 8 Feet Specific Capacity 2.5 ~~1~~ Gals. per min. per ft. of drawdown
   How Pumped with well machine " How measured time to fill a 5 gal. pail 0.65
   Observed effect on nearby wells none
9. PERMANENT PUMPING EQUIPMENT:
   Type Shallow well turbine Capacity 5 Gallons per minute
   How Driven electric motor Horse Power 1/3 R.P.M. 1725
   Depth of pump in well 44 Feet Depth of Foot piece in well none Feet
   Depth of Air Line in well none Feet Type of Meter on Pump none
10. USED FOR Farm house AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. *
    Taste Irony Odor none Color clear Temperature 56 °F
12. LOG _____ Are samples available? no
    (Give details on back of sheet or on separate sheet)
13. SOURCE OF DATA well drillers record
14. DATA OBTAINED BY Merl L. Moore DATE Sept. 22, 1951

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2073

NLI 001 2074

Log.
32' to 58' Raritan Sand. Phlj Km



RECEIVED
SEP 24 1951
Department of Conservation & Economic Development
Geologic & Top. Survey

3023573

Form 87-5M

Permit No. 30-142

Application No. _____

County _____

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

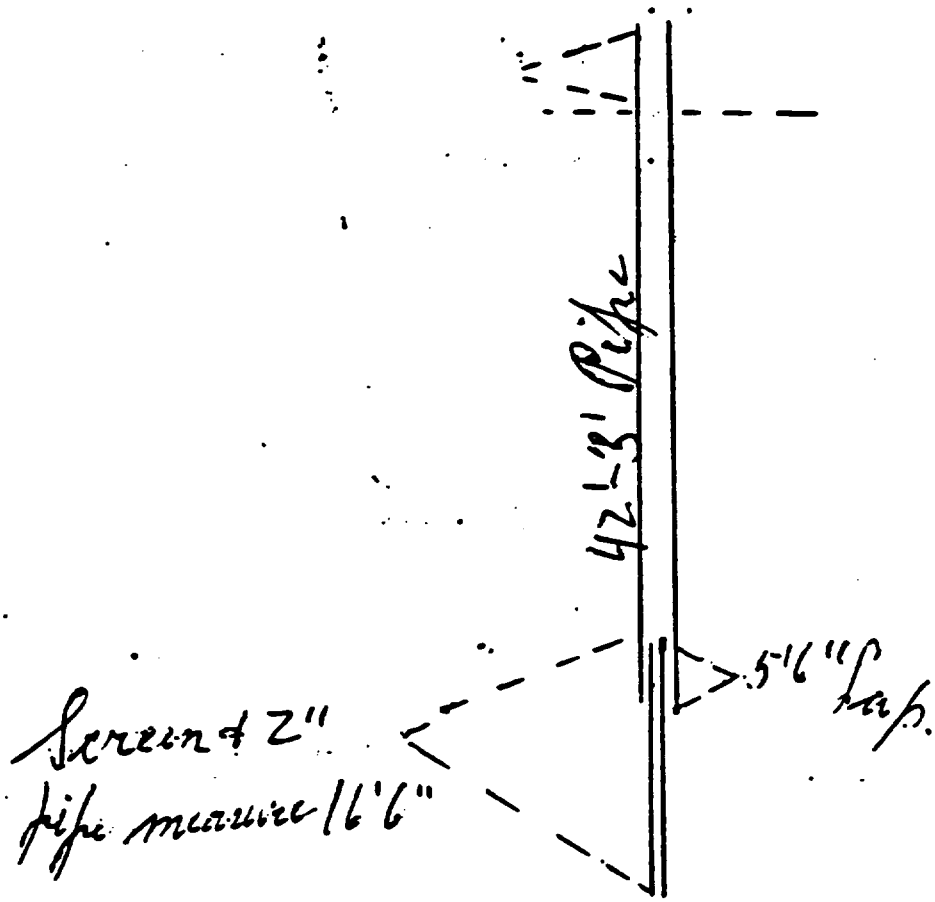
1. OWNER James Layton ADDRESS Pedricktown, N. J.
   Owner's Well No. 2 SURFACE ELEVATION 30 Feet (Above mean sea level)
2. LOCATION N.E. end of his tenent house
3. DATE COMPLETED May 6,'52 DRILLER Haines & Moore
4. DIAMETER: Top 3 Inches Bottom 3 Inches TOTAL DEPTH 53 Feet
5. CASING: Type bl. steel pipe Diameter 3 Inches Length 42 Feet
6. SCREEN: Type slotted Size of Opening 20 Diameter 2 3/4 Inches Length 10 Feet
   Range in Depth { Top 42 Feet, Bottom 52 Feet } Geologic Formation Raritan Strata
   Tail piece. Diameter 2 Inches Length 1 Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date May 6, 1952 Yield 18 Gallons per minute
   Static water level before pumping 20 Feet below surface
   Pumping level 30 feet below surface after 4 hours pumping
   Drawdown 10 ' Feet Specific Capacity 1.8 Gals. per min. per ft. of drawdown
   How Pumped with well machine How measured time to fill a 5 gal. pail
   Observed effect on nearby wells no nearby wells
9. PERMANENT PUMPING EQUIPMENT: We installed a hand pump.
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR Summer farm laborers AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. *
    Taste irony Odor none Color clear Temperature 56 °F
12. LOG _____ Are samples available? no
    (Give details on back of sheet or on separate sheet)
13. SOURCE OF DATA well drillers record
14. DATA OBTAINED BY Earl L. Moore DATE May 14, 1952

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2075

NLI 001 2076

Log;
Yellow clay to I5'
I5' - 26' black clay
26' - 53' Sand with some clay



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Form 87 (85)

JUL 11 1978

30-23-712
30-1772

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Permit No. ~~[illegible]~~
Application No.
County

WELL RECORD

1. OWNER LESLIE ENGLAND ADDRESS PENNSVILLE-PEDRICKTOWN RD PERKINTOWN N.J.
   Owner's Well No. 23-30-413 SURFACE ELEVATION 30 Feet (Above mean sea level)
2. LOCATION PENNSVILLE-PEDRICKTOWN RD-PERKINTOWN N.J.
3. DATE COMPLETED 3/15/79 DRILLER GEORGE MAYERS
4. DIAMETER: top 4 inches Bottom 3 inches . TOTAL DEPTH 147 Feet
5. CASING: Type BLK STEEL Diameter 4 inches Length 137 Feet
6. SCREEN: Type GATER Size of Opening 020 Diameter 3 inches Length 11-3 Feet
   Range in Depth { Top 130 Feet, Bottom 147 Feet } Geologic Formation RARITAN
   Tail piece: Diameter NONE inches Length ✓ Feet
7. WELL FLOWS NATURALLY NO Gallons per Minute at ✓ Feet above surface
   Water rises to NO Feet above surface
8. RECORD OF TEST: Date 3/14/79 Yield 30 Gallons per minute
   Static water level before pumping 30 Feet below surface
   Pumping level 30 feet below surface after 2 hours pumping
   Drawdown NIL Feet Specific Capacity ✓ Gals. per min. per ft. of drawdown
   How Pumped AIR LIFT How measured 5 GAL-WATCH
   Observed effect on nearby wells NONE
9. PERMANENT PUMPING EQUIPMENT:
   Type SUBMERSIBLE Mfrs. Name VALLEY
   Capacity 10 G.P.M. How Driven ELEC H.P. 1/2 R.P.M. 3400
   Depth of Pump in well 90 Feet Depth of Footpiece in well NONE Feet
   Depth of Air Line in well NONE Feet Type of Meter on Pump NONE Size ___ Inches
10. USED FOR DOMESTIC AMOUNT { Average 500 Gallons Daily, Maximum 700 Gallons Daily }
11. QUALITY OF WATER GOOD Sample: Yes ✓ No.
    Taste FAIR Odor FAIR Color CLEAR Temp. ✓ °F
12. LOG (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy) Are samples available? NO
    NLI 001 2077
13. SOURCE OF DATA WELL LOG
14. DATA OBTAINED BY GEORGE MAYERS Date 3/14/79

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

0-45 Sand and gravel
45-72 Pastel Silty Clay
72-107 Beige color Clay
107-130 Red Clay
130-145 fine w/lite Raritan Sand
Water Level 30

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MAY 7 11 38 AM '79
GEOLOGY
AND
TOPOGRAPHY

NLI 001 2078

Form DWR-138
11/80

Coord: 3023712

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3714

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER PRATTA, DENNIS ADDRESS _____

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 33 Block: 43 Municipality: Oldmans Twp.

3. DATE COMPLETED 10/30/85 DRILLER D'Agostino Well Drilling

4. DIAMETER: Top 8 inches Bottom 8 inches TOTAL DEPTH 55 Feet

5. CASING: Type PVC Diameter 4 Inches Length 50 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 5 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date DID NOT TEST Yield _____ Gallons per minute

Static water level before pumping 14 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type Submersible Mfrs. Name Jacuzzi

Capacity 12 G.P.M. How Driven electric H.P. 1/2 R.P.M. 3450

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA D'Agostino Well Drilling, Inc. NLI 001 2079

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated,

30-3714 30-23-712

ME Dennis Pratta LOCATION Pennsville Pedricktown Rd

Builder Jack Plale 30-3714

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Soil		Brown	Loose	0"	12"
d.	Clay	Brown	Dry to Med.	12"	10'
d.		White	Med to Fine	10'	30'
d.	Clay	D Brown	Fine to Med	30'	40'
d.		Brown	Med to Fine	40'	50'
d		L Brown	Med to Fine	50'	55'

Distance out from building 40 Ft.

Distance offset right _____ Ft. Left _____ Ft. from sides of building

Well Depth 55' Casing diameter 4" Screen Length 5' To bottom'

Static level 14'

NLI 001 2080

Form DWR-138
11/60

Coord: 3023721

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-3394

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER PERRY, GENE H. & SONS ADDRESS BOX 242A, PERKINTOWN RD.

   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 21 Block: 29 Municipality: Oldmans Twp.

3. DATE COMPLETED 7/ 6/84 DRILLER D'Agostino Well Drilling

4. DIAMETER: Top 8 inches Bottom 8 inches TOTAL DEPTH 109 Feet

5. CASING: Type PVC Diameter 4 Inches Length 99 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 10 Feet

   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

   Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date DID NOT TEST Yield _____ Gallons per minute

   Static water level before pumping 18 Feet below surface

   Pumping level _____ feet below surface after _____ hours pumping

   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

   How pumped _____ How measured _____

   Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT: DID NOT INSTALL PERMANENT PUMPING EQUIPMENT

   Type _____ Mfrs. Name _____

   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes _____ No _____

    Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA D'Agostino Well Drilling, Inc. NLI 001 2081

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

AME Gene Perry LOCATION Redrickton 30-3394
30 23 721

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Top Soil		Black	Loose	0"	6"
Clay		Brown	Dry	6"	10'
Sand	Little Clay	White	Sticky to Med	10	20'
Sand		White	Med to Fine	20'	30'
Clay		Black	Sticky	30	60'
Clay		White	Sticky	60'	75'
Clay	Sand	Pinkish	Sticky & Fine	70'	85'
Sand		L Pink	Fine to Med.	85'	100'
Sand		L Pink	Med & Fine	100	109'

Distance out from building 6 feet

Distance offset right _____ feet left _____ feet from sides of building

Well depth 109' Casing diameter 4" Screen length 10'

Static level 18'

NLI 001 2082

30-23-731

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 31/2173
Application No. _____

WELL RECORD

OWNER Ronald Jenkins ADDRESS Box 46 Pedricktown

Owner's Well No. 113 SURFACE ELEVATION 20 Feet (above mean sea level)

LOCATION Same as above

DATE COMPLETED 11/1/77 DRILLER M. J. Dechamps 1055

DIAMETER: top 2 Inches Bottom 2 inches TOTAL DEPTH 35 Feet

CASING: Type Galv. Steel Diameter 2 inches Length 31 Feet

SCREEN: Type S. Steel Size of Opening 60 Diameter 2 inches Length 5 Feet

Range in Depth Top _____ Feet Bottom _____ Feet Geologic Formation Sand

Tail piece: Diameter _____ inches Length _____ Feet

WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

RECORD OF TEST: Date 11/1/77 Yield 25 Gallons per minute

Static water level before pumping 10 Feet below surface

Pumping level 10 feet below surface after 2 hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped Dewatering pump How measured 5 gal container

Observed effect on nearby wells None

PERMANENT PUMPING EQUIPMENT:

Type S. W. Jet Mfrs. Name A. Y. McDonald

Capacity 7 G.P.M. How Driven El. Motor H.P. 1/2 R.P.M. 3450

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches

USED FOR Domestic AMOUNT Average 450 Gallons Daily Maximum 900 Gallons Daily

QUALITY OF WATER Good Sample: Yes XXX No. _____

Taste None Odor None Color Clear Temp. 55 °F

LOG _____ Are samples available? _____
(Give details on back of sheet or separate feet. If electric log as made, please furnish copy.)

SOURCE OF DATA M. J. DECHAMPS

DATA OBTAINED BY M. J. DECHAMPS Date 11/03/77

(Note: Use either side of this sheet for additions. Information such as log of materials penetrated analysis of the water, sketch map, sketch of specific casing arrangements, etc.)

NLI 001 2083

30-03-132

Form DWR-138
11 80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2656

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Old Man's Airport Inc. ADDRESS 43 Jenkins, Pennsville, NJ 0807

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Straughens Mill Road

3. DATE COMPLETED 6/21/82 DRILLER Dave Mattus

4. DIAMETER: Top 8 inches Bottom 8 inches TOTAL DEPTH 68 Feet

5. CASING: Type PVC Diameter 4 Inches Length 58 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 10 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date DID NOT TEST Yield _____ Gallons per minute

Static water level before pumping 36 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT: DID NOT INSTALL

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR DOMESTIC AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA D'Agostino Well Drilling, Inc. NLI 001 2084

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.23.732

30.23.732
30-2656

NAME Tom Kurts LOCATION Oldman's Airport Inc.

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
sand		brown	medium	0"	4'
clay		gray	sticky	4'	10'
clay	rocks	blue	Hard & Sticky	10'	15'
clay		black	sticky	15'	30'
clay	fine sand	grey black	sticky	30'	45'
sand		dk.gray	medium to fine	45'	55'
"		lt.gray	" "	55'	69'

Distance out from bldg. 15 ft.

Distance offset right _____ ft. left _____ ft. from sides of bldg.

Well Depth 68' Casing diameter 4" Screen length 10'

Static level 36'

Form DWR- 138
11/80

Coord: 3023[redacted] 732

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

30·23·732

PERMIT NO. 30-3789

APPLICATION NO.

COUNTY Salem

WELL RECORD

1. OWNER OLDMANS AIRPOT (TOM KURTS) ADDRESS BOX 179

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: S40 Block: 28 Municipality: Oldmans Twp.

3. DATE COMPLETED 7/16/86 DRILLER D'Agostino Well Drilling

4. DIAMETER: Top 6 inches Bottom 6 inches TOTAL DEPTH 65 Feet

5. CASING: Type PVC Diameter 2 Inches Length 58 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 2 Inches Length 7 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date DID NOT TEST Yield _____ Gallons per minute

Static water level before pumping 37 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT: DID NOT INSTALL

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA D'Agostino Well Drilling, Inc. NLI 001 2086

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30-23-448

FORM 87

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-1507
Application No. _____
County Salem

WELL RECORD

1. OWNER Joseph R. Taylor ADDRESS P. O. Box 86, Penns Grove, N. J.
Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION 130 New Road, Pedricktown

3. DATE COMPLETED 2/1/77 DRILLER Joe Majewski

4. DIAMETER: top 8 Inches Bottom 8 Inches TOTAL DEPTH 55 Feet

5. CASING: Type PVC Diameter 4 Inches Length 48 Feet

6. SCREEN: Type PVC Size of Opening slot Diameter 3 Inches Length 7 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date Did not test Yield _____ Gallons per minute

Static water level before pumping 16 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type Submersible Mfrs. Name Jacuzzi

Capacity 15 G.P.M. How Driven electric H.P. 1/2 R.P.M. 3450

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes _____ No. _____

Taste Good Odor _____ Color _____ Temp. _____ °F

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy).

13. SOURCE OF DATA D'Agostino Well Drilling Co. NLI 001 2087

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

30-23-448

FORM 8

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Permit No. 30-157
Application No. ____
County Salem

WELL RECORD

NLI 001 2088

1. OWNER James Johnston ADDRESS Rd 1, Game Creek Rd. Penn Grove
   Owner's Well No. ____ SURFACE ELEVATION ____ Feet (Above mean sea level)
2. LOCATION Same
3. DATE COMPLETED 7-9-77 DRILLER Joe Majewski
4. DIAMETER: top 8 inches Bottom 8 inches TOTAL DEPTH 40 Feet
5. CASING: Type PVC Diameter 4 inches Length 33 Feet
6. SCREEN: Type PVC Size of Opening Slot Diameter 3 inches Length 7 Feet
   Range in Depth { Top ____ Feet / Bottom ____ Feet } Geologic Formation ____
   Tail piece: Diameter ____ inches Length ____ Feet
7. WELL FLOWS NATURALLY ____ Gallons per Minute at ____ Feet above surface
   Water rises to ____ Feet above surface
8. RECORD OF TEST: Date Did Not Test Yield ____ Gallons per minute
   Static water level before pumping 12' Feet below surface
   Pumping level ____ feet below surface after ____ hours pumping
   Drawdown ____ Feet Specific Capacity ____ Gals. per min. per ft. of drawdown
   How Pumped ____ How measured ____
   Observed effect on nearby wells ____
9. PERMANENT PUMPING EQUIPMENT: Did Not Install Permanent Pumping Equipment
   Type ____ Mfrs. Name ____
   Capacity ____ G.P.M. How Driven ____ H.P. ____ R.P.M. ____
   Depth of Pump in well ____ Feet Depth of Footpiece in well ____ Feet
   Depth of Air Line in well ____ Feet Type of Meter on Pump ____ Size ____ inch
10. USED FOR Domestic AMOUNT { Average ____ Gallons Daily / Maximum ____ Gallons Daily }
11. QUALITY OF WATER Good Sample: Yes ____ No. ____
    Taste Good Odor ____ Color ____ Temp. ____
12. LOG ____ Are samples available? ____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA D'Agostino Well Drilling Co
14. DATA OBTAINED BY ____ Date ____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated [illegible] sketch map, sketch of special casing arrangements etc.)

OLDMAN, SALEM Co.

3023.451

Form 87-5M-9-49

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

Permit No. 30-80
Application No.
County

WELL RECORD

1. OWNER H.S. HUBER ADDRESS Pedricktown, N.J.

Owner's Well No. SURFACE ELEVATION 20' Feet (Above mean sea level)

2. LOCATION Pedricktown Pennsgrove Rd. Pedricktown, N.J.

3. DATE COMPLETED August 9th DRILLER Gus Hauser

4. DIAMETER: Top 4 Inches Bottom 4 Inches TOTAL DEPTH 83 Feet

5. CASING: Type Black Pipe Diameter 4 Inches Length 75 Feet

6. SCREEN: Type Perf Brass Size of Opening 80 Diameter 4 Inches Length 6 Feet

Range in Depth {Top 75 Feet, Bottom 81 Feet} Geologic Formation Sand

Top - Qcm
Bottom - Kmv
Comp. from - Kmv

Tail piece: Diameter 4 Inches Length 2 Feet

7. WELL FLOWS NATURALLY no Gallons per Minute at Feet above surface

Water rises to Feet above surface

8. RECORD OF TEST: Date Aug 9th 1951 Yield 20 Gallons per minute

Static water level before pumping 5 Feet below surface

Pumping level 9 feet below surface after 1 hours pumping

Drawdown 4 Feet Specific Capacity 5.0 Gals. per min. per ft. of drawdown

How Pumped air comp. How measured 55gal drum

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type not installed by us Capacity Gallons per minute

How Driven Horse Power R.P.M.

Depth of pump in well Feet Depth of foot piece in well Feet

10. USED FOR household AMOUNT {Average 500 Gallons Daily, Maximum 650 Gallons Daily}

11. QUALITY OF WATER good Sample: Yes No.

Taste good Odor none Color clear to cloudy Temperature °F

12. LOG on reverse side (Give details on back of sheet or on separate sheet) Are samples available?

13. SOURCE OF DATA Pedricktown N.J. NLI 001 2089

14. DATA OBTAINED BY Gus Hauser DATE

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Log

22 ft first water

22 to 65 ft Red Clay

65 to 73 White Medium sand changing to size of corn at 73 ft.

73 to 81 Course sand very large.

81 to 83 Yellow Clay Cement plug in bottom

Rantn.

RECEIVED
SEP 26 1951
Department of Conservation
& Economic Development
Geologic & Tech. Survey

NLI 001 2090

30 23 4 53

Form 87-5M

Permit No. 30-253

Application No. _____

County _____

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT

Division of Water Policy & Supply

WELL RECORD

1. OWNER Howard E. Justice ADDRESS Straughen Mill Road Pedricktown

   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Same as above

3. DATE COMPLETED 9-18-53 DRILLER Gus Hauser

4. DIAMETER: Top 4 Inches Bottom 4 Inches TOTAL DEPTH 55 Feet

5. CASING: Type Black steel pipe Diameter 4 Inches Length 45 Feet

6. SCREEN: Type Our own make perforated brass Size of Opening 1 A Diameter 4 Inches Length 6 Feet

   Range in Depth { Top 45 Feet, Bottom 51 Feet } Geologic Formation Coarse white and pink pea gravel

   Tail piece. Diameter 4 Inches Length 4 Feet

7. WELL FLOWS NATURALLY No Gallons per Minute at _____ Feet above surface

   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 9-18-53 Yield _____ Gallons per minute

   Static water level before pumping 18 Feet below surface

   Pumping level 18 feet below surface after ½ hours pumping

   Drawdown 3 Feet Specific Capacity 1⅓ Gals. per min. per ft. of drawdown

   How Pumped Bailing bucket How measured 5 gallon can

   Observed effect on nearby wells None to check with

9. PERMANENT PUMPING EQUIPMENT:

   Type Shallow well plunger Capacity 350 Gallons per minute

   How Driven Electricity Horse Power ½ R.P.M. 1750

   Depth of ~~pump~~ Foot valve in well 32 Feet Depth of Foot piece in well _____ Feet

   Depth of Air Line in well _____ Feet Type of Meter on Pump _____

10. USED FOR Domestic AMOUNT { Average 1000 Gallons Daily, Maximum 1500 Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes _____ No. _____

    Taste Good Odor None Color Milky Temperature 56 °F

12. LOG Please see reverse side (Give details on back of sheet or on separate sheet) Are samples available? No

    NLI 001 2091

13. SOURCE OF DATA Our well records

14. DATA OBTAINED BY Gus Hauser DATE 9-18-53

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2092

0	-	12	Yellow sand
12	-	46	White clay
46	-	51	Coarse white and pink pea gravel
51	-	55	Fine white beach sand

RECEIVED
NOV 23 1983
Department of Conservation
& Economic Development
Geologic & Info. Branch

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 – 05219
Atlas Sheet Coordinates 30 : 23 : 453

OWNER IDENTIFICATION - Owner HANKINS, KEVIN & CAROL
Address STRAUGHENS MILL RD
City PEDRICKTOWN State NJ Zip Code 08067

WELL LOCATION - If not the same owner please give address. Owner's Well No. 3005219
Address
County Salem Municipality OLDMANS TWP. Lot No. 34 Block No. 29

WELL USE Domestic Status In Use

WATER USE Domestic Average 550 gals. daily Maximum 600 gals. daily

WELL CONSTRUCTION Date well completed 7 / 17 / 88
BOREHOLE DIMENSIONS Depths: Total 75 ft. Finished 75 ft.
Diameter: Top 6 in. Bottom 5 in.
Land Surface Elevation at well _____ ft. Elevation was determined using _____
Casing Height (stick-up) above land surface _____ ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		62	4	Schd 40 PVC
Casing 2				
Casing 3				
Screen 1	62	10	4	.020 PVC
Screen 2				
Tail Piece		3	4	
Gravel Pack	30			#2 Ricci
Grout	28			Bentonite Slurry
Grouting Method	Tremmie to 28'			

WELL FLOWS NATURALLY _____ gals. per min. at _____ ft. above the land surface.
Water rises to _____ ft. above the land surface.

RECORD OF TEST Test Date 7 / 17 / 88
Static water-level before pumping 7 ft. below land surface. Water level 13 ft. below land surface after 1 hrs. of pumping.
Water level was measured using M-Scope Drawdown 6 ft.
Discharge rate measured using 5 Gal Pail Discharge Rate 25 gals. per min.
Well was pumped using Submersible Specific Capacity 4.1 gals. per min. per ft. of drawdown
Observed effects on nearby wells None
Water Quality (taste, odor, color, etc.) Good

PERMANENT PUMPING EQUIPMENT Installed by John Schiavo Pump Type Submersible
Mfrs. Name Myers Model S2J102-J1025P
CAPACITY: Pump delivers 25 GPM at 40 PSI pressure.
POWER: 1 HP at 3450 RPM Power Source 220 from house
DEPTHS: Pump 40 ft. Footpiece _____ ft. Airline _____ ft.
FLOW METER: Model _____ installed on _____ in. diameter pipe.

JOHN SCHIAVO (AQUA TECH) NLI 001 2093

CONTRACTOR - Name of Drilling Contractor
Address RD1 Box 276
City Titusville State Pa Zip Code 16354
Name of Driller John Schiavo License No. M1369

Signature of Contractor John P. Schiavo Date 9 / 3 / 88

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05219
30. 23. 453

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method Mud Rotary

Type of Rig Failing 1250

Aquifer/Geo. Fm. Raritan (upper)

DEP USE ONLY

Storet Hydrogeo Code _____

USGS Hydrogeo Code _____

Depth to Bedrock _____ ft.

Bedrock Lith. Code _____

Bedrock Fm. Code _____

Completed by _____

Date ___ / ___ / ___

LOG		Thick.	Lith.	Fm.
0-2	Topsoil			
2-22	Fine White Sand			
22-36	White Clay			
36-73	Med. to Coarse White Sand			

GWPI No. ___ - _____

NJPDES No. _____ - ___

Latitude ___ ° ___ ' ___ "

Longitude ___ ° ___ ' ___ "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle _____

Drainage Basin Code _____

County/Municipality Code _____

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by _____

Date ___ / ___ / ___

NLI 001 2094

DWR 138A
1/88

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-06013
APPLICATION NO. _____
COUNTY Salem
COORD. 30 23 428

Test Boring

WELL RECORD

1. OWNER Atlantic Electric ADDRESS Pleasantville NJ
   Owner's Well No. T-15 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Power line
3. DATE COMPLETED 10/12/89 DRILLER Mark Soil Investigation
4. DIAMETER: Top 6 inches Bottom 6 inches TOTAL DEPTH 50 Feet
5. CASING: Type _____ Diameter _____ inches Length _____ Feet (N.A.)
6. SCREEN: Type _____ Size of Opening _____ Diameter _____ inches Length _____ Feet (N.A.)
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail Piece: Diameter _____ inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface (N.A.)
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute (N.A.)
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: (N.A.)
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches
10. USED FOR Test Boring AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No _____ (N.A.)
    Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG 0-25 F-C gravel sand 25-50 gray clay Are samples available? _____
    (Give details on back of sheet or on another sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Driller
14. DATA OBTAINED BY Doug Walsh Date 12/19/89

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2095

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30- 05810
Atlas Sheet Coordinates 30 : 23 : 429

OWNER IDENTIFICATION - Owner LEMKE, BRUCE
Address RD 1 / BOX 223
City PEDRICKTOWN State NJ Zip Code 08067

WELL LOCATION - If not the same owner please give address. Owner's Well No. 30-05810
Address Box 223 Straughens Mill Rd
County Salem Municipality ~~OLDMANS TWP.~~ Lot No. 1A Block No. 29

WELL USE Domestic Status In Use

WATER USE Domestic Average 550 gals. daily Maximum 60 gals. daily

WELL CONSTRUCTION Date well completed 6 / 12 / 89
BOREHOLE DIMENSIONS Depths: Total 80 ft. Finished 80 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well _____ ft. Elevation was determined using _____
Casing Height (stick-up) above land surface _____ ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		66	4	Sch 40 PVC
Casing 2				
Casing 3				
Screen 1	66	10	4	.020 PVC
Screen 2				
Tail Piece		4		
Gravel Pack	50			#2 Ricci
Grout	Surface			Bentonite Slurry
Grouting Method	Tremmie to 50'			

WELL FLOWS NATURALLY _____ gals. per min. at _____ ft. above the land surface.
Water rises to _____ ft. above the land surface.

RECORD OF TEST Test Date 6 / 12 / 89
Static water-level before pumping 10 ft. below land surface. Water level 12 ft. below land surface after 1 hrs. of pumping.
Water level was measured using M-Scope Drawdown 2 ft.
Discharge rate measured using 5gal pail Discharge Rate 30 gals. per min.
Well was pumped using Submersible Specific Capacity 15 gals. per min. per ft. of drawdown
Observed effects on nearby wells None
Water Quality (taste, odor, color, etc.) Good

PERMANENT PUMPING EQUIPMENT Installed by John Schiavo Pump Type Submersible
Mfrs. Name Myers Model SJ J102-J1025P
CAPACITY: Pump delivers 25 GPM at 50 PSI pressure.
POWER: 1 HP at 3450 RPM Power Source 220 from house
DEPTHS: Pump 30 ft. Footpiece _____ ft. Airline _____ ft.
FLOW METER: Model _____ installed on _____ in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor JOHN SCHIAVO (AQUA TECH) NLI 001 2096
Address RD1 Box 276.
City Titusville State Pa Zip Code 16354
Name of Driller John Schiavo License No. M1369

Signature of Contractor John P. Schiavo Date 6 / 13 / 89

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30-05810
30·23·429

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method Rotary

Type of Rig Failing 1250

Aquifer/Geo. Fm. Raritan (upper)

DEP USE ONLY

Storet Hydrogeo Code _____
USGS Hydrogeo Code _____
Depth to Bedrock _____ ft.
Bedrock Lith. Code _____
Bedrock Fm. Code _____

Completed by _____
Date ___ / ___ / ___

LOG		Thick.	Lith.	Fm.
0-1	Topsoil			
1-15	Coarse orange sand + gravel			
15-22	Med white sand			
22-30	Silty white clay			
30-37	White sand streaks			
37-65	Red + White clay + lignite			
65-80	Med to coarse white + orange sand			

GWPI No. ___ - ___ NJPDES No. ___ - ___

Latitude ___ ° ___ ' ___ " Longitude ___ ° ___ ' ___ "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle _____

Drainage Basin Code _____ County/Municipality Code _____

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by _____ Date ___ / ___ / ___

NLI 001 2097

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05212
Atlas Sheet Coordinates 30 : 23 : 439

OWNER IDENTIFICATION - Owner LOGAN WELLS WATER CO
Address MILL ROAD, P.O. BOX 249
City MULLICA HILL State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No. 1A
Address Pureland Park
County Gloucester Municipality LOGAN TWP Lot No. 65 Block No. 48

WELL USE Replacement-Potable Water Status Complete

WATER USE Average gals. daily Maximum gals. daily

WELL CONSTRUCTION Date well completed 9 / 20 / 88
BOREHOLE DIMENSIONS Depths: Total 166 ft. Finished 156 ft.
Diameter: Top 12 in. Bottom 12 in.
Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface 2.42 ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
Casing 1		123.42	8"	steel
Casing 2		7	8"	steel
Casing 3				
Screen 1	121	22	8"	s.s. .045
Screen 2	150	5	8"	s.s. .045
Tail Piece		1	8"	
Gravel Pack		61		#2 morie
Grout	0	61		cement
Grouting Method	Tremie			

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date 9 / 27 / 88
Static water-level before pumping 11.58 ft. below land surface. Water level 25.92 ft. below land surface after 24 hrs. of pumping.
Water level was measured using M-scope Drawdown 14.34 ft.
Discharge rate measured using Orifice Discharge Rate 210 gals. per min.
Well was pumped using VTP Specific Capacity 14.65 gals. per min. per ft. of drawdown
Observed effects on nearby wells None
Water Quality (taste, odor, color, etc.) n/a

PERMANENT PUMPING EQUIPMENT Installed by W. C. Services Pump Type Submersible
Mfrs. Name Grundfos Model SP16-8
CAPACITY: Pump delivers 100 GPM at 70 PSI pressure.
POWER: 7.5 HP at 3600 RPM Power Source Electric 460 volt
DEPTHS: Pump 67 ft. Footpiece n/a ft. Airline 67 ft.
FLOW METER: Model installed on in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor W.C. SERVICES NLI 001 2098
Address 664 S. Evergreen Avenue
City Woodbury State NJ Zip Code 08096
Name of Driller C. Sacco License No. J-816

Signature of Contractor John O'Brien Date 2/7/89

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 05712
30. 23. 439.

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method ☒Reverse Rotary

Type of Rig D-8

Aquifer/Geo. Fm.

DEP USE ONLY

Storet Hydrogeo Code
USGS Hydrogeo Code
Depth to Bedrock ft.
Bedrock Lith. Code
Bedrock Fm. Code

Completed by
Date / /

LOG

See Attached

Thick.	Lith.	Fm.

GWPI No. -

NJPDES No. -

Latitude ° ' "

Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code

County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by

Date / /

NLI 001 2099

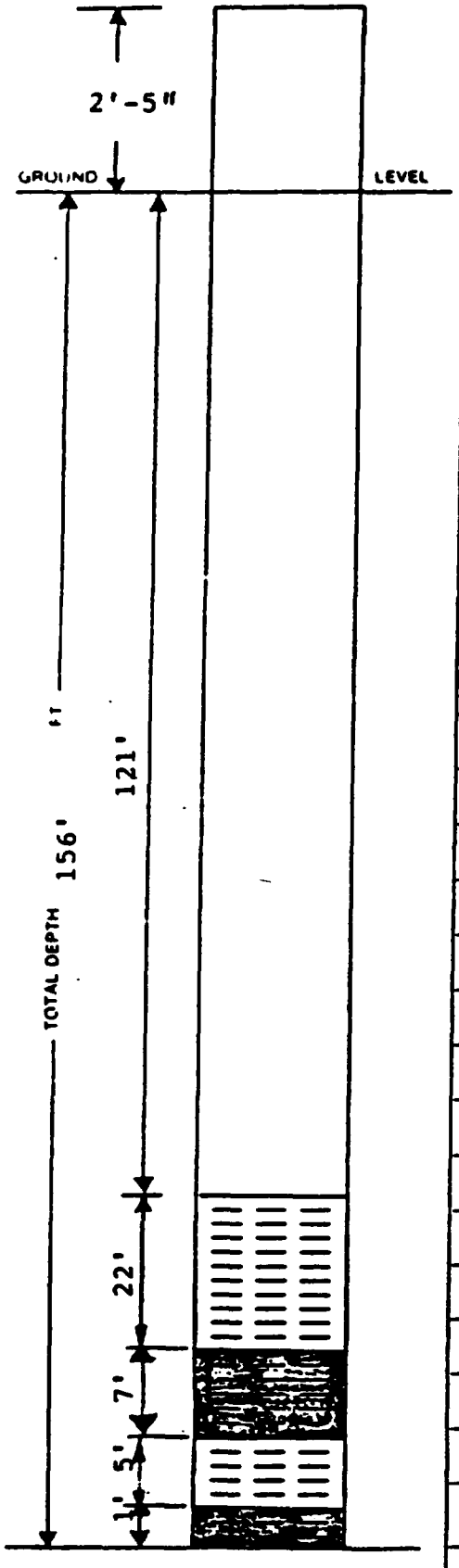
NLI 001 2100

30 23.439

30-05212

W. C. SERVICES, INC.

SINGLE CASED WELL



WELL LOG	FEET FROM GROUND SURFACE 0 to 166
Yellow gravel and sand	0-16
White sand	16-27
Gray clay	27-30
Orange clay and sands	30-31
Light gray clay	31-41
Red, white and orange clays	41-43
Gray & white sands	43-60
White & orange clay	60-62
Light gray clay	62-66
Light gray clay and fine gray sand	66-75
White sand/ White clay	75-77
White clay	77-82
Red, white, & gray clays	82-84
Med to fine white sands	84-94
Coarse white gravel	94-95
White, red & yellow clays	94-99
Fine white sand/ white clay	99-104
Coarse white sands	104-107
White & Red clays	107-112
White clay & very fine white sand	112-117
Med to fine white & gray sands	117-141
Coarse white sands	141-159
Red, white, & gray sands	159-166

NAME OF OWNER	Logan Wells Water C
Location	Pureland
Well No	1A
State Permit	30-05212
Job No	21751
Test Pumped (Hrs.)	24
Capacity (GPM)	210
Static Level	11'7"
Pumping Level	25'11"
Datum	Base
Specific Capacity	14.65
Diameter of Casing	8"
Depth of Well (Ground)	156'
Depth to Gravel	95'
Gravel Size	#2
Length of Casing & Screen	158'5"
Screen Material	s.s.
Screen Mfg.	Johnson
Screen Dia.	8" pipe size
Length of Screen	27'
Top of Screen Fitting	Weld ring
Bottom of Screen Fitting	Weld ring
Slot Size	.045
Seal Material	cement
Quantity	100 bags
Depth of Seal Material	95'
Drilling Machine	D-8
Date Well Completed	9/20/88

30-23-427

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-1149
Application No. _____
County _____

WELL RECORD

1. OWNER NOSTRIP CHEMICALS ADDRESS P. O. Box 348 Jamaica, New York

Owner's Well No. 1 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Pedricktown - Salem County - New Jersey

3. DATE COMPLETED 12/12/67 DRILLER A. C. SCHULTES & SONS, INC.

4. DIAMETER: top 6" Inches Bottom 6 Inches TOTAL DEPTH 122 Feet

5. CASING: Type Steel Diameter 6 Inches Length 107'6" Feet

6. SCREEN: Type Johnson St.Steel Size of Opening .050 Diameter 6 Inches Length 15'4" Feet

Range in Depth { Top 156'8" Feet / Bottom 122' Feet } Geologic Formation _____

Tail piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

RECORD OF TEST: Date 12/12/67 Yield 80 Gallons per minute

Static water level before pumping 11'10" Feet below surface

Pumping level 19'5" feet below surface after 6 hours pumping

Drawdown 7'1" Feet Specific Capacity 10.6 Gals. per min. per ft. of drawdown

How Pumped Vertical Turbine Pump (test) How measured Orifice 4" x 2"

Observed effect on nearby wells None

8. PERMANENT PUMPING EQUIPMENT:

Type Vertical Turbine Pump Mfrs. Name Worthington

Capacity 50 G.P.M. How Driven Electric H.P. 3 R.P.M. 1800

Depth of Pump in well 47 Feet Depth of Footpiece in well None Feet

Depth of Air Line in well 41 Feet Type of Meter on Pump _____ Size _____ Inches

9. USED FOR Industrial AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes _____ No. _____

Taste None Odor None Color Clear Temp. _____ °F

12. LOG See Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

NLI 001 2101

13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY A. C. SCHULTES & SONS, INC. Date Ø Jan. 9, 1968

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

Well Completion Report

30-23.427
30-1149
No.

A. C. SCHULTES & SONS *Contractors* TEST HOLES · WATER FOR ALL PURPOSES
ESTABLISHED 1921 ARTESIAN WELLS

501 MANTUA AVENUE WOODBURY, NEW JERSEY

Phone: TIlden 5-5656

Distributors of Worthington Corporation

GROUND LEVEL

TOTAL DEPTH - FT.

CASING

STRAINER

WELL LOG	FEET FROM GROUND SURFACE	
Brown Sand	0 TO 8'	
Med. Course White Sand	8 - 15'	Name of Owner NOSTRIP CHE
Clay, Sandish	15 - 20'	Job # 7428
Sand, Gravel, some Stone	20 - 32'	Location Pedricktown, N.
White Clay	32 - 39'	Well No. 1
Sand, Gravel, Stones	39 - 42'	Hrs. Pumped 6
Clay	42 - 45'	Capacity G.P.M. 80
Sand, Gravel, Stones Streaks of Red Clay	45 - 57'	Static Level 13'0"
Clay	57 - 59'	Pumping Level 19'4"
Sand & Gravel	59 - 66'	Specific Capacity 11
Clay	66 - 69'	Diameter of Well 6"
Snad, Gravel & Stones	69 - 78'	Dept of Well (ground) 107'6"
White and Red Clay	78 - 100'	Size of Casing 5"
Sand and Gravel, streaks of clay	100 - 126'	Length of Casing 107'6"
Clay	126 - 131'	Distance to Top of Packer (gr.
Sand and Gravel, streaks of Clay	131 - 151'	Type Screen JOHNSON
Clay	151 - 159'	Size of Screen 6"
Sandish Clay	159 - 161'	Length of Screen 15'4'
		Top Screen Fitting Threads
		Bottom Screen Fitting Threade
		Blank None
		Slot Size 50°
		Drilling Machine No. 1250
		Driller J. Nieder
		Gravel $3
		Bags of Cement None
		Date Well Completed 12/1

Well Driller Signature JOHN NIEDER

NLI 001 2102

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30 - 94399
Atlas Sheet Coordinates 30 : 23 : 179

OWNER IDENTIFICATION - Owner CASSANO, ELEANOR
Address RT 1 CROWN POINT RD.
City PEDRICKTOWN State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No.
Address Route 130
County Salem Municipality OLDMANS TWP. Lot No. 8 Block No. 38

WELL USE withdrawal Status in use

WATER USE Domestic Average 500 gals. daily Maximum 1800 gals. daily

WELL CONSTRUCTION Date well completed 11 / 3 / 86
BOREHOLE DIMENSIONS Depths: Total 40 ft. Finished 33 ft.
Diameter: Top 8 in. Bottom 8 in.
Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL *Screens: Note Slot Size(s)*
Casing 1		23	4	PVC Sch.40
Casing 2				
Casing 3				
Screen 1	23	10	4	PVC - Slot - .015
Screen 2				
Tail Piece				
Gravel Pack	21	9	8	#1 & #2 Well Gravel
Grout				
Grouting Method				

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date / / NO TEST TAKEN
Static water-level before pumping 15 ft. below land surface. Water level ft. below land surface after hrs. of pumping.
Water level was measured using Drawdown ft.
Discharge rate measured using Discharge Rate gals. per min.
Well was pumped using Specific Capacity gals. per min. per ft. of drawdown
Observed effects on nearby wells
Water Quality (taste, odor, color, etc.) Good

DID NOT INSTALL

PERMANENT PUMPING EQUIPMENT Installed by Pump Type
Mfrs. Name Model
CAPACITY: Pump delivers GPM at PSI pressure.
POWER: HP at RPM Power Source
DEPTHS: Pump ft. Footpiece ft. Airline ft.
FLOW METER: Model installed on in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor D'AGOSTINO WELL DRILLING NLI 001 2103
Address RR#8, Box 122
Bridgeton State NJ Zip Code 08302
Name of Driller Dave Mattus License No. 1005

Signature of Contractor Date 11 / 17 / 86

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30-04399

30,23179

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method: Mud Rotary

Type of Rig: Cyclone Rig

Aquifer/Geo. Fm.

DEP USE ONLY

Storet Hydrogeo Code

USGS Hydrogeo Code

Depth to Bedrock ft.

Bedrock Lith. Code

Bedrock Fm. Code

Completed by

Date / /

LOG

		Thick.	Lith.	Fm.
0" - 10"	Top Soil Black Loose			
10" - 15'	Sand - gravel			
15' - 20'	Sand brown Medium to fine			
20' - 23'	Clay Black Sticky			
23' - 33'	Sand L. Gray and D. Dray medium to fine			
33' - 40'	Clay black very sticky			

GWPI No. - NJPDES No. -

Latitude ° ' " Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by Date / /

NLI 001 2104

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30- 06023
Atlas Sheet Coordinates 30 : 23 : 179

OWNER IDENTIFICATION - Owner ~~BF GOODRICH CHEMICAL COMP~~
Address ~~PO 149 - MOORE & WALKER ROADS~~
City ~~AVON LAKE~~ State ~~OH~~ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No. Shallow well
Address Pedricktown
County Sale Municipality ~~OLDMANS TWP.~~ Lot No. ~~12~~ Block No. ~~38~~

WELL USE Industrial Status complete

WATER USE Average gals. daily Maximum gals. daily

WELL CONSTRUCTION Date well completed 11 / 15 / 89
BOREHOLE DIMENSIONS Depths: Total 147 ft. Finished 105 ft.
Diameter: Top 24" in. Bottom 36" in.
Land Surface Elevation at well ft. Elevation was determined using
Casing Height (stick-up) above land surface 3' ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL Screens: Note Slot Size(s)
		38'	26'	surface casing
Casing 1		76	18	outer casing steel
Casing 2		80	12	inside s.s. casing
Casing 3				
Screen 1	76	20	12	s.s. .030 slot
Screen 2	81	6	12	s.s.
Tail Piece	102	3	12	s.s.
Gravel Pack	15	90		#1 morie
Grout	0	73		~~Cement~~
Grouting Method	tremie pipe			

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date 11 / 30 / 89
Static water-level before pumping 32.5 ft. below land surface. Water level 72 ft. below land surface after 4 hrs. of pumping.
Water level was measured using M-scope Drawdown 39.5 ft.
Discharge rate measured using Orifice Discharge Rate 250 gals. per min.
Well was pumped using test pump Specific Capacity 6.4 gals. per min. per ft. of drawdown
Observed effects on nearby wells -
Water Quality (taste, odor, color, etc.) -

PERMANENT PUMPING EQUIPMENT Installed by W. C. Services Pump Type VTP
Mfrs. Name Worthington Model 10L22-5 stage
CAPACITY: Pump delivers 275 GPM at 100 PSI pressure.
POWER: 30 HP at 1800 RPM Power Source
DEPTHS: Pump 70 ft. Footpiece ft. Airline 70 ft.
FLOW METER: Model installed on in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor W.C. SERVICES NLI 001 2105
Address 664 S. Evergreen Avenue
City Woodbury State NJ Zip Code 08096
Name of Driller Jimes Schultes License No. 1152

Signature of Contractor James Schultes Date 2 / 2 /90

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 30-06023
30.23.179

Driller: Please use the space below for the log description. Note water bearing zones or geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method _____

Type of Rig XEME D-8

Aquifer/Geo. Fm. _____

DEP USE ONLY

Storet Hydrogeo Code _____
USGS Hydrogeo Code _____
Depth to Bedrock _____ ft.
Bedrock Lith. Code _____
Bedrock Fm. Code _____

Completed by _____
Date ____ / ____ / ____

LOG

See attached

Thick.	Lith.	Fm.

GWPI No. ____ - _____

NJPDES No. _____ - ____

Latitude ____ ° ____ ' ____ "

Longitude ____ ° ____ ' ____ "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle _____

Drainage Basin Code _____

County/Municipality Code _____

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data ☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by _____

Date ____ / ____ / ____

NLI 001 2106

Form 87-5M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

Permit No. 30-218
Application No. _____
County 30.23.1.8.1

1. OWNER Pan American Refining Corp. ADDRESS 122 East 42nd St., N.Y. 17, N.Y.
   Owner's Well No. Pump Test Well #1 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldmans Township, Salem County
3. DATE COMPLETED May 29, 1953 DRILLER Layne-New York Co. Inc.
4. DIAMETER: Top 8 Inches Bottom 6 Inches TOTAL DEPTH 217 Feet
5. CASING: Type Steel Diameter 8" & 6" Inches Length 217 Feet
6. SCREEN: Type None Size of Opening _____ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece. Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date None Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: None
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR Testing AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temperature _____ °F
12. LOG See reverse side (Give details on back of sheet or on separate sheet) Are samples available? _____
13. SOURCE OF DATA Layne-New York Co. Inc.
14. DATA OBTAINED BY Layne-New York Co. Inc. DATE Oct. 2, 1953

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2107

30-23.181
30-218

Each Stratum		Depth of Strata	Formation Found Each Stratum
1'		1'	Loam
9		10	Sand
19	CAPE MAY	29	Sand & gravel
2		31	Dark gray clay
8		39	Large gravel
4		43	Red clay
10		53	White clay
6		59	Dark gray clay
3	MAGOTHY	62	White medium size sand
1	RARITAN	63	Sand & clay
3		66	Coarse sand
10		76	Sandy clay, bits of decomposed wood
4		80	Fine brown sand
6		86	Coarse sand
7		93	Coarse sand with clay
13		106	Red gray clay
10		116	Light brown sandy clay
4		120	Dirty sand
2		122	Clean medium sand
2		124	Sand with pinkish clay cast
5		129	Medium fine sand
2		131	Clean sand & gravel
5		136	Sand & white clay balls
3		139	White sand with white clay
11		150	Fairly clean sand
4		154	Red clay
33		187	Gray & brown clay
30		217	Gravel & clay mixed
		Below 217	Large gravel & mica rock

RECEIVED
OCT 13 1953
Department of Conservation
& Economic Development
Geologic & Top. Survey

NLI 001 2108

30-23.182

Form 87-5M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

Permit No. 30-227
Application No. _____
County _____

1. OWNER Pan American Refining Corp. ADDRESS 122 East 42nd St., N.Y.17, N.Y.
   Owner's Well No. Formation Test #4 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldmans Township, Salem County
3. DATE COMPLETED June 2,1953 DRILLER Layne-New York Co.Inc.
4. DIAMETER: Top 5 Inches Bottom 5 Inches TOTAL DEPTH 205 Feet
5. CASING: Type None Diameter _____ Inches Length _____ Feet
6. SCREEN: Type None Size of Opening _____ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet Bottom _____ Feet } Geologic Formation _____
   Tail piece. Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date None Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: None
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR Formation Test AMOUNT { Average _____ Gallons Daily; Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temperature _____ °F
12. LOG See reverse side (Give details on back of sheet or on separate sheet) Are samples available? _____
13. SOURCE OF DATA Layne-New York Company, Inc.
14. DATA OBTAINED BY Layne-New York Co.Inc. DATE Oct. 2,1953

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2109

30.23.182.
30-227

Each Stratum	Depth of Strata	Formation Found each Stratum
5'	5'	Top soil
17	22	Fine brown sand
10	32	Coarse Brown sand
11	43	Coarse white sand
7	50	Coarse brown sand
84	134	Tough red clay - streaks of gravel
13	147	Coarse sand and gravel
21	168	Coarse gravel with clay
24	192	White and red clay
13	205	Coarse sand, gravel and boulders

RECEIVED
OCT 13 1953
Department of Conservation
& Economic Development
Geologic & Top. Survey

NLI 001 2110

30.23.182

rm DWR-138
/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-2649

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER Donald Chew ADDRESS 178 Rail Road Avenue, Pedricktown

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Same as above

3. DATE COMPLETED 3/10/82 DRILLER Dave Mattus

4. DIAMETER: Top 8 inches Bottom 8 inches TOTAL DEPTH 40 Feet

5. CASING: Type PVC Diameter 4 Inches Length 30 Feet

6. SCREEN: Type PVC Size of Opening Slot Diameter 4 Inches Length 10 Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date DID NOT TEST Yield _____ Gallons per minute

Static water level before pumping 3 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT: DID NOT INSTALL

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes _____ No _____

Taste Good Odor _____ Color _____ Temp. _____ °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA D'Agostino Well Drilling, Inc. NLI 001 2111

14. DATA OBTAINED BY _____ Date _____

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

30.03.182
30-2649

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL COLOR	GENERAL DESCRIPTION	DEPTH (FEET) FROM	DEPTH (FEET) TO
Soil	Roots	Black	Loose	0"	6"
Clay	Some Sand	Brown	Med Dry	6"	15'
Sand		Brownish	Med to Fine	15'	30'
Sand		Brownish gray	Med to Fine Some Coarse	30'	40'
Sand		Light Brownish	Med To Fine	40'	45'
Sand	Red Clay + Pink	Pinkish	Med To Fine	45'	53'

Distance out from bldg. 9' ft. 30.23.182

Distance offset right _____ ft. left _____ ft. from sides of bldg.

Well Depth 40' Casing diameter 4" Screen length 10'

Static level 3'

NLI 001 2112

30. 23. 188

Form 87-5M

Permit No. 30-226

Application No. _____

County _____

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

1. OWNER Pan American Refining Corp. ADDRESS 122 East 42nd St., N.Y.17, N.Y.
   Owner's Well No. Pump Test Well #2 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Oldmans Township, Salem County

3. DATE COMPLETED July 20,1953 DRILLER Layne-New York Co.Inc.

4. DIAMETER: Top 8 Inches Bottom 6 Inches TOTAL DEPTH 234 Feet

5. CASING: Type steel Diameter 8 Inches Length 165 Feet

6. SCREEN: Type Wire Wrapped Size of Opening _____ Diameter 4 Inches Length 10 Feet

   Range in Depth { Top 224 Feet / Bottom 234 Feet } Geologic Formation Sand and gravel

   Tail piece. Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface

8. RECORD OF TEST: Date July 20,1953 Yield 85 Gallons per minute
   Static water level before pumping 7'6" Feet below surface
   Pumping level 73'6" feet below surface after 8 hours pumping
   Drawdown 66 Feet Specific Capacity 1.3 Gals. per min. per ft. of drawdown
   How Pumped Turbine How measured Orifice
   Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:
   Type None Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____

10. USED FOR Testing AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER N.G. Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temperature _____ °F

12. LOG See reverse side Are samples available? _____
    (Give details on back of sheet or on separate sheet)

13. SOURCE OF DATA Layne-New York Company, Inc.

14. DATA OBTAINED BY Layne-New York Co.Inc. DATE Oct. 2,1953

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2113

30.23,188
30-224

Each Stratum	Depth of Strata	Formation Found each Stratum
1'	1'	Loam
7	8	Sandy clay
24	32	Sandy clay
6	38	Fine brown sand
6	44	Red & white clay
2	46	Grey clay
6	52	Fine brown sand with clay balls
3	55	Coarse sand, gravel & clay
3	58	Gravel & brown clay
14	72	Sand & gravel
3	75	Coarse sand & gravel
44	119	Red & grey clay
6	125	Grey sandy clay
8	133	Sandy clay, red & grey
22	155	Grey sandy clay
2	157	Sand & clay balls
13	170	Coarse sand & gravel
4	174	White clay
44	218	Sandy clay
1	219	Large gravel
1	220	Sand, grey clay
5	225	Sand & gravel
9	234	Sand & large gravel

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Geologic & Top. Survey

NLI 001 2114

30.23.189.

Form 87-5M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

Permit No. 30-221
Application No. _____
County 30.23.189

1. OWNER Pan American Refining Corp. ADDRESS 122 E. 42nd St., N.Y.17, N.Y.
   Owner's Well No. Formation Test Well No. 2 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldmans Township, Salem County
3. DATE COMPLETED May 19,1953 DRILLER Layne-New York Co.Inc.
4. DIAMETER: Top 5 Inches Bottom 5 Inches TOTAL DEPTH 216 Feet
5. CASING: Type Steel Diameter 4 Inches Length 216 Feet
6. SCREEN: Type None Size of Opening _____ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece. Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date None Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: None
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR Formation test AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temperature _____ °F
12. LOG See reverse side (Give details on back of sheet or on separate sheet) Are samples available? _____
13. SOURCE OF DATA Layne-New York Co.Inc.
14. DATA OBTAINED BY Layne-New York Co.Inc. DATE Oct. 2,1953

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2115

30.23.189
30-221

Each Stratum	Depth of Strata		Formation Found
1'	1'		Top soil
13	14	CAPE MAY	Coarse sand & gravel
48	62		Brown sand & gravel and streaks of clay
35	97		Tough red clay
38	135		Sand, gravel & streaks of clay
2	137		Red clay
13	150		Coarse brown sand
3	153	MAGOTHY	White clay
13	166	RARITAN	Coarse white sand & gravel
22	188		Clay mixed with sand & gravel
5	193		Red clay
22	215		Coarse sand & gravel
1	216	WIS	Rock

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Department of Conservation
& Economic Development
Geologic & Top. Survey

NLI 001 2116

30-23-197

Form DWR-138

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30 - 2823

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER William Kirschling ADDRESS Porch's Mill Rd., Swedesboro, New Jersey

Owner's Well No. 30 - 2823 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Oldmans Township Block 7 Lot 8

3. DATE COMPLETED Feb. 9, 1983 DRILLER F. C. Capel & Son

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 90 Feet

5. CASING: Type PVC Diameter 4 Inches Length 80 Feet

6. SCREEN: Type PVC Size of Opening 20 Diameter 4 Inches Length 10 Feet

Range in Depth { Top 80 Feet / Bottom 90 Feet } Geologic Formation Raritan

Tail Piece: Diameter none Inches Length _____ Feet

7. WELL FLOWS NATURALLY not Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date February 8, 1983 Yield 80 Gallons per minute

Static water level before pumping 12 Feet below surface

Pumping level 12 feet below surface after 4 hours pumping

Drawdown none Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped air lift How measured _____

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type Submersible Mfrs. Name Bould

Capacity 12 G.P.M. How Driven electric H.P. 3/4 R.P.M. _____

Depth of Pump in well 40 Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

0. USED FOR Irrigation AMOUNT { Average 400 Gallons Daily / Maximum 500 Gallons Daily }

1. QUALITY OF WATER Fair Sample: Yes ____ No X

Taste irony Odor none Color clear Temp. 54 °F.

2. LOG on reverse side Are samples available? no

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

SOURCE OF DATA drilling of well

14. DATA OBTAINED BY F. C. Capel & Son Date March 15, 1983

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2117

0 - 4	fine to coarse yellow sand
4 - 8	yellow clay
8 - 34	fine to coarse white sand
34 - 42	sandy white clay
42 - 45	red clay
45 - 50	fine to coarse yellow sand
50 - 55	coarse white sand and gravel
55 - 90	fine to coarse white sand

0.03	Manganese
4.8	iron
0.06	nitrates
6.4	pH
0	total coliform

APR 5 1983

30.23.413

Form 87-5M

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

WELL RECORD

Permit No. 30-817
Application No. _____
County 30.23.4.1.3 L

1. OWNER Pan American Refining Corp. ADDRESS 122 E. 42nd St., N.Y. 17, N.Y.
   Owner's Well No. Formation Test #1 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Oldmans Township, Salem County
3. DATE COMPLETED May 12, 1953 DRILLER Layne-New York Co. Inc.
4. DIAMETER: Top 5 Inches Bottom 5 Inches TOTAL DEPTH 240 Feet
5. CASING: Type Steel Diameter 4 Inches Length 240 Feet
6. SCREEN: Type None Size of Opening _____ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet, Bottom _____ Feet } Geologic Formation _____
   Tail piece. Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date None Yield _____ Gallons per minute
   Static water level before pumping _____ Feet below surface
   Pumping level _____ feet below surface after _____ hours pumping
   Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped _____ How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT: None
   Type _____ Capacity _____ Gallons per minute
   How Driven _____ Horse Power _____ R.P.M. _____
   Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
   Depth of Air Line in well _____ Feet Type of Meter on Pump _____
10. USED FOR Formation test AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes _____ No. _____
    Taste _____ Odor _____ Color _____ Temperature _____ °F
12. LOG See reverse side Are samples available? _____
    (Give details on back of sheet or on separate sheet)
13. SOURCE OF DATA Layne-New York Company, Inc.
14. DATA OBTAINED BY Layne-New York Co. Inc. DATE Oct. 2, 1953.

(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2119

(A)

30-23-413

30-217

LAYNE-NEW YORK CO., INC.

92 LIBERTY STREET, NEW YORK CITY

LOG OF WELL

Log of Well for Ford, Bacon and Davis Test No. Formation Test No. 1

Address Pedricktown

Well located at Pedricktown in County, State of New Jersey

Date Drilling started May 5, 1953 Date Test Hole Completed May 12, 1953

Total depth to bottom of Well 240' Diameter Test Hole 5"

Water stands when not pumping feet inches from the surface of the ground

EACH STRATUM	DEPTH OF STRATA	FORMATION FOUND EACH STRATUM	EACH STRATUM	DEPTH OF STRATA	FORMATION FOUND EACH STRATUM
1'	1'	Top Soil			
21'	12 22'	Coarse Brown Sand			
24'	36 46'	Gravel and Streaks of Clay		Cape May	
7'	43 53'	Coarse Sand and Gravel			
15'	58 68'	Grey Clay Mixed with Sand			
5'	63 73'	Coarse White Sand			
17'	80 90'	Brown Clay and Streaks of Sand			
19'	99 109'	Coarse Sand and Gravel.	Good Formation	Mag. Pen.	
75'	134 184'	Tough Red Clay and Streaks of Gravel			
31'	205 215'	Coarse Sand and Gravel.	Good Formation		
23'	228 238'	Red and Blue Clay			
2'	230 240'	Rock		Wm. Jam	
		Near coordinate G-3			

Remarks and opinion of Test

NLI 001 2120

Joseph Hough

Driller

30.23.413
30-217

Each Stratum	Depth of Strata	Formation Found
1'	1'	Top soil
21	22	Coarse brown sand
24	46	Gravel & streaks of clay
7	53	Coarse sand & gravel
15	68	Grey clay mixed with sand
5	73	Coarse white sand
17	90.	Brown clay and streaks of sand
19	109	Coarse sand and gravel
75	184	Tough red clay & streaks of gravel
31	215	Coarse sand and gravel
23	238	Red and blue clay
2	240	Rock

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Department of Conservation
& Economic Development
Geologic & Top. Survey

NLI 001 2121

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 3023413

PERMIT NO. 30-2892

APPLICATION NO. _____

COUNTY Salem

WELL RECORD

1. OWNER GATES, JOSEPH ADDRESS BOX 152, ROUTE 130

Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 11 Block: 39 Municipality: Oldmans Twp

3. DATE COMPLETED April 10, 1983 DRILLER South Jersey Well Drilling

4. DIAMETER: Top 4 inches Bottom 4 inches TOTAL DEPTH 110 Feet

5. CASING: Type PVC Diameter 4 Inches Length 100 Feet

6. SCREEN: Type PVC Size of Opening .016 Diameter 4 Inches Length 10 Feet

Range in Depth { Top 100 Feet / Bottom 10 Feet } Geologic Formation Clay & Sand

Tail Piece: Diameter 1¼ Inches Length 30 Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date April 12 Yield 20 Gallons per minute

Static water level before pumping 10 Feet below surface

Pumping level 15 feet below surface after 4 hours pumping

Drawdown 5 Feet Specific Capacity 4 Gals. per min. per ft. of drawdown

How pumped Jet pump How measured Flowmeter

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type Jet pump Mfrs. Name Sears

Capacity 15 G.P.M. How Driven Elec H.P. ½ R.P.M. 3400

Depth of Pump in well _____ Feet Depth of Footpiece in well 30 Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Domestic AMOUNT { Average 200 Gallons Daily / Maximum 350 Gallons Daily }

11. QUALITY OF WATER Good Sample: Yes ____ No ____

Taste Good Odor " Color _____ Temp. " °F.

12. LOG _____ Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA South Jersey Well Drilling Co.

14. DATA OBTAINED BY Ross Restuccio Date April 15, 1983

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2122

DWR-138A
1-88

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 30-06014
APPLICATION NO. _____
COUNTY Salem
COORD. 30-23415

Test Boring

WELL RECORD

1. OWNER Atlantic Electric ADDRESS Pleasantville NJ
Owner's Well No. T-14 SURFACE ELEVATION _____ Feet (above mean sea level)
2. LOCATION Power line
3. DATE COMPLETED 10/12/89 DRILLER M-R Soil Investigation
4. DIAMETER: Top 6 inches Bottom 6 inches TOTAL DEPTH 50 Feet
N/A 5. CASING: Type _____ Diameter _____ inches Length _____ Feet
N/A 6. SCREEN: Type _____ Size of Opening _____ Diameter _____ inches Length _____ Feet
Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
Tail Piece: Diameter _____ inches Length _____ Feet
N/A 7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
Water rises to _____ Feet above surface
N/A 8. RECORD OF TEST: Date _____ Yield _____ Gallons per minute
Static water level before pumping _____ Feet below surface
Pumping level _____ feet below surface after _____ hours pumping
Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
How pumped _____ How measured _____
Observed effect on nearby wells _____
N/A 9. PERMANENT PUMPING EQUIPMENT:
Type _____ Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ inches
10. USED FOR Test Boring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
N/A 11. QUALITY OF WATER _____ Sample: Yes _____ No _____
Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG 0-25 F-C gray sand 25-50 gray clay Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Driller
14. DATA OBTAINED BY Doug Walsh Date 12/19/89

(NOTE. Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

NLI 001 2123

Form 87

3023416

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 30-974
Application No. P-192
County

WELL RECORD

NLI 001 2124

1. OWNER Air Reduction Sales Co. ADDRESS 150 E. 42nd St., N.Y., N.Y.
Owner's Well No. 1 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Oldmann Twp, Salem County, N.J.

3. DATE COMPLETED 6-3-63 DRILLER Layne-New York Co. Inc

4. DIAMETER: top 18 inches Bottom 12 inches TOTAL DEPTH 135 Feet

5. CASING: Type Steel Diameter 12 inches Length 113 Feet

6. SCREEN: Type Stainless Steel Size of Opening Shutter Diameter 12 inches Length 20 Feet

Range in Depth { Top 112 Feet, Bottom 132 Feet } Geologic Formation Fine to medium light gray sand & gravel streks of clay

Tail piece: Diameter 12 inches Length 3 Feet

Kmr

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 6-3-63 Yield 600 Gallons per minute
Static water level before pumping 12 Feet below surface
Pumping level 67 feet below surface after 8 hours pumping
Drawdown 55 Feet Specific Capacity 10.9 Gals. per min. per ft. of drawdown
How Pumped Elect. Driven Turbine How measured Orifice
Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:
Type Turbine Mfrs. Name Layne & Bowler Inc Memphis, Tenn
Capacity 600 G.P.M. How Driven Elec. Motor H.P. 30 R.P.M. 1800
Depth of Pump in well 94 Feet Depth of Footpiece in well 10 Feet
Depth of Air Line in well 104 Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Industrial AMOUNT { Average _____ Gallons Daily, Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No. ____
Taste _____ Odor _____ Color _____ Temp. _____ °F

12. LOG See Reverse Side Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA Layne-New York Co. Inc

14. DATA OBTAINED BY Layne-New York Co. Inc Date 11/14/63

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated analysis of the water, sketch map, sketch of special casing arrangements etc.)

0'- 4' FINE TO MED. YELLOW SAND
4'- 21' COARSE TO MED SAND & FINE GRAVEL
21'- 35' RED CLAY
35'- 42' LIGHT GRAY CLAY WITH STREKS OF SAND
42'- 65' COARSE TO MEDIUM SAND & FINE GRAVEL
65'- 68' LIGHT GRAY CLAY
68'- 80' COARSE TO MED SAND & FINE GRAVEL
80'- 98' LIGHT GRAY & RED CLAY
98'- 105' STREKS OF LIGHT GRAY CLAY AND SAND
105'- 135' FINE TO MED. LIGHT GRAY SAND & GRAVEL
STREKS OF CLAY

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NLI 001 2125

EXHIBIT E

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DOC ID # 54385

DOC TITLE/SUBJECT:

EXHIBIT E
REMEDIAL INVESTIGATION REPORT
NSNJ INC / NL SITE
SHEET 1 OF 2

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EXHIBIT E
REMEDIAL INVESTIGATION REPORT
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SHEET 2 OF 2

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290 BROADWAY, 18TH FLOOR
NEW YORK, NY 10007

EXHIBIT F

Reference:

Klement, Alfred. ed., 1982, CRC Handbook of Environmental Radiation, CRC Press, Inc. Boca Raton, FL, pp5-21.

NLI 001 2130

NATURAL SOURCES OF ENVIRONMENTAL RADIATION

Alfred W. Klement, Jr.*

INTRODUCTION

Man is exposed in varying degrees, depending on his activities and location, to sources of radiation found in nature. Cosmic radiation entering the earth's atmosphere and crust is one source. Nuclear interactions of cosmic rays with matter produce radionuclides to which man is exposed. Other sources of natural radiation are elements found in the earth's crust that are composed of one or more radioisotopes.

COSMIC RADIATION

A number of reviews and data on cosmic radiation have been published.[3] Cosmic-ray dose rates vary[3] with latitude and geomagnetic latitude up to about 50°. For example, the whole-body dose rates at sea level from Alaska to Florida range from about 45 to 30 mrem/year. At 45°N from sea level to 8000 ft altitude the range is about 40 to 200 mrem/year. Based on these relationships, estimates of dose can be made for any population.

NATURAL RADIONUCLIDES

Primordial Radionuclides

A number of naturally occurring radionuclides are primordial, i.e., associated with the formation of the earth. The heaviest elements are composed entirely of radioisotopes, and all of these may be placed in one of four long-decay series; the important ones are the uranium, thorium, and actinium series. The neptunium series is of lesser interest. Decay schemes of the major long-decay series are shown in Figures 1 to 3. The primordial radionuclides are shown in Table 1.

Cosmogenic Radionuclides

Some radionuclides are produced through nuclear reactions between cosmic rays and nuclei in the atmosphere, soil, and water. Of the many radionuclides produced through these reactions, only a few are present at any time in detectable concentrations, and some of these require very tedious procedures for collection and analysis. Even when detected, some concentrations are available with large uncertainties. Those detectable and reported are listed in Table 2.[1]

Other cosmogenic nuclides, spallation products, thorium, uranium, and ^{40}K have been reported in meteoritic material; these include ^{10}Be, ^{14}C, ^{26}Al, ^{36}Cl, ^{37}Ar, ^{53}Mn, ^{60}Co, and others. Another group found in very small quantities and concentrations results from the natural fission of uranium and thorium.[4] Estimates of neutron-activated nuclides in air, soil, and water indicate the great variety of nuclides that are possible from cosmic ray reactions and natural fission.[5]

Some ranges of estimates of production rates of cosmogenic radionuclides are given

* This chapter was adapted from Klement, A. W., Jr., Natural radionuclides in foods and food source materials, in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission. It is taken in part from Klement, A. W., Jr., Miller, C. R., Minx, R. P., and Shleien, B., Estimates of Ionizing Radiation Doses in the United States 1960—2000: Report ORP/CSD 72-1, U.S. Environmental Protection Agency, Washington, D.C., 1972, 7. Reference 3 provides additional references.

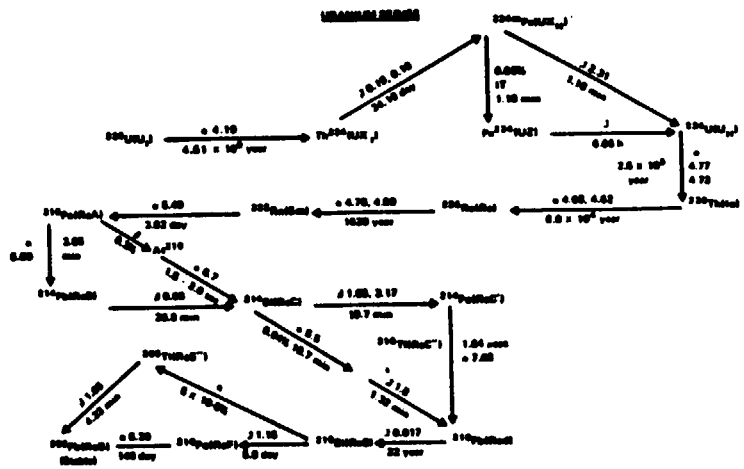

FIGURE 1. Uranium series decay scheme (α and β energies in megaelectronvolts). (From Klement, A. W., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.)

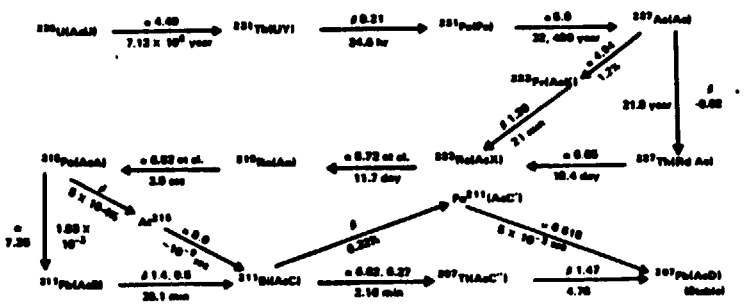

FIGURE 2. Actinium series decay scheme (α and β energies in megaelectronvolts). (From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man* Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.)

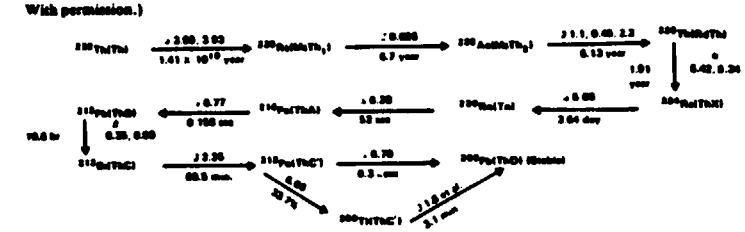

FIGURE 3. Thorium series decay scheme (α and β energies in megaelectronvolts). (From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.)

Table 1
PRIMORDIAL RADIONUCLIDES

Nuclide	Half-life (years)	% isotopic abundance	Emissions, decay	Energy of primary emission (MeV)	Specific activity (Ci/g element)
^{40}K	1.3×10^{9}	0.0118	β, γ, ϵ	1.32	8.3×10^{-5}
^{50}V	$\sim 6 \times 10^{15}$	0.24	β, γ, ϵ	—	$\sim 2.8 \times 10^{-14}$
^{87}Rb	4.7×10^{10}	27.85	β	0.27	2.5×10^{-6}
^{115}In	6×10^{14}	95.72	β	0.6	5.0×10^{-10}
^{138}La	1.1×10^{11}	0.089	β, γ, ϵ	0.205	2.1×10^{-10}
^{144}Ce	5×10^{-10}	11.07	α	1.5	5.7×10^{-14}
^{144}Nd	$\sim 5 \times 10^{15}$	23.85	β	1.8	$\sim 1.2 \times 10^{-14}$
^{147}Sm	1.06×10^{11}	14.97	α	2.24	3.38×10^{-9}
^{148}Sm	1.3×10^{11}	11.24	α	2.14	2.24×10^{-11}
^{149}Sm	$\sim 4 \times 10^{15}$	13.83	α	1.84	$\sim 8.2 \times 10^{-15}$
^{152}Gd	1.1×10^{14}	0.200	α	2.15	4.15×10^{-15}
^{174}Hf	4.3×10^{15}	0.18	α	2.5	8.4×10^{-14}
^{176}Lu	3.6×10^{10}	2.59	β, γ	0.42	1.47×10^{-10}
^{187}Re	7×10^{10}	62.93	β	<0.008	1.73×10^{-9}
^{190}Pt	7×10^{11}	0.0127	α	3.11	3.33×10^{-14}
^{192}Pt	$\sim 10^{15}$	0.78	α	2.6	$\sim 1.4 \times 10^{-14}$
^{204}Pb	1.4×10^{17}	1.48	α	2.6	1.83×10^{-16}
^{238}U (series*)					
^{235}U (series*)					
^{232}Th (series*)					

* See Figures 1 to 3.

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

Table 2
MAJOR COSMIC-RAY-ACTIVATED RADIONUCLIDES

Nuclide	Half-life	Emission, decay	Energy of primary emission (MeV)	Production rate (atom/cm^2-sec)
^{3}H	12.26 years	β	0.0181	0.12—1.3
^{7}Be	53 days	ϵ, γ	—	0.021—0.035
^{10}Be	2.7×10^{6} years	β	0.56	0.04—0.1
^{14}C	5760 years	β	0.156	2—2.6
^{22}Na	2.58 years	$\beta^+, \epsilon, \gamma$	0.54	—
^{32}Si	~700 years	β	0.1 (to ^{32}P)	2×10^{-4}
^{32}P	14.3 days	β	1.71	1×10^{-4}
^{33}P	25 days	β	0.25	1×10^{-4}
^{35}S	86.7 days	β	0.168	2×10^{-4}
^{36}Cl	3×10^{5} years	β, ϵ	0.71	—
^{38}Cl	55 min	β, γ	1.91, 2.18, 3.43	—

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

in Table 2. However, as mentioned above, cosmic ray intensities vary considerably around the earth. Also, the concentrations of nuclei available for reactions vary considerably. Except for very gross estimates of average concentrations on which very gross dose estimates may be made, such estimates are of little value unless they are the only estimates available or obtainable. Of course, the best estimates are based on

NLI 001 2131

actual measurements within a particular area of interest. Natural tritium may be used as an example. It has been estimated that tritium is produced in the range of 0.12 to 1.3 atoms/cm³-sec (see Table 2), which includes a number of locations and sampling and analytical techniques, the use of various half-lives, etc. It has been suggested that the production rate of tritium as an average around the world is 1 atom/cm³-sec.[4] Based on this figure, it was estimated that there are about 30 kg.[4] However, the concentrations of tritium in various media in various locations may differ by orders of magnitude. The situation is further compounded by the inhomogeneous physical, chemical, and biological processes coming into play. The compound uncertainties involved in such estimates are obvious. Further, when one attempts to superimpose the uncertainties of the effects of radiation on these uncertainties, it is doubtful that many arguments concerning such estimates have more than a trace of validity. For this reason, no attempt is made here to provide estimates of production rates in terms of curies. The discussion below provides estimates of more value in radiation protection; even so, the uncertainties are important considerations.

DISTRIBUTION OF NATURAL RADIONUCLIDES

Estimates of natural radionuclides in the earth's crust have been made; these are shown in Table 3.[1] These nuclides are found throughout the environment — soils, waters, and the atmosphere.

Soils

The concentration of natural radionuclides varies quite widely in soils, as may be expected. Geographic location and geological origin of soils as well as climatic, hydrological, and agricultural history are important in this regard. The uses of fertilizers in various agricultural situations have affected radionuclide concentrations to a large extent. For example, ^{40}K is increased in soils when potassium fertilizers are used. It has been reported[7] that some virgin soils (under cultivation 1 to 2 years) had concentrations of 2.0 mg K_2O/100 g,* while soils under cultivation for 20 years had concentrations of 28.8 mg K_2O/100 g.* Some fertilizers have been used that have relatively high concentrations of other natural radionuclides, particularly isotopes of radium. Also, fertilizers may affect the chemical form of natural radionuclides in soils and, thus, their physical transport and biological uptake.

Table 4 is a summary of a number of estimates of natural radionuclides in various soils.[1] Tables 5 and 6 provide additional estimates.[1] There are few data with regard to concentrations of nuclides found at very low concentrations.

Radionuclides in soils are internal and external sources of radiation exposure to man and the environment. However, it has been estimated that only about 1% of total soil potassium is exchangeable, so that the availability to plants depends on a number of factors such as cropping practice, leaching, erosion, irrigation waters, fertilizing, etc.[8] Although the availability mechanisms may be quite different, the same would perhaps be true for other radionuclides also. It should be kept in mind, however, that the external dose rates are not dependent on chemical form except as it is affected by some transport mechanism.

Natural Waters

Natural radionuclides in the seas and marine sediments were subjected to detailed study more recently than soils, but a large amount of data have been reported in the

* Concentrations of potassium in soils are usually given in terms of K_2O equivalents as normal practice by soil scientists. These could be easily converted to curies per gram of ^{40}K, but this would serve no purpose here.

Table 3
NATURAL RADIONUCLIDES IN THE EARTH'S CRUST (μg/g)

	Igneous rocks						Sedimentary rocks				Deep sea sediments	
			Granite									
Nuclide	Ultrabasic	Basaltic	High Ca	Low Ca	Syenites	Shales	Sandstones	Carbonates	Carbonate	Clay
K	0.0047	0.98	2.97	4.96	5.46	3.14	1.26	0.33	0.34	2.95
Sr	0.096	0.60	0.21	0.10	0.072	0.31	0.046	0.048	0.046	0.28
Pb	0.056	8.4	31	47	31	39	17	0.8	2.8	31
Th	0.01	0.21	0.04	0.25	0.86	0.1	0.4	0.4	0.4	1.4
U	0.008x	0.013	0.040	0.049	0.069	0.003	0.88	0.008x	0.009	0.102
^{232}Th	0.0x	5.3	9.0	10	17.0	4.5	10	1.27	3.9	30.2
^{238}U	0.0x	4.0	7.9	8.0	15.5	5.7	8.0	1.1	3.3	33
^{40}K	0.0x	0.79	1.3	1.5	2.7	0.96	1.5	0.19	0.57	3.7
^{87}Sr	0.0x	0.60	0.99	1.1	1.0	0.72	1.1	0.13	0.43	4.3
^{208}Pb	0.0x	0.75	1.2	1.4	2.5	0.89	1.4	0.13	0.53	5.3
^{232}Th	0.00x	0.011	0.018	0.02	0.036	0.013	0.02	0.0026	0.0076	0.076
^{238}U	0.0011	0.0036	0.041	0.0070	0.020	0.0059	0.0070	0.00054	0.00074	0.0074
^{40}K	0.0x	0.016	0.028	0.031	0.054	0.018	0.031	0.0053	0.013	0.12
^{87}Sr	0.015	0.80	0.22	0.28	0.18	0.30	0.10	0.13	0.12	1.2
^{208}Pb	0.004	4	8.5	17	13	12	1.7	1.7	x	7
Th	0.001	1	3	3	3	3.7	0.45	2.2	0.4	1.3

Note: x = an order of magnitude.

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

NLI 001 2132

Table 4
ESTIMATES OF NATURAL RADIONUCLIDES IN SOILS (pCi/g)[a,b,c]

Location	Radium	Thorium	Uranium	^{40}K
Cambridge Gault	1	—	—	—
Dublin	5.2,2.8	—	—	—
U.S.	1.97	3.6—6.1	—	—
U.S. subsoils	1.52	—	—	—
U.S.S.R. central mountains	0.28—0.95	0.25—1.30	0.3—6.0	—
Poland	—	1.0—1.2	3.1—3.2	—
Germany	0.15—1.30	—	—	—
Colorado—New Mexico	1.2—2.0	—	—	—
U.S.	80—800 mCi/mi^2	—	—	—
Germany—North America	39—700 mCi/mi^2	—	—	—
Germany(^{226}Ra)	433—1,660 mCi/mi^2	—	—	—
U.S.	0.9—1.5	—	—	0.0025—0.0075
Spain	0—237	—	—	—

[a] Summarized from Klement.[1] This table merely shows the paucity of data, but more importantly that the variability is very wide and these data are of little use in health protection except in a gross way, so that detailed studies would be needed on a local or specific area basis to be of value where a problem in this regard appears significant.
[b] The values shown were mostly originally reported in units of grams per gram.
[c] It has been estimated that for U.S. soils the average ^{40}K concentrations are about 21.3 Ci/mi^2.

From Klement, A. W., Jr., in Radioactive Fallout, Soils, Plants, Foods, Man, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

Table 5
ESTIMATES OF NATURAL RADIONUCLIDES IN THE LITHOSPHERE AND SOILS (pCi/g)

Nuclide	Lithosphere	Soils
Uranium	1	0.33
Th	0.87	0.65
Ra	1×10^{-6}	0.8
^{40}K	2.5×10^{-6}	1.3×10^{-6}
^{87}Rb	2.15	0.425

Adapted from Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965.

last few decades. A number of extensive reviews are available that summarize much of the data of interest (see References 1 and 3). Tables 7 and 8 provide a summary of concentrations of natural radionuclides in oceans and sediments:[1] Concentrations vary quite widely in marine waters and sediments, as in soils, because of geographic location, mixing, additions from fresh waters and silt, etc.

Concentrations of radium in fresh waters are shown in Table 9.[1] Some measurements of cosmogenic radionuclide concentrations in precipitation have been made and are summarized in Table 10.[1]

As a result of the distribution of natural radionuclides discussed above, it would be expected that they would be found in drinking waters as well. Thus, drinking waters are a source of dietary intake of natural radionuclides. Generally, natural fresh waters are processed to some extent before being used as drinking water. The processing of

Table 6
POTASSIUM-40 AND RUBIDIUM-87 IN SOILS OF THE U.S.S.R.[a]

Soils	^{40}K (pCi/g × 10^{-6})	^{87}Rb (pCi/g)
Tundra	1.01—4.12	0.7
Podzolic	1.26—3.09	0.55, 0.52
Chernozems	1.73—2.47	0.40—0.65
Chestnut and serozems	1.74—2.23	0.13—0.50
Red	0.17—0.42	0.35
Forest	1.64—2.49	0.52

[a] For dry soil in A, B, and C horizons.

Adapted from Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965.

Table 7
ESTIMATED AVERAGE CONCENTRATIONS OF PRIMORDIAL RADIONUCLIDES IN THE OCEANS AND SEDIMENTS

Nuclide	Seawater (g/l)	Surface sediments (g/g)	Nuclide	Seawater (g/l)	Surface sediments (g/g)
^{238}U	3.0×10^{-6}	1×10^{-6}	^{210}Po	1.0×10^{-20}	1.7×10^{-16}
^{235}U	2.1×10^{-8}	7.1×10^{-8}	^{211}Po	$<8.1 \times 10^{-20}$	1.4×10^{-16}
^{234}U	1.6×10^{-10}	8.1×10^{-11}	^{212}Po	3.0×10^{-20}	1.1×10^{-17}
^{234}Pa	1.4×10^{-10}	4.7×10^{-10}	^{214}Po	1.2×10^{-20}	2.4×10^{-20}
^{231}Pa	$<2 \times 10^{-10}$	1×10^{-11}	^{215}Po	$<6.8 \times 10^{-20}$	1.2×10^{-16}
^{232}Th	4.3×10^{-17}	1.4×10^{-17}	^{216}Po	2.2×10^{-11}	8.8×10^{-16}
^{230}Th	$<2 \times 10^{-8}$	5.0×10^{-8}	^{210}Bi	2.1×10^{-20}	8.8×10^{-20}
^{229}Th	8.6×10^{-20}	2.9×10^{-20}	^{212}Bi	2.2×10^{-16}	3.7×10^{-16}
^{228}Th	$<3 \times 10^{-16}$	2.0×10^{-20}	^{214}Bi	$<5.6 \times 10^{-16}$	1.0×10^{-16}
^{227}Th	4.0×10^{-16}	7×10^{-20}	^{216}Bi	7.8×10^{-19}	3.1×10^{-17}
^{226}Th	$<7.0 \times 10^{-20}$	1.3×10^{-17}	^{210}Pb	2.9×10^{-16}	1.2×10^{-16}
^{230}Ac	1.5×10^{-16}	2.4×10^{-20}	^{212}Pb	2.4×10^{-16}	3.9×10^{-16}
^{227}Ac	$<1 \times 10^{-16}$	5.9×10^{-16}	^{214}Pb	$<9.0 \times 10^{-16}$	1.6×10^{-20}
^{228}Ra	1.4×10^{-11}	2.3×10^{-16}	^{216}Pb	1.1×10^{-16}	4.5×10^{-16}
^{226}Ra	1.0×10^{-11}	4.0×10^{-11}	^{206}Pb	4.4×10^{-6}	—
^{224}Ra	2.1×10^{-20}	3.4×10^{-16}	^{208}Tl	4.1×10^{-16}	6.7×10^{-16}
^{223}Ra	$<4.4 \times 10^{-20}$	8.5×10^{-16}	^{209}Tl	$<1.2 \times 10^{-16}$	2.1×10^{-16}
^{223}Fr	$<7.0 \times 10^{-16}$	1.4×10^{-16}	^{144}Ce	4.4×10^{-6}	—
^{222}Rn	6.3×10^{-16}	2.5×10^{-17}	^{138}La	2.7×10^{-16}	—
^{220}Rn	3.3×10^{-16}	5.4×10^{-20}	^{87}Rb	3.3×10^{-6}	—
^{219}Rn	$<1.7 \times 10^{-20}$	3.1×10^{-20}	^{50}V	4.8×10^{-6}	—
^{210}Po	3.4×10^{-16}	1.4×10^{-20}	^{40}K	4.2×10^{-6}	$0.8—4.5 \times 10^{-6}$

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

waters will usually reduce concentrations. However, the processing may either increase or decrease the availability of a radionuclide for uptake in biological systems through changes in its chemical form. Table 11 summarizes concentrations of natural radionuclides in drinking water.[1]

NLI 001 2133

Table 8
ESTIMATED CONCENTRATIONS OF MAJOR COSMOGENIC RADIONUCLIDES IN THE OCEANS

Nuclide	Surface seawater (g/l)	Surface sediment (g/g)
^{35}S	$<1.8 \times 10^{-10}$	—
^{32}P	$<1.5 \times 10^{-10}$	—
^{33}P	$<3.1 \times 10^{-10}$	—
^{32}Si	5×10^{-10}	$0—2 \times 10^{-10}$
^{14}C	$2—3 \times 10^{-10}$	$0.1—1 \times 10^{-10}$
^{10}Be	$0.7—8 \times 10^{-17}$	$1—3 \times 10^{-10}$
^{7}Be	$<4.9 \times 10^{-17}$	—
^{3}H	$0.7—5 \times 10^{-10}$	—

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

Table 9
CONCENTRATION OF RADIUM IN FRESHWATERS[a,b] (pCi/l)

Location	Concentration
Various rivers	0.01—0.1
U.S.S.R. (normal)	1
U.S.S.R.	0.2—4
Germany (rivers)	0.07—0.84
U.S. (average)	0.1
U.S. (drinking water supplies)	0—6.5
Western U.S.	0.04—440
U.S.S.R. (deep spring brines)	up to 1,000
Germany (springs)	up to 18.4
Maine-New Hampshire (maximum)	730 (^{226}Ra)
Illinois (maximum)	36 (^{226}Ra)
Illinois (sandstone wells)	up to 36.1 (^{226}Ra)
Spas	1×10^{6}
U.S.S.R.	$20—272 \times 10^{6}$ (^{226}Ra)

[a] Summarized from Reference 1. This table merely shows the paucity of data; more important, the variability is very wide and these data are of little use in health protection except in a gross way, so that detailed studies would be needed on a local or specific area basis to be of value where a problem in this regard appears significant.
[b] The values shown were mostly originally reported in units of grams per gram.

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Food, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

Table 10
CONCENTRATIONS OF COSMOGENIC RADIONUCLIDES IN PRECIPITATION (atoms/ml)

Nuclide	Concentration
^{3}H	$5 \times 10^{6}—1 \times 10^{7}$
^{7}Be	$2 \times 10^{6}—6 \times 10^{6}$
^{14}C	14.7 dpm/g C
^{22}Na	~40
^{32}P	~40, 26
^{33}P	~30, 55
^{35}S	~400, 316
^{36}Cl	2.5

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

Table 11
CONCENTRATIONS OF RADIUM IN DRINKING WATER (pCi/l)

Location	Concentration
U.S.	0—0.17
Joliet, Ill.	5.8
Chicago, Ill.	0.03[a]
Germany	0.02—0.62
London	0.1

[a] This includes ^{226}Ra only.

Adapted from Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., Ed., Elsevier, Amsterdam, 1965.

Foods

Obviously, the human diet is a source of intake of natural radioactivity and human exposure. A large amount of data is available with regard to concentrations of natural radionuclides in foods. Tables 12 to 19 provide summaries of concentrations in various categories, locations, and age groups.[1] While the concentrations of natural radionuclides vary widely with location and local situations, agricultural practices, exportation and importation, manufacturing and marketing procedures, and other factors tend to equalize concentrations except in situations where foods are mostly locally grown and eaten. Indications are that while individual samples may vary widely, composite diets and samples do not as far as the statistical aspects of sampling and analyses are concerned, at least in the U.S. and probably other industrialized nations.

There are few data on concentrations of natural radionuclides in nonagricultural environmental biota.[1,3] The range shown is extreme for the data available, indicating the local nature of the situation. Concentrations in soils, air, and water for local situations generally dictate the range of concentrations to be found.

Air

Most of the natural radionuclides are found in the atmosphere in some locations and some situations.[3] However, isotopes of radon (especially ^{222}Rn) and their daugh-

NLI 001 2134

Table 12
RADIUM-226 IN FOOD GROUPS FOR ESTIMATION OF TOTAL DIETARY INTAKE[a,b]

Food groups	New York			Chicago			San Francisco		
	pCi ^{226}Ra/kg	pCi ^{226}Ra/year		pCi ^{226}Ra/kg	pCi ^{226}Ra/year		pCi ^{226}Ra/kg	pCi ^{226}Ra/year	
Whole wheat bread	1.2	12	12	2.9	29	29	2.8	28	28
White bread	1.5	36	54	2.9	70	105	2.5	60	90
Flour (white)	1.7	118	200	2.9	198	336	1.34	93	158
Milk (liquid)	0.34	117	40	0.52	180	62	0.83	286	97
Potatoes	2.3	56	129	1.4	33	77	2.0	48	110
Macaroni	1.6	80	128	0.77	38	61	1.7	85	136
Dried beans	6.3	6.3	40	1.9	4.8	30	1.2	3.0	19
Canned vegetables	3.2	18	58	2.3	21	67	2.3	21	67
Fresh vegetables	0.54	4.4	2.4	1.1	2.2	1.2	0.91	1.8	0.98
Root vegetables	1.2	108	130	0.57	51	61	0.66	59	71
Canned fruit	2.3	53	122	2.3	53	122	2.6	60	138
Fruit juices	0.37	9.7	3.6	1.6	31	11	0.75	14	5.3
Fresh fruit	0.49	31	15	0.86	53	26	0.71	44	21
Rice	2.8	99	277	0.57	57	160	0.63	63	177
Eggs	1.0	3.1	3.1	0.70	2.1	2.1	0.80	2.4	2.4
Fresh fish	7.9	4.6	36	2.7	16	21	2.6	15	20
Shellfish	0.68	66	45	0.71	47	32	0.88	58	40
Meat	1.1	127	140	1.0	127	127	1.0	127	127
Poultry	0.67	5.4	3.6	1.7	5.7	9.6	2.8	9.4	15
	0.86	1.2	1.0	2.5	2.5	2.5	2.8	2.8	2.8
		32	32	0.45	32	14	0.61	43	19
		34	34	0.64	22	14	1.9	67	42
		15	12	0.79	23	18	0.49	22	16

[a] Results of two samplings, 1960 to 1961.
[b] Only one sample, same value used for calculations.

From Hahlden, N. A. and Fiserne, I. M., in Fallout Program Quarterly Summary Report, Hardy, E. P., Jr. et al., Report HASL-112. U.S. Atomic Energy Commission, New York, 1961, 90.

Table 13
RADIUM AND CALCIUM IN GERMAN FOODS

Food item	^{226}Ra concentration pCi/kg	pCi/g Ca
Meat	0.8—1.5	8.8—79.5
Milk	0.3	0.2
Eggs	3.1	6.9
Butter	0.3	0.55
Fish	2.8—6.3	0.7—19.0
Cod liver oil	4.9	2240
Flour and bread	1.7—3.3	2.4—13.8
Margarine	0.1	0.34
Carrots	1.6—6.1	4.9—22.9
Cabbage (2)	1.0, 2.4	1.3, 2.6
Apples	0.9	15.0
Potatoes (N. Germany)	1.0	23.8
Potatoes (S. Germany)	0.6	12.4

From Muth, H., Rajewsky, B., Henke, H.-J., and Aurand, K., *Health Phys.*, 2, 239, 1960. With permission.

Table 14
RADIUM-226, THORIUM-228, AND ALPHA RADIOACTIVITY IN FOODS

Foods	Total α pCi/kg	^{226}Ra pCi/kg	^{228}Th pCi/kg
Breakfast cereals	9—380 (28)	25—68 (3)	5—61 (4)
Nuts	5—16,900 (10)	3—2730 (4)	3—1200
Brazil nuts	16,900 (1)	2730	1200
Peanuts	120 (1)	18	9
Confectionery	<1—2900 (11)	2.4—520	1.9—170
Beverages	<1—310 (12)	40—57 (4)	0.8—57
Meats and fish	<1—310 (17)	0.9—57 (9)	0.6—19 (9)
Cockles	310	57	19
Mussels	100	18.2	6.1
Sausages	16	2	1.7
Salmon (canned)	18	—	—
Veal, beef	7.5	0.9,—	0.6,—
Lamb	1	—	—
Fruits and vegetables	<1—23 (18)		
Pears	7	1.1	0.6
Milk products	<1—15 (9)	—	—
Cheese (4)	9—15	1.5 (1)	1.5 (1)
Bread and flour	8—147	—	—

From Turner, R. C., Radley, J. M., and Mayneord, W. V., *Health Phys.*, 1, 268, 1958. With permission.

ters are the only significant ones leading to widespread exposure through inhalation. Others, including the decay products of radon, contribute to radionuclides in soils and waters, as discussed above. Radon is released as a decay product from soils, rocks, waters, and building materials. It is also contained in natural gas and other fossil fuels. Radon concentrations vary considerably from place to place and from time to time.

NLI 001 2135

Table 15
ESTIMATES OF POTASSIUM-40 CONTENT OF FOODS*

Food groups	Estimated ^{40}K (range) pCi/kg food
Dairy products	(770—1510)
Cows milk	1180
Cheese	800
Fats, oils, shortenings	(0—480)
Butter	190
Margarine	480
Fruits (fresh, raw)	(620—3700)
Assorted berries	(750—1510)
Apples	620
Bananas	3520
Peaches	1320
Oranges	1400
Cantaloupes	1900
Grain products	(710—1900)
Wheat flour	710
Rice (white)	1070
White bread	1500
Whole wheat bread	1900
Nuts	(3500—6400)
Brazil nuts	5600
Coconut (dry, sweet)	6400
Peanuts (roasted, salted)	5820
Meats (cooked)	(2740—3320)
Seafoods (raw)	(925—4540)
Seafoods (cooked)	(925—2520)
Eggs	840
Vegetables	(910—4450)
Roots	3400
Carrots(raw)	910
Carrots (canned)	4450
Sweet potatoes	3400
White potatoes	(1080—6500)
Leaf or stem	1900
Cabbage (raw)	1150
Lettuce	6500
Spinach (raw)	2140
Spinach (canned)	2490
Celery	(800—4640)
Beans and peas	4640
Lima beans (raw)	1740
Lima beans (green, canned)	2490
Snap beans (green, raw)	3070
Peas (green, raw)	800
Peas (green, canned)	
Other	1900
Tomatoes (raw)	1900
Cucumbers (raw)	(1990—3070)
Corn, sweet (raw)	
Miscellaneous	4
Sugar (cane)	1900
Sugar (brown)	390
Beer	430
Cola beverages	

* Based on total K values.

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Fowler, E. B., ED., Elsevier, Amsterdam, 1964, 113. With permission.

Continuous monitoring records show that in many locations over extended periods of time air concentrations of radon vary both diurnally and seasonally.[15,16] Rainstorm and wind effects are also seen.[16] Further variations occur because of burning of fossil fuels both commercially and in dwellings. For example, the use of natural gas in dwellings increases ambient concentrations of radon in dwellings as well as the general environment, depending on the type of construction and ventilation, and perhaps other factors superimposed on the ambient atmospheric conditions.[17] While some studies have been conducted and some are in progress in this regard, insufficient data are available at present to provide a basis for a reasonable estimate of the natural gas contribution to population doses.

Because of the variations mentioned above, no meaningful list of concentrations of radionuclides in the atmosphere seems appropriate for this handbook. Even the gross estimate for *average* world-wide lung doses from radon differs by a factor of about 10. Realistic estimates of concentrations of radon and the resulting radiation doses must necessarily be made on a local or areal scale through detailed and continuous measurements over considerable time periods.

Some illustrative examples may be useful. Measurements made at Argonne National Laboratory in 1958 showed minima of 0.03 to 0.05 pCi Rn/*l* at heights above ground

Table 16
RADIUM-226 AND CALCIUM IN INFANT FOOD GROUPS AND ESTIMATED INTAKE FOR THE FIRST YEAR OF LIFE

Food group	Diet (kg)	^{226}Ra (pCi/kg	Ca (g/kg)	pCi ^{226}Ra/g Ca	Estimated intake: pCi ^{226}Ra/year	Estimated intake: g Ca/year
Cereals	8	14.3	0.22	1.74	114	66
Vegetables	23	0.59	0.29	2.0	14	7
Fruits	23	0.44	0.08	5.5	10	2
Meats	17	0.43	0.12	3.6	7.3	2
Nonmilk fraction of diet	—	—	—	1.9	145	77
Formula	37	0.39	0.95	0.41	14	35
Evaporated	137	0.39	1.56	0.25	53	214
Milk fraction of diet	—	—	—	0.27	67	249
Combined milk and nonmilk fractions	—	—	—	0.65	212	326

From Engelmann, E., in Fallout Program Quarterly Summary Report, Hardy, E. P., Jr. et al., Report HASL-113, U.S. Atomic Energy Commission, New York, 1961, 95.

Table 17
AVERAGE DAILY INTAKE OF RADIUM, POTASSIUM-40, AND CALCIUM FOR CHILDREN IN 1961*

Sampling location	No. of months	Diet (kg)	Ca (g)	^{40}K (months) (pCi)	Total Ra (range) (pCi)	Radium pCi/kg	Radium pCi/g Ca
Los Angeles, Calif.	11	1.60	0.96	1730(6)	5.42 (2.1—11)	3.4	5.6
Denver, Col.	10	2.16	1.47	2860(5)	6.7(1.7—12.6)	3.1	4.6
Atlanta, Ga.	10	1.56	0.88	1660(4)	5.1 (2.9—7.9)	3.2	5.7
St. Louis, Miss.	10	2.67	1.40	4360(4)	10.2 (3.6—29.7)	3.8	7.2
New York, N.Y.	12	1.25	0.62	1600(4)	3.5 (<1—<6)	2.8	5.6
Austin, Tex.	11	2.47	1.51	2730(4)	8.7 (3.6—17.2)	3.5	5.7
Seattle, Wash.	11	2.32	1.31	2830(6)	7.7 (2.1—13.6)	3.3	5.9
Chicago, Ill.	3	1.23	0.77	1590(3)	<7.5 (<1.4—<7.9)	<5	<9.7
Palmer, Alaska	3	1.91	0.73	2380(3)	<4.9 (1.6—6.7)	2.6	6.7
Tampa, Fla.	2	1.83	1.17	1960(2)	7.8 (5.7—<10)	4.3	6.7
Honolulu, Hawaii	2	2.12	0.62	2520(2)	14.4 (4.6—24.3)	6.8	23.2
Boston, Mass.	2	2.16	1.66	2600(2)	<9.0(<7.9—<10)	<4.2	<5.4
Memphis, Tenn.	3	1.96	1.20	2340(3)	<8.9(<7.1—9.6)	<4.5	<7.4
Salt Lake City, Utah	2	2.12	0.76	2590(2)	10.2 (7.2—13.2)	4.8	13.4
Unweighted averages	—	1.96	1.08	2410	<7.8 (<1—29.7)	<4.0	<8.0

* Composite samples for 7 days each month taken at boarding schools for children under 18 years of age. Samples include all beverages and snacks, but not drinking water. The ranges shown are those for monthly composite samples, < values are considered at value in averages.

From U.S. Public Health Service, *Radiol. Health Data*, 3, 42, 1962 (and subsequent issues).

at about 1 m and above.[18] At a height of 0.32 cm the minimum was 0.22 pCi/*l* and the maximum was 3.93 pCi/*l*. At all levels minima occurred between 10:00 a.m. and 12:00 noon (CST). Maxima at about 1 m ranged from 0.445 to 0.960 pCi/*l*. Another study[19] showed that radon in soil varied about 70-fold in different geological formations; variations of emanation rates into the atmosphere varied by 1000-fold among geographical regions, although they were quite uniform in Champaign County, Ill. at

NLI 001 2136

Table 18
RADIUM-226, POTASSIUM-40, AND LEAD-210 CONTENT OF COMPOSITE DIET SAMPLES AT CITIES IN THE U.S.

Item analyzed	No. of cities	Average/day (range)	Average/kg (range)	Average/g Ca (range)
pCi ^{226}Ra	25	1.6 (nd—5.0)	0.44 (nd—1.4)	0.83 (nd—2.4)
pCi ^{226}Ra	5	3.02 (2.17—4.35)	0.76 (0.58—1.04)	1.85 (1.35-2.40)
pCi ^{40}K	9	3400 (2600—3800)	900 (800—1100)	—
pCi ^{210}Pb	9	2.4 (nd—5.3)	0.7 (nd—1.4)	—
gCa	25	1.87 (1.27—2.11)	0.52 (0.44—0.59)	—
gCa	5	1.64 (1.54—1.82)	0.42 (0.40—0.43)	—
kg diet	25	3.40 (2.80—4.10)	—	—

From Klement, A. W., Jr., in *Radioactive Fallout, Soils, Plants, Foods, Man*, Foster, E. B., Ed., Elsevier, Amsterdam, 1965, 113. With permission.

$140 \pm 73 \times 10^{-16}$ Ci/cm^3-sec.* Some measurements of short-lived radon daughters have been reported from collections at some locations around the world.[30] These are shown in Table 20.

Natural Ecological Systems

Data are not available for natural radionuclide concentrations in natural ecological systems. A few data have been reported for some parts of some systems, mostly single species of plants and animals.[1,2,31] These are of little value in assessing radiation doses to wild organisms. Ecological factors are discussed in the chapter entitled "Ecological Factors in Dispersal of Radioactivity in the Biosphere."

* Note the confidence limits.

Table 19
COMPARISON OF DIETARY ^{226}Ra, ^{40}K, and ^{210}Pb BY INCOME AND AGE GROUPS

Sample groups	Sample weight: Total kg	Sample weight: kg/day	Sample weight: g Ca/kg	pCi ^{226}Ra/: kg	pCi ^{226}Ra/: g Ca	pCi ^{226}Ra/: day	pCi ^{40}K/: kg	pCi ^{40}K/: day	pCi ^{210}Pb/: kg	pCi ^{210}Pb/: day
Middle-income average diet										
San Francisco, Calif.	47.3	3.38	0.51	0.4	0.8	1.4	1100	3700	0.8	2.7
Chicago, Ill.	44.3	3.32	0.59	0.6	1.4	2.7	1000	3300	1.1	3.7
New York, N.Y.	41.0	2.93	0.46	0.4	0.8	1.2	900	2600	0.7	2.0
Low-income average diet										
San Francisco, Calif.	46.0	3.28	0.51	0.7	1.4	2.3	900	2900	1.2	3.9
Chicago, Ill.	46.4	3.31	0.58	0.7	1.4	2.3	900	3000	0.9	3.0
New York, N.Y.	44.6	3.19	0.52	0.4	0.8	1.3	1100	3500	[illegible]	[illegible]
Middle-income adult diet										
San Francisco, Calif.	39.2	2.80	0.36	0.4	1.6	1.1	—	—	—	—
Chicago, Ill.	42.2	3.01	0.38	[illegible]	[illegible]	[illegible]	—	—	—	—
New York, N.Y.	42.6	3.04	0.28	0.1	0.4	0.3	—	—	—	—
Infant (1-year-old) diet										
San Francisco, Calif.	22.0	1.57	0.63	0.7	1.1	1.1	—	—	—	—
Chicago, Ill.	22.6	1.62	0.59	[illegible]	[illegible]	[illegible]	—	—	—	—
New York, N.Y.	20.8	1.49	0.73	0.3	0.7	0.7	—	—	—	—

From Nicholson, L., Thompson, J. C., Jr., Hess, B. W., and Cooper, C. L., *J. Nutr.*, 78, 371, 1962. With permission.

NLI 001 2137

Table 20
SUMMARY OF MEASUREMENTS OF NATURAL RADIOACTIVITY IN THE GROUND LEVEL AIR

Site	Period of observation	Radioactivity (pCi/m³) Lead-214	Radioactivity (pCi/m³) Lead-212	Activity ratio lead-214/lead-212
Wales, Alaska	1953—59	20	0.16	125
Kodiak, Alaska	1950—60	9.9	0.04	250
Washington, D.C.	1950—61	122	1.34	91
Yokosuka, Japan	1954—58	56	0.48	117
Lima, Peru	1959—62	42	1.33	28
Chacaltaya, Bolivia	1958—62	40	0.53	72
Rio de Janeiro, Brazil	1958—62	51	2.54	20
Little America V, Antarctica	1956—58	2.5	<0.01	(>250)
South Pole	1959—62	0.47	<0.01	(>50)

From Lockhart, L. B., Jr., in *The Natural Radiation Environment*, Adams, J. A. S. and Lowder, W. M., Eds., University of Chicago Press, Chicago, 1964, 331. With permission.

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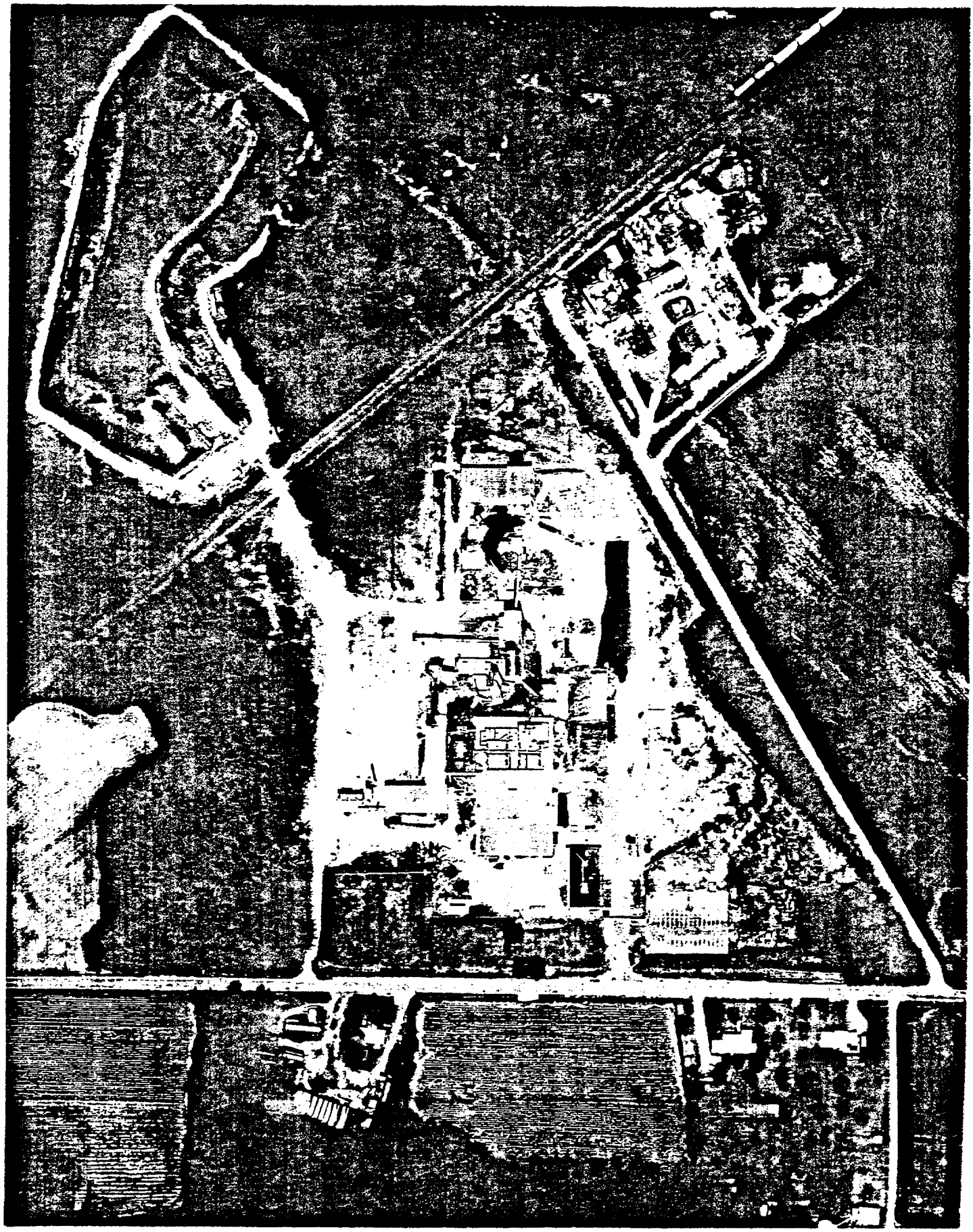
NLI 001 2138

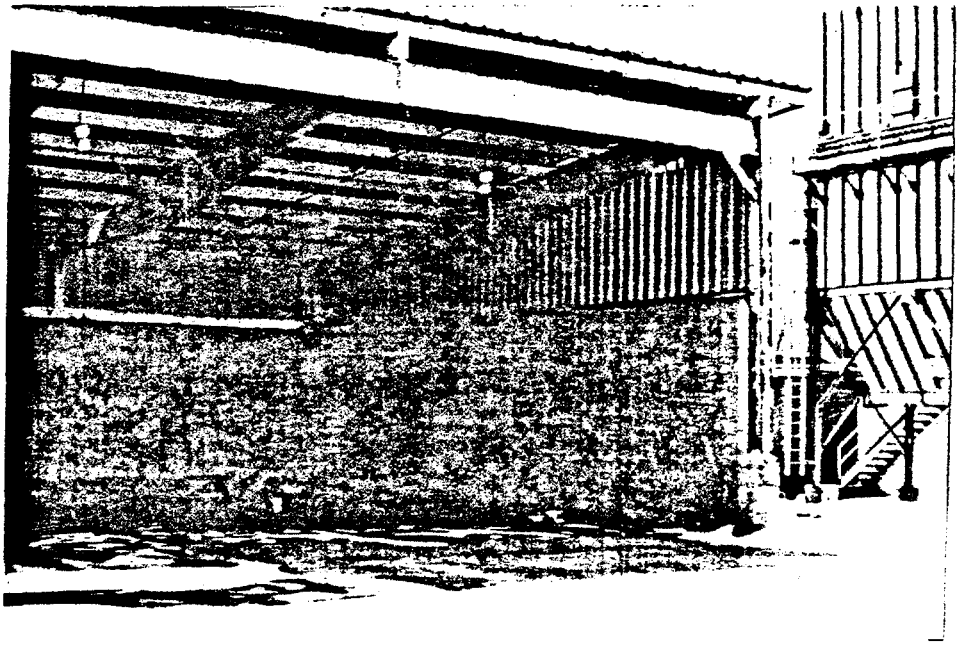
EXHIBIT G



September 9, 1984

NLI 001 2140

Slag Bin



February 1983

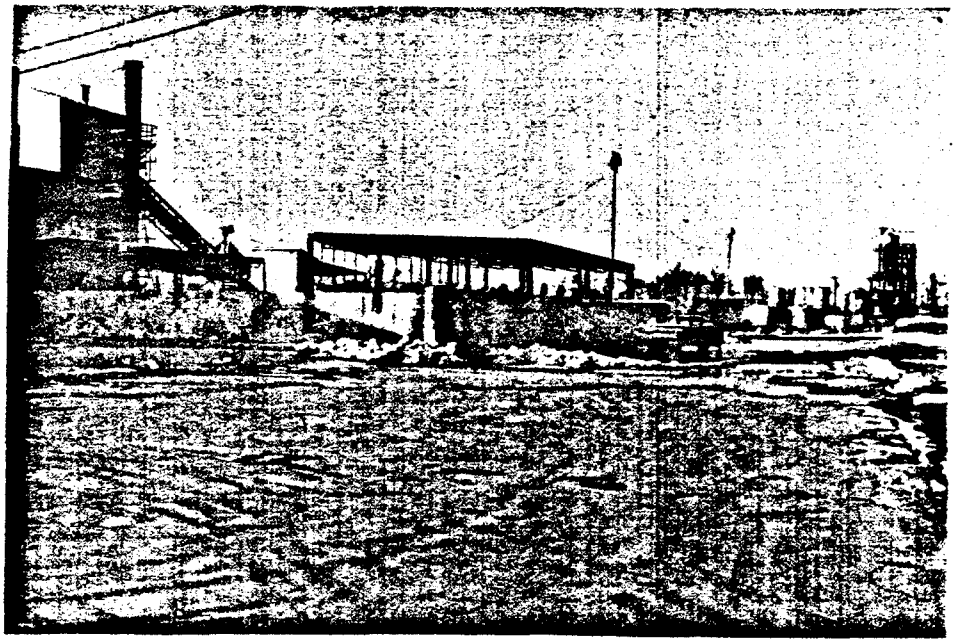
June 1985

East Side of Battery Yard

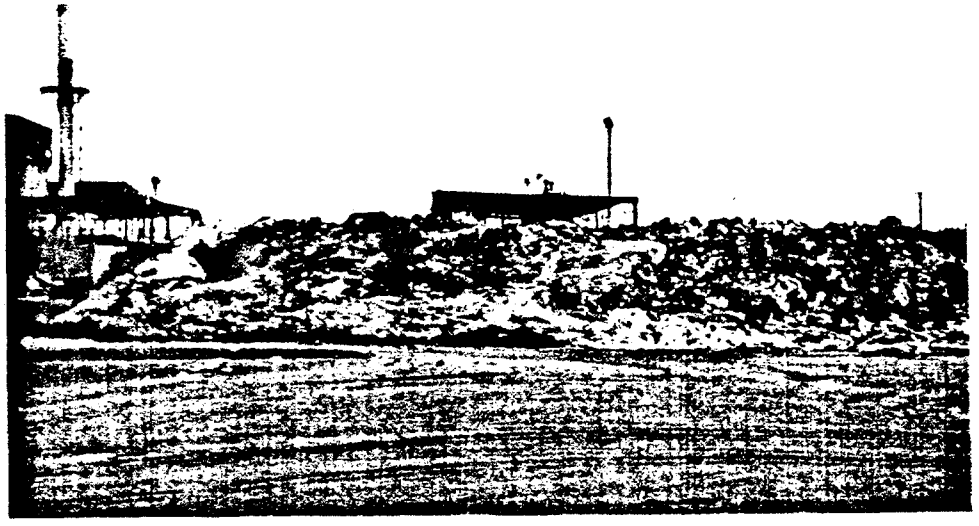
February 1983

June 1985

Iron & Coke Bin



February 1983



October 1983

NLI 001 2143

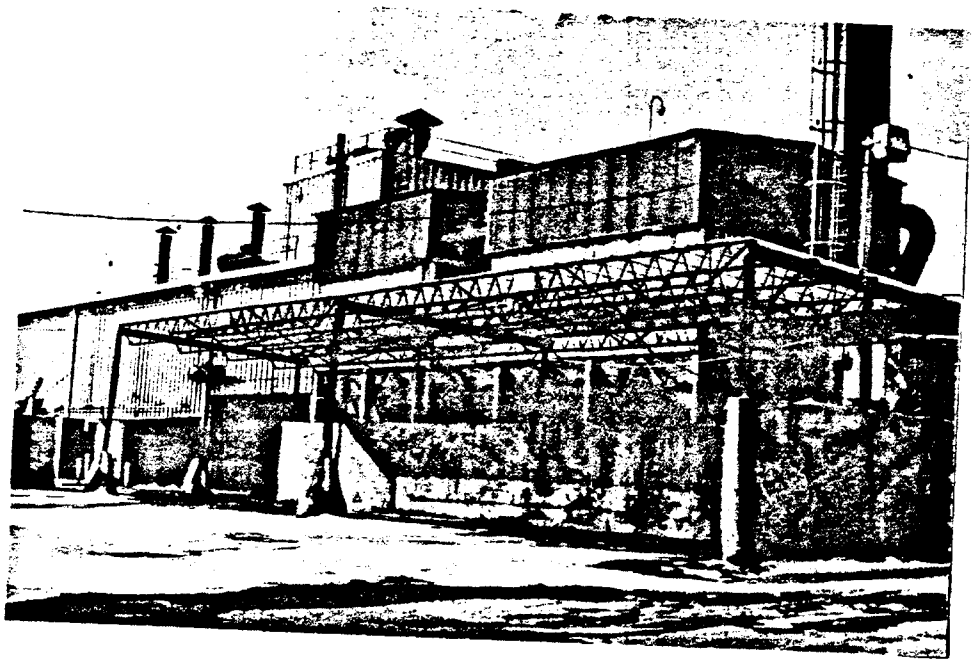
Battery Bin 5

February 1983

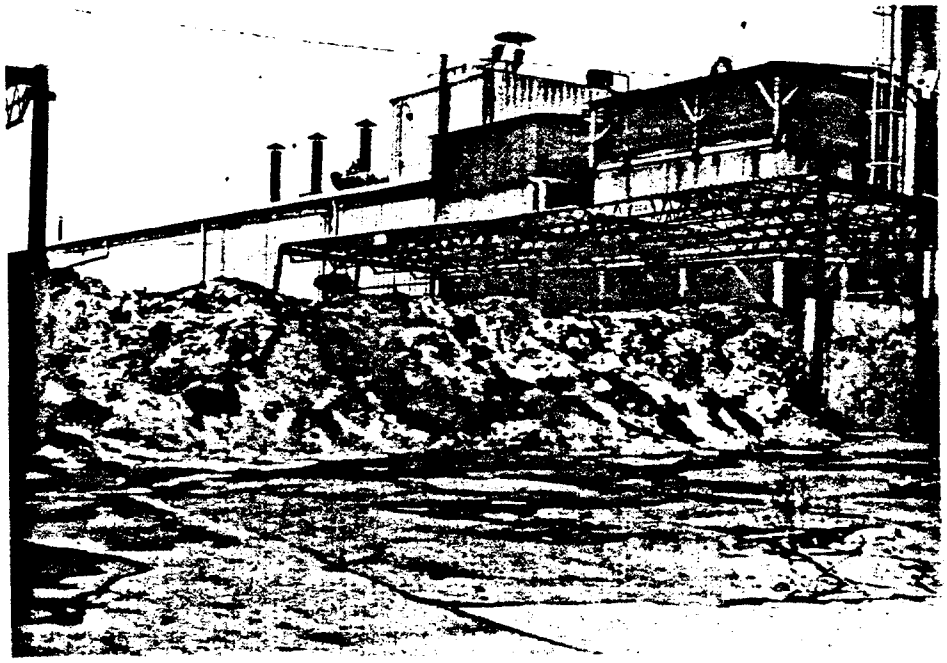
June 1985

NLI 001 2144

Dross Bins



February 1983



June 1985

NLI 001 2145

EXHIBIT H

TABLE 4
ANALYTICAL RESULTS OF ROTARY FURNACE SLAG
NSNJ SITE
PEDRICKTOWN, NJ

Parameter	EP Toxicity Limit	A[1]	B[2]	C[2]
Arsenic	5.0	0.002	<0.5	<0.2
Barium	100.0	6.3	<0.2	<0.2
Cadmium	1.0	0.03	<0.01	<0.01
Chromium	5.0	0.36	<0.05	<0.05
Lead	5.0	0.14	<0.1	<0.20
Mercury	0.2	0.0002	<0.02	<0.02
Selenium	1.0	0.041	<0.5	<0.3
Silver	5.0	0.01	<0.05	<0.05
Nickel	—	—	<0.05	<0.05
Flash Point	60°	60°	—	
Reactive Sulfide	—	25%	<5.	<5.
Reactive Cyanide	—	ND	<10.	<10.

Notes:

1. Slag samples analyzed by Century Environmental Testing Labs, Inc. All values given as ppm (mg/l) except Flash Point (°C), reactive sulfide (%) and reactive cyanide (%).

2. Slag samples analyzed by Stablex-Reutter, Inc. All values given as ppm (mg/l) except Flash Point (°C), reactive sulfide (mg/g) and reactive cyanide (mg/g).

EXHIBIT I

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

AUG 23 1990

Mr. Frank Hale
O'Brien & Gere Engineers, Inc.
440 Viking Drive
Suite 250
Virginia Beach, VA 23452

Re: NL Industries Superfund Site - Requested Guidance Documents

Dear Mr. Hale:

Enclosed are the potable well sampling data collected in 1988 and 1989 by EPA that you requested at the August 17th meeting in Edison, New Jersey. These data should be included in the Remedial Investigation (RI) Report, as was stated in the RI comments and at the meeting.

If you have any questions, please call me at (212) 264-6418.

Sincerely yours,

Michael H. Gilbert

Michael H. Gilbert
Southern New Jersey Compliance Section

Attachment

RECEIVED
AUG 27 1990
O'Brien & Gere Engineers, Inc.
Virginia Beach, VA

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

Joe Cruz
U.S. Route 130, Box 153
Pedricktown, NJ 08067

Potable Well Sample Collected Before Softener on August 17, 1988

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	6.0	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	<.003	NA[c]
Arsenic	ppm	<.001	0.05
Cadmium	ppm	<.001 J	0.01
Chromium	ppm	.011	0.05
Copper	ppm	<.020	1.0[b]
Lead	ppm	.022 J	0.05
Selenium	ppm	<.002	0.01
Total Organic Carbon	ppm	5	NA
Total Organic Halides	ppb	<10	NA
Sulfate	ppm	27	250[b]
Chloride	ppm	43	250[b]
Gross Alpha Radiation	pCi/L	<3.0	15
Gross Beta Radiation	pCi/L	<4.0	NA

Potable Well Sample Collected Before Softener on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	5.8	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 M	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.01 M	1.0[b]
Lead	ppm	.0097	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.003 M	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 U	NA
Zinc	ppm	.086	5[b]

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

Raymond Hoffman, Jr.
U.S. Route 130, Box 156
Pedricktown, NJ 08067

Sample Collected Before Softener on August 17, 1988 Before Sufficient Flushing

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	5.5	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	<.003	NA[c]
Arsenic	ppm	.002	0.05
Cadmium	ppm	<.001 J	0.01
Chromium	ppm	.009 J	0.05
Copper	ppm	.253 J	1.0[b]
Lead	ppm	.117 J	0.05
Selenium	ppm	<.002	0.01
Total Organic Carbon	ppm	<1	NA
Total Organic Halides	ppb	N/A	NA
Sulfate	ppm	4	250[b]
Chloride	ppm	12	250[b]
Gross Alpha Radiation	pCi/L	<1	15
Gross Beta Radiation	pCi/L	3.1+/-1.4	NA

Potable Well Sample Collected Before Softener on August 17, 1988 After Sufficient Flushing

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
Antimony	ppm	<.003	NA[c]
Arsenic	ppm	.003	0.05
Cadmium	ppm	<.001 J	0.01
Chromium	ppm	.005 J	0.05
Copper	ppm	.056 J	1.0[b]
Lead	ppm	.006 J	0.05
Selenium	ppm	<.002	0.01
Total Organic Carbon	ppm	4	NA
Total Organic Halides	ppb	<10	NA
Sulfate	ppm	6	250[b]
Chloride	ppm	11	250[b]
Gross Alpha Radiation	pCi/L	1.6+/-1.3	15
Gross Beta Radiation	pCi/L	3.4+/-1.7	NA

Potable Well Sample Collected Before Softener at Outdoor Spigot on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	6.2	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 U	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.03 M	1.0[b]
Lead	ppm	.01	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.002 M	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 U	NA
Zinc	ppm	.02 M	5[b]

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

Corrosion Control, Inc.
c/o Harry Skilton
U.S. Route 130, Box 156 A
Pedricktown, NJ 08067

Potable Well Sample Collected Before Softener at Outdoor Spigot on August 17, 1988

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	5.5	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	<.003	NA[c]
Arsenic	ppm	.006	0.05
Cadmium	ppm	<.001	0.01
Chromium	ppm	.013	0.05
Copper	ppm	<.02	1.0[b]
Lead	ppm	.002 J	0.05
Selenium	ppm	<.002	0.01
Total Organic Carbon	ppm	5	NA
Total Organic Halides	ppb	<10	NA
Sulfate	ppm	9.8	250[b]
Chloride	ppm	9	250[b]
Gross Alpha Radiation	pCi/L	<1.0	15
Gross Beta Radiation	pCi/L	<2.0	NA

Potable Well Sample Collected Before Softener from Outdoor Spigot on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	5.4	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 U	NA
Arsenic	ppm	.003 M	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.088	1.0[b]
Lead	ppm	.003 M	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.001 M	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 M	NA
Zinc	ppm	.015 U	5[b]

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

Guy Eyler
U.S. Route 130, Box 161
Pedricktown, NJ 08067

Potable Well Sample Collected Before Softener on August 17, 1988

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	5.4	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	<.003	NA[c]
Arsenic	ppm	<.001	0.05
Cadmium	ppm	<.001 J	0.01
Chromium	ppm	.012	0.05
Copper	ppm	.057	1.0[b]
Lead	ppm	.008 J	0.05
Selenium	ppm	<.02	0.01
Total Organic Carbon	ppm	2	NA
Total Organic Halides	ppb	<10	NA
Sulfate	ppm	27	250[b]
Chloride	ppm	15	250[b]
Gross Alpha Radiation	pCi/L	<1.0	15
Gross Beta Radiation	pCi/L	6.5+/-1.7	NA

Potable Sample Collected Before Softener at Outdoor Spigot on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	6.0	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 M	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.04 M	1.0[b]
Lead	ppm	.0058	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.001 U	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 U	NA
Zinc	ppm	.06 M	5[b]

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

Eleanor Cassano
U.S. Route 130, Box 163
Pedricktown, NJ 08067

Potable Sample Collected Before Softener on August 18, 1988

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	4.8	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	<.003	NA[c]
Arsenic	ppm	.003	0.05
Cadmium	ppm	<.001 J	0.01
Chromium	ppm	.007 J	0.05
Copper	ppm	<.02	1.0[b]
Lead	ppm	.005 J	0.05
Selenium	ppm	<.02	0.01
Total Organic Carbon	ppm	5	NA
Total Organic Halides	ppb	<10	NA
Sulfate	ppm	35	250[b]
Chloride	ppm	25	250[b]
Gross Alpha Radiation	pCi/L	<1.0	15
Gross Beta Radiation	pCi/L	4.8+/-1.6	NA

Potable Well Sample Collected Before Softener at Basement Spigot on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	6.0	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 U	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.03 M	1.0[b]
Lead	ppm	.0069	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.001 M	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 U	NA
Zinc	ppm	.086	5[b]

Potable Well Sample Collected After Softener at Kitchen Tap on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	7.4	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 U	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.01 U	1.0[b]
Lead	ppm	.001 M	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.001 U	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 M	NA
Zinc	ppm	.015 U	5[b]

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

James McCourt, Jr.
U.S. Route 130, Box 151
Pedricktown, NJ 08067

Potable Well Sample Collected on August 18, 1988

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	4.7	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	<.003	NA[c]
Arsenic	ppm	.002	0.05
Cadmium	ppm	.003 J	0.01
Chromium	ppm	.011	0.05
Copper	ppm	.045	1.0[b]
Lead	ppm	.004 J	0.05
Selenium	ppm	<.002	0.01
Total Organic Carbon	ppm	3	NA
Total Organic Halides	ppb	20.5	NA
Sulfate	ppm	85	250[b]
Chloride	ppm	49	250[b]
Gross Alpha Radiation	pCi/L	<5.0	15
Gross Beta Radiation	pCi/L	39+/-7	NA

Potable Well Sample Collected at Bathroom Tap on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	6.2	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.002 M	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.096	1.0[b]
Lead	ppm	.005	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.04 M	NA
Selenium	ppm	.001 U	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 M	NA
Zinc	ppm	.73	5[b]

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

Michael Wistar
Wistar Company
U.S. Route 130
Pedricktown, NJ 08067

Potable Well Sample Collected Before Softener at Upstairs Spigot on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	5.8	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 U	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	1.4	1.0[b]
Lead	ppm	.400	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.001 M	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 M	NA
Zinc	ppm	3.2	5.[b]

Potable Well Samples Collected Before Softener at Upstairs Spigot on August 1, 1989

	LEAD LEVEL (ppm)
Federal and State Standard[a]	0.05
After Ten Minutes of Flushing	0.096
After Fifteen Minutes of Flushing	0.027

Potable Well Sample Collected After Softener at Downstairs Tap on August 1, 1989

PARAMETER	UNIT	FIRST SAMPLE	SECOND SAMPLE	FEDERAL & STATE STANDARD[a]
Beryllium	ppm	.005 J	.005 U	NA
Cadmium	ppm	.01[d] U	.01[d] U	0.01
Chromium	ppm	.06[e] U	.06[e] U	0.05
Copper	ppm	.03 M	.063	1.0[b]
Lead	ppm	.001 U	.002 M	0.05
Nickel	ppm	.02 J	.02 U	NA
Silver	ppm	.01 U	.01 U	0.05
Zinc	ppm	.03 U	.03 U	5.[b]

NL INDUSTRIES, INC SUPERFUND SITE
Pedricktown, Salem County, New Jersey
Remedial Investigation Potable Well Sampling Program

Joseph Gates
U.S. Route 130, Box 152
Pedricktown, NJ 08067

Potable Well Sample Collected After Softener at Kitchen Tap on July 22, 1989

PARAMETER	UNIT	VALUE	FEDERAL & STATE STANDARD[a]
pH	standard units	6.6	Federal: 6.5-8.5 State: 5-9 [b]
Antimony	ppm	.001 M	NA
Arsenic	ppm	.001 U	0.05
Beryllium	ppm	.01 U	NA
Cadmium	ppm	.01[d] U	0.01
Chromium	ppm	.02 U	0.05
Copper	ppm	.05 M	1.0[b]
Lead	ppm	.016	0.05
Mercury	ppm	.0002 U	0.002
Nickel	ppm	.02 U	NA
Selenium	ppm	.001 U	0.01
Silver	ppm	.01 U	0.05
Thallium	ppm	.001 U	NA
Zinc	ppm	.015 U	5[b]

[a] Federal and State drinking water standards are identical, except for pH. Unless otherwise noted, Federal standards are the Primary Maximum Contaminant Levels - National Primary Drinking Water Regulations under the Federal Safe Drinking Water Act. Unless otherwise noted, State standards are the Primary Maximum Contaminant Levels as authorized by the New Jersey Safe Drinking Water Act.

[b] Secondary drinking water standard. Secondary Federal standards are the Secondary Maximum Contaminant Levels - National Secondary Drinking Water Regulations under the Federal Safe Drinking Water Act. Secondary State standards are the Secondary Maximum Contaminant Levels as authorized by the New Jersey Safe Drinking Water Act.

Secondary standards set limits for contaminants in drinking water which may affect the aesthetic qualities and the public's acceptance of drinking water (e.g., taste and odor).

[c] Not Available. No Federal or State drinking water standard for this parameter.

[d] Detection limit used was at the drinking water standard for this parameter. Reported value found is below the detection limit, and therefore below the standard.

ppm - Parts per million, equivalent to milligrams per liter.

ppb - Parts per billion, equivalent to micrograms per liter.

J - Reported value is qualified as estimated.

M - Reported value exceeds the detection limit used for this parameter, but is estimated due to proximity to detection limit.

U - Detection limit listed for this parameter. No value is reported, as level is below detection level.

EXHIBIT J

NSNJ/NL SITE
CURRENT 1990 USEPA
DRINKING WATER
MAXIMUM CONTAMINANT LEVELS

Constituent	Maximum Contaminant Level (mg/l)	Date Promulgated
Arsenic	0.050	December 24, 1975
Cadmium	0.010	December 24, 1975
Chromium	0.050	December 24, 1975
Lead	0.050	December 24, 1975
Selenium	0.010	December 24, 1975
Silver	0.050	December 24, 1975
Combined RA-226 and RA-228	5 pCi/l	December 24, 1975
Gross Alpha	15 pCi/l	December 24, 1975

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS SITE MITIGATION
CN 413, Trenton, NJ. 08625-0413
(609) 984-2902
Fax # (609) 633-2360

Anthony J. Farro
Director

DRAFT

INTERIM NJDEP SOIL ACTION LEVELS

Total Petroleum Hydrocarbons (TPHC)	100 ppm
Surrogate Levels:	
Acid Extractables (AE)	Case-by-Case
Base Neutrals (BN)	10 ppm
Volatile Organics (VOC)	1 ppm
Pesticides:	
DDT	1-10 ppm
Chlordane	1 ppm
Other	Case-by-Case
Polychlorinated Biphenyls (PCBs)	1-5 ppm
Polycyclic Aromatic Hydrocarbons (PAH)	10 ppm
Inorganics:	
Antimony	10 ppm
Arsenic	20 ppm
Barium	400 ppm
Beryllium	1 ppm
Cadmium	3 ppm
Chromium	100 ppm
Copper	170 ppm
Lead	250-1,000 ppm
Nickel	100 ppm
Mercury	1 ppm
Molybdenum	1 ppm
Selenium	4 ppm
Silver	5 ppm
Thallium	8 ppm
Vanadium	100 ppm
Zinc	350 ppm

changed by NJDEP at 8/17 mtg

ppm = Parts per million (mg/kg)

The action levels are reference numbers used to identify presence of contamination. All contamination identified at a site above the action level should have horizontal and vertical extent delineated. Specific cleanup objectives are developed by a case-by-case basis (and may be the action levels in some instances).

the Central Pine Barrens, and other reasonable uses. Quality criteria for these waters may be found in N.J.A.C. 7:9-5.6.

(g) Subdivision of the groundwater categories identified in this section shall follow the procedures in N.J.A.C. 7:9-5.10.

7:9-6.6 Ground-water quality criteria

The maximum limits for a specific criterion shall be exceeded only as a result of natural conditions. The Department may establish limits in the terms and conditions of a permit which will allow the secondary standards as identified in N.J.A.C. 7:9-6.6(b) and (c) to be exceeded provided that there is no adverse effect upon the designated uses of ground water.

(a) Ground-water quality criteria for the Central Pine Barrens (Class GW1):

	Pollutant Substance or Chemical		Ground-Water Quality Criteria
1.	Aldrin/Dieldrin	1.	0.003 ug/l
2.	Arsenic and Compounds	2.	0.05 mg/l
3.	Barium	3.	1.0 mg/l
4.	Benzidine	4.	0.0001 mg/l
5.	Cadmium	5.	Natural Background
6.	Chromium (Hexavalent) and Compounds	6.	Natural Background
7.	Cyanide	7.	0.2 mg/l
8.	DDT and Metabolites	8.	0.001 ug/l
9.	Endrin	9.	0.004 ug/l
10.	Lead and Compounds	10.	0.05 mg/l
11.	Mercury and Compounds	11.	0.002 mg/l
12.	Nitrate-Nitrogen	12.	2.0 mg/l
13.	Phenol	13.	0.3 mg/l
14.	Polychlorinated Biphenyls	14.	0.001 ug/l
15.	Radionuclides	15.	Prevailing regulations adopted by the USEPA pursuant to sections 1412, 1415 and 1450 of the Public Health Services Act as amended by the Federal Safe Drinking Water Act (PL 93-523)
16.	Selenium and Compounds	16.	Natural Background
17.	Silver and Compounds	17.	0.05 mg/l
18.	Toxaphene	18.	0.005 ug/l
19.	Ammonia	19.	0.5 mg/l
20.	BOD (5-day)	20.	3 mg/l
21.	Chloride	21.	10 mg/l
22.	Coliform Bacteria	22.	a) by membrane filtration, not to exceed four per 100 ml in more than one sample when less than 20 are examined per month; or b) by fermentation tube, with a standard 10 ml portion, not to be present in three or more portions in more than one sample when less than 20 are examined per month, or c) prevailing criteria adopted pursuant to the Federal Safe Drinking Water Act (PL 93-523)
23.	Color	23.	None Noticeable
24.	Copper	24.	1.0 mg/l
25.	Fluoride	25.	2.0 mg/l
26.	Foaming Agents	26.	0.5 mg/l
27.	Iron	27.	0.3 mg/l
28.	Manganese	28.	0.05 mg/l

NLI 001 2165

29.	Odor and Taste	29.	None Noticeable
30.	Oil and Grease and Petroleum Hydrocarbons	30.	None Noticeable
31.	pH (Standard Units)	31.	4.2-5.8
32.	Phosphate, Total	32.	0.7 mg/l
33.	Sodium	33.	10 mg/l
34.	Sulfate	34.	15 mg/l
35.	Total Dissolved Solids	35.	100 mg/l
36.	Zinc and Compounds	36.	5 mg/l

(b) Ground-water quality criteria statewide where the total dissolved solids (TDS, Natural Background) Concentration is less than or equal to 500 mg/l (Class GW2):

	Pollutant Substance or Chemical		Ground-Water Quality Criteria
1.	Aldrin/Dieldrin	1.	0.003 ug/l
2.	Arsenic and Compounds	2.	0.05 mg/l
3.	Barium	3.	1.0 mg/l
4.	Benzidine	4.	0.0001 mg/l
5.	Cadmium and Compounds	5.	0.01 mg/l
6.	Chromium (Hexavalent) and Compounds	6.	0.05 mg/l
7.	Cyanide	7.	0.2 mg/l
8.	DDT and Metabolites	8.	0.001 ug/l
9.	Endrin	9.	0.004 ug/l
10.	Lead and Compounds	10.	0.05 mg/l
11.	Mercury and Compounds	11.	0.002 mg/l
12.	Nitrate-Nitrogen	12.	10 mg/l
13.	Phenol	13.	3.5 mg/l
14.	Polychlorinated Biphenyls	14.	0.001 ug/l
15.	Radionuclides	15.	Prevailing regulations adopted by the USEPA pursuant to sections 1412, 1415 and 1450 of the Public Health Services Act as amended by the Federal Safe Drinking Water Act (PL 93-523)
16.	Selenium and Compounds	16.	0.01 mg/l
17.	Silver and Compounds	17.	0.05 mg/l
18.	Toxaphene	18.	0.005 ug/l

Secondary Standards

19.	Ammonia	19.	0.5 mg/l
20.	Chloride	20.	250 mg/l
21.	Coliform Bacteria	21.	a) by membrane filtration, not to exceed four per 100 ml in more than one sample when less than 20 are examined per month, or b) by fermentation tube, with a standard 10 ml portion, not to be present in three or more portions in more than one sample when less than 20 are examined per month, or c) prevailing criteria adopted pursuant to the Federal Safe Drinking Water Act (PL 93-523)

NLI 001 2166

22.	Color	22.	None Noticeable
23.	Copper	23.	1.0 mg/l
24.	Fluoride	24.	2.0 mg/l
25.	Foaming Agents	25.	0.5 mg/l
26.	Iron	26.	0.3 mg/l
27.	Manganese	27.	0.05 mg/l
28.	Odor and Taste	28.	None Noticeable
29.	Oil and Grease and Petroleum Hydrocarbons	29.	None Noticeable
30.	pH (Standard Units)	30.	5-9
31.	Phenol	31.	0.3 mg/l
32.	Sodium	32.	50 mg/l
33.	Sulfate	33.	250 mg/l
34.	Total Dissolved Solids	34.	500 mg/l
35.	Zinc and Compounds	35.	5 mg/l

(c) Ground-water quality criteria statewide where the total dissolved solids (TDS, Natural background) concentration is between 500 mg/l and 10,000 mg/l (Class GW3):

Primary Statewide/Toxic Pollutants

	Pollutant Substance or Chemical		Ground-Water Quality Criteria
1.	Aldrin/Dieldrin	1.	0.003 ug/l
2.	Arsenic and Compounds	2.	0.05 mg/l
3.	Barium	3.	1.0 mg/l
4.	Benzadine	4.	0.0001 mg/l
5.	Cadmium and Compounds	5.	0.01 mg/l
6.	Chromium (Hexavalent) and Compounds	6.	0.05 mg/l
7.	Cyanide	7.	0.2 mg/l
8.	DDT and Metabolites	8.	0.001 ug/l
9.	Endrin	9.	0.004 ug/l
10.	Lead and Compounds	10.	0.05 mg/l
11.	Mercury and Compounds	11.	0.002 mg/l
12.	Nitrate-Nitrogen	12.	10 mg/l
13.	Phenol	13.	3.5 mg/l
14.	Polychlorinated Biphenyls	14.	0.001 ug/l
15.	Radionuclides	15.	Prevailing regulations adopted by the USEPA pursuant to sections 1412, 1415 and 1450 of the Public Health Services Act as amended by the Federal Safe Drinking Water Act (PL 93-523)
16.	Selenium and Compounds	16.	0.01 mg/l
17.	Silver and Compounds	17.	0.05 mg/l
18.	Toxaphene	18.	0.005 ug/l

Secondary Standards

19.	Ammonia	19.	0.5 mg/l
20.	Chloride	20.	Natural Background

NLI 001 2167

21.	Coliform Bacteria	21.	a) by membrane filtration, not to exceed four per 100 ml in more than one sample when less than 20 are examined per month, or b) by fermentation tube, with a standard 10 ml portion, not to be present in three or more portions in more than one sample when less than 20 are examined per month, or c) prevailing criteria adopted pursuant to the Federal Safe Drinking Water Act (PL 93-523)
22.	Color	22.	None Noticeable
23.	Copper	23.	1.0 mg/l
24.	Fluoride	24.	2.0 mg/l
25.	Foaming Agents	25.	0.5 mg/l
26.	Iron	26.	0.3 mg/l
27.	Manganese	27.	0.05 mg/l
28.	Odor and Taste	28.	None Noticeable
29.	Oil and Grease and Petroleum Hydrocarbons	29.	None Noticeable
30.	pH (Standard Units)	30.	5-9
31.	Phenol	31.	0.3 mg/l
32.	Sodium	32.	Natural Background
33.	Sulfate	33.	Natural Background
34.	Total Dissolved Solids	34.	Natural Background
35.	Zinc and Compounds	35.	5 mg/l

7:9–6.7 Ground water designated areas

(a) All areas of the State shall be classified either: Statewide, except Central Pine Barrens; or Central Pine Barrens.

(b) The Statewide designated area shall be all areas of the State except as provided in (c) below.

(c) The Central Pine Barrens Area (The Boundary of Central Pine Barrens is further clarified by the Official Map which is available for review at the New Jersey Department of Environmental Protection, Division of Water Resources or appropriate county planning board, board of health, or municipality.) boundaries will underlie the following surface water drainages:

1. Mullica River Watershed:

i. Mullica River and tributaries upstream from Lower Bank Road Bridge at Lower Bank to source;

ii. Wading River and tributaries upstream of Route 542 Bridge to source;

(1) Freshwater segment of Ives Branch and its tributaries from 10 foot contour crossing Ives Branch;

iii. West Branch Bass River and tributaries upstream from the Bass River State Forest Boundary (where it crosses the West Branch of Bass River, downstream of Stage Road);

iv. East Branch Bass River and tributaries upstream from the Bass River State Forest boundary (where it crosses the East Branch Bass River, downstream of Stage Road);

v. Indian Cabin Creek and tributaries upstream from Egg Harbor City Lake to source.

2. Cedar Creek (Lacey Township and tributaries upstream of Route 9, (head of tide) surrounded by the northern ridgeline; and the southern ridgeline west of the Garden State Parkway and the southern ridgeline (between the Garden State Parkway and Route 9) as defined by Lacey Road, Manchester Avenue, and Haines Road.

3. All fresh waters west of the Garden State Parkway bounded by the Mullica and Cedar Creek (Lacey Township) watersheds.

4. Toms River Watershed:

i. DeVanport Branch and tributaries upstream from Route 530 to source;

ii. Unnamed tributary to Michaels Branch through Keswick Grove and tributaries upstream from the east crossing of the Penn Central Railroad to source.

5. Rancocas Creek Watershed:

i. South branch Rancocas creek and tributaries upstream from Route 206 to source.

ii. Jade Run and tributaries upstream from Route 206 to source.

iii. Mt. Misery Brook and tributaries upstream of the western intersection of the Lebanon State Forest boundary at Mt. Misery.

iv. Tributaries to Pole Bridge Branch upstream of the Penn Central Railroad.

6. The Central Pine Barrens boundary underlies the surface water drainages in the following State and National Park, Forests, and Fish and Wildlife lands:

i. Greenwood Branch and tributaries within the boundaries of Greenwood Rancocas Reserve and Lebanon State Forest.

ii. Tributaries to Country Lake, Mirror Lake and Hanover Lake within the boundaries of the Whitesbog Fish and Wildlife

NLI 001 2168

EXHIBIT K

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

AUG 14 1990

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Stephen W. Holt
NL Industries, Inc.
Corporate Environmental Services
P.O. Box 1090
Hightstown, N.J. 08520

Re: NL Industries Superfund Site - Draft RI Comments

Dear Mr. Holt:

Attached is a summary of U.S. Environmental Protection Agency's (EPA's) removal actions taken at the NL Industries Superfund Site, which is located in Pedricktown, Salem County, New Jersey. Portions of the summary may be incorporated, where appropriate, into the Draft Remedial Investigation (RI) Report which will soon be revised by you and your contractor.

If you have any questions, please call me at (212) 264-6418.

Sincerely yours,

Michael H. Gilbert

Michael H. Gilbert
Southern New Jersey Compliance Section

Attachments (2)

cc: Frank Hale, O'Brien & Gere

RECEIVED
AUG 17 1990
O'Brien & Gere Engineers, Inc.
Virginia Beach, VA.

NL INDUSTRIES SUPERFUND SITE SUMMARY

REMOVAL ACTIONS: AUGUST, 1990

EPA conducted a Phase I Removal Action in March and April 1989. There were two objectives. The first one was construction of a chain-link fence that would fully enclose the former plant at the Site. The second objective was temporary encapsulation of the on-site slag piles. A surfacing agent called "Semi-Pave" was sprayed on the slag piles to provide a tough protective covering, thus minimizing the migration of particulate slag via wind transport and surface runoff. This encapsulation is only a temporary measure, lasting a year or two; the RI/FS report will include an evaluation of alternatives for permanent remediation of the slag piles.

As part of the RI Phase I Sampling Program, an inventory of raw and waste materials was conducted at the site. The inventory revealed the storage of various hazardous chemicals, notably red phosphorus and metallic sodium, in a concrete block, locked storage area inside a warehouse.

EPA commenced a Phase II Removal Action in November 1989 and is near completion. It has addressed the following: further treatment of the slag piles, the security of the contaminated buildings, and the removal of the most toxic and reactive materials from the site.

Berms composed of sand and straw were installed around each of the slag piles to aid in containing the slag and to filter surface runoff. In addition, the slag piles were treated with a second coating of the same encapsulant to reduce further slag migration. In April or 1990, the retaining walls around slag piles A, B, C, and D were reenforced.

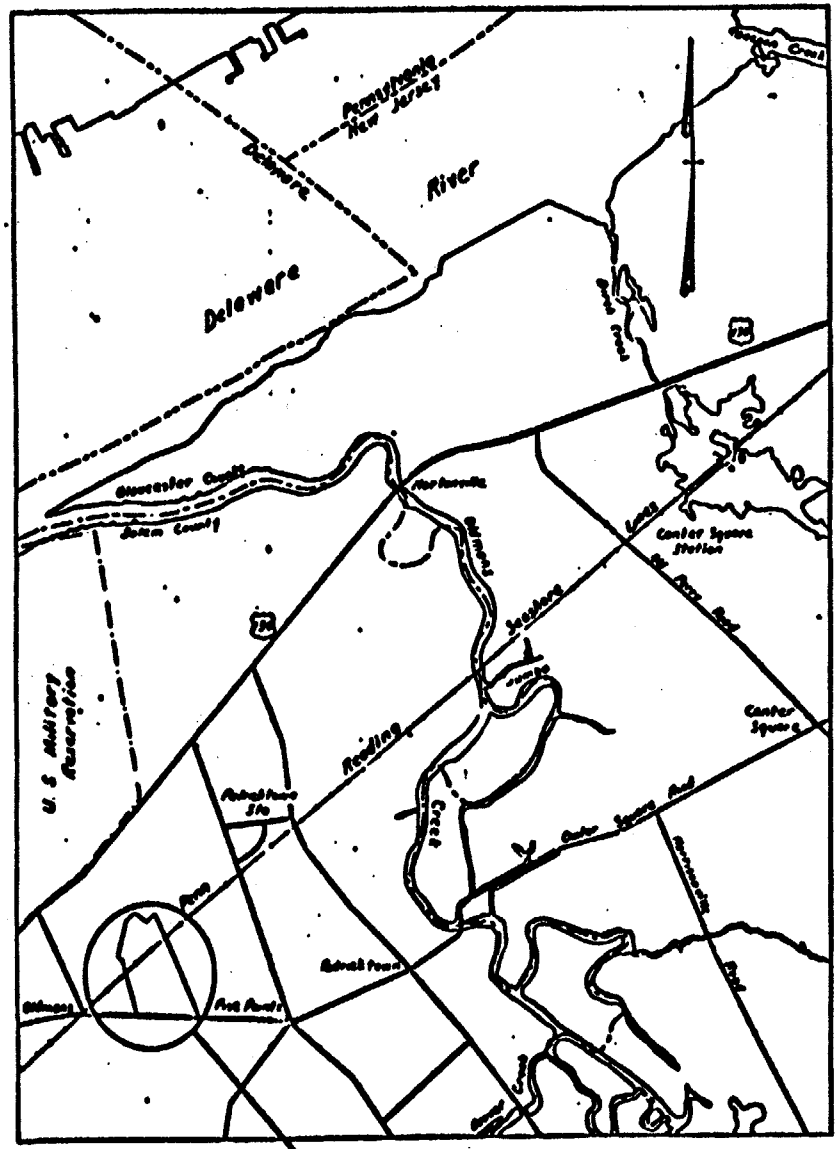
In July and August of 1989, EPA sampled private potable wells located along U.S. Route 130, just north of the site, with the closest one being approximately 1000 feet from the landfill. The samples were analyzed for pH and various metals.

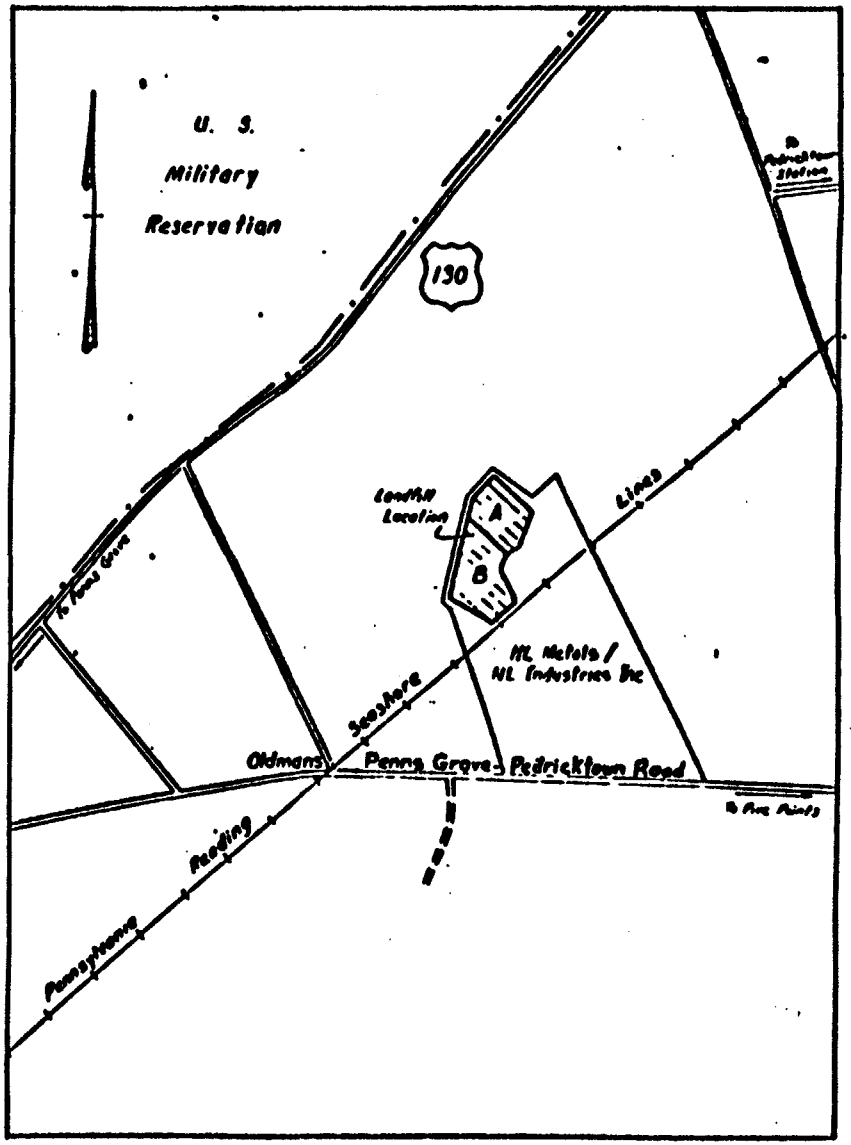
Chain-link fence gates were installed at all entrances of the contaminated buildings to deter trespassing. Moreover, the leaky roof of the storage building which houses the lead oxide pile was repaired.

Over 40,000 pounds of toxic and reactive materials were removed from the site, with the bulk to be recycled and the remainder sent for disposal to a permitted landfill. These materials included arsenic, metallic sodium, red phosphorus and waste oil.

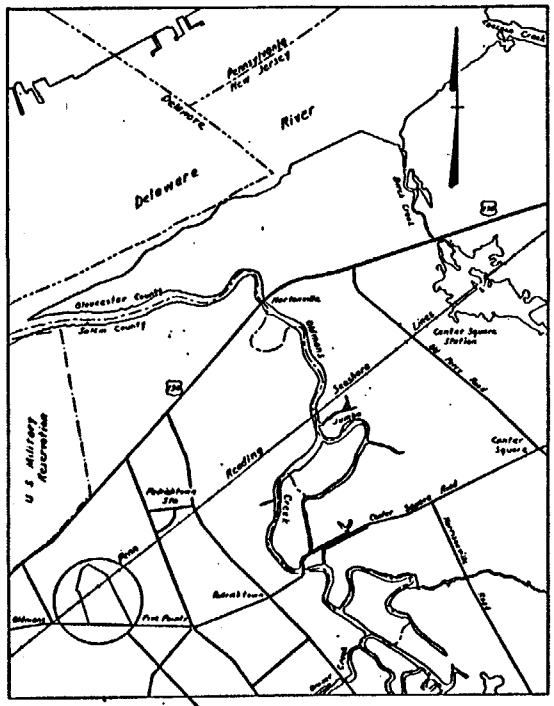
EPA commenced a Phase III Removal Action in December 1989, and is still continuing. This phase consists of extensive sampling of the slag piles, lead oxide pile and surface water at the Site's former smelting facility to determine whether and how these materials can be removed from the Site before the RI/FS is completed.

EXHIBIT L

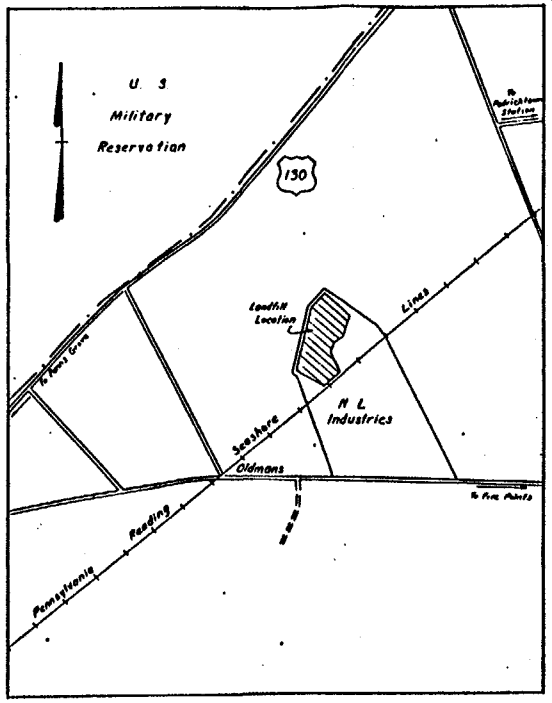

Pennsylvania
New Jersey
Delaware
River
Delaware
Gloucester County
Salem County
Hortonville
Oldmans
Seashore
Lines
Center Square Station
Center Square
Reading
Creek
Pedricktown Sta
Penn
Pedricktown
Oldmans
Five Points
U. S. Military Reservation


U. S.
Military
Reservation
130
Landfill Location
A
B
Lines
HL Metals / NL Industries Inc
Seashore
Oldmans
Penns Grove - Pedricktown Road
Reading
Pennsylvania
To Pedricktown Station
To Penns Grove
To Five Points

NLI 001 2174



N L Industries Location
Scale 1" = 2000'



Approximate Project Site
Scale 1" = 650'

OCT 21 1982

NO	DATE	APPR	REVISION	NO	DATE	APPR	REVISION
1	9/1/82		CONSTRUCTION DWG'S ISSUED TO NL INDUSTRIES-SUBJECT TO DEP REVIEW				

WESTON
WEST CHESTER PENNSYLVANIA

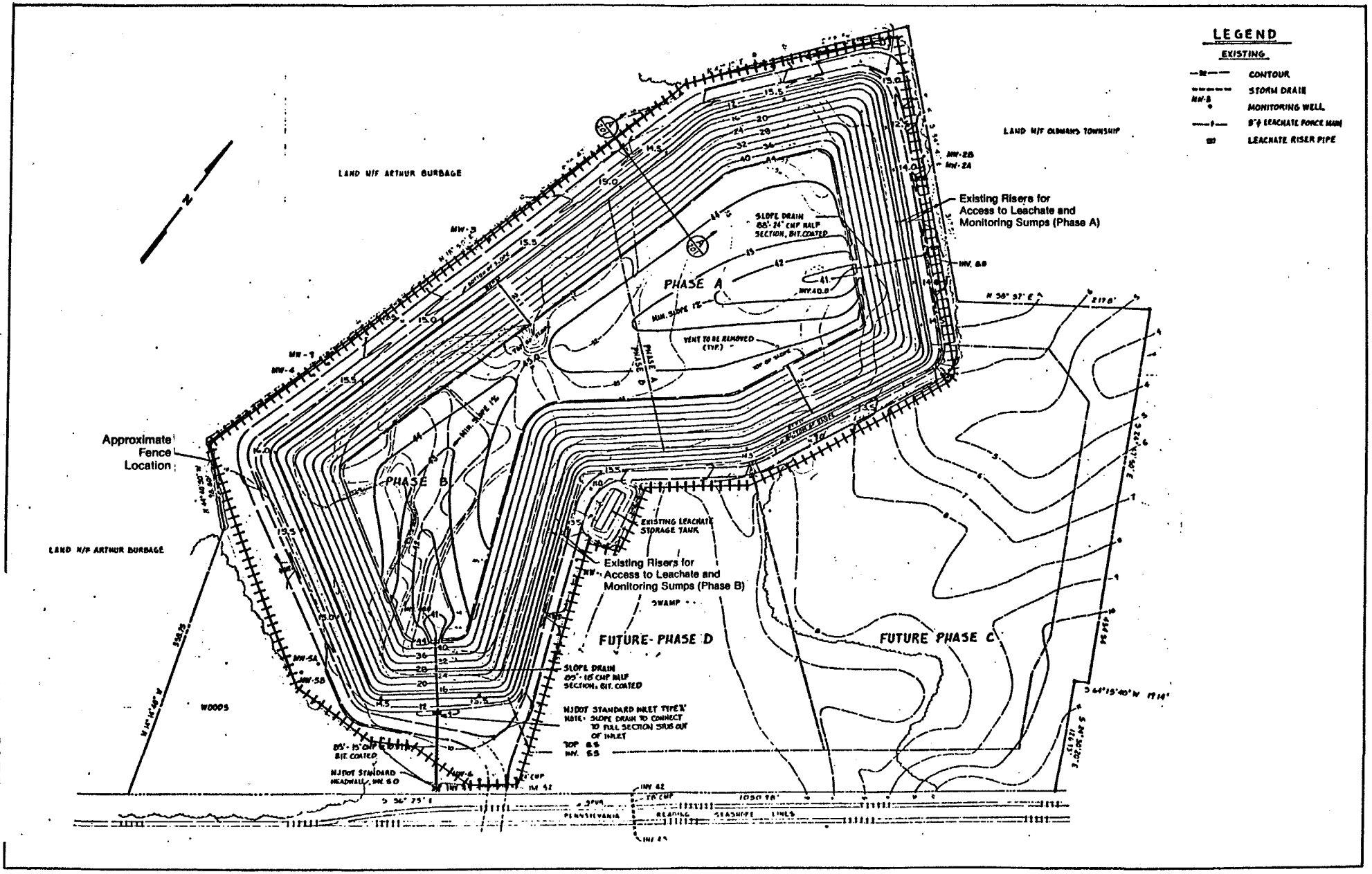
CHECKED D.D. [signature] 6/22/77
DES ENG
PROJ ENG MRRDR 6/23/77
PROJ MGR
APPROVED
APPROVED

CLIENT APPROVALS
ISSUED FOR DATE

N L Industries
Project Location

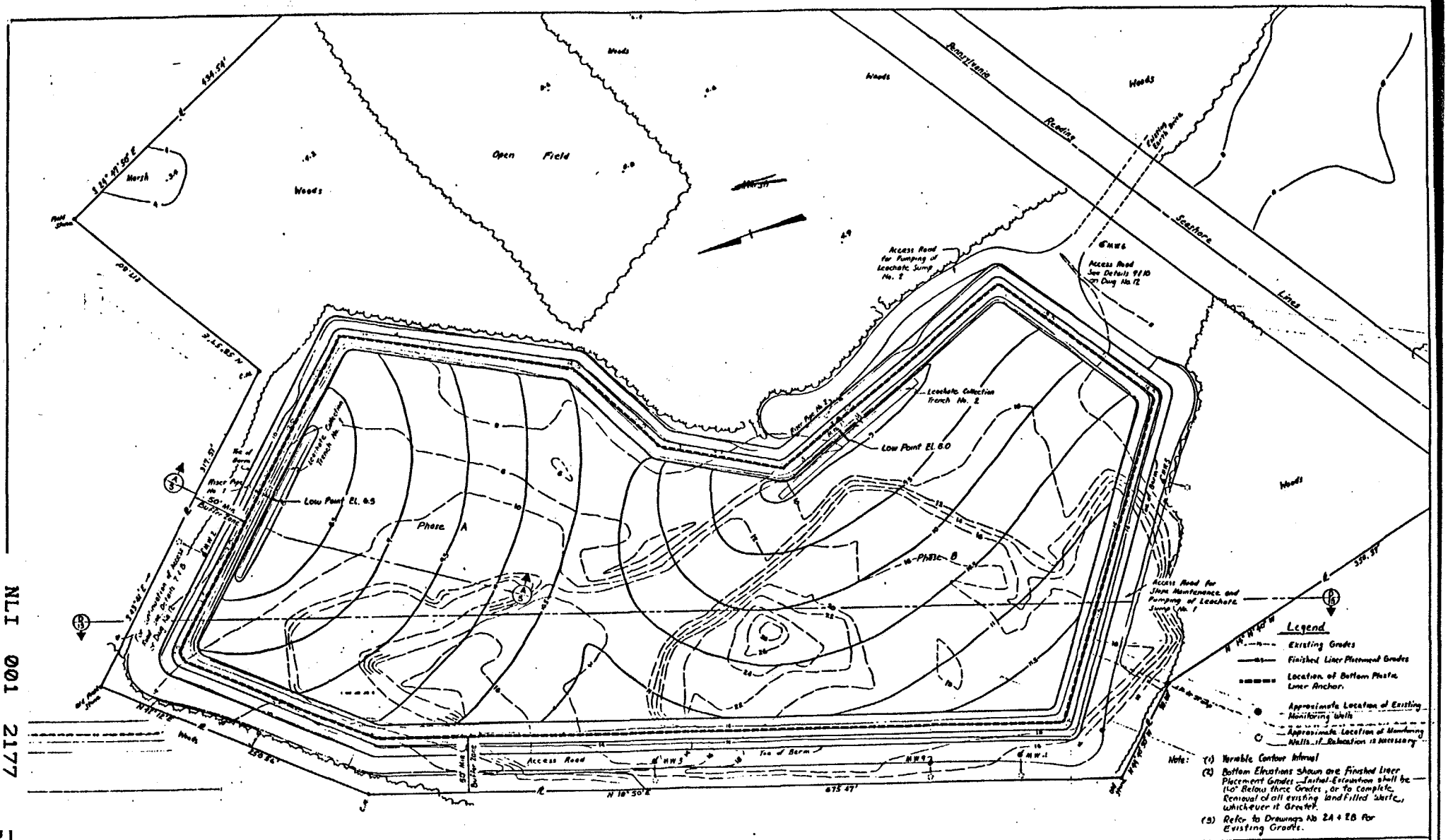
DRAWN WHP
DATE 5-27-77
SCALE AS NOTED
W.O. NO. 193-03
DWG NO. 1
REV NO. 1
SHT 1 OF 14

NLI 001 2175



DRAWING 2 FACILITY PLAN

NLI 001 2176



2	1/12	GENERAL REVISIONS: CONSTRUCTION DWG ISSUED TO NL INDUSTRIES SUBJECT TO DEP PL.					
1		SUBMITTED FOR N.J. D.E.C. REVIEW					
	DATE	APPR	REVISION	NO	DATE	APPR	REVISION

WESTON
WEST CHESTER PENNSYLVANIA

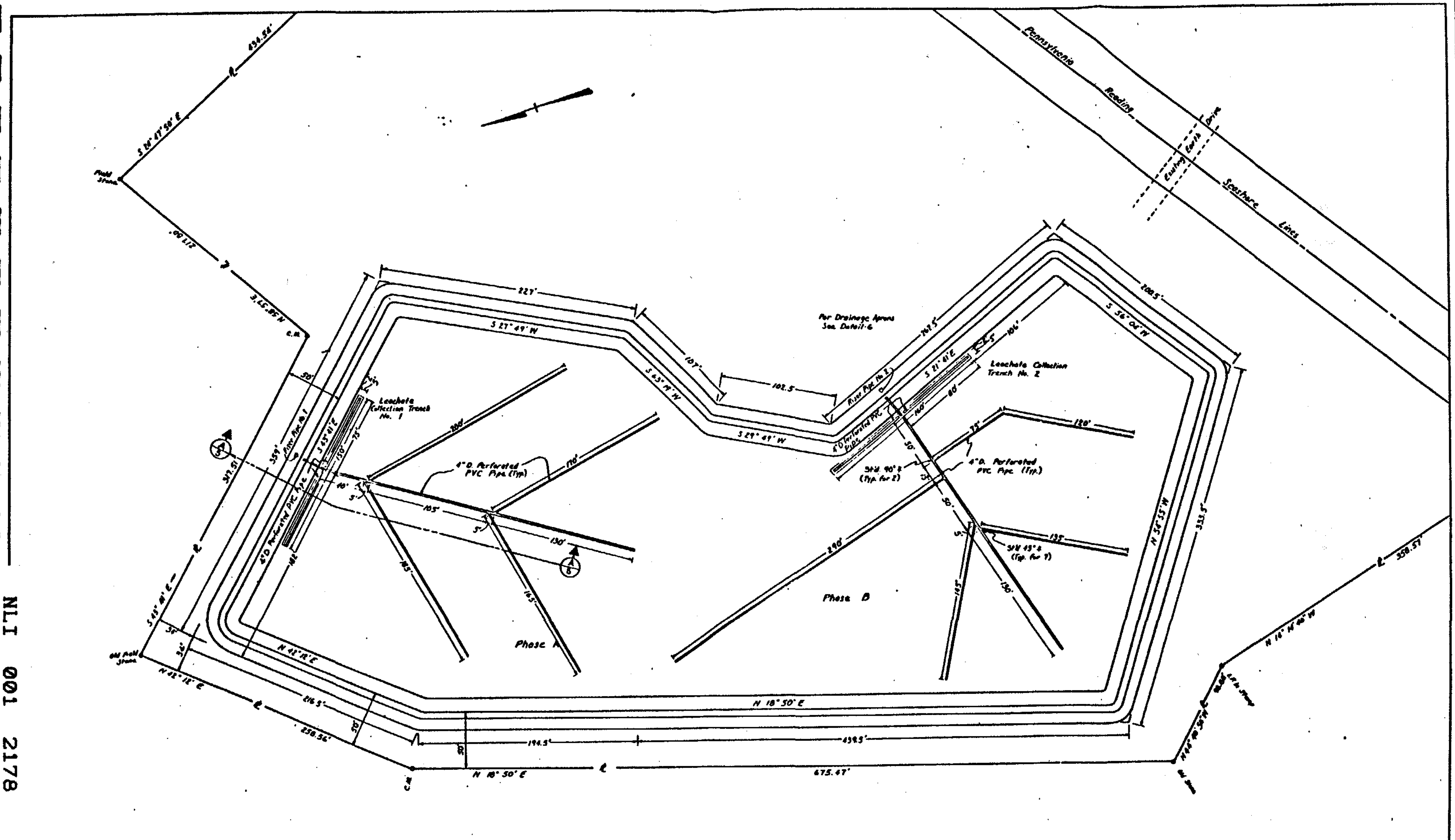
CHECKED D.S. Cassel 6/25/77
DES ENG
PROJ ENG M.L.T. 6/24/77
PROJ MGR
APPROVED
APPROVED

CLIENT APPROVALS
ISSUED FOR DATE

N L Industries
Bottom Plastic Liner Finished Contours

DRAWN WHP	DATE 5-24-77	DWG. NO 3	REV NO 2
SCALE 1" = 40'	W.O. NO 793-03	SHT 4 OF 14	

NLI 001 2177



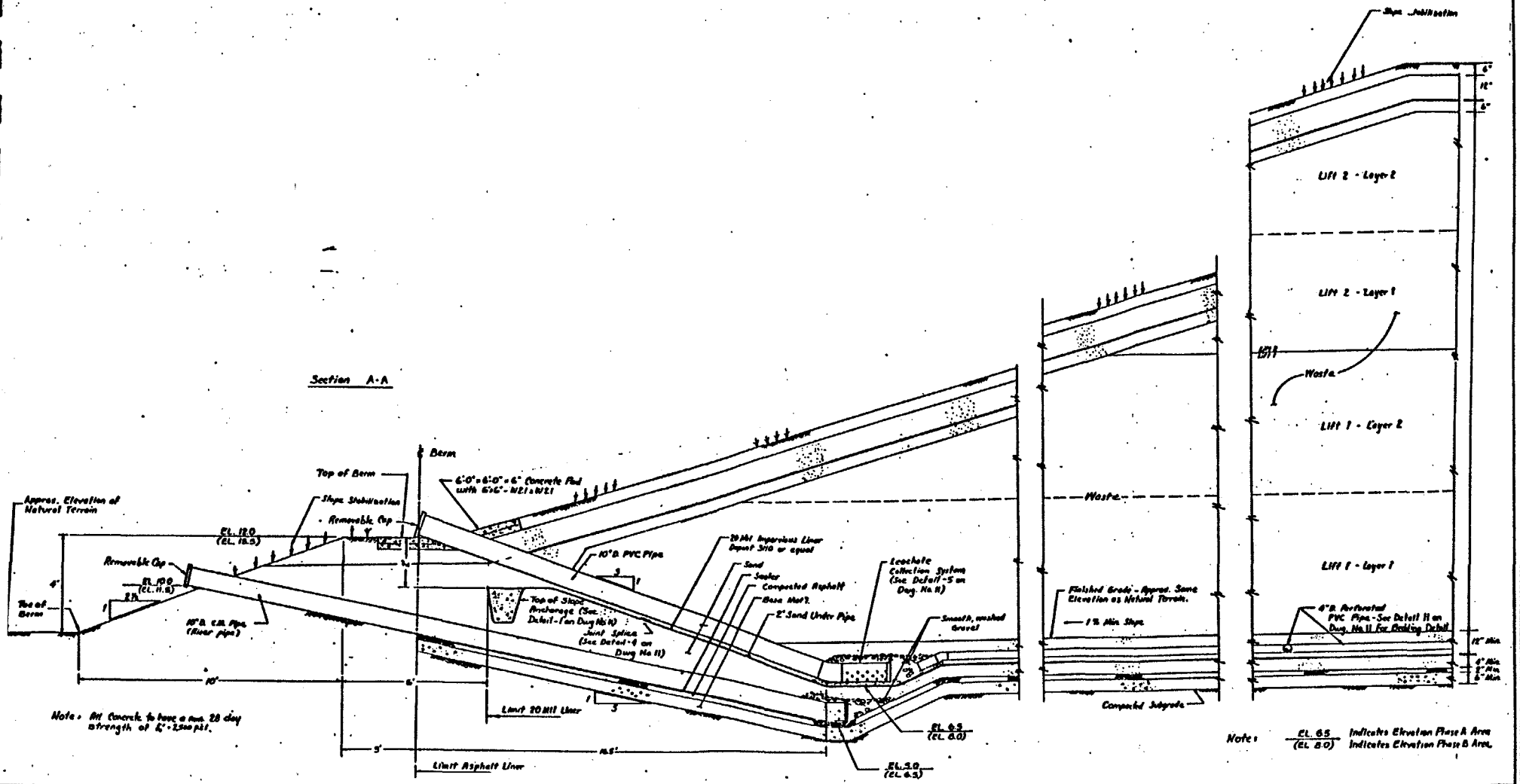
NLI 001 2178

No.	Date	Appr.	Revision
2			GENERAL REVISIONS CONSTRUCTION DWG'S ISSUED TO N.L. INDUSTRIES
1			SUBMITTED FOR N.J. DEP REVIEW

WESTON
WEST CHESTER PENNSYLVANIA

N L Industries
Leachate Collection System
w/ Dimensions

Drawn: WHP
Date: 3-25-77
Scale: 1" = 40'
W.O. No.: 793-03
Dwg. No.: 4
Rev. No.: 2



4	[illegible]	GENERAL REVISIONS	
5	[illegible]	TOP LINER WAS 5-10 Mil, Now 20 Mil	
	[illegible]	GENERAL REVISIONS & CONSTRUCTION DWG'S ISSUED TO NL INDUSTRIES SUBJECT TO D.E.R. REVIEW	
	[illegible]	SUBMITTED FOR N.J. DER. REVIEW	

REVISION | NO. | DATE | APPR. | REVISION

WESTON
WEST CHESTER PENNSYLVANIA

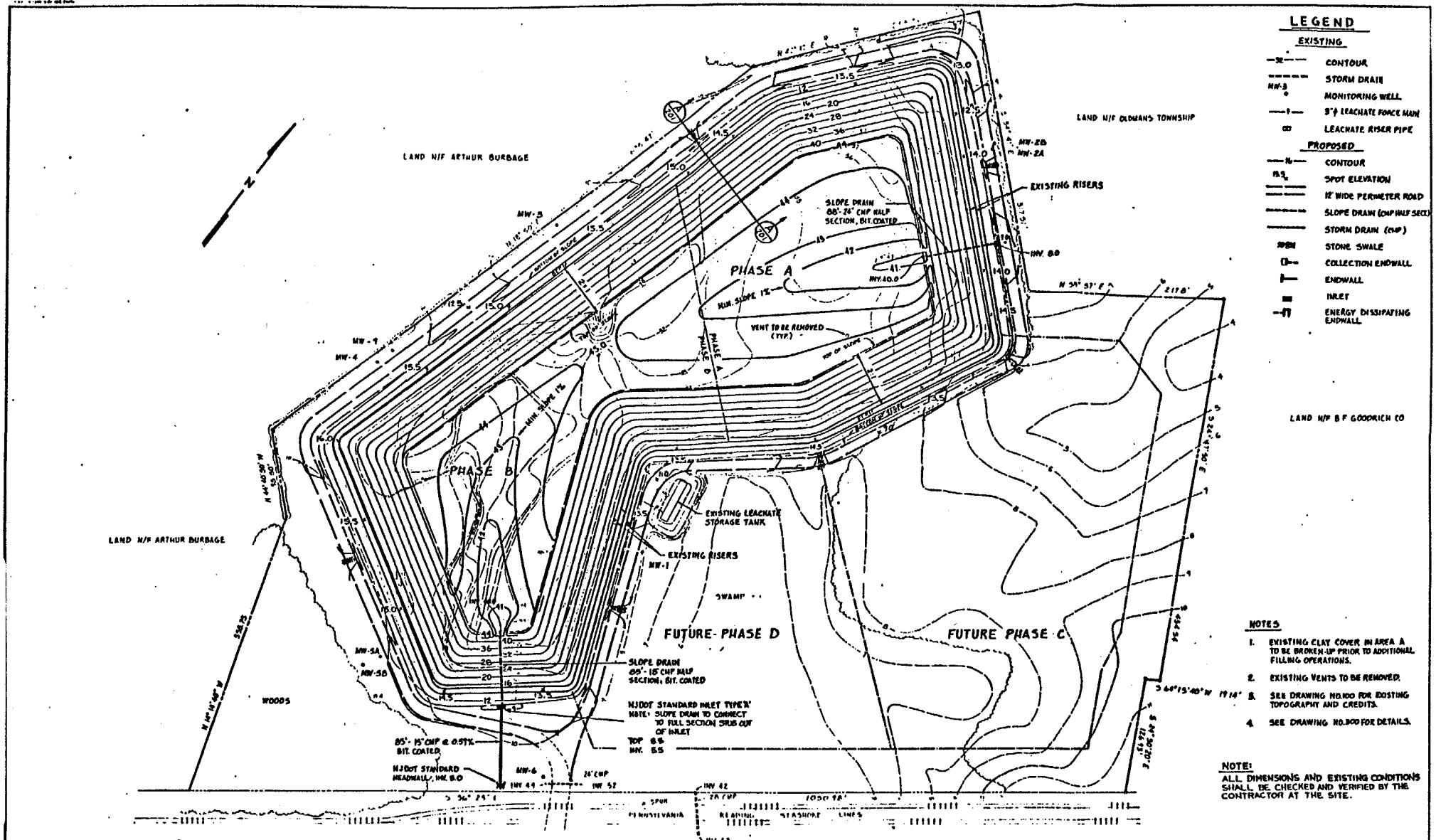
CHECKED D.D. Cassel 6/11/77
DES. ENG.
PROJ. MGR. [illegible] 6/11/77
PROJ. MGR.
APPROVED
APPROVED

CLIENT APPROVALS
ISSUED FOR | DATE

NL Industries
Typical Fill Section
A-A

DRAWN WHP | DATE 5-26-77 | DWG. NO. 5 | REV. NO. 4
SCALE 1" = 2' | W.O. NO. 793-03 | SHT. 6 OF 14

NLI 001 2179



1			REV. MAX. TOP ELEVATION
0			REV PER NL COMMENTS

NL METAL / NL INDUSTRIES, INC.
PEDRICKTOWN PLANT
SALEM COUNTY NEW JERSEY

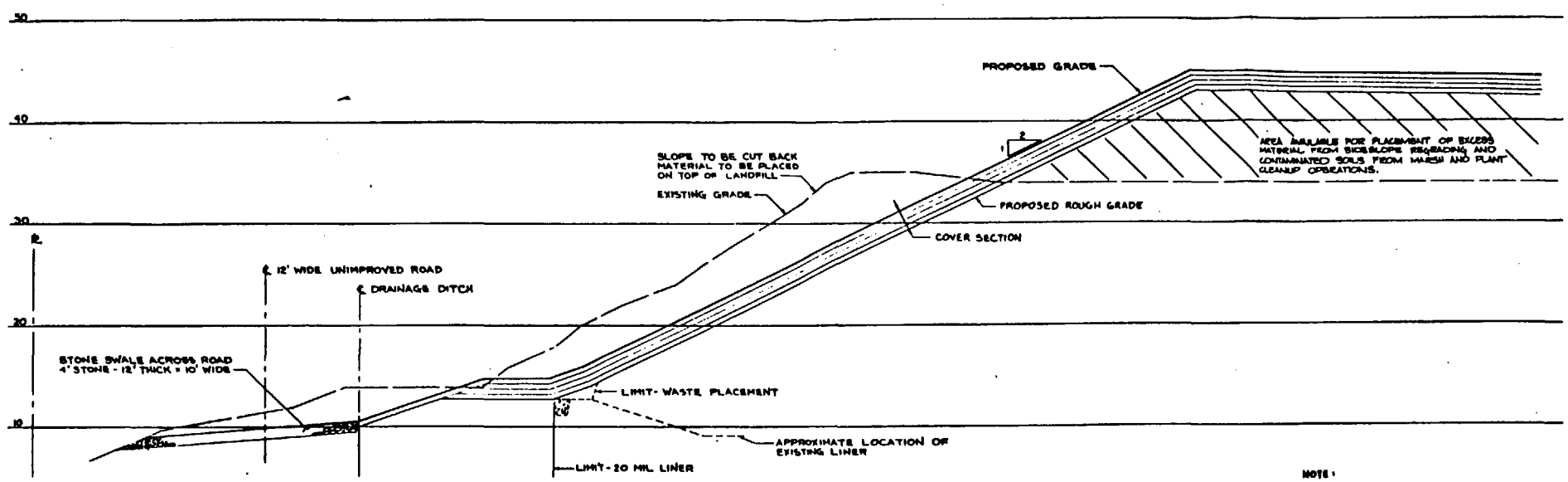
WESTON

CHECKED	ALL	9-11-81
DES ENG	DDC	9-11-81
PROJ ENG	DD Carroll	9-11-81
PROJ MGR	JES	9-11-81
APPROVED	KR	9/11/81
APPROVED	MMC	9-11-81

FINAL CONTOURS
INCLUDING FINAL COVER

DRAWN L.F./D.C.	DATE 8-31-81	DWG. NO. 6	REV. NO. 1
SCALE 1" = 50'	WO NO. 0193-08-01		

NLI 001 2180



NOTE:

1. REFER TO DWG. 200 FOR PLAN
2. SEE DWG. 300 FOR COVER DETAIL

1	4/8		REV. TOP ELEVATION
1	5/6	47	REV PER NL COMMENTS

NL METAL / NL INDUSTRIES, INC.
PEDRICKTOWN PLANT
SALEM COUNTY NEW JERSEY

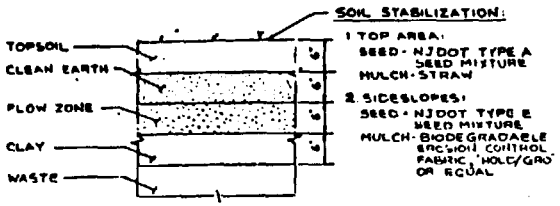
WESTON

CHECKED	ALL	9-11-81
DRAWN	DDC	9-11-81
PROJ. ENG.	D. Cassel	9-11-81
APPROVED		9-11-81
APPROVED		9-11-81

SECTION A-A

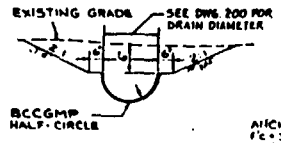
DRAWN	L. FARKAS	DATE 8-19-81	DWG. NO. 7
SCALE	1" = 5'	W.O. NO. 0793-CB-01	REV. NO. 1

NLI 001 2181

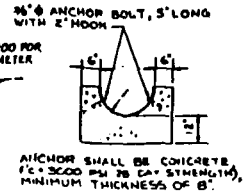


TYPICAL COVER SECTION

NOTE: CLAY SHALL HAVE A PERMEABILITY LESS THAN 10^{-7} cm/sec.

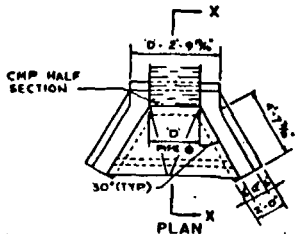


INSTALLATION DETAIL

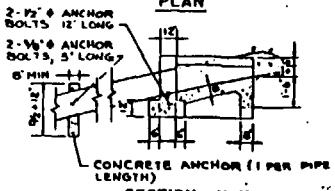


PIPE ANCHOR DETAIL

SLOPE DRAIN DETAILS



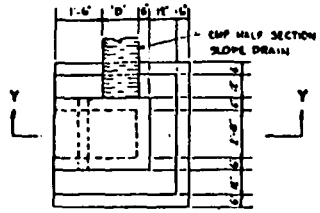
PLAN



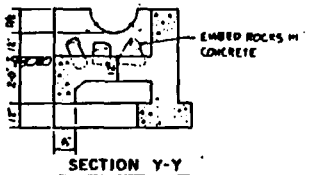
SECTION X-X

COLLECTION ENDWALL

NOTE: ALL CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI.



PLAN



SECTION Y-Y

ENERGY DISSIPATING ENDWALL

1	ADDED NOTES REV PER NL COMMENTS		

NL METAL / NL INDUSTRIES, INC.
PEDRICKTOWN PLANT
SALEM COUNTY NEW JERSEY

WESTON

CHECKED	ALL	9-4-81	
DRAWN			

DETAILS

L. FARKAS	8-31-81	8	1
NONE	0145-06-01		

NLI 001 2182

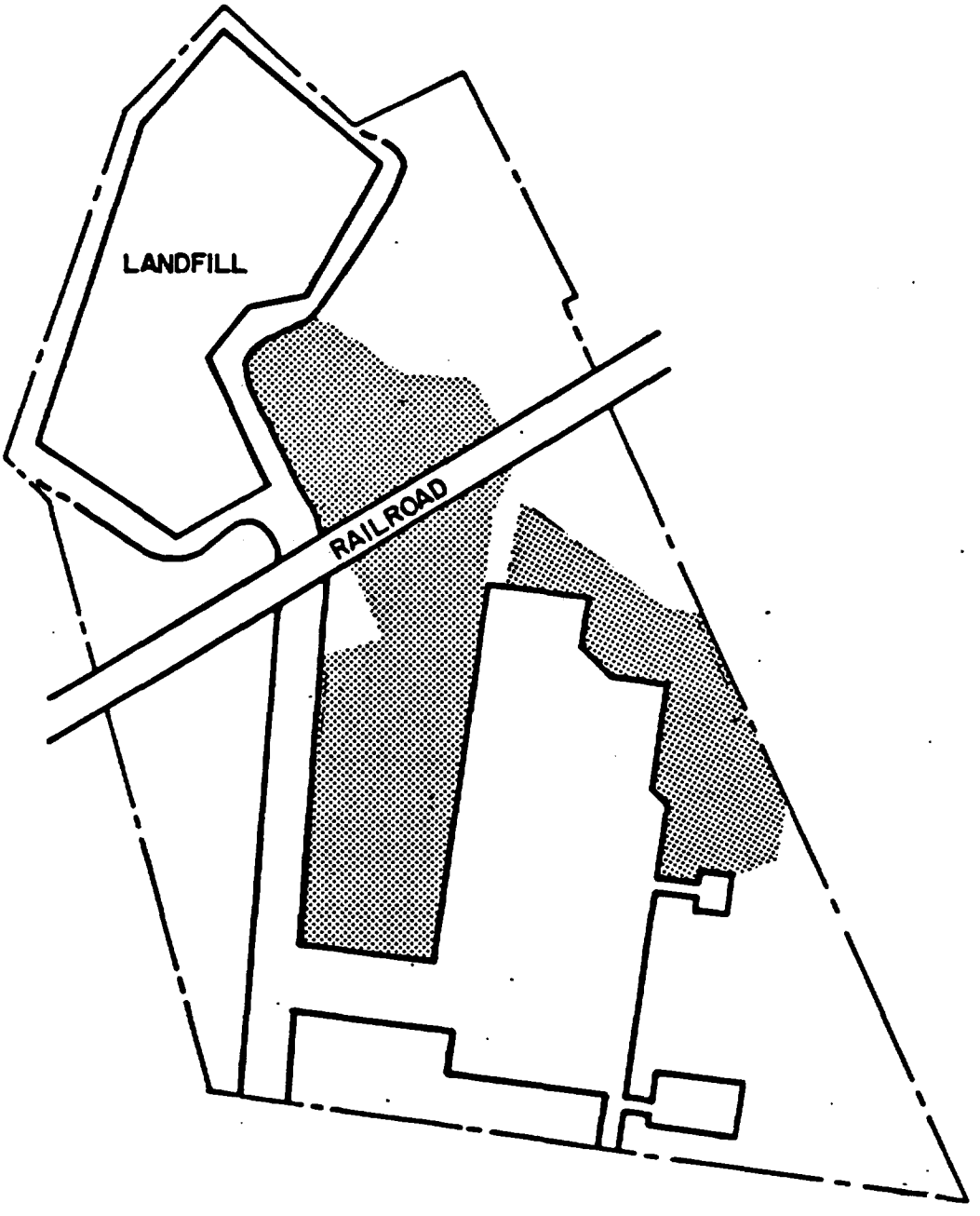
EXHIBIT M

FIGURE 4

NL INDUSTRIES, INC.
PEDRICKTOWN, NEW JERSEY

SOIL REPLACEMENT AREA

SCALE: 1" = 300'



NLI 001 2184

O'BRIEN & GERE ENGINEERS, INC.

SWAMP SCRAPING

A) CONTRACTORS

1) Meckel - Bob Gitardi
2) Winzinger - Jack Dixon
3) Murray - Ken Murray
4) Continental Vanguard - John Fazio, Sr.

B) Remove all contaminated material to depths indicated by grid - 7 ft. elevation contour limit. Average removal 20" of muds with 6" water; maximum at 36". Total approximately 4 acres contaminated water and mud material to be (a) placed in landfill and (b) removed to outside approved landfill.

C) Backfill to previously existing grade with clean fill material.

D) No contaminated water runoff allowed.

E) Discharge stream included with repair or calvert north of railroad track crossing road bed.

F) Suggested Procedure of Removal

1) Block railroad calvert on south side.
2) Pump via hose through calvert the water from north side to south side.
3) Scrape north marsh per specifications.
4) Replace north marsh with clean fill and grade to prevent ponding.
5) Allow water to drain from south side naturally preventing flooding of completed north side.
6) Build earthen dike from south side calvert southeasterly direction to edge of swamp - allowing northeast corner of south swamp to drain naturally.
7) Pump water from southwest swamp area into northeast corner of southern swamp.
8) Scrape and finish southwest portion of south swamp.
9) Open southwest swamp at railroad culvert allowing drainage through calvert.
10) Block off northeast section of southern swamp from the calvert.
11) Pump water from the northeast section to calvert.
12) Upon dewatering, scrape and finish northeast section. Block entry swale during work.
13) Remove temporary earthen dike and use as fill in for final grade for northeast section of southern swamp.
14) Block up both swales and allow water to back up beyond the damming.

PART III - PROPOSED CONTRACT SUMMARY

SCOPE:

A. To remove the alleged contaminated soils from the area known as the marsh (during dry surfact conditions) to an average depth of approximately 18-24". This involves an area of approximately 4.3 acres situated northwest of the production area and is intercepted by a railroad line and siding.

The removed soils shall be deposited in the on-site landfill facility, in a manner that prevents the release of same from the secured facility.

In addition, the existing C.S. culvert beneath the landfill road, just north of the railroad siding, shall be removed and replaced with a steel duct provided by NL and the road grade and surface replaced.

The excavated areas are to be backfilled with clean fill dirt. (Sand or river wash will not be accepted.) Backfill material must have binding characteristics such as a clay content of approximately 50%. The top six inches (6") of fill shall be capable of supporting vegative growth.

Upon backfilling, the area shall be impacted and graded to prevent the ponding of storm water.

The existing culvert connecting the north and south portions of the "marsh" and the marsh discharge stream shall be cleared and graded to prevent ponding of water.

B. The plant soil clean-up shall consist of the removal of the alleged contaminated soils in those areas identified on the attached drawings as "A" through "J". The average depth of soil removal shall be six inches (6"), except for areas "E", "F" and "J", which are designated for backfill and grading areas only.
Backfill material similar to that specified above (with the exception, that the top 4" of all areas (except the marsh) shall consist of topsoil and shall be seeded with Kentucky "31") shall be used to replace removed soils and to regrade in the general directions indicated on the attached print. The grades shall pick up and blend in with existing paved areas and areas adjoining clean-up areas, and shall have a minimum of a 2-3 degree slope. Regrading shall be performed in a manner that prevents ponding of surface waters.

All removed soils shall be placed in the on-site landfill facility in a manner that secures same, as specified above.

C. Backfill and compact the paved swale at the north end of the plant, as indicated on the attached drawing, with backfill material as specified above. Apply a minimum of 3" compacted hydraulic asphalt concrete: New Jersey Mix #5 or equivalent upon acceptance of the owner.

The repair of specified paved areas shall be completed in accordance with the above.

D. The aisle between the existing lead train and slag train shall be cleaned of all contaminating materials, backfilled and sealed. The top 4" shall consist of reinforced concrete rated at a minimum of 4000 PSI (28 day strength). The reinforcing fabric shall be installed 2" below final grade and shall consist of a 6" X 6" welded wire mesh.