EPA REGION V ARCS PROGRAM
EPA Contract No. 68-W8-0093
Work Assignment No. 17-5L4J
SEC Donohue Project No. 20026

EPA Region 5 Records Ctr.
200062

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VOLUME 2
DRAFT REMEDIAL INVESTIGATION REPORT
APPENDIX A - BACKGROUND INFORMATION, AND
APPENDIX B - TECHNICAL MEMORANDA (PHASE I)

HIMCO DUMP
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
ELKHART, INDIANA

August
~~MAY~~ 1992

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604

APPENDIX A

BACKGROUND INFORMATION

Fit Results
USGS Well Logs

ecology and environment, inc.
111 WEST JACKSON BLVD., CHICAGO, ILLINOIS 60604, TEL. 312-663-9415
International Specialists in the Environment

NARRATIVE SUMMARY
HIMCO DUMP
ELKHART, INDIANA

The Himco Dump site covers approximately 40 acres of former marsh land. The site is located at County Road 10 and the Napanee Extension in the Town of Elkhart, located in Elkhart County, Indiana. The site operated between 1960 and 1976 under the ownership of Mr. Charles Himes. A marshy area was excavated and general refuse, medical and pharmaceutical wastes were landfilled in the resulting hole. There is also a possibility that industrial waste was buried in the excavation.

The total amount of hazardous waste landfilled at the site is unknown. According to laboratory analysis of samples taken by Ecology and Environment FIT members during the site inspection of July 30, 1984, groundwater is contaminated with cobalt, selenium, beryllium, cadmium, copper, manganese, and other inorganic metals. The Rocky Mountain Analytical Laboratory performed the above analysis which corroborated earlier residential well sample analysis which showed high manganese levels. The site is located above a continuous portion of the local outwash aquifer system that is the sole source of drinking water for the community. A conservative estimate of 20,000 people may be affected by drinking water contaminated by the site.

In 1974, Mr. Himes was advised by the State Health Commissioner to drill deep wells for six local residences that were shown to have contaminated shallow wells.

In 1975, Mr. Himes signed a consent agreement (adopted by the Stream Pollution Control Board) that resulted in the closing of the landfill in September 1976. Much of the landfill was covered by sand. Several leachate streams were visible during the site inspection of July 30, 1984 by the E & E FIT.

In 1980, the USGS conducted a hydrogeologic study of the area and this helped influence the installation by U.S. EPA of two interceptor wells to divert contaminated groundwater away from the North Main Street Well Field located approximately 1 1/2 miles south east of the site. The interceptor wells have NPDES permits and discharge into nearby Christiana Creek.

22Z:1T

DETECTED METALS - 1984
Himco Dump
Elkhart, Indiana

Units: ug/l (ppb)

Analytes	Field Blank	Upgradient Wells D/19'	D/174'	E/17'	E/174'	M/24'	Dup M24'	P/24'	Offsite Down Gradient I/35'	I/172'	Surface Water UG	DG	Sediment Units: mg/kg (ppm) UG	DG
Aluminum	-	12,500	-	350,000	-	296	269	175	1,890	-	-	-	1,640	424
Arsenic	-	26	-	200	-	-	-	26	-	-	-	-	1.8	2.0
Barium	-	121	-	803	165	172	175	97	414	66	-	-	14	-
Beryllium	-	-	-	11	-	-	-	-	-	-	-	-	-	-
Cadmium	-	-	-	10	-	-	-	-	-	-	-	-	-	-
Chromium	-	370	-	461	-	16	12	-	-	-	-	-	3.9	1.3
Cobalt	-	-	-	132	-	-	-	-	-	-	-	-	2.7	-
Copper	-	73	-	555	-	-	-	-	-	-	-	-	3.9	-
Iron	-	67,400	1,230	146,000	1,580	12,300	14,800	11,400	5,520	507	246	210	4,380	1,550
Lead	-	73	-	401	-	7.7	9.0	6.7	-	-	-	-	5.8	1.6
Manganese	-	1,630	158	2,150	41	331	320	182	133	24	24	12	43	103
Mercury	-	0.21	-	1.4	-	-	-	-	-	-	-	-	-	-
Nickel	-	103	-	422	-	-	-	-	-	-	-	-	4.4	-
Selenium	-	-	2.0	14	-	-	-	4.7	-	-	-	-	-	-
Tin	-	-	-	-	32	-	-	-	-	55	-	-	1.1	1.2
Vanadium	-	-	-	326	-	-	-	-	-	-	-	-	-	-
Zinc	11	164	38	1,630	44	224	309	58	18	55	65	-	19	5

- = Not detected at or above contract required detection limit.
UG = Upgradient
DG = Downgradient
X/YY' = Well/sampling depth in feet.

ARCS/F/HIMCO/ABB

DETECTED ORGANICS - 1984
Bimco Dump
Elkhart, Indiana

Units: ug/l (ppb)

Compound	Field Blank	Upgradient Wells D/19'	D/174'	E/17'	E/174'	H/24'	Dup H/24'	P/24'	Offsite Down Gradient I/35'	I/172'	Surface Water UG	DG	Sediment Units: ug/kg (ppb) UG	DG
Volatiles														
Acetone	32	39	39		164	60	100	230					492 C	66 C
Benzene	5 K	5 K	5		5 K	5 K	5 K	4	5 K		5 K	5 K		10 K
2-Butanone					106		79							
Chloroethane								13						
Chlorofluoromethane					43 J	57 J	37 J	18 J						
Dichlorodifluoromethane					61 J	79 J	56 J	14 J						
1,1-Dichloroethane								15						
Trans 1,2-Dichloroethene					8	9	7							
Diethylether								44 J					45 J	78 J
1,4-Dioxane								9 J						
Ethylbenzene									5 K					
2-Hexanone									5 K					
Methylene Chloride				5 K	5 K	5			5 K		15 C		319 C	249 C
Toluene	5 K			5 K	5 K	3	5 K	5 K	5 K	5 K			10 K	10 K
Trichloroethane					5 K		5 K	5 K						
Carbon Disulfide									1					
Semi-Volatiles														
1,2,4-Trichlorobenzene					10 K									
1,4-Dichlorobenzene					7 K									

K - Compound detected above instrument detection limit but below contract required detection limit.
J - Compound identified by computer library search, concentration estimated.
C - Associated lab blank contained detectable level, value reported has had blank level subtracted from it.
UG - Upgradient.
DG - Downgradient.
X/YY' - Well/sampling depth in feet.

DETECTED ORGANICS - 1984
Himco Dump
Elkhart, Indiana
(Continued)

Units: ug/l (ppb)

Compound	Field Blank	Upgradient Wells D/12'	D/174'	E/17'	E/174'	M/24'	Dup M/24'	P/24'	Offsite Down Gradient I/35'	I/172'	Surface Water UG	DG	Sediment Units: ug/kg (ppb) UG	DG
Naphthalene	10 K													
Di-N-Butylphthalate	10 K	10 K	10 K	10 K	15	10 K		10 K	10 K	10 K	10 K	10 K		
Acenapthene					25 K									
2,4-Dinitrotoluene					20 K									
N-Nitrosodinpropylamine					9									
Pyrene					13									
Phenol						62	76							
4-Methylphenol						197	235							
Bis(2-ethylhexyl) phthalate						10 K	266 C	20						
Diethylphthalate	10 K			10 K					10 K				150 K	
Caprolactam						274 J	145 J							
Sulfur						39 J	41 J						1180 J	
Dioctylester-hexanonedioic acid							1190 J							
Unknowns														
Volatile fraction							5 J							
Semi-Volatile fraction													1080 J	1390 J
PCB/Pesticides														
None detected														

K - Compound detected above instrument detection limit but below contract required detection limit.
J - Compound identified by computer library search, concentration estimated.
C - Associated lab blank contained detectable level, value reported has had blank level subtracted from it.
UG - Upgradient
DG - Downgradient

ARCS/P/HIMCO/AB7

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DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 mi. W. of Bangsmere St. on Co. Rd. 20 & about 1/2 mi. N. of Rd. - W. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick G., Lowell C., Dan F., Frank C.

WELL INFORMATION

Depth of well: 496 Date well was completed: Oct. 6, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 490

Diameter of liner (if used): Total Length:

Diameter of Screen: 4 5/8" 4 5/8" Length: 3' long 3' long Slot Size: .015 SS WW bottom screen .040 SS WW top screen

475 ft. to bottom of screen 495' to bottom of pipe

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 6.5 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 60 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling Inc.

Date: October 27, 1977

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine to med. sand & gravel	0	30
med. to coarse sand & gravel	30	48
fine to med. sand w/some gravel	48	160
fine to med. gravel w/some sand – finer at bottom	160	240
med. gravel w/some sand	240	275
fine to med. gravel w/sand	275	300
med. gravel w/some sand	300	318
fine to med. gravel	318	375
fine gravel & sand	375	465
med. gravel & broken stone	465	475
fine to med. gravel & broken stone	475	489
blue shale	489	492
brown siltstone	492	496
10 hrs.		
NOTE: 18 jts. 200 PSI (20')		
6 jts. 160 PSI (20')		
1 jt. 160 PSI plain end		

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY _____ TWP. 24N RGE. 4E W.M. SEC. 36

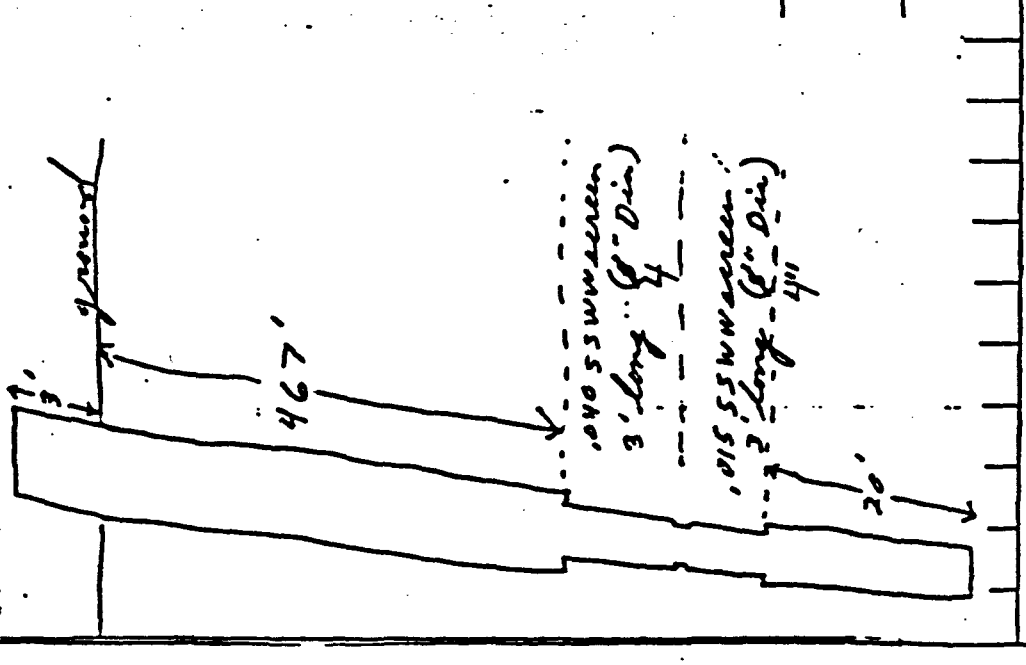
Topo Map _____ Ground Elevation 760 Subdivision Name _____

Field Located By _____ Date _____ Depth to bedrock 489

Courthouse Location By _____ Date _____ Bedrock elevation 273

Location accepted w/o verification by _____ Aquifer elevation _____ Lot Number _____

1820 ft W of EL. _____ ft N of SL. _____ ft E of WL. _____ ft S of NL.



U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART COUNTY: ELKHART

WELL # B1 INTERPRETATION BY: A. Martin

DATE: 4/30/79

FORMATION	FROM	TO
Sand & Gravel - 1325	0	132
Clay	132	135
Sand & Gravel	135	292
Silty Sand & Gravel 1325	292	307
Sand & Gravel	307	487
Shale	487	492
[illegible]	492	495

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C-1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 4E Sec. 36

About 1/2 Mi. W. of Nappanee St. on Co. Rd. 10 about 1/8 Mi. N. of Rd. - N. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 355 Date well was completed: Oct. 4, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 337½

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' long Slot Size: .018 SS WW
340' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 6.7 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 35 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: [illegible]

Date: October 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
med. to coarse sand & gravel	0	55
fine to med. sand & fine gravel - very sandy	55	135
95 - 100 streaks of gray clay		
sand brown clay	135	143
med. sand w/some gravel	143	147
sandy brown clay	147	149
med. sand w/some gravel	149	151
sandy brown clay	151	153
sand & gravel	153	154
brown-gray clay	154	156
sand & gravel	156	159
brownish gray clay	159	160
sand & gravel	160	161
brownish gray clay	161	180
medium sand & gravel	180	195
fine to med. sand & gravel (sandy)	195	210
fine to med. sand & gravel (sandy) & some brownish gray clay mixed	210	228
brownish gray clay	228	230
fine to med. sand & some gravel	230	235
med. sand & gravel w/some broken shale	235	255
fine sand	255	305
fine to med. sand & fine gravel	305	343
fine sand	343	355
bottom of screen 340 ft.		
10 hrs.		
NOTE: 8 jts. 200 PSI (20)		
8 jts. 160 PSI (20+) 1 ft. 160 PSI plain		
Casing ear shaped at 116 ft.		

COUNTY Ellsworth TWP. 15 S RGE. 7 W ¼ ¼ ¼ SEC. 7

Topo Map Osborne

Field Located By USGS Date

Courthouse Location By _____ Date _____

Location accepted w/o verification by _____

Ft W of EL. _____ Ft N of SL. _____ Ft E of WL. 2650 Ft S of NL. 1050

Ground Elevation 1754

Depth to bedrock _____

Bedrock elevation _____

Aquifer elevation _____

Subdivision Name _____

Lot Number _____

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

(Fill in completely - Refer to [illegible] for [illegible])

Elkhart

Name [illegible] Owner [illegible] Address [illegible]

Driving directions to the well location: Indiana, [illegible] Sec. 20

About 3/4 mi. [illegible] to Co. Rd. 20 on Tuppance St., go W. on [illegible]

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

NAME OF WELL OWNER [illegible]

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART COUNTY: ELKHART

WELL # C-1 INTERPRETATION BY: A Martin

DATE: 4/20/79

FORMATION	FROM	TO
Sand & Gravel - 147	0	147
Sandy Clay	147	149
Sand & Gravel 2	149	151
Sandy Clay	151	153
Sand & Gravel 1	153	154
Clay	154	156
Sand & Gravel 3	156	159
Clay	159	160
Sand & Gravel 1	160	161
Clay	161	180
Sand & Gravel 48	180	228
Clay	228	230
Sand & Gravel 125	230	355

D-2

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
fine brown sand & gravel	0	18
fine to med. gravel	18	49
gritty sandy gray clay	49	52
fine to med. sand & gravel ~~w/streaks of gray clay~~	52	168
med. sand & gravel w/sand	168	174
blue shale	174	185
(used rolyphos on this well)		
4 hrs.		
NOTE: 2 jts. 200 PSI (20+)		
6 jts. 160 PSI (20+)		
11' 160 PSI		

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY Elkhart TWP. 33 N RGE. [illegible] NE ¼ [illegible] ¼ [illegible] SEC [illegible]

Topo Map [illegible] Ground Elevation 796 Subdivision Name

Field Located By [illegible] Date 10/[illegible]/77 Depth to bedrock 174

Courthouse Location By _____ Date _____ Bedrock elevation 595

Location accepted w/o verification by _____ Aquifer elevation _____ Lot Number _____

50 Ft W of EL. _____ Ft N of SL. _____ Ft E of WL. _____ Ft S of NL.

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART COUNTY: ELKHART

WELL # D-2 INTERPRETATION BY: A Mo

DATE: 4/30/79

FORMATION	FROM	TO
Sand & Gravel - 46	0	46
Clay	46	50
Sand & Gravel 124	50	174
Shale	174	185

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E - Test Hole

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctiv landmarks, etc. Twp. 38N R. 4E Sec. 36

About 800' W. of Nappanee St. on N. side of Co. Rd. 10 - South Hole

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick C., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 315 Date well was completed: Oct. 10, 1977

Diameter of casing or drive pipe: none Total Length:

Diameter of liner (if used): Total Length:

Diameter of Screen: none Length: Slot Size:

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) none fee

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

(Drawdown is the differenc between static level and wate level at end of test)

Signature: [illegible]

Date: October 27, 1977

FOR WELL LOG SPACE USE REVERSE SIDE OF THIS SHEET

E. Test Hole

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY Elkhart TWP. 38N RGE. 4E ¼ ¼ SEC. Subdivision Name

Topo Map Osceola — 900 Ft W of EL. — Ground Elevation 764

Field Located By U.S.G.S. Date 10/[illegible] — Ft N of SL. — Depth to bedrock 303

Courthouse Location By Date — Ft E of WL. — Bedrock elevation 461

Location accepted w/o verification by — Ft S of NL. — Aquifer elevation — Lot Number

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	6	brown dirty sand
6	30	gray fine to med. sand w/some gravel
30	82	gray med. sand & gravel
82	84	gray clay
84	88	fine to med. sand & gravel
88	89	gray clay
89	165	fine to med. brown sand w/some gravel
165	167	sandy gray clay
167	176	gray fine to med. sand & gravel
176	195	gritty gray clay
195	197	fine to med. sand & gravel
197	199	gray clay
199	202	sand & gravel
202	210	gray clay
210	221	gray fine to med. sand & gravel
221	233	gray clay
233	253	fine to med. sand & gravel w/streaks of clay
253	255	granite boulder
255	260	gray clay
260	303	soft blue-gray clay
303	315	blue shale
		4 hrs.
		No well set

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DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. 30 ?'

On N. sd. of Tr. Rt. 19 where Rd. starts to curve to S. E. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.

Building Contractor _____ Address _____

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 225 Date well was completed: Oct. 11, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 186

Diameter of liner (if used): _____ Total Length: _____

Diameter of Screen: 2" Length: 5' long ~~2 Screens 12'~~ overall Slot Size: .018 SS WW 195' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other _____

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 15.4 feet

Bailer Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

Pumping Test: Hours Tested Air Rate 30 g.p.m. Drawdown _____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature Ortman Drilling, Inc. by

Date October 26, 1977

-5

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY [illegible] TWP. 38N RGE. 5E SW ¼ [illegible] ¼ NW ¼ SEC. 31 Subdivision Name

Topo Map [illegible]

Field Located By [illegible] Date [illegible]

Courthouse Location By _____ Date _____

Location accepted w/o verification by _____

3600 Ft W of EL. Ground Elevation 760

1900 Ft N of SL. Depth to bedrock 220

_____ Ft E of WL. Bedrock elevation 540

_____ Ft S of NL. Aquifer elevation _____ Lot Number _____

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	10	fine brown sand
10	17	fine to med. gray sand
17	23	med. to coarse sand & gravel
23	30	soft gray clay
30	37	med. sand & gravel
37	77	gray clay
77	92	fine dirty sand
92	99	gray clay
99	137	fine dirty sand
137	156	fine to med. sand w/some gravel
156	212	gray clay w/streaks of sand & gravel
212	220	blue clay
220	225	blue shale
		8 hrs.
		NOTE: 4 jts. 200 (20+)
		5 jts. 160 (30+)
		6' 160

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART COUNTY: ELKHART

WELL # F-5 INTERPRETATION BY: A Mar

DATE: 4/12 7?

FORMATION		FROM	TO
Sand & Gravel	37	0	37
Clay		31	79
Dirty Sand	14	79	93
Clay		93	100
Dirty Sand	28	100	128
Sandy Clay		128	135
Sand & Gravel	23	135	157
Clay		158	166
Sand	1	166	167
Clay		167	182
Sand & Gravel	13	182	195
Clay w/ streaks of sand		195	212
Clay		212	220
Shale		220	22

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[redacted]

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DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Osolo

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. 31

W. of Bristol St. on Edwardsburg Ave. 1 Block, th. W. about 150' on N. sd. N. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick O., Frank G., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 224 Date well was completed: Oct. 17, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 160

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' long ~~2 Screens 12'~~ overall Slot Size: .018 SS WW 169' to bottom of scr

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 8.3 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 75 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

3

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

17/17/55

COUNTY _____ TWP: 11 RGE. _____ E ¼ _____ ¼ NE SEC 31 Subdivision Name _____

Topo Map _____ Ft W of EL. _____ Ground Elevation 762

Field Located By _____ Date _____ Ft N of SL. _____ Depth to bedrock 216

Courthouse Location By _____ Date _____ Ft E of WL. _____ Bedrock elevation 546

Location accepted w/o verification by _____ Ft S of NL. _____ Aquifer elevation _____ Lot Number _____

WATER WELL LOG

To	From	FORMATIONS (Color, type of material, hardness, etc.)
56	0	fine to med. sand & gravel
63	56	gray clay
65	63	sand & gravel
68	65	gray clay
190	68	fine to med. sand w/some gravel
172	170	gray clay
181	180	gray clay
		[illegible]
187	186	gray clay
202	190	soft pinkish brown clay
216	202	brownish gray clay
224	216	blue shale
		4 hrs.
		NOTE: 3 jts. 200 PSI (20+)
		4 jts. 160 PSI (20+)
		1 jt. 160 PSI plain end

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART COUNTY: ELKHART

WELL # G-3 INTERPRETATION BY: A. Morris

DATE: 4/2/79

FORMATION	FROM	TO
Sand & Gravel 55	0	55
Clay	55	63
Sand & Gravel 2	63	65
Clay	65	67
Sand & Gravel 123	67	190
Clay	190	216
Shale	216	224

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I-1

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled: Elkhart Civil Township: Cleveland

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctiv landmarks, etc. Twp. 38N R. 4E Sec. 36

1 Block N. of Mishawaka St. on Kappanee St., th. W. 1/2 Block on S. sd. W. Well

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner: U. S. Geological Survey Address: 1819 N. Meridian, Indianapolis, Ind.

Building Contractor: Address:

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address: 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Frank C., Lowell C.

WELL INFORMATION

Depth of well: 195 Date well was completed: Oct. 13, 1977

Diameter of casing or drive pipe: 5" PVC Total Length: 163

Diameter of liner (if used): Total Length:

Diameter of Screen: 2" Length: 5' 2 Screens - 12' overall Slot Size: .030 SS WW 172' to bottom of scr

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 9 feet

Bailer Test: Hours Tested ____ Rate ____ g.p.m. Drawdown ____ ft.

Pumping Test: Hours Tested Air Rate 100 g.p.m. Drawdown ____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature: Ortman Drilling, Inc.

Date: October 26, 1977

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY [illegible] TWP. [illegible] N RGE. [illegible] SE ¼ [illegible] ¼ [illegible] SEC 36 Subdivision Name

Topo Map [illegible]

Field Located By [illegible] Date [illegible]

Courthouse Location By _____ Date _____

Location accepted w/o verification by _____

[illegible] Ft W of EL.

[illegible] Ft N of SL.

_____ Ft E of WL.

_____ Ft S of NL.

Ground Elevation 752

Depth to bedrock 193

Bedrock elevation 559

Aquifer elevation _____

Lot Number _____

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	6	sand
6	8	red sandy clay
8	26	sand & fine gravel
26	28	sandy gray clay
28	37	sand & med. to coarse gravel
37	124	sandy gray clay
124	174	fine to med. gravel
174	184	gritty brown clay
184	193	fine gravel
193	195	blue shale
		4 hrs.
		NOTE: 3 jts. 200 PSI (20+)
		5 jts. 160 PSI (20+)
		3' 160 PSI

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART COUNTY: ELKHART

WELL # I-3 INTERPRETATION BY: [illegible]

DATE: 4/12/77

FORMATION		FROM	TO
Sand & Gravel	35%	0	33
Clay		33	43
Sandy Clay		43	54
Clay		54	88
Sand	3%	89	92
Sandy Clay		92	124
Sand & Gravel	50%	124	17[illegible]
Clay		174	184
Gravel	9%	184	193
Shale		193	19[illegible]

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[redacted]
U3

DIVISION OF WATER
DEPARTMENT OF NATURAL RESOURCES, STATE OF INDIANA
STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township Osolo ?

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc. Twp. 38N R. 5E Sec. 32 ?

Southwest Corner of Oak St. & McNaughton St.

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner U. S. Geological Survey Address 1819 N. Meridian, Indianapolis, Ind.

Building Contractor _____ Address _____

Name of Well Drilling Contractor: Ortman Drilling, Inc.

Address 717 S. Malfalfa Road, Kokomo, Indiana

Name of Drilling Equipment Operator: Rick C., Frank C., Lowell C., Dan E.

WELL INFORMATION

Depth of well: 175 Date well was completed: Oct. 12, 1977

Diameter of casing or drive pipe: 5" Total Length: 149

Diameter of liner (if used): _____ Total Length: _____

Diameter of Screen: 2" Length: 5' Slot Size: .040 SS WW
152' to bottom of screen

Type of Well: Drilled [X] Gravel Pack [ ] Driven [ ] Other _____

Use of Well: For Home [ ] Test For Industry [ ] For Public Supply [ ] Stock [ ]

Method of Drilling: Cable Tools [ ] Rotary [X] Rev. Rotary [ ] Jet [ ] Bucket Rig [ ]

Static water level in completed well (Distance from ground to water level) 13.9 feet

Bailer Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

Pumping Test: Hours Tested Air Rate 20 g.p.m. Drawdown _____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature Ortman Drilling, Inc.

Date October 26, 1977

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY _____ TWP. 38N RGE. [illegible] N½ [illegible] ¼ [illegible] ¼ SEC. 31 Subdivision Name _____

Topo Map _____ [illegible] Ft W of EL. Ground Elevation 254

Field Located By [illegible] Date [illegible] [illegible] Ft N of SL. Depth to bedrock 165

Courthouse Location By _____ Date _____ _____ Ft E of WL. Bedrock elevation 589

Location accepted w/o verification by _____ _____ Ft S of NL. Aquifer elevation _____ Lot Number _____

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	20	fine to med. sand w/some gravel
20	39	med. to coarse sand & gravel
39	110	gray clay
110	122	alternate layers of sand & gravel & clay
122	145	gray clay
145	155	med. sand & gravel (tight)
155	165	blue clay
165	175	blue shale
		3 hrs.
		NOTE: 2 jts. 200 PSI (20+)
		5 jts. 160 PSI (20+)
		9' 160 PSI

U. S. GEOLOGICAL SURVEY

WRD - INDIANA

COMPOSITE LITHOLOGIC LOG

(DATA FROM DRILLER'S AND GAMMA LOGS)

PROJECT: ELKHART COUNTY: ELKHART

WELL # J-3 INTERPRETATION BY: A. Mar-

DATE: 4/12/79

FORMATION		FROM	TO
Sand & Gravel	42	0	42
Clay		42	56
Dirty Sand	3	56	59
Clay		59	112
Dirty Sand	9	112	121
Sandy Clay		121	136
Sand & Gravel	5	136	141
Sandy Clay		141	144
Sand & Gravel	11	144	155
Clay		155	165
Shale		165	175

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M

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled ELKHART Civil Township _____

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

_____

_____

_____

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner _____ Address _____

Building Contractor _____ Address _____

Name of Well Drilling Contractor: _____

Address _____

Name of Drilling Equipment Operator: _____

WELL INFORMATION

Depth of well: _____ Date well was completed: 5/3/79

Diameter of casing or drive pipe: 2" _____ Total Length: 50'

Diameter of liner (if used): — Total Length: _____

Diameter of Screen: 2" Length: 5' Slot Size: 18

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other _____

Use of Well: OBSERVATION For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: AUGERS Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 29 feet

Bailer Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

Pumping Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature _____

Date _____

WATER WELL LOG

FORMATIONS (Color, type of material, hardness, etc.)	From	To
WHITE [illegible]	0	[illegible]
GREY [illegible]	[illegible]	[illegible]
BLACK GLOP TYPE OF SAND	16	25
DRY BROWN FINE SAND [illegible]	25	32
BROWN [illegible]	32	43
GREY FINE SAND & MED GRAVEL	43	
BTH	105	
AUGERS FILLED W/ FINE SAND		
PUSHED #13 SCREEN + GALVANIZED		
PIPE IN OPEN HOLE TO 103'		
SEALED W/ BENTONITE		
TD = 75' - 8' SAND IN WELL		
COULD NOT DEVELOP W/ PUMP		
USED AIR COMPRESSOR TO DEVELOP		
WELL		
TD = 102.2 + 0.43 = 103.65		
W/L ≈ 9'		

FOR ADMINISTRATIVE USE ONLY (Well driller does not fill out)

COUNTY ELKHART TWP. 38N RGE. 4E NW ¼ SE ¼ NE ¼ SEC. 36

M(1) DEEP WELL

Topo Map Osceola

Field Located By 11665 Date 5/3/29

Courthouse Location By _____ Date _____

Location accepted w/o verification by _____

900 Ft W of EL. Ground Elevation 767

Ft N of SL. Depth to bedrock _____

Ft E of WL. Bedrock elevation _____

1700 Ft S of NL. Aquifer elevation _____

Subdivision Name _____

Lot Number _____

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N

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled Elkhart Civil Township _____

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

_____

_____

_____

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner [illegible] Address [illegible]

Building Contractor _____ Address _____

Name of Well Drilling Contractor: SAME

Address —

Name of Drilling Equipment Operator: [illegible]

WELL INFORMATION

Depth of well: 22.95 Date well was completed: 4/30/79

Diameter of casing or drive pipe: 2" Dia. Total Length: 25'

Diameter of liner (if used): — Total Length: _____

Diameter of Screen: 2" Length: 5' Slot Size: 40

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other _____

Use of Well: OBSERVATION For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: AUGER Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) 8.41 feet

Bailer Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

Pumping Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature _____

Date _____

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY Elkhart # N TWP. 38N RGE. 4E SE ¼ SW ¼ NE SEC. 36 Subdivision Name

Topo Map Osceola

Field Located By USGS Date 4/30/79

Courthouse Location By _____ Date _____

Location accepted w/o verification by _____

1900 Ft W of EL. Ground Elevation 763

_____ Ft N of SL. Depth to bedrock _____

_____ Ft E of WL. Bedrock elevation _____

2200 Ft S of NL. Aquifer elevation _____ Lot Number _____

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	3	Med br sand + clay
3	7	Med br sand & fine gvl
7	17	Med br sand & fine gvl Water table ≈ 8'
17	(26)	Grey med sand & fine gvl
		It + coarse gvl
		4TH 30
		F 30 40 dit sand
		Diamond ≈ 20 gpm
		7/L 60 - 150 = 8.41
		7/D 26.50 + 43 = 3.55
		Set in heater box

DIVISION OF WATER
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STATE OFFICE BUILDING
INDIANAPOLIS, INDIANA 46204
Telephone 633-5267 Area Code 317

WATER WELL RECORD

WELL LOCATION

(Fill in completely - Refer to instruction sheet)

County in which well was drilled _____ Civil Township _____

Driving directions to the well location: Include County Road Names, Numbers, Subdivision Name, lot number, distinctive landmarks, etc.

_____

_____

_____

NAME OF WELL OWNER and/or BUILDING CONTRACTOR

Well Owner _____ Address _____

Building Contractor _____ Address _____

Name of Well Drilling Contractor: _____

Address _____

Name of Drilling Equipment Operator: _____

WELL INFORMATION

Depth of well: _____ Date well was completed: _____

Diameter of casing or drive pipe: 2" PLASTIC Total Length: _____

Diameter of liner (if used): _____ Total Length: _____

Diameter of Screen: _____ Length: _____ Slot Size: 40

Type of Well: Drilled ☒ Gravel Pack ☐ Driven ☐ Other _____

Use of Well: OBSERVATION For Home ☐ For Industry ☐ For Public Supply ☐ Stock ☐

Method of Drilling: AUGER Cable Tools ☐ Rotary ☐ Rev. Rotary ☐ Jet ☐ Bucket Rig ☐

Static water level in completed well (Distance from ground to water level) _____ feet

Bailer Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

Pumping Test: Hours Tested _____ Rate _____ g.p.m. Drawdown _____ ft.

(Drawdown is the difference between static level and water level at end of test)

Signature _____

Date _____

SITE Q

FOR ADMINISTRATIVE USE ONLY
(Well driller does not fill out)

COUNTY ELKHART TWP. 38N RGE. 4E SE ¼ NE ¼ SE SEC 36 Subdivision Name

Topo Map Osceola | 600 Ft W of EL. | Ground Elevation 756

Field Located By [illegible] Date 4/26/79 | 1900 Ft N of SL. | Depth to bedrock

Courthouse Location By Date | Ft E of WL. | Bedrock elevation

Location accepted w/o verification by | Ft S of NL. | Aquifer elevation | Lot Number

WATER WELL LOG

From	To	FORMATIONS (Color, type of material, hardness, etc.)
0	13	FINE BROWN SAND
13	22	[illegible] - COURSE GREY SAND [illegible]
22		HOLE CAVED 1' BELOW S.L. COULD NOT GET REMOVE IN HOLE
		SET [illegible] SCREEN
		SURGED & PUMPED TILL CLEAR
		W/L = 6.99 - 2.04 = 4.95
		TD = 21.63 + .44 = 22.07
		ABOUT 2' OF SAND IN SCREEN
		SHOULD BE BROWN W/ AIR
		LOCATION ≈ 2' W + 6' S
		OF FIRE HYDRANT @ SITE Q
		WELL IS SET IN METER BOX

APPENDIX B

TECHNICAL MEMORANDA (Phase I Field Work)

TM 1	Soil Boring and Monitoring Well Installation
TM 2	Well Development of EPA Wells
TM 3	Staff Gauge Installation
TM 4	Geotechnical Borings
TM 5	Geotechnical Data Evaluation
TM 6	Private Well Sampling and Basement Air Screening
TM 7	Landfill Cap Soil Sampling
TM 8	Groundwater Sampling
TM 9	Surface Water and Sediment Sampling
TM 10	Test Pit Excavation and Geophysical Exploration Program
TM 11	Slug Testing and Analysis
TM 12	Waste Mass Gas Sampling
TM 13	Installation of Water Table Wells and Landfill Cap Sampling
TM 14	Wetlands Assessment and Identification
TM 15	Wetland Soil Sampling
TM 16	Water Level Measurements
TM 17	Health and Safety

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 1

DATE: January 16, 1991

TO: Vanessa Harris, Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.023
Himco Dump RI/FS

MONITORING WELL INSTALLATION

Introduction

Four deep groundwater monitoring wells were installed as described in Exhibit A, Field Sampling Plan Addendum to Volume 2, Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana. Drilling activities for these well installations began on November 27, 1990, and were completed December 15, 1990. These piezometers were installed to provide groundwater samples for chemical analysis and water elevations to be used in groundwater flow analysis. Steve Padovani and Tom Puchalski of Donohue & Associates, Inc., inspected the drilling and well installation activities, completed qualitative logs based upon visual inspection of cuttings liberated during air rotary drilling, performed and documented air monitoring using a photoionization detector and gasponder, and completed well installation documentation forms and activity logs. Drilling and well installations were completed by John Mathes and Associates, Inc. (Columbia, Illinois), with a TH 60, Ingersol Rand air rotary rig.

Methods

Drilling and well installation methods were performed as described in Exhibit A, Field Sampling Plan Addendum to Volume 2, Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana, Section 4.2.

Air rotary drilling was used to advance boreholes prior to the installation of piezometers. A 7-7/8-inch tricone bit was advanced ahead of 8-inch driven steel casing. No samples were retained from these four borings for piezometer installations, but the Donohue geologist completed an approximate log as drilling progressed based upon visual inspection of drill cuttings.

Piezometers were finished at the following depths: P101B, 98 feet; P101C, 165 feet, P102B, 65.4 feet; and P102C, 159.5 feet. Their locations are provided in Figure 1.

A typical piezometer installation began with steam cleaning of the 2-inch diameter stainless steel well casing and plastic 1-inch diameter tremie pipe. Following steam cleaning, the 5-foot screen (Dietrich 2-inch I.D., flush-threaded, 0.010-inch slot, Schedule 5, Type 304 stainless) and riser (Dietrich 2-inch I.D., flush-threaded, Schedule 5, Type 304 stainless) were wrapped with teflon tape at the joints and threaded together before being lowered into the borehole. Enough 10-foot stainless steel sections were threaded together to allow a 2.5-foot riser stickup to extend above the ground surface. Excess stickup was cut off with a pipe cutter. In P102B, the annular space between the well screen and the borehole wall were backfilled with number 10-20 silica sand (Colorado Silica Sand, Colorado Silica Sand, Inc., Colorado Springs, Colorado) to 3.4 feet above the top of the well screen. P101B, P101C, and P102C were installed with natural formation sand which collapsed onto the well screen from 2 to 4 feet above the top of the well screen.

The placement of the filter pack was followed by the installation of a 2.5- to 3-foot thick bentonite slurry seal. From the bentonite seal to approximately 3 feet from ground surface, the annular space was backfilled with a cement/bentonite grout. A concrete collar was used to cement the protective casing (steel 4-inch diameter) in place. Vented, threaded PVC caps were installed at the top of the 2-inch risers. Protective casings were supplied with locking lids. Boring logs are provided in Appendix A. Well installation diagrams are provided in Appendix B.

Deviations

Intermediate piezometer P102B was installed at 65.4 feet rather than 100 feet since a silt and silty clay layer approximately 34 feet thick was logged beginning at approximately 65 to 70 feet while the boring for P102C was drilled. P102B was installed directly above this confining unit.

P102C was intended to be installed at 175 feet, however, a fine dense sand unit encountered at about 120 feet slowed down the rate of casing advance to less than 20 feet per hour. Very little water was being produced from this zone. Because driving casing became slowed to the point of futility, the well was installed at 159.5 feet by drilling beyond the 140-foot bottom of the 8-inch casing.

P101C was also intended to be installed at 175 feet, however, a large hole developed beneath the back of the rig by settling of sand during casing pounding. This problem, in addition to sand heaving up into the 8-inch casing, forced the installation to occur at 165 feet.

A natural formation sand was used in place of the specified filter pack sand in P102C, P101B, and P101C since sand immediately collapsed the borehole as the drill bit was removed. The 2-inch casing was installed beyond the bottom of the 8-inch casing by jetting water with a tremie pipe while allowing the weight of the 2-inch casing to sink it down to the previously drilled depth. Most of the jetted water circulated back up the 8-inch casing and was not lost to the formation.

Head pressures and loose formation sand also account for natural sand which blew up within the 8-inch casing before the bentonite slurry seal could be installed to the base of the 8-inch casing. Up to 2 feet of sand flowed up into the 8-inch casing prior to seal installation. Specific depths of seal placement are provided for each well in Appendix B.

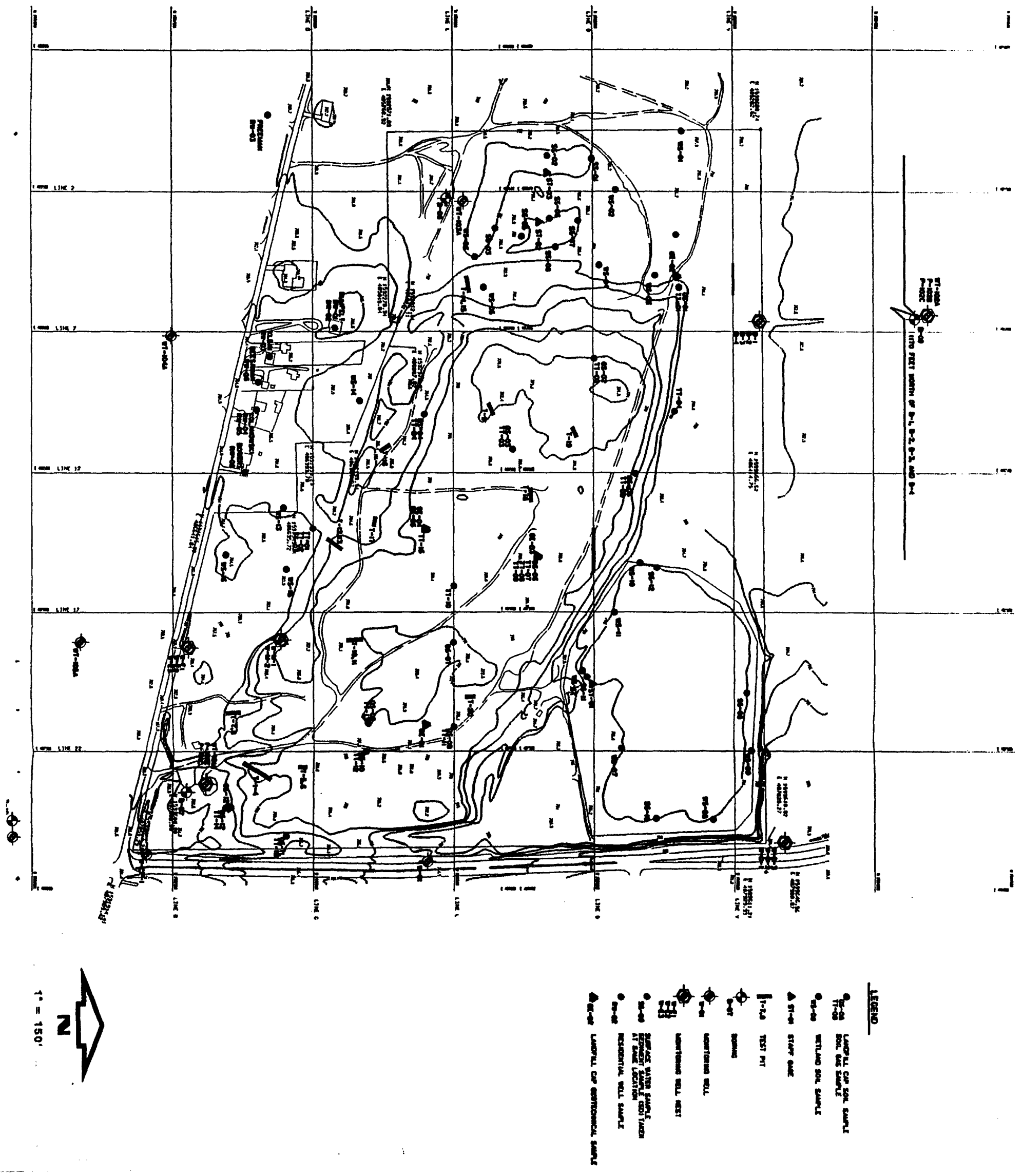
Summary of Results

No samples were retained for this task. The stratigraphy at these locations is provided by boring logs for water table well locations and geotech borings.

The most significant challenge to overcome during these well installations was due to sand heaving up into the 8-inch casing while well installations were being done. The rate of sand heaving was fast enough so that by the time the drill stem was broken and pulled from the boring, up to 70 feet of sand had heaved up into the 8-inch casing. This sand had to be removed prior to well installation.

The sand was cleared from the casing at P102C by jetting water down into the 8-inch casing as the 2-inch casing was installed. Sand and water circulated up and out of the 8-inch casing which allowed the 2-inch casing to drop. Once the sand was removed from the 8-inch casing, further jetting below the 8-inch casing allowed the 2-inch casing to drop below the 8-inch casing and, therefore, expose the 2-inch casing to the formation. This method was required to expose the screen below the 8-inch casing because attempts to pull the casing up were not successful. Shallower installations at P101B and P102B, however, were installed by pulling the 8-inch casing up while the 2-inch casing remained stationary. The installation at P101C required additional effort since the 8-inch casing could not be pulled up, and jetting was not successful beyond the bottom of the 8-inch casing. After two attempts at jetting the well in place, the boring was overdrilled 10 feet and then jetted. This third attempt was successful.

A/R/HIMCO/AH4



MAY 1991

FIGURE 1
SITE LOCATION MAP
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20028

Donohue ENGINEERS ARCHITECTS SCIENTISTS

APPENDIX A

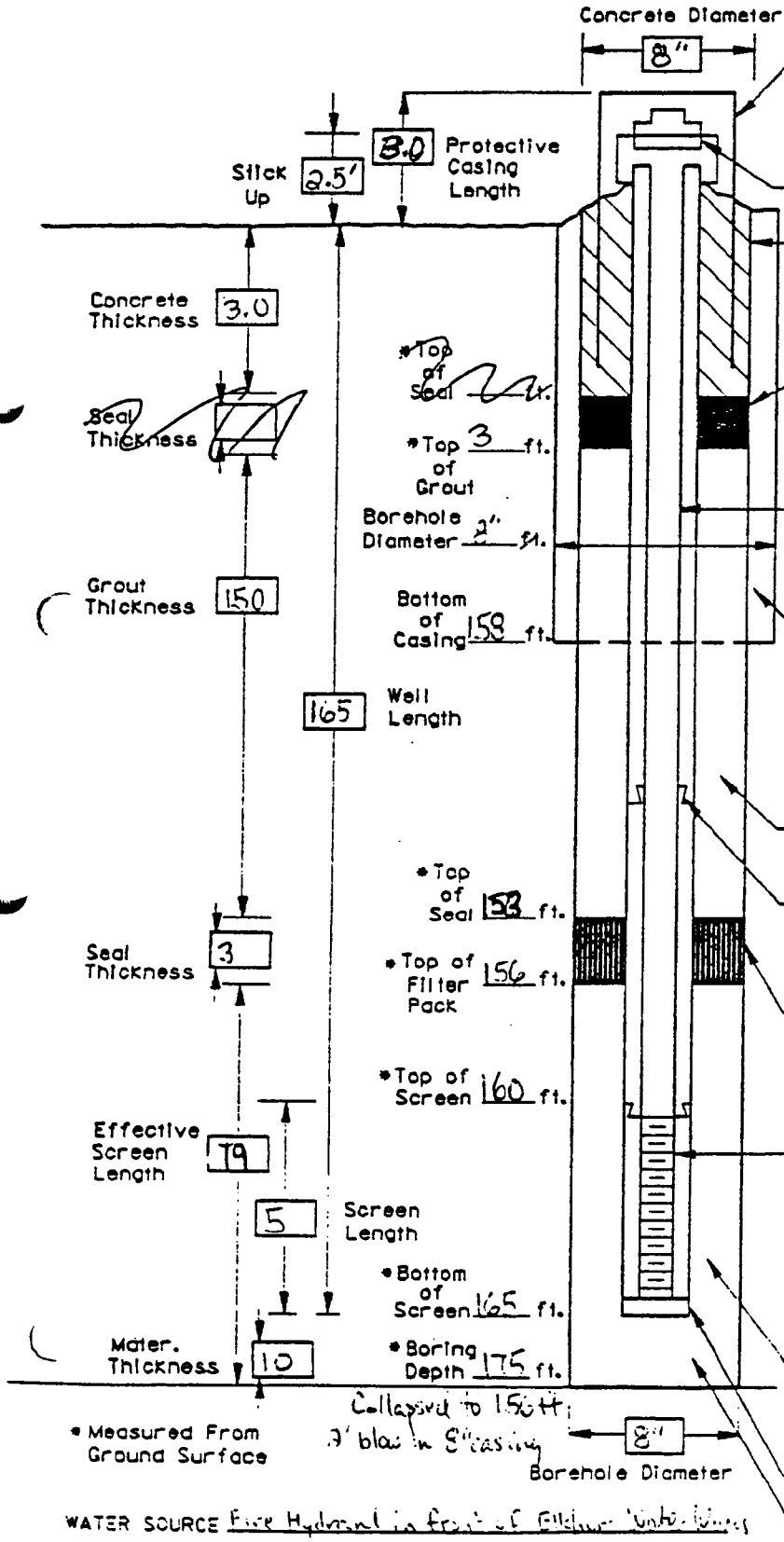
APPROXIMATE BORING LOGS

Donohue Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM

Form 1

Site: HIMCO DUMP Date: 12/12/90
Inspected By: Tom Pudvak Project No. 30006.023 Well No. P1C1C
Driller/Contractor MAX TINNIN, DON BREWINGTON/MATHES



PROTECTIVE CASING
Type Steel Vented Yes/No
Diameter 4" Locked Yes
Length 6.0' Key * KA675

GUARD POSTS
Type Steel/Concrete National fill

CAP OR PLUG Vented Yes/No Type PVC

CONCRETE COLLAR
Cement 5 lbs. + Water 2½ gal.
Total Quantity 6 gal
Manufacturer Rite Mix

UPPER SEAL
Powder/Granular/Pellets Quantity gal
Hydrated gal., Time
Manufacturer

PIPE Type Stainless Steel Schedule 5 Type 304
O.D. 2.4" I.D. 2.0"
Length/Sec. 10 feet No. Of Sec. 16+1 cut
Manufacturer Dietrich 9 Threads/ft.

GROUT Type Cement/Bentonite 32% Bentonite
Mix 846 lbs. of TYPE I A Portland +
45 lbs. of Bentonite powder +
Water 80 gals. Total Quant. 150 gal.
Manufacturers Portland-Lafarge Bentonite Wyo-Ben

OUTSIDE GROUT Type
AMOUNT

JOINTS Flush Threaded Yes/No
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer Dietrich

LOWER SEAL
Powder/Pellets Quantity 10 lbs gal.
Hydrated Slurry 10 gal., Time
Manufacturer NATURALGEL WYO-BEN PRODUCTS

SCREEN
Type Continuous Wrap Stainless Schedule 5
Length/Sec. 5 ft No. of Sec. 1
O.D. 2.4" I.D. 2.0"
Slot Size .010 No. Slots/ft.
Manufacturer Dietrich

FILTER PACK Type(s) Natural Formation
Source Fine Silt Sand Volume gal.
Manufacturer

PLUG OR CAP Type Stainless Length 1"

MATERIAL Natural Formation - SM

WATER SOURCE Fire Hydrant in front of Fitchburg Water Works

Form 104

Donohue

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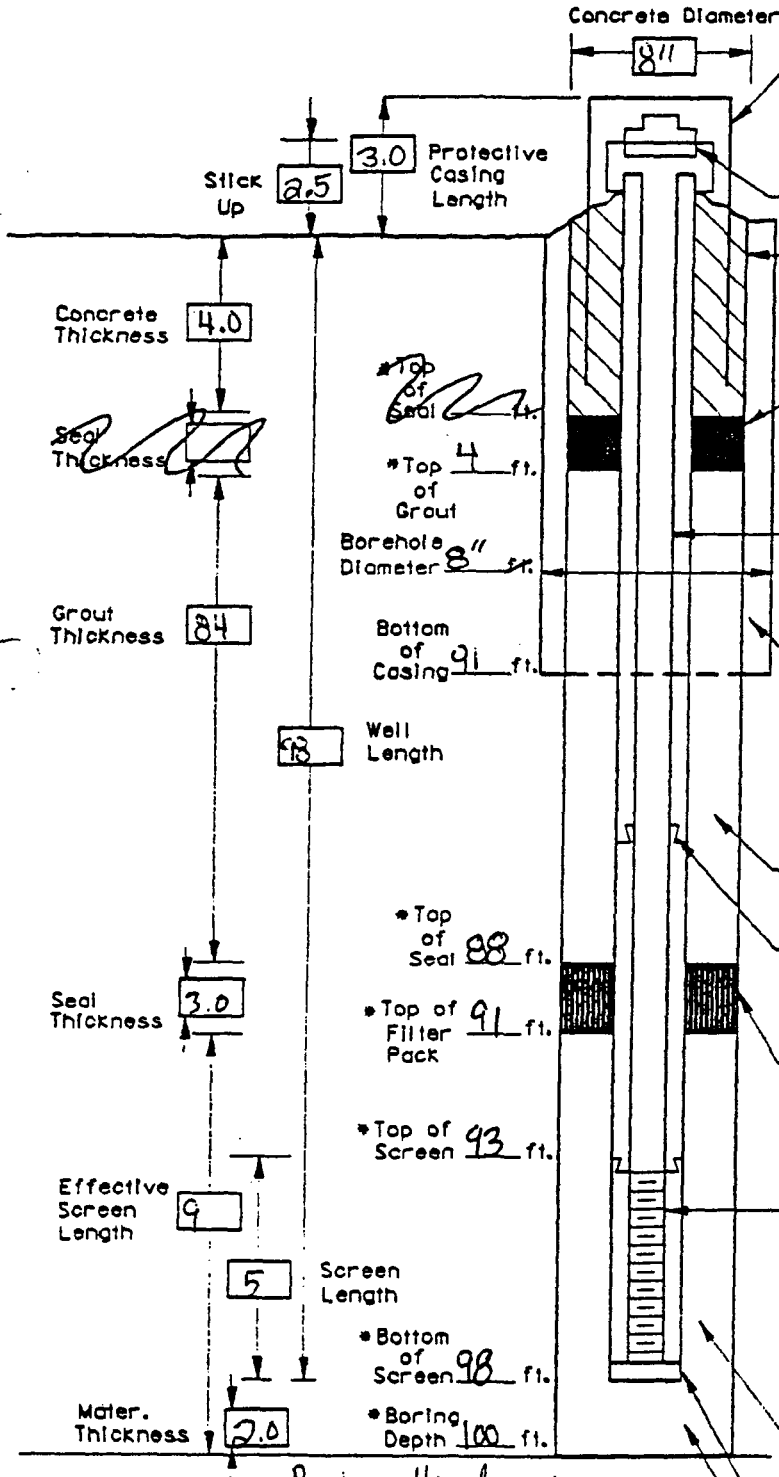
COMPUTER AIDED DESIGN/DRAFTING

DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM

Site: Himco Dump Date: 12/14/90
Inspected By: Tom Pudhalski Project No. 20026.023 Well No. P101B
Driller/Contractor Max Tinnin Don Brewington / Mathes



* Measured From Ground Surface

Boring collapsed on screen and out of 8" casing as it was pulled

PROTECTIVE CASING
Type Steel Vented Yes/No Type Steel/cement filled
Diameter 4" Locked Yes National
Length 6.0' Key * KA675

GUARD POSTS

CAP OR PLUG Vented Yes/No Type PVC

CONCRETE COLLAR
Cement 165 lbs. + Water ~~12~~ 5 gal.
Total Quantity 12 gal.
Manufacturer Rite Mix

UPPER SEAL
Powder/Granular/Pellets Quantity ~~gal~~
Hydrated ~~gal.. Time~~
Manufacturer

PIPE Type Stainless Steel Schedule 5 Type 304
O.D. 2.4" I.D. 2.0"
Length/Sec. 10 feet No. Of Sec. 10
Manufacturer Dietrich

GROUT Type Cement/Bentonite Batch 12/14
Mix 846 lbs. of Type I A Portland +
45 lbs. of bentonite powder +
Water 80 gals. Total Quant. 150 gal.
Manufacturers Portland-Lafarge Bentonite WYO-BEN

OUTSIDE GROUT Type
AMOUNT

JOINTS Flush Threaded Yes/No
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer Dietrich

LOWER SEAL
Powder/Pellets Quantity 10 lbs ~~gal~~
~~Hydrated~~ Slurry 15 gal.. ~~Time~~
Manufacturer Naturalgel WYOBEN PRODUCTS

SCREEN
Type Schedule
Length/Sec. 5 ft No. of Sec. 1
O.D. 2.4" I.D. 2.0"
Slot Size .010 ~~No. Slots/ft.~~
Manufacturer Dietrich

FILTER PACK Type(s) Natural Formation Sand
~~Source~~ Fine silty Sand ~~Volume gal.~~
~~Manufacturer~~

PLUG OR CAP Type Stainless Length 1"

MATERIAL Natural Formation Fine grained Silty Sand

WATER SOURCE Fire hydrant in front of Elkhart Water Works

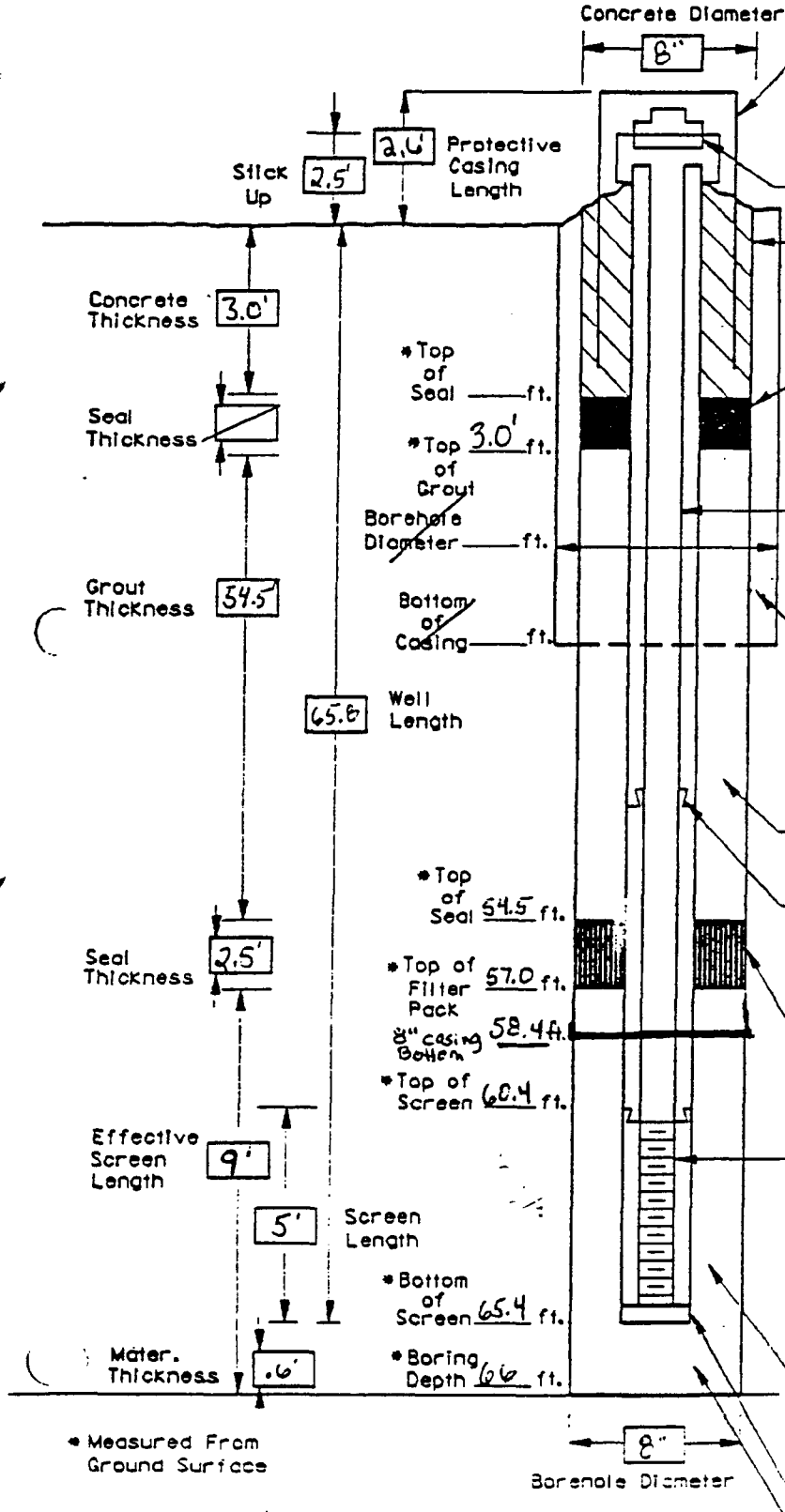
Notes:

Donohue Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM

Form

Site: Himco Dump Date: 12/2/90
Inspected By: S. Padovani Project No. 20026 Well No. P102B
Driller/Contractor Max Tinnin / Mathes



* Measured From Ground Surface

PROTECTIVE CASING
Type Steel Vented Yes/No Type Lose fitted
Diameter 4" Locked Yes
Length 4' Key # 192-641

CAP OR PLUG Vented Yes/No Type PVC

CONCRETE COLLAR
Cement 50 lbs. + Water .5 gal.
Total Quantity ____ g
Manufacturer ____

UPPER SEAL
Powder/Granular/Pellets Quantity ____ g
Hydrated ____ gal.. Time ____
Manufacturer ____

PIPE Type Stainless Steel Schedule 5
O.D. 2 3/8" I.D. 2"
Length/Sec. 10' No. Of Sec. 6
Manufacturer Diedrich

GROUT Type ____
Mix ____ lbs. of ____ +
____ lbs. of ____ +
Water ____ gals. Total Quant. ____ gc
Manufacturers ____

OUTSIDE GROUT Type Bentonite-Portland Mix
AMOUNT 9 gal H2O, 9 bags portland (94 lb/bag), 45 lbs ben

JOINTS Flush Threaded Yes/No
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer ____

LOWER SEAL
Powder/Pellets Quantity 5 gc
Hydrated by formation water gal.. Time 1100
Manufacturer Lafarge

SCREEN
Type Stainless Steel Schedule 5
Length/Sec. 6.8' No. of Sec. 1
O.D. 2 1/4" I.D. 2"
Slot Size 10 No. Slots/ft. 180
Manufacturer Diedrich

FILTER PACK Type(s) Natural grain w/#40 .3mm
Source Ozark Mountains Volume ____ gc
Manufacturer General Minerals

PLUG OR CAP Type Stainless Steel Length 1.5'

MATERIAL Sand + Gravel

GUARD POSTS
Type Lose fitted

WATER SOURCE Elkhart Municipality

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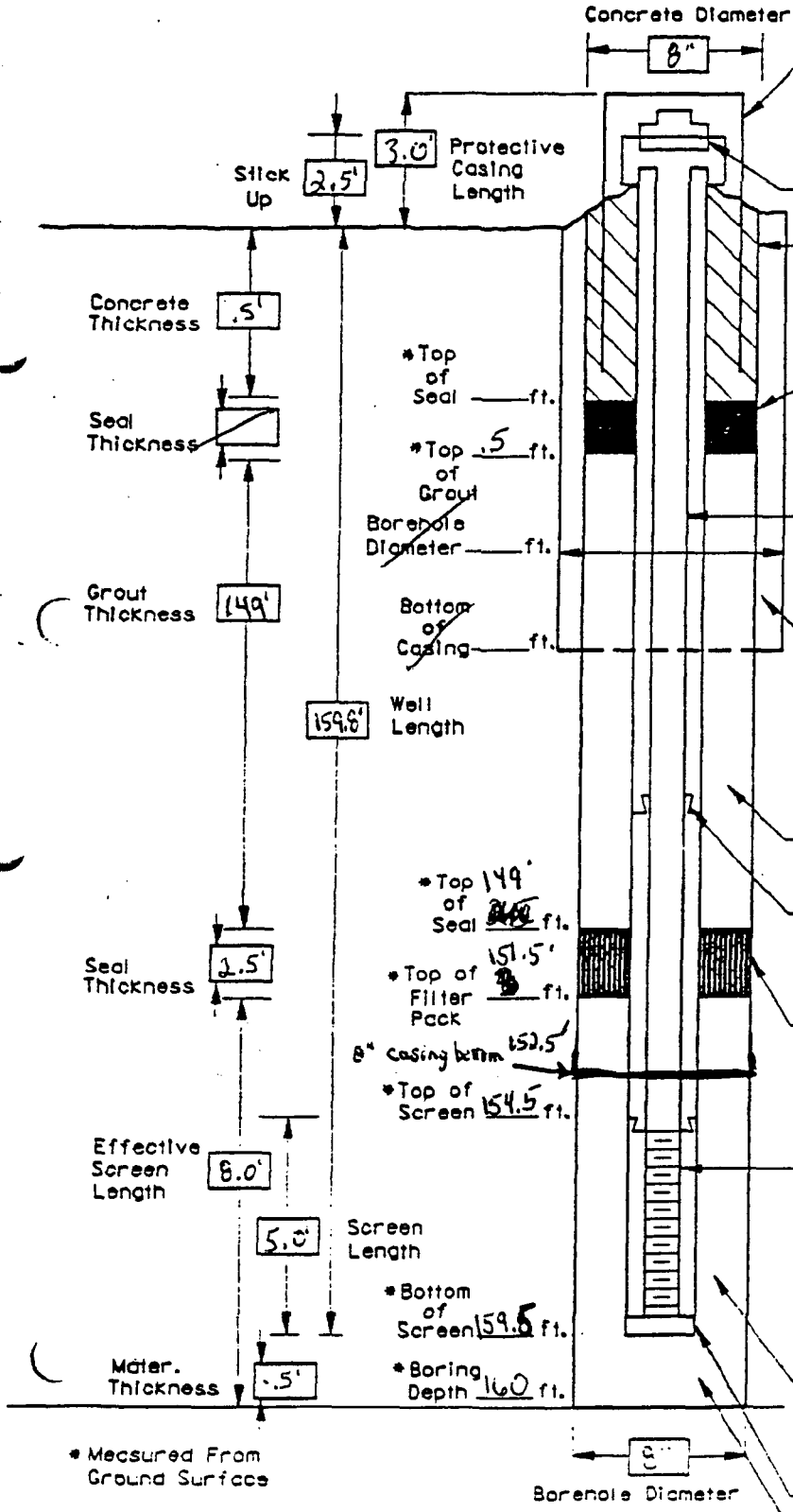
DOUBLE CASING WELL/PIEZOMETER INSTALLATION DIAGRAM

Form 1C

Site: Himco Dump Date: 12/1/90
Inspected By: S. Paderani Project No. 20026 Well No. P102C
Driller/Contractor Max Tinnin / Mathes



* Measured From Ground Surface

PROTECTIVE CASING
Type Steel Vented Yes/No
Diameter 4" Locked Yes
Length 4' Key # 192-641

GUARD POSTS
Type Loose Fitted

CAP OR PLUG Vented Yes/No Type

CONCRETE COLLAR
Cement .50 lbs. + Water .5 gal.
Total Quantity gal
Manufacturer

UPPER SEAL
Powder/Granular/Pellets Quantity gal
Hydrated gal., Time
Manufacturer

PIPE Type Stainless Steel Schedule 5
O.D. 2 3/8" I.D. 2"
Length/Sec. 10 ft/sec. No. Of Sec. 16 + 1/4 ft.
Manufacturer Diedrich

GROUT Type
Mix lbs. of +
lbs. of +
Water gals. Total Quant. gal.
Manufacturers

OUTSIDE GROUT Type Cement-bentonite grout - Volclay
AMOUNT 425 gal

JOINTS Flush Threaded Yes/No
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer

LOWER SEAL
Powder/Pellets Quantity ~10 gal.
Hydrated gal., Time
Manufacturer Lafarge

SCREEN
Type Steel Schedule 5
Length/Sec. 16.8 No. of Sec. 1
O.D. 2 1/4" I.D. 2"
Slot Size 10 No. Slots/ft. 180
Manufacturer Diedrich

FILTER PACK Type(s) Natural Material 160-154.5 Sw 240
Source Clark Mountains Volume gal.
Manufacturer General material

PLUG OR CAP Type Steel Length 1.5"

MATERIAL Fine Sand

WATER SOURCE Elkart - Main St. Station water treatment

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BORING LOG

SOIL BORING NO. P10iB

SITE: Himco Dump PROJECT NO. 30036.033

DRILLING METHOD: 7 7/8" Blade bit Air rotary 8" drive casing

LOG BY: TOM PUCITALSKI
DRILLER: John Mathes / Mike Tinnin
WEATHER: 30s, windy w/ Don Brewington

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Grass field

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/13/90
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
0		SM											
10		SM	10 YR 4/1 Dark Grey Medium Grained Silty Sand, wet							1600	0	21.3 / 0.0	0.0 / 0.0
20													
30		GP	Poorly graded Gravel 85% 1" dia. shang, igneous & black igneous, 30% orgin dark grey sand, saturated							1645	0	21.3 / 0.0	0.0 / 0.0
40													
50		SM	10 YR 4/1 Dark Grey Silty Sand, medium grained, saturated							1730	0	21.3 / 0.0	0.0 / 0.0
60			SOP wet 12/13/90 START dry 12/14/90										
70		GW	Well graded GRAVEL 85% 1/2-3" shard & shang gvl 15% medium grained sand										
80		SM	10 YR 5/1 Grey SILTY SAND 60% fine grn sand, 40% silt wet							1109	0	21.3 / 0.0	0.0 / 0.0
90		~~SM~~											
100		SM	10 YR 5/2 Grayish Brown SILTY SAND 70% fine grn sand 30% silt, saturated							1330	0	21.3 / 0.0	0.0 / 0.0

This is an approximate log based upon cuttings blown out of the boring during air rotary drilling.

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BORING LOG

SOIL BORING NO. P1020

SITE: Himco Dump PROJECT NO. 20026

DRILLING METHOD: Air Rotary

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:

LOG BY: S. Padovani
DRILLER: Max Tinnin - Mathes
WEATHER: Cold

PHYSICAL SETTING:

DATE START: 11/30/90
DATE COMPLETE: 11/30/90
WELL INSTALLATION: 11/30/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL
			Brown medium to coarse grained sand with gravel							1440	.2	20.8/0
10												
20			Poorly sorted grey Sand + Gravel							1530	.2	20.8/2
30												
40			Poorly sorted Sand + Gravel							1615	-	20.7/3
50												
60			Poorly sorted Sand w/ Gravel							1740	.2	21.0/3
70			medium grained sand w/ trace clay chunks									
			~~Clay~~ Silty fine grained sand									
80			Sandy Silt									
			Sandy Silt / Silt							1000	.2	21.0/0
90												
			Silty clay / clay DRY!!!									
100												
			Clay (tight)							1130	.2	21.0/0
110												
			Brownish well sorted medium grained sand. ~~Some~~ Trace gravel pieces @ 116'									
120			Brownish well sorted ~~Coarse~~ Fine grained							1230	.2	21.0/0
			Sand									
130			VERY TIGHT FORMATION - Not much water									
			Takes 1½ hours to drive 30 feet									
140												
			BLIND DRILLING									

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BORING LOG

SOIL BORING NO. (P102)

SITE: Homco Dump PROJECT NO. 20026

DRILLING METHOD: Air Rotary

LOG BY: S Padovani
DRILLER: Max Tinn - Mathes
WEATHER: Cold

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/28/90
DATE COMPLETE: 11/30/90
WELL INSTALLATION: 11/30/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2/LEL
			Brownish well sorted V. Fine grained sand							1500	.2	20.9%
150			Tight!!! very little water									
160			Pounding the casing has become futile - Tom P. the drillers, and I agreed to set well screen at this depth									
170												
			COMMENTS: 8" steel casing Down to 152.5'									
			: These Soil descriptions and depths are approximate!									
			BLIND DRILLING									
			* 500 gallons of water put down well to hold formation back at 160' However, most of this water exits out of the top of the 8" casing and does not enter the formation GBP 12/16/90									

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BORING LOG

SOIL BORING NO. P102B

SITE: Himco Dump PROJECT NO. 20026

DRILLING METHOD: Air rotary w/ 8" casing driver

LOG BY: S. Paberuni
DRILLER: Max Tinnon
WEATHER: Cloudy, Cool 40°F

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/30/90
DATE COMPLETE: 12/1/90
WELL INSTALLATION: 12/1/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL
			Brown medium to coarse gravel							1130	.2	20.8/0
10			Sand with gravel									
20			Poorly Sorted sand + Gravel							1500	.2	20.8/0
30												
40			Poorly sorted Sand + Gravel							1550	.20	20.8/0
50												
60			Poorly sorted sand + gravel - Trace clay chunks							1745	.20	20.8/0
			PLENTY OF WATER									
			BLIND DRILLING									

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BORING LOG

SOIL BORING NO. P101C

SITE: Himco Dump PROJECT NO. 20026

DRILLING METHOD: Air Rotary with casing driver

LOG BY: S. Pedovani

DRILLER: Mike Tinnin-Mathes

WEATHER: cold/rain mixed w/ snow - High winds

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Grass field

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 12/3/90

DATE COMPLETE: 12/12/90

WELL INSTALLATION: 12/12/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL
			Multicolored ~~med to~~ coarse grained sand with pebbles							1000	.2	20.8/0
10												
20			Poorly sorted multicolored medium to coarse grained sand with pebbles							1600	.2	20.8/0
30												
40			SAND + Gravel							1700	.2	20.8/0
50			Multicolored medium to coarse grained sand w/ pebbles									
60												
70												
80										1100	.2	20.8/0
90			Fine to medium grained sand									
100			Fine to medium grained sand							1100	.2	20.8/0
110												
120			medium grained sand w/ <10% fine grained sand							1200	.2	20.8/0
130												
140			BLIND DRILLING									

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. P-101C

SITE: Himco Dump PROJECT NO. 20026.023

DRILLING METHOD: 7 1/2" Blade bit
140-165 Air rotary 0-140 wash 140-165
0-140 7 1/2" tricone
LOG BY: TOM PUCHALSKI
DRILLER: MAX TINNIN DON BREWINGTON
WEATHER: Clear, 40s, SE wind 10-15mph

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Grass field

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/3/90
DATE COMPLETE: 12/12/90
WELL INSTALLATION: 12/12/90

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL	H_2S
140		SP	10YR 5/3 Brown SAND, saturated										
150		SM	152' 10YR 5/2 Grayish Brown SILTY SAND 30-40% silt - Rest fine sand										
		CL	Gray SILTY CLAY - On bit							1127	0	21.6/0.0	0
160		CL	Gray SILTY CLAY - On drill bit Wash rotary to 165' 12/12/90 858										
170			LOST ~~200~~ ~100 gallons to formation 1515 12/12/90 SEP										
			LOST ~160 gallons inside casing during attempted well installation on 12/11/90 ~~858~~ SEP										
180													

EOB 175' 12/12/90 1528 SEP

This log is approximate. It is based on cuttings produced during air rotary drilling.

TECHNICAL MEMORANDUM - NO. 2

ORIGINAL

DATE: January 23, 1991

TO: Vanessa Harris - Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 175L4J
Donohue Project No. 20026.024
Himco Dump

WELL DEVELOPMENT

Introduction

All newly installed groundwater monitoring wells at the Himco Dump site in Elkhart, Indiana, were developed a minimum of 24 hours after their installation. Water table wells were developed on November 13 and 14, 1990, and piezometers were developed December 15 and 16, 1990. Developed water table wells include WT101A, WT102A, WT103A, WT104A, WT105A, and WT106A. Developed piezometers include P101B, P101C, P102B, and P102C. The locations of these wells are provided in Figure 1 of this memorandum. Water table wells were developed by John Mathes & Associates, Inc., and Eric Slusser of Donohue & Associates, Inc. Piezometers were developed by Max Tinnin and Don Brewington of John Mathes & Associates, Inc., and Tom Puchalski of Donohue & Associates, Inc. Wells were developed to remove sediment from the well and to allow the maximum amount of groundwater to enter the well for groundwater sampling. Well development helps assure that a representative groundwater sample is obtained.

Methods

Well development was carried out as specified in the Final Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study Elkhart, Indiana, Section 4.2.2.3.

The development method for water table wells was different from the development method for piezometers. Water table wells were pumped by hand using a Brainard Killman hand pump.

Piezometers were developed using compressed air provided by the TH60 drill rig. An air purging device developed by John Mathes & Associates, Inc., was used. This device consists of a compressed air line attached to a tube directed down into the well which takes an 180-degree bend upward into the base of a 1-1/2-inch I.D. plastic water hose. The air lifts the sand and water up through the plastic hose. This method was used for these deep

wells because a high volume of water and sand was required to be removed in a short amount of time.

Pumps with sufficient pumping rates are not available for 2-inch wells. The air developer served to remove the sand from the well and purge the groundwater in a reasonable amount of time.

Pumping of the well continued until at least five well volumes were removed and the purge water was silt free, the water temperature was stabilized to $\pm 0.5^\circ$ C, pH was stabilized to ± 0.1 units, and conductivity was stabilized to ± 10 percent.

Measurements of pH, conductivity, color, temperature, and turbidity were recorded at least once after each of the five well volumes were purged.

Deviations

High pressure hot water washing of the Brainard Killman hand pump and the air development pump was used for decontamination between wells instead of soap and water, isopropanol, and deionized water as was described in Section 4.2.2.4 of the sampling plan. The lengths of PVC connections and lengths of the exit hose and air compressor hose were not easily cleaned by hand. The high pressure hot water wash provided a quicker and more thorough method of decontamination for this equipment.

The sampling plan specified using a submersible pump for well development. The air development device used by Mathes for the development of the piezometers was used in place of a submersible pump. No submersible pump is available which could pump out the sand and purge the groundwater as quickly from a 2-inch well as did the air development tool.

Summary of Results

Copies of completed field forms are provided in Appendix A. The development methods successfully cleared the sand and silt from the installed groundwater monitoring wells and removed the required purge volumes so that a representative groundwater sample could be collected after the wells had stabilized for a minimum of two weeks. All groundwater wells provided sufficient groundwater volume to conduct groundwater sampling.

TP/ds

A/R/HIMCO/AA9

APPENDIX A

WELL DEVELOPMENT DATA

Sheet ____ of ____

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Well Development

Project No. 20026.023 Site Hinco Dump

Method of Development Pumped X Bailed ____ Blown ____ Surge Block ____

Equipment ____ Airlift ____ N2 Lift ____ In. Bailer ____ Length 5 Ft. Material ____

Pump PVC Manufacturer Brandid Kilmer Diameter 1 1/4" 10 5' section

Description of site (weather, temp, soil conditions) Cool, sunny mid 40s

11-13-90

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
WT106A 11:15	9.38	18.47	4		7.33	501	Br	N?	54.9	V turb.	11:37 initial
11:44			16		7.11	869	Lt Br		54.1	turb.	
11:45			24		7.11	876	Lt Br		54.1	Slightly turb.	
1149			32		7.08	895	V Lt Br		54.1	Slightly turbid	
11:53			40		7.11	894	V Lt Br		54.1	V slight	
12:05			50	9.38	7.13	898	clear		54.4	Clear	

Additional Notes: 2" well πr^2 7.48 = 0.163 WC = 9.09 9.09 x 0.163 = 1.

8" sand pack 2.611 x 9.09 = 23.73 x .3 = 7.12

7.12 - 1.48 = 5.64 Sand pack 3.56 - 2" well

~~5.64 + 1.48 = 7.12 1 well~~ vol gal

~~2.48~~ x 1.48 + 6.68 = 8.16 1 well vol

22.25

Entered on computer ____ Signature [signature] Date 11/14/90

Sheet ____ of ____

Donohue
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Well Development

Project No. 20026.023 Site Himco Dump

Method of Development Pumped X Bailed ____ Blown ____ Surge Block ____

Equipment ____ Airlift ____ N2 Lift ____ In. Bailer 1 1/4" Length 5 Ft. Material ____

Pump PVC Manufacturer Bramaid Kilmer Diameter 1 1/4" 10 5' Section

Description of site (weather, temp, soil conditions) warmer sunny 40's - 46°

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
WT 105A 2:44	10.20	18.52	8		7.77	363	Br	?	53.2	V turbid	Pumping 2:42
2:49			16	12	7.79	435	Br		52.6	turbid	
2:53			24		7.81	430	Br		52.5	turbid	
15:10			32		7.89	399	Br		50.0	turbid	
15:16			40		7.90	410	Lt Br		50.1	turbid - slightly turbid	
15:20			55	10.29	7.92	412	Lt Br		50.3	turbid - slight	

St 2:35 set-up 11-13-97

Additional Notes: W = HD 2" well .163 8" 2.661

W = 8.32

S = ~~[illegible]~~ [(H x B) - W] x .3

T = W + S

2" H x D = .163 x 8.32 = 1.36 1 well vol - 2" pin

8" = [(2.661 x 7.34) - (1.36)] x .3 = Sand pack

21.72 - 1.36

[20.36] x .3 = 6.11 + 1.36 = 7.47 = 1 well vol bore well and sand pack

W Water well vol
H height of Colu.
D diam. borehole diam
T total vol of well + Sand pack.
B Borehole diam

Entered on computer ____ Signature ____ Date / /

Sheet ____ of ____

Donohue
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Well Development

Project No. 20026.023 Site Hinco Dump

Method of Development Pumped X Bailed ____ Blown ____ Surge Block ____

Equipment ____ Airlift ____ N2 Lift ____ In. Bailer ____ Length ____ Ft. Material ____

Pump PVC Manufacturer Brainard Kilman Diameter 1 1/4" 5' section

Description of site (weather, temp, soil conditions) Warm Sunny 45°

11-13-97

Setup 4:50

5:06

Surging

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
WT-104A 5:08	12.34	18.66	3		8.4	208	Br	N	49	v turbid	
5:10			6		8.48	218	Br	N	49.8	v turbid	
5:12			18		8.50	219	Br	N	51.2 ~~49.9~~	turbid	
5:15			24		8.52	224	Lt Br	N	51.6	turbid	
5:21			30	12.31	8.40	218	Lt Br	N	51.1	turbid	

Additional Notes: W = HD = 1.03 2" well H = 6.32 water column

S = [(H x D) - W] .3 = [(2.611 x 6.32) - 1.03] .3 =

T = W + S (16.50 - 1.03) .3

(15.47) .3 = 4.64 + 1.03 = 5.67 = 1 well vol

Entered on computer ____ Signature [signature] Date 11/14/97

Sheet ____ of ____

Donohue
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Well Development

Project No. 20026.023 Site Hines Drop

Method of Development Pumped X Bailed ____ Blown ____ Surge Block ____

Equipment ____ Airlift ____ N2 Lift ____ In. Bailer ____ Length ____ Ft. Material ____

Pump PVC Manufacturer Brainerd Kilmer Diameter 1 1/4" to 5' section

Description of site (weather, temp, soil conditions) Sunny Cool 40s

11-14-90
start
9:46

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
WT-103A / 9:49	6.05	18.44	3		7.79	665	Br	N	57.2	V turbid	Initial
9:55			22		7.69	675	Lt Br	Y	56.1	Slightly turb	Surged 5 min Iron Smell or Sulfur
10:07			33		7.68	687	Lt Br	Y	57.1	Slightly turbid	Iron or Sulfur Smell
10:11			44		7.61	711	clear	Y	57.5	clear	Slight Sulfur Smell ? or Iron
10:16			55		7.60	725	clr	Y	57.5	clear	

Additional Notes: 2" well .163 8" 2.611 H = 12.34 ft H = Water column

W = HD 0.163 x 12.34 = 2.01 gal. W 2" well volume

S = [(H x B) - W] 0.3 [(2.611 x 12.34) - (2.01) = (30.21)(.3) = B borehole dia

32.22 9.063

T = W + S T Sand pack and well well vol.

T = 9.063 + 2.01 = 11.07 gallons - 1 well vol including sand pack and pipe

Entered on computer ____ Signature [signature] Date 11/14/90

Sheet ____ of ____

Donohue
Engineers & Architects

Well Development

Project No. 20026.023 Site Himes Dump

Method of Development Pumped X Bailed ____ Blown ____ Surge Block ____

Equipment ____ Airlift ____ N2 Lift ____ In. Bailer 1 1/4" Length 5 Ft. Material ____
section

Pump PVC Manufacturer Brainard Kilman Diameter 1 1/4" ID

Description of site (weather, temp, soil conditions) Cool sunny 40s - 50s by noon

11-14-90

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
WT 102A 11:17	10.97	18.09	3		7.45	1160	Br	N	54.5	V turbid	muddy bot - surged 5 min
11:23			13		7.46	1322	Br	N	53.2	V turbid	Surge 5 min at 15 gal
11:30			19		7.40	1352	Br	W	52.8	" " turbid turbid	
11:34			26		7.45	1351	Br	N	53.3	"	
11:36			33		7.42	1370	Br	W	53.3	turbid	
11:44			55	10.98	7.42	1355	VLt Br	N	53.3	V slightly turbid	

Additional Notes: 2" .163 8" 2.611 H = height of water = 7.11 ft

W = HD = .163 × 7.11 = 1.16

S = [(H×B) − W] .3 = [18.56 − 1.16] .3 = 5.22 gal
17.40

total well & sand pack = W+S = 5.22 + 1.16 = 6.38 gal

S sand pack volume
B borehole diam
W well volume
T sand pack and well

Entered on computer ____ Signature Eric D Alm Date 11/14/90

Sheet ____ of ____

Donohue
Engineers & Architects

Well Development

Project No. 20026.023 Site Himco Dump

Method of Development Pumped X Bailed ____ Blown ____ Surge Block ____

Equipment ____ Airlift ____ N2 Lift ____ In. Bailer ____ Length ____ Ft. Material ____

Pump PVC Manufacturer Brainard Kilman Diameter 1 1/4" 10 5' sec.

Description of site (weather, temp, soil conditions) cool, sunny, low 50's

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
~~W-10 13:51~~	11.42	18.67	3		6.81	1319	Br	N	51.2	Vturbid	13.49 surging
14:00			13	1	6.73	1408	Br-Gr	N	51.1	turbid	surging at 13 gal 5 min
14:08			20		6.70	1419	Br-Gr	N	51.5	turbid	
14:11			27		6.70	1420	Lt Y Br-Gr	N	51.6	turbid	
14:13			34		6.74	1428	Lt Y Br-Gr	N	51.9	Slight H_2 turbid	
14:18			55	1.48	6.77	1414	Lt Y Br-Gr	N	51.4	Vsli, ltl turbid	

1:49-
11-14-90

Additional Notes: 2" 0.163 5" 2.611 H = 7.19' H = ~~thickness~~ of water column

W = H x D = .163 x 7.19 = 1.17 S = Sand pack volume

S = [(H x B) - W] 0.3 = (18.77 - 1.17) .3 = (17.60) .3 = 5.28 D - diameter ~~borehole~~ well

T = W + S 5.28 + 1.17 = 6.45 gal. - 1 well vol B diameter borehole

W well volume

T = Sand pack as well

Entered on computer ____ Signature Eric D. Shum Date 11/14/90

Donohue

Engineers & Architects

Well Development 12/15/96

Project No. 20026.023 Site Himco Dump

Method of Development Pumped ✓ Bailed _____ Blown _____ Surge Block _____

Equipment ✓ Airlift ~~WAC~~ N2 Lift _____ In. Bailer _____ Length 100 Ft. Material ASTM D2233 Plastic Exit Hose

Pump Air rig Manufacturer Mathes Diameter 3/4"

Description of site (weather, temp, soil conditions) 44°F, south wind 10-15mph, partly sunny, wet soil

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
P102C / 1324	10.57	136.81	15		5.91	478	Brown	N	51.2	High	Silty
1333			60		6.05	474	Lt Brn	"	51.2	Med	Silt settling out
1345			100		5.91	452	Lt Gray	"	51.0	Low	Silt settling out
1357			140		6.04	441	"	"	50.4	"	Silt & fine sand settling
1513			190		5.90	487	Clear	"	48.4	None	Fine sand ~ 1mm in jar
1526			215		6.18	476	"	"	10°C	None	"
1530			230	159.50	6.14	411	"	"	10°C	"	"

Additional Notes: Initial air surge blew sand from screen

Entered on computer _____ Signature _____ Date / /

Donohue
Engineers & Architects

Well Development 12/15/90

Project No. 20026.023 Site Himco Dump

Method of Development Pumped ✓ Bailed ____ Blown ____ Surge Block ____

Equipment ✓ Airlift ✓ N2 Lift ____ In. Bailer ____ Length 100 Ft. Material ASTM D2233 Plastic Hose

Pump Air supplied by Pig Manufacturer Mathes Diameter 3/4" exit hose

Description of site (weather, temp, soil conditions) 43°F, South wind 14 mph, partly sunny, soil wet

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
P1B2B 1200	9.90	67.29	30		5.93	604	Lt Grey	N	49.2	Slight grey	
1210			40		6.46	633	Clear	N	50.9	None	
1215			50		6.34	634	"	"	57.0	"	
1229			75		5.87	643	"	"	51.1	"	
1240			130		6.29	634	"	"	50.4	"	
1245			140		6.34	642	"	"	51.5	"	
1249			160		6.11	641			51.4		
1254	9.90	67.29		67.29							

Additional Notes: Initial air surge blew sand from screen.

Entered on computer ____ Signature ____ Date / /

Sheet 1 of 1

Donohue
Engineers & Architects

Well Development 12/15/90

Project No. 20076.023 Site Himco Dump

Method of Development Pumped ✓ Bailed ____ Blown ____ Surge Block ____

Equipment ✓ Airlift ____ N2 Lift ____ In. Bailer ____ Length 100 Ft. Material ASTM D2233 Plastic Exit Hose

Pump Air Rig Manufacturer Mathes Diameter 3/4"

Description of site (weather, temp, soil conditions) 40°F, south wind 10-20mph, overcast, wet soil

Well No. / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
PIOIC 1626	12.57	160.37			GEP	10/15/90					
1656			30		~~11.57~~	728	Clear	N	12°C	None *	pH meter malfunction
1706			70		*	677	Clear	N	12°C	None	can't recalibrate pH
1718			125			677	"	"	12°C	"	
1724			180			666	"	"	12°C	"	
1739			275			668	"	"	12°C	"	
1745			300			666	"	"	12°C	"	
		166.54		14.22							

Additional Notes: Initial air surge blew sand from screen

Entered on computer ____ Signature ____ Date / /

Donohue
Engineers & Architects

Well Development 12/16/90

Project No. 20026.023 Site Himco Dump

Method of Development Pumped ✓ Bailed ____ Blown ____ Surge Block ____

Equipment ✓ Airlift ____ N2 Lift ____ In. Bailer ____ Length 100 Ft. Material ASTM D2233 Plastic Exit Hose

Pump Air Rig Source Manufacturer Mathes devised pump Diameter 3/4"

TH60 Ingersol Rand

Description of site (weather, temp, soil conditions) 40°F, calm, overcast, foggy, drizzle, wet soil

Well No / Time	Depth to Water	Depth to Bottom	Volume Removed (gal.)	Depth After	pH	Cond.	Color	Odor Y/N	Temp.	Turbidity	Comments
PI013 815	9.57	92.80	50		7.18	802	Clear	N	52.4	None	No sand or silt
" 833			80		7.26	1010	"	"	11°C	"	"
" 840			150		7.35	1090	"	"	12°C	"	"
" 848			190		7.29	1118	"	"	12°C	"	"
" 855			225		7.29	1119	"	"	11.5°C	"	"
" 904			300		7.26	1173	"	"	12°C	"	"
" 910	10.52	100.60		100.60							

Additional Notes: Initial air surge blew sand out of screen

Entered on computer ____ Signature ____ Date / /

ORIGINAL

TECHNICAL MEMORANDUM - NO. 3

DATE: January 21, 1991

TO: Vanessa Harris, Site Manager

CC: Marcia Kuehl, RI Lead
Roman Gau, Project Manager
Mike Crosser, TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 175L4J
Donohue Project No. 20026.024
Himco Dump

STAFF GAUGES

Introduction

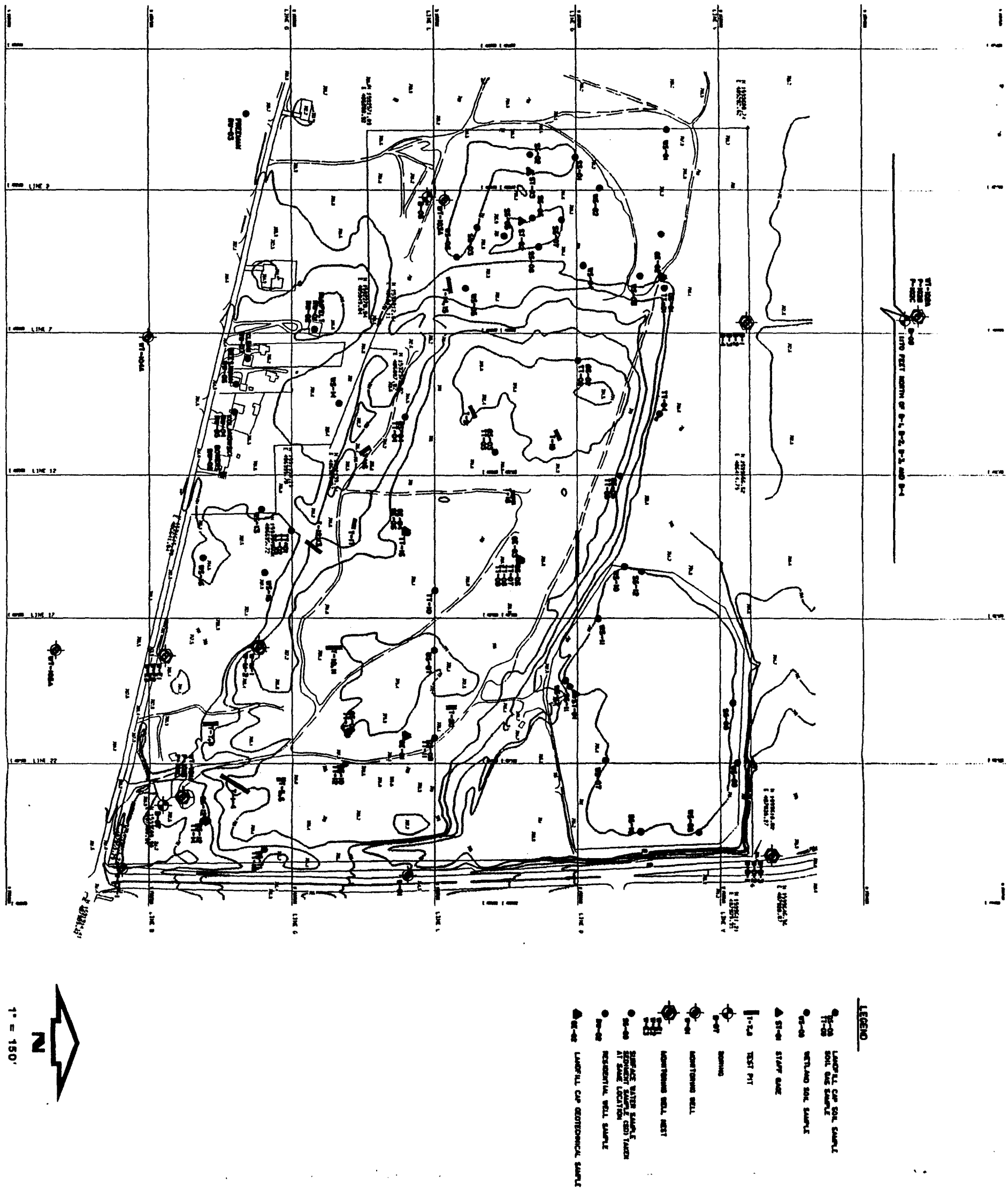
Three staff gauges were installed at the Himco Dump Site; one was installed in the gravel pit pond at the northeast area of the site, one was installed at the "L"-shaped fish pond at the southwest corner of the site, and one was installed at the smallest pond on-site located east of the "L"-shaped fish pond (Figure 1). The posts for anchoring the gauges were installed on October 24, 1990, by Eric Slusser and Tom Puchalski of Donohue & Associates, Inc. The gauges were installed onto the posts by Anya Kirykowicz and Steve Spiewak on December 14, 1990.

The staff gauges were installed in order to gather surface water elevation data. The measurements were taken on the same days as groundwater elevations from monitoring wells so that interconnection of groundwater and surface water can be evaluated.

Methods

The installation of staff gauges proceeded as described in Section 4.3 Surface Water Hydraulic Monitoring of the Final Field Sampling Plan, Himco Dump RI/FS, Elkhart, IN. The actual material used for the anchor posts for staff gauges deviated from what was described in the sampling plan. Two-inch I.D. electrical conduit in 8- or 10-foot lengths were used in place of the coupled galvanized steel described in the plan.

Anchor posts were driven into the bottom sediments of the ponds with a post driver. Hip waders were used to allow the installation in water approximately 2 feet deep about 3 to 5 feet from the shoreline. About 4 feet of the posts remained above water after driving in-place to allow the attachment of a sheet metal rule marked to 0.01-foot.



MAY 1991

FIGURE 1
SITE LOCATION MAP
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20028

Donohue ENGINEERS ARCHITECTS SCIENTISTS

The sheet metal rules were attached to the anchor posts by bolts which pass through the rule and into the posts. Holes were drilled in the posts to accommodate the bolts by using an electric drill at each staff gauge location. A gasoline powered electric generator was used to power the drill. The sheet metal rules were anchored with the top of the rule flush with the top of the anchor post. The elevations of the tops of the anchor posts were surveyed by Lang Feeney of South Bend, Indiana, on December 16, 1990.

Deviations

The locations deviate slightly from those shown in Figure 4-1 of the sampling plan. While the ponds shown in Figure 4-1 all have gauges installed, Figure 1 of this memorandum more accurately locates the actual staff gauge locations within each pond. The locations were modified to account for shoreline and bottom sediment conditions which were most favorable for the staff gauge installations. The conditions include consolidated bottom sediments, which provide a sturdy anchoring of the post, and the absence of shoreline brush which makes accessing and reading the gauges difficult.

Summary of Results

A table of the observed surface water levels and groundwater monitoring well water level elevations are included in Appendix A. Measurements of the level of ice during months when the surface water was frozen do not accurately reflect the free water surface elevation and should not be used to evaluate surface water to groundwater connection.

TP/ke

A/R/HIMCO/AA6

APPENDIX A

WATER LEVEL MEASUREMENTS AND ELEVATIONS

19 lot 2

DONOHUE

WATER ELEVATION

Feb. 1, 1991

PROJECT NO. 20026 SITE Himco Dump

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY LOCKED	CAPPED	CRACKED	OBSTRUCT	COMMENTS
B-1		6.25			X	X			1052 No protective casing
B-2		6.15		13.88		X			1055
B-3		7.44		130.34	X	X			1059
B-4		6.45		175.16	X	X			1110
CP-1		3.82		20.19		X			1013 2/2/91 No protective casing
E-2		9.82		16.54		X			1612
E-3		11.11		175.65	X	X			1614
F-1		7.67		31.28		X			1755
F-2		14.08		147.83	X	X			1438
F-3		16.98			X	X			1453
G-1		12.48		52.02	X	X			1413
G-3		22.08		169.89	X	X			1424
I-1		9.48		172.92	X	X			1540
I-2		8.78		15.67		X			1544
I-3		9.14		32.15	X	X			1872
J-1		12.03		42.64	X	X			1514
J-2		10.29		17.81		X	X		1524 ~~2/2/91~~ SP 2/2/91
J-3		18.63		153.39	X	X			1520
M-1		15.61		103.24		X			1045 2/2/91
M-2		14.84		24.76		X			1050
N-1		8.81		29.22		X			0947 Flush
O-1		5.0		23.47		X			1820
O-1		8.34		29.97		X			0931
WT101A		9.96		18.70	X	X			1145
P101B		9.89		100.47	X	X			1152
P101C		9.78		106.53	X	X			1159
WT106A		7.87		18.50	X	X			1558
WT105A		9.0		18.56	X	X			1625
WT104A		10.75		18.69	X	X			1635
WT103A		5.28		18.47	X	X			1001 2/2/91
WT102A		10.17		18.18	X	X			0851 2/2/91

DESCRIPTION OF SITE F 1 1687 DTW = 11.38 DTB = 71.75

SOIL CONDITIONS O-1: Flush w/ground water = me tex cover to side casing filling

WEATHER hum. ice, water cap no screwed on TEMPERATURE

ENTERED ON COMPUTER ___ SIGNATURE ___ DATE ___

Pg 2 of 2

DONOHUE

WATER ELEVATION

PROJECT NO. 10026 SITE Hime Dump

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY				COMMENTS
					LOCKED	CAPPED	CRACKED	OBSTRUCT	
P10dB		9.85		67.25	X	X			0911 2/2/91
P10dC		10.27		159.96	X	X			0845 2/2/91
Staff01		—							Ice on Pond
Staff02		—							Ice on Pond
Staff03		—							Ice " "

DESCRIPTION OF SITE

SOIL CONDITIONS

WEATHER TEMPERATURE

ENTERED ON COMPUTER SIGNATURE DATE

DONOHUE

WATER ELEVATION

PROJECT NO 20026 SITE HIMCO DUMP - INITIAL WELL INVENTORY

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY: LOCKED	CAPPED	CRACKED	OBSTRUCT	COMMENTS
E-1?	771.11	[illegible]		21.38	X	X			11/6/90 [illegible]
E-2		11.02'		[illegible]		X			11/6/90 [illegible] NO PROTECTIVE [illegible]
E-3		12.99'		15.52		X			[illegible]
B-1		9.56'		22.25'		X			11/6/90 NOT [illegible]
B-4		9.55'		175.12'	X	X			11/6/90 NO PROTECTIVE CASING [illegible] EAST
B-3		7.34'		130.23'	X	X			11/6/90 NO PROTECTIVE CASING 5" ID
B-2		[illegible]		12.91'		X			11/6/90 NO PROTECTIVE CASING 2" ID
B-1		11.38'			X	X			11/6/90 NO PROTECTIVE CASING (NORTHWEST WEST) 5" ID
CP-1	UNABLE TO OPEN					X			11/6/90 NO PROTECTIVE CASING [illegible] UNDERGROUND
M-1		[illegible]		103.34'		X			11/6/90 [illegible]
M-2		[illegible]		[illegible]		X			11/6/90 [illegible] VENT PLUGGED
L-1		12.58		62.53	X	X			11/6/90 NO PROTECTIVE CASING, VENTED 5" ID, SILTY
L-2		10.46		186.0	X	X			11/6/90 NO PROTECTIVE CASING, VENTED 5" ID, SILTY
L-4		11.73		18.91		X			11/6/90 NO PROTECTIVE CASING, VENT IS PLUGGED 2" ID NO LOCKING CAP
I-3		9.38		22.20	X	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID CASING
I-1		10.67		172.82	X	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID CASING
I-2		0.05		15.64	NO	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 2" PVC
Q-1		5.87		23.69	NO	X			11/6/90 UNLOCKED FLUSH MOUNT WELL BOX NEXT TO HYDRANT, ACROSS FROM PAINT SPOT
J-1		11.65		42.70	X	X	X		11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID PVC
J-3		22.18		153.62	X	X			" "
J-2		9.76		17.80	NO	X			11/6/90 UNLOCKED, 5" ID PVC WELL VENTED CAP
F-2		17.06		147.85	X	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID PVC
F-3?		20.34		180.20	X	X			" " [illegible]
F-1?		9.5		31.25	NO	X			[illegible] NO PROTECTOR, [illegible] 5"
G-1		13.75		46.87	X	X			11/6/90 NO PROTECTOR, VENTED CAP 5" ID PVC CASING
G-3		27.68		—	X	X			" " " UNABLE TO LOCATE TOTAL DEPTH
P-1		8.90		25.24	NO	NO			11/6/90 FLUSH MOUNT WELL BOX, WELL 2" ID AT AN ANGLE
O-1		10.19		29.77	X	X			11/6/90 FLUSH MOUNT WELL BOX WELL 2" ID PVC

DESCRIPTION OF SITE _____

SOIL CONDITIONS _____

WEATHER _____ TEMPERATURE _____

ENTERED ON COMPUTER ___ SIGNATURE _____ DATE _____

TECHNICAL MEMORANDUM - NO. 4

ORIGINAL

DATE: January 22, 1991

TO: Vanessa Harris, Site Manager

CC: Marcia Kuehl, RI Lead
Roman Gau, Project Manager
Mike Crosser, TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump RI/FS

GEOTECH BORINGS

Introduction

Four deep (175-foot) geotech borings were drilled and sampled as described in Exhibit A, Field Sampling Plan Addendum to Volume 2, Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana. Drilling activities for these borings began on December 17, 1990, and were completed January 9, 1991. These four borings were completed to investigate the site stratigraphy and to collect samples for geotechnical analysis at the Himco Dump Site, Elkhart, Indiana. The boring locations are provided in Figure 1 of this memorandum. Drilling and sampling activities were completed by Max Tinnin and Don Brewington of John Mathes and Associates, Inc. (Columbia, Illinois) with a TH60, Ingersol Rand air/mud rotary rig. Tom Puchalski of Donohue & Associates, Inc., inspected the drilling and sampling, completed time logs, logged all samples, collected select samples for geotechnical analysis, and performed air monitoring using a photoionization detector and gasponder.

Methods

Drilling and sampling were performed as described in Exhibit A, Field Sampling Plan Addendum to Volume 2, Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana, Section 4.2.

Each geotech boring began with using air rotary and a 7-7/8-inch tricone bit. The boring was blind-drilled to 18 feet. Eight-inch casing was then pounded down into the borehole to 8 or 9 feet. The 8-inch steel casing was then temporarily sealed in-place using granular bentonite. A 3-foot diameter steel casing was installed at the surface with a 6-inch diameter PVC tube extending to a 500-gallon mud tub. After the drilling mud was mixed in the tub, mud rotary drilling began. A 5-7/8-inch blade bit was used for the remainder of Borings 7, 8, and 9. Once this bit was worn out, a 7-7/8-inch blade bit replacement was used to drill Boring 10. Split-spoon sampling was accomplished with a 2-inch O.D., 2-foot long split-spoon sampler passed down through the inside of the drill stem. The split-spoon sampler was driven by a 140-pound down-hole hammer which was operated by a winch at the surface.

The Donohue geologist performed atmospheric monitoring at 5-foot intervals using a photoionization detector and gasponder. The geologist also logged all the samples using the Unified Soil Classification System (U.S.C.S.) based on visual inspection. A Munsell Color Chart was used to describe all soil colors.

The borings were drilled to the following depths: BRG-7, 174.5 feet; BRG-8, 166 feet; BRG-9, 173.5 feet; and BRG-10, 174 feet.

All borings were abandoned by backfilling with cement/bentonite grout emplaced by tremie pipe.

Deviations

The sampling plan specified using a 3-7/8-inch bit, however, either a 5-7/8 or 7-7/8-inch bit was used. The larger bits were required because split-spoon sampling was performed through the inside of the blade bit. Using a larger bit had no effect on the sampling of geotechnical borings.

Although several attempts were made to push shelby tubes, none were successful.

Boring 8 was finished at 166 feet instead of 175 feet because a till aquitard greater than 4 feet thick was encountered. In order to avoid passing through this aquitard at this downgradient location, the hole was stopped after two split-spoons sampled the unit.

Summary of Results

Boring logs, including atmospheric monitoring results, are provided in Appendix A.

Of the 20 geotechnical and 20 TOC samples sent to the laboratory, 15 geotechnical and 15 TOC samples were collected from the four deep geotech borings. Although three shelby tube samples were also designated to be collected from these four borings, attempts to retrieve these samples were unsuccessful.

Several complications caused delays in the drilling schedule. Some of the difficulties were weather-related. The operation of the drill rig was dependent upon the air system being free of water. Condensation would generally build up overnight which caused pressure losses in the air system. Isopropanol dripped into the lines would eventually clear up this problem. Mud or water freezing in the circulation hoses or in the mud pump also caused delays in the morning while a propane torch was used to thaw frozen parts.

One day of drilling was lost to an equipment failure. One of the main hydraulic hoses ruptured on the drill rig requiring replacement.

TP/ds

A/R/HIMCO/AA7

APPENDIX A

BORING LOGS

Donohue

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: Himco Dump PROJECT NO. 20026.023

SOIL BORING NO. BRG-07

DRILLING METHOD: Mud Rotary 7 7/8"
20'-175' blade bit - 7 7/8"-7 5/8"
Air rotary 5 1/8 tricone 0-70 feet
LOG BY: TOM PUCHALSKI
DRILLER: Max Tinnin Don Brewington
WEATHER: 40s, overcast Mathes

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

60 ft south of P101B
PHYSICAL SETTING: Flat grass field

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/16/90
DATE COMPLETE: 12/18/90
WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2 / LEL	CO / H_2S
2			Blind drilled first 20 feet with air rotary 7 7/8 tricone bit.										
4			See log for BRG01 for first 20 feet at this location.										
6			18 SEP 2/10/90										
8			← 8" casing to 9 feet - pulled and switched to 8" casing to 19' @ 900 and 45 feet depth										
10													
12													
14													
16													
18										1450	0	21.3 / 0	0 / 0
		SM	10YR 5/1, Gray SILTY SAND, 90% fn grn					2"SS	18-20'	1645	0	21.5 / 0	0 / 0
20			10% md to co 20% silt, trace shaving										
			small gvl, sat OUTWASH					GEO - 18-19'					
22													
										Start 12/17/90			
24			10YR 5/1 Gray SILTY SAND, with gravel medium grained	15				2"SS	23-25'	819	0	21.3 / 0.6	0 / 0
		SM	80% Sand, 20% Silt, 2 broken cobbles in										
26			space > 2" diameter, sat OUTWASH										
28			OUTWASH										
		GM	10YR 5/1 Gray SILTY GRAVEL, 70% 1/2" dia	31				2"SS	28-30	832	0	21.3 / 0.0	0 / 0
30			gvl shd, 20% co-md grn snd, 10% silt					GEO-28-29		GT07-02			

Driller did not count

End of day 12/16/90

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BORING LOG

SOIL BORING NO. BRG-07

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: 5 1/8" ~~tricone~~ blade mud rotary, down hole 140 lb hammer on 2" split spoon

LOG BY: TOM PUCHALSKI

DRILLER: MAX TINNIN - MATHES

WEATHER: South wind 15 mph, overcast

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Flat grass field

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 12/16/90

DATE COMPLETE: 12/18/90

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
32													
34		GM	10YR 5/1 GRAY SILTY GRAVEL, 70% >2" dia gvl, 20% co-md snd, 10% silt, saturated OUTWASH	30				2"SS	33-35	838	0	21.2 / 007	0 / 0
36													
38		GM	10YR 5/1 Gray SILTY GRAVEL, 85% 1/2 - >2" dia gravel-sbrd, 20% co-md snd, 10% silt, sat OUTWASH	15				2"SS	38-40	848	0	21.2 / 007	0 / 0
40													
42													
44		GM	POOR RECOVERY, 1/4 - 1/2" sbrd gvl, some >2" 10% silty sand OUTWASH	14				2"SS	43 45	858	0	21.2 / 006	0 / 0
46			Begin loosing mud at surface due to poor seal at 8" casing/soil interface. Reseal with bentonite. Set up sand filter cone.						50 gallons mud lost down hole				
48		SP	10YR 5/1 Gray SAND, fine grained sat OUTWASH	35				2"SS	48-50	1059	0	21.2 / 007	0 / 0
50								GEO	48-49	GT07-03			
52													
54		SP	10YR 5/1 Gray SAND, fn grn, sat, trace 1/2" dia sbang gvl, scattered throughout, saturated OUTWASH	33				2"SS	53-55	1106 ↓	0	21.2 / 007	0 / 0
56													
58		GP	Poorly Graded GRAVEL, 3/4-1 inch diameter, most subrd. some sbang OUTWASH	24				2"SS	58-60	1107	0	21.2 / 007	0 / 0

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BORING LOG

SOIL BORING NO. BRG-C7

SITE: HIMCO DUMP PROJECT NO. 30036.033

DRILLING METHOD: 9 7/8" ~~tricone~~ blade mud rotary, down hole 140 lb hammer, 2"SS

LOG BY: TEP

DRILLER: MT, DB - JMA

WEATHER: South wind 15 mph, overcast

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Hot grass field.

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 12/6/90

DATE COMPLETE: 12/8/90

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
62													
64		SP	10YR 5/1 Gray SAND, fine grained, well sorted, saturated OUTWASH		30			2"SS	63-65	1145	0	21.3 / 0	0 / 0
66													
68		SP	10YR 6/2 Light Brownish Gray SAND, fine grn well sorted, saturated, one > 2" dia. cobble. OUTWASH		50			2"SS	68-70	1324	RAIN - Can't take air readings.		
70													
72			~~10YR 5/1 Gray~~ SP 10/10/90										
74		SP	10 YR 5/1 Gray SAND, well sorted, fine grained, saturated OUTWASH		46			2"SS	73-75	1334			
76													
78		SP	10YR 5/1 Gray SAND, fine grained, trace 1/4" silty clay clasts 10YR 6/1 Light gray, saturated		54			2"SS	78-80	1346			
80			OUTWASH										
82													
84		SM	10YR 5/1 Gray SILTY SAND, fn grn, trace 1/4" silty clay 10YR 6/1 Lt gray, sat 20% silt OUTWASH		61			2"SS	83-85	1358			
86													
88		SM	AS ABOVE + 1 > 2" dia cobble broken in spoon		48			2"SS	88-90	1414			
90													

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BORING LOG

SOIL BORING NO. BRG07

SITE: HIMCO DUMP PROJECT NO. 20036.073

DRILLING METHOD: 5 7/8" ~~bit~~ hole mud rotary, down hole 140 lb hammer, 2" SS

LOG BY: TEP

DRILLER: MT, DB / Mathes

WEATHER: Raining, southwind 10 mph 40°

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Grass field

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 12/16/90

DATE COMPLETE: 12/18/90

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2 / LEL	CO / H_2S
92													
94		SM	2.5 Y, 5/2 Grayish Brown SILTY SAND, 1 inch stratified zone, interlayered gray silty clay clast, silt layers, and silty sand layers each ~ 1/4" thick, saturated OUTWASH / LACUSTRINE	50				2"SS	93-95	1420	Raining		
96													
98		SM	2.5 Y, 5/2 Grayish Brown SILTY SAND, fine grained, 20% silt, low cch, saturated OUTWASH	30				2"SS	98-100	1428			
100													
102													
104		SM	2.5 Y, 5/2 Grayish Brown SILTY SAND, fine grn, 20% silt, low cch, 2-1 inch stratified silt / fn sand zones, saturated OUTWASH / LACUSTRINE	40				2"SS	103-105	1435			
106													
108		SM	2.5 Y 5/2 Grayish Brown SILTY SAND, fn grn, 20% silt, low cch, saturated OUTWASH	50				2"SS	108-110	1445			
110													
112													
114		SP	2.5 Y 5/2 Grayish Brown SAND, fn grained saturated OUTWASH	51				2"SS	113-115	1457	0	21.3 / 0	0 / 0
116													
118		SM	2.5 Y 5/2 Grayish Brown SILTY SAND, fine grn, 20% silt, saturated OUTWASH	41				2"SS	118-120	1513	Rain		
120													

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BORING LOG

SOIL BORING NO. BEG07

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: 5 7/8 ~~Tricone~~ bicone bit mud rotary, down hole 140 lb hammer, 2" SS

LOG BY: TOM PUCHALSKI

DRILLER: MT/DB – Mathes

WEATHER: Rain, 40s, southwind 7mph

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Grass Field

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 12/16/90

DATE COMPLETE: 12/18/90

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
122													
124		SP	2.5Y 5/2 Grayish Brn SAND, well sorted, few ch, saturated, fine grained	50				2"SS	123-125	1521	0	21.3/0	0/0
			OUTWASH										
126													
128		SP	AS ABOVE + trace coarse sand - white subangular grains	52				2"SS	128-130	1528	RAIN		
			OUTWASH										
130													
132													
134		SP	2.5Y 5/2 Grayish Brn SAND, fine grained few ch, soft trace coarse sand strong	50				2"SS	133-135	1537			
			OUTWASH										
136													
138		SP	As Above	50				2"SS	138-140	1555			
			OUTWASH										
140													
142													
144		SP	As Above	54				2"SS	143-145	1600			
			OUTWASH										
146													
148		SP	As Above	48				2"SS	148-150	1610			
			OUTWASH										

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BORING LOG

SOIL BORING NO. BRG07

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: 9 1/8 blade bit and rotary, 140 lb down-hole hammer, 2" SS
LOG BY: TOM PURHALSKI
DRILLER: Max Tinnin Don Brewington
WEATHER: Rain, low 40s, southwind 5 mph PHYSICAL SETTING: grass field

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/16/90
DATE COMPLETE: 12/18/90
WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
152													
154		SP	2.5Y 5/2 Grayish Brown SAND, fine grained, loose, sat, trace coarse sand-strong	45				2"SS	153-155	1620	0	21.2 / 0	0 / 0
156													
158		SP	As Above	51				2"SS	158-160	1630	Rain		
									GEOTECH	158-158.5	GT0705		
160													
162													
164		CL	10YR 5/1 Gray SILTY CLAY, medium plasticity trace 1/4" sbrd gvl, moist	36				2"SS	163-165	1646			
									GEOTECH	163-164	GT0706		
			TILL										
166													
168		SM SP	10YR 2.5Y 5/2 Grayish Brn SILTY SAND with gvl 1/2" 2.5Y 5/2 Grayish Brn SAND, fine grained saturated	39				2"SS	168-170	1700			
170			OUTWASH										
			HARD DRILLING AT 171'										
172													
174		ML	2.5Y 5/2 Grayish Brn SILT, loose, dense, moist trace 1/8" subrounded gravel TILL	for 1 foot 65				2"SS	173-175	1705			
		12/17/90	Drilled to 174, took additional spoon 174-174.5					2"SS	174-174.5	1738			
			EOB Drilled to 179', split spoon to 173.5'					GEO	174-174.5	1738	GT07-07		
176			1705 12/17/90 Tom Purhalski										
			1730 12/18/90 926-Push Shelby tube at 174 feet. Tube and AW reducer remain down hole-grouted with cement/bentonite for abandonment										

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BORING LOG

SOIL BORING NO. BRG08

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: 5 7/8" tricone & air to 20 feet. 5 7/8 blade bit & mud rotary 20-175 feet

LOG BY: TOM PUCHALSKI

DRILLER: Max Tinnin/Don Brewington - Mathes

WEATHER: Clear 38°F South wind 5mph

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: 60 ft south of WT103

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 12/19/90

DATE COMPLETE:

WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
2			Blind drill with air rotary										
4			See log for WT103A for first 20 feet										
6		8" casing to 9 feet											
8													
10													
12													
14													
16										1043	0	21.3 / 0	0 / 0
18		SW	10YR 5/1 Gray Gravelly Sand, 40% sbang med grn sand, 30% coarse sand, 30% shrd & sbang small gravel, saturated OUTWASH	39				3"SS	18-20	1220	0	21.2 / 0	0 / 0
20								GEOTECH - GT08-01				18-19'	
22								3"SS					
24		GP(?)	RECOVERED ONE 3" COBBLE IN SPOON TIP	15					23-25	1231	0	21.0 / 0	0 / 0
26													
28		SW	10YR 5/1 Gray GRAVELLY SAND, 40% sbang coarse grn snd, 30% med grn, 30% shrd & sbang crse-med 1/4" sub 3" saturated	33				3"SS	28-30	1242	0	21.3 / 0	0 / 0

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BORING LOG

SOIL BORING NO. BRG08

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: See page 1

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:

LOG BY: TOM PUCHACSKI
DRILLER: See page 1
WEATHER: "

PHYSICAL SETTING: "

DATE START: 12/19/96
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
30													
32													
34		SP	2.5 Y 5/2 Grayish Brown SAND, medium grn trace strong coarse sand, trace strong grvl, saturated	33				2"SS	33-35	1749	0	21.3 / 0	0 / 0
			OUTWASH										
36													
38		GW	2.5 Y 5/2 Grayish Brown GRAVEL, 1/8" - 1/2" angular & strong, trace medium sand, sat	25				2"SS	38-40	1255	0	21.2 / 0	0 / 0
40			OUTWASH										
42													
44		GW	GRAVEL, most broken > 2", green volcanics, dolomite saturated	15					43-45	1305	0	21.3 / 0	0 / 0
			OUTWASH										
46													
48		GW	well graded GRAVEL 30% fine sand 70% 1/8-1" grvl, some > 2" saturated	45					48-50	1311	0	21.1 / 0	0 / 0
50			OUTWASH										
52													
54		SP	2.5Y 5/2 Grayish Brown SAND, fine grn trace medium sand, saturated non cohesive, non plastic	40					53-55	1318	0	21.3 / 0	0 / 0
			OUTWASH										
56													
58		SP	As Above	17					58-60	1335	0	21.5 / 0	0 / 0

End of Hole 12/19/96 1305

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BORING LOG

SOIL BORING NO. BRG08

SITE: HIMCO DUMP PROJECT NO. 20036.023

DRILLING METHOD: See pg 1

LOG BY: TEP
DRILLER: See pg 1
WEATHER: Snow, 18°F, west wind 7mph

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: See pg 1

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/19/90
DATE COMPLETE:
WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
60			Start 1145 1/3/91										
62													
64		GW	WELL GRADED GRAVEL > 3" Boleum in tip - green mafic volcanic - basalt, most 3/4" sbrd OUTWASH	50				2"SS	63-65	1347	0	21.3 / 0	0 / 0
								TOC08-01	63-63.5				
66													
68		SP	10YR 6/2 LT brownish grey SAND, well sorted fine grained, non plas, low coh, sat OUTWASH	32				2"SS	68-70	1353	0	21.3 / 0	0 / 0
								TOC08-02	68-68.5				
70													
72													
74		SP	10 YR 5/2 Grayish Brown SAND, well sorted fin grained, non plas, low coh, sat trace angular white inclusions - Solid plagioclase or chert(?) OUTWASH	65				2"SS	73-75	1400	0	21.3 / 0	0 / 0
								TOC08-03	73-73.5				
76													
78		SP	As above OUTWASH	40				2"SS	78-80	1410	0	21.3 / 0	0 / 0
								TOC08-04	78-78.5				
80													
82													
84		SP	Same as above OUTWASH	41				2"SS	83-85	1420	0	21.3 / 0	0 / 0
								TOC08-05	83-83.5				
86													
			3.5" zone of silty clay layers										
88		SM	10YR 5/2 Grayish Brn SILTY SAND, 20% silt 80% fin grn sand, stratified silty clay layers 3.5" thick	41				2"SS	88-90	1434	0	20.9 / 0	0 / 0
								GTOR-02	88-88.5				

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BORING LOG

SOIL BORING NO. BRG08

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: See pg. one

LOG BY: TEP
DRILLER: See Pg one
WEATHER: See page three

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: See Pg. 1

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/19/90
DATE COMPLETE:
WELL INSTALLATION: None

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H2S
90													
92													
94		SP	10YR 5/2 Grayish Brown SAND: fine grained, well sorted, non coh, sat	41				2"SS	93-95	1451	0	21 / 0	0 / 0
									GT08-03	93-93.5			
96			OUTWASH										
98			NO RECOVERY	50				2"SS	98-100	1500	0	21.0 / 0	0 / 0
100													
102													
104		SP	10YR 5/2 Grayish Brown SAND, coarse mixed with fine and fg grading into fine grained, low coh, non plas, sat	20				2"SS	103-105	1510	0	19.0 / 0	0 / 0
106			OUTWASH										
108		SP	As above but all OUTWASH fine grained	50				2"SS	108-110	1519	0	20.1 / 0	0 / 0
110													
112													
114		SP	As Above- OUTWASH	50				2"SS	113-115	1526	0	21.7 / 0	0 / 0
116													
118		SP	As Above OUTWASH	50				2"SS	118-120	1543	0	19.9 / 0	0 / 0

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BORING LOG

SOIL BORING NO. BRG08

SITE: HINCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: See pg. one

LOG BY: TEP
DRILLER: See pg one
WEATHER: See pg three

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: See pg one

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/9/90
DATE COMPLETE:
WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
0													
122													
124		SP	10YR 5/2 Grayish Brown SAND, fine grained, nonplas, low cch, sat	50				2"SS	123-125	1555	0	19.9 / 0	0 / 0
			Very fine grained - almost silt stratification occassional, trace organic debris in stratification < 1% OUTWASH										
126													
128		SP	10YR 5/2 Grayish Brown SAND, well sorted, fine grained, low cch, non plas, sat OUTWASH	48				2"SS	128-130	1605	0	20.1 / 0	0 / 0
130													
132													
134		SP	As above	50				2"SS	133-135	1631	0	21.0 / 0	0 / 0
136	~?~												
138		GW	Well graded Gravel with sand, most gvl >2" (broken in spoon) some 1", sand fine grained, saturated OUTWASH	50				2"SS	138-140	1641	0	19.9 / 0	0 / 0
140													
142		GP	Poorly graded GRAVEL, most 1/4" sbrd, 15% fn grn sand; OUTWASH	50				2"SS	143-145	1653	0	20.0 / 0	0 / 0
144								GT08-04		143-143.5			
146													
148		GP	Poorly graded Gravel As above	50				2"SS	148-150	1700	0	20 / 0	0 / 0

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BORING LOG

SOIL BORING NO. BRG08

SITE: HIMCO DUMP PROJECT NO. 20076.023

DRILLING METHOD: See pg 1

LOG BY: TEP
DRILLER: See pg 1
WEATHER: See pg three

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: See pg one

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 12/19/90
DATE COMPLETE:
WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2 / LEL	CO / H_2S
150													
152													
154		GR	Poorly graded GRAVEL 30% fn-grn sand, most gravel > 2" (broken in spoon) OUTWASH					2"SS	153-155	1707	0	21.0 / 0	0 / 0
156													
158		SM	Gray silty Clay layered with fn grn silty sand 10YR 5/2 Grayish Brown SILTY SAND, fine grained, 20% silt, moist OUTWASH					2"SS	158-160	1722	0	20.0 / 0	0 / 0
160													
162													
164		ML	10YR 5/2 Grayish Brown SILT, trace clay, moist trace 1/2" sbang gvl TILL					2"SS	163-165	1740	0	19.9 / 0	0 / 0
								GEOTECH	GT0805	1740	163-164		
166		ML	10YR 4/2 Dark Grayish Brown SILT, trace clay, trace sbang gvl 1/8", moist TILL					2"SS	165-167	1749	0	20.1 / 0	0 / 0
168									168-170	SEP			
170			EOB 1/3/91 1740 Tom Puchalski Split Spoon to 166, drilled 7 7/8 bit to 165' 5 7/8 SEP										
172									173-175	SEP			
174													
176													

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BORING LOG

SOIL BORING NO. BRGC9

SITE: HIMCO DUMP PROJECT NO. 20036-023

DRILLING METHOD: 7 7/8 tricone & air to ~18 feet, 5 7/8 blade bit & mud rotary - remainder of boring

LOG BY: TOM PUCHALSKI

DRILLER: Mac Tinnin / Don Brewington Mathes

WEATHER: Sunny, 35°F, west wind Single

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: 60 ft south of 102 west at woods edge

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: January 5, 1991

DATE COMPLETE:

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2 / LEL	
2			Blind drill with air to 18 feet										
4			See log for WT102A for first										
			18 feet.										
6													
8													
10													
12													
14													
16													
18			START 1400 1/5/91										
		SP	10 YR 5/3 Brown, SAND, poorly sorted,	18				2"SS	18-20	1400	0	0 / 0	0 / 0
			coarse grained, sat, trace gvl, trace md sand					TOC09-04		18-19			
20			OUTWASH										
22													
24		SP	10 YR 5/3 Brown SAND, fn grained, sat, non plas	25				2"SS	23-25	1404	0	20.5 / 0	0 / 0
			OUTWASH					TOC09-03		23-23.5			
26													
28		SP	10 YR 5/3 Brown SAND 20% fine 70% md,	25				2"SS	28-30	1414	0	20.5 / 0	0 / 0
			10% coarse, sat					TOC09-03		28-28.5			

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BORING LOG

SOIL BORING NO. BRG09

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD:

LOG BY:
DRILLER:
WEATHER:

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 1/5/91
DATE COMPLETE:
WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
32													
34		SP	10 YR 5/3 Brown SAND, fine grained, sat trace small sbang gvl. OUTWASH	25				2"SS	33-35	1420	0	21.2 / 0	0 / 0
								TOC09-04		33-33.5			
36													
38		GP	Poorly graded GRAVEL, trace fine sand, most gvl >2" diam, broken in spoon OUTWASH	25				2"SS	38-40	1425	0	21.0 / 0	0 / 0
40													
42													
44		GP	Poorly graded GRAVEL, most sbrd, some sbang 3/4", basalt, dolomite, chert OUTWASH NO SAND	26				2"SS	43-45	1433	0	20.3 / 0	0 / 0
46													
48		GP	Poorly graded GRAVEL, 10% 1" sbang 10% fn grn sand, sat OUTWASH	40				2"SS	48-50	1441	0	21 / 0	0 / 0
								TOC09-05		48-48.5			
50													
52													
54		SP	10YR 5/3 Brown SAND, poorly graded, fn grn, trace 1" grit sbang, qtzite, sat OUTWASH	16				2"SS	53-55	1449	0	20 / 0	0 / 0
								GTC09-01		53-53.5			
56													
58		SP	10YR 5/3 Grayish Brown SAND, 20% 1" sbang gvl, sat OUTWASH	25				2"SS	58-60	1450	0	20.3 / 0	0 / 0

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BORING LOG

SOIL BORING NO. BRG09

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: See page 1

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 1/5/91
DATE COMPLETE:
WELL INSTALLATION:

LOG BY: TOM PUCHALSKI
DRILLER: JMA
WEATHER: See page 1
PHYSICAL SETTING: Page 1

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	
60													
62													
64		SP	10YR 5/2 Grayish Brown SAND, noncoh, non plas, fine grained, sat OUTWASH	40				2"SS	63-65	1527	0	20.3 / 0	0 / 0
								GT09-02	63-63.5				
66													
68		SP	As above OUTWASH	28				2"SS	68-70	1537	0	21.3 / 0	0 / 0
								GT09-03	68-68.5				
70													
72													
74		SP	As above OUTWASH	8"	50			2"SS	73-75	1544	0	21.3 / 0	0 / 0
76													
78		SW	10YR 5/2 Grayish Brown GRAVELLY SAND, low cohesion, non plas, sat 10/60/30 fn/med/co sand 60% 40% gravel ½"	8"	50			2"SS	78-80	1554	0	21.3 / 0	0 / 0
80			strong OUTWASH										
82			Driller feels change										
		CL	5Y 5/2 Olive grey SILTY										
84		SP	5Y 5/1 Gray SAND, fine grained - close to silt low coh, non plas, sat OUTWASH					2"SS	83-85	1610	0	21.3 / 0	0 / 0
86													
88		SP	5Y 4/3 Olive grey SAND as above	6"	75			2"SS	88-90	1625	0	21.3 / 0	0 / 0

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BORING LOG

SITE: HIMCO DUMP PROJECT NO. 20026.022

SOIL BORING NO. BRG09

DRILLING METHOD: See Page 990

LOG BY: Page 990

DRILLER:

WEATHER: Overcast, 24°F.

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START:

DATE COMPLETE:

WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2 / LEL	
90		C	5Y 4/2 Olive Gray SILTY CLAY, strat fied 1/8" apart, moist, low plas LACUSTRINE										
92													
94		CL		32				2"SS	93-95	1644	0	21.3 / 0	0 / 0
96			Attempt Shelby Tube 95-97 1745 - No Recovery in Tube START 950 1/6/91										
98		CL	NO RECOVERY CL in sparse tip SILTY CLAY LACUSTRINE	35				2"SS	98-100	953	0	21.3 / 0	0 / 0
100													
102													
104		CL	5Y 4/1 Dark Gray SILTY CLAY, med plas, med cohe, non stratified, wet	12				2"SS	103-105	1005	0	21.1 / 0	0 / 0
106			LACUSTRINE										
108		SP	5Y 4/2 Olive gray SAND, 80% fn grained, 20% medium grnd, subangular, silt	45				2"SS	108-110	1013	0	21 / 0	0 / 0
110			OUTWASH										
112													
114		CL	5Y 4/1 Dark Gray SILTY CLAY, med plas, med cohe, non stratified, wet changes color to 2.5Y 5/2 Grayish Brown SILTY clay	17				2"SS	113-115	1023	0	21.3 / 0	0 / 0
116			OUTWASH										
118		ML	2.5Y 5/2 Grayish Brown SILT, trace fn sand in laminae, trace clay, wet	35				2"SS	118-120	1034	0	21.3 / 0	0 / 0

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BORING LOG

SOIL BORING NO. RBG09

SITE: HIMCO DUMP PROJECT NO. 2C036.023

DRILLING METHOD: See Page One

LOG BY: Page One
DRILLER:
WEATHER: See page four

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Page One

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: Jan 5, 1991
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	
120													
122													
124		CL	5Y 4/1 Dark Gray SILTY CLAY, med plas, med coh, non stratified, wet LACUSTRINE	20				2"SS	123-125	1040	0	21.3 / 0	0 / 0
126			5										
128		SM	5Y 5/2 Olive Gray SILTY SAND, non plas low coh, 60% fn sand 15% silt 5% 1/4" sbang gvl, non stratified TILL	30				2"SS	128-130	1044	0	21.3 / 0	0 / 0
130													
132													
134		SP SM SP ML	10YR 5/6 Yellow-Brown SAND, fine grained, non coh, moist - in 1" thick cross-bedded layers with 10YR 4/2 Dark Grayish Brown ~~SILTY SAND~~ SILT ~~CLAY~~, non plas, moist, low coh OUTWASH	35				2"SS	133-135	1058	0	21.3 / 0	0 / 0
136													
138		SP	10YR 5/3 Brown SAND, fine grained, low coh, non plas, soft OUTWASH	50				2"SS	138-140	1105	0	21.4 / 0	0 / 0
140													
142													
144		SM	5Y 4/2 Olive Gray SILTY SAND 75% fn grn sand 10% 1/4" sbang gvl, 15% silt med coh, non plas, moist TILL	40				2"SS	143-145	1120	0	21.3 / 0	0 / 0
									GT09	-06	143	143.5	
146													
148		SM	As Above TILL	50				2"SS	148-150	1130	0	21.4 / 0	0 / 0
150													

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BORING LOG

SOIL BORING NO. BRG09

SITE: HIMCO DUMP PROJECT NO. 20036.023

DRILLING METHOD: See Page One

LOG BY: See Page One

DRILLER: See Page One

WEATHER: See Page Four

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: See pg 1

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: Jan 5, 1991

DATE COMPLETE: Jan 6, 1991

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	
150													
152													
154		ML	10YR 5/4 Yellowish Brown SILT, stratified Lithic color changes to 7.5Y 5/6 Strong Brown low rch, non plas, moist LACUSTRINE	3"	50			2"SS	153/155	1143	0	21.0/0	0/0
156													
158		SP	5Y 5/2 Olive gray SAND, well sorted, fine grained, sat; stratified LACUSTRINE	3"	60			2"SS	158-160	1155	0	21.0/0	0/0
160													
162													
164		ML	5Y 5/2 Olive Gray SILT, low rch, non plas, moist, stratified LACUSTRINE		33			2"SS	163-165	1300	0	21.1/0	0/0
								GTC9-07	163-163.5				
166													
168		SP	5Y 5/2 Olive Gray SAND, non rch, non plas fine grn, sat OUTWASH		35			2"SS	168-170	1330	0	21.0/0	0/0
170													
172													
174		SP	5Y 5/2 Olive Gray SAND, non rch, non plas, fine grained, sat OUTWASH		50			2"SS	173-175	1331	0	21.1/0	0/0
								GTC9-08	173-173.5				
176		ECB	1230 1/6/91 Split spoon to 173.5, 5 7/8 blade bit to 173.0 Tom Puchalski										

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BORING LOG

SOIL BORING NO. RRG10

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: 7 7/8 tricone with air rotary to 18 feet. 7 7/8 blade bit & mud rotary to end of boring

LOG BY: TOM PUCHALSKI

DRILLER: John Mathes & Assoc. Inc

WEATHER: 19°F, clear, NE wind 5 mph

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: Jan 7, 1991

DATE COMPLETE:

60 feet west of WT106A

PHYSICAL SETTING: grass at wind edge

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
0			Blind drill to 18 feet with 7 7/8" tricone & air rotary. See log for WT104A for first 18 feet.										
2													
4													
6													
8													
10													
12													
14													
16													
18			Start 1000 1/8/91										
		SP	10YR 5/2 Grayish Brown GRAVELLY SAND 70% and to coarse grained subrounded sand, 30% 1/2" subangular gravel, non cohesive, non plastic, saturated Fines < 20 grain	15				8"SS	18-20	1011	0	0.0 / 0	0 / 0
20			OUTWASH					TOC	10-01		1F-15	5	
22													
24		SP	10YR 5/2 Grayish Brown SAND, Fine grained, non coh, non plas, saturated	24				8"SS	23-25	1038	0	0.0 / 0	0 / 0
			OUTWASH					TOC	10-02	23-23.5			
26													
28		SP	10YR 4/2 Dark Grayish Brown SAND, fine, medium, trace med gravel, sat	24				8"SS	28-30	1156	0	0.0 / 0	0 / 0
30			OUTWASH					TOC	10-03	28-28.5			

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BORING LOG

SOIL BORING NO. BRG10

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: See Page One

LOG BY: See Page One
DRILLER: See Page One
WEATHER: See page one

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Pg one

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: Jan 7, 1991
DATE COMPLETE:
WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
30													
32													
34			NO RECOVERY 2" Subangular cobble in nose	18				2"SS	33-35	1215	0	21.1 / 0	0 / 0
36													
38		GP	GRAVEL, most > 2" - brecken shrd,	40				2"SS	38-40	1345	0	21.1 / 0	0 / 0
			some 1"-3/4", basalt, dolomite predominate,					GT 10-01	38-39				
40			OUTWASH										
42													
44		GP	GRAVEL As above	42				2"SS	43-45	1434	0	21.1 / 0	0 / 0
			OUTWASH										
46													
48		CL	5Y 4/1 Dark Grey SILTY CLAY, low plasticity,	53				2"SS	48-50	1443	0	21.1 / 0	0 / 0
			low cohesive, saturated					GT 10-02					
50			LACUSTRINE					TOC 10-04	49-50				
52													
		SP	5Y 4/1 Dark Grey SAND, well sorted,										
54			fine grained, non cohesive, saturated	52				2"SS	53-55	1450	0	20.6 / 0	0 / 0
			very fine grained - non silt size					TOC 10-05	53-54				
			OUTWASH										
56													
58		SP	As above	50				2"SS	58-60	1500	0	19.6 / 0	0 / 0
			OUTWASH										

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BORING LOG

SOIL BORING NO. BRG10

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: Sonic

LOG BY: Tyler Cox

DRILLER:

WEATHER: Overcast, SE wind 12, 30°F

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Page 1

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: Jan 7, 1991

DATE COMPLETE:

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
60													
62													
64		SP	5Y 4/1 Dark Grey SAND, fine grained, well sorted, loose, non plas, saturated very fine grained - near silt size OUTWASH	30				2"SS	63-65	1507	0	21.0 / 0	0 / 0
66													
68			NO RECOVERY	50				2"SS	68-70 69	1528	0	21.0 / 0	0 / 0
70													
72													
74		SP	5Y 5/2 Olive Gray, SAND, fine grained, loose, saturated OUTWASH	41				2"SS	73-75	1542	0	21.0 / 0	0 / 0
								GT10-03	73-74				
76													
78		SP	2.5Y 5/2 Grayish Brown SAND, fine grained, loose, non plastic, saturated OUTWASH	40				2"SS	78-80	1548	0	21.0 / 0	0 / 0
80													
82													
84		SP	Same as above OUTWASH	39				2"SS	83-85	1557	0	21.0 / 0	0 / 0
86													
88		SP	As above OUTWASH	40				2"SS	88-90	1603	0	21.0 / 0	0 / 0
90													

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BORING LOG

SOIL BORING NO. BRG10

SITE: HIMCO DUMP PROJECT NO. 20026.023

DRILLING METHOD: See Page One

LOG BY: See Page One

DRILLER: See Page One

WEATHER: Page Three

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: Jan 7, 1991

DATE COMPLETE:

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
90													
92													
94		SP	2.5Y 5/2 Grayish Brown SAND, fine grained, non coh, non plastic, saturated	40				2"SS	93-95	1645	0	21/0	0/0
			OUTWASH										
96													
98		SP	Same as above	40				2"SS	98-100	1645	0	21/0	0/0
100													
102													
104		SP	2.5Y 5/2 Grayish Brown SAND, fine grained, trace med grn, non coh, saturated	50				2"SS	103-105	1630	0	21.1/0	0/0
			OUTWASH										
106													
108		SP	2.5Y 5/2 Grayish Brown SAND, fine grained trace coarse grained subangular white grained, non coh, sat	50				2"SS	108-110	1645	0	21.1/0	0/0
110			OUTWASH										
112													
114		SP	Same as above	43				2"SS	113-115	1655	0	21.1/0	0/0
			OUTWASH										
116													
118		CL	10YR 5/1 Gray SILTY CLAY, med plas, medium wet	11				2"SS	118-120	1700	0	21.1/0	0/0

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BORING LOG

SOIL BORING NO. RRG10

SITE: HINCO DUMP PROJECT NO. 20086.023

DRILLING METHOD: Geoprobe

LOG BY: Page One

DRILLER:

WEATHER: 32°F, mist + snow, NE wind 5 mph

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Page One

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: Jan 7, 1991

DATE COMPLETE: Jan 9, 1991

WELL INSTALLATION: NONE

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL	CO/H_2S
120													
122													
			Start 1/9/91 910										
124		SP	10YR 5/3 Brown SAND, well sorted, fine grained, noncoh, non plas, saturated	35				2"SS	123-125	920	0	21.1/0	0/0
			CUTWASH										
126													
128		SP	As above	35				2"SS	128-130	934	0	21.1/0	0/0
			CUTWASH										
130													
132													
134		SP	As above	35				2"SS	133-135	939	0	21.1/0	0/0
			CUTWASH										
136													
138		SP	As above + trace angular white mineral - fine grn	35				2"SS	138-140	950	0	21.1/0	0/0
140			CUTWASH										
142													
144		SP	10YR 5/3 Brown SAND, well sorted, 80% fine grained, 20% medium grn, noncoh, non plas, saturated	30				2"SS	143-145	956	0	21.1/0	0/0
			CUTWASH										
146													
148		SP SL	10YR 5/3 Brown SAND, fine grn, noncoh, non plas	31				2"SS	148-150	1000	0	21.1/0	0/0
150		SP	Sat. alternating with 1" to 1/4" thick layers of 10YR 5/1 Gray silty clay lenses, wet										
			CUTWASH										

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BORING LOG

SOIL BORING NO. BRG10

SITE: HIMCO DUMP PROJECT NO. 20036.023

DRILLING METHOD: See Page One

LOG BY: Page One

DRILLER:

WEATHER: Page Five

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: Page One

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: Jan 7, 1991

DATE COMPLETE: Jan 9, 1991

WELL INSTALLATION: NONE

DEPTH (IN FEET)	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	CO / H_2S
150													
152													
154		SP	5Y 5/2 Olive Gray SAND, fine grained - near silt size, stratified, low cohesion, non plas, saturated LACUSTRINE	20				2"SS	153-155	1017	0	21.1 / 0	0 / 0
156													
158		CL	2.5YR 5/2 Grayish Brown SILTY CLAY, med plas, med coh, sat	15				2"SS	158-160	1021	0	21.1 / 0	0 / 0
		SM	2.5YR 5/2 Grayish Brown SILTY SAND, fine grained, low coh, non plas, saturated ~~40% silt 60% sand~~ LACUSTRINE					GEOTECH	GT04	158-158.5			
160													
162													
164		SM	2.5YR 5/2 Grayish Brown, SILTY SAND, 60% fine grained qtz sand, 30% silt, ~~20%~~ 15% clay, trace 1/8" gravel, low coh, non plas, saturated [redacted] LACUSTRINE	20				2"SS	163-165	1032	0	21.1 / 0	0 / 0
166													
168		CL	10YR 4/1 Dark Gray SILTY CLAY, med plas, med coh, stratified, moist LACUSTRINE	20				2"SS	168-170	1040	0	21.1 / 0	0 / 0
170													
172													
174		ML	10YR 4/1 Dark Gray SILT, non plas, no coh, non stratified, moist LACUSTRINE	10				2"SS	173-175	1046	0	21.1 / 0	0 / 0
								GT05	173-174				
176			ECB Split spoon to 174, drill 7 7/8 to 175 1/9/91 1050 Gary Fuchalski										

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 5

DATE: April 1, 1991

TO: Marcia Kuehl

CC: Bob Isenberg

FROM: John Cicone

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.025
Himco Landfill RI/FS

GEOTECHNICAL DATA EVALUATION

Introduction

The objective of this data evaluation is to determine if the data provided from laboratory consolidation and triaxial shear tests, Atterberg limits, grain size and permeability is sufficient enough for use in Remedial Investigation (RI) and Feasibility Study (FS) reports for the Himco Landfill.

Analytical Results

The following table shows the tests for which data was provided and a summary of the results:

LABORATORY TEST	RESULTS
Unconsolidated Undrained (uu) Triaxial Shear	Cohesion (c) = 7 psi = 1008 psf friction angle (ϕ) = 33 degrees
Atterberg Limits	See Table 1 (attached)
Grain Size	30 curves total
Consolidation	Unable to obtain results with given data (see Geotechnical Data Interpretation)

Geotechnical Data Interpretation

Data provided for the unconsolidated undrained (uu) triaxial shear testing was sufficient to obtain cohesion and friction angle values. The attached figure shows the Mohr-Coulomb failure envelope plotted by the laboratory and the tangent line drawn by Donohue to obtain cohesion (c) and friction angle (ϕ) values. Test results indicate cohesion and friction angle for the test sample are approximately 7 psi and 33 degrees, respectively.

Data provided for grain size and Atterberg limits was complete and require no additional interpretation.,

Data was provided for a consolidation test. The consolidation coefficient, c_v, which is used to determine how long consolidation will take, can normally be determined from this test. However, c_v cannot be obtained with the data provided. All of the data curves seem to indicate the specimens had not reached 100% consolidation when the test was stopped. Two possible conclusions can be drawn from this termination. The first is that the test was stopped too early resulting in an incomplete curve and c_v cannot be calculated. The second is that the material may have undergone a very rapid consolidation and c_v could only be obtained with some difficulty and accuracy would be limited. The grain size curve for the consolidation test sample indicated a clayey silt, which does not normally have a rapid consolidation. Therefore, the second possibility seems less likely; however, definite conclusions cannot be made with available information.

Data was also provided for the consolidation test to allow for calculation of the compression index, C_c. This value is used to determine the magnitude of consolidation settlement. This value cannot be obtained because the x-axis is labeled improperly as ELAPSED TIME (min) when it should be labeled as a load or pressure (see attached figure).

Summary

The triaxial shear, Atterberg limit and grain size data were sufficient to obtain strength parameters, and to establish soil classifications of the on-site soil.

No permeability test data was provided with the laboratory results and should be obtained if drainage of material beyond site boundaries is a concern.

Consolidation test information was insufficient to calculate c_v and C_c. The laboratory should be contacted to determine why testing was stopped and to relabel the appropriate graph. Further, the laboratory should, as a matter of common practice, provide the c_v and C_c values.

Attachments
- Atterberg Limits Results
- Triaxial Shear Test Results
- Compression Index Curve

A/R/HIMCO/AH6

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: SAS 5993E SML / TETC NO. : 91-212-3108
CLIENT PROJECT NO.: 5993E CLIENT : VIAR COMPANY
REPORT DATE : Feb. 18, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : HD K 14-01 DEPTH : N/A ft.
INITIAL DRY DENSITY : 91.0 pcf. INITIAL MOISTURE CONTENT : 34.0 pct.
INITIAL VOID RATIO : 0.816
SPECIFIC GRAVITY : 2.65 (assumed)

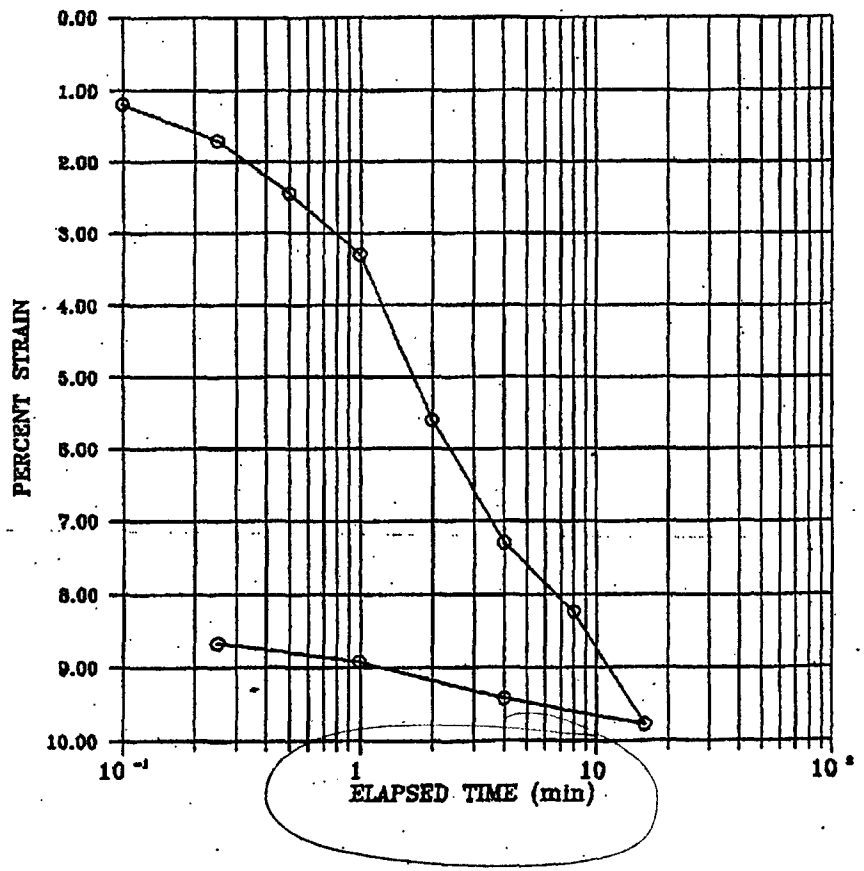


TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

PROJECT : SAS 5993E

TETC NO. : 91-220-3108

PROJECT NO. : SAS 5993E

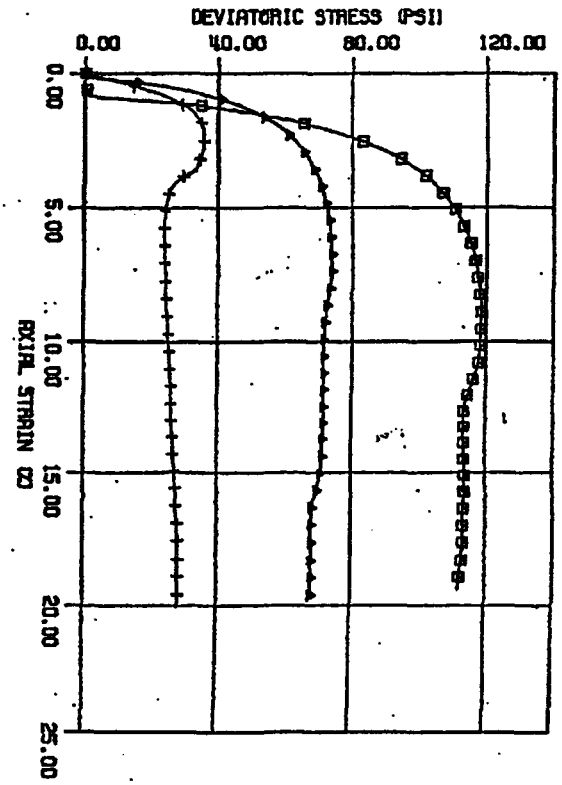
CLIENT : VIAR COMPANY

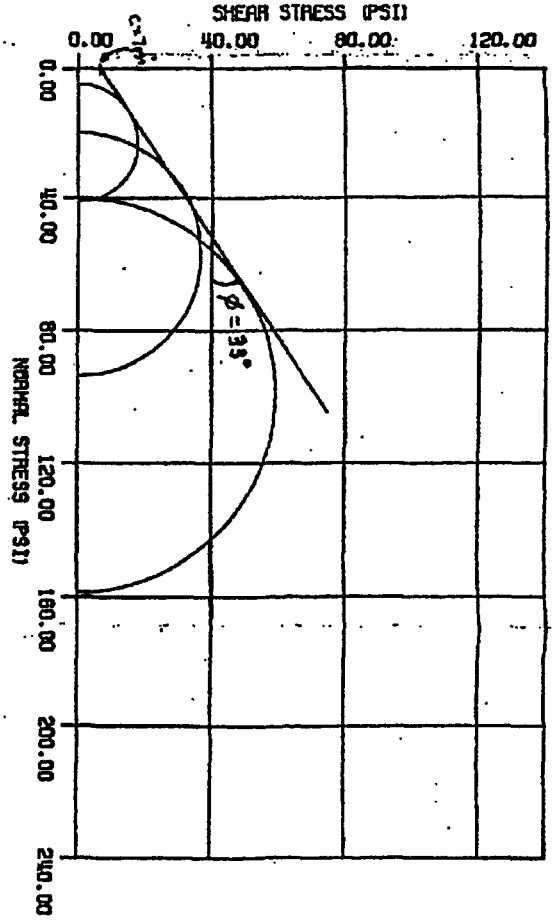
REPORT DATE Feb. 19, 1991

SUMMARIZED BY: S. Sayswatana

LABORATORY MANAGER : (Arul) K. Arulmoli

BORING & SAMPLE NO.	ATTERBERG LIMITS (ASTM D 4318)		
	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)
HDGT-07-06-01	21	12	9
HDGT-07-07-01	17	13	4
HDGT-08-05-01	16	11	5
HDGT-09-06-01	14	11	3
HDGT-09-07-01	23	14	9
HDGT-10-04-01	21	13	8
HDGT-10-05-01	24	17	7





SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	TEST TYPE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	EFF. CONF. PRESSURE (PSI)	MAX DEV. STRESS (PSI)	STRAIN RATE (%/MIN)	BACK PRESSURE (PSI)
□	[illegible]	[illegible]	32	TUBE	—	UU	87.8	31.3	10.0	116.3	0.007	0.0
▲	[illegible]	[illegible]	32	TUBE		UU	74.5	38.0	20.0	75.8	0.000	0.0
+	[illegible]	[illegible]	32	TUBE		UU	74.4	35.0	5.0	36.0	0.000	0.0

PROJECT: SAS5993E
PROJECT NUMBER: 91ZD03

DATE: 02/91

The Earth Technology Corporation

TRIAXIAL TEST RESULTS
TEST TYPE: UU

TABLE 1

SUMMARY

OF

LABORATORY TEST RESULTS

PROJECT : SAS 5993E

TETC NO. : 91-220-3108

PROJECT NO. : SAS 5993E

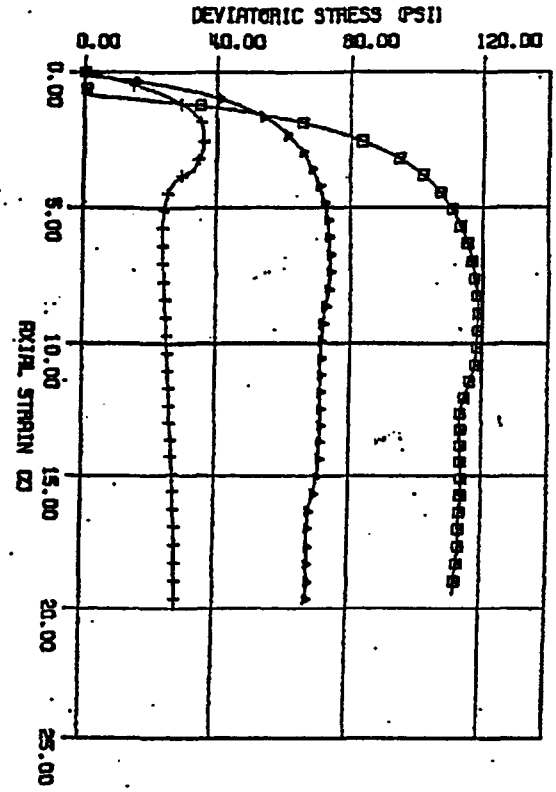
CLIENT : VIAR COMPANY

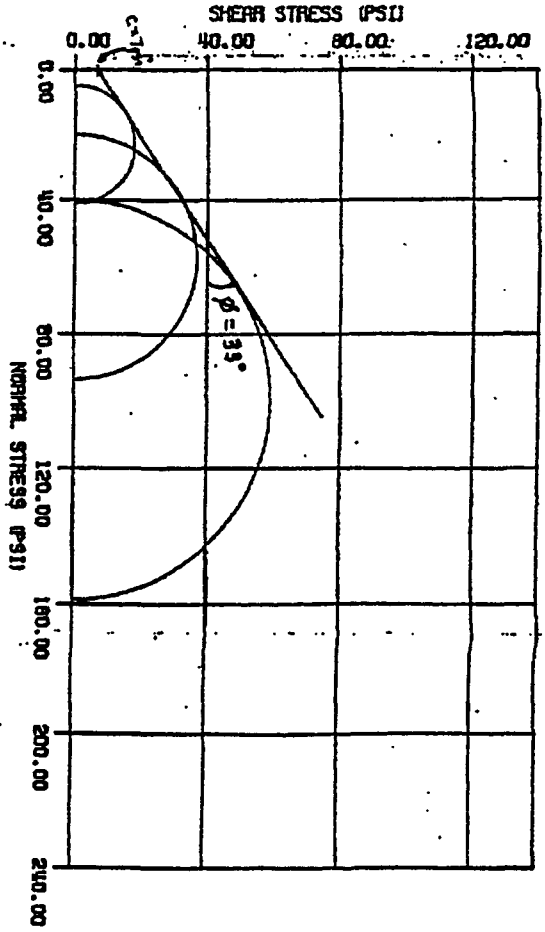
REPORT DATE Feb. 19, 1991

SUMMARIZED BY: S. Sayawatana

LABORATORY MANAGER : (Arul) K. Arulmoli

BORING & SAMPLE NO.	ATTERBERG LIMITS (ASTM D 4318)		
	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)
HDGT-07-06-01	21	12	9
HDGT-07-07-01	17	13	4
HDGT-08-05-01	16	11	5
HDGT-09-06-01	14	11	3
HDGT-09-07-01	23	14	9
HDGT-10-04-01	21	13	8
HDGT-10-05-01	24	17	7





SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	TEST TYPE	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	EFF. CONF. PRESSURE (PSI)	MAX DEV. STRESS (PSI)	STRAIN RATE (%/MIN)	BACK PRESSURE (PSI)
□	[illegible]	[illegible]	[illegible]	TUBE		UU	77.8	31.3	10.0	118.3	0.007	0.0
▲	[illegible]	[illegible]	[illegible]	TUBE		UU	74.5	34.0	20.0	74.8	0.000	0.0
+	[illegible]	[illegible]	[illegible]	TUBE		UU	54.1	45.0	5.0	36.0	0.000	0.0

PROJECT: SAS5993E
PROJECT NUMBER: 91ZD03

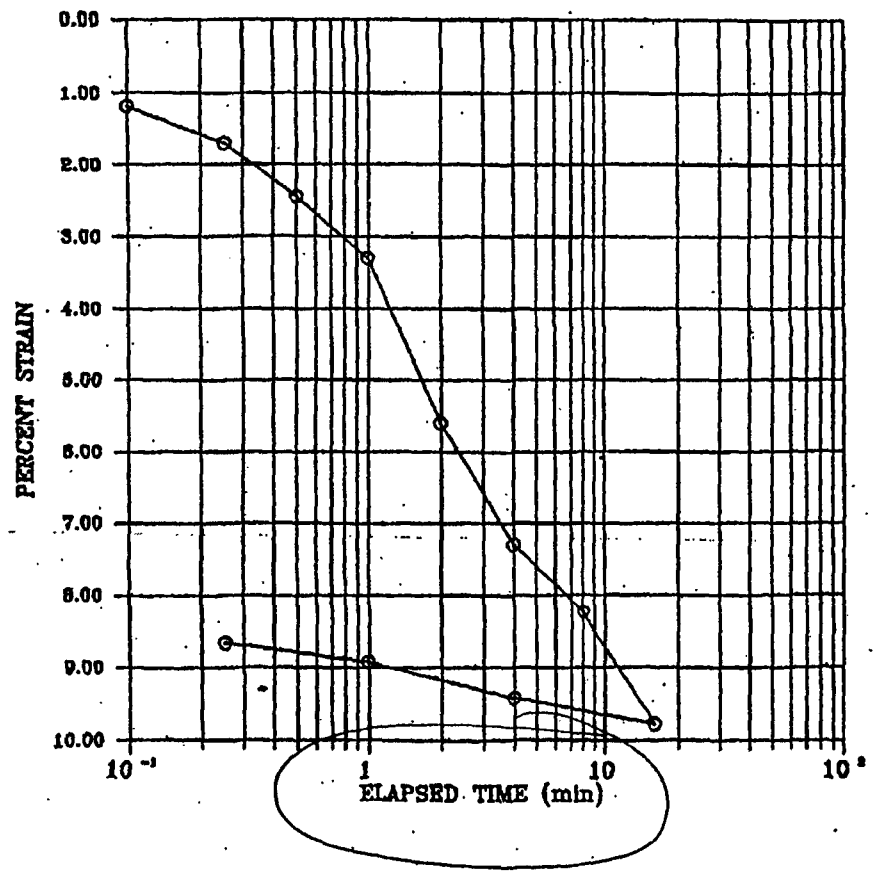
The Earth Technology Corporation

TRIAXIAL TEST RESULTS
TEST TYPE: UU

CONSOLIDATION TEST RESULTS
(ASTM D2435)

PROJECT: SAS 5993E SML / TETC NO. : 91-212-3108
CLIENT PROJECT NO.: 5993E CLIENT : VIAR COMPANY
REPORT DATE : Feb. 18, 1991 SUMMARIZED BY : S. Sayawatana

SAMPLE NO. : HD K 14-01 DEPTH : N/A ft.
INITIAL DRY DENSITY : 91.0 pcf. INITIAL MOISTURE CONTENT : 34.0 pct.
INITIAL VOID RATIO : 0.816
SPECIFIC GRAVITY : 2.55 (assumed)



TECHNICAL MEMORANDUM - NO. 6

ORIGINAL

DATE: APRIL 29, 1991

TO: Vanessa Harris - Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA Arcs Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump Phase I

PRIVATE WELL SAMPLING AND BASEMENT AIR SCREENING

Introduction

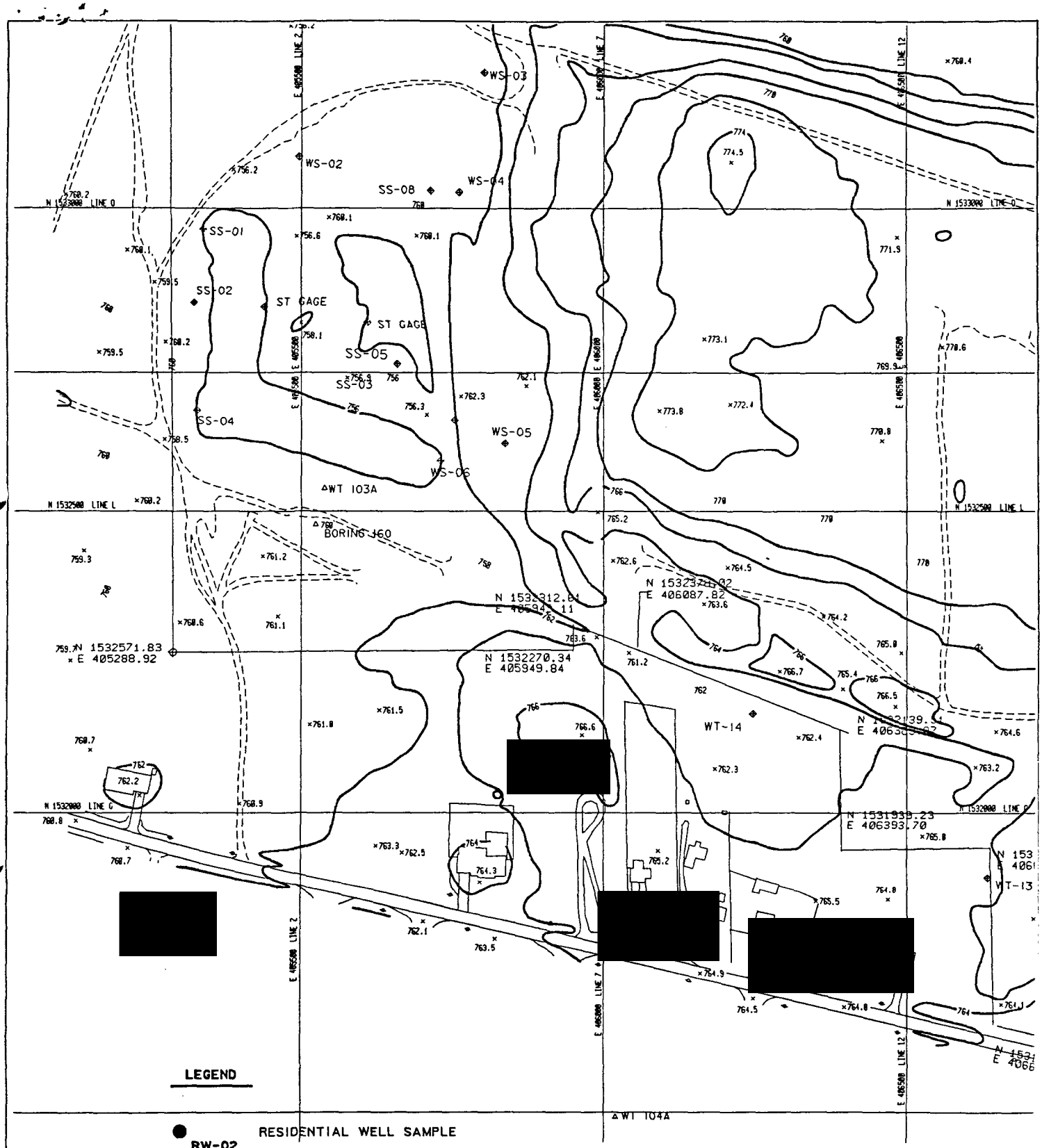
Groundwater samples were collected from five residential wells immediately south of the Himco Dump site along County Road 10, and one residential well immediately south of County Road 10 on October 22, 23, and 24, 1990. Four basements of these residences along County Road 10 were also screened for the presence of landfill gases.

Residential wells were sampled to investigate groundwater quality. Originally, all residences had shallow (approximately 22 feet deep) wells. Deeper wells (RW-01, RW-03, RW-04, RW-06, RW-07, RW-08) (at 152 to 172 feet) were installed in 1974. Although the state found high levels of manganese in these wells in 1974 and were ordered replaced, some of the original shallow wells remain. Two wells (RW-02 and RW-05) were sampled at residences where an older shallow well was accessible in addition to their present deep wells. Shallow wells were sampled in addition to deep wells at the Rumfelt and Kolanowski residences.

Basement gas was screened to evaluate if landfill gas which may be generated at the site has migrated off-site and into these nearby resident's basements. This screening was qualitative to check for the presence of methane and hydrogen sulfide.

Procedures

Groundwater sampling of residential wells and basement air screening was carried out as described in Sections 4.2.4 and 4.8 of the Final Field Sampling Plan, Himco Dump, Remedial Investigation/Feasibility Study, Elkhart, Indiana. The residents names and their addresses are: [redacted] CR 10; [redacted] CR 10; [redacted] CR 10; [redacted] CR 10; [redacted] CR 10; and [redacted] CR 10 (Figure 1). Samples obtained from newer deep wells were obtained directly from the tap at the kitchen



MARCH 1991

FIGURE 1
RESIDENTIAL WELL LOCATIONS

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20026

Donohue ENGINEERS ARCHITECTS SCIENTISTS

sink or if available, at a tap in the basement ahead of the water softener. The tap was allowed to purge for five minutes before the sample was collected. Samples taken from shallow wells were purged by bailing. A 1-inch bailer was used in these 1 1/2-inch I.D. wells.

Samples for bromide analysis were field filtered using a millipore filtration unit and 0.45 micron filters. Measurements of field pH, conductivity, temperature, and dissolved oxygen were obtained at the field trailer immediately following sample collection. Preservatives, sample bottles, and holding times are summarized in Table 4-2 of the Final Field Sampling Plan.

Deviations from Project Plans

One of the six residences which were originally scheduled for well sampling and basement air screening was removed from the list when the owner of the home could not be located. A homeowner located south of the Himco Dump immediately south of County Road 10 (Freeman) solicited EPA to be added to the list of residential wells to be sampled. Sampling of the Freeman well brought the total residential well locations back up to the anticipated six. The Kolanowski residence did not have a basement and, consequently, was not screened for landfill gas.

Not all of the original six old shallow wells were intact and accessible. In practice, only two older shallow wells (RW-02 and RW-05) were accessible for sampling.

The shallow residential wells were not of large enough diameter (1-1/2-inch) to sample with a Keck pump as described in the field sampling plan. A 1-inch bailer was used as an alternative sampling method.

Five gallons were removed from each of the two residential wells. Readings of pH, conductivity, dissolved oxygen, and volume removed were not recorded during purging of the residential wells, but were recorded after 5 minutes of running the tap for deep wells, or upon removal of 5 gallons from shallow wells.

The 1-inch bailer was decontaminated between sampling locations by an alconox and tap water wash, a tap water rinse, an isopropanol rinse, and two deionized or distilled water rinses. Isopropanol rinsates were collected in a 5-gallon bucket and covered for eventual discharge into an on-site frac tank.

Summary of Results

Eight groundwater samples were collected from six locations. Six deep wells were sampled from taps and two shallow wells were sampled by bailing.

The [redacted] shallow wells were abandoned; the shallow [redacted] well was in a location which made it inaccessible to bailing, and the fourth shallow well was at a residence which was locked and not occupied.

Basement air was screened at the [redacted] residences. A hydrogen sulfide and methane gas detector was used to screen the basement air. No detections of these compounds were registered during any of the basement air monitoring.

A/R/HIMCO/AB2

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 7

DATE: January 24, 1991

TO: Vanessa Harris - Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump

LANDFILL CAP SOIL SAMPLING

Introduction

Twelve soil samples of the landfill cap at the Himco Dump site in Elkhart, Indiana, were collected for chemical analysis on November 8, 9, 10, 11, and 12. Sampling methods described in the Final Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana were followed. Sampling was done by Eric Slusser and Tom Puchalski of Donohue & Associates, Inc. The purpose of sampling the landfill cap was to characterize the chemistry of the white powder matrix which makes up the majority of the cap material.

Methods

Section 4.0 of the Final Field Sampling Plan, Himco Dump Remedial Investigation/ Feasibility Study, Elkhart, Indiana, describes the method used for soil cap sampling and the technique used to define the sampling locations. The sampling locations were spread out to cover the entire landfill cap. Soil samples were located from a systematic grid marked by survey stakes. The actual soil sampling locations are provided in Figure 1. Completed soils data forms are presented in Appendix A.

The twelve soil samples were collected from depths as shallow as three to nine inches and as deep as eight to sixteen inches. The depth varied dependent upon the thickness of the overlying sand and topsoil cover. The cover material overlying the white material, assumed to be calcium sulfate, was removed with a shovel prior to sampling at each location. A hand auger was used to dig out the white material. The sample was placed in a stainless steel bowl and immediately placed in two 4 oz. jars for volatile analysis. The remaining sample volume in the bowl was mixed using a stainless steel spoon. After a homogeneous mixture was obtained, the sample was divided into four quadrants. Small portions of each quadrant were used to fill each remaining sample jar.

Before sampling and between each sample location, all sampling equipment was decontaminated with: (1) a soap and tap water wash, (2) a tap water rinse, (3) an isopropanol rinse, and (4) two rinses with distilled or deionized water. Isopropanol rinses were retained in a covered 5-gallon pail for eventual discharge into the on-site frac tank.

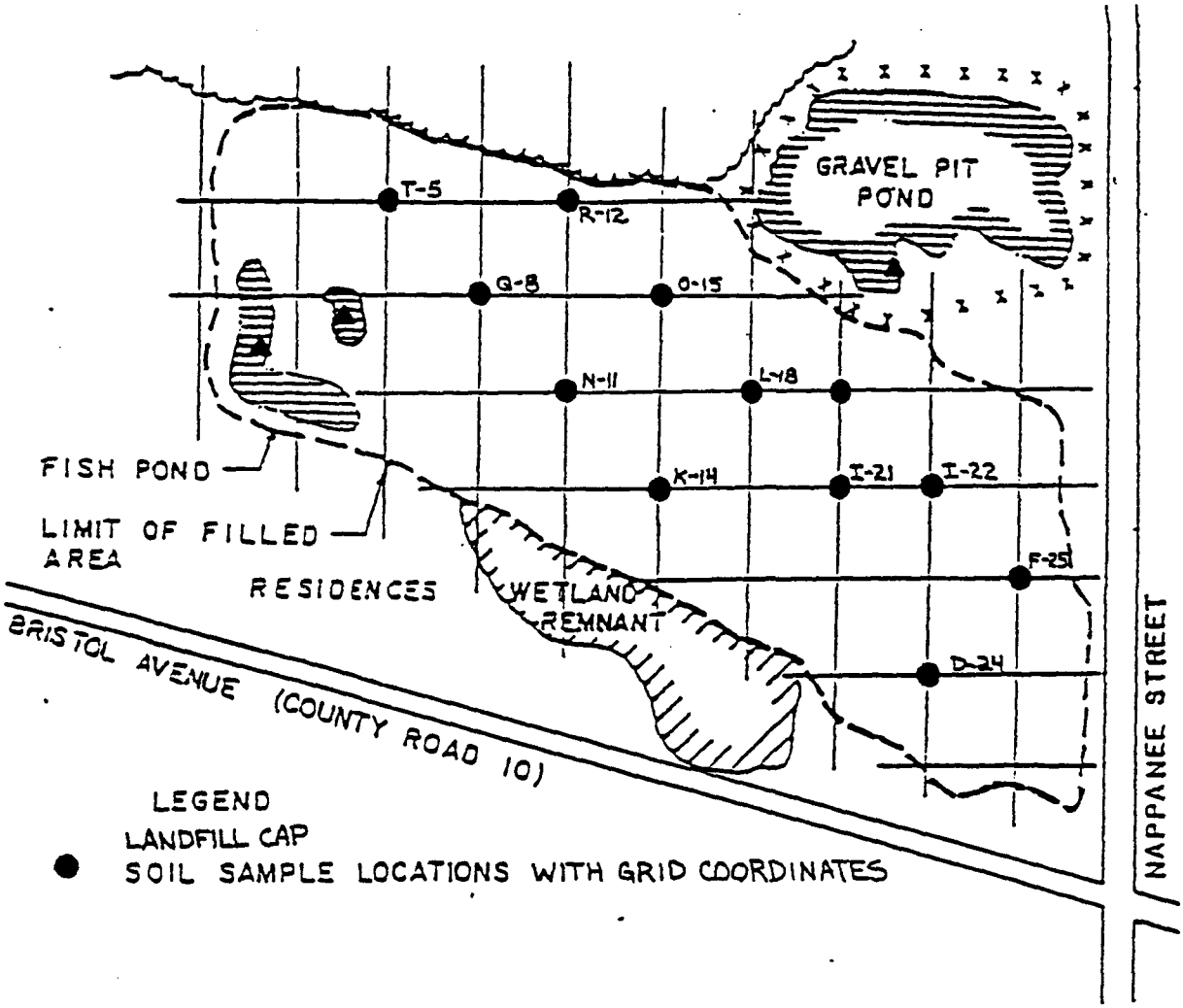
Deviations

Figure 4-1 of the Field Sampling Plan shows soil sampling locations based on a grid system which was not used in the field. The grid shown in Figure 4-1 is diagramatic and not meant to represent the final surveyed grid. It was designed to show approximate soil cap sampling locations. Actual grid points were selected in the field using the general pattern, as shown in Figure 4-1, so that the entire area of the landfill cap was sampled. The actual grid points are shown in Figure 1 of this memorandum. Photographs were not taken of each location on the landfill cap as the sampling areas were similar, and the photo would not aid in identifying the location.

Summary of Results

Soil samples of the cap soil material were taken at twelve locations spaced out across the area of the landfill cap. In general, the white material thins from west to east. The appearance of the white material is uniform with no discernible trends. Soils data forms are provided in Appendix A of this memorandum.

A/R/HIMCO/AB1



0 500 1000

SCALE: FEET

SCALE IS APPROXIMATE

SOURCE: US EPA, AUGUST, 1986

Donohue

APPROXIMATE SITE SAMPLING LOCATIONS

N

20026

MAY, 1990

FIELD SAMPLING PLAN

HIMCO DUMP SITE

ELKHART, INDIANA

FIGURE 1

Engineers • Architects • Scientists

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Capsc. 1 Ch
Soil Subsample ~~T-5~~ GS-(

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.02

DATE 11/8/90

TIME 1408

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 12-18" from surface

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: T-5 survey marker at northwest corner of land fill cap at edge of wards.

DESCRIPTION OF SUBSAMPLE: White silt (ML) non plas, low cohe, damp.

ANY OTHER CHARACTERISTICS OF NOTE: 1 foot of fine gravel Brn silty sand fill on top of white cap material. Used a shovel to remove upper sand then hand augered from 12-18".

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Cap Soil

Soil Subsample GS 02

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20076.02

DATE 11/8/90

TIME 1641

COLLECTOR TOM BUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 6-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Q-8 survey stake ≈ 350 feet east of western edge of landfill cap

DESCRIPTION OF SUBSAMPLE: 6 inches of topsoil and brown silty sand overlying sample. Sample is white silt (ML) non plas, loose, damp.

ANY OTHER CHARACTERISTICS OF NOTE: Bottom of white silt cap at ≈ 18".

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Capsoil

Soil Subsample GS03

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.02

DATE 11/9/90

TIME 848

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 6-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Capsoil at survey stake N-11 near middle of flat covered landfill, vegetation at ground surface consists of moss and grass.

DESCRIPTION OF SUBSAMPLE: Sample consists of white silt (ML) with a trace of fine brown sand in thin (≈ a few mm) stringers.

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Capsoil

Soil Subsample GS04

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 30036.033

DATE 11/9/90

TIME 937

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-3" Silt, Sand Cover - Not sampled
3"-17" Sampled
white silt

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Survey marker K-14 near southeast end of landfill cap about 300 feet north of wetland remnant

DESCRIPTION OF SUBSAMPLE: White silt (ML) with a trace of brown sand in thin fractures. Moist, non plastic, low cohesion

ANY OTHER CHARACTERISTICS OF NOTE: Sumac is dead in this area. Reached grey moist paper (waste) at 18". Methane gas was exiting the auger hole. We immediately covered the hole

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill
Soil Subsample GS05

Engineers & Architects & Scientists **Site** Limco Dump **Project No.** 70036.03

DATE 11/10/90

TIME 841

COLLECTOR Eric Slusser
Tom Puchalski

SAMPLE DEPTH 8-16"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Middle north area of landfill cap ≈ 100 feet ~~north~~ south of woods at survey stake R-12 11/1/90

DESCRIPTION OF SUBSAMPLE: White silt (ML) thoroughly, non plas, damp.

ANY OTHER CHARACTERISTICS OF NOTE: 0-8" brown fn grn silty sand fill. Refusal at 18" is light brown paste-like material. No odor

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill Ca

Soil Subsample GS06

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 30026.02

DATE 11/10/90

TIME 905

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 6-14"
Ø

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: ≈ 200 feet south of brush at south end of quarry pond at survey stake A-15

DESCRIPTION OF SUBSAMPLE: White silt (ML), low coh non plas, moist. 6" of cover fill consists of brown fine grained silty sand ~~cov~~ which was not sampled. Grey silty sand at 14" was also not sampled.

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill Cap

Soil Subsample GS07

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.02

DATE 11/11/90

TIME 9/12

COLLECTOR ERIC SLUSSER
TOM PUCHALSKI

SAMPLE DEPTH 12-15"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: At survey location L-18 at area of grass and small trees and sumac at east edge of landfill cap ≈ 400 feet south of the west edge of the quarry pond.

DESCRIPTION OF SUBSAMPLE: Sample consists of white silt (ML) low cohesion, non plas, moist with brown fractures - rare.

ANY OTHER CHARACTERISTICS OF NOTE: A thin layer of white silt exists from 3-5" sandwiched between fine silty sand cover material

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill Cap

Soil Subsample GS08

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20036.03

DATE 11/11/90

TIME 954

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 13"-15"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Near west edge of access road at east edge of landfill cap at survey marker L-21. About 200 feet

DESCRIPTION OF SUBSAMPLE: White areas and light gray areas of silt (ML) with hematite-trace. Trace light yellow fractures

0-6" - Brown fine silty sand
6-13" Black cinderey fill
13-15" White & gray silt — Sampled
15" Grey fine sand

ANY OTHER CHARACTERISTICS OF NOTE: Chemical odor

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill 1

Soil Subsample GS19

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.02

DATE 11/11/90

TIME 1127

COLLECTOR TOM PIKUHLSKI
ERIC SLUSSER

SAMPLE DEPTH 8-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: East edge of high flat landfill cap ~30 feet west of access road at survey marker I-21

DESCRIPTION OF SUBSAMPLE: White silt (ML) low plas, nonplas, moist with a trace of black fractures. 3" of brown fine SM cover - not sampled.

ANY OTHER CHARACTERISTICS OF NOTE: Lichens at surface

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill Cap

Soil Subsample GS10

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 30026.03

DATE 11/12/90

TIME 853

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 3-9"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Survey grid point I-22 at east edge of access road. Piles of asphalt debris nearby.

DESCRIPTION OF SUBSAMPLE: White silt (ML) interlayered with brown 10YR 5/3 fine grained silty sand (SM). Sample has cinacrid H_2S odor.

ANY OTHER CHARACTERISTICS OF NOTE: Base of silt defined by lower fine grained brown sand.

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill Cap
Soil Subsample GS11 & Dup

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 11/12/90

TIME 947

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-4" - Cover soil - Not Sampled
4"-18" - Sampled

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: 60 feet west of Nappanee St extension at F-25

DESCRIPTION OF SUBSAMPLE: White silt with a trace of rootlets. Silt is moist, low coh. non plas.

ANY OTHER CHARACTERISTICS OF NOTE: Did not reach the base of the white silt

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Landfill Cap

Soil Subsample GS12

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.03

DATE 11/12/90

TIME 1032

COLLECTOR ERIC SLUSSER
TOM PUCHALSKI

SAMPLE DEPTH 4-8"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Survey stake D-24 east of access road ≈ 100 feet NE of job trailer

DESCRIPTION OF SUBSAMPLE: White silt (ML) with light brown fracture ~~fills~~ staining & rootlets.

ANY OTHER CHARACTERISTICS OF NOTE: Could not sample at B-23 as no white silt was present.

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 8

DATE: April 3, 1991

TO: Vanessa Harris - Site Manager

CC: Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump RI/FS

WELL SAMPLING

Introduction

Ten groundwater monitoring wells installed during this investigation, and 23 previously installed wells were sampled at the Himco Dump site on November 14 through January 9, 1991, to investigate the vertical and horizontal extent and degree of contamination of the uppermost unconsolidated aquifer. Groundwater samples were collected by Eric Slusser, Steve Spiewak, Tracy Koach, and Anya Kirykowicz of Donohue & Associates, Inc. Groundwater samples were collected as described in Section 4.2.4 of the Final Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana. The well locations are shown in Figure 1. Completed purge and sample collection forms are in Appendix A. Table 1 contains the well bottom depths for all wells used in the sampling event.

Methods

All field meters were calibrated at the beginning of each day before sampling activities began. The sampling equipment was transported to each well location in plastic coolers.

After unlocking the protective casing, a photoionization detector was used to monitor the air near the casing top. A decontaminated water level measuring tape was then lowered into the well casings to obtain a water level and well bottom depth. This information was recorded on the purge and sample form. A well volume was calculated from this information so that at least five volumes could be removed during the purging process.

A YSI water quality meter was connected in-line with a Keck pump so that direct measurements of pH, conductivity, and temperature could be collected from the purge water. Purging continued until the readings have stabilized to pH ± 0.1 unit, conductivity ± 10 percent, and temperature to $\pm 0.5^\circ$ C. This information was recorded on the purge and sample collection form. As soon as the purge pump was removed, a second reading of the water level was obtained.

An alternative purging method was used for 4-inch diameter wells due to the large volumes of purge water which needed to be removed before sampling. A stainless steel submersible pump was used which pumped up to 20 gallons per minute. This 220-volt electric pump received its power from a portable gasoline generator.

A 500-gallon polyethylene tank was strapped to the back of a four-wheel drive pickup truck so that the purge water could be collected from each well and transported to the on-site 21,000-gallon frac tank. Measurements of pH, conductivity, and temperature were recorded periodically during the purging process with a combination pH, conductivity, temperature meter. The Keck pump was used to sample these wells following purging with the submersible pump.

Wells F-1 and F-3 were purged by bailing with a 1-inch diameter bailer. Readings of pH, conductivity, and temperature were collected periodically as purging progressed.

The time between the completion of purging and the collection of the sample did not exceed 24 hours for any well. Table 4-2 of the Final Field Sampling Plan summarizes the sample container and preservative requirements. When a preservative was added to a sample, pH paper was used to ensure that adequate preservative was added.

Samples obtained for dissolved metals or bromide analysis were collected in a one liter polyethylene container for filtration at the field trailer. Samples were filtered with 0.45 micron paper using a millipore filtration unit in combination with nitrogen supplied by a pressurized tank.

All samples were stored in coolers with ice until custody was relinquished to the sample custodian at the field trailer.

Outer parts of the Keck pump and the one-inch bailer, which came into contact with groundwater and were used for sample collection, were cleaned between wells with an Alconox and tap water wash, a tap water rinse, an isopropanol rinse, and two deionized water rinses. The inner parts of the Keck pump and the submersible purge pump were cleaned by pumping distilled water through the system, or in the case of the purge pump, by rinsing the inside and outside several times with distilled water.

Deviations

Wells F-1 and F-3 were purged and sampled with a bailer instead of a Keck pump as described in the sampling plan. A Keck pump was too large to fit in these wells. Using a bailer did not effect the sample integrity.

A 3-inch submersible pump was used to purge the 4-inch diameter wells because a more rapid purging method than a Keck pump was needed to remove the large volume of groundwater from these wells. The purging was followed with sampling accomplished with a Keck pump.

Summary of Results

Twenty-three wells installed in 1977 and 1979 by the U.S.G.S. and ten wells installed by Donohue for this investigation were sampled for groundwater. Large volumes of purge water were required to be removed to purge the required five-well volumes because of the 4-inch diameter and extreme depth (up to 495 feet) of some of the U.S.G.S. wells.

TP/ke

A/R/HIMCO/AG7

WELL DESIGNATION	DEPTH TO SCREEN BOTTOM (in ft.)
B-1	495
B-2	12
B-3	129
B-4	173
CP-1	20
E-2	17
E-3	174
F-1	32
F-2	153
F-3	15
G-1	50
G-3	169
I-1	172
I-2	15
I-3	35
J-1	40
J-2	18
J-3	152
M-1	24
M-2	103
N-1	30
O-1	20
Q-1	20
WT-101A*	18.75
WT-102A*	18.50
WT-103A*	18.50
WT-104A*	18.80
WT-105A*	18.50
WT-106A*	21.25
P-101B*	100.50
P-101C*	167.50
P-102B*	67.90
P-102C*	162.00

* Wells installed by Donohue during this investigation. All others were installed by the U.S.G.S. in 1977 and 1979.

A/R/HIMCO/AG7

APPENDIX A

WELL PURGE AND SAMPLE COLLECTION FORMS

Donohue
Engineers & Architects

Well Purging and Sample Collection

N-1

Project No. 20026.223 Site HINCO DUMP

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site (weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
1555	8.95	29.29	3.32							
1605						7.35	.143	11.8	Y	SLIGHT (OFF. 1.5)
1610				3.5		7.63	.256	12.5	Y	SLIGHT (LT. GRAYISH)
				7.0		7.63	.300	12.6	Y	LITTLE SLIGHT
1615				10.5		7.62	.302	12.7	N	
1618				14.0		7.61	.305	12.7	N	
1620				17.5		7.60	.309	12.7	N	
1630	WAITING									
1645	FINISH									DISSOLVED OXYGEN = 4.25

2" well
Notes 0.163 X 20.34 = 3.32 gal = 1 well vol WC = 29.29 - 8.95 = 20.34

COND. SET UP 2 ND VOL 3.32 MOTT.

Signature Date 11-29-90

P.M./86

Donohue
Engineers & Architects

Well Purging and Sample Collection

O-1

Project No. 20026.023 Site HIMCO DUMP

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site (weather, temp., soil, conditions)

12/3/90

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond. mho/cm	Temp °C	Turbidity Y/N	Comments
C-1 1530	9.16	28.5	3.32							
C-1 1535				0		7.8	0.523	12.0	slightly	
C-1 1538				5.5		7.89	0.527	12.5	CLEAR	
C-1 1540				7.0		7.90	0.524	12.6	CLEAR	
C-1 1542				10.5		8.36	0.529	12.6	CLEAR	
C-1 1544				14.0		14.75	0.515	12.6	CLEAR	pH, weeps up to
C-1 1546				17.5		9.17	0.514	12.6	CLEAR	
C-1 1548				21.0		8.36	0.512	12.6	CLEAR	
C-1 1550				24.5		8.11	0.511	12.6	CLEAR	
C-1 1552				28.0		8.00	0.510	12.7	CLEAR	
C-1 1554				31.5		7.95	0.507	12.6	CLEAR	
C-1 1556				35.0		7.90	0.506	12.6	CLEAR	
				~~38.5~~	AK 12/3/90					
C-1 1600					AK 12/3/90					SAMPLING
C-1 1620					TR 9.15					
										DISSOLVED OXYGEN = 2.5

Notes C-1: 24.5 - 9.16 = 20.34; 20.34 x 0.163 = 3.32; 3.32 x 5 = 16.6

Signature Date 12-3-90

P.M./86

Donohue
Engineers & Architects

Well Purging and Sample Collection

X-1

Project No. 20026.023 Site Hinco Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site (weather, temp., soil, conditions) INDUSTRIAL STREET, NEXT TO HYDRANT, GRASS, PT. SUNNY, W. WDY, 60 40's

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
X-1				0		7.69	.186	10.5		1350
1354	4.97	23.69	3.05	3.1		7.61	.954	12.2	Y VERY	GREENISH TINT
1355				6.2		7.61	.979	12.9	Y SLIGHT	LT GREENISH TINT
1400				9.3		7.57	.966	13.0	Y SLIGHT	"
1403				12.4		7.51	.961	13.0	Y SLIGHT	VERY LT GRN TINT
1405				15.5		7.49	.953	12.9	Y SLIGHT	"
1410	SAMPLING									
1420	FINISH				4.97					
										D.O. = 3.3

Notes 2" well 0.163 x 18.72 = 3.05 = 1 well volume WC = 23.69 - 4.97 = 18.72 ft

Signature Date 11-29-86

P.M./86

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Well Purging and Sample Collection

WT 101A

Project No. 20026.003 Site Hinco Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site GRASSY, MID 30's, CLDY, WINDY
(weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
WT 101A										
1550	11.26	18.70	1.21	1		7.45	.989	11.1	slightly turbid	11:04 [illegible]
11:04				1.5		7.45	.989	11.7	slightly turbid	coloring — yellow in green
11:06				3.0		7.44	.984	12.1	v slightly turbid	
11:07				4.5		7.41	.977	12.2	v slightly turbid	
11:08				6.0		7.38	.971	12.3	v slightly turbid	
11:10				7.5		7.35	.965	12.3	v slightly turbid	
1622	SAMPLING									
1655	FINISH AT WT 101A									
										DISSOLVED OXYGEN
										5.35

Notes 2" old Calc. 0.163 X 7.19 = 1.17 gals = 1 well vol. 18.70 - 11.26 = 7.44 ft

7.44 X 0.163 = 1.21 gals = 1 well vol.

[illegible] 2.5 gal X5 [illegible]

Signature [illegible] Date [illegible]

P.M./86

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Well Purging and Sample Collection

1-5/10-A

Project No. 20026.023 Site HINCO DUMP

Method of Purging Pumped ✓ Bailed

Equipment ✓ Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site (weather, temp., soil, conditions) IN TRUCK WINDY, MID 30'S, CLOUDY

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
WT 10A						7.43	1.64x	10.7		
1420	10.30	18.16	1.28	1		7.93	1.045	10.7	V slightly t-5.0	(1425)
1422				1.5		7.96	1.054	11.7	V slightly t-5.0	
1424				3.0		7.98	1.051	12.1	N	
1425				4.5		7.98	1.055	12.3	N	
1426				6.0		7.96	1.056	12.3	N	
1427				7.5		7.95	1.053	12.3	N	
1437	SAMPLING									
1455	FINISH									DISSOLVED OXYGEN 6.41

Notes 2" old calc. 0.163 x 7.11 = 1.16 gal = 1 well vol. 15.16 - 10.3 = 7.86 ft.
0.163 x 7.86 = 1.28 gals = 1 well vol.

CONDUCTIVITY ON 2 SCALE READING ON YSI 3200 METER

Signature [signature] Date 11-22-90

P.M./86

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Well Purging and Sample Collection

WT 103A

Project No. 20026.023 Site HINCO DUMP

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site (weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
WT 103A										
1135	5.29	18.48	2.15	1		7.02	.495	12.1	Y slightly	(11:49 [illegible])
11:51				2.5		8.13	.533	14.4	N	
11:53				5.0		8.18	.539	15.4	N	
11:54				7.5		8.08	.537	15.5		
11:56				10.0		8.05	.537	15.5		
11:58				12.5		8.03	.536	15.6		
1202	SAMPLING									
1220					5.29					DISSOLVED OXYGEN 2.21

Notes old calc. 2" 0.163 x 12.34 = 2.01 gal = 1 well vol. WL 18.48 - 5.29.

new 0.163 x 13.19 = 2.15 gal = 1 well vol

CONDUCTIVITY ON A SCALE RANGING ON YSI 33[illegible] METER

Signature [illegible] Date 11-[illegible]

P.M./86

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Well Purging and Sample Collection

WT 104A

Project No. 20026.023 Site HIMCO DUMP

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site GRASS, BRUSH, MID 40'S
(weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.) (Total)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
WT 104A										
0900	11.75'	18.90	1.2 gal	0		7.77	0.088	10.1	slightly	
0921				2		7.97	0.093	10.8	↓	
0923				3.5		8.25	0.097	11.0	↓	
0924				5		8.34	0.098	11.1	↓	
0926				6.5		8.44	0.100	11.2	↓	
				8		8.49	0.101	11.3	↓	
				9.5		8.53	0.102	11.3	↓	
				11.0		8.55	0.102	11.3	clear	
0932				12.5		8.56	0.102	11.3	↓	
0934				14		8.57	0.103	11.3	↓	
0935	Begin Sampling									D.O. = 10.0
	TAKE Field Duplicate									mg/L
1020	FINISH				11.75					

Notes old cal.
0.163 x 6.32 = 1.03 gal = 1 well vol.
New cal
0.163 x 7.15 = 1.17 gal = 1 well vol.

Conductivity meter on 2 scale reading mmho/cm on YSI 3500 meter

Signature [signature] Date 11-28-90

P.M./86

Donohue
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Well Purging and Sample Collection

WT 105A

Project No. 20036.023 Site Hinco Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump KECK Manufacturer Diameter Description of site (weather, temp., soil, conditions) PT TROLLING, 40's, LITE WIND, PT CLDY.

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
WT 105A										
5:40	9.72	18.52	1.43	1		8.07	.306	11.2	Y	SLIGHT
				1.5		8.14	.304	11.7	Y	"
				3.0		8.16	.299	12.1	Y	VERY SLIGHT
				4.5		8.15	.297	12.2	N	
5:22				6.0		8.14	.297	12.2	N	
				7.5		8.13	.296	12.2	N	
5:22	STOP SAMPL. NO									
5:25	FINISH									
										D.O. = 5.25

Notes 2" well old calc. 0.163 x 8.32 = 1.36 gal 1 well vol 18.52 - 9.72 = WC = 8.80

0.163 x 8.80 = 1.43 gal 1 well vol

Cont. SAMPLE OUT OF SEDIMENT

Signature [signature] Date 1/29/90

P.M./86

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Well Purging and Sample Collection

WT 10.6 ft

Project No. 20026023 Site Himco Dump

Method of Purging Pumped x Bailed

Equipment Keck Airlift N2 Lift In. Bailer Length Ft. Material

Pump Manufacturer Johnson Diameter Description of site hmd 50s-60s, scattered
(weather, temp., soil, conditions)

14°C

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
WT 10.6 ft / 10:34	9.46	18.47	1.5	1.0		7.15	684	603	N	DO 2.2
10:39				3.0		7.18	710	608	N	DO 2.1
10:43				4.5		7.13	711	592	N	DO =2.3
10:47				6.0		7.08	728	590	N	DO =2.2
10:51				7.5	9.46	7.08	733	590	N	DO =2.2
	Samples		10:55							

Notes 2" well πr^2 (7.48) = 0.163 0.163 x 9.09 = 1.4 gal (old calc.)

he 0.163 x 9.0 ft = 1.46 = 1.5 gallons 1 well vol.

Signature [signature] Date 11-27-93

P.M./86

P-101B

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Well Purging and Sample Collection

Project No. 20026.023 Site Himco Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump Manufacturer Keck Diameter 1.75" Description of site Cold Snowing, wind NW 5-10 mph.
(weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
P-101B 8:52	9.30	100.70	14.90	15		9.70	.736	11.8	Y	Slightly turbid, lt tan
9:02				30		9.28	.887	11.8	Y	Slightly turbid lt tan
9:13				45		8.90	.846	11.8	Y	slightly turbid lt tan
9:23				60		8.63	.828	11.8	Y	Slightly turbid [illegible]
9:34				75		8.52	.801	[illegible]	Y	Slightly turbid milky
9:44				90		8.44	.776	11.5	Y	V Slightly turbid milky
10:21				105		8.48	.759	11.5	Y	V Slightly turbid milky
	Water Sampled 12:09									

Notes 2" well WC = 100.70 - 9.30 = 91.50

91.40 x 0.163 = 14.91

Conductivity Readings on 2 scale in mU/cm

Signature [signature] Date 1/9/91

P.M./86

P-101C

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Well Purging and Sample Collection

Project No. 20026.023 Site Himco Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump Manufacturer Keck Diameter 1.75" Description of site (weather, temp., soil, conditions) cold, cloudy, scattered snow, low 30's

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
P-101C 14:57	9.40	163.0*	25.04	25		8.07	.436	12.0	Y	Slightly turbid Lt Gr.
15:14				50		7.98	.434	11.9	Y	[illegible]
15:32				75		7.94	.424	11.8	Y	Lt Gray-Brown turbid-slightly
15:49				100		7.92	.422	11.8	Y	v slightly turbid Lt Gray-Brown
16:07				126		7.91	.42[illegible]	11.7		
	Water Sample			16:11						

Notes 2" well = 153.6 x 0.163 = 25.04 wc = 163.0 - 9.40 = 153.6

* very muddy bottom, hard to tell may have ~2.0-3' of Sediment

Conductivity readings on 2 scale in mU/cm

Signature Eric D. Sluss Date 1/9/91

P.M./86

WT ~~Ele~~ - 106 A

01/08/91

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Well Purging and Sample Collection

Project No. 20026 023 Site Hime Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump X Manufacturer Keck Diameter 1.75 Description of site Cold cloudy mid 20s
(weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
01/08/91 16:41	7.10	18.60	1.87	2		7.44	.353	9.3	Y	Lt br v slightly turbid
16:42				4		7.23	.566	9.9	N	
16:44				6		7.21	.604	10.1	N	
16:46				8		7.21	.614	10.1	N	
16:48				10	7.10	7.21	.624	10.2	N	
	Water Sampled at 16:11									

Notes 2" well 11.50 x 0.163 = 1.87 = 1 well vol WL 18.60 - 7.10 = 11.50

Conductivity reading on 2 scale in mΩ/cm

Signature E. D. [illegible] Date 1-8-91

P.M./86

WT-105A

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Well Purging and Sample Collection

Project No. 20026 023 Site Hinco Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump Y Manufacturer Keck Diameter 1.75 Description of site Cold cloudy mid 20s
(weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
WT105A 14:47	8.10	18.70	1.73	2		8.05	.175	10.4	Y	Lt Br
14:50				4		7.59	.196	10.4	N	
14:51				6		7.59	.197	10.5	N	
14:53				8		7.59	.200	10.5	N	
14:54				10		7.59	.202	10.5	N	
					8.10					

Notes 2" well 10.60 x 0.163 = 1.73 = 1 well vol WC = 18.70 - 8.10 = 10.60

Conductivity on 2 scale in mmo/cm

Signature E. D. Hess Date 11/8/91

P.M./86

P-102C

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Well Purging and Sample Collection

Project No. 200 26 023 Site Hime Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump ✓ Manufacturer Keck Diameter 1.75 Description of site (weather, temp., soil, conditions) cool cloudy low 20s upper 10s

-8-91

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
9:54	7.60	151.6	24.35	25		7.87	1243	11.2	Y Tubes B	[illegible]
10:23				50		7.80	301	11.2	Y	4 turn (scale) [illegible]
10:40				75		7.77	301	11.2	N	
10:57				100		7.76	300	11.2	N	
11:48				125		7.77	300	11.3	N	
					11.35					
	Water	Sample	11:50							

Notes 2" well 149.4 x 0.163 = 24.35 = 1 well WC 151 - 7.6 = 143.4

Decision - turn lowered pump to accommodate formation flow (not as high a recharge) pump down ~35 below TOC

Conductivity Reading on the 2 scale in m℧/cm

Signature Eric D Slum Date 1/8/91

P.M./86

P-102B

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Well Purging and Sample Collection

Project No. 20026 023 Site Himco Dump

Method of Purging Pumped Y Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump Y Manufacturer Keck Diameter 1.75 Description of site Snow cold mid 20s
(weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
P-102B 14:05	9.11	67.35	9.49	10		7.46	.454	11.5	N	muck bottom st 2:42 14:50
14:51				20		7.45	.456	11.4	N	
15:02				30		7.45	.455	11.4	N	
15:14				40		7.45	.455	11.3	N	
15:38				50		7.47	.454	11.3	N	
					9.25					
	Water Sampled			at	15:42					

Notes 2" well WC = 67.35 - 9.11 = 58.24

58.24 x 0.163 = 9.49 gallons = 1 well vol

Conductivity on 2 scale of YSI mmo/cm

Signature [signature] Date 1-7-91

P.M./86

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Well Purging and Sample Collection

NT-10.2A

Project No. 20026.023 Site Hinco Dump

Method of Purging Pumped ✓ Bailed

Equipment Airlift N2 Lift In. Bailer Length Ft. Material

Pump ✓ Manufacturer Keck Diameter 1.75 Description of site Cold sunny 12 to 20' wind South 5-5 mph, gust up to 10 mph
(weather, temp., soil, conditions)

Well No. / Time	Depth to Water	Depth to Bottom	Volume Calculated (gal.)	Volume Removed (gal.)	Depth After	pH	Cond.	Temp	Turbidity Y/N	Comments
1-7-91 13:18	9.45	18.16	1.42	1.5		7.30	.400	13	Y	OVA=0
13:20				3.0		7.30	.560	11.2	Y	
13:21				4.5		7.28	.562	11.2	N	
13:22				6.0		7.28	.569	11.1	N	
13:23				7.5		7.28	.568	11.1	N	
					9.45					
	Water Sampler			13.24						

Notes 0.163x 8.71 = 1.42 = 1 well vol WC = 18.16 - 9.45 = 8.71

Conductivity Reading on 2 scale in mU/cm

Signature Eric D Shum Date 1-7-91

P.M./86

TECHNICAL MEMORANDUM NUMBER 9

ORIGINAL

DATE: January 28, 1991

TO: Vanessa Harris - Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump RI/FS

SURFACE WATER/SEDIMENT SAMPLING

Introduction

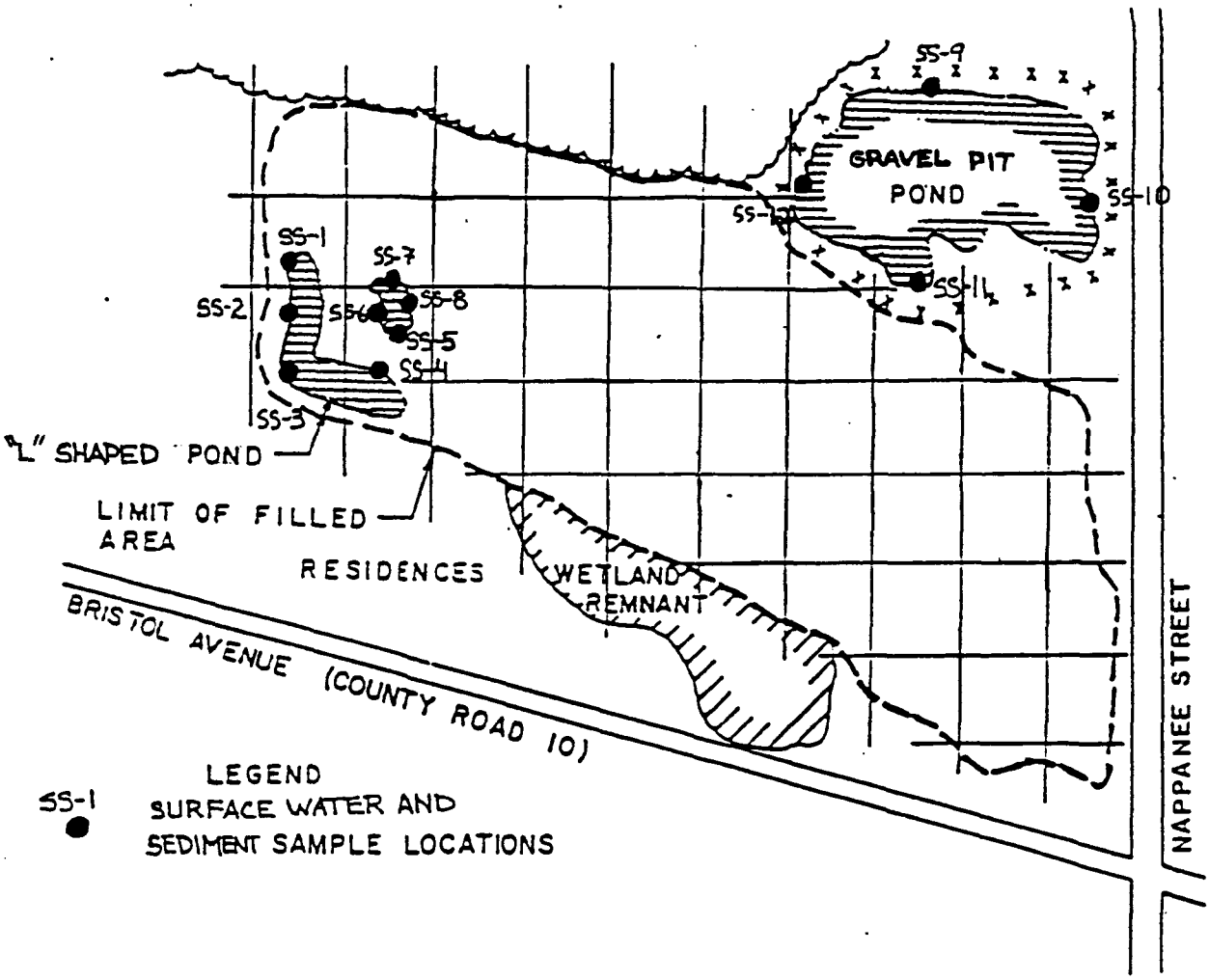
Surface water and sediment samples were taken at four locations at each of the three ponds at the Himco Dump Site in Elkhart, Indiana, to investigate the degree and extent of surface water and sediment contamination. Sampling was done by Eric Slusser and Tom Puchalski of Donohue & Associates, Inc., on October 17, 18, 19, and 20, 1991. This memorandum describes the sampling methods used in the field as compared to the methods described in the Final Field Sampling Plan.

Methods

Three surface water bodies are present at the Himco Dump Site. The two smaller ponds are located at the southwestern portion of the site. The larger of these two ponds is "L"-shaped with the longer channel oriented north-south and the shorter channel oriented east-west. Both channels of the "L"-shaped pond are approximately 100 feet wide and 400 feet long. The smaller pond is directly northeast of the "L"-shaped pond and is approximately 100 by 170 feet. The shorelines and bottoms of these two ponds are generally gravel and sand. Their depths are unknown, but because they were excavated with a backhoe, they are assumed to be less than 15 feet deep.

The gravel pit pond is the largest surface water body on-site. It is located in the northeast corner of the study area. It is approximately 850 feet wide in the east-west direction and 400 to 550 feet wide in the north-south direction. The depth of the gravel pit pond is unknown. The shoreline and bottom is generally gravel and sand.

The four locations at each of the three ponds were selected so that the north, south, east, and west shorelines were sampled (Figure 1). A description of the sampling location was written on the surface water and sediment field data form (Appendix A). A photograph was taken of each sample location.



0 500 1000

SCALE: FEET

SCALE IS APPROXIMATE

SOURCE: US EPA, AUGUST, 1986

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APPROXIMATE SITE SAMPLING LOCATIONS

N

20026

FIELD SAMPLING PLAN
HIMCO DUMP SITE
ELKHART, INDIANA

FIGURE 1

Engineers • Architects • Scientists

The surface water samples were collected before the sediment samples and on different days at all locations. Surface water was collected by lowering the capped sample bottle below the surface and opening it under water to allow the sample to trickle in. The bottle was then capped under water and brought back up out of the water. The water sample was put in a cooler with ice to be transported to the field trailer. Readings of pH, conductivity, temperature, and dissolved oxygen were taken in the back of a pickup truck at the edge of the pond immediately after carrying them from each location (Table 1).

Sediment samples were collected at the same locations as were surface water samples at approximately 2 to 3 feet offshore at water depths which ranged from 0 to 2 feet. A shovel was used to collect the sample from approximately 0 to 4 inches. Sediment samples were placed in a stainless steel bowl, and the excess water was poured off. Grab samples for volatile analysis were immediately placed in two 4-oz. jars with no headspace. The remainder of the sample was mixed using a stainless steel spoon. The resultant homogeneous mixture was spread evenly in the bowl. The sediment was divided into four quadrants. Small portions were taken from each quadrant for each jar until the remaining jars were filled. A visual description, including texture and color, was written on the field data form.

The shovel, sample composite bowl, and mixing spoon were decontaminated between sample locations by:

1. Alconox and tap water water wash.
2. A tap water rinse.
3. An isopropanol rinse.
4. Two deionized or distilled water rinses.

Isopropanol rinsates were collected in a 5-gallon bucket and covered until eventual discharge into the on-site frac tank.

Deviations

A shovel was used instead of a bucket to collect the sediment sample because the sediment was consolidated by plant roots in some locations to the degree that a bucket could not scrape up the required sample volume.

Summary of Results

Twelve surface water and twelve sediment samples were collected. No visual evidence of contamination was apparent in any of these samples. Figure 1 shows the surface water/sediment sampling locations, and Appendix A contains the surface water and sediment field data forms, which describe the appearance of the samples.

TP/ke

A/R/HIMCO/AB4

TABLE 1

Sample Number	Date	T° F	pH	Conductivity ms/cm	DO mg/l
SS-1	10/17/90	69	8.11	792	6
SS-2	10/18/90	50.2	8.02	753	9
SS-3	10/18/90	48.5	8.31	704	8.4
SS-4	10/18/90	49.8	8.27	707	8.6
SS-5	10/18/90	49.6	7.93	534	8.4
SS-6	10/18/90	49.4	7.58	538	5.8
SS-7	10/18/90	48.3	7.06	431	3.2
SS-8	10/19/90	46.8	8.06	471	7.2
SS-9	10/19/90	55.6	8.06	637	7.2
SS-10	10/19/90	60.0	7.99	659	6.4
SS-11	10/19/90	61.7	8.00	693	6.7
SS-12	10/19/90	61.7	8.00	693	6.7

A/R/HIMCO/AB4

APPENDIX A

SURFACE WATER AND SEDIMENT FIELD DATA FORMS

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SURFACE WATER FIELD DATA & SEDIMENT

CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER (SS-1) SD-C

WATER

DATE 10/17/90

TIME 8:00 AM

COLLECTOR Tom Puchalski
Eric Slusser

SEDIMENT

DATE 10/17/90

TIME 1140

COLLECTOR Tom Puchalski
Eric Slusser

WATER DEPTH 1-foot

pH 8.11

TEMPERATURE OF WATER 69°F

COLOR Clear

ODOR None

CLARITY Clear - Some vegetation

COND 797 µS/cm

DO 6 mg/l

SAME LOCATION

SEP 10/17/90 Lt brown ~~Gray Sand, Black Muck~~ Mix

~~H_2S~~ None

PHYSICAL DESCRIPTION OF SAMPLING POINT NW corner of large L shaped fish pond 15' east of corner 3' off of north shore.

ANY OTHER CHARACTERISTICS OF NOTE Sediment is light brown medium sand with a trace of strong 3/4" pebbles.

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER SS-2 SD-0

	WATER	SEDIMENT
DATE	TEP 10/17/90 ~~10/17/90~~ 10/18/90	10/17/90
TIME	800 AM	1440
COLLECTOR	ERIC SLUSSER TOM PUCHALSIC DOROTHEA DOWNS	TOM PUCHALSICI ERIC SLUSSER

WATER DEPTH 2'

SAME LOCATION

pH 8.02

TEMPERATURE OF WATER 50.2

COLOR Clear

TEP 10/17/90 ~~Lt brown~~ Grey Sand, black

ODOR None

~~None~~ H_2S

CLARITY Clear - Non turbid

COND 753 µS/cm

DO 9 mg/l

PHYSICAL DESCRIPTION OF SAMPLING POINT 125' south of north shore of L shaped fish pond off of the west bank. Sandy marly drop off.

ANY OTHER CHARACTERISTICS OF NOTE Sediment is organic rich

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER (SS-3) SD-C

	WATER	SEDIMENT
DATE	10/18/90	10/17/90
TIME	8:15	3:30 p.m
COLLECTOR	ERIC SLUSSER TOM PUCHALSKI DOROTHEA DOWNS	TOM PUCHALSKI ERIC SLUSSER

WATER DEPTH 1'

pH Sep 10/10 ~~48.5°F~~ 8.31

TEMPERATURE OF WATER 48.5 °F

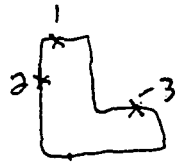
COLOR Clear — Lt Brown Sand

ODOR None — None

CLARITY Clear - Non turbid

COND 704

DO 8.4



PHYSICAL DESCRIPTION OF SAMPLING POINT Southeast corner of L shaped fish pond 3' south of shore for sediment 1' off shore for surface water

ANY OTHER CHARACTERISTICS OF NOTE Sandy gravel shoreline

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SURFACE WATER FIELD DATA & SEDIMENT

CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER (SS-4) SD-0

	WATER	SEDIMENT
DATE	10/18/90	10/18/90
TIME	8:35 A.M.	1415
COLLECTOR	ERIC SLUSSER TOM PUCHALSKI DOROTHEA DOWNS	SLUSSER PUCHALSKI
WATER DEPTH	1-foot	1-foot
pH	8.27	
TEMPERATURE OF WATER	49.8	
COLOR	Clear	Brown
ODOR	None	None
CLARITY	Clear	

707

8.6

PHYSICAL DESCRIPTION OF SAMPLING POINT SW corner of large L shaped fish pond 1-foot off west shore. Water depth drops off to 5' close to shore.

ANY OTHER CHARACTERISTICS OF NOTE Sediment consists of medium grained sand in gravelly sand gravel 3/4-1/8" sbang. Some marl.

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER: SS-05 / SD-05

	WATER	SEDIMENT
DATE	10/18/90	10/18/90
TIME	10:55 AM	1445
COLLECTOR	ERIC SLUSSER TOM PUCHALSKI DOROTHEA DOWNS	SLUSSER PUCHALSKI
WATER DEPTH	1'	2'
pH	7.93	
TEMPERATURE OF WATER	49.6	
COLOR	Clear	Brown sand, black muck
ODOR	None	H_2S
CLARITY	Clear - Non turbid	
COND	534 µS/cm	
DO	8.4 mg/l	

PHYSICAL DESCRIPTION OF SAMPLING POINT: Middle of south shore of small pond near fish pond

ANY OTHER CHARACTERISTICS OF NOTE: Sediment - Gravelly sand & muck, gravel - most ½" sharp, sand med grn.

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER: SS-CG SD-CG

	WATER	SEDIMENT
DATE	10/18/90	10/20/90
TIME	11:15 AM	805
COLLECTOR	ERIC SLUSSER TOM PUCHALSKI DOROTHEA DOWNS	TOM PUCHALSKI ERIC SLUSSER
WATER DEPTH	1'	1'
pH	7.58	
TEMPERATURE OF WATER	49.4	
COLOR	Light brown to clear	Lt brown sand
ODOR	None	None
CLARITY	Slight turbid	
COND	538	
DO	5.8	

PHYSICAL DESCRIPTION OF SAMPLING POINT ≈ 25 feet south of north shore of small pond near L shaped fish pond on west bank ≈ 7' offshore

ANY OTHER CHARACTERISTICS OF NOTE Sediment sample is gravelly sand, light brown medium sand 75%, angular, course angular sand 10%, 15% ½" stony gravel

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER: SS-07 / ~~S~~ 07

	WATER	SEDIMENT
DATE	10/18/90	10/20/90
TIME	1135 AM	834 AM
COLLECTOR	DOROTHEA DOWNS ERIC SLUSSER TOM PUCHALSKI	TOM PUCHALSKI ERIC SLUSSER
WATER DEPTH	1'	1'
pH	7.06	
TEMPERATURE OF WATER	48.3 °F	
COLOR	Light brown	Grey
ODOR	Slight H_2S	Strong H_2S
CLARITY	Slight turbid	
COND	431	
DO	3.2	

PHYSICAL DESCRIPTION OF SAMPLING POINT
Middle of north shore of small pond in cattails.
Sheen on water - metallic grey.

ANY OTHER CHARACTERISTICS OF NOTE Sediment is fine grained angular sand with a trace of sbrd gvl ≈ 1/4" dia. SM - Silty sand 20% sand

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER 35-08 51-08

	SURFACE WATER	SEDIMENT
DATE	10/19/90	10/20/90
TIME	820	920
COLLECTOR	TOM PUCHALSKI ERIC SLUSSER	TOM PUCHALSKI ERIC SLUSSER
WATER DEPTH	8"	8"
pH	8.06	
TEMPERATURE OF WATER	46.8	
COLOR	Clear	Grey
ODOR	None	None
CLARITY	Clear	
COND	471	
DO	7.2	

PHYSICAL DESCRIPTION OF SAMPLING POINT east shore of small pond north of L shaped fish pond midpoint of shore

ANY OTHER CHARACTERISTICS OF NOTE Slight sheen on water - non iridescent

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SURFACE WATER FIELD DATA

CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER SS-09 SD-09

	WATER	SEDIMENT
DATE	10/19/90	10/20/90
TIME	1000	1050.
COLLECTOR	TOM PUCHALSKI ERIC SLUSSER DOROTHEA DOWNS	TOM PUCHALSKI ERIC SLUSSER

WATER DEPTH 1'

pH 8.06

TEMPERATURE OF WATER 55.6

COLOR	Clear	10YR 5/3 Brown
ODOR	None	None
CLARITY	Clear	

COND 637

DO 7.2

PHYSICAL DESCRIPTION OF SAMPLING POINT Midpoint of north shore of quarry 2 feet offshore

ANY OTHER CHARACTERISTICS OF NOTE Sediment is silty, sand (SM) with a trace of 1/2" sbrd gvl

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SURFACE WATER FIELD DATA & SEDIMENT

CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER SS-10 SD-10

	WATER	SEDIMENT
DATE	10/19/90	10/20/90
TIME	1020	1118 AM
COLLECTOR	ERIC SLUSSER TOM PUCHALSKI DOROTHEA DOWNS	TOM PUCHALSKI ERIC SLUSSER
WATER DEPTH	1'	1'
pH	7.99	
TEMPERATURE OF WATER	60.0	
COLOR	Clear	10 YR 5/3 Brown
ODOR	None	None
CLARITY	Clear	
COND	659 µS/cm	
DO	6.4 ~~ppb~~/cm mg/l	

PHYSICAL DESCRIPTION OF SAMPLING POINT Midpoint of east shore at quarry 2' offshore

ANY OTHER CHARACTERISTICS OF NOTE Sediment is silty sand (SM) with a trace of 1/4" shard gvl.

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER: SS-11 / SD-11

	WATER	SEDIMENT
DATE	10/19/90	10/20/90
TIME	1050	1150
COLLECTOR	TOM PUCHALSKI ERIC SLUSSER DOROTHEA DOWNS	TOM PUCHALSKI ERIC SLUSSER
WATER DEPTH	1-foot	1-foot
pH	8.00	
TEMPERATURE OF WATER	61.7	
COLOR	Clear	10YR 5/3 Brown & N2/Black
ODOR	None	None
CLARITY	Clear	
COND	693	
DO	6.7	

PHYSICAL DESCRIPTION OF SAMPLING POINT 2 feet off south shore of Quarry near midpoint of shore in bay near fence gate at south of quarry

ANY OTHER CHARACTERISTICS OF NOTE Sediment is GW gravelly sand 70% 1/2-1/8" shd gvl, 30% fn grn ang sand. Some black silt in areas mixed with gravelly sand.

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SURFACE WATER FIELD DATA & SEDIMENT CONTAMINATION SURVEY

SITE IDENTIFIER NUMBER: SS-12, SD-12

	WATER	SEDIMENT
DATE	10/19/90	10/20/90
TIME	1110	1227
COLLECTOR	TOM PUCHACSKI ERIC SLUSSER DOROTHEA DOWNS	TOM PUCHACSKI ~~ERIC SLUSSER~~
WATER DEPTH	1'	1'
pH	8.00	
TEMPERATURE OF WATER	61.7°F	
COLOR	Clear	10YR 5/3 Brown
ODOR	None	None
CLARITY	Clear	
COND	693 µS/cm	
DO	6.7 mg/l	

PHYSICAL DESCRIPTION OF SAMPLING POINT: Midpoint of west shore of quarry ≈ 2 feet off shore

ANY OTHER CHARACTERISTICS OF NOTE: Sediment is gravelly sand, 70% fn grained angular sand 30% sbrd gvl ¼-½", some 3"-not included in samples

ORIGINAL

TECHNICAL MEMORANDUM - NO. 10

DATE: January 29, 1991

TO: Vanessa Harris - Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump

TEST PITS

Introduction

Twenty test pits were excavated at the Himco Dump Site in Elkhart, Indiana, on November 28, 29, 30, and December 1 to determine if metal drums are buried at the site. All excavations were carried out in Level B personal protection. Excavations were dug by Chris Goodwin and Mike Donohue of John Mathes and Associates, Inc. Air monitoring of the excavation and logging of the pit were done by Tom Puchalski of Donohue & Associates, Inc. Perimeter monitoring downwind of the excavation was done by Anya Kirykowicz of Donohue & Associates, Inc. The purpose of this memo is to describe the test pit excavation methods and results as they relate to the Final Field Sampling Plan.

Methods

Test pit excavation locations were determined by Rob Stenson and Tom Puchalski of Donohue & Associates, Inc., from a magnetic anomaly map produced for the site by STS Consultants. Excavation procedures are described in Section 4.9 of the Final Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana.

A separate memorandum provided by STS Consultants describes the field and data evaluation methods they used to perform the EM, Magnetic survey, and produce anomaly maps (Appendix A).

Once the locations of the test pits were determined and marked on the magnetic anomaly map, their locations were staked in the field by reference to the site survey grid stakes. After defining the work zone with caution tape and setting up the Level B equipment, the excavation was ready to begin. As the excavation proceeded, the Donohue geologist described the types of waste and soil being excavated by completing a trench log. Readings on air monitoring equipment were periodically recorded on an atmospheric monitoring log. Air monitoring was also performed continuously by a second person at the downwind side

of the excavation outside of the work zone. Readings on a PID and OVA, H_2S, $\%O_2$, LEL, and CO were all monitored. Photographs were taken of large metal objects or other objects of significance. The bottom of the pit was defined by reaching the water table or approximately 15 feet, whichever was shallower. Upon completion of the pit, a measuring tape was used to define the depth of the excavation and the depths to any significant waste or soil horizons. Following the completion of trench logs, the excavation was immediately backfilled. Prior to surveying in the trench locations, all were staked with wooden lath and survey tape.

Upon demobilization from the site, the backhoe was decontaminated by steam cleaning at the decontamination pad. Wastewater generated from steam cleaning activities was collected by the decontamination pad and pumped by sump pump from the collection pit to the on-site frac tank.

Deviations

The backhoe was decontaminated once before demobilization from the site. Decontamination was not required upon mobilization or in between test pit locations as described in the Final Field Sampling Plan because no sampling for chemical analysis was performed, and all test pit locations were on-site in areas of former waste disposal.

Summary of Results

Twenty test pit locations were excavated. Each test pit was twenty-five feet long. Some test pit locations were along the same direction and a direct extension of adjoining test pits, in some cases, producing up to a 100-foot long continuous trench. Test pit locations are provided in Figure 1. Completed test pit log forms are included in Appendix B.

Other than a few scarce 55-gallon drum lids, one rusted and crushed 55-gallon drum which may have been a burn barrel for garbage, and a few 25-gallon crushed drums, no significant buried drums were discovered. Other metallic objects were discovered which can account for the observed magnetic anomalies. Excavated metallic objects consist of scrap metal strips and angle iron, pipes, sheet metal, refrigerator condensers, wire, lawn mower parts, car bumpers, metal boxes, car mufflers, and pails.

A summary of the information contained in the trench logs and atmospheric monitoring logs follows.

Trench 1-4

Trenches 1-4 were excavated from northeast to southwest adjacent to each other to form one long 100-foot trench along hummocky terrain. Two iron beams, concrete, and metal pipe was protruding from the ground surface in several places. Grass covered hummocks were approximately six feet higher than the surrounding terrain. The spoils were piled on the down-wind east side of the trench. The trench was originally approximately 5 feet wide but this dimension widened to 10 feet at the north and south 25 feet due to cave-in. The trench depth varied from 6 feet on the northeast end to 12 feet on the southwest.

The stratigraphy of TP-1 through TP-4 can be summarized as follows. A thin 0.5 to 2.0-foot layer of silty sand topsoil fill overlies a white calcium sulfate layer which grades to black at its base. The calcium sulfate layer pinches out in TP-2 but is present as a brown and white silt layer in TP-3. It was not present in TP-4, but is correlative with black and white stringers 2 to 0.5 feet thick.

Municipal waste, from 2 to 5 feet thick, described in detail in the trench log, is present below the calcium sulfate. Water began flowing into the trench at 7 feet so the trench was not excavated deeper on this end. As the trench excavation proceeded south, no new water sources began flowing. TP-2, therefore, was excavated deeper to 11 feet. The waste layer pinched to about one foot thick in TP-2.

Metal objects were found which can explain the anomaly mapped for this area. Scrap metal strips, steel I-beams, metal pipe, sheet metal, and two drum lids were found within the waste layer in TP-1, 2, 3, and 4.

Air Monitoring

Air monitoring of TP-1 through TP-4 produced a high reading of 30 to 40 ppm and a low of 2 ppm on an OVA. No positive readings were produced on the PID, radiation detector, or lumidor. OVA readings down-wind of the trench at the work zone boundary were sporadic. Reading between 10 and 60 ppm lasted about 5 seconds spaced 1 to 2 minutes apart. Readings were not detected 250 feet down wind of the trench.

Trench 5-6

Trenches 5 and 6 were excavated adjoining one another to form one 50-foot trench oriented north-south. This trench was located in hummocky grass covered terrain similar to the location of TP1-TP4. Excavation spoils were piled on the eastern (down wind) side of the trench. The trench width was 5 feet. The depth extended to 14 feet.

The first foot of the profile of these two trenches consist of brown silty sand topsoil fill. Below the topsoil is calcium sulfate which varied in thickness from one to 9 feet. Below the calcium sulfate lenses is black silty sand with wood, plastic wrap, and sheet metal distributed throughout.

The water table was not reached in this excavation. The water source at the north end of TP-5 was perched water contained within the void space of the waste layer from 2-6 feet.

The majority of the metal objects were found at 8 feet in TP-5 and 6. The objects consist primarily of sheet metal. A small metal oven or refrigerator was excavated from TP-6 near the north end at approximately 8 feet.

Atmospheric Monitoring

The OVA was the only air monitoring instrument which had readings above background. Readings from 30 to 100 ppm were registered at the excavation. Downwind perimeter monitoring registered 20-30 ppm, 50 feet from the trench (east), 2 to 3 ppm, 150 feet east,

and 0 at 250 feet. Higher readings averaging 30 to 40 ppm and instantaneous sporadic readings greater than 100 ppm were observed at the 6-foot depth in TP-5.

Trench 7-8

Trenches 7-8 were excavated adjoining one another to form one north-south trench extending 50 feet. These two trenches were excavated approximately 5 to 7 feet wide and stopped at 12 feet where the water table was encountered. The water table was reached before the bottom of the waste; groundwater is flowing through the waste at this location.

The silty sand topsoil is only a few inches thick at this location. Below the topsoil is about 1 feet of calcium sulfate. From 1 feet to the bottom of the pit at 12 feet is mixed waste consisting of paper, wood, fiber templates, plastic bags, black sand, Alka-Seltzer wrappers, bottles and caps, toothpaste samples, and glass bottles.

Metal objects include one unmarked 55-gallon and one unmarked 25-gallon drums. More significant metal objects include metal pipe found at 2 feet in TP-8, car bumpers, refrigerator compressors, sheet metal,and aerosol cans. Markings on aerosol cans suggests one source as Sudden Beauty hair spray and Dristan Hay Fever Spray were most common. Three 55-gallon drum lids were also found. Only one had legible markings marked "Aliphatic Resin."

Native yellow brown sand was encountered near the south end of TP-8 from the surface to the base of the excavation at 12 feet.

Atmospheric Monitoring

Sporadic readings of up to 700 ppm were observed on the OVA. Thirty-two ppm H_2S were observed on the lumidor which periodically set off the instrument alarm. H_2S readings were also sporadic; readings were highest during excavation of calcium sulfate. Perimeter monitoring of the downwind side of the trench exhibited readings of 30 to 50 ppm on the OVA at the work zone tape, and 3 to 6 ppm at 75 feet downwind of the work zone tape.

Trench 9

Trench 9 was excavated from northeast to southwest extending 25 feet. The ground surface at this area is flat and sparsely grass covered. Calcium sulfate is present at the ground surface. The silty sand topsoil is approximately 6 inches thick. Below this thin layer of topsoil is 2.5 feet of calcium sulfate. From 3 to 5 feet, waste was excavated consisting of tires, wood, paper, black sand, Alka-Seltzer wrappers, rubber 1/8-inch bands, and plastic bags.

Few metal objects were excavated from this pit. Three unmarked 55-gallon drums lids and bundles of wire were excavated at about 4 feet.

A lower calcium sulfate layer extends half way across the trench from the northeast end from 5 to 8 feet in depth. Mixed paper and plastic waste make up the majority of the waste from 8 to 12 feet. The water table was encountered at 12 feet where the excavation stopped.

The lower limit of the waste was not reached before the water table was encountered. Groundwater is flowing through waste at this location. As the bottom of the trench filled with groundwater, gas was bubbling up through the water originating from the waste at the base of the trench.

Atmospheric Monitoring

Readings of up to 500 ppm were observed on the OVA during the excavation of TP-9. Most of the OVA readings were from 20 to 100 ppm at the trench. Readings of H_2S up to 38 ppm were observed during excavation and piling of calcium sulfate at the surface. Perimeter monitoring at the downwind border of the work zone exhibited OVA readings ranging from 2 to 90 ppm. Readings 100 feet further downwind were 2 to 7 ppm, and readings 200 feet downwind were 0.8 to 3 ppm. No perimeter readings above background were detected for H_2S or any other monitored parameters.

Trench 10-11

Trenches 10-11 were excavated oriented north-south with TP-10 on the north adjoining TP-11 on the south to form one 50-foot long trench. Spoils were piled on the east side of the trench.

TP 10-11 is located in a partially grass-covered area. The topsoil is about 1 foot thick consisting of yellow brown silty sand. A lens of waste extends about 12 feet south of the north boundary of TP-10. The lens is approximately 2 feet thick and consists of plastic bags, glass and plastic bottles, wood, and paper. The rest of the trench consists of white, black, and gray layers of calcium sulfate. A few scarce 1"x5" boards were found scattered throughout the calcium sulfate. Groundwater was encountered at 8 feet before the base of the calcium sulfate was reached. Very little metal was discovered in this trench. One piece of sheet metal was located 10 feet south of the north edge of TP-10 at 3 feet.

Atmospheric Monitoring

Positive readings of H_2S and OVA were observed during excavating of TP 10-11. No other instruments had readings above background. OVA readings ranged from 10 to 200 ppm at the trench and 0 to 90 ppm downwind of the trench at the work zone tape. H_2S readings ranged from 2 to 14 ppm at the trench with no H_2S detected downwind of the trench outside of the work zone.

Trench 12-13

TP 12-13 were excavated at the south end of the landfill cap at a relatively flat grass-covered area. Two 25-foot long, 5-foot wide trenches were oriented along a northeast trend and adjoined to create one 50-foot long trench. Excavation stopped at 10 feet when the water table was encountered.

Approximately 6 inches of yellow brown silty sand topsoil fill was found covering about 7.5 feet of white calcium sulfate. Some of the fracture faces of the calcium sulfate were yellow. This may relate to the H_2S atmospheric readings obtained during excavation of this material. This layer is relatively thick in this trench when compared to other trenches excavated on-site. At 8 feet, a 1-foot thick layer of waste was encountered within the

calcium sulfate. The waste consists of wood and paper with lesser amounts of sheet metal, rubber sheets, and Alka-Seltzer wrappers. Groundwater was observed to be pouring out of void spaces associated with the waste layer. This black groundwater poured into the bottom of the trench as the excavation proceeded. Gases were observed bubbling up through the groundwater from the calcium sulfate at the base of the trench.

Atmospheric Monitoring

Positive readings of H_2S and readings on the OVA were observed during trenching of TP 12-13. H_2S readings range from 1 to 46, averaging about 7 at the trench. No downwind H_2S was detected during perimeter monitoring outside the work zone. OVA readings range from 20- greater than 1,000 ppm, averaging about 200 ppm at the trench. Perimeter OVA ranged from 10 to 50 ppm, with average readings about 10 ppm. Readings of 1.5 to background were observed 100 feet downwind of the trench.

Trench 14-15

TP 14-15 were excavated at the southwest edge of the landfill cap at a grass-covered flat area immediately west of the slope east up to the top of the landfill cap. The western boundary of fill was excavated at TP 14-15. Two 25-foot long trenches were oriented east-west and adjoined to make one 50-foot long excavation. Spoils were piled on the north side of the trench. The trench was excavated to 5 feet wide, but sloughing of the sidewalls during excavation widened the trench to up to 15 feet in places.

The stratigraphic profile begins with approximately 1-foot of brown to yellow brown silty sand topsoil. Below this layer is a 1 foot thick layer of white to gray hardened calcium sulfate. Native sand was encountered from 2 to 9 feet. Several zones of black sand approximately 6 inches thick and 6 feet long were found throughout the buff to brown native sand. No water was encountered in TP-14. As the excavation proceeded east, the depth was decreased to 6 feet since no fill material was present below the calcium sulfate at one to two feet. At the eastern-most edge of TP-15, wood debris, a refrigerator compressor, metal pipe, and sheet metal debris were discovered at about 4 feet in depth. Groundwater began pouring out of this area of debris and proceeded to fill the trench with water. Backfilling of the trench began as soon as the water began pouring out. By the time the backfilling was complete, there was excess volume of groundwater which was displaced by backfill material so that a several inch deep by 30-foot wide puddle was left at the west end of TP-14 on the ground surface.

Atmospheric Monitoring

No abnormal readings were observed other than OVA detections. The OVA readings ranged from 1 to 400, averaging less than 20 ppm. Downwind perimeter OVA readings ranged from 0 to 90 ppm, averaging sporadic readings of 20 ppm. OVA readings were sporadic from 1 to 5 ppm 100 feet downwind. The absence of H_2S readings during the excavation of this trench may be related to the relatively little amount of calcium sulfate encountered.

Trench 16

One 25-foot long trench was oriented on a northwest trend at this location. Approximately one-half foot of brownish yellow fine-grained silty sand topsoil was found overlying a one-foot thick layer of calcium sulfate. Waste was excavated below the calcium sulfate. The waste consists of black wood, paper, plastic and glass bottles, rubber, plastic bags, and smaller amounts of sheet metal, metal pipe, and an empty gas container from a small engine. Black groundwater was reached at 4 feet so the excavation stopped at this depth. A few extra scoops were excavated to 6 feet at the southeast end of the trench. These saturated spoils were not removed, but piled in the northwestern end of the trench. This extra excavation was done to attempt to define the lower limit of the waste. Waste continued beyond 6 feet deep.

Atmospheric Monitoring

Reading of H_2S and positive readings on the OVA were observed during excavation of TP-16. H_2S readings range from 2 to 27 ppm at the trench, but were not detected downwind outside of the work zone. OVA readings ranged from 10 to 500 ppm. Perimeter OVA readings ranged from background to 12 ppm. No OVA readings were observed 50 feet downwind of the trench.

Trench 17

Trench TP-17 is oriented on an east-west trend extending 25 feet. The trench was approximately 5 feet wide. A thin (several inch) layer of yellow brown silty sand topsoil fill covers an 8-inch thick layer of calcium sulfate. Below the calcium sulfate, waste was encountered. Approximately 80 percent of the waste is rubber sheets and bands with minor paper, wood, glass bottles, and minor corroded sheet metal and aluminum bars at less than 2.5 feet. Groundwater was encountered at 2 feet in TP-17, so the excavation was stopped at this depth.

Atmospheric Monitoring

OVA readings up to 2 ppm were observed during trenching of TP-17. No other readings were observed above background on any air monitoring instruments either at the trench or downwind of the trench at the work zone perimeter.

Trench 18

TP-18 is oriented along an east-west trend. The excavation was approximately 5 feet wide and 25 feet long. A thin veneer of sandy topsoil covers about an 8-inch thick layer of calcium sulfate. Waste was excavated below the calcium sulfate layer. The waste consists of paper, plastic, rubber, glass, cardboard, one plastic unmarked, empty 55-gallon drum, and metal objects such as a car bumper, and 3x3x5-foot sheet metal box. Groundwater was encountered before the base of the waste at 7 feet.

Atmospheric Monitoring

The OVA was the only air monitoring device which detected air contaminants above background. OVA readings ranged from 2 to 100 ppm at the trench. OVA readings at the

work zone boundary downwind of the trench were sporadic ranging from 1 to 80 ppm . One hundred feet downwind, the OVA readings were down to background.

Trench 19

TP-19 is oriented slightly northeast trending. It is 25 feet long and approximately 5 feet wide. It is located at the northwest corner of the landfill cap.

The stratigraphic column begins with 1 foot of black, organic rich topsoil. From 1 foot to 2 feet, a layer of calcium sulfate was discovered. Below the calcium sulfate layer, waste was excavated. The waste consists primarily of wood, cardboard, glass bottles, beverage cans, and plastic. Small amounts of metal were excavated at the 3-foot depth consisting of a car muffler; two 55-gallon drums lids, unmarked and corroded; and a metal pail. The water table was encountered at 9 feet before the base of the waste was reached. Waste is, therefore, within the zone of saturation at this location.

Atmospheric Monitoring

The OVA was the only air monitoring instrument which had readings above background during the excavation of TP-19. Readings at the trench ranged from background to 2 ppm. Perimeter monitoring at the downwind direction revealed sporadic readings on the OVA which ranged from 0 to 120 ppm. Readings averaged about 50 ppm. Approximately 60 feet downwind from the trench, OVA readings were down to background with sporadic pulses to 5 ppm

Trench 20

TP-20 was excavated at the northeast corner of the site south of the quarry pond. This trench was oriented along a north-south trend extending 25 feet. The trench width varied from 5 to 8 feet.

The stratigraphic profile of this trench begins with a 1-foot thick layer of brown silty sand topsoil. Below the topsoil is a 1-foot thick layer of calcium sulfate. From 2 to 11 feet, waste is present. The waste consists of paper, cardboard, plastic bags, wood, black sand, and minor glass bottles. At the base of the waste, a second calcium sulfate layer was discovered. Groundwater was flowing from the interface of the waste and underlying white to gray calcium sulfate. A crumpled piece of sheet metal, roughly 3x3-foot, was excavated from the calcium sulfate at about the 12-foot depth. The excavation was completed at 13 feet where the water table was encountered.

Air Monitoring

Readings of H_2S and detections using the OVA were the only above background values observed during the excavation of TP-20. OVA readings at the trench ranged from background to greater than 1,000 ppm. Perimeter monitoring at the outside edge of the downwind side of the trench revealed OVA readings of 20 to 80 ppm with an average of 20 ppm. One hundred feet further downwind, the OVA readings averaged 10 ppm and were down to background 150 feet downwind from the trench.

TP/ke

A/R/HIMCO/AB5

APPENDIX A

FIELD PROCEDURES AND DATA EVALUATION METHODS FOR GEOPHYSICAL SURVEY

ORIGINAL

TECHNICAL MEMORANDUM

DATE: April 30, 1991

TO: Vanessa Harris, Site Manager

CC: Roman Gau, Project Manager
Mike Crosser, TSQAM

FROM: David L. Grumman, Project Geophysicist
STS Consultants, Ltd.

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026
STS Project No. 026.023
Himco Dump Site
Elkhart, Indiana

GEOPHYSICAL EXPLORATION PROGRAM

Introduction

STS Consultants, Ltd. (STS) was requested by Donohue to conduct combined electromagnetic and magnetic geophysical surveys at the above-referenced site. The objectives of the surveys were to identify and map anomalous zones to help target subsequent site explorations by Donohue. The survey encompassed approximately 60 acres at the Himco Dump Site. The specific geophysical survey areas include the fill areas, the unfilled margins of the dump, and a wetland remnant along the south central boundary of the landfill.

Survey Methods

The geophysical explorations consisted of combined electromagnetic terrain conductivity and magnetometer surveys.

Instrumentation

The electromagnetic (EM) survey was performed using a Geonics EM-31-DL terrain conductivity meter (EM-31) with a DL-55 data logger. The magnetometer (Mag) survey was performed using an EG&G G-856 proton procession magnetometer with two (top and bottom) sensors. The use of two sensors allows the measurement of the magnetic gradient at each survey position. A laptop field computer was used to download and process the field data during the survey. All geophysical survey instrumentation, with the exception of the field computer, were provided to STS by Donohue.

Mobilization and Field Personnel

Equipment operation was checked at STS's Northbrook, Illinois, office prior to mobilizing to the site. The geophysical survey equipment appeared to be in good working order. The STS field survey crew, Mark Stroebel, Michael Monteith, and David Grumman, arrived on-site Monday, October 22, 1990, and met with Ms. Marsha Kuehl and Mr. Tom Puchalski of Donohue to review the geophysical survey objectives and site safety procedures. At that time, a 100-foot by 100-foot staked grid was still being established on-site by a subcontract land surveyor.

Survey Procedures

EM and Mag readings were taken at 25-foot intervals along survey lines spaced every 25 feet. Distances were paced-off between each staked survey grid point. Survey line nomenclature is described further in the addendum to this memo. Consistent instrument orientations were used across the survey area. Only vertical dipole EM readings were taken, and perpendicular EM readings were not taken. Each STS instrument operator maintained a field notebook during the survey and noted conditions including surface obstructions, nearby metallic objects or structures, possible sources of electrical interference, reference points along selected survey lines (for data validation), and skipped readings.

Several base stations were established along the landfill's periphery to monitor magnetometer drift. The results of the base station readings generally showed low level drift in the magnetometer data during the field survey (+/- 75 gammas, approximate). The Mag field data were not adjusted to compensate for these low level variations during the data reduction. Selected survey points were also used to monitor drift in the EM readings; however, only negligible variations in the EM base station data were observed and drift corrections were not made.

Data Reduction

The field data were returned to sTS's Northbrook, Illinois, office for data reduction and contouring. The data reduction steps for the magnetometer data consisted of: converting field data files to binary format, merging data files, gradient processing, grid position assignments, adjustments for erroneous and/or missing data, conversion of files to contourable ASCII (x-y-z) format for contouring, and computerized data contouring. A similar procedure was used to isolate the top and bottom Mag sensor readings. The EG&G program MAGPAC was used to reduce the Mag data.

A similar data reduction sequence was used for the EM data and consisted of: grid position assignments, adjustments for erroneous or missing data, separating quadrature and in-phase readings, conversion of data files to contourable ASCII (x-y-z) format, merging data files, and data contouring. The Geonics Ltd. program DAT31Q was used for the EM data reduction.

Deviations

Two field mobilizations were required to complete the survey since the survey grid had not been completed during the first mobilization. Field data from overlapping survey lines from both field efforts were evaluated and found to be consistent and generally reproducible between mobilizations.

An analysis of the Mag gradient data showed that the top sensor malfunctioned erratically during the survey, and thereby rendered the top sensor data unusable. The erratic data occurred at unpredictable intervals and appeared related to a sensor or instrument error. The anomalous top sensor readings did not match data trends in the more stable bottom sensor data. Consequently during data reduction, the bottom sensor total field data was isolated, reduced, and contoured.

The wetland remnant area was surveyed using an approximate grid system set-up by STS since no grid had been established by the land surveyors in this area.

Summary of Results

Over 3,000 site grid points were surveyed using the magnetometer and EM techniques.

Magnetometry Results

The contoured results of the magnetic data show several magnetic anomalies on-site. Figure 1 illustrates the contoured total field data (bottom sensor) and identifies the anomalies considered significant and not related to cultural interferences. These anomalies ranged between plus or minus 1000 to 4000 gammas in magnitude. Background magnetism appeared to be approximately 56750 gammas. A partial listing of some of the larger anomalies is as follows:

- Southeast-central region, directly north of site entrance.
- South central area, approximately 300 feet north of the remnant wetland.
- West central area (10, M).

EM Results

The contoured quadrature and in-phase EM data show several very large anomalous regions on-site (50 to 500 mmhos/m). More discreet anomalies are not easily resolved from the extensive quadrature anomalies, although several more localized in-phase anomalies (10 to 40 ppt) are apparent. Background levels were considered to be in the range of 10 to 40 mmhos/m for the quadrature phase and 0 to -2 ppt for the in-phase readings. Figures 2 and 3 illustrate the contoured quadrature and in-phase EM data, respectively. The extent of the large quadrature phase anomalies appears to highlight the approximate limits of filling, and shows that the surveys did provide minimal coverage beyond the fill boundaries. The in-phase data is considered more useful in the identification and mapping of conductive waste burial areas, i.e., areas which could contain concentrations of barrels, metal scrap, or highly conductive buried wastes. A partial list of the most significant in-phase anomalies includes:

- Southeast central area, north of site entrance.
- Southeast central, northwest of site entrance.
- Northeast central, south of former grave pit.
- Entire central region of landfill.

Data from the wetland remnant do not appear to show significant anomalous Mag or EM levels, as no readings appeared to be elevated above what would be considered background levels for sand soils. The quadrature data ranged between 2 and 20 mmhos/m. The wetland data was not included in the contoured data since the wetland survey grid could not be reliably tied into the site survey grid.

RS/ke

A/R/HIMCO/AH2

ADDENDUM TO TECHNICAL MEMORANDUM

Grid Position Nomenclature

Several survey positioning schemes were used during the survey. The land surveyors established a 100-foot by 100-foot staked grid using numbers (1-25) along the east-west axis (increasing eastward), and letters (A-U) along the north-south axis (increasing northward). Station A-25 was very close to the southeast corner of the survey area. STS adopted a geophysical survey line/station reference scheme by designating land survey line No. 25 as geophysical survey line 100, with the line numbers decreasing by 1 for each survey line moving west. Geophysical station numbers were simply the linear distance along each survey line north of the A line, where the A line equals 0 north. Finally, during data reduction, line numbers were reassigned to reflect Easting/Northing distances, in feet, by designating station A-25 equal to station 10,000 East, 0 North. The following table schematically presents the line numbering:

Survey Line Reference Nomenclature

Land Surveyors Staked Location	Geophysical Field Survey	Geophysical Contour Coordinates
Easting	Easting	Easting
25	100	10,000
	99	9,975
	98	9,950
	97	9,925
24	96	9,900
	95	,875
--	--	--
2	1	7,550
1	0	7,525
ns	201	7,475
ns	202	7,450

ns: Not Staked

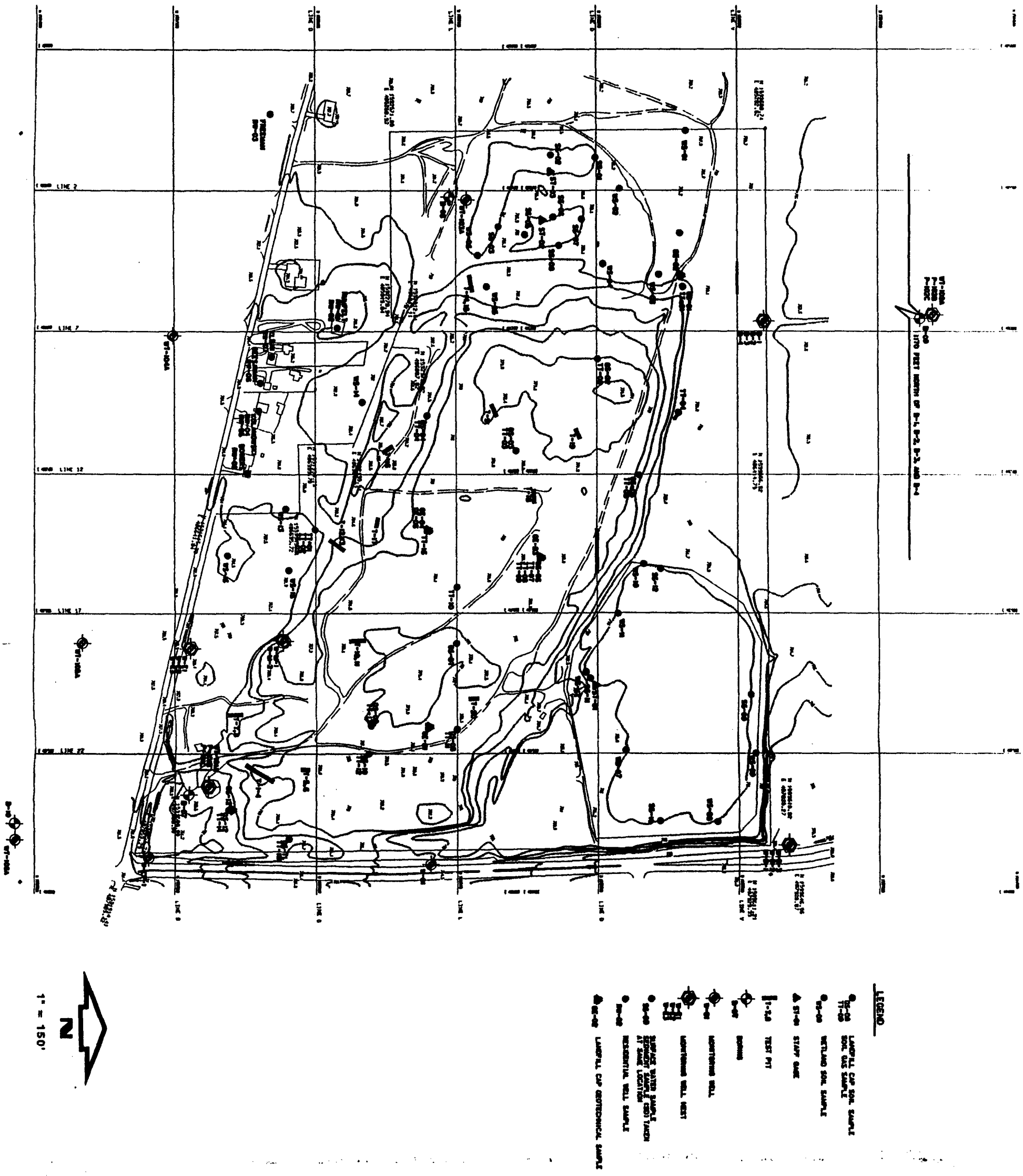
The northing grid spacing was 25 feet, however, the EM meter automatically incremented/decremented this interval. The northing interval is irrelevant to the Magnetometer until data reduction. The range of northing coordinates for the survey area is 0 feet (southeast corner of site) to 2,050 feet (northwest corner of site).

Computer Data Files

The enclosed diskettes contain the following data:

Disk	Files	Comment
3 1/2" Diskette	HHimco1.new,..., HHimco19.new DHimco1.new,...,	Reduced EM Data files for using DAT31Q
	Himco1.dat,..., Himco16.dat	Raw Mag Data files (unreduced)
5 1/4" Diskette	Himco1VQ.xyz	x-y-z data file for EM quadrature data
	Himco1VI.xyz	x-y-z data file for EM in-phase data
	HimcoMG.dat	x-y-z data file for magnetometer
Gradiometer		data (erroneous)
	Himcobot.dat	x-y-z data file for bottom sensor magnetometer data

A/R/HIMCO/AH2



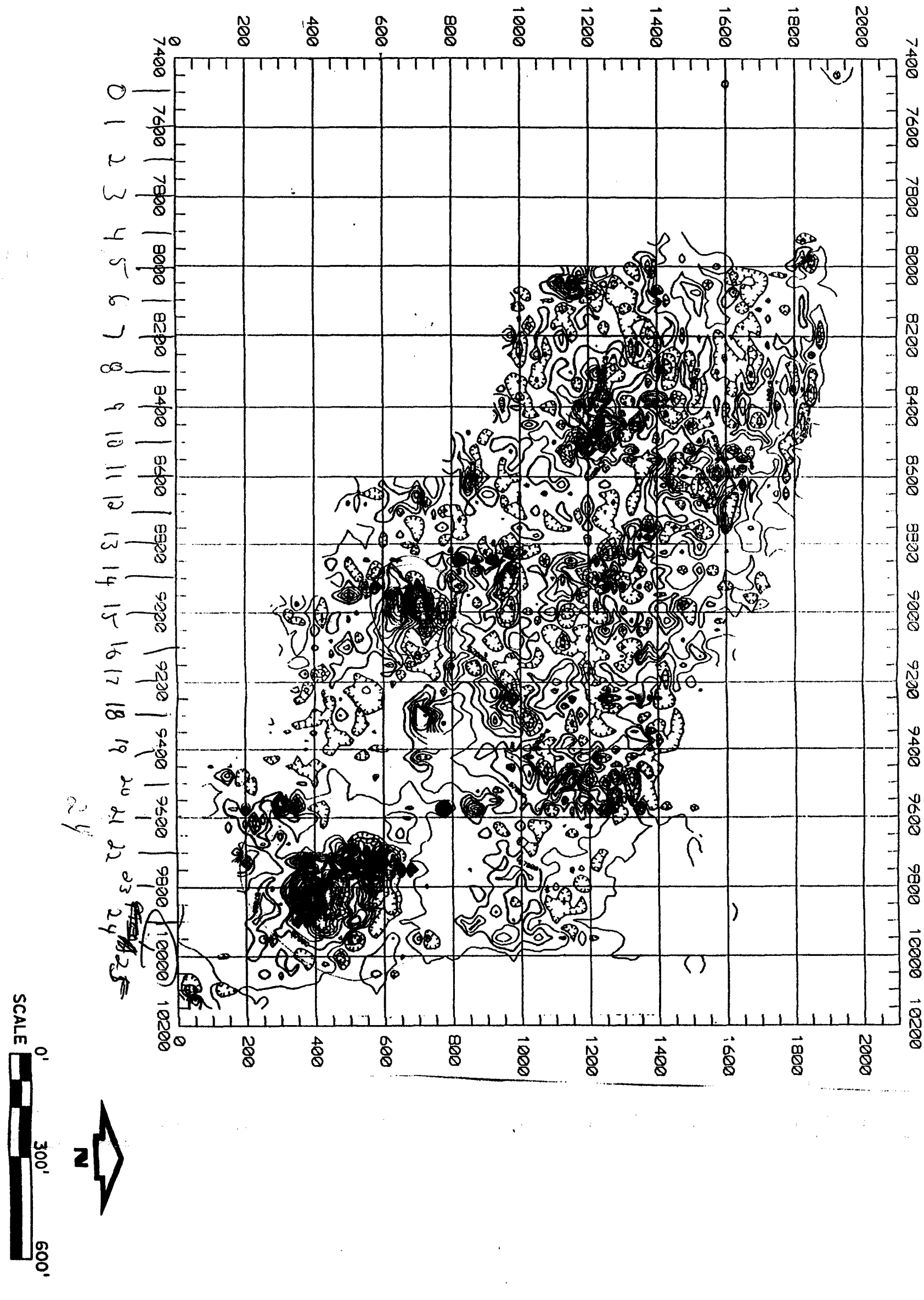
MAY 1991

FIGURE 1
SITE LOCATION MAP
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20028

Donohue ENGINEERS ARCHITECTS SCIENTISTS



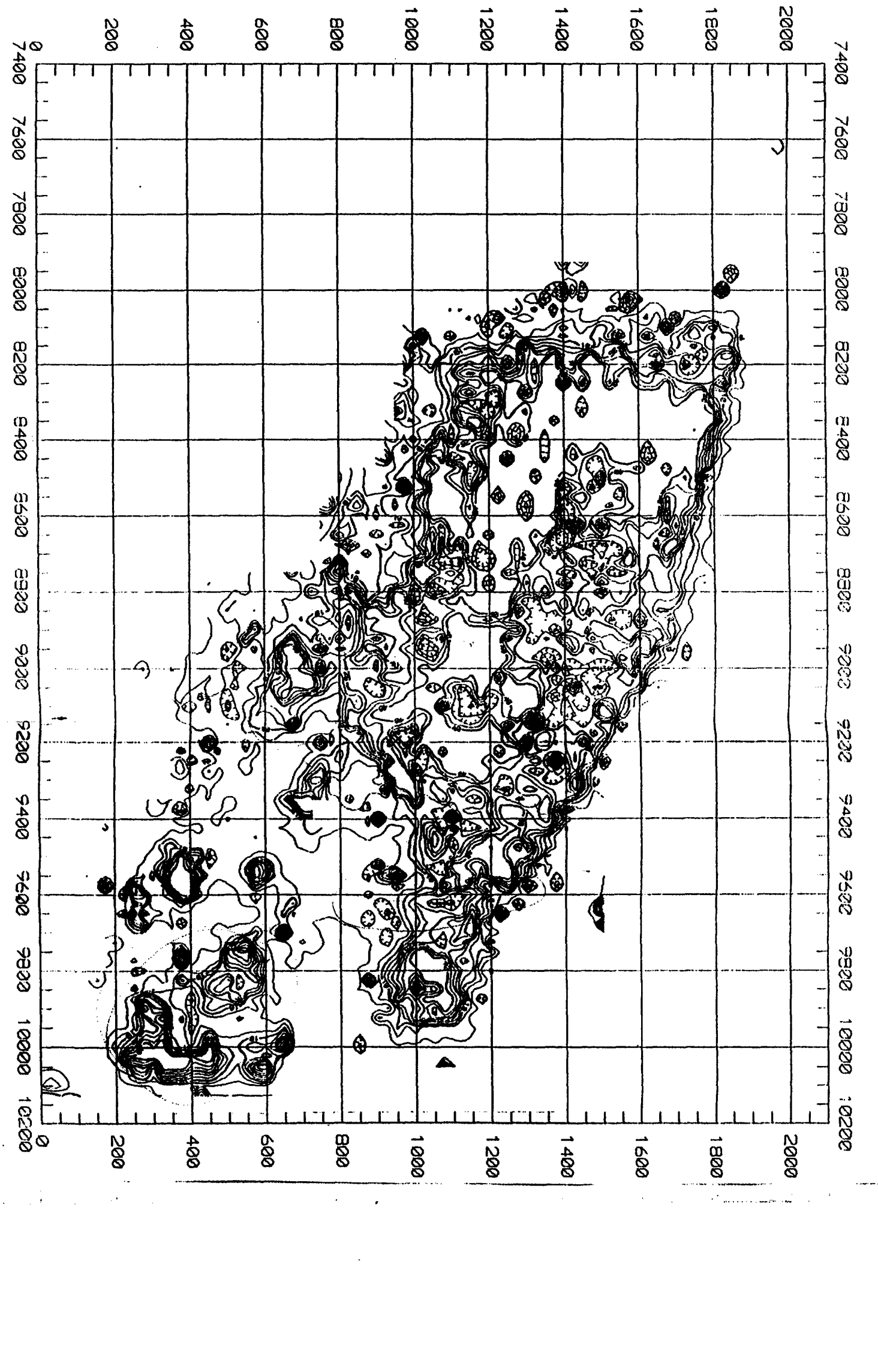
MAY 1991

FIGURE 1
MAGNETOMETER SURVEY
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20028

Donohue ENGINEERS ARCHITECTS SCIENTISTS



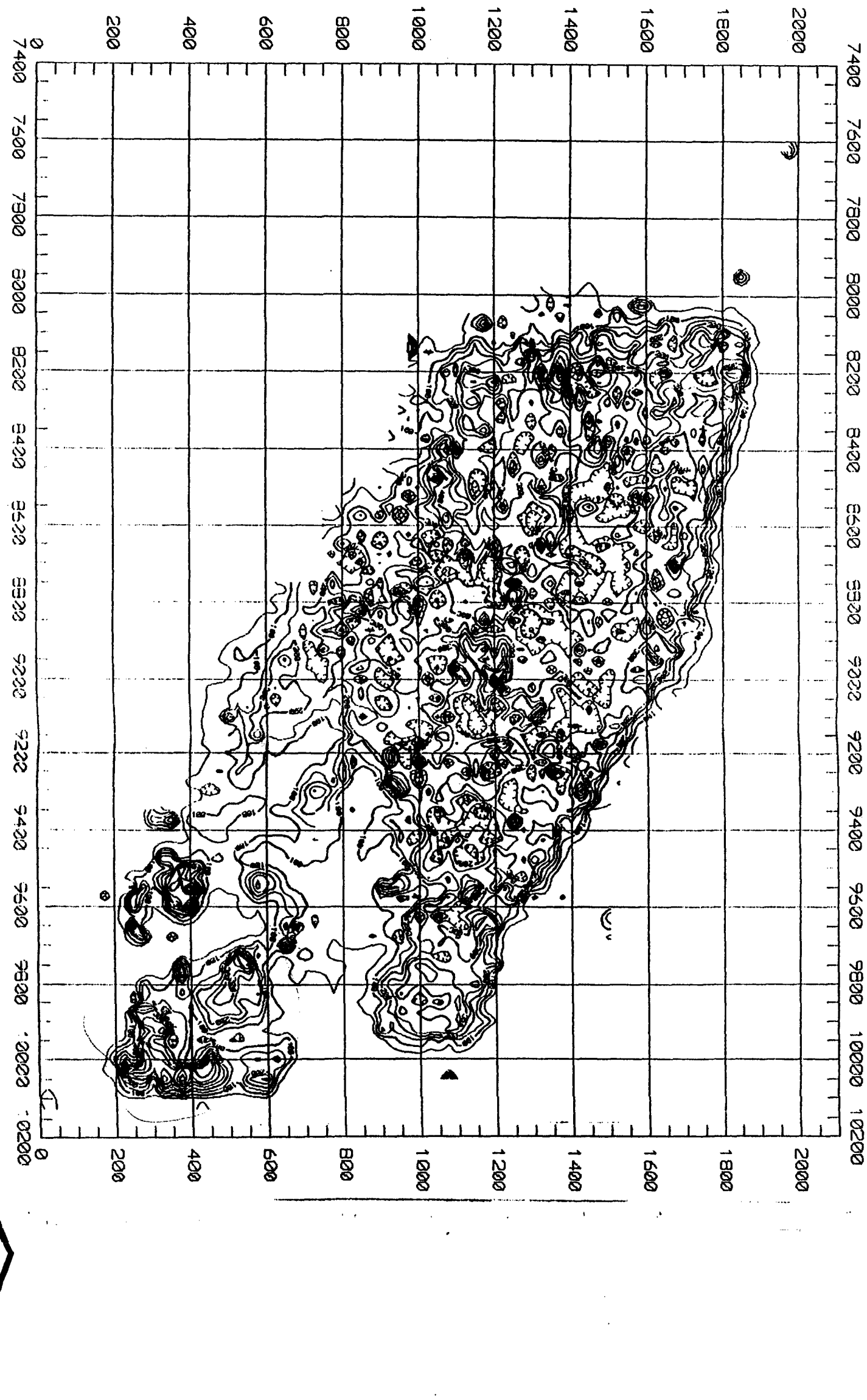
MAY 1991

FIGURE 3
IN-PHASE EM-31 SURVEY
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20028

Donohue ENGINEERS ARCHITECTS SCIENTISTS



MAY 1991

FIGURE 6
QUADRATURE PHASE EM-31 SURVEY
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

Donohue ENGINEERS ARCHITECTS SCIENTISTS

20028

APPENDIX B

TEST PIT LOGS

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/29/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TEP
TRENCH NO.: TP-1
TRENCH LENGTH: 0 FT TO 25 FT
TRENCH WIDTH: ~~5 ft to 10 ft where caved~~

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
							Brn silty sand top soil 10 yr 5/6 ylwish brn						
		White silt grading to blk at base											
		Black debris, saturated, bricks, wood, metal scraps, wire, railroad ties, trace Alka seltzer bottles											
	5	Plastic bag layer					ends here						
		Mauve material paste-like				Water flows down to trench from here south							
					Bottom								
	10												
	15												
	20												
	25												

REMARKS:

TRENCH LOG FORM

Donahue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/29/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TEP
TRENCH NO.: TP-2
TRENCH LENGTH: 25 FT TO 50 FT
TRENCH WIDTH: 5 ft

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1 2 3 4 5 6 7 8 9 0	DRUM QUANTITY	REMARK NO.
		Ylw brn silty sand, roots moist		
		White silty black sand mixed with scrap metal strips & debris pipes		
	5			
		Pale yellowish silty sand, fungru - Native		
	10			
		Bottom of pit		
	15			
	20			
	25			

REMARKS:

TRENCH LOG FORM

Donahue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/28/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TEP
TRENCH NO.: TP-3
TRENCH LENGTH: 50 FT TO 75 FT
TRENCH WIDTH: 5-8 ft

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		Ylw brn 10 yr 5/6 silty sand top soil moist, roots											
		Brown & white silt layer											
	5	Black sand metal strips & sscraps - metal corroded, Lids, buff sand at base										2 drum	
		25Y 7/4 Pale ylw fr groen silty sand - Native soil											
	10												
	15												
	20												
	25												

REMARKS:

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/28/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TEP
TRENCH NO.: TP-4
TRENCH LENGTH: 75 FT TO 100 FT
TRENCH WIDTH: 8 ft.

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		Black and white stringers (solidified sludge) up to 2' most 6" in brown sand											
	5						Anacin boxes - empty						
		Thin metal strips ~1" wide metal pipe pinches out on north											
		scarce - 3 or 4 corroded drum lids, scrap metal pipe, sheet metal											
		~~Tanto grey silty san (sm) Native~~											
	10												
		BOTTOM											
	15												
	20												
	25												

REMARKS:

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026-023
DATE: 11/28/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TEP
TRENCH NO.: TP 5 & 6
TRENCH LENGTH: 75 FT TO 100 FT
TRENCH WIDTH: 5 feet

TP-5 TP-6

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT)	DRUM QUANTITY	REMARK NO.
		1 2 3 4 5 25 6 7 8 9 0 50		
		Brown silty sand top soil		
		$CaSO_4$		
	5	$CaSO_4$		
		Most sheet metal at 8 ft		
		Sheet metal, metal strips, weed		
		black sand, plastic wrap		
		* * *

TRENCH LOG FORM

Donohue

CLIENT: USEPA-ARCS
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/29/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES CHRIS GOODWIN MIKE DONAHUE
LOG BY: TEP
TRENCH NO.: 7 & 8
TRENCH LENGTH: 0 FT TO 50 FT
TRENCH WIDTH: 5 ft.

N TP-7 TP-8 S

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		CaSO4											
		~~Thin layer of topsoil~~						Metal Pipe					
								Car BUMPER, REFRIGERATOR COMPRESSOR					
	5							SHEET METAL					
		~~MIXED WASTE - FIBERGLASS TEMPLATES, WOOD, PAPER, AEROSOL CANS-SUDDEN BEAUTY HAIR SPRAY, CRISTIAN~~										HALY	
		TOOTHPASTE SAMPLER, ~~Alka-Seltzer wrappers~~, plastic bags						~~metal pipe~~				FEVER	
								~~DRUM - 25 gallon - CORRODED~~				~~SPRAY~~	
	10	black sand, alka seltzer lids						Matrix of mixed waste					
		~~BOTTOM OF PIT~~									BOTTOM OF PIT		
	15												
		DRUM:											
		1 55-gallon				3 lids		1 marked Aliphatic Resin					
		unmarked											
	20	1 25-gallon											
		unmarked											
	25												

NATIVE YELLOW BRN SAND

REMARKS:

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: HIMCO DUMP
PROJECT NO.: 20026.023
DATE: 11/29/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH: TD-9

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TOM PUCHALSKI
TRENCH NO.: TP-9
TRENCH LENGTH: 0 FT TO 25 FT
TRENCH WIDTH: 5-6 ft

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		$CaSO_4$											
		3 drum lids											
	5	Tires, wood, black sand, plastic bags, Alka-seltzer wrappers											
		rubber in 1/8" bands											
		$CaSO_4$											
	10	Paper, plastic bags											
		bottom at 12'											
	15												
	20												
	25												

REMARKS: The only metal present was three 55 gallon drum lids - unmarked, and budndles of wire all at about 4' depth.

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/30/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TOM PUCHALSKI
TRENCH NO.: 10 & 11
TRENCH LENGTH: 0 FT TO 50 FT
TRENCH WIDTH: 5 ft.

N 10 11 S

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		Ylw Brw silty sand TOP SOIL - roots											
		Plastic bags, bottles, wood paper											
	5	$CaSO_4$ - Black layer mixed with white & gray, some 1" x 5" boards.											
	10	Bottom of pit											
	15												
	20												
	25												

REMARKS: Very little metal. One piece of sheet metal was located 10 feet south of north edge of TP-10 at 3" depth.

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/30/90
GRID COORD.: START - N ____ E ____ N ____ E ____
END - N ____ E ____ N ____ E ____
CONTROL MONUMENT GRID COORD.: N ____ E ____ N ____ E ____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: MATHES
LOG BY: TEP
TRENCH NO.: 12 & 13
TRENCH LENGTH: 0 FT TO 50 FT
TRENCH WIDTH:

N 12 13 S

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		Ylw brown silty sand top soil fill											
	5	$CaSO_4$ White with some fracture faces yellow											
	10	wood, paper, sheet metal					sheet metal			Rubber sheets, wood		Bottom	
		$CaSO_4$											
		Alka-seltzer Wrapper											
	15												
	20												
	25												

REMARKS:

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: HIMCO
PROJECT NO.: 20026.023
DATE: 11/30/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: Mathes
LOG BY: Tom Puchalski
TRENCH NO.: 14 & 15
TRENCH LENGTH: 0 FT TO 50 FT
TRENCH WIDTH: 5 - 7 ft

W 14 15 E

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1 2 3 4 5 6 7 8 9 0	DRUM QUANTITY	REMARK NO.
		Brown to Ylw brn silty sand topsoil - Roots		
		Hardened $CaSO_4$ - White to gray		
		Natural sand buff to brown with black zones 6" thick --6' long, unsaturated	Wood & metal debris	
	5		Flowing water	
			Metal debris	
	10			
	15			
	20			
	25			

REMARKS: Water began pouring frow east end of trench and nearly filled trench by the time the backfill was complete. Rate of discharge did not slow during the 10 minutes of observation.

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: Himco
PROJECT NO.: 20026.023
DATE: December 1, 1990
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: Mathes
LOG BY: TEP
TRENCH NO.: TP-16
TRENCH LENGTH: 0 FT TO 25 FT
TRENCH WIDTH: 5 feet

NW SE

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1 2 3 4 5 6 7 8 9 0	DRUM QUANTITY	REMARK NO.
		$CaSO_4$		
		Black - wood, paper, bottles, rubber, plastic bags. Trace of sheet metal and metal pipe		
	5			
	10			
		Brownish ylw top soil, fine ground silty sand, roots moist.		
	15			
	20			
	25			

REMARKS: Metal - sheet metal - mirror - one sheet, metal gas can from lawnmower with hole in it, two 1" x 2' metal pipes. Shallow groundwater did not allow deeper excavation.

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: Himco
PROJECT NO.: 20026.023
DATE: 12/1/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: JMA
LOG BY: TEP
TRENCH NO.: 17
TRENCH LENGTH: 0 FT TO 25 FT
TRENCH WIDTH: 5

W E

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		~~$CaSO_4$~~											
		~~80% rubber sheets and bands, rest - paper, wood, glass, trace aluminum~~											
											Photo #1		
	5	Ylw brown silty sand (S17) top soil, roots, moist											
	10												
	15												
	20												
	25												

REMARKS:

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: Himco
PROJECT NO.: 20026.023
DATE: 12/1/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: Mathes
LOG BY: Tom Puchalski
TRENCH NO.: TP-18
TRENCH LENGTH: 0 FT TO 25 FT
TRENCH WIDTH: 5 ft

W E

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		topsoil											
		CaSO4											
		Municipal Waste & paper, plastic, rubber, glass, cardboard											
		x 1 plastic 55 gal drum											
	5						X - car bumper & other large metal objects						
							(3 x 3 x 5 sheet metal box)						
	10												
	15												
	20												
	25												

REMARKS:

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: Himco
PROJECT NO.: 20026.023
DATE: 12/1/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: JMA (John Mathes & Assoc.)
LOG BY: TEP
TRENCH NO.: TP-19
TRENCH LENGTH: 0 FT TO 25 FT
TRENCH WIDTH: 5

W E

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 1	2	3	4	5	6	7	8	9	0	DRUM QUANTITY	REMARK NO.
		Black organic rich top soil											
							White $CaSO_4$						
		muffler, drum lids, pail											
	5	Wood, cardboard, trash, bottles, cans, glass, plastic											
	10												
	15												
	20												
	25												

REMARKS:

TRENCH LOG FORM

Donohue

CLIENT: USEPA
PROJECT: Himco Dump
PROJECT NO.: 20026.023
DATE: 12/1/90
GRID COORD.: START - N____ E____ N____ E____
END - N____ E____ N____ E____
CONTROL MONUMENT GRID COORD.: N____ E____ N____ E____
ELEVATION, TOP OF TRENCH:

SHEET 1 OF 1
EXCAVATOR: JMA
LOG BY: TEP
TRENCH NO.: 20
TRENCH LENGTH: 0 FT TO 25 FT
TRENCH WIDTH: 5 - 8 ft

N S

STRATA CHANGE OF WATER LEVEL	DEPTH	TRENCH LENGTH (FT) 5 10 15 20 25	DRUM QUANTITY	REMARK NO.
		top soil - brown silty sand		
		$CaSO_4$		
	5	Paper, cardboard, plastic bags, minor glass bottles, wood, black sand		
	10	water at interface		
		White to gray $CaSO_4$		
		crumpled sheet metal - Photo #7	bottom	
	15			
	20			
	25			

REMARKS:

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 11

DATE: April 29, 1991

TO: Vanessa Harris

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump Phase I

SLUG TESTING FIELD PROCEDURES AND ANALYSIS

Introduction

Following well development, groundwater monitoring wells listed in Table 1, were slug-tested at the Himco Dump. Wells E3, F1, F2, M1, and M2 were installed in 1977 and 1979 by the United States Geological Survey (U.S.G.S.) The remainder of the wells were installed by Donohue for this remedial investigation. The wells were slug-tested to determine hydraulic conductivity of outwash deposits at several points across the site at the depths listed in Table 1. Slug testing was done on December 1, 2, 14, and January 4, 1991, by Cathy Fruehe, Tracy Koach, Anya Kirykowicz, and Tom Puchalski of Donohue & Associates, Inc.

Field Methods

An ORS Environmental Equipment Model EL-200 data logger and pressure transducer were used to collect slug test data. The battery-operated unit translates water pressure into electrical signals within the transducer. The electrical signals are relayed by a cable to the data logger where they are converted and displayed as water level data. The time and water level data are recorded during the test and stored in the data logger memory until the data is sent to a disk or printer for later analysis.

Slug tests were performed as described in Section 4.2.3.3 of the Final Field Sampling Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana. The setup for the slug test began by unlocking the protective casing and using a decontaminated popper tape to measure the static water level and the depth to well bottom. This data was recorded on In-Field Hydraulic Conductivity Slug Test Forms (Appendix B). A 15 or 5 psi transducer was decontaminated with soap and tap water, and a tap water rinse before lowering into the well. The mode which allows the water level to be read on the data logger display was activated so that the depth of water above the transducer could be read while the transducer was lowered into the water. The transducer cable was duct taped to the protective casing when a maximum of approximately 9 feet of water was above the level

of the transducer. A 4-foot long stainless steel slug was slowly lowered down the well until a slight perturbation in static water level was noticed on the data logger LCD display, indicating the slug had intersected water table. The slug was raised a few inches above the water surface as the water level was allowed to equilibrate. After the water level had equilibrated, the data recording mode of the logger was activated simultaneously with lowering the slug 4 to 5 feet into the water. The falling water level and time were recorded in the data logger memory. When the static water level was re-established, the falling head test was ended. A record of the rising water level and time was obtained as the slug was removed from the water. The test was complete when the static water level was reached. These procedures were repeated until all 15 wells were slug tested.

Analysis Evaluation

Slug test data were analyzed using the method of Bouwer and Rice (1976), through the use of a PC-based computer program developed by Donohue & Associates, Inc. The assumptions of the method are that 1) the drawdown of the water table around the well is negligible, 2) flow above the water table (capillary fringe) can be ignored, 3) well losses are negligible, and 4) the aquifer is homogeneous and isotropic.

Deviations

For unknown reasons, the data plots resulting from a small number of tests were not indicative of a normal test. A straight line plot of the natural logarithm of the drawdown plotted against time was not provided, so the analysis could not be performed. A falling or a rising head test or both was successfully run for every previously selected well. Therefore, all the required results were obtained.

Summary of Results

Printouts of the data and data plots of drawdown versus time are included in Appendix A.

Selection of the segment of the data plot of the natural logarithm of drawdown versus time to be used for the calculation of hydraulic conductivity was based upon the following criteria as described in Bouwer and Rice (1976):

- The straight line portion of the plot of recovery versus time is the valid data to be used in the analysis. An evaluation of the fit of the data to a straight line was accomplished by linear regression analysis included in the program. Most of the regression values indicated a strong linear relationship in the data. This implies that the assumptions of the analysis method are being met.

- For the wells with rapid recovery times, the first few data points were used in the analysis. If the hydraulic conductivity of the aquifer was significantly different (several orders of the magnitude) from the hydraulic conductivity of the sand pack, sand pack dewatering was accounted for in the analysis.

REFERENCES

Bouwer, H., 1989, The Bouwer and Rice Slug Test - An Update, v. 27, n. 3, pp. 304-309.

Bouwer, H., and Rice, R.C., 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells, Water Resources Research, v. 12, n. 3, pp. 423-428, 1976.

Freeze, R.A., and Cherry, J.A., 1979, Groundwater, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, pp. 29.

TABLE 1

WELL NUMBER	HYDRAULIC CONDUCTIVITY (cm/s)	BOTTOM DEPTH OF SCREEN	SOIL CLASS+WELL SCREENED IN
M1-RISE	3.17×10^{-3}	103.24	SP, GP
M1-FALL	1.43×10^{-3}	103.24	SP, GP
F1-RISE	1.21×10^{-1}	31.28	*
F1-FALL	4.51×10^{-2}	31.28	*
F2-FALL	1.27×10^{-3}	147.83	*
F2-RISE	7.37×10^{-4}	147.83	*
M2-RISE	3.69×10^{-2}	24.76	*
E3-RISE	7.95×10^{-4}	175.65	SP, GP
E3-FALL	4.61×10^{-4}	175.65	SP, GP
P101B-FALL	3.99×10^{-3}	100.47	SM
P101C-FALL	1.11×10^{-3}	166.53	SP
P102B-RISE	3.50×10^{-2}	67.25	SP
P102B-FALL	3.91×10^{-2}	67.25	SP
P102C-RISE	3.59×10^{-3}	159.96	SP
WT101A-RISE	2.69×10^{-2}	18.70	SP
WT101A-FALL	9.45×10^{-3}	18.70	SP
WT102A-RISE	4.14×10^{-3}	18.18	SP-SM,SP-GP,SM
WT102A-FALL	6.80×10^{-3}	18.18	SP-SM,SP-GP,SM
WT103A-RISE	4.10×10^{-2}	18.47	SW-GW
WT103A-FALL	1.86×10^{-2}	18.47	SW-GW
WT104A-RISE	3.89×10^{-2}	18.69	SP,SW-GW
WT104A-FALL	5.07×10^{-3}	18.69	SP,SW-GW
WT105A-RISE	1.93×10^{-2}	18.56	SP
WT105A-FALL	1.01×10^{-2}	18.56	SP
WT106A-RISE	4.71×10^{-2}	18.50	SP-GP
WT106A-FALL	8.40×10^{-2}	18.50	SP-GP
AVERAGE	**2.33×10^{-2}**		

* Data not available.

\+ United Soil Classification System

A/R/HIMCO/AB6

APPENDIX A

DATA PLOTS AND ANALYSIS

BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "*".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft. (Y)	DRAWDOWN (Y')	TIME sec (X')	LN (Y')
1		8.42	1.560	0.00	0.4447
2		8.44	1.540	0.20	0.4318
3		8.46	1.520	0.40	0.4187
4		8.49	1.490	0.60	0.3988
5		8.50	1.480	0.80	0.3920
6		8.52	1.460	1.00	0.3784
7		8.54	1.440	1.20	0.3646
8		8.55	1.430	1.40	0.3577
9		8.57	1.410	1.60	0.3436
10		8.59	1.390	1.80	0.3293
11		8.61	1.370	2.00	0.3148
12		8.62	1.360	2.20	0.3075
13		8.64	1.340	2.40	0.2927
14		8.65	1.330	2.60	0.2852
15		8.67	1.310	2.80	0.2700
16		8.68	1.300	3.00	0.2624
17		8.70	1.280	3.20	0.2469
18		8.72	1.260	3.40	0.2311
19		8.74	1.240	3.60	0.2151
20		8.75	1.230	3.80	0.2070
21		8.76	1.220	4.00	0.1989
22		8.78	1.200	4.20	0.1823
23		8.79	1.190	4.40	0.1740
24		8.81	1.170	4.60	0.1570
25		8.83	1.150	5.00	0.1398
26		8.84	1.140	5.20	0.1310
27		8.86	1.120	5.40	0.1133
28		8.88	1.100	5.60	0.0953
29		8.89	1.090	6.00	0.0862
30		8.91	1.070	6.20	0.0677
31		8.92	1.060	6.40	0.0583
32		8.94	1.040	6.60	0.0392
33		8.95	1.030	7.00	0.0296
34		8.98	1.000	8.00	0.0000
35		9.03	0.950	9.00	-0.0513
36		9.08	0.900	10.00	-0.1054
37		9.13	0.850	11.00	-0.1625
38		9.19	0.790	12.00	-0.2357
39		9.23	0.750	13.00	-0.2877
40		9.27	0.710	14.00	-0.3425
41		9.32	0.660	15.00	-0.4155
42		9.35	0.630	16.00	-0.4620
43		9.39	0.590	17.00	-0.5276
44		9.43	0.550	18.00	-0.5978
45		9.46	0.520	19.00	-0.6539
46		9.49	0.490	20.00	-0.7133
47		9.52	0.460	21.00	-0.7765
48		9.55	0.430	22.00	-0.8440
49		9.58	0.400	23.00	-0.9163
50		9.62	0.360	24.00	-1.0217
51		9.66	0.320	25.00	-1.1394
52		9.71	0.270	26.00	-1.3093
53		9.74	0.240	27.00	-1.4271
54		9.77	0.210	28.00	-1.5606
55		9.79	0.190	29.00	-1.6607
56		9.82	0.160	30.00	-1.8326
57		9.84	0.140	31.00	-1.9661
58		9.86	0.120	32.00	-2.1203
59		9.87	0.110	33.00	-2.2073
60		9.89	0.090	34.00	-2.4079
61		9.90	0.080	35.00	-2.5257

PROJECT NAME : HIMCO
PROJECT NO : 20026.024
WELL NO : M-1 RISE
ANALYST : FUCHALSKI
DATE COLLECTED : 12-2-90
RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
MAX DRAWDOWN (IN SUBSET): (Ymax) = 1.56 Ft.
STATIC WATER LEVEL: (SWL) = 9.98 Ft.
DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 88.40 Ft.
EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 15.00
---LOG OF L/(r sub w) = 1.1761
FOR PARTIALLY PENETRATING WELLS--
A = 1.93
B = 0.29
FOR FULLY PENETRATING WELLS--
C = 1.38

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.1971
CONST.2 = 5.5599 =(MAX. OF 6.0)= 5.5599
LN(Re/(r sub w)) = 2.30

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -6.50E-02 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.04E-04 ft/sec <==========
3.17E-03 cm/sec <==========

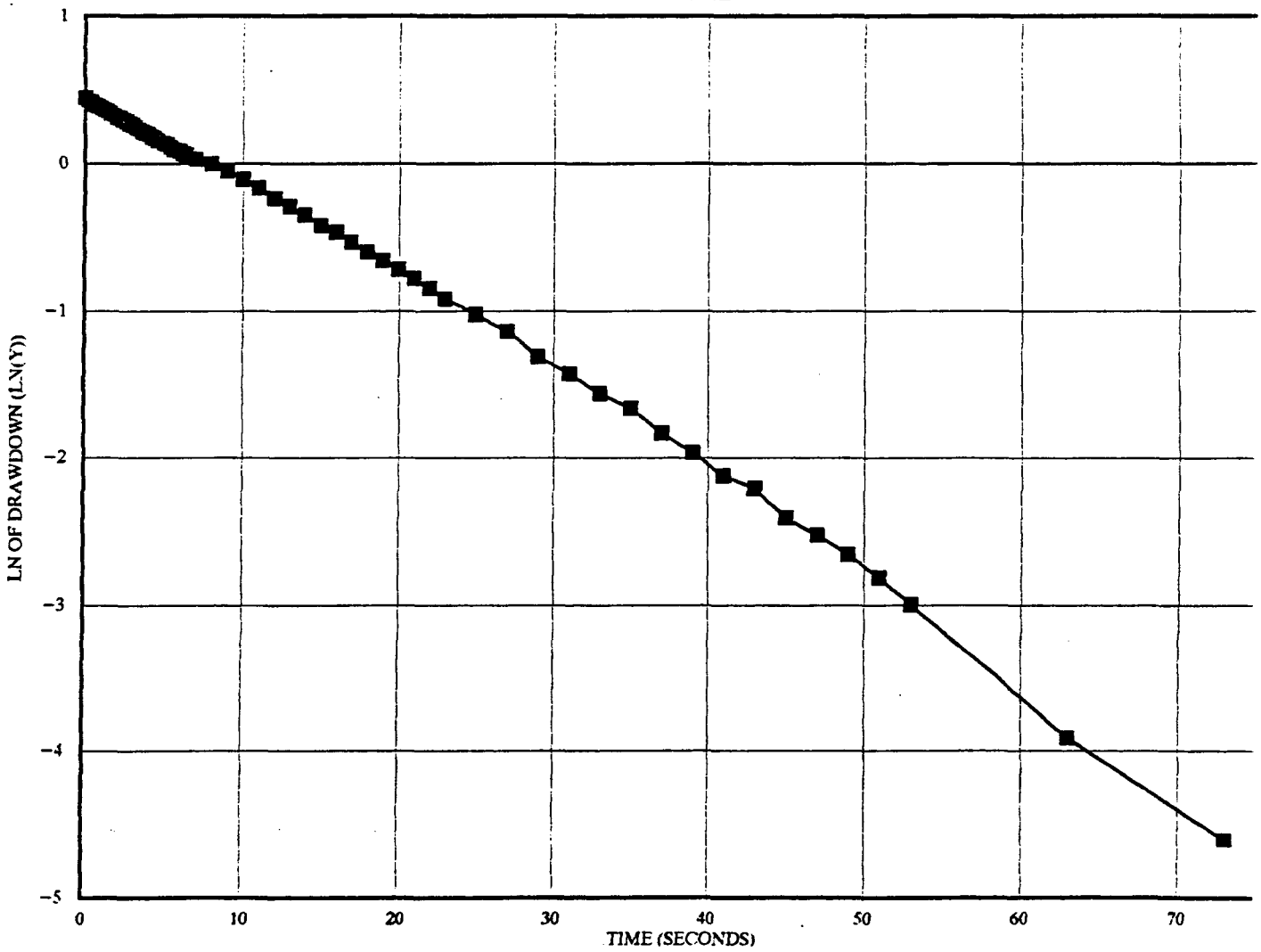
t= 0 - 73 s

Regression Output:

Constant	4.96E-01
Std Err of Y Est	0.0842
R Squared	0.9947
No. of Observations	66
Degrees of Freedom	64
X Coefficient(s)	-6.50E-02
Std Err of Coef.	0.0006

RATE OF RECOVERY TEST: WELL M−1

RISE



BOWNER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "#".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#PROJECT NAME :HIMCO
#PROJECT NO : 20026.024
#WELL NO :N-1 FALL
#ANALYST :PUCHALSKI
#DATE COLLECTED :12-2-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 5.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = -1.38 Ft.
#STATIC WATER LEVEL: (SWL) = 5.98 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 98.40 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
#SANDPACK'S SPECIFIC YIELD (Sv) = 0.10

BOWNER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 15.00
---LOG OF L/(r sub w) = 1.1761
FOR PARTIALLY PENETRATING WELLS--
A = 1.93
B = 0.29
FOR FULLY PENETRATING WELLS--
C = 1.36

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.1971
CONST.2 = 5.5599 =(MAX. OF 6.0)= 5.5599
LN(Re/(r sub w) = 2.30

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -2.94E-02 sec^(-1)

#HYDRAULIC CONDUCTIVITY (K) = 4.70E-05 ft/sec <==========
1.43E-03 cm/sec <==========

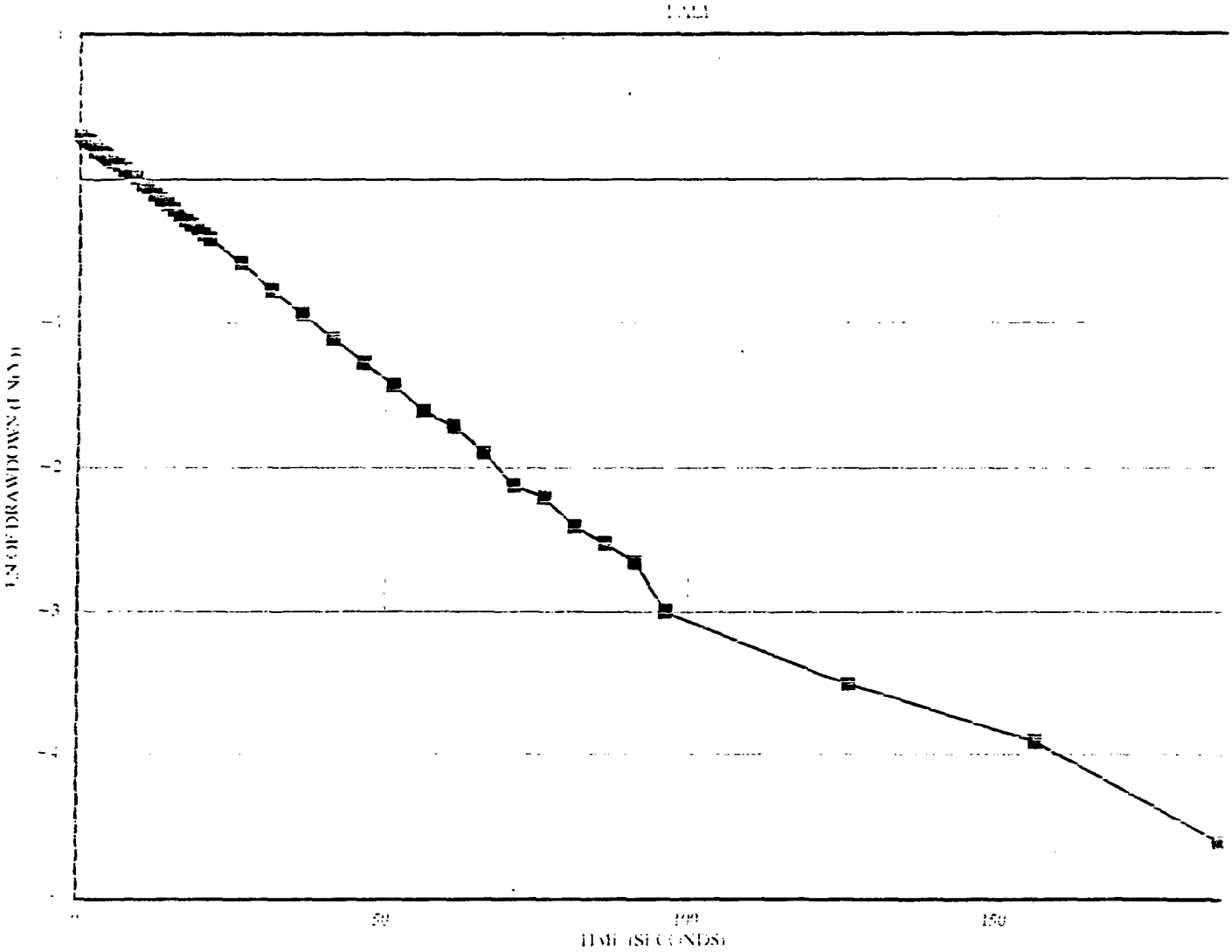
t = 0-186.4 s

Regression Output:

Constant	2.37E-01
Std Err of Y Est	0.1530
R Squared	0.9841
No. of Observations	58
Degrees of Freedom	56
X Coefficient(s)	-2.94E-02
Std Err of Coef.	0.0005

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		11.36	1.360	0.00	0.3221
2		11.34	1.360	0.20	0.3075
3		11.33	1.350	0.40	0.3001
4		11.32	1.340	0.60	0.2927
5		11.31	1.330	0.80	0.2852
6		11.30	1.320	1.20	0.2776
7		11.29	1.310	1.40	0.2700
8		11.29	1.300	1.60	0.2624
9		11.27	1.290	1.80	0.2546
10		11.25	1.270	2.20	0.2390
11		11.24	1.260	2.40	0.2311
12		11.23	1.250	2.60	0.2231
13		11.22	1.240	2.80	0.2151
14		11.21	1.230	3.00	0.2070
15		11.20	1.220	3.20	0.1989
16		11.19	1.210	3.40	0.1906
17		11.18	1.200	3.60	0.1823
18		11.17	1.190	4.00	0.1740
19		11.16	1.180	4.20	0.1655
20		11.15	1.170	4.40	0.1570
21		11.14	1.160	4.60	0.1484
22		11.13	1.150	4.80	0.1398
23		11.12	1.140	5.00	0.1310
24		11.11	1.130	5.40	0.1222
25		11.09	1.110	6.40	0.1044
26		11.05	1.070	7.40	0.0677
27		11.02	1.040	8.40	0.0392
28		10.99	1.010	9.40	0.0100
29		10.94	0.960	10.40	-0.0408
30		10.92	0.940	11.40	-0.0619
31		10.88	0.900	12.40	-0.1054
32		10.85	0.870	13.40	-0.1393
33		10.82	0.840	14.40	-0.1744
34		10.79	0.810	15.40	-0.2107
35		10.76	0.780	16.40	-0.2485
36		10.73	0.750	17.40	-0.2877
37		10.71	0.730	18.40	-0.3147
38		10.68	0.700	19.40	-0.3567
39		10.66	0.680	20.40	-0.3857
40		10.64	0.660	21.40	-0.4155
41		10.54	0.560	26.40	-0.5798
42		10.44	0.460	31.40	-0.7765
43		10.37	0.390	36.40	-0.9416
44		10.31	0.330	41.40	-1.1087
45		10.26	0.280	46.40	-1.2730
46		10.22	0.240	51.40	-1.4271
47		10.18	0.200	56.40	-1.6094
48		10.16	0.180	61.40	-1.7148
49		10.13	0.150	66.40	-1.8971
50		10.10	0.120	71.40	-2.1203
51		10.09	0.110	76.40	-2.2073
52		10.07	0.090	81.40	-2.4079
53		10.06	0.080	86.40	-2.5257
54		10.05	0.070	91.40	-2.6593
55		10.03	0.050	96.40	-2.9957
56		10.01	0.030	126.40	-3.5066
57		10.00	0.020	156.40	-3.9120
58		9.99	0.010	186.40	-4.6052

RATE OF RECOVERY TEST: WELL M-1

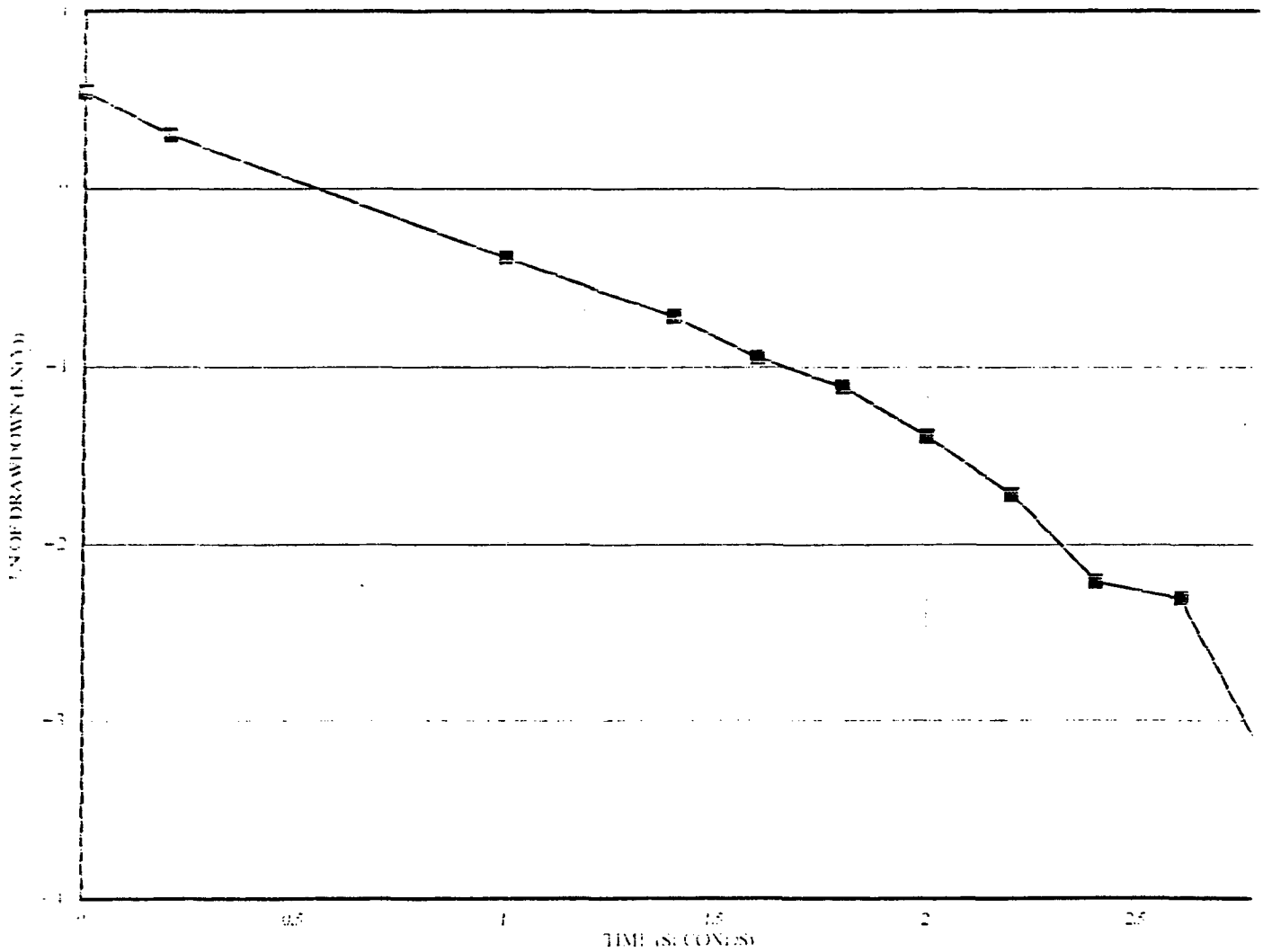


BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "*".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	*TIME min (t)	*DEPTH TO WATER Ft. (Y)	DRAWDOWN (Y')	TIME sec (t')	LN (t')		
						*PROJECT NAME	:HIMCO
						*PROJECT NO	: 20926.024
						*WELL NO	:P-1 FALL
1		11.78	1.730	0.00	0.5481	*ANALYST	:FUCHALSKI
2		11.41	1.360	0.20	0.3075	*DATE COLLECTED	:12-2-90
3		10.73	0.680	1.00	-0.3857	*RISER PIPE (ID): (r sub c) =	2.0 in. = 0.0833 (radius in ft.)
4		10.54	0.490	1.40	-0.7133	*EFFECTIVE SCREEN DIAMETER: (r sub w) =	6.0 in. = 0.2333 (radius in ft.)
5		10.44	0.390	1.60	-0.9416	*EFFECTIVE SCREEN LENGTH: (L) =	5.00 Ft.
6		10.36	0.330	1.80	-1.1987	*MAX DRAWDOWN (IN SUBSET): (Yeax) =	-1.70 Ft.
7		10.30	0.250	2.00	-1.3863	*STATIC WATER LEVEL: (SWL) =	10.05 Ft.
8		10.23	0.180	2.20	-1.7148	*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) =	22.85 Ft.
9		10.16	0.110	2.40	-2.2073	*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) =	175.00 Ft.
10		10.15	0.100	2.60	-2.3026	*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES. 0 IF NO)?	0
11		10.09	0.040	2.80	-3.2189	*SANDPACK'S SPECIFIC YIELD (Sy) =	0.10
12		10.07	0.020	3.00	-3.9120		
13		10.06	0.010	8.00	-4.6052	BOUWER AND RICE CURVE COEFFICIENTS:	
14		10.05	0.000	10.00	ERR	RATIO OF L/(r sub w) =	15.00
15						---LOG OF L/(r sub w) =	1.1761
16						FOR PARTIALLY PENETRATING WELLS--	
17						A =	1.93
18						B =	0.29
19						FOR FULLY PENETRATING WELLS--	
20						C =	1.36
21							
22						---EVALUATION OF LN(Re/(r sub w)):	
23						CONST.1 =	0.2602
24						CONST.2 =	6.1235 =(MAX. OF 6.0)= 6.0000
25						LN(Re/(r sub w) =	1.98
26							
27						EFFECTIVE r sub c (for sandpack dewatering) =	0.0833
28						(1/T)(LN(Yo/Yt)) (SLOPE) =	-1.08E+00 sec^(-1)
29							
30						HYDRAULIC CONDUCTIVITY (K) =	1.48E-03 ft/sec (==========
31							4.51E-02 cm/sec (==========
32							t = 0-2.6 s
33						Regression Output:	
34						Constant	6.47E-01
35						Std Err of Y Est	0.1620
36						R Squared	0.9750
37						No. of Observations	10
38						Degrees of Freedom	8
39							
40						X Coefficient(s)	-1.08E+00
41						Std Err of Coef.	0.0610
42							
43							

RATE OF RECOVERY TEST: WELL F-1

FALL

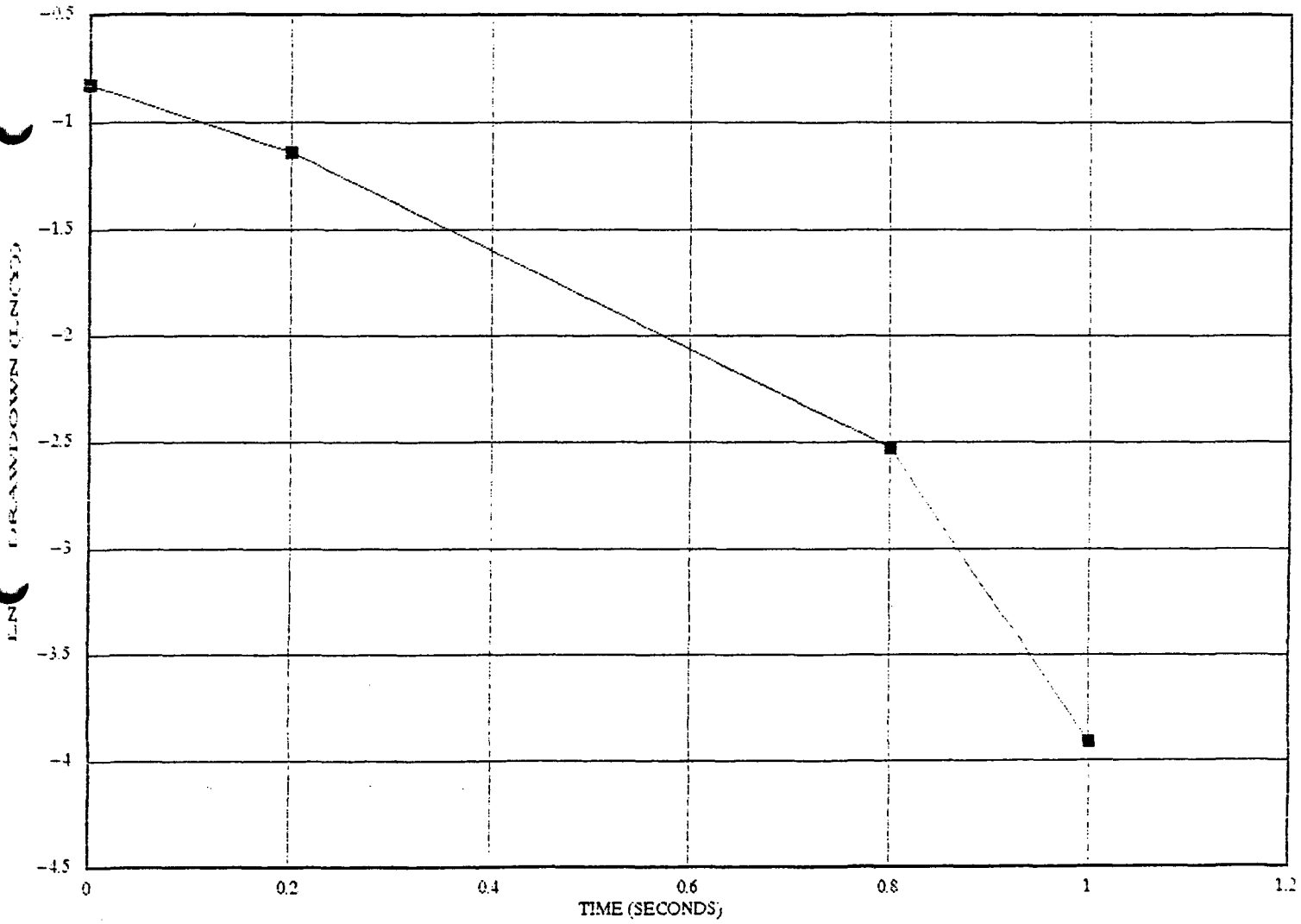


BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "*".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

*	*TIME min	*DEPTH TO WATER Ft.	DRAWDOWN (Y)	*TIME sec (T)	LN (Y)		
1		9.61	0.440	0.00	-0.8210	*PROJECT NAME	:AIMCO
2		9.73	0.320	0.20	-1.1394	*PROJECT NO	: 20-26.024
3		9.97	0.080	0.80	-2.5257	*WELL NO	:F-1 SIZE
4		10.03	0.020	1.00	-3.9120	*ANALYST	:PUCHALSKI
5						*DATE COLLECTED	:12-2-90
6						*RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)	
7						*EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)	
8						*EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.	
9						*MAX DRAWDOWN (IN SUBSET): (Ymax) = -1.31 Ft.	
10						*STATIC WATER LEVEL: (SWL) = 10.05 Ft.	
11						*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 22.85 Ft.	
12						*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.	
13						*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0	
14						*SANDPACK'S SPECIFIC YIELD (Sy) = 0.10	
15						BOUWER AND RICE CURVE COEFFICIENTS:	
16						RATIO OF L/(r sub w) = 15.00	
17						---LOG OF L/(r sub w) = 1.1761	
18						FOR PARTIALLY PENETRATING WELLS--	
19						A = 1.93	
20						B = 0.29	
21						FOR FULLY PENETRATING WELLS--	
22						C = 1.38	
23						---EVALUATION OF LN(Re/(r sub w)):	
24						CONST.1 = 0.2602	
25						CONST.2 = 6.1235 =(MAX. OF 6.0)= 6.0000	
26						LN(Re/(r sub w) = 1.98	
27						EFFECTIVE r sub c (for sandpack dewatering) = 0.0833	
28						(1/T)(LN(Yo/Y1)) (SLOPE) = -2.88E+00 sec^(-1)	
29						HYDRAULIC CONDUCTIVITY (K) = 3.96E-03 ft/sec <==========	
30						1.21E-01 cm/sec <==========	
31						t = 0-1 s	
32						Regression Output:	
33						Constant -6.57E-01	
34						Std Err of Y Est 0.4276	
35						R Squared 0.9393	
36						No. of Observations 4	
37						Degrees of Freedom 2	
38						X Coefficient(s) -2.88E+00	
39						Std Err of Coef. 0.5186	
40							
41							
42							
43							

RATE OF RECOVERY TEST: WELL F−1

RISE



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN '$'.
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (T)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y)
1		9.80	0.260	0.00	-1.3471
2		9.81	0.250	1.00	-1.3863
3		9.82	0.240	4.00	-1.4271
4		9.83	0.230	6.00	-1.4697
5		9.84	0.220	8.00	-1.5141
6		9.85	0.210	14.00	-1.5606
7		9.86	0.200	17.00	-1.6094
8		9.87	0.190	20.00	-1.6607
9		9.89	0.170	27.00	-1.7720
10		9.90	0.160	32.00	-1.8326
11		9.91	0.150	42.00	-1.8971
12		9.93	0.130	47.00	-2.0402
13		9.94	0.120	57.00	-2.1203
14		9.95	0.110	62.00	-2.2073
15		9.96	0.100	67.00	-2.3026
16		9.97	0.090	82.00	-2.4079
17		9.98	0.080	87.00	-2.5257
18		10.01	0.050	127.00	-2.9957
19		10.03	0.030	157.00	-3.5066
20		10.04	0.020	247.00	-3.9120
21		10.05	0.010	427.00	-4.6052

$PROJECT NAME : HIMCO
$PROJECT NO : 20026.024
$WELL NO : F-I RISE
$ANALYST : PUCHALSKI
$DATE COLLECTED : 12-2-90
$RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
$EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
$EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
$MAX DRAWDOWN (IN SUBSET): (Ymax) = 0.26 Ft.
$STATIC WATER LEVEL: (SWL) = 10.06 Ft.
$DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 166.25 Ft.
$EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
$INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
$SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 15.00
---LOG OF L/(r sub w) = 1.1761
FOR PARTIALLY PENETRATING WELLS--
A = 1.93
B = 0.29
FOR FULLY PENETRATING WELLS--
C = 1.38

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.1771
CONST.2 = 3.2677 =(MAX. OF 6.0)= 3.2677
LN(Re/(r sub w) = 2.71

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -1.29E-02 sec^(-1)

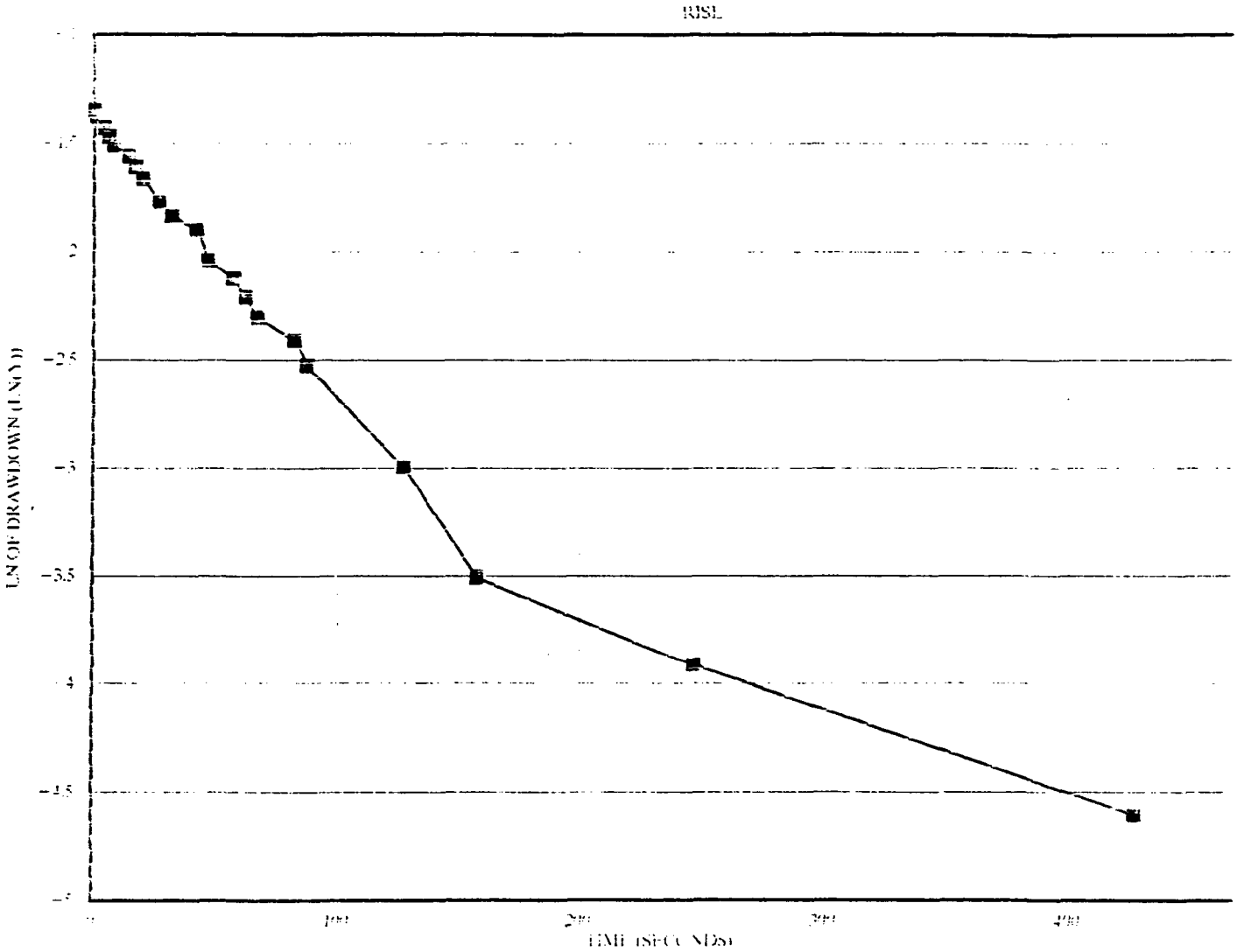
HYDRAULIC CONDUCTIVITY (K) = 2.42E-05 ft/sec <==========
7.37E-04 cm/sec <==========

t = 0-127 s

Regression Output:

Constant	-1.39E+00
Std Err of Y Est	0.0292
R Squared	0.9962
No. of Observations	18
Degrees of Freedom	16
X Coefficient(s)	-1.29E-02
Std Err of Coef.	0.0002

RATE OF RECOVERY TEST: WELL F-2



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "*".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	*TIME min (X)	*DEPTH TO WATER Ft. (Y)	*DRAWDOWN (Y')	*TIME sec (X')	LN (Y')
1		6.03	0.780	0.00	-0.02
2		6.28	0.730	0.40	-0.31
3		6.32	0.690	1.20	-0.37
4		6.36	0.650	1.40	-0.43
5		6.39	0.620	1.60	-0.48
6		6.42	0.590	1.80	-0.53
7		6.45	0.560	2.00	-0.58
8		6.48	0.530	2.20	-0.63
9		6.50	0.510	2.40	-0.67
10		6.52	0.490	2.60	-0.71
11		6.54	0.470	2.80	-0.76
12		6.57	0.440	3.00	-0.82
13		6.58	0.430	3.20	-0.84
14		6.60	0.410	3.40	-0.89
15		6.62	0.390	3.60	-0.94
16		6.63	0.380	3.80	-0.97
17		6.64	0.370	4.00	-0.99
18		6.66	0.350	4.20	-1.05
19		6.68	0.330	4.40	-1.11
20		6.70	0.310	4.60	-1.17
21		6.71	0.300	5.00	-1.20
22		6.72	0.290	5.20	-1.24
23		6.73	0.280	5.40	-1.27
24		6.75	0.260	5.60	-1.35
25		6.76	0.250	6.00	-1.39
26		6.77	0.240	6.20	-1.43
27		6.78	0.230	6.40	-1.47
28		6.79	0.220	6.60	-1.51
29		6.80	0.210	6.80	-1.56
30		6.81	0.200	7.00	-1.61
31		6.82	0.190	7.60	-1.66
32		6.83	0.180	8.00	-1.71
33		6.84	0.170	8.40	-1.77
34		6.85	0.160	8.60	-1.83
35		6.86	0.150	9.00	-1.90
36		6.87	0.140	9.40	-1.97
37		6.88	0.130	9.80	-2.04
38		6.89	0.120	11.80	-2.12
39		6.91	0.100	12.80	-2.30
40		6.92	0.090	12.80	-2.41
41		6.94	0.070	14.80	-2.66
42		6.95	0.060	15.80	-2.81
43		6.96	0.050	18.80	-3.00
44		6.97	0.040	20.80	-3.22
45		6.98	0.030	22.60	-3.51
46		6.99	0.020	27.60	-3.91
47		7.00	0.010	33.60	-4.61

*PROJECT NAME :HIMCO
*PROJECT NO : 20026.024
*WELL NO :M-2 RISE
*ANALYST :FUCHALSKI
*DATE COLLECTED :11-1-90
*RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
*EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
*EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
*MAX DRAWDOWN (IN SUBSET): (ymax) = 0.98 Ft.
*STATIC WATER LEVEL: (SWL) = 7.01 Ft.
*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 9.53 Ft.
*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
*SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 15.00
---LOG OF L/(r sub w) = 1.1761
FOR PARTIALLY PENETRATING WELLS--
A = 1.93
B = 0.29
FOR FULLY PENETRATING WELLS--
C = 1.38

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3281
CONST.2 = 6.2074 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) = 1.74

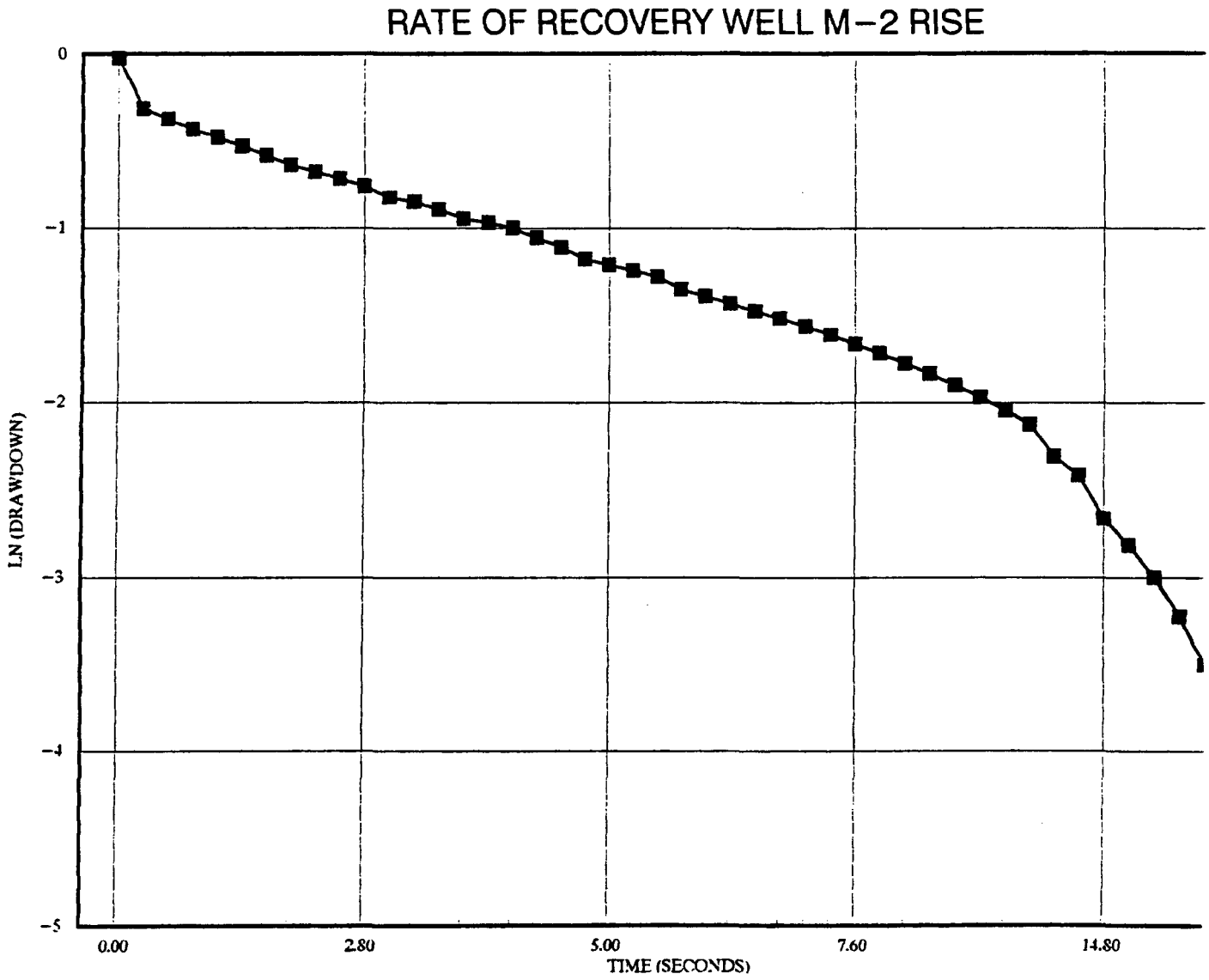
EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = 1.00E+00 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.21E-03 ft/sec <==========
3.69E-02 cm/sec <==========

t=0.4-9.8s

Regression Output:

Constant	-1.73E-18
Std Err of Y Est	0.0000
R Squared	1.0000
No. of Observations	36
Degrees of Freedom	34
X Coefficient(s)	1.00E+00
Std Err of Coef.	0.0000


RATE OF RECOVERY WELL M-2 RISE
0
-1
-2
-3
-4
-5
LN (DRAWDOWN)
0.00
2.80
5.00
7.60
14.80
TIME (SECONDS)

BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "X".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		8.15	0.180	0.00	-1.7148
2		8.14	0.170	2.00	-1.7720
3		8.13	0.160	6.00	-1.8326
4		8.12	0.150	9.00	-1.8971
5		8.11	0.140	11.00	-1.9661
6		8.10	0.130	19.00	-2.0402
7		8.09	0.120	23.00	-2.1203
8		8.08	0.110	27.00	-2.2073
9		8.07	0.100	31.00	-2.3026
10		8.06	0.090	35.00	-2.4079
11		8.05	0.080	41.00	-2.5257
12		8.04	0.070	53.00	-2.6593
13		8.03	0.060	63.00	-2.8134
14		8.02	0.050	73.00	-2.9957
15		8.01	0.040	83.00	-3.2189
16		8.00	0.030	93.00	-3.5066
17		7.99	0.020	103.00	-3.9120
18		7.98	0.010	123.00	-4.6052
19		7.97	0.000	183.00	ERR
20					
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#PROJECT NAME :HIMCO
#PROJECT NO : 20026.024
#WELL NO :E-3 FALL
#ANALYST :ELIAS
#DATE COLLECTED :12-1-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 11.60 Ft.
#MAX DRAWDOWN (IN SUBSET): (hmax) = -0.13 Ft.
#STATIC WATER LEVEL: (SWL) = 7.97 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 11.60 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
#SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 34.80
---LOG OF L/(r sub w) = 1.5416
FOR PARTIALLY PENETRATING WELLS--
A = 2.60
B = 0.36
FOR FULLY PENETRATING WELLS--
C = 2.03

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3099
CONST.2 = 6.1948 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) = 2.24

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -2.25E-02 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.51E-05 ft/sec <==========
4.61E-04 cm/sec <==========

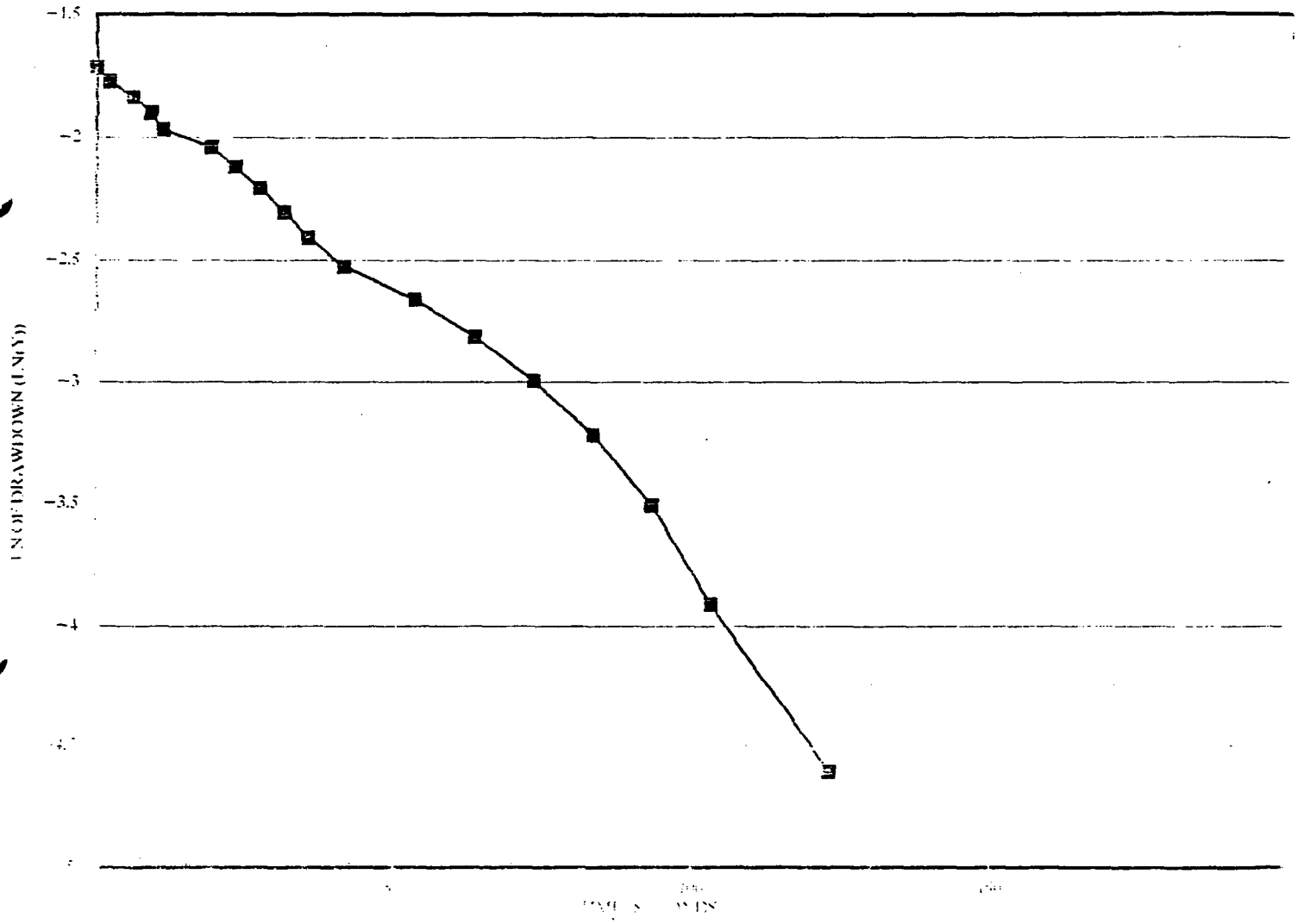
t=19-41s

Regression Output:

Constant	-1.61E+00
Std Err of Y Est	0.0087
R Squared	0.9982
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s)	-2.25E-02
Std Err of Coef.	0.0005

RATE OF RECOVERY TEST: WELL E-3

FALL



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "*".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X)	LN (Y)
1		7.9e	0.010	0.00	-4.6052
2		7.66	0.250	2.00	-1.2379
3		7.69	0.280	2.80	-1.2730
4		7.70	0.270	3.00	-1.3093
5		7.71	0.260	4.00	-1.3471
6		7.72	0.250	5.00	-1.3863
7		7.73	0.240	11.00	-1.4271
8		7.74	0.230	13.00	-1.4697
9		7.75	0.220	15.00	-1.5141
10		7.76	0.210	17.00	-1.5606
11		7.77	0.200	20.00	-1.6094
12		7.78	0.190	22.00	-1.6607
13		7.79	0.180	25.00	-1.7148
14		7.80	0.170	31.00	-1.7720
15		7.81	0.160	35.00	-1.8326
16		7.82	0.150	39.00	-1.8971
17		7.83	0.140	41.00	-1.9661
18		7.84	0.130	47.00	-2.0402
19		7.85	0.120	51.00	-2.1203
20		7.87	0.100	65.00	-2.3026
21		7.88	0.090	75.00	-2.4079
22		7.90	0.070	85.00	-2.6593
23		7.91	0.060	95.00	-2.8134
24		7.92	0.050	125.00	-2.9957
25		7.93	0.040	145.00	-3.2189
26		7.94	0.030	165.00	-3.5066
27		7.95	0.020	205.00	-3.9120
28					
29					
30					
31					
32					
33					
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35					
36					
37					
38					
39					
40					
41					
42					
43					

#PROJECT NAME : HIMCO
#PROJECT NO : 20026.024
#WELL NO : E-2 RISE
#ANALYST : ELIAS
#DATE COLLECTED : 12-14-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 11.60 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = 0.26 Ft.
#STATIC WATER LEVEL: (SWL) = 7.97 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 11.60 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 1
#SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 34.80
---LOG OF L/(r sub w) = 1.5416
FOR PARTIALLY PENETRATING WELLS--
A = 2.60
B = 0.36
FOR FULLY PENETRATING WELLS--
C = 2.03

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3099
CONST.2 = 6.1948 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w) = 2.24

EFFECTIVE r sub c (for sandpack dewatering) = 0.1318
(1/T)(LN(Yo/Yt)) (SLOPE) = -1.55E-02 sec^(-1)

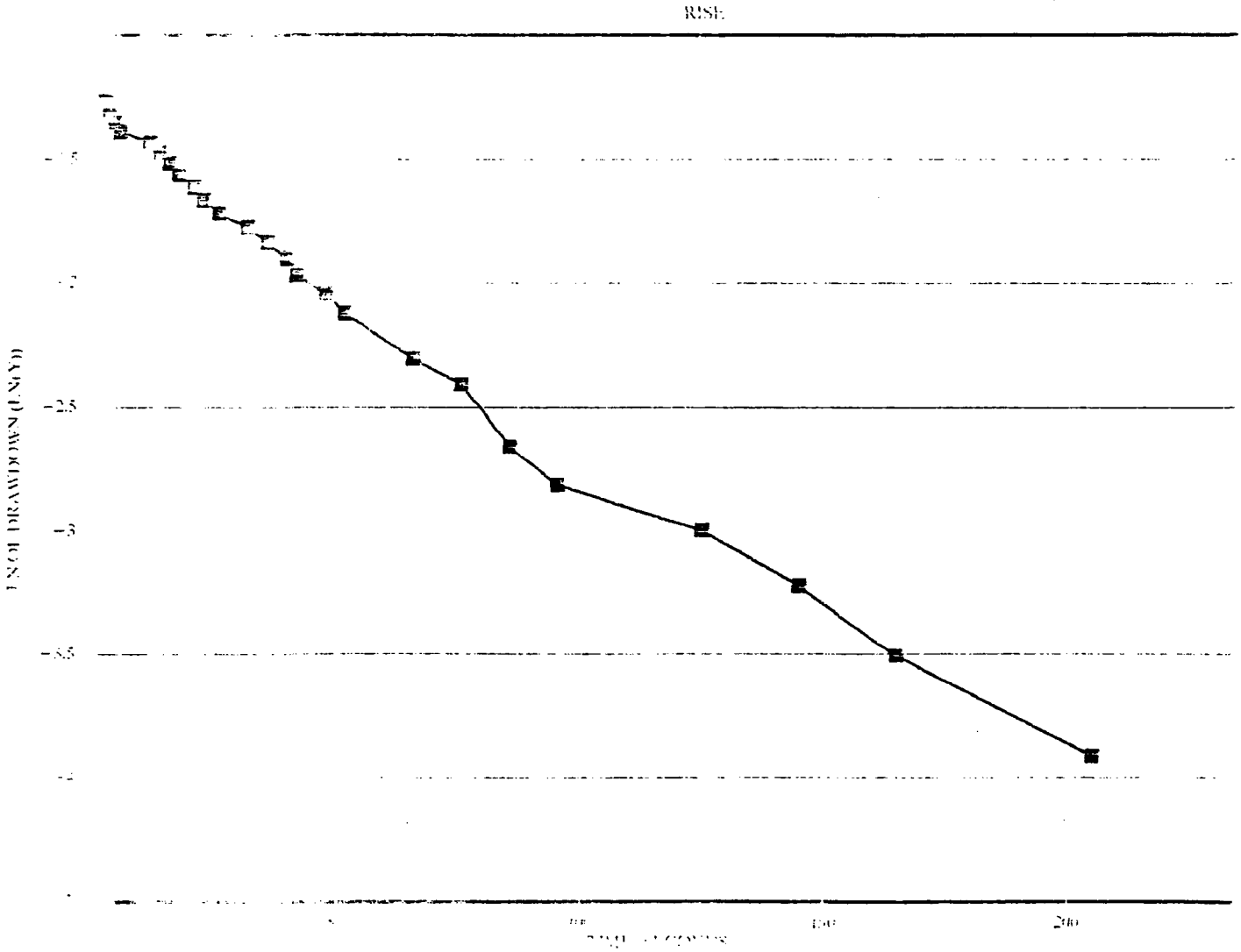
HYDRAULIC CONDUCTIVITY (K) = 2.61E-05 ft/sec <==========
7.95E-04 cm/sec <==========

t = 4-20s

Regression Output:

Constant	-1.28E+00
Std Err of Y Est	0.0201
R Squared	0.9622
No. of Observations	7
Degrees of Freedom	5
X Coefficient(s)	-1.55E-02
Std Err of Coef.	0.0014

RATE OF RECOVERY TEST: WELL E-3



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
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#	TIME sec (X)	DEPTH TO WATER Ft. (Y)	DRAWDOWN (Y')	TIME sec (X')	LN (Y')
1		10.48	0.420	0.00	-0.9675
2		10.43	0.370	0.40	-0.9943
3		10.37	0.310	0.80	-1.1712
4		10.33	0.270	1.20	-1.3093
5		10.32	0.260	2.00	-1.3471
6		10.31	0.250	3.00	-1.3863
7		10.30	0.240	4.40	-1.4271
8		10.29	0.230	7.20	-1.4697
9		10.28	0.220	11.00	-1.5141
10		10.27	0.210	16.00	-1.5606
11		10.26	0.200	24.00	-1.6094
12		10.25	0.190	25.00	-1.6607
13		10.24	0.180	27.00	-1.7148
14		10.23	0.170	29.00	-1.7720
15		10.22	0.160	30.00	-1.8326
16		10.21	0.150	36.00	-1.8971
17		10.20	0.140	38.00	-1.9661

#PROJECT NAME :HIMCO
#PROJECT NO : 20026.024
#WELL NO :F-2 FALL
#ANALYST :ELIAS
#DATE COLLECTED :12-2-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 6.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = -0.43 Ft.
#STATIC WATER LEVEL: (SWL) = 10.06 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 166.25 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 1
#SANDPACK'S SPECIFIC YIELD (Sv) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 15.00
---LOG OF L/(r sub w) = 1.1761
FOR PARTIALLY PENETRATING WELLS--
A = 1.93
B = 0.29
FOR FULLY PENETRATING WELLS--
C = 1.38

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.1771
CONST.2 = 3.2677 =(MAX. OF 6.0)= 3.2677
LN(Re/(r sub w)) = 2.71

EFFECTIVE r sub c (for sandpack dewatering) = 0.1318
(1/T)(LN(Yo/Yt)) (SLOPE) = -8.88E-03 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 4.17E-05 ft/sec <==========
1.27E-03 cm/sec <==========

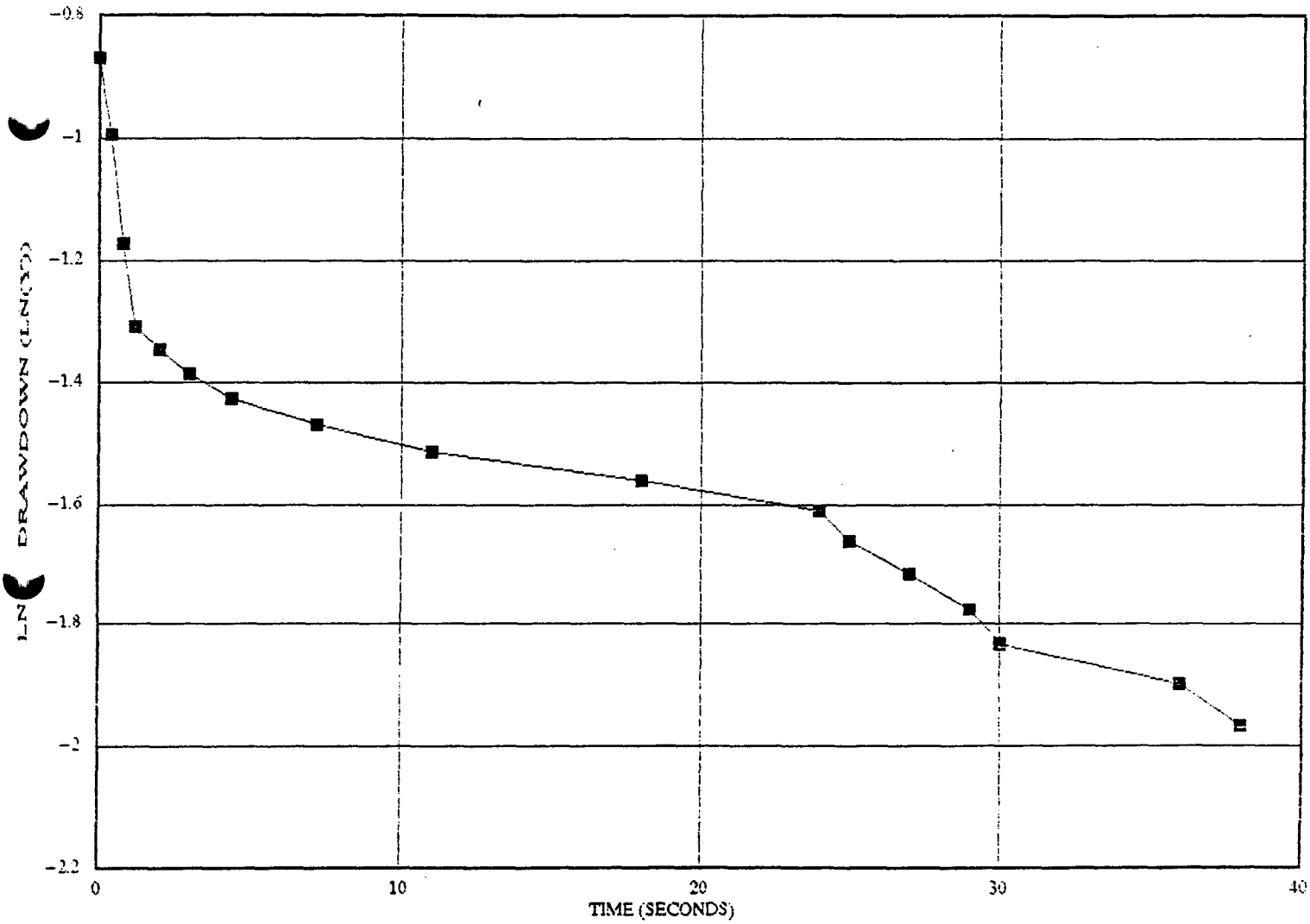
t=4.4-29 s

Regression Output:

Constant	-1.40E+00
Std Err of Y Est	0.0122
R Squared	0.9783
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s)	-8.88E-03
Std Err of Coef.	0.0008

RATE OF RECOVERY TEST: WELL F-2

FALL



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#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		11.60	1.340	0.00	0.2927
2		11.57	1.110	1.40	0.1044
3		11.55	1.090	1.60	0.0862
4		11.53	1.070	1.80	0.0677
5		11.51	1.050	2.00	0.0488
6		11.49	1.030	2.20	0.0296
7		11.48	1.020	2.40	0.0198
8		11.46	1.000	2.60	0.0000
9		11.45	0.990	2.80	-0.0101
10		11.43	0.970	3.00	-0.0305
11		11.42	0.960	3.20	-0.0408
12		11.40	0.940	3.40	-0.0619
13		11.38	0.920	3.60	-0.0834
14		11.37	0.910	3.80	-0.0943
15		11.35	0.890	4.00	-0.1165
16		11.34	0.880	4.20	-0.1278
17		11.33	0.870	4.40	-0.1393
18		11.31	0.850	5.40	-0.1625
19		11.26	0.800	6.40	-0.2231
20		11.20	0.740	7.40	-0.3011
21		11.14	0.680	8.40	-0.3857
22		11.09	0.630	9.40	-0.4620
23		11.05	0.590	10.40	-0.5276
24		11.00	0.540	11.40	-0.6162
25		10.96	0.500	12.40	-0.6931
26		10.93	0.470	13.40	-0.7550
27		10.89	0.430	14.40	-0.8440
28		10.86	0.400	15.40	-0.9163
29		10.83	0.370	16.40	-0.9943
30		10.80	0.340	17.40	-1.0788
31		10.78	0.320	18.40	-1.1394
32		10.75	0.290	19.40	-1.2379
33		10.72	0.260	20.40	-1.3471
34		10.70	0.240	21.40	-1.4271
35		10.65	0.220	22.40	-1.5141
36		10.65	0.190	23.40	-1.6607
37		10.63	0.170	24.40	-1.7720
38		10.62	0.160	25.40	-1.8326
39		10.60	0.140	26.40	-1.9661
40		10.59	0.130	27.40	-2.0402
41		10.55	0.120	28.40	-2.1203
42		10.56	0.100	32.40	-2.3026
43		10.54	0.080	34.40	-2.5257
44		10.52	0.060	36.40	-2.8134
45		10.51	0.050	40.40	-2.9957
46		10.50	0.040	42.40	-3.2189
47		10.49	0.030	44.40	-3.5066
48					

#PROJECT NAME : HIMCO
#PROJECT NO : 20626.024
#WELL NO : #1018 FALL
#ANALYST : PUCHALSKI
#DATE COLLECTED : 04-Jan-91
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 6.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = -1.34 Ft.
#STATIC WATER LEVEL: (SWL) = 10.46 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 91.00 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
#SANDPACK'S SPECIFIC YIELD (Sv) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:

RATIO OF L/(r sub w) =	15.00
---LOG OF L/(r sub w) =	1.1761
FOR PARTIALLY PENETRATING WELLS--	
A =	1.93
B =	0.29
FOR FULLY PENETRATING WELLS--	
C =	1.38

---EVALUATION OF LN(Re/(r sub w)):

CONST.1 =	0.1961	
CONST.2 =	5.5294	=(MAX. OF 6.0)= 5.5294
LN(Re/(r sub w) =	2.31	

EFFECTIVE r sub c (for sandpack dewatering) =	0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) =	-8.15E-02 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.31E-04 ft/sec <==========
3.99E-03 cm/sec <==========

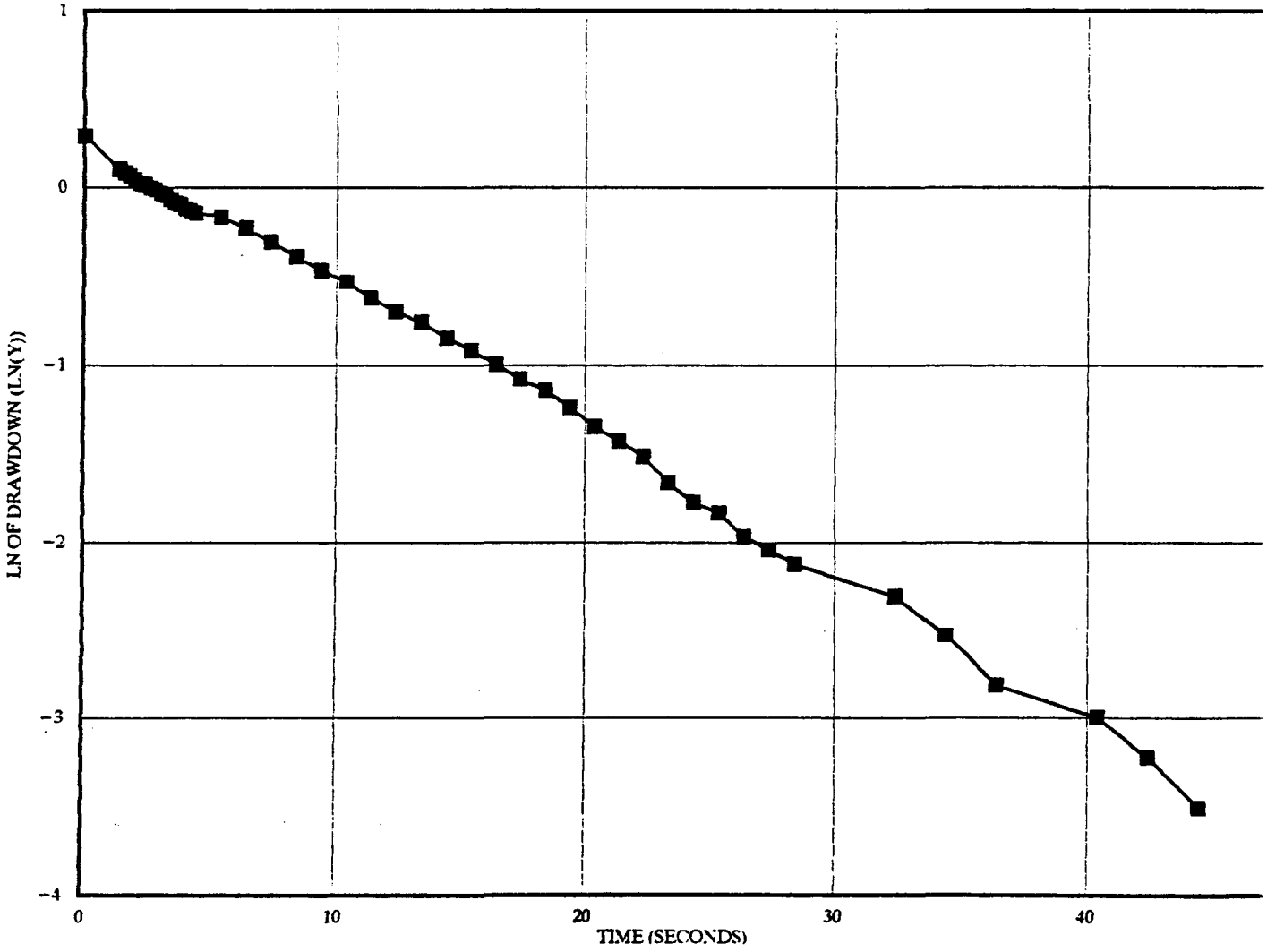
t=0-44.4s

Regression Output:

Constant	2.59E-01
Std Err of Y Est	0.0606
R Squared	0.9966
No. of Observations	47
Degrees of Freedom	45
X Coefficient(s)	-8.15E-02
Std Err of Coef.	0.0007

RATE OF RECOVERY TEST: WELL P101B

FALL



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*	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		11.06	1.430	0.00	0.3577
2		10.99	1.420	1.00	0.3507
3		10.98	1.410	9.00	0.3436
4		10.97	1.400	16.00	0.3365
5		10.96	1.390	28.00	0.3293
6		10.95	1.380	34.00	0.3221
7		10.94	1.370	38.00	0.3148
8		10.93	1.360	41.00	0.3075
9		10.92	1.350	47.00	0.3001
10		10.91	1.340	51.00	0.2927
11		10.90	1.330	55.00	0.2852

*PROJECT NAME : MINCO
*PROJECT NO : 2005b.024
*WELL NO :P101C FALL
*ANALYST :FUCHALSKI
*DATE COLLECTED : 04-Jan-91
*RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
*EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
*EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
*MAX DRAWDOWN (IN DUPSET): (Ymax) = -1.38 Ft.
*STATIC WATER LEVEL: (SWL) = 9.57 Ft.
*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 10.86 Ft.
*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
*SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 15.00
---LOG OF L/(r sub w) = 1.1761
FOR PARTIALLY PENETRATING WELLS--
A = 1.93
B = 0.29
FOR FULLY PENETRATING WELLS--
C = 1.38

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3156
CONST.2 = 6.1992 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) = 1.78

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -2.94E-02 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 3.64E-05 ft/sec <==========
1.11E-03 cm/sec <==========

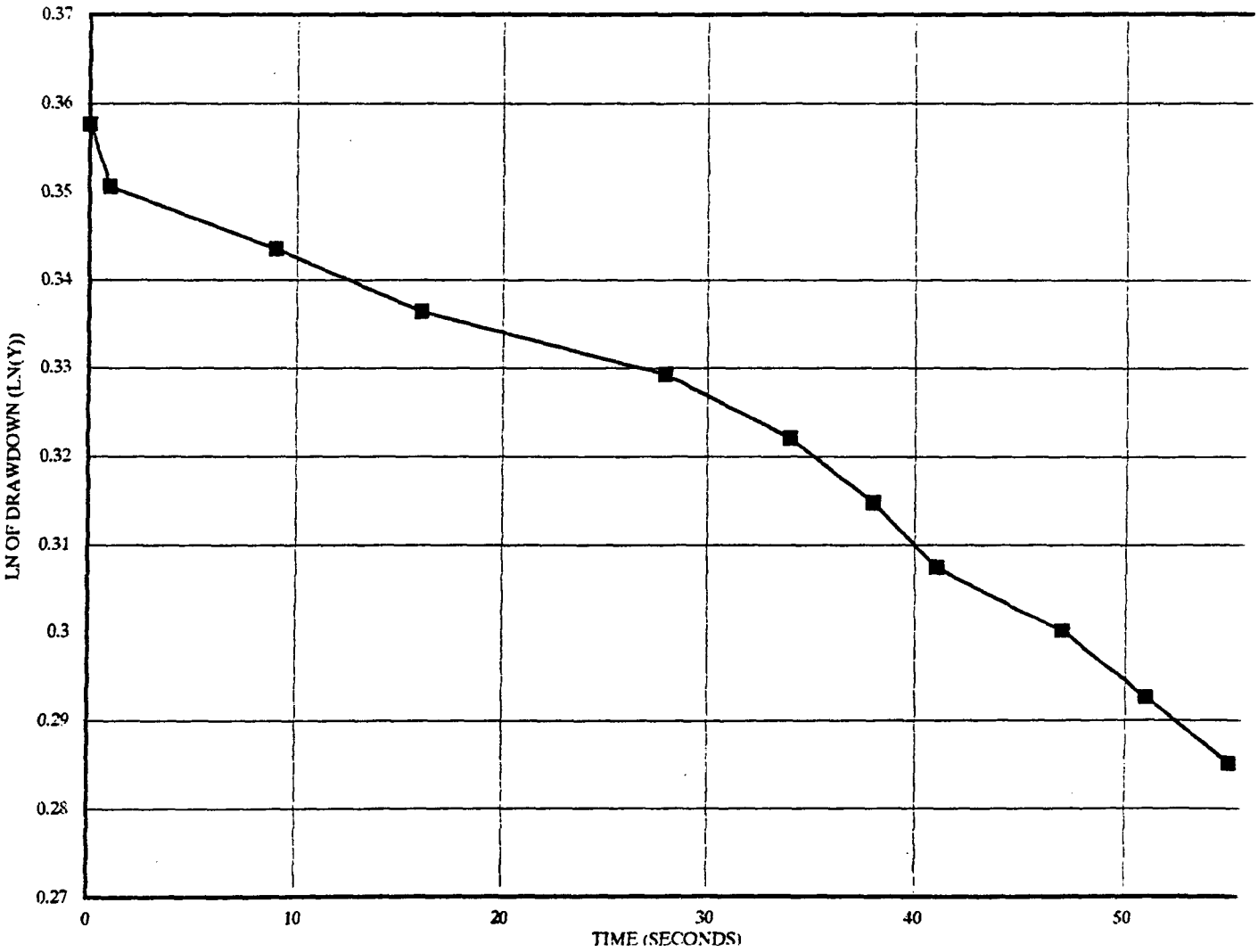
t=0-55s

Regression Output:

Constant	2.37E-01
Std Err of Y Est	0.1530
R Squared	0.9841
No. of Observations	58
Degrees of Freedom	56
X Coefficient(s)	-2.94E-02
Std Err of Coef.	0.0005

RATE OF RECOVERY TEST: WELL P101C

FALL



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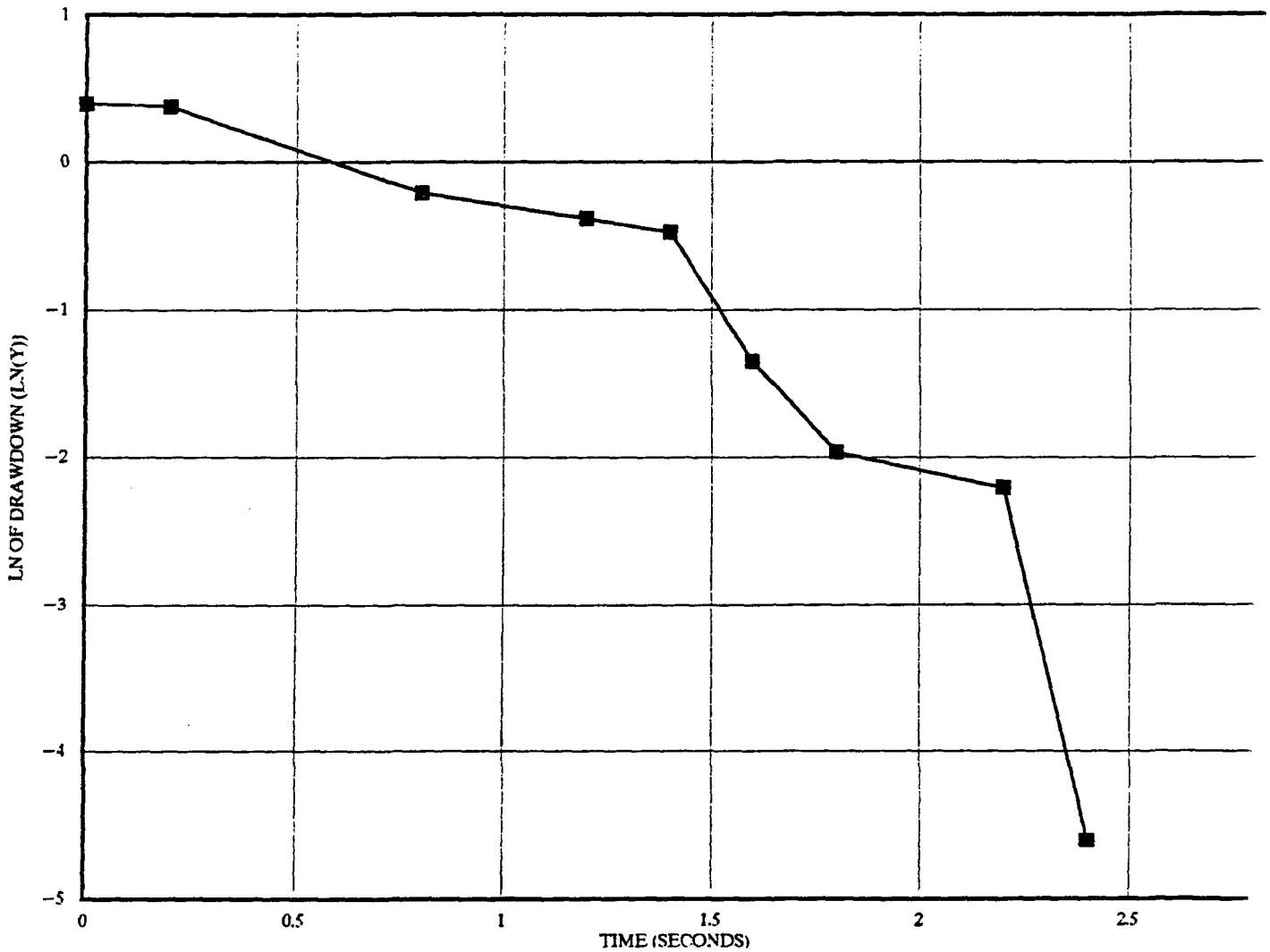
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	*TIME min (X)	*DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')		
						*PROJECT NAME	:HIMCO
						*PROJECT NO	: 20026.024
						*WELL NO	:F102F FALL
1		11.25	1.490	0.00	0.3989	*ANALYST	:PUCHALSKI
2		11.22	1.460	0.20	0.3784	*DATE COLLECTED	: 04-Jan-91
3		10.57	0.810	0.80	-0.2107	*RISER PIPE (ID):	(2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
4		10.44	0.680	1.20	-0.3857	*EFFECTIVE SCREEN DIAMETER:	(2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
5		10.38	0.620	1.40	-0.4780	*EFFECTIVE SCREEN LENGTH:	(L) = 9.00 Ft.
6		10.02	0.260	1.60	-1.3471	*MAX DRAWDOWN (IN SUBSET):	(Ymax) = 2.46 Ft.
7		9.90	0.140	1.80	-1.9661	*STATIC WATER LEVEL:	(SWL) = 9.76 Ft.
8		9.87	0.110	2.20	-2.2073	*DEPTH FROM SWL TO EFF. SCREEN BOTTOM:	(H) = 58.46 Ft.
9		9.77	0.010	2.40	-4.6052	*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM):	(D) = 175.00 Ft.
10						*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)?	0
11						*SANDPACK'S SPECIFIC YIELD (Sv) =	0.10
12							
13						BOUWER AND RICE CURVE COEFFICIENTS:	
14						RATIO OF L/(r sub w) =	27.00
15						---LOG OF L/(r sub w) =	1.4314
16						FOR PARTIALLY PENETRATING WELLS--	
17						A =	2.33
18						B =	0.32
19						FOR FULLY PENETRATING WELLS--	
20						C =	1.74
21							
22						---EVALUATION OF LN(Re/(r sub w)):	
23						CONST.1 =	0.2129
24						CONST.2 =	5.8568 =(MAX. OF 6.0)= 5.8568
25						LN(Re/(r sub w) =	2.71
26							
27						EFFECTIVE r sub c (for sandpack dewatering) =	0.0833
28						(1/T)(LN(Yo/Yt)) (SLOPE) =	-1.23E+00 sec^(-1)
29							
30						HYDRAULIC CONDUCTIVITY (K) =	1.28E-03 ft/sec <==========
31							3.91E-02 cm/sec <==========
32							t=0-2.2 s
33						Regression Output:	
34						Constant	6.85E-01
35						Std Err of Y Est	0.3651
36						R Squared	0.8865
37						No. of Observations	8
38						Degrees of Freedom	6
39							
40						X Coefficient(s)	-1.23E+00
41						Std Err of Coef.	0.1795
42							
43							

RATE OF RECOVERY TEST: WELL P102B

FALL



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#	TIME min (X)	DEPTH TO WATER Ft. (Y)	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		8.83	0.430	0.00	-0.0726
2		8.91	0.350	0.20	-0.1625
3		9.01	0.250	0.40	-0.2877
4		9.11	0.150	0.60	-0.4306
5		9.22	0.040	0.80	-0.6162
6		9.32	0.440	1.00	-0.8210
7		9.44	0.320	1.20	-1.1394
8		9.52	0.240	1.40	-1.4271
9		9.61	0.150	1.60	-1.8971
10		9.72	0.040	1.80	-3.2189
11					
12					
13					
14					
15					
16					
17					
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#PROJECT NAME :HIMCO
#PROJECT NO : 20026.024
#WELL NO :P102B RISE
#PANALYST :PUCHALSKI
#DATE COLLECTED : 04-Jan-91
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 5.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 9.00 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = 2.46 Ft.
#STATIC WATER LEVEL: (SWL) = 9.76 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 58.46 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
#SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 27.00
---LOG OF L/(r sub w) = 1.4314
FOR PARTIALLY PENETRATING WELLS--
A = 2.33
B = 0.32
FOR FULLY PENETRATING WELLS--
C = 1.74

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.2129
CONST.2 = 5.8568 =(MAX. OF 6.0)= 5.8568
LN(Re/(r sub w)) = 2.71

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -1.10E+00 sec^(-1)

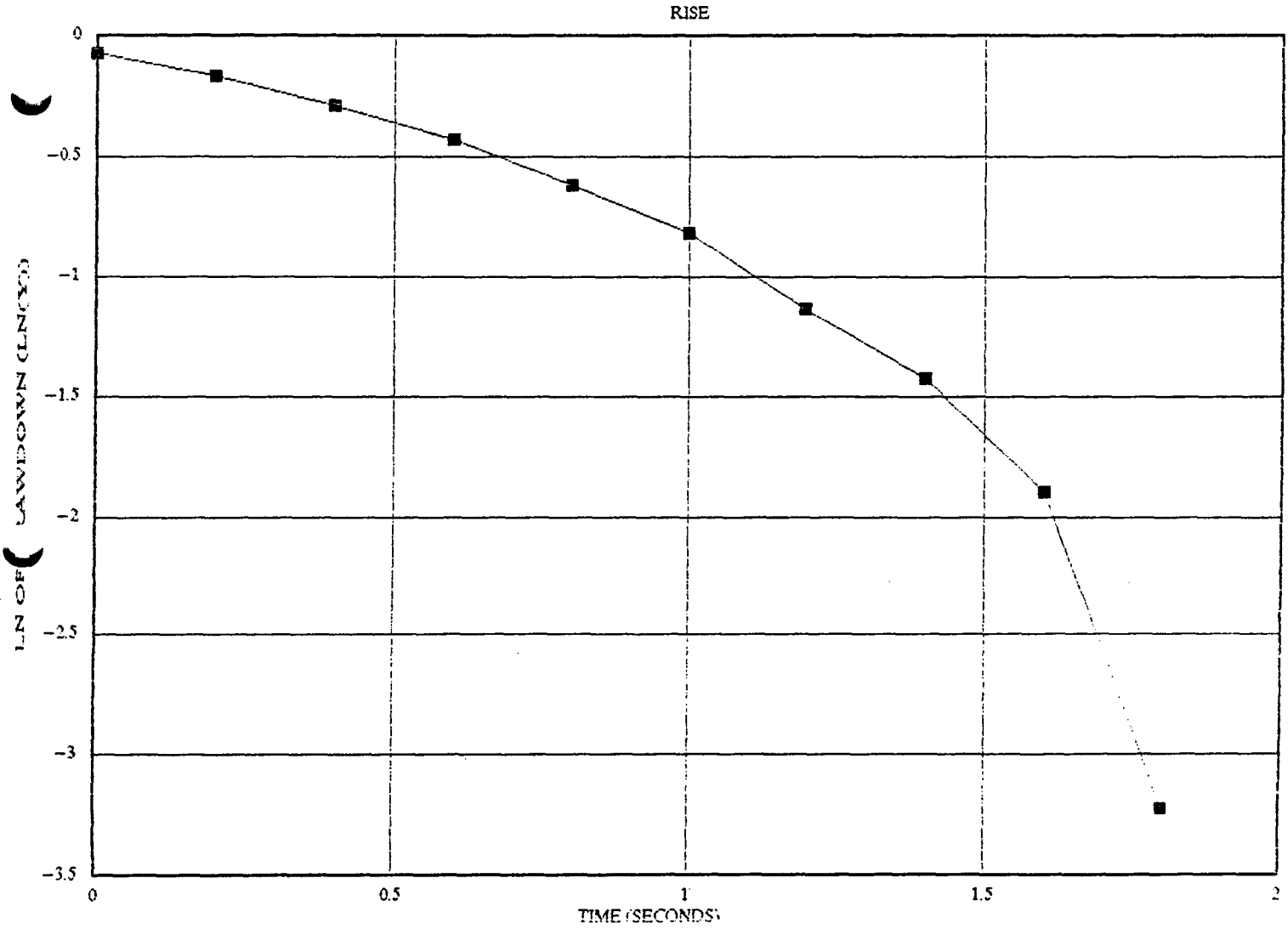
HYDRAULIC CONDUCTIVITY (K) = 1.15E-03 ft/sec <==========
3.50E-02 cm/sec <==========

t=0 -1.65

Regression Output:

Constant	1.17E-01
Std Err of Y Est	0.1557
R Squared	0.9447
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	-1.10E+00
Std Err of Coef.	0.1905

RATE OF RECOVERY TEST: WELL P102B



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "#".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X)	LN (X)
1		10.45	0.840	0.00	-0.1744
2		10.47	0.820	1.40	-0.1985
3		10.48	0.810	1.60	-0.2107
4		10.49	0.800	1.80	-0.2231
5		10.50	0.790	2.00	-0.2357
6		10.51	0.780	2.20	-0.2485
7		10.52	0.770	2.40	-0.2614
8		10.53	0.760	2.60	-0.2744
9		10.54	0.750	2.80	-0.2877
10		10.55	0.740	3.00	-0.3011
11		10.56	0.730	3.20	-0.3147
12		10.57	0.720	3.40	-0.3285
13		10.58	0.710	3.60	-0.3425
14		10.59	0.700	3.80	-0.3567
15		10.60	0.690	4.00	-0.3711
16		10.61	0.680	4.20	-0.3857
17		10.62	0.670	4.40	-0.4005
18		10.63	0.660	5.40	-0.4155
19		10.64	0.650	6.40	-0.4308
20		10.65	0.640	7.40	-0.4463
21		10.66	0.630	8.40	-0.4620
22		10.67	0.620	9.40	-0.4780
23		10.68	0.610	10.40	-0.4943
24		10.69	0.600	11.40	-0.5108
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#PROJECT NAME : HIMCO
#PROJECT NO : 20026.014
#WELL NO : P102C RISE
#ANALYST : PUCHALSKI
#DATE COLLECTED : 04-Jan-91
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 5.00 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = 0.23 Ft.
#STATIC WATER LEVEL: (SWL) = 11.29 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 149.40 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
#SANDPACK S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 15.00
---LOG OF L/(r sub w) = 1.1761
FOR PARTIALLY PENETRATING WELLS--
A = 1.93
B = 0.29
FOR FULLY PENETRATING WELLS--
C = 1.38

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.1802
CONST.2 = 4.3412 =(MAX. OF 6.0)= 4.3412
LN(Re/(r sub w)) = 2.54

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -6.68E-02 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.18E-04 ft/sec <==========
3.59E-03 cm/sec <==========

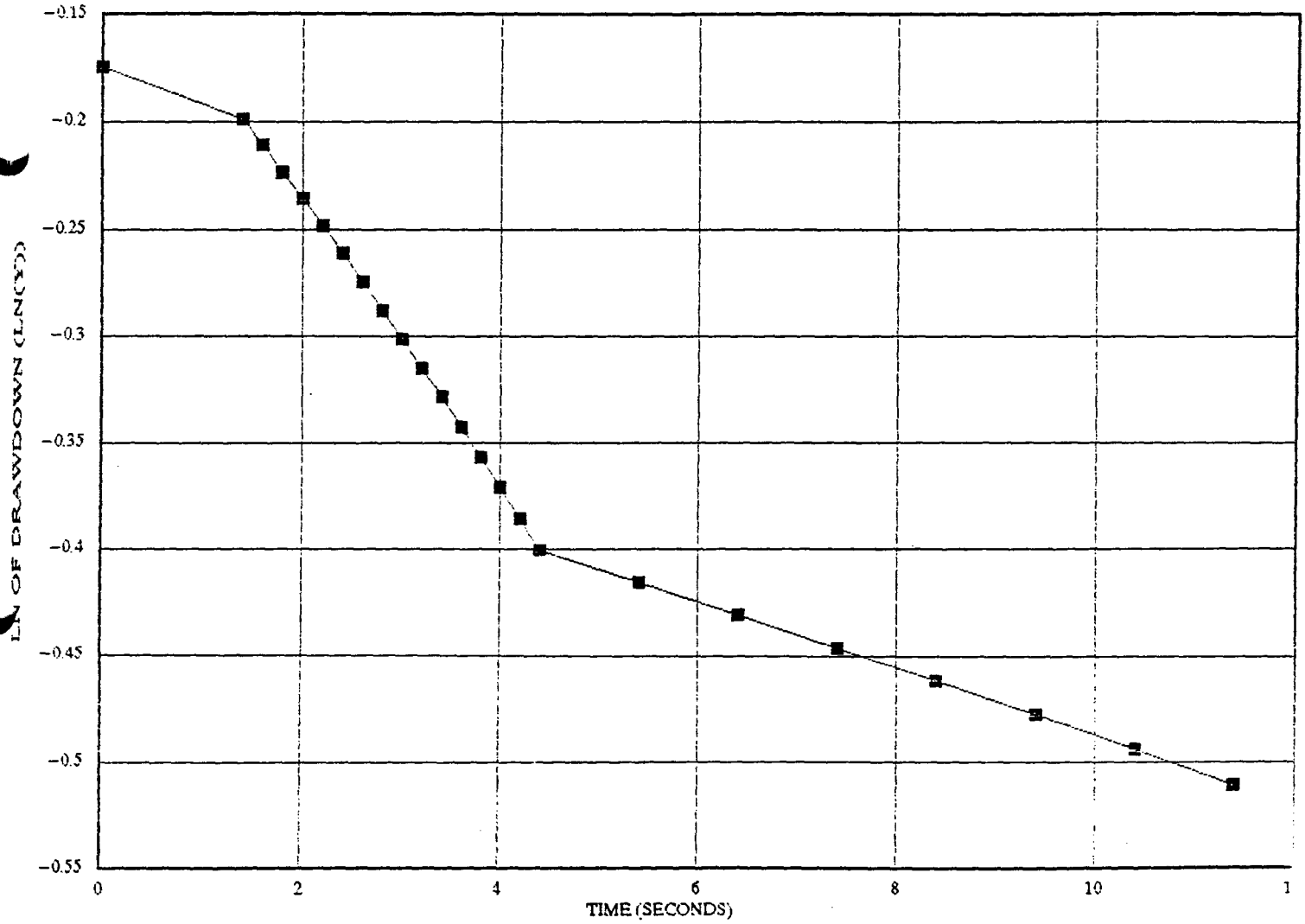
t=1.4-4.2s

Regression Output:

Constant	-1.02E-01
Std Err of Y Est	0.0016
R Squared	0.9993
No. of Observations	15
Degrees of Freedom	13
X Coefficient(s)	-6.68E-02
Std Err of Coef.	0.0005

RATE OF RECOVERY TEST: WELL P102C

RISE



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
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#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		8.95	1.950	0.00	0.6675
2		8.30	1.280	0.80	0.2469
3		7.25	0.230	1.00	-1.4697
4		7.21	0.190	2.00	-1.6607
5		7.17	0.150	2.60	-1.8971
6		7.14	0.120	2.80	-2.1203
7		7.13	0.110	3.00	-2.2073
8		7.12	0.100	4.00	-2.3026
9		7.11	0.090	4.60	-2.4079
10		7.10	0.080	4.80	-2.5257
11		7.09	0.070	5.00	-2.6593
12		7.08	0.060	5.80	-2.8134
13		7.07	0.050	7.00	-2.9957
14		7.06	0.040	9.00	-3.2189
15		7.05	0.030	11.00	-3.5066
16		7.04	0.020	16.00	-3.9120
17		7.03	0.010	22.00	-4.6052
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#PROJECT NAME :MCO
#PROJECT NO : 20026.024
#WELL NO :MT-1014 FALL
#ANALYST :ELIAS
#DATE COLLECTED :12-1-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 6.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 7.44 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = -1.90 Ft.
#STATIC WATER LEVEL: (SWL) = 7.02 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 8.64 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 1
#SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 22.32
---LOG OF L/(r sub w) = 1.3467
FOR PARTIALLY PENETRATING WELLS--
A = 2.17
B = 0.31
FOR FULLY PENETRATING WELLS--
C = 1.59

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3379
CONST.2 = 6.2128 *(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) = 1.93

EFFECTIVE r sub c (for sandpack dewatering) = 0.1318
(1/T)(LN(Yo/Yt)) (SLOPE) = -1.38E-01 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 3.10E-04 ft/sec <==========
9.45E-03 cm/sec <==========

t=2.-22s

Regression Output:

Constant	-1.80E+00
Std Err of Y Est	0.2057
R Squared	0.9411
No. of Observations	14
Degrees of Freedom	12
X Coefficient(s)	-1.38E-01
Std Err of Coef.	0.0099

BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
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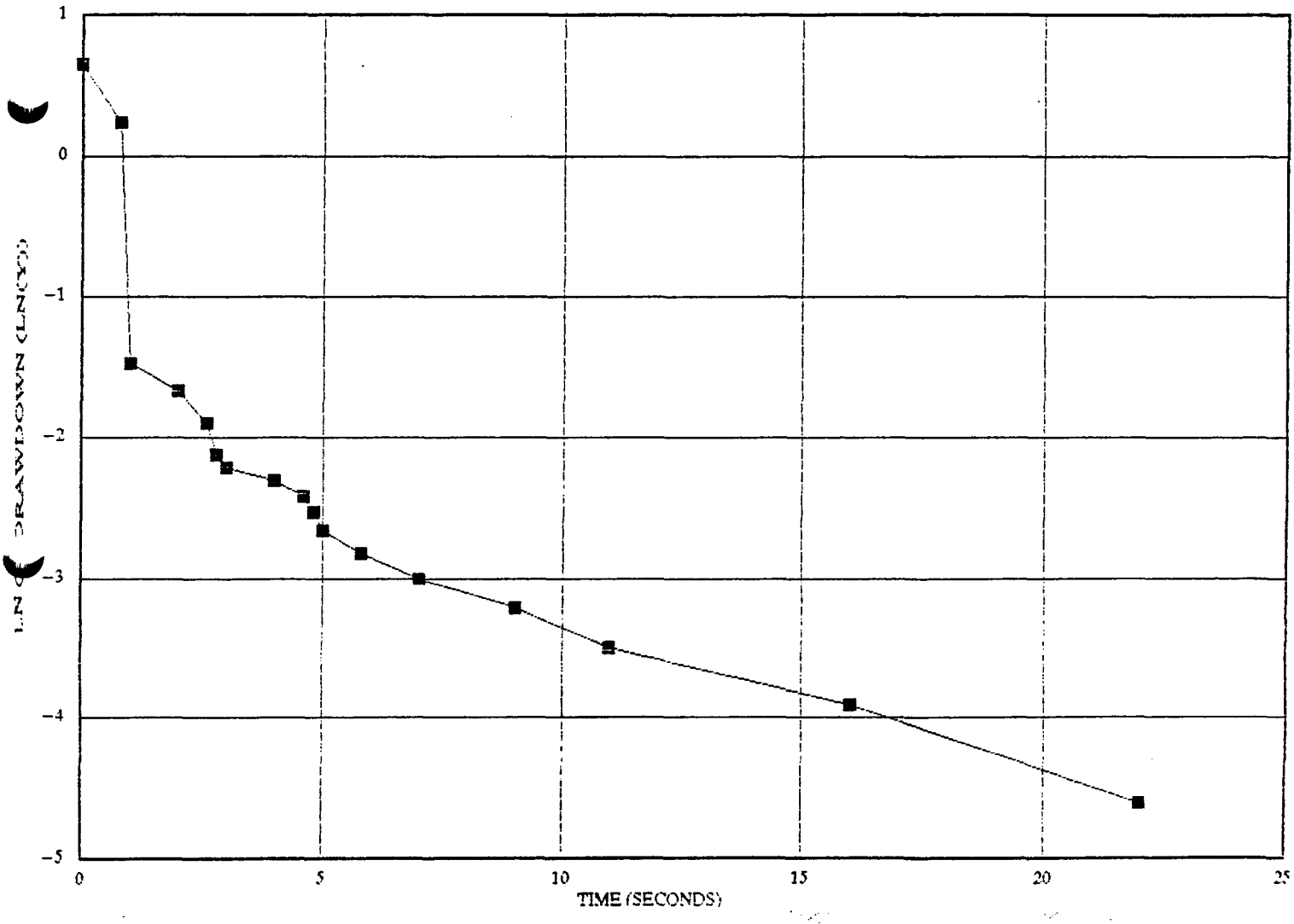
RATE OF RECOVERY TEST: WELL WT-101-A

FALL



PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y)	
1		6.35	0.670	0.00	-0.4005	$PROJECT NAME :NIMCO
2		6.40	0.620	0.20	-0.4780	$PROJECT NO : 20026.024
3		6.52	0.500	0.40	-0.6931	$WELL NO :NT-101A RISE
4		6.64	0.380	0.60	-0.9676	$ANALYST :ELIAS
5		6.73	0.290	0.80	-1.2379	$DATE COLLECTED :12-1-90
6		6.80	0.220	1.00	-1.5141	$RISER PIPE (ID): (r sub c) = 2.0 in. = 0.0833 (radius in ft.)
7		6.83	0.190	1.20	-1.6607	$EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
8		6.87	0.150	1.40	-1.8971	$EFFECTIVE SCREEN LENGTH: (L) = 7.44 Ft.
9		6.89	0.130	1.60	-2.0402	$MAX DRAWDOWN (IN SUBSET): (Ymax) = 0.67 Ft.
10		6.91	0.110	1.80	-2.2073	$STATIC WATER LEVEL: (SWL) = 7.02 Ft.
11		6.93	0.090	2.00	-2.4079	$DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 6.64 Ft.
12		6.95	0.070	2.20	-2.6593	$EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
13		6.96	0.060	2.40	-2.8134	$INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
14		6.97	0.050	2.60	-2.9957	$SANDPACK'S SPECIFIC YIELD (Sy) = 0.10
15		6.98	0.040	2.80	-3.2189	
16		6.99	0.030	3.00	-3.5066	
17		7.00	0.020	3.20	-3.9120	
18		7.01	0.010	9.20	-4.6052	
19		7.02	0.000	19.20	ERR	
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BOUWER AND RICE CURVE COEFFICIENTS:

RATIO OF L/(r sub w) = 22.32

---LOG OF L/(r sub w) = 1.3487

FOR PARTIALLY PENETRATING WELLS--

A = 2.17

B = 0.31

FOR FULLY PENETRATING WELLS--

C = 1.59

---EVALUATION OF LN(Re/(r sub w)):

CONST.1 = 0.3379

CONST.2 = 6.2128 =(MAX. OF 6.0)= 6.0000

LN(Re/(r sub w)) = 1.93

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833

(1/T)(LN(Yo/Yt)) (SLOPE) = -9.77E-01 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 8.81E-04 ft/sec <==========

2.69E-02 cm/sec <==========

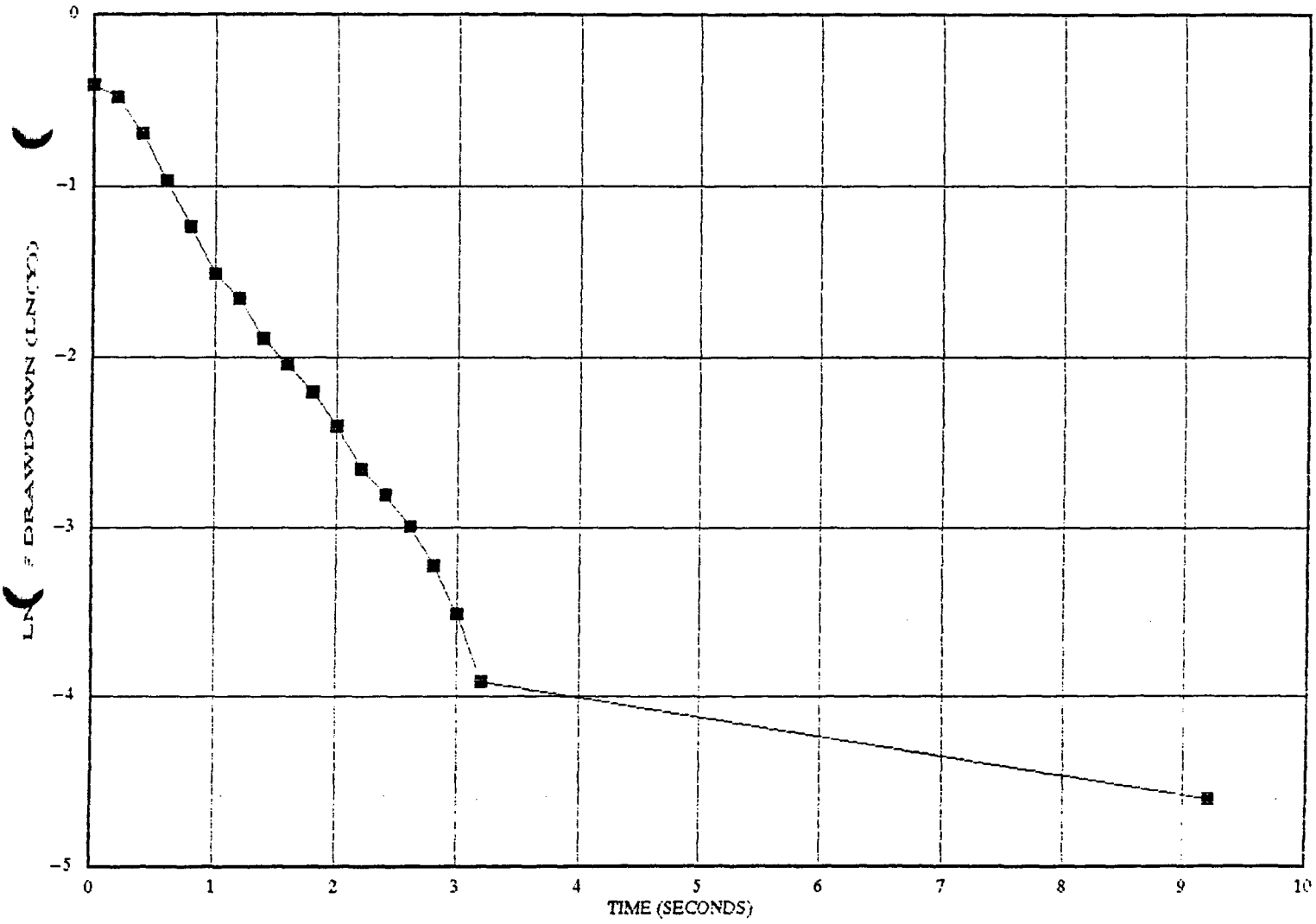
t=1-3s

Regression Output:

Constant	-4.94E-01
Std Err of Y Est	0.0425
R Squared	0.9961
No. of Observations	11
Degrees of Freedom	9
X Coefficient(s)	-9.77E-01
Std Err of Coef.	0.0202

RATE OF RECOVERY TEST: WELL WT-101-A

RISE



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
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PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y)
1		7.02	0.000	0.00	ERR
2		7.94	0.920	1.00	-0.0834
3		7.21	0.190	2.80	-1.6607
4		7.16	0.140	3.00	-1.9661
5		7.11	0.110	3.60	-2.2073
6		7.12	0.100	3.80	-2.3026
7		7.11	0.090	4.00	-2.4079
8		7.10	0.080	4.80	-2.5257
9		7.09	0.070	5.00	-2.6593
10		7.08	0.060	5.80	-2.8134
11		7.07	0.050	8.80	-2.9957
12		7.06	0.040	10.00	-3.2189
13		7.05	0.030	13.00	-3.5066
14		7.04	0.020	16.00	-3.9120
15		7.03	0.010	22.00	-4.6052
16			7.020		
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*PROJECT NAME	:HIMCO
*PROJECT NO	: 20026.024
*WELL NO	:WT-102A FALL
*ANALYST	:ELIAS
*DATE COLLECTED	:12-1-90
*RISER PIPE (ID): (2 r sub c) =	2.0 in. = 0.0833 (radius in ft.)
*EFFECTIVE SCREEN DIAMETER:(2 r sub w) =	8.0 in. = 0.3333 (radius in ft.)
*EFFECTIVE SCREEN LENGTH: (L) =	10.29 Ft.
*MAX DRAWDOWN (IN BUBBER): (Hmax) =	-0.01 Ft.
*STATIC WATER LEVEL: (SWL) =	7.02 Ft.
*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) =	10.29 Ft.
*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) =	175.00 Ft.
*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)?	1
*SANDPACK'S SPECIFIC YIELD (Sy) =	0.10

BOUWER AND RICE CURVE COEFFICIENTS:

RATIO OF L/(r sub w) =	30.87
---LOG OF L/(r sub w) =	1.4895
FOR PARTIALLY PENETRATING WELLS--	
A =	2.47
B =	0.34
FOR FULLY PENETRATING WELLS--	
C =	1.86
---EVALUATION OF LN(Re/(r sub w)):	
CONST.1 =	0.3207
CONST.2 =	6.2028 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) =	2.14
EFFECTIVE r sub c (for sandpack dewatering) =	0.1318
(1/T)(LN(Yo/Yt)) (SLOPE) =	-1.23E-01 sec^(-1)
HYDRAULIC CONDUCTIVITY (K) =	2.23E-04 ft/sec
	6.80E-03 cm/sec

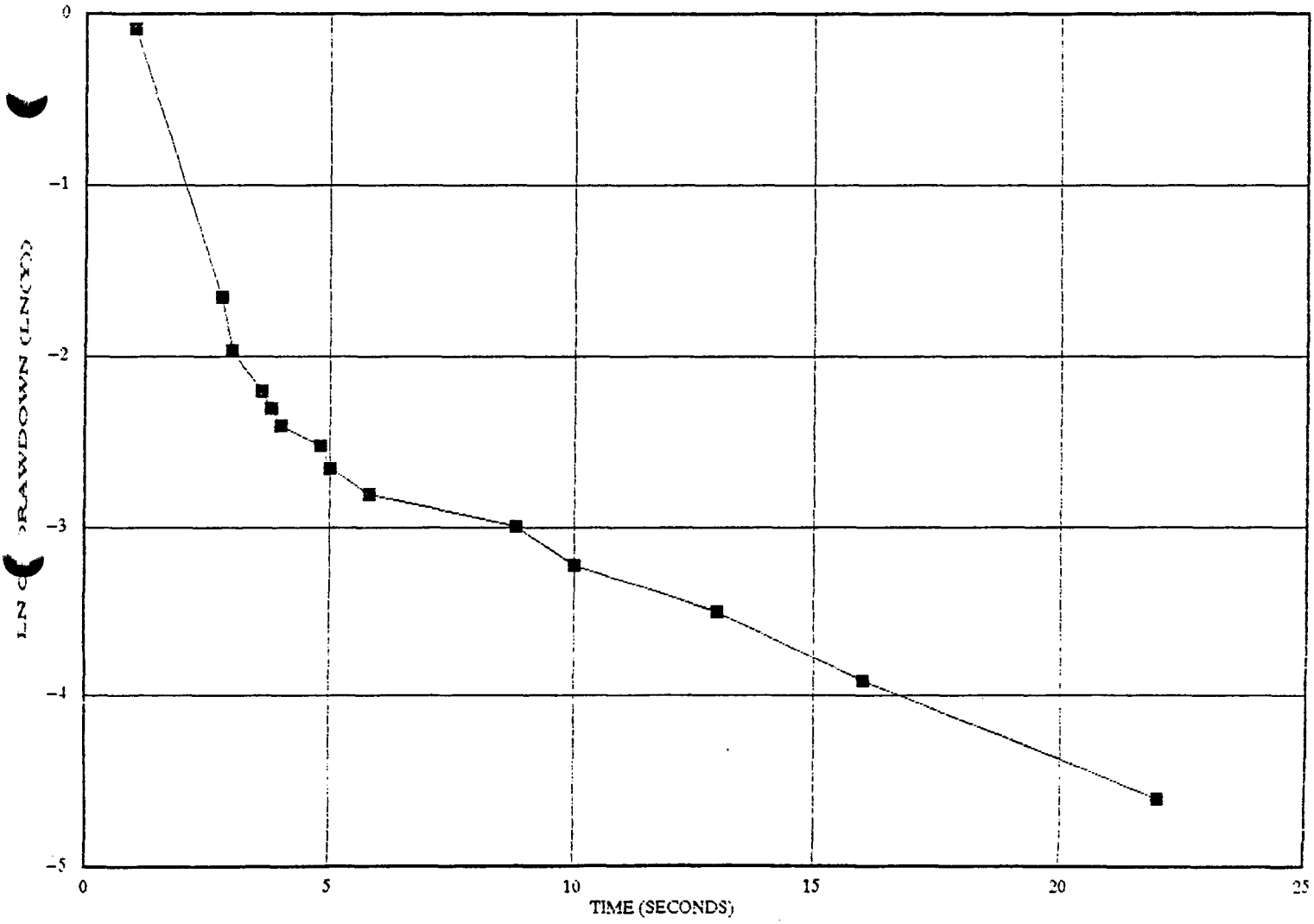
t = 3.6-22 s

Regression Output:

Constant	-1.93E+00
Std Err of Y Est	0.0966
R Squared	0.9849
No. of Observations	11
Degrees of Freedom	9
X Coefficient(s)	-1.23E-01
Std Err of Coef.	0.0051

RATE OF RECOVERY TEST: WELL WT-102-A

FALL



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
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PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	$TIME min (X)	$DEPTH TO WATER Ft. (Y)	DRAWDOWN (Y')	TIME sec (X')	LN (Y)
1		5.94	4.350	0.00	1.4702
2		6.25	4.040	1.60	1.3962
3		6.42	3.910	1.80	1.3376
4		6.56	3.710	2.00	1.3110
5		6.67	3.620	2.20	1.2865
6		6.73	3.560	2.40	1.2698
7		6.78	3.510	2.60	1.2556
8		6.82	3.470	2.80	1.2442
9		6.85	3.440	3.00	1.2355
10		6.88	3.410	3.20	1.2267
11		6.89	3.400	3.40	1.2238
12		6.90	3.390	3.60	1.2208
13		6.92	3.370	3.80	1.2149
14		6.93	3.360	4.00	1.2119
15		6.94	3.350	4.60	1.2090
16		6.95	3.340	4.80	1.2060
17		6.96	3.330	5.00	1.2030
18		6.97	3.320	6.00	1.2000
19		6.98	3.310	7.00	1.1969
20		6.99	3.300	10.00	1.1939
21		7.00	3.290	13.00	1.1909
22		7.01	3.280	20.00	1.1876

$PROJECT NAME :HIMCO
$PROJECT NO : 20026.024
$WELL NO :WT-10CP RISE
$ANALYST :ELIAS
$DATE COLLECTED :12-14-90
$RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
$EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
$EFFECTIVE SCREEN LENGTH: (L) = 11.09 Ft.
$MAX DRAWDOWN (IN SUBSET): (Ymax) = 4.04 Ft.
$STATIC WATER LEVEL: (SWL) = 10.29 Ft.
$DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 9.53 Ft.
$EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 12.33 Ft.
$INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 1
$SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 33.27
---LOG OF L/(r sub w) = 1.5221
FOR PARTIALLY PENETRATING WELLS--
A = 2.55
B = 0.35
FOR FULLY PENETRATING WELLS--
C = 1.97

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3281
CONST.2 = 2.1282 =(MAX. OF 6.0)= 2.1282
LN(Re/(r sub w)) = 2.34

EFFECTIVE r sub c (for sandpack dewatering) = 0.1318
(1/T)(LN(Yo/Yt)) (SLOPE) = -7.41E-02 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.36E-04 ft/sec <==========
4.14E-03 cm/sec <==========

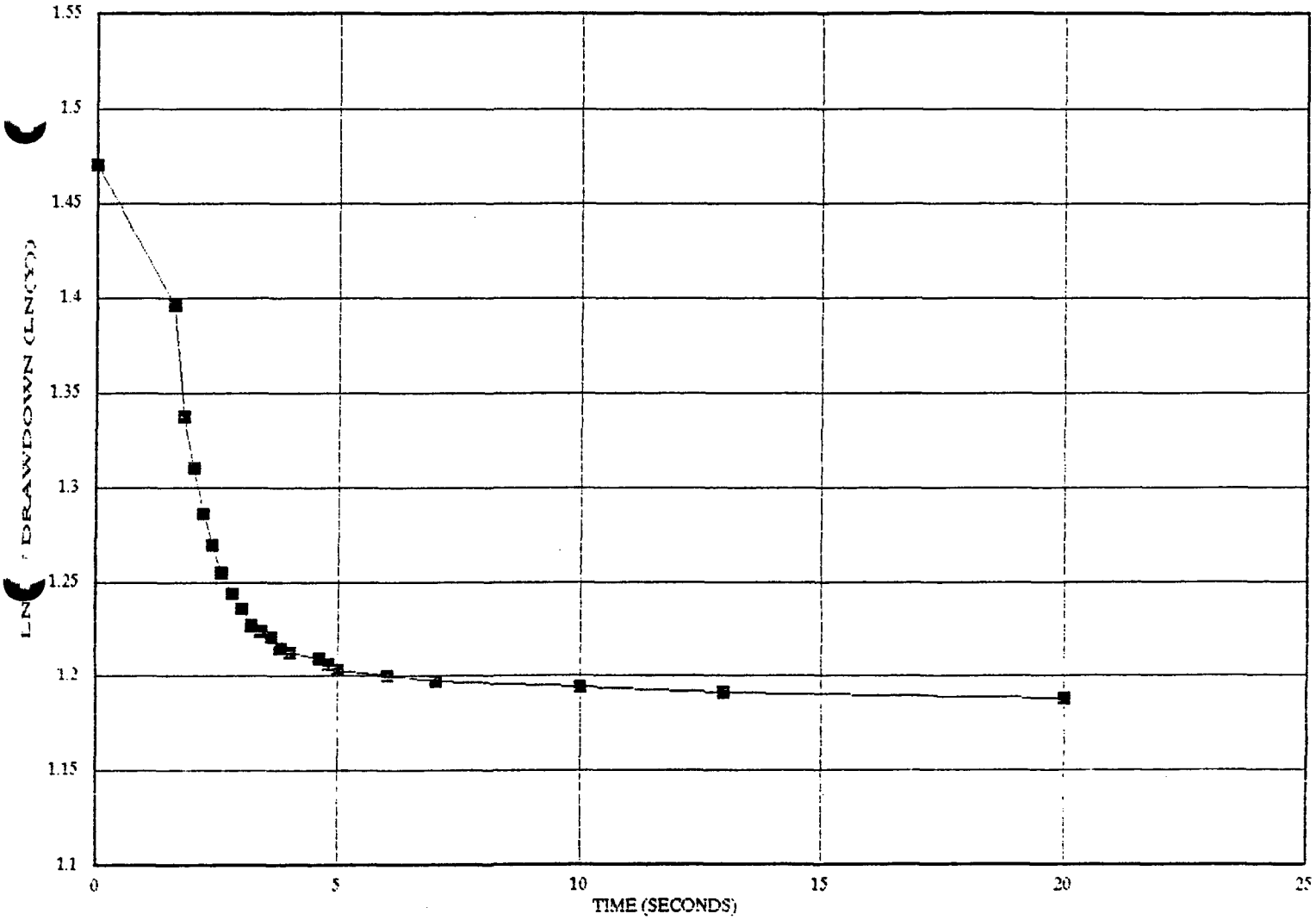
t = 2-4 s

Regression Output:

Constant	1.45E+00
Std Err of Y Est	0.0056
R Squared	0.9686
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s)	-7.41E-02
Std Err of Coef.	0.0067

RATE OF RECOVERY TEST: WELL WT-102A

RISE



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
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PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		7.96	0.000	0.00	ERR
2		8.30	0.320	0.20	-1.1394
3		8.26	0.290	0.60	-1.2730
4		8.21	0.230	0.80	-1.4697
5		8.18	0.200	1.00	-1.6094
6		8.15	0.170	1.20	-1.7720
7		8.07	0.090	1.40	-2.4079
8		8.06	0.080	1.60	-2.5257
9		8.03	0.050	1.80	-2.9957
10		8.00	0.020	2.00	-3.9120
11		7.98	0.000	2.20	ERR

#PROJECT NAME :HIMCO
#PROJECT NO : 20026.024
#WELL NO :WT-103A FALL
#ANALYST :ELIAS
#DATE COLLECTED :12-14-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 5.0 in. = 0.2083 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 8.46 Ft.
#MAX DRAWDOWN (IN SUPSET): (ymax) = -0.30 Ft.
#STATIC WATER LEVEL: (SWL) = 7.96 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 8.46 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 12.33 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
#SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 19.38
---LOG OF L/(r sub w) = 1.2874
FOR PARTIALLY PENETRATING WELLS--
A = 2.07
B = 0.30
FOR FULLY PENETRATING WELLS--
C = 1.50

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3711
CONST.2 = 2.8685 *(MAX. OF 6.0)= 2.8685
LN(Re/(r sub w)) = 1.92

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -5.92E-01 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 6.10E-04 ft/sec <==========
1.86E-02 cm/sec <==========

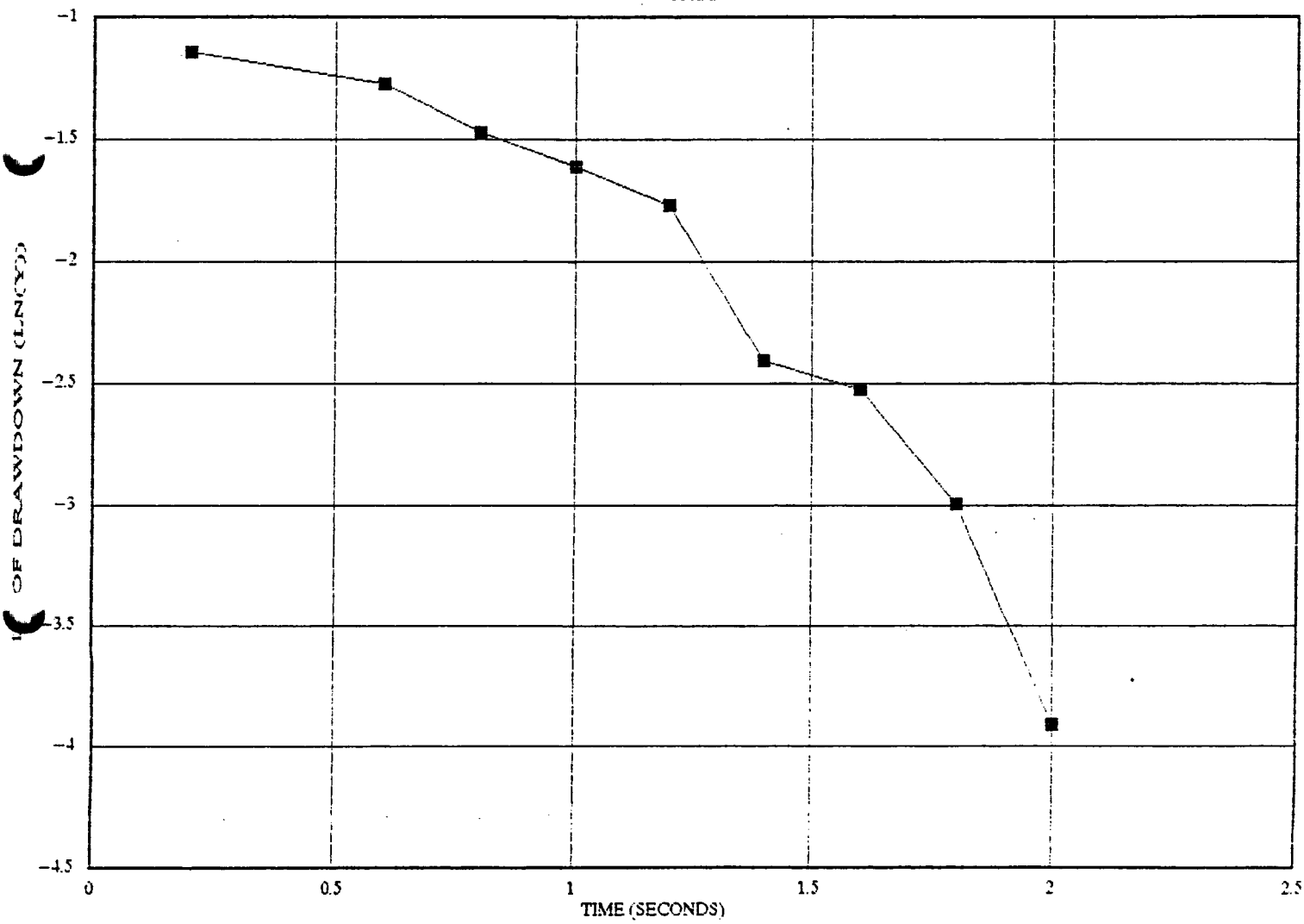
t=0.2-1 s

Regression Output:

Constant	-9.88E-01
Std Err of Y Est	0.0590
R Squared	0.9464
No. of Observations	4
Degrees of Freedom	2
X Coefficient(s)	-5.92E-01
Std Err of Coef.	0.0997

RATE OF RECOVERY TEST: WELL WT-103A

FALL



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
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PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	*TIME min (X)	*DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		7.53	7.980	0.00	2.0769
2		7.55	0.450	0.20	-0.7985
3		7.61	0.430	0.40	-0.8440
4		7.69	0.370	0.60	-0.9943
5		7.78	0.290	0.80	-1.2379
6		7.86	0.200	1.00	-1.6094
7		7.91	0.120	1.20	-2.1203
8		7.96	0.070	4.00	-2.6593
9		7.97	0.020	5.00	-3.9120
10		7.98	0.010	23.00	-4.6052
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*PROJECT NAME :HIMCO
*PROJECT NO : 20026.024
*WELL NO :WT-103A RISE
*WELL:ST :E.IAE
*DATE COLLECTED : December 14, 1990
*RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
*EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
*EFFECTIVE SCREEN LENGTH: (L) = 6.46 Ft.
*MAX DRAWDOWN (1% SUBSET): (ymax) = 0.32 Ft.
*STATIC WATER LEVEL: (SWL) = 7.98 Ft.
*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 4.46 Ft.
*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 12.33 Ft.
*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
*SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 19.38
---LOG OF L/(r sub w) = 1.2874
FOR PARTIALLY PENETRATING WELLS--
A = 2.07
B = 0.30
FOR FULLY PENETRATING WELLS--
C = 1.50

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3711
CONST.2 = 2.8685 =(MAX. OF 6.0)= 2.8685
LN(Re/(r sub w)) = 1.92

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -1.31E+00 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.35E-03 ft/sec <==========
4.10E-02 cm/sec <==========

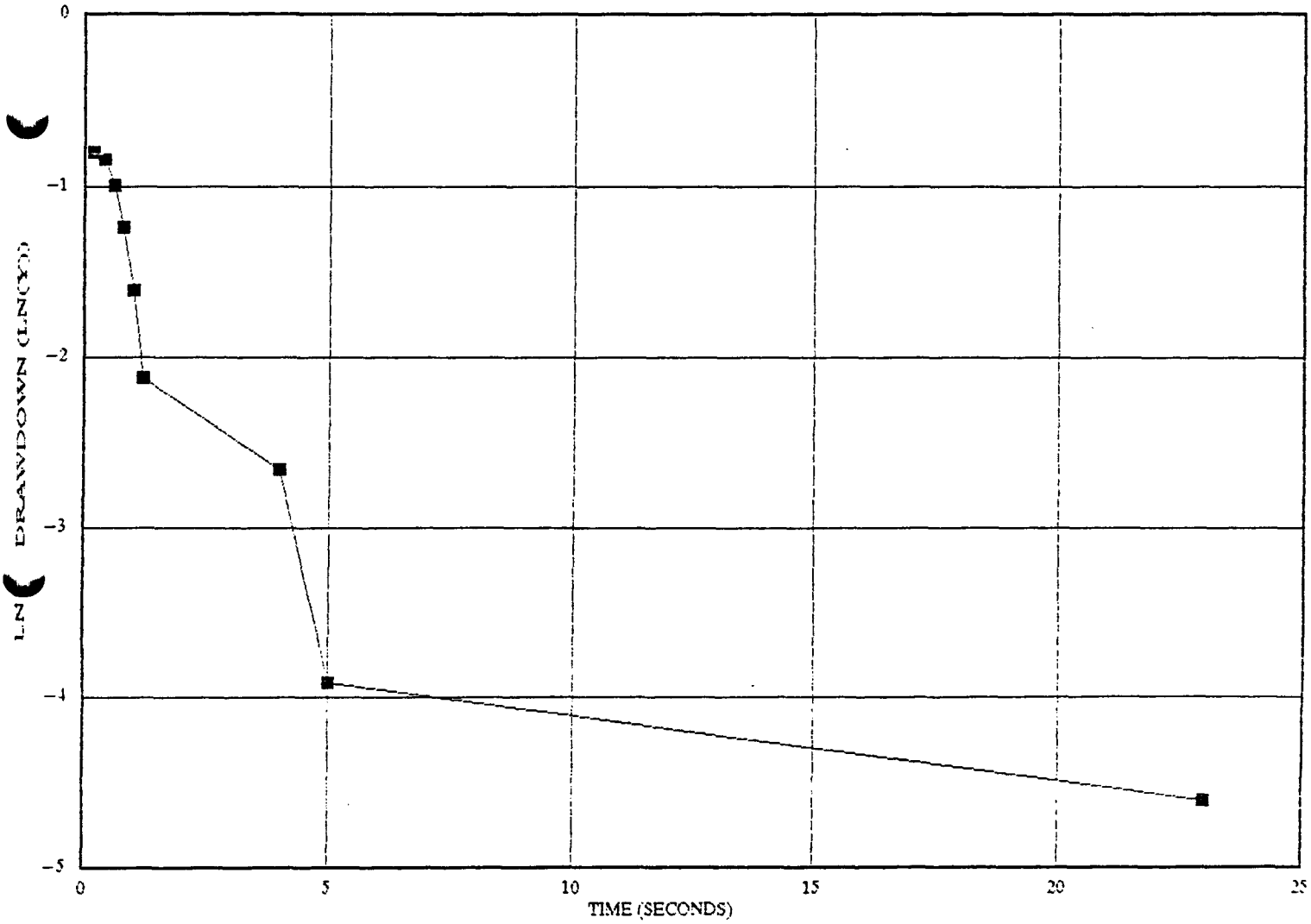
t=.2-1.25

Regression Output:

Constant	-3.53E-01
Std Err of Y Est	0.1756
R Squared	0.9065
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s)	-1.31E+00
Std Err of Coef.	0.2098

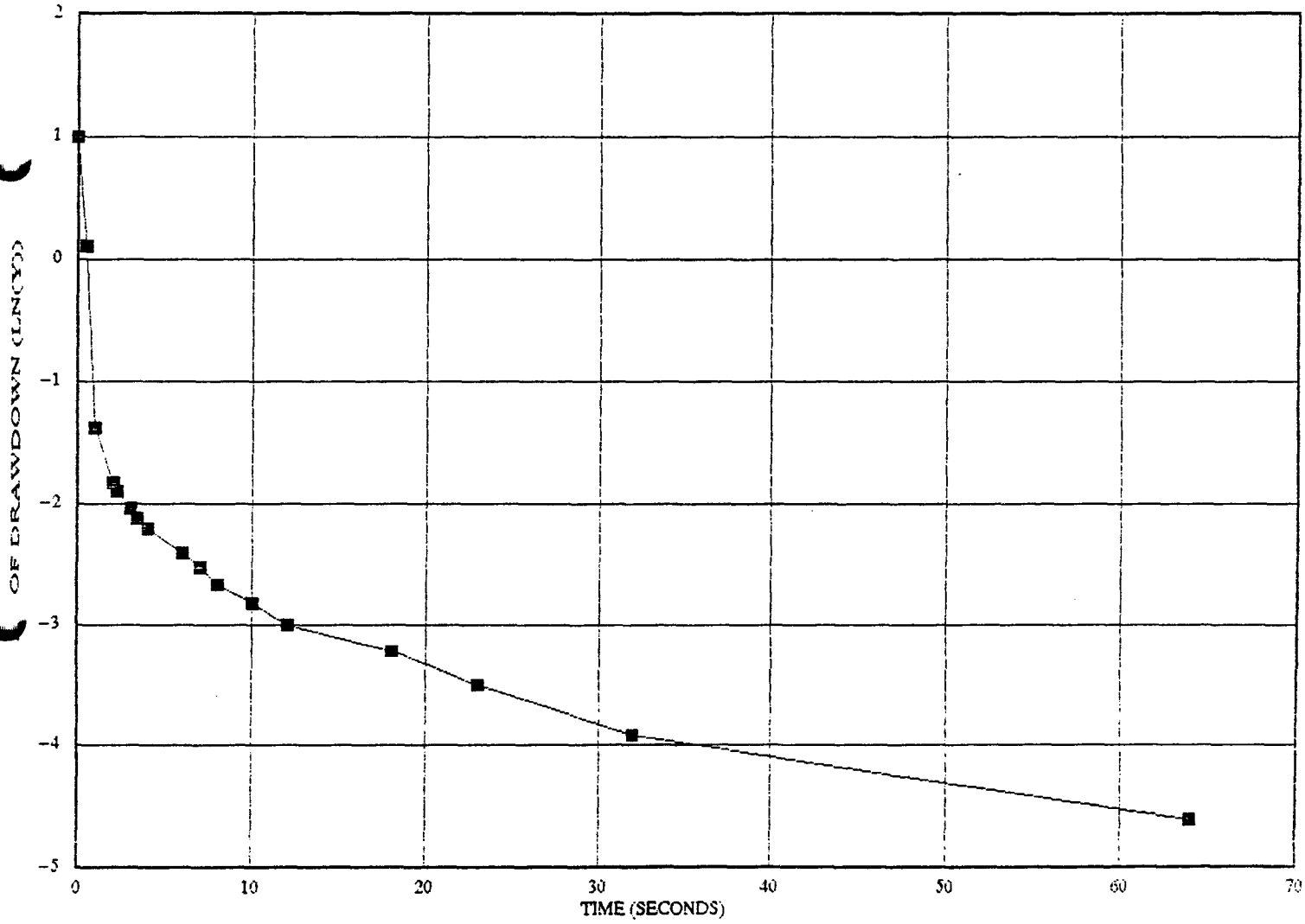
RATE OF RECOVERY TEST: WELL WT – 103A

RISE



RATE OF RECOVERY TEST: WELL WT-104A

FALL



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#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')	
1		6.02	0.010	0.00	-4.6052	*PROJECT NAME :HIMCO
2		5.18	0.830	2.00	-0.1863	*PROJECT NO : 20026.024
3		5.31	0.700	2.60	-0.3567	*WELL NO :WT-104A RISE
4		5.44	0.570	2.80	-0.5621	*ANALYST :ELIAS
5		5.55	0.460	3.00	-0.7765	*DATE COLLECTED :12-14-90
6		5.65	0.360	3.20	-1.0217	*RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
7		5.72	0.290	3.40	-1.2379	*EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
8		5.73	0.280	3.60	-1.2730	*EFFECTIVE SCREEN LENGTH: (L) = 12.67 Ft.
9		5.77	0.240	3.80	-1.4271	*MAX DRAWDOWN (IN SUBSET): (Ymax) = 0.70 Ft.
10		5.81	0.200	4.00	-1.6094	*STATIC WATER LEVEL: (SWL) = 6.01 Ft.
11		5.84	0.170	4.20	-1.7720	*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 12.67 Ft.
12		5.86	0.150	4.40	-1.8971	*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
13		5.87	0.140	4.60	-1.9661	*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 1
14		5.88	0.130	4.80	-2.0402	*SANDPACK'S SPECIFIC YIELD (Sy) = 0.10
15		5.90	0.110	5.00	-2.2073	BOUWER AND RICE CURVE COEFFICIENTS:
16		5.91	0.100	5.60	-2.3026	RATIO OF L/(r sub w) = 38.01
17		5.92	0.090	5.80	-2.4079	---LOG OF L/(r sub w) = 1.5799
18		5.93	0.080	6.00	-2.5257	FOR PARTIALLY PENETRATING WELLS--
19		5.94	0.070	7.00	-2.6593	A = 2.71
20		5.95	0.060	7.80	-2.8134	B = 0.37
21		5.96	0.050	8.00	-2.9957	FOR FULLY PENETRATING WELLS--
22		5.97	0.040	11.00	-3.2189	C = 2.16
23		5.98	0.030	12.00	-3.5066	---EVALUATION OF LN(Re/(r sub w)):
24		5.99	0.020	15.00	-3.9120	CONST.1 = 0.3024
25		6.00	0.010	25.00	-4.6052	CONST.2 = 6.1882 =(MAX. OF 6.0)= 6.0000
26		6.01	0.000	39.00	ERR	LN(Re/(r sub w)) = 2.31
27						EFFECTIVE r sub c (for sandpack dewatering) = 0.1318
28						(1/T)(LN(Yo/Yt)) (SLOPE) = -8.06E-01 sec^(-1)
29						
30						HYDRAULIC CONDUCTIVITY (K) = 1.28E-03 ft/sec <==========
31						3.89E-02 cm/sec <==========
32						
33						Regression Output: t=2.6-4.6 s
34						Constant 1.64E+00
35						Std Err of Y Est 0.0748
36						R Squared 0.9827
37						No. of Observations 11
38						Degrees of Freedom 9
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40						X Coefficient(s) -8.06E-01
41						Std Err of Coef. 0.0356
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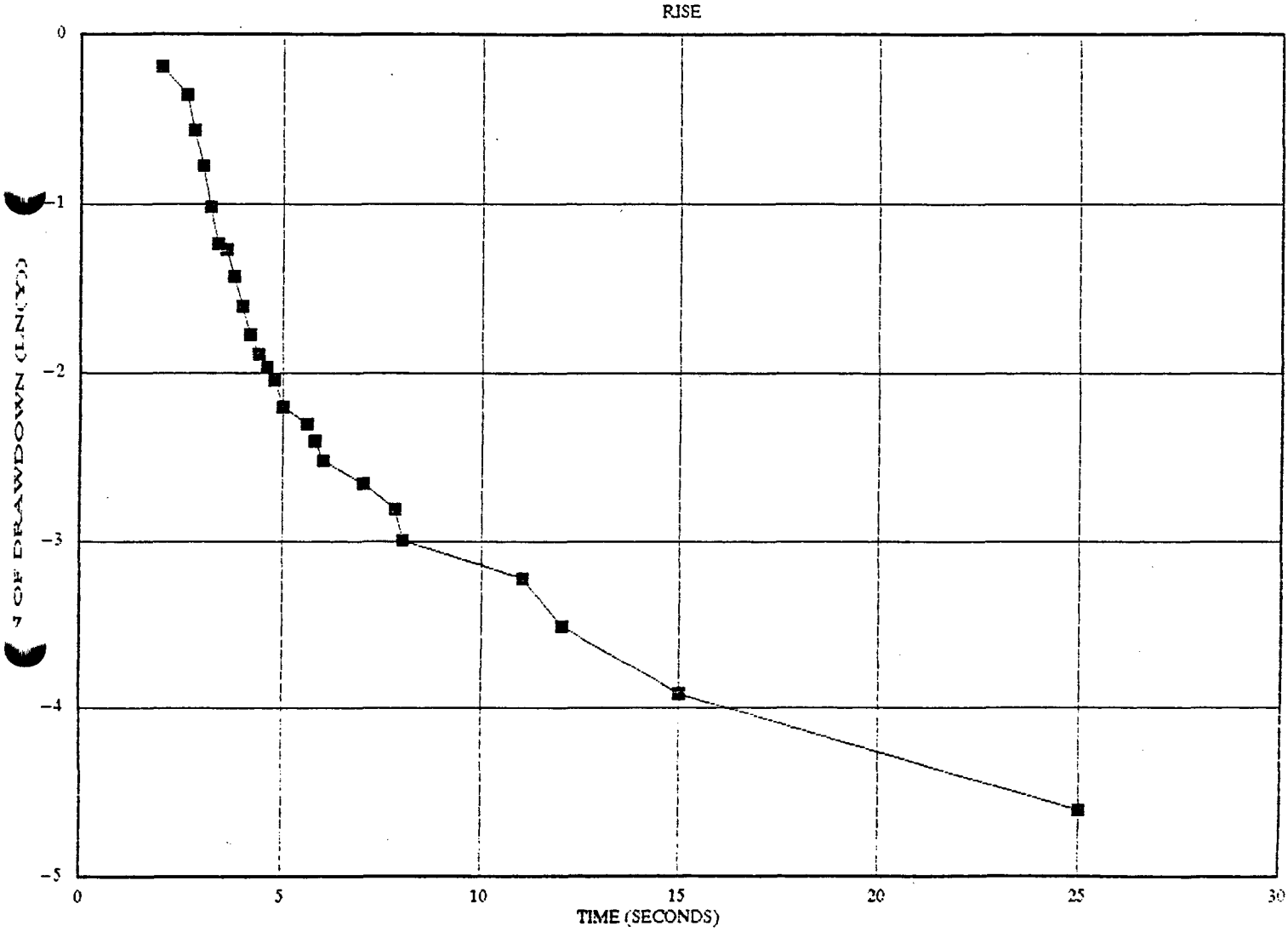
43						

RATE OF RECOVERY TEST: WELL WT−104A



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#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X)	LN (Y)
1		9.96	1.980	0.00	0.6831
2		9.42	1.440	0.20	0.3646
3		8.13	0.150	1.40	-1.8971
4		8.12	0.140	1.60	-1.9661
5		8.11	0.130	1.80	-2.0402
6		8.10	0.120	2.00	-2.1203
7		8.09	0.110	2.60	-2.2073
8		8.08	0.100	3.40	-2.3026
9		8.07	0.090	3.60	-2.4079
10		8.06	0.080	4.40	-2.5257
11		8.05	0.070	5.40	-2.6597
12		8.04	0.060	6.40	-2.8134
13		8.03	0.050	8.60	-2.9957
14		8.02	0.040	13.40	-3.2189
15		8.01	0.030	18.40	-3.5066
16		8.00	0.020	27.00	-3.9066
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#PROJECT NAME :HMCO
#PROJECT NO : 20626.024
#WELL NO :WT-105A FALL
#ANALYST :ELIAS
#DATE COLLECTED :12-14-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0533 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 10.08 Ft.
#MAX DRAWDOWN (IN SUBSET): (Ymax) = -0.13 Ft.
#STATIC WATER LEVEL: (SWL) = 7.96 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 10.08 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 1
#SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 30.24
---LOG OF L/(r sub w) = 1.4806
FOR PARTIALLY PENETRATING WELLS--
A = 2.45
B = 0.34
FOR FULLY PENETRATING WELLS--
C = 1.66

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3227
CONST.2 = 6.2041 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) = 2.13

EFFECTIVE r sub c (for sandpack dewatering) = 0.1318
(1/T)(LN(Yo/Yt)) (SLOPE) = -1.61E-01 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 3.32E-04 ft/sec <==========
1.01E-02 cm/sec <==========

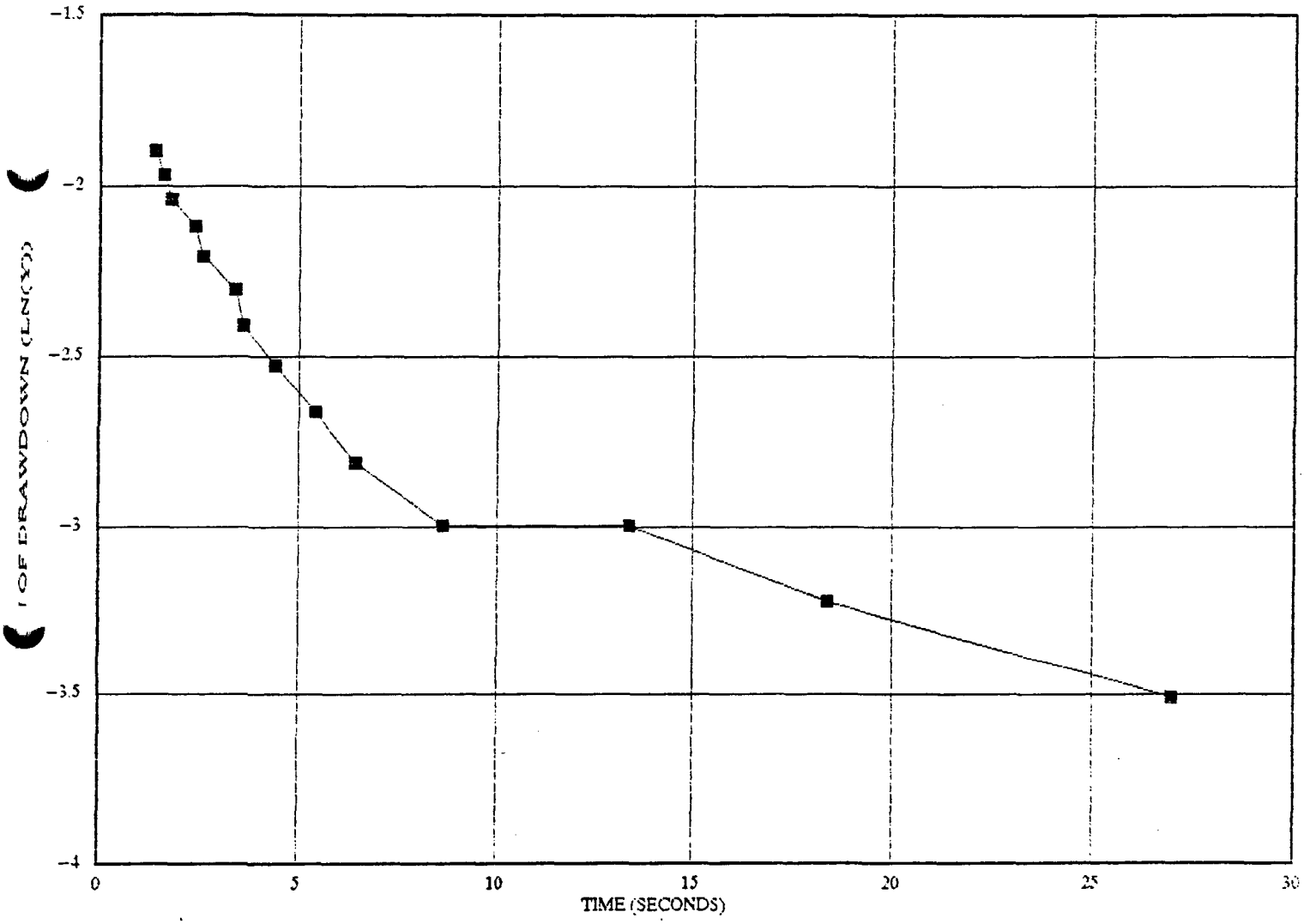
t=2.6-4.4 s

Regression Output:

Constant	-1.73E+00
Std Err of Y Est	0.0057
R Squared	0.9549
No. of Observations	4
Degrees of Freedom	2
X Coefficients:	-1.61E-01
Std Err of Coef.	0.0279

RATE OF RECOVERY TEST: WELL WT-105A

FALL



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#	*TIME min (X)	*DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		6.82	1.160	0.00	0.1484
2		7.03	0.950	0.60	-0.0512
3		7.26	0.720	1.00	-0.3285
4		7.39	0.590	1.20	-0.5276
5		7.51	0.470	1.40	-0.7550
6		7.60	0.380	1.60	-0.9676
7		7.67	0.310	1.80	-1.1712
8		7.73	0.250	2.00	-1.3863
9		7.79	0.190	2.20	-1.6607
10		7.82	0.160	2.40	-1.8326
11		7.84	0.140	2.60	-1.9661
12		7.85	0.130	2.80	-2.0402
13		7.87	0.110	3.00	-2.2073
14		7.88	0.100	3.20	-2.3026
15		7.89	0.090	3.40	-2.4079
16		7.90	0.080	3.60	-2.5257
17		7.91	0.070	3.80	-2.6593
18		7.93	0.050	5.00	-2.9957
19		7.94	0.040	7.00	-3.2189
20		7.95	0.030	9.00	-3.5066
21		7.96	0.020	13.00	-3.9120
22		7.97	0.010	19.00	-4.6052
23		7.98	0.000	32.00	ERR
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*PROJECT NAME :MMCO
*PROJECT NO : 2602a.024
*WELL NO :WT-105A RISE
*ANALYST :ELIAS
*DATE COLLECTED :12-14-96
*RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
*EFFECTIVE SCREEN DIAMETER:(2 r sub w) = 8.0 in. = 0.3333 (radius in ft.)
*EFFECTIVE SCREEN LENGTH: (L) = 10.08 Ft.
*MAX DRAWDOWN (IN SUBSET): (Ymax) = 0.95 Ft.
*STATIC WATER LEVEL: (SWL) = 7.98 Ft.
*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 10.08 Ft.
*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
*SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 30.24
---LOG OF L/(r sub w) = 1.4806
FOR PARTIALLY PENETRATING WELLS--
A = 2.45
B = 0.34
FOR FULLY PENETRATING WELLS--
C = 1.86

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3227
CONST.2 = 6.2041 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w) = 2.13

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -8.62E-01 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 6.32E-04 ft/sec <==========
1.93E-02 cm/sec <==========

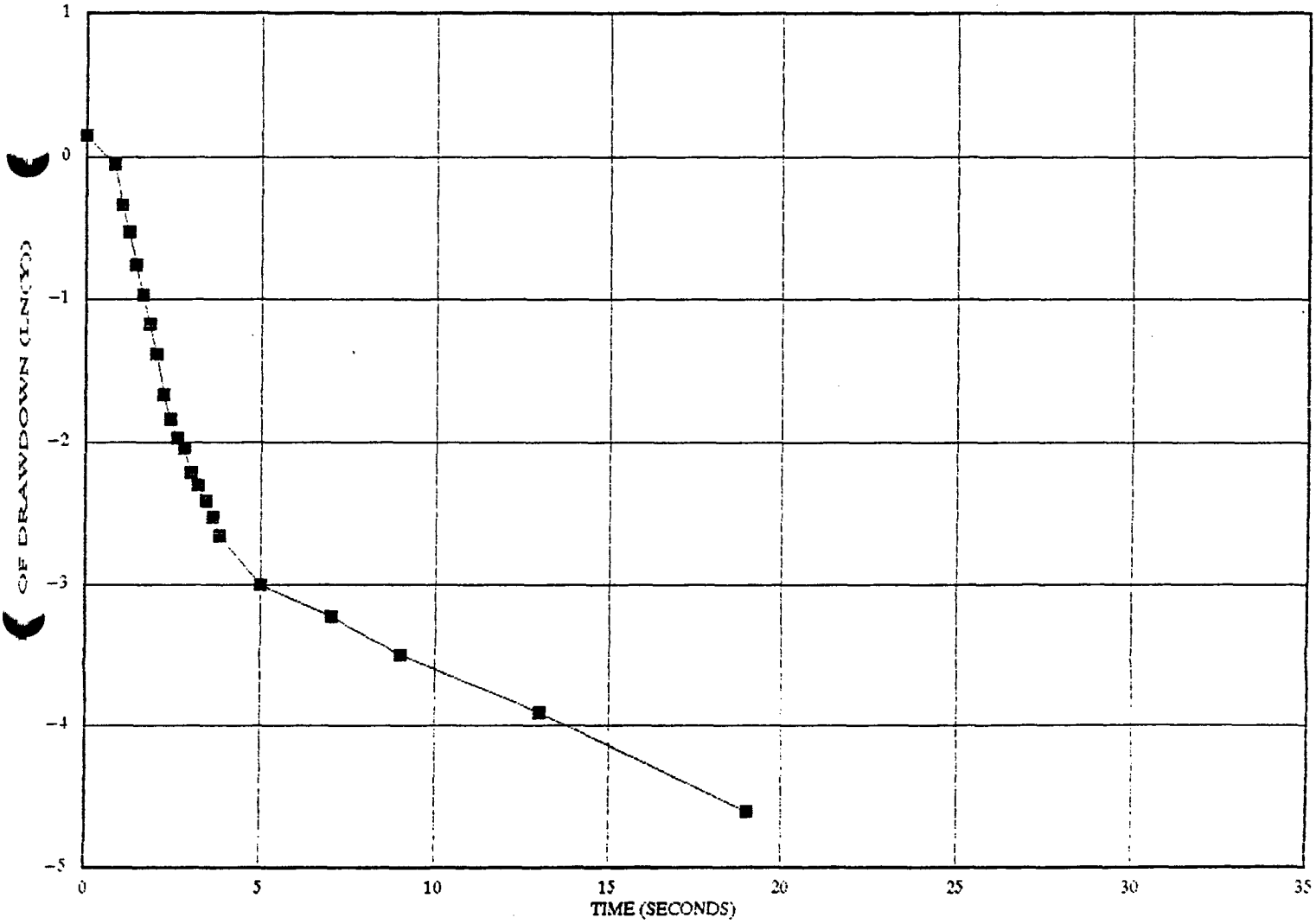
t = 2.2-3.8 s

Regression Output:

Constant	4.33E-01
Std Err of Y Est	0.1316
R Squared	0.9766
No. of Observations	16
Degrees of Freedom	14
X Coefficient(s)	-8.62E-01
Std Err of Coef.	0.0357

RATE OF RECOVERY TEST: WELL WT-105A

RISE



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PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		9.02	0.000	0.00	ERR
2		9.96	0.940	1.00	-0.0619
3		9.80	0.780	1.40	-0.2485
4		9.32	0.300	1.60	-1.2040
5		9.24	0.220	1.80	-1.5141
6		9.10	0.080	2.00	-2.5257
7		9.07	0.050	2.80	-2.9957
8		9.06	0.040	3.00	-3.2189
9		9.05	0.030	4.00	-3.5066
10		9.04	0.020	7.00	-3.9120
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#PROJECT NAME :HIMCO
#PROJECT NO : 20026.024
#WELL NO :WT-106A FALL
#ANALYST :ELIAS
#DATE COLLECTED :12-1-90
#RISER PIPE (ID): (2 r sub c) = 2.0 in. = 0.0833 (radius in ft.)
#EFFECTIVE SCREEN DIAMETER: (2 r sub w) = 6.0 in. = 0.3333 (radius in ft.)
#EFFECTIVE SCREEN LENGTH: (L) = 9.25 Ft.
#MAX DRAWDOWN (IN SUBSET): (hmax) = -0.78 Ft.
#STATIC WATER LEVEL: (SWL) = 9.02 Ft.
#DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 9.25 Ft.
#EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
#INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
#SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 27.75
---LOG OF L/(r sub w) = 1.4433
FOR PARTIALLY PENETRATING WELLS--
A = 2.36
B = 0.32
FOR FULLY PENETRATING WELLS--
C = 1.77

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3310
CONST.2 = 6.2091 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) = 2.06

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -3.57E+00 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 2.76E-03 ft/sec <==========
8.40E-02 cm/sec <==========

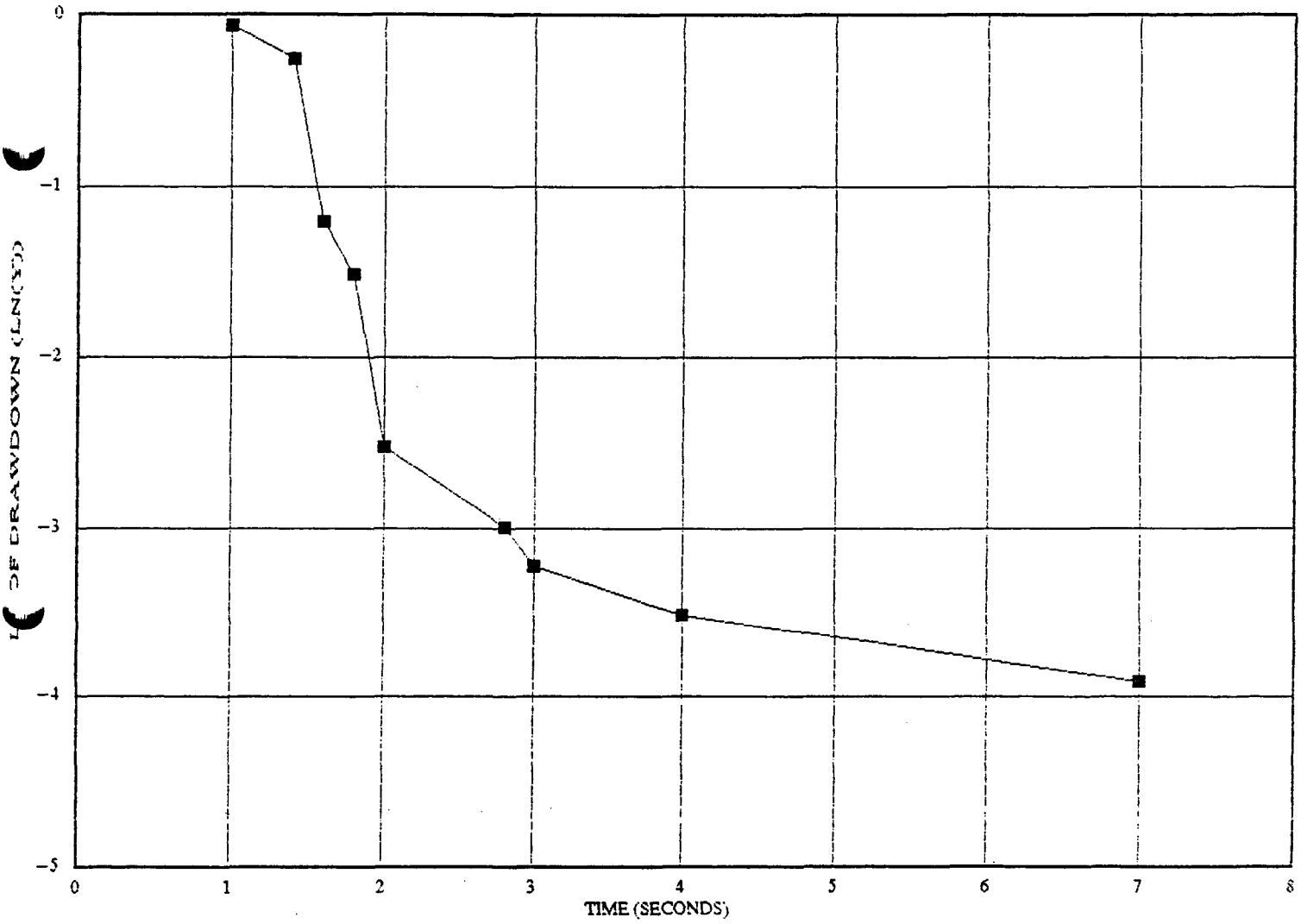
t=1.4-2.0 s

Regression Output:

Constant	4.70E+00
Std Err of Y Est	0.2139
R Squared	0.9654
No. of Observations	4
Degrees of Freedom	2
X Coefficient(s)	-3.57E+00
Std Err of Coef.	0.4782

RATE OF RECOVERY TEST: WELL WT-106A

FALL



BOUWER AND RICE METHOD FOR INTERPRETATION OF SLUG TESTS: FOR UNCONFINED AND LEAKY CONFINED AQUIFERS.
TO UTILIZE THIS WORKSHEET, ENTER YOUR DATA AT LOCATIONS MARKED BY AN "*".
PROGRAM CAN INCLUDE EFFECTS OF SANDPACK DEWATERING (ASSUMING WATER IS RISING WITHIN THE SANDPACK).

#	TIME min (X)	DEPTH TO WATER Ft.	DRAWDOWN (Y)	TIME sec (X')	LN (Y')
1		8.48	0.540	0.00	-0.6162
2		8.58	0.440	0.20	-0.8210
3		8.60	0.420	1.00	-0.8675
4		8.69	0.330	1.40	-1.1067
5		8.79	0.230	1.60	-1.4697
6		8.86	0.160	1.80	-1.8326
7		8.92	0.100	2.00	-2.3026
8		8.95	0.070	2.20	-2.6593
9		8.97	0.050	2.40	-2.9957
10		8.99	0.030	2.60	-3.5066
11		9.00	0.020	2.80	-3.9120
12		9.01	0.010	14.00	-4.6052

*PROJECT NAME :HIMCO
*PROJECT NO : 20026.024
*WELL NO :WT-106A RISE
*ANALYST :ELIAS
*DATE COLLECTED :12-1-90
*RISER PIPE (IE): (r sub c) = 2.0 in. = 0.0833 (radius in ft.)
*EFFECTIVE SCREEN DIAMETER:(r sub w) = 8.0 in. = 0.3333 (radius in ft.)
*EFFECTIVE SCREEN LENGTH: (L) = 9.25 Ft.
*MAX DRAWDOWN (IN SUBSET): (Ymax) = 0.33 Ft.
*STATIC WATER LEVEL: (SWL) = 8.02 Ft.
*DEPTH FROM SWL TO EFF. SCREEN BOTTOM: (H) = 9.25 Ft.
*EST. AQUIFER DEPTH (SWL TO AQUIFER BOTTOM): (D) = 175.00 Ft.
*INCLUDE SANDPACK DEWATERING (ENTER 1 IF YES, 0 IF NO)? 0
*SANDPACK'S SPECIFIC YIELD (Sy) = 0.10

BOUWER AND RICE CURVE COEFFICIENTS:
RATIO OF L/(r sub w) = 27.75
---LOG OF L/(r sub w) = 1.4433
FOR PARTIALLY PENETRATING WELLS--
A = 2.36
B = 0.32
FOR FULLY PENETRATING WELLS--
C = 1.77

---EVALUATION OF LN(Re/(r sub w)):
CONST.1 = 0.3310
CONST.2 = 6.2091 =(MAX. OF 6.0)= 6.0000
LN(Re/(r sub w)) = 2.06

EFFECTIVE r sub c (for sandpack dewatering) = 0.0833
(1/T)(LN(Yo/Yt)) (SLOPE) = -2.00E+00 sec^(-1)

HYDRAULIC CONDUCTIVITY (K) = 1.55E-03 ft/sec <==========
4.71E-02 cm/sec <==========

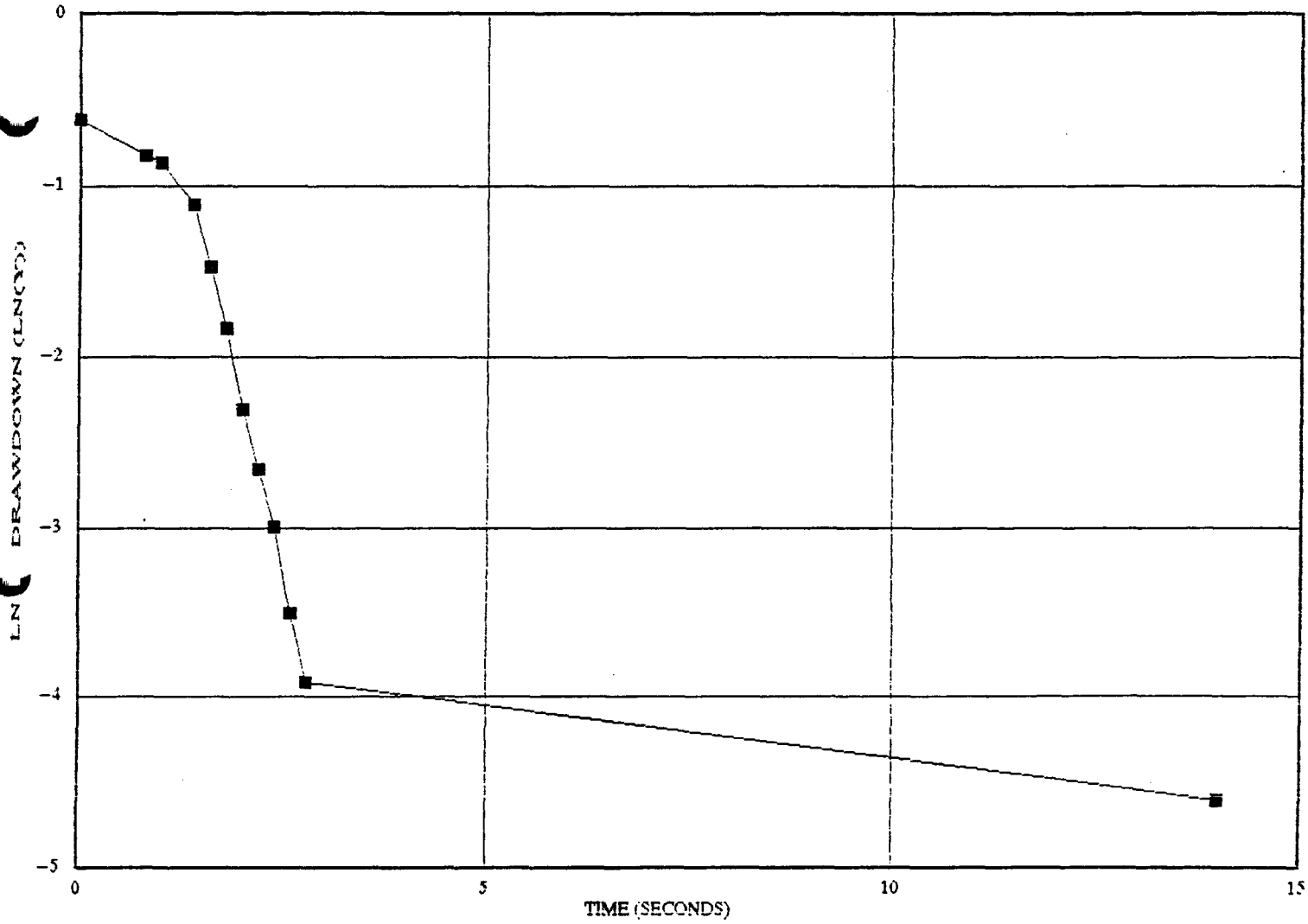
t=1.4-2.8 s

Regression Output:

Constant	1.73E+00
Std Err of Y Est	0.0458
R Squared	0.9981
No. of Observations	8
Degrees of Freedom	6
X Coefficient(s)	-2.00E+00
Std Err of Coef.	0.0353

RATE OF RECOVERY TEST: WELL WT-106A

RISE



APPENDIX B

IN-FIELD HYDRAULIC CONDUCTIVITY SLUG TEST FIELD FORMS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET 1 OF 1

PROJECT NO.: 20026.023

SITE: HIMCO DUMP

WELL NUMBER: P102B

LOGGER ID NUMBER: 04

CLIENT: USEPA

WELL DRILLED BY: John Mathes & Assoc

DATE TEST PERFORMED: Jan 4, 1991

TIME TEST PERFORMED: 1300

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) BOTH

FORMATION WELL SCREENED IN: OUTWASH

STATIC WATER LEVEL (T.C.P.): 8.87

TOTAL DEPTH OF WELL: 67.33'

DEPTH OF WATER IN WELL: 58.46'

INITIAL TRANSDUCER WATER LEVEL: 9.76

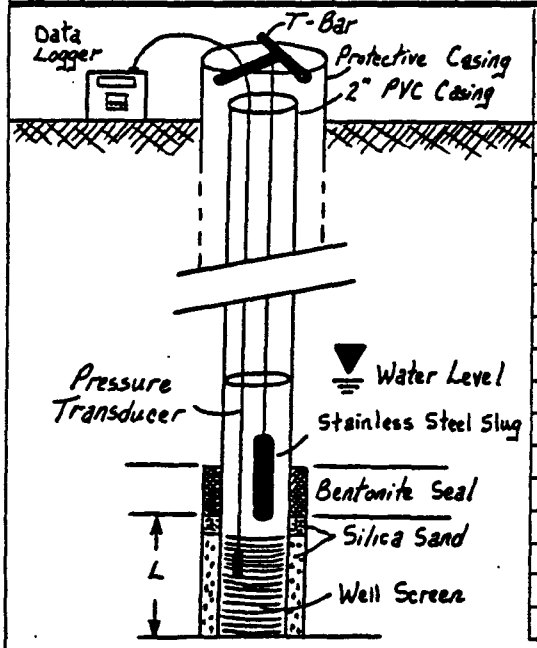
STATIC TRANSDUCER WATER LEVEL:

DIAMETER OF BOREHOLE: 8"

DIAMETER OF PIPE: 2"

SCREEN LENGTH: 5 feet

EFFECTIVE SCREEN LENGTH* "L": 9 feet



*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

PRESSURE TRANSDUCER PSI:

STAINLESS STEEL SLUG LENGTH:

NOTES:

TEST PERFORMED BY: Tom PUCHALSKI

DATE: Jan. 4 1991

LOGGER DOWNLOADED BY: K. Elm

DATE: 1/14/91

CALCULATIONS BY:

DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

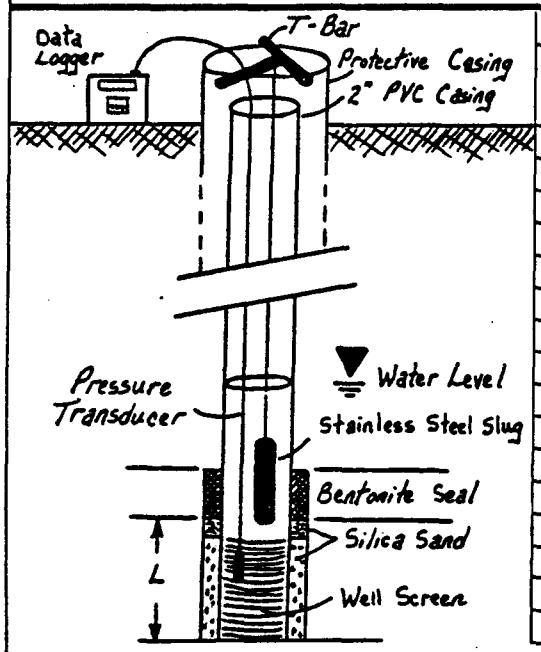
SHEET 1 OF 1

PROJECT NO.: 20026.023
SITE: HIMCO DUMP

WELL NUMBER: P101B
LOGGER ID NUMBER: 02

CLIENT: USEPA
WELL DRILLED BY: John Mathes & Assoc, Inc.
DATE TEST PERFORMED: 1/4/91
TIME TEST PERFORMED: 1140
TOP OF PIPE ELEVATION:
OBSERVATION WELL/PIEZOMETER (circle):
FALL/RISE TEST (circle)
FORMATION WELL SCREENED IN: Outwash
STATIC WATER LEVEL (T.C.P.): 9.05

TOTAL DEPTH OF WELL: 100.57
DEPTH OF WATER IN WELL: 91.00
INITIAL TRANSDUCER WATER LEVEL: 10.46
STATIC TRANSDUCER WATER LEVEL:
DIAMETER OF BOREHOLE: 8"
DIAMETER OF PIPE: 2"
SCREEN LENGTH: 5'
EFFECTIVE SCREEN LENGTH* "L": 5'



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	25	1/5	5	5
2	25	1	25	30
3	10	2	20	50
4	30	5	150	200
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 5
STAINLESS STEEL SLUG LENGTH: 4 feet

NOTES:

TEST PERFORMED BY: TOM PUCHALSKI — DATE: 1/4/91
LOGGER DOWNLOADED BY: [illegible] — DATE: 1/14/91
CALCULATIONS BY: [illegible] — DATE:
COMPUTER FILE NAME: P101BR

Donohue ENGINEERS ARCHITECTS SCIENTISTS

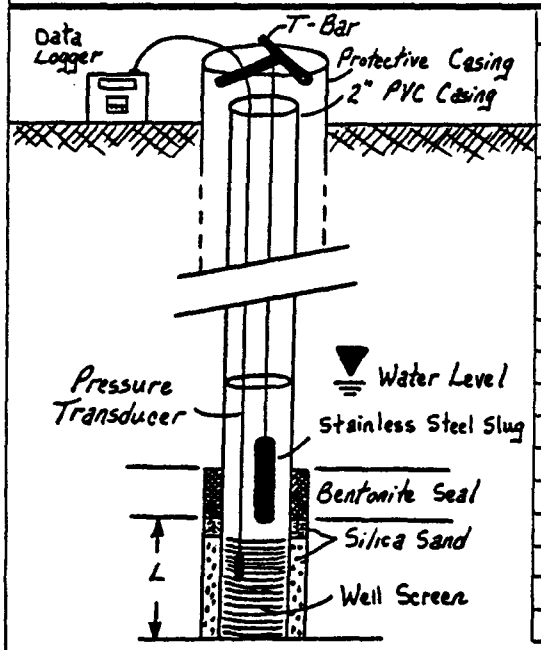
INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET 1 OF 1

PROJECT NO.: 20026.023
SITE: HIMCO DUMP
WELL NUMBER: P101C
LOGGER ID NUMBER: 01

CLIENT: USEPA
WELL DRILLED BY: John Mathes & Assoc, Inc.
DATE TEST PERFORMED: 1/4/91
TIME TEST PERFORMED: 1040
TOP OF PIPE ELEVATION:
OBSERVATION WELL/PIEZOMETER (circle):
FALL/RISE TEST (circle)
FORMATION WELL SCREENED IN: Outwash SP
STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 162.67'
DEPTH OF WATER IN WELL: ~~9.33'~~ 9.57'
INITIAL TRANSDUCER WATER LEVEL: 9.55
STATIC TRANSDUCER WATER LEVEL: 10.88
DIAMETER OF BOREHOLE: 8 inches
DIAMETER OF PIPE: 2 inches
SCREEN LENGTH: 5 feet
EFFECTIVE SCREEN LENGTH* "L": 5 feet



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	5	1/5		1
2	5	1/5		2
3				3
4				4
5				5
6				6
7				7
8				8
9				9
10				10
11	25	1/5	5	5
12	25	1	25	30
13	10	2	20	50
14	30	5	150	200
15				
16				

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 5
STAINLESS STEEL SLUG LENGTH: 4

NOTES: Rerun test at 1241 Station 03 transducer static 9.98
11.43 - static start rising test - Poor test

TEST PERFORMED BY: TOM PUCHALSKI — DATE: 1/4/91
LOGGER DOWNLOADED BY: C Elias — DATE: 1/4/91
CALCULATIONS BY: KE — DATE:
COMPUTER FILE NAME: P101C R

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET ___ OF ___

PROJECT NO.: 20026.023

WELL NUMBER: E-3

SITE: Himco

LOGGER ID NUMBER: 719021

CLIENT: USEPA

WELL DRILLED BY:

DATE TEST PERFORMED: 12-14-90

TIME TEST PERFORMED: 11:15

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) Both

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 175.58'

DEPTH OF WATER IN WELL: 11.60'

INITIAL TRANSDUCER WATER LEVEL: 7.96'

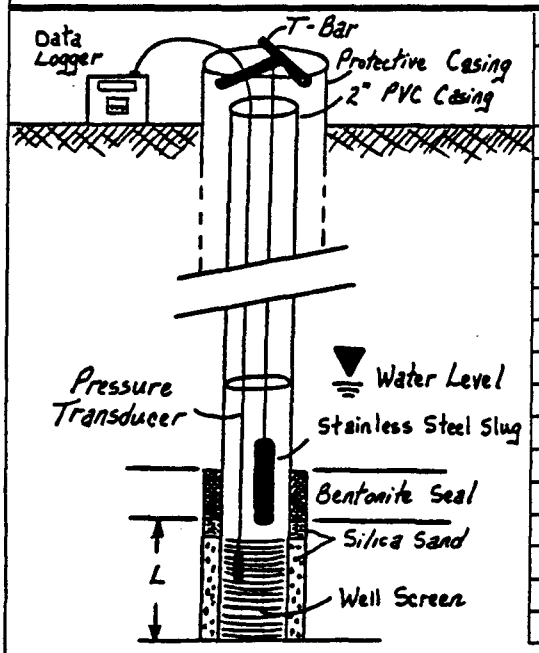
STATIC TRANSDUCER WATER LEVEL: 7.96'

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 5" ID

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)	
1	50	0.2	10	10	F.H.
2	15	1	15	15	
3	15	5	75	75	
4	15	30	450	450	
5					
6					
~~7~~ 1	50	0.2	10	10	R.H.
~~8~~ 2	15	1	15	15	
~~9~~ 3	15	5	75	75	
~~10~~ 4	15	30	450	450	
11					
12					
13					
14					
15					
16					

**"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Identified as 53

TEST PERFORMED BY: T. Koch / E. Slusser DATE: 12-14-90

LOGGER DOWNLOADED BY: T Koch DATE: 12-14-90

CALCULATIONS BY: DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET 1 OF 1

PROJECT NO.: 20020.023

WELL NUMBER: F-2

SITE: HINCO

LOGGER ID NUMBER: 719021

CLIENT: EPA

WELL DRILLED BY:

DATE TEST PERFORMED: 12-2-90

TIME TEST PERFORMED: 0950

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) Both

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: > 150'

DEPTH OF WATER IN WELL: 13.95

INITIAL TRANSDUCER WATER LEVEL:

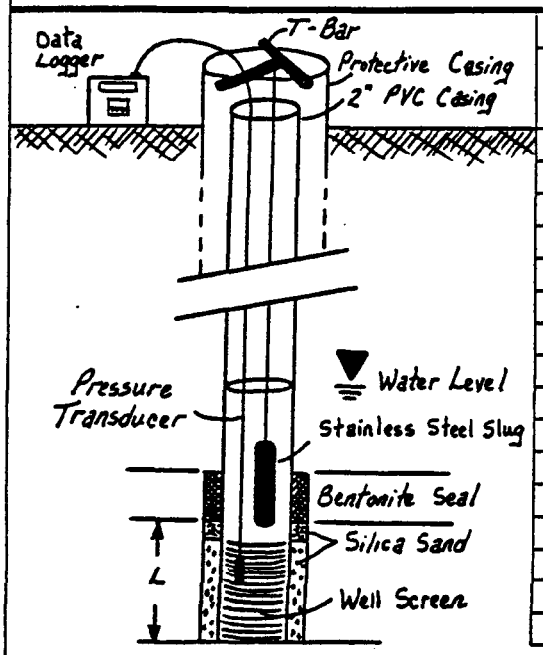
STATIC TRANSDUCER WATER LEVEL: 10.06'

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 5"

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	50	0.2	10	10
2	15	1	15	15
3	15	5	75	75
4	15	30	450	450
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Identified as 02

TEST PERFORMED BY: C. Fleuke, T. Koch

DATE: 12-2-90

LOGGER DOWNLOADED BY: C Fleuke

DATE: 12-2-90

CALCULATIONS BY:

DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET ____ OF ____

PROJECT NO.: 20026.023

WELL NUMBER: F-7

SITE: HIMCO

LOGGER ID NUMBER: 719021

CLIENT: EPA

TOTAL DEPTH OF WELL: 31.3'

WELL DRILLED BY: ____

DEPTH OF WATER IN WELL: 8.45'

DATE TEST PERFORMED: 12-2-90

INITIAL TRANSDUCER WATER LEVEL: ____

TIME TEST PERFORMED: 0915

STATIC TRANSDUCER WATER LEVEL: 10.05'

TOP OF PIPE ELEVATION: ____

DIAMETER OF BOREHOLE: ____

OBSERVATION WELL/PIEZOMETER (circle): ____

DIAMETER OF PIPE: 2"

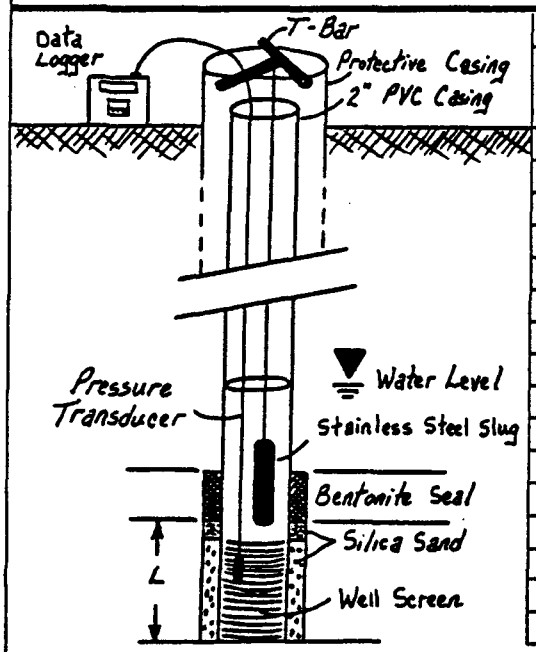
FALL/RISE TEST (circle) Both

SCREEN LENGTH: ____

FORMATION WELL SCREENED IN: ____

EFFECTIVE SCREEN LENGTH* "L": ____

STATIC WATER LEVEL (T.C.P.): ____



*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	50	0.2	10	10
2	15	1	30	30
3	15	2	30	30
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Identified as 01
- Well Not Locked

TEST PERFORMED BY: C. FRIDL, T. KOACH

DATE: 12-2-90

LOGGER DOWNLOADED BY: ____

DATE: ____

CALCULATIONS BY: ____

DATE: ____

COMPUTER FILE NAME: ____

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SHEET 1 OF 1

PROJECT NO.: 20026 023

SITE: HIMCO

WELL NUMBER: M-1

LOGGER ID NUMBER: 719021

CLIENT: EPA

WELL DRILLED BY:

DATE TEST PERFORMED: 12-2-90

TIME TEST PERFORMED: 1130

TOP OF PIPE ELEVATION:

~~OBSERVATION WELL~~ PIEZOMETER (circle):

FALL/RISE TEST (circle) Both

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 104.50'

DEPTH OF WATER IN WELL: 16.10'

INITIAL TRANSDUCER WATER LEVEL:

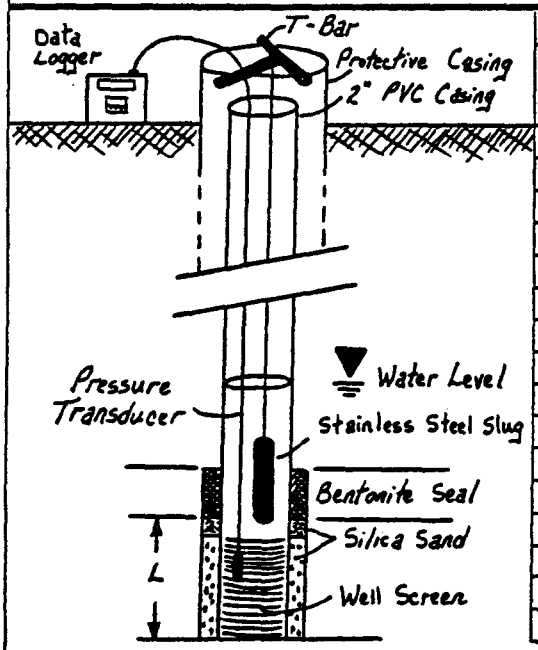
STATIC TRANSDUCER WATER LEVEL: 9.98'

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 2"

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	50	0.2	10	10
2	15	1	15	15
3	15	5	75	75
4	15	30	450	~~450~~
5				
~~6~~ 1	50	0.2	10	10
~~7~~ 2	15	1	15	15
~~8~~ 3	15	2	30	30
~~9~~ 4	~~15~~ 30	~~10~~	~~150~~	~~150~~
~~10~~ 4	6	10	60	60
11				
12				
13				
14				
15				
16				

Falling Head

Rising Head

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Falling Head test stopped - returned to static before segment 4 was completed

Station ID #3

TEST PERFORMED BY: C. Fraelich & T. Kirch

DATE: 12-2-90

LOGGER DOWNLOADED BY:

DATE:

CALCULATIONS BY:

DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET ____ OF ____

PROJECT NO.: 20026.023

SITE: HIMCO

WELL NUMBER: M-2

LOGGER ID NUMBER: 719021

CLIENT: EPA

WELL DRILLED BY: ____

DATE TEST PERFORMED: ~~12-2-90~~ 12-2-90

TIME TEST PERFORMED: ~~11:35~~

TOP OF PIPE ELEVATION: ____

OBSERVATION WELL/PIEZOMETER (circle): ____

FALL/RISE TEST (circle) Both

FORMATION WELL SCREENED IN: ____

STATIC WATER LEVEL (T.C.P.): ____

TOTAL DEPTH OF WELL: 24.80'

DEPTH OF WATER IN WELL: 15.25'

INITIAL TRANSDUCER WATER LEVEL: ____

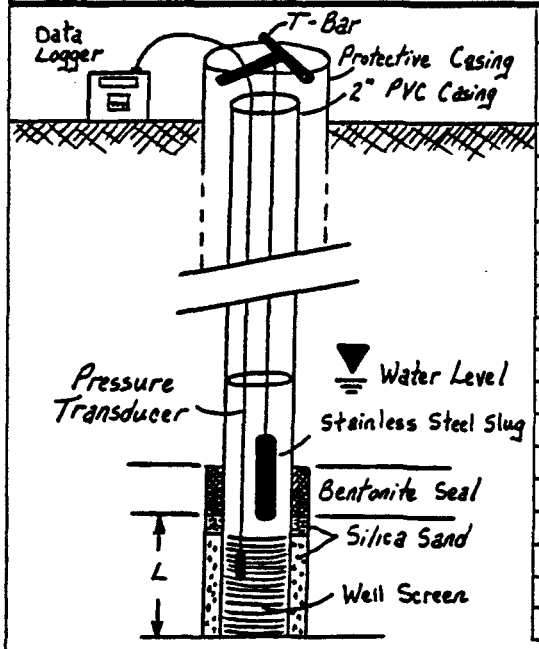
STATIC TRANSDUCER WATER LEVEL: 8.03'

DIAMETER OF BOREHOLE: ____

DIAMETER OF PIPE: 2"

SCREEN LENGTH: ____

EFFECTIVE SCREEN LENGTH* "L": ____



SILOG II LOGGING SEQUENCE				
SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: ____

STAINLESS STEEL SLUG LENGTH: ____

NOTES: SITION ID # 4
OBSTRUCTION AT ~ 16' SLUG COULD NOT GO DOWN WELL - Redone on 12-14-90 with 2' slug; form attached

TEST PERFORMED BY: C. Fowler, T. Kuch

DATE: 12-2-90

LOGGER DOWNLOADED BY: ____

DATE: ____

CALCULATIONS BY: ____

DATE: ____

COMPUTER FILE NAME: ____

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET ___ OF ___

PROJECT NO.: 20026.023

SITE: Hinco

WELL NUMBER: M-2

LOGGER ID NUMBER: 219021

CLIENT:

WELL DRILLED BY:

DATE TEST PERFORMED: 12-14-90

TIME TEST PERFORMED:

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle)

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 24.80

DEPTH OF WATER IN WELL: 15.27

INITIAL TRANSDUCER WATER LEVEL:

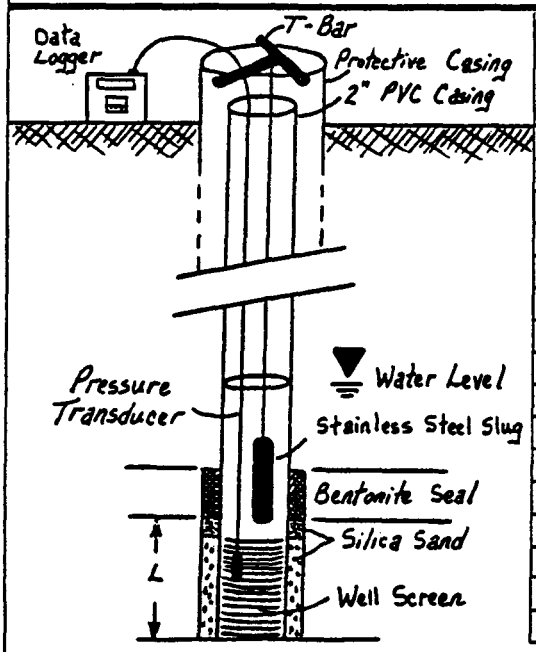
STATIC TRANSDUCER WATER LEVEL: 7.01

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 2"

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)	
1	50	0.2	10	10	
2	15	1	15	15	F.H.
3	15	5	75	75	
4	15	30	450	450	
5					
~~6~~ 1	50	0.2	10	10	
~~7~~ 2	15	1	15	15	R.H
~~8~~ 3	15	5	75	75	
~~9~~ 4	15	30	450	450	
10					
11					
12					
13					
14					
15					
16					

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 2'

NOTES: Indicated @ 22

TEST PERFORMED BY: T. Kroch; E. Slusser DATE: 12-14-90

LOGGER DOWNLOADED BY: T. Kroch DATE: 12-14-90

CALCULATIONS BY: DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET 1 OF 1

PROJECT NO.: 20026.023

WELL NUMBER: WT 101A

SITE: HIMCO

LOGGER ID NUMBER: 719021

CLIENT: EPA

WELL DRILLED BY: ~~Donohue~~ ~~12-11~~ 12-1-90 Matrics

DATE TEST PERFORMED: 12/1/90

TIME TEST PERFORMED: 1428 & 1430

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) Both

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.): –

TOTAL DEPTH OF WELL: 18.70

DEPTH OF WATER IN WELL: – 11.26

1Y/28

INITIAL TRANSDUCER WATER LEVEL:

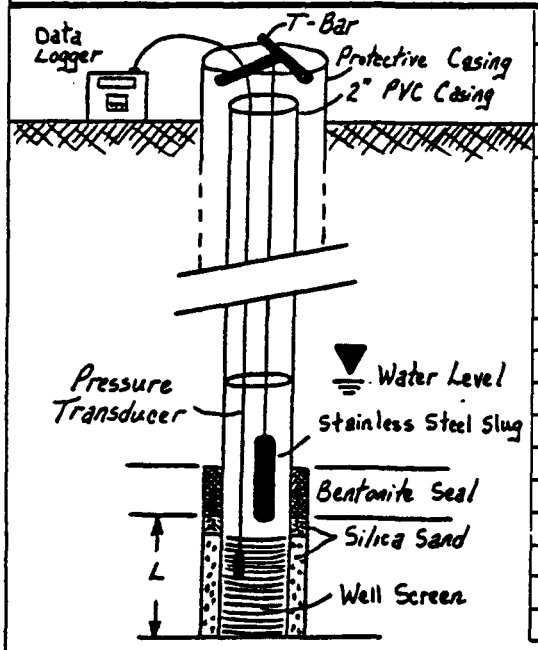
STATIC TRANSDUCER WATER LEVEL: 7.02'

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 2"

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	50	0.2 seconds	10	10
2	60	1 second	60	60
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Rising & Falling Head tests manually stopped due to very fast recovery

TEST PERFORMED BY: Cathy Fruehe DATE: 12/1/90

LOGGER DOWNLOADED BY: Cathy Fruehe DATE: 12/1/90

CALCULATIONS BY: DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET ____ OF ____

PROJECT NO.: 20026.023

WELL NUMBER: WT102A

SITE: Himco

LOGGER ID NUMBER: 719021

CLIENT: USEPA

WELL DRILLED BY:

DATE TEST PERFORMED: 12-14-90

TIME TEST PERFORMED: 14:30

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) BOTH

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 18.16

DEPTH OF WATER IN WELL: 10.29'

INITIAL TRANSDUCER WATER LEVEL:

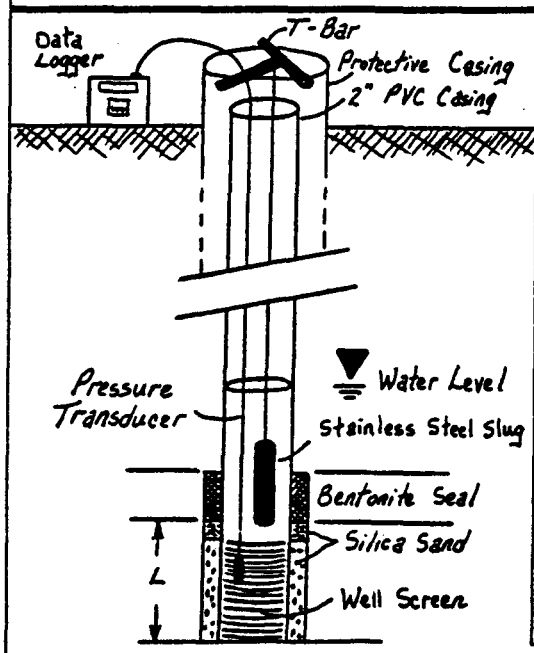
STATIC TRANSDUCER WATER LEVEL: 7.01

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 2"

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)	
1	50	0.2	10	10	
2	15	1	15	15	F.H.
3	15	5	75	75	
4	15	30	450	450	
5					
~~8~~ 1	50	0.2	10	10	
~~8~~ 2	15	1	15	15	R.H
~~8~~ 3	15	5	75	75	
~~8~~ 4	15	30	450	450	
10					
11					
12					
13					
14					
15					
16					

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15#

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Identified as 12

TEST PERFORMED BY: T Koch / E. Slusser DATE: 12-14-90

LOGGER DOWNLOADED BY: T Koch DATE: 12-14-90

CALCULATIONS BY: DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET ___ OF ___

PROJECT NO.: 20026.023

WELL NUMBER: WT103A

SITE: Himco

LOGGER ID NUMBER: 719021

CLIENT: USEPA

WELL DRILLED BY:

DATE TEST PERFORMED: 12-14-90

TIME TEST PERFORMED: 13:59

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) BOTH

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 18.48

DEPTH OF WATER IN WELL: 5.46'

INITIAL TRANSDUCER WATER LEVEL:

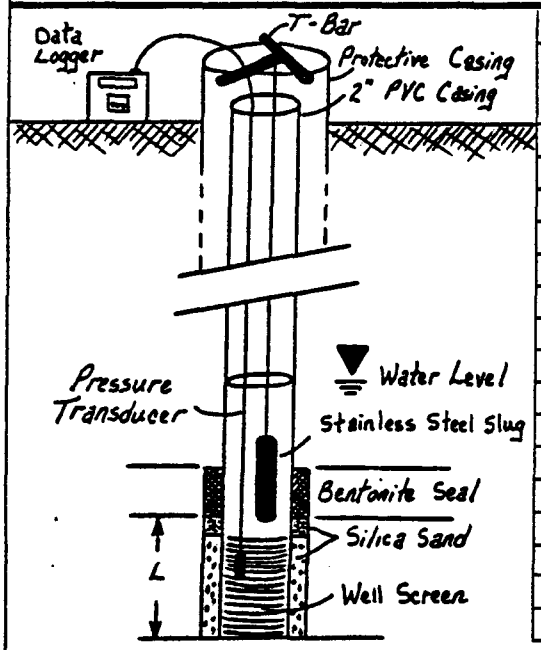
STATIC TRANSDUCER WATER LEVEL: 7.98'

DIAMETER OF BOREHOLE: 2"

DIAMETER OF PIPE:

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	50	0.2	10	10
2	15	1	15	15
3	15	5	75	75
4	15	30	450	450
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Identified as 13

TEST PERFORMED BY: T Koch, E. Slusser

DATE: 12-14-90

LOGGER DOWNLOADED BY: T Koch

DATE: 12-14-90

CALCULATIONS BY:

DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET ___ OF ___

PROJECT NO.: 20026.023

SITE: Himco

WELL NUMBER: WT104A

LOGGER ID NUMBER: 719021

CLIENT: USEPA

WELL DRILLED BY:

DATE TEST PERFORMED: 12-14-90

TIME TEST PERFORMED: 1260

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) Fall H

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 13.69'

DEPTH OF WATER IN WELL: 11.67'

INITIAL TRANSDUCER WATER LEVEL:

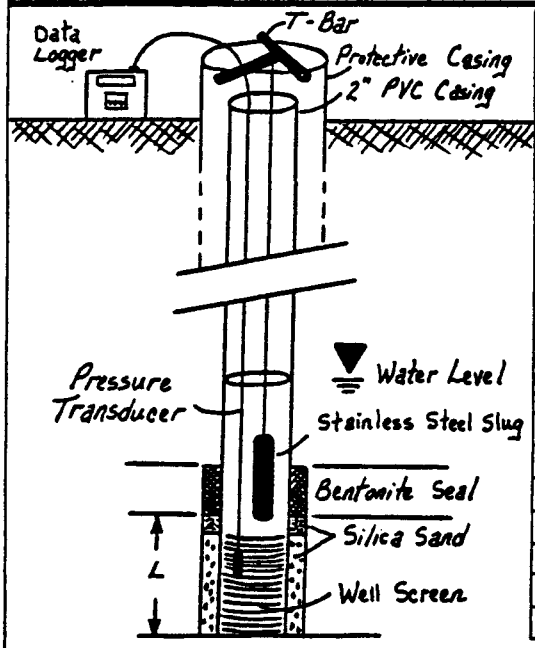
STATIC TRANSDUCER WATER LEVEL: 6.01'

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 2" ID

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)	
1	50	0.2	10	10	
2	15	1	15	15	F.H.
3	15	5	75	75	
4	15	30	450	450	
5					
~~5~~ 1	50	0.2	10	10	
~~6~~ 2	15	1	15	15	F.H.
~~7~~ 3	15	5	75	75	
~~8~~ 4	15	30	450	450	
10					
11					
12					
13					
14					
15					
16					

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES: Identified as 14

TEST PERFORMED BY: T Koach / E. Slusser

DATE: 12-14-90

LOGGER DOWNLOADED BY: T Koach

DATE: 12-14-90

CALCULATIONS BY:

DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET 1 OF 1

PROJECT NO.: 20026.023

SITE: HIMCO

WELL NUMBER: WT105A

LOGGER ID NUMBER: 719021

CLIENT: EPA

WELL DRILLED BY: Mathes

DATE TEST PERFORMED: 12-1-90

TIME TEST PERFORMED: 1600

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) Both

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 19.55'

DEPTH OF WATER IN WELL: 9.28'

INITIAL TRANSDUCER WATER LEVEL:

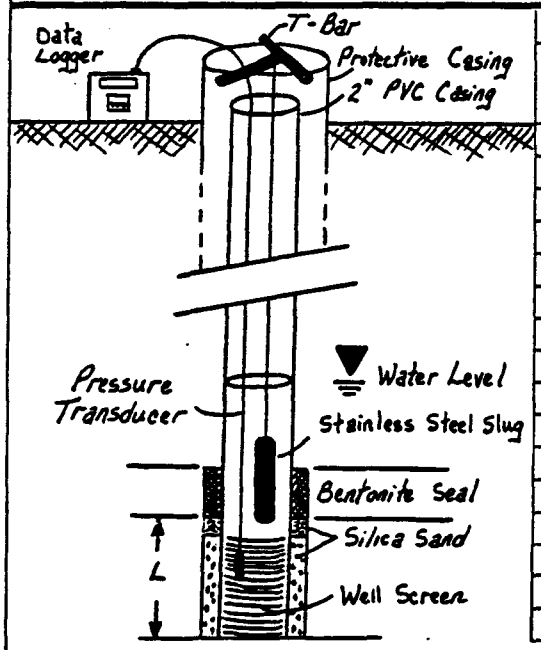
STATIC TRANSDUCER WATER LEVEL: 7.98'

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 2"

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	50	0.2	10	10
2	15	1	15	15
3	15	2	30	30
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES:

TEST PERFORMED BY: C. Feuche, S. Spiewak, E. Shosey DATE: 12-1-90

LOGGER DOWNLOADED BY: C. Feuche DATE: 12-1-90

CALCULATIONS BY: DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET 1 OF 1

PROJECT NO.: 20026.023

SITE: HIMCO

WELL NUMBER: WT 106 A

LOGGER ID NUMBER: 719021

CLIENT: EPA

WELL DRILLED BY: Mathes

DATE TEST PERFORMED: 12-1-90

TIME TEST PERFORMED: 1530

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) Both

FORMATION WELL SCREENED IN:

STATIC WATER LEVEL (T.C.P.):

TOTAL DEPTH OF WELL: 18.50'

DEPTH OF WATER IN WELL: 8.45'

INITIAL TRANSDUCER WATER LEVEL: 9.02

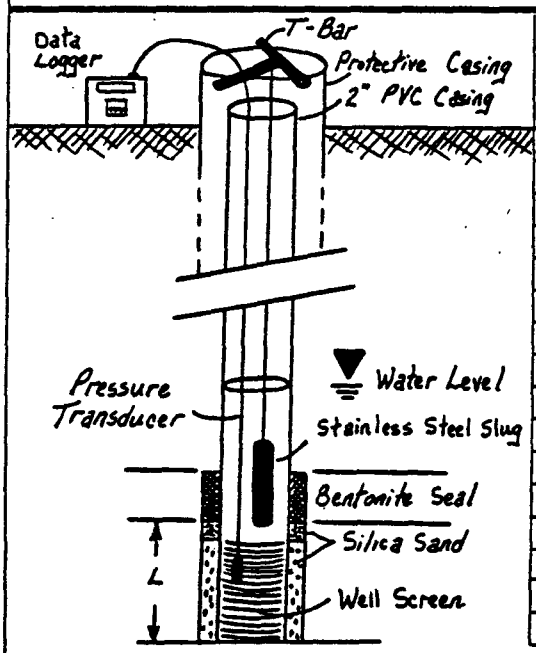
STATIC TRANSDUCER WATER LEVEL: 9.02

DIAMETER OF BOREHOLE:

DIAMETER OF PIPE: 2"

SCREEN LENGTH:

EFFECTIVE SCREEN LENGTH* "L":



*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1	50	0.2	10	10
2	15	1	15	15
3	15	2	30	30
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				

PRESSURE TRANSDUCER PSI: 15

STAINLESS STEEL SLUG LENGTH: 4'

NOTES:

TEST PERFORMED BY: C. Fleury, S. Spiewak, E. Slusser DATE: 12-1-90

LOGGER DOWNLOADED BY: C. Fleury DATE: 12-1-90

CALCULATIONS BY: DATE:

COMPUTER FILE NAME:

Donohue ENGINEERS ARCHITECTS SCIENTISTS

INFIELD HYDRAULIC CONDUCTIVITY SLUG TEST

SHEET 1 OF 1

PROJECT NO.: 20026.023

SITE: HIMCO DUMP

WELL NUMBER: P102C

LOGGER ID NUMBER: 05

CLIENT: USEPA

WELL DRILLED BY: John Mathes & Assoc

DATE TEST PERFORMED: Jan 4, 1991

TIME TEST PERFORMED: 1330

TOP OF PIPE ELEVATION:

OBSERVATION WELL/PIEZOMETER (circle):

FALL/RISE TEST (circle) BOTH

FORMATION WELL SCREENED IN: OUTWASH

STATIC WATER LEVEL (T.C.P.): 9.41'

TOTAL DEPTH OF WELL: 158.81

DEPTH OF WATER IN WELL: 149.40

INITIAL TRANSDUCER WATER LEVEL: 11.29'

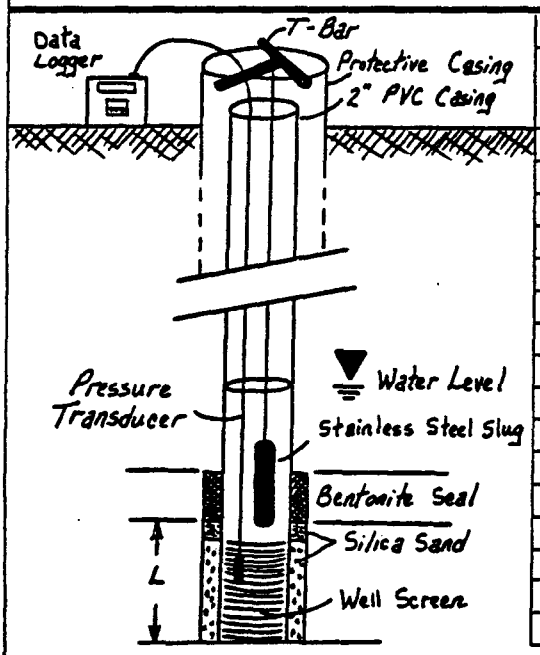
STATIC TRANSDUCER WATER LEVEL: 10.88'

DIAMETER OF BOREHOLE: 8"

DIAMETER OF PIPE: 2"

SCREEN LENGTH: 5'

EFFECTIVE SCREEN LENGTH* "L": 5'



*"L" length is less than the sand pack length if the water table intersects sand pack, where "L" will equal distance between water table and bottom of sand pack.

SILOG II LOGGING SEQUENCE

SEGMENT NUMBER	NUMBER OF READINGS	INTERVAL (SEC.)	SEGMENT DURATION (SEC.)	ELAPSED TIME (SEC.)
1				
2				
3				
4				
5				
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11				
12				
13				
14				
15				
16				

PRESSURE TRANSDUCER PSI: 5

STAINLESS STEEL SLUG LENGTH: 4

NOTES: Water level did not drop during falling head test

TEST PERFORMED BY: TOM PUCHALSKI DATE: Jan 4, 1991

LOGGER DOWNLOADED BY: Kim Elias DATE: 1/14/91

CALCULATIONS BY: KE DATE:

COMPUTER FILE NAME: P102CR F

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 12

DATE: February 17, 1991

TO: Vanessa Harris, Site Manager

CC: Roman Gau, Project Manager
Mike Crosser, TSQAM

FROM: Marcia A. Kuehl

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump Site, Elkhart, Indiana

Waste Mass Gas Sampling

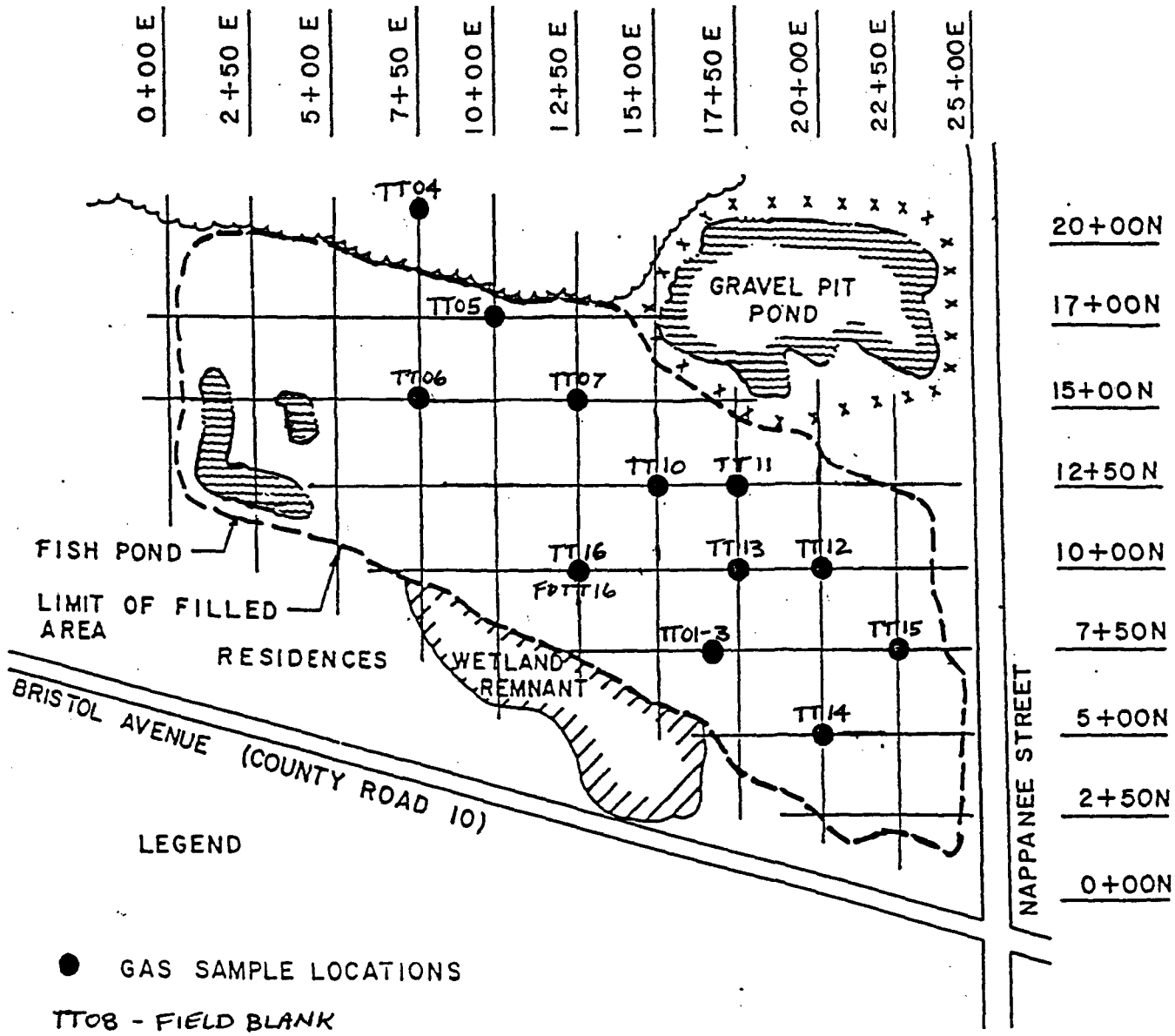
This technical memorandum presents the waste mass gas sampling method and the analytical results from three initial samples which were used to establish sample collection times and pump rates.

Introduction

Characterization of the Himco Dump Site waste mass gas was necessary to select appropriate remedial alternatives and develop the risk assessment. Typical municipal landfill gas consists primarily of of methane, carbon dioxide, and a small amount of hydrogen sulfide. If volatile organic solvents have been disposed in the landfill, the gas will also contain volatile organic compounds (VOCs). Historical site groundwater data indicates the presence of acetone, trans-1,2-dichloroethene, chloroethane, chlorofluoromethane, and dichlorodifluoromethane in shallow groundwater. No historical waste mass gas or ambient air data exists for the site. Accordingly, samples were collected and analyzed for the EPA Target Compound List VOCs and up to 10 tentatively identified VOCs.

Twelve cap soil sampling locations, as shown in Figure 1, were selected for waste mass gas collection. These locations were chosen based on the highest field VOC readings, as measured by the HNu, or where the highest methane or hydrogen sulfide ambient concentrations, as measured by the Lumidor Gasponder IV meter, were noted in the 0- to 18-inch soil sample headspace.

Two sampling events were conducted. On November 7, 1990, three samples were collected at location G-20 by Marcia Kuehl and Dorothea Downs (Ebasco) in order to establish pump rates and sample collection times. The collection time and pump rate must be sufficient to collect enough sample volume for analysis yet not saturate the Tenax® adsorbent. On November 13 and 14, 1990, the remaining locations were sampled by Marcia Kuehl, Tom Puchalski, and Dorothea Downs. One trip blank, one field blank, one field duplicate, two matrix spikes, and two matrix spike duplicates were also collected on November 13 and 14, 1990, for a total of 18 samples sent for analysis.



SOURCE: US EPA, AUGUST, 1986

Donohue

WASTE GAS SAMPLING LOCATIONS

N

20026

1990

FIELD SAMPLING PLAN
HIMCO DUMP SITE
ELKHART, INDIANA

FIGURE 1

Engineers • Architects • Scientists

Methods

The following equipment and materials were used during the waste mass gas sampling:

1. Lumidor Gasponder IV Model PGM-14 (for measurement of methane and hydrogen sulfide).
2. Hollow perforated nickel plated alloy steel soil probe, 10 feet maximum length x 5/8 inch OD.
3. KVA Macho portable soil gas probe system.
4. Gilian Gilair peristaltic sampling pump.
5. Digital soap bubble flow meter - EZ Cal Sensidyne.
6. HNu photoionization detector.
7. Stop watch.
8. Teflon tubing.
9. Tenax/charcoal sorbent tubes (supplied by CLP SAS lab).
10. Tenax sorbent tubes (supplied by CLP SAS lab).
11. Culture tubes (supplied by CLP SAS lab).
12. Friction-top can with charcoal for packaging.
13. Freezer.
14. Water, deionized and tap.
15. Isopropanol (A.C.S.).
16. Five-gallon pail with cover to contain isopropanol rinses.
17. Liquinox soap.
18. Brushes.
19. EPA Region V sample tags and SMO traffic report labels.
20. Plastic bags.
21. Camera and film.
22. Polyester gloves.
23. Generator (20 amp, 120 volt), gas powered.

The local weather station was called each morning prior to sample collection to get the current temperature, wind speed and direction, humidity, and barometric pressure. Sampling was done when winds were below 10 mph and no rain or snow was present. High winds disperse vapors emanating from the borehole, and moisture in the tenax and charcoal sorbents interfere with the chemical analysis.

The pump and a dummy sorbent tube assembly was calibrated daily prior to sample collection with the EZ Cal Sensidyne digital soap bubble flow meter using seven readings. Multiple readings are recommended by the flow meter calibrator manufacturer due to the inherent variability of the bubbles generated. The mean value of readings was used as the actual pump rate because the pump rotameter reading scale was not readable to within 0.10 liters/minute.

The KVA Macho® System 13-pound air rotary hammer, powered by a gas powered generator, was used to drive the stainless steel probe into the ground. A 3-foot sampling interval was attempted at each location. Gas inlets were at the bottom 3 inches of the probe. Refusal occurred prior to 3 feet at some locations due to the presence of waste and/or compacted calcium sulfate. The borehole with the probe inserted was allowed to equilibriate for 15 minutes prior to sample collection.

The SAS laboratory prepared and preanalyzed the sorbent tubes prior to sample collection. Results of the analysis are contained in Attachment A. Acceptable levels of volatile organics with boiling points less than 110°C (acetone, benzene, hexane, tetrachloroethylene, and toluene) were reported. Amounts detected were 0.4 to 12.9 ng per pair of tubes which was not of sufficient magnitude to prevent accurate determination of the sample components expected. It should be noted that the compound levels reported for the preanalysis verify that the sorbent tubes are purged of these compounds and are considered "clean" for subsequent sample collection.

The sorbent tubes were contained in sealed culture tubes, removed from the freezer, and opened only just before actual sample collection. The sorbent tubes were handled with polyester-gloved hands and did not contact any other surfaces. It was important to keep the sorbent tubes themselves free from fingerprints and dust as the tubes are placed directly in the desorption unit for analysis at the lab.

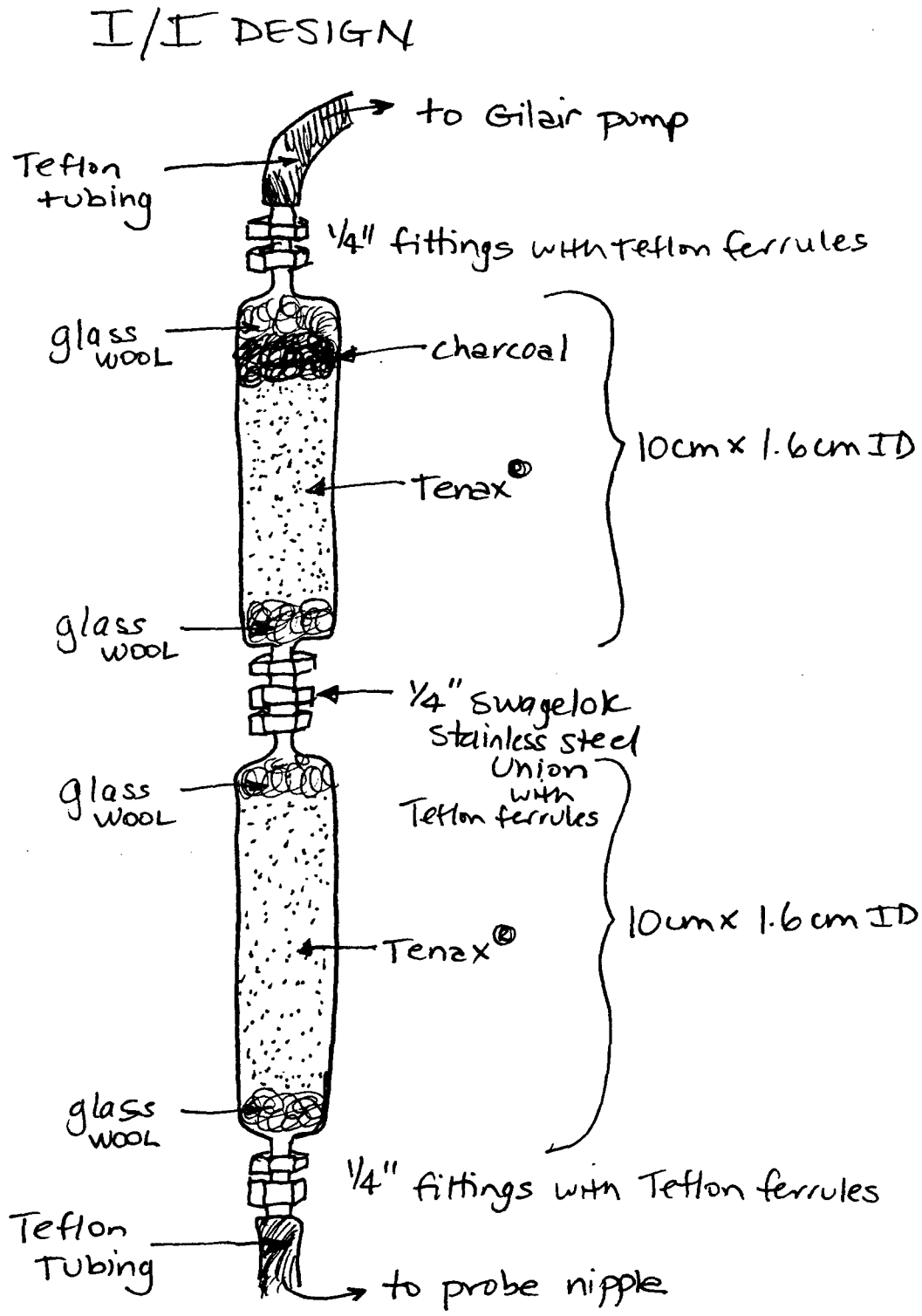
Figure 2 presents the sampling train used in the field. Teflon tubing was connected from the probe nipple to the end of the sorbent tube assembly. The sorbent tube assembly consisted of the tenax tube and then the tenax/charcoal tube connected in series using teflon ferrules and stainless steel Swagelok® fittings. The tube assembly was connected to the Gilian/Gilair precalibrated pump using teflon tubing.

After the pump was started, the start time, rotameter reading, sorbent tube numbers, and collection conditions were recorded on the Soil Gas Survey Form (Attachment B). At the end of the sampling period, the flow rate was checked using the rotameter and recorded on the Soil Gas Survey Form (Attachment B). The flows at the beginning and end of all sampling periods did not vary by more than 10 percent, so all tubes used were considered valid samples. The end time was then recorded, and the sorbent tube assembly disconnected with polyester-gloved hands, replaced in the culture tubes, and the tubes labeled with EPA tags and SAS labels. The culture tubes were sealed in a paint can containing a layer of charcoal on the bottom and packaged with ice for next day shipment to IT Corporation laboratory, Cincinnati, Ohio.

Decontamination of the steel soil probe was done between borings using liquinox and tap water wash, followed by a tap water rinse, an isopropanol rinse, and two rinses with deionized water. The sampling pump was decontaminated by pumping several liters of ambient air through it. Decontamination rinses containing isopropanol were containerized for eventual discharge to the municipal wastewater treatment system.

FIGURE 2

SAMPLING TRAIN
HIMCO DUMP



The total volumetric flow for each cartridge was calculated and recorded on the Soil Gas Survey Form using the following equation:

$$V_m = \frac{T \times Q_A}{1000}$$

where:

V_m = Total volume sampled in liters at measured temperature and pressure

Q_A = Flow rate in ml/minute

T = Sampling time = $T_2 - T_1$, minutes

T_2 = Stop time

T_1 = Start time

The total volume (V_s) at standard conditions, 25°C and 760 mmHg, was then calculated from the following equation and included on the chain-of-custody form so the lab could report results in ng/l.

$$V_s = V_m \times \frac{P_A}{760} \times \frac{298}{273 + t_A}$$

where:

P_A = Average barometric pressure, mmHg
t_A = Average ambient temperature, °C

Summary of Results

Samples as listed in Table TM12-1 were collected. Field trial sample analytical results are in Attachment C and detected compounds are summarized in Table TM12-2. No Time Weighted Averages (TWA) were exceeded.

Compounds detected were 1,1,2-trichloro-, 1,2,2-trifluoroethane, methylene chloride, acetone, benzene, toluene, 1,1,1-trichloroethane, and carbon disulfide.

Deviations

The following deviations from the Field Sampling Plan occurred, but were not judged by the Site QC officer and Site Manager as negatively impacting data quality:

1. Borehole equilibration was done for 15 minutes rather than the 5 minutes specified in the FSP. The time was extended after evaluation of the data collected on November 7, 1990, which indicated that the greatest concentration of 1,1,2-trichloro - 1,2,2-trifluoroethane was measured in the sample collected after the borehole was open for 15 minutes.

2. The initial sampling rate specified in the FSP was 1 liter/min for 20 minutes. Based on conversations with other ARCS contractors familiar with use of the VOST sorbent tube assembly for gas sampling and the analytical laboratory, a rate of approximately 4 liters/minute was selected. Sampling times of 16.87 minutes, 12.18 minutes, and 5.00 minutes were used on November 7, 1990, during the field trial. Based on these results, a sample volume (V_S) of approximately 2 liters was selected using a pump flow rate of approximately 4 liters/minute for 10 minutes, and the borehole was left open to equilibriate for 15 minutes after probe insertion. Remaining samples, HDTT04-HDTT07, HDTT10-HHFDTT16, were collected using these operating parameters.

3. The FSP indicated that two sampling locations were to be sampled during the field trial. Only one location was sampled as the weather was threatening, and rain was expected.

4. The Corporate Health and Safety Manager reviewed the sampling and documentation during the initial field trial.

5. A bottle blank, as specified by the FSP, was not collected. A field blank consisting of a pair of sorbent tubes uncapped and exposed to site ambient air for the sampling period (10 minutes) was collected based on advice from the CLP laboratory and other ARCS contractors.

6. Two sets of matrix spike and matrix spike duplicate sorbent tubes were collected and consisted of four sets of unexposed tubes. These samples were added as the SAS method specified this QC requirement at a frequency of 1 per 10 field samples.

7. Refusal occurred during sampling due to the 3-foot sample interval could not be achieved for all samples, as indicated in Table TM12-1.

A/R/HIMCO/AA5

TABLE TM12-1

VOLATILE MASS GAS SAMPLES COLLECTED
Himco Dump Site
Elkhart, Indiana

Grid Point Location	Borehole equil. time (min.)	Sample Number	Sample Depth (ft.)	Mean Pump Flow Rate L/min.	Sample Time (min.)	Total Volumetric Flow (V_m) (liters)
G-20	5	HD-TT01	0.75	4.21	16.87	71.0
G-20	17	HD-TT02	0.75	4.21	12.18	51.3
G-20	30	HD-TT03	0.75	4.21	5.00	21.0
OFF-SITE	15	HD-TT04	3.0	4.17	10.00	41.7
R-12	15	HD-TT05	2.4	4.17	10.00	41.7
Q-8	15	HD-TT06	2.7	4.17	10.00	41.7
O-15	15	HD-TT07	3.0	4.17	10.00	41.7
FIELD BLANK	--	HD-FBTT08	0	--	10.00	--
TRIP BLANK	--	HD-TBTT09	--	--	--	--
L-18	15	HD-TT10	2.0	4.17	10.00	41.7
L-21	15	HD-TT11	2.6	4.17	10.00	41.7
I-22	15	HD-TT12	3.0	4.17	10.00	41.7
D-24	15	HD-TT14	3.0	4.17	10.00	41.7
F-25	15	HD-TT15	3.0	4.17	10.00	41.7
K-14	15	HD-TT16	3.0	4.17	10.00	41.7
K-14	15	HD-FDTT16	3.0	4.17	10.00	41.7
Matrix Spike	--	HD-TTMS01	--	--	--	--
Matrix Spike	--	HD-TTMS02	--	--	--	--
Matrix Spike Duplicate	--	HD-TTMSD01	--	--	--	--
Matrix Spike Duplicate	--	HD-TTMSD02	--	--	--	--

A/R/HIMCO/AA5

TABLE TM12-2

WASTE MASS GAS FIELD TRIAL ANALYTICAL RESULTS
Himco Dump Site
Elkhart, Indiana

Detected Volatile Organic	HD-TT01 ng/L	HD-TT02 ng/L	HD-TT03 ng/L	TWA ng/L
Methylene Chloride	2.66 B	7.83 B	14.6	350,000
Acetone	5.31	8.29	17.9	1,780,000
Benzene	0.66 J	1.84	2.25	30,000
Toluene	23.9	30.9	21.3	375,000
1,1,2-Trichloroethane-1,2,2-Trifluoroethane	19.9	138	225	NE
Unknown Hydrocarbon (RT 11.26)	3.32	9.22	ND	NE
Carbon Disulfide	ND	3.22	ND	30,000
1,1,1-Trichloroethane	ND	2.30	ND	1,900,000
Unknown Hydrocarbon (RT 16.22)	ND	3.69	ND	NE

Legend:

B - Detected in unexposed lab blank tubes.
J - Estimated concentration, below detection limit.
ND - Not detected.
RT - Retention Time, in units.
TWA = Time Weighted Average for normal 8-hour workday. and a 40-hour workweek.
NE = Not Established.

A/R/HIMCO/AA5

ATTACHMENT A

VOST BLANK CHECK RESULTS

INTERNATIONAL TECHNOLOGY CORPORATION

VOST Blank Check Results

ITAS Cincinnati

Client I.D. USEPA - VIAR

W.O. # X0-10-293

Date	Analyst	Tube No.s	Batch	Acetone	Benzene	Hexane	Perc	Toluene	DONOHUE #	SITE		Unknown (1)	Can No.
10/24	VR	T4161 TC1555	301	—	1.3	—	9.0	0.8	TT10	L-18		<5ng	1
		T3262 TC35		3.3	1.9	1.0	12.0	0.7	TT12	I-22			
		T14 TCX4241		6.0	3.9	0.5	11.4	0.9	TT09	TB			
		T60 TC4640		4.5	2.2	1.3	12.9	0.8	TT08	FB	Tube says 4648		
		T-100 TC47		5.3	3.0	1.1	10.0	0.9	TT05	R-12			
		T2154 TC4602		6.1	2.1	1.5	7.7	0.6	TT04	UPWIND			
10/26		T4721 TC4752	302	—	0.8	—	—	—					
		T4488 TC4741		1.4	1.9	1.3	4.2	0.7	TT06	Q-8			
		T4211 TC4754		7.3	2.3	4.0	8.2	0.9	TT11	L-21			
		T3907 TC4744		1.0	1.3	1.4	4.5	0.6	TT07	O-15			
		T4717 TC4484		2.6	1.3	1.6	3.0	0.5	MS01				2
		T4673 TC4735		—	1.1	0.5	3.7	0.4	MSD01				
		T4694 TC4141		1.1	0.9	0.8	0.8	0.5	MSD02				
		T4727 TC4126		2.5	1.5	0.9	—	—	TT16	F-14			
		T4698 TC4742		—	1.4	1.2	—	0.6	FDTT16	F-14			
		T4713 TC4748		2.6	1.0	1.2	—	0.4					
		T4716 TC4648		6.8	2.2	0.6	9.7	0.5	TT14	D-24			
10/28		T4715 TC3148		8.8	3.3	0.6	—	0.7	MS02				
		T42 TC3182		6.0	1.9	1.1	—	0.5	TT15	F-25			
		T4670 TC4538		5.1	1.4	2.4	—	—					
		T4723 TC3619		7.6	1.5	0.8	—	0.6	TT13	I-21			

(1) based on benzene response factor for the largest unknown peak in run. All targets are listed as NG per pair.

M-3001-A-1-8/92-4

INTERNATIONAL TECHNOLOGY CORPORATION

VOST Blank Check Results

ITAS Cincinnati

Client I.D. USEPA - VIAR

W.O. # XO-10-293

Date	Analyst	Tube No.s	Batch	Acetone	Benzene	Hexane	Perc	Toluene	EPA ID	DONOHME ID	Vm * Liters	Unknown (1)	Can No.
10/31	VR/mm	T 4629 Tc 4490	305	0.6	1.0	1.3	—	0.6	TT01	G-20	~~70.95~~ 71.02 mm	2-5ing	1
		T3865 TC2315		1.4	1.7	2.0	8.8	0.9	used to pumps	Calibrate MAH 11/4/90			
		T2049 Tc 3366		0.7	1.3	1.7	—	0.8	2049 - used to calibrate				
		T4131 TC438		1.0	1.3	1.3	2.5	0.6	TT03	G-20	~~23.55~~ 23.05 mm		
		T2322 TC4475		0.8	1.5	2.2	2.8	0.8	TT02	G-20	~~57.38~~ 51.28 mm		
11/1		T4483 Tc 3989		—	0.5	0.5	—	1.1	extra				

(1) based on benzene response factor for the largest unknown peak in run. All targets are listed as NG per pair. *uncorrected to STD conditions (Vm)

M-3001-A-L-030-4

ATTACHMENT B

SOIL GAS SURVEY FORMS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/7/90 EPA SAS NO.: 5798 E-1/E-2

SITE: Homco DONOHUE SPL NO.: HD1T01

PROJECT NO.: 20026

SAMPLING TEAM: Marcia Kuehl, Dorothea Downs

SAMPLING CONDITIONS

Gastech GX86 (cal 11/7/90)

TEMPERATURE: 40 °F – 32 x 5/9 = 4.4 °C (tA)

BAROMETRIC PRESSURE (PA): 30.05 mm Hg at 0800 AM/PM

RELATIVE HUMIDITY: 92 %

WIND: 5-10 mph from SW

WEATHER: cloudy, sleet

HNu: 0.20 ppm

H_2S: 0 ppm

CH_4: 0 % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E Grid point G-20 near frac tank

SAMPLING INTERVAL: 18-24" ft

SOIL CONDITIONS AT SURFACE: wet, moss growing on soil

PUMP CALIBRATION

cal readings
4.20 4.21 4.20 4.19 4.21 4.20 4.20 4.20 L/min

PUMP MFG/MODEL/SN: Gilian SN2961 (Gilair)

CALIBRATOR MFG/MODEL/SN: E2Cal/Sensidyne /251222

INITIAL CALIBRATION (QA) TO ~~4.205~~ 4.21 (n=7) L/MIN AT TIME: 0900

CALIBRATION VERIFICATION: ROTAMETER READING 4.0 L/min TIME: 0900

ROTAMETER READING 4.0 L/min TIME: 1330

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE

% DIFFERENCE 0 %

SAMPLE COLLECTION

TENAX CHARCOAL TUBE NUMBER: TC4490 E-1

~~CHARCOAL~~ TENAX TUBE NUMBER: T4629 E-2

STOP TIME: 11:53:52

START TIME: 11:37:00

TIME ELAPSED (T) 16:52 sec MINUTES 16.87 min

COLLECTION CONDITIONS: raining ~3"
refusal at 18", calcium sulfate
underneath refusal at 18"

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 16.87 x ~~4.206~~ 4.21 = ~~70.95~~ 71.02 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 3.01 \text{ LITERS (Vs)*}$$

tA = 4.4

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/7/90 EPA SAS NO.: 5798E-3/E-4

SITE: Hinco DONOHUE SPL NO.: HDTT02

PROJECT NO.: 20026,

SAMPLING TEAM: Marcia Kuehl Dorothea Downs

SAMPLING CONDITIONS

See 11/7/90,

TEMPERATURE: _____ °F – 32 x 5/9 = _____ °C (tA) HNu: _____ ppm

BAROMETRIC PRESSURE (PA): _____ mm Hg at _____ AM/PM H_2S: _____ ppm

RELATIVE HUMIDITY: _____ % CH_4: _____ % LEL

WIND: _____ mph from _____

WEATHER: _____

SAMPLE GRID COORDINATES.: _____ N _____ E Same borehole as TT01

SAMPLING INTERVAL: _____ ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION

See 11/7/90

PUMP MFG/MODEL/SN: _____

CALIBRATOR MFG/MODEL/SN: TT01

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ *

SAMPLE COLLECTION

TENAX & CHARCOAL TUBE NUMBER: TC4475 E-3 ~~CHARCOAL~~ TENAX TUBE NUMBER: T2322 E-4

STOP TIME: 12:19:25 COLLECTION CONDITIONS: _____

START TIME: 12:07:14

TIME ELAPSED (T) 12:11 sec MINUTES

12.18 min

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 12.18 x ~~4.206~~ 4.21 = ~~57.38~~ 51.28 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA}$$ = 2.17 LITERS (Vs)*

tA = 4.4

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/7/90 EPA SAS NO.: 5798E-5/E-6

SITE: Himco DONOHUE SPL NO.: HDTT03

PROJECT NO.: 20026.

SAMPLING TEAM: Maria Kuehl Dorothea Dawns

SAMPLING CONDITIONS

See 11/7/90 TT01

TEMPERATURE: _____ °F – 32 x 5/9 = _____ °C (tA)

BAROMETRIC PRESSURE (PA): _____ mm Hg at _____ AM/PM

RELATIVE HUMIDITY: _____ %

WIND: _____ mph from _____

WEATHER: _____

HNu: _____ ppm

H_2S: _____ ppm

CH_4: _____ % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E

SAMPLING INTERVAL: _____ ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION

See 11/7/90 TT01

PUMP MFG/MODEL/SN: _____

CALIBRATOR MFG/MODEL/SN: _____

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE

ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ *

SAMPLE COLLECTION

E-5 TENAX + CHARCOAL TUBE NUMBER: TC 438

STOP TIME: 12:28:23

START TIME: 12:23:23

TIME ELAPSED (T) 5.00 MINUTES

~~CHARCOAL~~/TENAX TUBE NUMBER: T 4131 (E-6)

COLLECTION CONDITIONS: See 11/7/90 TT01

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 5.00 x ~~4.206~~ 4.21 = ~~23.55~~ 21.05 LITERS (Vm)

Vs = Vm x PA / 760 x 298 / (273 + tA) = 0.89 LITERS (Vs)*

tA = 4.4

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

0900 Am

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5798E ~~E7, E8~~ E12, E-1

SITE: Himco DONOHUE SPL NO.: HDT04 UPWIND OFFSITE

PROJECT NO.: 20026

SAMPLING TEAM: M. Kuehl / D. Downs / T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 25 °F – 32 x 5/9 = _____ °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 0715 AM/PM H_2S: 0 ppm

RELATIVE HUMIDITY: 92 % CH_4: 0 % LEL

WIND: 0 mph from ~~N = NE~~ MAX

WEATHER: sunny

SAMPLE GRID COORDINATES.: 50' N of S-10 E MAX

SAMPLING INTERVAL: 3.0 ft

SOIL CONDITIONS AT SURFACE: frosty, leaves moist (in woods)

PUMP CALIBRATION

cal readings (L/min): 4.21 4.18 4.22 4.02 4.21 4.15 4.19

PUMP MFG/MODEL/SN: Gilian/Gilair /2196

CALIBRATOR MFG/MODEL/SN: Etcal Sensidyne /251222

INITIAL CALIBRATION (QA) TO $\bar{X}$=4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4 L/min TIME: 0850

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4 L/min TIME: 0915

% DIFFERENCE 0 %

SAMPLE COLLECTION

TENAX + CHARCOAL TUBE NUMBER: TC4602 (E-12 ~~E-7 MAX~~) ~~CHARCOAL~~/TENAX TUBE NUMBER: T2154 (E-13 ~~E-8 MAX~~)

STOP TIME: _____ COLLECTION CONDITIONS: may have hit

START TIME: used stopwatch water table, suction created at

TIME ELAPSED (T) 10.00.06 MINUTES T= 2min

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.34 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

10:45 AM

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5793E

SITE: Himco DONOHUE SPL NO.: TT05 ~~E-7, E-10~~ E-14, E-15

PROJECT NO.: 20026

SAMPLING TEAM: M Kuenl / D Downs / Tom Puchaloski

SAMPLING CONDITIONS

TEMPERATURE: 25 °F – 32 x 5/9 = _____ °C (tA)

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 0715 AM/PM

RELATIVE HUMIDITY: 92 %

WIND: 0 mph from _____

WEATHER: Sunny

HNu: 0 ppm

H_2S: 0 ppm

CH_4: 0 % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E R-12

SAMPLING INTERVAL: 2'5" ft, refusal

SOIL CONDITIONS AT SURFACE: visible CaSO4, sand H2S odor ambient

PUMP CALIBRATION

see also TT04 for cal readings

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: EZ Cal Sensidyne / 251222

INITIAL CALIBRATION (QA) TO $\bar{X}$ = 4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4.04 l/min TIME: 10:30

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.04 l/min TIME: 11:05

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-14 ~~E-7~~ ~~E-10~~ TENAX x 2

CHARCOAL TUBE NUMBER: TC47

STOP TIME: used 10:55

START TIME: ~~stopwatch~~ 10:45 AM

TIME ELAPSED (T) 10.00 00 MINUTES

~~MUST TO~~ E-15

~~CHARCOAL~~ TENAX TUBE NUMBER: TT100

COLLECTION CONDITIONS: Vacuum created at T=2 min CaSO4 with yellow labels subsurface

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.34 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

11:50 AM

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5798E ~~E-11, E-12~~ E-16, E-17

SITE: Himco DONOHUE SPL NO.: HDT06

PROJECT NO.: 20026

SAMPLING TEAM: M. Kuehl / D. Downs / T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 25 °F – 32 x 5/9 = _____ °C (tA)

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 0715 AM/PM

RELATIVE HUMIDITY: 92 %

WIND: 0 mph from _____

WEATHER: Sunny

HNu: 0 ppm

H_2S: 0 ppm

CH_4: 0 % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E Q8

SAMPLING INTERVAL: 2' 8" ft

SOIL CONDITIONS AT SURFACE: grassy

PUMP CALIBRATION

See also T104 for cal readings

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: E2Cal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO X=4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4.0 TIME: 11:32

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE

ROTAMETER READING 4.0 TIME: 12:05

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-11 TENAX ↓ CHARCOAL TUBE NUMBER: TC4741

STOP TIME: 12:00

START TIME: 11.50

TIME ELAPSED (T) 10.00.00 MINUTES

E-12 ~~CHARCOAL~~/TENAX TUBE NUMBER: T4488

COLLECTION CONDITIONS: _____

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.84 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

~~1445~~ TIME: ~~AM~~ 1405

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5798E E18, E19

SITE: Hmw DONOHUE SPL NO.: HDTT07

PROJECT NO.: 20026

SAMPLING TEAM: M. Kuehl / D. Downs / T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 40 °F – 32 x 5/9 = _____ °C (tA)

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at ~~0715~~ ~~AM~~ 12:15 ~~AM~~ PM

RELATIVE HUMIDITY: _____ %

WIND: 0 mph from _____

WEATHER: Sunny

HNu: 0 ppm

H2S: 0 ppm

CH4: 0 % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E 0-15

SAMPLING INTERVAL: 3.0 ft

SOIL CONDITIONS AT SURFACE: H2S odor - intermittent ambient moist, moss

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: EZ cal / sensidyne / 251222

INITIAL CALIBRATION (QA) TO $\bar{X}$ = 4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4.0 TIME: 1340

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.0 TIME: 1510

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-18 TENAX & CHARCOAL TUBE NUMBER: TC 4744

~~CHARCOAL~~/TENAX TUBE NUMBER: E-19 T3907

STOP TIME: used

START TIME: stopwatch

TIME ELAPSED (T) 10.00.00 MINUTES

1350 hole open

COLLECTION CONDITIONS: vacuum created at T=1 min took field blank at this location

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = ~~41 min~~ 10.00 x 4.17 = LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.75 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

1405

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5798E / E-20, E-21 FB

SITE: Himco DONOHUE SPL NO.: HDTT08 Field Blank

PROJECT NO.: 20026

SAMPLING TEAM: MKuehl / D. Downs / T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 48 °F – 32 x 5/9 = _____ °C (tA)

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 1215 AM/PM

RELATIVE HUMIDITY: _____ %

WIND: 0 mph from _____

WEATHER: Sunny

HNu: 0 ppm

H_2S: 0 ppm

CH_4: 0 % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E taken at TT07

SAMPLING INTERVAL: 0 ft ambient air only

SOIL CONDITIONS AT SURFACE: NA

PUMP CALIBRATION pump not used

PUMP MFG/MODEL/SN: _____

CALIBRATOR MFG/MODEL/SN: _____ NA

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ %

SAMPLE COLLECTION

E-20 TENAX & CHARCOAL TUBE NUMBER: TC 46480 NA

E-21 ~~CHARCOAL~~/TENAX TUBE NUMBER: T60

STOP TIME: used stopwatch

START TIME:

TIME ELAPSED (T) 10.00 MINUTES

COLLECTION CONDITIONS: opened end caps for 10 minutes + recapped at location TT07

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = ~~4.17~~ NA x ~~10.00~~ NA = _____ LITERS (Vm) not applicable

Vs = Vm x PA / 760 x 298 / (273 + tA) = _____ LITERS (Vs)*

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

no time
QC

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5798E E-22, E-23 JB

SITE: Himco DONOHUE SPL NO.: HD/T09

PROJECT NO.: 20026 TRIP BLANK

SAMPLING TEAM: M Kuehl/D. Downs/T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 48 °F – 32 x 5/9 = _____ °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 1215 AM/PM H_2S: 0 ppm

RELATIVE HUMIDITY: 92 % CH_4: 0 % LEL

WIND: 0 mph from _____

WEATHER: sunny

SAMPLE GRID COORDINATES.: _____ N _____ E not applicable

SAMPLING INTERVAL: _____ ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION

PUMP MFG/MODEL/SN: _____ not applicable

CALIBRATOR MFG/MODEL/SN: _____

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ %

SAMPLE COLLECTION

E-22 TENAX & CHARCOAL TUBE NUMBER: TCX4241 E-23 ~~CHARCOAL~~/TENAX TUBE NUMBER: T14

STOP TIME: _____ COLLECTION CONDITIONS: UNOPENED ACCOMPANIED CAN 1 TUBES WITEN SHIPPED FROM LAB

START TIME: _____

TIME ELAPSED (T) NOT APPLICABLE MINUTES

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = _____ x _____ = _____ LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = _____ \text{ LITERS (Vs)*}$$

not applicable

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

1450

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5798E E-24, E-25

SITE: HMWD DONOHUE SPL NO.: HDII-10

PROJECT NO.: 20026

SAMPLING TEAM: M Kuehl / D. Downs / T Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 78 °F – 32 x 5/9 = _____ °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 1215 AM/PM H2S: 0 ppm

RELATIVE HUMIDITY: 92 % CH4: 0 % LEL

WIND: 0 mph from _____

WEATHER: sunny

SAMPLE GRID COORDINATES.: _____ N _____ E L-18

SAMPLING INTERVAL: 2.00 ft

SOIL CONDITIONS AT SURFACE: Sandy, visible GaSoy

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: Elcal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO X=4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4.0 TIME: 1440

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.0 TIME: 1505

% DIFFERENCE 0

SAMPLE COLLECTION

E-24 TENAX & CHARCOAL TUBE NUMBER: TC1555

E-25 ~~CHARCOAL~~/TENAX TUBE NUMBER: T4161

STOP TIME: ~~used~~ stopwatch

START TIME: 1430

TIME ELAPSED (T) 10.00.00 MINUTES

COLLECTION CONDITIONS: no unusual conditions

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = ~~4.17 min~~ 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.75 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

1525

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 3798E E-26, E-27

SITE: HMW DONOHUE SPL NO.: HDTI-11

PROJECT NO.: 20026

SAMPLING TEAM: M Kuehl / D Downs / T Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 48 °F – 32 x 5/9 = _____ °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 1215 AM/PM H_2S: 0 ppm

RELATIVE HUMIDITY: 92 % CH_4: 0 % LEL

WIND: 0 mph from _____

WEATHER: Sunny, cooling off

SAMPLE GRID COORDINATES.: _____ N _____ E L-21

SAMPLING INTERVAL: 2' 7" ft refusal

SOIL CONDITIONS AT SURFACE: Sandy, dry

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilar / Gilian / 2196

CALIBRATOR MFG/MODEL/SN: Ecal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO $\bar{X}$ = 4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4.0 L/min TIME: 1510

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.0 L/min TIME: 1530

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-26 TENAX

CHARCOAL TUBE NUMBER: TC4754

hole open 1510

STOP TIME: ~~used~~ stopwatch

START TIME:

TIME ELAPSED (T) 10.00.00 MINUTES

E-27

~~CHARCOAL~~ TENAX TUBE NUMBER: T4211

COLLECTION CONDITIONS: Intermittent suction, rotameter variable (in waste?) during sampling period

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.75 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

1555

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5748E-28, E-29

SITE: Himco DONOHUE SPL NO.: HDTT-12

PROJECT NO.: 20026

SAMPLING TEAM: TM Kuehl/D. Downs/T Pychalski

SAMPLING CONDITIONS

TEMPERATURE: 48 °F – 32 x 5/9 = _____ °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 1215 AM/PM H_2S: 0 ppm

RELATIVE HUMIDITY: 92 % CH_4: 0 % LEL

WIND: 0 mph from _____

WEATHER: sun setting

SAMPLE GRID COORDINATES.: _____ N _____ E I-22

SAMPLING INTERVAL: 3.00 ft

SOIL CONDITIONS AT SURFACE: off road - sand near asphalt piles

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilian/Gilair/~~251222~~ 2196

CALIBRATOR MFG/MODEL/SN: Ezcal/Sensidyne/251222

INITIAL CALIBRATION (QA) TO $\bar{X}$=4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4.0 TIME: 1545

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.0 TIME: 1620

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-28 TENAX CHARCOAL TUBE NUMBER: TC35

E-29 ~~CHARCOAL~~/TENAX TUBE NUMBER: T3262

STOP TIME: used stopwatch

hole open 1540 START TIME:

TIME ELAPSED (T) 10.00 MINUTES

COLLECTION CONDITIONS: intermittent vacuum conditions variable rotameter readings

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.75 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

1700

CLIENT: EPA ARCS DATE: 11/13/90 EPA SAS NO.: 5798E E-30, E-31

SITE: Hmco DONOHUE SPL NO.: HDTT-13

PROJECT NO.: 20026

SAMPLING TEAM: M Kuehl / D Downs / T Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 48 °F – 32 x 5/9 = _____ °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.23 mm Hg at 1215 AM/PM H_2S: 0 ppm

RELATIVE HUMIDITY: 92 % CH_4: 0 % LEL

WIND: 0 mph from _____

WEATHER: cool, dusk

SAMPLE GRID COORDINATES.: _____ N _____ E I-21

SAMPLING INTERVAL: 3.00 ft

SOIL CONDITIONS AT SURFACE: mounded sand - high point in berm

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: Ecal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO ~~X~~ $\bar{X}$ = 4.17 (n=7) L/MIN AT TIME: 0530

CALIBRATION VERIFICATION: ROTAMETER READING 4.0 TIME: 1645

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.0 TIME: 1715

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-30 TENAX + CHARCOAL TUBE NUMBER: TC3419 E-31 ~~CHARCOAL~~ TENAX TUBE NUMBER: T4723

STOP TIME: used stopwatch COLLECTION CONDITIONS: intermittent

hole open 1645 START TIME: variable rotameter, suction

TIME ELAPSED (T) 10.01.00 MINUTES created - noted upon sample train removal

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.75 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

0905

CLIENT: EPA ARCS DATE: 11/14/90 EPA SAS NO.: 5798E E-32, E-33

SITE: Himco DONOHUE SPL NO.: HDTT-14

PROJECT NO.: 20026

SAMPLING TEAM: M. Kuehl / D. Downs / T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 35 °F – 32 x 5/9 = 1.67 °C (tA)

BAROMETRIC PRESSURE (PA): 30.20 mm Hg at 0800 AM/PM

RELATIVE HUMIDITY: 81 %

WIND: 5-10 mph from SE

WEATHER: sunny, mild

HNu: 0 ppm

H_2S: 0 ppm

CH_4: 0 % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E D-24

SAMPLING INTERVAL: 3.0 ft

SOIL CONDITIONS AT SURFACE: Sandy, visible CaSO4

PUMP CALIBRATION

pump cal readings
4.17 4.19 4.25
4.23 4.08
4.16 4.11

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: Ezcal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO $\bar{X}$ = 4.17 n=7 L/MIN AT TIME: 0600

CALIBRATION VERIFICATION: ROTAMETER READING 4.00 TIME: 0840

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.00 TIME: ~~08~~ 0920 MAA

% DIFFERENCE 0

SAMPLE COLLECTION

E-32 TENAX + CHARCOAL TUBE NUMBER: TC4648

MAA E-33 ~~CHARCOAL~~ TENAX TUBE NUMBER: T4716

STOP TIME: used stop watch

START TIME:

TIME ELAPSED (T) 10.00 MINUTES

hole open 0845

COLLECTION CONDITIONS: drilled through waste, 3 separate "layers" felt during probe insertion

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

Vs = Vm x PA/760 x 298/(273 + ~~tA~~ 1.67) = 1.79 LITERS (Vs)*

30.20

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

.043

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

0945

CLIENT: EPA ARCS DATE: 11/14/90 EPA SAS NO.: 5798E E-34, E-35

SITE: Himco DONOHUE SPL NO.: HD IT-15

PROJECT NO.: 20026

SAMPLING TEAM: M Kuehl / D Downs / T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 35 °F – 32 x 5/9 = 1.67 °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.20 mm Hg at 0800 AM/PM H_2S: 0 ppm

RELATIVE HUMIDITY: 81 % CH_4: 0 % LEL

WIND: 5-10 mph from SE

WEATHER: sunny, mild

SAMPLE GRID COORDINATES.: _____ N _____ E F-25

SAMPLING INTERVAL: 3.0 ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilian / Gilair / 2169

CALIBRATOR MFG/MODEL/SN: Ecoal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO $\bar{X}$=4.17 n=7 L/MIN AT TIME: 0600

CALIBRATION VERIFICATION: ROTAMETER READING 4.00 TIME: 0935

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.00 TIME: 0955

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-34 TENAX & CHARCOAL TUBE NUMBER: TC3182 ~~CHARCOAL~~ TENAX TUBE NUMBER: T42 E-35

STOP TIME: used stopwatch

START TIME: hole open 0430 AM

TIME ELAPSED (T) 10.00 MINUTES

COLLECTION CONDITIONS: suction created at 30-60 seconds intermittent rotameter variability

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.79 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

1025

CLIENT: EPA ARCS DATE: 11/14/90 EPA SAS NO.: 5798E E-36, E-37

SITE: Homco DONOHUE SPL NO.: HDTT16

PROJECT NO.: 20026

SAMPLING TEAM: M Kuehl / D. Downs / T. Puchalski

SAMPLING CONDITIONS

TEMPERATURE: 35 °F – 32 x 5/9 = 1.67 °C (tA) HNu: 0 ppm

BAROMETRIC PRESSURE (PA): 30.20 mm Hg at 0800 AM/PM H_2S: 0 ppm

RELATIVE HUMIDITY: 81 % CH_4: 0 % LEL

WIND: 5-10 mph from SE

WEATHER: Sunny mild

SAMPLE GRID COORDINATES.: _____ N _____ E K-14

SAMPLING INTERVAL: 3.0 ft

SOIL CONDITIONS AT SURFACE: sandy, dead sumac

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: Ecal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO $\bar{X}$ = 4.17 n=7 L/MIN AT TIME: 0600

CALIBRATION VERIFICATION: ROTAMETER READING 4.00 TIME: 1005

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.00 TIME: 1035

% DIFFERENCE 0 %

SAMPLE COLLECTION

E-36 TENAX & CHARCOAL TUBE NUMBER: TC4126

hole open 1010

STOP TIME: used stopwatch

START TIME:

TIME ELAPSED (T) 10.00 MINUTES

non E-37 ~~CHARCOAL~~/TENAX TUBE NUMBER: T4727

COLLECTION CONDITIONS: Suction created, intermittent variable rotameter readings

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.79 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

1040

CLIENT: EPA ARCS DATE: 11/14/90 EPA SAS NO.: 5798E E-38, E-39

SITE: Hmco DONOHUE SPL NO.: HD FD TT16

PROJECT NO.: 20026

SAMPLING TEAM: M Kuehl / D. Downs / T. Pucholski

SAMPLING CONDITIONS

TEMPERATURE: 35 °F – 32 x 5/9 = 1.67 °C (tA)

BAROMETRIC PRESSURE (PA): 30.20 mm Hg at 0800 AM/PM

RELATIVE HUMIDITY: 91 %

WIND: 5-10 mph from SE

WEATHER: Sunny mild

HNu: 0 ppm

H_2S: 0 ppm

CH_4: 0 % LEL

SAMPLE GRID COORDINATES.: _____ N _____ E K-14

SAMPLING INTERVAL: 3.0 ft

SOIL CONDITIONS AT SURFACE: Sandy, dead sumac

PUMP CALIBRATION

PUMP MFG/MODEL/SN: Gilian / Gilair / 2196

CALIBRATOR MFG/MODEL/SN: Ecal / Sensidyne / 251222

INITIAL CALIBRATION (QA) TO $\bar{X}$=4.17 n=7 L/MIN AT TIME: 0600

CALIBRATION VERIFICATION: ROTAMETER READING 4.00 TIME: 0935

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING 4.00 TIME: 1100

% DIFFERENCE 0

SAMPLE COLLECTION

E-38 TENAX & CHARCOAL TUBE NUMBER: TC4742

~~CHARCOAL~~ TENAX TUBE NUMBER: T4698 E-39

STOP TIME: used stopwatch

START TIME:

TIME ELAPSED (T) 10.00 MINUTES

COLLECTION CONDITIONS: field dup at hole TT16

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = 10.00 x 4.17 = 41.7 LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = 1.74 \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/14 EPA SAS NO.: 5798E E-40 E-41

SITE: Hmco DONOHUE SPL NO.: HD-TI MS01

PROJECT NO.: 20026

SAMPLING TEAM: M Kuenl

SAMPLING CONDITIONS

TEMPERATURE: _____ °F – 32 x 5/9 = _____ °C (tA) HNu: _____ ppm

BAROMETRIC PRESSURE (PA): _____ mm Hg at _____ AM/PM H_2S: _____ ppm

RELATIVE HUMIDITY: _____ % CH_4: _____ % LEL

WIND: _____ mph from _____ not applicable

WEATHER: _____

SAMPLE GRID COORDINATES.: _____ N _____ E

SAMPLING INTERVAL: _____ ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION not applicable

PUMP MFG/MODEL/SN: _____

CALIBRATOR MFG/MODEL/SN: _____

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ *

SAMPLE COLLECTION

E-40 TENAX & CHARCOAL TUBE NUMBER: TC 4484 ~~CHARCOAL~~ Max E-41 TENAX TUBE NUMBER: T4717

STOP TIME: _____ COLLECTION CONDITIONS: _____

START TIME: not applicable matrix spike

TIME ELAPSED (T) _____ MINUTES unexposed tubes

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = _____ x _____ = LITERS (Vm) not applicable

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = _____ \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/14/90 EPA SAS NO.: 5798E E-42, E-43

SITE: Himco DONOHUE SPL NO.: HD IIMSD01

PROJECT NO.: 20026

SAMPLING TEAM: MKuehl

SAMPLING CONDITIONS

TEMPERATURE: _____ °F – 32 x 5/9 = _____ °C (tA) HNu: _____ ppm

BAROMETRIC PRESSURE (PA): _____ mm Hg at _____ AM/PM H_2S: _____ ppm

RELATIVE HUMIDITY: _____ % CH_4: _____ % LEL

WIND: _____ mph from _____ not applicable

WEATHER: _____

SAMPLE GRID COORDINATES.: _____ N _____ E

SAMPLING INTERVAL: _____ ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION

PUMP MFG/MODEL/SN: _____ not applicable

CALIBRATOR MFG/MODEL/SN: _____

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ *

SAMPLE COLLECTION

E-42 CHARCOAL TUBE NUMBER: TC4735 E-43 ~~CHARCOAL~~/TENAX TUBE NUMBER: T4673

STOP TIME: not applicable COLLECTION CONDITIONS: _____

START TIME: _____ matrix spike duplicate

TIME ELAPSED (T) _____ MINUTES unexposed tubes

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = _____ x _____ = _____ LITERS (Vm) not applicable

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = _____ \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/14/90 EPA SAS NO.: 5798E E-44, E-45

SITE: Hmco DONOHUE SPL NO.: HDTM502

PROJECT NO.: 20026

SAMPLING TEAM: M Kuehl

SAMPLING CONDITIONS

TEMPERATURE: _____ °F – 32 x 5/9 = _____ °C (tA) HNu: _____ ppm

BAROMETRIC PRESSURE (PA): _____ mm Hg at _____ AM/PM H_2S: _____ ppm

RELATIVE HUMIDITY: _____ % CH_4: _____ % LEL

WIND: _____ mph from _____ not applicable

WEATHER: _____

SAMPLE GRID COORDINATES.: _____ N _____ E

SAMPLING INTERVAL: _____ ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION

PUMP MFG/MODEL/SN: not applicable

CALIBRATOR MFG/MODEL/SN: _____

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ *

SAMPLE COLLECTION

E-44 CHARCOAL TUBE NUMBER: TC3148 not ~~CHARCOAL~~ E-45 TENAX TUBE NUMBER: T4715

STOP TIME: _____ COLLECTION CONDITIONS: _____

START TIME: not applicable matrix spike

TIME ELAPSED (T) _____ MINUTES unexposed tubes

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = _____ x _____ = _____ LITERS (Vm)

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = _____ \text{ LITERS (Vs)*}$$ not applicable

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

Donohue ENGINEERS ARCHITECTS SCIENTISTS

SOIL GAS SURVEY FORM

CLIENT: EPA ARCS DATE: 11/14/90 EPA SAS NO.: 5798E E-46, E-47

SITE: Homco DONOHUE SPL NO.: HD TMSD02

PROJECT NO.: 20026

SAMPLING TEAM: M. Kuehl

SAMPLING CONDITIONS

TEMPERATURE: _____ °F – 32 x 5/9 = _____ °C (tA) HNu: _____ ppm

BAROMETRIC PRESSURE (PA): _____ mm Hg at _____ AM/PM H_2S: _____ ppm

RELATIVE HUMIDITY: _____ % CH_4: _____ % LEL

WIND: _____ mph from _____

not applicable

WEATHER: _____

SAMPLE GRID COORDINATES.: _____ N _____ E

SAMPLING INTERVAL: _____ ft

SOIL CONDITIONS AT SURFACE: _____

PUMP CALIBRATION

PUMP MFG/MODEL/SN: _____ not applicable

CALIBRATOR MFG/MODEL/SN: _____

INITIAL CALIBRATION (QA) TO _____ L/MIN AT TIME: _____

CALIBRATION VERIFICATION: ROTAMETER READING _____ TIME: _____

*IF > 10%, SAMPLE TUBES SUSPECT, RESAMPLE ROTAMETER READING _____ TIME: _____

% DIFFERENCE _____ *

SAMPLE COLLECTION

E-46 CHARCOAL TUBE NUMBER: TC4141 MAL E-47 ~~CHARCOAL/TE~~NAX TUBE NUMBER: T4694

STOP TIME: _____ COLLECTION CONDITIONS: _____

START TIME: _____ not applicable matrix spike duplicates

TIME ELAPSED (T) _____ MINUTES unexposed tubes

TOTAL VOLUMETRIC FLOW CALCULATION

Vm = T x QA = _____ x _____ = _____ LITERS (Vm)

not applicable

$$Vs = Vm \times \frac{PA}{760} \times \frac{298}{273 + tA} = _____ \text{ LITERS (Vs)*}$$

*RECORD Vs IN LITERS ON SAS CHAIN OF CUSTODY REMARKS COLUMN.

F/SOIL GAS

ATTACHMENT C

LABORATORY RESULTS
FIELD TRIAL SAMPLES

Transmission from:

ITAS - Cincinnati
11499 Chester Road
Cincinnati, Ohio 45246

FAX # (513) 782-4644

Voice # (513) 782-4600

From: PATRICK FARRELL

Department: GC/MS

To: CHARLENE KHAZAE / MARCA KUHEL

Company: DONAHUE & ASSOCIATES

Department:

FAX #: 1-414-458-0550

Voice #:

Special Instructions/Comments:

FORM 1A & 1E FOR SAS PROJECT #5798-E
FOR FURTHER INFO CONTACT PATRICK FARRELL
@ 513-782-4805

Disposition of Original: ○ Return to Originator ○ Discard

Total Number of Pages including this cover sheet: 9 **FAX Operator:** PF

VOLATILE ORGANICS ANALYSIS DATA SHEET

HDT01-01

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E | 5798E-1 / 5798E-2

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: X0-11-064-01A

SAMPLE WT/VOL: NA

LAB FILE ID: 5798-E1

LEVEL:(low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not dec. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

CONCENTRATION UNITS: NG/L

CAS NO.	COMPOUND	~~NG/BG~~ DET. LIMIT	Q
74-87-3	CHLOROMETHANE	3 ~~10~~	U
74-83-9	BROMOMETHANE	3 ~~10~~	U
75-01-4	VINYL CHLORIDE	3 ~~10~~	U
75-00-3	CHLOROETHANE	3 ~~10~~	U
75-09-2	METHYLENE CHLORIDE	~~8~~ 3 ~~5~~	B
67-64-1	ACETONE	~~18~~ 5 ~~10~~	
75-15-0	CARBON DISULFIDE	2 ~~5~~	U
75-35-4	1,1-DICHLOROETHENE	2 ~~5~~	U
75-34-3	1,1-DICHLOROETHANE	2 ~~5~~	U
540-59-0	1,2-DICHLOROETHENE (TOTAL)	2 ~~5~~	U
67-66-3	CHLOROFORM	2 ~~5~~	U
107-06-2	1,2-DICHLOROETHANE	2 ~~5~~	U
78-93-3	2-BUTANONE	3 ~~10~~	U
71-55-6	1,1,1-TRICHLOROETHANE	2 ~~5~~	U
56-23-5	CARBON TETRACHLORIDE	2 ~~5~~	U
108-05-4	VINYL ACETATE	3 ~~10~~	U
75-27-4	BROMODICHLOROMETHANE	2 ~~5~~	U
78-87-5	1,2-DICHLOROPROPANE	2 ~~5~~	U
10061-01-5	cis-1,3-DICHLOROPROPENE	2 ~~5~~	U
79-01-6	TRICHLOROETHENE	2 ~~5~~	U
124-48-1	DIBROMOCHLOROMETHANE	2 ~~5~~	U
79-00-5	1,1,2-TRICHLOROETHANE	2 ~~5~~	U
71-43-2	BENZENE	~~2~~ 1 ~~5~~	J
10061-02-6	trans-1,3-DICHLOROPROPENE	2 ~~5~~	U
75-25-2	BROMOFORM	2 ~~5~~	U
108-10-1	4-METHYL-2-PENTANONE	3 ~~10~~	U
591-78-6	2-HEXANONE	3 ~~10~~	U
127-18-4	TETRACHLOROETHENE	2 ~~5~~	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	2 ~~5~~	U
108-88-3	TOLUENE	~~72~~ 24 ~~5~~	
108-90-7	CHLOROBENZENE	2 ~~5~~	U
100-41-4	ETHYL BENZENE	2 ~~5~~	U
100-42-5	STYRENE	2 ~~5~~	U
1330-20-7	XYLENE (TOTAL)	2 ~~5~~	U

FORM 1 A VOA

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENATIVELY IDENTIFIED COMPOUNDS

HDT01-01

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E | 5798-E1 / 5798-E2

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: X0-11-064-01A

SAMPLE WT/VOL: NA

LAB FILE ID: 5798-E1

LEVEL:(low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not deo. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

NUMBER OF TIC'S FOUND: 2

CONCENTRATION UNITS: NG/L

CAS NUMBER	COMPOUND NAME	RET. TIME	~~NG/OC~~	Q
76-13-1	112-TRICHLORO-122-TRIFLUOROETHANE	9.22	20 ~~68~~	J
	UNKNOWN HYDROCARBON	11.26	3 ~~10~~	J

1HOTT02-01

VOLATILE ORGANICS ANALYSIS DATA SHEET

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E | 5798E-3 / 5798E-4

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: XD-11-064-02A

SAMPLE WT/VOL: NA

LAB FILE ID: 5798-E3

LEVEL (low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not dec. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

CONCENTRATION UNITS: NG/L

CAS NO.	COMPOUND	~~NG/DC~~ DET. LIMIT	Q
74-87-3	CHLOROMETHANE	5 ~~10~~	U
74-83-9	BROMOMETHANE	5 ~~10~~	U
75-01-4	VINYL CHLORIDE	5 ~~10~~	U
75-00-3	CHLOROETHANE	5 ~~10~~	U
75-09-2	METHYLENE CHLORIDE	~~17~~ 8 ~~5~~	B
67-64-1	ACETONE	~~18~~ 8 ~~10~~	
75-15-0	CARBON DISULFIDE	~~7~~ 3 ~~5~~	
75-35-4	1,1-DICHLOROETHENE	2 ~~5~~	U
75-34-3	1,1-DICHLOROETHANE	2 ~~5~~	U
540-59-0	1,2-DICHLOROETHENE (TOTAL)	2 ~~5~~	U
67-66-3	CHLOROFORM	2 ~~5~~	U
107-06-2	1,2-DICHLOROETHANE	2 ~~5~~	U
78-93-3	2-BUTANONE	5 ~~10~~	U
71-55-6	1,1,1-TRICHLOROETHANE	~~8~~ 2 ~~5~~	
56-23-5	CARBON TETRACHLORIDE	2 ~~5~~	U
108-05-4	VINYL ACETATE	5 ~~10~~	U
75-27-4	BROMODICHLOROMETHANE	2 ~~5~~	U
78-87-5	1,2-DICHLOROPROPANE	2 ~~5~~	U
10061-01-5	cis-1,3-DICHLOROPROPENE	2 ~~5~~	U
79-01-6	TRICHLOROETHENE	2 ~~5~~	U
124-48-1	DIBROMOCHLOROMETHANE	2 ~~5~~	U
79-00-5	1,1,2-TRICHLOROETHANE	2 ~~5~~	U
71-43-2	BENZENE	~~1~~ 2 ~~5~~	J
10061-02-6	trans-1,3-DICHLOROPROPENE	2 ~~5~~	U
75-25-2	BROMOFORM	2 ~~5~~	U
108-10-1	4-METHYL-2-PENTANONE	5 ~~10~~	U
591-78-6	2-HEXANONE	5 ~~10~~	U
127-18-4	TETRACHLOROETHENE	2 ~~5~~	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	2 ~~5~~	U
108-88-3	TOLUENE	~~67~~ 31 ~~5~~	
108-90-7	CHLOROBENZENE	2 ~~5~~	U
100-41-4	ETHYL BENZENE	2 ~~5~~	U
100-42-5	STYRENE	2 ~~5~~	U
1330-20-7	XYLENE (TOTAL)	2 ~~5~~	U

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENATIVELY IDENTIFIED COMPOUNDS

HDT102-01

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E 5798-E3 / 5798-E4

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: X0-11-064-02A

SAMPLE WT/VOL: NA

LAB FILE ID: 5798-E3

LEVEL:(low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not dec. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

NUMBER OF TIC'S FOUND: 3

CONCENTRATION UNITS: NG/L

CAS NUMBER	COMPOUND NAME	RET. TIME	~~NG/OG~~	Q
76-13-1	112-TRICHLORO-122-TRIFLUOROETHANE	9:18	100 ~~300~~	J
	UNKNOWN HYDROCARBON	11:22	10 ~~20~~	J
	UNKNOWN HYDROCARBON	16:22	4 ~~8~~	J

VOLATILE ORGANICS ANALYSIS DATA SHEET

HDT03-01

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E | 5798E-5 / 5798E-6

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: X0-11-064-03A

SAMPLE WT/VOL: NA

LAB FILE ID: 5798-E5

LEVEL (low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not dec. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

CONCENTRATION UNITS: NG/L

CAS NO.	COMPOUND	~~NG/DG~~	Q
		DET. LIMIT	
74-87-3	CHLOROMETHANE	11 ~~10~~	U
74-83-9	BROMOMETHANE	11 ~~10~~	U
75-01-4	VINYL CHLORIDE	11 ~~10~~	U
75-00-3	CHLOROETHANE	11 ~~10~~	U
75-09-2	METHYLENE CHLORIDE	~~15~~ 16 ~~5~~	B
67-64-1	ACETONE	~~15~~ 18 ~~10~~	
75-15-0	CARBON DISULFIDE	6 ~~5~~	U
75-35-4	1,1-DICHLOROETHENE	6 ~~5~~	U
75-34-3	1,1-DICHLOROETHANE	6 ~~5~~	U
540-59-0	1,2-DICHLOROETHENE (TOTAL)	6 ~~5~~	U
67-66-3	CHLOROFORM	6 ~~5~~	U
107-06-2	1,2-DICHLOROETHANE	6 ~~5~~	U
78-93-3	2-BUTANONE	11 ~~10~~	U
71-55-6	1,1,1-TRICHLOROETHANE	6 ~~5~~	U
56-23-5	CARBON TETRACHLORIDE	6 ~~5~~	U
108-05-4	VINYL ACETATE	11 ~~10~~	U
75-27-4	BROMODICHLOROMETHANE	6 ~~5~~	U
78-87-5	1,2-DICHLOROPROPANE	6 ~~5~~	U
10061-01-5	cis-1,3-DICHLOROPROPENE	6 ~~5~~	U
79-01-6	TRICHLOROETHENE	6 ~~5~~	U
124-48-1	DIBROMOCHLOROMETHANE	6 ~~5~~	U
79-00-5	1,1,2-TRICHLOROETHANE	6 ~~5~~	U
71-43-2	BENZENE	2 ~~5~~	J
10061-02-6	trans-1,3-DICHLOROPROPENE	6 ~~5~~	U
75-25-2	BROMOFORM	6 ~~5~~	U
108-10-1	4-METHYL-2-PENTANONE	11 ~~10~~	U
591-78-6	2-HEXANONE	11 ~~10~~	U
127-18-4	TETRACHLOROETHENE	6 ~~5~~	U
79-34-5	1,1,2,2-TETRACHLOROETHANE	6 ~~5~~	U
108-88-3	TOLUENE	~~19~~ 21 ~~5~~	
108-90-7	CHLOROBENZENE	6 ~~5~~	U
100-41-4	ETHYL BENZENE	6 ~~5~~	U
100-42-5	STYRENE	6 ~~5~~	U
1330-20-7	XYLENE (TOTAL)	6 ~~5~~	U

HDTT03-01

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENATIVELY IDENTIFIED COMPOUNDS

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E | 5798-E5 / 5798-E6

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: X0-11-064-03A

SAMPLE WT/VOL: NA

LAB FILE ID: 5798-E5

LEVEL (low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not dec. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

NUMBER OF TIC'S FOUND: 1

CONCENTRATION UNITS: NG/L

CAS NUMBER	COMPOUND NAME	RET. TIME	~~NG-BC~~	Q
76-13-1	112-TRICHLORO-122-TRIFLUOROETHANE	9:20	200	J

VOLATILE ORGANICS ANALYSIS DATA SHEET

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E | VBLKAC0

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: VBLKAC0

SAMPLE WT/VOL: NA

LAB FILE ID: VBLKAC0

LEVEL (low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not dec. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

CONCENTRATION UNITS:

CAS NO.	COMPOUND	NG/DC		Q
			DET. LIMIT	
74-87-3	CHLOROMETHANE		10	U
74-83-9	BROMOMETHANE		10	U
75-01-4	VINYL CHLORIDE		10	U
75-00-3	CHLOROETHANE		10	U
75-09-2	METHYLENE CHLORIDE	10	5	
67-64-1	ACETONE		10	U
75-15-0	CARBON DISULFIDE		5	U
75-35-4	1,1-DICHLOROETHENE		5	U
75-34-3	1,1-DICHLOROETHANE		5	U
540-59-0	1,2-DICHLOROETHENE (TOTAL)		5	U
67-66-3	CHLOROFORM		5	U
107-06-2	1,2-DICHLOROETHANE		5	U
78-93-3	2-BUTANONE	13	10	
71-55-6	1,1,1-TRICHLOROETHANE		5	U
56-23-5	CARBON TETRACHLORIDE		5	U
108-05-4	VINYL ACETATE		10	U
75-27-4	BROMODICHLOROMETHANE		5	U
78-87-5	1,2-DICHLOROPROPANE		5	U
10061-01-5	cis-1,3-DICHLOROPROPENE		5	U
79-01-6	TRICHLOROETHENE		5	U
124-48-1	DIBROMOCHLOROMETHANE		5	U
79-00-5	1,1,2-TRICHLOROETHANE		5	U
71-43-2	BENZENE		5	U
10061-02-6	trans-1,3-DICHLOROPROPENE		5	U
75-25-2	BROMOFORM		5	U
108-10-1	4-METHYL-2-PENTANONE	17	10	
591-78-6	2-HEXANONE	39	10	
127-18-4	TETRACHLOROETHENE		5	U
79-34-5	1,1,2,2-TETRACHLOROETHANE		5	U
108-88-3	TOLUENE		5	U
108-90-7	CHLOROBENZENE		5	U
100-41-4	ETHYL BENZENE		5	U
100-42-5	STYRENE		5	U
1330-20-7	XYLENE (TOTAL)		5	U

FORM 1A VOA

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENATIVELY IDENTIFIED COMPOUNDS

LAB NAME: PEI ASSOCIATES

CONTRACT: SAS 5798-E VBLKAC0

SAMPLE MATRIX: TENAX

LAB SAMPLE ID: VBLKAC0

SAMPLE WT/VOL: NA

LAB FILE ID: VBLKAC0

LEVEL:(low/med) LOW

DATE RECIEVED: 11/8/90

% MOISTURE: not dec. NA

DATE ANALYZED: 11/8/90

DILUTION FACTOR: 1

NUMBER OF TIC'S FOUND: 0

CONCENTRATION UNITS:

CAS NUMBER	COMPOUND NAME	RET. TIME	NG OC	Q

FORM 1E VOA-TIC

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 13

DATE: December 10, 1990

TO: Vanessa Harris
Project Files, Himco Dump Site

CC: M. Kuehl - RI Lead
R. Gau - Project Manager
M. Crosser - TSQAM

FROM: Rob Cannestra, Hydrogeologist

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump RI/FS Phase I

INSTALLATION OF WATER TABLE WELLS AND LANDFILL CAP SAMPLING

Introduction

Six shallow observations wells were installed on or adjacent to the Himco Dump site between the dates of November 5, 1990, and November 14, 1990. Water table observation wells were installed to obtain water elevation information and to allow for groundwater sampling. Tasks associated with the installation of these wells included logging and classification of continuously sampled soils, field screening of soil samples, collection of soil samples for chemical and geotechnical analysis, and well installation. In addition, geotechnical samples were taken from five locations on the landfill cap. Landfill cap samples were collected for testing to determine the engineering properties of the cap. The following text summarizes the methods and procedures used to complete these tasks and point out deviations from procedures written in the Field Sampling Plan (FSP) or drilling specifications.

Drilling and Sampling

Soil borings BRG-1 through BRG-6 were advanced using hollow stem auger techniques. The subcontractor, John Mathes and Associates (Mathes), used a Central Mine Equipment (CME) 550 ATV rig equipped with 4.25-inch ID (8.0-inch OD) hollow stem augers to complete these borings. All borings were continuously sampled from ground surface to total depth using a 3-inch OD stainless steel split spoon sampler. Two stainless steel split spoon samplers were used. Split spoon samplers were decontaminated between sampling intervals according to the following steps: (1) tap water rinse, (2) alconox wash, (3) tap water rinse, (4) isopropanol rinse, (5) two deionized water rinses.

At each location, borings were drilled and sampled to a depth of 16.0 feet to allow the well screen to be installed intersecting the water table. All borings were extended a nominal one foot by blind drilling with the hollow stem augers. The extension of borings was completed to accommodate any formation collapse during monitoring well installation. After completing a well installation, the drill rig and drilling tools were steam cleaned before proceeding to the next installation.

Field Screening and Logging of Soil Samples

After recovering the split spoon and immediately upon opening the sampler barrel, soil samples were field screened by slowly running an HNu photoionization detector (PID) over the length of the sample. The highest PID reading observed for each sample interval was recorded on the boring log.

After field screening, samples were collected for volatile organic compound (VOC) and other chemical analyses. Samples were logged by recording the attempted sample interval, sample length recovered, blow counts, and providing a visual description of the soil. Sample descriptions included the sample color (reference Munsell color chart), relative density, major and minor soil components, general engineering properties and references to the depositional environment. Based on these observations, soils were classified according to the Unified Soil Classification System (USCS). Completed soil boring logs are attached in Appendix A.

Sample Collection

Samples were collected for chemical and geotechnical analysis. Chemical sampling included samples for VOC, base neutrals (BNA), polychlorinated biphenyls (PCBs), cyanide and metals analysis. Geotechnical sampling included samples for Total Organic Carbon (TOC), Atterberg limits and grain size analyses. Samples collected during the completion of borings for water table well installations are summarized in Table 1.

Chemical Sampling

VOC samples were collected immediately after field screening the split spoon. Two 120 ml jars were filled with soil taken over the entire length of the recovered sample for VOC analysis. After filling the VOC sample jars, the remaining soil was emptied into a stainless steel mixing bowl and mixed with a stainless steel spoon. After mixing, two 8 oz. composite samples were taken of the homogenous soil mixture for BNA, PCB, and metals analyses. The sample mixing bowl and spoon were decontaminated between samples by the same method as the split spoon samplers.

According to the Work Plan, chemical samples were to be taken from the first five split spoons (upper 10 feet) at each shallow well location. However, elevated PID readings, peculiar odors or visual signs of contaminations required the collection of samples at depths below 10 feet. In these cases, the additional deeper samples were substituted for shallower samples displaying no signs of contamination. Potentially contaminated samples were collected below 10-foot depths in borings BRG-03, BRG-05, and BRG-06.

TABLE 1

RECORD OF COLLECTED SOIL SAMPLES
WATER TABLE WELL BORINGS
Himco Dump Site
December, 1990

Boring	Depth Interval (Feet)	CHEMICAL SAMPLING VOCs	BNA/PCB Pesticides	Metals Cyanide	Duplicate	GEOTECHNICAL SAMPLING TOC	Atterberg Limits	Grain Size
BRG-01	0-2	X	X	X		X		
	2-4	X	X	X				
	4-6	X	X	X				
	6-8	X	X	X	X			
	10-12	X	X	X				
	14-16						X	X
BRG-02	0-2	X	X	X				
	2-4	X	X	X		X		
	4-6	X	X	X				
	6-8	X	X	X				
	8-10	X	X	X				
	14-16						X	X
BRG-03	0-2	X	X	X				
	2-4	X	X	X				
	4-6	X	X	X	X			
	6-8	X	X	X				
	8-10					X		
	14-16	X	X	X			X	X
BRG-04	0-2	X	X	X				
	2-4	X	X					
	4-6	X	X	X				
	6-8	X	X	X				
	8-10	X	X	X				
	14-16						X	X

TABLE 1

RECORD OF COLLECTED SOIL SAMPLES
WATER TABLE WELL BORINGS
Himco Dump Site
December, 1990
(continued)

Boring	Depth Interval (Feet)	CHEMICAL SAMPLING VOCs	BNA/PCB Pesticides	Metals Cyanide	Duplicate	GEOTECHNICAL SAMPLING TOC	Atterberg Limits	Grain Size
BRG-05	2-4	X	X	X	X			
	8-10	X	X	X				
	10-12	X	X	X				
	12-14	X	X	X				
	14-16	X	X	X		X	X	X
BRG-06	0-2	X	X	X				
	4-6	X	X	X				
	6-8					X	X	X
	8-10	X	X	X				
	12-14	X	X	X				
	14-16	X	X	X				

W/A/AG7

Geotechnical Samples

Geotechnical samples were collected randomly from borings completed for the installation of shallow observation wells. With the exception of boring BRG-06, samples for Atterberg limits and grain size analysis were taken in the interval to be screened during the well installation. Samples for Total Organic Carbon (TOC) analysis were not collected from every boring completed for the installation of shallow observation wells.

Geotechnical samples were collected after retrieval of chemical samples from the remaining composited soil. One 8 oz. jar was collected for Atterberg limit and grain size analysis. An additional 8 oz. jar sample was taken for TOC analysis when applicable.

All samples were labelled, packaged, and shipped according to the details of the field sampling plan. The site sample custodian completed the appropriate chain-of-custody documentation. Samples were shipped to the appropriate labs by Federal Express.

Well Installations

Shallow observation wells W-101A through W-106A were installed to intersect the water table., Observations made during the drilling and sampling of borings completed for the installation of the wells were used to determine the depth of the water table. Because of the shallow water table encountered, modifications were made to the general well specifications to ensure that the well screens intersected the water table. Table 2 summarizes well construction information and general well information for water table observation wells at the Himco Dump site. Well construction diagrams are included in Appendix B.

Wells were constructed using Schedule 5, Type 304, flush threaded stainless steel riser attached to 10-foot, continuous wire wrap, 0.010-inch slot, stainless steel screens. Stainless steel screens and riser were manufactured by Diedrich. Well screens and riser were steam cleaned immediately proceeding installation, handled only while wearing clean latex gloves, and wrapped in protective plastic during transport. All flush threaded joints were wrapped with teflon tape to provide a tight seal. A concentrated effort was made to assure that well construction materials were not contaminated during handling or installation.

In general, observation wells were installed to depths of approximately 16 feet rather than the anticipated 20 feet. To allow for the installation of a 10-foot screen in these shallower borings, the thickness of the filter pack overlying the screen, bentonite seal, and concrete cap were decreased. In the modified well installations, filter packs were extended from 0.3 (WT-105A) to 1.2 (WT-101A) feet above the top of the well screen. Bentonite pellet seals were cut to a nominal 1.0-foot thickness rather than the specified 2.0 feet. The accuracy of measured depths was assured by the shallowness of these installations.

TABLE 2

WATER TABLE OBSERVATION WELL INFORMATION
Himco Dump Site
December 1990

Well Number	State Plane Coordinates North	State Plane Coordinates East	Top of Pipe Elevation	Screen Length (Feet)	Depth to Bottom of Well (Feet)	Depth to Bottom of boring (Feet)	Depth to Bottom of Bentonite Seal (Feet)
WT-101A	1,531,617.69	407,617.00	764.35	10	16.3	17.5	4.2
WT-102A	1,534,861.43	405,928.37	769.08	10	16.0	16.8	4.5
WT-103A	1,532,537.90	405,532.73	760.59	10	16.0	17.0	4.0
WT-104A	1,531,496.08	406,013.86	765.57	10	16.3	17.6	4.3
WT-105A	1,531,174.04	407,105.64	762.94	10	16.0	16.8	4.9
WT-106A	1,530,932.11	407,806.75	761.47	10	16.2	17.0	5.0

A/R/HIMCO/AH1

In addition, to facilitate the timely completion of wells, hydration times at several locations were shortened to approximately one-half hour. The integrity of these seals was visually checked prior to the installation of a concrete cap. Finally, concrete cap thickness was reduced from a specified 5.0 feet to a nominal 3.0-foot thickness to accommodate the shallow installation. None of these modifications is expected to adversely affect the performance of these wells.

Despite efforts made to ensure that well screens intersected the water table, the extremely shallow water table at the location of WT-103A made this impossible. During installation, depth to water in WT-103A was approximately 4.0 feet, placing the water level above the interval to be screened. Temporal fluctuations may cause water levels to decrease, potentially lowering the water level into the screened interval at this location.

Landfill Cap Geotechnical Samples

Geotechnical samples, including jar samples for grain size and Atterberg limit testing, and shelby tube samples for consolidation undrained triaxial shear were recovered from five locations on the landfill cap. Landfill cap sample locations varied slightly from those originally specified because they were located at points on the geophysical survey grid rather than the proposed site survey grid. The site survey grid was not completed at the time landfill cap samples were taken. Rather than sample at random or approximate locations on the cap, samples referenced geophysical survey grid points. Landfill cap geotechnical sample locations are included in the site location map (Figure 1).

Landfill cap samples were recovered by digging through the topsoil cover (average thickness approximately 0.5 feet) to the calcium sulfate cap. Once the cap was encountered, excavations were extended by hand to a depth of approximately 1.5 feet. At this depth, two pint size jar samples were collected for grain size and Atterberg limit testing. After collecting jar samples, the CME 550 drill rig was used to push 24-inch shelby tubes. The dense nature of the calcium sulfate cap made pushing the tubes difficult. At several locations, shelby tubes appeared to penetrate through the cap material into waste. If shelby tubes potentially encountered waste, they were marked as containing potential waste on the tube exterior. Additional shelby tube samples were attempted at two locations for one-dimensional consolidation testing, however, no sample was recovered at one location (adjacent to GE-01). Geotechnical sample holes were backfilled with spoils and hand compacted.

Atmospheric Monitoring

Air quality monitoring within the breathing zone and at the borehole was completed after recovery of the samples. A PID was used to monitor for volatile organic compounds. A GasTech® meter was used to monitor the levels of hydrogen sulfide (H_2S), oxygen, and indicate the percent of the Lower Explosive Limit (LEL) for methane. A miniRAD radiation detector was used to monitor for radioactivity. The highest readings produced by each instrument were recorded in the sections provided on the boring log. During the drilling and sampling of BRG-06, one sampling team member became physically ill while jarring samples from the 12 to 14-foot depth interval. However, atmospheric monitoring of

the borehole and recovered sample did not show any elevated readings at this depth. Atmospheric monitoring results recorded during the completion of borings is included in the completed soil boring logs attached in Appendix A.

Atmospheric monitoring was completed periodically during well installations. Efforts were made to take readings at the beginning of the installation procedure and during the installation as sections of auger were removed from the boring. Atmospheric monitoring during well installations was generally terminated after the installation of the bentonite seal as the boring was then considered effectively plugged off. Results of atmospheric monitoring during well installations were recorded on daily atmospheric monitoring logs attached in Appendix B.

During the recovery of geotechnical samples from the landfill cap, atmospheric monitoring was complete as shallow excavations were completed and as shelby tubes were withdrawn. Atmospheric readings taken during geotechnical sampling of the landfill cap were recorded on daily atmospheric monitoring logs attached in Appendix C.

No elevated levels were recorded during atmospheric monitoring conducted during the completion of shallow wells and landfill cap geotechnical sampling.

SUMMARY

Six shallow soil borings were completed for the installation of water table observation wells. Soil samples were recovered for chemical analysis from the 0 to 10-foot depth interval or if contamination was indicated or observed, from intervals below 10 feet. Contamination was observed at depths below 10 feet in borings BRG-01, BRG-03, BRG-05, and BRG-06. Soil samples were submitted for VOC, BNA, PCB, pesticides, metals and cyanide analyses. Select soil samples were submitted for geotechnical analyses including TOC, grain size, and Atterberg limits.

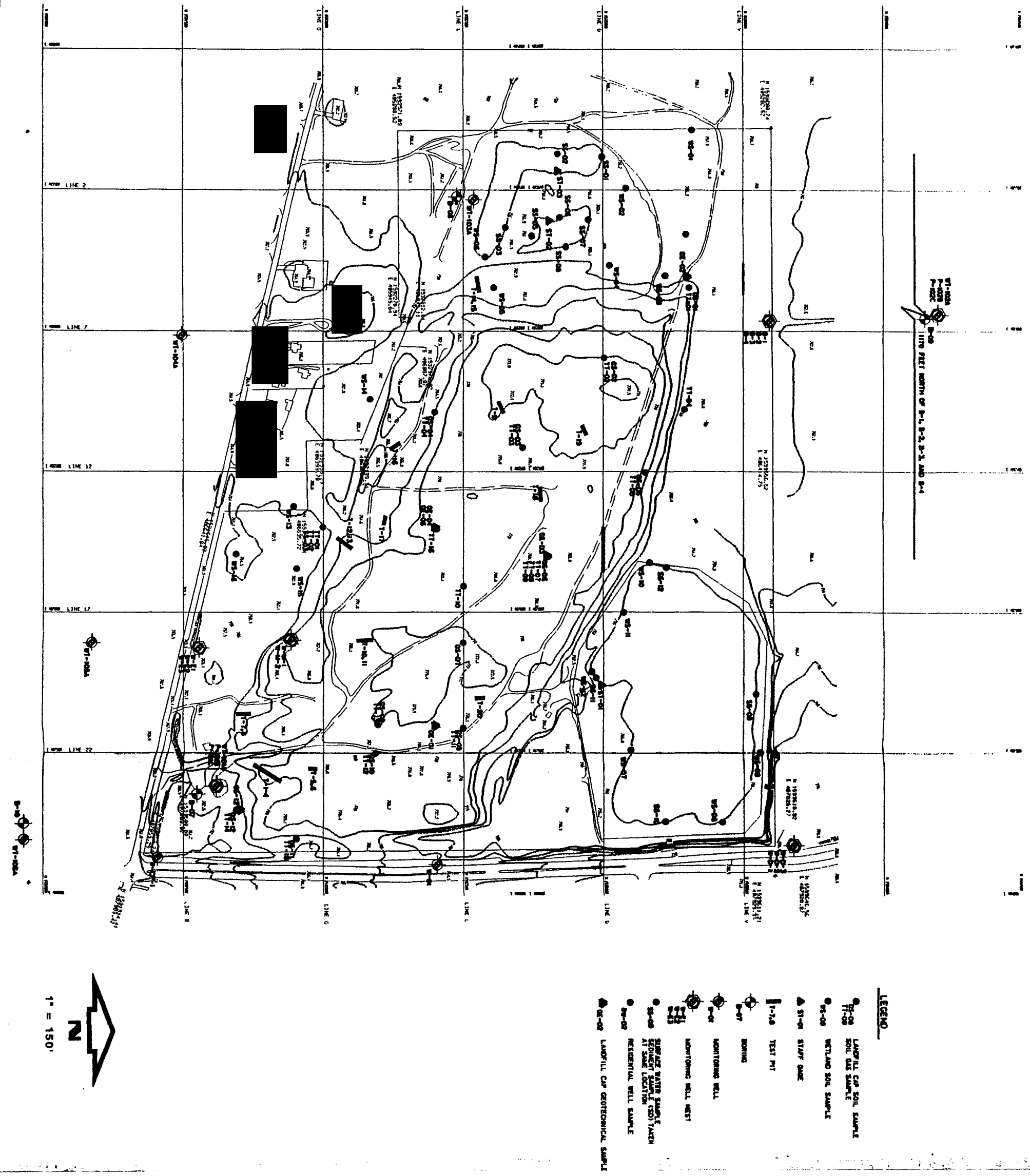
Six water table observation wells were installed to intersect the water table. These wells were constructed to provide groundwater elevation information and to facilitate groundwater sampling. Concrete cap and bentonite seal thicknesses were modified to accommodate proper screening due to the shallow water table. Despite these efforts, the water level in WT-103A is above the well screen.

Geotechnical samples of the landfill cap below the surface cover were collected to determine the engineering properties of the cap. Jar and shelby tube samples of the landfill cap were collected and submitted for grain size, Atterberg limit, consolidation undrained triaxial shear, and non-dimensional consolidation testing. Shelby tube samples were potentially pushed into waste material and were appropriately labeled. At one shelby tube sample location, no sample was recovered.

A/R/HIMCO/AG8

FIGURE 1

SAMPLE LOCATION MAP



MAY 1991

FIGURE 1
SITE LOCATION MAP
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20026

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APPENDIX A

SOIL BORING LOGS

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: HMCC DUMP PROJECT NO. 20023.023

SOIL BORING NO. BRG-01

DRILLING METHOD: CME 550 4 1/4" I.D. HOLLOW STEM AUGERS (10.25" O.D.)
LOG BY: R. CANNESTRA
DRILLER: D. ELLIS
WEATHER: PTLY CLDY, 45°, NW WIND

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
11/12/90	13:--	10.4	17.8

PHYSICAL SETTING: GRASS ADJACENT TO LANDFILL

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/12/90
DATE COMPLETE:
WELL INSTALLATION: WT-101A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS (BKGRND HNu 0.2)	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O2 / LEL	H2S / CO	
	EOLIAN	OL-SM	MED DENSE, 10YR 2/1 BLACK SILTY SAND, TOPSOIL	22				SS-1	0-2'	13:51	0.2	21.2/0	0/0	A
1	OUTWASH	SP	MED. DENSE 10YR 5/6 YELLOWISH BROWN SAND (MEDIUM, SUBANG, FROSTED QUARTZITIC GRAINS) TR F-CRS SAND, TR SM GRAVEL (SUBANG-ANG, DOLOMITIC CLASTS) NON-PLAS NON COHESIVE, TR SILT, DAMP					3"	0.2					
							19		IN SPOON					
2	OUTWASH	SP	MED. DENSE, 10YR 5/8, YELLOWISH BROWN SAND (F-M, SUBANG-ANG, FROSTED, QUARTZITIC GRAINS) NON PLASTIC, NON COHESIVE, SOME Fe_2O_3 STAINING & MOTTLING IN LOWER 6-8" OF SPOON, DAMP.	16				SS-2	2'-4'	13:57	0.2	21.1/0	0/0	B
3								3"	0.2					
							16		IN SPOON					
4	OUTWASH	SP	MED DENSE, MOTTLED 10YR 7/4 & 10YR 4/1 VERY PALE BROWN/DARK YELLOWISH BROWN SAND (MEDIUM, SUBANG-SUBRND, FROSTED QUARTZITIC GRAINS) TR CRS SAND, TR SMALL GRAV (ANG-SUBANG, DOLOMITIC CLASTS) NON PLASTIC, NONCOHESIVE, DAMP	17				SS-3	4'-6'	14:24	0.2	21.1/0	0/0	C
5								3"	0.2					
									IN SPOON					
			NOTE TIP OF SPOON APPEARS WET				19							
6	OUTWASH	SP	MED. DENSE 10YR 5/6, YELLOWISH BROWN, SAND (MEDIUM, SUBANG-SUBRND, FROSTED, QUARTZITIC GRAINS) TRACE CRS SAND, TR SM GRAVEL (DOLOMITIC CLASTS) NON PLASTIC, NON-COHESIVE, MOIST-WET	13				SS-4	6'-8'	14:29	0.2	21.1/0	0/0	D
7								3"	0.2	DUPLICATE				BEHP
			COLOR CHANGE @ 7.5YR 7/1 TO 10YR 5/3 BROWN, SLIGHT COARSENING @ THIS DEPTH ALSO						IN SPOON					
8							20							
	OUTWASH	SP	LOOSE, 10YR 5/4 YELLOWISH BROWN SAND (MEDIUM, SUBANG-SUBRND, FROSTED, QUARTZITIC GRAINS) TR CRS SAND, NON PLASTIC, SLIGHT COHESION, SATURATED	10				SS-5	8'-10'	14:46	0.2	21.2/0	0/0	E
9								3"	0.2					
									IN SPOON					
10							21							
	OUTWASH	SP	VERY LOOSE, 10YR 5/4 YELLOWISH BROWN SAND (MEDIUM-CRS, SUBANG-SUBRND, QUARTZITIC GRAINS), NON PLAS NON COHESIVE, @ 10.7 COLOR CHANGE TO 7.5YR 3/0	3				SS-6	10'-12'	15:00	0.2	21.1/0	0/0	F
11		BROWN						3"	0.2					
		BLACK	BLACK SAND (M-CR, SUBANG-SUBRND, FROSTED, QUARTZITIC GRAINS, TR GRAVEL SUBANG, DOLOMITIC CLASTS) NON PLASTIC, SLIGHT COHESION				12		IN SPOON					
12	OUTWASH		SATURATED, NO ODOR	52				SS-7	12'-14'	15:15	0.2	21.1/0	0/0	G
		SP	VERY DENSE, 10YR 4/1 DARK GRAY SAND (MEDIUM-CRS, SUBRND-SUBANG, FROSTED QUARTZITIC GRAINS) TR SM GRAVEL (SUBANG, DOLOMITIC CLASTS) NON PLASTIC NONCOHESIVE, FEW MICA, SATURATED					3"	0.2					
13							12		IN SPOON					
14			DENSE 10YR 4/1 DK GRAY SAND (MEDIUM, SUBANG-SUBRND, FROSTED, QUARTZITIC GRAINS, TR SM-M GRAVEL (DK GRAY	47				SS-8	14'-16'	15:27	0.2	21.1/0	0/0	
								3"						

Sheet __ of __

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BORING LOG

SITE: HIMCO DUMP PROJECT NO. 20026.023

SOIL BORING NO. BRG-01

DRILLING METHOD: CME 550 4¼ IN ID HOLLOW STEM AUGERS (0.65' OD)
LOG BY: R CANNESTRA
DRILLER: D. ELLIS
WEATHER:

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/12/90
DATE COMPLETE: 11/12/90
WELL INSTALLATION: WT-10A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL	H_2S/ZAP
		SP	NON PLASTIC, NON COHESIVE, FETID ODOR, SATURATED				17			SEE PREVIOUS PAGE			
-16			BLIND DRILL BRG-01 TO 17.0' TO ALLOW FOR 'SLUFF' DURING WELL INSTALLATION. NO SAMPLE TAKEN 16.0' TO 17.0'										
-17			END OF BORING BRG-01 11/12/90 @ 15:40 TOTAL DEPTH 17.0'										
-18			Kelly Cannestra										
-19													
-20													

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. BRG-2

SITE: HIMCO DUMP PROJECT NO. 20026.

DRILLING METHOD: 0.65' OD (4¼ IN ID) HOLLOW STEM AUGERS WITH CME 550
LOG BY: R. CANNESTRA
DRILLER: D. ELLIS
WEATHER: CLEAR, LT BREEZE, 40°-48°

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
11/10	12:20	0.4	AUGERS @ 16

BACKGROUND PID 0.2
PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/10/90
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O2 / LEL	RAD
	EOLIAN	OL-SM	MD, 10YR 3/3, DK BROWN SILTY ORGANIC SAND SAND F-M, Tr Co SAND & Sm GRAV (SUBANG, DOLO) SLIGHTLY COHESIVE, NONPLASTIC, MOIST	11				SS-1	0-2	13:35	0.2	20.5/0	0
1.0								3"	0.2 IN SPOON				
	OUTWASH	SP-SM	MD, 10YR 3/6, DK YELLOWISH BROWN SILTY SAND SAND (M-F), Tr Sm, DOLO, SUBANG GRAVEL SLIGHT COHESIVE, NON PLASTIC, MOIST				20						
2		SP	MD, 10YR 4/6, DK YELLOWISH BROWN, SAND F-M, SUBROUNDED FROSTED QUARTZITIC GRAINS, Tr (7-8%) Sm-M, SUBANG Tr SUBRND, DOLO, GRAVEL, NON PLASTIC, NON COHESIVE, MOIST - DAMP	13				SS-2	2-4	13:45	0.2	20.3/0	0
								3"	0.2 IN SPOON				
3							7						
4		SP	D 10YR 6/3 PALE BROWN SAND, FM, QUARTZITIC FROSTED, SUBANG-SUBRND GRAINS, NON PLAS, NON COHESIVE, MOIST, Tr	32				SS-3	4-6	14:20	0.2	20.5/0	0
								3"	0.2				
5			MOTTLED W/ DK YELLOWISH BROWN @ 5.5						IN SPOON SPLIT SAMPLE W/ MILES				
6	OUTWASH	SP	MD, 10YR 6/2, PALE BROWN MOTTLED W/ 10YR 5/8, SAND, F-M, QUARTZITIC, FROSTED, SUBRND-RND GRAINS, Tr SILT NON PLASTIC, SLIGHT COHESION, Tr ORGANIC FRAGMENTS, MOIST	27				SS-4	6-8	14:26	0.2	20.4/0	0
								3"	0.2 IN SPOON				
							18						
8		SP	MD, 10YR 6/4, LT YELLOWISH BROWN, SAND F-M SUBRND, FROSTED, QUARTZITIC GRAINS, Tr SILT, NON PLASTIC, SLIGHT COHESION, Tr Co SAND, MOIST - WET	14				SS-5	8-10	14:58	0.2	20.5/0	0
								3"	0.2 IN SPOON				
9			@ 9.0 FT COLOR CHANGE TO										
10	OUTWASH	SP	MD, 10YR 4/4, DK YELLOWISH BROWN, SAND, F-M, Tr F & Co SAND, GRAINS SUBANG-SUBRND, FROSTED, PITTED, NON PLASTIC NON COHESIVE, Tr Sm GRAV, DOLOMITIC, SATURATED.	20				SS-6	10-12	15:05	0.2	20.4/0	0
								3"	0.2 IN SPOON				
11							18						
12		SP	DENSE 10YR 5/3 BROWN, SAND, MEDIUM Tr F & Co SAND, GRAINS ANG, QUARTZITIC SUBANG-SUBRND, 3" LAYER OF SILTY FINE SAND @ 13.1, NON COHESIVE NON PLAST	20				SS-7	12-14	15:35	0.2	20.4/0	0
								3"	0.2 IN SPOON				
13		SP-SM	SATURATED				16						
14			VD, 10YR 5/4 YELLOWISH BROWN SAND F-M Tr Co SAND & Sm GRAVEL, 3" Co SAND Tr Sm GRAV, [illegible]	65				SS-8	14-16	15:42	0.2	/0	0
									0.2				

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BORING LOG

SOIL BORING NO. BRG-02

SITE: HIMCO DUMP PROJECT NO. 20026

DRILLING METHOD: 8.25" ID (4¼ IN I.D.) HOLLOW STEM AUGERS W/ CME 550
LOG BY: R. CANNESTRA
DRILLER: D. ELLIS
WEATHER: CLEAR, LT BREEZE, 40°-48°

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/10/90
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL
			10 SILTY SAND - SURND, QUARTZITIC, FROSTED GRAVEL SUBANGULAR SURND., DOLOMITIC, GRANITIC SATURATED				18	SEE PREVIOUS PAGE				
			END SAMPLING AT 16.0 FT ADVANCE BORING TO 16.8 FT TO ACCOMODATE SLIFF IN BOREHOLE									

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BORING LOG

SITE: KIMCO DUMP PROJECT NO. 20026

SOIL BORING NO. B26-03

DRILLING METHOD: 4 1/4" ID HOLLOW STEM AUGERS (0.65' O.D)
LOG BY: R CANNESTRA
DRILLER: D ELLIS
WEATHER: PTLY CLDY,

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
11/11/90	1:30	4.1	17.0

PHYSICAL SETTING: ADJ TO POND BRUSH FIELD

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/11/90
DATE COMPLETE: 11/11/90
WELL INSTALLATION: WT-103A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS (BACKGROUND HNu 0.1 PPM)	B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	TIME	PID	O_2 / LEL	H_2S / CO
	EOLIAN	OL	LOOSE 2.5Y 4/2, DK GRAYISH BROWN		9			SS-1	0-2	9:22	0.1	20.6/0	0/0
		SW-GW	SAND (M-C), GRAINS QUARTZITIC, SUBANG										
	OUTWASH		TO SUBRND, PITTED, 10% SM-L GRAV.					3"	0.1				
1			(SUBRND, DOLOMITIC,) DAMP										
		1.3	(3" BROWN SILTY SAND, SOME ORGANICS, TOPSOIL						IN SPOON				
	OUTWASH	SP	MD, 10YR 5/3, BROWN, SAND, (MEDIUM, PITTED				19						
2			SUBANG SUBRND QUARTZITIC GRAINS) TR F-CO										
			SAND, TR SM-M GRAVEL (SUBANG-SUBRND		15			SS-2	2-4	9:35	0.1	20.6/0	0/0
			DOLOMITIC) NON PLASTIC, NONCOHESIVE,										
			DAMP-MOIST					3"	0.1				
3			(COLOR CHANGE @ 4.2 @ SPOON-1P)										
									IN SPOON				
							15						
4													
	OUTWASH	SP	DENSE, 10YR 5/3, BROWN, SAND, (MEDIUM		45			SS-3	4-6	9:47	0.1	20.9/0	0/0
			SUBRND, PITTED, FROSTED, QUARTZITIC										
			GRAINS) TR F-CO SAND, TR SILT, NONPLASTIC					3"	0.1	DUPLICATE TAKEN			
			SLIGHT COHESION, SATURATED										
5									IN SPOON		(SOILS)		
							17						
6													
	OUTWASH	SP	DENSE, 10YR 5/3, BROWN, SAND, (MEDIUM		43			SS-4	6-8	9:57	0.1	20.9/0	0/0
			SUBRND-RND, PITTED, FROSTED, QUARTZITIC										
			GRAINS) TR F-CO SAND, TR SM GRAV					3"	0.1				
			(DK BLACK SUBANG DOLOMITIC CLASTS)										
			NON PLASTIC, NONCOHESIVE, SATURATED						IN SPOON				
							17						
8													
		SP	DENSE, 10YR 5/3, BROWN, SAND, (MEDIUM		49			SS-5	8-10	10:20	0.1	20.9/0	0/0
			SUBANG-RND, PITTED, FROSTED, QUARTZITIC										
			GRAINS) TR F-CO SAND, NON PLASTIC					3"	0.1				
9			SLIGHT COHESION, SATURATED.										
		9.3	AT 9.5, 10YR 5/3 BROWN SAND F-CO						IN SPOON				
	OUTWASH		LAYER, TR SM GRAVEL, DOLOMITIC				16						
		SW	SOME FeO2 STAINING IN THIS LAYER										
10													
		SW	DENSE 10YR 5/2, GRAYISH BROWN, SAND		35			SS-6	10-12	10:33	0.1	20.9/0	0/0
			F-CO, 12-15% GRAVEL (BROWN, BLACK										
			SUBANG, DOLOMITIC, CLASTS) NON-					3"	0.1				
11			PLASTIC, NONCOHESIVE, SATURATED										
							12		IN SPOON				
12													
	OUTWASH	SW-GW	DENSE, 10YR 5/1, GRAY, SAND & GRAVEL		23			SS-7	12-14	10:50	0.1	20.9/0	0/0
			SAND F-CO SUBANG-SUBRND FROSTED										
			QUARTZITIC GRAINS, GRAVEL (SM-M					3"	0.1				
			SUBANG DUFF-BLK DOLOMITIC CLASTS)										
13			TR SILT, NON PLASTIC, NONCOHESIVE						IN SPOON				
			SATURATED										
14													
			VERY DENSE, 10YR 5/1 GRAY, SAND & GRAVEL		76			SS-8	14-16	11:00	0.1	20.6/0	0/0
			(SAND F-CO SUBRND-SUBANG FROSTED										

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BORING LOG

SOIL BORING NO. BRG-03

SITE: HIMCO DUMP PROJECT NO. 20026

DRILLING METHOD: 4 1/4" ID HOLLOW STEM AUGERS
LOG BY: R. CANNESTRA
DRILLER: D. ELLIS
WEATHER: OVERCAST, NW BREEZE

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: ADJACENT TO POND

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11/11/90
DATE COMPLETE: 11/11/90
WELL INSTALLATION: WT-103A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2/LEL
			Tr SILT, NONPLASTIC, NON COHESIVE, FETTED DOOR IN SAMPLE, SATURATED						SEE PREVIOUS PAGE			
16			BLIND DRILL TO 17.0' TO ALLOW EOB COLLAPSE DURING WELL INSTALLAT. NO SAMPLE TAKEN 16.0-17									
17			E.O.B BRG-03 11/11/90									
			T.D. 17.0 FEET									
			R. Cannestra									

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BORING LOG

SITE: HIMCO DUMP PROJECT NO. 20026

SOIL BORING NO. BRG-04

DRILLING METHOD: CME 550
4 1/4" ID HO-LOW STEM AUGERS

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:

LOG BY: R CANNESTRA
DRILLER: D. ELLIS
WEATHER: OVERCAST

BKGRND HNu READING 0.1 PPM
PHYSICAL SETTING: GRASS

DATE START: 11/11/90
DATE COMPLETE: 11/11/90
WELL INSTALLATION: WT-104A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	INTERVAL	AIR MONITORING TIME	PID	O_2 / LEL	RAD / H_2S
	EOLIAN	OL-SM	LOOSE, 2.5Y 3/2 V. DARK GRAYISH BROWN, SILTY SAND, F-M, ORGANICS, MOIST.	9				SS-1	0'-2'	16:00	0.2	20.9/0	
1	OUTWASH	SP	10YR 4/4 SAND (MEDIUM SUBANG-SUBRND QUARTZITIC) Tr f-m GRAVEL MOIST				18	3"	0.2 ppm IN SPOON				
2		SP	MEDIUM DENSE, 10YR 4/6, DARK YELLOWISH BROWN, SAND (MEDIUM SUBANG-SUBRND FRM-FGS, QUARTZITIC GRAINS) Tr-SOME SILT Tr F-M-CANT — GRAVEL (f-m-M, SUBANG DOLOMITIC CLASTS) NON PLASTIC SLIGHT COHESION, MOIST	12			16	SS-2 3"	2'-4' 0.2 ppm IN SPOON	16:07	0.2	20.9/0	0/0
4	OUTWASH	SP	MEDIUM DENSE, MOTTLED 10YR 4/6 (DK YELLOW BROWN) & 10YR 7/3 VERY PALE BROWN SAND (F-M, SUBANG-SUBRND, FROSTED, QUARTZITIC GRAINS) Tr Co SAND Tr f-m-M DOLOMITIC GRAVEL (DK BROWN & TAN, SUBANG CLASTS) Tr SILT, NON PLASTIC, SLIGHT COHESION DAMP	15			17	SS-3 3"	4'-6' 0.2 ppm IN SPOON	16:26	0.2	20.9/0	0/0
6	OUTWASH	SP	MEDIUM DENSE 10YR 6/3 PALE BROWN SAND, (F-M, SUBANG-ANG, FROSTED, QUARTZITIC GRAINS) Tr Co SAND, Tr SILT Tr ORGANIC FRAGMENTS, Tr GRAVEL (SUBANG DOLO CLASTS) NON-PLASTIC, NONCOHESIVE, DAMP-MOIST.	12			18	SS-4 3"	6'-8' 0.2 ppm IN SPOON	16:36	0.2	20.9/0	0/0
8		SP	LOOSE, 10YR 4/4 DARK YELLOWISH BROWN, SAND (F-M, SUBANG-ANG, FROSTED QUARTZITIC GRAINS) Tr Co SAND, OCC SM DK DOLOMITIC GRAVEL (SUBANG-SUBRND) NONPLASTIC NONCOHESIVE MOIST (WATER TABLE APPEARS @ 8.8 FEET)	5			17	SS-5 3"	8'-10' 0.2 ppm IN SPOON	16:57	0.2	20.9/0	0/0
10	OUTWASH	SP	MEDIUM DENSE, 10YR 5/3 BROWN SAND (F-M GRAINS FINES TOWARDS BOTTOM OF SPOON GRAINS ARE SUBANG-ANG, QUARTZITIC) Tr Co SAND, OCC f-m GRAVEL (DOLOMITIC GRANITIC SUBANG) NONPLASTIC, NON-COHESIVE, SATURATED	25			18	SS-6 3"	10'-12' 0.2 ppm IN SPOON	17:08	0.2	20.6/0	0/0
12	OUTWASH	SP	MED. DENSE-DENSE, 10YR 5/3 BROWN, SAND (F-M, SUBANG-ANG, QUARTZITIC GRAINS) Tr Co SAND, 2" SAND OF FRO2 STAINING @ 13.5' NONPLASTIC NONCOHESIVE, SATURATE	20			16	SS-7 3"	12'-14' 0.2 ppm IN SPOON	17:28	0.2	20.6/0	0/0
14			DENSE 10YR 5/3, BROWN SAND (F-M SUBANG TO ANG QUARTZITIC GRAINS) Tr F-	20				SS-8	14'-16'	17:37	0.2	20.6/0	0/0

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BORING LOG

SOIL BORING NO. BRG-Ø4

SITE: HIMCO DUMP PROJECT NO. 20026

DRILLING METHOD: 4 1/4" ID HOLLOW STEM AUGERS

LOG BY: R. CANNESTRA

DRILLER: D. ELLIS

WEATHER: OVERCAST, NW WIND, 45

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: LEVEL GRASS

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 11/11/90

DATE COMPLETE: 11/11/90

WELL INSTALLATION: WT-104A

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2/LEL
		SP	YELLOW BROWN, NON PLASTIC, NONCOHESIVE SATURATED					SEE PREVIOUS SHEET				
16			NO SAMPLE TAKEN 16.0-17.0 FT BORING ADVANCED TO 17.6 BY BLIND DRILL TO ACCOMODATE "SLUFF" IN BOREHOLE FOR WELL INSTALLATION									
			END OF BORING BRG-Ø4 11/11/90 17:45									
			Rolly Cannestra									

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: HIMCO DUMP SUPERFUND PROJECT NO. 20026

SOIL BORING NO. BR6-05

DRILLING METHOD: CME 550 4 1/4 IN ID (8 1/2 IN OD) HOLLOW STEM AUGER
LOG BY: R. CANNESTRA
DRILLER: DAVE ELLIS
WEATHER: OVERCAST

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING: ADJACENT TILLED FIELD

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11-9-90
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	BACKGROUND PID 0.4 AIR MONITORING TIME	PID	O_2/LEL	GEIGER
		OL	MD, 10YR 3/2 VS GRAVELLY BROWN SILTY ORGANIC SAND, 3 1/2 SILT, TR ORGANICS, OCC SM-L SUBRND, DOLOMITIC GRAVEL, MOIST	13				SS-1	0-2	15:03	0.4	20.6/0	0
								3"	0.5	0.5			
1	TP												
	OUTWASH	SP-SM	MD, 10YR 4/6 DK YELLOWISH BROWN SAND, F-M, TR SOME SILT, TR CO SAND, TR SM-L SUBRND, TR ORGANICS, MOIST				19						
2													
	OUTWASH	SP	MD, 10YR 4/6 DK YELLOWISH BROWN SAND F-M, TR SILT, TR CO SAND, TR SM-L SUBRND, FEW STAINING, MOIST	18				SS-2	2-4	15:25	0.4	20.6/0	0
								3"	0.6	0.6			
3													
							20						
4													
		SP	MD 10YR 4/6 DK YELLOWISH BROWN SAND, F-M, TR SILT, OCC SM-M SUBRND DOLOMITIC GRAVEL, TR CO SAND, MOIST	21				SS-3	4-6	15:35	0.5	20.6/0	0
								3"	0.7	0.7			
5													
							21						
6													
		SP	MD 10YR 4/6 DK YELLOWISH BROWN SAND F-M, TR SILT, TR CO SAND, TR SM SUBRND GRAVEL DOLOMITIC, TR DK BLACK GRAINS @ ZONE OF PID HIT, S.D HIT ALSO AT APPARENT WT ~7.5'	17				SS-4	6-8	15:45	0.4	20.6/0	0
								3"	1.6	1.6			
7													
							19						
8													
		SW-SP	MD 10YR 5/2 BROWN SAND F-C, TR SILT, TR SM GRAVEL, DOLOMITIC, SAMPLE PID 3.0 (1/2 AFTER PK GRAND) SATURATED	28				SS-5	8-10	16:00	0.6	20.6/0	0
								3"	2.0		4.6	BOREHOLE	
9													
							15						
10													
	OUTWASH	SP	MD 10YR 5/2 BROWN SAND MEDIUM TR SILT, TR SM GRAVEL, DOLOMITIC, OCC BLACK GRAINS, SILT SMEAR FAMILY ?REDUCED IRON? IN PORE SATURATED	25				SS-6	10-12	16:25	5.2	20.6/0	0
								3"	3.4		5.0		
11													
							15						
12													
	OUTWASH	SP	MD, 10YR 5/2, BROWN, SAND, MEDIUM, TR SILT, TR GRAVEL, DOLOMITIC, SUBANG SCC BLACK GRAINS, SATURATED	57				SS-7	12-14	16:40	BZ=0.8	20.6/0.3	0
								3"	20.0+		BH 4.4		
13													
14													
	OUTWASH	SP	MD 10YR 5/2 BROWN SAND F-C, TR SILT, TR GRAVEL, [illegible]	60				SS-8	14-16	17:10	BZ=0.6	20.6/0	0

BFHP

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BORING LOG

SOIL BORING NO. BRG-05

SITE: HIMCO DUMP SUPERFUND PROJECT NO. 20026

DRILLING METHOD: CME 550
4¼ IN ID (8½ IN OD)
HOLLOW STEM AUGER
LOG BY: R. CANNESTRA
DRILLER: D ELLIS (MATHES)
WEATHER: OVERCAST

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:
DATE START: 11-
DATE COMPLETE:
WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2 / LEL
		SP						SS-3				
			END OF BORING BRG-05									
			TD 16.0									

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BORING LOG

SITE: HMCS DUMP PROJECT NO. 20026

SOIL BORING NO. BRG-6

DRILLING METHOD: HOLLOW STEM AUGER

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING
11-9	9:40	7.0'	16.0'

GROUND SURFACE ELEV.:
COORDINATES:
NORTH:
EAST:

LOG BY: R. LANNEGRA
DRILLER: J. ELLIS
WEATHER: OVERCAST

DATE START: 11-08-90
DATE COMPLETE: 11-08-90

PHYSICAL SETTING: GRASS

WELL INSTALLATION: YES

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING TIME	PID	O_2/LEL	GIEGER
		OL	LOOSE, 10YR4/2, DARK GRAYISH BROWN SILTY SAND F-M, QUARTZ, TR ORGANICS, SL GRAV		6			SS-1	0-2'	15:25	0.2	20.4/0	0
			LOOSE 10YR 5/6 YELLOWISH BROWN SAND					3"	0.2 ppm				
	OUTWASH	SP-SW	M-C, MOSTLY MEDIUM, TR SM-L SUB RND GRAVEL, MOIST		1-								
			DENSE, 10YR 5/6, YELLOWISH BROWN SAND, M-Co, TR SM-M SUBANG TO SUBRND SOME LIMONITE STAINING, MOIST		19			SS-2	2-4	15:38	0.2	20.9/0	0
			CHANGES COLOR @ 2.2' TO 10YR 6/2 LT BROWNISH GRAY SOME MOTTLING					3"	0.2 ppm				
		SP					18						
	OUTWASH		DENSE, 10YR 6/6 BROWNISH YELLOW, SAND MEDIUM, TR F-Co SAND, OCC SM-M SUBRND DOLOMITIC GRAVEL, OCC 1-2 mm LAMINATIONS, MOIST		20			SS-3	4-6	15:58	0.2	20.9/0	0
5								3"	0.3 ppm				
		SP	DENSE 10YR 5/4 YELLOWISH BROWN, SAND MEDIUM, TR F-Co SAND OCCASIONAL RND-SUBRND DOLO GRAVEL SM-M, MOIST WET @ 7.3'		18			SS-4	6-8	16:18	0.2	20.9/0	0
								3"	0.8 ppm				
	OUTWASH	SP	DENSE 10YR 5/2, BROWN, SAND, M-Co Co SAND SEAM 1-2" @ 8.4 FT, TR SILT, OCC SM DOLO GRAVEL (SUBRND-SUBANG) WET & SATURATED		28			SS-5	8-10	16:38	0.2	20.9/0	0
								3"	0.2 ppm				
							19						
10	OUT WASH	SP-SW	DENSE, 10YR 5/2 BROWN, SAND, F-Co GRAV. SEAM 2" @ 10.2' TR SILT SAND TURNING FINER NEAR TOP GRAV SM-L SUBANG-SUB RND DOLOMITE		44			SS-6	10-12	16:54	0.2	20.9/0	0
								3"	0.2 ppm				
			CLAY										
		SP-GP	LOOSE-VD, 10YR 5/1 V M SAND & GRAVEL [illegible] TR FERROUS, TR SOLVENT ODOR SATURATED OCC BLACK GRAVEL		20			SS-7	12-14	17:20	0.2	20.9/0	0
								3"	0.2 ppm				
		SP	DENSE 10-YR 5/1 GRAY SAND (MAINLY SM) [illegible] F-M SAND, GRAINS SUBANG-SUBRND, SOLVENT ODOR SAT		18			SS-8	14-16	17:20	0.2	20.9/0	0
		GP						3"	[illegible]				

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COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SITE: FMCO DUMP PROJECT NO. 2CC

SOIL BORING NO. BRG-6

DRILLING METHOD: HOLLOW STEM AUGER

LOG BY: R CANNESTRA

DRILLER: D. ELLIS

WEATHER: CLEAR & COOL

WATER LEVEL READINGS

DATE	TIME	DEPTH	CASING

PHYSICAL SETTING:

GROUND SURFACE ELEV.:

COORDINATES:

NORTH:

EAST:

DATE START: 11-08-90

DATE COMPLETE: 11-08-90

WELL INSTALLATION:

DEPTH IN FEET	SOIL DEPOSITIONAL ENVIRONMENT	USCS	SOIL DESCRIPTION AND DRILLING COMMENTS	SAMPLING DATA: B	N	A	R	SAMPLE TYPE	SAMPLE INTERVAL	AIR MONITORING: TIME	PID	O_2 / LEL
		SP-GP	SEE PAGE 1									
			END OF BORING AT 16.0'									
			11/08/90 RBC									

APPENDIX B

WELL CONSTRUCTION DIAGRAMS

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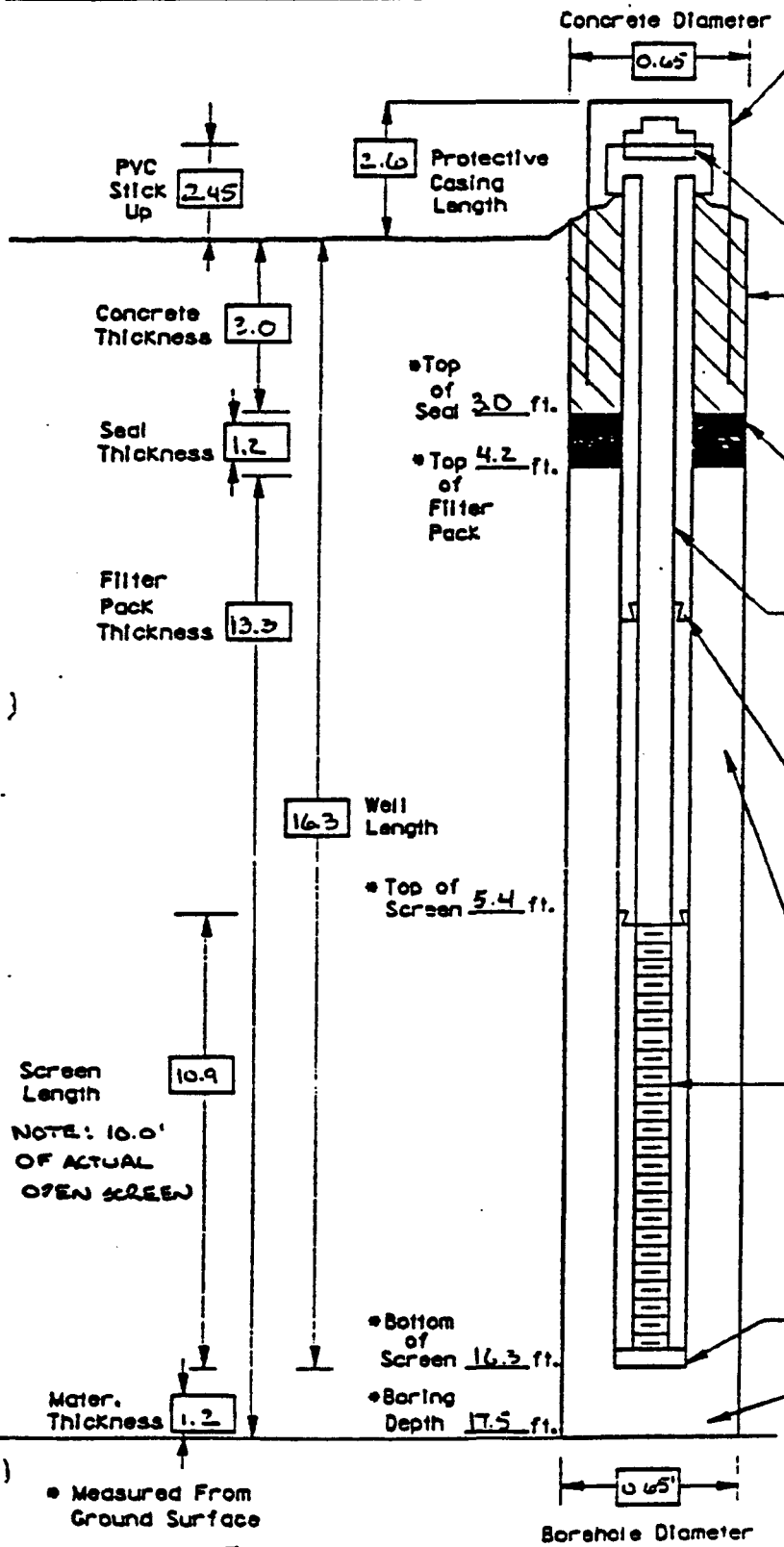
COMPUTER AIDED DESIGN/DRAFTING

Water Table Well Installation Diagram

Form

Site: HIMCO DUMP Date: NOVEMBER 17, 1990
Inspected By: _____ Project No. 20026.003 Well No. WT-101A
Driller/Contractor _____



* Measured From Ground Surface

PROTECTIVE CASING
Type STEEL Vented (Yes)/No Type FLUSH
Diameter 4" Locked YES, MASTER
Length 5.6 Key # 3232

GUARD POSTS ✓ LOOSE

CAP OR PLUG Vented (Yes)/No Type PVC SLIP CONN AND THREADED PLUG

CONCRETE COLLAR
Cement PALMIX 150 lbs.+Water 6 gal. ____
Total Quantity ____ gal. ____
Manufacturer PALMIX (PRE MIXED

SEAL
Powder/Granular/(3/8" Pellets) Quantity 9.0 c
Hydrated 3 gal., Time 16:50 - 02 h
Manufacturer PELONITE by BOCTEST INC

PIPE Type FLUSH THREADED STAINLESS Schedule TYPE 5 #3
O.D. 2.0" I.D. 1.9
Length/Sec. 10.0 No. Of Sec. PARTIAL
Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No ____
Teflon Taped (Yes)/No O-Ring Yes/(NO)
Manufacturer ACE HARDWARE

FILTER PACK Type(s) SILICA SAND #10-20
Source COLORADO SILICA SAND
Volume 3.25 100lb BAGS ~ 22 gal c
Manufacturer COLORADO SILICA SAND, INC.
COLORADO ~~STICKS~~ SPRINGS

SCREEN STAINLESS
Type STEEL CONTINUOUS WRAP Schedule TYPE 5 #30
Length/Sec. 5.3 No. of Sec. 2
O.D. 2.0" I.D. 1.9
Slot Size 0.010 No. Slots/ft. ____
Manufacturers DIEDRICH

CAP OR PLUG Type THREADED BLANK CAP Length 0.3

MATERIAL COLLAPSE AND FILTER PACK

WATER SOURCE ELKHART MUNICIPAL WATER SUPPLY

Notes: _____

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Water Table Well Installation Diagram

Form

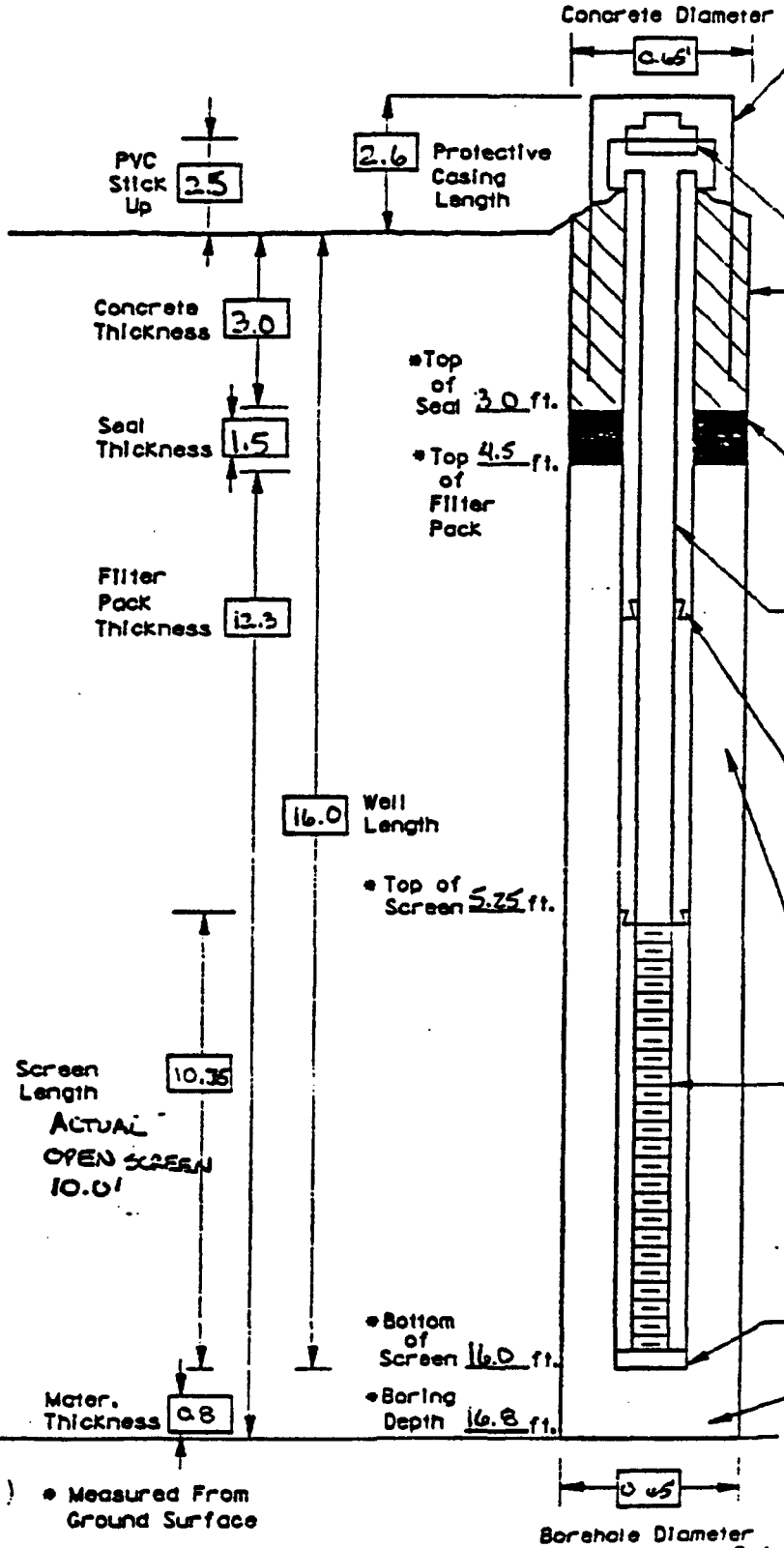
Site: HIMCO DUMP SITE Date: 11-

Inspected By: R. CANNESTRA Project No. 20026 Well No. WT-102A

Engineers & Architects
COMPUTER AIDED DESIGN/DRAFTING

R. Cannestra

Driller/Contractor D. ELLIS / MATHES



* Measured From Ground Surface

PROTECTIVE CASING
Type STEEL Vented (Yes)/No Type LOCKE CAP
Diameter 4" Locked YES, MASTER
Length 5.6' Key # 2532

GUARD POSTS

CAP OR PLUG Vented (Yes)/No Type PVC SLIP CAP W/ THREADED PLU

CONCRETE COLLAR
Cement PREE-MIX lbs.+Water _____ gal. _____
Total Quantity 2 BAGS + 7 gal gal. _____
Manufacturer GENERAL CONTRACTORS ST. LOUIS MISSOURI

SEAL
Powder/Granular (Pellets) 3/8 Quantity 4 g
Hydrated H_2O # 3 gal., Time 17:05-17:3
Manufacturer PELONITE, ROCKTEST, INC

PIPE Type STAINLESS STEEL Schedule TYPE 5 GRADE 30
O.D. 2.0" I.D. 1.9
Length/Sec. 10.1 No. Of Sec. PARTIAL
Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No _____
Teflon Taped (Yes)/No O-Ring Yes/(No)
Manufacturer ACE HARDWARE

FILTER PACK Type(s) SILICA SAND # 10-20
Source COLORADO SILICA SAND CO
Volume 2 1/2 100 lb BAGS + 22.0 g
Manufacturer COLO SILICA SAND CO, COLORADO SPRINGS, COLO.

SCREEN CONTINUOUS WIRE WRAP TYPE 5
Type STAINLESS STEEL Schedule GRADE 304
Length/Sec. 5.3 No. of Sec. 2
O.D. _____" I.D. _____
Slot Size 0.0.0 No. Slots/ft. CONTINUOUS WIRE WRA
Manufacturers DIEDRICH

CAP OR PLUG Type STAINLESS STEEL Length 0.15'

MATERIAL COLLAPSE & FILTER SAND

WATER SOURCE ELKHART MUNICIPAL WATER PLANT

Notes: BORING EXTENDED TO 16.8 RATHER THAN 16.0 TO ALLOW FOR "SLUGGE" WHEN DRILLING AUGERS

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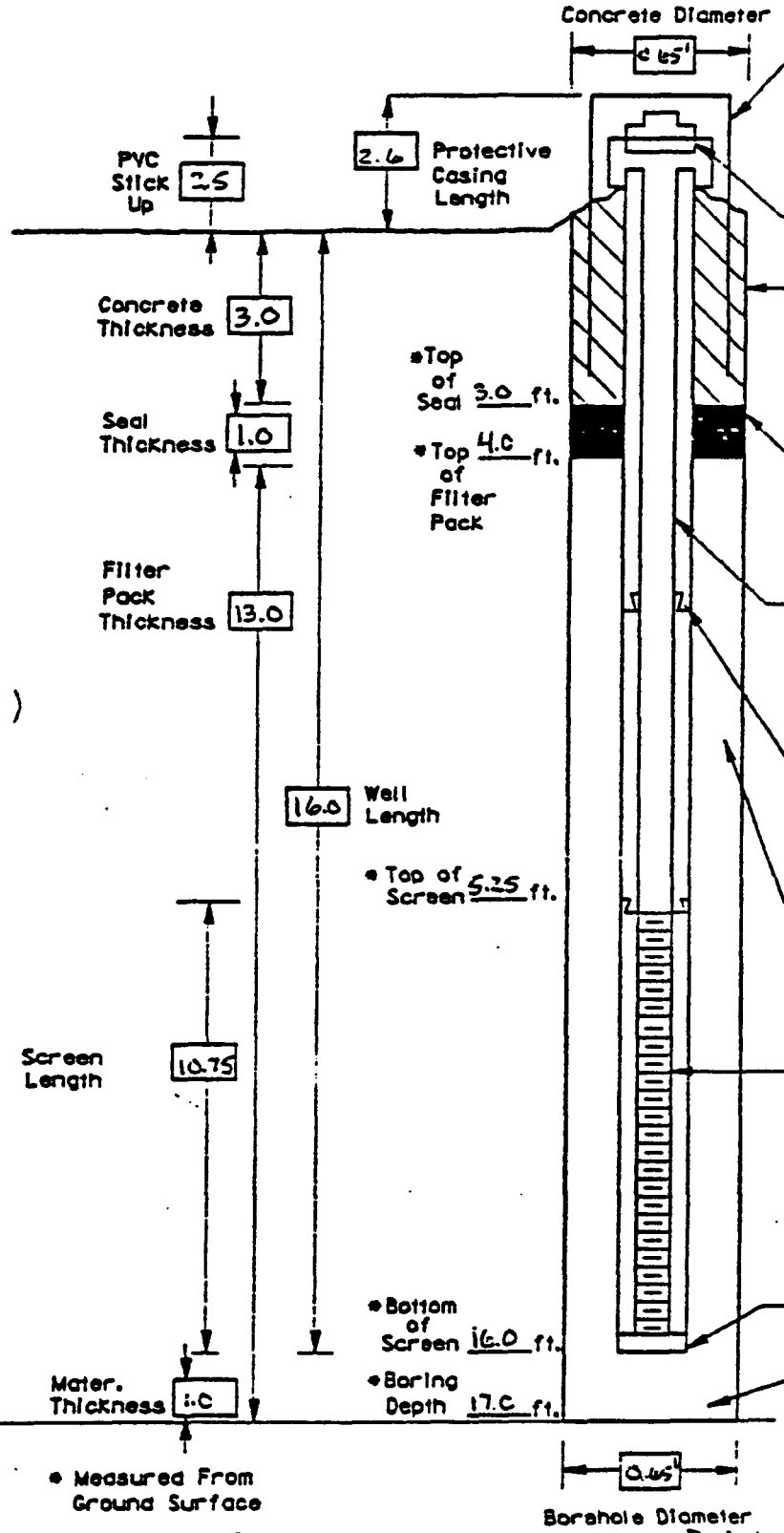
COMPUTER AIDED DESIGN/DRAFTING

Water Table Well Installation Diagram

Form

Site: HIMCO DUMP Date: 11/11/90
Inspected By: R. CANNESTRA Project No. 200-26 Well No. WT-103A
Driller/Contractor D. ELLIS / MATHES



* Measured From Ground Surface

PROTECTIVE CASING
Type STEEL Vented (Yes)/No
Diameter 4" Locked YES MASTER
Length 5.6 Key # 2537

GUARD POSTS
Type NONE

CAP OR PLUG Vented (Yes)/No Type SLIP COUPLE WITH THREADED PLUG

CONCRETE COLLAR
Cement PREE-MIX lbs.+Water _____ gal. _____
Total Quantity _____ gal. _____
Manufacturer GENERAL CONTRACTORS ST LOUIS, MO

SEAL
Powder/Granular (Pellets) 3/8 Quantity 3 GAL g
Hydrated 2.5 gal., Time 12:00 P - 14:
Manufacturer PELONITE by ROCKTEST

PIPE Type FLUSH THREADED STAINLESS Schedule TYPE 5 GRADE 304
O.D. 2.0" I.D. 1.9"
Length/Sec. 10.0 No. Of Sec. PARTIAL
Manufacturer DIEDRICH

JOINTS Flush Threaded Yes/No _____
Teflon Taped Yes/No O-Ring Yes/No
Manufacturer _____

FILTER PACK Type(s) SILICA SAND
Source COLORADO SILICA SAND
Volume 2.5 100 lb BAGS @ 18.5 g
Manufacturer COLORADO SILICA SAND COLORADO SPRINGS CO.

SCREEN CONTINUOUS WIRE
Type WRAP STAINLESS Schedule TYPE 5 GRADE 304
Length/Sec. 5.3 No. of Sec. 2
O.D. 2.0" I.D. 1.9"
Slot Size 0.010 No. Slots/ft. _____
Manufacturers DIEDRICH

CAP OR PLUG Type STAINLESS THREADED PLUG Length 0.15

MATERIAL COLLAPSE & FILTER PACK

WATER SOURCE ELKHART MUNICIPAL WATER PLANT

Notes: _____

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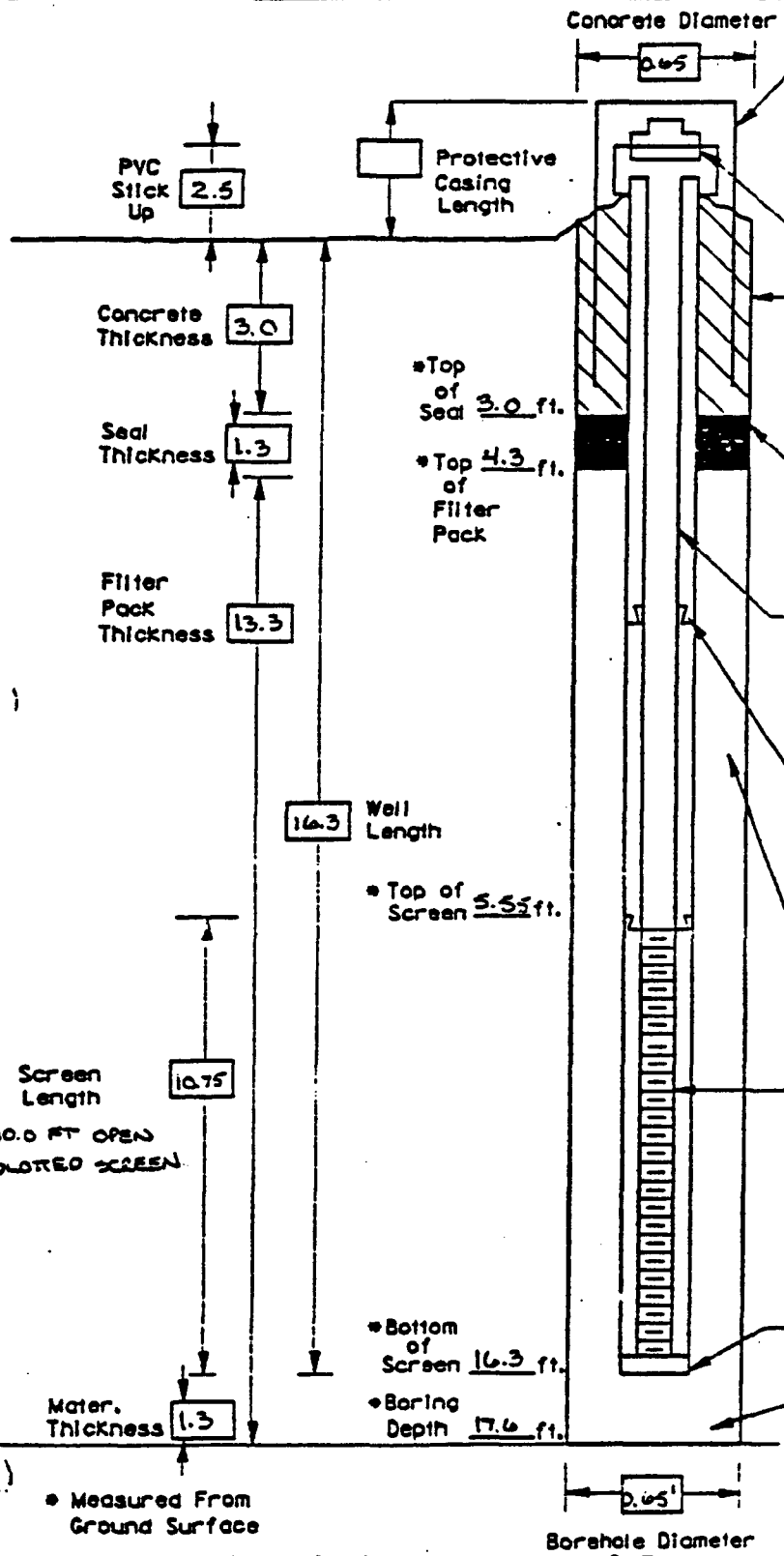
COMPUTER AIDED DESIGN/DRAFTING

Water Table Well Installation Diagram

Form

Site: HIMCO DUMP SITE Date: 11/12/80
Inspected By: R. CANNESTRA Project No. 200-26-023 Well No. WT-104A
Driller/Contractor D ELLIS / MATHES



PROTECTIVE CASING
Type STEEL Vented (Yes)/No Type LOOSE FITTING LID
Diameter 4" Locked YES, MASTER
Length 5.6' Key # 2532

GUARD POSTS

CAP OR PLUG Vented (Yes)/No Type SLIP CAP (PVC W/ THREADED PLUG)

CONCRETE COLLAR
Cement PALMIX lbs.+Water _____ gal. _____
Total Quantity _____ gal. _____
Manufacturer PALMIX

SEAL
Powder/Granular/(3/8" Pellets) Quantity 3.0 g
Hydrated 2.0 gal., Time 9:50-11:15
Manufacturer PELONITE by ROCTEST

PIPE Type FLUSH THREAD STAINLESS Schedule TYPE 5 #316
O.D. 2.0" I.D. 1.9
Length/Sec. 10.0 No. Of Sec. PARTIAL
Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No _____
Teflon Taped (Yes)/No O-Ring Yes/(No)
Manufacturer ACE HARDWARE

FILTER PACK Type(s) GRADE 10/20 SILICA SAND
Source COLORADO SILICA SAND
Volume 3.5 100lb BAGS 24.0 g
Manufacturer COLORADO SILICA SAND, INC.
P.O. BOX 15615
COLORADO SPRINGS, CO

SCREEN
Type CONTINUOUS WIRE WELP - STAINLESS Schedule TYPE 5/304
*Length/Sec. 5.3 No. of Sec. 2
O.D. 2.0" I.D. 1.9
Slot Size 0.010 No. Slots/ft. _____
Manufacturers DIEDRICH

CAP OR PLUG Type STAINLESS THREADED PLUG Length 0.15'

MATERIAL COLLAPSE & FILTER PACK

WATER SOURCE ELKHART MUNICIPAL WATER PLANT
Notes: WATER LEVEL 9.9 FT FROM GS THROUGH AUGERS
* FROM OPEN SCREEN @ COMPLETION [illegible] 12.5 [illegible]

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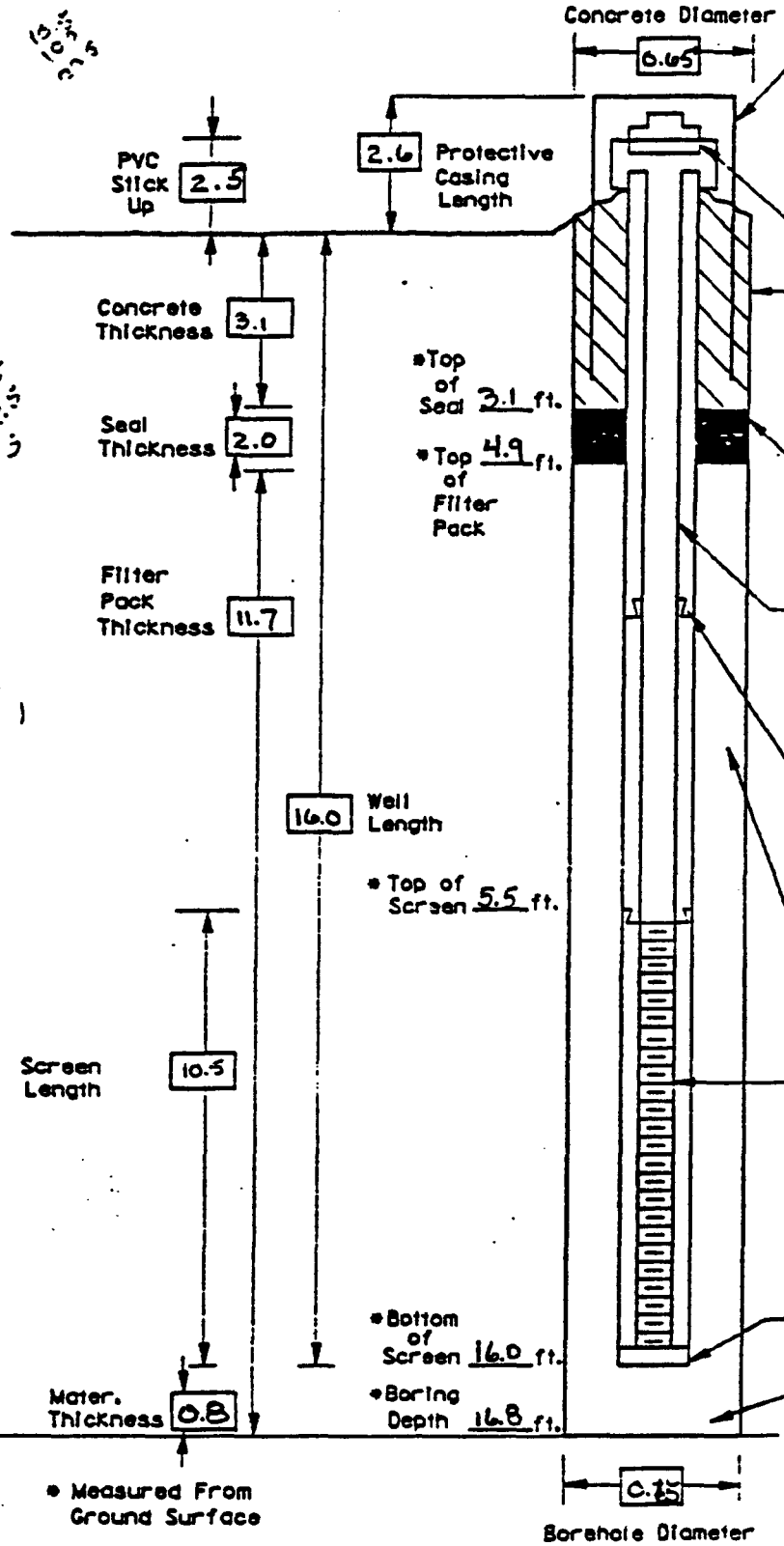
COMPUTER AIDED DESIGN/DRAFTING

Water Table Well Installation Diagram

Form 1(

Site: HIMCO DUMP Date: 11/10/90
Inspected By: R. CANNESTRA Project No. 20026 Well No. WT-105A
Driller/Contractor D. ELLIS/MATHES



* Measured From Ground Surface

PROTECTIVE CASING
Type STEEL Vented (Yes)/No Type LOCKS
Diameter 4" Locked MASTER
Length 5.6' Key # 2532

GUARD POSTS

CAP OR PLUG Vented (Yes)/No Type PVC THREAD SLIP CAP & PLUG

CONCRETE COLLAR
Cement PREMIXED lbs.+Water VARIABLE gal.
Total Quantity 3 BAGS gal. ±15
Manufacturer GENERAL MATERIALS, ST. LOUIS

SEAL
Powder/Granular/(Pellets) Quantity 5 gal
Hydrated 2.5 gal., Time 9:15 - 9:42
Manufacturer PELONITE by Rockford INC

PIPE Type STAINLESS Schedule
O.D. I.D.
Length/Sec. 10.1 No. Of Sec. PART 1A
Manufacturer DIEDRICH

JOINTS Flush Threaded (Yes)/No
Teflon Taped (Yes)/No O-Ring Yes/(No)
Manufacturer ACE HARDWARE

FILTER PACK Type(s) SILICA SAND #10-20
Source COLORADO SILICA SAND, COLORADO SPR
Volume 20 gal 2 and 5/8 bags
Manufacturer COLORADO SILICA SAND

SCREEN CONTINUOUS WRAP
Type STAINLESS Schedule
Length/Sec. 5. No. of Sec. 2
O.D. I.D.
Slot Size 0.01 No. Slots/ft.
Manufacturers DIEDRICH

CAP OR PLUG Type STAINLESS Length 0.1

MATERIAL COLLAPSE & SILICA SAND

WATER SOURCE
Notes: WATER @ 7.5' THRU AUGERS
SEAL HYDRATED 25-30 MIN BEFORE PLACING CONCRETE CAP

Sheet 1 of 1

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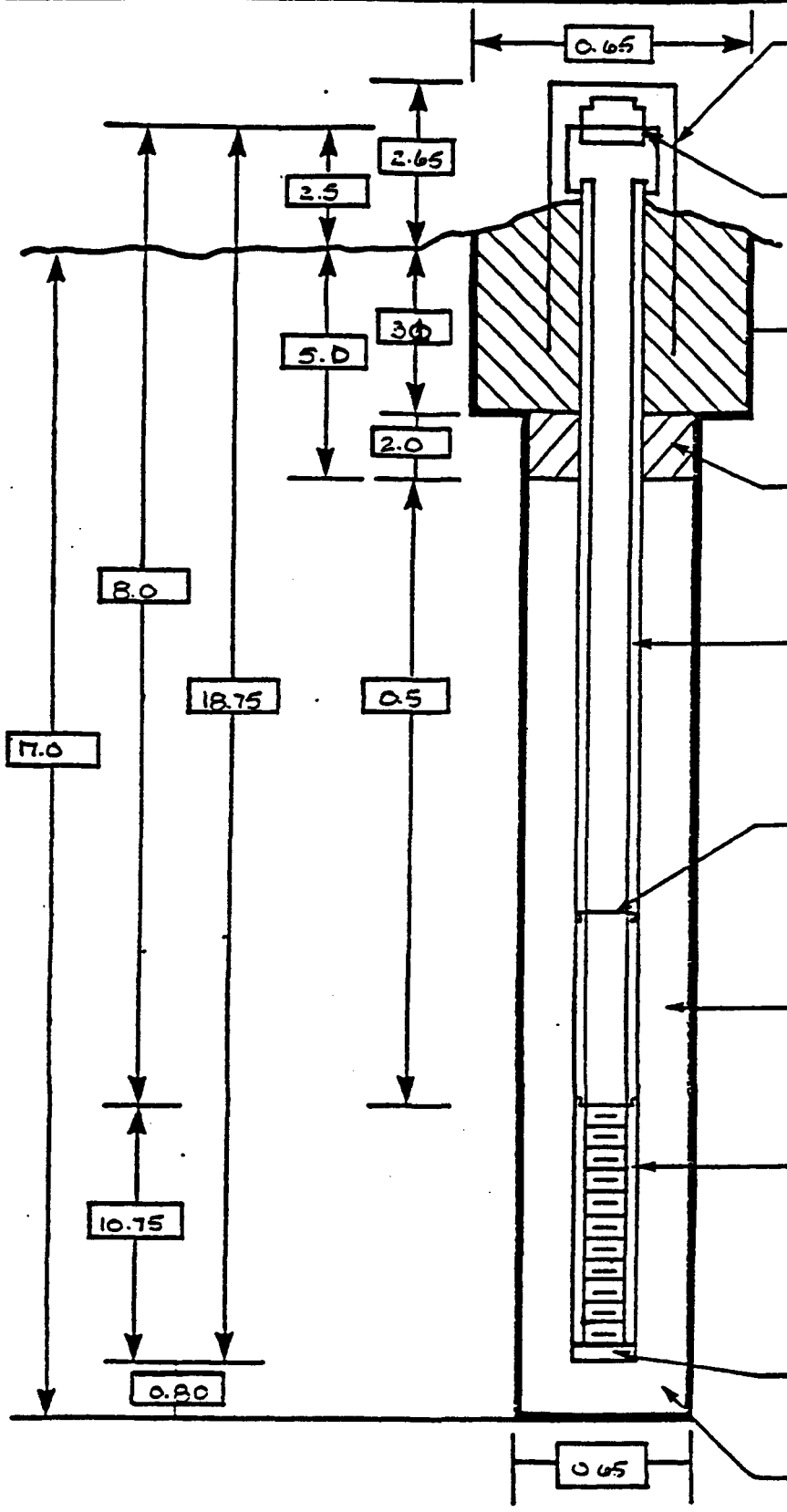
OBSERVATION WELL INSTALLATION DIAGRAM

Well No. WT 106A

Site: HIMCO DUMP, ELKHART, IN Date: NOVEMBER 9, 1990

By: R. CANNESTRA / MATHES Project No. 20026.023



Protective Casing

Type STEEL Vented ✓ Type STEEL 3

Diameter 4" Locked YES, MASTER

Length 5.6 Key # 2532

Guard Posts

Plug

Type SLIP COUPLING W/ THREADED PLUG

Vented YES

Concrete Collar PREMIXED

~~Quant. Cement~~ MIXTURE 160 lbs. + Quant. Water ___ gal.

Total Quant. 5.0 gal.

Manufacturer PREEMIX, GENERAL CONTRACTOR ST LOUIS MO

Seal

Powder/Granular/Pellets (3/8) Quant. 5.0 gal.

Manufacturer PELCONITE by ROCTEST

Hydrated 2.5 gal., Time 11:01 – 11:30

Pipe

Type FLUSH THREADED STAINLESS STEEL

O.D. 2.0" Manufacturer DIEDRICH

I.D. 1.9" Schedule TYPE 5 #304

Length/per sec. 10.0 No. of sec. PARTIAL

Joints

Threaded Flush Joint YES

Teflon Taped Yes/No

Tape TEFLON

Manufacturer ACE HARDWARE

Backfill

Type(s) SILICA SAND #10-20

Source COLORADO SILICA SAND, COLO. SPRG

Volume

Screen

Type CONTINUOUS WIRE WRAP SS Slot Size 0.010

O.D. 2.0" No. Slots/ft.

I.D. 1.9" Schedule TYPE 5 #304

Manufacturer DIEDRICH

Length/per sec. 5.3 No. of sec. 2

Cap

Type THREADED STAINLESS STEEL PLUG (0.15' LENGTH

Material

COLLAPSE & FILTER PACK

Notes: Water Source ELKHART MUNICIPAL WATER WORKS

WATER LEVEL IN BOREHOLE PRIOR TO INSTALLATION ~7.0 BELOW G.S.

APPENDIX C
DAILY ATMOSPHERIC MONITORING LOGS

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Atmospheric Monitoring Log
Field Safety

Project Site: HIMCO DUMP
Health & Safety Officer: A. KIRYKOWICZ
Project Number: ~~18~~ 20026.033
Level of Protection: D
Level of Action:
Description of site (weather, temp, soil conditions): PARTLY CLDY, LT NW BREEZE, 33
BACKGROUND HNu READINGS 0.3 ppm

Date / Time	Site	Depth	RAD ~~OVA~~	HNU	OXGEN	LEL / H_2S	Comments
11/12 8:15	WT-104A	17	0.0	0.5	20.6	0 / 0	UNCAPPING AUGERS
11/12 9:10	WT-104A	15	0.0	0.3	20.9	0 / 0	PULL FIRST AUGER FLIGHT
11/12 9:22	WT-104A	10	0.0	0.3	20.9	0 / 0	PULL SECOND AUGER FLIGHT
11/12 9:42	WT-104A	15	0.0	0.3	20.5	0 / 0	PULL THIRD AUGER FLIGHT
11/12 16:20	WT-101A	15	0.0	0.2	21.1	0 / 0	HNU BACKGROUND 0.2 PULL FIRST AUGER FLIGHT
11/12 16:28	WT-101A	10	0.0	0.2	21.1	0 / 0	PULL SECOND AUGER FLIGHT
11/12 16:40	WT-101A	5	0.0	0.2	21.1	0 / 0	PULL THIRD AUGER

Additional Notes: BACKGROUND HNu - 0.3 ppm

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Atmospheric Monitoring Log
Field Safety

Project Site HIMCO DUMP Health & Safety Officer A. KIRYKOWICZ

Project Number 20026 Level of Protection

Level of Action

Description of site (weather, temp, soil conditions) PTLY CLDY, LT BREEZE

Date / Time	Site	Depth	RAD ~~OVA~~	HNU	OXGEN	LEL	Comments
11/11 11:41	WT-103A	15	0	0.1	20.9	0	PULLING AUGERS 1ST FLIGHT $H_2S = 0$
11/11 11:49	WT-103A	10	0	0.1	20.9	0	PULLING AUGERS 2nd FLIGHT $H_2S = 0$
11/11 12:02	WT-103A	5.0	0	0.1	20.9	0	PULLING AUGERS 3rd FLIGHT $H_2S = 0$

Additional Notes:

Signature Robert Cannatelli Date 11/11/90

Donohue
Engineers & Architects

Atmospheric Monitoring Log
Field Safety

Project Site: HIMCO DUMP SITE
Health & Safety Officer: A. KIRYKOWICZ
Project Number: 20026
Level of Protection: D
Level of Action:
Description of site (weather, temp, soil conditions): CLEAR, 35-45, SOILS MOIST-SATURATED
HNU BKGRD 0.6 / GASTECH

Date / Time	Site	Depth	~~OVA~~ MIN. RAD	HNU	OXGEN	LEL	Comments
11/10 8:20	WT-105A	16.	0	0.6	20.4	0	READING TAKEN IN BOREHOLE & WORKING AREA, AFTER OPENING HOLE
11/10 8:35	WT-105A		0	0.2	20.4	0	INSTALLING WELL, PULL FIRST AUGER
11/10 8:52	WT-105A		0	0.2	20.4	0	" " " SECOND AUGER
11/10 9:08	WT-105A			0.1	20.5	0	THIRD AUGER

Additional Notes:

Signature: R Camarotas
Date: 11/10/90

Donohue
Engineers & Architects

Atmospheric Monitoring Log
Field Safety

Project Site: HIMCO DUMP SUPERFUND SITE
Health & Safety Officer: ANYA KIRYKOWICZ
Project Number: 20026
Level of Protection: C
Level of Action: C (DURING WELL INSTALLATION @ WT-106A)
Description of site (weather, temp, soil conditions): OVERCAST, 35-46°

Date / Time	Site	Depth	OVA	HNU	OXGEN	LEL	Comments
11/9 9:40	WT 106 HIMCO	16'		0.2	20.1	0 0	CO_2 000
11/9 9:51	WT 106 HIMCO	17		0.2	20.5	0.0	CO_2 000
11/9 10:30	DURING	WELL	CONST.	0.4	209	0 0	CO_2 0
11/9 10:45	"	WORK ZONE	—	0.2	20.6	0.0	CO_2 = 0
11/9 10:55	"	WORK ZONE	—	0.2	20.9	0.0	CO_2 = 0 (READINGS SIMILAR TO THOSE WITH SOLVENT UPOR)

Additional Notes:

Signature: Robert B. Cannestra
Date: 11-9-90

NW NW NW x 2

Donohue
Engineers & Architects

Atmospheric Monitoring Log
Field Safety

Project Site HIMCO DUMP — Health & Safety Officer A. KIRYKOWICZ

Project Number 20026.023 — Level of Protection D

Level of Action

Description of site (weather, temp, soil conditions) PARTLY CLDY, CALM 35°

HN. #7109 719049 BKGRND 1.0ppm

Date / Time	Site	Depth	RAD ~~OVA~~	HNU	OXGEN	LEL	H_2S	Comments
11/13 10:28	T-5	1.5-2.5	0	1.0	21.2	0	0	ONLY ABLE TO PUSH TUBE
11/13 10:40	T-5	1.5-4.5	0	1.0	21.1	0	0	SAMPLE SLIPS OUT OF TUBE
11/13 11:10	O-15	2.0-5.0	0	1.0	21.1	0	0	6" TOPSOIL & ~ 1.0' OF WHITE COVER
11/13 11:30	O-15	2.0-5.0	0	0.2	21.1	0	0	SWITCH HNU BGRND 0.2 TUBE MAY CONTAIN WASTE
11/13 11:55	K-14	1.5-4.5	0	1.0	21.1	0	0	SOIL 0-4", WHITE 4'-±3.0 BELOW 3' POTENTIAL WASTE
11/13 12:08	K-14D	1.5-4.5	0	1.0	21.1	0	0	" "
11/13 14:09	D-24	1.0-4.0	0	1.0	21.2	0	0	SOIL 0-3", CALCIUM SULFATE 3"-1.0' WASTE 1.0 ↓

Additional Notes:

Signature [signature] Date Nov. 13, 1996

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 14

DATE: May 1, 1991

TO: Vanessa Harris, Site Manager

CC: Marcia Kuehl, RI Lead
Roman Gau, Project Manager
Mike Crosser, TSQAM

FROM: Anya Kirykowicz
Dave Richardson

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Himco Dump RI/FS
Donohue Project No. 20026.024

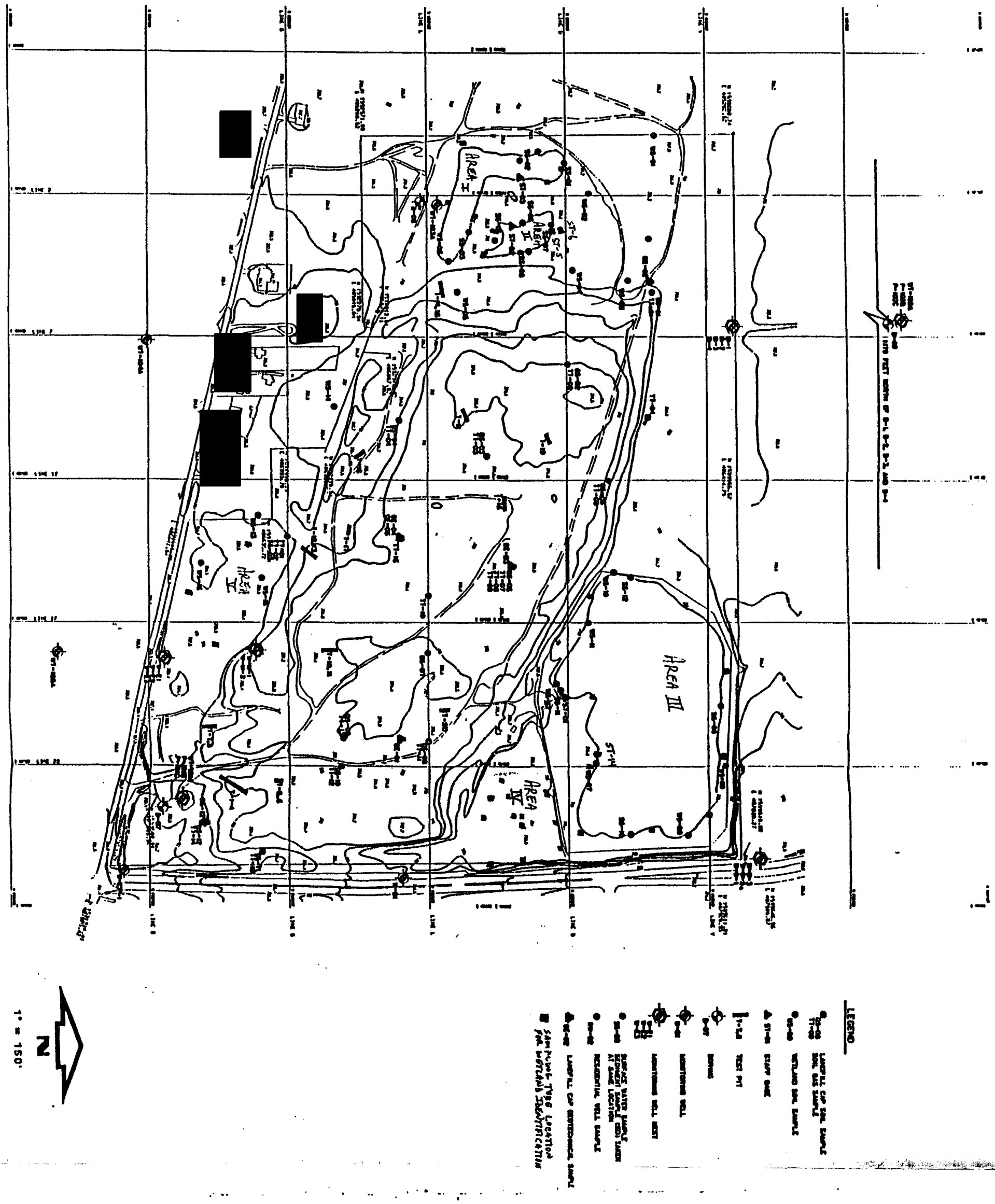
WETLANDS ASSESSMENT AND IDENTIFICATION

Introduction

On October 22, 23, and 24, 1990 Donohue & Associates, Inc. conducted an on-site wetlands assessment and identification at the Himco Dump Superfund Site as part of the RI Work Plan. The delineation was conducted by Dave Richardson and Anya Kirykowicz. Three suspected wetland areas were designated as Northwest Wetland Area, Wetland Remnant, and Gravel Pit Wetland Area. The location of these areas is presented in Figure 1.

Methods

As outlined in Section 4.6.1 of the Final Field Sampling Plan, Himco Dump RI/FS Elkhart, Indiana, three essential characteristics were used to identify wetland areas. These characteristics are: hydric soils, wetland hydrology, and hydrophytic vegetation. These characteristics and their technical criteria are described below. The approximate boundaries between wetland and upland areas were identified using methods prescribed in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" (Federal Interagency Committee for Wetland Delineation, 1989). The Disturbed Area Wetland Determination Method was used, with the hydrophytic vegetation assessment taking the lead. Sampling tube cores were used to examine the soil profile for hydric soils and wetland hydrology. An assessment of hydrophytic vegetation was made at each sampling tube core. The following equipment was used: soil sampling tube, dead blow hammer, site map, field notebook, Munsell Soil Color Charts, flagging tape, wooden lathe, camera, plastic bags, field guides for plant identification, USGS topographic map, Hydric Soils of the United States List, and an aerial photograph.



MAY 1991

FIGURE 1
SITE LOCATION MAP
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20026

Donohue ENGINEERS ARCHITECTS SCIENTISTS

Wetland Hydrology

Wetland hydrology is defined as permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil. The wetland hydrology criterion is met if a site is inundated or saturated to within 1.5 feet below the surface, based on the soil drainage characteristics, for at least one consecutive week during the growing season in an average rainfall year (Federal Interagency Committee for Wetland Delineation, 1989). This criterion is the least exact and the most difficult to assess in the field.

Hydric Soil

Hydric soils are defined as soils that are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part (U.S.D.A. Soil Conservation Service, 1987). An area has hydric soils when the National Technical Committee for Hydric Soils criteria are met. These criteria relate to soil types, soil drainage characteristics, water table levels and frequency of flooding or ponding.

Hydrophytic Vegetation

Hydrophytic, or wetland, vegetation is defined as macrophytic plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content (Federal Interagency Committee for Wetland Delineation, 1989). The U.S. Fish and Wildlife Service publishes a list of plant species that occur in wetlands by region. Each species in the list is given an indicator status reflecting the range of estimated probability that it may occur in a wetland versus non-wetland area across its entire distribution. These indicator categories are listed below:

- Obligate Wetland (OBL). Occur almost always (estimated probability >99%) under natural conditions in wetlands.
- Facultative Wetland (FACW). Usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
- Facultative (FAC). Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
- Facultative Upland (FACU). Usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability (1%-33%).
- Obligate Upland (UPL). Occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in non-wetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the National List.

The hydrophytic vegetation criterion for wetland identification is met when more than 50 percent of the dominant species at a given site are obligate, facultative wetland or facultative species.

Deviations

The three suspected wetland areas were renamed in the field. The Northwest Wetland Area was divided into Area I and Area II. The Gravel Pit Wetland was designated Area III. The Wetland Remnant was designated Area V. An area immediately south of the gravel pit was designated Area IV. This area was added to the field investigation based on visual observations. The study areas are shown on Figure 1.

Summary of Results

Sampling tube cores were used to examine the soil profile for hydric soils and wetland hydrology. A total of thirty-nine sites were chosen for soil sampling, representing the various conditions on the site. The vegetation was sampled at these 39 sites. Some of the plant species were not identified in the field but were collected , tagged, and identified off-site. Field work was conducted in late autumn, making identification difficult. The locations for the 39 sites are shown on Figure 1.

The only area identified as a wetland was Area IV. All of the other locations were non-wetland based on existing normal conditions or due to fill materials that were placed in close proximity to open water.

Hydrophytic vegetation identified in these wetland areas included: Typha angustifolia (Narrow-leaf Cattail-OBL), Carex sp. (Sedge sp.), Equisetum hyemale (Rough Horesetail-FACW), Solidago gigantea (Giant Goldenrod-FACW), Salix sp. (Willow sp.), Aster novae-angliae (New England Aster-FACW), and other Solidago sp. and Aster sp.

AK:llw

A/R/HIMCO/AB9

TECHNICAL MEMORANDUM - NO 15

ORIGINAL

DATE: January 25, 1991

TO: Vanessa Harris - Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Tom Puchalski
Anya Kirykowicz

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump RI/FS

WETLAND SOIL SAMPLING

Introduction

Sixteen soil samples were collected from three suspected wetland areas at the Himco Dump Site on October 21, 22, 23, and November 7, 1990; six from the Northwest Wetland Area, four from the Wetland Remnant, and six from the Gravel Pit Wetland Area (Figure 1). These soil samples were collected to investigate for possible soil contamination associated within these possible wetland areas. Sampling locations were selected to include what were suspected to be areas of most likely contamination. These areas included suspected wetland areas receiving drainage from the landfill cover as determined by aerial photography and field observations, and areas of apparent stressed vegetation. Soil samples were composited at each location from 0 to 18 inches or shallower where the auger met with refusal. Wetland soil sampling for chemical analysis was performed by Eric Slusser and Tom Puchalski of Donohue & Associates, Inc.

Methods

Section 4.6.4 of the Final Field Sampling Plan, Himco Dump RI/FS, Elkhart, Indiana, describes the wetlands soil sampling procedures. A hand auger was used to collect the sample at each location. After gathering soil to the required 18-inch depth, grab samples were retrieved from the sample bowl and put in 4-oz. glass jars for volatile analysis. These jars were filled with no head space remaining. The remaining soil was classified (USCS), the color identified using a Munsell Color Chart, and examined for obvious signs of contamination. This information was recorded on a soils data form (Appendix A). A stainless steel spoon was used to stir the remaining soil until a homogeneous mixture was obtained. The mixture was divided into four equal size quadrants. Portions were taken from each of the four quadrants to fill the remaining sample jars.

The hand auger, mixing spoon, and composite bowl were decontaminated between sampling points using an alconox and tap water wash, a tap water rinse, an isopropanol rinse, and two deionized or distilled water rinses. Isopropanol rinses were captured in a 5-gallon bucket and covered for eventual discharge into the on-site frac tank. A photograph was taken of each wetland soil sampling location.

Deviations

The sixteen sampling locations were selected prior to the wetland assessment and identification. Only one of the locations designated as a wetland sample (WS-#) was from a wetland location. WS-07 was located near ST-14 (sampling tube-14) of the wetland identification procedures. ST-14 met all three of the wetland criteria - hydric soil, hydrology and hydrophytic vegetation.

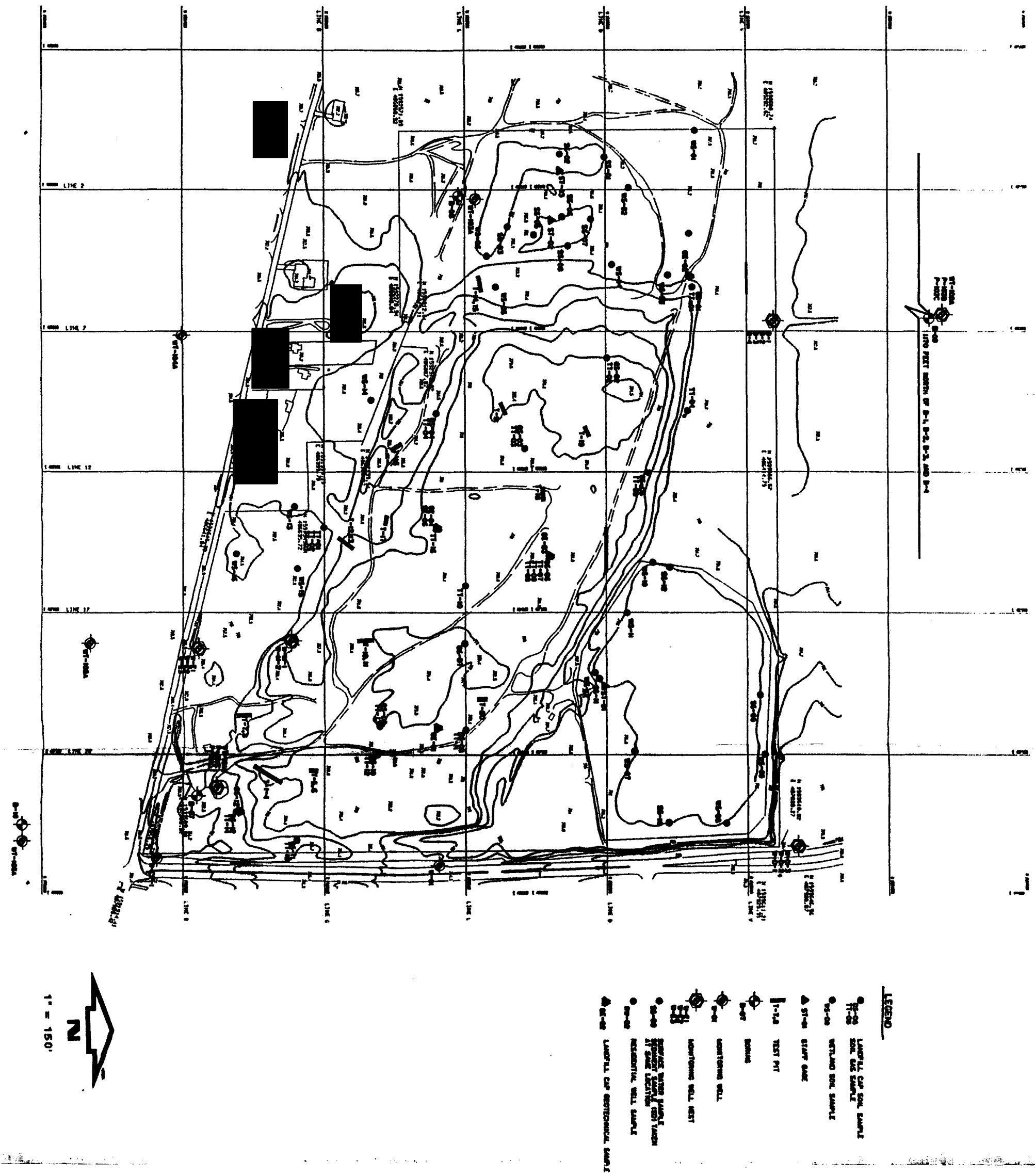
A stainless steel hand auger was used to collect the soil sample rather than a sampling tube as was described in the sampling plan. Besides being more labor intensive, a sampling tube does not collect sufficient soil volume to fill the required sample jars. Several pushes of the tubes would have been required at each sampling location. With the hand auger, sufficient sample volume was collected with one run from 0 to 18 inches.

Summary of Results

Sixteen soil samples for chemical analysis were collected in suspected wetland areas. Sample locations are provided in Figure 1. Wetland Soil Data forms are provided in Appendix A. A summary of wetland soil sampling locations, suspected wetland area, and materials encountered is provided in Appendix B.

TP:AK:ds

A/R/HIMCO/AB3



MAY 1991

FIGURE 1
SITE LOCATION MAP
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20026

Donohue ENGINEERS ARCHITECTS SCIENTISTS

APPENDIX A

SOILS DATA FORMS

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Northwest Bermr

Soil Subsample WS-1

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/21/90

TIME 1625

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: North end of Norwest wetland remnant, in grassy area.

DESCRIPTION OF SUBSAMPLE: 10YR 4/1 Dark grey silty sand (SM), loose coh, moist

ANY OTHER CHARACTERISTICS OF NOTE: 1" of moss at surface, roots to 3"

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Northwest Remn

Soil Subsample WS-2

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/2/90

TIME 1645

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: South end of Northwest Remnant in prairie.

DESCRIPTION OF SUBSAMPLE: 10YR 6/1 Light grey silty sand (SM) low cohesion, moist

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Northwest Ram
Soil Subsample WS-03

Engineers & Architects & Scientists **Site** Hinco Dump **Project No.** 20026.02

DATE 10/22/90

TIME 857

COLLECTOR ERIC SLUSSER
DOROTHEA DOWNS
TOM PUCHALSKI

SAMPLE DEPTH 0-6"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Low area 40 yards south of tree line & 50 yards west of landfill filled & capped area.

DESCRIPTION OF SUBSAMPLE: 10 YR 3/1 Very dark grey, Silty Sand (SM) fine grained 60% sand 40% silt, moist, low coh, roots.

ANY OTHER CHARACTERISTICS OF NOTE: Refusal at gravel layer 6" below surface.

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Northwest Rem

Soil Subsample WS-04

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/22/90

TIME 9:40

COLLECTOR Eric Slusser
Dorothea Downs

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: ~~Flat~~ low area 30 ~~yds~~ yards ~~south~~ east ~~west~~ of tree line and 60 yards west of landfill filled and capped area.

DESCRIPTION OF SUBSAMPLE: 7.5 YR 5/4 Brown silty sand 0-10" (SM) fine grained. 65% sand 35% silt moist, low coh roots upper 0.5' 10-18" grey 7.5 YR 5/0 Grey silty sand (SM) fine grained 65% sand, 35% silt low coh, moist - sat H_2S smell

ANY OTHER CHARACTERISTICS OF NOTE: H_2S smell in grey silty sand

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Northwest Rem

Soil Subsample WS-05

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/22/93

TIME 10:16

COLLECTOR Eric Slusser
Dorothea Downs

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: ~~Flat~~ low area in 40 yard east of pond 50 yards west of landfill filled and capped Grass ~~horse~~ ~~horsetails~~ cattails present

DESCRIPTION OF SUBSAMPLE: 0-12" 7.5 YR 5/4 Brown silty sand (SM) fine grain 65% sand 35% silt moist low coh roots tapes 2-3" 12-18 10 YR 3/0 V. Dark Gray silty sand (SM) 65% sand 35% silt. wet low coh

ANY OTHER CHARACTERISTICS OF NOTE: H_2S smell from V. Dark Gray silty sand ~~reflected~~ reflect between 19-20"

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Northwest Ramp
Soil Subsample WS-06

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/23/90
TIME 825
COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-12"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: East shore of L shaped pond at southeast end of pond at midpoint, 6" from water edge.

DESCRIPTION OF SUBSAMPLE: 10 5YR 5/4 Yellowish Brown, fine grained silty sand (SM).

ANY OTHER CHARACTERISTICS OF NOTE:

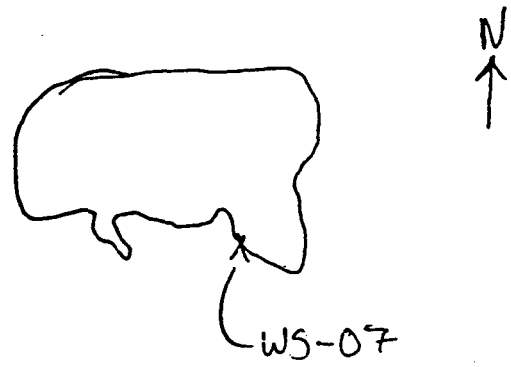
SHEET 1 OF 1

Donohue **Soils Data Form**

Soil Sample Area Quarry
Soil Subsample WS-07

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.02

DATE 10/21/90
TIME 955 AM
COLLECTOR TOM PUCHALSKI
ERIC SLUSSER



SAMPLE DEPTH 0-14"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Southeast corner of quarry pond in 4" of clear water in cattails

DESCRIPTION OF SUBSAMPLE: 5Y, 3/1 Very dark grey fine grained silty sand (SM), any gravel, trace small shells.

ANY OTHER CHARACTERISTICS OF NOTE: Slight H_2S odor

SHEET 1 OF 1

Donohue **Soils Data Form**

Soil Sample Area Quarry
Soil Subsample WS-08

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/21/90

TIME 1051 AM

COLLECTOR JON PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Northeast corner of quarry pond in 8" of clear water in cattail area.

DESCRIPTION OF SUBSAMPLE: 5Y 3/1 Very dark grey fine grained silty sand (SM), angular grains, trace of small shells

ANY OTHER CHARACTERISTICS OF NOTE: H_2S odor.

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Quarry
Soil Subsample WS-09

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.02

DATE 10/21/90

TIME 1122 AM

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: On north shore of quarry 5 feet north of water edge in horse tails 0-4" gravel ≈ 1/4-1/2" & sand grading to gravelly sand 4"-18".

DESCRIPTION OF SUBSAMPLE: 10YR 5/3 Brown ~~sandy~~ gravelly sand (SW) 20% 1/8" shaney gvl, sand-angular fn to md grained

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Quarry

Soil Subsample WS-10

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/21/90

TIME 1412 PM

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Middle of west bank in 8" water. Edge of cattails. 1 foot off shore

DESCRIPTION OF SUBSAMPLE: ~~SP~~ SP 10YR 5/3 Brown fine grained sand (SP)

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** Quarry

Soil Subsample WS-11 & Dup

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.00

DATE 10/21/90

TIME 1438

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: South shore of quarry 70 yards east of west shore 1' off shore.

DESCRIPTION OF SUBSAMPLE: 10YR 5/3 Brown mixed with 5Y 3/1 very dark grey fineograined sand-silty (SM) with trace 1/2" shrd gvl

ANY OTHER CHARACTERISTICS OF NOTE: H_2S odor in grey areas. Roots intertwinning to form a cluster at surface to 3".

SHEET 1 OF 1

Donohue **Soils Data Form**

Soil Sample Area Quarry
Soil Subsample WS-12

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.003

DATE 10/21/90
TIME 1550
COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: South shore of quarry towards south edge of bay at base of steep bank in 6" of water.

DESCRIPTION OF SUBSAMPLE: Multi-colored gravel ≈ 1/2" subang. 10% fine sand

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** South Wetland Rec

Soil Subsample WS-13

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.02

DATE 10/23/90

TIME 1355

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-18"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: Southwest corner of wetland remnant near Klein property, 100' north in grassy area

DESCRIPTION OF SUBSAMPLE: 10 YR 3/2 Very Dark Grayish Brown Silty Sand (SM) 30% silt 70% fine grained angular sand, roots to 3" low org, moist, grass at surface

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** South Wetland Form
Soil Subsample WS-14

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.073

DATE 10/23/90
TIME 1418
COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-8" - Refusal at gravel layer

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: West edge of south wetland remnant 15 yards south of old rail road grade in low grassy area.

DESCRIPTION OF SUBSAMPLE: 10YR 4/4 Dark Yellowish Brown silty sand (SM) 70% fine grained angular sand 30% silt, low cohesion, moist

ANY OTHER CHARACTERISTICS OF NOTE:

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** South Hillside Remn

Soil Subsample WS-15

Engineers & Architects & Scientists **Site** Hinco Dump **Project No.** 20026-02

DATE 10/23/96

TIME 1431

COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-6" - Refusal at gravel layer 2" strong

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: 40 yards south of old railroad grade in open grassy area near east edge of remnant - 100 yards ~~four~~ set west of east border

DESCRIPTION OF SUBSAMPLE: 10YR 3/2 Very Dark Grayish Brown silty sand (SM) 70% fn grn ang sand, 30% silt, low coh, moist

ANY OTHER CHARACTERISTICS OF NOTE: Methane odor in air

SHEET 1 OF 1

Donohue **Soils Data Form** **Soil Sample Area** South Wetland Ro
Soil Subsample WS-16

Engineers & Architects & Scientists **Site** Himco Dump **Project No.** 20026.023

DATE 10/23/90
TIME ~~2~~ 1455
COLLECTOR TOM PUCHALSKI
ERIC SLUSSER

SAMPLE DEPTH 0-8"

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: 40 yards north of road in brushy grassy area of southeast portion of southeast wetland remnant.

DESCRIPTION OF SUBSAMPLE: 10 YR 3/1 Very dark grayish brown silty sand (SM) 70% fn grn gray sand, 30% silt, low cohy moist, roots to 2".

ANY OTHER CHARACTERISTICS OF NOTE:

APPENDIX B

APPENDIX B

WETLAND SOIL SAMPLE NUMBER	SUSPECTED WETLAND AREA LOCATION	SAMPLE CHARACTERISTICS
01	*	Dark grey silty sand. Moss at surface, roots to 3".
02	*	Light grey silty sand
03	*	Very dark grey silty sand. Refusal at gravel layer (6" below surface).
04	*	Grey silty sand; H_2S odor.
05	*	Dark grey silty sand; H_2S odor (refusal at 20").
06	I	Yellowish brown silty sand.
07	III	Very dark grey silty sand. Trace small shells; H_2S odor.
08	III	Very dark grey silty sand. Trace small shells; H_2S odor.
09	III	Brown gravelly sand.
10	III	brown fine grained sand.
11	III	Brown mixed with very dark grey silty sand H_2S odor in grey areas.
12	III	Multi-colored gravel and fine sand.
13	V	Very dark greyish brown silty sand.
14	*	Dark yellowish brown silty sand.
15	V	Very dark greyish brown silty sand.
16	V	Very dark greyish brown silty sand.

* Located outside of suspected wetland area

A/R/HIMCO/AB3

ORIGINAL

TECHNICAL MEMORANDUM NUMBER 16

DATE: May 1, 1991

TO: Vanessa Harris, Site Manager

CC: Marcia Kuehl - RI Lead
Roman Gau - Project Manager
Mike Crosser - TSQAM

FROM: Anya Kirykowicz

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Donohue Project No. 20026.024
Himco Dump RI/FS

WATER LEVEL MEASUREMENTS

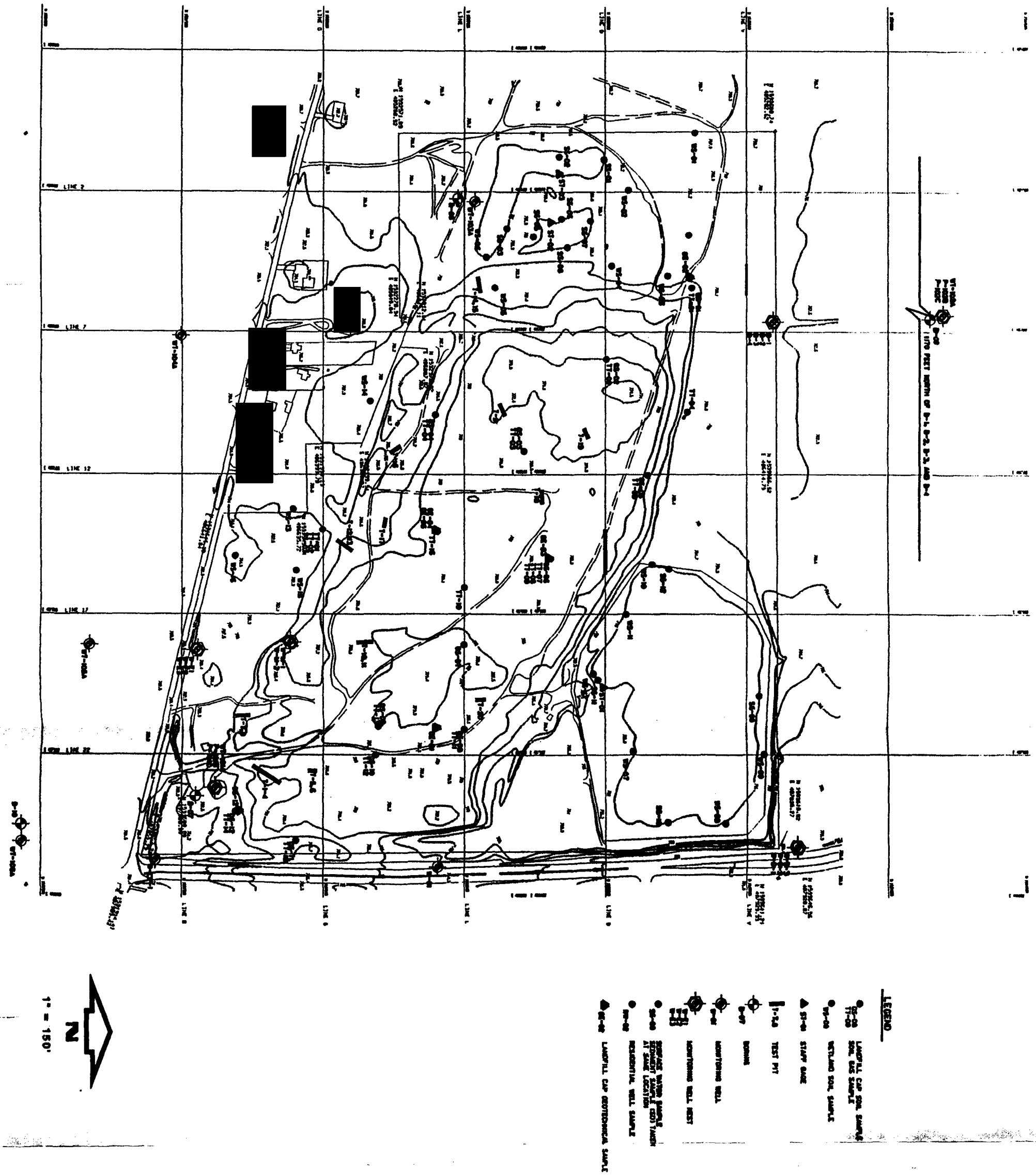
Introduction

Water level and well depth measurements were taken at the Himco Dump Site on November 6, 1990, February 1, 1991 and February 2, 1991. Static water levels were measured and recorded to determine groundwater flow directions and gradients at the site (water table elevations map). Water level and well depth measurements were also taken after installation of new wells, before and after well development and during scheduled groundwater sampling. Information concerning those measurements may be found in the respective technical memorandums. Water level and well depth measurements were conducted by Rob Cannestra, Anya Kirykowicz and Tracey Koach of Donohue & Associates, Inc. Well locations are shown in Figure 1.

Methods

Section 4.2.3.3 and Section 4.2.3.4 of the Final Field Sampling Plan, Himco Dump RI/FS, Elkhart, Indiana, described water level, well depth measurements and decontamination procedures. The water level surface was measured using poppers and electronic water level indicators. Each well had a reference point on top of the PVC well casing, from which water level measurements were taken. Measurements were noted to the nearest 0.01 feet. Each well was surveyed with respect to mean sea level elevation with an accuracy of 0.01 feet. Water level, well depth and staff gauge measurements were made within a 24-hour period.

The poppers and electric water level indicators were decontaminated between wells using an Alconox soap and tap water wash, tap water rinse, isopropanol rinse and two deionized or distilled water rinses. The isopropanol rinses were captured in a 5-gallon bucket and covered for discharge into the on-site frac tank.



MAY 1991

FIGURE 1
SITE LOCATION MAP
(TECHNICAL MEMO)

HIMCO DUMP
SUPERFUND SITE
ELKHART, INDIANA

20026

Donohue ENGINEERS ARCHITECTS SCIENTISTS

APPENDIX A

WATER LEVEL MEASUREMENT AND ELEVATIONS

Deviations

Distilled water rinses were used during decontamination procedures in addition to deionized water.

Summary of Results

Water level measurement forms are attached in Appendix A.

AK:lh

A/R/HIMCO/AC0

DONOHUE

WATER ELEVATION

PROJECT NO: 20026. SITE: HIMCO DUMP - INITIAL WELL INVENTORY

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY: LOCKED	CAPPED	CRACKED	OBSTRUCT	COMMENTS
E-1	721.11	[illegible]		81.38	X	X			11/6/90 [illegible]
E-2		11.32'		[illegible]		X			[illegible] NO PROTECTIVE
E-3		12.99'		[illegible]	X	X			[illegible]
B-1		9.64'		[illegible]		X			11/6/90 NOT [illegible]
B-4		7.55'		175.12'	X	X			11/6/90 NO [illegible] EXIST
B-3		7.34'		130.23	X	X			11/6/90 NO [illegible]
B-2		7.04'		12.91'		X			11/6/90 NO [illegible] 2" ID
B-1		7.38'			X	X			11/6/90 NO PROTECTIVE [illegible]
CP-1	UNABLE TO OPEN					X			11/6/90 NO [illegible]
M-1		[illegible]		103.34'		X			11/6/90 [illegible]
M-2		[illegible]		[illegible]		X			11/6/90 [illegible] VENT PLUGGED
L-1		12.58		62.53	X	X			11/6/90 NO PROTECTIVE CASING, VENTED 5" ID, SILTY
L-2		10.46		186.0	X	X			11/6/90 NO PROTECTIVE CASING VENTED 5" ID, SILTY
L-4		11.73		19.91		X			11/6/90 NO PROTECTIVE CASING, CAP IS PLUGGED 2" ID NO LOCKING CAP
I-3		9.28		22.20	X	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID CASING
I-1		10.67		172.82	X	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID CASING
I-2		0.05		15.64	NO	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 2" PVC
Q-1		5.87		23.69	NO	X			11/6/90 UNLOCKED FLUSH MOUNT WELL BOX NEXT TO LYSIMETER, ACROSS FROM PAIN[illegible]
J-1		11.65		42.70	X	X	X		11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID PVC
D-3		22.18		153.62	X	X			" "
J-2		9.76		17.90	NO	X			11/6/90 UNLOCKED, 5" ID PVC WELL VENTED CAP
F-2		17.06		147.85	X	X			11/6/90 NO PROTECTIVE CASING, VENTED CAP 5" ID PVC
F-3		20.34		180.20	X	X			" " [illegible]
F-1		[illegible]		31.25	NO	X			[illegible] NO PROTECTOR, [illegible]
C-N		13.75		46.27	X	X			11/6/90 NO PROTECTOR, VENTED CAP 5" ID PVC CASING
G-3		27.69		—	X	X			" " " UNABLE TO LOCATE TOTAL DEPTH
P-1		8.90		25.24	NO	NO			11/6/90 FLUSH MOUNT WELL BOX, WELL 2" ID AT AN ANGLE
O-1		10.19		29.77	X	X			11/6/90 FLUSH MOUNT WELL BOX WELL 2" ID PVC

DESCRIPTION OF SITE _____

SOIL CONDITIONS _____

WEATHER _____ TEMPERATURE _____

ENTERED ON COMPUTER ___ SIGNATURE _____ DATE _____

DONOHUE

WATER ELEVATION

PROJECT NO. 20026 SITE Himco Dump

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY				COMMENTS
					LOCKED	CAPPED	CRACKED	OBSTRUCT	
P102B	768.83	9.85	758.98	67.25	X	X			0911 2/2/91
P102C	769.25	10.27	758.98	159.96	X	X			0845 2/2/91
Staff 01	756.87								
Staff 02	756.98								
Staff 03	756.79								

DESCRIPTION OF SITE

SOIL CONDITIONS

WEATHER TEMPERATURE

ENTERED ON COMPUTER SIGNATURE DATE

DONOHUE

WATER ELEVATION

Feb. 1, 1991

PROJECT NO. 20026 SITE Himco Dump

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY LOCKED	CAPPED	CRACKED	OBSTRUCT	COMMENTS
B-1		6.25			X	X			1052 No protective casing
B-2		6.15		13.88		X			1055
B-3		7.44		130.34	X	X			1059
B-4		6.45		175.16	X	X			1110
CP-1		3.82		20.19		X			1013 2/2/91 No Protective casing
E-2		9.82		16.54		X			1612
E-3		11.11		175.65	X	X			1614
F-1		7.67		31.28		X			1755
F-2		14.08		147.83	X	X			1438
F-3		16.98			X	X			1453
G-1		12.48		52.02	X	X			1413
G-3		22.08		169.89	X	X			1424
I-1		9.48		172.92	X	X			1540
I-2		8.78		15.67		X			1544
I-3		9.14		32.15	X	X			1872
J-1		12.03		42.64	X	X			1514
J-2		10.29		17.81		X	X		1524 ~~2/2/91~~ 2/2/91
J-3		18.63		153.39	X	X			1520
M-1		15.61		103.24		X			1045 2/2/91
M-2		14.84		24.76		X			1050
N-1		8.81		29.22		X			0947 Flush
O-1		5.0		23.47		X			1820
O-1		8.34		29.97		X			0931
WT101A		9.96		18.70	X	X			1145
P101B		9.89		100.47	X	X			1152
P101C		9.78		166.53	X	X			1159
WT106A		7.87		18.50	X	X			1558
WT105A		9.0		18.56	X	X			1625
WT104A		8.02		18.69	X	X			1635
WT103A		5.28		18.47	X	X			1001 2/2/91
WT102A		10.17		18.18	X	X			0851 2/2/91

DESCRIPTION OF SITE F1 1647 DTW = 11.38 MTR = 71.75

SOIL CONDITIONS O-1: Flush w/ground water meter rever to side casing filling

WEATHER hiun, ice, water cap no screwed on TEMPERATURE

ENTERED ON COMPUTER ___ SIGNATURE ___ DATE ___

DONOHUE

WATER ELEVATION

PROJECT NO. 10026 SITE Hime Dump

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY				COMMENTS
					LOCKED	CAPPED	CRACKED	OBSTRUCT	
P10dA		9.85		67.25	X	X			0911 2/2/91
P10dC		10.27		159.96	X	X			0845 2/2/91
Staff01		—							Ice on Pond
Staff02		—							Ice on Pond
Staff03		—							Ice " "

DESCRIPTION OF SITE

SOIL CONDITIONS

WEATHER TEMPERATURE

ENTERED ON COMPUTER SIGNATURE DATE

TECHNICAL MEMORANDUM - NO. 17

ORIGINAL

DATE: November 1, 1991

TO: Vanessa Harris, Site Manager

CC: Mansour Ghiasi, RI Lead
Roman Gau, Project Manager
Mike Crosser, TSQAM

FROM: Anya Kirykowicz

SUBJECT: EPA ARCS Region V Contract No. 68-W8-0093
EPA Work Assignment No. 17-5L4J
Himco Dump RI/FS
Donohue Project No. 20026.024

HEALTH AND SAFETY

Introduction

Donohue & Associates, Inc., conducted field work from October 1990 to January 1991 and from September 1991 to October 1991 at the Himco Dump Superfund site in accordance with the Final Field Sampling Plan, Himco Dump RI/FS, Elkhart, Indiana - 1990 and the Addendum I, Phase II Work Plan, Himco Dump Remedial Investigation/ Feasibility Study - August 1991, respectively. Personnel entering the site followed the protocols established in the Health and Safety Plan, Himco Dump Remedial Investigation/Feasibility Study, Elkhart, Indiana, Final July 1990 (HASP, 1990) and the Final Addendum I Health and Safety Plan, Himco Dump Remedial Investigation/Feasibility Study, Phase II, Elkhart, Indiana - August 1991 (Addendum I, 1991).

Methods

As outlined in Section 1.0 of the HASP, 1990, the plan was prepared in accordance with the ARCS V Program Health and Safety Guideline HAS-1 and the regulatory requirement of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response." The HASP, 1990 was implemented during Phase I activities. The following tasks were completed during Phase I: sediment and surface water sampling, trenching, soil boring/monitoring well installation, soil sampling, staff gauge installation, waste mass gas sampling, wetland identification, monitoring well development, slug tests, groundwater sampling, survey, and geophysical survey.

During Phase II activities, the HASP, 1990 and Addendum I, 1991 were implemented. Tasks completed during Phase II were: trenching, soil boring/monitoring well installation, wetland delineation, soil sampling, groundwater sampling, leachate sampling, sediment and surface water sampling. Addendum I, 1991 addresses safe boating practices for the collection of sediment and surface water samples.

Deviations

There were no deviations from the HASP, 1990 and the Addendum I, 1991, except for reassignment of staff listed in the project organization.

Summary Results

The HASP, 1990 and Addendum I, 1991 were adhered to by staff from the following: Donohue and Associates, Inc.; John Mathes & Associates; Life Systems, Inc.; Lang, Feeney & Associates, Inc.; Engineering-Science, Inc.; STS Consultants, Ltd.; United States Environmental Protection Agency; and the Indiana Department of Environmental Management.

A/R/HIMCO/AH7